

GARMIN®

Embraer Prodigy® Touch Flight Deck 300 Pilot's Guide



Embraer Phenom 300

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This manual reflects the operation of System Software version 1633.A4 or later for the Prodigy® Touch Flight Deck 300. Some differences in operation may be observed when comparing the information in this manual to later software versions.

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-
- 

WARNING: *Navigation and terrain separation must NOT be predicated upon the use of the terrain avoidance feature. The terrain avoidance feature is NOT intended to be used as a primary reference for terrain avoidance and does not relieve the pilot from the responsibility of being aware of surroundings during flight. The terrain avoidance feature is only to be used as an aid for terrain avoidance. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.*

 - 

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

 - 

WARNING: *Do not use outdated database information. Databases used in the system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.*

 - 

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

 - 

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

 - 

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

 - 









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







 - 

WARNING: *The Prodigy® Touch Integrated Flight Deck 300, as installed in the Embraer Phenom 300 aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the system. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.*

 - 

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

-
-  **WARNING:** The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the system utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the system can be misused or misinterpreted and, therefore, become unsafe.
-
-  **WARNING:** To reduce the risk of unsafe operation, carefully review and understand all aspects of the Prodigy® Touch Pilot's Guide documentation and the Embraer Phenom 300 Airplane Flight Manual. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the system to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.
-
-  **WARNING:** The illustrations in this guide are only examples. Never use the system to attempt to penetrate a thunderstorm. Both the FAA Advisory Circular, Subject: Thunderstorms, and the Aeronautical Information Manual (AIM) recommend avoiding "by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."
-
-  **WARNING:** Lamp(s) inside this product may contain mercury (HG) and must be recycled or disposed of according to local, state, or federal laws. For more information, refer to our website at www.garmin.com/aboutGarmin/environment/disposal.jsp.
-
-  **WARNING:** Because of variation in the earth's magnetic field, operating the system within the following areas could result in loss of reliable attitude and heading indications. North of 72° North latitude at all longitudes. South of 70° South latitude at all longitudes. North of 65° North latitude between longitude 75° W and 120° W. (Northern Canada). North of 70° North latitude between longitude 70° W and 128° W. (Northern Canada). North of 70° North latitude between longitude 85° E and 114° E. (Northern Russia). South of 55° South latitude between longitude 120° E and 165° E. (Region south of Australia and New Zealand).
-
-  **WARNING:** Do not use GPS to navigate to any active waypoint identified as a 'NON WGS84 WPT' by a system message. 'NON WGS84 WPT' waypoints are derived from an unknown map reference datum that may be incompatible with the map reference datum used by GPS (known as WGS84) and may be positioned in error as displayed.
-
-  **CAUTION:** The PFD and MFD displays use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. **CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING.** It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.
-
-  **CAUTION:** The system does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and the pilot's authority to operate this device under FAA/FCC regulations.
-

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-  **NOTE:** All visual depictions contained within this document, including screen images of the panel and displays, are subject to change and may not reflect the most current system and databases. Depictions of equipment may differ slightly from the actual equipment.
-
-  **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:** This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.
-
-  **NOTE:** 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:** Operating the system in the vicinity of metal structures or electro magnetic fields can cause sensor differences that may result in large heading errors during start-up, shut down, or while taxiing. This may result in heading miscompare or no compare annunciations.
-
-  **NOTE:** Use of polarized eyewear may cause the flight displays to appear dim or blank.
-

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	B	March, 2013	Pages 62, 63	Added missing callout numbers on Figures 2-1 and 2-2.

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SECTION 1 SYSTEM OVERVIEW	
1.1 System Description	1
1.2 System Power-up	4
1.3 Prodigy® Touch Flight Deck 300 Controls	6
PFD Controls	6
Touchscreen Controller	13
1.4 System Operation	32
Normal Display Operation	32
Reversionary Display Operation	32
Touchscreen Controller Failure	36
AHRS Operation	36
GPS Receiver Operation	37
Annunciations	41
1.5 System Management	42
Avionics Settings	42
Crew Profiles	50
Avionics Status	52
SiriusXM Information	54
Screen Cleaning	54
1.6 Utilities	55
Timer	55
Trip Stats	56
1.7 Secure Digital Cards	59
SECTION 2 FLIGHT INSTRUMENTS	
2.1 Flight Instruments	64
Airspeed Indicator	64
Attitude Indicator	66
Altimeter	69
Vertical Speed Indicator (VSI)	71
Vertical Deviation	72
Horizontal Situation Indicator (HSI)	74
Course Deviation Indicator (CDI)	78
2.2 Garmin SVT™ (Synthetic Vision Technology)	85
SVT Operation	86
SVT Features	87
Field of View	96
2.3 Supplemental Flight Data	97
Temperature Displays	97
Wind Data	98
Vertical Navigation (VNAV) Indications	99
2.4 PFD Annunciations and Alerting Functions	100
Marker Beacon Annunciations	100
Traffic Annunciations	100
Terrain Annunciations	101
Altitude Alerting	101
Low Altitude Annunciation	102
Minimum Descent Altitude/Decision Height Alerting	102
Radar Altimeter	103
2.5 Abnormal Operations	105
Abnormal GPS Conditions	105
Unusual Attitudes	106
Garmin SVT Troubleshooting	107
SVT Unusual Attitudes	107
SECTION 3 ENGINE AND AIRFRAME SYSTEMS	
3.1 Engine Indication System (EIS)	111
Takeoff Data Set Window	112
Engine Indications	113
Fuel and Electrical Indications	115
Cabin Pressurization	116
Spoiler and Landing Gear	117
Flaps and Trim	118
3.2 Synoptics	119
System Status	120
Environmental Control System (ECS)	121
Electrical	123
Fuel	124
Ice Protection System	125
Engine Maintenance	127
3.3 Crew Alerting System (CAS)	128
CAS Message Prioritization	128
3.4 Abnormal Operations	129
Engine	129
Cabin pressurization	130
Flaps	131
Trim	131
SECTION 4 AUDIO AND CNS	
4.1 Overview	133
PFD COM/NAV display and Controls	133
Touchscreen Controller Audio and CNS Controls	134
4.2 COM Operation	136
COM Transceiver Selection and Activation	136
COM Frequency Tuning	139
Frequency Spacing	146
Automatic Squelch	147

Volume	148	Map Panning.....	198
HF COM Transceiver Selection and Activation	149	Topography.....	203
HF COM Volume	150	Map Symbols	206
4.3 NAV Operation.....	151	Airways	212
NAV Radio Selection and Activation	151	Track Vector	214
NAV Receiver Tuning	152	Wind Vector	215
Marker Beacon Receiver	158	Fuel Range Ring	216
ADF/DME Tuning	159	Field of View (SVT).....	217
4.4 Mode S Transponder	164	Selected Altitude Intercept Arc.....	218
TCAS II Transponder Controls.....	164	Obstacles.....	219
TCAS II Transponder Mode Selection.....	165	5.3 Waypoints.....	220
Entering a Transponder Code	166	Airports	221
IDENT Function	168	Intersections	227
Flight ID Reporting.....	168	NDBs.....	230
4.5 Additional Audio Functions.....	169	VORs.....	233
Mono/Stereo Headsets	169	User Waypoints	236
Speaker	169	5.4 Airspaces	244
Intercom	170	5.5 Direct-to-Navigation	248
Passenger Address (PA) System	176	5.6 Flight Planning.....	254
Clearance Recorder and Player.....	177	Flight Plan Creation	255
Simultaneous COM Operation.....	178	Adding Waypoints to an Existing Flight Plan.....	260
Entertainment Inputs	179	Adding Airways to a Flight Plan	264
4.6 Controller Pilot Data Link Communications (CPDLC).....	180	Adding Procedures to a Stored Flight Plan	266
Connecting to the CPDLC System	180	Flight Plan Storage	273
Creating a Message	183	Flight Plan Editing	275
Responding to an ATC Message	185	Along Track Offsets.....	278
Viewing CPDLC Message Dialogs	185	Parallel Track	279
Deleting Message Dialogs	186	Activating a Flight Plan Leg	282
Disconnecting from the CPDLC System	186	Inverting a Flight Plan	283
4.7 Abnormal Operation	187	Closest Point of FPL	285
Stuck Microphone.....	187	User-Defined Holding Patterns	286
COM Tuning Failure.....	187	5.7 Vertical Navigation	289
Emergency Mode.....	187	Altitude Constraints.....	293
Audio Controller Fail-Safe Operation	188	5.8 Procedures	296
<hr/>		Departures.....	296
SECTION 5 FLIGHT MANAGEMENT		Arrivals	298
5.1 Introduction	189	Approaches	300
Navigation Status Bar	191	5.9 Trip Planning	307
5.2 Using Map Displays.....	193	Weight and Fuel	307
Map Settings Sync.....	193	Trip Planning.....	312
Map Orientation.....	194	5.10 Navigating a Flight Plan.....	316
Map Range.....	196	5.11 Abnormal Operation.....	342

SECTION 6 HAZARD AVOIDANCE	
6.1 SiriusXM Weather	346
Activating Services.....	346
Accessing SiriusXM Weather Products	347
6.2 Airborne Color Weather Radar	373
System Description	373
Principles of Airborne Weather Radar.....	373
NEXRAD and Airborne Weather Radar	374
Antenna Beam Illumination	374
Safe Operating Distance.....	377
Basic Antenna Tilt Setup	378
Weather Mapping and Interpretation	380
Ground Mapping and Interpretation	394
Additional Radar Displays.....	395
System Status.....	397
6.3 TAWS-A	399
Displaying TAWS-A Information	400
TAWS Pane	403
System Status.....	417
TAWS-A Abnormal Operations	417
6.4 TCAS II Traffic	419
TCAS II Alerts	420
Displaying TCAS II Traffic	422
Operation	425
System Status.....	429
SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM	
Basic Autopilot Operation.....	432
7.1 AFCS Controls	433
7.2 Flight Director Operation	435
Activating the Flight Director	435
Flight Director Selection	436
AFCS Status Box.....	436
Command Bars.....	437
Flight Director Modes.....	438
7.3 Vertical Modes	439
Pitch Hold Mode (PIT)	440
Selected Altitude Capture Mode (ALTS).....	441
Altitude Hold Mode (ALT)	441
Vertical Speed Mode (VS)	443
Flight Level Change Mode (FLC).....	444
Vertical Navigation Modes (VPTH , ALTV).....	445
Glidepath Mode (GP)	450
Glideslope Mode (GS)	452
Takeoff (TO) and Go Around (GA) Modes	453
7.4 Lateral Modes	454
Roll Hold Mode (ROL)	455
Low Bank Mode	455
Heading Select Mode (HDG)	456
Navigation Modes (FMS, VOR, LOC, BC)	457
Approach Modes (FMS, VAPP, LOC).....	459
7.5 Autopilot and Yaw Damper Operation	461
Flight Control	461
Engaging the Autopilot and Yaw Damper	462
Control Wheel Steering	462
Disengaging the Autopilot and Yaw Damper.....	462
7.6 Example Procedures	464
Departure	464
Intercepting a VOR Radial.....	467
Flying a Flight Plan/FMS Course	468
Descent	469
Approach.....	473
Go Around/Missed Approach	476
7.7 AFCS Annunciations and Alerts	478
AFCS CAS Messages	478
AFCS Voice Alerts.....	478
Overspeed Protection.....	479
SECTION 8 ADDITIONAL FEATURES	
8.1 SafeTaxi	482
SafeTaxi Database Information	484
8.2 ChartView (Optional)	486
Chart Selection.....	487
Day/Night View	489
ChartView Database Information	491
8.3 FliteCharts	495
Chart Selection.....	496
Day/Night View	498
FliteCharts Cycle Number and Expiration Date.....	500
8.4 Airport Directory	503
Airport Directory Database Cycle Number & Revision... 504	
8.5 Satellite Telephone and Datalink Services	506
Registering With Connex	506
Contacts	507
Telephone Communication (Optional).....	510

Text Messaging (SMS) 518

WiFi Connections (Optional) 527

8.6 SiriusXM Satellite Radio (Optional) 530

 Activating SiriusXM Satellite Services 530

 Using SiriusXM Radio..... 532

8.7 Scheduled Messages..... 535

8.8 Electronic Documents 539

 Installed Documents 539

 User Documents 539

 Viewing Electronic Documents 540

8.9 Flight Data Logging 544

8.10 Checklists 546

8.11 Abnormal Operation 549

APPENDICES

Annunciations and Alerts 551

 Crew Alerting System (CAS) 551

 CAS Messages..... 552

 Comparator Annunciations 558

 Reversionary Sensor Annunciations 559

 Prodigy® Touch Flight Deck 300 System Annunciations . 560

 Prodigy® Touch Voice Alerts 562

 Pilot Profile Import/Export Messages 577

 TAWS-A ALERTS..... 577

 TCAS II Alerts and Annunciations 579

Database Management 581

 Jeppesen Databases..... 581

 Automatic Database Synchronization Feature..... 586

 Garmin Databases 587

Glossary..... 593

Frequently Asked Questions 599

Map Symbols 603

INDEX

Index I-1

SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the Embraer Prodigy® Touch Flight Deck 300 as installed in the Phenom 300 aircraft. The Embraer Prodigy® Touch Flight Deck 300 is an integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the flight crew using flat-panel color displays and Touchscreen Controllers. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1400W** (3) – Each GDU is configured as one of two Primary Flight Displays (PFDs) or one Multi-function Display (MFD). The GDU 1400W features a 14-inch light emitting diode (LED) backlit widescreen display with a 1280 x 800 resolution. The unit installed on the left/pilot side is designated as PFD1, and the one installed on the right/copilot side is designated as PFD2. The unit installed in the center is designated as the MFD. The displays communicate with each other, the Touchscreen Controllers, and with the on-side GIA 63W Integrated Avionics Unit (IAU) through a High-Speed Data Bus (HSDB) Ethernet connection.
- **GTC 570** (2) – The Touchscreen Controller provides MFD control, Multi-function Window (MFW) control on the PFD, in addition to FMS functions, data entry capability, and communications control to the system. The unit installed on the left/pilot side is designated as GTC1, and the one installed on the right/copilot side is designated as GTC2. Each touchscreen controller communicates with the on-side PFD in addition to the MFD using an HDSB connection.
- **GMA 36** (2) – The Remote Audio Unit integrates navigation/communication radio (NAV/COM) digital audio, intercom, and marker beacon audio. Each unit is connected to the on-side Touchscreen Controller using an HSDB interface and to the cross-side IAU using an RS-232 connection as a backup path. Each GMA 36 is also connected to the Cockpit Voice Recorder (CVR) using a digital/analog connection.
- **GIA 63W** (2) – The Integrated Avionics Units (IAU) function as the main communications hub, linking several LRUs with each on-side PFD. Each IAU contains a GPS Satellite-Based Augmentation System (SBAS) receiver, a very high frequency (VHF) communication/navigation/glideslope (COM/NAV/GS) receiver, a flight director (FD) and system integration microprocessors.
- **GEA 71** (3) – The Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicates with both IAUs using an RS-485 digital interface.
- **GSD 41** (2) – This unit is a data concentrator used to expand the input and output capabilities of the system. HSDB communications occur among Garmin LRUs. The ARINC 429 protocol connects non-Garmin LRUs as shown in Figure 1-1.
- **GRS 77** (2) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 protocol to the on-side and cross-side IAU, the on-side PFD, and to the MFD. An RS-232 backup path connects each AHRS to each IAU. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, with the ADC to obtain air data, and with both IAUs to obtain GPS information. AHRS operation is discussed in System Operation, later in this section.
- **GMU 44** (2) – The Magnetometer measures local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. The magnetometer receives power directly from the AHRS and communicates with it via an RS-485/422 and RS-232 digital interface.

- **GDR 66** (1) – The VHF Data Link Transceiver is a transceiver for sending and receiving Controller Pilot Data Link Communications (CPDLC) messages by using the Touchscreen Controllers. It also supports analog voice communications. It communicates with the #1 GSD 41 unit using an RS-485/422 interface.
- **GDL 69A** – The Satellite Data Link Radio Receiver receives weather information, as well as digital audio entertainment. The Data Link Receiver communicates with the #1 GSD, #2 GSD, and MFD via a HSDB connection. A subscription to SiriusXM Weather and/or SiriusXM Satellite Radio service is required to enable the GDL 69A capability.
- **GMC 715** – The AFCS Mode Controller provides AFCS control through an RS-232 digital interface. The unit is connected to PFD1 and the MFD.
- **GSA 80** (1) and **GSA 81** (3) – The GSA 80 Servo is used for automatic control of YAS-SAS. The GSA 81 Servos are used for automatic control of pitch, roll, and yaw. These units interface with each IAU using RS-482/422 connections.
- **GSM 86** (4) – The GSM 86 Servo Gearboxes are responsible for transferring the output torque of the servo actuators to the mechanical flight-control surface linkages.
- **GWX 70** (1) – Provides airborne weather and ground mapped radar data to the PFDs and to the MFD. The unit is connected to the #1 GSD via HSDB connection.
- **GDL 59** (1) – Provides a Wi-Fi datalink and System Data Logging capability. The unit is connected to the #2 GSD via HSDB, and to the optional GSR 56 Iridium Transceiver using an RS-232 bus and a digital/analog connection.
- **GSR 56** (1) – The Iridium Transceiver provides voice communications by means of a telephone handset in the cabin and pilot and copilot headsets in the cockpit. The transceiver can also send and receive short message service (SMS) text messages. The GSR 56 also receives data link weather products from the Garmin Connex weather service through the Iridium satellite network. The transceiver can also send and receive data provided by the GDL 59 through the RS-232 bus.

The Phenom 300 is also equipped with a GFC 700 Automated Flight Control System (AFCS), providing the flight director (FD), autopilot (AP), manual electric trim, and touch control steering (TCS) functions of the Prodigy® Touch Flight Deck 300 System.



NOTE: Refer to the *Automatic Flight Control System (AFCS) Section* for details on the *GFC 700 AFCS*.

Figure 1-1 shows interconnection of the LRUs.



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

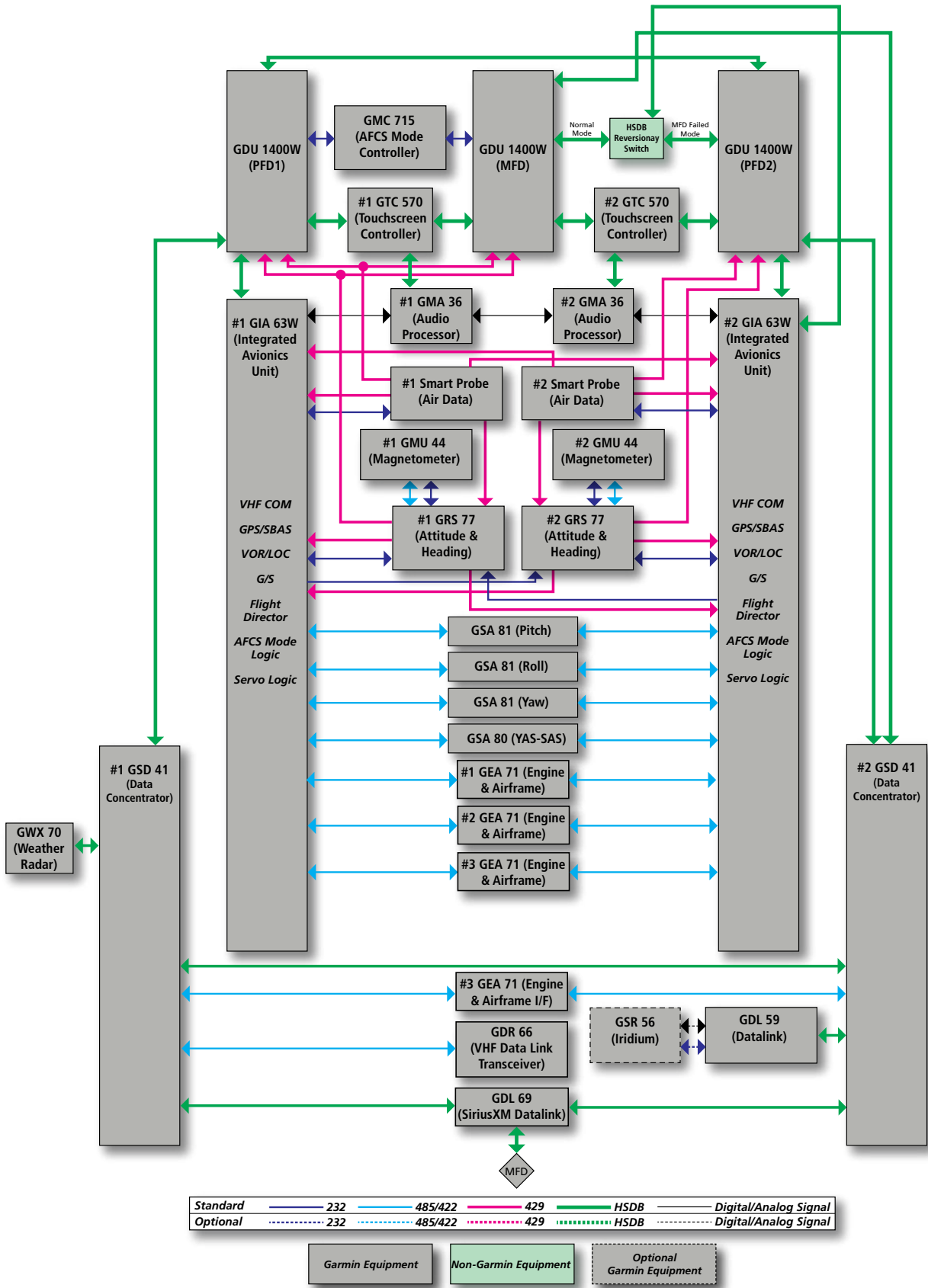


Figure 1-1 Basic System Block Diagram

1.2 SYSTEM POWER-UP



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



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

The Prodigy® Touch Flight Deck 300 is integrated with the aircraft electrical system and receives power directly from electrical busses. The PFDs, MFD, Touchscreen Controllers, and supporting sub-systems include both power-on and continuous built-in test features that exercise the processors, memory, external inputs, and outputs to provide safe operation.

During system power-up, the system displays test annunciations, as shown in Figure 1-2. All system annunciations should be extinguished typically within the first minute of power-up. Upon power-up, annunciator lights on the AFCS Controller illuminate momentarily.

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

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

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

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

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

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

Test Annunciation



Figure 1-2 PFD Power-Up



Figure 1-3 MFD Power-Up



Figure 1-4 Touchscreen Controller Home Screen

1.3 PRODIGY® TOUCH FLIGHT DECK 300 CONTROLS

The Prodigy® Touch Flight Deck 300 controls have been designed to simplify operation of the system and minimize workload and the time required to access sophisticated functionality. Controls are located on the PFD bezels, the Touchscreen Controllers, and the AFCS Controller. PFD controls and the Touchscreen Controllers are discussed in this section. AFCS controls are described in the AFCS section. See the Audio and CNS Section for more information about NAV/COM controls.

PFD CONTROLS



PFD Softkeys (Full Mode)



Display Pane does not use softkeys

PFD Softkeys (Split Mode)

Figure 1-5 PFD Softkeys in Full Mode and Split Mode

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

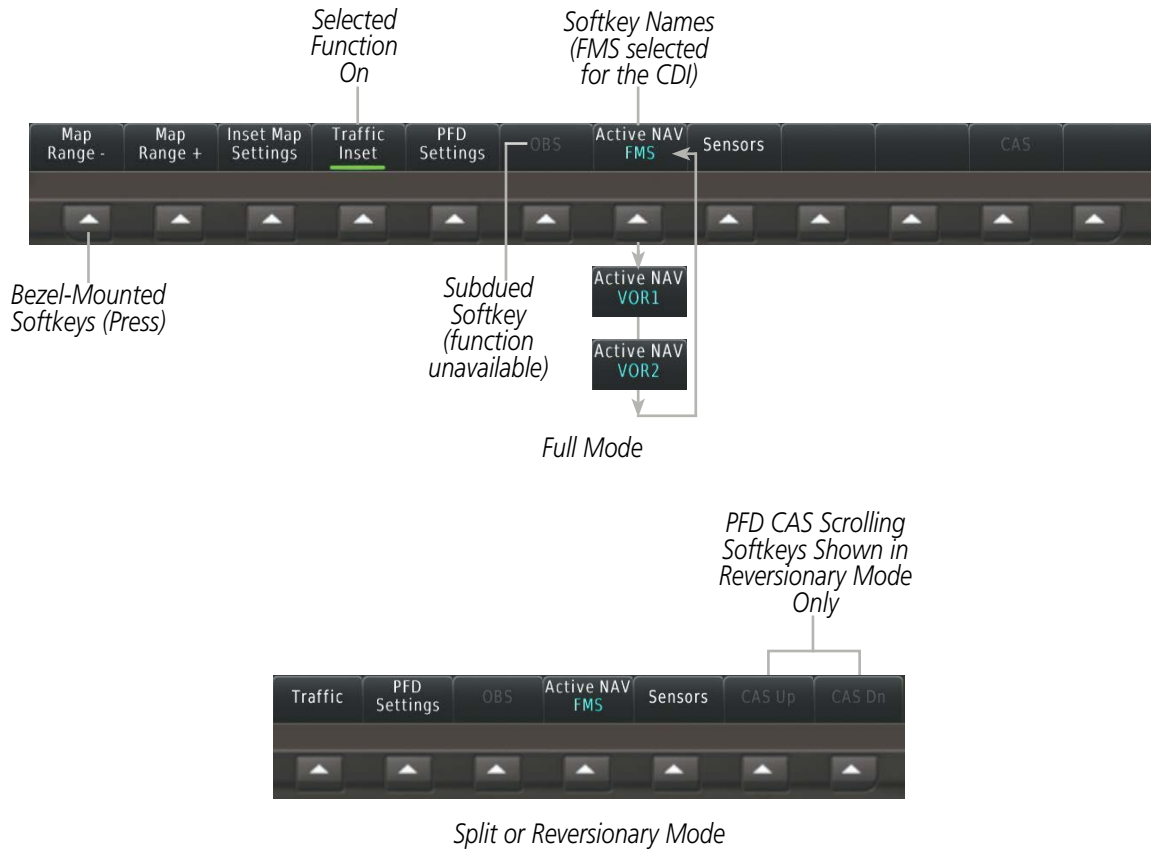


Figure 1-6 Top Level PFD Softkeys

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

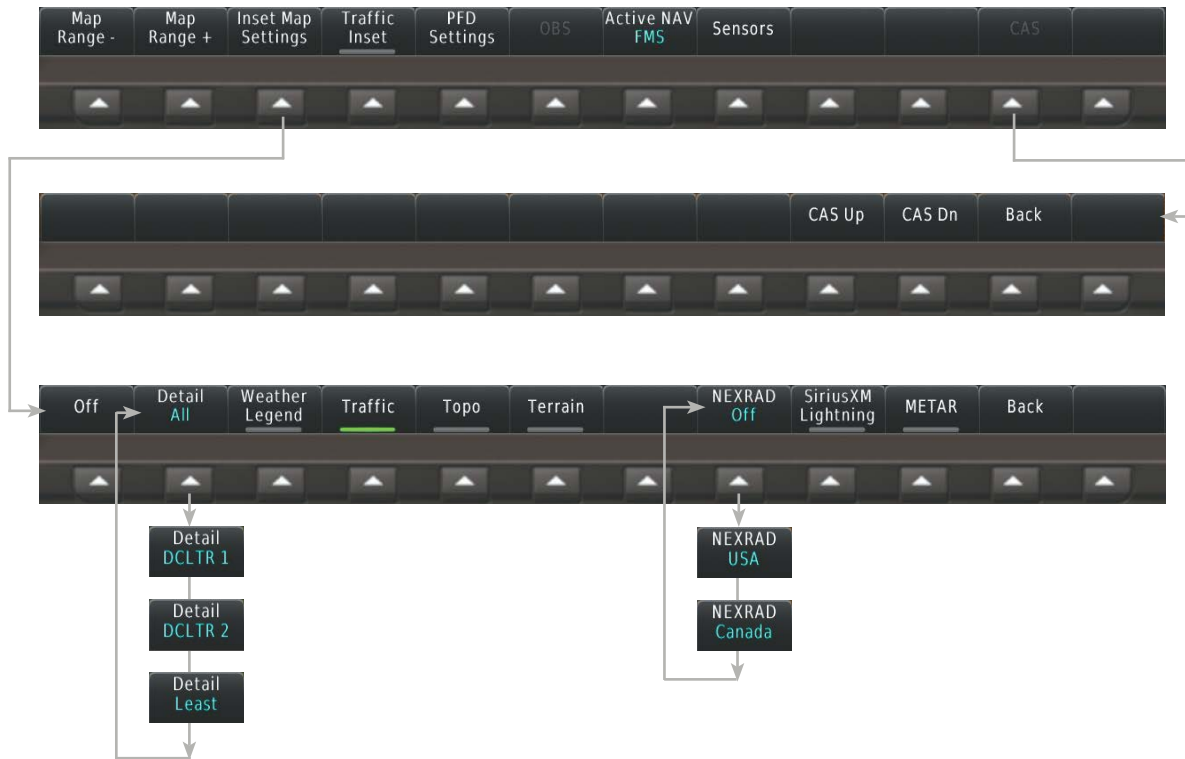


Figure 1-7 Inset Map Settings and CAS Softkeys

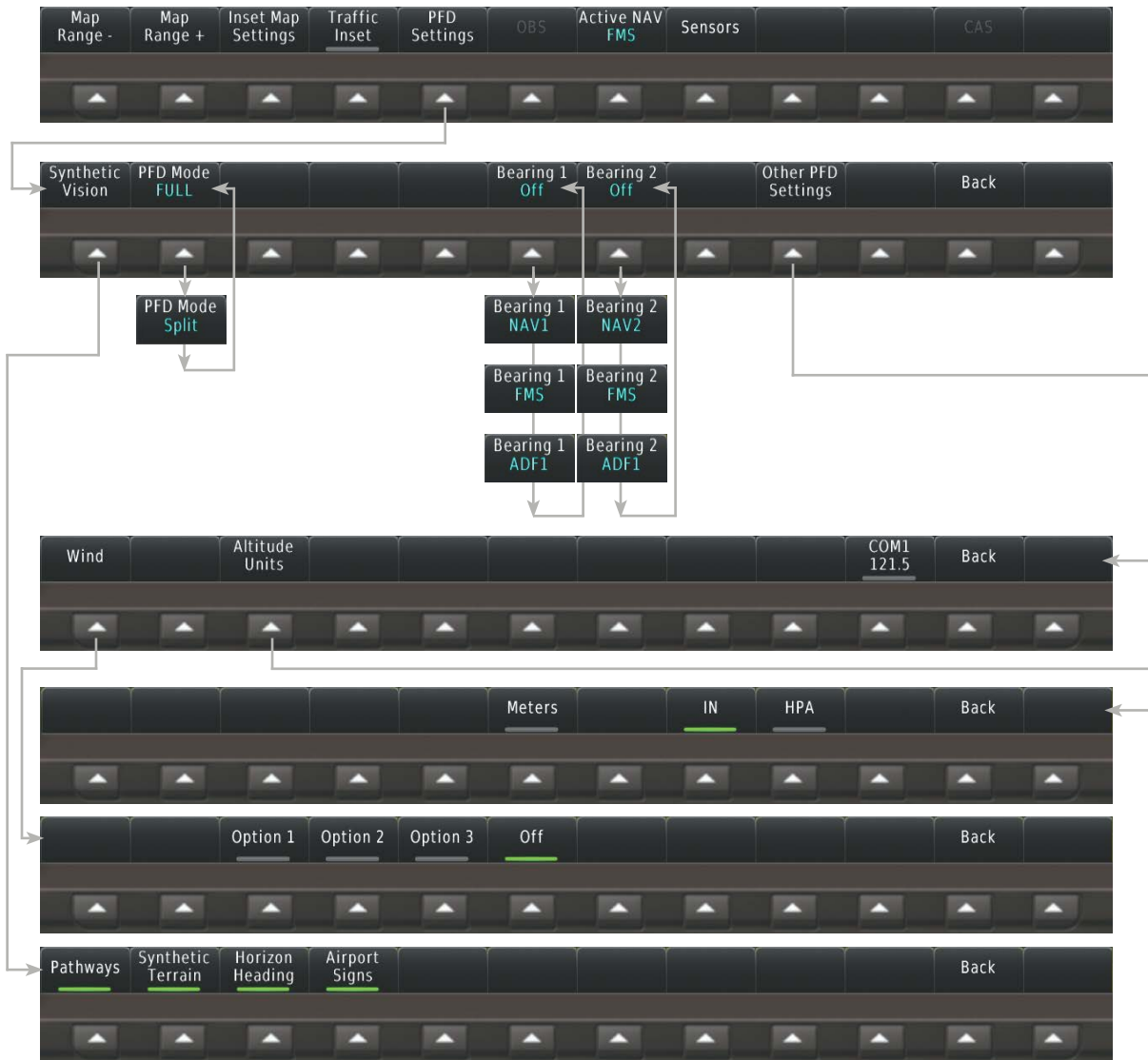


Figure 1-8 PFD Settings Softkeys

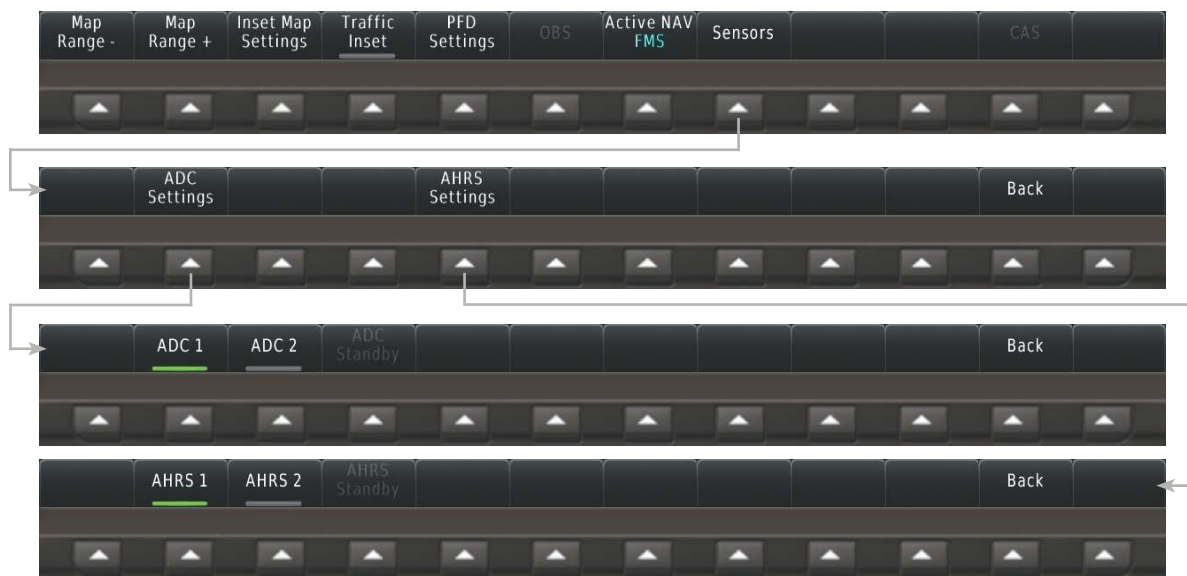


Figure 1-9 Sensor Softkeys

Level 1	Level 2	Level 3	Level 4	Description
Map Range -				Decreases the Inset Map display range
Map Range +				Increases the Inset Map display range
Inset Map Settings				Displays the Inset Map display settings softkeys
	Off			Removes the Inset Map from the display
	Detail			Selects desired amount of map detail; cycles through declutter levels: All (No Declutter): All map features visible DCLTR 1 : Declutters land data DCLTR 2 : Declutters land and SUA data Least : Removes everything except for the active flight plan
	Weather Legend			Displays/removes the name of the selected data link weather provider (SiriusXM, Connex) and the weather product icon and age box (for enabled weather products).
	Traffic			Adds or removes the display of traffic on the Inset Navigation Map. The softkey annunciator is green when the traffic function is on. When the traffic function is off, the annunciator is gray.
	Topo			Adds or removes the display of map topography on the Inset Map. The softkey annunciator is green when topography is on. When topography is off, the annunciator is gray.
	Terrain			Adds or removes the display of relative terrain information on the Inset Navigation Map. The softkey annunciator is green when topography is on. When topography is off, the annunciator is gray.
	NEXRAD Radar			Displays/removes NEXRAD Inset Map; cycles through regions. USA: Displays NEXRAD data only for the United States Canada: Displays NEXRAD data only for Canada Off: Removes NEXRAD data from the Inset Map
	SiriusXM Lightning			Adds or removes the display of SiriusXM information on the Inset Navigation Map. The softkey annunciator is green when the lightning function is on. When the lightning function is off, the annunciator is gray.
	METAR			Adds or removes the display of SiriusXM or Connex METAR data on the Inset Navigation Map. The softkey annunciator is green when the METAR data is enabled. When the METAR data is off, the annunciator is gray.
Traffic Map				Replaces the Inset Map with a dedicated traffic display. The softkey annunciator is green when the dedicated traffic display on. When the Inset Map is on, the softkey annunciator is gray.
PFD Settings				Displays the PFD settings softkeys.

Level 1	Level 2	Level 3	Level 4	Description
	Synthetic Vision			Displays the softkeys for enabling or disabling Synthetic Vision features.
		Pathways		Displays Pathway Boxes on the Synthetic Vision Display.
		Synthetic Terrain		Enables synthetic terrain depiction.
		Horizon Heading		Displays compass heading along the Zero-Pitch line.
		Airport Signs		Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.
	PFD Mode			Enables or disables a multi-function Display Pane on the PFD. FULL: Display Pane is disabled. The PFD display occupies the full screen. Split: Display Pane is enabled. The PFD screen is split between the PFD display and the Display Pane.
	Bearing 1			Cycles the Bearing 1 Information Window through NAV1, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	Bearing 2			Cycles the Bearing 2 Information Window through NAV2, GPS/waypoint identifier and GPS-derived distance information, ADF/frequency, and Off.
	Other PFD Settings			Displays additional PFD settings softkeys.
		Wind		Displays the wind option softkeys
			Option 1	Headwind/Tailwind and crosswind components.
			Option 2	Wind direction arrow and speed.
			Option 3	Wind direction arrow with direction and speed.
			Off	Information not displayed.
		Altitude Units		Displays softkeys to select altitude unit parameters.
			Meters	When enabled, displays altimeter in meters.
			IN	Press to display the BARO setting as inches of mercury
			HPA	Press to display the BARO setting as hectopascals.
		COM1 121.5		Tunes COM1 to the emergency frequency.
OBS				Selects OBS mode on the CDI when navigating by GPS (only available with active leg). When OBS is on, the softkey annunciator is green.

Level 1	Level 2	Level 3	Level 4	Description
Active NAV				Cycles through FMS, VOR1, and VOR2 navigation modes on the CDI.
Sensors				Displays the sensor selection softkeys.
	ADC Settings			Displays the ADC selection softkeys.
		ADC 1		Selects the number 1 ADC. The softkey annunciator is green when selected.
		ADC 2		Selects the number 2 ADC. The softkey annunciator is green when selected.
		ADC Standby		Indicates the standby ADC input is being used by the system.
	AHRS Settings			Displays the AHRS selection softkeys.
		AHRS 1		Selects the number 1 AHRS. The softkey annunciator is green when selected.
		AHRS 2		Selects the number 2 AHRS. The softkey annunciator is green when selected.
		AHRS Standby		Indicates the standby AHRS input is being used by the system.

TOUCHSCREEN CONTROLLER

The Touchscreen Controllers are a pedestal-mounted user interface allowing for ease of data entry, MFD/Display Pane operation, and NAV/COM tuning. The touchscreen uses an infrared grid to determine the location of touch and allows usage with gloves. Many procedures in this Pilot's Guide are performed using the Touchscreen Controller.

Radio tuning can be accomplished using the CNS Bar at the top of the Touchscreen Controller screen (refer to the Audio Panel and CNS Section for more information about NAV/COM tuning).

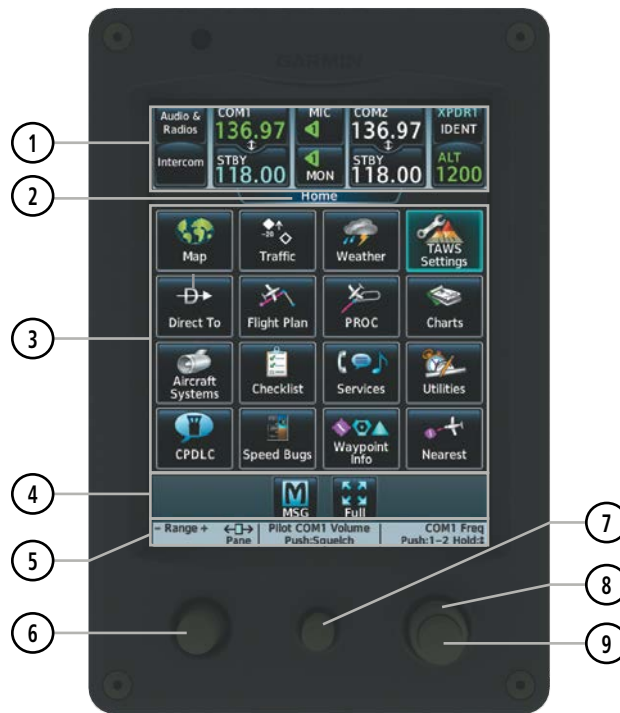


Figure 1-10 GTC 570 Touchscreen Controller

- ① **CNS Bar** Displays/controls COM, NAV, XPDR, and ICS functions
- ② **Screen Title** Displays the title of the current screen
- ③ **Screen** Displays set of context sensitive controls and data
- ④ **Button Bar** Displays System level buttons (e.g. Home, MSG, Full/Half, Scroll Up/Down, Back, Enter, Cancel)
- ⑤ **Label Bar** Displays labels to show status and current functions of joystick and knobs
- ⑥ **Joystick** Provides functions as labeled on the screen (e.g. Map Panning, Map Range)
- ⑦ **Middle Knob** Provides functions as labeled on the screen (e.g. COM volume/squelch)
- ⑧ **Large Right Knob** Provides functions as labeled on the screen (e.g. COM Freq/switching, Data Entry)
- ⑨ **Small Right Knob** Provides functions as labeled on the screen (e.g. COM Freq/switching/Hold, Data Entry)

The Touchscreen Controller's functions are arranged by screen. Each screen has a title which appears at the top of the screen area (and below the CNS bar). The contents of each screen change dynamically in response to pilot or system input.

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

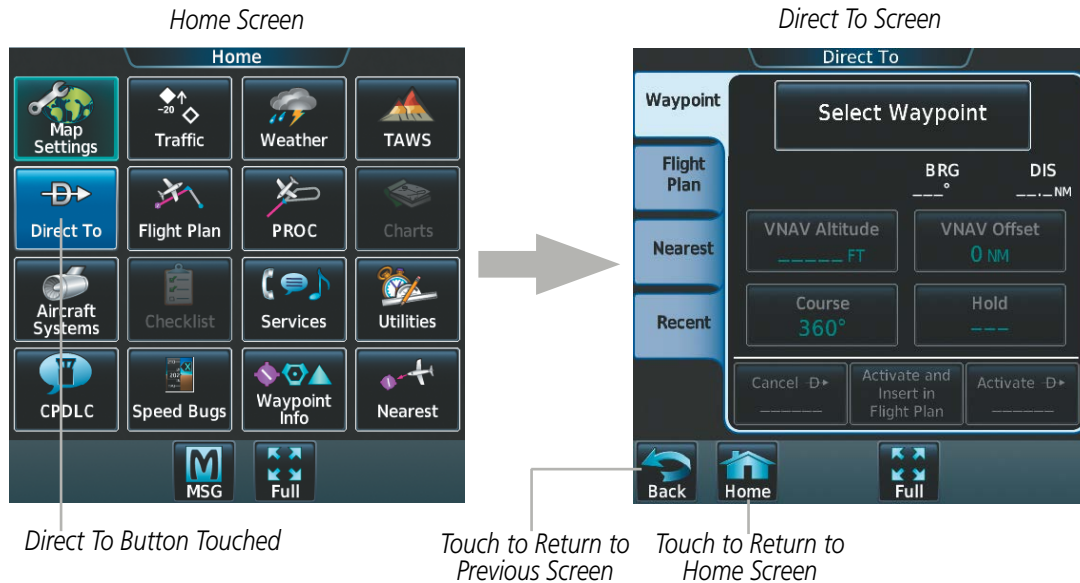


Figure 1-11 Touchscreen Controller Screen Navigation

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

The CNS Bar, positioned above the screen area, is always displayed during system operation and is accessible at any time. Some functions on the CNS Bar will cause another screen to be displayed (in the screen area below the CNS Bar); however, touching the Back or Cancel Button will return to the previous screen.



Figure 1-12 Accessing Screens with the CNS Bar

The Button Bar, displayed below the screen area, displays the system-level buttons which are context-sensitive. For example, if scrolling is available on a screen, the Button Bar includes corresponding **Up** and **Down** Scroll Arrow buttons.



Figure 1-13 Button Bar Displays System-Level Buttons

The Button Bar is also where the **Home**, **Cancel**, and **Back** buttons are displayed. If the system issues a message, the **MSG** button is shown. Touching this button will display the Messages Screen. The Button Bar also contains a **Full** or **Half** button for controlling the size of display pane on the MFD (discussed later in this section).

	Returns to the Home Screen		Selects MFD half-display mode.
	Returns to the previous screen		Selects MFD full-display mode
	Displays the CPDLC Messages window on Touchscreen Controller. Flashes when a new CPDLC message is received.		Scrolls up in a list
	Displays the System Messages window on Touchscreen Controller. Flashes when a new system message is issued.		Scrolls down in a list
	Displays the Telephone window on Touchscreen Controller. Flashes when a new telephone call is received.		Cancels data entry and returns to the previous screen
	Displays the SMS Text Inbox window on Touchscreen Controller. Flashes when a new CPDLC message is received.		Accepts entered data into the system.

Table 1-1 Button Bar Buttons with Functions

The Label Bar, near the bottom of the Touchscreen Controller and above the Joystick and Knobs displays the current function of each control as a reference. These functions include Map Range adjustment, Display Pane selection, radio volume/squelch adjustment, COM radio tuning, and alphanumeric data entry.

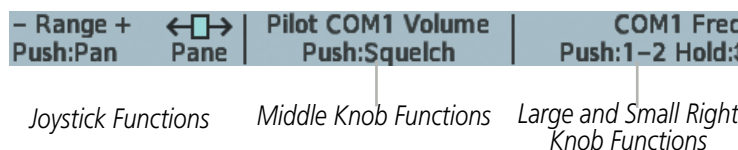


Figure 1-14 Label Bar Indicates Context-Sensitive Joystick and Knob Functions

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

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

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



NOTE: While the touch screen controller provides a high level of touch recognition accuracy, consider the following to reduce the probability of touch errors:

- Make sure each button touch results in the expected response.
- Avoid holding anything close to the glass surface while deciding which button to touch, or resting the hand or fingers on the bezel edges around the glass surface. This can cause interruption of the infrared beams, leading to inadvertent activation or unresponsive touchscreen controls.
- When selecting a button on a scrollable list, avoid sliding movements which can cause inadvertent scrolling.

Some adjustments are made using horizontal or vertical sliders. To use, simply touch within the slider box and slide the finger in the desired slider bar direction, then release the finger. The finger may move outside of the slider box during adjustment; slider movement stops when either the finger is released or the slider has reached its maximum travel.



Volume Adjustment Slider



Map Detail Adjustment Slider

Figure 1-15 Sliders on the Touchscreen Controller

When a Touchscreen Controller screen window contains more information than the window can currently show, a scroll bar and scroll buttons appear. To scroll inside of a window, touch the controller while moving the finger up or down accordingly. To scroll more quickly, move the finger up or down rapidly in a flicking motion. Scrolling can also be performed by pressing the **Up** or **Down** scroll buttons. If additional scrolling is required to view all information in the window, each touch of the scroll button will display one ‘page’ of information.

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



Figure 1-16 Touchscreen Controller with Tabs and Scroll Arrows

Elements on the Touchscreen Controller screens (such as buttons and sliders) appear subdued (dimmed) to indicate their functions are currently not available.

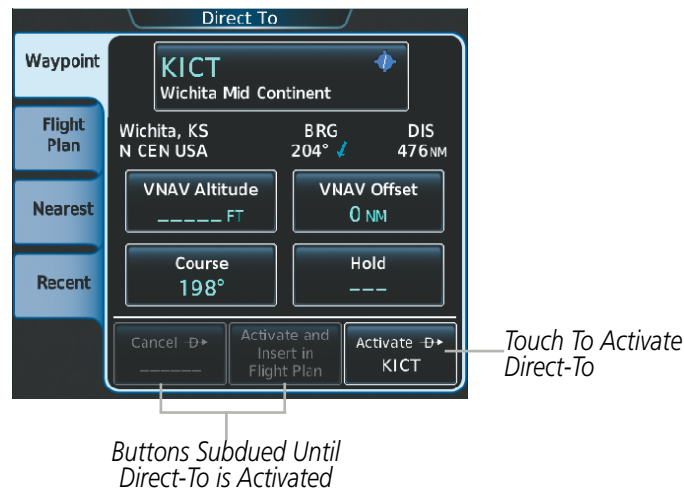


Figure 1-17 Subdued Buttons on Touchscreen Controller

In some cases, the screen area of the Touchscreen controller (including the buttons) may also appear subdued to indicate functions on that screen are unavailable while the other Touchscreen Controller is controlling a particular system resource.

BUTTON TYPES

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



Figure 1-18 Touchscreen Controller Annunciator Buttons

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

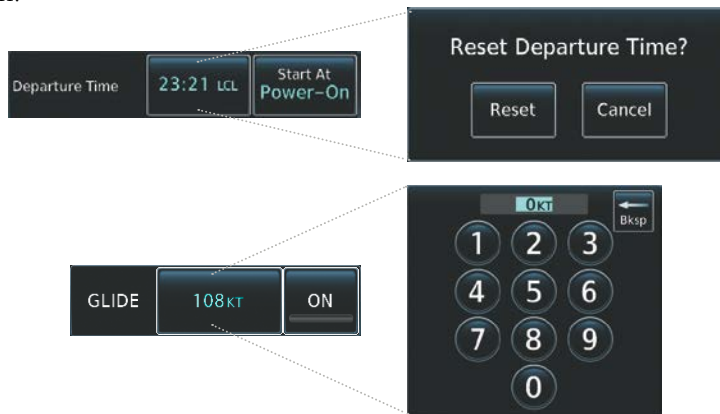


Figure 1-19 Touchscreen Controller Datafield Buttons

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

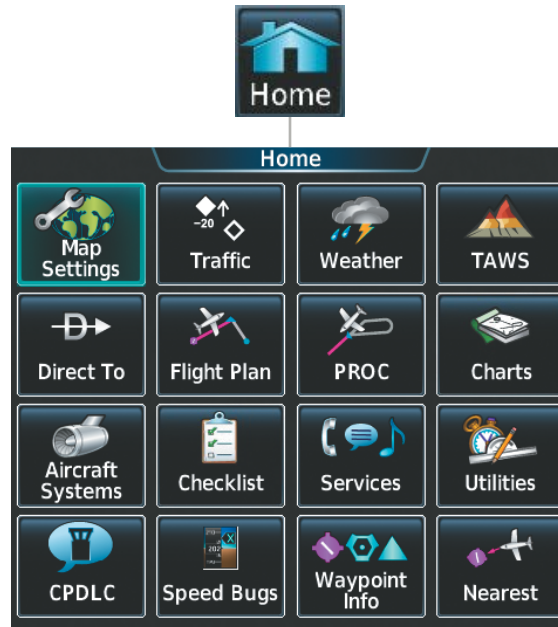



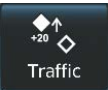


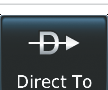
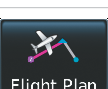
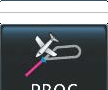
Figure 1-20 Failed Buttons on Touchscreen Controller










SCREENS

HOME SCREEN

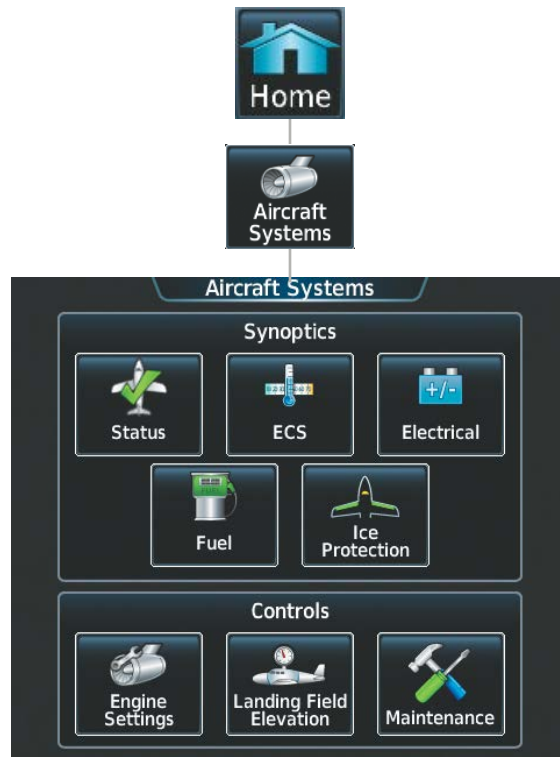
On the Home Screen, the top row of buttons (Map, Traffic, Datalink Weather, and TAWS) are each associated with a corresponding display that may be presented on a display pane. When one of these buttons is touched, the selected display pane shows the associated display and the button border on the Touchscreen Controller is highlighted in light blue to indicate the map associated with the button is selected for display. When returning to the Home Screen, the selected display pane will show the display associated with the highlighted button.



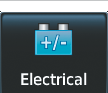


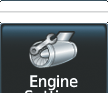




	Shows Navigation Map Display in the selected Display Pane. Touch button again to access Map Settings Display on Touchscreen Controller.
	Shows Traffic Map Display in the selected Display Pane. Touch button again to access Traffic Map Settings Display on Touchscreen Controller.
	Shows Weather Display in the selected Display Pane. Touch button again to access Map Settings Display on Touchscreen Controller.
	Shows the TAWS Display in the selected Display Pane. Touch button again to access TAWS Settings screen on Touchscreen Controller.
	Accesses Direct-To screen on Touchscreen Controller.
	Accesses Active Flight Plan screen on the Touchscreen Controller. A Flight Plan display is shown on the selected Display Pane.
	Accesses Procedures screen on Touchscreen Controller. Additional map displays may be shown as procedures are selected.

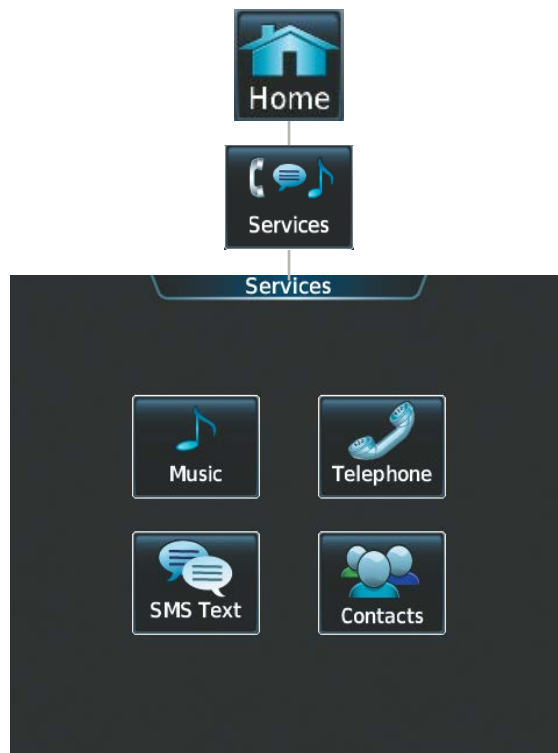
 Charts	Accesses Charts screen on Touchscreen Controller. Charts are shown on the selected Display Pane.
 Aircraft Systems	Accesses Systems screen on Touchscreen Controller. Systems data can be selected for display on the Touchscreen Controller, and displayed on the MFD. Also provides means to perform and monitor system tests.
 Checklist	Touch to display the Checklist Screen. The Checklist Screen provides access to the various aircraft checklists.
 Services	Accesses Services Menu Screen on Touchscreen Controller. Includes optional voice phone and text messaging services, SiriusXM Satellite Radio controls.
 Utilities	Weight and Fuel, TOLD (Takeoff and Landing Data) VREF, Trip Planning functions, Minimums, Trip Statistics, Timer, Scheduled Messages, GPS Status, FLC Profile, Initialization.
 CPDLC	Displays the CPDLC (Controller Pilot Data Link Communications) Screen. Provides controls for managing CPDLC connections, and message management features.
 Speed Bugs	Displays the Speed Bugs Screen on the Touchscreen Controller. Provides for enabling and disabling speed bugs and setting bug parameters.
 Waypoint Info	Provides information about Airports, Intersections, VORs, NDBs, User Waypoints. Also allows creation of User Waypoints.
 Nearest	Provides information about the nearest Airports, Intersections, VORs, NDBs, User Waypoints, Airspace, ARTCC facilities, Flight Service Stations, and Weather reporting stations.





AIRCRAFT SYSTEMS SCREEN



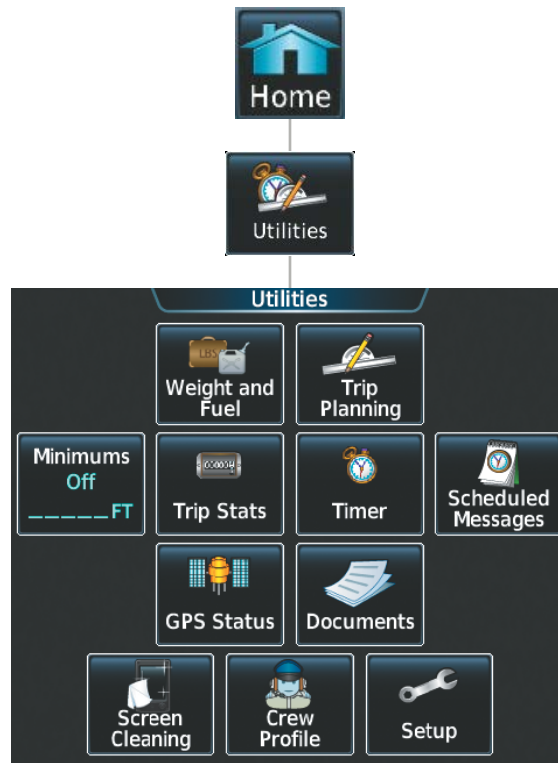
	Shows the Status display in Half-Mode in the selected Display Pane. Includes information on various aircraft systems.
	Shows the Environmental Control System synoptic display in the selected Display Pane in Half-Mode. Includes information on the cabin temperature, oxygen quantities, and cabin pressurization.
	Shows the Electrical synoptic display in the selected Display Pane in Half-Mode. Includes information on batteries, generators, and busses.
	Shows the Fuel synoptics display in the selected Display Pane in Half-Mode. Includes the fuel quantities and weights, statuses of fuel flow, and valve positions.
	Shows the Anti Ice synoptic display in the selected Display Pane. Displays anti-ice system status information.
	Displays the Engine Settings Screen on the Touchscreen Controller. This screen provides for changing engine thrust rating and entering takeoff data.
	Displays the Landing Field Elevation Screen on the Touchscreen Controller. Allows for manual or FMS entry of field elevation.
	Provides functions accessible to maintenance personnel.




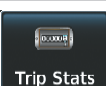




SERVICES SCREEN



 Music	Music Screen provides controls for SiriusXM Satellite Radio including channel selection, volume, and muting settings.
 Telephone	Telephone Screen shows the status of the Iridium satellite telephone connection and provides telephone controls.
 SMS Text	SMS Text Messaging Screen provides management of incoming and outgoing SMS (short message service) text messages.
 Contacts	Contacts Screen provides management of contact information including phone and email addresses. Also provides quick access to stored contacts via phone, SMS, or email.

UTILITIES SCREEN



	Accesses Weight and Fuel screen on the Touchscreen Controller. Provides for input of weight and balance data and performs calculations.
	Accesses the Trip Planning screen on the Touchscreen Controller.
	Accesses the Minimums screen on the Touchscreen Controller. Provides controls for the Minimum Descent Altitude/Decision Height alerting function. Button displays the current minimums altitude and source if provided.
	Accesses the Trip Statistics screen on the Touchscreen Controller. Shows information regarding Flight Time, Departure Time, Odometer, Trip Odometer, Average Ground Speed, and Maximum Ground Speed. Also provides controls for trip statistic configuration.
	Accesses the Timer screen on the Touchscreen Controller. Controls the timer on the PFD.
	Used to create custom messages to be displayed one-time or periodically. The Touchscreen Controller displays these messages on the Messages Screen on the Touchscreen Controller.
	Shows the GPS Status display in the selected Display Pane. Touchscreen Controller provides additional RAIM prediction function, GPS receiver selection, and SBAS selection.
	Shows controls for viewing electronic documents on the Touchscreen Controller, and displays documents in the selected Display Pane.

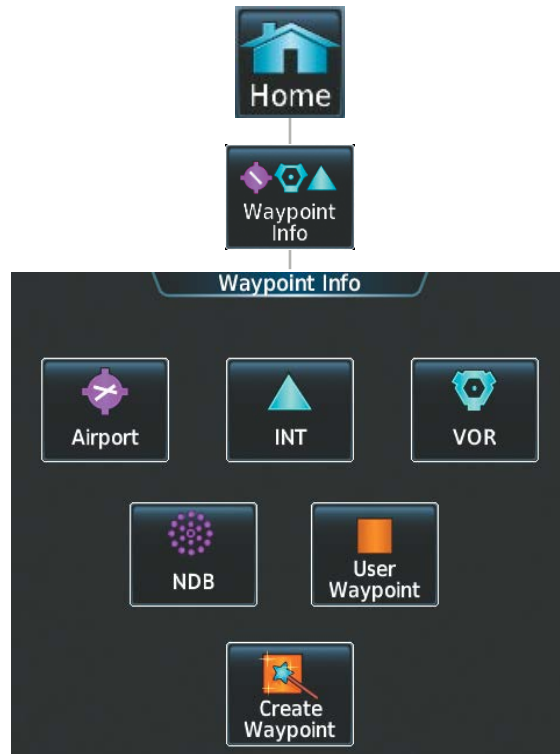
<p>Screen Cleaning</p>	<p>Feature temporarily disables touchscreen glass input to allow for manual cleaning. Turn or press any knob on the Touchscreen Controller to exit Screen Cleaning Mode.</p>
<p>Crew Profile</p>	<p>Controls for activating and managing crew profiles.</p>
<p>Setup</p>	<p>Avionics Settings and Status, Data Link Services registration and status, Wi-Fi setup.</p>







SETUP SCREEN



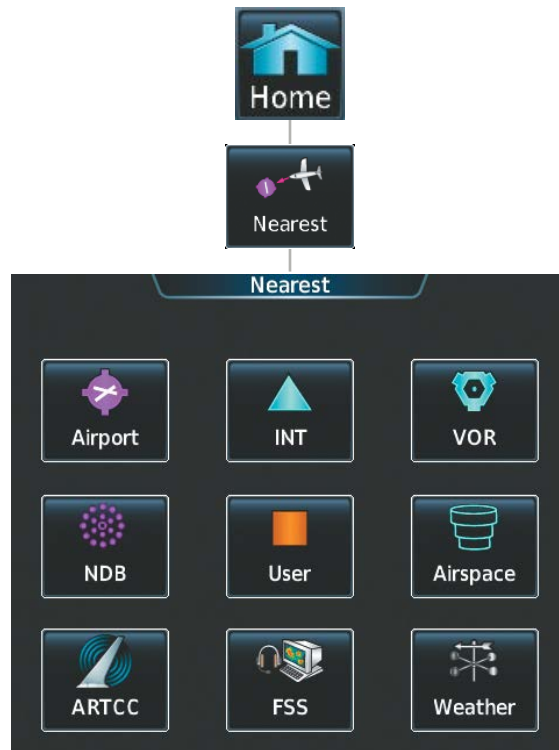
<p>Avionics Settings</p>	<p>Provides controls for changing system avionics settings, such as, time format, units of measure, airspace alert settings, and MFD Data Bar Fields.</p>
<p>Avionics Status</p>	<p>Displays information on the Touchscreen Controller for installed LRUs, system software, and databases.</p>
<p>SiriusXM Info</p>	<p>Shows the SiriusXM Information Screen on the Touchscreen Controller. Used to activate audio and data services from SiriusXM Satellite Radio and to verify subscriptions of SiriusXM Weather products.</p>
<p>GFDS Registration</p>	<p>Used to register with Garmin Flight Data Services (GFDS). Also provides information on current GFDS registration.</p>
<p>Wi-Fi Setup</p>	<p>Provides controls for selecting available wireless networks, and for storing favorite wireless hotspots.</p>
<p>CPDLC Settings</p>	<p>Displays the CPDLC Screen, giving access to the CPDLC Test Mode.</p>

WAYPOINT INFO SCREEN



 Airport	Accesses airport information including frequencies, weather, procedures, charts, runways, and airport directory data.
 INT	Shows information for a selected intersection including bearing, distance, and location.
 VOR	Provides VOR information including frequencies and location.
 NDB	Provides NDB information including frequencies and locations.
 User Waypoint	Provides location information for User Waypoints including a list of User Waypoints.
 Create Waypoint	Create User Waypoints based on present position or a designated location.

NEAREST SCREEN



	Displays a list of the nearest airports, with runway, bearing, and distance information.
	Displays a list of the nearest intersections with bearing and distance information.
	Displays a list of the nearest VORs with bearing, distance, and frequency information.
	Displays a list of the nearest NDBs with bearing, distance, and frequency information.
	Displays a list of the nearest User Waypoints with bearing and distance information.
	Displays information about the nearest airspace and status.
	Displays information about the nearest ARTCC facilities including bearing, distance, and frequencies.
	Displays the nearest Flight Service Stations with bearing, distance, and frequency information
	Displays the nearest weather reporting sources, bearings, distances, and frequencies

TOUCHSCREEN CONTROLLER JOYSTICK AND KNOBS

The functions of the Joystick and Knobs on the Touchscreen Controller are context-sensitive. The Label Bar, shown above each corresponding control, indicates which function(s) currently apply to each control.

The Joystick may be turned to increase or decrease map range, or to increase or decrease detail on certain system displays. When the Joystick is pushed, the Map Pointer is activated for Map Panning (push again to deactivate Map Pointer).

The Middle Knob is turned to increase or decrease the selected audio source volume. If a COM radio is selected, pushing the Middle Knob activates/deactivates squelch. If a NAV radio is selected (on the Audio & Radios Screen), pushing the Middle Knob enables NAV audio to be heard for identification.

The Large and Small Right Knobs are used for radio tuning and selection, frequency transfer, and data entry. Turning the Large Right knob tunes the selected radio frequency in 1 MHz increments; the Small Right Knob adjusts the frequency in 1 KHz increments. Push the Small Right Knob momentarily to change the selected COM radio source (COM 1 or COM 2) for tuning. Push and hold the Small Right Knob for 1.5 seconds to transfer the selected Standby COM frequency to the active COM frequency.

During data entry, turn the Large Right Knob to move the cursor position. Turn the Small Right Knob to select a character for the highlighted cursor position. Push the Small Right Knob to enter the data (see the Data Entry discussion later in this section for more information about Data Entry methods.)

CONTROLLING DISPLAY PANES (NORMAL OPERATIONS)

After system power-up, the MFD presents the Navigation Map Pane and the Traffic Map Pane in a side-by-side format in Half Mode.

In Half Mode operation, the left half of the MFD (excluding the EIS display) is associated with the #1 (or pilot's side) Touchscreen Controller; the right portion is associated with the #2 (or co-pilot's side) Touchscreen Controller. Each Touchscreen Controller may be used to select and control a display on its respective MFD half in Half Mode.

When a PFD is operating in Split Mode, the on-side Touchscreen Controller will also control the Display Pane on the PFD.

The Joystick on each Touchscreen Controller, when moved to the right or left, selects the active pane on the MFD or applicable PFD. On PFD1 and the left pane on the MFD, the active pane is indicated by a light blue Pane Title Bar and outline. On PFD2 and the right pane on the MFD, the active pane is indicated by a magenta Pane Title Bar and outline.

In Half Mode, the #1 and #2 Touchscreen Controllers retain independent settings for their respective display half being controlled, allowing for greater flexibility and customization. For example, both the left and right MFD halves may be showing a Navigation Map display, but with different map orientations or overlay data based on the flight crew preferences on each half.

In normal operations, the system continues operating in Half Mode until Full Mode is selected on either Touchscreen Controller.

Light Blue Title Bar Indicates Display Pane Selected Using #1 Touchscreen Controller

PFD1 in Split Mode with a Display Pane

MFD in Half Mode with Two Display Panes

PFD2 in Split Mode with a Display Pane

Magenta Title Bar Indicates Display Pane Selected Using #2 Touchscreen Controller

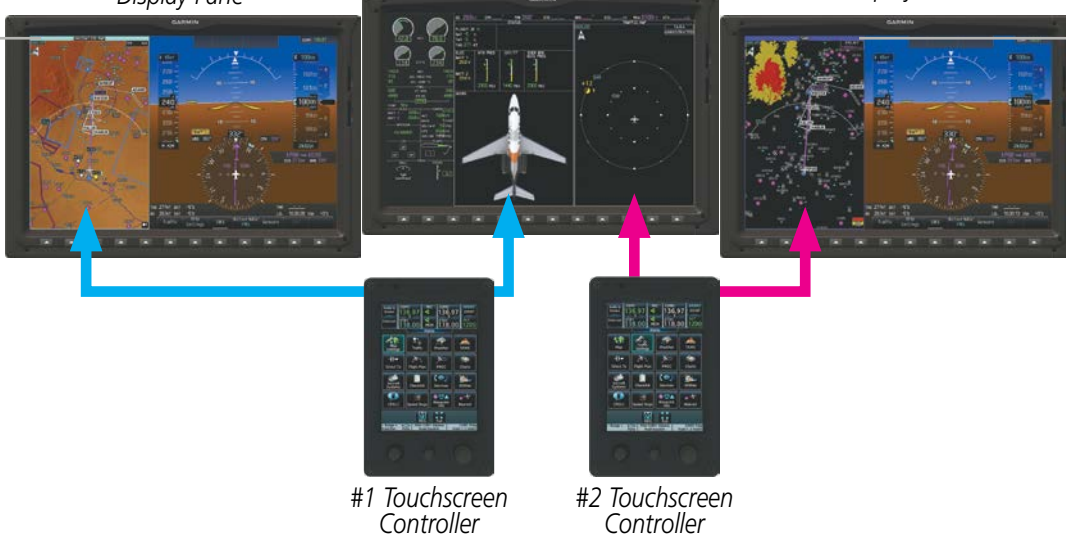


Figure 1-21 Display Pane Control (Normal Operations, PFDs in Split Mode)

Multi-Function Display (MFD)



Navigation Map Display Currently Selected on Left Display Pane



#1 Touchscreen Controller

Traffic Map Display Currently Selected on Right Display Pane



#2 Touchscreen Controller

Touch to Select Full Mode Operation

Figure 1-22 MFD and Touchscreen Controllers (Half Mode Operation)

Full Mode is available when a Touchscreen Controller shows a **Full** Button in the Button Bar. When the **Full** Button is touched, the MFD display half for the Touchscreen Controller on which the mode was selected expands to a full display (Figure 1-23).

The Touchscreen Controller that enabled Full Mode will have the ability to change the selected display settings while operating in Full Mode. For example, if the #1 Touchscreen Controller enabled the Navigation Map Display in Full Mode, the #1 Touchscreen Controller can be used to customize the map overlay data or change the map orientation while operating in Full Mode (accessed using the **Map Settings** Button.) The #2 Touchscreen Controller displays a diminished (dimmed) screen area if the **Map Settings Screen** is selected on this controller to indicate these functions are not currently available using the #2 Touchscreen Controller.

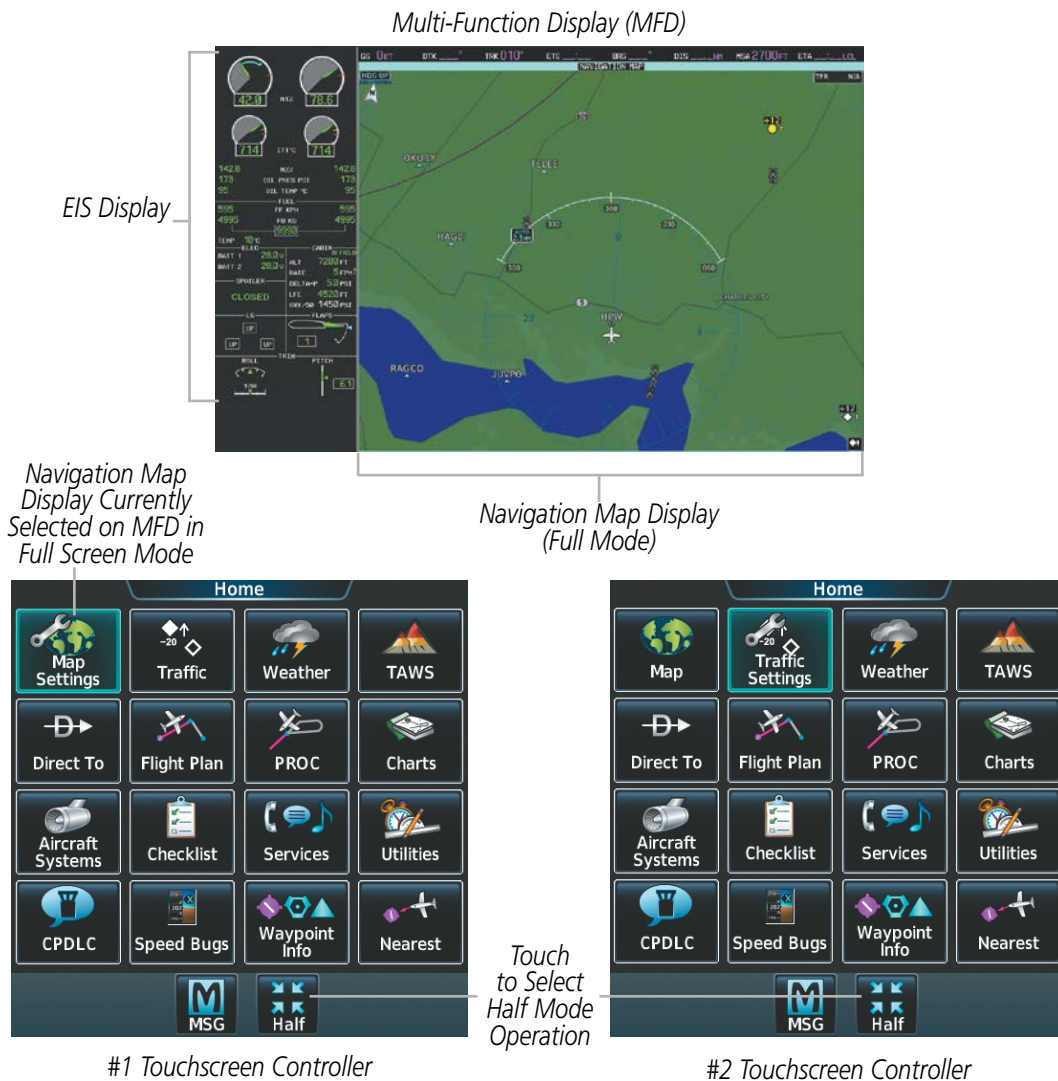


Figure 1-23 MFD and Touchscreen Controllers (Full Mode Operation)

Regardless of which Touchscreen Controller enabled Full Mode, either Touchscreen Controller joystick may be used to adjust map range or activate the map panning function, when available. The Label Bar on the Touchscreen Controller will indicate the availability of these functions.

To resume Half Mode operation on either Touchscreen Controller, touch the **Half** Button on the Touchscreen Controller when it is shown in the Button Bar.

The system also enters Half Mode automatically if the Touchscreen Controller which did not select Full Mode is used to select another MFD display, or if either Touchscreen Controller selects an MFD display which can only be presented in Half Mode (such as the aircraft systems displays).

DATA ENTRY

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

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

Using the Touchscreen Controller keyboard to enter alphanumeric data:

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



Figure 1-24 Entering a Waypoint on the Touchscreen Controller's Alphanumeric Keypads

It is not necessary to touch the **Enter** Button to complete certain data fields for which a specific number of characters is always required. For example, after entering four digit transponder squawk code, the system automatically accepts this data 1.5 seconds after the fourth button has been pressed (if the entry has not been cancelled).

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

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

1.4 SYSTEM OPERATION

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

NORMAL DISPLAY OPERATION

In normal operating mode, the PFD presents graphical flight instrumentation (attitude, heading, airspeed, altitude, vertical speed), replacing the traditional flight instrument cluster (see the Flight Instruments Section for more information).

The MFD displays a navigation information, as well as flight plan, weather, traffic and terrain information in either two half-size display panes or one full-size display pane, depending on the selection made on the GTCs. The left portion of the MFD is dedicated to the Engine Indication System (EIS; see the EAS Section).

The Touchscreen Controller provides radio management, MFD control and data entry, as well as feature selection and data display for the selected features.



Figure 1-25 Normal Operation

REVERSIONARY DISPLAY OPERATION



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

If a GDU fails or is off-line, the system provides the capability to show a PFD, an EIS display, and a display pane on another GDU in Reversionary Mode.

The Phenom 300 employs dedicated three-position mode switches for PFD1 and PFD2. These PFD mode switches allow for placing the GDUs in automatic, manual or split-screen reversionary modes. The Split Mode selected using these switches is used for viewing the reversionary display in a split screen format, unlike the Split Mode Softkey on the PFD, which allows for viewing the normal display in a split screen format. The following discussion illustrates some of the various reversionary mode display combinations.

AUTO REVERSION

- **PFD1 failure, PFD1 Mode Switch set to AUTO, PFD2 Mode Switch set to AUTO** – MFD enters reversionary Full Mode and PFD2 continues to operate normally.



Figure 1-26 Automatic Reversionary Mode - PFD1 Failure

- **MFD failure, PFD1 Mode Switch set to AUTO, PFD2 Mode Switch set to AUTO** – PFD1 operates normally when in Full Mode. If PFD1 is operating in Split Mode, it will switch to Full Mode. PFD2 enters reversionary mode. If PFD2 is operating in Split Mode, it will switch to reversionary Full Mode.



Figure 1-27 Automatic Reversionary Mode - MFD Failure

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



Figure 1-28 Automatic Reversionary Mode - PFD2 Failure

MANUAL REVERSION

- **PFD1 Mode Switch set to REV, PFD2 Mode Switch set to AUTO** – PFD1 and MFD enter reversionary Full Mode. PFD2 continues to operate normally.



Figure 1-29 Manual Reversionary Mode - PFD1

- **PFD2 Mode Switch set to REV, PFD1 Mode Switch set to AUTO** – PFD2 and MFD enter reversionary Full Mode. PFD1 continues to operate normally.



Figure 1-30 Manual Reversionary Mode - PFD2

- **PFD1 and PFD2 Mode Switches set to REV** – PFD1, MFD, and PFD2 enter reversionary Full Mode.



Figure 1-31 Manual Reversionary Mode - PFD1 and PFD2

- **PFD1 Mode Switch set to Split, PFD2 Mode Switch set to AUTO** – PFD1 and MFD enter reversionary Split Mode. PFD2 continues to operate normally.



Figure 1-32 Manual Reversionary Split Mode - PFD1

- **PFD2 Mode Switch set to Split, PFD1 Mode Switch set to AUTO** – PFD2 and MFD enter reversionary Split Mode. PFD1 continues to operate normally.



Figure 1-33 Manual Reversionary Split Mode - PFD2

- **PFD1 Mode Switch set to REV, PFD2 Mode Switch set to Split** – PFD1 and MFD enter reversionary Full Mode. PFD2 enters reversionary Split Mode.



Figure 1-34 Manual Reversionary Mode - PFD1 Reversionary Full Mode, PFD2 Reversionary Split Mode

- **PFD2 Mode Switch set to REV, PFD1 Mode Switch set to Split** – PFD2 and MFD enter reversionary Full Mode. PFD1 enters reversionary Split Mode.



Figure 1-35 Manual Reversionary Mode - PFD2 Reversionary Full Mode, PFD1 Reversionary Split Mode

- **PFD1 and PFD2 Mode Switches set to Split** – PFD1, MFD, and PFD2 enter reversionary Split Mode.



Figure 1-36 Manual Reversionary Split Mode - PFD1 and PFD2

If the MFD is operating in Reversionary Mode (e.g. PFD1 or PFD2 failure), the Touchscreen Controller on the failed PFD side controls the Reversionary Mode display pane. If PFD1 or PFD2 is in Reversionary Mode, the on-side Touchscreen Controller controls the Reversionary Mode display pane.

If both PFD1 and PFD2 fail or are off-line, the #1 Touchscreen Controller controls the Reversionary Mode display pane on the MFD. The #2 Touchscreen Controller's functions (with the exception of display pane control) continue to be available in the event of PFD1 and PFD2 failure.

TOUCHSCREEN CONTROLLER FAILURE

If either Touchscreen controller fails or is off-line, the operating Touchscreen Controller controls the display panes for both PFDs and the MFD. In addition, the single Touchscreen Controller provides audio and CNS control for both the pilot and copilot.

AHRS OPERATION

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

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

In addition to using internal sensors, the GRS 77 AHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the AHRS relies upon GPS and magnetic field measurements. If either of these external measurements is unavailable or invalid, the AHRS uses air data information for attitude determination. Four AHRS modes of operation are available (see Figure 1-37) and depend upon the combination of available sensor inputs. Loss of air data, GPS, or magnetometer sensor inputs is communicated to the pilot by message advisory alerts.

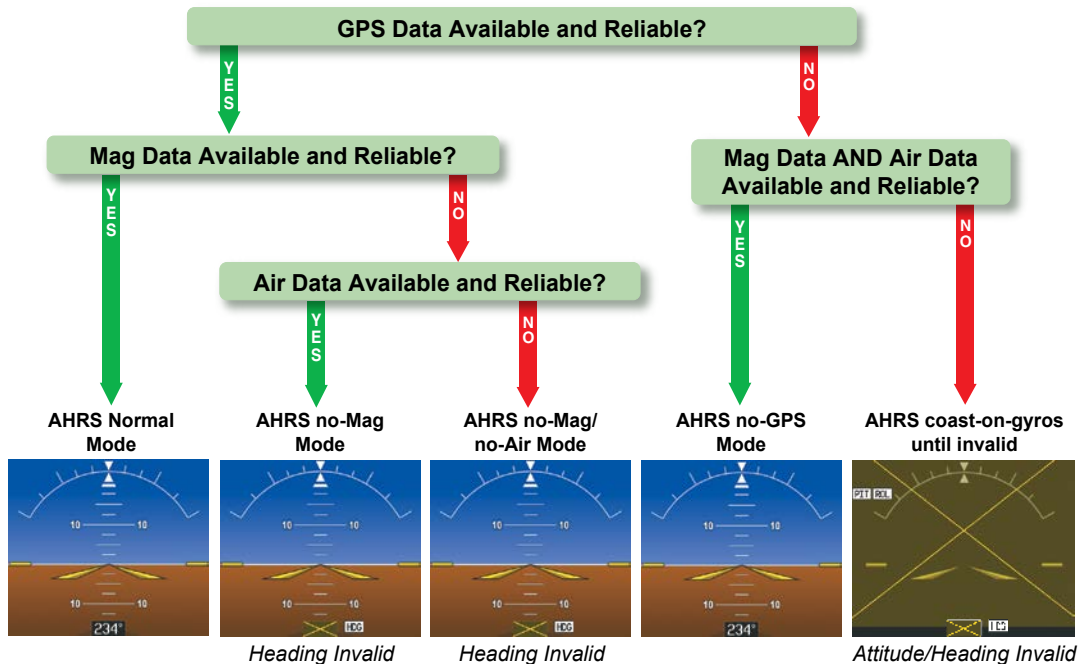


Figure 1-37 AHRS Operation

GPS INPUT FAILURE



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

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

MAGNETOMETER FAILURE

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

AIR DATA INPUT FAILURE

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

GPS RECEIVER OPERATION

Each GIA 63W Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS 1 for the #1 IAU or GPS 2 for the #2 IAU) may be viewed on the GPS 1 or GPS 2 STATUS Pane and the GPS Status Screen on the Touchscreen Controller (refer to Figure 1-38).

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

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

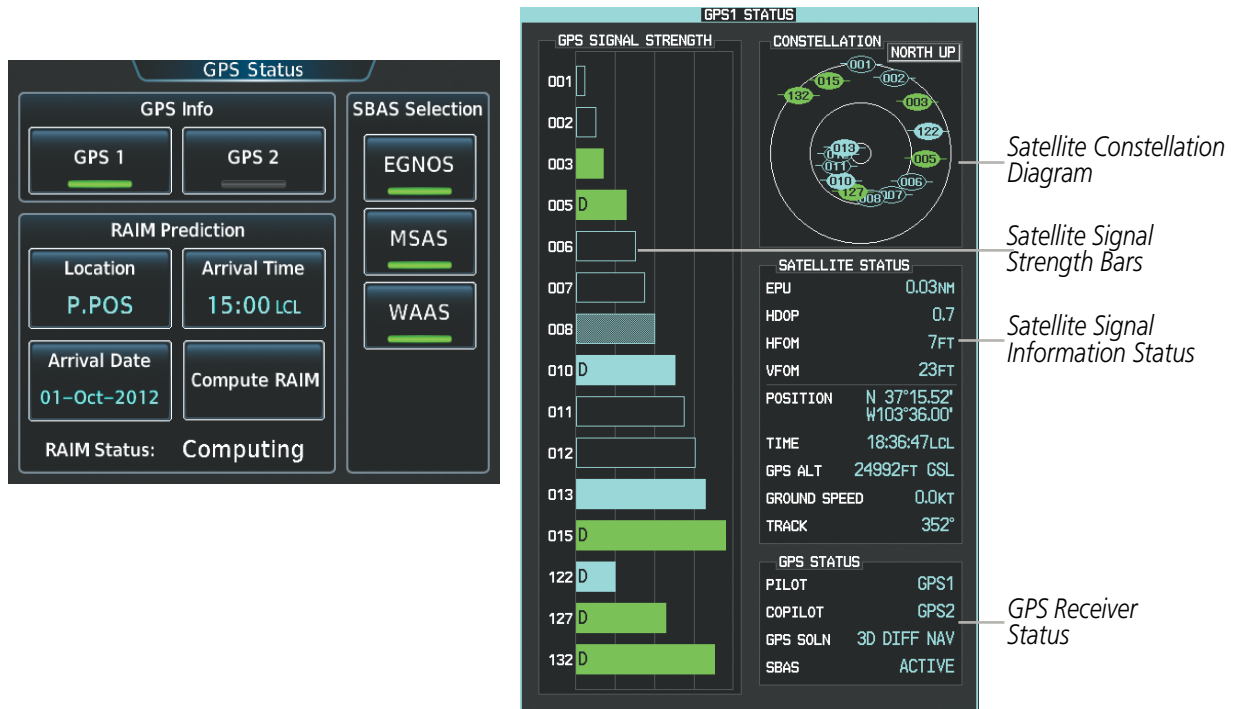


Figure 1-38 GPS Receiver Information

Selecting the GPS receiver:

- 1) From the **Home** Screen, touch **Utilities** > **GPS Status**.
- 2) Touch the **GPS 1** annunciator button to select the #1 GPS receiver. The button annunciator will be green when selected on. The system displays the GPS 1 STATUS Pane.
- 3) Touch the **GPS 2** annunciator button to select the #2 GPS receiver. The button annunciator will be green when selected on. The system displays the GPS 2 STATUS Pane.

SATELLITE CONSTELLATION DIAGRAM

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

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

SATELLITE SIGNAL STATUS

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

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

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

GPS RECEIVER STATUS

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

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

GPS SATELLITE SIGNAL STRENGTHS

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

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

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

SBAS SELECTION

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

Enabling/Disabling EGNOS, MSAS or WAAS

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

RAIM (RECEIVER AUTONOMOUS INTEGRITY MONITORING) PREDICTION

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

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

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

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

Predicting RAIM availability:

- 1) From the **Home**, touch **Utilities** > **GPS Status** > **Location**.
- 2) Touch the **Waypoint** Button to enter the location for which RAIM will be predicted. Touch the **Present Position** Button to enter the aircraft’s current position as the prediction location.
- 3) If the **Waypoint** Button was touched in step 2, enter the waypoint identifier using the alphanumeric buttons. If the **Present Position** Button was touched in step 2, proceed to step 5.
- 4) Touch the **Enter** Button.
- 5) The location selected for RAIM prediction is now displayed on the **Location** Button.
- 6) Touch the **Arrival Time** Button.
- 7) Enter the planned arrival time for the selected location using the numeric buttons
- 8) Touch the **Enter** Button. The time is now displayed on the **Arrival Time** Button.
- 9) Touch the **Arrival Date** Button.

- 10) Touch the button for the desired year. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired year.
- 11) Touch the button for the desired month. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired month.
- 12) Touch the button for the desired day. If necessary, touch and drag in the window, or use the **Up** and **Down** buttons to display the desired day. The selected date is now displayed on the **Arrival Date** Button.
- 13) Touch the **Compute RAIM** Button. One of the following will be displayed in the RAIM Status field.
 - ‘Computing’—RAIM calculation in progress
 - ‘Available’—RAIM is predicted to be available for the specified waypoint, time, and date
 - ‘Not Available’—RAIM is predicted to be unavailable for the specified waypoint, time, and date
 - ‘_____’—RAIM has not been computed for the specified waypoint, time, and date combination

ANNUNCIATIONS

When an LRU or an LRU function fails, a yellow ‘X’ is typically displayed on windows associated with the failed data (Figure 1-39). Upon system power-up, certain instruments remain invalid as equipment begins to initialize. All windows should be operational within one minute of power-up. If any window remains flagged, the system should be serviced by a Garmin-authorized repair facility.



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

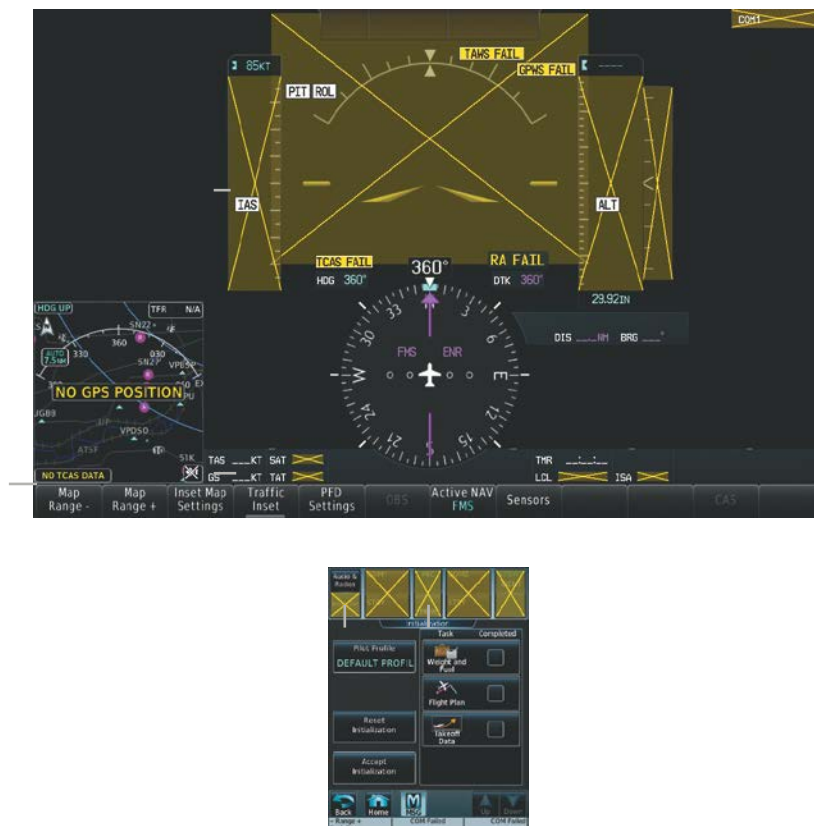


Figure 1-39 System Failure Annunciations, Reversionary Mode

1.5 SYSTEM MANAGEMENT

The Touchscreen Controllers allow management of various system parameters, in addition to providing status and database information for the system.

AVIONICS SETTINGS

Avionics Settings are categorized into 5 Tabs (**System**, **Units**, **Alerts**, **MFD Fields**, and **Audio**):

SYSTEM SETTINGS

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



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

Setting the Time Format:

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

Setting the Time Offset Value:

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

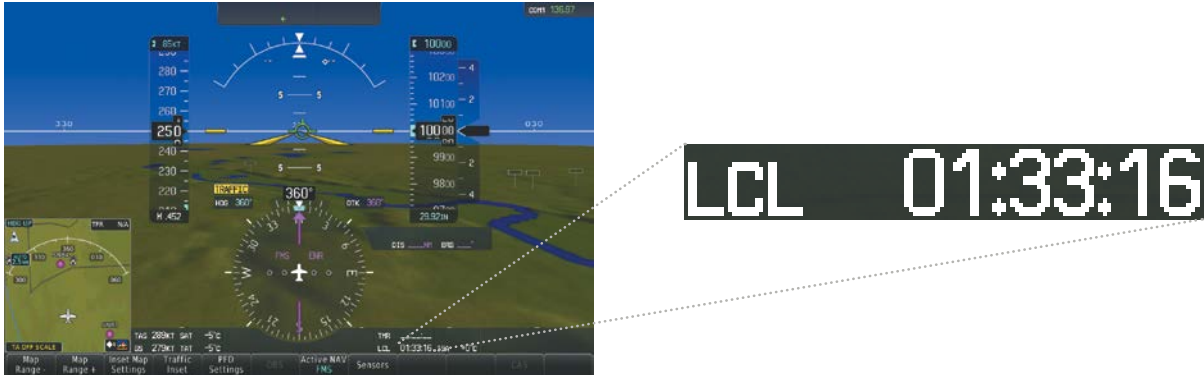


Figure 1-40 System Time (Local 24-hr Format)

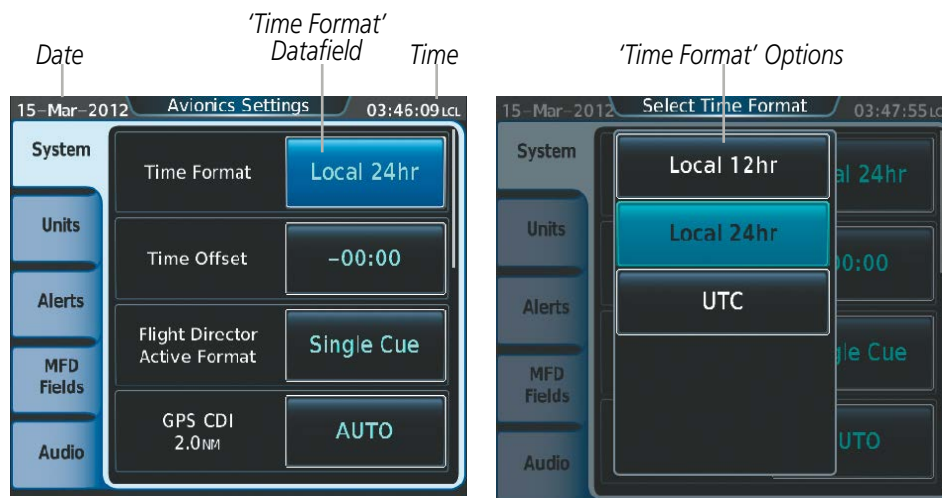


Figure 1-41 Time Format Settings

Setting the Flight Director Active Format:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Touch the Flight Director Active Format button to display a list of flight director formats (button displays currently selected Flight Director Active Format in light blue).
- 4) Touch either the **Single Cue** or **Dual Cue** Buttons.

GPS CDI RANGE

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

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

Setting the GPS CDI Range:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the System tab.
- 3) Touch the GPS CDI button (button displays current GPS CDI range in light blue).
- 4) Touch one of the following GPS CDI Range Buttons: **0.30 NM**, **1.00 NM**, **2.00 NM**, or **AUTO**.

COM CHANNEL SPACING



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

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

Setting COM Channel Spacing:

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

NEAREST AIRPORTS

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

Setting the Nearest Airport surface matching criteria:

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

Setting the Nearest Airport Minimum Runway Length matching criteria:

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

Restoring default Avionics Settings:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch one of the following tabs: **System, Units, Alerts, MFD Fields, or Audio**.
- 3) Scroll as necessary and touch the **Restore Default** Button..
- 4) Touch **Yes** to restore all settings in the selected tab to their default settings, or touch the **Cancel** Button.

UNITS SETTINGS

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

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

- Nav angle (magnetic, true)

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

Affects Current Heading, Selected Heading, and Selected Course.

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

- Temperature (Celsius, Fahrenheit)
Affects display cabin temperature readout and temperature deviation from ISA.
- Position Format (HDDD°MM.MM', HDDD°MM'SS.S")
Affects all position displays.

Changing unit settings:

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

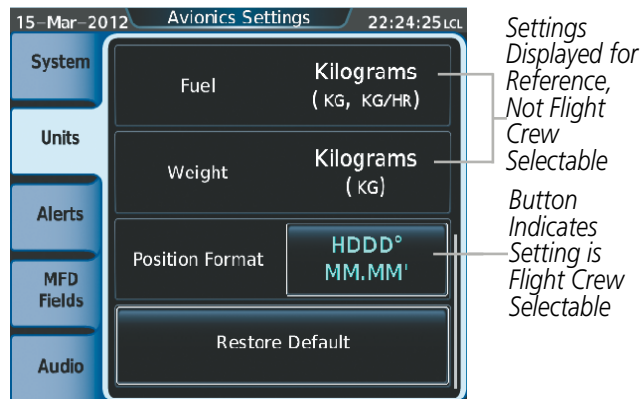


Figure 1-42 Viewing Unit Data on the Avionics Settings Screen

ALERTS SETTINGS

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

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

- Baro transition alert
- Altitude buffer distance alert
- Arrival alerts
- Airspace alerts

BARO TRANSITION ALERT SETTINGS

Enabling/Disabling the Baro Transition Alert:

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

Setting the Baro Transition Alert altitude:

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

ARRIVAL ALERT SETTINGS

Enabling/disabling Arrival Alerts:

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

Setting the Arrival Alert distance:

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

AIRSPACE ALERTS

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

Alerts for the following airspaces can be turned enabled/disabled:

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

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

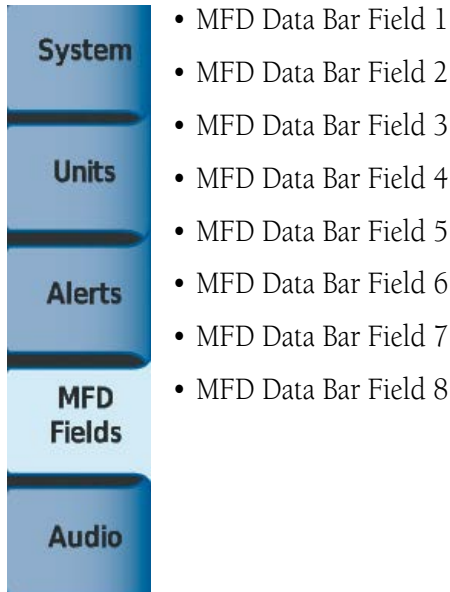
Enabling/disabling an airspace alert:

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

Setting the altitude buffer distance:

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

MFD FIELDS SETTINGS



The MFD Navigation Status Bar can display up to eight navigation data bar fields. By default, the Navigation Status Bar displays Ground Speed (GS), Desired Track (DTK), Track (TRK), Estimated Time Enroute (ETE), Bearing (BRG), Distance (DIS), Minimum Safe Altitude (MSA), and Estimated Time of Arrival (ETA). The system assigns each data bar field a corresponding number, 1 through 8, as displayed from left-to-right in the MFD Navigation Status Bar.

Change the information shown in an MFD Data Bar field:

- 1) From the **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) If necessary, touch the **MFD Fields** Tab.
- 3) Scroll as needed and touch the MFD Data Bar Field Number to be changed (1 through 8); current selection for each data bar field displayed in light blue.
- 4) Scroll as needed and touch the button corresponding to the desired data to be shown in the selected MFD Data Bar Field.

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

- Bearing (BRG)
- Distance (DIS)
- Desired Track (DTK)
- Endurance (END)
- Enroute Safe Altitude (ESA)
- Estimated Time of Arrival (ETA)
- Estimated Time Enroute (ETE)
- Fuel On Board (FOB)
- Fuel Over Destination (FOD)
- Ground Speed (GS)
- Minimum Safe Altitude (MSA)
- True Air Speed (TAS)
- Cross-Track Error (XTK)

AUDIO SETTINGS



- Audio Alert Voice

AUDIO

From the **Audio** Tab the audio alert voice gender can be set to male or female.

To change the audio alert voice:

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

CREW PROFILES

The system automatically stores various settings and selections within crew profiles. These include a wide range of parameters for both the pilot and copilot including (but not limited to) map settings, avionics settings, PFD settings, user waypoints, and weight and balance information.

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

After system power-up, the Default Profile is the active crew profile, regardless which Crew Profile was active before the power cycle. If needed, the flight crew may activate a different crew profile on the Initialization Screen or the Crew Profile Screen.

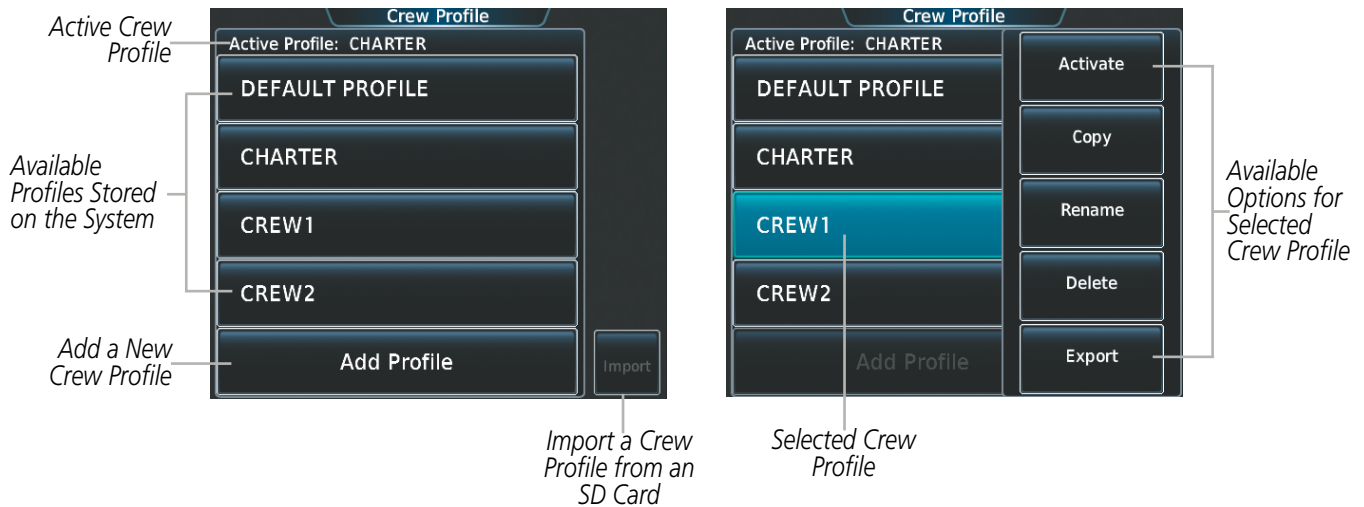


Figure 1-43 Managing Crew Profiles on the Crew Profile Screen

Adding a new crew profile:

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

Activating a crew profile:

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

Copying an existing crew profile:

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

Renaming an existing crew profile:

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

Deleting a crew profile:

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

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

Importing a crew profile from an SD card:

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

Exporting a crew profile to an SD card:

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

AVIONICS STATUS

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

LRU INFO

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

Viewing LRU information:

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

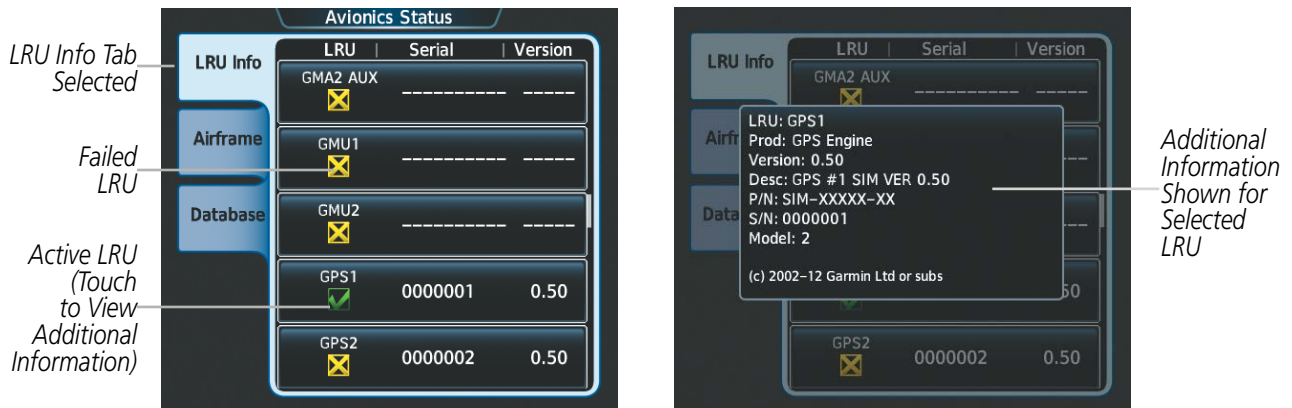


Figure 1-44 Viewing LRU Info Information on the Touchscreen Controller

AIRFRAME

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

Viewing airframe information:

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

DATABASE

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

Viewing database information:

- 1) From **Home**, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Database** Tab.
- 3) Touch **MFD1, PFD1, PFD2, GT1, or GTC2** Buttons to view database information for the selected LRU.
- 4) Scroll as needed to view the database information for the selected LRU, then touch **Back** or **Home**.

SIRIUSXM INFORMATION



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

Viewing SiriusXM Information:

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

SiriusXM Satellite Radio services are subscription-based. The service is activated by providing SiriusXM Satellite Radio with either one or two coded IDs, depending on the equipment. Either the Audio Radio ID or the Data Radio ID, or both, must be provided to SiriusXM to activate the subscription.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. Either or both services can be activated. SiriusXM uses one or both of the coded IDs to send an activation signal.

These IDs are located:

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

Activating SiriusXM Weather and SiriusXM Satellite Radio:

- 1) Position the aircraft so the GDL 69A antenna has an unobstructed view of the sky.
- 2) From **Home** touch **Utilities > Setup > SiriusXM Info > Start**. Touchscreen Controller displays 'ACTIVATING'.
- 3) When system indicates activation has completed, touch '**Lock**' to save the activation changes, or touch '**Cancel**' to exit without saving changes.

SCREEN CLEANING

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

Cleaning the Touchscreen Controller screen:

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

1.6 UTILITIES

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

TIMER

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

Setting the generic timer:

- 1) From the **Home**, touch **Utilities > Timer**.
- 2) Touch the **Time** Button.
- 3) Input the desired time using the numeric keypad or the Large and Small Right Knobs, then touch the **Enter** Button or press the **Right Knob**.
- 4) Touch the **Start** Button. The button changes to 'Stop'.
- 5) To stop the timer, touch the **Stop** Button.
- 6) To reset the timer, touch the **Reset** Button.

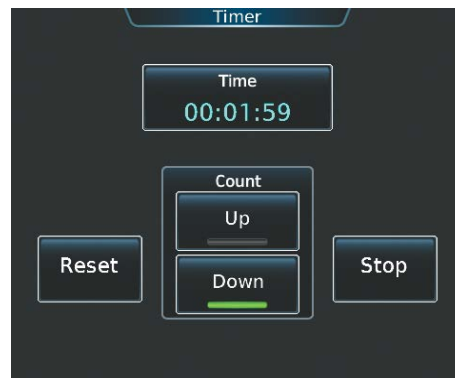


Figure 1-45 Timer (Touchscreen Controller)

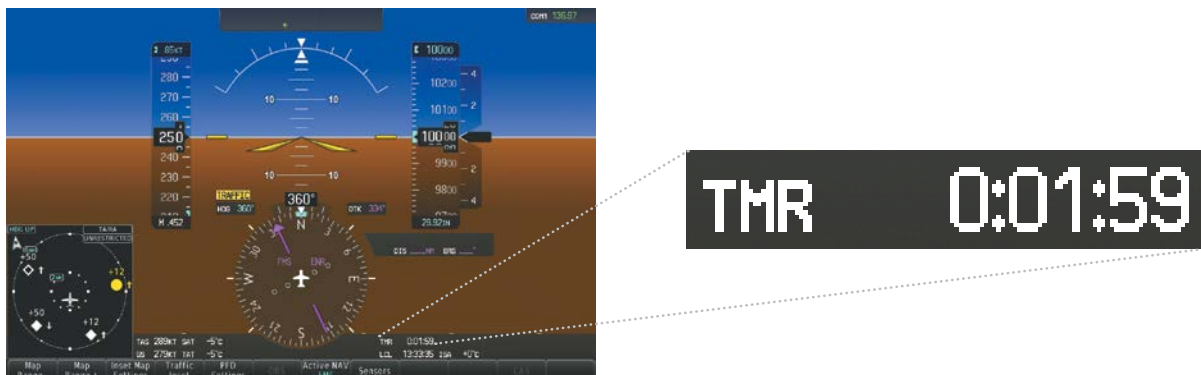


Figure 1-46 Timer (PFD)

TRIP STATS

FLIGHT TIME

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

Setting the flight timer starting criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Flight Time **Start At** Button (Figure 1-47).
- 3) Touch either the **Power On** or **In-Air** Button. A green annunciator indicates the selected option.
- 4) Touch the **Accept** Button.

Resetting the flight timer:

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

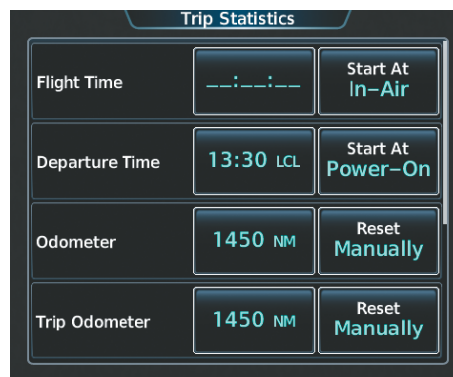


Figure 1-47 Trip Statistics Options

DEPARTURE TIME

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

Setting the departure timer starting criterion:

- 1) From **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Departure Time **Start At** Button.
- 3) Touch either the **Power On** or **In-Air** Button. A green annunciator indicates the selected option.
- 4) Touch the **Accept** Button.

Resetting the departure time:

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

ODOMETER

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

Setting the odometer automatic reset criterion:

- 1) From the **Home**, touch **Utilities** > **Trip Stats**.
- 2) Touch the Odometer **Reset** Button (Figure 1-47).
- 3) Touch the **Power On**, **In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 4) Touch the **Accept** Button.

Manually resetting the odometer:

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

TRIP ODOMETER

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

Setting the Trip Odometer automatic reset criterion:

- 1) From the **Home** Screen, touch **Utilities** > **Trip Stats**.
- 2) Touch the Trip Odometer **Reset** Button (Figure 1-47).
- 3) Touch the **Power On**, **In-Air**, or **Manually** Button. A green annunciator indicates the selected option. Note manual reset is always available regardless of the option selected for automatic reset.
- 4) Touch the **Accept** Button.

Manually resetting the Trip Odometer:

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

HOUR METER

The hour meter shows accumulated engine time. It begins counting when N1 is above 5 percent on either engine. It stops counting when N1 drops below 5 percent. This is a system timer and is not pilot adjustable.

AVERAGE GROUND SPEED

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

Setting the average ground speed automatic reset criterion:

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

Manually resetting the Odometer:

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

MAXIMUM GROUND SPEED

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

Setting the Maximum Ground Speed automatic reset criterion:

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

Manually resetting the Maximum Ground Speed:

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

1.7 SECURE DIGITAL CARDS



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



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



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

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

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

Install an SD card

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

Remove an SD card

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

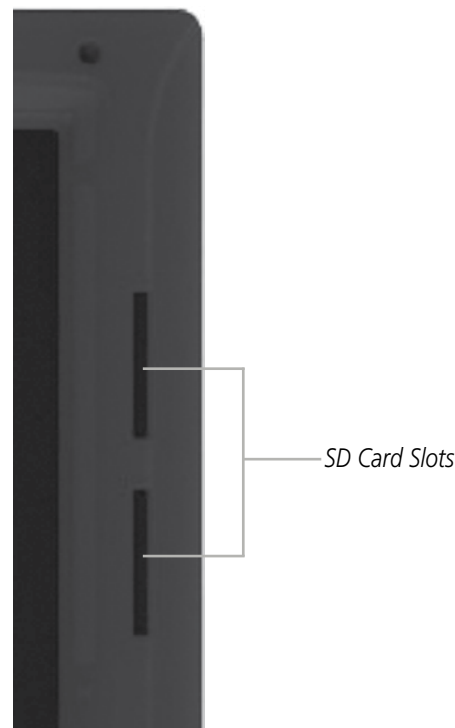


Figure 1-48 Display Bezel SD Card Slots

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SECTION 2 FLIGHT INSTRUMENTS



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



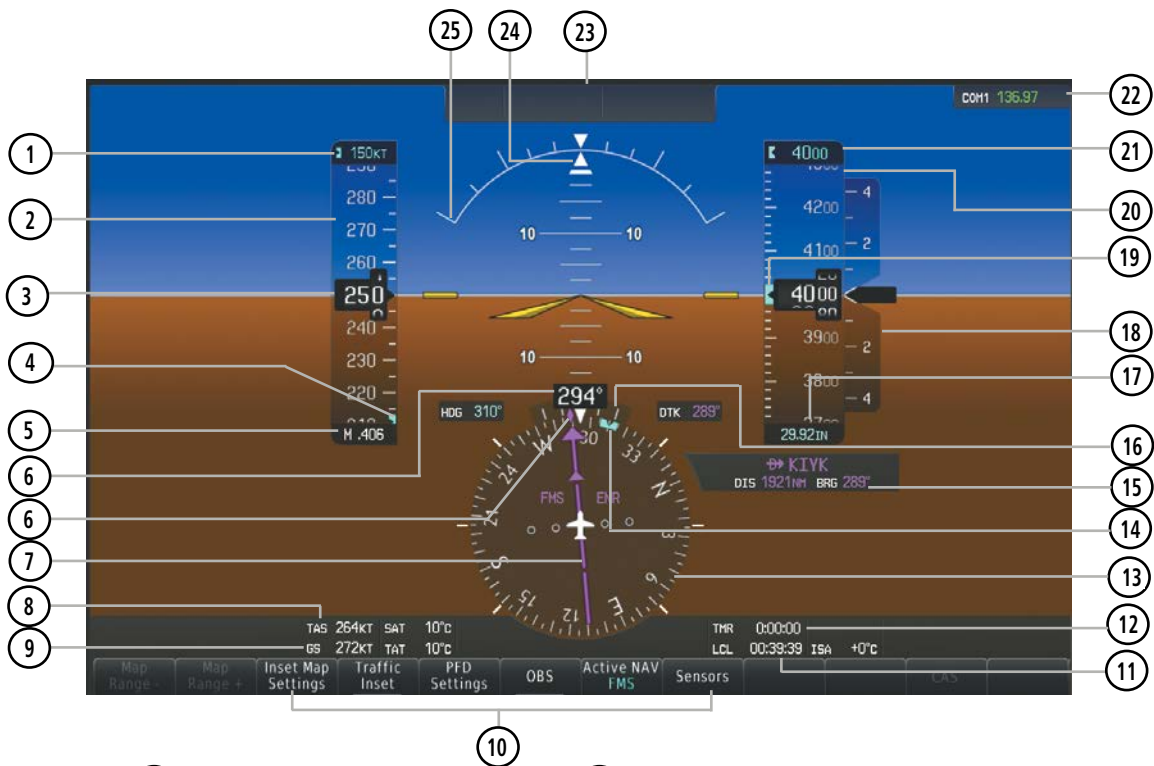
NOTE: The Automatic Flight Control System (AFCS) provides additional readouts and indicators (bug) on selected flight instruments. Refer to the AFCS Section for details on these indicators (bug) and readouts, as they appear on the display during certain AFCS flight director modes.

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

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

- Airspeed Indicator, showing
 - Indicated airspeed
 - Airspeed awareness ranges
 - Vspeed reference flags
 - Mach number
 - Airspeed reference and bug
- Groundspeed
- True airspeed
- Attitude Indicator with slip/skid indication
- Altimeter, showing
 - Trend vector
 - Barometric setting
 - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNAV) indications
- Total Air Temperature (TAT)
- Static Air Temperature (SAT)
- ISA Temperature Deviation
- Horizontal Situation Indicator, showing
 - Turn Rate Indicator
 - Bearing pointers and information windows
 - Navigation source
 - Course Deviation Indicator (CDI)
 - Bearing pointers and information windows
- Course Deviation Indicator (CDI)
- Generic Timer
- Wind data
- Radar Altimeter (RA)
- Barometric minimum descent altitude (MDA)

The PFDs also display various alerts and annunciations.



- | | |
|--|----------------------------------|
| ① Airspeed Reference | ⑭ Heading Bug |
| ② Airspeed Indicator | ⑮ Navigation Status Box |
| ③ Indicated Airspeed | ⑯ Turn Rate Indicator |
| ④ Airspeed Reference Bug | ⑰ Barometric Altimeter Setting |
| ⑤ Mach Number | ⑱ Vertical Speed Indicator (VSI) |
| ⑥ Current Track Indicator | ⑲ Selected Altitude Bug |
| ⑦ Course Deviation Indicator (CDI) | ⑳ Altimeter |
| ⑧ True Airspeed | ㉑ Selected Altitude |
| ⑨ Ground Speed | ㉒ COM Frequency Box |
| ⑩ Softkeys | ㉓ AFCS Status Box |
| ⑪ System Time | ㉔ Slip/Skid Indicator |
| ⑫ Timer | ㉕ Attitude Indicator |
| ⑬ Horizontal Situation Indicator (HSI) | |

Figure 2-1 Primary Flight Display (Default)



- | | |
|--------------------------------|--|
| ① Reversionary Sensor Window | ⑪ Bearing Information Windows |
| ② Traffic Annunciation | ⑫ ISA Temperature Deviation |
| ③ IAS Comparator Annunciation | ⑬ Minimum Descent Altitude/Decision Height |
| ④ Vspeed References | ⑭ CAS Window |
| ⑤ Selected Heading | ⑮ Selected Course |
| ⑥ Wind Data | ⑯ Radar Altimeter |
| ⑦ Inset Map | ⑰ TAWS Annunciation |
| ⑧ DME1 Information Window | ⑱ Current Vertical Speed |
| ⑨ Static Air Temperature (SAT) | ⑲ Glideslope Indicator |
| ⑩ Total Air Temperature (TAT) | |

Figure 2-2 Additional PFD Information

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR



NOTE: Refer to the Airplane Flight Manual (AFM) for speed criteria and Vspeed values.

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The numeric labels and major tick marks on the moving tape represent intervals of 10 knots. The minor tick marks on the moving tape represent intervals of five knots. Speed indication starts at 20 knots, with 80 knots of airspeed scale viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching maximum operating speed (V_{MO}/M_{MO}), at which point it turns red along with the Mach number readout.

The Mach number is displayed below the Airspeed Indicator (Figure 2-3) for airspeeds at or above Mach 0.4 or at altitudes of 26,227 feet or higher. The color of the readout is the same as the color of the airspeed pointer.

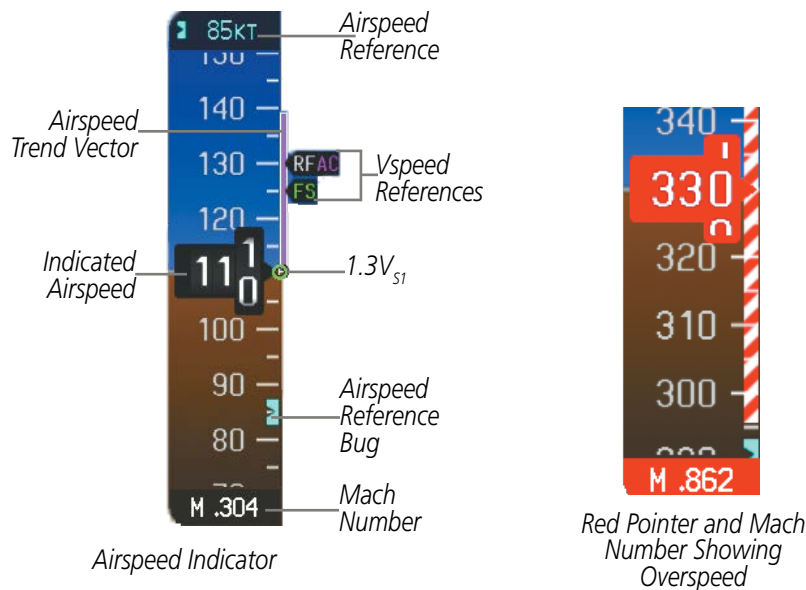


Figure 2-3 Airspeed Indicator

Speeds above the maximum operating speed, V_{MO} or M_{MO} depending on aircraft altitude, appear in the high speed awareness range, shown on the airspeed tape by a red/white barber pole. An aural overspeed warning tone is generated if the airspeed exceeds the high airspeed limit. If the indicated airspeed is within the red range, the airspeed pointer is displayed in red. An aural stall warning is generated if the airspeed falls below V_{LSA} . An open green circle on the airspeed tape represents $1.3V_{S1}$. The green circle is displayed when in the air below 18,000 feet, and it indicates the stall warning system is functioning correctly.

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

The Airspeed Reference is displayed above the Airspeed Indicator in the box indicated by a selection bug symbol. A bug corresponding to this speed is shown on the tape. If the Airspeed Reference exceeds the range shown on the tape, the bug appears at the upper or lower edge of the tape. See the AFCS Section for more information about the Airspeed Reference.

Vspeeds can be changed and their flags turned on/off from the Timer/References Window. When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale. By default, all Vspeed values are reset and all flags turned off during power up.

	Vspeed	Flag
Takeoff	V ₁	1
	V _R	R
	V ₂	2
	V _{FS}	FS
Landing	V _{AP}	AP
	V _{REF}	RF
	V _{AC}	AC
	V _{FS}	FS

Table 2-1 Vspeed Flag Labels

Vspeeds are categorized as either takeoff or landing. Takeoff Vspeed flags are automatically turned off when airspeed reaches 160 knots. The order in which the categories are displayed is determined by whether the aircraft is on the ground or in the air. If the aircraft is on the ground, the takeoff Vspeeds are displayed at the top of the Vspeed list. If the aircraft is in the air, the landing Vspeeds are displayed at the top.

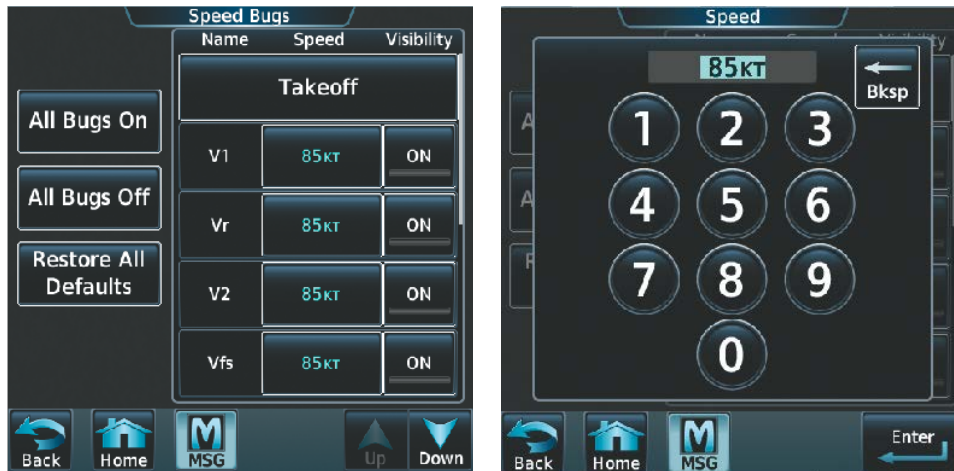


Figure 2-4 Vspeed Settings

Changing Vspeeds and turning Vspeed flags on/off:

- 1) From the **Home** Screen, touch **Speed Bugs**
- 2) To turn the Vspeed on or off, touch the **On** Button.
- 3) To set or change a Vspeed value, touch the Data Field for the Vspeed, enter a value in the keypad, and touch **Enter**. The icon next to the Vspeed value (Figure 2-5) indicates that the Vspeed is a pilot-entered value.



Figure 2-5 Pilot-Entered Vspeed

Turning all Vspeed flags on/off:

- 1) From the **Home** Screen, touch **Speed Bugs**.
- 2) To activate all Vspeed flags, touch the **All Bugs On** Button.
- 3) To remove all Vspeed flags, touch the **All Bugs Off** Button.

Restoring all Vspeed defaults:

- 1) From the **Home** Screen, touch **Utilities > Speed Bugs**.
- 2) Touch the **Restore All Defaults** Button.

ATTITUDE INDICATOR

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

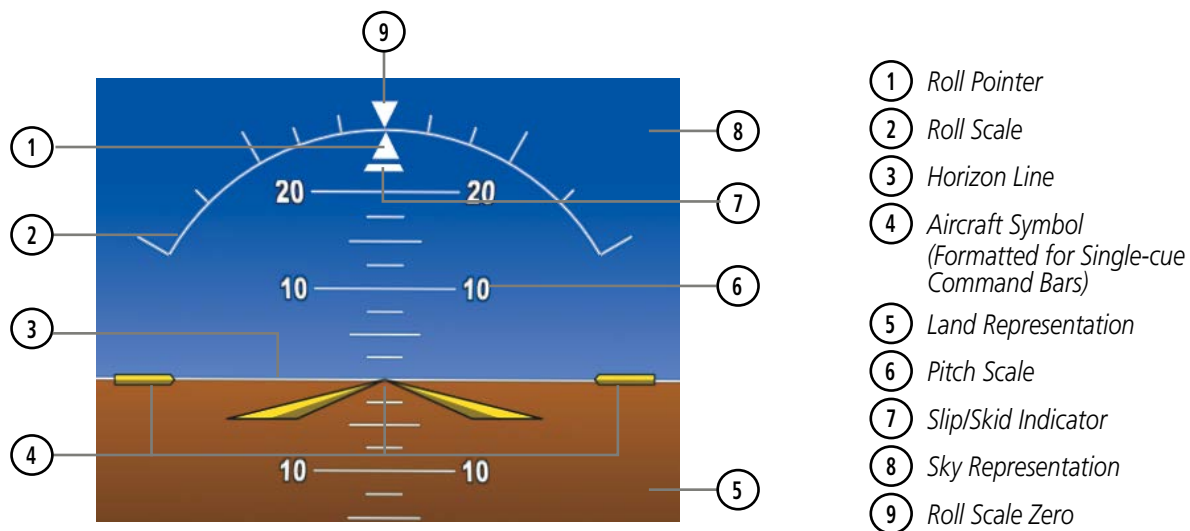


Figure 2-6 Attitude Indicator

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

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

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

The Attitude Indicator also provides pitch cues to comply with TCAS II Resolution Advisories; see the Hazard Avoidance Section for details.



Figure 2-7 Slip/Skid Indication

The yellow symbolic aircraft on the Attitude Indicator changes appearance based on selection of AFCS flight director Command Bar format (see the AFCS Section for details). Both PFDs show the same Command Bar format and Aircraft Symbol. The Command Bar format (single cue or dual cue) may be selected on the GTC Avionics Settings Screen.

Changing Command Bar and Aircraft Symbol format.

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab.
- 3) Touch the **Flight Director Active Format** Data Field.
- 4) Touch desired setting (**Single Cue** or **Dual Cue**).

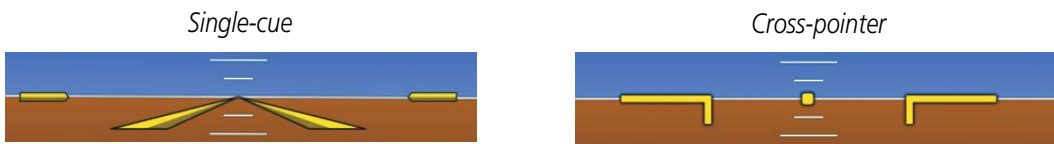


Figure 2-8 Flight Director Format Settings

ALTIMETER

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

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

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

Setting the Selected Altitude:

Turn the **ALT** Knob on the GMC 715 AFCS Controller to set the Selected Altitude in 100-ft increments. When meters are displayed, Selected Altitude is adjusted in 50 meter increments..

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

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

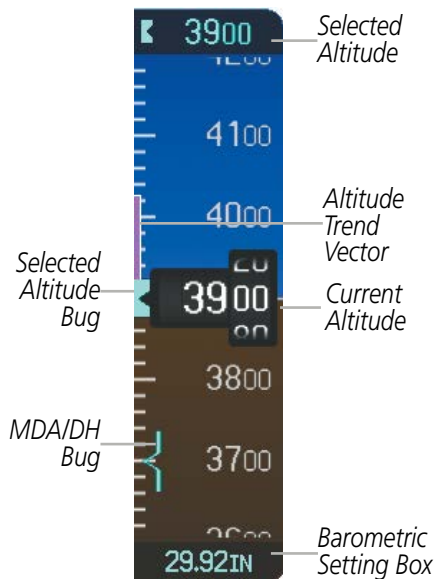


Figure 2-9 Altimeter

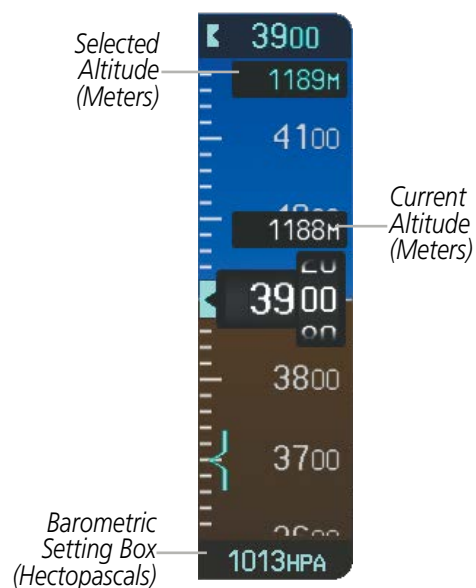


Figure 2-10 Altimeter (Metric)

The altitude tape does not change scale when the altitudes are displayed in meters.

Displaying altitude in meters:

- 1) Select the **PFD Settings** Softkey to display the second-level softkeys.
- 2) Select the **Other PFD Settings** Softkey.
- 3) Select the **Altitude Units** Softkey.
- 4) Select the **Meters** Softkey to turn on metric altitude readouts.

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

Selecting the altimeter barometric pressure setting:

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

Selecting standard barometric pressure:

Press the **BARO** Knob to select standard pressure; STD BARO is displayed in the Barometric Setting box.



Figure 2-11 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

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

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

Setting the Baro Transition Alert:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Alerts** Tab.
 - To turn the alert on or off, touch the **Baro Transition Alert Enable** Button.
 - To set or change the Baro Transition Alert Altitude, touch the **Baro Transition Alert** Data Field. Enter the desired altitude on the keypad, and touch **Enter**.

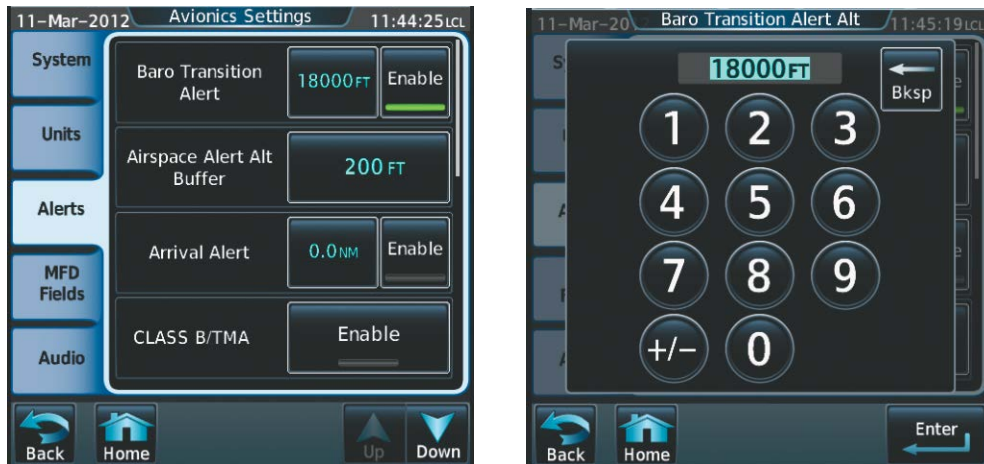


Figure 2-12 Baro Transition Alert

VERTICAL SPEED INDICATOR (VSI)

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

A magenta chevron is displayed on the VSI to indicate the Required Vertical Speed for reaching a VNAV target altitude once the “TOD [Top of Descent] within 1 minute” alert has generated. See the Flight Management and AFCS sections for details on VNAV features. Refer to Section 2.3, Supplemental Flight Data, for more information about VNAV indications on the PFD. The VSI also provides vertical speed guidance during TCAS II Resolution Advisories; see the Hazard Avoidance section for details.

VERTICAL DEVIATION

The Vertical Deviation Indicator (VDI) is a magenta chevron indicating the baro-VNAV vertical deviation when Vertical Navigation (VNAV) is being used (Figure 2-13). The VDI appears in conjunction with the “TOD within 1 minute” alert. Full-scale deflection (two dots) on the VDI is 1000 feet. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management Section for details on VNAV features, and refer to Section 2.3, Supplemental Flight Data, for more information about VNAV indications on the PFD.

The Glideslope Indicator (Figure 2-14) appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, “NO GS” is displayed in place of the diamond.

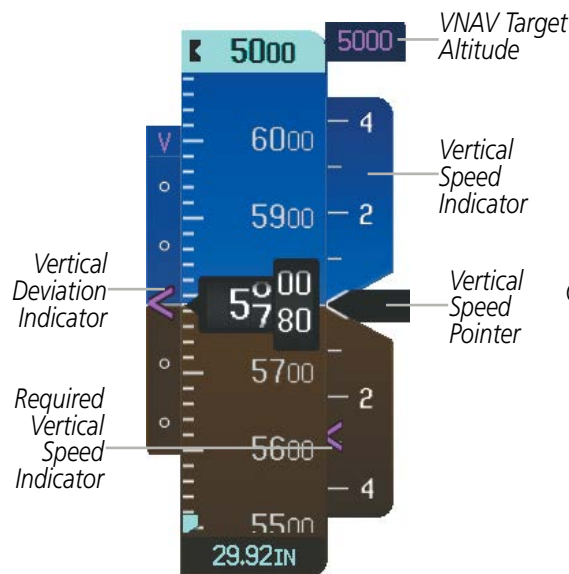


Figure 2-13 Vertical Speed and Deviation Indicators (VSI and VDI)

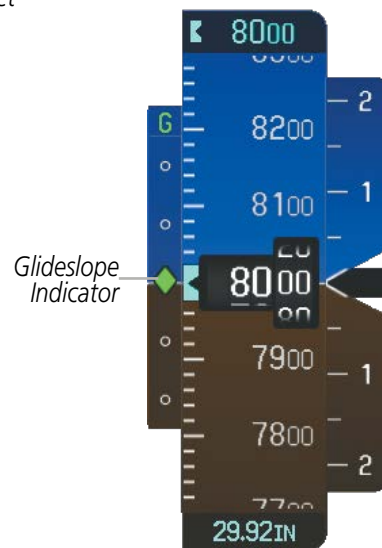


Figure 2-14 Glideslope Indicator

The glidepath is analogous to the glideslope for FMS approaches supporting SBAS vertical guidance (LNAV+V, LNAV/VNAV, LPV). When an approach of this type is loaded into the flight plan, FMS is the selected navigation source, and SBAS is used for vertical approach guidance, the Glidepath Indicator appears as a magenta diamond (Figure 2-15). If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the diamond.

While executing an LNAV/VNAV approach and SBAS is unavailable, baro-VNAV (barometric vertical navigation) is used for vertical guidance. This occurs due to any of the following conditions:

- SBAS fails or becomes unavailable prior to the FAF
- The aircraft is outside of SBAS coverage
- SBAS is manually disabled on the GPS Status page of the GTC

Baro-VNAV is also the source of vertical approach guidance if the LNAV/VNAV procedure does not support SBAS vertical guidance.

While baro-VNAV is being utilized, the Glidepath Indicator appears as a magenta pentagon (Figure 2-16). If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the pentagon.

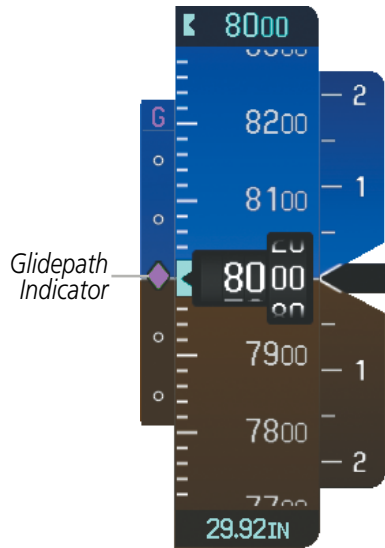


Figure 2-15 Glidepath Indicator

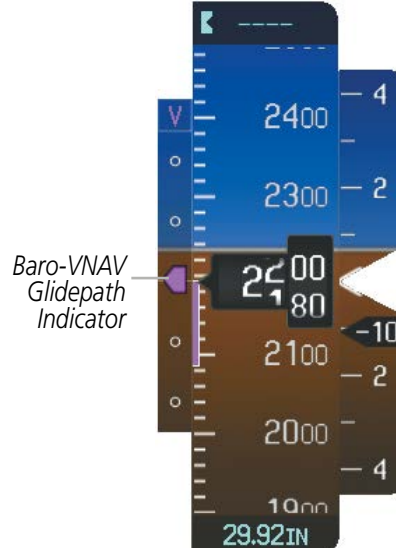


Figure 2-16 Baro-VNAV Glidepath Indicator

HORIZONTAL SITUATION INDICATOR (HSI)

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

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

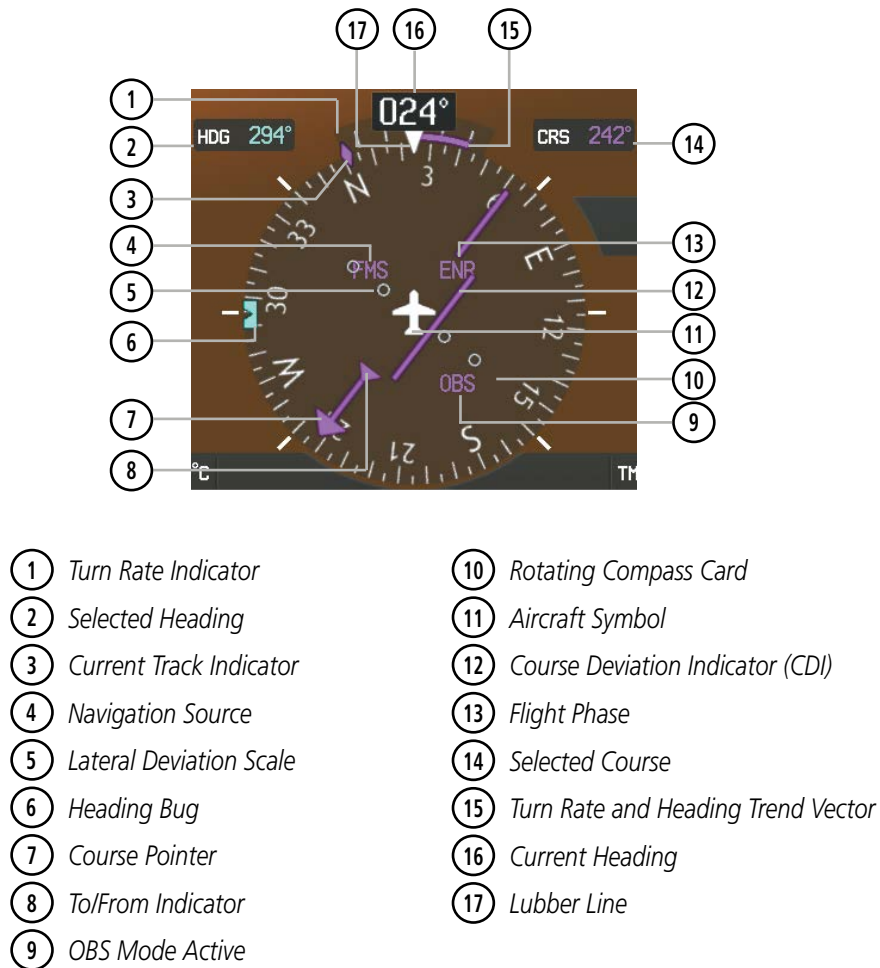


Figure 2-17 Horizontal Situation Indicator (360° HSI)

A digital reading of the current heading appears on top of the HSI. The current track is represented on the HSI by a magenta diamond. To the upper left of the HSI, the Selected Heading is shown in light blue; the light blue bug on the compass rose corresponds to the Selected Heading. The Desired Track (DTK) is shown in magenta to the upper right of the HSI when the selected navigation source is FMS without OBS mode active. The Selected Course (CRS) is shown to the upper right of the HSI in green when the selected navigation source is VOR or LOC and in magenta when the selected navigation source is FMS with OBS mode active.

Adjusting the selected heading:

Turn the **HDG** Knob to set the Selected Heading on both PFDs.

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

Adjusting the Selected Course:

Turn the **CRS** Knob to set the Selected Course (for each PFD).

Press the **CRS** Knob to re-center the CDI and return the course pointer to the bearing of the active waypoint or navigation station.



Figure 2-18 Heading and Course Indications (Magnetic)

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation or referenced to true north (denoted 'T'), and are set on the GTC Avionics Setup Screen. When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the navigation angle setting to 'True' at the appropriate time.



Figure 2-19 Heading and Course Indications (True)

Changing the navigation angle setting:

- 1) From the **Home** Page touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **Units** Tab.
- 3) Touch the **Nav Angle** Data Field.
- 4) Touch the desired setting (**Magnetic** or **True**).

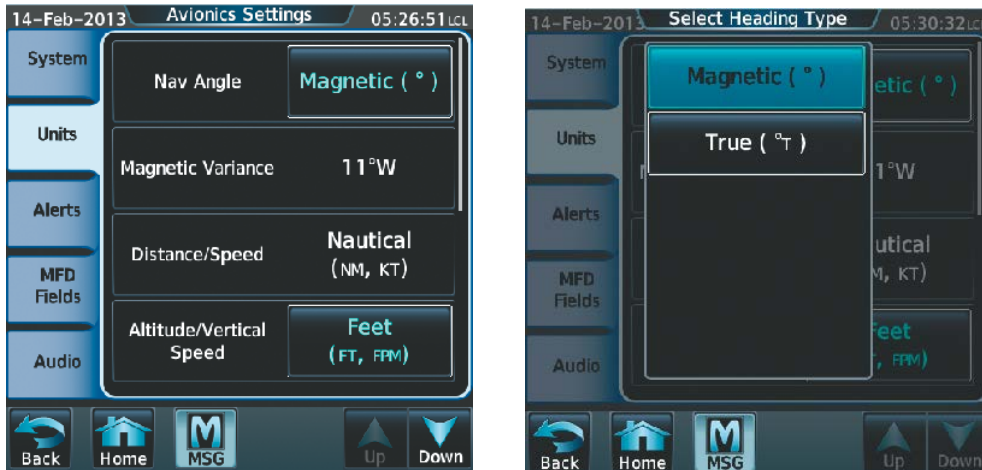


Figure 2-20 Navigation Angle Settings

TURN RATE INDICATOR

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



Figure 2-21 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

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

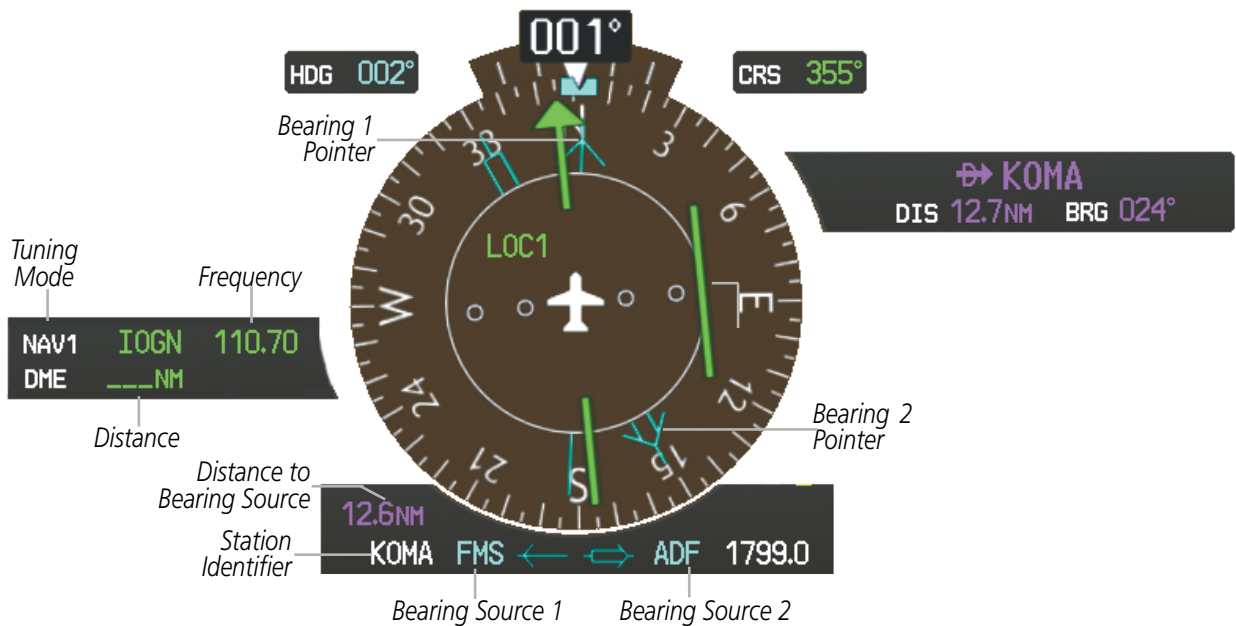


Figure 2-22 HSI with Bearing and Distance Information

When a bearing pointer is displayed, its associated information window is also displayed. The Bearing Information windows (Figure 2-22) are beneath the HSI and displays the following information:

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

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

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

Selecting bearing display and changing sources:

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

COURSE DEVIATION INDICATOR (CDI)

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

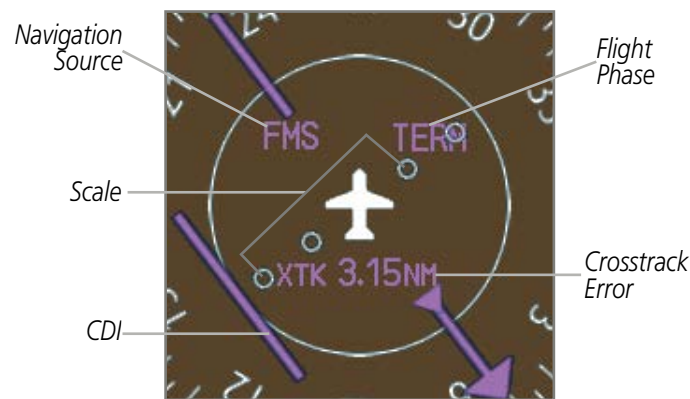


Figure 2-23 Course Deviation Indicator

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

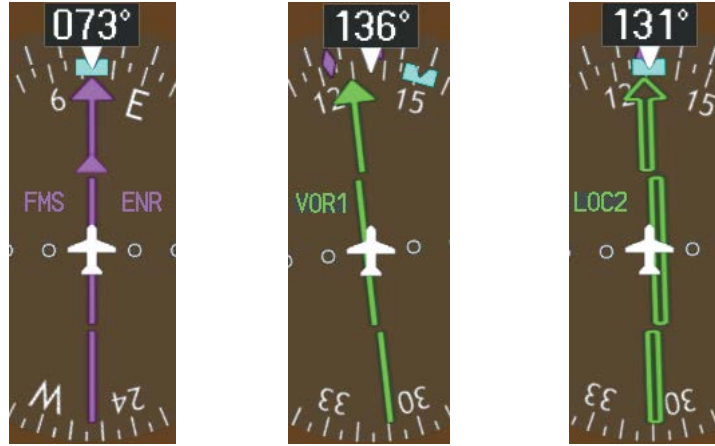


Figure 2-24 Navigation Sources

Changing navigation sources:

- 1) Select the **Active NAV** Softkey to change from FMS to VOR1 or LOC1.
- 2) Select the **Active NAV** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2.
- 3) Select the **Active NAV** Softkey again to return to FMS.



Figure 2-25 Selecting a Navigation Source

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

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

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

If the same VOR/LOC navigation source is selected on both PFDs, the navigation source annunciation turns yellow on both displays if not synchronized. Once the CDIs are synchronized (CDI Synchronization turned on), they remain synchronized until the selection is changed. When turning on the system for use, it remembers the last CDI synchronization setting.

FMS CDI SCALING

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

The current FMS CDI scale setting is displayed on the GTC Avionics Settings Screen and the full-scale deflection setting may also be changed on this screen. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

Changing the selected FMS CDI setting:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab.
- 3) Touch the **GPS CDI** Data Field.
- 4) Touch desired setting (**2.00 NM**, **1.00 NM**, **0.30 NM**, or **AUTO**).

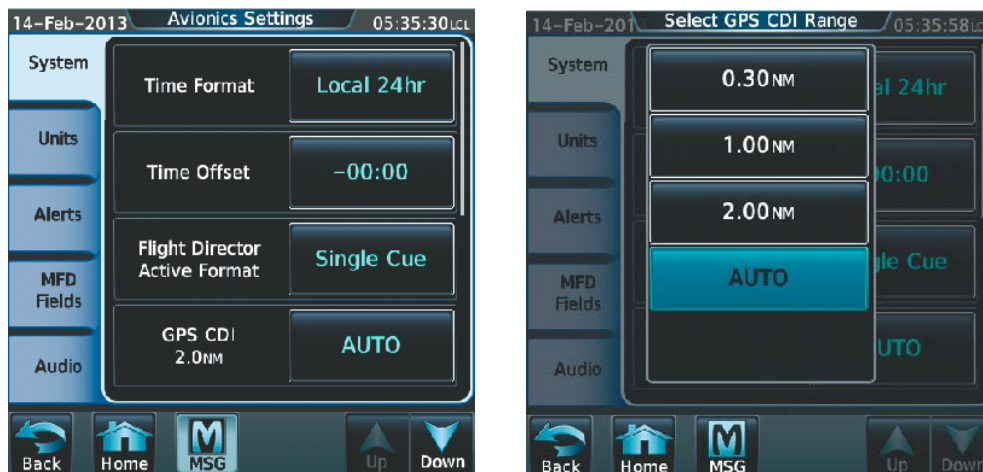


Figure 2-26 GPS CDI Settings

When set to 'Auto' (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-27, Table 2-2).

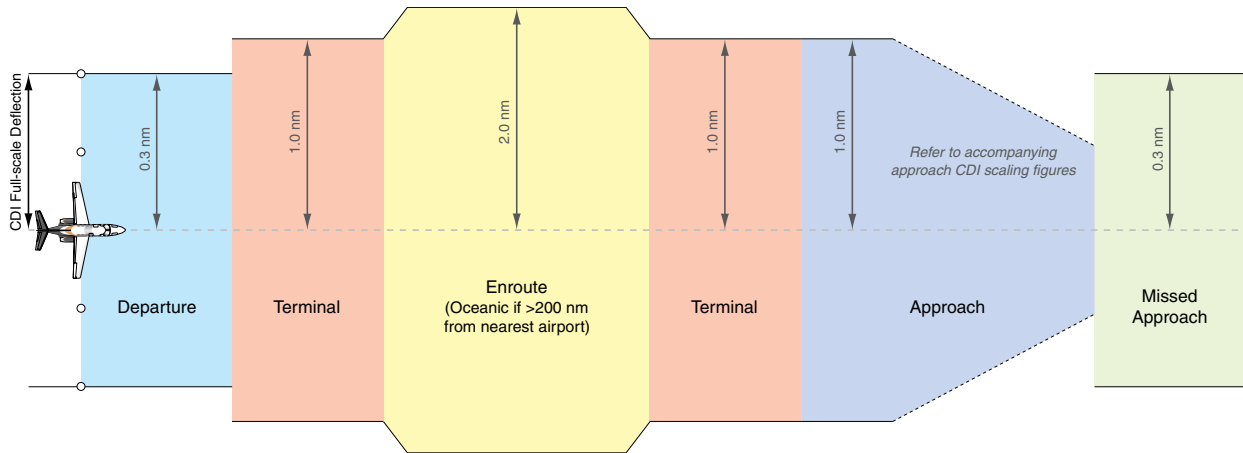


Figure 2-27 Automatic CDI Scaling

- Once a departure procedure is activated, the CDI is scaled for **departure** (0.3 nm).
- The system switches from departure to **terminal** CDI scaling (1.0 nm) under the following conditions:
 - The next leg in the departure procedure is not aligned with the departure runway
 - The next leg in the departure procedure is not a CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF leg (see Glossary for leg type definitions)
 - After any leg in the departure procedure that is not a CA or FA leg
- At 30 nm from the departure airport the **enroute** phase of flight is automatically entered and CDI scaling changes to 2.0 nm over a distance of 1.0 nm, except under the following conditions:
 - When navigating with an active departure procedure, the flight phase and CDI scale does not change until the aircraft arrives at the last departure waypoint (if more than 30 nm from the departure airport) or the leg after the last departure waypoint has been activated or a direct-to waypoint is activated.
- If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for **oceanic** flight (2.0 nm).
- Within 31 nm of the destination airport (**terminal** area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm, except under the following conditions:
 - Upon reaching the first waypoint of an arrival route that is more than 31 nm from the destination airport, the flight phase changes to terminal and the CDI scale begins to transition down from 2.0 nm to 1.0 nm over a distance of 1.0 nm.
- During **approach**, the CDI scale ramps down even further (Figures 2-28 and 2-29). This transition normally occurs within 2.0 nm of the Final Approach Fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is active or if Vectors-To-Final (VTF) are selected.
 - If the active waypoint is the FAF, the ground track and the bearing to the FAF must be within 45° of the final approach segment course.
 - If the active waypoint is part of the missed approach procedure, the active leg and the preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

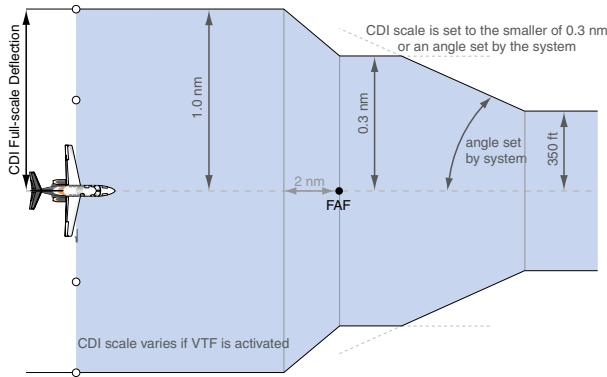


Figure 2-28 Typical LNAV and LNAV+V Approach CDI Scaling

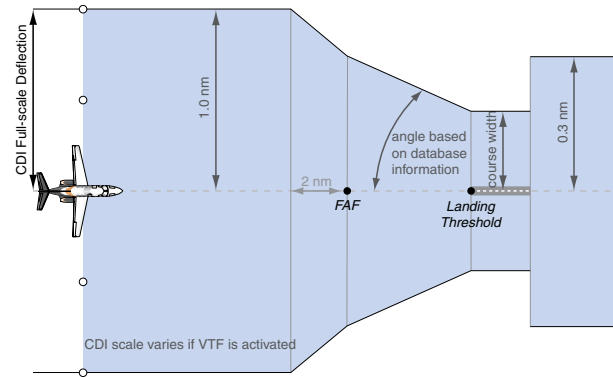


Figure 2-29 Typical LNAV/VNAV, LPV and LP Approach CDI Scaling

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

Flight Phase	Annunciation*	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	2.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (Figure 2-28)
Approach (Non-precision with Vertical Guidance)	LNAV + V	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (Figure 2-29)
Approach (LPV)	LPV	
Approach (LP)	LP	
Missed Approach	MAPR	0.3 nm

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

Table 2-2 Automatic GPS CDI Scaling

OBS MODE



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

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

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

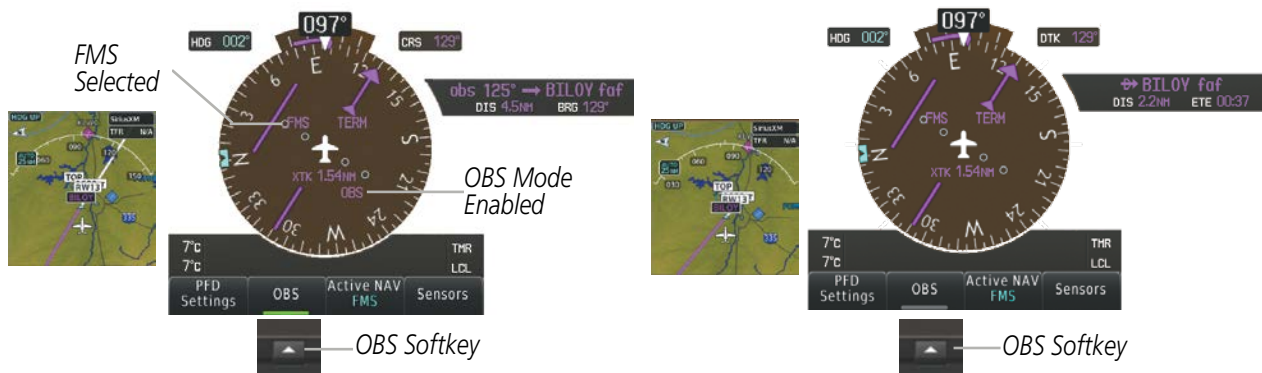


Figure 2-30 Omni-bearing Selector (OBS) Mode

Enabling/disabling OBS Mode while navigating an FMS flight plan:

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

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. 'SUSP' appears on the HSI at the lower right of the aircraft symbol. The **OBS** Softkey label changes to indicate the suspension is active as shown in Figure 2-31. Selecting the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.



Figure 2-31 Suspension of Automatic Waypoint Sequencing

2.2 GARMIN SVT™ (SYNTHETIC VISION TECHNOLOGY)



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

Garmin SVT™ (Synthetic Vision Technology) is a visual enhancement to the Vision Flight Deck. SVT depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 44 degrees to the left and 44 degrees to the right. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a 4.9 arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of 4.9 arc-seconds, meaning that the terrain elevation contours are stored in squares measuring 4.9 arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled until the required data is restored.

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

The Terrain Awareness and Warning System (TAWS-A) is integrated within SVT to provide visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Terrain alerts are displayed in red and yellow shading on the PFD.

The terrain display is intended for situational awareness only. It may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of TAWS-A terrain or obstacle data displayed by the SVT.

The following SVT enhancements appear on the PFD:

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



Figure 2-32 Synthetic Vision Imagery

SVT OPERATION

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

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

Horizon Heading, **Airport Signs**, and **Pathways** softkeys are only available when the **Synthetic Terrain** Softkey is activated (softkey annunciator is green). After activating the **Synthetic Terrain** Softkey, the **Horizon Heading**, **Airport Signs**, and **Pathways** softkeys may be activated in any combination to display desired features. When system power is cycled, the last selected state (on or off) of the SVT feature softkeys is remembered.

- **Pathways** Softkey enables display of rectangular boxes that represent course guidance.
- **Synthetic Terrain** Softkey enables synthetic terrain depiction.
- **Horizon Heading** Softkey enables the display of heading marks and digits on the zero pitch line.
- **Airport Signs** Softkey enables airport signposts.

Activating and deactivating SVT:

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

Activating and deactivating Pathways:

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

Activating and deactivating Horizon Headings:

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

Activating and deactivating Airport Signs:

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

SVT FEATURES

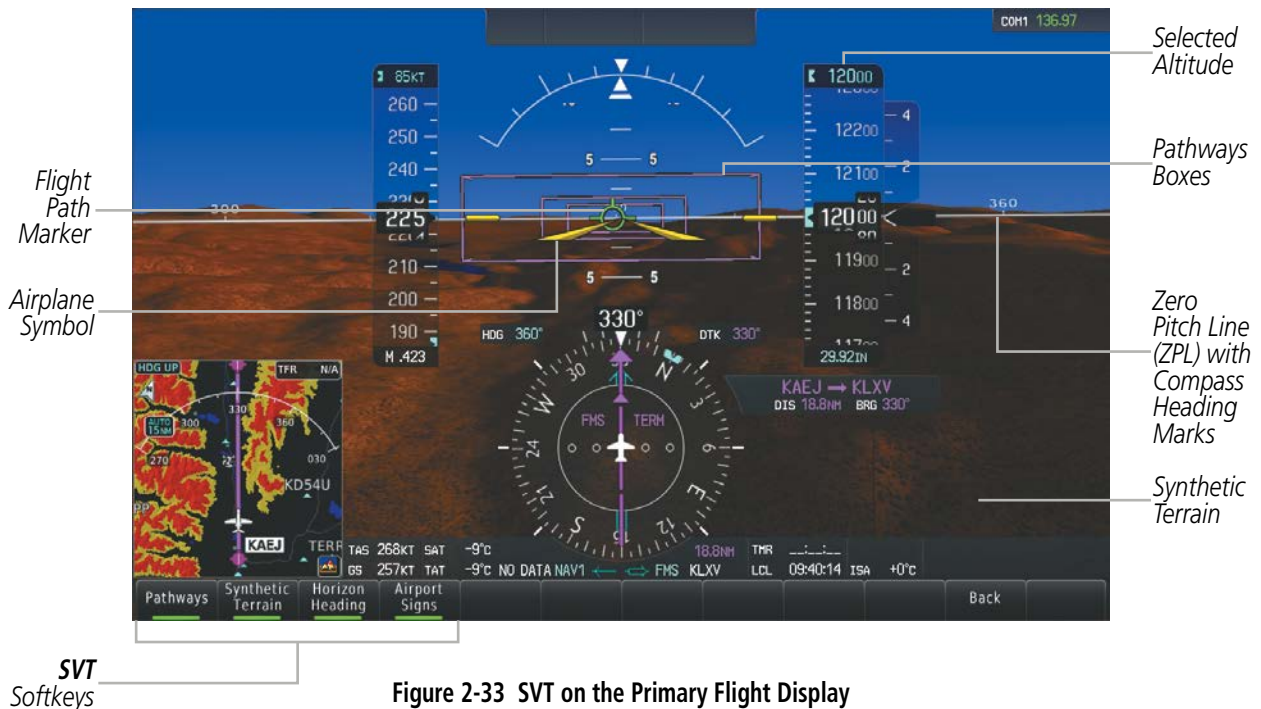


Figure 2-33 SVT on the Primary Flight Display



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

PATHWAYS

Pathways provide a three-dimensional perspective view of the selected route of flight shown as colored rectangular boxes representing the horizontal and vertical flight path of the active flight plan. The box size represents 700 feet wide by 200 feet tall during enroute, oceanic, and terminal flight phases. During an approach, the box width is 700 feet or one half full scale deviation on the HSI, whichever is less. The height is 200 feet or one half full scale deviation on the VDI, whichever is less. The altitude at which the pathway boxes are displayed is determined by the higher of either the selected altitude or the VNAV altitude programmed for the active leg in the flight plan (Figure 2-34).

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

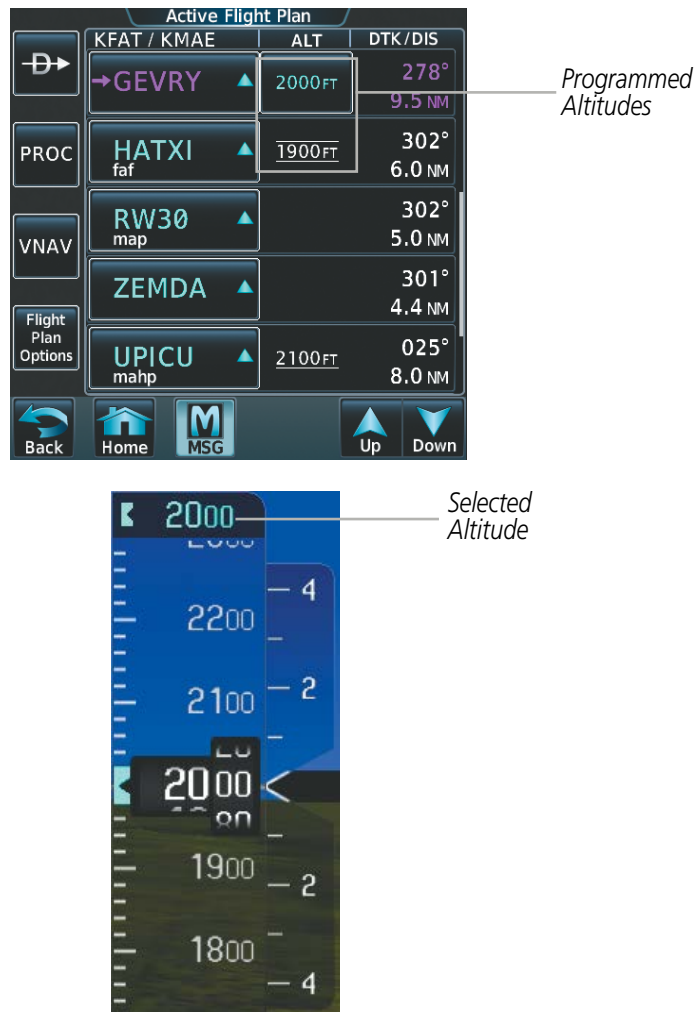


Figure 2-34 Selected and Programmed Selected Altitude

Pathways provide supplemental glidepath information on an active ILS, LPV, LNAV/VNAV, and some LNAV approaches. Pathways are intended as an aid to situational awareness and should not be used independent of the

CDI, VDI, glide path indicator, and glide slope indicator. They are removed from the display when the selected navigation information is not available. Pathways are not displayed beyond the active leg when leg sequencing is suspended and are not displayed on any portion of the flight plan leg that would lead to intercepting a leg in the wrong direction.

DEPARTURE AND ENROUTE

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

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

DESCENT AND APPROACH

Pathways are shown descending only for a programmed descent (Figures 2-35, 2-36). When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided that the selected altitude is lower than the programmed altitude.

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

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

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

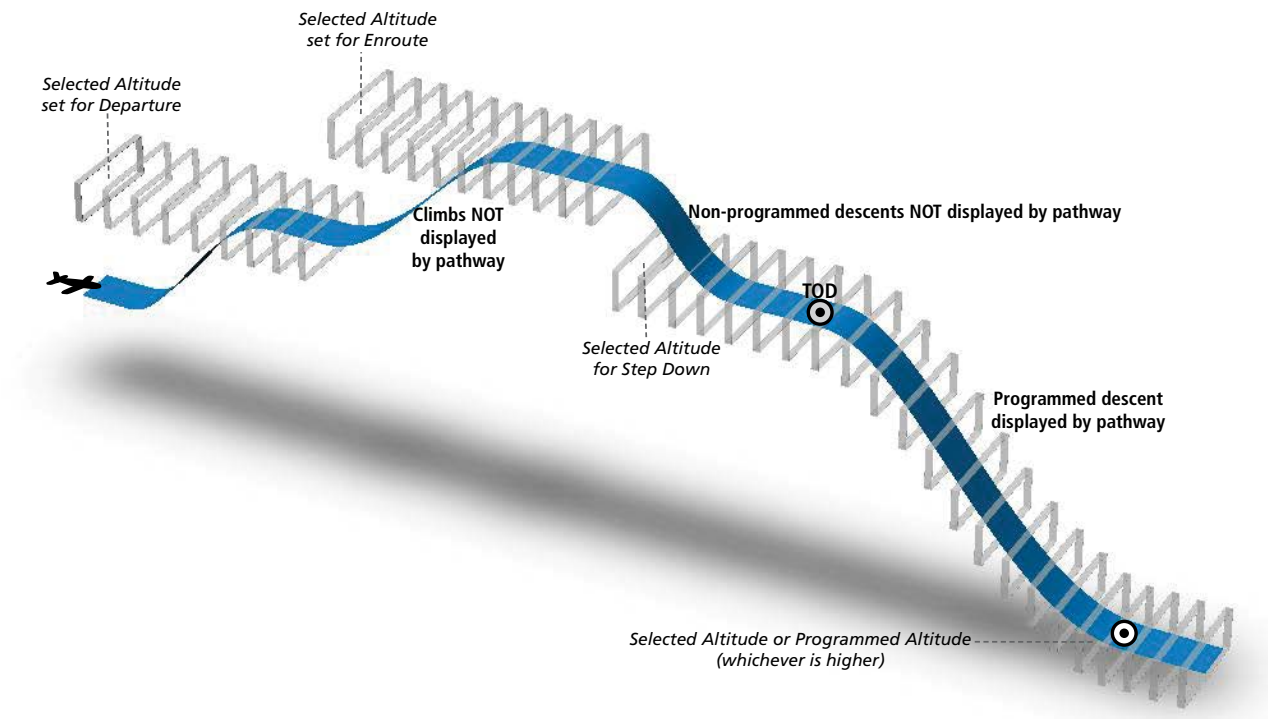


Figure 2-35 SVT Pathways, Enroute and Descent

MISSED APPROACH

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

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

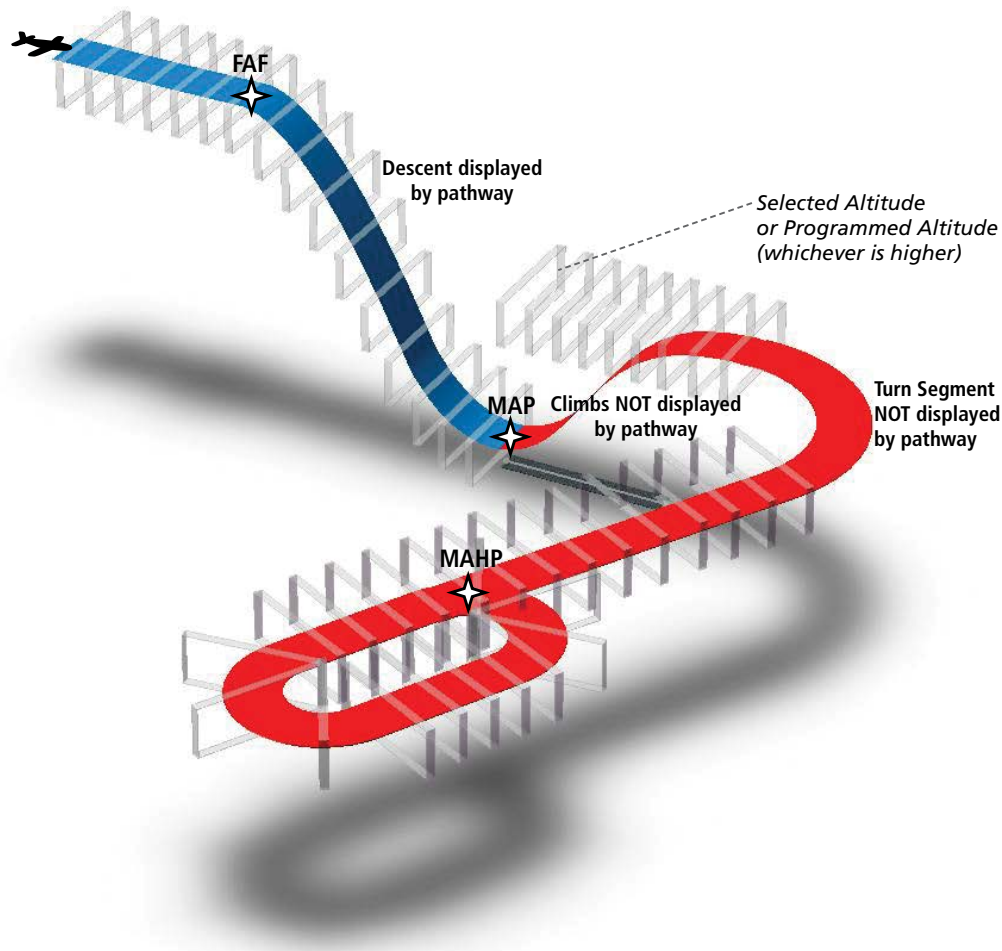


Figure 2-36 SVT Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

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

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

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the pathway boxes.

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



Figure 2-37 Flight Path Marker Position is Affected by Wind

ZERO PITCH LINE

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

HORIZON HEADING

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

TRAFFIC



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

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

AIRPORT SIGNS

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



Figure 2-38 Airport Signs

RUNWAYS



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



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

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



Figure 2-39 Airport Runways

TAWS-A ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts. In addition to the yellow terrain shading for a caution alert and the red shading for a warning alert, TAWS-A alerting will also indicate potential impact points. These potential impact points correspond to red and/or yellow X symbols on the PFD Inset Map (as shown in Figure 2-41), Navigation Status Pane, and TAWS-A Pane. Terrain shading will only occur on the synthetic terrain display on the PFD and TAWS-A Pane. No terrain shading nor potential impact points will be displayed on the PFD inset map or the Navigation Status Pane. For more detailed information regarding TAWS-A, refer to the Hazard Avoidance Section.

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



Figure 2-40 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the Inset map and MFD maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

As with terrain alerting, obstacle alerting is limited to the synthetic terrain display on the PFD and the TAWS-A Pane.



Figure 2-41 Obstacle

FIELD OF VIEW

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

Enabling or Disabling the field of view indication:

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

The following figure compares the PFD forward looking depiction with the MFD plan view and Field of View turned on.



Figure 2-42 PFD and MFD Field of View Comparison

2.3 SUPPLEMENTAL FLIGHT DATA

In addition to the flight instruments, the PFDs also display various supplemental information, including temperatures, wind data, and Vertical Navigation (VNAV) indications.

TEMPERATURE DISPLAYS

The Total and Static air temperatures (TAT and SAT) are displayed in the lower left of the PFD. ISA Temperature Deviation is displayed in the lower right of the PFD. These temperatures are displayed in degrees Celsius (°C) or Fahrenheit (°F) as configured by the installation personnel.



Figure 2-43 TAT, SAT, and ISA

WIND DATA

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



Figure 2-44 Wind Data

Displaying wind data:

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

VERTICAL NAVIGATION (VNAV) INDICATIONS

When a VNAV flight plan has been activated, VNAV indications (VNAV Target Altitude, RSVI, VDI) appear on the PFD in conjunction with the “TOD within 1 minute” message and “Vertical track” voice alert. See the Flight Management section for details on VNAV features. VNAV indications are removed from the PFD according to the criteria listed in Table 2-3.



Figure 2-45 Vertical Navigation Indications (PFD)

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

Table 2-3 VNAV Indication Removal Criteria

2.4 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

MARKER BEACON ANNUNCIATIONS

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

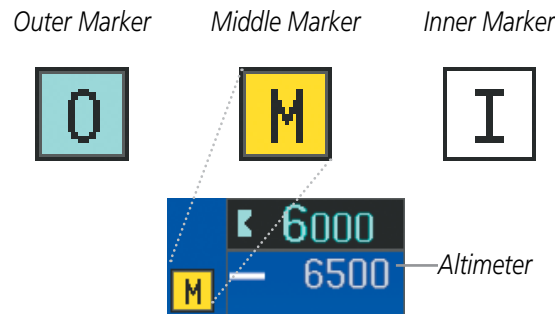


Figure 2-46 Marker Beacon Annunciations

TRAFFIC ANNUNCIATIONS

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

- The PFD Inset Map is enabled, displaying traffic.
- A flashing black-on-yellow (TA) TRAFFIC annunciation or white-on-red (RA) TRAFFIC annunciation appears to the top left of the Attitude Indicator for five seconds and remains displayed until no TAs or RAs are detected in the area.
- One or more aural traffic alerts is generated.
- When an RA becomes active, vertical guidance pitch cues will appear on the Attitude Indicator and Vertical Speed Indicator; see the Hazard Avoidance Section for details about TCAS II.

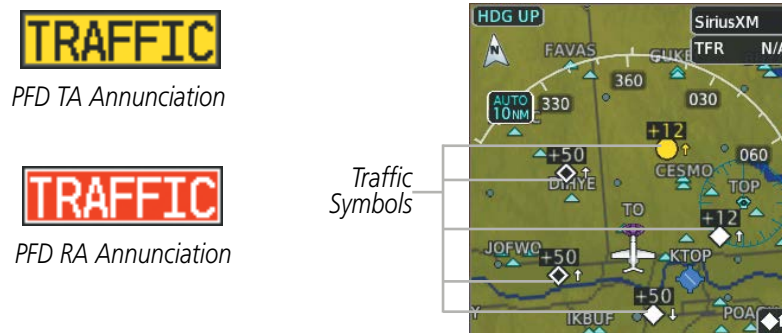


Figure 2-47 Traffic Annunciation and Inset Map with Traffic Displayed

TERRAIN ANNUNCIATIONS

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



Figure 2-48 Traffic and Example TAWS-A Annunciations

ALTITUDE ALERTING

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

- Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude changes to black text on a light blue background and flashes for 5 seconds.
- When the aircraft passes within 200 ft of the Selected Altitude, an aural tone is heard, and the Selected Altitude changes to light blue text on a black background and flashes for 5 seconds.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band (± 200 feet of the Selected Altitude) an aural tone is heard. The Selected Altitude changes to yellow text on a black background and flashes for 5 seconds.



Figure 2-49 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: The Low Altitude Annunciation is available only when SBAS is available and TAWS-A terrain alerting is inhibited.

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

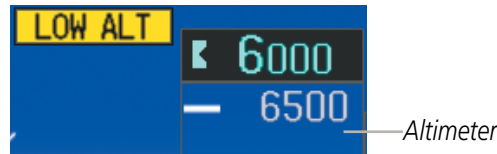


Figure 2-50 Low Altitude on GPS SBAS Approach

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a Minimum Descent Altitude (MDA) or Decision Height (DH), based on barometric, radar, or temperature compensated altitude can be set. When active, the altitude setting is displayed to the lower left of the Altimeter and with a bug at the corresponding altitude along the Altimeter (once the altitude is within the visible range of the tape). The following visual annunciations alert the pilot when approaching the MDA/DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, the 'BARO MIN', RA MIN, or 'TEMP COMP' box appears with the altitude in light blue text. The bug appears on the altitude tape in light blue once in range.
- When the aircraft passes through 100 feet of the MDA/DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn yellow and the aural alert, "Minimums Minimums", is heard.

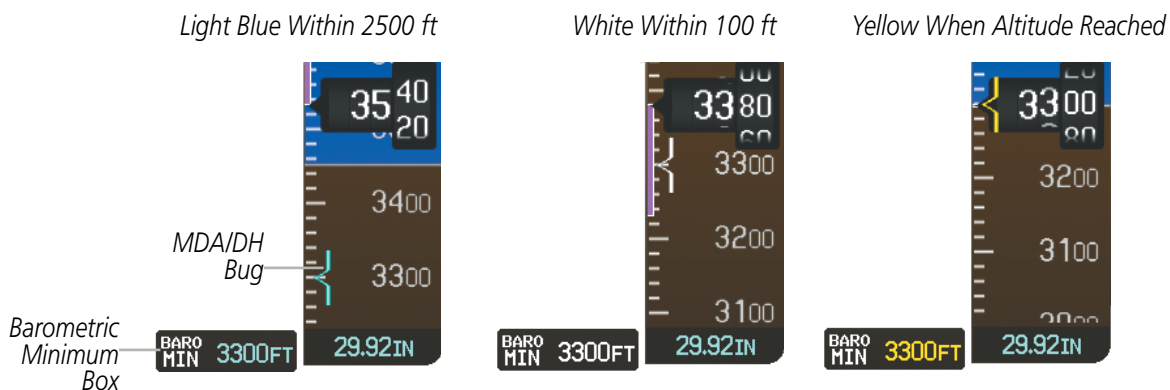


Figure 2-51 Barometric MDA/DH Alerting Visual Annunciations

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. If the aircraft proceeds to climb after having reached the MDA/DH, once it reaches 50 feet above

the MDA/DH, alerting is disabled. The MDA/DH is synchronized on both PFDs. The function is reset (set to “Off”) when the power is cycled or another approach is activated.

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

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



Figure 2-52 Minimum Descent Altitude/Decision Height

RADAR ALTIMETER

When the radar height (the aircraft altitude above ground level detected by the radar altimeter) is between zero and 2500 feet, the current value is displayed in white above the selected course box (Figure 2-53). Display of radar height becomes more sensitive as the height above ground decreases (Table 2-4).



Figure 2-53 Current Radar Height

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

Table 2-4 Radar Altimeter Sensitivity

When the radar altimeter is selected as the altitude source for the minimum descent altitude/decision height alerting function, the radar altimeter numeric display changes to yellow upon descending to at or below this altitude (Figure 2-54). Refer to the Minimum Descent Altitude/Decision Height Alerting discussion in this section for more information about this function.



Figure 2-54 RA as Altitude Source for MDA/DH

A ground line (Figure 2-55) is shown on the Altimeter to display the aircraft's height relative to the ground. If the data becomes invalid, the message 'RA FAIL' is displayed in yellow in place of the current radar height (Figure 2-56).

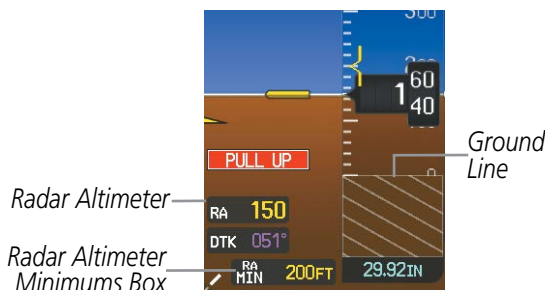


Figure 2-55 Altimeter Displaying the Ground Line



Figure 2-56 Radar Altimeter Invalid Data

2.5 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-5 can appear on the PFD when abnormal GPS conditions occur. Refer to the Flight Management Section for more information on Dead Reckoning Mode.

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

Table 2-5 Abnormal GPS Conditions Annunciated on HSI



Figure 2-57 Abnormal GPS Condition Annunciations

In Dead Reckoning Mode, the following items on the PFD are shown in yellow:

- CDI (When FMS is the selected navigation source, the CDI does not turn yellow and is simply removed a few seconds following the appearance of the “GPS LOI” annunciation.)
- Current Track Bug
- Wind Data
- Distances in the Bearing Information windows
- GPS bearing pointers

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

UNUSUAL ATTITUDES

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

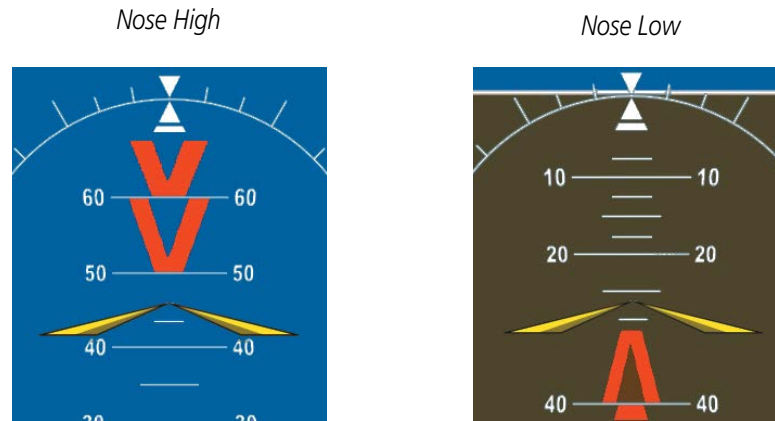


Figure 2-58 Pitch Attitude Warnings

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

- Traffic Annunciations
- Flight Director Command Bars
- Inset Map
- Total Air Temperature (TAT)
- Static Air Temperature (SAT)
- ISA Temperature Deviation
- Wind Data
- System Time
- Generic Timer
- Minimum Descent Altitude/ Decision Height readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNAV Target Altitude
- Selected Heading
- Selected Course/Desired Track
- PFD Setup Menu

GARMIN 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 PFD display reverts to the standard blue-over-brown attitude display.

SVT becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data
- 4.9 arc-second terrain data
- Obstacle data
- TAWS function is not available, in test mode, or failed

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

SVT UNUSUAL ATTITUDES

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



Figure 2-59 Blue Sky Bar with Full Display Terrain

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SECTION 3 ENGINE AND AIRFRAME SYSTEMS



NOTE: Refer to the Airplane Flight Manual (AFM) for limitations.

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

- The **Engine Indication System** (EIS) displays electrical, fuel, engine, pressurization, and flight control information on the left side of the Multi Function Display (MFD).
- **Synoptics pages** are provided for monitoring the status of the doors, brakes, hydraulics, oxygen, pressurization, environmental control, electrical, fuel, and de-icing systems.
- The **Crew Alerting System** (CAS) displays advisories, cautions, and warnings to communicate conditions, statuses, and system failures. CAS messages are grouped by level of importance and color-coded based on urgency and appear in a window to the right of the Altimeter on the Primary Flight displays (PFDs). See the Appendices for a list of possible CAS messages.

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

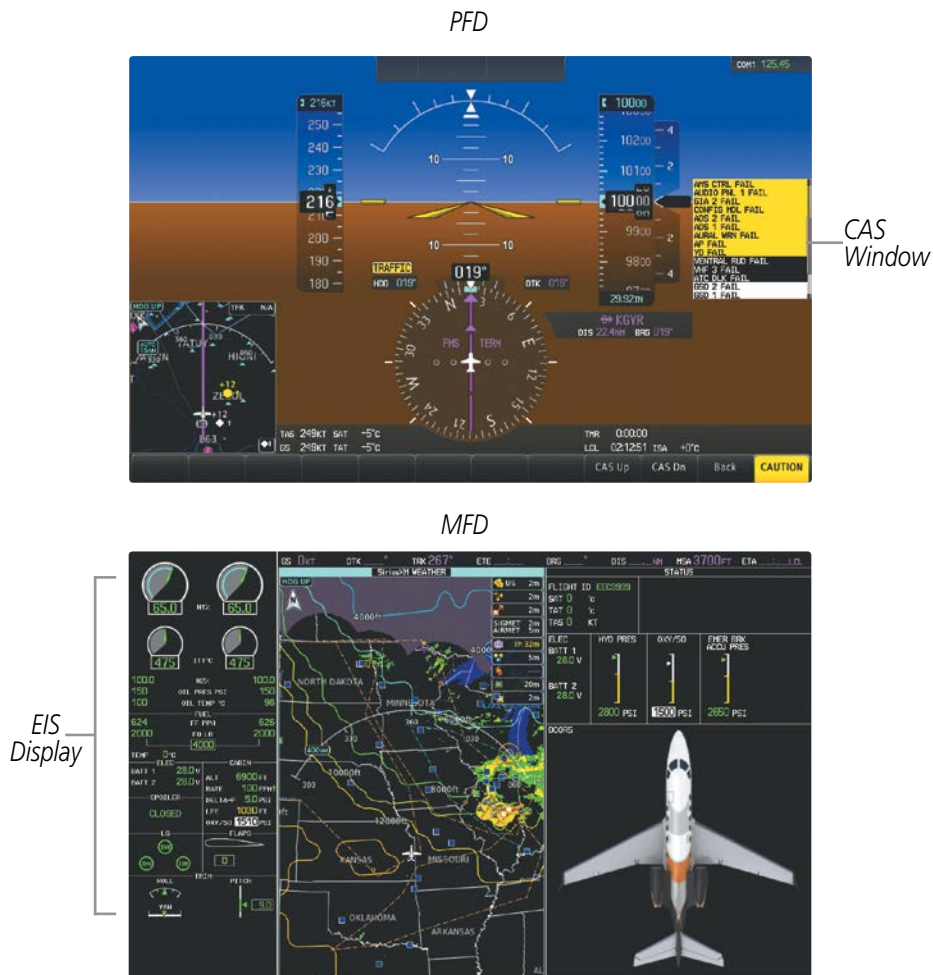


Figure 3-1 EICAS (Normal)

In the event of a display failure, depending on the failed display(s), the operating display(s) may be re-configured to present Primary Flight Display (PFD) symbology together with condensed EIS and MFD information (refer to the System Overview for more information about Reversionary Mode).



Figure 3-2 EICAS (Reversionary Mode)

3.1 ENGINE INDICATION SYSTEM (EIS)

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

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

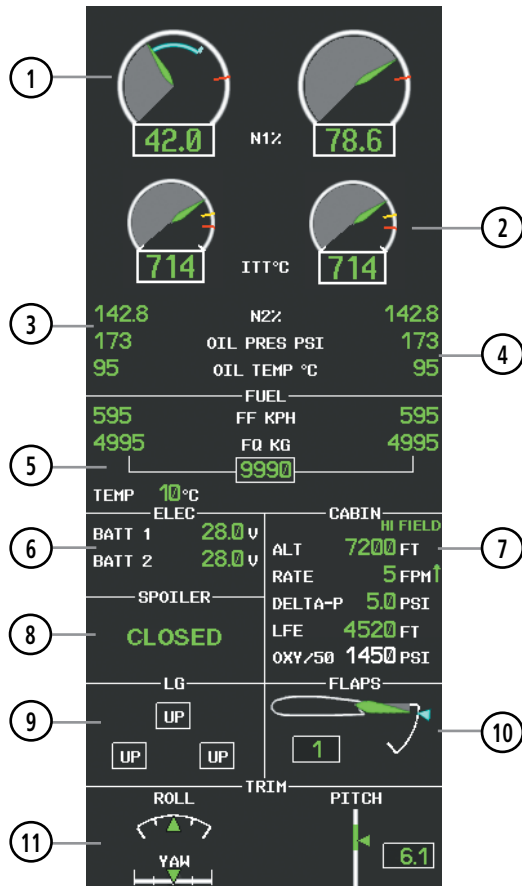


Figure 3-3 EICAS Display (Normal)

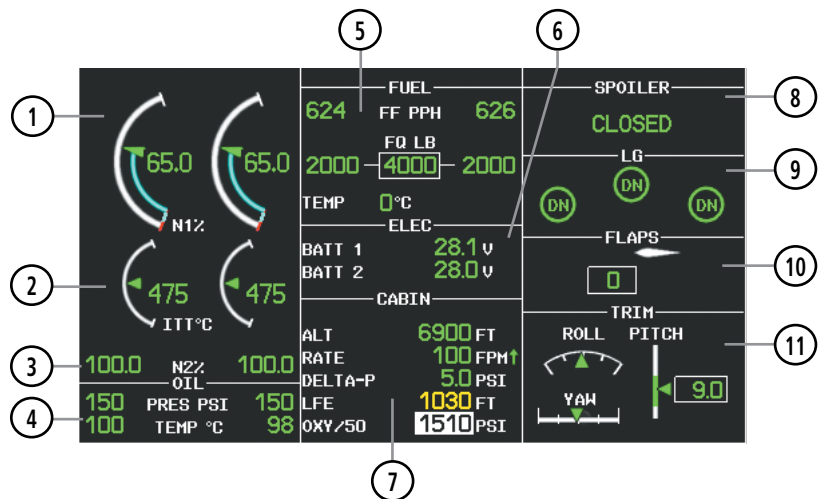


Figure 3-4 EIS Display (Reversionary)

- | | | |
|--|--------------------------------|-----------------------|
| ① Engine Fan Rotation Speed | ④ Oil Pressure and Temperature | ⑧ Spoiler Status |
| ② Interstage Turbine Temperature (ITT) | ⑤ Fuel Display | ⑨ Landing Gear Status |
| ③ Engine High Pressure Compressor Rotation Speed | ⑥ Battery Voltmeter | ⑩ Flap Indicator |
| | ⑦ Pressurization Display | ⑪ Trim Indicator |

TAKEOFF DATA SET WINDOW

When the aircraft is parked or is taxiing, the Outside Air Temperature (OAT) for the departure airport can be set and Automatic Thrust Reserve (ATR) enabled/disabled in the Takeoff Data Set Window.

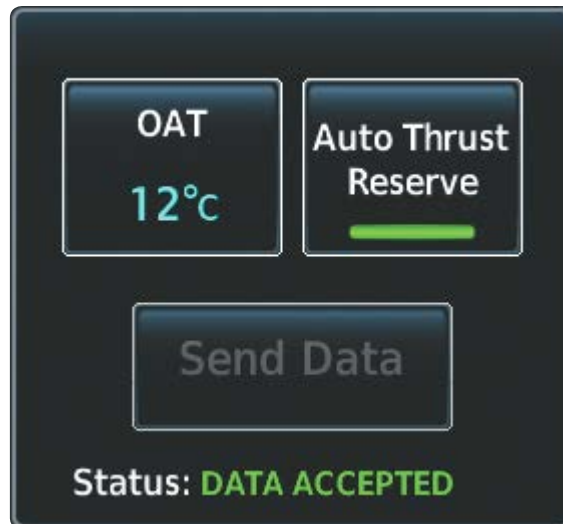


Figure 3-5 Takeoff Data Set Window

Setting the Outside Air Temperature (OAT):

- 1) From **Home**, touch **Aircraft Systems > Engine Settings**
- 2) Touch **Set Data**, then touch **OAT**.
- 3) Use the keypad to enter the OAT and touch the **Enter** button to confirm the new OAT.
- 4) To confirm the selected takeoff settings, touch the **Send Data** Button.

Or:

To cancel the operation, touch **BACK** or **Home**.

On aircraft electrical power-up, Automatic Thrust Reserve (ATR) is enabled by default. ATR status (defined in Table 3-1) is shown at the top of the EIS Display (Figure 3-7).

Indication*	Description
ATR	ATR enabled in both engines
ATR	ATR armed in both engines, but inactive
TO - RSV	ATR activated in at least one engine
GA - RSV	ATR activated in at least one engine in Go-Around Mode

* When no indication is shown, ATR has not been enabled or armed in both engines.

Table 3-1 Automatic Thrust Reserve (ATR) Status

Disabling/enabling Automatic Thrust Reserve (ATR):

- 1) From **Home**, touch **Aircraft Systems > Engine Settings**
- 2) Touch **Set Data**.
- 3) Touch the Auto Thrust Reserve Button to enable/disable (green indicates enabled).
- 4) If desired, change the OAT while the Takeoff Data Set Window is displayed.
- 5) To confirm the selected takeoff settings touch the **Send Data** Button,

Or:

To cancel the operation, touch **BACK**. or **Home**

ENGINE INDICATIONS

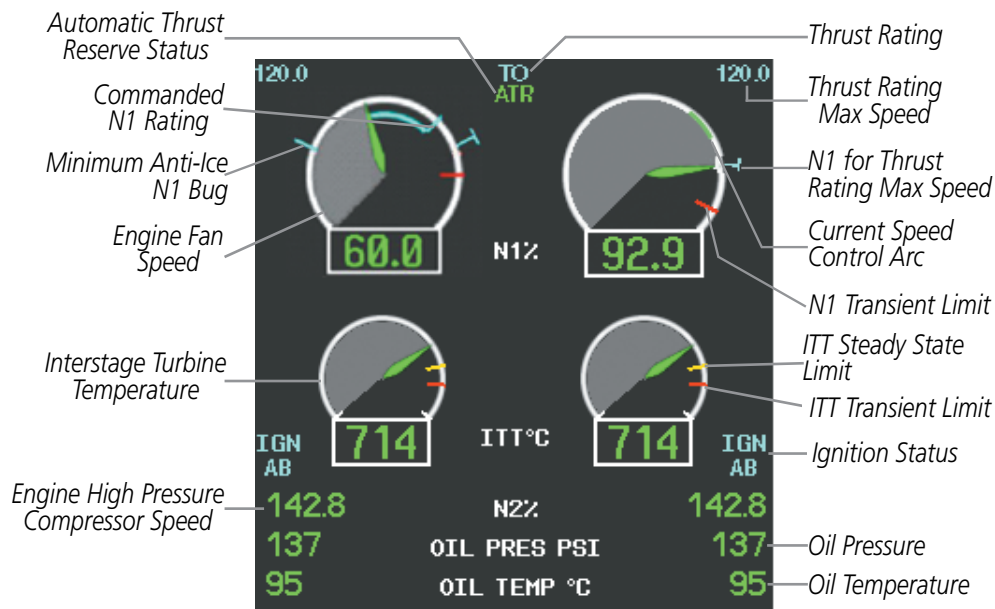


Figure 3-6 Engine and Oil Indications

The upper portion of the EIS Display is devoted to showing indications for the engines: engine stage rotation speeds (N1 and N2; shown as percentages), ATR status, thrust rating information, Interstage Turbine Temperatures (ITT; degrees Celsius, °C), and oil pressure (pounds per square inch, psi) and temperature (°C).

The N1 gauges indicate the engine fan rotation speeds, while the N2 readouts show the engine high pressure compressor rotation speeds. Both are shown as percentages. Values and limits are obtained from the Full Authority Digital Engine Controller (FADEC).

On the N1 gauges, the following indications can be displayed:

- Commanded N1 Rating (based on Thrust Lever Angle, TLA, position) – When the current N1 value is below the commanded rating, a light blue arc is drawn from the current to the commanded N1 value.
- N1 value corresponding to the Thrust Rating Maximum Speed (shown as a light blue T-shaped bug)
- Current Speed Control N1 value (shown as a green arc)
- Minimum Anti-Ice N1 Bug – Indicates which N1 should be commanded for full anti-ice capacity (shown as a light blue tick mark)
- Engine shutdown (normal operations) – When the engines are shutting down normally, the N1 gauges display a light blue “OFF” annunciation (Figure 3-8).



Figure 3-7 Engine Shutdown Indication

Interstage Turbine Temperatures (ITT) values and limits are obtained from the Full Authority Digital Engine Control (FADEC). Ignition status appears below the ‘IGN’ label beside the ITT scales (A, B, AB, or OFF).

THRUST RATING

The thrust rating for the engines is shown at the center top of the EIS Display, above and between the N1 gauges (see Table 3-2 for indications). The maximum value of the speed range (in kt) for the displayed thrust rating is shown above each N1 gauge. While the aircraft is in the air, the rating can be changed to suit the conditions for maximum climb or continuous thrust.

Indication	Thrust Rating
CRZ	Cruise
CLB	Max Climb
CON	Continuous
TO	Takeoff
GA	Go Around

Table 3-2 Thrust Rating Indications

Selecting a thrust rating:

- 1) From **Home**, touch **Aircraft Systems > Engine Settings**
- 2) To choose the continuous thrust rating, select the **Continuous** Button,
Or:
To choose the Maximum Climb thrust rating, select the **Maximum Climb** Button.
- 3) Touch **BACK** or **Home** to exit.

CURRENT SPEED CONTROL (CSC)

Current Speed Control (CSC), if available, can be activated while the autopilot is engaged and AFCS Altitude Hold Mode is active. During CSC, the FADEC varies engine thrust to maintain the desired airspeed, within a certain control range.

When CSC is active, green arcs appear on the N1 gauges, at values corresponding to the current speed selected (Figure 3-7).

The N1 gauge flashes 'LIM' (black text on yellow background) if the CSC maximum authority limit has been reached for the corresponding engine (Figure 3-9).



Figure 3-8 N1 Current Speed Control Limit

Selecting Current Speed Control (CSC):

- 1) Enter Altitude Hold Mode (see the AFCS Section for details).
- 2) Press the **CSC** Key (on the AFCS Control Unit).

FUEL AND ELECTRICAL INDICATIONS

The fuel display is located beneath the oil indicators and shows the fuel flow in pounds per hour (pph) and the tank fuel quantity in pounds (lb) for each engine, the total fuel quantity, and the fuel tank temperature in °C. The factory can also configure the Fuel Display for metric units.

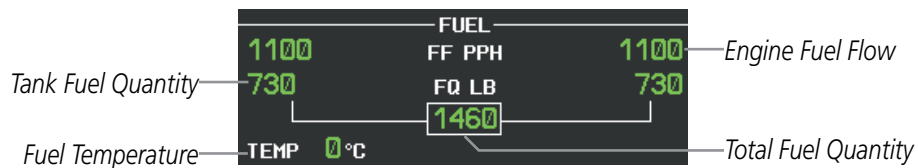


Figure 3-9 Fuel Display

Voltages for batteries 1 and 2 are shown as readouts below the fuel indications.



Figure 3-10 Electrical Display

CABIN PRESSURIZATION

The Cabin Display shows cabin pressurization information (cabin altitude and rate of change, differential cabin pressure) is shown along with the Landing Field Elevation (LFE) and oxygen system pressure. The trend of cabin pressure altitude rate change is indicated by a green arrow beside the rate readout.

The LFE is set automatically based on the destination in the active flight plan by touching the FMS Mode Button, but can also be adjusted manually by the pilot. Automatically entered values appear in green; if the value is entered by the pilot, it changes to light blue. Pilot-selected LFE is yellow for 30 seconds when a difference of >5 feet occurs. A red “X” is displayed if the LFE is out of range or the data source is invalid.

If the landing field elevation is high enough, the indication “HI FIELD” is shown at the top of the Cabin Display and the cabin altitude caution and warning thresholds are increased to avoid generation of nuisance alert indications.

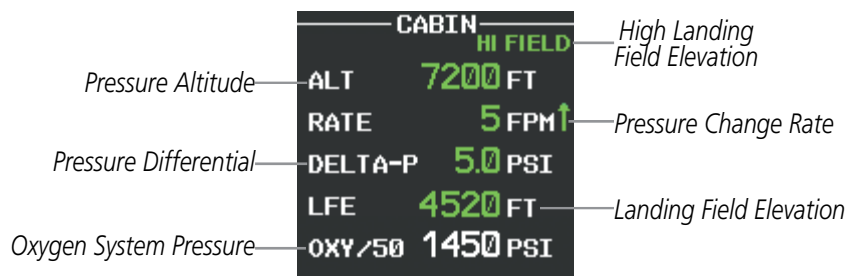


Figure 3-11 Cabin Pressure Display

Setting the displayed landing field elevation:

- 1) From **Home**, touch **Aircraft Systems > Landing Field Elevation**.
- 2) Touch the **FMS** Button to set the Landing Field Elevation to the value for the destination airport in the current flight plan.
Or:
 Use the **Manual** button to set the desired elevation using the keypad.
- 3) To confirm the new Landing Field Elevation value, select the **Enter** Button.

SPOILER AND LANDING GEAR

Spoiler and landing gear statuses are shown using the indications in Tables 3-3 and 3-4, respectively.

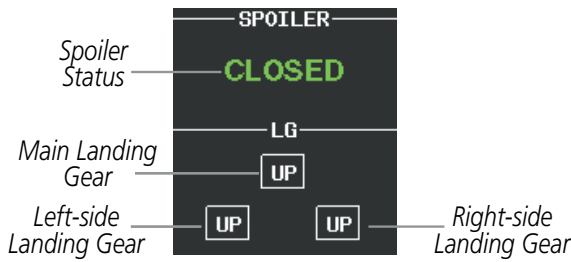


Figure 3-12 Spoiler and Landing Gear Indications

Indication	Description
	Invalid information
SPDBRK	Spoilers out of takeoff configuration
FAIL	Spoilers failed
CLOSED	Spoilers retracted
GND SPLR	Ground spoilers deployed
SPDBRK	Speedbrakes deployed
STEEP	Steep Mode enabled (optional)

Table 3-3 Spoiler Indications

Indication	Description
	Landing Gear Down
	Landing Gear Up
	Landing Gear Transitioning (Normal)
	Landing Gear Locked Down (Abnormal)
	Landing Gear Locked Up (Abnormal)
	Landing Gear Transitioning (Abnormal)

Table 3-4 Landing Gear Position Indications

FLAPS AND TRIM

Flap deflection is normally displayed beneath the trim indications using a rotating pointer and a green readout indicating the flap lever setting (0, 1, 2, 3, or FULL). A light blue bug marks the selected flap position. When the flap is in motion, the readout is dashed. If the position data becomes invalid, a red 'X' is displayed over the flap pointer.

Pitch, roll, and yaw trim indications are shown along scales at the bottom of the EIS Display. If the trim information becomes invalid, the pointers are removed and the readout (for pitch) is displayed with a red "X".

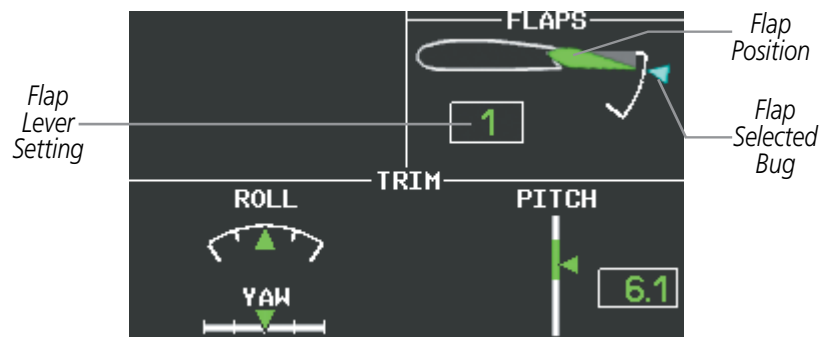


Figure 3-13 Flap and Trim Indications

3.2 SYNOPTICS

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

- Anti-ice system
- Brake system
- Doors
- Electrical system
- Environmental system
- Fuel system
- Hydraulics system
- Oxygen system
- Pressurization system

Accessing Synoptic Pages:

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

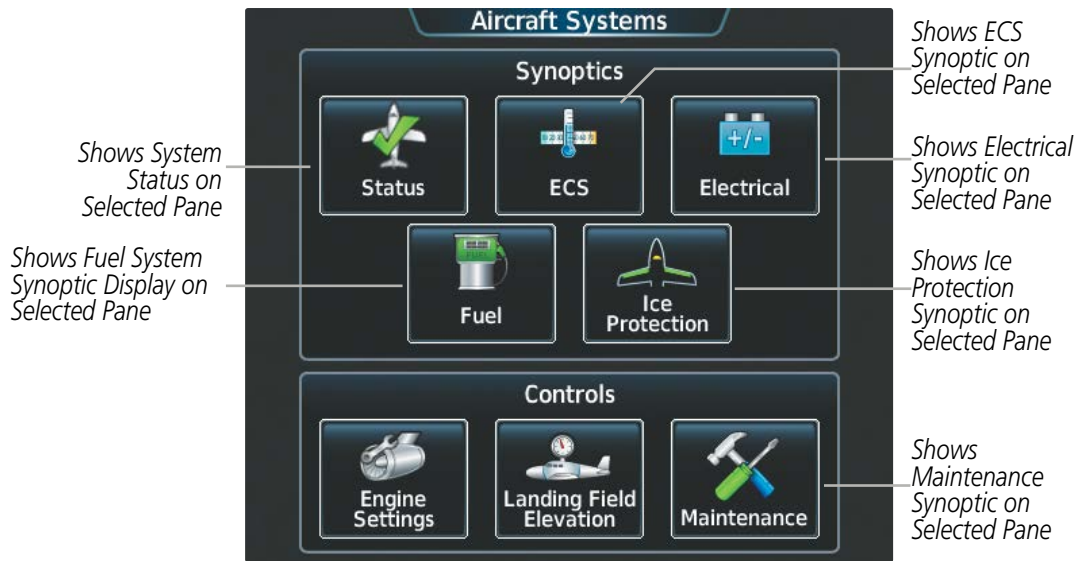
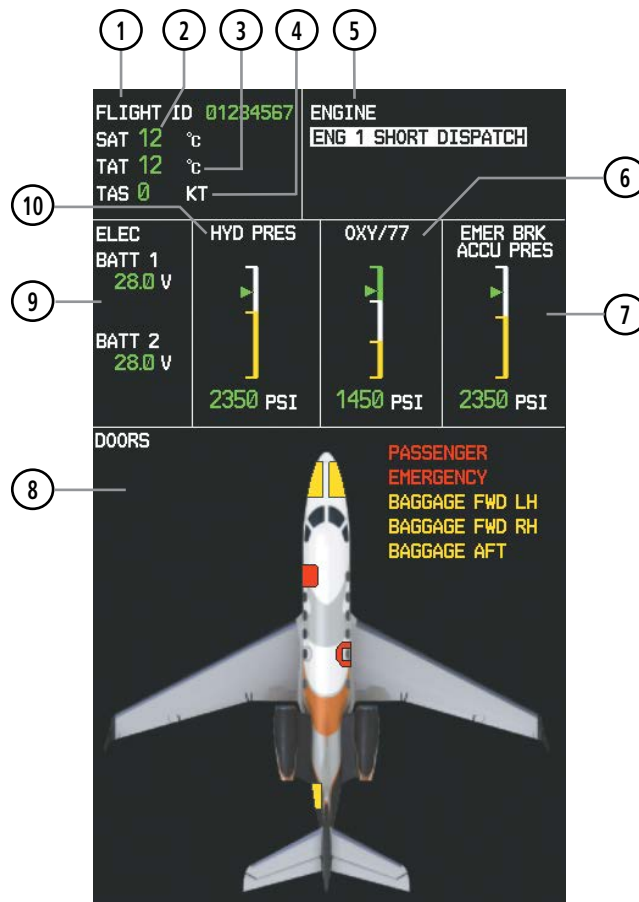


Figure 3-14 Aircraft Systems Screen

SYSTEM STATUS

The Status Synoptics Page is displayed after the power-up splash screen is acknowledged on the MFD. The aircraft diagram displays open passenger and emergency doors in red and open baggage doors in yellow.

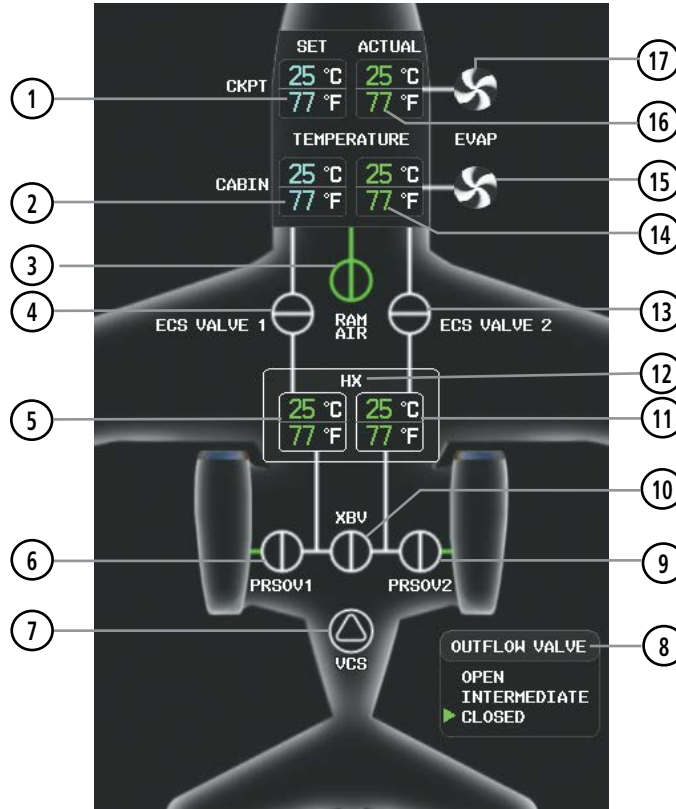


- | | |
|--------------------------------|--|
| ① Flight ID | ⑥ Oxygen |
| ② Static Air Temperature (SAT) | ⑦ Emergency Brake Accumulator Pressure |
| ③ Total Air Temperature (TAT) | ⑧ Door Status |
| ④ True Airspeed (TAS) | ⑨ Electrical Status |
| ⑤ Engine Dispatch Message Box | ⑩ Hydraulic Pressure |

Figure 3-15 System Status Synoptics Page

ENVIRONMENTAL CONTROL SYSTEM (ECS)

The Environmental Control System (ECS) Synoptic Page provides information about cockpit and cabin temperatures as well as status information for valves, fans, heat exchangers, and the Vapor Cycle System.



- ① Cockpit Temperature Setting
- ② Cabin Temperature Setting
- ③ Ram Air Valve (RAV)
- ④ Environmental Control System Valve (ECS) 1
- ⑤ Cockpit Duct Temperature Setting
- ⑥ Pressure Regulating Shutoff Valve (PRSOV) 1
- ⑦ Vapor Cycle System (VCS)
- ⑧ Outflow Valve (OFV) Status*
- ⑨ Pressure Regulating Shutoff Valve (PRSOV) 2
- ⑩ Crossbleed Valve Status (XBV)
- ⑪ Cabin Duct Temperature Setting
- ⑫ Heat Exchanger Cooling Pack Circuit
- ⑬ Environmental Control System Valve (ECS) 2
- ⑭ Actual Cabin Temperature
- ⑮ Cabin Evaporator Fan
- ⑯ Actual Cockpit Temperature
- ⑰ Cockpit Evaporator Fan

Figure 3-16 Environmental Control System Synoptics Page

* Outflow valve (OFV) status is displayed only while the aircraft is parked or taxiing.

Lines between icons on the diagram denote ducting. Icons shown in green are operating normally. A white icon may indicate that a unit is off or not otherwise operating normally (see Table 3-5). A red “X” indicates failure of a unit.













Unit	Icons and Descriptions		
Fan	 On	 Off	
Heat Exchanger	 On	 Off	
Vapor Cycle System	 On	 Off	
PRSOV Valve Crossbleed Valve	 Open with flow	 Open, no flow	 Closed
ECS Valve Ram Air Valve	 Open with flow	 Open, no flow	 Closed

Table 3-5 Environmental Control System Unit Status Indications

ELECTRICAL

The Electrical Synoptics Page uses a diagram of the aircraft’s electrical system to display the system status. The generators, ground power supply (GPU), batteries, and buses are shown in green to denote normal operation. Color of the units changes depending on the condition (Table 3-6). A red “X” over a component indicated invalid data or a failed unit.

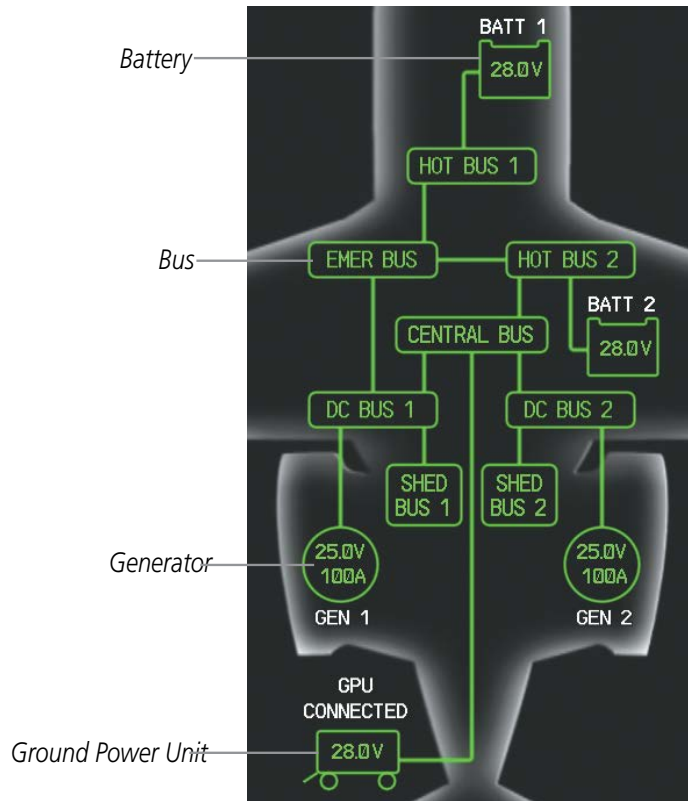


Figure 3-17 Electrical Synoptics Page

Unit	Icons and Descriptions		
Generator	N2>52%	Bus off	N2<52%
Bus	On	Bus off	
Hot Bus	Normal	Abnormal	
Battery	Normal	Abnormal	

Table 3-6 Electrical System Unit Status Indications

FUEL

The Fuel Synoptics Page displays the status of the fuel tanks and feed system. A red “X” over a component indicated invalid data or a failed unit.

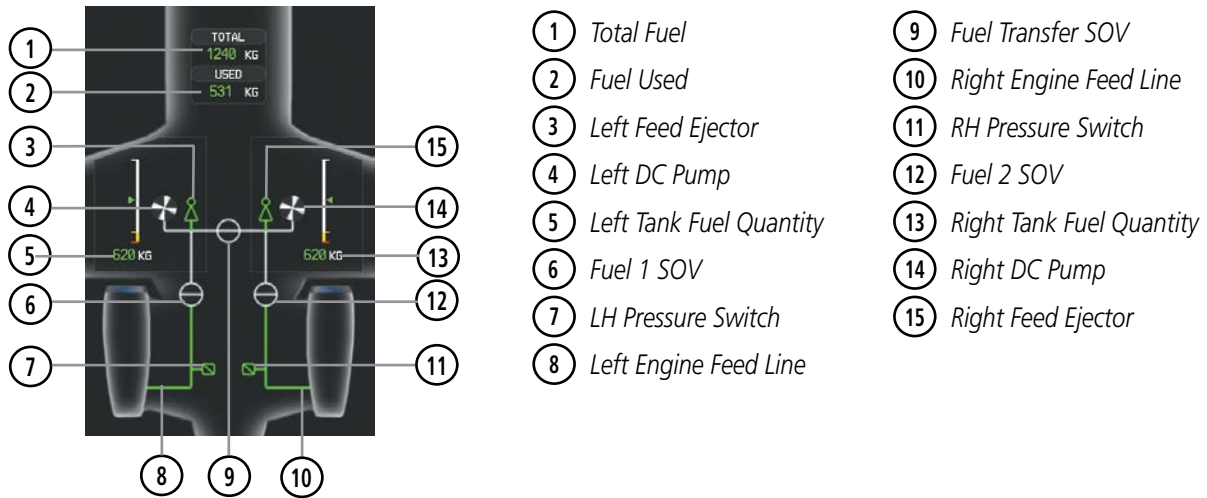


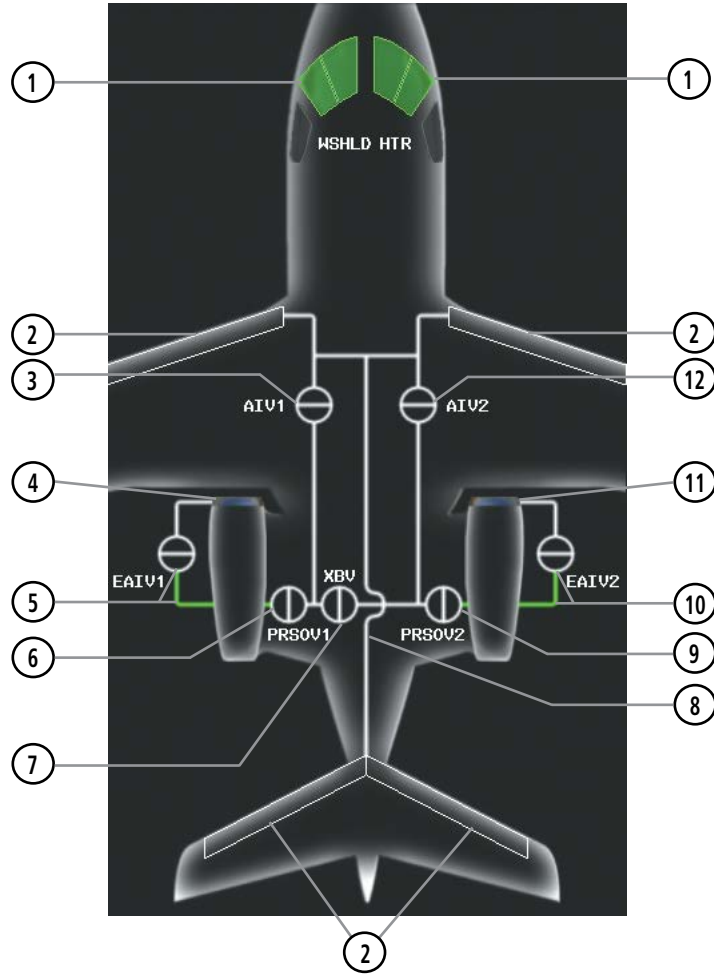
Figure 3-18 Fuel Synoptics Page

Unit	Icons and Descriptions			
Fuel Line				
	Operating	Not operating		
Feed Ejector				
	Operating	Not operating		
Fuel Pressure Switch				
	Operating	Not operating		
Fuel Shut Off Valve				
	Open with flow	Open, no flow	In transit	Closed
DC Pump				
	Operating	Not operating		
Fuel Transfer Valve				
	Open with flow	Open, no flow	In transit	Closed

Table 3-7 Fuel System Unit Status Indications

ICE PROTECTION SYSTEM

When the ice protection system is operating normally, all components are shown in green on the system diagram. Items in white indicate components which are off. A red “X” over a component indicated invalid data or a failed unit.



- | | |
|--|--|
| ① Windshield Heaters | ⑦ Crossbleed Valve |
| ② Boot Lines and Valves | ⑧ Ice Protection Bleed Duct |
| ③ Anti Ice Valve (AIV) 1 | ⑨ Pressure Regulating Shut-Off Valve 2 (PRSOV 2) |
| ④ Bleed Duct and Skin 1 | ⑩ Engine Anti Ice Valve (EAV) 2 Valve and Bleed Line |
| ⑤ Engine Anti Ice Valve (EAV) 1 Valve and Bleed Line | ⑪ Bleed Duct and Skin 2 |
| ⑥ Pressure Regulating Shut-Off Valve 1 (PRSOV 1) | ⑫ Anti Ice Valve (AIV) 2 |

Figure 3-19 Ice Protection Synoptics Page









Unit	Icons and Descriptions		
Anti Ice Line			
	Operating	Not operating	
Crossbleed Valve (XBV) Pressure Regulating Shutoff Valve (PRSOV)			
	Open with flow	Open, no flow	Closed
Anti Ice Valve (AIV) Engine Anti Ice Valve (EAIV)			
	Open with flow	Open, no flow	Closed

Table 3-8 Ice Protection System Unit Status Indications

The Minimum Anti-Ice N1 Bug (Figure 3-20) appears as a light blue tick mark on the N1 engine gauges. It indicates which N1 should be commanded to achieve full anti-ice capability. The bug is visible when the landing gear is extended and wing anti-ice is on, or when an engine or engine bleed air is lost. If the anti-ice capacity is not fully operational, the message “A-I LO CAPACITY” appears on the Crew Alerting System (CAS).

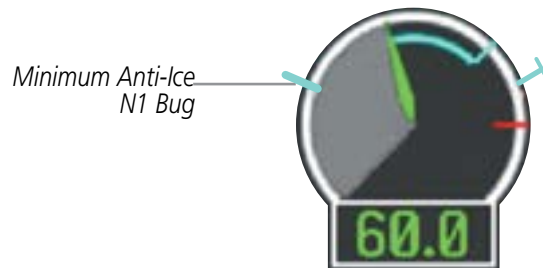


Figure 3-20 Engine Minimum N1 Anti-Ice Indication

ENGINE MAINTENANCE



NOTE: Refer to the Airplane Flight Manual (AFM) for required actions.

The Engine Maintenance Synoptics Page can only be displayed when the aircraft is on the ground and both engines are off. Maintenance personnel can view status messages for engine dispatch items and the following engine parameter exceedance peaks and durations recorded by the FADEC for the last engine start-shutdown cycle:

- Engine fan rotation speed (N1)
- Engine high pressure compressor rotation speed (N2)
- Inter Turbine Temperature (ITT)
- Main oil temperature and Pressure
- Fuel temperature

If no peaks are detected, the values and times are displayed as dashes. The data is cleared from the display using the **CLEAR E1** and **CLEAR E2** buttons on the touch screen controller.

The Engine Maintenance Page also displays ITT and N1 trims loaded in each Engine Data Collection Unit (EDCU).

ENGINE MAINTENANCE PAGE			
ENGINE DISPATCH			
ENG 1 NO DISPATCH	ENG 2 NO DISPATCH		
	ENG 2 LOW MARGIN		
ENG 1 FUEL FILTER BYP	ENG 2 FUEL FILTER BYP		
ENGINE 1			
	PEAK	SEC	ZONE
N1 HIGH	---	---	
N2 HIGH	---	---	
ITT HIGH	---	---	C
OIL TEMP	103	10	
OIL PRESS	26	12	C
FUEL TEMP	138	1	
ENGINE 2			
	PEAK	SEC	ZONE
N1 HIGH	---	---	
N2 HIGH	---	---	
ITT HIGH	---	---	C
OIL TEMP	103	10	
OIL PRESS	26	12	B
FUEL TEMP	138	1	
ENGINE TRIMS			
ENG1 N1	154.321	ENG2 N1	138.230
ENG1 ITT	430.012	ENG2 ITT	4.823

Figure 3-21 Engine Maintenance Synoptics Page

3.3 CREW ALERTING SYSTEM (CAS)

NOTE: Aural alerts associated with abnormal conditions and advisories are managed through the audio panels. Refer to the Audio Panel and CNS Section for more information.

NOTE: Refer to the Appendices Section for more information on the Crew Alerting System (CAS).

When Crew Alerting System (CAS) messages are generated, the CAS Window opens to the right of the Altimeter (on the PFDs). Up to 14 messages can be displayed; when more than 14 messages accumulate, the **CAS** Softkey becomes available. Pressing the **CAS** Softkey displays softkeys for scrolling up and down through the messages in the CAS Window.



Figure 3-22 CAS Display

CAS MESSAGE PRIORITIZATION

NOTE: Information on CAS messages in this pilot's guide is always superseded by the AFM.

CAS messages are grouped by criticality (warning, caution, advisory) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action, and the softkey label changes to display the appropriate annunciation when a CAS message is generated.

- **Warning** (red) – Immediate crew awareness and action required; accompanied by an aural tone (triple chime every 3 seconds) and flashing 'WARNING' softkey annunciation.
- **Caution** (yellow) – Immediate crew awareness and possible future corrective action required; accompanied by an aural tone (single chime every 5 seconds) and flashing 'CAUTION' softkey annunciation.

- **Advisory** (white) – Crew awareness required and subsequent action may be required; accompanied by a flashing ‘ADVISORY’ softkey.

The softkey annunciation flashes and the corresponding aural alert sounds until acknowledged by depressing the softkey.



Figure 3-23 Softkey Annunciations (MSG Softkey Labels)

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated, and continue to flash until acknowledged. Advisory CAS messages, flash for 5 seconds or until acknowledged.

Some CAS messages are differentiated as root causes of other failures and should be considered first during the decision-making process when multiple CAS messages are displayed. These “golden” messages flash until acknowledged and remain in inverse video after being acknowledged manually.

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

3.4 ABNORMAL OPERATIONS



NOTE: Refer to the Airplane Flight Manual (AFM) for corrective pilot actions.

ENGINE

When an engine failure occurs, besides the CAS message corresponding to the failed engine (“E1 FAIL” or “E2 FAIL”), the corresponding N1 gauge displays the annunciation “FAIL” in black text over a yellow background (Figure 3-24). Detection of an engine fire causes a CAS message corresponding to the engine on fire (“E1 FIRE” or “E2 FIRE”) in addition to the “FIRE” annunciation to be displayed over the ITT gauge in white text over a red background (Figure 3-25).



Figure 3-24 Engine Failure Indication



Figure 3-25 Engine Fire Indication

CABIN PRESSURIZATION

If the cabin altitude (ALT) reaches a caution level, the readout displays black text on a yellow background. When a high cabin altitude warning occurs, the readout is displayed with white text on a red background, and the corresponding CAS message “CAB ALTITUDE HI” is issued.

A cabin pressure change rate (RATE) caution readout is indicated with black text on a yellow background. If low flow or a cabin leak is detected, the cabin pressure change rate readout displays white text on a red background and the trend arrow becomes red (Figure 3-26).

Excessive cabin differential pressure (DELTA-P) causes the pressure readout to display a yellow background and black text; warnings are indicated with red background with white readout text. The CAS message “CAB DELTA-P FAIL” accompanies this condition.

Low oxygen system pressure (OXY) is indicated by a yellow background and black text. The CAS message “OXY LO PRES” is also issued.

If the pilot selected landing field elevation (LFE) differs by more than five feet from the FMS LFE value, the LFE readout is shown as black text with a yellow background for 30 seconds.

A red “X” is displayed in place of any readout on the Cabin Display that is invalid or out of range.

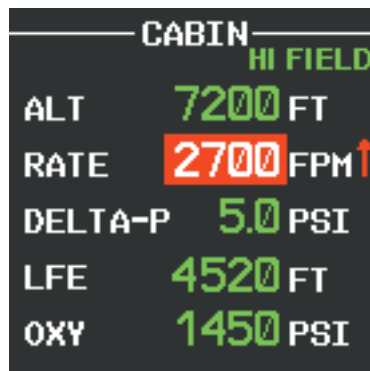


Figure 3-26 Cabin Display with Leak Detected

FLAPS

The following denote abnormal flap conditions:

- Flaps not in position for takeoff – Flap pointer and readout are shown in red with white text (Figures 3-27 and 3-28).
- Flaps have failed or become jammed – Flap pointer and readout are shown in yellow with black text (Figure 3-29)
- Flaps unavailable – Flap pointer is removed and readout is shown in light blue with black text (Figure 3-30)
- Flaps position data invalid – Flap pointer and readout displayed with a red “X”

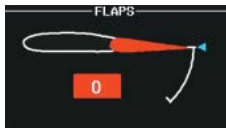


Figure 3-27 Flaps Retracted at Takeoff

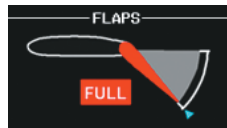


Figure 3-28 Flaps at FULL (Landing) Position at Takeoff

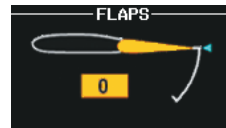


Figure 3-29 Flaps Failed



Figure 3-30 Flaps Unavailable

TRIM

Aileron or rudder mistrim are denoted with yellow arrows pointing in the direction of mistrim on the Roll and Yaw Trim indicators (Figure 3-31).

If takeoff configuration has been selected and the pitch trim position is not within the green band on the pitch trim scale, the pointer and readout turn red with white text (Figure 3-32).



Figure 3-31 Mistrim



Figure 3-32 Pitch Trim Outside Takeoff Configuration

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SECTION 4 AUDIO AND CNS

4.1 OVERVIEW

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

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

The Mode S transponder is controlled with the Touchscreen Controller. The Transponder Button is located in the upper right of the touchscreen, right below the XPDR IDENT Button. The Transponder Button displays the active four-digit code, mode, and reply status (Figure 4-1).

PFD COM/NAV DISPLAY AND CONTROLS



Figure 4-1 COM/NAV Window, Active NAV Window, and Active COM Frequency Box

- ① **Active NAV Window** – Displays active NAV station ID, frequency, and DME distance.
- ② **Selected Source/Frequency Box** – Displays selected communication source and frequency.

TOUCHSCREEN CONTROLLER AUDIO AND CNS CONTROLS



Figure 4-2 Touchscreen CNS Bar Controls

- ① **MIC** Button – Switches between the #1 COM transceiver and the #2 COM transceiver.
- ② **COM1** Button – Transfers the standby and active COM1 frequencies.
- ③ **Audio & Radios** Button – Displays/removes the Audio & Radios Screen. The Audio & Radios Screen is used to control the communication and navigation radios and the Audio settings for the pilot and copilot.
- ④ **Intercom** Button – Displays/removes the Intercom Screen. The Intercom Screen is used to control the intercom isolation, volume, and squelch settings for the pilot and copilot.
- ⑤ **STBY** Button (COM1) – Displays/removes the COM1 Standby Screen. The COM1 Standby Screen is used to enter and transfer COM1 frequencies.
- ⑥ **COM2** Button – Transfers the standby and active COM2 frequencies.

- ⑦ Transponder IDENT Button – Sends a distinct identity indication to Air Traffic Control (ATC). When selected, the word IDENT is displayed in green and pulsates for the duration of the transmission. While the transponder is replying to an interrogation, an R is displayed on the button.
- ⑧ Transponder Code Button– Displays/removes the Transponder Screen. The Transponder Screen is used to select the transponder modes and the transponder code using the keypad.
- ⑨ **STBY** Button (COM2) – Displays/removes the COM2 Standby Screen. The COM2 Standby Screen is used to enter and transfer COM2 frequencies.
- ⑩ **MON** Button – Controls which receivers are being explicitly monitored.
- ⑪ Function Label – Indicates middle knob function. *Typical*: Pilot COM1/COM2 Volume, Push: Squelch
- ⑫ Function Label – Indicates right large and small knob function. *Typical Frequency Entry*: COM1/COM2 Frequency, Push: 1-2, Hold: ⬆ *Typical Data Entry*: Data Entry, Push: Enter, Hold: ⬆
- ⑬ Middle Knob – Function as labeled (see #12)
- ⑭ Large/Small Right Knob – Function as labeled (see #12). *Data Entry*: Large knob moves the cursor from field to field. Small knob edits character by character. *Frequency Entry*: Large knob increases/decreases MHz; Small knob increases/decreases kHz. Press the small knob to confirm the frequency. Press and hold to transfer the standby frequency to the active frequency.

4.2 COM OPERATION

COM TRANSCEIVER SELECTION AND ACTIVATION



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

The COM1 and COM2 Frequencies are shown on the CNS Bar. The COM1, COM2 and COM3 frequencies are also shown on the Audio & Radios Screen. The COM transceiver can be selected for transmitting on the Touchscreen Controller. During reception of audio from the COM radio selected for transmission, audio from the other COM radio(s) is muted.

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

Enabling COM3 voice communication:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If necessary, scroll to find COM3.
- 3) Touch the **Datalink** Button.
- 4) Touch the **OK** Button in response to "Disable Datalink Mode?". To cancel the request, touch the **Cancel** Button.

Disabling COM3 voice communication:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If necessary, scroll to find COM3.
- 3) Touch the COM3 Frequency Button.
- 4) Touch the **Datalink** Button to disable COM3 voice communication.

Or:

- 1) From **Home**, touch the **CPDLC** Button to display the CPDLC Screen.
- 2) Touch the **OK** Button in response to "Switch Radio to Data Mode?". To cancel the request, touch the **Cancel** Button.

Selecting a COM Radio for transmission:

Touch the **MIC** Button in the CNS Bar to switch between COM1 and COM2 radios until the desired COM is selected.

Or:

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

Selecting a COM Radio for monitoring:

Touch the **MON** Button in the CNS Bar to monitor the COM not selected for transmission.

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the **COM1** Button, **COM2** Button, or **COM3** Button to select the COM radio for monitoring.

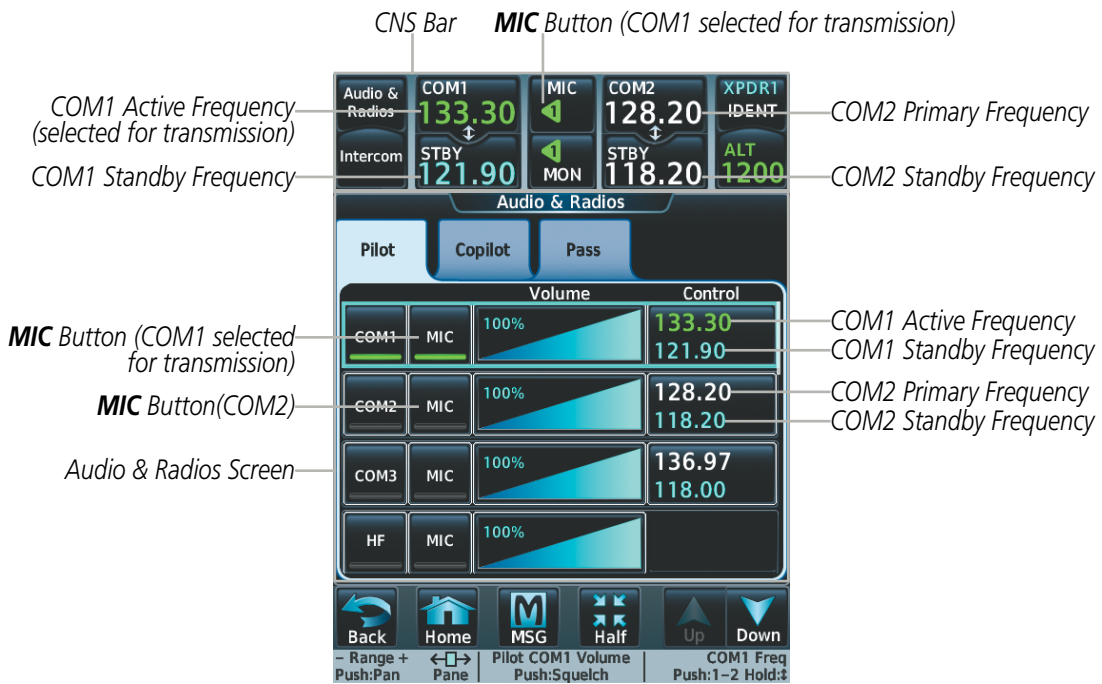


Figure 4-3 Selecting a COM Radio for Transmission

CNS Bar Symbol	Meaning of Symbol
	COM1 selected for transmission/monitoring
	COM2 selected for transmission/monitoring
	HF COM selected for transmission/monitoring
	COM3 selected for transmission/monitoring
	An additional audio source is manually selected for monitoring
	Passenger Address is selected for transmission

CNS Bar MIC/MON Button Symbols

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency. During COM signal reception, a white RX appears by the active COM frequency.

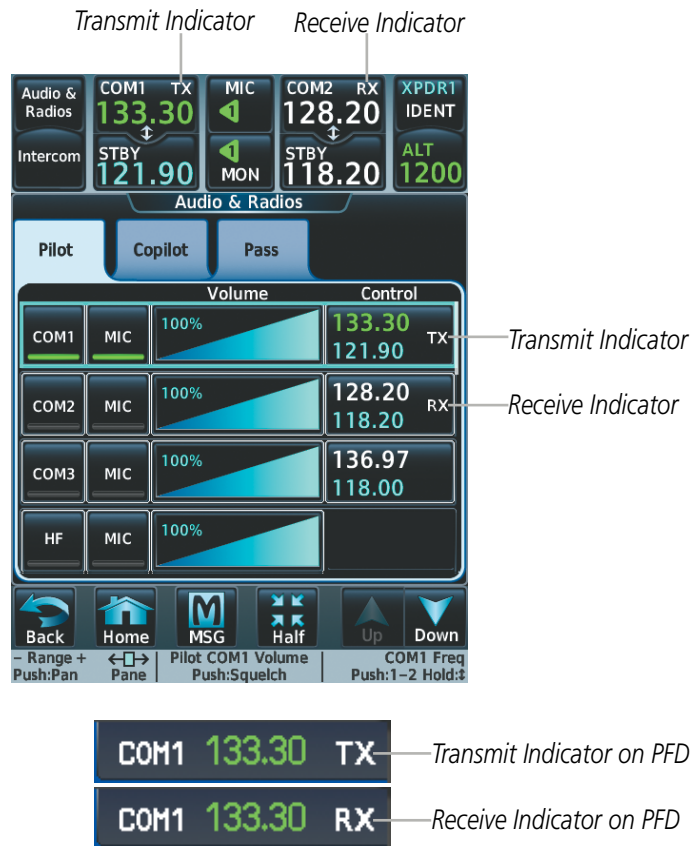


Figure 4-4 COM Radio Transmit and Receive Indications

COM FREQUENCY TUNING

NOTE: If an invalid frequency is entered, the invalid digits are ignored and a confirmation window appears.

Selecting a COM1/2 frequency using the Touchscreen Controller:

- 1) Touch the COM1 **STBY** Button or COM2 **STBY** Button in the CNS Bar to display the COM1/COM2 Standby Screen.
- 2) Use the keypad to select the frequency.
- 3) Touch the **Enter** Button to accept the new frequency as the COM1/COM2 standby frequency; or touch the **XFER** Button to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency.

Or:

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



Figure 4-5 COM Frequency Tuning Keypad

Or:

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



Figure 4-6 Audio & Radios Screen - COM1/COM2 Frequency Tuning

Or:

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

Selecting a COM3 frequency using the Touchscreen Controller:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the COM3 volume slider to select COM3 for tuning.
- 3) Turn the large and small right knobs to select the frequency (Large knob increases/decreases MHz; Small knob increases/decreases kHz).
- 4) Press the small right knob to accept the new frequency as the standby frequency; or press and hold the small right knob to accept the new frequency as the COM1/COM2 active frequency and transfer the previously active frequency to the standby frequency



Figure 4-7 Audio & Radios Screen - COM3 Frequency Tuning

Or:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the COM3 frequency button to display the COM3 Standby Screen.
- 3) Use the keypad to select the desired frequency.
- 4) Touch the **Enter** Button to accept the new frequency as the COM3 standby frequency; or touch the **XFER** Button to accept the new frequency as the COM3 active frequency and transfer the previously active frequency to the standby frequency.

Finding and selecting a COM frequency from the CNS Bar:

- 1) Touch the **COM1 STBY** Button (CNS Bar) or the **COM2 STBY** Button (CNS Bar) or the COM3 Frequency Button to display the COM1/2/3 Standby Screen.
- 2) Touch the **Find** Button to display the Find COM Frequency Screen.
- 3) Touch the tab for the desired type of frequency (Recent, Nearest, Dest, Flight Plan, or Favorite).
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to accept the new frequency as the COM1/COM2/COM3 standby frequency.



Figure 4-8 Find COM Frequency Screen

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

- 1) From **Home**, touch **Waypoint Info > Airport** to display the Airport Information Screen.
- 2) If needed, touch the airport button to enter/find the desired airport.
- 3) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 4) Scroll the list to find the desired frequency.
- 5) Touch the frequency button to display the Load Frequency Screen.
- 6) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

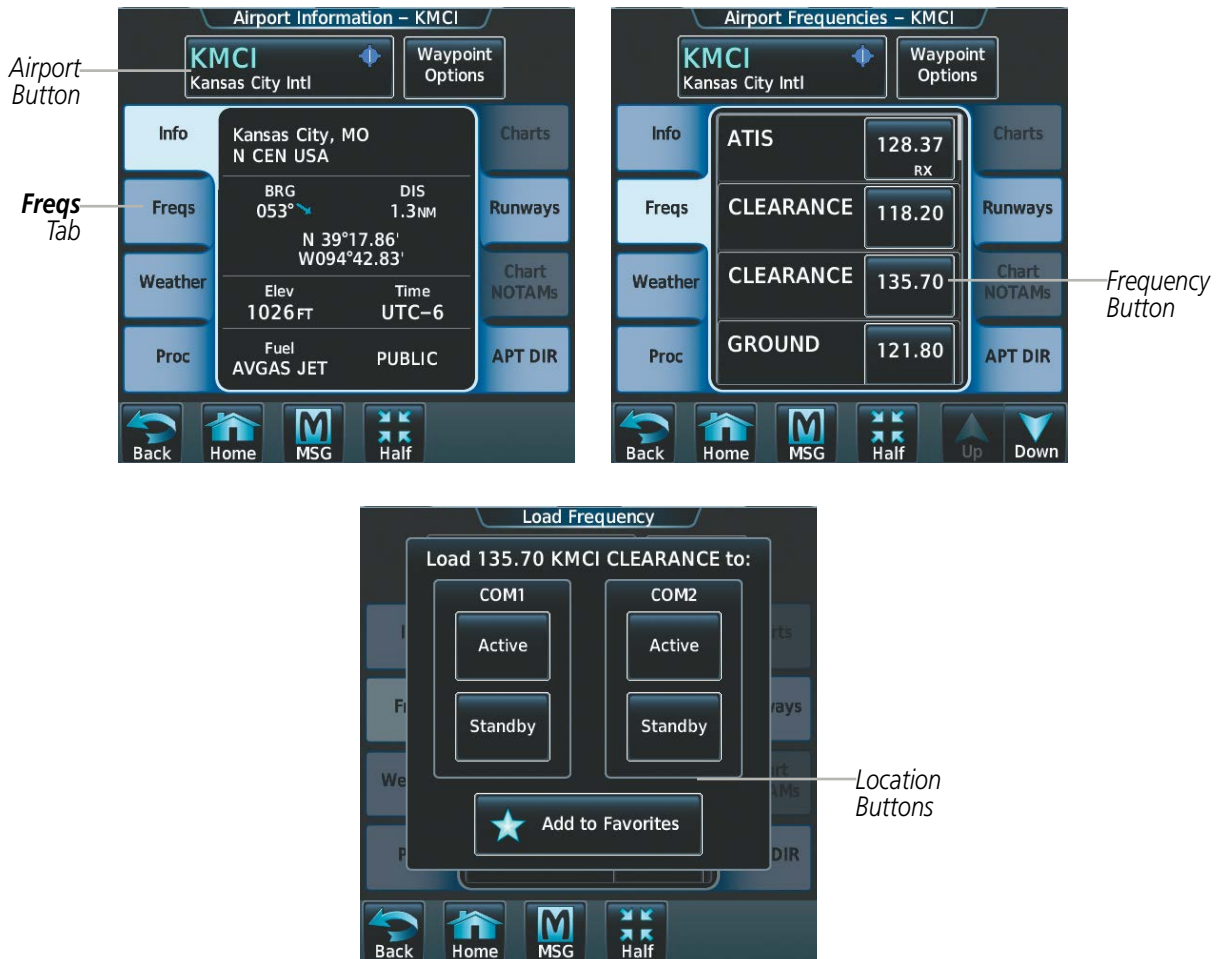


Figure 4-9 Airport Info Screen Tuning

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

- 1) From **Home**, touch **Nearest > Airport** to display the Nearest Airport Screen.
- 2) Scroll the list to find the desired airport.
- 3) Touch the airport button to display the Waypoint Options Window.
- 4) Touch the **Airport Info** Button to display the Airport Information Screen.
- 5) Touch the **Freqs** Tab to display the Airport Frequencies Screen.
- 6) Scroll the list to find the desired frequency.
- 7) Touch the frequency button to display the Load Frequency Screen.
- 8) Touch the location button to load the frequency to COM1/2 Active/Standby or Favorites.

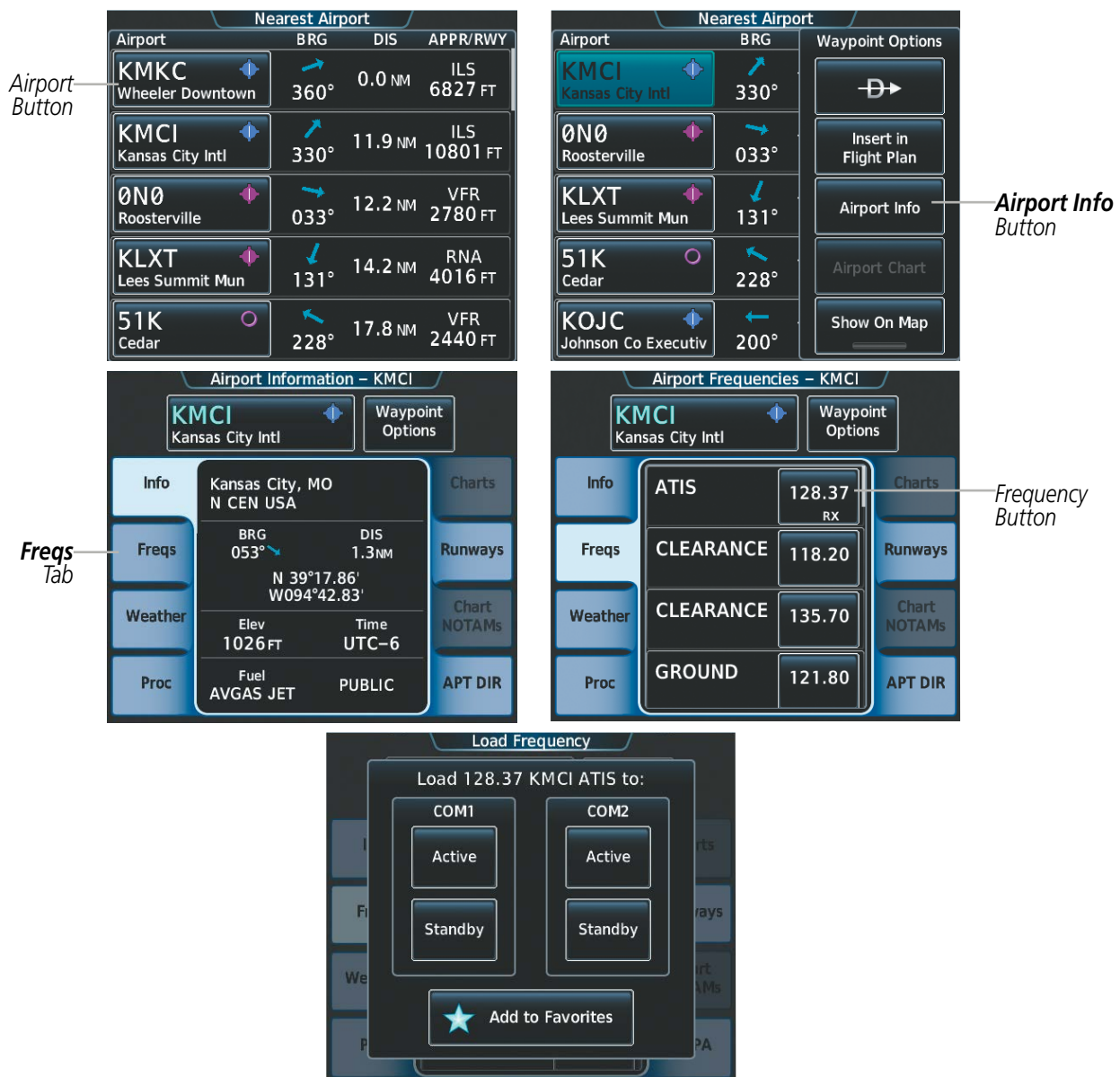


Figure 4-10 Nearest Airport Tuning

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

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

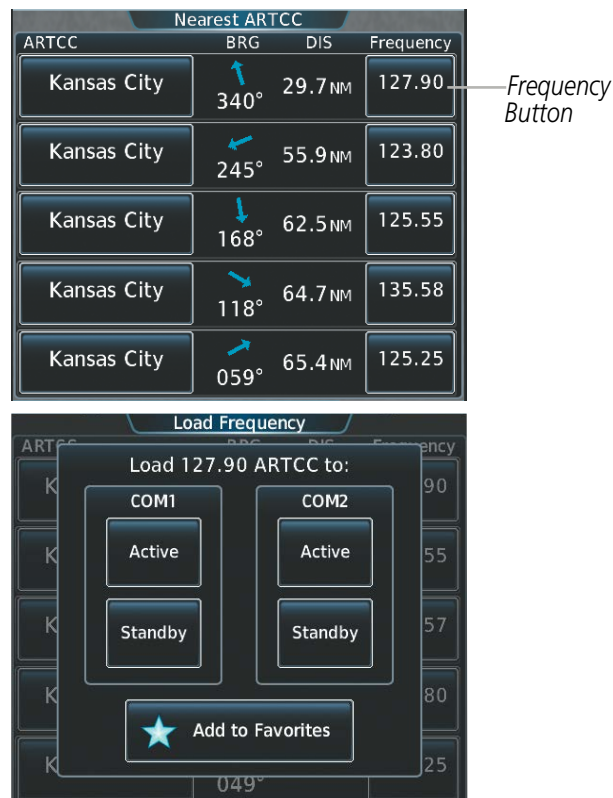


Figure 4-11 Nearest Airspace/ARTCC/FSS/Weather Tuning

FREQUENCY SPACING

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



Figure 4-12 COM Channel Spacing

Changing COM frequency channel spacing:

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



Figure 4-13 Changing COM Frequency Channel Spacing

AUTOMATIC SQUELCH

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

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



Figure 4-14 COM Radio Automatic Squelch Disable/Enable

VOLUME

The selected COM radio volume level can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the COM volume slider. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. Sliding to the right increases volume, sliding to the left decreases volume. When adjusting volume, the level is displayed in place of the active frequency in the CNS Bar, and remains for two seconds after the change. When the Audio & Radios Screen is displayed, the volume changes are not shown in the CNS Bar.

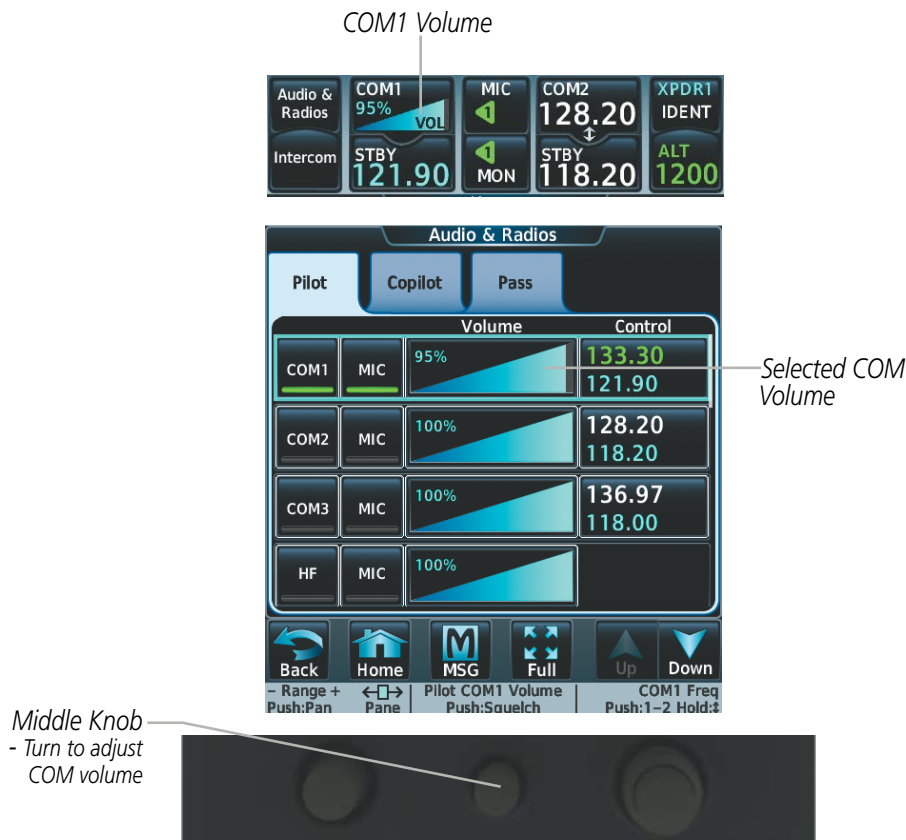


Figure 4-15 COM Volume Level

HF COM TRANSCIVER SELECTION AND ACTIVATION

The HF COM Frequencies are shown on the PFD. The HF COM transceiver can be selected for transmitting on the Touchscreen Controller. During reception of audio from the HF COM radio selected for transmission, audio from the other COM radio(s) is muted.

Selecting the HF COM Radio for transmission:

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

Selecting the HF COM Radio for monitoring:

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

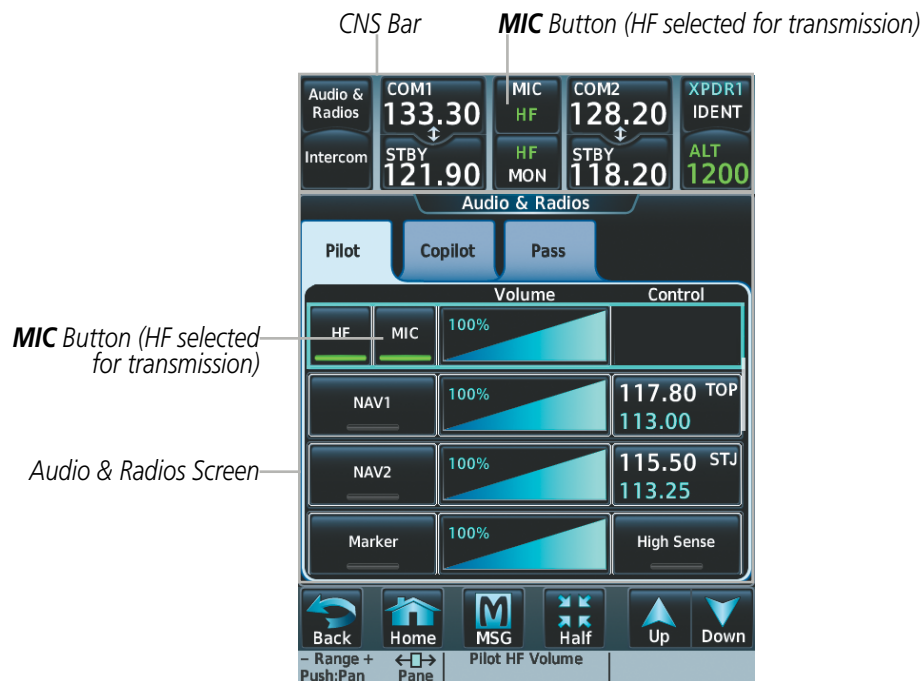


Figure 4-16 Selecting the HF COM Radio for Transmission



Figure 4-17 HF COM Frequency Displayed on PFD

HF COM VOLUME

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

The volume can also be adjusted on the PFD using the PFD Controller. With the COM/NAV Window displayed, turn the large right knob to select the VOLUME field. Turn the small right knob to adjust the volume (Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume).

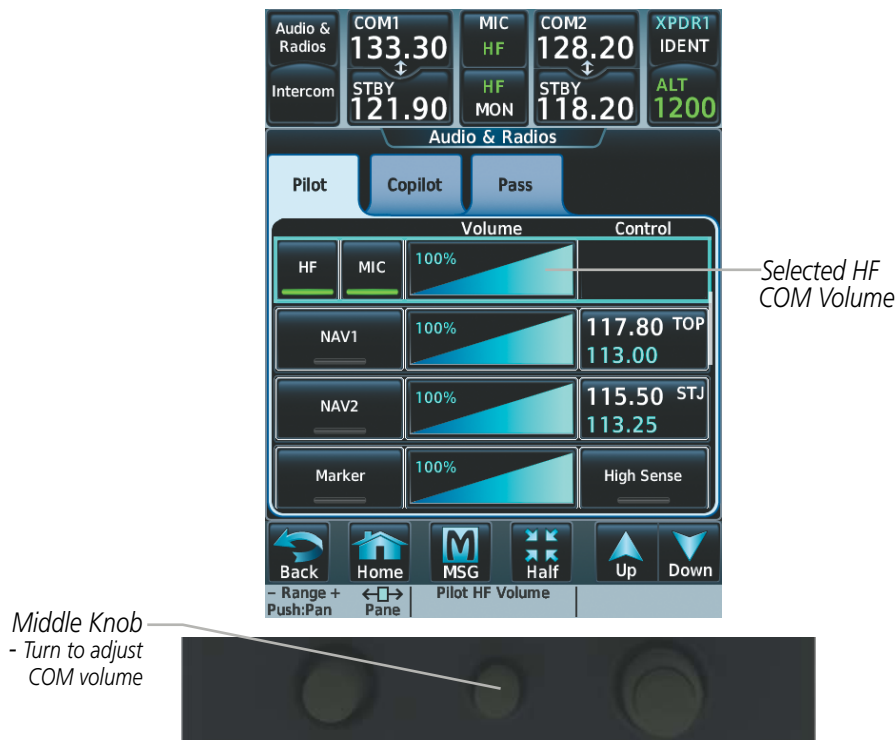


Figure 4-19 COM Volume Level

4.3 NAV OPERATION

NAV RADIO SELECTION AND ACTIVATION

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

A NAV radio is selected for navigation by selecting the **Active NAV** Softkey located on the PFD. The NAV frequency selected for navigation is displayed in green. Selecting the **Active NAV** Softkey once selects NAV1 as the navigation radio. Selecting the **Active NAV** Softkey a second time selects NAV2 as the navigation radio. Selecting the **Active NAV** Softkey a third time activates FMS mode. Selecting the **Active NAV** Softkey again cycles back to NAV1.

The three navigation modes that can be cycled through are:

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



Figure 4-20 Selecting a NAV Radio for Navigation

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

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

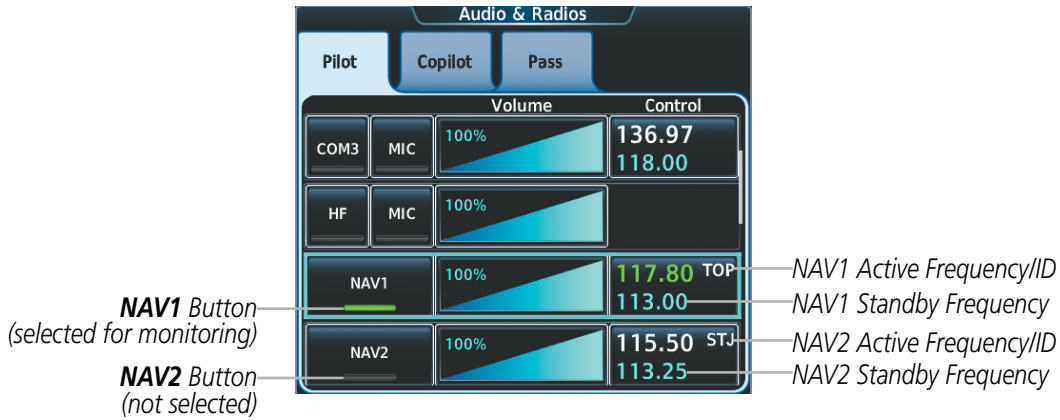


Figure 4-21 Selecting a NAV Radio for Monitoring

Selecting/deselecting a navigation radio for monitoring:

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

NAV RECEIVER TUNING

The NAV frequencies are tuned from the Touchscreen Controller.



Figure 4-22 Audio & Radios Screen - NAV Frequency Tuning

Selecting a NAV frequency using the Touchscreen Controller:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Touch the NAV1/NAV2 frequency button to select NAV1/NAV2 for tuning, and display the NAV1/NAV2 frequency tuning screen.

- 3) Use the keypad to select the desired frequency.
- 4) Touch the **Enter** Button to enter the new frequency as the NAV1/NAV2 standby frequency; or touch the **XFER** Button to enter the new frequency as the NAV1/NAV2 standby frequency and transfer it to the active frequency.



Figure 4-23 NAV Frequency Tuning Window

Or:

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

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

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



Figure 4-24 Airport Info Screen Tuning

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

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



Figure 4-25 VOR Info Screen Tuning

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

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

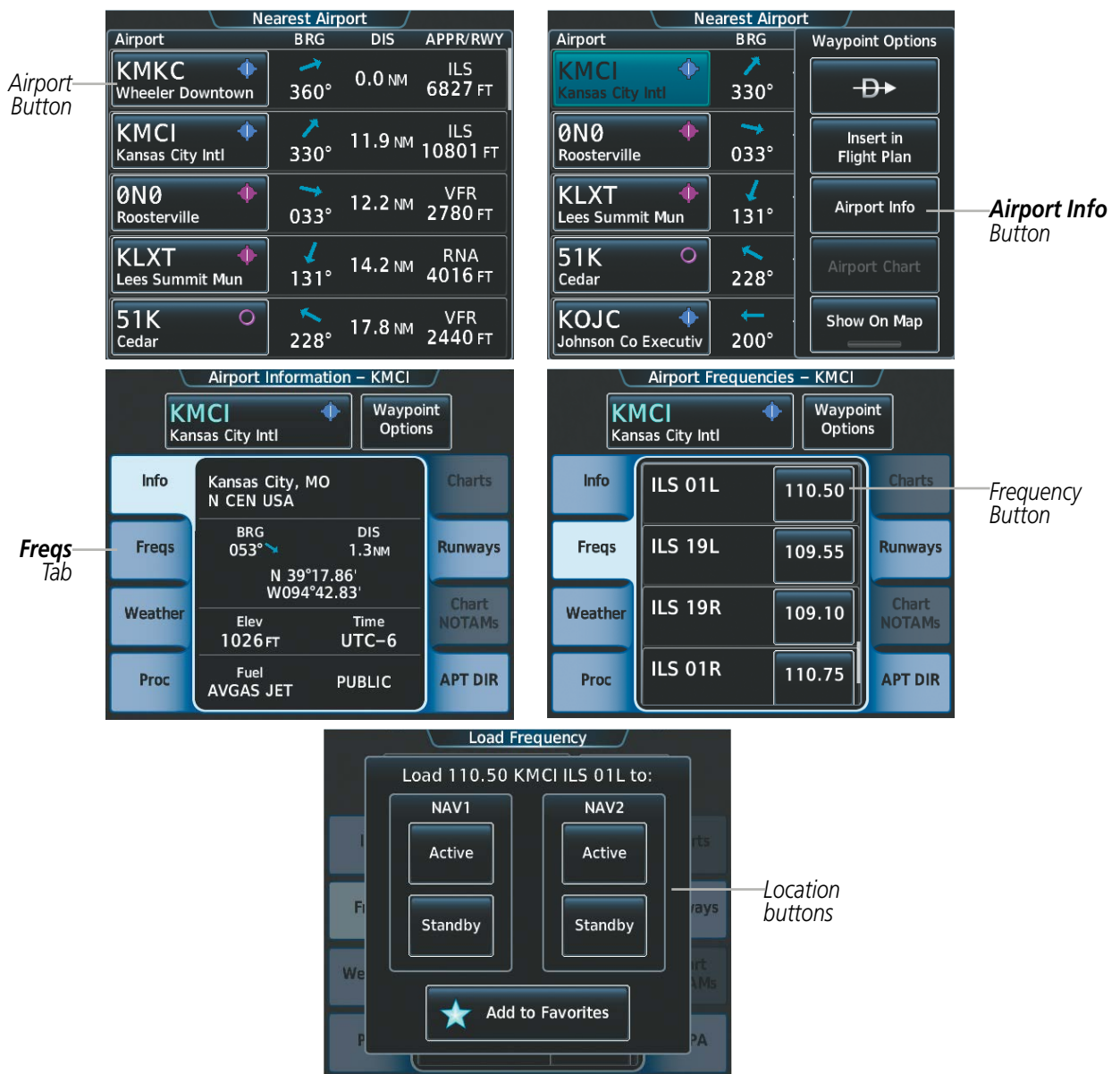


Figure 4-26 Nearest Airport Tuning

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

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

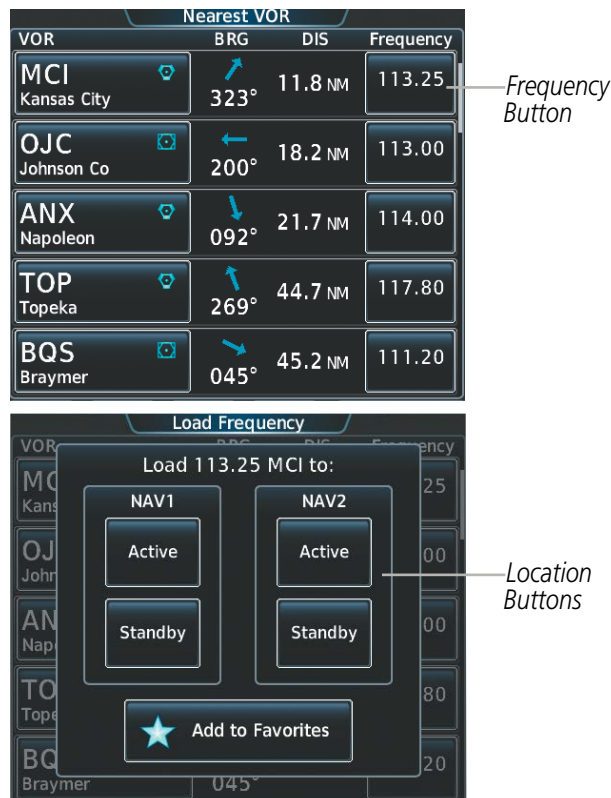


Figure 4-27 Nearest VOR/FSS/Weather Tuning

VOR/LOC ID

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

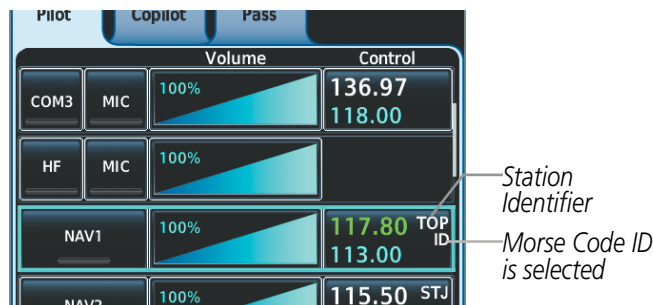


Figure 4-28 VOR/LOC ID Locations

VOLUME

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

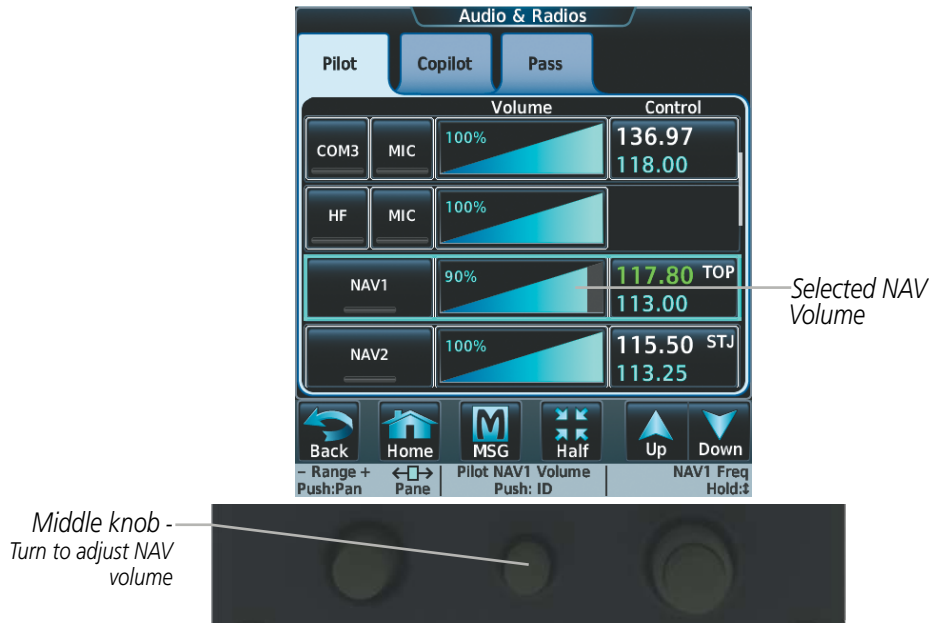


Figure 4-29 NAV Volume Level

AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION

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

NOTE: When an ILS/LOC approach has been activated in FMS Mode, the system switches to NAV Mode as the final approach course is intercepted (within 15 nm of the FAF). See the Flight Management Section for details.

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

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

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

MARKER BEACON RECEIVER

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

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

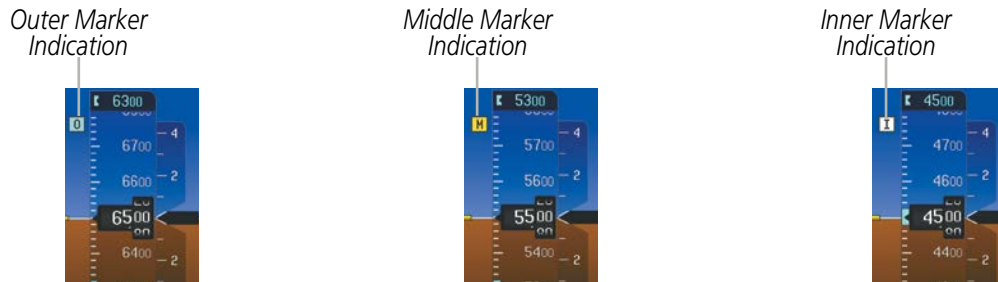


Figure 4-30 Marker Beacon Annunciations on the PFD



Figure 4-31 Marker Beacon Keys

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

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

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

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

ADF/DME TUNING

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

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

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

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

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

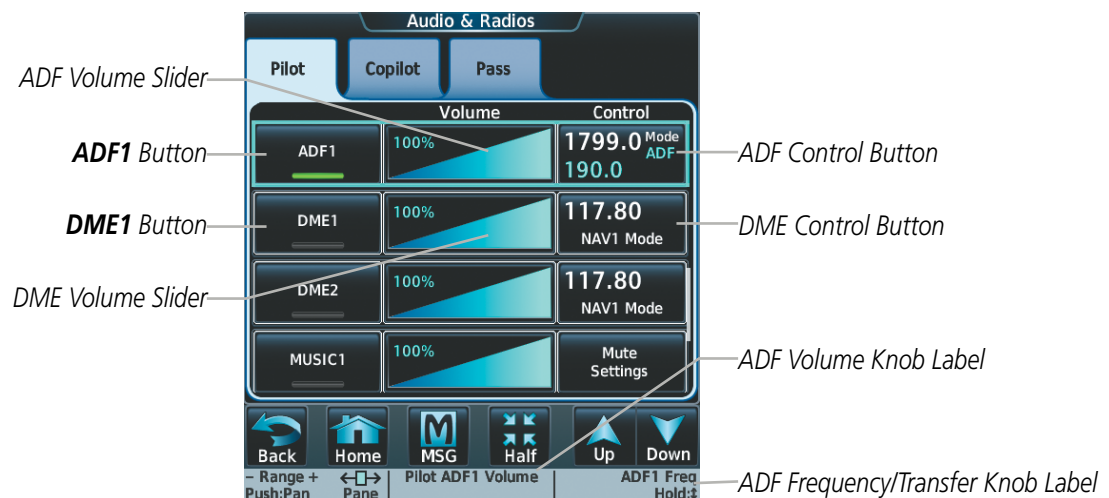


Figure 4-32 ADF/DME Tuning

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

ADF TUNING

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

Selecting an ADF frequency:

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



Figure 4-33 ADF Mode/Tuning Screen

Or:

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

Finding and selecting an ADF frequency:

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



Figure 4-34 Finding an ADF Frequency

Transferring the active and standby ADF frequencies:

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



Figure 4-35 ADF Frequency Transfer

SELECTING ADF RECEIVER MODE

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

- ANT (Antenna) – The ADF bearing pointer parks on the HSI at 90 degrees. Best mode for listening to NDB audio.
- ADF (Automatic Direction Finder) – The ADF pointer points to the relative bearing of the NDB station.
- ADF/BFO (ADF/Beat Frequency Oscillator) – The ADF pointer points to the relative bearing of the NDB station and an audible tone confirms signal reception. This mode allows identification of the interrupted carrier beacon stations used in various parts of the world.
- ANT/BFO (Antenna/Beat Frequency Oscillator) – The ADF bearing pointer parks on the HSI at 90 degrees while an audible tone is provided when a signal is received. This mode also allows identification of the interrupted carrier beacon stations and confirms signal reception.

Selecting an ADF receiver mode:

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

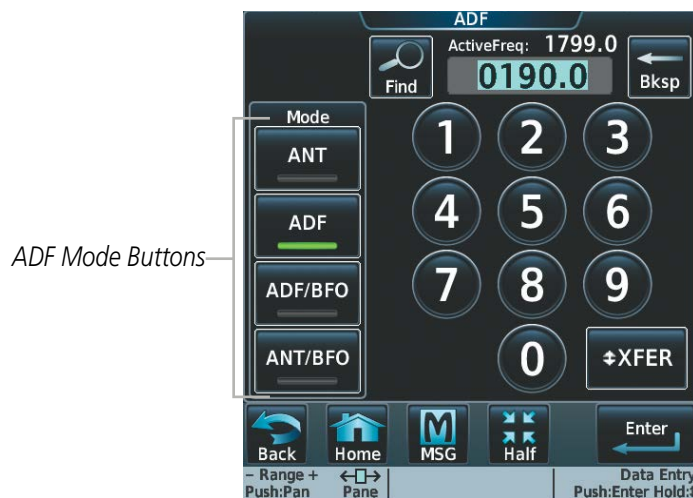


Figure 4-36 ADF Mode Selection

DME TUNING

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

The following DME transceiver pairings can be selected:

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



Figure 4-37 DME Mode Selection

Selecting DME transceiver pairing:

- 1) Touch **Audio & Radios** to display the Audio & Radios Screen.
- 2) Scroll the list to find the DME.
- 3) Touch the DME mode control button to display the DME Mode Window.
- 4) Touch the **NAV1 Mode**, **NAV2 Mode**, or **HOLD Mode** Button to select the DME mode.

4.4 MODE S TRANSPONDER

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

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

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

TCAS II TRANSPONDER CONTROLS

TCAS II transponder mode selection, code entry, Flight ID entry, and IDENT activation are controlled and displayed on the Touchscreen Controller.



Figure 4-38 Transponder Display and Controls

TCAS II TRANSPONDER MODE SELECTION

Transponder mode selection can be automatic (**ALT** Mode) or manual (**STBY**, **ON**, and **ALT** Modes) and is accessed by selecting the Transponder Mode Button, then the **Standby**, **On**, or **Altitude Reporting** Button.

Selecting a transponder mode:

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

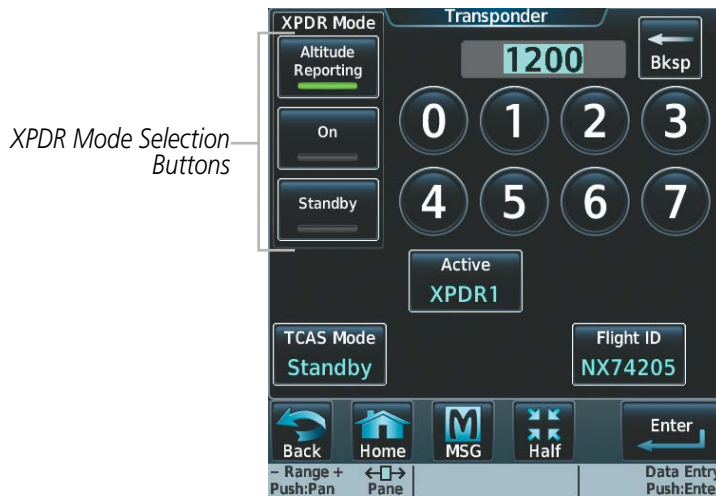


Figure 4-39 TCAS II Transponder Mode Selection

STANDBY MODE (MANUAL)

NOTE: In Standby Mode, the IDENT function is inhibited. TCAS II is switched to Standby Mode, because the transponder is not capable of supporting TCAS II operation in Standby Mode.

Standby Mode can be selected at any time by touching the **Standby** Button. In Standby, the transponder does not reply to interrogations, but new codes can be entered. When Standby is selected, a white STBY indication appears in the Transponder Mode Button and the transponder code is also white. In all other modes, these fields appear in green.



Figure 4-40 Standby Mode

ON MODE (MANUAL)



NOTE: TCAS II is switched to Standby Mode, because the transponder is not capable of supporting TCAS II operation in ON Mode.

ON Mode can be selected at any time by touching the **On** Button. ON Mode generates Mode A and Mode S replies, but Mode C altitude reporting is inhibited. In ON Mode, a green ON indication appears in the Transponder Mode Button.



Figure 4-41 ON Mode

ALTITUDE MODE (AUTOMATIC OR MANUAL)

Altitude Reporting Mode is automatically selected when the aircraft becomes airborne. Altitude Reporting Mode may also be selected manually by touching the **Altitude Reporting** Button.

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



Figure 4-42 Altitude Reporting Mode

ENTERING A TRANSPONDER CODE

Entering a transponder code with the keypad:

- 1) Touch the Transponder Code Button to display Transponder Screen.
- 2) Use the keypad to select the desired code.
- 3) Touch the **Enter** Button to enter the new code, or wait approximately two seconds for automatic entry.



Figure 4-43 Transponder Code Entry

Entering a transponder code with the knobs:

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

Or:

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

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

IDENT FUNCTION

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

Selecting the Transponder IDENT Button sends a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identifying transponder from all the others on the air traffic controller’s screen. When the Transponder IDENT Button is selected, the word IDENT appears on the button and pulsates for the duration of the identity indication.



Figure 4-44 Transponder IDENT Indication

FLIGHT ID REPORTING

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

When the Flight ID must be entered before flight operation, the identifier is placed on the Transponder Screen on the Touchscreen Controller. The Flight ID field can hold up to eight characters.

Entering a Flight ID:

- 1) Touch the Transponder Mode Button to display the Transponder Screen.
- 2) Touch the **Flight ID** Button to display the keypad.
- 3) Use the keypad to select the desired flight ID.
- 4) Touch the **Enter** Button to enter the new flight ID.



Figure 4-45 Flight ID Entry

4.5 ADDITIONAL AUDIO FUNCTIONS

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

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

SPEAKER

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

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

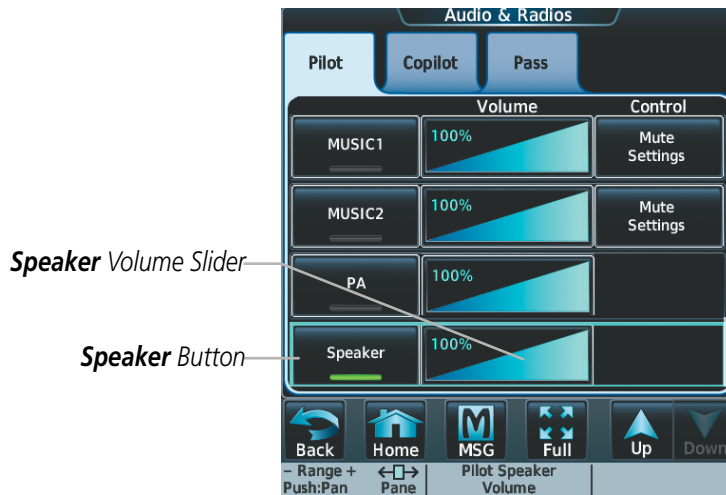


Figure 4-46 Speaker Audio Selection

INTERCOM

The Audio Panel includes an eight-mode intercom system (ICS) and two stereo music inputs for the pilot, copilot and passengers. The intercom provides Pilot and Copilot isolation from the passengers and aircraft radios. Each of the three link arrows are selected/deselected by touching the arrow.

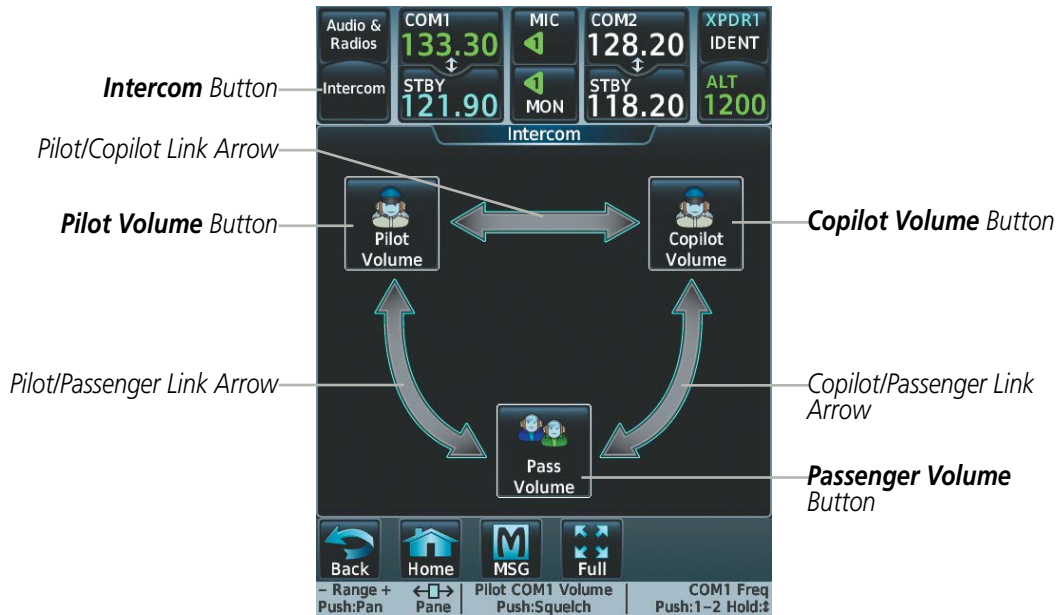


Figure 4-47 Intercom Controls

ALL INTERCOM MODE

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

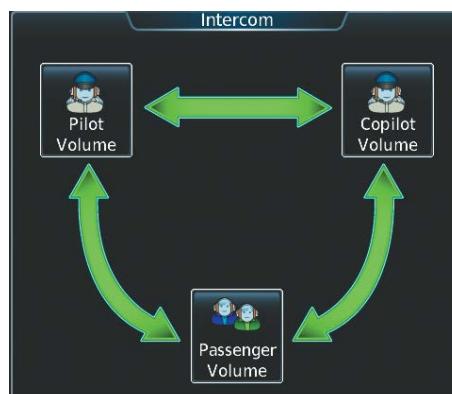


Figure 4-48 All Intercom Mode

COPILOT-PASSENGER INTERCOM MODE

In 'Copilot-Passenger' mode the Pilot and Copilot hear each other. The Copilot and Passengers also hear each other.

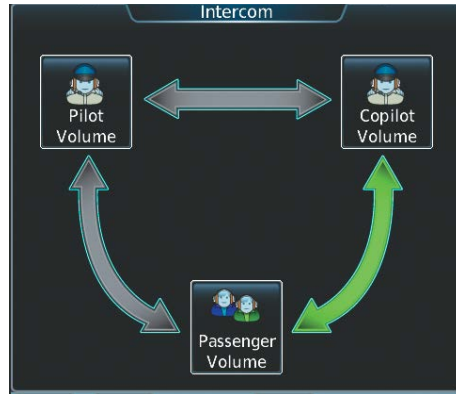


Figure 4-49 Copilot-Passenger Intercom Mode

PILOT-COPILOT INTERCOM MODE

In 'Pilot-Copilot' mode the Pilot and Copilot hear each other. The Passengers hear each other.

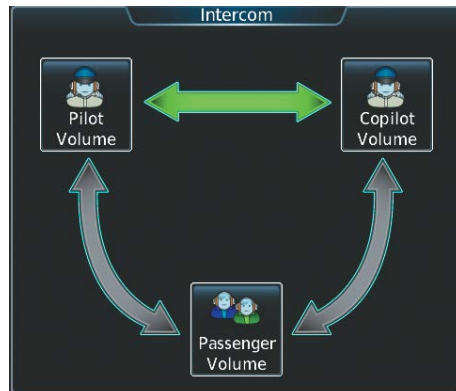


Figure 4-50 Pilot-Copilot Intercom Mode

PILOT-PASSENGER INTERCOM MODE

In ‘Pilot-Passenger’ mode the Pilot and Copilot hear each other. The Pilot and Passengers also hear each other.

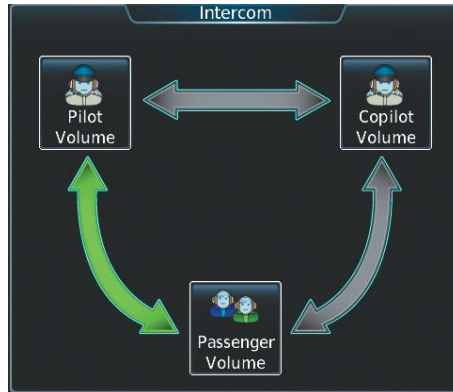


Figure 4-51 Pilot-Passenger Intercom Mode

ALL ISOLATE MODE

In ‘All Isolate’ mode the Pilot and Copilot hear the aircraft audio. The Passengers hear each other.

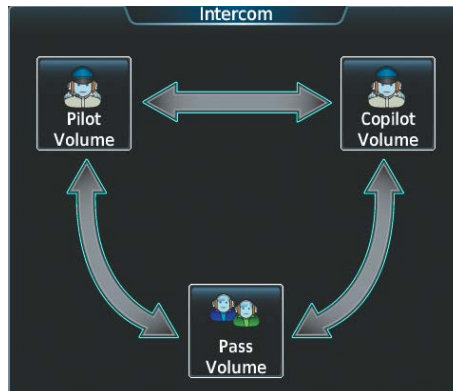


Figure 4-52 All Isolate Mode

PILOT-PASSENGER/COPILOT-PASSENGER INTERCOM MODE

In 'Pilot-Passenger/Copilot-Passenger' mode the Passengers hear the pilot, copilot, and each other.

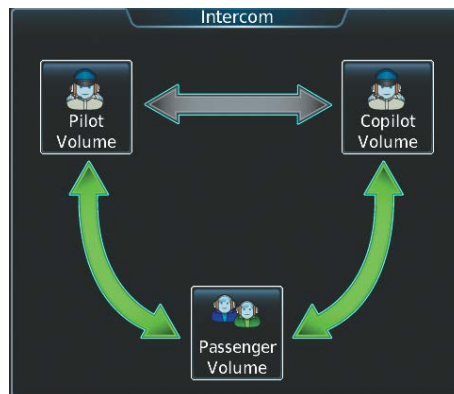


Figure 4-53 Pilot-Passenger/Copilot-Passenger Intercom Mode

PILOT-PASSENGER/PILOT-COPILOT INTERCOM MODE

In 'Pilot-Passenger/Pilot-Copilot' mode the Pilot and Copilot hear each other. The Passengers hear the Pilot and each other.

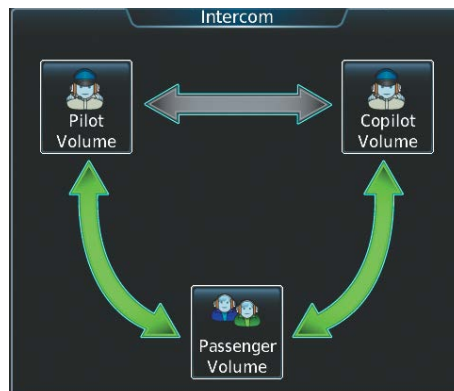


Figure 4-54 Pilot-Passenger/Pilot-Copilot Intercom Mode

COPILOT-PASSENGER/PILOT-COPILOT INTERCOM MODE

In 'Copilot-Passenger/Pilot-Copilot' mode the Pilot and Copilot hear each other. The Passengers hear the Copilot and each other.

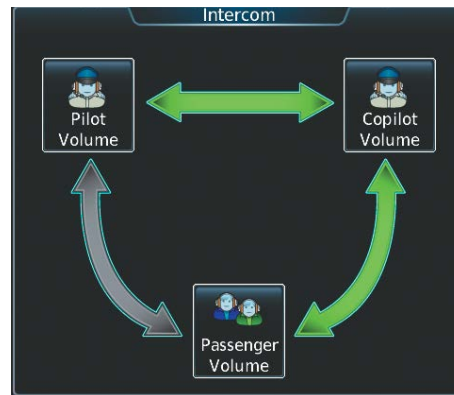


Figure 4-55 Copilot-Passenger/Pilot-Copilot Intercom Mode

INTERCOM VOLUME AND SQUELCH

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

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

Adjusting intercom volume:

- 1) Touch the **Intercom** Button to display the Intercom Screen.
- 2) Touch the **Pilot Volume** or **Copilot Volume** button to display the Pilot or Copilot Intercom Settings Screen.
- 3) Adjust the volume by using the middle knob or by sliding your finger on the volume slider.

Adjusting intercom squelch:

- 1) Touch the **Intercom** Button to display the Intercom Screen.
- 2) Touch the **Pilot Volume** or **Copilot Volume** button to display the Pilot or Copilot Intercom Settings Screen.
- 3) Touch the Squelch Mode Button to disable Auto Squelch.
- 4) Adjust the squelch by using the middle knob or by sliding your finger on the squelch slider.

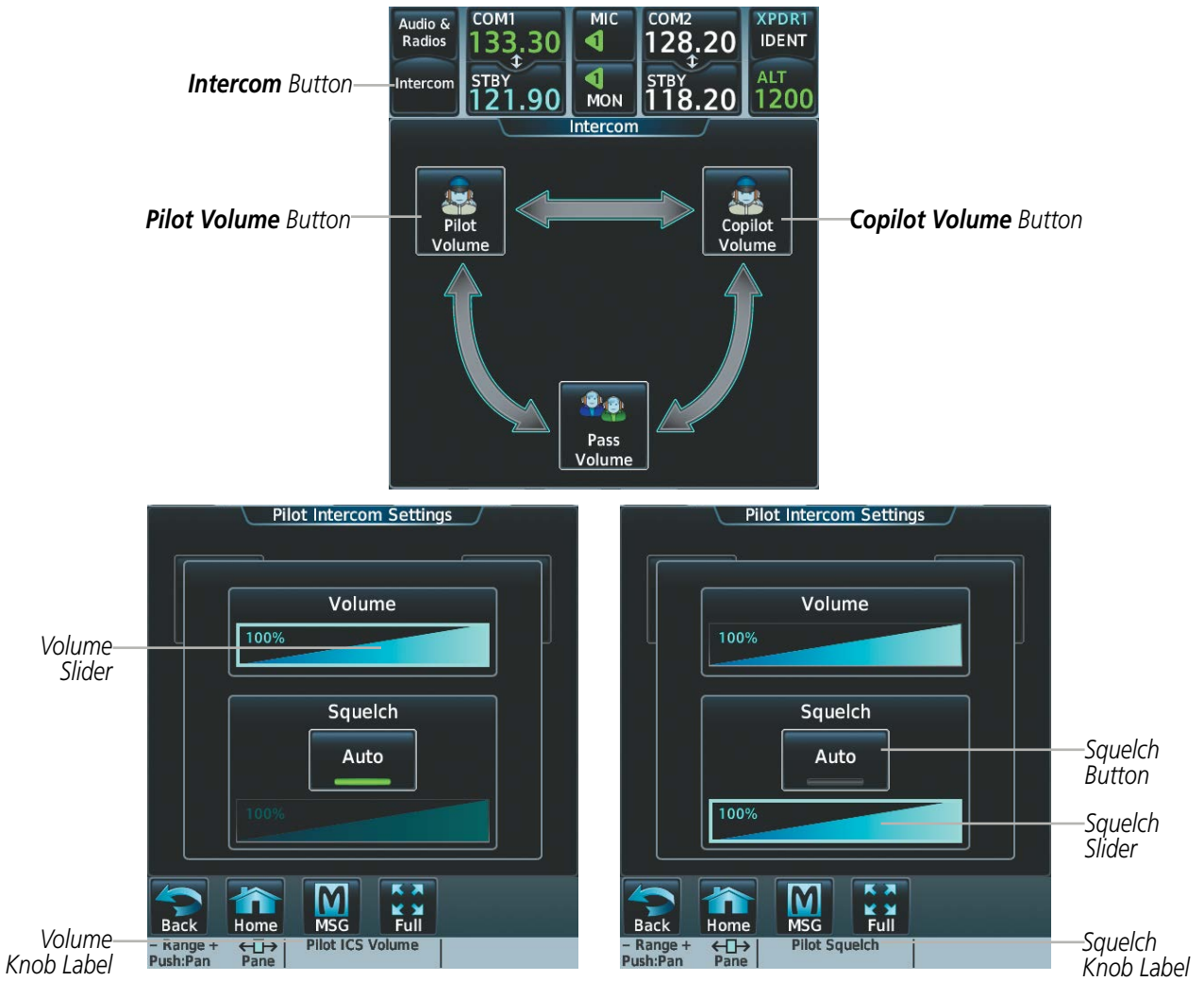


Figure 4-56 Intercom Volume/Squelch Controls

PASSENGER ADDRESS (PA) SYSTEM

A passenger address system is available for delivering voice messages to the passengers. When the **PA** Button is selected on the Touchscreen Controller, the MIC Annunciator is replaced with a green PA, and the active COM frequency changes to white, indicating that there is no COM selected. The active COM frequency on the PFD is replaced by a white PA annunciation. A Push-to-Talk (PTT) must be pressed to deliver PA announcements. The PA Annunciator flashes about once per second while the PTT is depressed.

The PA volume can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume.



Figure 4-57 PA Controls

Selecting the PA system for transmission:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) Scroll the list to find the PA.
- 3) Touch the **PA** Button on the Audio & Radios Screen to select the PA for transmission.

CLEARANCE RECORDER AND PLAYER

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

Touching the **Recorder** (Play) Button plays the latest recorded memory block. The **Recorder** (Stop) Button is displayed while the audio is playing. When the present memory block has finished playing the **Recorder** (Play) Button is displayed again.

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

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

Powering down the system automatically clears all recorded blocks.

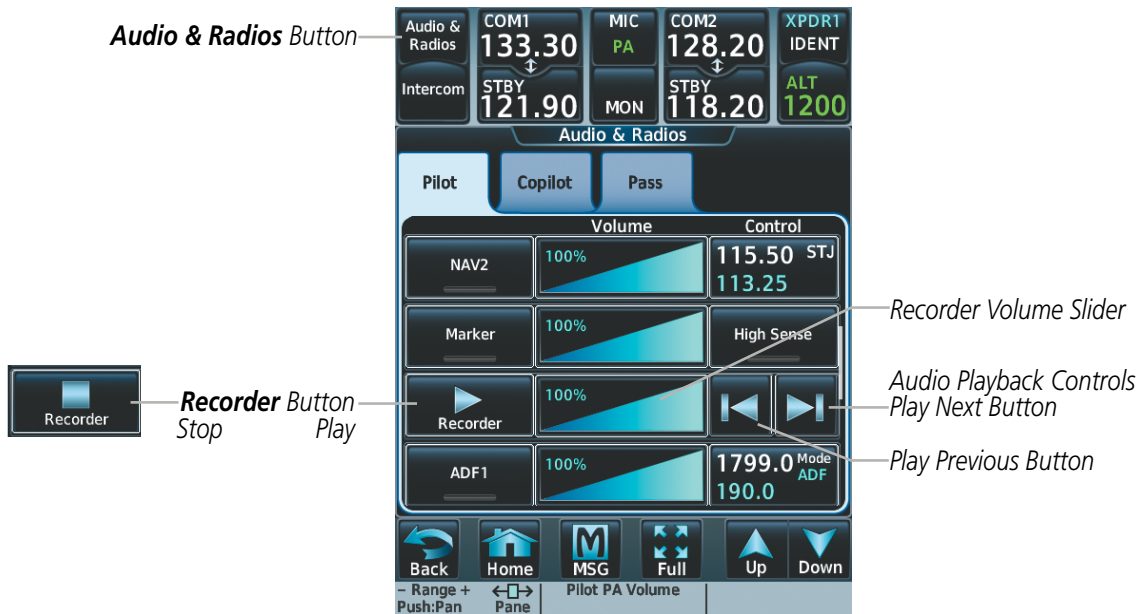


Figure 4-58 Recorder Controls

SIMULTANEOUS COM OPERATION

The pilot and the copilot can transmit and receive simultaneously over separate COM radios. The selected COM MIC Annunciator flashes when either pilot's microphone PTT is pressed.

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



Figure 4-59 Simultaneous COM Operation

ENTERTAINMENT INPUTS

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

The pilot, copilot and passengers can select each of the entertainment inputs independently.

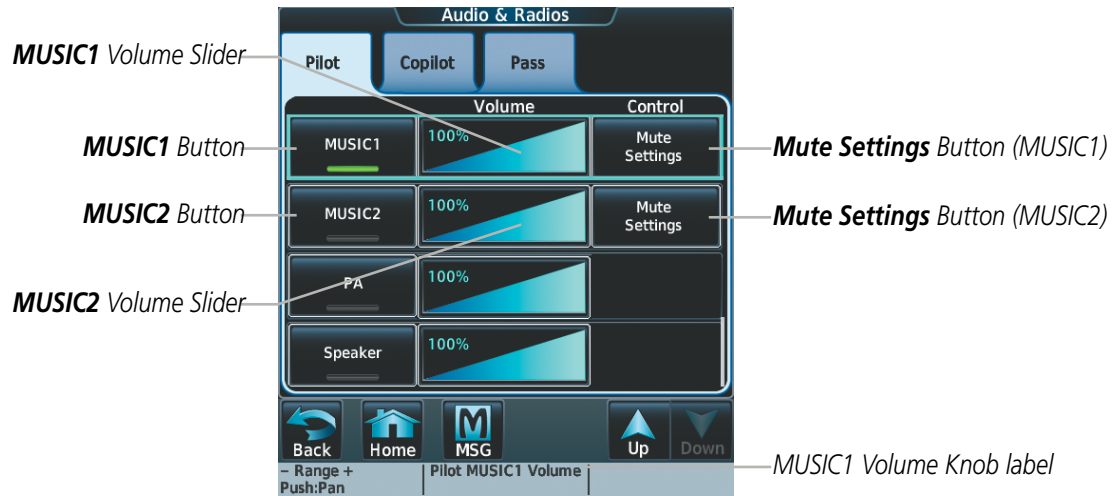


Figure 4-60 Entertainment Audio Control

Selecting/deselecting MUSIC1/2 input:

- 1) Touch the **Audio & Radios** Button to display the Audio & Radios Screen.
- 2) If selecting for the Copilot or Passengers, touch the **Copilot** Tab or the **Pass** Tab.
- 3) Scroll the list to find MUSIC1 or MUSIC2.
- 4) Touch the **MUSIC1** or **MUSIC2** Button to select/deselect the MUSIC1/2 input for the selected position (pilot, copilot, or passengers).

The MUSIC1/2 volume can be adjusted from 0 to 100% on the touchscreen controller by turning the middle knob or by sliding your finger right or left on the volume slider.

MUSIC MUTING

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

SIRIUSXM RADIO ENTERTAINMENT

SiriusXM Radio audio from the Data Link Receiver can be connected to both the MUSIC1 and MUSIC2 inputs (optional). Refer to the Additional Features Section for more details on the Data Link Receiver.

Connecting a stereo input to the MUSIC1 jack removes the SiriusXM Radio Audio from that input.

4.6 CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)

The GDR 66 VHF Data Link Transceiver provides the link from the Prodigy Touch Flight Deck 300 to the Controller Pilot Data Link Communications system (CPDLC). The CPDLC system provides data link communication between the aircraft and an Air Traffic Control facility. Communication is normally in the form of text message elements that resemble phraseology used in voice communications with ATC.

Generally, messages are closed with an acknowledgement or acceptance. When a message is acknowledged, the connection with the ATC facility is not terminated, but kept active for future communication.

Communication hand-off to the next ATC facility is usually performed automatically, but may also be accomplished manually by the pilot.

CONNECTING TO THE CPDLC SYSTEM

A flight plan must be filed prior to logging on to the CPDLC system. After entering flight plan information in the required fields and successfully logging on to the system, messages may be sent and received.

Log-on Setup:

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) If necessary, touch the **Status** Tab to display the Logon Setup buttons as shown on Figure 4-61.



Figure 4-61 CPDLC Log-On Display



Figure 4-62 ATC Facility List

- 3) Touch the **Facility** Button. A list of available ATC facilities is displayed as in Figure 4-62.
- 4) Touch the appropriate ATC facility to which the CPDLC connection will be established. In this case, EDGG will be selected. The selected facility is now displayed in the Facility field, as seen in Figure 4-63.



Figure 4-63 CPDLC Log-On Facility Set



Figure 4-64 Entering Flight ID (Tail Number Shown)

- 5) Touch the **Flight ID** Button. The Flight ID entry screen is displayed as in Figure 4-64. Enter the Flight ID or aircraft registration number, whichever is appropriate for the filed flight plan.
- 6) Touch **Enter**. The Flight ID number is displayed in the Flight ID field as shown in Figure 4-65.



Figure 4-65 CPDLC Log-On Flight ID Set



Figure 4-66 Entering Destination Airport

- 7) Touch the **Destination Airport** Button. The Destination Airport entry screen is displayed as in Figure 4-66. Enter the airport identifier for the destination airport used in the filed flight plan.

- 8) Touch **Enter**. The airport identifier is displayed in the Destination Airport field as shown in Figure 4-67.



Figure 4-67 CPDLC Log-On Destination Airport Set



Figure 4-68 Entering Departure Time

- 9) The Filed Departure Airport field is prefilled with the airport identifier corresponding to the current aircraft location, in this case KPUB. If the flight plan was filed using a different airport identifier, touch the **Filed Dep Airport** Button and enter the appropriate airport identifier. Touch **Enter**.
- 10) Touch the **Filed Dep Time** Button. The entry screen is displayed as in Figure 4-68. Enter the departure time used in filing the flight plan.
- 11) Touch **Enter**. The confirmation screen is displayed as shown in Figure 4-69.

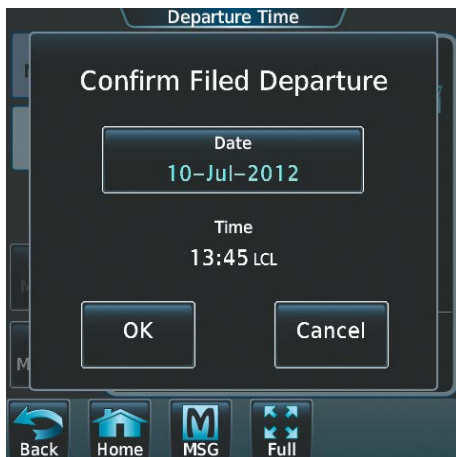


Figure 4-69 Confirming Departure Time



Figure 4-70 Departure Time Set

- 12) Touch **OK**. The departure time is displayed in the Filed Dep Time field as shown in Figure 4-70.

Performing the system log-on:

- 1) After performing the previous Logon Setup procedure, verify the Link Status display indicates a link with a ground station is available. An available link is indicated by a green line between the aircraft symbol and the ground station antenna symbol, as seen in Figure 4-70.
- 2) Touch the **Logon** Button. The Link Status display indicates 'Connecting' with an animated dashed green line between the ground station antenna symbol and the ATC facility symbol, as seen in Figure 4-71. Touching the **Cancel** Button will terminate the log-on process. When connection is complete, the display indicates 'Connected' with an solid green line between the ground station antenna symbol and the ATC facility symbol, as seen in Figure 4-72.



Figure 4-71 CPDLC Connecting to ATC Facility



Figure 4-72 System is Connected and Active

CREATING A MESSAGE

Creating a message consists of choosing from a pre-determined list of requests, entering the required information, and sending the request.

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) Touch the **Create Message** Button. A list of requests is presented for selection as shown in Figure 4-73.
- 3) For discussion purposes, 'Request Level' is selected in this example by touching the **Request Level** Button. A window is displayed for entering further information as shown in Figure 4-74.



Figure 4-73 List of New Message Types



Figure 4-74 Select Altitude Entry

- 4) Touch the **Request Level** Button. The Altitude Entry display is shown as in Figure 4-75.



Figure 4-75 Altitude Entry



Figure 4-76 Reason for Request

- 5) Select the desired altitude mode by touching the **Flight Level** or **FT** (feet) Button. A green annunciator indicates the selected mode.
- 6) Using the number keys, enter the altitude to be requested.
- 7) Touch the **Enter** Button. The requested altitude is displayed as in Figure 4-76.
- 8) Touch the **Reason** Button. A list of pertinent reasons is presented as in Figure 4-77.



Figure 4-77 List of New Message Types



Figure 4-78 Enter Requested Altitude

- 9) In this example, the flight level change request is initiated due to decreased aircraft performance. Touch the **Due to Aircraft Performance** Button. The selected reason is displayed as in Figure 4-78.
- 10) Touch the **Send** Button.

RESPONDING TO AN ATC MESSAGE

Responding to an ATC message consists of choosing from a pre-determined list of responses or acknowledgements, then sending the response or acknowledgement.

VIEWING CPDLC MESSAGE DIALOGS

The status of a string of messages and responses, or dialog, may be checked and past message dialogs viewed. When the system power is cycled, the list of message dialogs is deleted.

To view messages:

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) If necessary, touch the **CPDLC Messages** Tab. A list of message dialogs is displayed as seen in Figure 4-79.



Figure 4-79 Message Dialog List

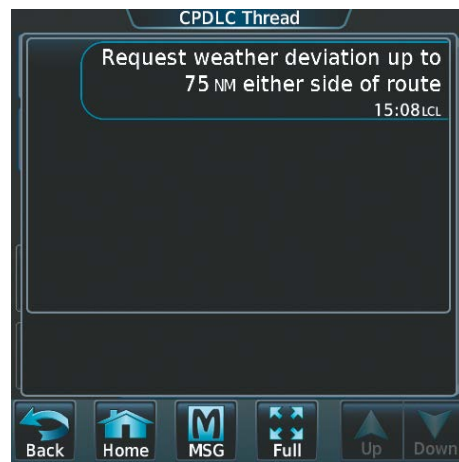


Figure 4-80 Message Dialog Thread

- 3) Touch a message dialog box to display the message thread, as seen in Figure 4-80.

Or:

- 1) Touch the flashing **CPDLC** Button on the Button Bar.
- 2) If necessary, touch the **CPDLC Messages** Tab. A list of message dialogs is displayed.



Figure 4-81 CPDLC Button on the Button Bar

DELETING MESSAGE DIALOGS

While the system deletes the list of message dialogs when power is turned off, individual message dialogs may also be deleted manually. Message dialogs considered closed may also be deleted.

To delete a single message dialog:

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) If necessary, touch the **CPDLC Messages** Tab.
- 3) Touch the message dialog to be deleted.
- 4) Touch the **Delete** Button. A confirmation window is displayed.
- 5) Touch the **OK** Button to delete the message dialog.

To delete all closed message dialogs:

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) Touch the Delete Messages Button. A confirmation window is displayed.
- 3) Touch the **OK** Button. All closed message dialogs are deleted.

DISCONNECTING FROM THE CPDLC SYSTEM

A flight plan must be filed prior to logging on to the CPDLC system. After entering flight plan information in the required fields and successfully logging on to the system, messages may be sent and received.

- 1) From the **Home** Screen, touch **CPDLC**.
- 2) If necessary, touch the **Status** Tab.
- 3) Touch the **Logoff** Button to disconnect the system.

4.7 ABNORMAL OPERATION

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

STUCK MICROPHONE

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

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

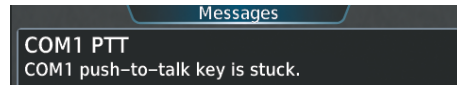


Figure 4-82

COM TUNING FAILURE

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



Figure 4-83 COM Tuning Failure

EMERGENCY MODE

The emergency frequency (121.500 MHz) can be tuned in COM1 by selecting the emergency mode.

Selecting emergency mode:

- 1) Select the **PFD Settings** Softkey on the PFD.
- 2) Select the **Other PFD Settings** Softkey on the PFD.
- 3) Select the **COM1 121.5** Softkey on the PFD to tune COM1 to the emergency frequency.

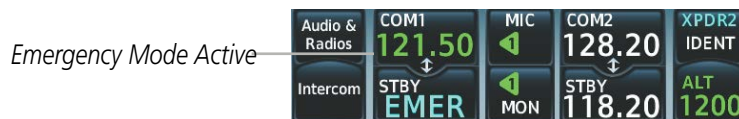


Figure 4-84 COM1 Emergency Mode Active

AUDIO CONTROLLER FAIL-SAFE OPERATION

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

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The Prodigy™ Touch Flight Deck 300 is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains GPS navigation using the Prodigy™ Touch Flight Deck 300.

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

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

Navigation mode indicates which sensor is providing the course data (e.g., GPS, VOR) and the flight plan phase (e.g., Departure (DPRT), Terminal (TERM), Enroute (ENR), Oceanic (OCN), Approach (LNAV, LNAV+V, L/VNAV, LP, LPV), or Missed Approach (MAPR)). L/VNAV, LP, and LPV approaches are only available with SBAS. L/VNAV approaches will be flown as a Baro VNAV approach when SBAS is not available.

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

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by selecting the **Detail** Softkey on the PFD for the Inset Map, and by the Map Detail Slider on the Touchscreen Controller for navigation maps. The Navigation Map can be oriented three different ways: North Up (NORTH UP), Track Up (TRK UP), or Heading Up (HDG UP).

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

There are 28 different map ranges available, from 250 feet to 1000 nm. Range is indicated in the upper left quadrant of the range ring shown around the aircraft icon. This indicated range is the range from the aircraft icon to the range ring, and roughly half the range to the top edge of the displayed map. To change the map range on any map, turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range. To change the Inset Map range, use the **Map Range -** and the **Map Range +** softkeys, or turn the **Joystick** on the PFD Controller.



Figure 5-1 GPS Navigation Information on the PFD

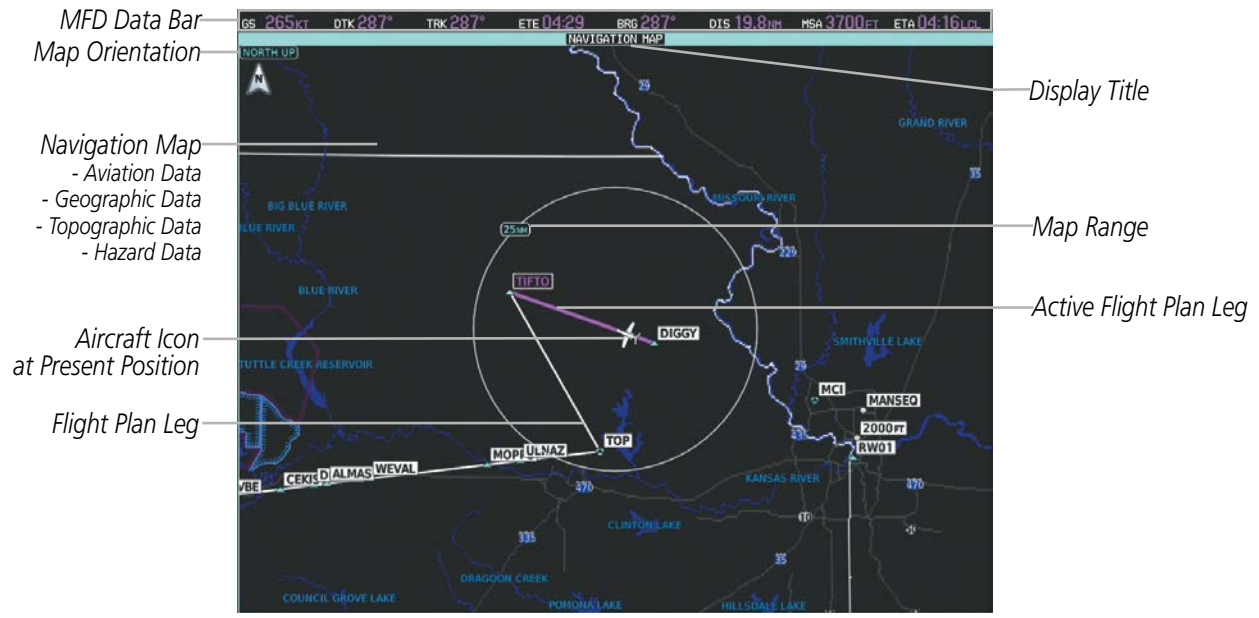


Figure 5-2 GPS Navigation Information on the MFD Navigation Map Display

NAVIGATION STATUS BAR

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



PFD Navigation Status Bar

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

The symbols used in the PFD status bar are:

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

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

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



MFD Navigation Data Bar

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

Changing a field in the MFD Navigation Data Bar:

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



Figure 5-3 MFD Data Bar Field Selection

5.2 USING MAP DISPLAYS

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

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

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

MAP SETTINGS SYNC

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

Enabling/disabling map settings synchronization:

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

Or:

- 1) Touch the **Off** Button to disable synchronization.



Figure 5-4 Map Settings Synchronization

MAP ORIENTATION

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



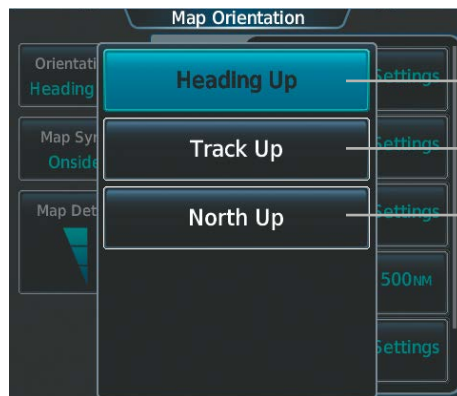
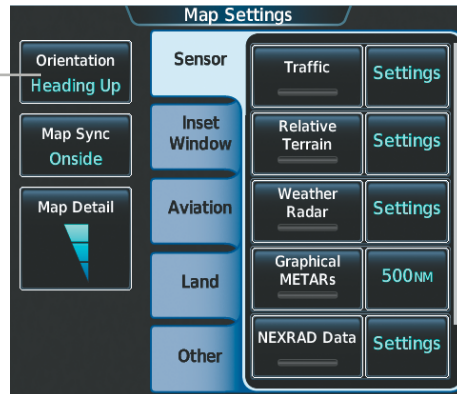
Figure 5-5 Map Orientation

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

Changing the Navigation Map orientation:

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

Orientation Button



Heading Up Orientation



Track Up Orientation



North Up Orientation

Figure 5-6 Map Orientation Selection

MAP RANGE

There are 28 different map ranges available, from 250 feet to 1000 nm. Range is indicated in the upper left quadrant of the range ring shown around the aircraft icon. This indicated range is the range from the aircraft icon to the range ring, and roughly half the range to the top edge of the displayed map. To change the map range on any MFD map, turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range. To change the Inset Map range, use the **Map Range -** and the **Map Range +** softkeys.



Figure 5-7 Map Range

AUTO ZOOM

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

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

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

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

- The ‘time out’ time (configurable on the Touchscreen Controller Map Settings Screen) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the ‘time out’ value to zero causes the manual override to never time out.
- When the maximum ‘look forward’ time is set to zero, the upper limit becomes the maximum range available (1000 nm).
- When the minimum ‘look forward’ time is set to zero, the lower limit becomes 0.75 nm.

Configuring automatic zoom:

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

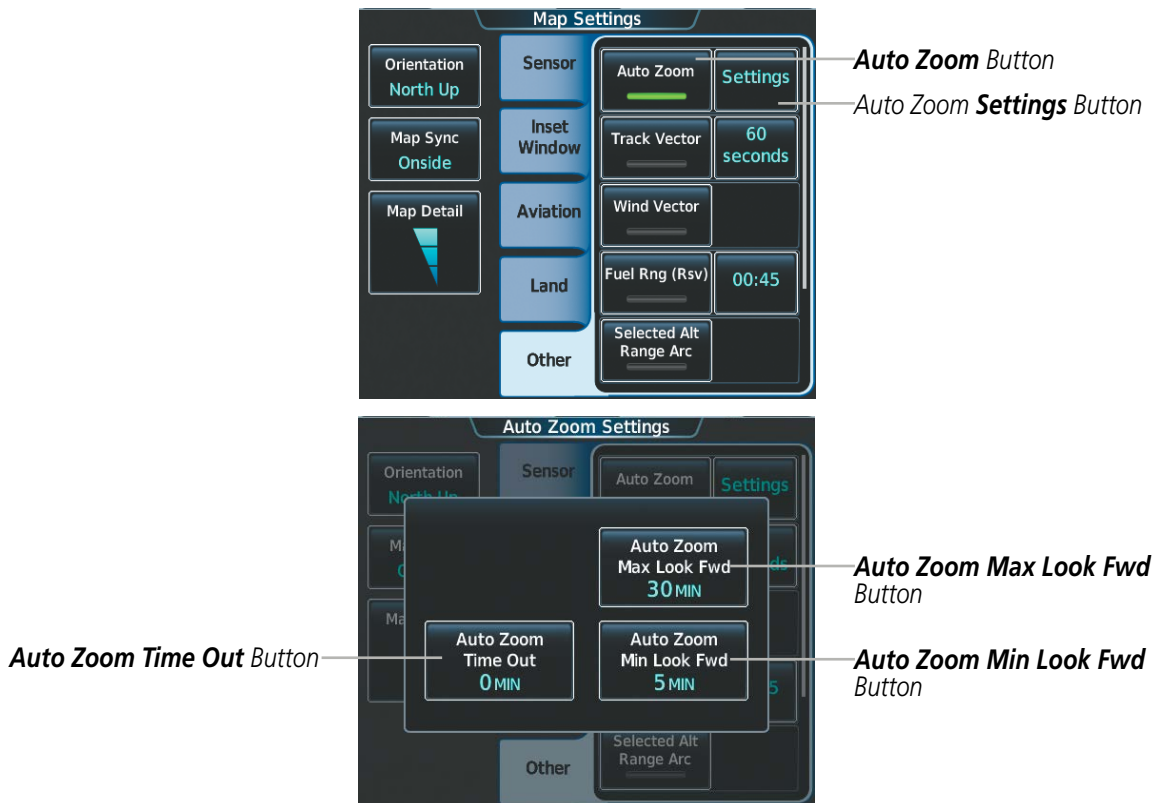


Figure 5-8 Auto Zoom Setup

MAP PANNING

The Map Pointer allows the pilot to:

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

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



Figure 5-9 Navigation Map - Map Pointer Activated

Panning the map:

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

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

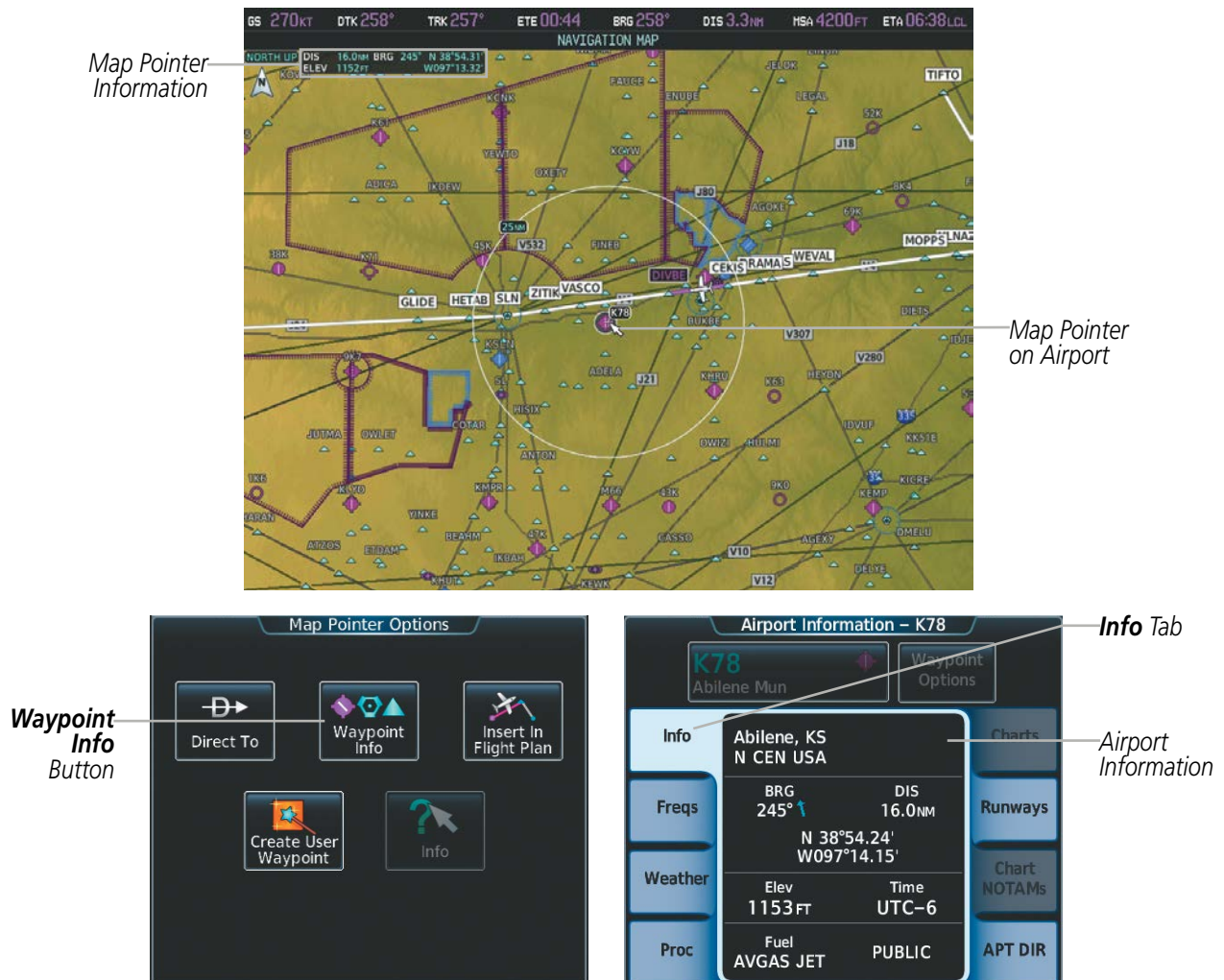


Figure 5-10 Navigation Map - Map Pointer on Airport

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

- 1) Place the Map Pointer on an airport, NAVAID, or user waypoint.
- 2) Touch the **Waypoint Info** Button to display the waypoint information screen.
- 3) Press the **Joystick** to exit the waypoint information screen and remove the Map Pointer from the Navigation Map.

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

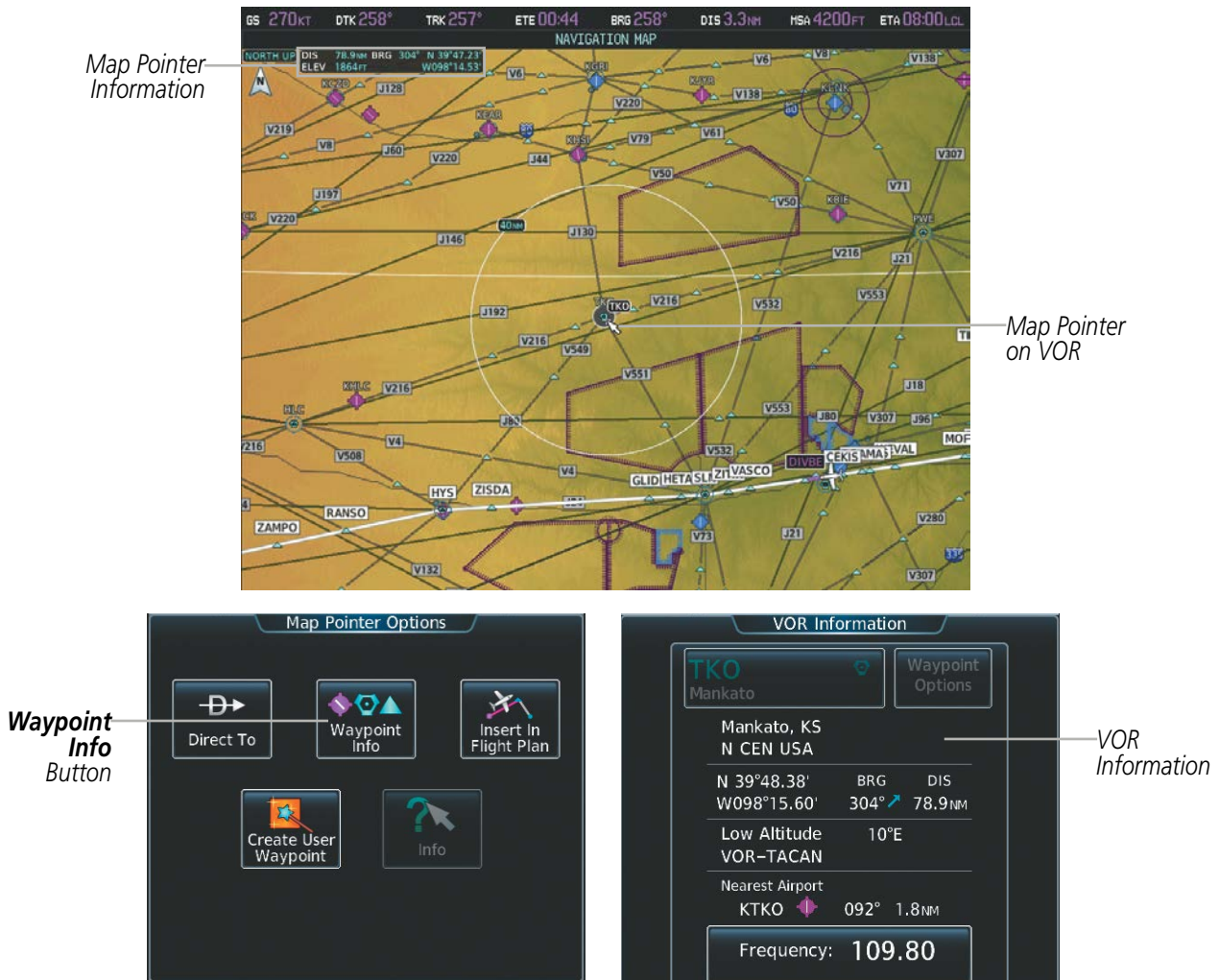


Figure 5-11 Navigation Map - Map Pointer on VOR

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

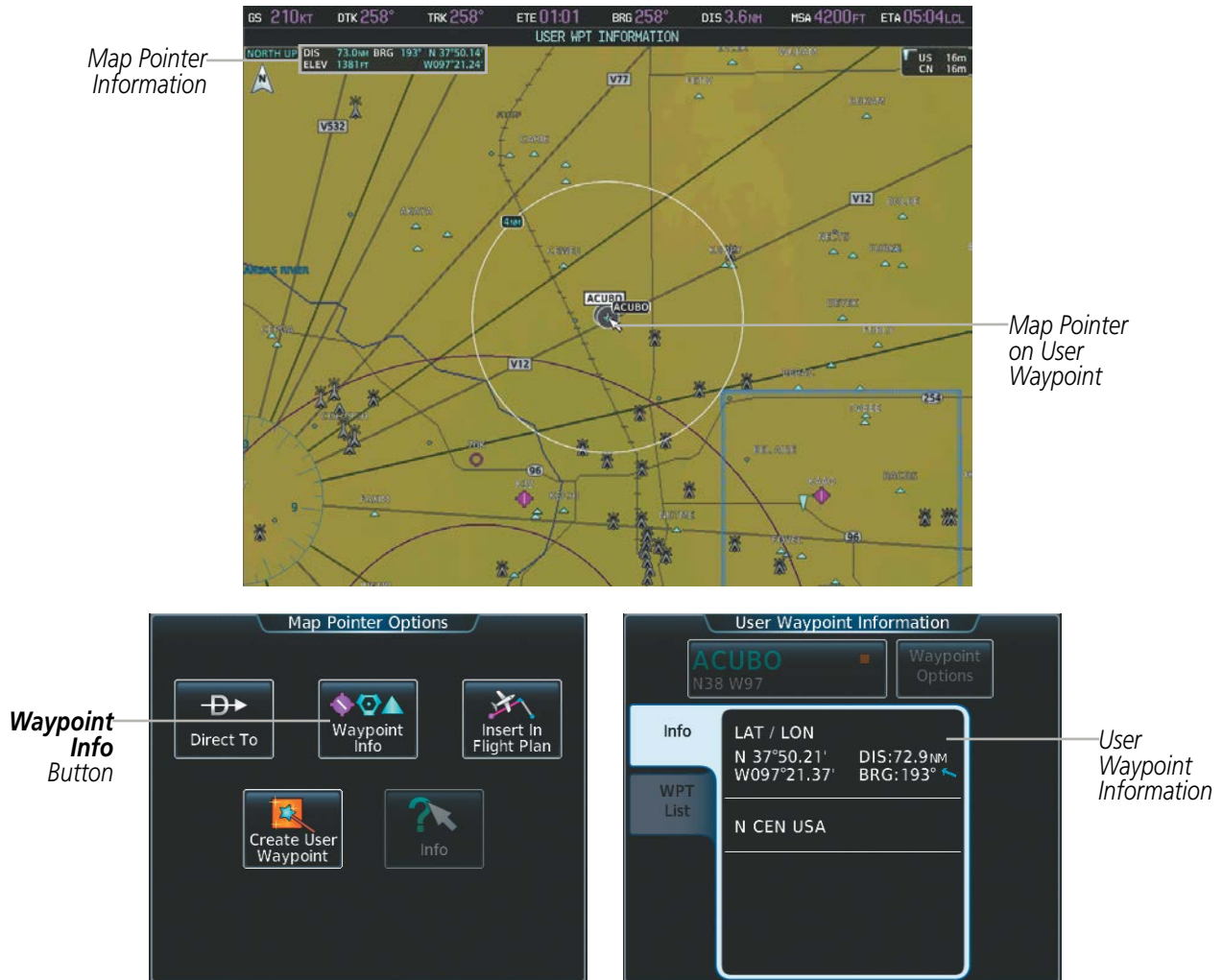


Figure 5-12 Navigation Map - Map Pointer on User Waypoint

When the Map Pointer is on an airspace boundary, the boundary is highlighted and airspace information is shown in a box above and to the right of the Map Pointer. The information includes the name and class of airspace, the ceiling in feet above Mean Sea Level (MSL), and the floor in feet MSL. When an airspace is selected

on the map display, additional frequency information is also available by pressing the **Airspace Info** Button on the Touchscreen Controller.



Figure 5-13 Navigation Map - Map Pointer on Airspace

Reviewing information for a special use or controlled airspace:

- 1) Place the Map Pointer on a waypoint.
- 2) Touch the **Airspace Info** Button to display the Airspace Information Screen.
- 3) Press the **Joystick** to exit the Airspace Information Screen and remove the Map Pointer from the Navigation Map.

TOPOGRAPHY

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

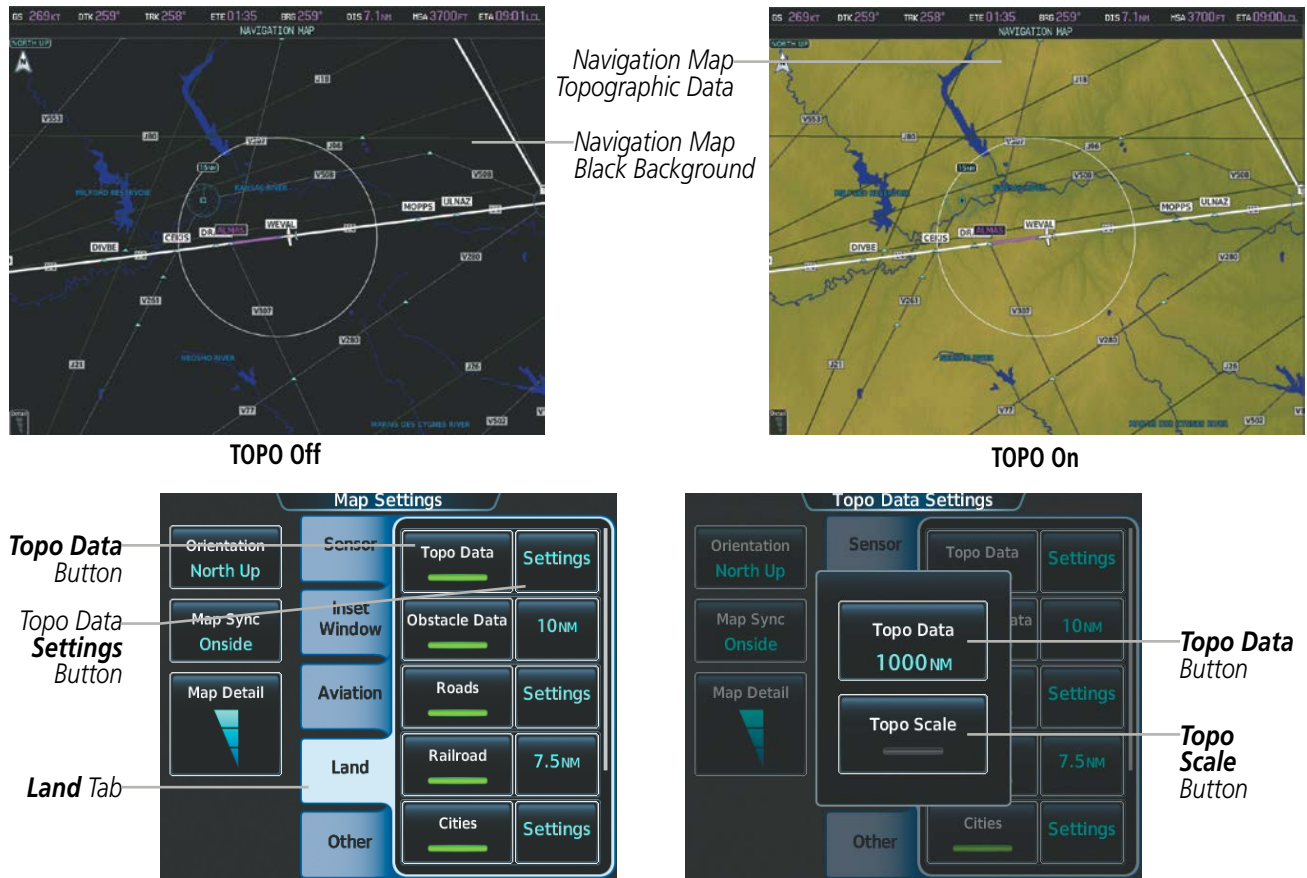


Figure 5-14 Navigation Map - Topographic Data

Displaying/removing topographic data on navigation map displays:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the **Topo Data** Button, if necessary.
- 4) Touch the **Topo Data** Button to display/remove topographic data on the navigation map.



Figure 5-15 PFD Inset Map - Topographic Data

Displaying/removing topographic data from the PFD Inset Map:

- 1) Press the **Inset Map Settings** Softkey on the PFD.
- 2) Press the **Topo** Softkey to display/remove topographic data on the Inset Map.
- 3) Press the **Back** Softkey to return to the top level softkeys.

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

Selecting a topographical data range:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the Topo Data **Settings** Button, if necessary.
- 4) Touch the Topo Data **Settings** Button to display the Topo Data Settings Screen.
- 5) Touch the **Topo Data** Button to display the Map Topo Range list.
- 6) Scroll the list if necessary to find the desired range, and touch the range button.

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

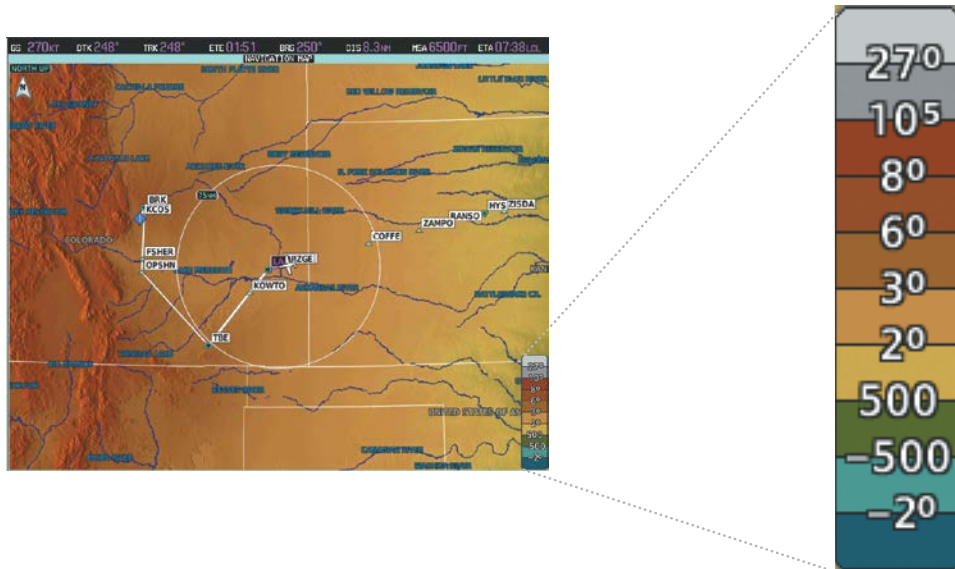


Figure 5-16 Navigation Map - Topo Scale

Displaying/removing the topographic scale:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Scroll the list to find the Topo Data **Settings** Button, if necessary.
- 4) Touch the Topo Data **Settings** Button to display the Topo Data Settings Screen.
- 5) Touch the **Topo Scale** Button to display/remove the topographic scale.

MAP SYMBOLS

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

LAND SYMBOLS

The following items are configured on the Land Tab on the Map Options Screen:












Land Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Topo Data		1000	1000
Obstacle Data	See Appendix F	10	25
Roads			
Interstate Highway (Freeway)		50	100
International Highway (Freeway)		50	100
US Highway (National Highway)		15	100
State Highway (Local Highway)		7.5	50
Local Road (Local Road)	N/A	4	25
Railroad		7.5	25
Large City (> 200,000)		100	1000
Medium City (> 50,000)		50	150
Small City (> 5,000)		25	100
State/Province		400	1000
Rivers and Lakes (River/Lake)		75	100

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the Aviation Tab of the Map Settings Screen:



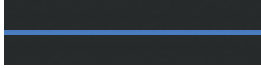
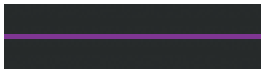




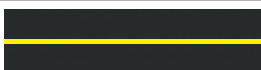






Aviation Symbols	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airways		50	250
High Altitude Airways		50	250
Class B/TMA		50	250
Class C/TCA		50	150
Class D		10	100
Restricted		50	150
MOA (Military)		50	150
Other/ADIZ		50	150
TFR		250	1000
Large Airport		100	250
Medium Airport		50	100
Small Airport		25	50
VOR Waypoint		50	250
INT Waypoint		25	25
NDB Waypoint		25	50
User Waypoint		25	250
SafeTaxi	See Additional Features	1.5	4
Runway Extension		7.5	50

Table 5-2 Aviation Symbol Information

SYMBOL SETUP

All navigation maps can display aviation and land symbols. Aviation and land symbol types (e.g. runway extensions, railroads) can be removed individually.

Displaying/removing a navigation or land symbol type:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab or **Land** Tab, if necessary.
- 3) Scroll the list to find the desired item.
- 4) Touch the annunciator button to display/remove the symbol type from navigation maps.

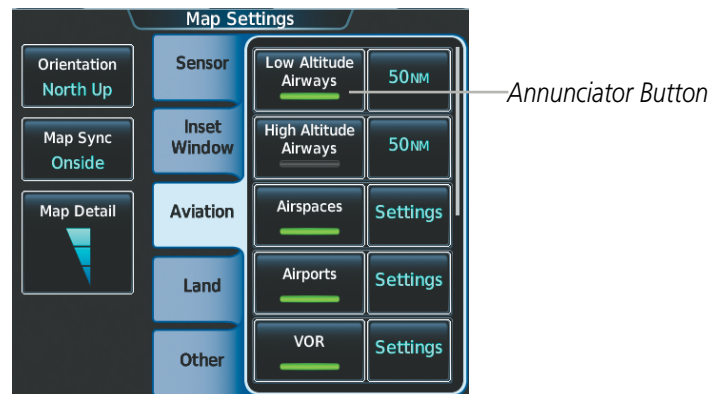


Figure 5-17 Map Settings Screen - Individual Items On/Off

The range button sets the maximum range at which items appear on the display.

Selecting an Aviation or Land item range:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab or **Land** Tab, if necessary.
- 3) Scroll the list to find the desired item.
- 6) Touch the range button to display the range choices.
- 7) Touch a range selection button to select the maximum range.
- 8) Repeat steps 2-6 as necessary.

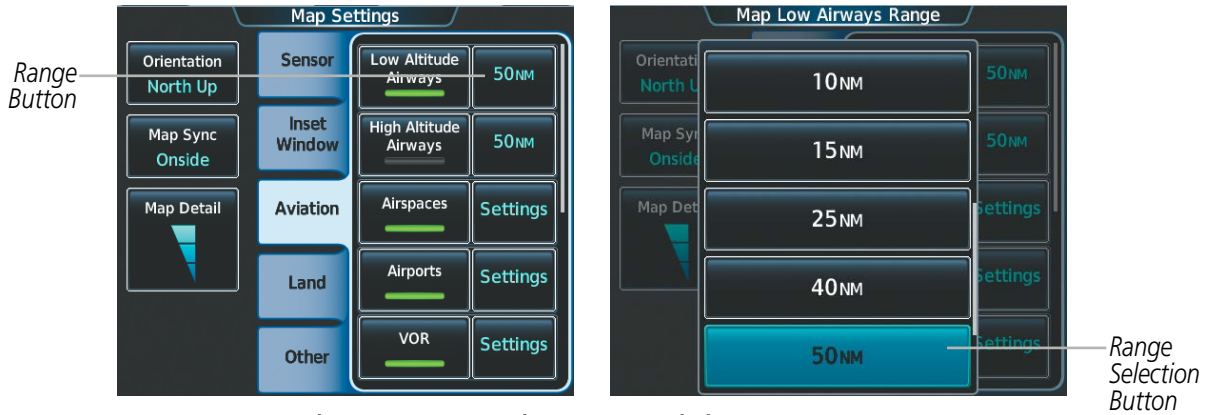


Figure 5-18 Map Settings Screen - Aviation Data Setup

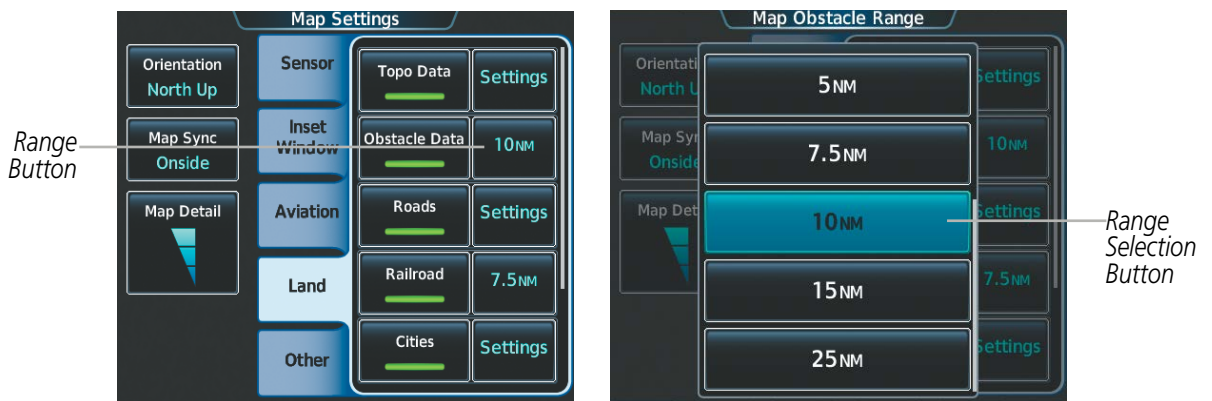


Figure 5-19 Map Settings Screen - Land Data Setup

MAP DETAIL

The declutter feature allows the pilot to progressively step through four levels of map detail. The navigation map detail level is displayed on the Map Settings Screen on the Touchscreen Controller and on the navigation map. The PFD Inset Map detail level is shown on the Inset Map and the **Detail** Softkey.



Figure 5-20 Navigation Map - Map Detail

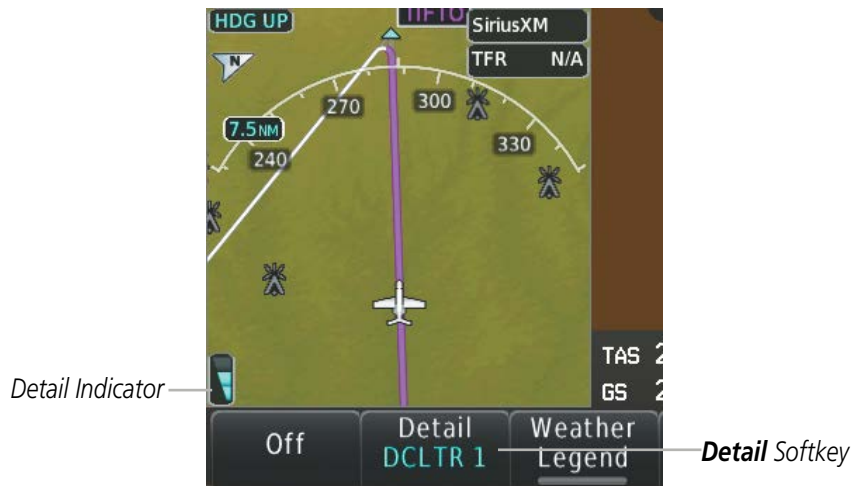


Figure 5-21 Inset Map - Map Detail

Adjusting the navigation map detail:

- 1) From **Home**, touch **Map** > **Map Settings** > **Map Detail**.
- 2) Slide up or down on the **Map Detail** Slider to adjust the navigation map detail.

Adjusting the the PFD Inset Map detail:

- 1) Press the **Inset Map Settings** Softkey on the PFD.
- 2) Press the **Detail** Softkey as necessary to adjust the Inset Map detail.

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

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

Table 5-3 Navigation Map Items Decluttered for each Detail Level

AIRWAYS

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

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

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

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



Figure 5-22 Airways on MFD Navigation Map

Airways may be displayed on the map at the pilot's discretion using the Touchscreen Controller. The airway range can also be programmed to only display airways on the MFD when the map range is at or below a specific value.

Displaying/removing airways:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Touch the **Low Altitude Airways** Button to display/remove the low altitude airways.
- 4) Touch the **High Altitude Airways** Button to display/remove the high altitude airways.



Figure 5-23 Map Options Screen - Airways Setup

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

Selecting an airway range:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Aviation** Tab, if necessary.
- 3) Touch the low altitude or high altitude range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range. The following range items are configurable on the airways menu.

Airway Type	Airway Symbol/Line	Highlighted Airway Information Box	Default Range (nm)	Maximum Range (nm)
Low Altitude Airway			50	500
High Altitude Airway			50	500

Table 5-4 Airway Range Information

TRACK VECTOR

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



Figure 5-24 Navigation Map - Track Vector

Displaying/removing the track vector:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Track Vector** Button to display/remove the track vector.

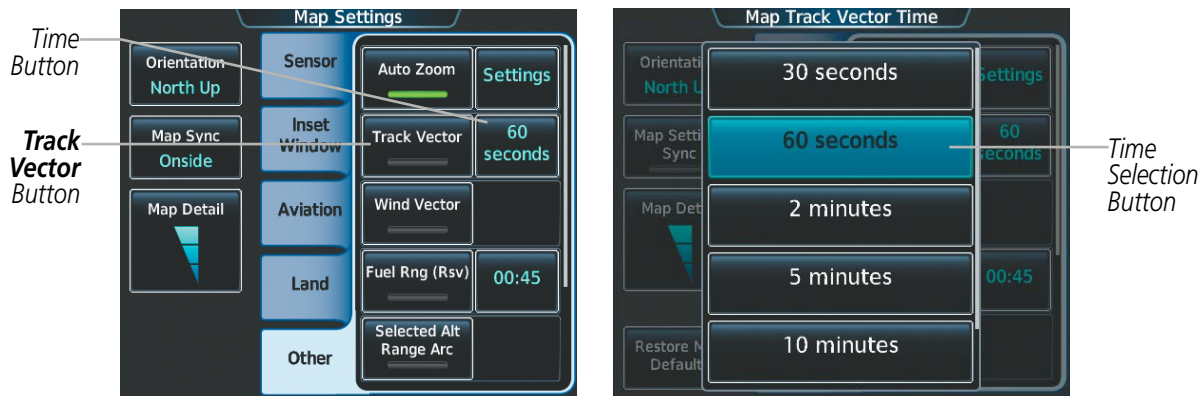


Figure 5-25 Map Options Screen - Track Vector Setup

Selecting track vector look-ahead time:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the time button to display the time selection buttons.
- 4) Scroll the list, if necessary, and touch a time selection button to select the look-ahead time.

WIND VECTOR

The map displays a wind vector arrow in the upper right-hand portion of the screen. Wind vector information is displayed as a white arrow pointing in the direction in which the wind is moving for wind speeds greater than or equal to 1 kt. It is always a straight line for the 2 min, 5 min, 10 min and 20 min settings.



Figure 5-26 Navigation Map - Wind Vector



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

Displaying/removing the wind vector:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Wind Vector** Button to display/remove the track vector.

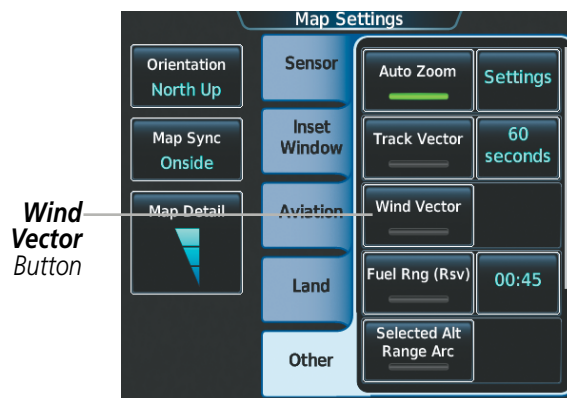


Figure 5-27 Map Options Screen - Wind Vector Setup

FUEL RANGE RING

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

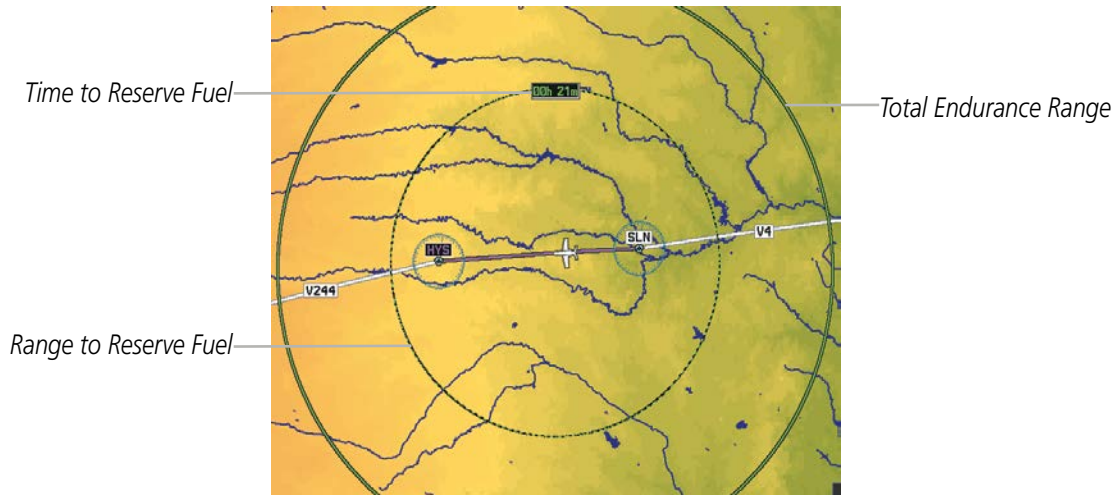


Figure 5-28 Navigation Map - Fuel Range Ring

Displaying/removing the fuel range ring:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Fuel Rng (Rsv)** Button to display/remove the fuel range ring.

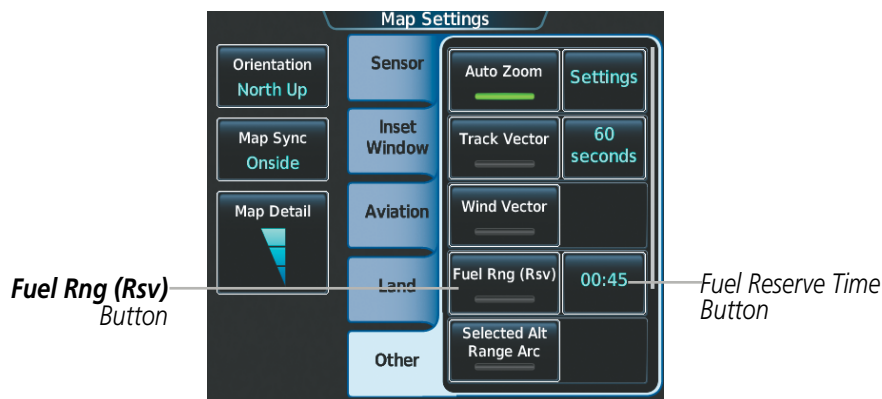


Figure 5-29 Map Options Screen - Fuel Range Ring Setup

Selecting fuel reserve time:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the fuel reserve time button to display the keypad.
- 4) Use the keypad to enter the fuel reserve time.

FIELD OF VIEW (SVT)

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



SVT View on the PFD



Field of View on the MFD

Figure 5-30 PFD and Navigation Map Field of View Comparison

Displaying/removing the field of view:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Scroll to display the **Field of View** Button.
- 4) Touch the **Field of View** Button to display/remove the field of view.

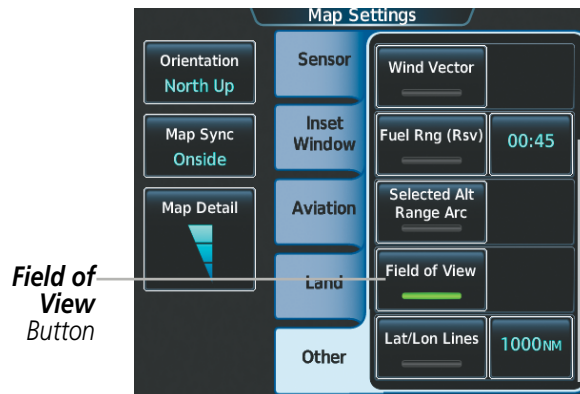


Figure 5-31 Map Settings Screen - Field of View Setup

SELECTED ALTITUDE INTERCEPT ARC

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

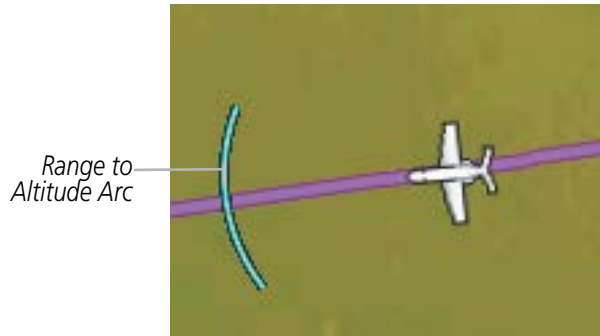


Figure 5-32 Navigation Map - Range to Altitude Arc

Displaying/removing the selected altitude intercept arc:

- 1) From **Home**, touch **Map** > **Map Settings**.
- 2) Touch the **Other** Tab, if necessary.
- 3) Touch the **Selected Alt Range Arc** Button to display/remove the selected altitude intercept arc.

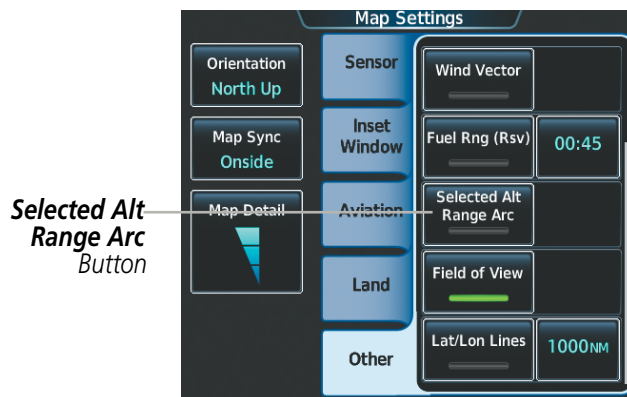


Figure 5-33 Map Options Screen - Selected Altitude Intercept Arc Setup

OBSTACLES

The navigation map can display the location of obstacles (e.g. towers). The obstacles are shown as red, yellow, or gray, depending on the height relative to the aircraft AGL altitude. See the Hazard Avoidance section for more details on symbol and color usage.



Figure 5-34 Navigation Map - Obstacles

Displaying/removing obstacles:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Touch the **Obstacle Data** Button to display/remove the obstacles.



Figure 5-35 Map Options Screen - Obstacle Setup

Selecting the obstacle data range:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Land** Tab, if necessary.
- 3) Touch the obstacle range button to display the range selection buttons.
- 4) Touch a range selection button to select the maximum map display range.

5.3 WAYPOINTS

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

Communication and navigation frequencies can be found and tuned from waypoint data, Refer to the Audio and CNS section for details.

Waypoints can be selected by entering the ICAO identifier, entering the name of the facility, or by entering the city name. See the System Overview section for detailed instructions on entering data in the system.

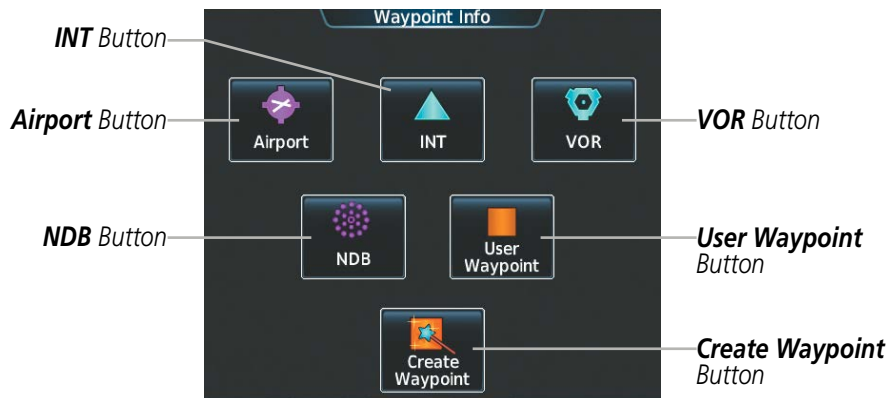


Figure 5-36 Waypoint Info Screen

If duplicate entries exist for an identifier, a Waypoint Duplicates Screen is displayed when the **Enter** Button is touched or the small right knob is pressed.

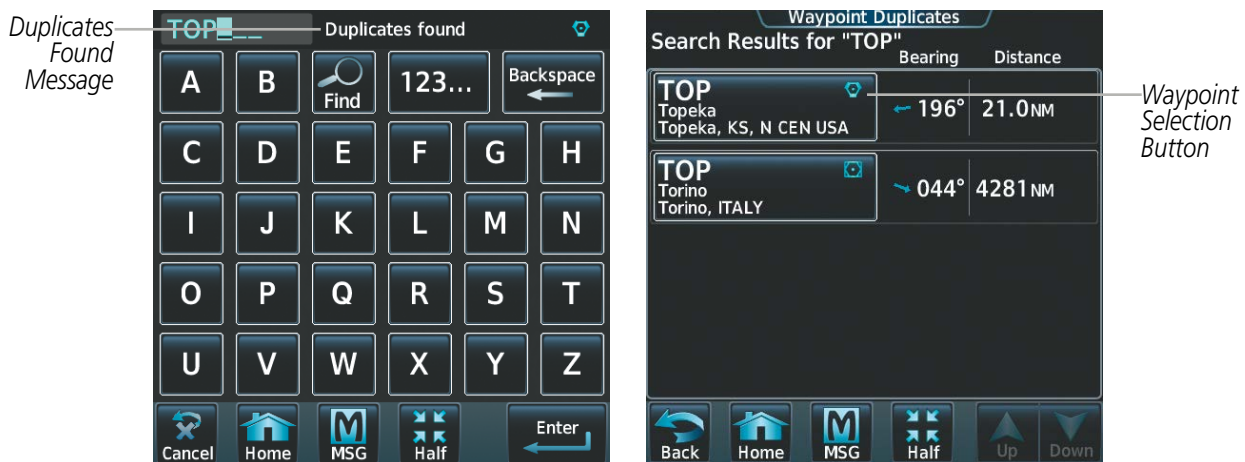


Figure 5-37 Waypoint Duplicates Screen

AIRPORTS

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

The Airport Information Display displays a map of the currently selected airport and surrounding area, and the Airport Information Screen on the Touchscreen Controller allows the pilot to view airport information, load frequencies, review runways, and review instrument procedures that may be involved in the flight plan. For airports with multiple runways, information for each runway is available. See the Audio and CNS Section for more information on finding and tuning frequencies. After engine startup, the Airport Information Display defaults to the airport where the aircraft is located. After a flight plan has been loaded, it defaults to the destination airport. On a flight plan with multiple airports, it defaults to the airport which is the current active waypoint.

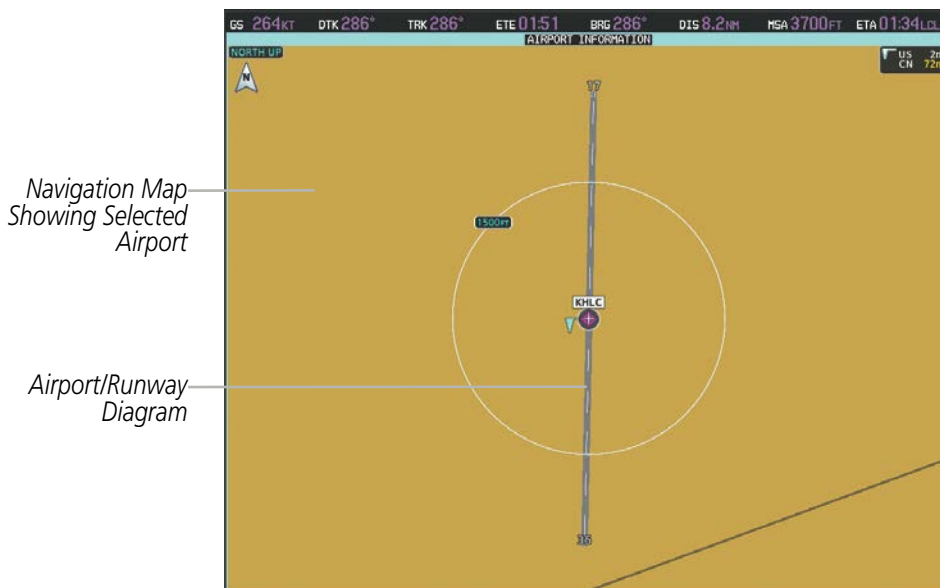


Figure 5-38 Airport Information Display on MFD



Figure 5-39 Airport Information Screen

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

Usage type: PUBLIC, MILITARY, PRIVATE, or HELIPORT
Fuel Available: AVGAS, JET



Figure 5-40 Airport Frequencies Screen

The following descriptions and abbreviations are used on the Airport Frequencies Screen:

COM Availability: TX (transmit only), RX (receive only), PT (part time), i (additional information available)
COM Frequencies: Approach*, Arrival*, ASOS, ATIS, AWOS, Center, Class B*, Class C*, Clearance, Control, CTA*, Departure*, Gate, Ground, Helicopter, Multicom, Other, Pre-Taxi, Radar, Ramp, Terminal*, TMA*, Tower, TRSA*, Unicom * May include Additional Information)
NAV Frequencies: ILS, LOC

See the Hazard Avoidance section for the description of the information shown on the **Weather** Tab. See the Procedures discussion later in this section about loading procedures from the **Proc** Tab. See the Additional Features section for the description of the information shown on the **Charts** Tab and the **Chart NOTAMs** Tab.

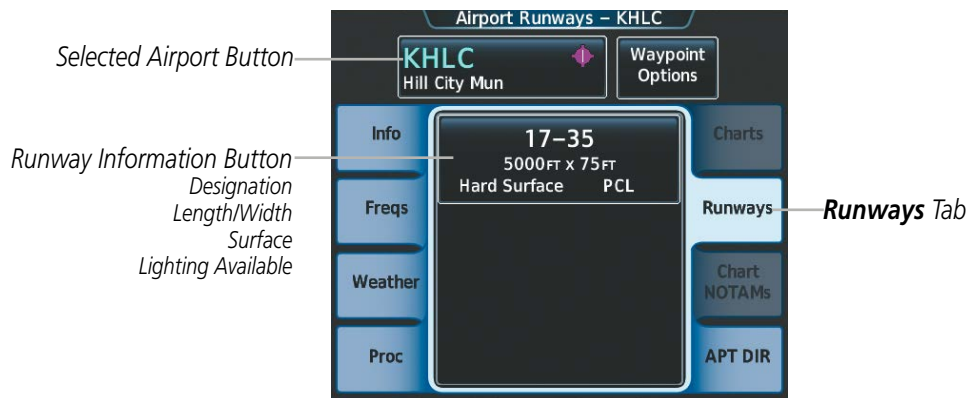


Figure 5-41 Airport Runways Screen

The following descriptions and abbreviations are used on the Airport Runways Screen:

Runway surface type: Hard, Turf, Sealed, Gravel, Dirt, Soft, Unknown, or Water
Runway lighting type: No Lights, Part Time, Full Time, Unknown, or PCL (for pilot-controlled lighting)



Figure 5-42 Airport Directory Info Screen

The following types of airport directory information are shown (if available):

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

Selecting an airport for review by identifier:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.
- 3) Touch the selected airport button to display the keypad.
- 4) Use the keypad to enter the airport identifier.
- 5) Touch the **Enter** Button to accept the identifier and display the airport information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Airport Information Display, if necessary.

Finding and selecting an airport for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.

- 3) Touch the selected airport button to display the keypad.
- 4) Touch the **Find** Button to display the Find Waypoint Screen.
- 5) Touch the **Search** Tab to display the **Search By** Button.
- 6) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 7) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 8) Use the keypad to enter the name.
- 9) Touch the **Enter** Button to accept the entry and display the search results.
- 10) Touch an airport selection button to display the airport information on the Touchscreen Controller.
- 11) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Airport Information Display, if necessary.

Finding and selecting an airport for review by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Info** Tab, if necessary.
- 3) Touch the selected airport button to display the keypad.
- 4) Touch the **Find** Button to display the Find Waypoint Screen.
- 5) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of airports in the selected category.
- 6) Touch an airport selection button to display the airport information on the Touchscreen Controller.
- 7) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Airport Information Display, if necessary.

Selecting a runway:

- 1) From **Home**, touch **Waypoint Info > Airport**.
- 2) Touch the **Runways** Tab. to display the runway information buttons.
- 3) Touch a runway information button to select the runway.
- 4) Touch the **Waypoint Options** Button, then the **Show on Map** Button to view the runway on the MFD, if necessary.

The Nearest Airport Display displays a map of the nearest airport and surrounding area, and the Nearest Airport Screen on the Touchscreen Controller allows the pilot to view airport information, load frequencies, review runways, and review instrument procedures that may be involved in the flight plan. For airports with multiple runways, information for each runway is available. See the Audio and CNS Section for more information on finding and tuning frequencies.

The Nearest Airports Screen displays a list of up to 25 nearest airports (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest airports available, “NONE WITHIN 200NM” is displayed.

A dashed white line is drawn on the Nearest Airport Display from the aircraft position to the selected nearest airport.



Figure 5-43 Nearest Airport Display



Figure 5-44 Nearest Airport Screen

Viewing information for a nearest airport:

- 1) From **Home**, touch **Nearest > Airport**.
- 2) Touch a nearest airport button to display the Waypoint Options Window and highlight the airport on the MFD.
- 3) Touch the **Airport Info** Button to display the Airport Information Screen.
- 4) Touch a Tab to display the desired information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Nearest Airport Display, if necessary.

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

The minimum runway length and surface type used when determining the 25 nearest airports to display on the Nearest Airports Screen are set on the Avionics Settings Screen under the System Tab. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are not appropriately surfaced from being displayed. Default settings are 0 feet (or meters) for runway length and “HARD/SOFT” for runway surface type.

Selecting nearest airport surface matching criteria:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab, if necessary.
- 3) Scroll the list to display the **Nearest Airport Runway Surface** Button.
- 4) Touch the **Nearest Airport Runway Surface** Button to display the surface choices.
- 5) Touch a surface selection button to set the surface criteria.

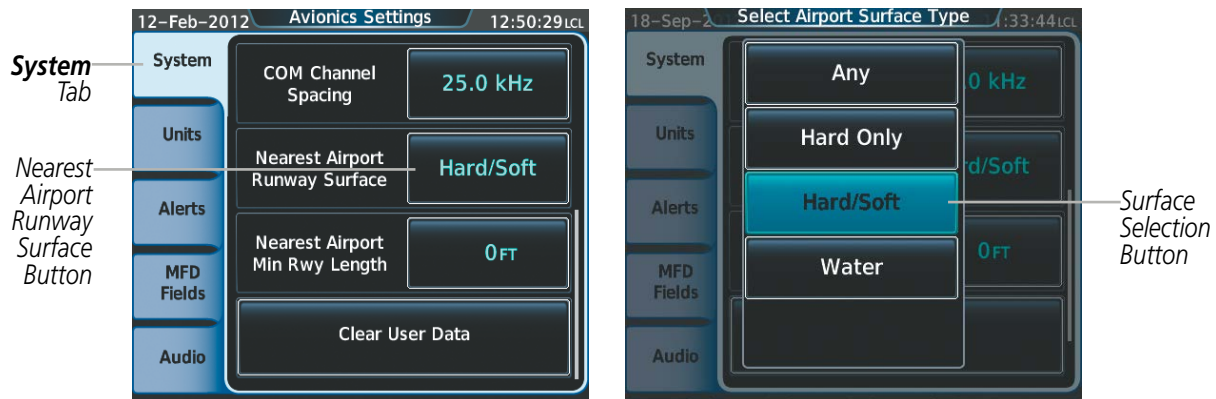


Figure 5-45 Nearest Airport Runway Surface Selection

Selecting nearest airport minimum runway length matching criteria:

- 1) From **Home**, touch **Utilities > Setup > Avionics Settings**.
- 2) Touch the **System** Tab, if necessary.
- 3) Scroll the list to display the **Nearest Airport Min Rwy Length** Button.
- 4) Touch the **Nearest Airport Min Rwy Length** Button to display the keypad.
- 5) Use the keypad to enter the minimum length.
- 6) Touch the **Enter** Button to accept the length criteria.



Figure 5-46 Nearest Airport Runway Length Selection

INTERSECTIONS

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

The Intersection Information Display displays a map of the currently selected intersection and surrounding area, and the Intersection Information Screen on the Touchscreen Controller allows the pilot to view intersection information.



Figure 5-47 Intersection Information Display

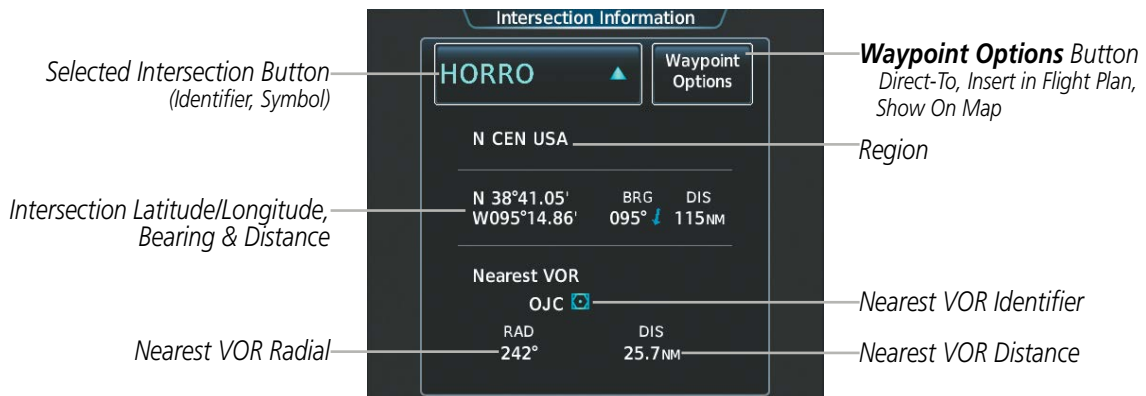


Figure 5-48 Intersection Information Screen

Selecting an intersection:

- 1) From **Home**, touch **Waypoint Info** > **INT**.
- 2) Touch the selected intersection button to display the keypad.
- 3) Use the keypad to enter the intersection identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the intersection information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Intersection Information Display, if necessary.

Finding and selecting an intersection by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info** > **INT**.
- 2) Touch the selected intersection button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of intersections in the selected category.
- 5) Touch an intersection selection button to display the intersection information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the Intersection Information Display, if necessary.

The Nearest Intersection Display displays a map of the nearest intersection and surrounding area, and the Nearest Intersection Screen on the Touchscreen Controller allows the pilot to view intersection information, and initiate a direct-to or insert the intersection in the flight plan.

The Nearest Intersection Screen displays a list of up to 25 nearest intersections (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest intersections available, "NONE WITHIN 200NM" is displayed.

A dashed white line is drawn on the Nearest Intersection Display from the aircraft position to the selected nearest intersection.



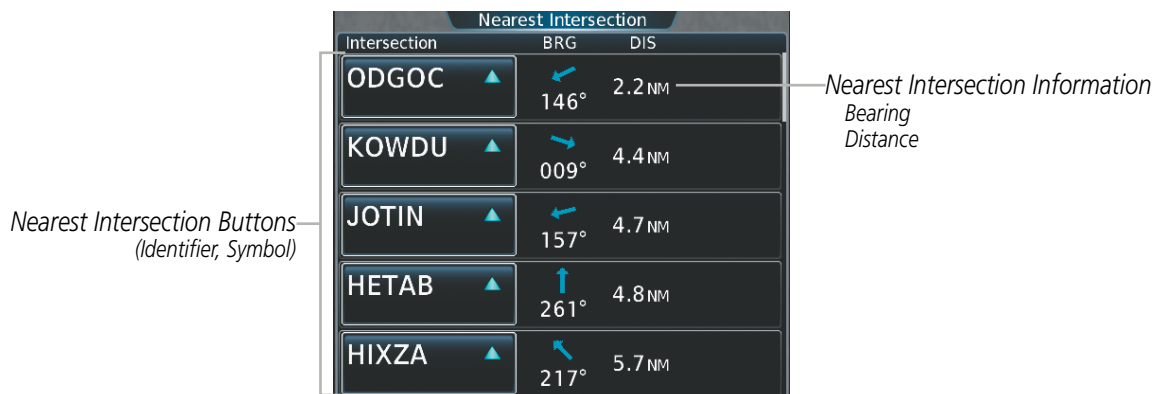
NOTE: *The list only includes waypoints that are within 200 nm.*



Navigation Map Showing Nearest Intersection

Nearest Intersection

Figure 5-49 Nearest Intersection Display



Nearest Intersection Buttons (Identifier, Symbol)

Nearest Intersection Information Bearing Distance

Figure 5-50 Nearest Intersection Screen

Viewing information for a nearest intersection:

- 1) From **Home**, touch **Nearest > INT**.
- 2) Touch a nearest Intersection button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest Intersection Display, if necessary.
- 4) Touch the **Intersection Info** Button to display the Intersection Information Screen.

NDBs

The NDB Information Display on the MFD displays a map of the currently selected NDB and surrounding area, and the NDB Information Screen on the Touchscreen Controller allows the pilot to view NDB information.



Figure 5-51 NDB Information Display

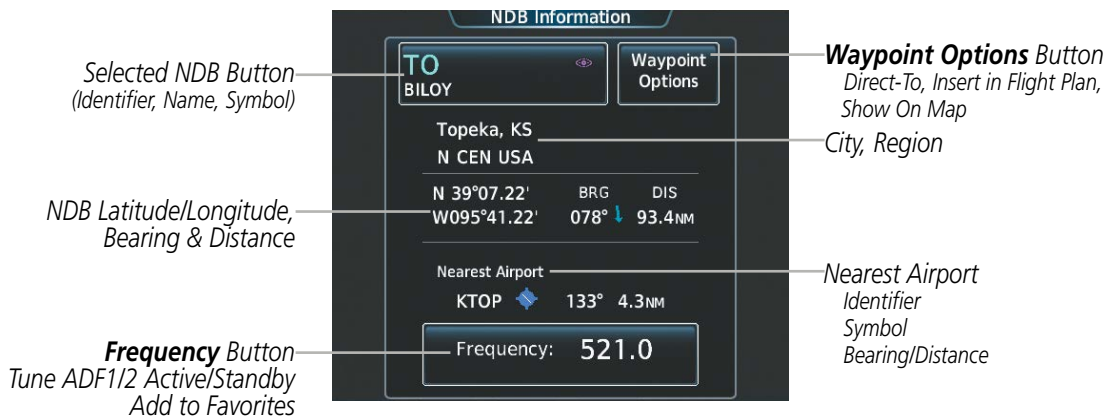


Figure 5-52 NDB Information Screen



NOTE: Compass locator (LOM, LMM): a low power, low or medium frequency radio beacon installed in conjunction with the instrument landing system. When LOM is used, the locator is at the Outer Marker; when LMM is used, the locator is at the Middle Marker.

Selecting an NDB:

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Use the keypad to enter the NDB identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the NDB information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information Display, if necessary.

Finding and selecting an NDB for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch an NDB selection button to display the NDB information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information Display, if necessary.

Finding and selecting an NDB by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > NDB**.
- 2) Touch the selected NDB button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of NDBs in the selected category.
- 5) Touch an NDB selection button to display the NDB information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the NDB Information Display, if necessary.

The Nearest NDB Display displays a map of the nearest NDB and surrounding area, and the Nearest NDB Screen on the Touchscreen Controller allows the pilot to view NDB information, and initiate a direct-to or insert the NDB in the flight plan.

The Nearest NDB Screen displays a list of up to 25 nearest NDBs (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest NDBs available, “NONE WITHIN 200NM” is displayed.

A dashed white line is drawn on the Nearest NDB Display from the aircraft position to the selected nearest NDB .



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



Figure 5-53 Nearest NDB Display

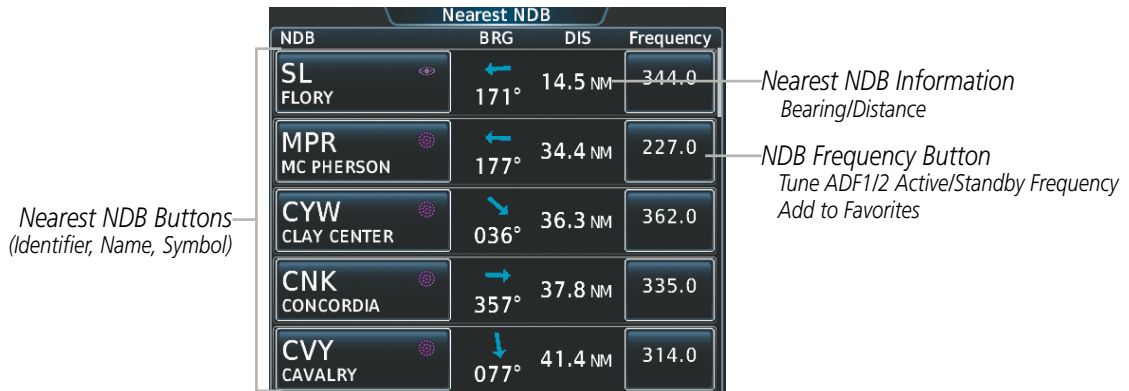


Figure 5-54 Nearest NDB Screen

Viewing information for a nearest NDB:

- 1) From **Home**, touch **Nearest > NDB**.
- 2) Touch a nearest NDB button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest NDB Display, if necessary.
- 4) Touch the **NDB Info** Button to display the NDB Information Screen.

VORs

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

The VOR Information Display displays a map of the currently selected VOR and surrounding area, and the VOR Information Screen on the Touchscreen Controller allows the pilot to view VOR information.



Figure 5-55 VOR Information Display

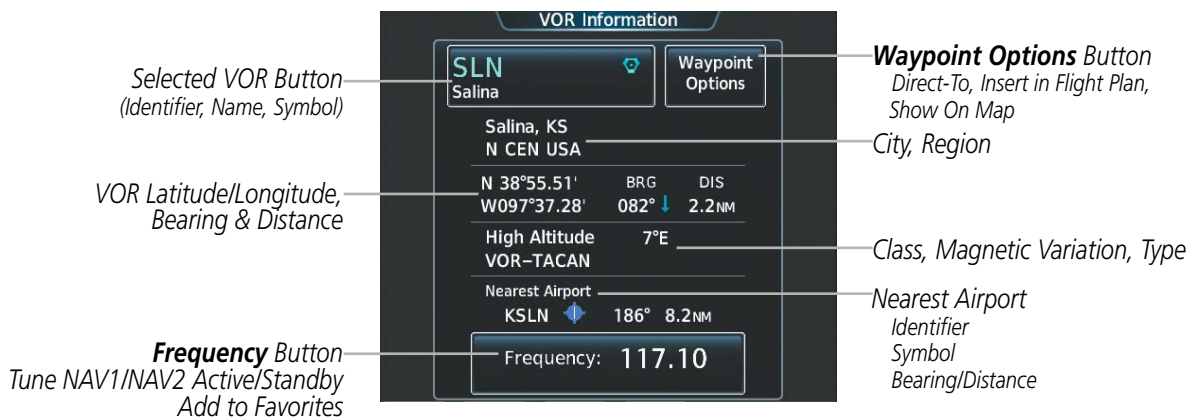


Figure 5-56 VOR Information Screen

The VOR classes used are: LOW ALTITUDE, HIGH ALTITUDE, and TERMINAL.

Selecting a VOR:

- 1) From **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Use the keypad to enter the VOR identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the VOR information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information Display, if necessary.

Finding and selecting a VOR for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a VOR selection button to display the VOR information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information Display, if necessary.

Finding and selecting a VOR by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info** > **VOR**.
- 2) Touch the selected VOR button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent**, **Nearest**, **Flight Plan**, or **Favorites** Tab to display a list of VORs in the selected category.
- 5) Touch a VOR selection button to display the VOR information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the VOR Information Display, if necessary.

The Nearest VOR Display displays a map of the nearest VOR and surrounding area, and the Nearest VOR Screen on the Touchscreen Controller allows the pilot to view VOR information, initiate a direct-to, insert the VOR in the flight plan, or tune a NAV frequency.

The Nearest VOR Screen displays a list of up to 25 nearest VORs (five entries can be displayed at one time). If there are more than five they are displayed in a scrollable list. If there are no nearest VORs available, “NONE WITHIN 200NM” is displayed.

A dashed white line is drawn on the Nearest VOR Display from the aircraft position to the selected nearest VOR.



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



Figure 5-57 Nearest VOR Display

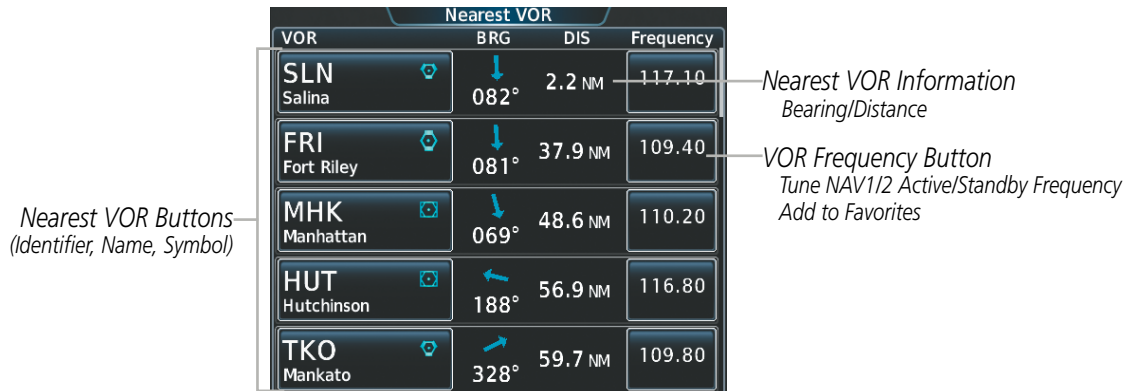


Figure 5-58 Nearest VOR Screen

Viewing information for a nearest NDB:

- 1) From **Home**, touch **Nearest > VOR**.
- 2) Touch a nearest VOR button to display the Waypoint Options Window and highlight the VOR.
- 3) Touch the **Show on Map** Button to display the Nearest VOR Display, if necessary.
- 4) Touch the **VOR Info** Button to display the VOR Information Screen.

USER WAYPOINTS

The system can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map display (except PFD Inset Map, Trip Planning, or Procedure) by selecting a position on the map using the **Joystick**, or from the User Waypoint Information Screen by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude. Once a waypoint has been created, it can be renamed, deleted, or moved. Temporary user waypoints are erased upon system power down.



Figure 5-59 User Waypoint Information Display

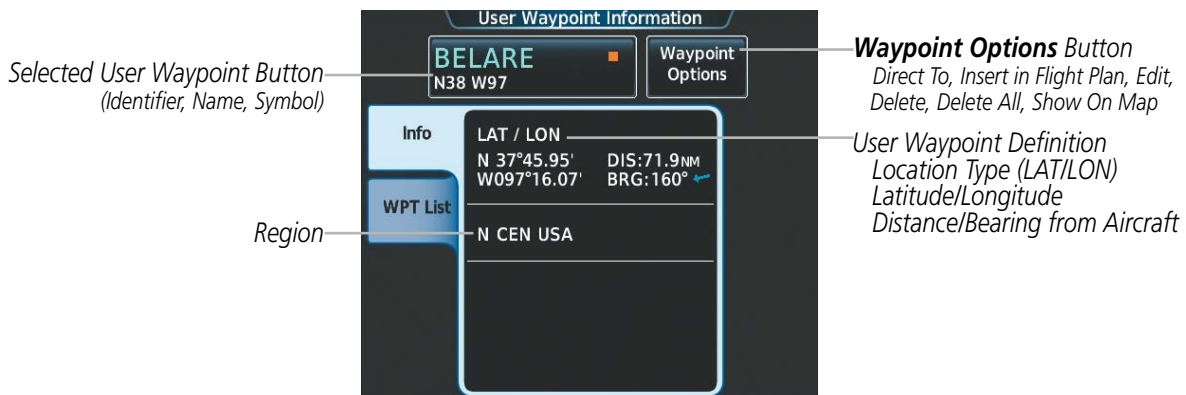


Figure 5-60 User Waypoint Information Screen (defined by latitude/longitude)

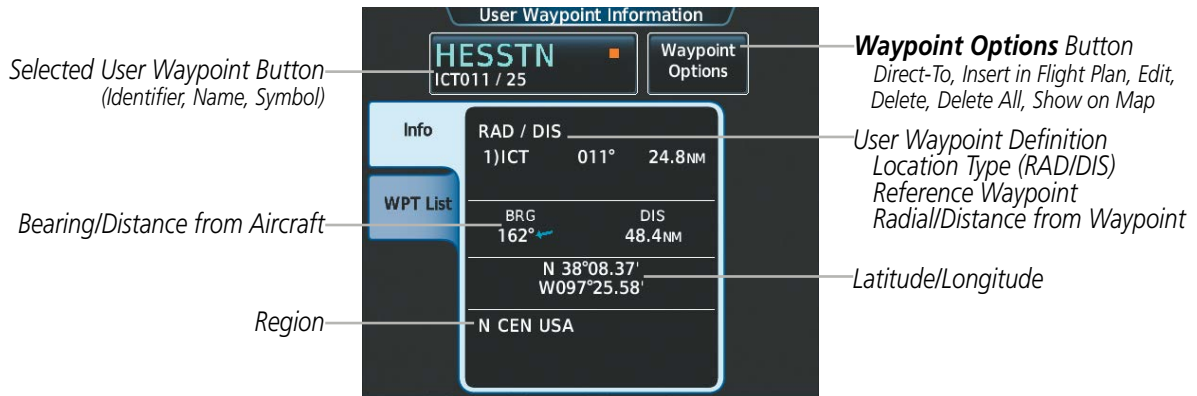


Figure 5-61 User Waypoint Information Screen (defined by radial/distance from waypoint)

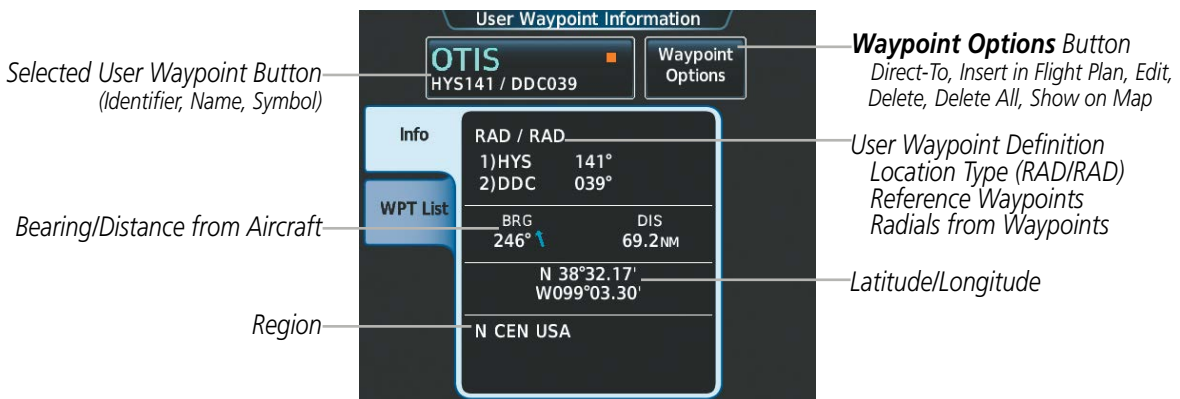


Figure 5-62 User Waypoint Information Screen (defined by radials from two waypoints)

Selecting a user waypoint:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Use the keypad to enter the user waypoint identifier.
- 4) Touch the **Enter** Button to accept the identifier and display the user waypoint information on the Touchscreen Controller.
- 5) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information Display, if necessary.

Finding and selecting a user waypoint for review by facility name or city name:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Search** Tab to display the **Search By** Button.
- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.

- 7) Use the keypad to enter the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a user waypoint selection button to display the user waypoint information on the Touchscreen Controller.
- 10) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information Display, if necessary..

Finding and selecting a user waypoint by category (Recent, Nearest, Flight Plan, or Favorites):

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) Touch the selected user waypoint button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the **Recent, Nearest, Flight Plan, or Favorites** Tab to display a list of user waypoints in the selected category.
- 5) Touch a user waypoint selection button to display the user waypoint information on the Touchscreen Controller.
- 6) Touch the **Waypoint Options** Button, then the **Show on Map** Button to display the User Waypoint Information Display, if necessary.



Figure 5-63 Nearest User Waypoint Display

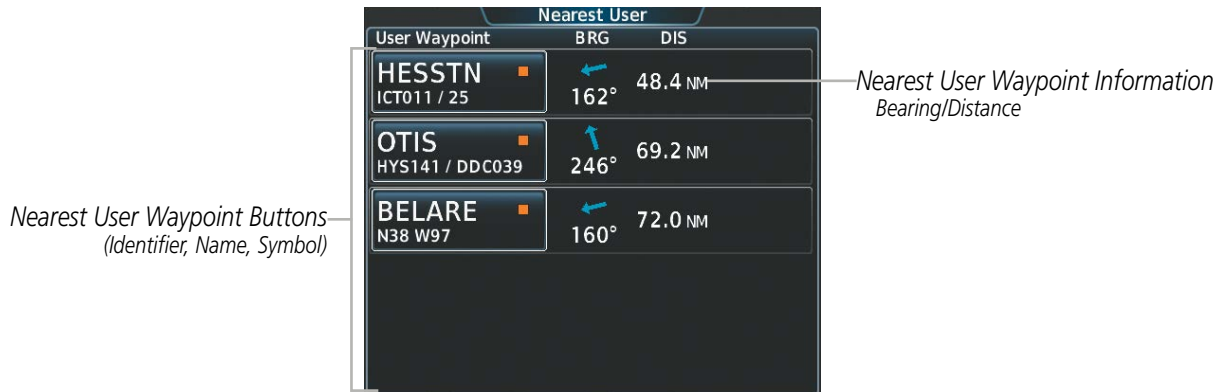


Figure 5-64 Nearest User Waypoint Screen

Viewing information for a nearest user waypoint:

- 1) From **Home**, touch **Nearest > User**.
- 2) Touch a nearest user waypoint button to display the Waypoint Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest User Display on the MFD, if necessary.
- 4) Touch the **User Waypoint Info** Button to display the User Waypoint Information Screen.

CREATING USER WAYPOINTS

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

Creating user waypoints from the User Waypoint Information Screen:

- 1) From **Home**, touch **Waypoint Info > Create Waypoint**. The current aircraft position is the default location of the new waypoint.
- 2) Touch the user waypoint name button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 4) If desired, define the type and location of the waypoint in one of the following ways:
 - a) Touch the **Type** Button to display the User Waypoint Type Window.
 - b) Touch the **RAD/DIS** Button to select the bearing/distance from a waypoint type.
 - c) Touch the **REF** Button to display the keypad.
 - d) Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
 - e) Touch the **RAD** Button to display the keypad.
 - f) Use the keypad and the **Enter** Button to select the radial.
 - g) Touch the **DIS** Button to display the keypad.
 - h) Use the keypad and the **Enter** Button to select the distance.



Figure 5-65 Create User Waypoint Screen (defined by bearing/distance from a waypoint)

Or:

- a) Touch the **Type** Button to display the User Waypoint Type Window.
- b) Touch the **RAD/RAD** Button to select the bearings from two waypoints type.
- c) Touch a **REF** Button to display the keypad.
- d) Use the keypad and the **Enter** Button, or the Find function, to select the waypoint.
- e) Touch the corresponding **RAD** Button to display the keypad.
- f) Use the keypad and the **Enter** Button to select the radial.
- g) Repeat steps c – f for the other reference waypoint and radial.

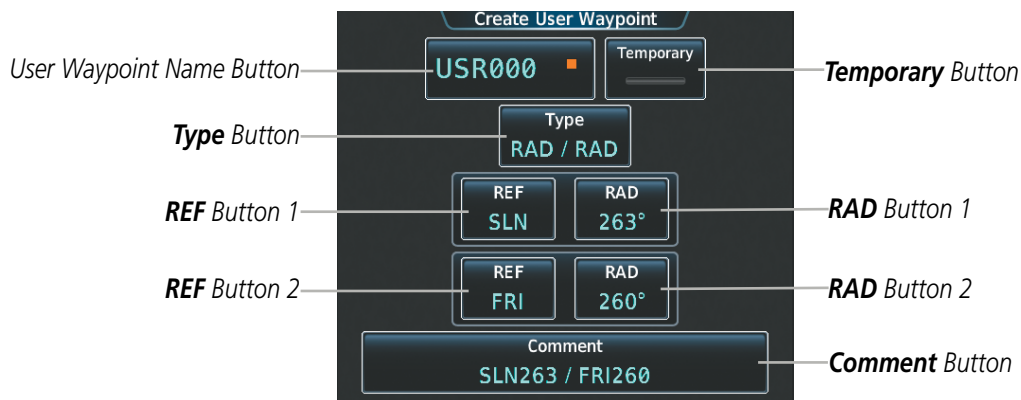


Figure 5-66 Create User Waypoint Screen (defined by radials from two waypoints)

Or:

- a) Touch the **Type** Button to display the User Waypoint Type Window.
- b) Touch the **LAT/LON** Button to select the latitude/longitude type.
- c) Touch the **LAT/LON** Button to display the keypad.
- d) Use the keypad and the **Enter** Button to select the latitude and longitude.



Figure 5-67 Create User Waypoint Screen (defined by latitude/longitude)

- 5) If desired, change the waypoint comment.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 6) If desired, touch the **Temporary** Button to change the waypoint storage method. When the annunciator on the button is green, the waypoint is only stored until the next power cycle. When the annunciator is gray, the waypoint is stored until manually erased.
- 7) Touch the **Create** Button to accept the new user waypoint.

Creating user waypoints from map pages:

- 1) Press the **Joystick** to activate the panning function and display the Map Pointer Options Screen on the Touchscreen Controller.
- 2) Use the **Joystick** to pan to the map location of the desired user waypoint.
- 3) Touch the **Create User Waypoint** Button. The Create User Waypoint Screen is displayed with the captured position.
- 4) Touch the user waypoint name button to display the keypad.
- 5) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 6) If desired, change the waypoint comment. The comment defaults to the abbreviated latitude/longitude of the user waypoint.
 - a) Touch the **Comment** Button to display the keypad.
 - b) Use the keypad and the **Enter** Button to select the comment.
- 7) Press the **Create** Button to create the new waypoint.
- 8) Press the **Joystick** to deactivate the panning function and return to the previous display on the Touchscreen Controller.



Figure 5-68 Create User Waypoint Screen (initiated from map page)

EDITING USER WAYPOINTS

Editing a user waypoint comment:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Comment** Button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint comment (up to 25 characters).
- 7) Touch the **Save** Button to accept the new comment.
- 8) Touch the **YES** Button in response to the question "Are you sure you want to modify this waypoint?".

Editing a user waypoint name:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the user waypoint name button to display the keypad.
- 6) Use the keypad and the **Enter** Button to select a user waypoint name (up to six characters).
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **YES** Button in response to the question "Are you sure you want to modify this waypoint?".

Editing a user waypoint type and location:

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **RAD/DIS** Button, the **RAD/RAD** Button, or the **LAT/LON** Button to select the waypoint type.
- 7) Touch the **REF** Button, the **RAD** Button, the **DIS** Button, or the **LAT/LON** Button, as required, to bring up the keypad.
- 8) Use the keypad and the **Enter** Button to select the user waypoint location.
- 9) Touch the **Save** Button to accept the new type and location.
- 10) Touch the **YES** Button in response to the question "Are you sure you want to modify this waypoint?".

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

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Edit** Button to display the Edit User Waypoint Screen.
- 5) Touch the **Type** Button to display the User Waypoint Type Window.
- 6) Touch the **P. POS** Button to select the aircraft present position as the location.
- 7) Touch the **Save** Button to accept the new name.
- 8) Touch the **YES** Button in response to the question "Are you sure you want to modify this waypoint?".

DELETING USER WAYPOINTS**Deleting a single user waypoint:**

- 1) From **Home**, touch **Waypoint Info > User Waypoint**.
- 2) If necessary, touch the **WPT List** Tab to display the list of user waypoints, and touch the desired user waypoint selection button.
- 3) Touch the **Waypoint Options** Button to display the Waypoint Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **YES** Button in response to the question "Would you like to delete the user waypoint XXXXXX?".

5.4 AIRSPACES

The system can display the following types of airspaces: Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), Other Airspace, Air Defense Interdiction Zone (ADIZ), and Temporary Flight Restriction (TFR).

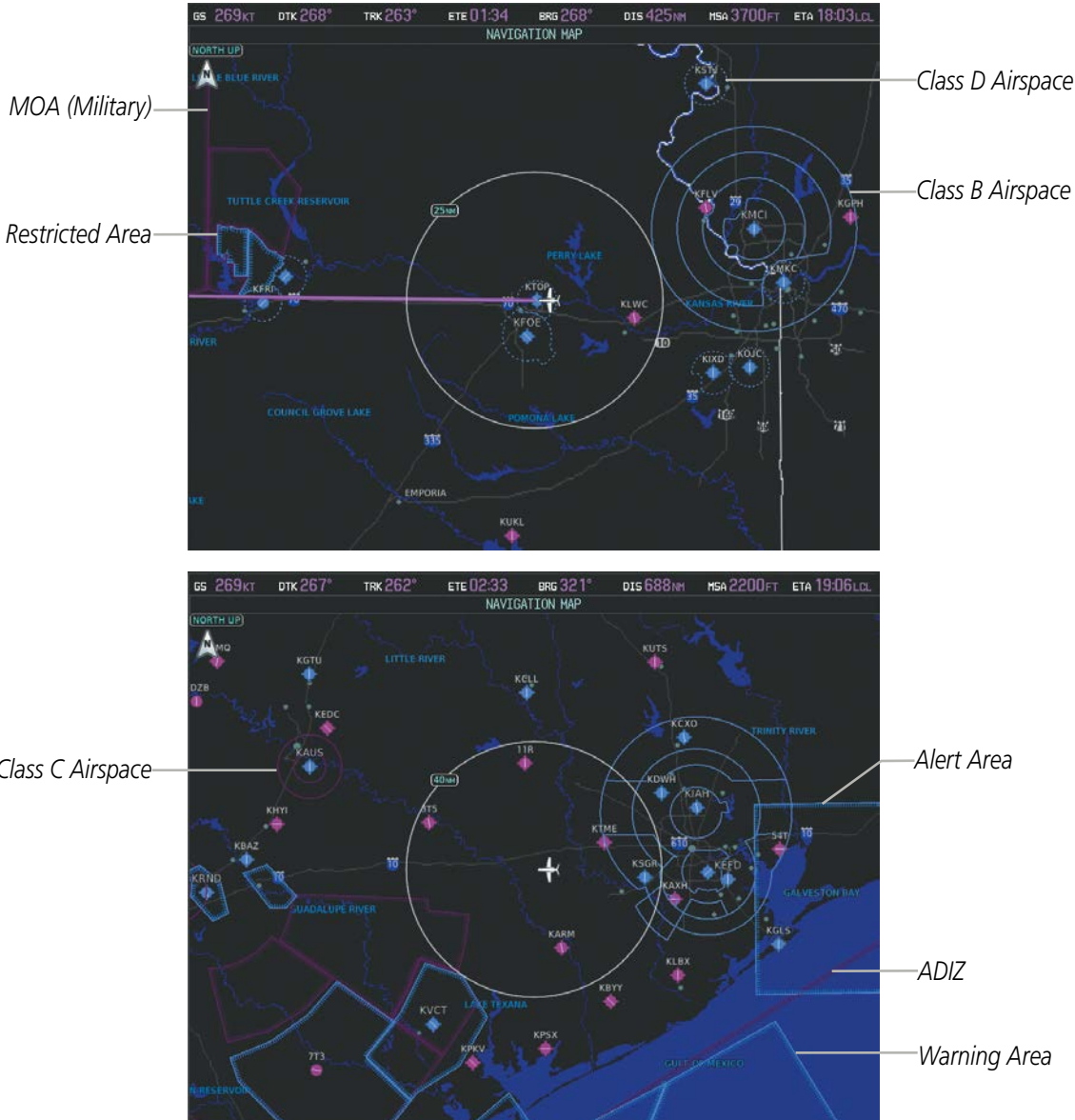


Figure 5-69 Airspaces

The Nearest Airspace Screen and the Message window on the Touchscreen Controller provide additional information about airspaces and the location of the aircraft in relationship to them.

The Alerts Tab on the Avionics Settings Screen allows the pilot to turn the controlled/special-use airspace alerts on or off. This does not affect the alerts listed on the Nearest Airspace Screen or the airspace boundaries depicted on the Navigation Map Display. It simply turns on/off the alert provided when the aircraft is approaching or near an airspace.

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

Changing the altitude buffer distance setting:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Touch the Airspace Alert Alt Buffer Button to display the keypad.
- 4) Use the keypad and the **Enter** Button to select the buffer distance.

Turning an airspace alert on or off:

- 1) From **Home**, touch **Utilities** > **Setup** > **Avionics Settings**.
- 2) Touch the **Alerts** Tab to display the list of alert settings.
- 3) Scroll the list if necessary.
- 4) Touch the airspace alert enable button to enable/disable the alert.



Figure 5-70 Avionics Settings Screen - Alerts Tab

Map ranges for the airspace boundaries are selected on the Aviation Tab on the Map Settings Screen. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

The Nearest Airspace Screen and the Nearest Airspace Display can be used to quickly find airspaces close to the flight path. The Nearest Airspace Display shows a map of airspace boundaries and surrounding area. The Nearest Airspace Screen displays airspace information. In addition, a selected frequency associated with the airspace can be loaded from the Nearest Airspace Screen.



Figure 5-71 Nearest Airspace Display

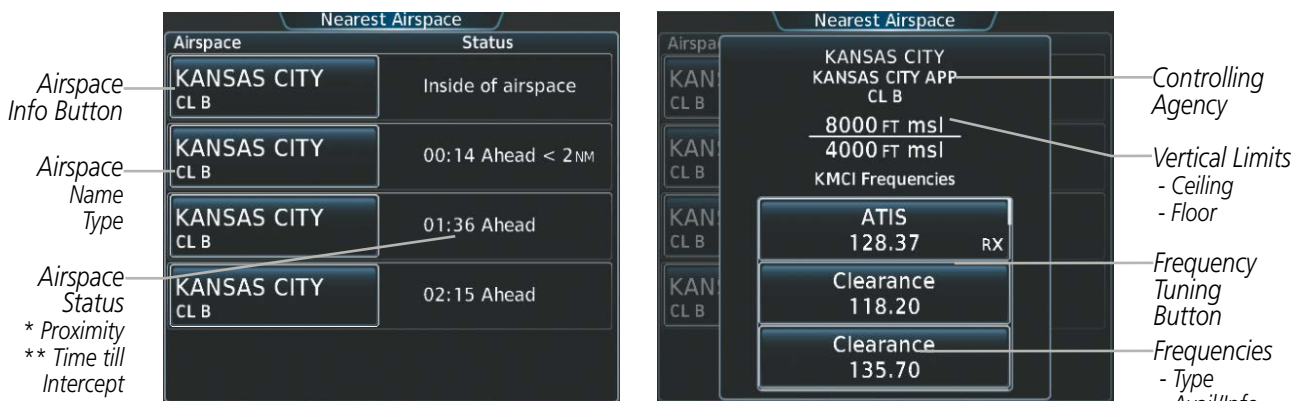


Figure 5-72 Nearest Airspace Screen

*Proximity: Ahead, Inside, Ahead<2nm, Within 2nm
**Time till Intercept: Only if Ahead or Ahead < 2nm

Selecting and viewing an airspace alert with its associated information:

- 1) From **Home**, touch **Nearest > Airspace**.
- 2) Touch an airspace info button to display the Airspace Options Window.
- 3) Touch the **Show on Map** Button to display the Nearest Airspace Information Display, if necessary.
- 4) Touch the **Details** Button to see more information about the airspace.

When an airspace alert occurs, the MSG Button on the Touchscreen Controller begins flashing. Touch the flashing button to view the list of alerts. The following airspace alerts are displayed in the message window:

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

Table 5-6 Airspace Alert Messages

5.5 DIRECT-TO-NAVIGATION

The Direct-to method of navigation, initiated by touching the **Direct To** Button on the Touchscreen Controller, or by pressing the **↵** Button on the PFD Controller, is quicker to use than a flight plan when needing to navigate to a single point such as a nearby airport.

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

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

The Direct-to Window on the PFD and the Direct To Screen on the Touchscreen Controller allows selection and activation of direct-to navigation, and displays selected direct-to waypoint data on the PFD and the Touchscreen Controller. Any waypoint can be entered as a direct-to destination.




Figure 5-73 Direct To Screen

Selecting a waypoint as the direct-to destination by identifier:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the waypoint selection button to display the keypad.
- 3) Use the keypad to select the waypoint identifier.
- 4) Touch the **Enter** Button to accept the identifier, and return to the Direct To Screen.
- 5) Touch the **Activate ↵** Button to activate the direct-to.

Finding and selecting a waypoint as the direct-to destination by facility name or city name:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the waypoint selection button to display the keypad.
- 3) Touch the **Find** Button to display the Find Waypoint Screen.
- 4) Touch the Search Tab to display the **Search By** Button.

- 5) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
- 6) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
- 7) Use the keypad to select the name.
- 8) Touch the **Enter** Button to accept the entry and display the search results.
- 9) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 10) Touch the **Activate**  Button to activate the direct-to.

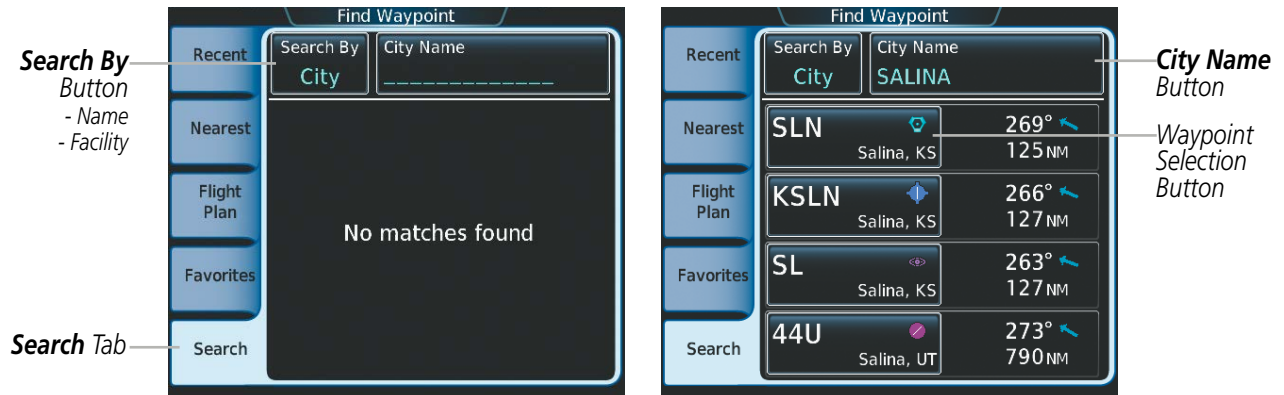



Figure 5-74 Find Waypoint Screen - Search by City Name

Selecting a waypoint as the direct-to destination by category (Flight Plan, Nearest, or Recent):

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Flight Plan** Tab, the **Nearest** Tab, or the **Recent** Tab, as necessary.
- 3) Touch a waypoint selection button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 4) Touch the **Activate**  Button to activate the direct-to.

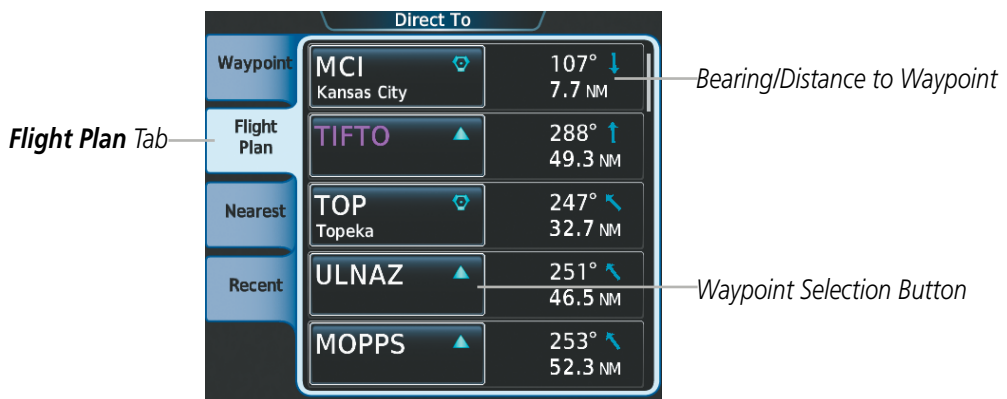


Figure 5-75 Direct To Screen - Flight Plan Tab

Selecting a waypoint as the direct-to destination from the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch a waypoint selection button to display the Waypoint Options Screen.
- 3) Touch the **→** button to choose the waypoint as the direct-to destination, and return to the Direct To Screen.
- 4) Touch the **Activate →** Button to activate the direct-to.

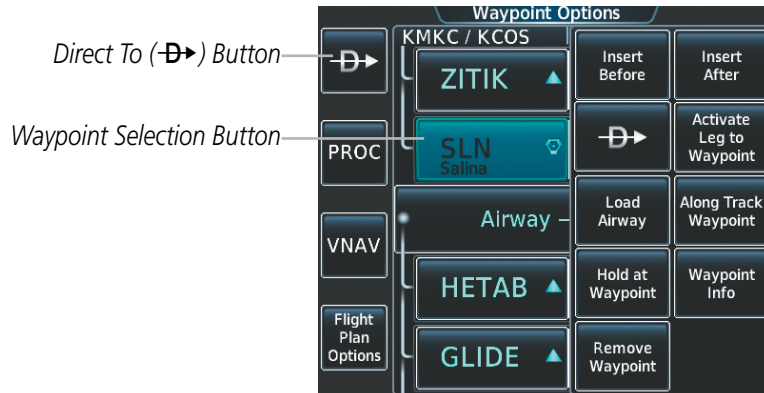


Figure 5-76 Waypoint Options Screen

Selecting the active flight plan waypoint as the direct-to destination:

- 1) From **Home**, touch the **→** Button to choose the active flight plan waypoint as the direct-to destination, and return to the Direct To Screen.
- 2) Touch the **Activate →** Button to activate the direct-to.

Or:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch the **→** button to choose the active flight plan waypoint as the direct-to destination, and return to the Direct To Screen.
- 3) Touch the **Activate →** Button to activate the direct-to.

The direct-to function can be accessed from any waypoint information screen (Airport Information, Intersection Information, VOR Information, NDB Information, or User Waypoint Information), and from some of the nearest waypoint screens (Nearest Airport, Nearest Intersection, Nearest VOR, Nearest NDB, Nearest User, or Nearest Weather) . If the direct-to is initiated from the Active Flight Plan Screen when no waypoint has been selected, the default waypoint is either the active flight plan waypoint (if a flight plan is active) or no waypoint (Select Waypoint Button is active). Direct-to requests on waypoint information screens or nearest waypoint screens defaults to the displayed waypoint.

Selecting any waypoint as a direct-to destination:

- 1) Select the screen containing the desired waypoint type and select the desired waypoint.
- 2) Touch the **Waypoint Options** Button.
- 3) Touch the **Direct To** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate Direct To** Button to activate the direct-to.

Selecting a nearby airport as a direct-to destination:

- 1) From **Home**, touch **Nearest > Airport**.
- 2) Touch a nearest airport button to display the Waypoint Options Window and highlight the airport.
- 3) Touch the **Direct To** button to choose the waypoint as the direct-to destination, and display the Direct To Screen.
- 4) Touch the **Activate Direct To** Button to activate the direct-to.

Direct-to destinations may also be selected by using the map pointer on the navigation map.

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

- 1) From the navigation map display, press the **Joystick** to display the pointer.
- 2) Move the **Joystick** to place the pointer at the desired destination location.
- 3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted, and the **Direct To** Button is activated.
- 4) Touch the **Direct To** Button to display the Direct To Screen with the selected point entered as the direct-to destination.
- 5) Touch the **Activate Direct To** Button to activate the direct-to.

Cancelling a Direct To:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Cancel Direct To** Button.
- 3) Touch the **YES** Button in response to the question "Cancel Direct To XXXXXX".

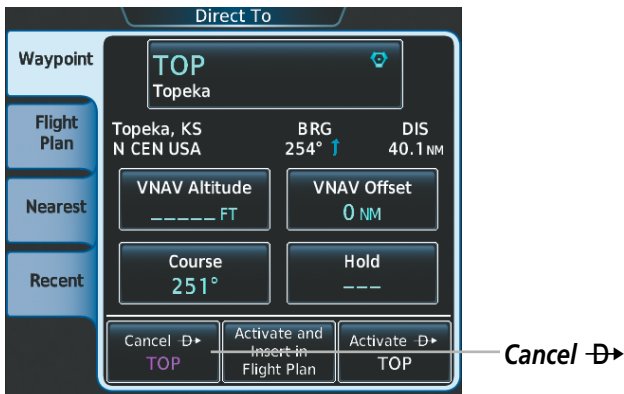


Figure 5-77 Cancelling a Direct To

When navigating a direct-to, the system sets a direct great circle course to the selected destination. The course to a destination can also be manually selected.

Selecting a manual direct-to course:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Course** Button to display the keypad.
- 3) Use the keypad to select the course.
- 4) Touch the **Enter** Button to accept the course, and return to the Direct To Screen.
- 5) Touch the **Activate** **➔** Button to activate the direct-to using the manually selected course.

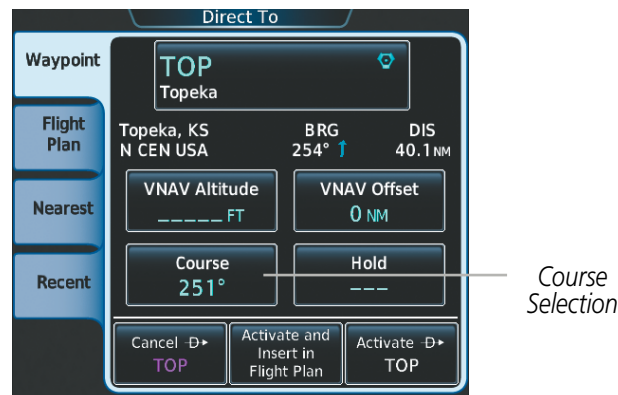


Figure 5-78 Direct To - Selecting a Manual Course

Reselecting the direct course from the current position:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Activate** **➔** Button to activate the direct-to using the direct course.

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

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

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **VNAV Altitude** Button to display the keypad.
- 3) Use the keypad to select the altitude.
- 4) Touch the **Enter** Button to accept the altitude, and return to the Direct To Screen.
- 2) Touch the **VNAV Offset** Button to display the keypad.
- 3) Touch the **(Before) -** Button or the **(After) +** Button, if necessary.
- 3) Use the keypad to select the offset distance.
- 4) Touch the **Enter** Button to accept the offset distance, and return to the Direct To Screen.
- 5) Touch the **Activate** **-D▶** Button to activate the direct-to using the VNAV constraints.

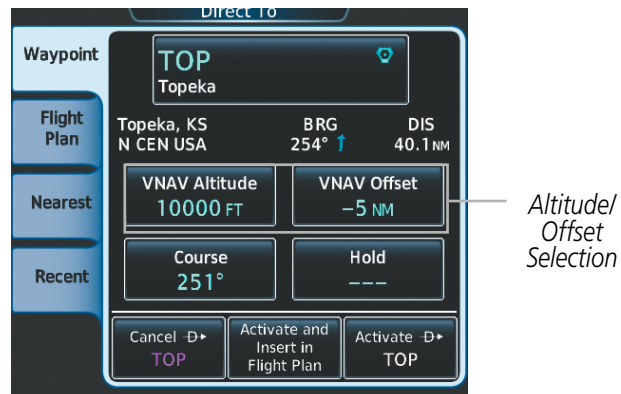


Figure 5-79 Direct To - Setting VNAV Constraints

Removing a VNAV constraint:

- 1) From **Home**, touch **Direct To**.
- 2) Touch the **Activate** **-D▶** Button to activate the direct to without the VNAV constraints.

5.6 FLIGHT PLANNING

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

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

Table 5-7 Flight Plan Leg Symbols

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

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

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

The following could cause the airway update to fail:

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

FLIGHT PLAN CREATION

There are three places to create, modify, or view a flight plan:

- Active Flight Plan Screen on the Touchscreen Controller (create/modify the active flight plan)
- Flight Plan Catalog Screen on the Touchscreen Controller (create/modify a stored flight plan)
- Active Flight Plan on the MFD (view the active flight plan)

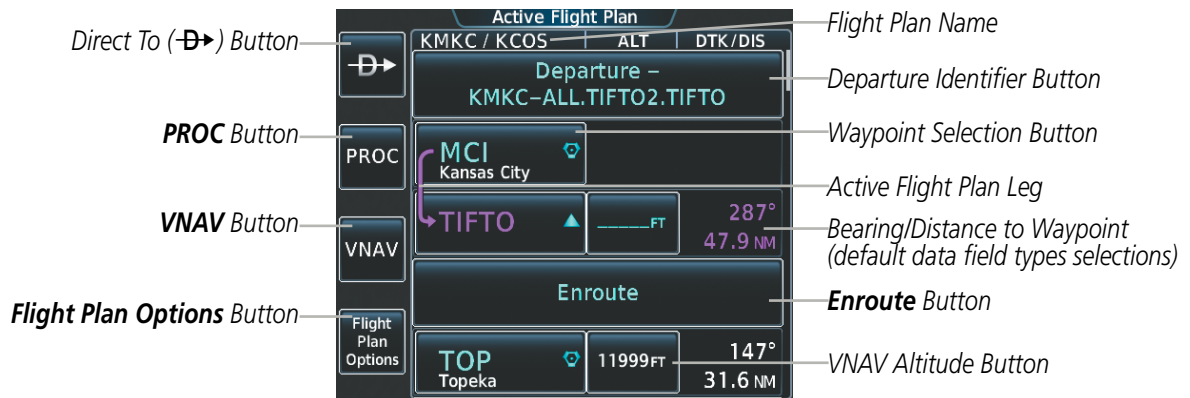


Figure 5-80 Active Flight Plan Screen

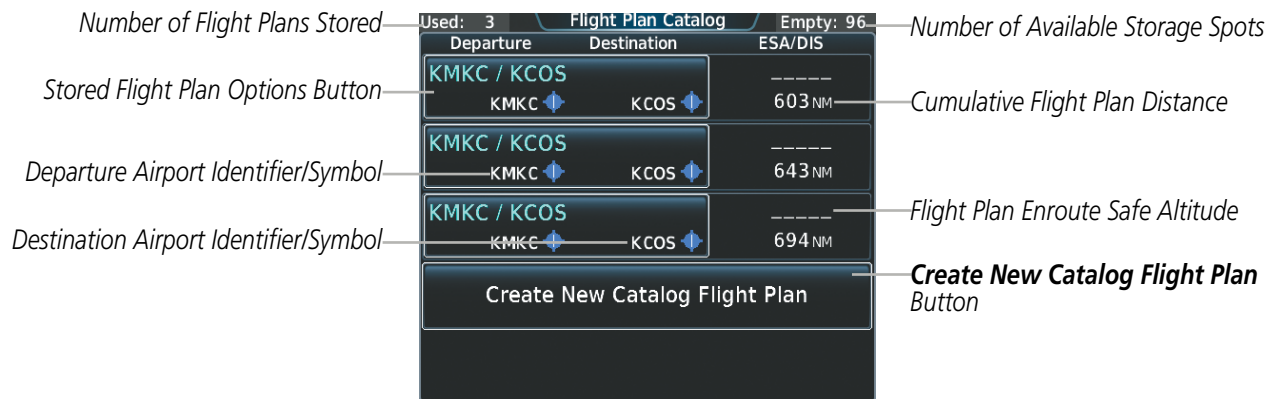


Figure 5-81 Flight Plan Catalog Screen



Figure 5-82 Active Flight Plan displayed on MFD

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

Displaying/removing the active flight plan on the navigation map display:

- 1) From **Home**, touch **Map > Map Settings**.
- 2) Touch the **Inset Window** Tab.
- 3) Touch the **Flight Plan Text** Button to display/remove the active flight plan information.

Creating an active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch the **Add Waypoint** Button to display the keypad.
- 3) Select the identifier of the departure waypoint. The active flight plan is modified as each waypoint is entered.

Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the right Knobs to select a waypoint identifier.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
- b) Touch the **Nearest, Recent, Flight Plan, or Favorites** Tab and select the waypoint from from the list of waypoints.

Or:

- a) Touch the **Find** Button to display the Find Waypoint Screen.
 - b) Touch the Search Tab to display the **Search By** Button.
 - c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
 - d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
 - e) Use the keypad and the **Enter** Button to accept the entry and display the search results.
 - f) Touch a waypoint selection button to choose the waypoint.
- 4) Repeat step numbers 2 and 3 to enter each additional flight plan waypoint.

Creating a stored flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch the **Create New Catalog Flight Plan** Button to display the Edit Stored Flight Plan Screen.
- 4) Touch the **Add Waypoint** Button to display the keypad.
- 5) Select the identifier of the departure waypoint. The active flight plan is modified as each waypoint is entered.
Use the keypad and the **Enter** Button to select a waypoint Identifier.

Or:

Use the right knobs to select a waypoint identifier.

Or:

- a) Touch the Find Button to display the Find Waypoint Screen.
 - b) Touch the Nearest, Recent, Flight Plan, or Favorites Tab and select the waypoint from the list of waypoints.
- Or:**
- a) Touch the **Find** Button to display the Find Waypoint Screen.
 - b) Touch the Search Tab to display the **Search By** Button.
 - c) If necessary, touch the **Search By** Button to choose Search by City or Search by Facility.
 - d) Touch the **Facility Name** Button or the **City Name** Button to display the keypad.
 - e) Use the keypad and the **Enter** Button to accept the entry and display the search results.
 - f) Touch a waypoint selection button to choose the waypoint.
- 6) Repeat step numbers 4 and 5 to enter each additional flight plan waypoint.

Flight plans can be imported from an SD Card or exported to an SD Card.

Importing a Flight Plan from an SD Card

- 1) Insert the SD card containing the flight plan in the top card slot on the MFD.
- 2) From **Home**, touch **Flight Plan > Flight Plan Options > Catalog > Create New Catalog Flight Plan > Flight Plan Options**.
- 3) Touch the **Import** Button to display the Import Flight Plan Screen.
- 4) Touch a flight plan selection button to display the flight plan information and activate the **Import** Button.
- 5) Touch the **Import** Button.
- 7) Touch the **OK** Button to return to the Edit Stored Flight Plan Screen.

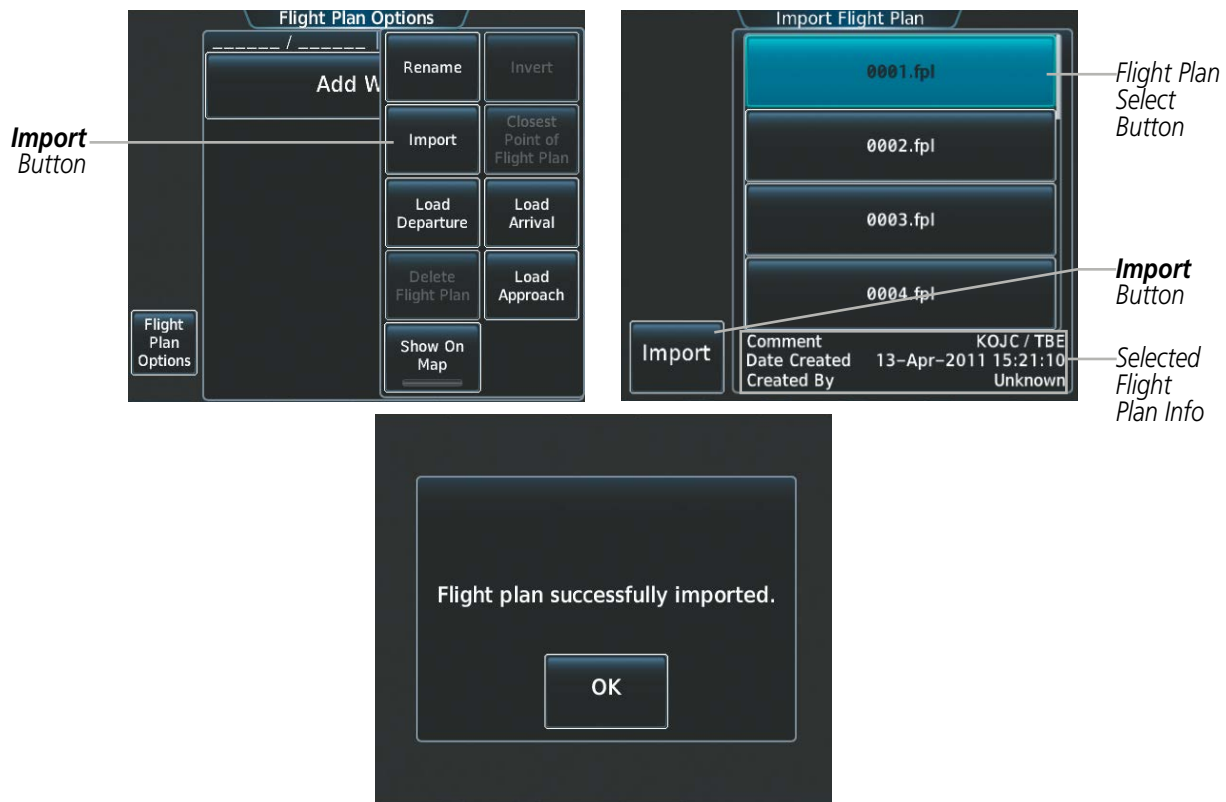


Figure 5-83 Flight Plan Import



NOTE: If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.

Exporting a stored Flight Plan to an SD Card

- 1) Insert the SD card for storing the flight plan in the top card slot on the MFD.
- 2) From **Home**, touch **Flight Plan > Flight Plan Options**
- 3) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 4) Touch a flight plan selection button to display the Catalog Options Window.
- 5) Touch the **Export** Button to display the Export Flight Plan Screen.
- 6) Touch the **File Name:** Button to rename the exported flight plan using the keypad or right knob, if necessary.
- 7) Touch the **Export** Button.
- 8) Touch the **OK** Button in response to the "Flight Plan Successfully Exported." prompt to return to the Flight Plan Options Screen.



NOTE: The exported flight plan will not contain any procedures or airways.

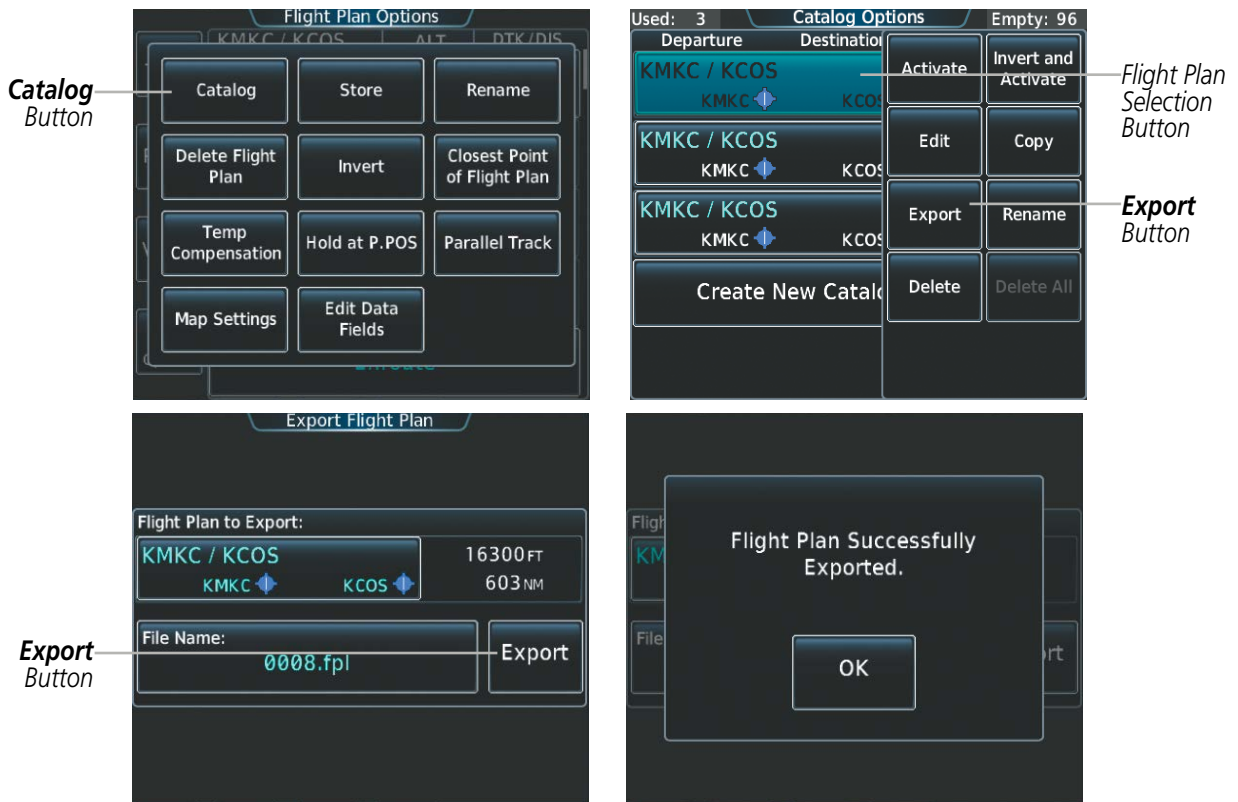


Figure 5-84 Stored Flight Plan Export

ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

Waypoints can be added to the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added to the flight plan. Flight plans are limited to 99 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 99, the message “Flight plan is full. Remove unnecessary waypoints.” appears and the new waypoint(s) are not added to the flight plan.



Figure 5-85 Edit Stored Flight Plan Screen

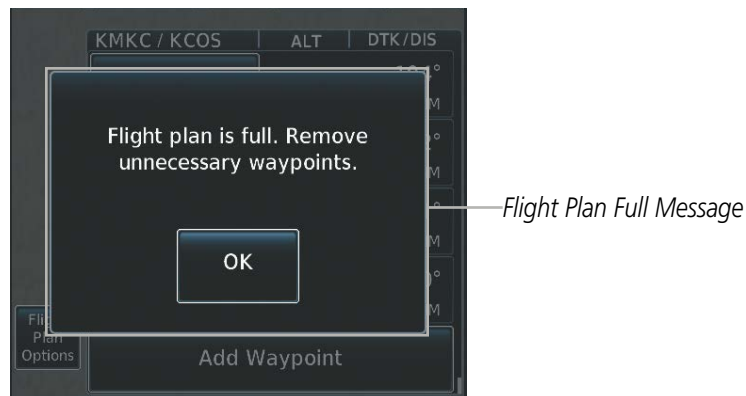


Figure 5-86 Edit Stored Flight Plan Screen - Flight Plan Full

Adding a waypoint to a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch a waypoint options button to display the Waypoint Options Window.

- 6) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.
- 7) Use the keypad, right knob, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-87 Edit Stored Flight Plan Screen - Waypoint Options Window

Or:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll to the end of the list, if necessary to show the **Add Waypoint** Button.
- 6) Touch the **Add Waypoint** Button to display the keypad is displayed.
- 7) Use the keypad, right knob, or the Find function to select the new waypoint.
- 8) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.



Figure 5-88 Edit Stored Flight Plan Screen - Adding a Waypoint to the end of the Flight Plan



NOTE: If the identifier entered in the Waypoint Information Window has duplicates, a 'Duplicates found' message is shown. Touch the **Enter** Button and the Waypoint Duplicates Screen is displayed. Touch a waypoint selection button to select the correct waypoint.

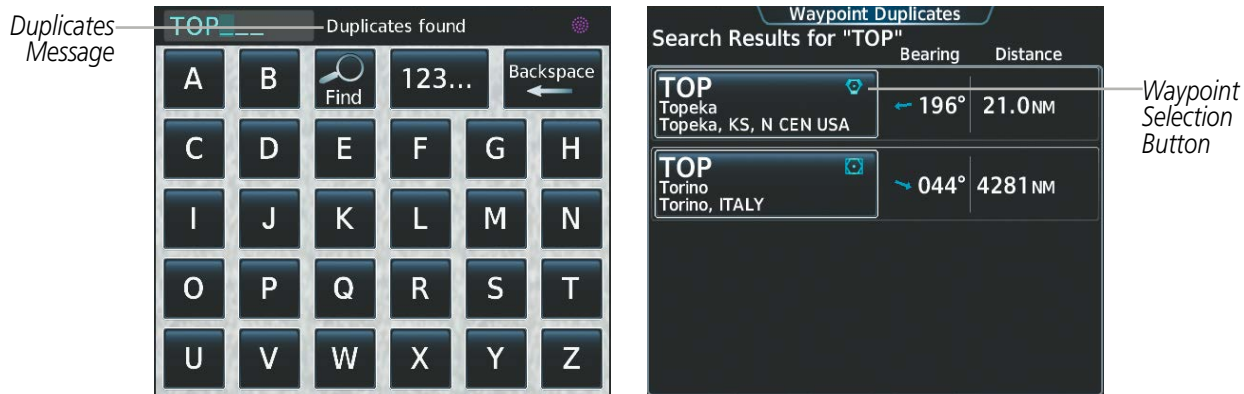


Figure 5-89 Duplicate Waypoints

Adding a waypoint to the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Touch a waypoint button to display the Waypoint Options Window.
- 3) Touch the **Insert Before** Button or the **Insert After** Button to select where the new waypoint will be placed in relation to the selected waypoint. The keypad is displayed.
- 4) Use the keypad, right knob, or the Find function to select the new waypoint.
- 5) Touch the **Enter** Button to accept the waypoint and place it in the flight plan.

Adding waypoints to the active flight plan using the map pointer:

- 1) Press the **Joystick** to activate the panning function on the Navigation Map Display and pan to the map location of the desired waypoint. When the pointer is activated, the Map Pointer Options Screen is displayed on the Touchscreen Controller. When the pointer highlights a map location that can be added to the active flight plan, the **Insert In Flight Plan** Button is activated.
- 2) Touch the **Insert In Flight Plan** Button. The Insert Before Waypoint Screen is displayed.
- 3) Touch the waypoint selection button to select where to insert the new waypoint. The waypoint is inserted into the active flight plan before the selected waypoint.



Figure 5-90 Active Flight Plan Display - Map Pointer Active

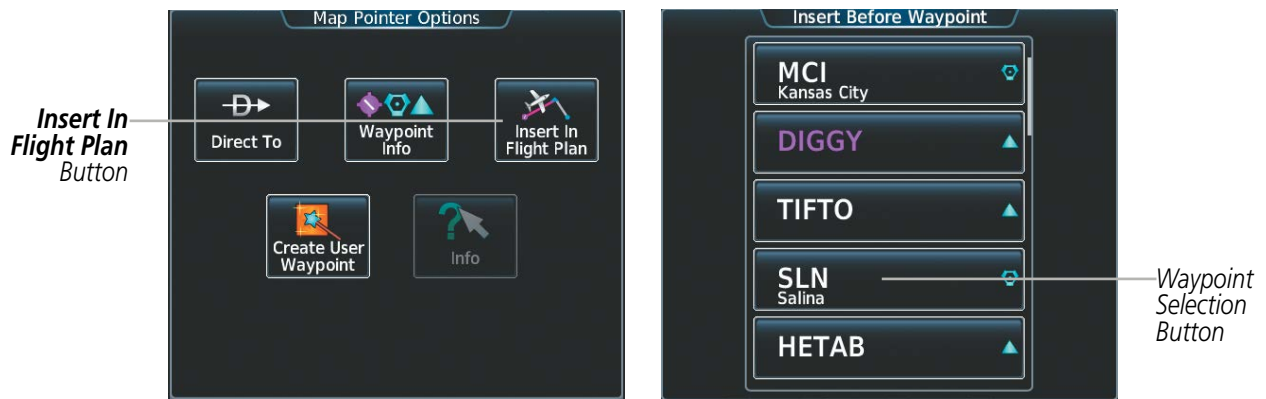


Figure 5-91 Inserting Waypoint in Active Flight Plan

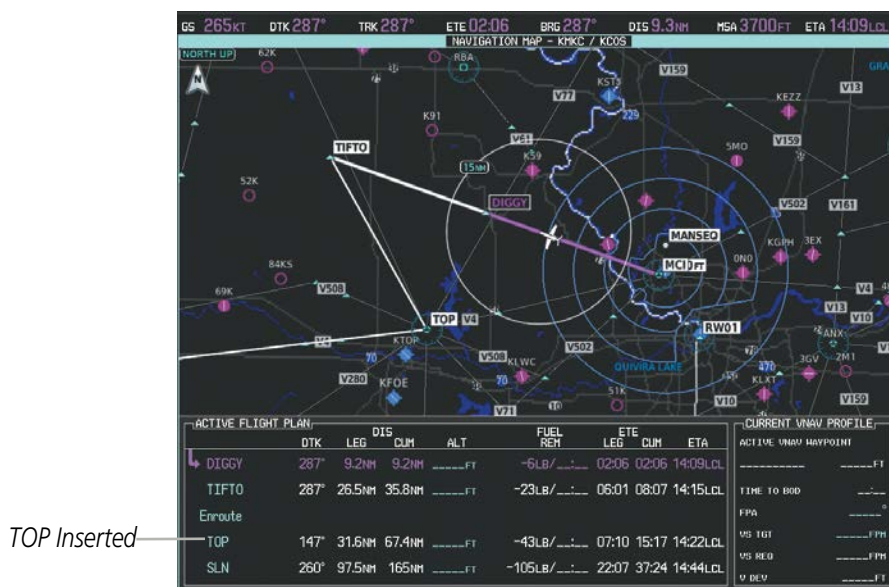


Figure 5-92 KTOP in Flight Plan

ADDING AIRWAYS TO A FLIGHT PLAN

Airways can be added to the active flight plan or any stored flight plan. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The system also anticipates the desired airway based on the selected waypoint and the flight plan.

Adding an airway to the active flight plan:

- 1) From **Home**, touch **Flight Plan**.
- 2) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 3) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 4) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window (the exit points are displayed in alphabetical order, not the order they appear in the airway).
- 5) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 6) Touch the **Load Airway** Button to insert the airway into the active flight plan.



Figure 5-93 Adding an Airway to the Active Flight Plan

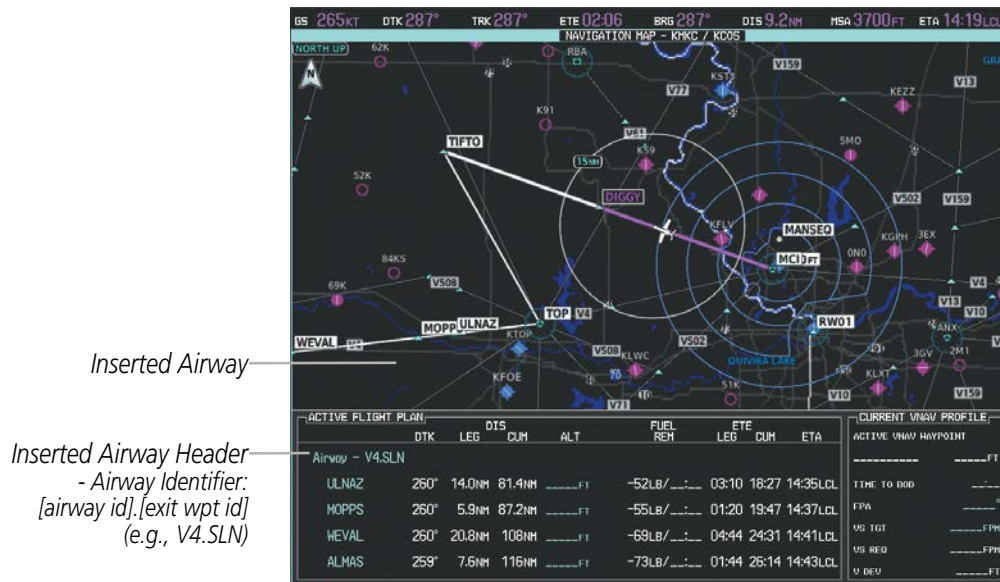
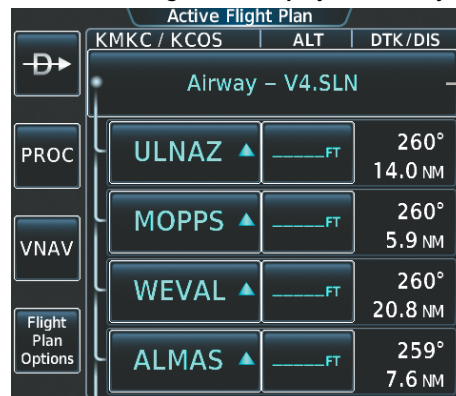


Figure 5-94 Active Flight Plan Display - V4 Airway Loaded



Inserted Airway Header
- Airway Identifier:
[airway id].[exit waypoint id]
(e.g., V4.SLN)

Figure 5-95 Active Flight Plan Screen - V4 Airway Loaded

Adding an airway to a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 6) Touch the **Load Airway** Button to display the Airway Selection Screen.
- 7) Scroll the list if necessary and touch an airway selection button to select the airway and display the Select Exit Window.
- 8) Scroll the list if necessary and touch an airway exit point selection button to select the airway exit point and display the Airway Waypoint Sequence.
- 9) Touch the **Load Airway** Button to insert the airway into the stored flight plan.

RESTRICTIONS ON ADDING AIRWAYS

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

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

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

In the US, airways that are “one-way” for specified hours of operation are not uncommon. These airways are always bidirectional in the system database.

The system only allows correct airway sequences to be inserted. If the pilot subsequently inverts the flight plan, the system inverts the airway waypoint sequence and removes the airway header.

ADDING PROCEDURES TO A STORED FLIGHT PLAN

The system allows the pilot to insert pre-defined instrument procedures from the navigation database into a flight plan. The procedures are designed to facilitate routing of traffic leaving an airport (departure), arriving at an airport (arrival), and landing at an airport (approach). See the procedures section for more details.



Figure 5-96 Edit Stored Flight Plan Screen - Flight Plan Options

DEPARTURE (DP)

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. The route is defined by selection of a departure, the transition waypoints, and a runway.

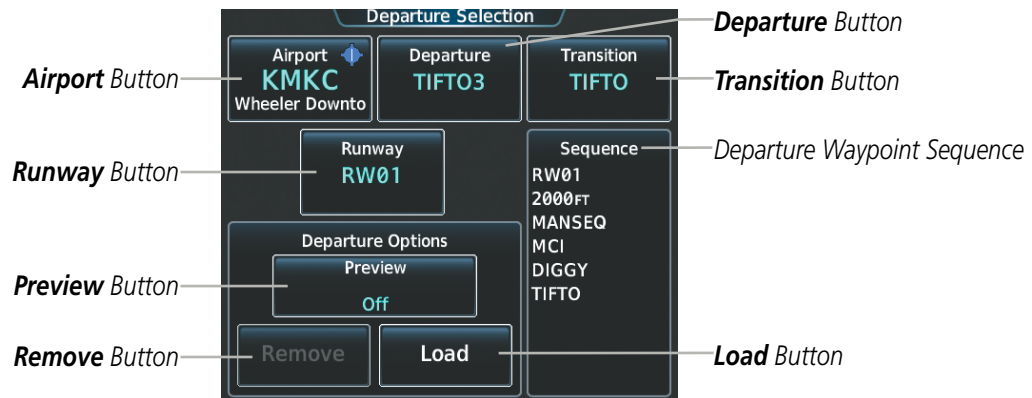


Figure 5-97 Departure Selection Screen

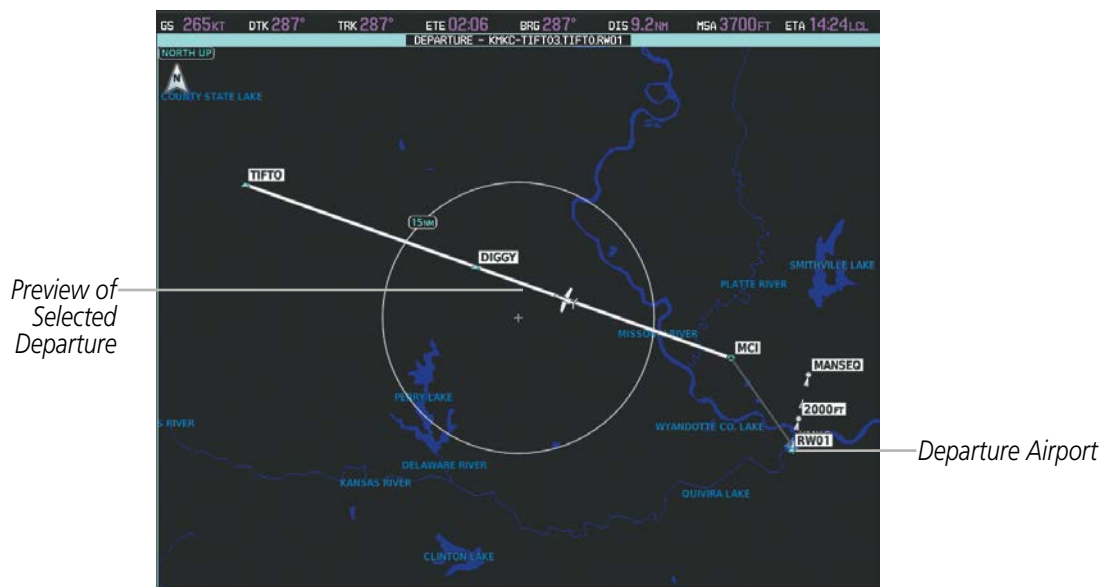


Figure 5-98 Departure Display - Preview of the Selected Departure

Loading a departure procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.
- 6) Touch the **Load Departure** Button to display the Departure Selection Screen.
- 7) Touch the **Departure** Button to display the Select Departure Screen with a list of available departures.
- 8) Scroll the list if necessary and touch a departure selection button to select the departure and return to the Departure Selection Screen.

- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Departure Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure.
- 14) Touch the **Load** Button to insert the departure into the stored flight plan.



Figure 5-99 Edit Stored Flight Plan Screen - Departure Inserted



Figure 5-100 Stored Flight Plan Display - Departure Inserted

ARRIVAL (STAR)

A Standard Terminal Arrival (STAR) is loaded at the destination airport in the flight plan. Only one arrival can be loaded at a time in a flight plan. The route is defined by selection of an arrival, the transition waypoints, and a runway.

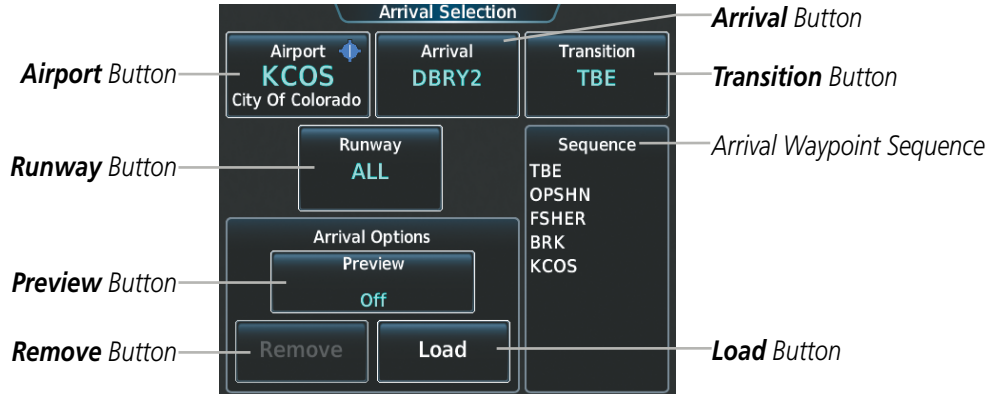


Figure 5-101 Arrival Selection Screen

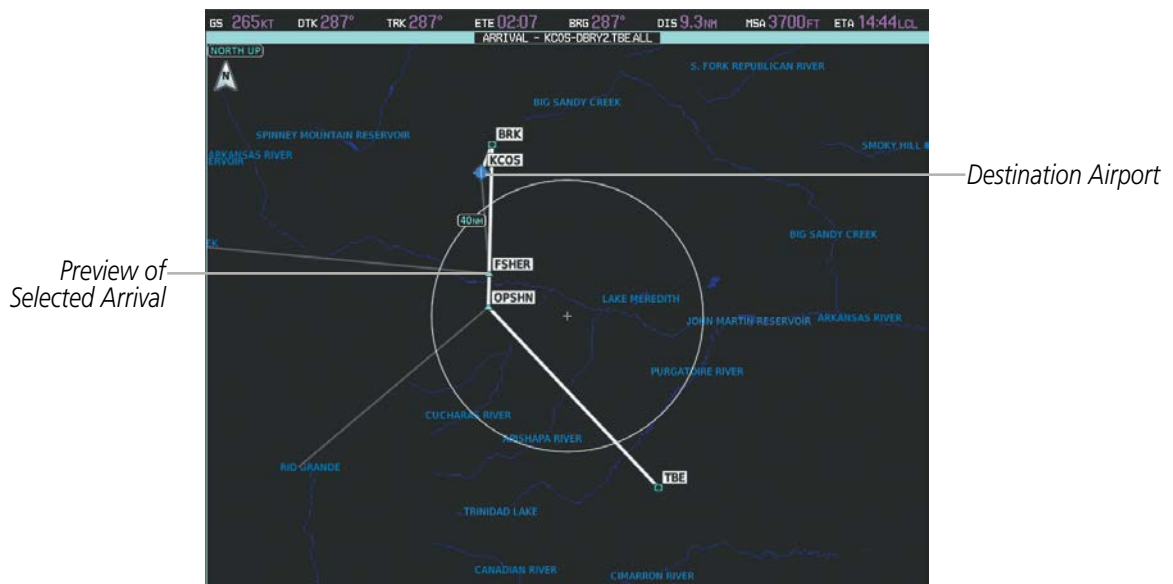


Figure 5-102 Arrival Display - Preview of the Selected Arrival

Loading an arrival procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.

- 6) Touch the **Load Arrival** Button to display the Arrival Selection Screen.
- 7) Touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 8) Scroll the list if necessary and touch an arrival selection button to select the arrival and return to the Arrival Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Arrival Selection Screen.
- 11) Touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 12) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 13) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival.
- 14) Touch the **Load** Button to insert the arrival into the stored flight plan.

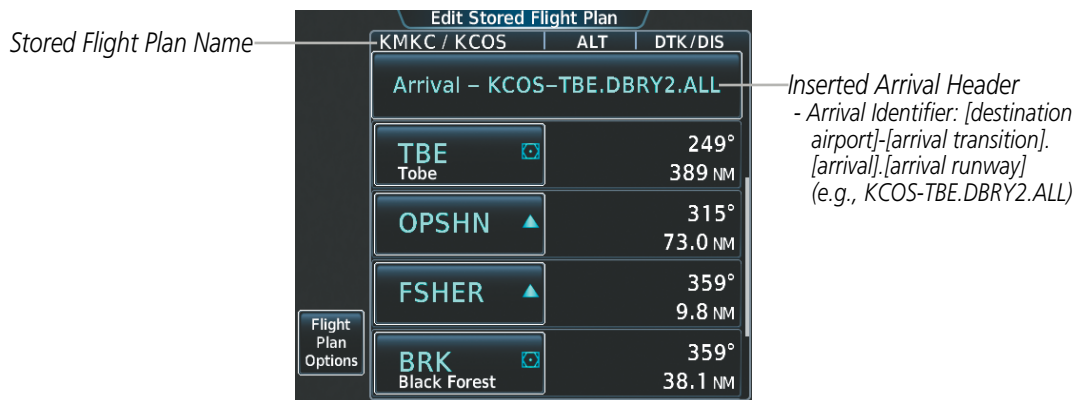


Figure 5-103 Edit Stored Flight Plan Screen - Arrival Inserted

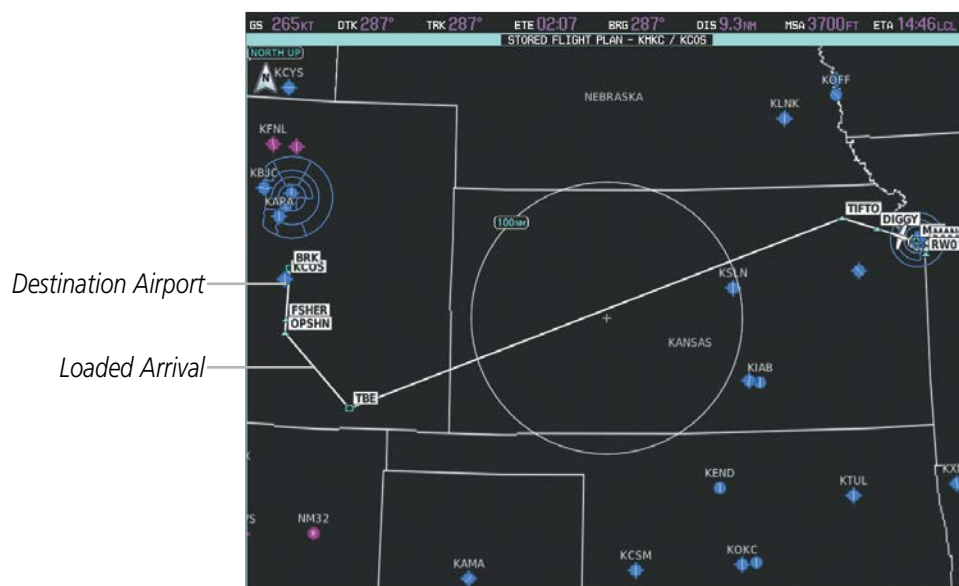


Figure 5-104 Stored Flight Plan Display - Arrival Inserted

APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a flight plan. The route for a selected approach is defined by designating transition waypoints.

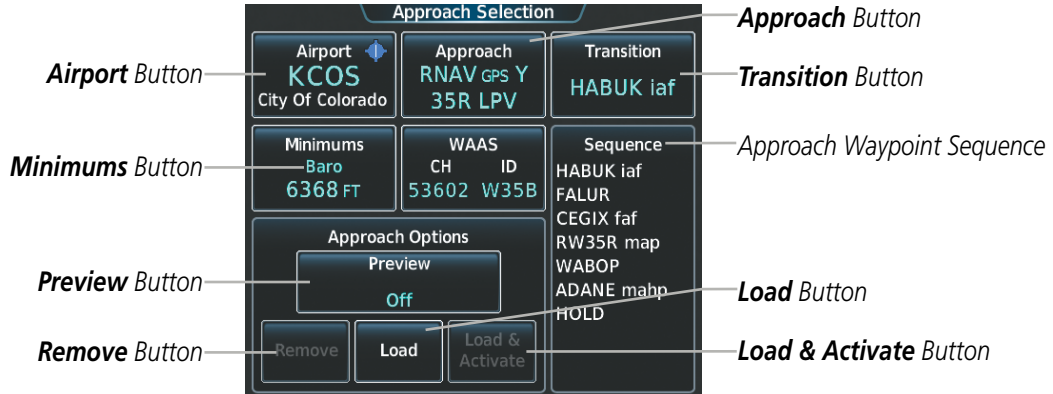


Figure 5-105 Approach Selection Screen

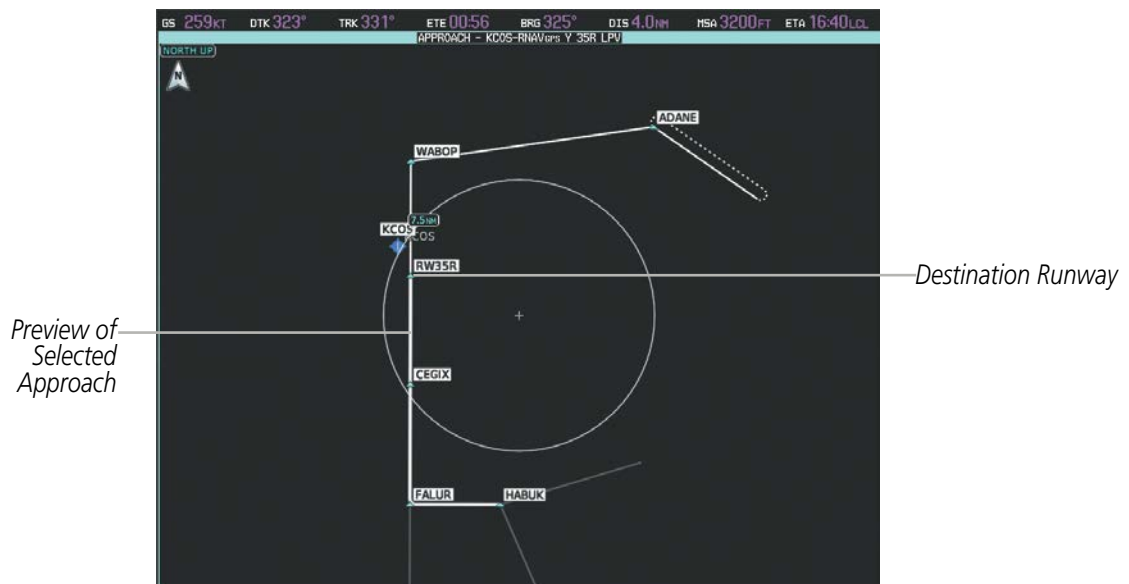


Figure 5-106 Approach Display - Preview of the Selected Approach

Loading an approach procedure into a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen.
- 5) Touch the **Flight Plan Options** Button to display the Flight Plan Options Window.

- 6) Touch the **Load Approach** Button to display the Approach Selection Screen.
- 7) Touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
- 8) Scroll the list if necessary and touch an approach selection button to select the approach and return to the Approach Selection Screen.
- 9) Touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 10) Scroll the list if necessary and touch a transition selection button to select the transition and return to the Approach Selection Screen.
- 11) Touch the **Minimums** Button to display the Minimums Screen.
- 12) Touch the **Baro** Button to activate barometric minimums.
- 13) Use the keypad to select the minimums altitude.
- 14) Touch the **Enter** Button to accept the minimums altitude and return to the Approach Selection Screen.
- 15) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 16) Touch the **Load** Button to insert the approach into the stored flight plan.

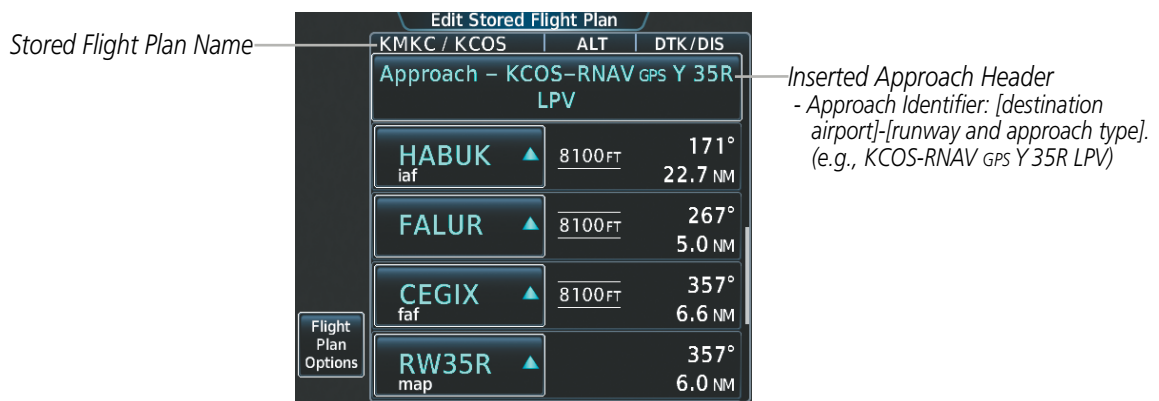


Figure 5-107 Edit Stored Flight Plan Screen - Approach Inserted



Figure 5-108 Stored Flight Plan Display - Approach Inserted

FLIGHT PLAN STORAGE

The system can store up to 99 flight plans. The active flight plan is erased when the system is powered off or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Screen.

Viewing information about a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen. The flight plan information is displayed showing departure, destination, total distance, and enroute safe altitude information for the stored flight plans.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Edit** Button to display the Edit Stored Flight Plan Screen to view the waypoints in the stored flight plan.

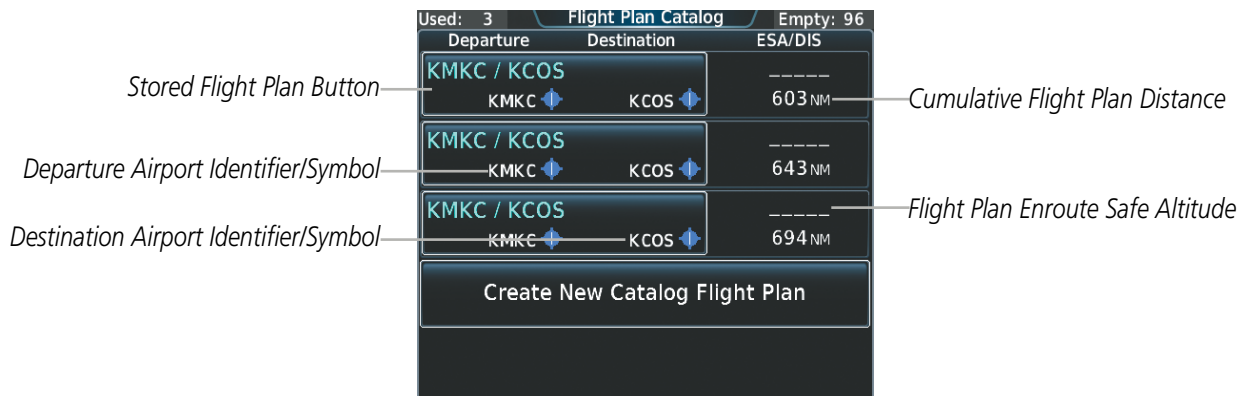


Figure 5-109 Flight Plan Catalog Screen



Figure 5-110 Edit Stored Flight Plan Screen

Storing an active flight plan from the Active Flight Plan Screen:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Store** Button.
- 3) Touch the **OK** Button in response to the question “Store XXXX/XXXX into catalog?”.

ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

Activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Activate** Button.
- 5) Touch the **OK** Button in response to “Activate Selected Flight Plan and Replace Current Active Route?”. To cancel the request, touch the **Cancel** Button.

Inverting and activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 5) Touch the **OK** Button in response to “Invert and Activate Selected Flight Plan and Replace Current Active Route?”. To cancel the request, touch the **Cancel** Button.

COPY A FLIGHT PLAN

The system allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

Copying a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Copy** Button.
- 5) Touch the **OK** Button in response to "Copy Flight Plan <flight plan name>?". The copied flight plan is placed at the end of the list of stored flight plans. To cancel the request, touch the **Cancel** Button.

DELETE A STORED FLIGHT PLAN

Individual flight plans can be deleted from the system memory.

Deleting a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Touch a stored flight plan button to display the Catalog Options Window.
- 4) Touch the **Delete** Button.
- 5) Touch the **OK** Button in response to "Delete Flight Plan <flight plan name>?". The flight plan is deleted, and any flight plans following it in the list are shifted up. To cancel the request, touch the **Cancel** Button.

FLIGHT PLAN EDITING

The active flight plan or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

DELETING THE ACTIVE FLIGHT PLAN

The system allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the system.

Deleting the active flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Delete Flight Plan** Button.
- 3) Touch the **OK** Button in response to "Delete all waypoints in flight plan?". The active flight plan is deleted. To cancel the request, touch the **Cancel** Button.

REMOVING FLIGHT PLAN ITEMS

Individual waypoints, entire airways, and entire procedures can be deleted from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be deleted individually. Attempting to delete a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification.'

Removing an individual waypoint from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 3) Touch the **Remove Waypoint** Button.
- 4) Touch the **Yes** Button in response to "Remove <waypoint name>?" The waypoint is removed. To cancel the request, touch the **No** Button.

Removing an entire airway from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Remove Airway** Button.
- 4) Touch the **Yes** Button in response to "Remove Airway -<airway name> from flight plan?" The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **No** Button.

Removing an entire procedure from the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.
- 3) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 4) Touch the **Yes** Button in response to "Remove <procedure> -<procedure name> from flight plan?" The procedure is removed (the departure airport remains when removing a departure). To cancel the request, touch the **No** Button.

Removing an individual waypoint from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a waypoint selection button to display the Waypoint Options Window.
- 6) Touch the **Remove Waypoint** Button.
- 7) Touch the **Yes** Button in response to "Remove <waypoint name>?" The waypoint is removed. To cancel the request, touch the **No** Button.

Removing an entire airway from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 6) Touch the **Remove Airway** Button.
- 7) Touch the **Yes** Button in response to "Remove <airway name>?" The airway is removed, but the starting and ending waypoints remain in the flight plan. To cancel the request, touch the **No** Button.

Removing an entire procedure from a stored flight plan:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Edit** Button.
- 5) Scroll the list if necessary and touch a departure, arrival, or approach selection button to display the Departure, Arrival, or Approach Options Window.
- 6) Touch the **Remove Departure** Button, the **Remove Arrival** Button, or the **Remove Approach** Button.
- 7) Touch the **Yes** Button in response to "Remove <procedure> -<procedure name> from flight plan?" The procedure is removed (the departure airport remains when removing a departure). To cancel the request, touch the **No** Button.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification.

Changing the active flight plan comment:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Rename** Button to display the keypad.
- 3) Use the keypad to select the comment.
- 4) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Options Screen.

Changing the active flight plan comment using the PFD Controller:

- 1) On the PFD Controller, press the **FPL** Button to display the Direct To Window.
- 2) Turn the large **PFD** Knob to move the cursor to the comment field, if necessary.
- 3) Turn the small **PFD** Knob one click to activate the editing cursor (flashing).
- 4) Turn the large and small **PFD** knobs to select the comment (large knob moves the cursor; small knob selects the character)
- 5) Press the **ENT** Key or the small **PFD** Knob to accept the selection.

Changing a stored flight plan comment:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan options button to display the Catalog Options Window.
- 4) Touch the **Rename** Button to display the keypad.
- 5) Use the keypad to select the comment.
- 6) Touch the **Enter** Button to accept the comment, and return to the Flight Plan Catalog Screen.

CHANGING FLIGHT PLAN DATA FIELDS

The data fields displayed on the Touchscreen Controller for each flight plan can be changed. The default settings for the data fields are DTK - Desired Track and DIS - Distance.

Changing the flight plan data fields:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Edit Data Fields** Button to display the Flight Plan Data Fields Screen.
- 3) Touch the **Data Field 1** Button or the **Data Field 2** Button to display the Select Field Type Screen.
- 4) Scroll the list if necessary and touch a data field type button to select the field type and return to the Select Field Type Screen.
- 5) Touch the other data field button to choose another data field type, or touch the **Restore Defaults** Button to return to the default settings.

ALONG TRACK OFFSETS

A waypoint having an “along track offset” distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 99 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

A waypoint must be adjacent to its parent waypoint in the flight plan, so the system limits the along-track distance to less than the length of the leg before or after the selected waypoint. If the selected waypoint is the active waypoint, the distance is limited to less than the distance to go to the active waypoint. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed at or after the final approach fix of an approach.

The along track offset distance cannot be modified once entered, but the altitude can be modified. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.



Figure 5-111 Along Track Offset

Entering an along track offset distance:

- 1) From **Home**, touch **Flight Plan**
- 2) Touch a waypoint options button to display the Waypoint Options Screen.
- 3) Touch the **Along Track Waypoint** Button to bring up the Along Track Offset Waypoint Screen.
- 4) Use the keypad to select the distance in the range of 1 to 99 nm (limited by leg distances).
- 5) Touch the **(Before) -** Button or **(After) -** Button to select the offset waypoint direction.
- 4) Touch the **Enter** Button to insert the offset waypoint into the active flight plan.

PARALLEL TRACK

The Parallel Track feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case “-p” placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.



NOTE: Vertical navigation is unavailable while the Parallel Track feature is active.



Figure 5-112 Active Flight Plan Display - Prior to Activating Parallel Track

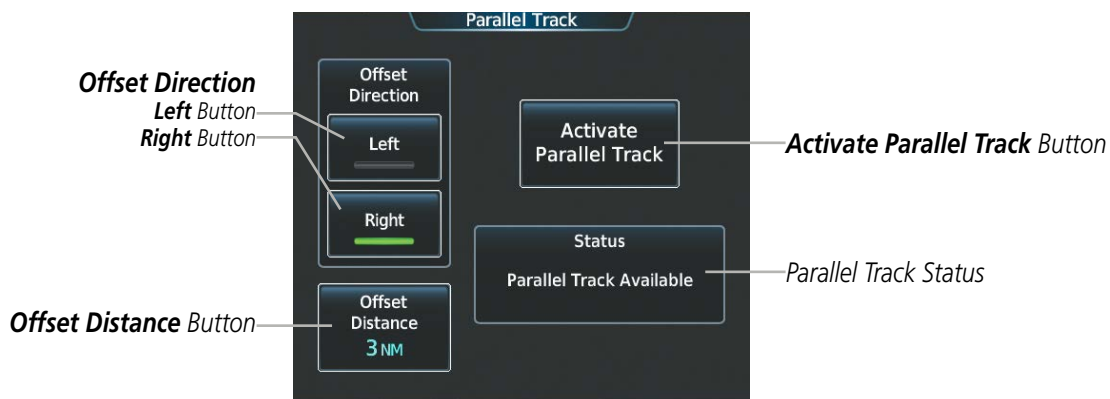


Figure 5-113 Parallel Track Screen - Selecting Parallel Track

Activating parallel track:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options** > **Parallel Track**
- 2) Touch the **Left** Button or the **Right** Button to choose the offset direction.
- 3) Touch the **Offset Distance** Button to display the keypad.
- 4) Use the keypad to select the distance.
- 5) Touch the **Enter** Button to accept the distance, and return to the Parallel Track Screen.
- 6) Touch the **Activate Parallel Track** Button to activate the parallel track function.

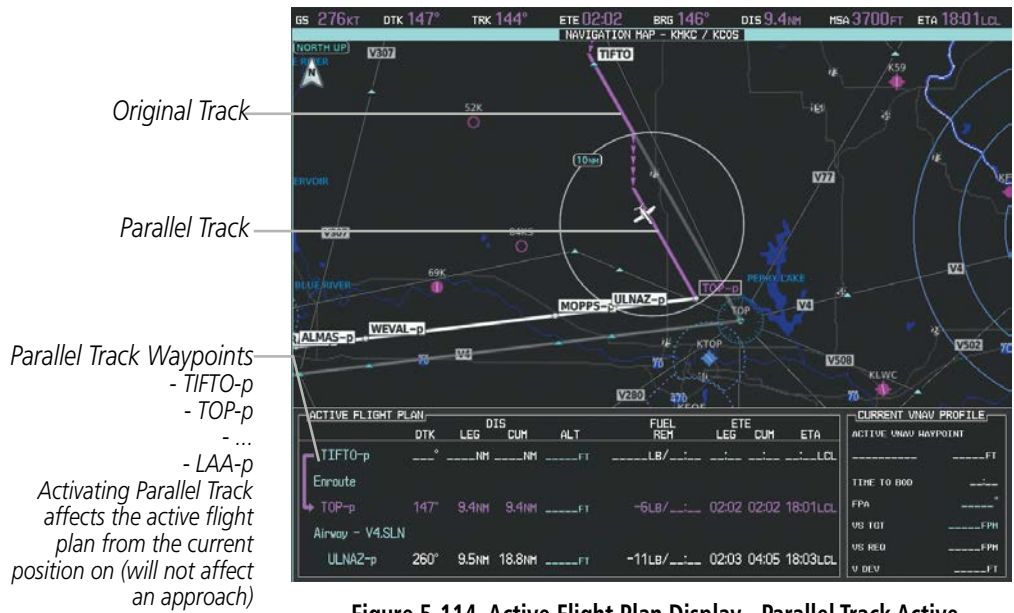


Figure 5-114 Active Flight Plan Display - Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates that the system is unable to activate the parallel track because of invalid geometry.

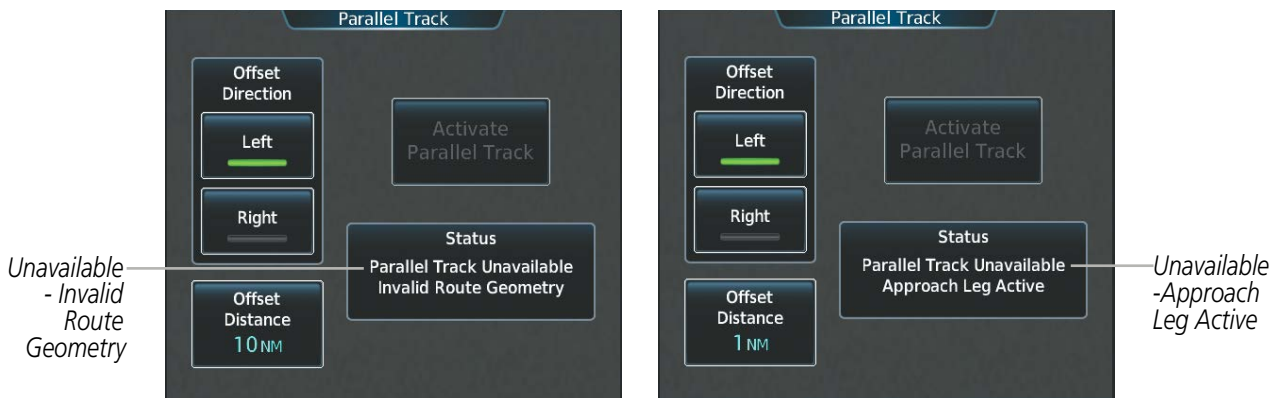


Figure 5-115 Parallel Track Unavailable

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type.

Canceling parallel track:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options** > **Parallel Track**
- 2) Touch the **Cancel Parallel Track** Button to cancel the parallel track function.

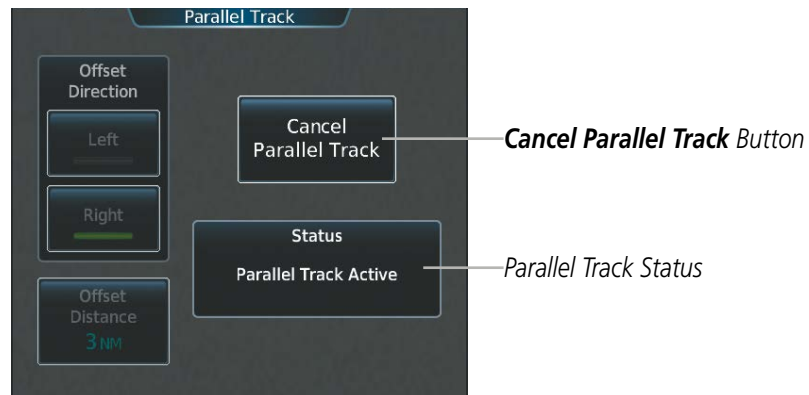


Figure 5-116 Parallel Track Screen - Cancelling Parallel Track

ACTIVATING A FLIGHT PLAN LEG

The system allows selection of a highlighted leg as the “active leg” (the flight plan leg which is currently used for navigation guidance).

Activating a flight plan leg:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the waypoint selection button to select the the destination waypoint for the desired leg. The Waypoint Options Window is displayed.
- 3) Touch the **Activate Leg to Waypoint** Button.
- 4) Touch the **OK** Button in response to “Activate Leg?” The new active flight plan leg is activated. To cancel the request, touch the **Cancel** Button.

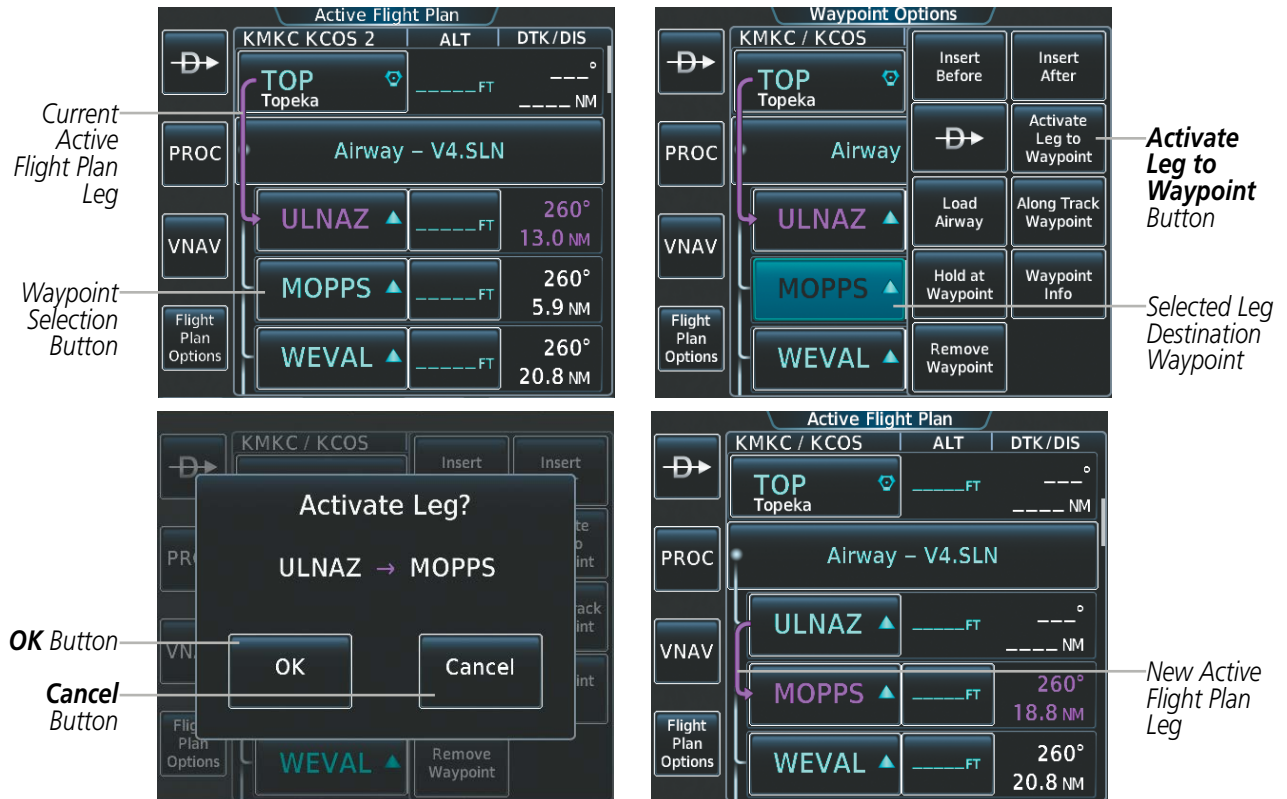


Figure 5-117 Active Flight Plan Screen - Activating a Flight Plan Leg

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

Inverting the active flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Invert** Button
- 3) Touch the **Yes** Button in response to "Invert active flight plan?" The active flight plan leg is inverted. To cancel the request, touch the **No** Button.

Inverting and activating a stored flight plan:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Catalog** Button to display the Flight Plan Catalog Screen.
- 3) Scroll the list if necessary and touch a flight plan selection button to display the Catalog Options Window.
- 4) Touch the **Invert and Activate** Button.
- 7) Touch the **OK** Button in response to "Invert and Activate Selected Flight Plan and Replace Current Active Route?" The stored flight is inverted and becomes the active flight plan. The stored flight plan is not modified. To cancel the request, touch the **Cancel** Button.

COLLAPSING AIRWAYS

The system allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page Screen. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: “From” waypoint, “To” waypoint, and the “Next” waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the “To” or the “Next” waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.



Figure 5-118 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list if necessary and touch an airway selection button to display the Airway Options Window.
- 3) Touch the **Collapse All** Button or the **Expand All** Button to collapse/expand all airways and return to the Active Flight Plan Screen.

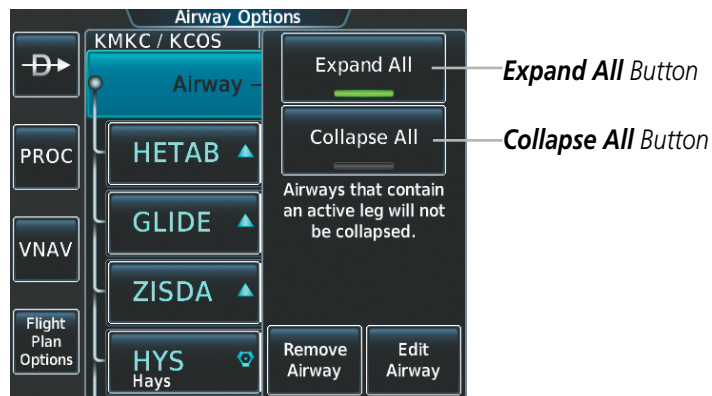


Figure 5-119 Active Flight Plan Screen -Collapsing Expanding Airways

CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a selected waypoint, and allows creation of a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

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

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options**
- 2) Touch the **Closest Point of Flight Plan** Button to display the Closest Point of Flight Plan Screen
- 3) Touch the From waypoint button to display the keypad.
- 4) Use the keypad and the **Enter** Button to select the "From" waypoint.
- 5) Touch the **Insert Point into Flight Plan** Button to add the calculated waypoint into the flight plan. The name for the new waypoint is derived from the identifier of the From waypoint.

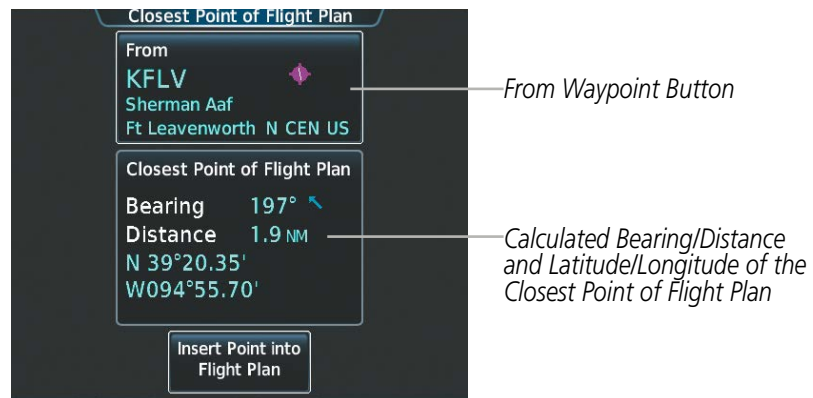


Figure 5-120 Closest Point of FPL



Figure 5-121 Closest Point of FPL inserted in Active Flight Plan

USER-DEFINED HOLDING PATTERNS

A holding pattern can be defined at any active flight plan waypoint, or at the aircraft present position.

Creating a user-defined hold at an active flight plan waypoint:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the waypoint selection button to select the the waypoint at which to define the holding pattern. The Waypoint Options Window is displayed.
- 3) Touch the **Hold at Waypoint** Button. The Hold at Waypoint Window is displayed.
- 4) Touch the Turn Direction Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 5) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 6) Touch the Hold Entry Course Button to display the keypad. Use the keypad and the **Enter** Button to select the entry angle.
- 7) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 8) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 9) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 10) Touch the **Create** Button to add the hold into the flight plan.



Figure 5-122 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

Creating a user-defined hold at the aircraft present position:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**
- 2) Touch the **Hold at P.POS** Button. The Hold at Waypoint Window is displayed.
- 3) Touch the Turn Direction Button, and touch the **Right** Button or the **Left** Button to select the turn direction.
- 4) Touch the Course Direction Button, and touch the **Inbound** Button or the **Outbound** Button to select the course direction.
- 5) Touch the Hold Entry Course Button to display the keypad. Use the keypad and the **Enter** Button to select the entry angle.
- 6) Touch the Leg Length Mode Button, and touch the **Distance** Button or the **Time** Button to select the length mode.
- 7) Touch the **Leg Time** Button or the **Leg Distance** Button to display the keypad. Use the keypad and the **Enter** Button to select the length of the leg.
- 8) Touch the **Expect Further Clearance** Button to display the keypad. Use the keypad and the **Enter** Button to select the time for a reminder.
- 9) Touch the **Create** Button to add the hold into the flight plan.

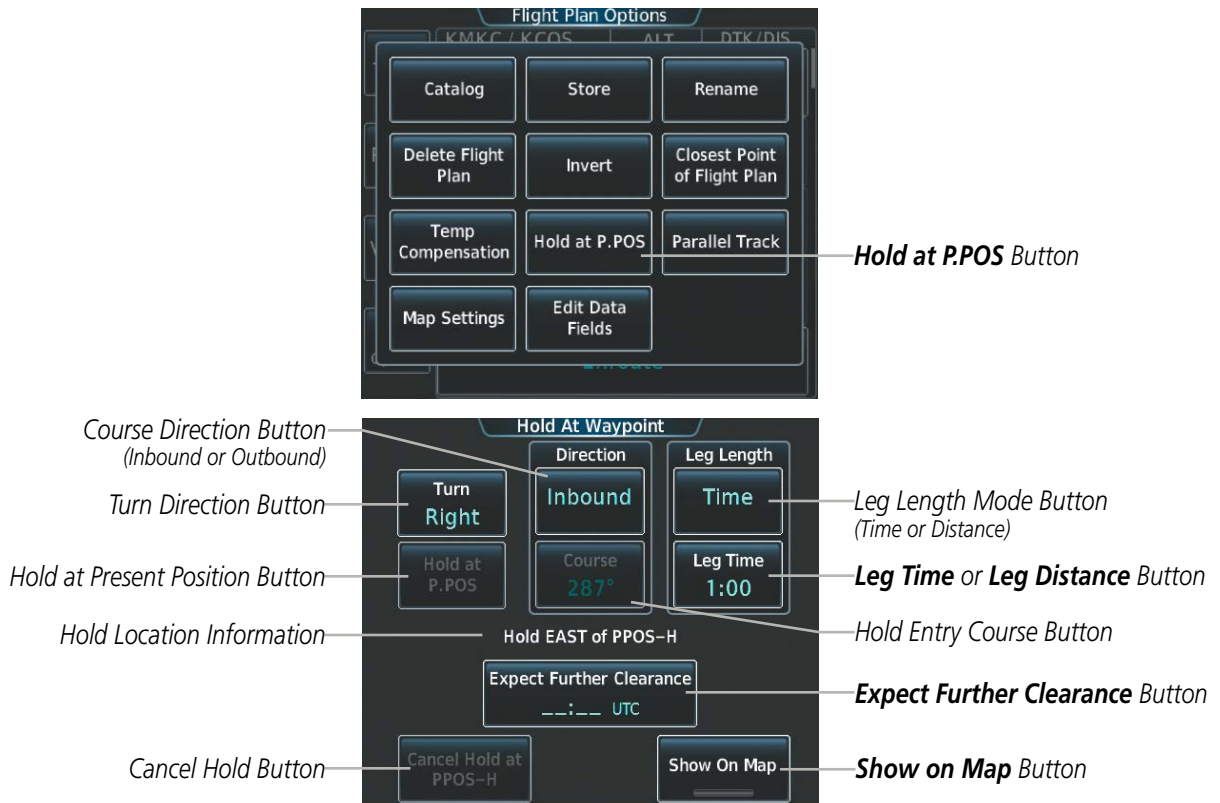


Figure 5-123 Creating a User Defined Holding Pattern at the Aircraft Present Position

Removing a user-defined hold:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch the hold waypoint selection button. The Waypoint Options Window is displayed.
- 3) Touch the **Remove Hold** Button.
- 4) Touch the **OK** Button in response to "Remove Holding Pattern?" The holding pattern is removed. To cancel the request, touch the **Cancel** Button.

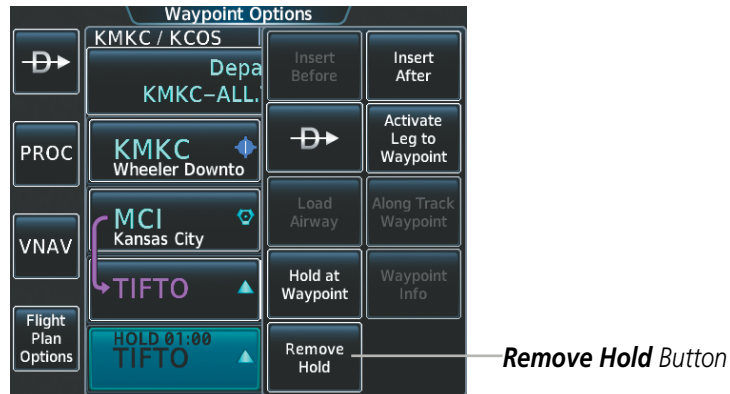


Figure 5-124 Removing a User Defined Holding Pattern

5.7 VERTICAL NAVIGATION

NOTE: The system supports vertical navigation for all lateral leg types except for CA, CI, FA, FM, HA, HM, PI, VA, VD, VI, VR, and VM. Vertical constraints are not retained in stored flight plans.

The system Vertical Navigation (VNAV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan. Both manual and autopilot-coupled guidance are supported.

NOTE: Making course changes greater than 90° during a descent with vertical guidance may cause excessive and rapid movement of the vertical deviation indicator and SVS Pathways.

The system updates vertical path guidance continuously using ground speed and the calculated distance to the Bottom of Descent (BOD). Due to turn anticipation guidance (turn-smoothing), distance to the BOD can be affected by course changes greater than approximately 5 degrees. Ground speed can be affected by factors such as shifts in wind direction, aircraft power management, pitch angle, and course changes. Abrupt and/or substantial changes to either the distance to the BOD, ground speed, or both can cause similarly abrupt/substantial changes in vertical path guidance.

Because of turn-smoothing, changes to both distance to the BOD and ground speed tend to be more extreme when the BOD is also a waypoint that marks a large course change. These speed and distance changes will be accounted for in the computed required vertical path and reflected in the vertical guidance indications.



Figure 5-125 VNAV Profile Screen - Enable/Disable VNAV



Figure 5-126 Active Flight Plan Display - VNAV Enabled

VNAV Altitude
Constraint

Current Vertical
Navigation Profile
Enabled (valid data)



Figure 5-127 Active Flight Plan Display - VNAV Disabled

VNAV Altitude
Constraint

Current Vertical
Navigation Profile
Disabled (fields dashed)

Enabling/Disabling VNAV guidance:

- 1) From **Home**, touch **Flight Plan** > **VNAV**
- 2) Touch the **VNAV Enabled** Button to enable/disable vertical navigation.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indicator (RVS1) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNAV PROFILE box are dashed. VNAV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint “designated” for vertical guidance. Selecting the **VNAV -D➔** Softkey on the VNAV Profile Screen allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNAV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the **-D➔** Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

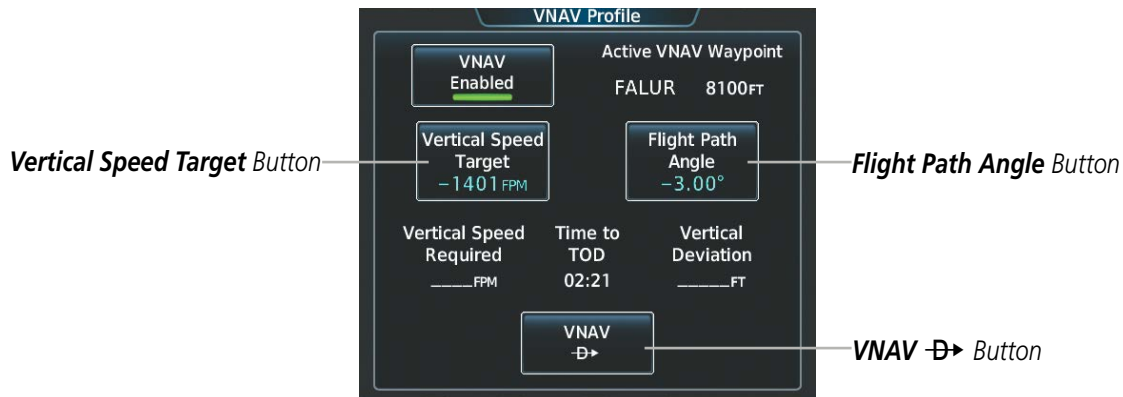


Figure 5-128 VNAV Profile Screen - Vertical Navigation Profile Modification

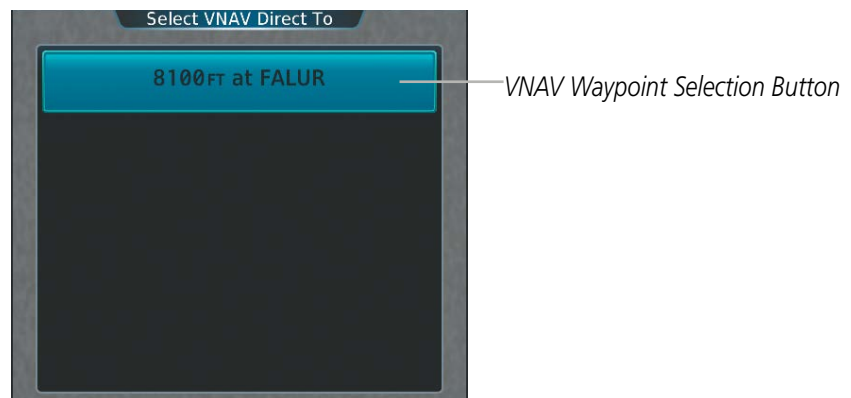


Figure 5-129 Selecting the VNAV Direct To Waypoint

Activating a vertical navigation direct to:

- 1) From **Home**, touch **Flight Plan > VNAV**
- 2) Touch the **VNAV -D➔** Button to display the Select VNAV Direct To Screen with a list of possible Vertical navigation direct to choices.
- 3) Scroll the list, if necessary, and touch a VNAV waypoint selection button.
- 4) Touch the **Activate** Button in response to “Activate Vertical **-D➔**: NNNNNFT at XXXXXX” to initiate the vertical navigation direct to. Vertical guidance begins to the altitude constraint for the selected waypoint. To cancel the request, touch the **Cancel** Button.



Current Vertical Navigation Profile - Prior to VNAV Direct To

Figure 5-130 Active Flight Plan Display - VNAV Direct To Not Active



Current Vertical Navigation Profile - After VNAV Direct To

Figure 5-131 Active Flight Plan Display - VNAV Direct To Active

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) on the VNAV Profile Screen.

Modifying the VS TGT and FPA:

- 1) From **Home**, touch **Flight Plan > VNAV**
- 2) Touch the **Vertical Speed Target** Button or the **Flight Path Angle** Button to display the keypad.
- 3) Use the keypad and the **Enter** Button to select the vertical speed target or the flight path angle.

ALTITUDE CONSTRAINTS

The system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for “Cross at” altitudes. If the procedure states “Expect to cross at,” then the altitude is not in the database. In this case the altitude may be entered manually.



Figure 5-132 Active Flight Plan Screen - Waypoint Altitude Constraints

White Text	Light Blue Text	Light Blue Subdued Text
Altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point, or altitude retrieved from the navigation database. The altitude is provided as a reference and is not designated to be used in determining vertical speed and deviation guidance.	Altitude is designated for use in giving vertical speed and deviation guidance. Altitude does not match the published altitude in navigation database or no published altitude exists. The pencil icon indicates manual designation or manual data entry.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.

Table 5-8 Altitude Constraint Color Coding

Altitudes associated with arrival and approach procedures are “auto-designated”. This means the system automatically uses the altitudes loaded with the arrival or approach for giving vertical speed and deviation guidance. Note that these altitudes are displayed as blue text up to, but not including, the FAF. The FAF is always a “reference only” altitude and cannot be designated, unless the selected approach does not provide vertical guidance. In this case, the FAF altitude can be designated.

Altitudes that have been designated for use in vertical guidance can be “un-designated”. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

Designating the current waypoint altitude to be used for vertical guidance:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Enter** Button to designate the current altitude to be used for vertical guidance. The altitude is now shown in blue, indicating it is usable for vertical guidance.



Figure 5-133 Active Flight Plan Screen - Waypoint Altitude Designation

Altitude constraints are displayed and entered to the nearest foot mean sea level (MSL) or flight level to the nearest hundred feet. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the system allows entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). When a database altitude restriction of type “AT or ABOVE” or “AT or BELOW” is activated, the system uses the “AT” portion of the restriction to define the vertical profile.

An altitude constraint is invalid if:

- Meeting the constraint requires the aircraft to climb
- Meeting the constraint requires the maximum flight path angle or maximum vertical speed to be exceeded
- The altitude constraint results in a TOD behind the aircraft present position
- The constraint is within a leg type for which altitude constraints are not supported
- The altitude constraint is added to the FAF of an approach that provides vertical guidance (e.g., ILS or GPS SBAS approach)
- The altitude constraint is added to a waypoint past the FAF.

Selecting and designating a new waypoint altitude to be used for vertical guidance:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) If necessary, touch the **Flight Level** Button or the **MSL** Button to choose the altitude entry type.
- 4) Use the keypad to select a new VNAV altitude and touch the **Enter** Button to designate the new altitude to be used for vertical guidance. The altitude is now shown in blue, indicating it is usable for vertical guidance.

Altitude constraints can be modified or deleted after having been added to the flight plan. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the system displays the altitude restriction from the database provided no predicted altitude can be provided. The system also provides a way to reinstate a published altitude constraint that has been edited.

Removing an altitude constraint provided by the navigation database:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV altitude?' window is displayed.
- 4) Touch the **OK** Button. The altitude is now shown in white, indicating it is not usable for vertical guidance. To cancel the request, touch the **Cancel** Button.

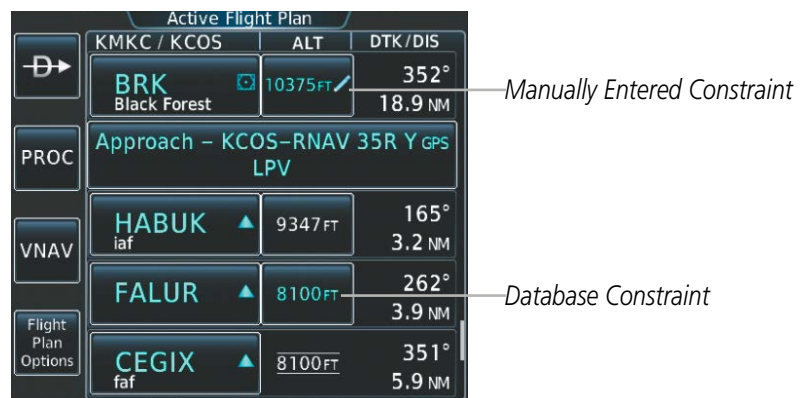


Figure 5-134 Active Flight Plan Screen - Deleting Altitude Constraints

Removing an altitude constraint that has been manually entered:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove VNAV altitude?' window is displayed.
- 4) Touch the **OK** Button. The altitude is now shown in white, indicating it is not usable for vertical guidance. To cancel the request, touch the **Cancel** Button.

Reverting a manually entered altitude constraint back to the navigation database value:

- 1) From **Home**, touch **Flight Plan**
- 2) Scroll the list, if necessary, and touch a VNAV ALT button to display the VNAV Altitude Window.
- 3) Touch the **Remove VNAV ALT** Button. A 'Remove or Revert to published VNAV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Touch the **Revert** Button. The altitude is now the database altitude and is shown in light blue, indicating it is usable for vertical guidance.

5.8 PROCEDURES

The system can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APPRs) are stored within the database and can be loaded using the Touchscreen Controller.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure selection screen defaults to the appropriate airport, saving some time selecting the correct airport. Whenever an approach is selected, the choice to either “Load” or “Load & Activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

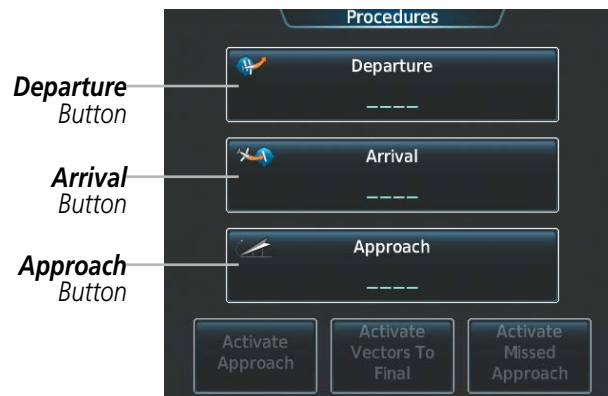


Figure 5-135 Loading Procedures on the Touchscreen Controller

DEPARTURES

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. If a departure is loaded when another departure is already in the active flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

LOADING A DEPARTURE INTO THE ACTIVE FLIGHT PLAN

Loading a departure into the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the departure airport.
- 4) Touch the **Enter** Button to accept the departure airport.
- 5) If necessary, touch the **Departure** Button to display the Select Departure Screen with a list of available departures.

- 6) Scroll the list if necessary and touch a departure selection button to select the departure.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.
- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Departure Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the departure.
- 12) Touch the **Load** Button to insert the departure into the active flight plan.

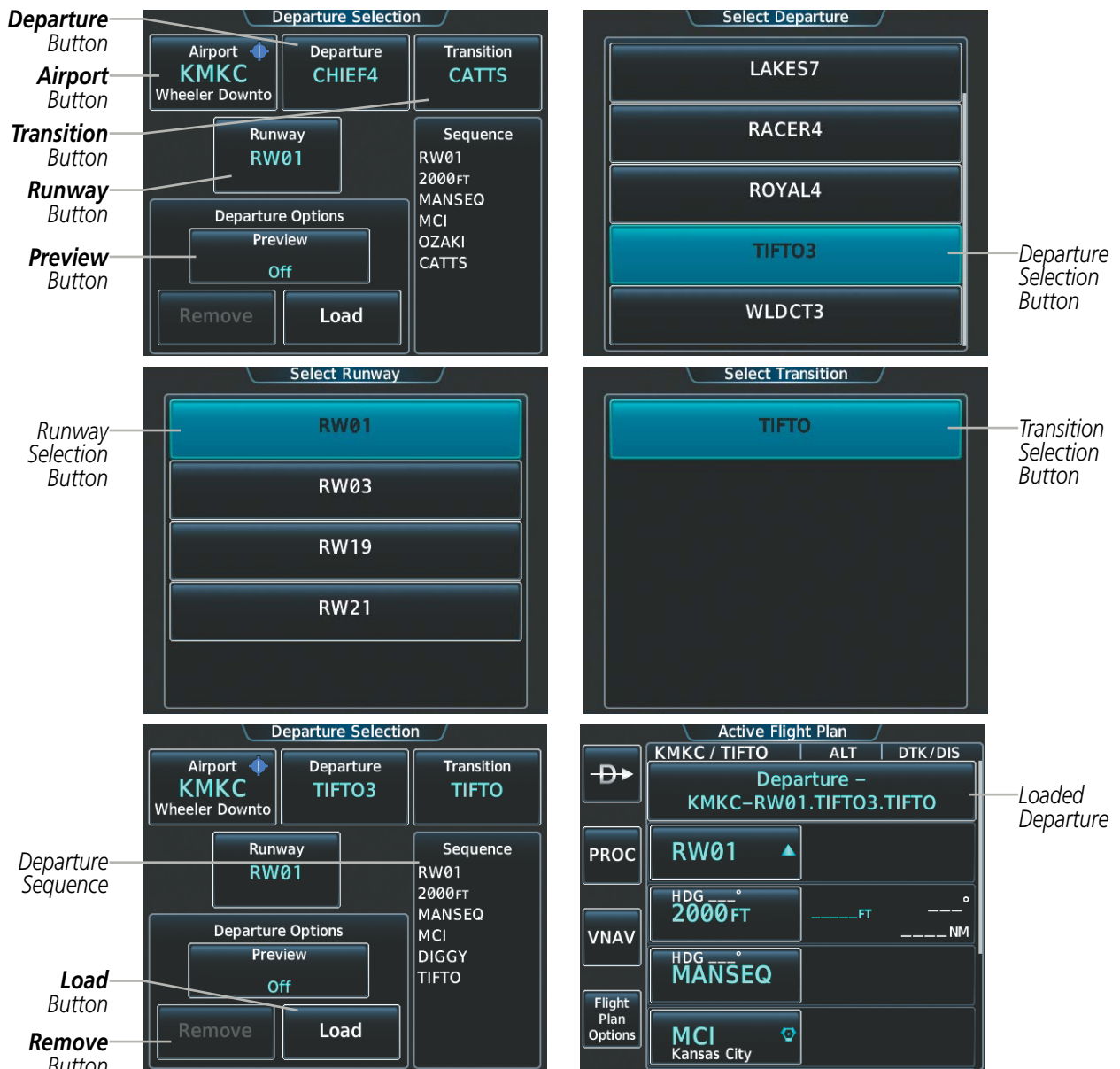


Figure 5-136 Loading a Departure into the Active Flight Plan

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the airport.
- 3) Touch the **PROC** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 through 6 as necessary.

REMOVING A DEPARTURE FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

Removing a departure from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Departure** Button to display the Departure Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove departure?' window is displayed.
- 4) Touch the **Yes** Button. The departure is removed from the active flight plan. To cancel the request, touch the **No** Button.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded at any airport that has one available. Only one arrival can be loaded at a time in a flight plan. If an arrival is loaded when another arrival is already in the active flight plan, the new arrival replaces the previous arrival. The route is defined by selection of an arrival, the transition waypoints, and a runway.

LOADING AN ARRIVAL INTO THE ACTIVE FLIGHT PLAN**Loading an arrival into the active flight plan using the Touchscreen Controller:**

- 1) From **Home**, touch **PROC**
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the arrival airport.
- 4) Touch the **Enter** Button to accept the arrival airport.
- 5) If necessary, touch the **Arrival** Button to display the Select Arrival Screen with a list of available arrivals.
- 6) Scroll the list if necessary and touch an arrival selection button to select the arrival.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.

- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the arrival.
- 12) Touch the **Load** Button to insert the arrival into the active flight plan.

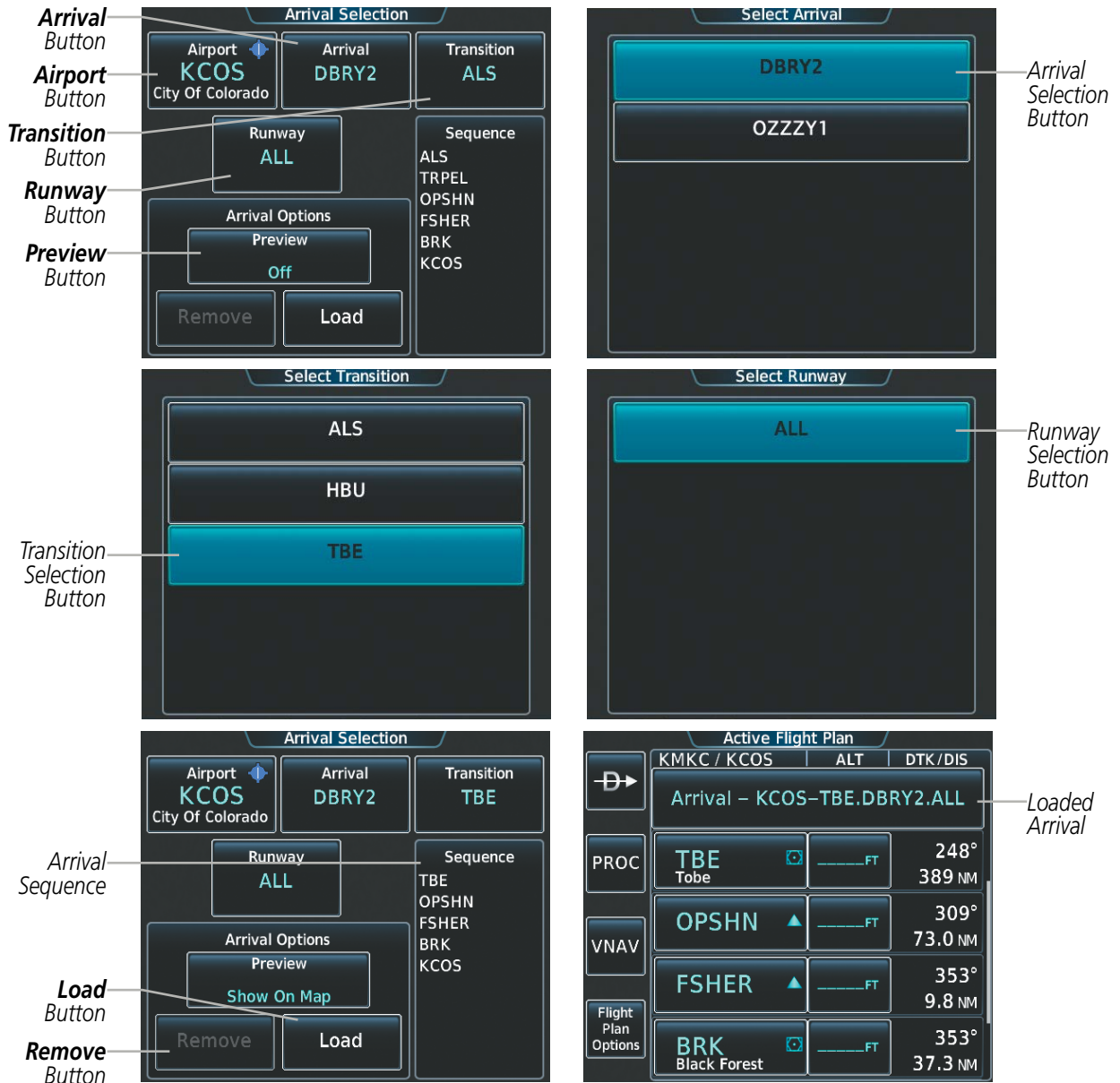


Figure 5-137 Loading an Arrival into the Active Flight Plan

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the **Airport Selection Button** to display the keypad and use it to select the airport.
- 3) Touch the **PROC** Tab to display the Airport Procedures Screen.

- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 through 6 as necessary.

REMOVING AN ARRIVAL FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the Active Flight Plan.

Removing an arrival from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Arrival** Button to display the Arrival Selection Screen.
- 3) Touch the **Remove** Button. A 'Remove arrival?' window is displayed.
- 4) Touch the **Yes** Button. The arrival is removed from the active flight plan. To cancel the request, touch the **No** Button.

APPROACHES



NOTE: *If certain GPS parameters (SBAS, RAIM, etc.) are not available, some published approach procedures for the desired airport may not be displayed in the list of available approaches.*

An Approach Procedure (APPR) can be loaded at any airport that has one available, and provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. Only one approach can be loaded at a time in a flight plan. If an approach is loaded when another approach is already in the active flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

Whenever an approach is selected, the choice to either “Load” or “Load & Activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a “GPS” designation to the right of the procedure name indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown by tuning the NAV receiver to the proper frequency and selecting that NAV receiver on the CDI.

The SBAS GPS allows for flying LNAV, LNAV/VNAV, LP, and LPV approaches according to the published chart. LNAV+V is a standard LNAV approach with advisory vertical guidance provided for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the system PFD in the same location as the ILS glideslope using a magenta diamond. In all cases where LNAV+V is indicated by the system during an approach, LNAV minima are used. The active approach type is annunciated on the HSI as shown in the following table:


HSI Annunciation	Description	Example on HSI
LNAV	GPS approach using published LNAV minima	 <p>Approach Type</p> <ul style="list-style-type: none"> - LNAV - LNAV+V - L/VNAV - LP - LPV
LNAV+V	GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV (available only if SBAS available)	GPS approach using published LNAV/VNAV minima (downgrades to Baro VNAV if SBAS unavailable)	
LP (available only if SBAS available)	GPS approach using published LP minima (downgrades to LNAV if SBAS unavailable)	
LPV (available only if SBAS available)	GPS approach using published LPV minima	

Table 5-9 Approach Types

LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

Loading an approach into the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) If necessary, touch the **Airport** Button to display the keypad and use it to select the approach airport.
- 4) Touch the **Enter** Button to accept the approach airport.
- 5) If necessary, touch the **Approach** Button to display the Select Approach Screen with a list of available approaches.
- 6) Scroll the list if necessary and touch an arrival selection button to select the arrival.
- 7) If necessary, touch the **Transition** Button to display the Select Transition Screen with a list of available transitions.
- 8) Scroll the list if necessary and touch a transition selection button to select the transition.
- 9) If necessary, touch the **Runway** Button to display the Select Runway Screen with a list of available runways.
- 10) Scroll the list if necessary and touch a runway selection button to select the runway and return to the Arrival Selection Screen.
- 11) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 12) Touch the **Load** Button to insert the approach into the active flight plan.



NOTE: When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

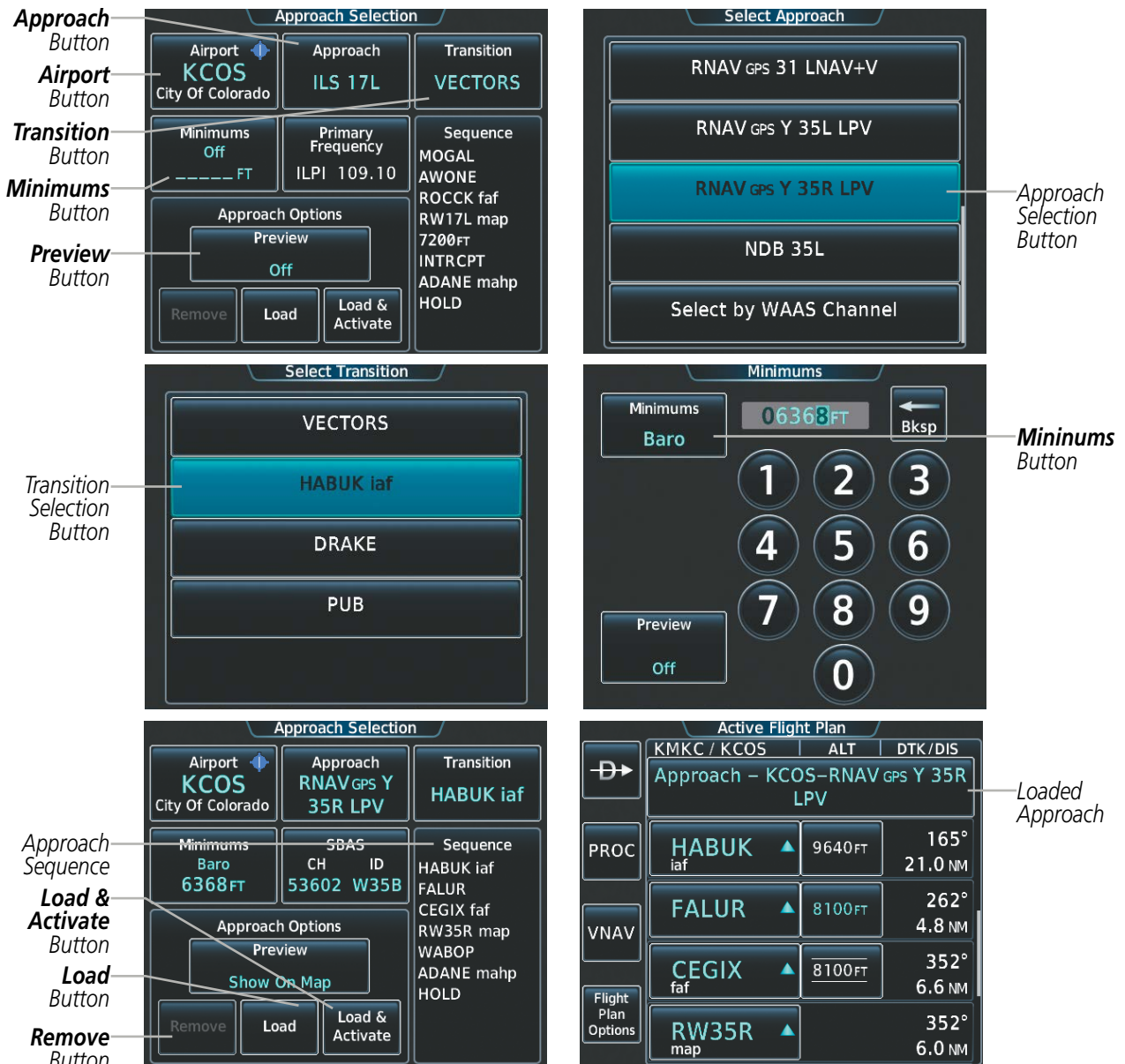


Figure 5-138 Loading an Approach into the Active Flight Plan

Viewing available procedures at an airport:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the airport.
- 3) Touch the **PROC** Tab to display the Airport Procedures Screen.
- 4) Scroll the list if necessary and touch a procedure selection button. The procedure selection screen is displayed on the Touchscreen Controller for the selected procedure
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the procedure.
- 6) Touch the **Back** Button to return to the Airport Procedures Screen to view another procedure.
- 7) Repeat steps 4 through 6 as necessary.

Loading an approach into the active flight plan from the Airport Information Screen:

- 1) From **Home**, touch **Waypoint Info > Airport**
- 2) If necessary, touch the Airport Selection Button to display the keypad and use it to select the destination airport.
- 3) Touch the **PROC** Tab to display the Airport Procedures Screen.
- 4) Scroll the list, if necessary, and touch an approach selection button. The Approach Selection Screen is displayed on the Touchscreen Controller for the selected approach.
- 5) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 6) Edit the approach, if required.
- 7) Touch the **Load** Button to insert the approach into the active flight plan.

Loading an approach into the active flight plan from the Nearest Airport Screen:

- 1) From **Home**, touch **Nearest > Airport**
- 2) If necessary, scroll the list to find the airport and touch the airport selection button to display the Waypoint Options Window for the selected airport. If the airport is not listed, touch any airport selection button to display the Waypoint Options Window.
- 3) Touch the **Airport Info** Button to display the Airport Information Screen. If in the previous step, the airport was not listed, touch the airport button and use the keypad to select the destination airport.
- 4) Touch the **PROC** Tab to display the Airport Procedures Screen.
- 5) Scroll the list, if necessary, and touch an approach selection button. The Approach Selection Screen is displayed on the Touchscreen Controller for the selected approach.
- 6) Touch the **Preview** Button, then the **Show on Map** Button to show the preview of the approach.
- 7) Edit the approach, if required.
- 8) Touch the **Load** Button to insert the approach into the active flight plan.

ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Screen.

Activating a previously loaded approach using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Approach** Button to activate the approach.

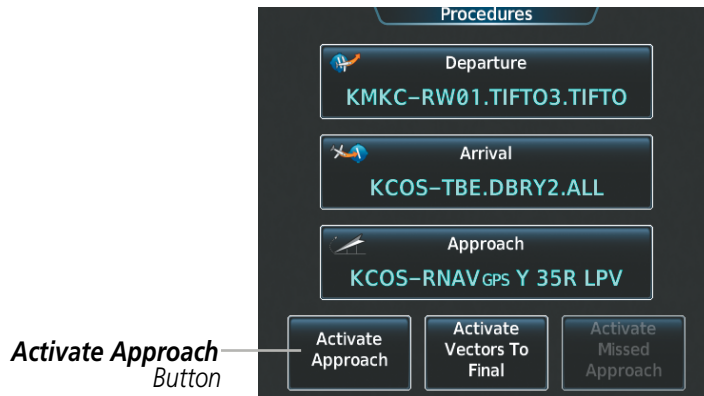


Figure 5-139 Activating an Approach on the Touchscreen Controller

In many cases, it may be easiest to “load” the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, select ‘Activate Vector-To-Final’, which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Vectors To Final** Button to activate vectors to final.

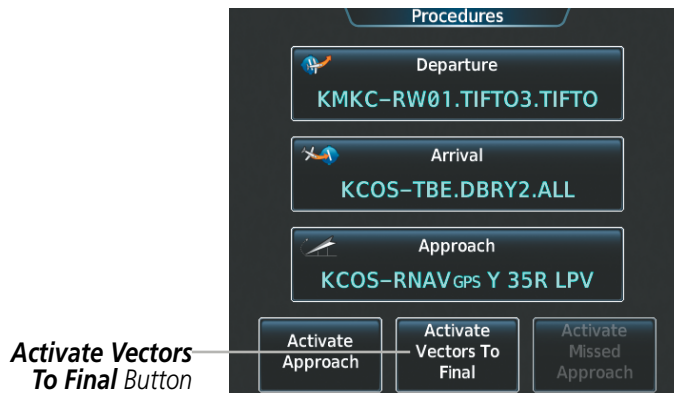


Figure 5-140 Activating Vectors to Final on the Touchscreen Controller

REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

Removing an approach from the active flight plan using the Touchscreen Controller:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Approach** Button to display the Approach Selection Screen.
- 3) Touch the **Remove** Button. A ‘Remove approach?’ window is displayed.
- 4) Touch the **OK** Button. The approach is removed from the active flight plan. To cancel the request, touch the **Cancel** Button.

MISSED APPROACH

Activating a missed approach in the active flight plan:

- 1) From **Home**, touch **PROC**
- 2) Touch the **Activate Missed Approach** Button to activate the missed approach. The aircraft automatically sequences to the MAHP.

Or:

Press the Go-Around Button.

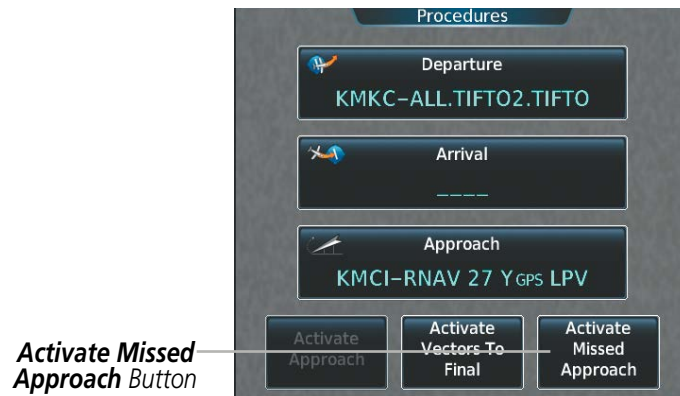


Figure 5-141 Activating a Missed Approach on the Touchscreen Controller

TEMPERATURE COMPENSATED ALTITUDE

A temperature compensated altitude can be computed and used at the FAF of a loaded approach. A temperature compensated altitude is displayed with a snowflake (❄️) icon.

Enabling temperature compensated altitude:

- 1) From **Home**, touch **Flight Plan > Flight Plan Options**.
- 2) Touch the **Temp Compensation** Button to display the Temp Compensation Screen.
- 3) Touch the **Temp Compensation** Annunciator Button to enable/disable temperature compensation.
- 4) Touch the **<airport> Temp** Button to display the numeric keypad. Use the keypad and the **Enter** Button to select the temperature at the **<airport>**. The compensated altitude is computed and shown in the flight plan.

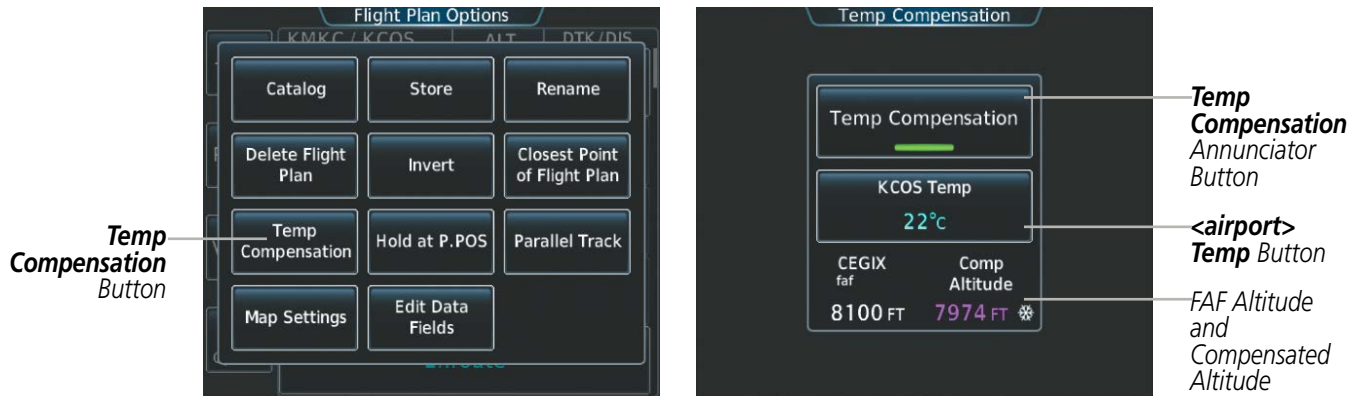


Figure 5-142 Flight Plan Options Screen - Temperature Compensation

COURSE TO ALTITUDE

In this missed approach procedure, the altitude immediately following the MAP (in this case '1426ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the required altitude required to safely make the first turn toward the MAHP is exceeded. In this case, if the aircraft altitude is below the specified altitude (1,426 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 1,426 feet reached. After reaching 1,426 feet, a direct-to is established to the published MAHP (in this case LYMES). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (LYMES) to begin the missed approach procedure. The altitude constraint value defaults to 400 feet AGL when there is no Course to Altitude defined in the published procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, the procedure dictates a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would be appear in the list of waypoints as '5500ft'. Again, if the aircraft altitude is lower than the prescribed altitude, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.



Figure 5-143 Course to Altitude

5.9 TRIP PLANNING

The system allows the pilot to enter values for weight and fuel planning. The pilot can also view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data.

WEIGHT AND FUEL

Weight planning is done on the Weight and Fuel Screen by entering data on each of the tabs. The basic operating weight is shown on the Operating Weight Tab and is calculated by adding the basic empty weight to the pilot and stores weight.



Figure 5-159 Weight and Fuel Screen - Operating Weight Tab

Calculating basic operating weight:

- 1) From **Home**, touch **Utilities** > **Weight and Fuel**.
- 2) Touch the **Set Empty Weight** Button to display the keypad.
- 3) Use the keypad to enter the basic empty weight.
- 4) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 5) Touch the **Pilot(s) & Stores** weight button to display the keypad.
- 6) Use the keypad to enter the pilot and stores weight.
- 7) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Total passenger weight is calculated by multiplying the number of passengers by the average passenger weight. Zero Fuel Weight is calculated by adding the basic operating weight, total passenger weight, and cargo weight.



Figure 5-160 Weight and Fuel Screen - Payload Tab

Calculating zero fuel weight:

- 1) From **Home**, touch **Utilities** > **Weight and Fuel**.
- 2) Touch the **Payload** Tab to display the zero fuel weight calculation.
- 3) Touch the number of passengers button to display the keypad.
- 4) Use the keypad to enter the number of passengers.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 6) Touch the average passenger weight button to display the keypad.
- 7) Use the keypad to enter the average passenger weight.
- 8) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.
- 9) Touch the cargo weight button to display the keypad.
- 10) Use the keypad to enter the cargo weight.
- 11) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Aircraft weight is calculated by adding the zero fuel weight to the fuel on board weight. Both the fuel on board and aircraft weight decrement as fuel is burned, providing the current value for each.

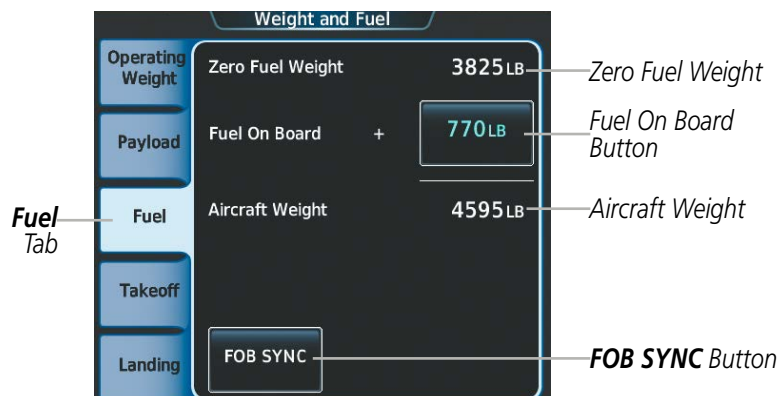


Figure 5-161 Weight and Fuel Screen - Fuel Tab

Calculating aircraft weight:

- 1) From **Home**, touch **Utilities** > **Weight and Fuel**.
- 2) Touch the **Fuel** Tab to display the aircraft weight calculation.
- 3) Touch the fuel on board button to display the keypad.
- 4) Use the keypad to enter the fuel on board.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

Or:

- 1) From **Home**, touch **Utilities** > **Weight and Fuel**.
- 2) Touch the **Fuel** Tab to display the aircraft weight calculation.
- 3) Touch the **FOB SYNC** Button to insert the fuel weight from the fuel sensors.

Ramp weight is calculated by adding the zero fuel weight to the initialized fuel on board weight. Takeoff weight is calculated by subtracting the taxi fuel weight from the ramp weight.

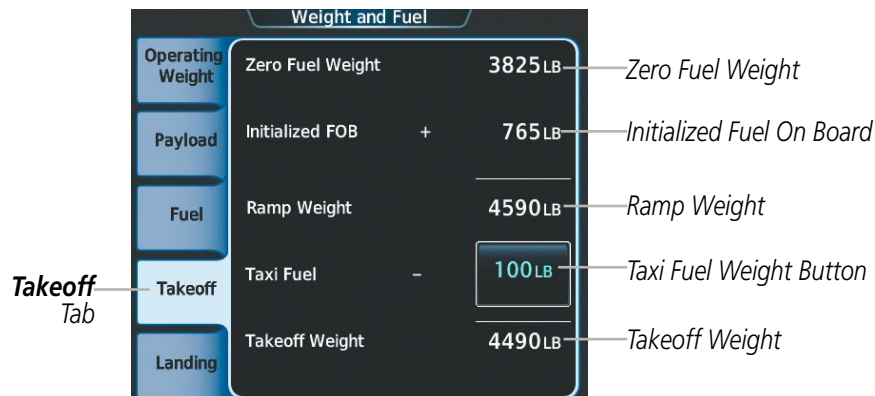


Figure 5-162 Weight and Fuel Screen - Takeoff Tab

Calculating takeoff weight:

- 1) From **Home**, touch **Utilities** > **Weight and Fuel**.
- 2) Touch the **Takeoff** Tab to display the takeoff weight calculation.
- 3) Touch the taxi fuel weight button to display the keypad.
- 4) Use the keypad to enter the taxi fuel weight.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

When the aircraft is in the air and a destination waypoint has been entered, the fuel calculations can be completed.

- Estimated landing weight = zero fuel weight + estimated landing fuel weight.
- Estimated landing fuel weight = fuel on board weight - (fuel flow x ETE)
- Excess fuel weight = estimated landing fuel weight - fuel reserves weight

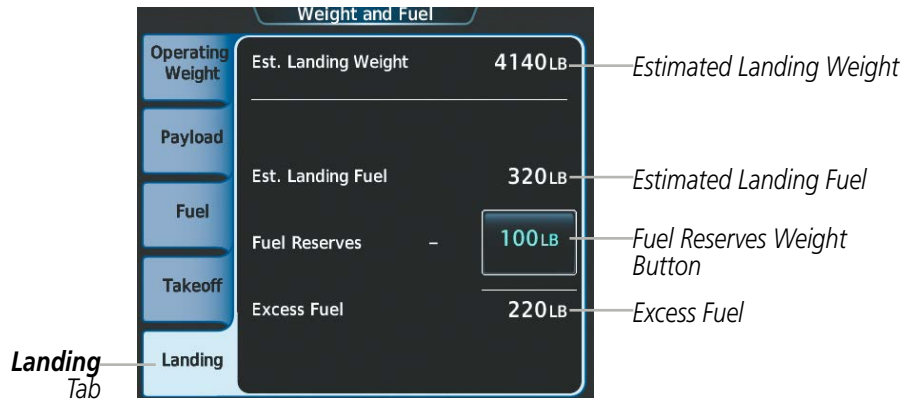


Figure 5-163 Weight and Fuel Screen - Landing Tab

If the aircraft is on the ground or a destination waypoint has not been entered, the following fields display invalid values consisting of four dashes:

- Estimated landing weight
- Estimated landing fuel weight
- Excess fuel weight

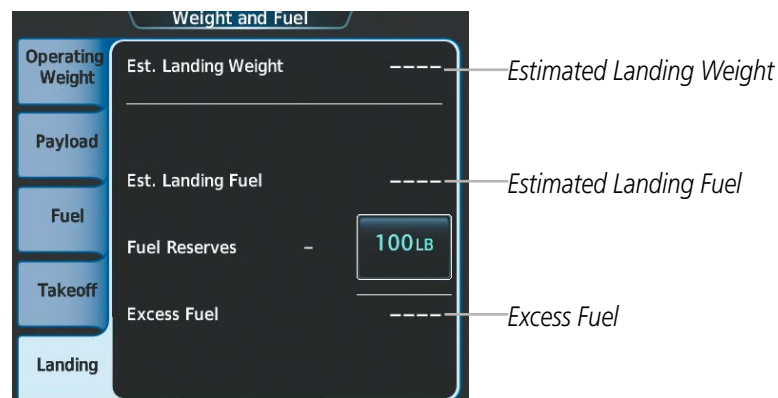


Figure 5-164 Weight and Fuel Screen - Landing Tab with Invalid Fields

Entering fuel reserve:

- 1) From **Home**, touch **Utilities > Weight and Fuel**.
- 2) Touch the **Landing** Tab to display the landing weight and fuel calculations.
- 3) Touch the fuel reserves weight button to display the keypad.
- 4) Use the keypad to enter the fuel reserves weight.
- 5) Touch the **Enter** Button to accept the entry, and return to the Weight and Fuel Screen.

WEIGHT CAUTION AND WARNING CONDITIONS

If the zero fuel weight is greater than the maximum allowable zero fuel weight, then the zero fuel weight is displayed in amber.

If the aircraft weight is greater than the maximum allowable takeoff weight, then the takeoff weight is displayed in amber.

If the estimated landing weight is greater than the maximum allowable landing weight, then the estimated landing weight is displayed in amber.

If the estimated landing fuel weight is positive, but less than or equal to the fuel reserves weight, the following values are displayed in amber:

- Estimated landing fuel weight
- Excess fuel weight

If the estimated landing fuel weight is zero or negative, then the following values are displayed in red:

- Estimated landing fuel weight
- Excess fuel weight

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Screen on the Touchscreen Controller. To access the Trip Planning Screen, start at **Home**, touch **Utilities**, then **Weight and Fuel**.



Figure 5-144 Trip Planning Screen - Manual Mode

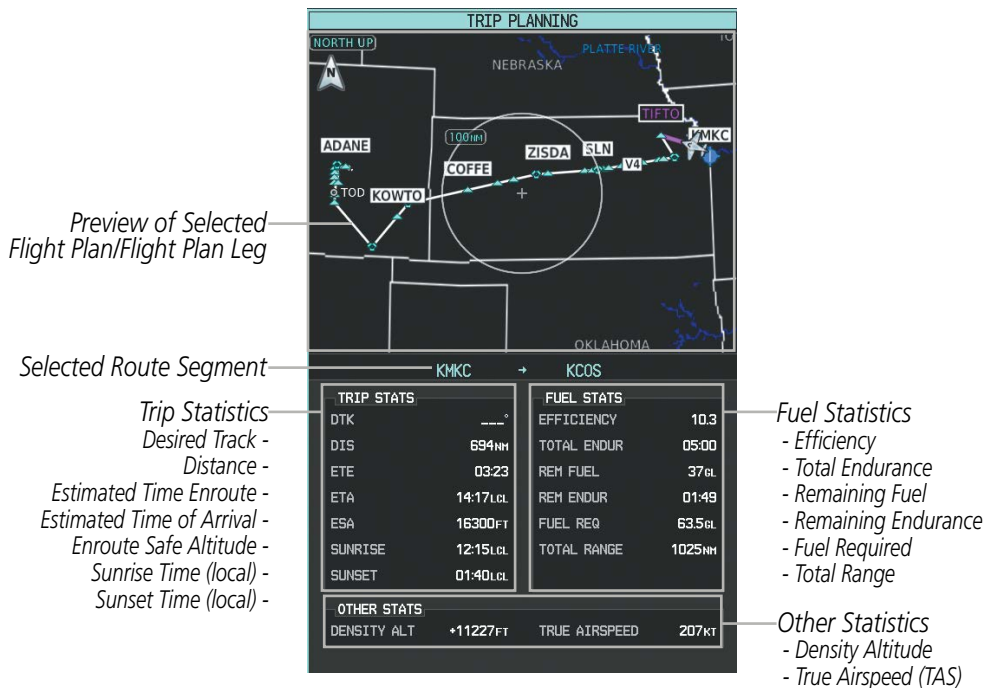






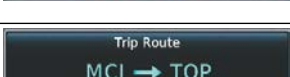
Figure 5-145 Trip Planning Display

The trip planning inputs are based on sensor inputs (automatic mode) or on pilot inputs (manual entry mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (Depart Time) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.
- Calibrated airspeed (Cal Airspeed) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (Indicated Alt) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the trip route selected and the trip planning inputs.

Trip Route Mode	Trip Route Button	Description
Stored Flight Plan - Cumulative Mode		Waypoints are the starting and ending waypoints of the selected flight plan.
Stored Flight Plan - Leg Mode		Waypoints are the endpoints of the selected leg.
Active Flight Plan - Remaining Mode		The 'from' waypoint is the present position of the aircraft or a selected waypoint, and the 'to' waypoint is the endpoint of the active flight plan.
Active Flight Plan - Leg Mode		The 'from' waypoint is the present position of the aircraft or a selected waypoint, and the 'to' waypoint is the endpoint of the selected leg.
Waypoint Mode		Manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes and is the local time at the destination.
 - If in waypoint mode then the ETA is the ETE added to the departure time.
 - If a stored flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
 - If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes and are the local time at the destination.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

Selecting the Stored Flight Plan - Cumulative trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Cumulative Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Stored Flight Plan - Leg trip route mode:

- 1) From **Home**, touch **Utilities > Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch a stored flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Remaining trip route mode:

- 1) From **Home**, touch **Utilities** > **Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Touch the **Remaining Flight Plan** Button to select the mode and return to the Trip Planning Screen.

Selecting the Active Flight Plan - Leg trip route mode:

- 1) From **Home**, touch **Utilities** > **Trip Planning**
- 2) Touch the **Trip Route** Button to display the Input Selection Window.
- 3) Touch the **Select from Flight Plan** Button to display the Select Flight Plan Screen.
- 4) Scroll the list, if necessary, and touch the active flight plan button to display the Select Flight Plan Leg Screen.
- 5) Scroll the list, if necessary, and touch a flight plan leg selection button to select the mode and return to the Trip Planning Screen.

Selecting the waypoints trip route mode:

- 1) From **Home**, touch **Utilities** > **Trip Planning**
 - 2) Touch the **Trip Route** Button to display the Input Selection Window.
 - 3) Touch the **Select Starting and Ending Waypoints** Button to display the Select Starting and Ending Locations Window.
 - 4) Touch the starting waypoint button to display the Select Starting Location Window.
 - 5) Touch the **Present Position** Button to use the present position of the aircraft and return to the Select Starting and Ending Locations Window.
- Or:**
- 6) Touch the **Waypoint** Button to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
 - 7) Touch the ending waypoint button to select a waypoint using the keypad and return to the Select Starting and Ending Locations Window.
 - 8) Touch the **Accept** Button to select the mode and return to the Trip Planning Screen.

When the manual entry mode is selected, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

- 1) From **Home**, touch **Utilities** > **Trip Planning**
- 2) Touch the **Manual Entry** Button to enable the manual entry data field buttons.
- 3) Touch an input data field button and use the keypad to select the value.
- 4) Touch the **Enter** Button to accept the value and return to the Trip Planning Screen.
- 5) Repeat steps 3 and 4 for each of the data fields.

5.10 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the SBAS capable GPS system while the system provides vertical guidance through descents. A lateral flight plan (LNAV) would be navigated in much the same way, but would not include vertical guidance when the final approach course is active.



NOTE: The following example flight plan is for instructional purposes only. All database information depicted should be considered not current.

The example is a flight plan from KMKC to KCOS filed using the TIFTO3 departure, various Victor Airways, and the DBRY2 arrival with the transition at TBE. The flight plan includes an enroute altitude of 12,000 feet, an LPV (WAAS) approach selected for runway 35R, and a missed approach executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.

- 1) Prior to departure, the TIFTO3 departure, the airways, and the DBRY2 arrival at KCOS are loaded. See the Procedures section for loading departures and arrivals. Note the magenta arrow in Figure 5-146 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

- 2) Figure 5-146 shows the aircraft on the assigned heading of 240°. 'TERM' (Terminal) is the current CDI flight phase displayed on the HSI indicating 1.0 nm CDI scaling.

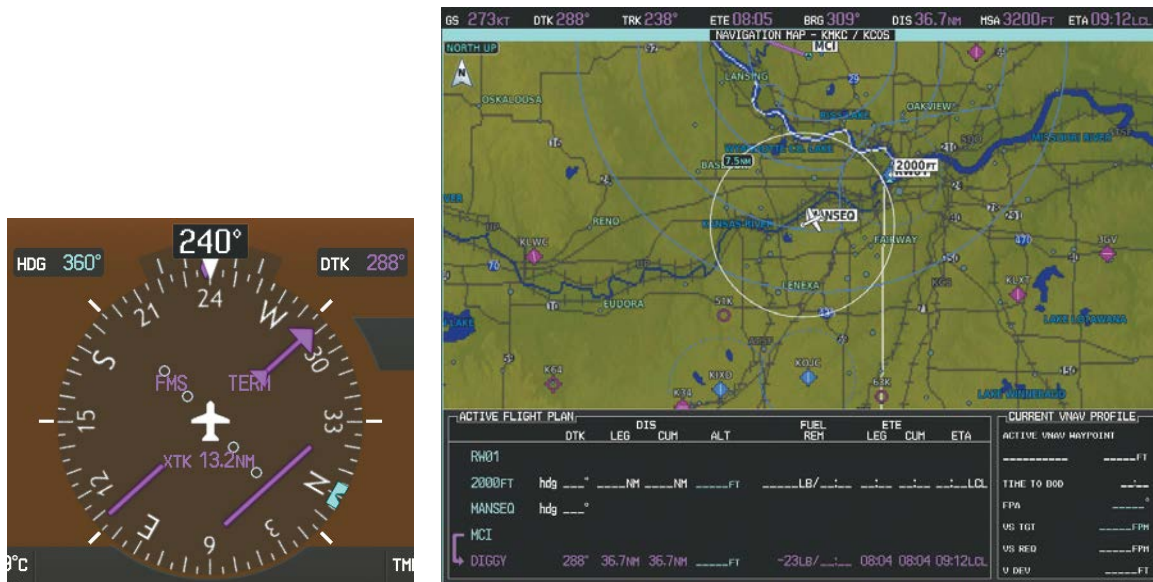


Figure 5-146 Assigned Heading of 240°

- 3) ATC now assigns routing to join V4. A heading of 290° is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-147.

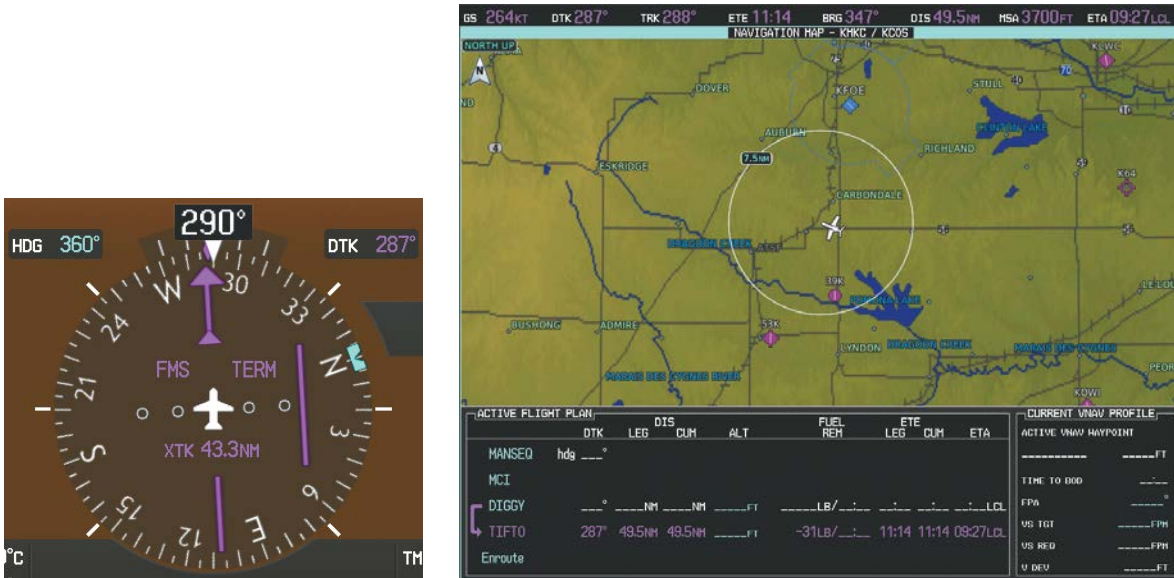


Figure 5-147 Assigned Heading of 290°

- 4) Enter V4 into the flight plan.
 - a) From **Home** on the Touchscreen Controller, touch the **Flight Plan** Button to display the Active Flight Plan Screen as shown in Figure 5-148.



Figure 5-148 Begin Adding V4 to the Active Flight Plan

b) The desired entry point for V4 (TOP) must be entered. Touch the desired waypoint selection button (SLN) shown in Figure 5-149 to display the Waypoint Options Window.

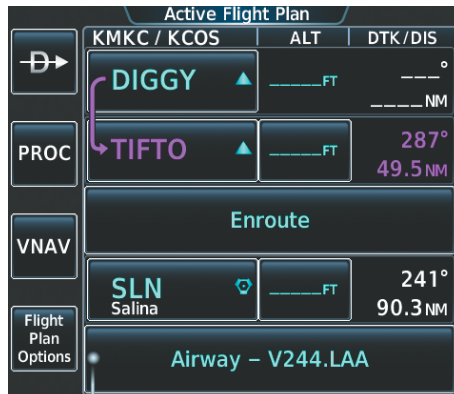


Figure 5-149 Selecting the Insertion Point

c) Touch the **Insert Before** Button shown in Figure 5-150 to display the keypad.



Figure 5-150 Entering V4 Entry Point

d) Use the keypad to select the desired entry point for V4, Topeka VOR (TOP), as shown in Figure 5-151.



Figure 5-151 Selecting V4 Entry Point

e) Touch the **Enter** Button. TOP is inserted into the flight plan as in Figure 5-152.

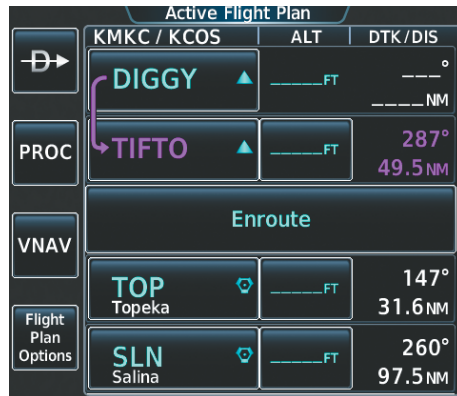


Figure 5-152 TOP Inserted into the Flight Plan

f) Touch the desired waypoint selection button (TOP) to display the Waypoint Options Window (Figure 5-153).

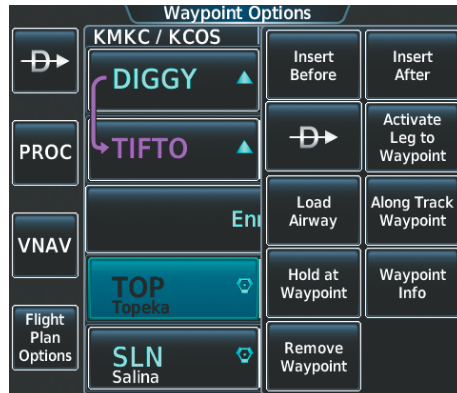


Figure 153 Begin Selecting the Airway

g) Touch the **Load Airway** Button to display the list of available airways for TOP as seen in Figure 5-154.



Figure 5-154 List of Available Airways for TOP

- h) Touch the **V4** Button to select the airway, and to display the list of available exit points for V4. Scroll the list to find SLN (Figure 5-155).

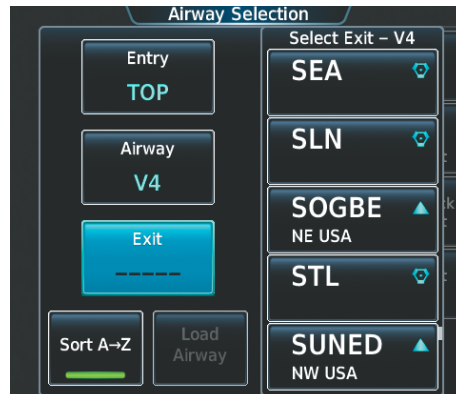


Figure 5-155 List of Available Exits for V4

- i) Touch the **SLN** Button to select the Salina VOR (SLN). The selected airway entry, exit, and waypoint sequence are displayed as shown in Figure 5-156.

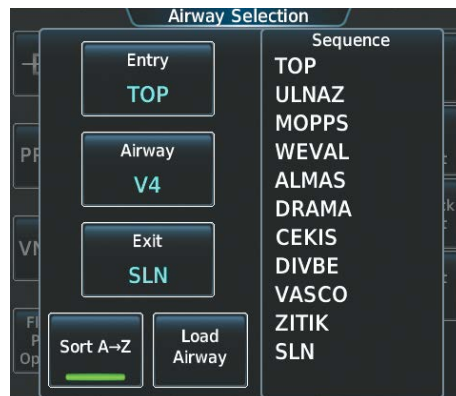


Figure 5-156 Ready to Load V4

- j) Touch the **Load Airway** Button. V4 is loaded into the Active Flight Plan.

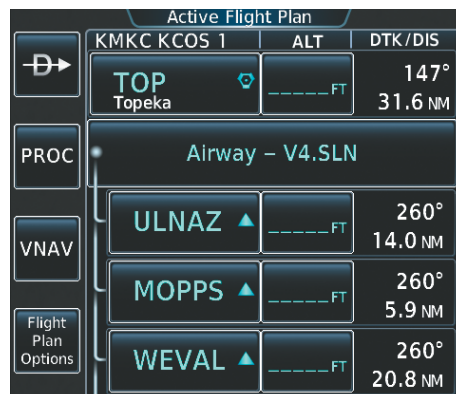


Figure 5-157 V4 Loaded

- 5) Making V4 the active leg of the flight plan.
 - a) Touch the **ULNAZ** Button to display the Waypoint Options Window as shown in Figure 5-158.

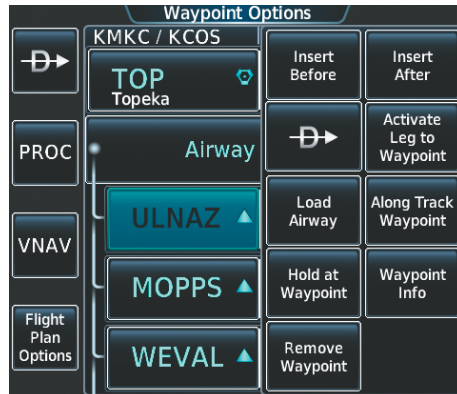


Figure 5-158 Activating V4 Leg

- b) Touch the **Activate Leg to Waypoint** Button. The confirmation window is now displayed as in Figure 5-159.



Figure 5-159 Confirm Active Leg

- c) Touch the **OK** Button to activate the leg (Figure 5-160).

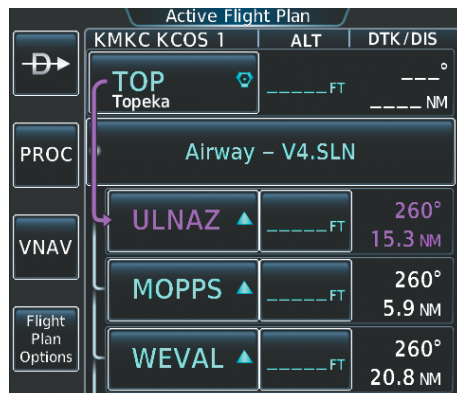


Figure 5-160 V4 Leg is Active

d) Note in Figure 5-161, the magenta arrow in the flight plan window and magenta line on the map indicating V4 is now the active flight plan leg. Note the phase of flight remained in Terminal (TERM) mode up to this point because a departure leg was active. Since a leg after the departure is now active, the current CDI flight phase is ENR (Enroute) and CDI scaling has changed to 2.0 nm.



Figure 5-161 V4 Now Active Leg

6) The aircraft continues on heading 290°. When crosstrack distance is less than 2.0 nm, the XTK disappears from the HSI and the CDI is positioned on the last dot indicating a 2.0 nm distance from the centerline of the next course.

- 7) As the CDI approaches center, the aircraft turns onto the active leg as seen in Figure 5-162.



Figure 5-162 Turn on to Active Leg

- 8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-163.



Figure 5-163 Turn to Intercept V244

9) As seen in Figure 5-164, V244 is now the active flight plan leg.



Figure 5-164 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-165.

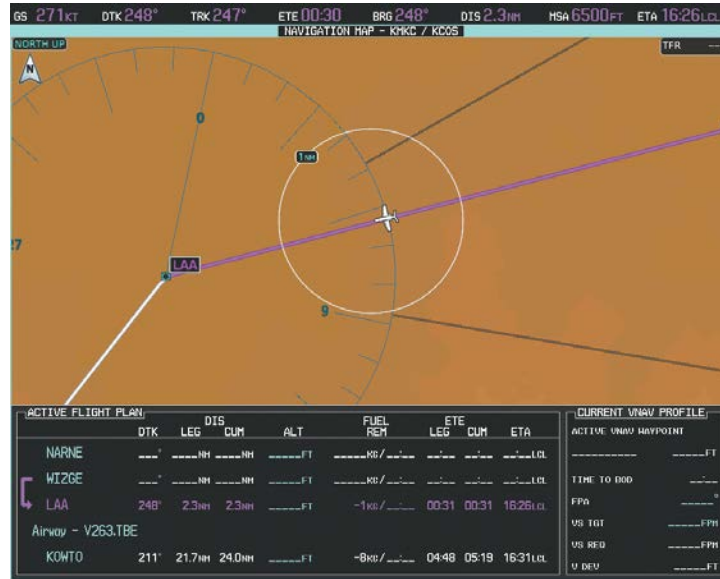


Figure 5-165 WIZGE to LAA Leg Active

11) ATC grants clearance to proceed direct to the OPSHN intersection to begin the arrival procedure. ATC advises to expect an altitude of 10,000 feet at OPSHN.

- a) From **Home**, touch the **Direct To** Button.
- b) Touch the **Flight Plan** Tab, and scroll the list to find OPSHN.
- c) Touch the **OPSHN** Button. The Direct To Screen is now displayed as shown in Figure 5-166.

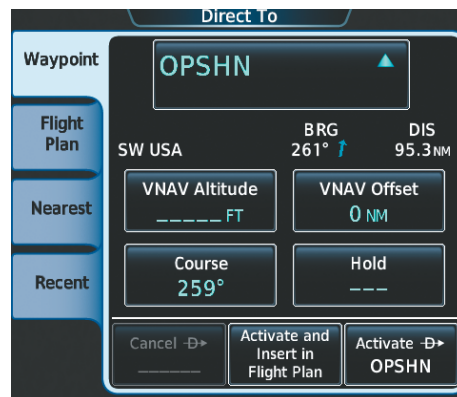


Figure 5-166 Direct To OPSHN

d) Touch the **VNAV Altitude** Button to display the keypad to select the VNAV altitude as shown in Figure 5-167.



Figure 5-167 Enter VNAV Altitude

e) An altitude of 10,000 feet is selected as requested by ATC.

f) Touch the **Enter** Button to accept the altitude value and return to the Direct To Screen.

g) Touch the **VNAV Offset** Button to display the keypad to select the offset distance as shown in Figure 5-168.



Figure 5-168 Enter VNAV Offset Distance

h) An offset, or distance from the waypoint at which to reach the selected altitude of three miles prior to OPSHN is selected. In other words, the system gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPSHN.

i) Touch the **Enter** Button to accept the offset distance and return to the Direct To Screen.

j) Press the **Activate** → **OPSHN** Button to activate the direct to.

Note, in Figure 5-169, the magenta arrow indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that were previously entered. The remaining waypoints in the loaded arrival procedure have no database specified altitudes, therefore, dashes are displayed. Keep the CDI centered and maintain a track along the magenta line to OPSHN.

Note the Direct-to waypoint is within the loaded arrival procedure, therefore, phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

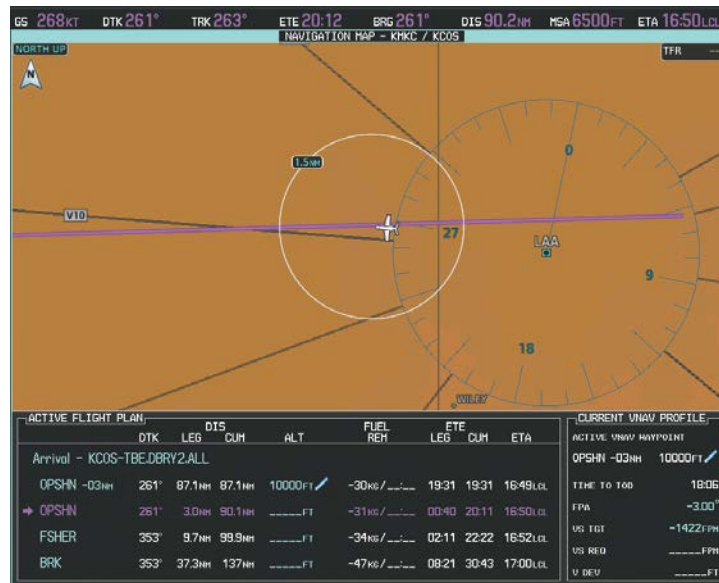


Figure 5-169 Direct To Active

12) The aircraft is proceeding to OPSHN. The expected approach is the RNAV LPV approach to runway 35R, so it is selected.

a) From **Home**, touch the **PROC** Button. to display the Procedures Screen (Figure 5-170).



Figure 5-170 Procedures Screen

b) Touch the **Approach** Button to display the Approach Selection Screen with KCOS selected as the destination airport as shown in Figure 5-171.

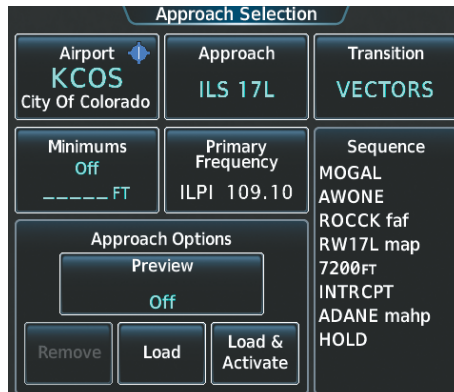


Figure 5-171 Approach Selection Screen

c) Touch the **Approach** Button. A list of available approaches for the destination airport is displayed as in Figure 5-172.



Figure 5-172 List of Available Approaches

d) Scroll the list to select the LPV approach for 35R as shown in Figure 5-173.



Figure 5-173 RNAV 35R LPV Approach Shown

- e) Touch the **RNAV GPS Y 35R LPV** Button. A list of available transitions for the selected approach is displayed as in Figure 5-174.



Figure 5-174 Select Transition Screen - List of Available Transitions

- f) Touch the **HABUK iaf** Button to select it as the transition and return to the Approach Selection Screen as shown in Figure 5-175.

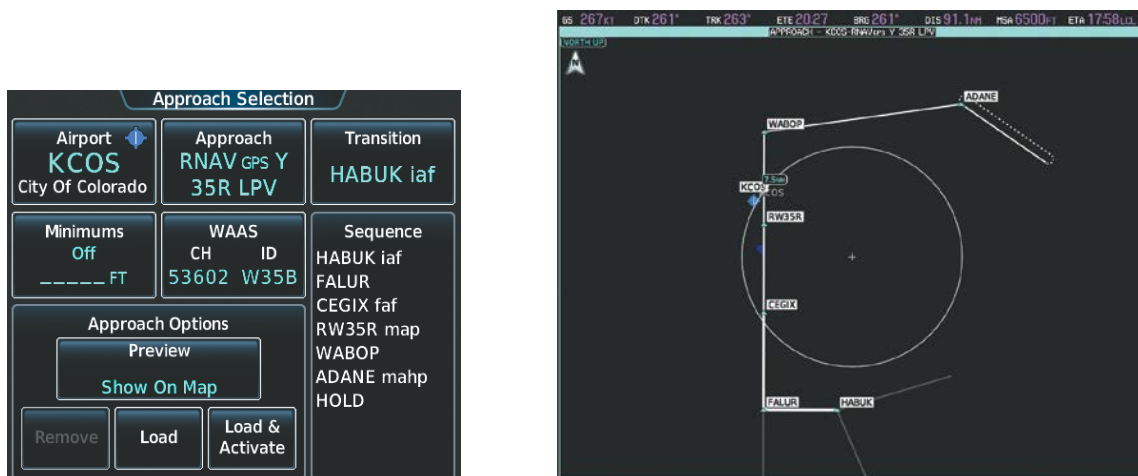


Figure 5-175 Approach Selected

- g) If necessary, touch the **Minimums** Button to select the minimum descent altitude (Figure 5-176). Touch the **Minimums** Button again, if necessary, then touch the **Baro** Button. Select the altitude using the keypad.



Figure 5-176 Selecting the Minimums

- h) If necessary, touch the **Enter** Button to accept the minimum descent altitude and return to the Approach Selection Screen (Figure 5-177).

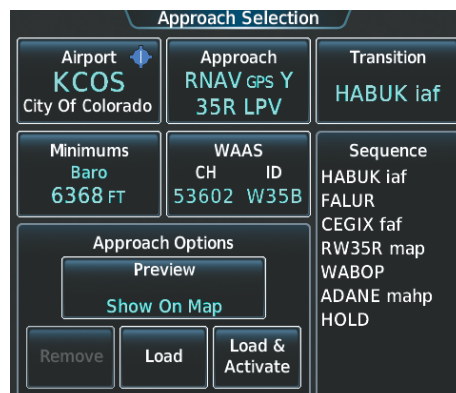


Figure 5-177 Minimums Set

i) Touch the **Load** Button. The selected approach is added to the flight plan as seen in Figure 5-178.



Figure 5-178 Loaded Approach

- 13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-179. The altitudes loaded from the database are displayed as light blue text, indicating these values are “designated” for use in computing vertical deviation guidance.

Note: To no longer use the displayed altitude for calculating vertical deviation guidance, perform the following:

- a) Touch the altitude button (e.g. 8100FT).
- b) Touch the **Remove VNAV ALT** Button.
- c) Touch the **OK** Button in response to the “Remove VNAV altitude?” prompt.

After making the altitude “non-designated”, it is displayed as white text (Figure 5-180).

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-178. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the WAAS GPS altitude source, therefore, the displayed altitude values are for reference only.



Figure 5-179 FALUR Designated for Vertical Guidance



Figure 5-180 FALUR Not Designated for Vertical Guidance

14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -3.0 degrees and a required vertical speed is computed to maintain the -3.0 FPA. To change the vertical flight path, perform the following steps.

- a) From **Home**, touch **Flight Plan** > **VNAV** to display the VNAV Profile Screen as shown in Figure 5-181.
- b) Touch the **Vertical Speed Target** Button to adjust the vertical speed, or touch the **Flight Path Angle** Button to adjust the FPA. Touching either button will display the keypad to select the desired value.

Note the information now displayed in the 'CURRENT VNAV PROFILE' box (Figure 5-182). Also, note the offset waypoint (orange box) and gray circle are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, vertical guidance is provided at the TOD that results in a -2.5 degree FPA descent to an altitude of 10,000 feet upon reaching the offset waypoint.

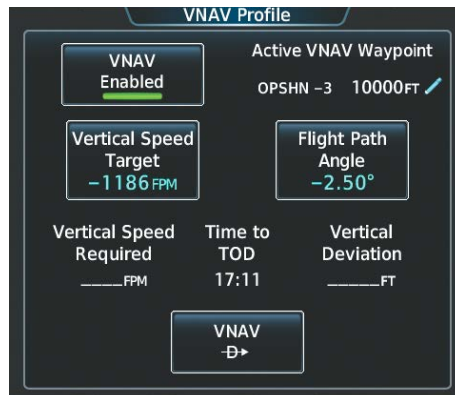


Figure 5-181 Adjusting the Descent

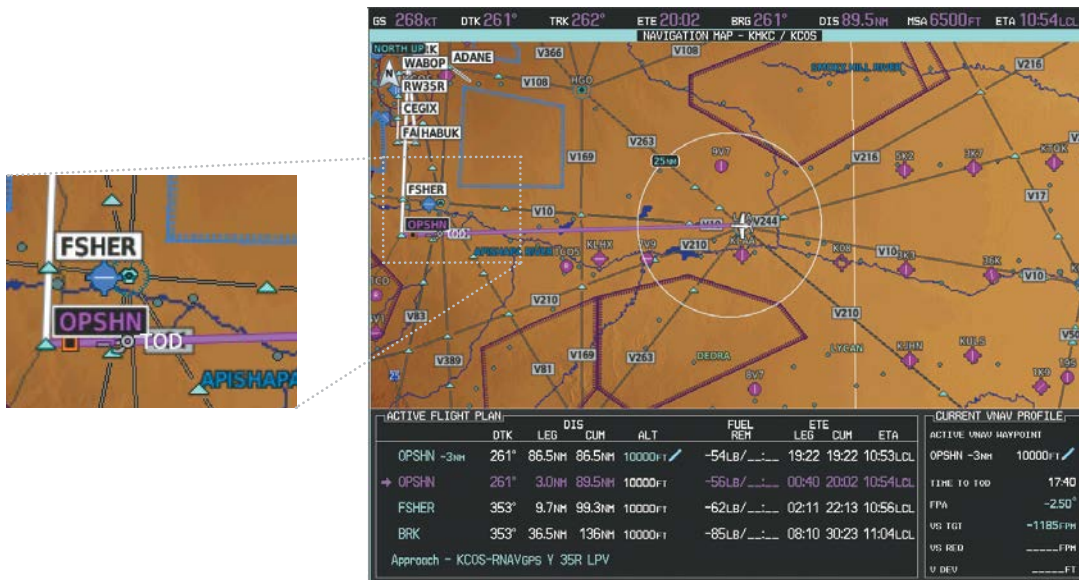


Figure 5-182 Adjusting the Descent

- c) Touch the **Enter** Button to accept the selected value.

- 15) As seen in Figure 5-183, the aircraft is approaching TOD. Note the target vertical speed required to reach the selected altitude. The Vertical Deviation Indicator (VDI) and the Required Vertical Speed Indicator (RVS) are now displayed on the PFD as shown in Figure 5-184. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-184, and an aural alert 'Vertical track' will be heard.

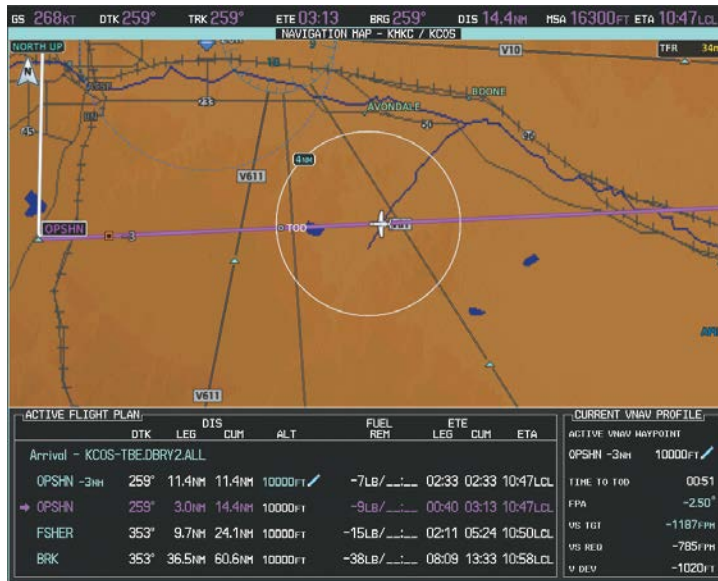


Figure 5-183 Approaching Top of Descent (TOD)

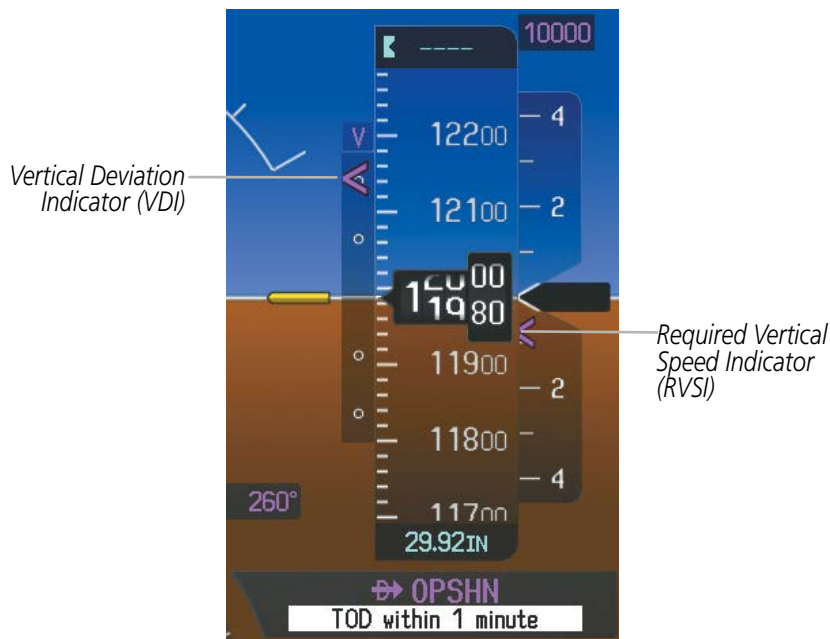


Figure 5-184 VDI & RVS Upon Reaching Top of Descent (TOD)

- 16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-185 .

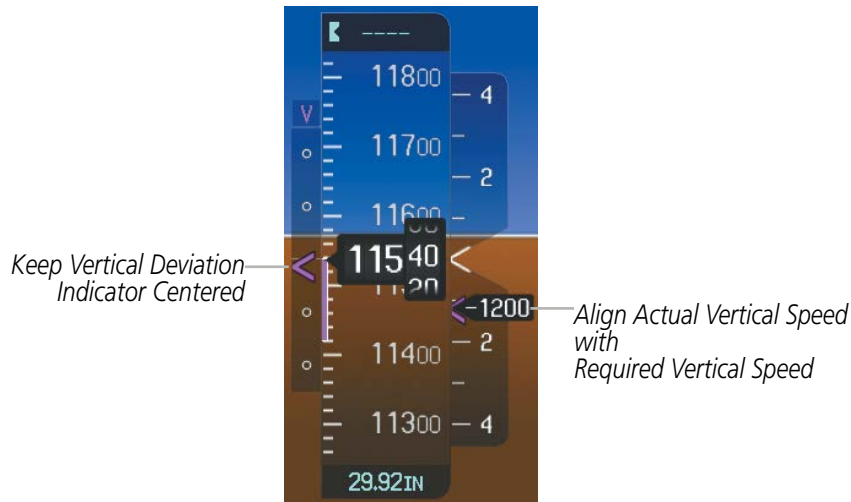


Figure 5-185 VDI & RVSI Showing Correctly Established Descent

- 17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-186. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

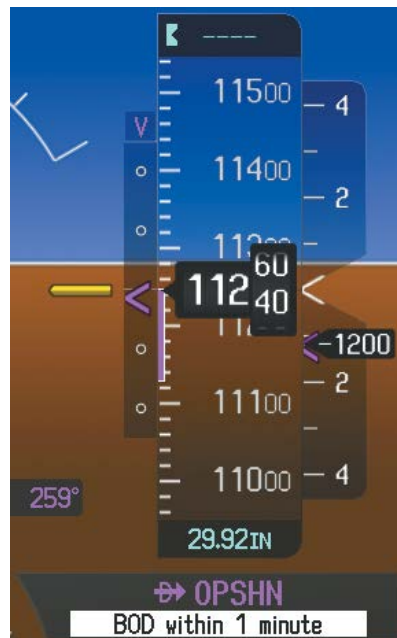


Figure 5-186 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

- 18) The aircraft is approaching OPSHN. The upcoming turn and next heading are annunciated on the PFD as seen in Figure 5-187. Initiate the turn and maneuver the aircraft on a track through the turn radius to intercept the magenta line for the OPSHN to FSHER leg and center the CDI.



Figure 5-187 Turn to intercept OPSHN to FSHER Leg

- 19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-188. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.



Figure 5-188 Tracking the OPSHN to FSHER Leg

- 20) The flight continues through the arrival procedure to FSHER (see Figure 5-189). At a point 31 nm from the destination airport, the phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

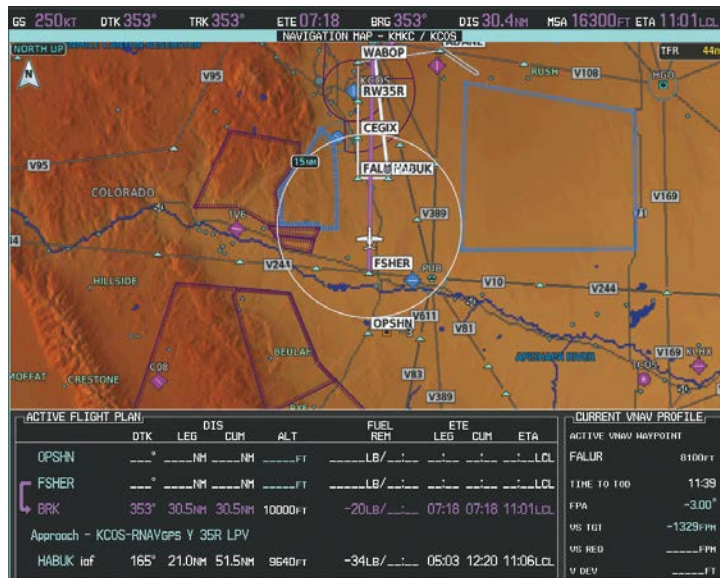


Figure 5-189 Awaiting Vectors to Final

After FSHER, you receive a radar vector to the final approach. Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.

21) Establish the course provided. When the course is established, activate Vectors To Final.

- a) From **Home**, touch **PROC**.
- b) Touch the **Activate Vectors to Final** Button.



Figure 5-190 Activating Vectors To Final

c) The active leg is now the established course direct to CEGIX faf (see Figure 5-191). The flight phase changes to LPV on the HSI indicating the current phase of flight is in Approach Mode and the approach type is LPV. CDI scaling changes accordingly and is used much like a localizer when flying an ILS approach. The RVSI is no longer displayed and the VDI changes to the Glidepath Indicator (as shown in Figure 5-190) when the final approach course becomes active.

The descent continues through the FAF (CEGIX) using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude "AT" 8,100 feet at the FAF. Note the altitude restriction lines over and under (At) the altitude in the 'ALT' field in Figure 5-191.

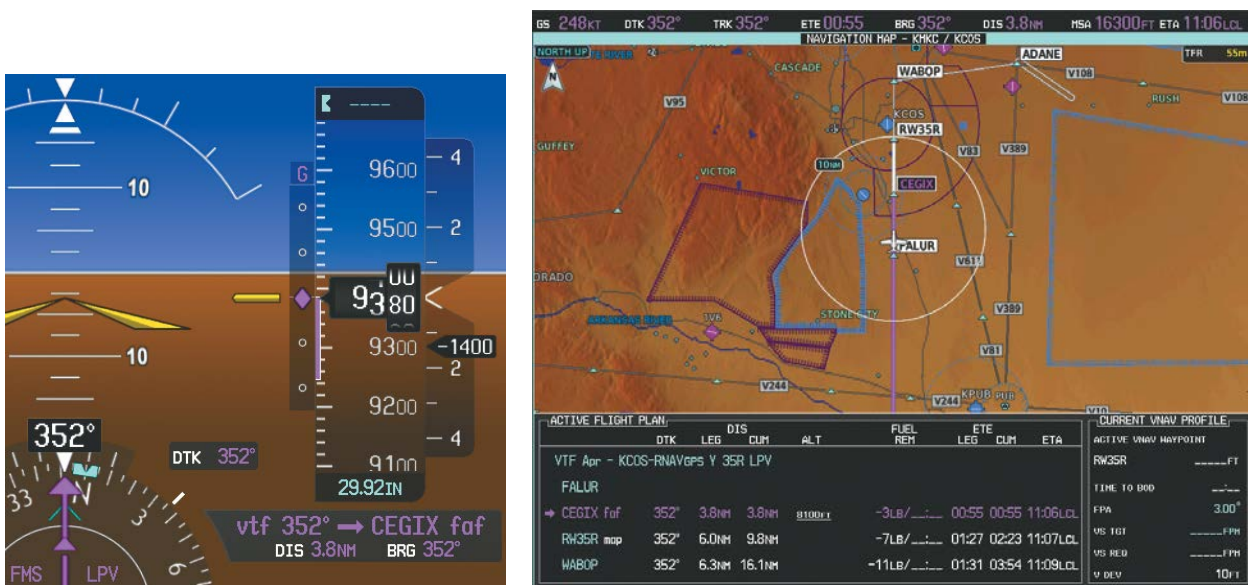


Figure 5-191 Vectors To Final Approach is Now Active

Note: In circumstances where it is required to manually activate the approach procedure, perform the following steps:

a) From **Home**, touch **PROC**.

b) Touch the **Activate Approach** Button (see Figure 5-190).

22) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-192.

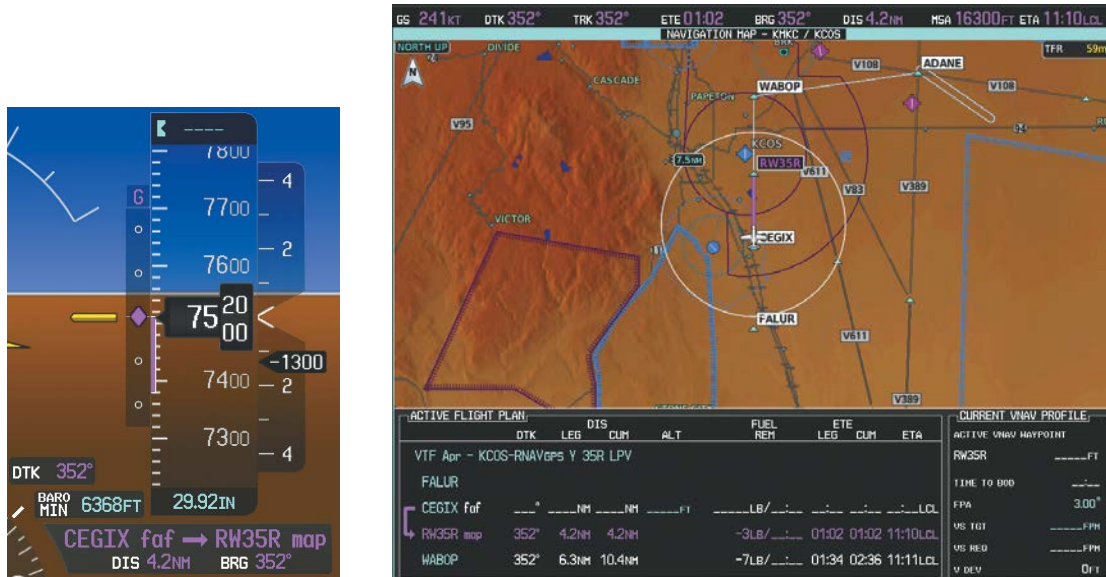


Figure 5-192 Descending to the Missed Approach Point

- 23) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Select the **SUSP** Softkey on the PFD to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to WABOP. The aircraft is climbing to reach 9,000 feet at the Missed Approach Hold Point (MAHP). The CDI flight phase now changes from LPV to MAPR as seen on the HSI.

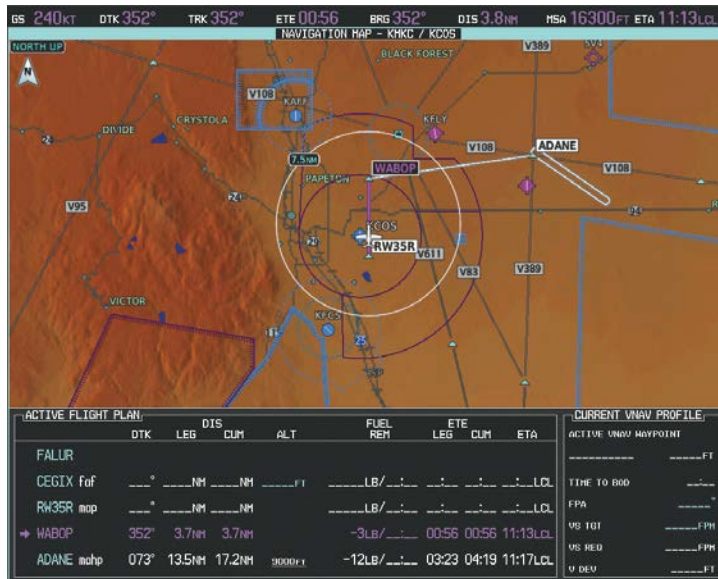


Figure 5-193 Missed Approach Active

- 24) The aircraft continues climbing to "AT or ABOVE" 9,000 feet at ADANE. A holding pattern is established at the MAHP (ADANE) as shown in Figure 5-194.



Figure 5-194 Establishing the Holding Pattern

- 25) The aircraft maintains 9,000 feet while following the magenta line through the hold as in Figure 5-195.



Figure 5-195 Hold Established

5.11 ABNORMAL OPERATION

This section discusses the Dead Reckoning mode of operation and the subsequent indications.



NOTE: *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the system stops using GPS.*

While in Enroute or Oceanic phase of flight, if the system detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the system uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the system in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the system through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/SBAS Mode due to the lack of satellite measurements needed to determine a position. Changes in wind speed and/or wind direction compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the system by the the letters 'DR' prominently displayed in yellow on the HSI below and to the left of the aircraft symbol on the CDI as shown in Figure 5-196. The CDI deviation bar is removed. Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the GTC. Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as yellow text on the display to denote degraded navigation source information.

Also, while the system is in DR Mode, the autopilot will not be coupled. TAWS is disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.



Figure 5-196 Dead Reckoning Mode - GPS Derived Data Shown in Yellow



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

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SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the Embraer Prodigy Touch are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- GDL 69A SiriusXM Weather (Subscription Optional)
- GWX 70 Airborne Color Weather Radar

Terrain Avoidance

- Terrain Awareness and Warning System Class-A (TAWS-A)

Traffic

- ACSS TCAS 3000SP™ Traffic Alert and Collision and Avoidance System II (TCAS II)

6.1 SIRIUSXM WEATHER



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

The GDL 69/69A is a remote-mounted satellite data link receiver. It provides SiriusXM Weather data to the system. The displays show graphical weather information and the associated text. The GDL 69A can also receive SiriusXM Satellite Radio entertainment services. Both weather data and audio entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

SiriusXM services require subscriptions. For more information on specific subscription packages, visit www.siriusxm.com.

ACTIVATING SERVICES

Before SiriusXM Weather and SiriusXM Satellite Radio can be used, the services must be activated by providing SiriusXM's customer service the coded IDs unique to the installed GDL 69/69A. SiriusXM Satellite Radio (audio) and SiriusXM Weather (data) services each have coded IDs. The Data and Audio Radio IDs must be provided to activate the weather service and entertainment subscriptions, respectively. These IDs are in the following locations:

- The SiriusXM Info Screen on the Touchscreen Controller (Figure 6-1)
- The label on the back of the GDL 69/69A data link receiver
- The GDL 69/69A SiriusXM Satellite Radio Activation Instructions included with the unit.

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal to enable the system to receive weather data and/or entertainment programming.

Establishing a SiriusXM Weather Data account:

- 1) From **Home**, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the ID shown in the Data Radio Window as seen in Figure 6-1.
- 3) Contact SiriusXM customer service through the telephone number listed on its website, www.siriusxm.com. Follow the instructions provided by SiriusXM customer service.

Activating SiriusXM Weather services:

- 1) Position the aircraft so the GDL 69/69A antenna has an unobstructed view of the sky, away from buildings.
- 2) From **Home**, touch **Utilities > Setup > SiriusXM Info**.
- 3) Touch the **Start** Button in the Activation Window (Figure 6-1). The Activation Window shows 'ACTIVATING' while processing the activation.
- 4) In the Weather Products Window, scroll as needed to view available weather products. Available weather products appear as white text; unavailable weather products appear in gray (diminished) text. It may take several minutes before all subscribed-to weather products become available.

- When the available weather products match all the weather products in the SiriusXM weather subscription, touch the **Lock** Button to save the activation changes, or touch the **Cancel**, **Back**, or **Home** Buttons to exit without saving changes.

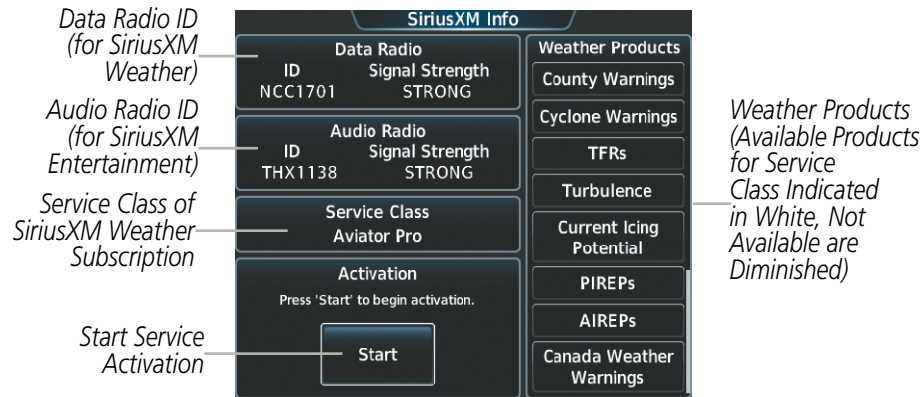


Figure 6-1 SiriusXM Info Screen

ACCESSING SIRIUSXM WEATHER PRODUCTS

The SiriusXM Weather Pane is the principal map pane for viewing SiriusXM Weather information (Figure 6-2). This is the only map pane capable of showing information for all available SiriusXM Weather products.

Viewing the SiriusXM Weather Pane:

- From Home, touch the **Weather** Button. Button is highlighted and becomes the **Weather Selection** Button. The selected pane shows a weather pane. If a weather pane other than 'SiriusXM WEATHER' is shown (such as 'WEATHER RADAR' in the pane title), continue with the procedure to view the SiriusXM Weather Pane.
- Touch the **Weather Selection** Button.
- Touch the **SiriusXM Weather** Button. Button is highlighted and becomes the **SiriusXM Settings** Button. The system shows the SiriusXM Weather Pane.

The system provides the ability to select a map orientation for the SiriusXM Weather Pane for a the selected display pane location. In addition to the Heading Up, Track Up, and North Up display options, the system can also synchronize the SiriusXM Weather Pane orientation to the Navigation Map Pane orientation.

Selecting a map orientation for the SiriusXM Weather Pane:

- From **Home**, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Weather Settings**.
- Touch the **Orientation** Button to change the selected map orientation (displayed in light blue)
- Touch the desired map orientation button (**Heading Up, Track Up, North Up, Sync To Nav Map**).



Touchscreen Controller (SiriusXM Weather Settings Screen)

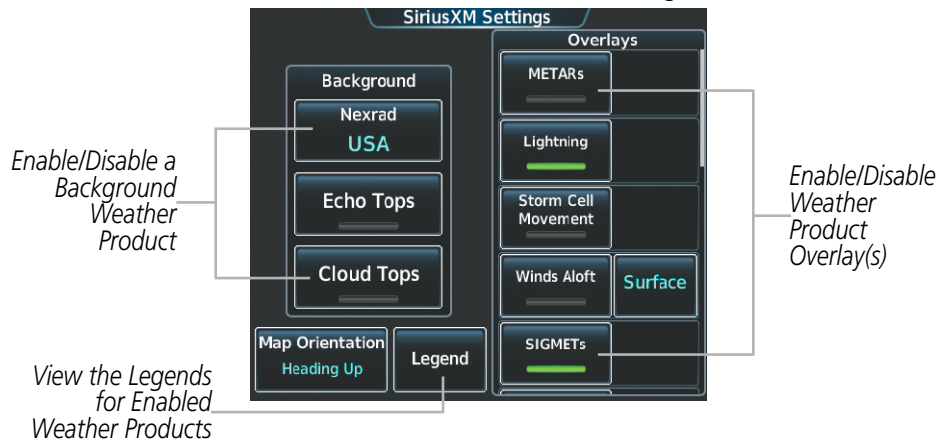


Figure 6-2 Viewing SiriusXM Weather Products on the SiriusXM Weather Pane



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

For each enabled SiriusXM Weather product, the system displays a weather product icon and product age. The product age is the elapsed time (in minutes) since the weather data provider compiled the weather product on the ground. The product age display does not indicate the age of the information contained within the weather product, which can be significantly older than the displayed weather product age.

The SiriusXM Weather service broadcasts weather products at specific intervals (defined in the **Broadcast Rate** column in Table 6-1). If for any reason, a product is not broadcast within the **Expiration Time** intervals (see Table 6-1), the system removes the expired data from the display, and shows dashes instead of the product age. This ensures the displayed information is consistent with what is currently being transmitted by the SiriusXM Weather service. If more than half of the expiration time has elapsed, the color of the product age changes to yellow. If data for a weather product is not available for any reason, the system displays 'N/A' next to the weather product symbol instead of the product age.

Table 6-1 shows the weather product symbols, the expiration times and the broadcast rates. The broadcast rate represents how often the SiriusXM Weather service transmits new signals that may or may not contain updated weather products. It does not represent the rate at which the weather information is updated or when the Data Link Receiver receives new data. SiriusXM and its weather data suppliers define and control the data update intervals, which are subject to change.
















SiriusXM Weather Product	Product Symbol	Expiration Time (Minutes)	Broadcast Rate (Minutes)
Next-generation Radar (NEXRAD)		30	5 (U.S.) 10 (Canada)
Cloud Tops		60	15
Echo Tops		30	7.5
SiriusXM Lightning		30	5
Storm Cell Movement		30	12
SIGMETs	SIGMET	60	12
AIRMETs	AIRMET	60	12
Meteorological Aerodrome Reports (METARs)		90	12
City Forecast		60	12
Surface Analysis		60	12
Freezing Levels		60	12
Winds Aloft		60	12
County Warnings		60	5
Cyclone (Hurricane) Warnings (CYCLONE)		60	12
Icing Potential (CIP and SLD)		90	22
Pilot Weather Reports (PIREPs)		90	12
Air Reports (AIREPs)		90	12
Turbulence		180	12
No Radar Coverage	no product image	30	5
Temporary Flight Restrictions (TFRs)	no product image	60	12
Terminal Aerodrome Reports (TAFs)	no product image	60	12

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

Table 6-2 shows which SiriusXM Weather products can be displayed (indicated with a '+' symbol) on specific maps.

SiriusXM Weather Product	PFD Inset Navigation Map	Navigation Map Panes	SiriusXM Weather Pane
NEXRAD	+	+	+
No Radar Coverage (Displayed with NEXRAD)	+	+	+
Cloud Tops			+
Echo Tops			+
SiriusXM Lightning	+	+	+
Storm Cell Movement	+	+	+
SIGMETs/AIRMETs			+
METARs	+	+	+
City Forecast			+
Surface Analysis			+
Freezing Levels			+
Winds Aloft		+	+
County Warnings			+
Cyclone Warnings			+
Icing Potential			+
PIREPs			+
AIREPs			+
Turbulence			+
TFRs	+	+	+
TAFs			+

Table 6-2 Weather Product Display Maps

Softkeys control which weather products are shown on the PFD Inset Navigation Map. The Touchscreen Controller controls the display of weather information on other map display panes such as the Navigation Map and SiriusXM Weather Panes. When most weather products are enabled for display, the corresponding button annunciator or softkey annunciator changes from gray (disabled) to green (enabled). For the NEXRAD weather product, pressing the **NEXRAD** Softkey cycles through the various coverage sources (USA, Canada, or Off), indicated by light blue text on the Softkey. On the SiriusXM Weather Settings Screen, touching the **Nexrad** Button allows the selection of those coverage sources, with the current selection shown in light blue on the **Nexrad** Button.

The Map Settings Screen on the Touchscreen Controller controls the maximum map range at which the system displays a weather product on a map; selecting a map range higher than this range will declutter the weather product from the map.

The SiriusXM Weather Settings Screen controls the enabling/disabling of weather products for the SiriusXM Weather Pane. The Map Settings Screen controls the enabling/disabling of weather products for the Navigation Map Panes.

Enabling/Disabling the display of SiriusXM Weather Products on Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll through the list to view the available weather products.
- 4) Touch a weather product annunciator button to enable/disable the selected weather product. Button annunciator is green when a weather product is enabled, or gray when disabled.

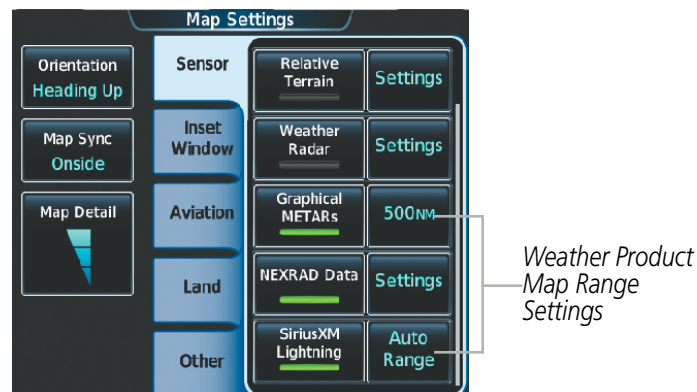


Figure 6-3 Map Settings Screen
(Sensor Tab Selected)

Selecting maximum map range to show SiriusXM Weather products:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll to the list to view the weather products.

- 4) To select the maximum map range to display Graphical METARs or SiriusXM Lightning, touch the range button next to the weather product. Then scroll through the list and touch the desired map range above which the product will be removed, or touch **Auto Range** to select the maximum map range available to display that weather product.
- 5) To select the maximum map range to display NEXRAD Data, touch the NEXRAD Data **Settings** Button, followed by the NEXRAD Data range button. Then scroll through the list and touch the desired map range above which the product will be removed, or touch 'Auto Range' to select the maximum map range to display the NEXRAD weather product.

Weather information displayed on maps other than the SiriusXM Weather Pane use settings based on those selected on the Map Settings Screen.

The SiriusXM Settings Screen on the Touchscreen Controller can display a legend for each weather product currently enabled on the SiriusXM Weather Pane.

Viewing legends for weather products enabled on the SiriusXM WEATHER Pane:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**
- 2) Touch the **Legend** Button. The Weather Legends Window appears on the Touchscreen Controller.
- 3) Scroll as needed to view the weather legends for the enabled weather products.
- 4) To remove the Weather Legends Window, touch **Back** or **Home**.

The system displays additional information about the following weather products by panning over the product on the map with the map pointer.

- Echo Tops
- Storm Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- PIREPSs
- AIREPs

To enable the Map Pointer for panning, press the **Joystick**, then move the **Joystick** to position the Map Pointer over the desired product. To stop panning, press the **Joystick** again, or touch the **Back** Button on the Touchscreen Controller. Turn the **Joystick** clockwise to increase map range, counter-clockwise to decrease map range. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

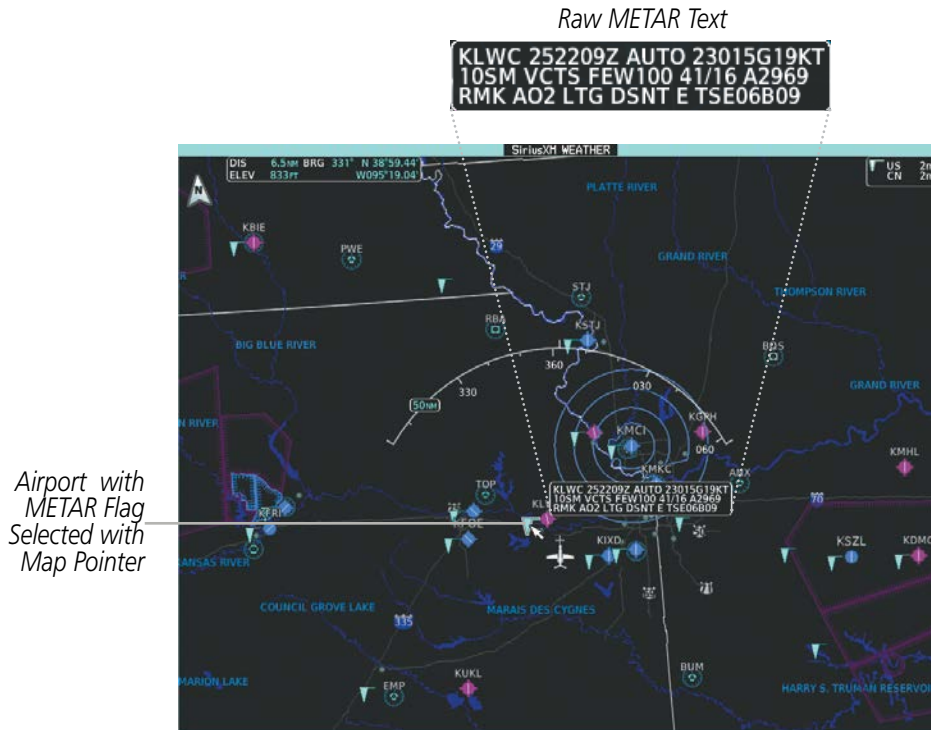


Figure 6-4 Panning on the SiriusXM Weather Pane

NEXRAD

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

NOTE: The NEXRAD weather product cannot be displayed at the same time as terrain, echo tops, turbulence, or icing data.

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm. In addition to a wide array of services, the NEXRAD network provides important information about severe weather and air traffic safety.

Individual NEXRAD sites supply the network with radar images, and the images from each site may arrive at the network at different rates and times. Periodically, the weather data provider compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The data provider then sends the NEXRAD data to the SiriusXM Weather service, whose satellites transmit this information during the next designated broadcast time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. The NEXRAD weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

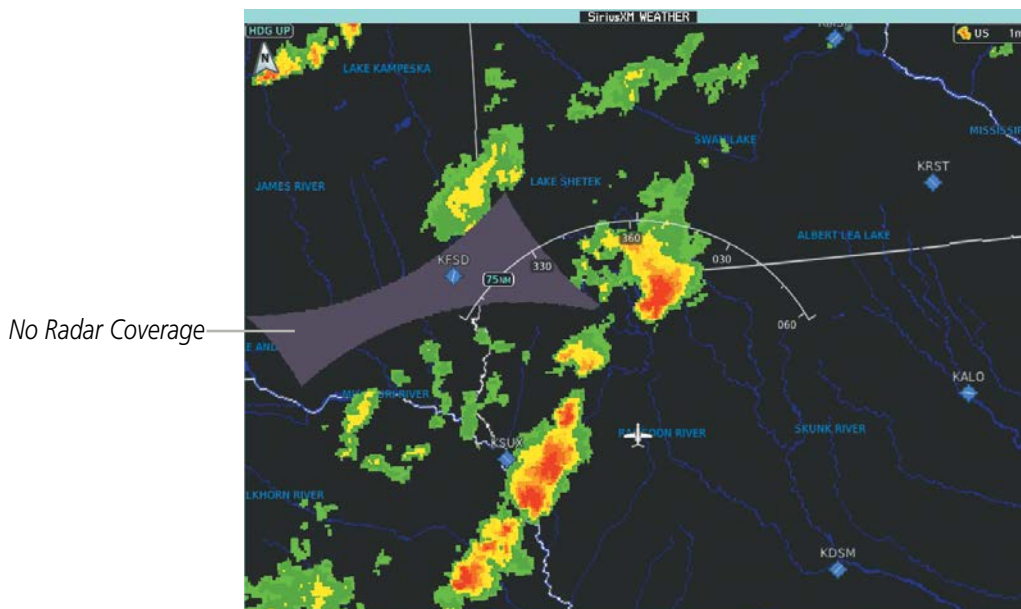


Figure 6-5 NEXRAD Weather Product on the SiriusXM Weather Pane

Showing NEXRAD weather information on PFD Inset Navigation Map (FULL Mode PFD):

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **NEXRAD** Softkey to cycle through following coverage modes: Off (disables NEXRAD information), USA, Canada (softkey label changes to indicate the selected coverage option with each softkey press).
- 3) Press the **Back** Softkey to return to the top-level PFD Softkeys.

Displaying NEXRAD weather information (Navigation Map panes)

- 1) From Home, Touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **NEXRAD Data** Button to enable/disable the display of the NEXRAD weather product.
- 4) To change the coverage mode of the NEXRAD weather product displayed on the Navigation Map Pane, touch the NEXRAD Data **Settings** Button. The NEXRAD Data Coverage Button displays the currently selected coverage area in light blue text ('USA' or 'Canada').
 - a) Touch the NEXRAD Data Coverage Button.
 - b) Touch either the **USA** or **Canada** Button.
- 5) When finished changing NEXRAD settings for the Navigation Maps, touch **Back** or **Home**.

Displaying NEXRAD weather information (SiriusXM Weather Pane)

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Find the **Nexrad** Button in the Background window. Light blue text inside the button indicates the currently selected coverage mode ('Off', 'USA' or 'Canada').
- 3) To change the selected coverage mode, touch the **Nexrad** Button, then touch one of the following buttons: **Off** (removes NEXRAD information from the pane), **USA**, or **Canada**.

The display shows composite data from all available NEXRAD radar sites in the selected coverage area (either United States or Canada.) This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the strength of the radar returns. All weather product legends can be viewed on the Touchscreen Controller. For the NEXRAD legend (Figure 6-6), touch the **Legend** Button when NEXRAD is enabled for display on the SiriusXM Weather Settings Screen.

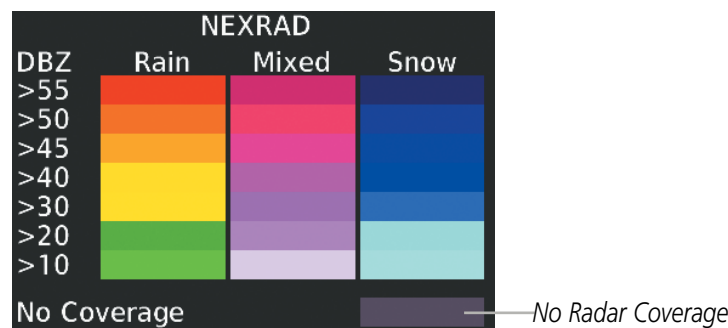


Figure 6-6 NEXRAD Legend

The display of No Radar Coverage is always active when either the NEXRAD or Echo Tops weather products are enabled for display. Areas where NEXRAD radar coverage and Echo Tops information is not currently available, or outside of the selected coverage source area, or is not being collected are indicated in a gray shade of purple (Figure 6-6).

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD LIMITATIONS

NEXRAD radar images may have certain limitations:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

NEXRAD LIMITATIONS (CANADA)

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed regardless of actual precipitation type.

ECHO TOPS



NOTE: When the Echo Tops product is enabled on the SiriusXM Weather Pane, NEXRAD and Cloud Tops data are removed.

The Echo Tops weather product (Figure 6-7) shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

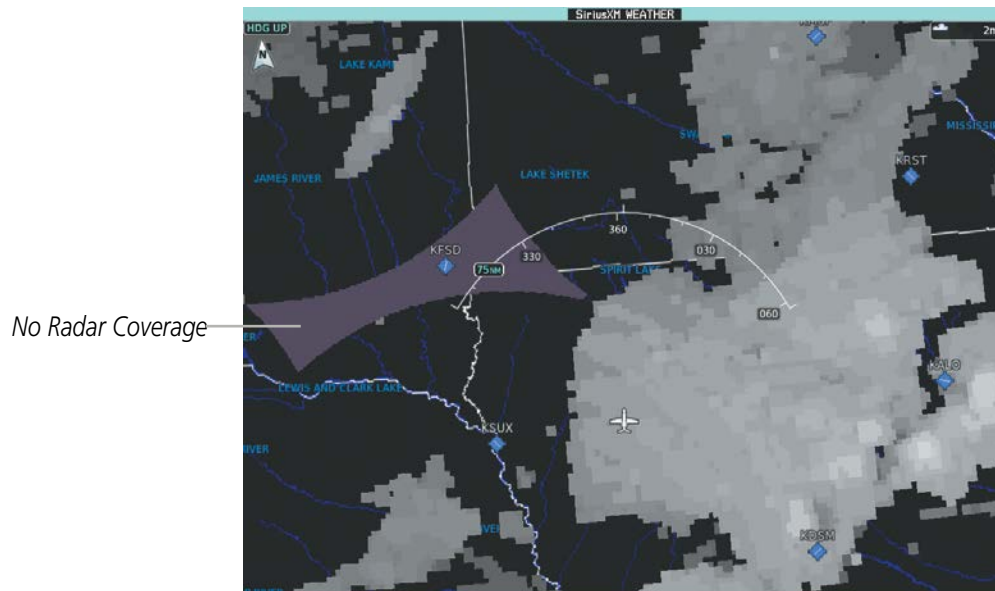


Figure 6-7 Echo Tops Weather Product

Enabling/Disabling Echo Tops information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Echo Tops** Button in the Background Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display the Echo Tops legend when it Echo Tops is enabled. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, only one of these products may be displayed at a time. When Echo Tops is enabled, the system disables NEXRAD and Cloud Tops information.

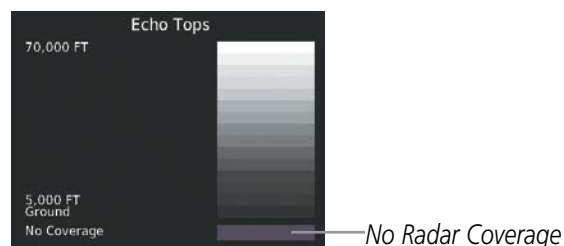


Figure 6-8 Echo Tops Legend

The display of No Radar Coverage is always active when either NEXRAD or Echo Tops is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently selected, not available, or is not being collected are indicated in gray shade of purple (Figures 6-7, 6-8).

CLOUD TOPS



NOTE: The Cloud Tops and Echo Tops weather products cannot be displayed at the same time on the SiriusXM Weather Pane.

The Cloud Tops weather product (Figure 6-9) depicts cloud top altitudes as determined from satellite imagery. When the Cloud Tops background is enabled, the system disables Echo Tops data.



Figure 6-9 Cloud Tops Weather Product

Enabling/Disabling Cloud Tops information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Cloud Tops** Button in the Background window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

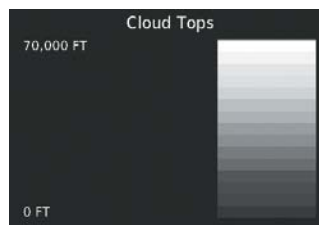


Figure 6-10 Cloud Tops Legend

SIRIUSXM LIGHTNING

The SiriusXM Lightning weather product (Figure 6-11) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike has occurred within a two-kilometer region. The system does not display the exact location of lightning strikes.

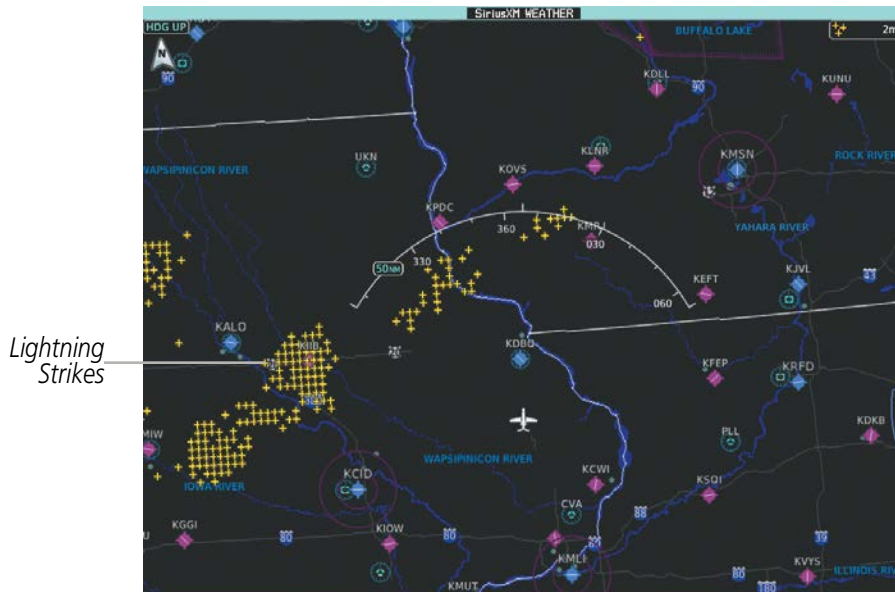


Figure 6-11 SiriusXM Lightning Weather Product

Enabling/Disabling SiriusXM Lightning information (SiriusXM Weather Pane):

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Touch the **Lightning** Button in the Overlays Window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

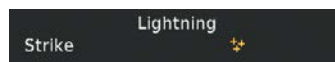


Figure 6-12 SiriusXM Lightning Legend

Displaying SiriusXM Lightning information (Navigation Map Panes):

- 1) From Home, touch **Map** > **Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 4) Scroll as needed and touch the **SiriusXM Lightning** Button.

Displaying SiriusXM Lightning information (PFD Inset Navigation Map):

- 1) If the Traffic Inset Map is displayed, press the **Traffic Map** Softkey to disable the Traffic Inset Map.
- 2) Press the **Inset Map Settings** Softkey.
- 3) Press the **SiriusXM Lightning** Softkey to enable/disable display lightning information.
- 4) Press the **Back** Softkey to return to the top-level softkeys.

STORM CELL MOVEMENT

The Cell Movement map overlay (Figure 6-13) shows the location and movement of storm cells as identified by the ground-based system. Yellow squares represent cells, with short orange arrows indicating the direction of cell movement.

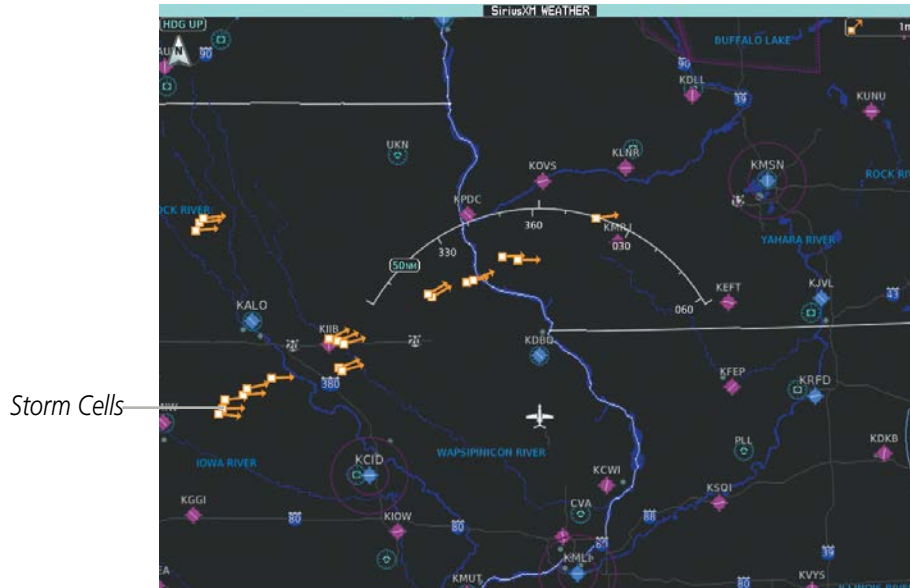


Figure 6-13 Storm Cell Movement Weather Product

Enabling/Disabling Storm Cell Movement Information (SiriusXM Weather Pane)

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Touch the **Storm Cell Movement** Button in the Overlays window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

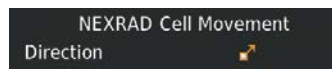


Figure 6-14 Cell Movement Legend

Displaying Storm Cell Movement Information (Navigation Map Pane)

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the NEXRAD Data **Settings** Button.
- 4) Touch the **Storm Cell Movement** Button. When button annunciator is green, the system will show the Storm Cell Movement with the NEXRAD weather product when NEXRAD is enabled.

SIGMETS AND AIRMETS

The National Weather Services issues SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) for potentially hazardous weather. The service issues a Convective SIGMET for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

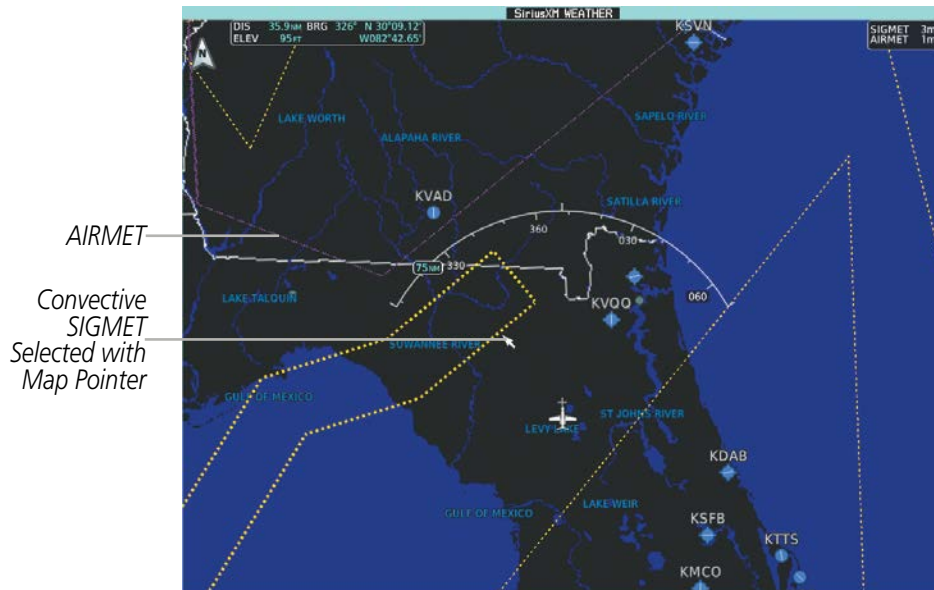


Figure 6-15 AIRMET and SIGMET Weather Products

Enabling/Disabling AIRMET and SIGMET information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed and touch the **AIRMETS** and/or **SIGMETS** Buttons in the Overlays window.
- 3) To view the text of a AIRMET or SIGMET, press the **Joystick** and move the map pointer with the **Joystick** over the SIGMET or AIRMET border or icon until it is highlighted.
- 5) Touch the **AIRMET/SIGMET** Button to show the AIRMET / SIGMET Information Screen with the selected AIRMET or SIGMET.
- 6) Scroll as needed to view full text of the report, then touch the **Back** or **Home** buttons.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

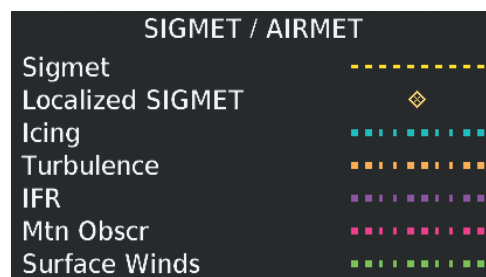


Figure 6-16 SIGMET/AIRMET Legend

METARS

NOTE: Atmospheric pressure as reported for METARs is given in hectopascals (hPa), except for in the United States, where it is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.

NOTE: METAR information is only displayed within the installed navigation database coverage area.

METARs (METEorological Aerodrome Reports) describe observed weather conditions at airports and reporting stations. METARs are generally updated hourly, but may be updated more frequently if conditions warrant. METARs typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure. They can also contain information on precipitation amounts, lightning, and other critical data. METARs are shown as colored flags at airports that provide them.

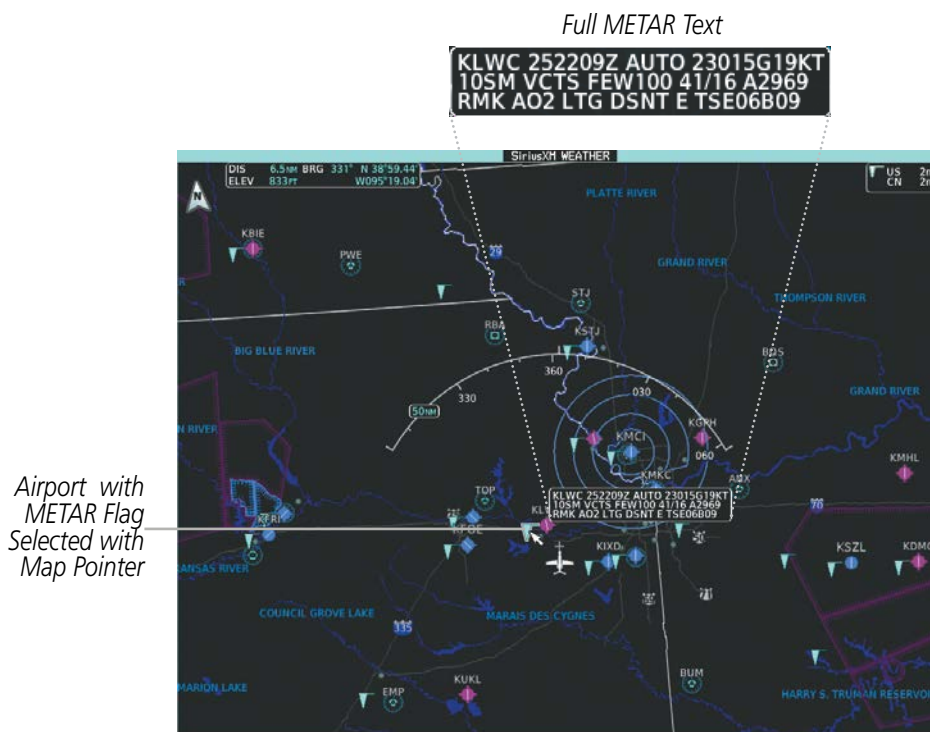


Figure 6-17 Panning on the SiriusXM Weather Pane

Showing METAR text (SiriusXM Weather Pane):

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Touch the **METARs** Button in the Overlays window. The system displays METAR flags at available reporting stations when METARs are enabled (button annunciator is green).
- 3) To view METAR text, press the Joystick and move the map pointer with the Joystick over a METAR reporting station.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for weather product(s) enabled on the SiriusXM Weather Pane. Scroll as necessary to view the information, then touch **Back** or **Home**.

Showing METAR text (Navigation Map Panes):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Scroll as needed and touch the **Graphical METARs** Button.

Textual METAR information is also available on the Airport Information screens on the Touchscreen Controllers. When viewing the Airport Information screen for an airport, touch the Weather Tab and scroll as needed to view the METAR text.

The graphical METAR flag color shown on the maps is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain adequate information.

METAR	
VFR	▲
MVFR	▲
IFR	▲
LIFR	▲
UNKNOWN	▲

Figure 6-18 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST



NOTE: Surface Analysis and City Forecast data are displayed only within the installed navigation database coverage area.

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

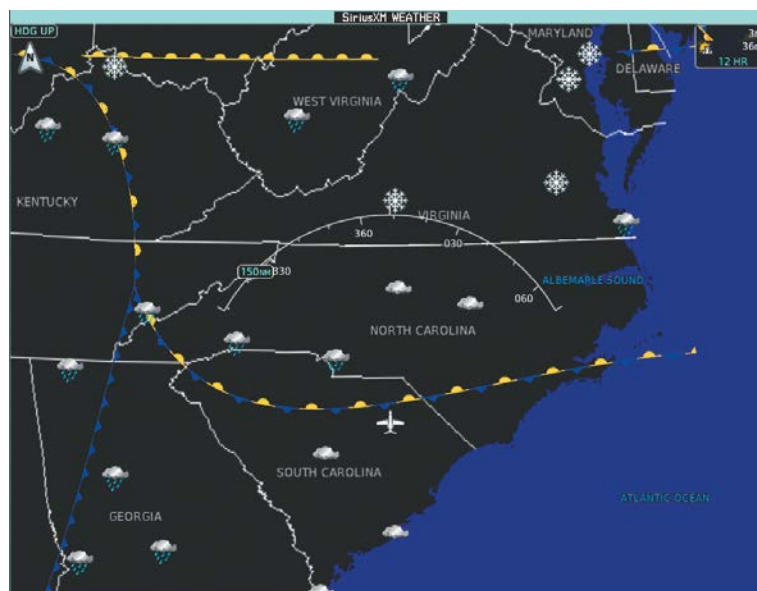


Figure 6-19 Current Surface Analysis Weather Product

Displaying Surface Analysis and City Forecast information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Surface Conditions** Button.
- 3) If needed, touch the Surface Conditions forecast period button (to the right of the **Surface Conditions** Button) and select from **Current, 12 Hours, 24 Hours, 36 hours, or 48 Hours** forecast periods from the pop-up selection window.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

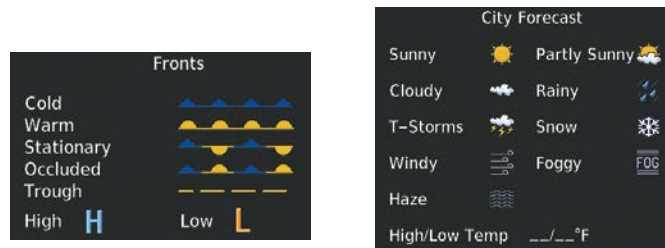


Figure 6-20 Surface Analysis and City Forecast Legend

FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-21). When no information is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display.

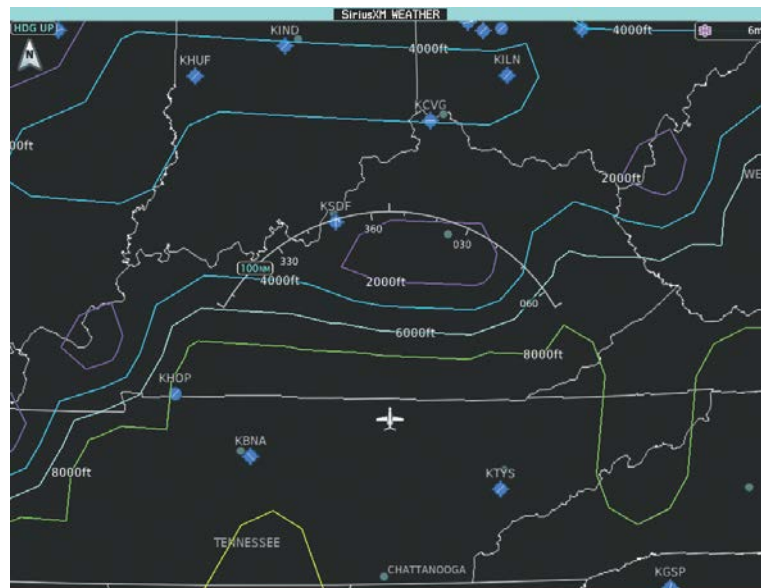


Figure 6-21 Freezing Level Weather Product

Displaying Freezing Level information:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Freezing Level** Button.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-22 Freezing Level Legend

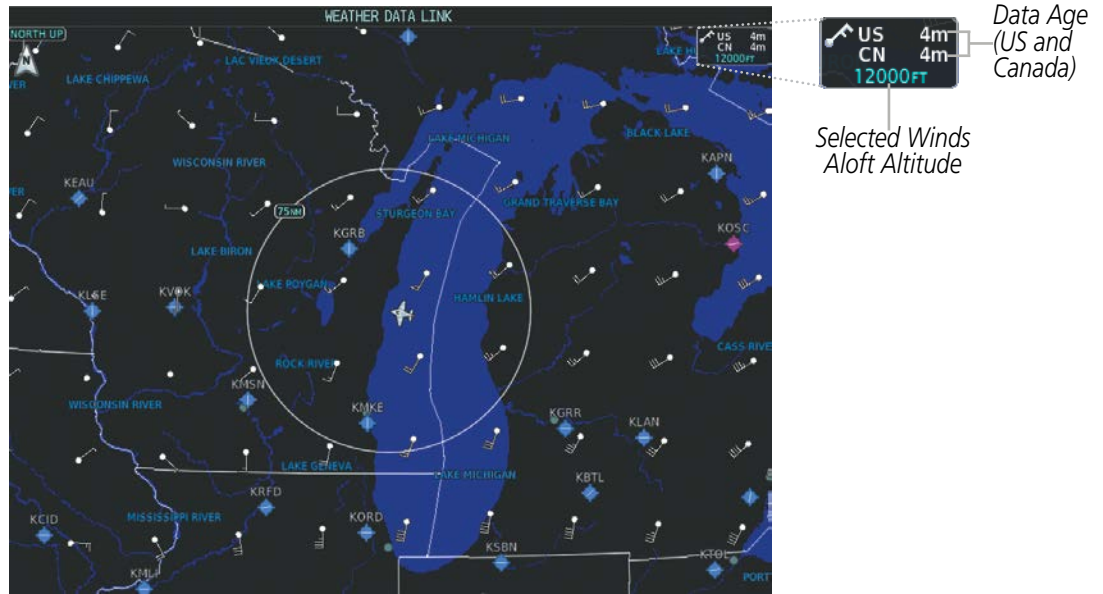
WINDS ALOFT

The Winds Aloft weather product (Figure 6-23) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Winds Aloft** Button.
- 3) To change the selected winds aloft altitude, touch the Winds Aloft altitude button and select the desired winds aloft altitude from Surface to 42,000 feet MSL from the pop-up window.

Winds Aloft Overlay at 12,000 Feet



SiriusXM Weather Settings Screen



Figure 6-23 Displaying Winds Aloft Information

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

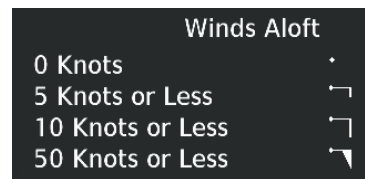


Figure 6-24 Winds Aloft Data with Legend

COUNTY WARNINGS

The County Warnings weather product (Figure 6-25) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on severe thunderstorms, tornadoes, and flood conditions.

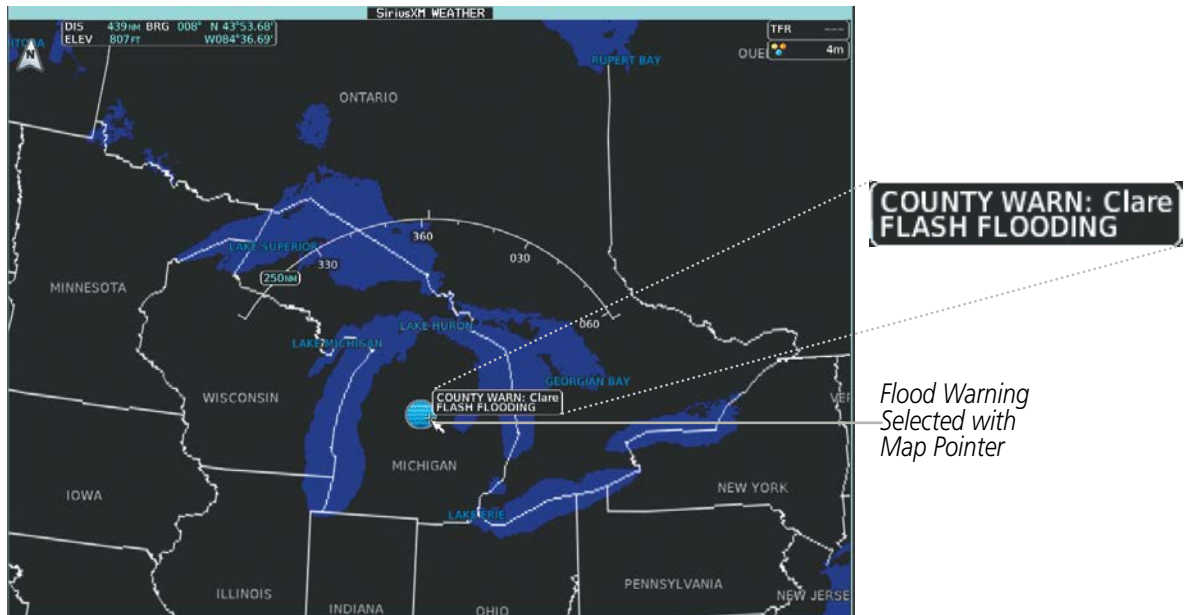


Figure 6-25 County Warnings Weather Product

Displaying County Warning information:

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **County Warnings** Button.
- 3) To view additional information (such as county name), press the **Joystick** to activate the map pointer and move the **Joystick** to highlight a County Warning. County Warning information appears in a box near the map pointer.
- 4) When finished, press the **Joystick** to deactivate the map pointer.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-26 County Warnings Legend

CYCLONE WARNINGS

The Cyclone weather product shows the current location of cyclones (hurricanes), tropical storms, and their projected tracks.



Figure 6-27 Cyclone (Hurricane) Weather Product

Enabling/Disabling cyclone (hurricane) weather product:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Cyclone Warnings** Button.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

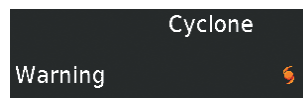


Figure 6-28 Cyclone Legend

ICING (CIP & SLD)



NOTE: Icing data cannot be displayed at the same time as NEXRAD weather product.

Current Icing Product (CIP) data (Figure 6-29) shows a graphical view of the icing environment. Icing severity is displayed in four categories: light, moderate, severe, and extreme (not specific to aircraft type). The CIP product is not a forecast, but a presentation of the conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors.

Displaying Icing data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll as needed in the Overlays window and touch the **Current Icing Potential** Button.
- 3) Touch the Current Icing Potential altitude button (to the right of the **Current Icing Potential** annunciator Button) and scroll to and touch the desired altitude button (from 1,000 feet up to 30,000 feet.)

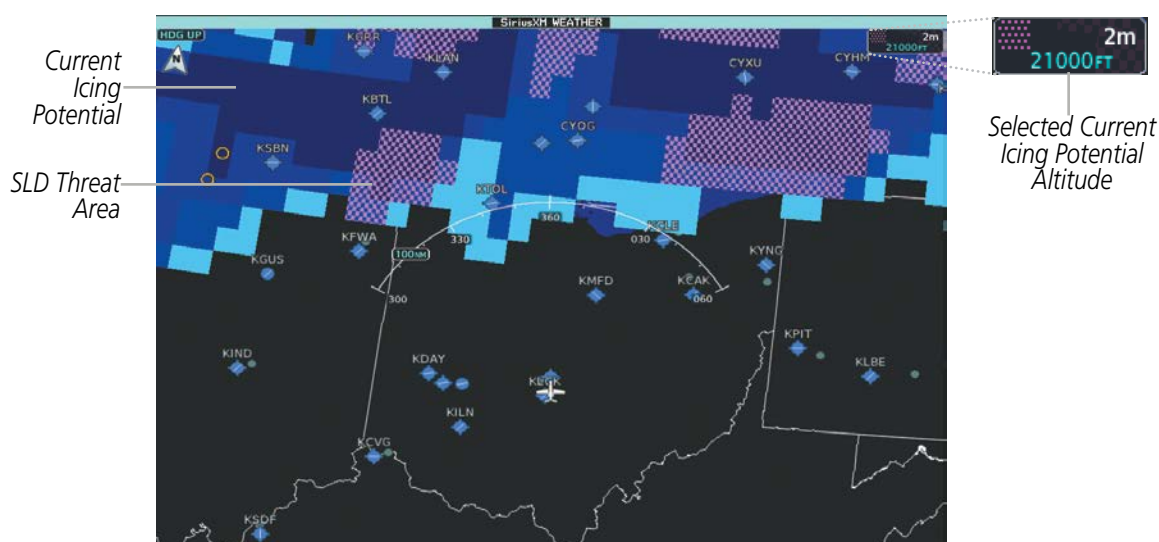


Figure 6-29 Current Icing Potential Overlay at 21,000 Feet

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.



Figure 6-30 Icing Potential Legend

TURBULENCE



NOTE: The Turbulence weather product cannot be displayed at the same time as NEXRAD weather product.

The Turbulence weather product (Figure 6-31) identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence data is intended to supplement AIRMETs and SIGMETs.

Displaying Turbulence data:

- 1) From Home, touch **Weather > Weather Selection > SiriusXM Weather > SiriusXM Settings**.
- 2) Scroll in the the Overlays window and touch the **Turbulence** Button.
- 3) Touch the Turbulence altitude button (to the right of the **Turbulence** annunciator button) and touch to select an altitude from which to display turbulence data (from 1,000 feet up to 45,000 feet).

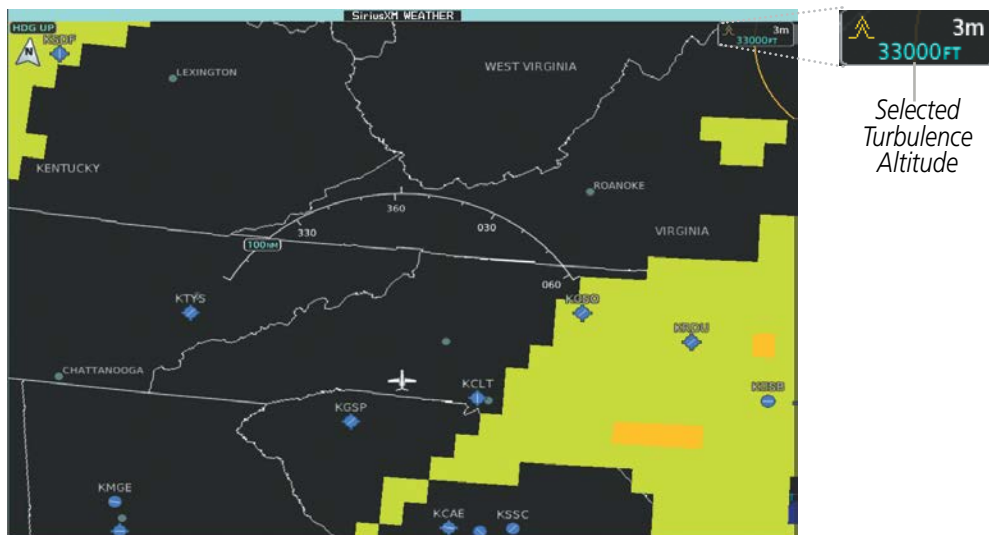


Figure 6-31 Turbulence Weather Product at 33,000 Feet

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

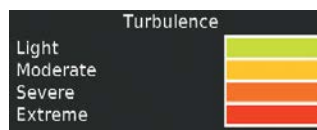


Figure 6-32 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) (Figure 6-33) provide weather observations collected from pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). AIREPs are used almost exclusively by commercial airlines.

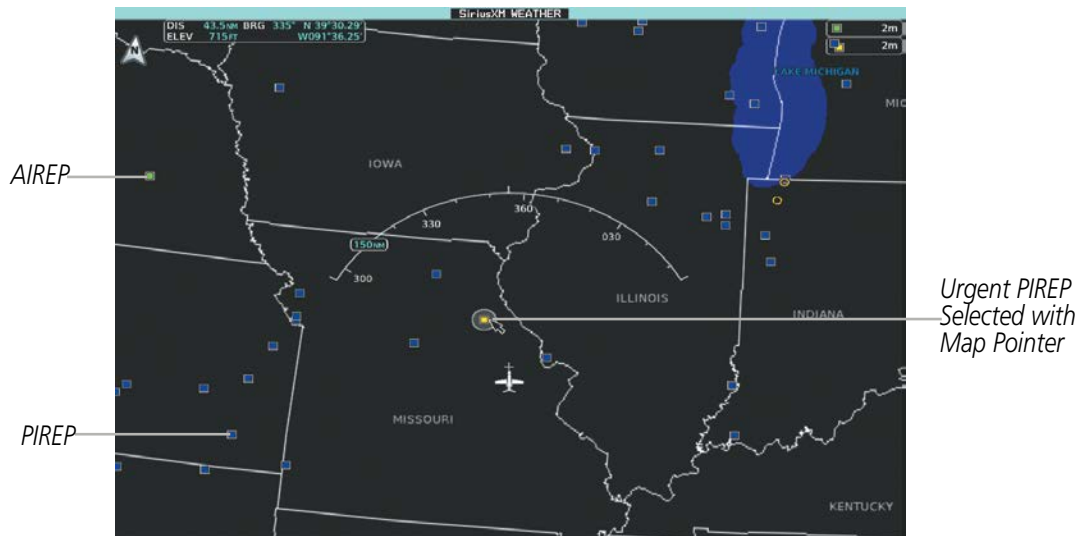


Figure 6-33 AIREPs and PIREPs on the SiriusXM Weather Pane

Displaying PIREP or AIREP data:

- 1) From Home, touch **Weather** > **Weather Selection** > **SiriusXM Weather** > **SiriusXM Settings**.
- 2) Scroll in the Overlays window as needed and touch the **AIREPs** or **PIREPs** Buttons.
- 3) To view PIREP/AIREP text, push the joystick to activate the map pointer and move the pointer with the **Joystick** until the selected report is highlighted, then touch the **PIREP Info** or **AIREP Info** Button.
- 4) Scroll as needed through the report text, then touch **Back** or **Home**.

Touch the **Legend** Button on the SiriusXM Weather Settings Screen to display weather legend(s) for enabled weather product(s). Scroll as necessary to view the information, then touch **Back** or **Home**.

The PIREP color is determined by the type (routine or urgent).


PIREPS	
Urgent	
Routine	
AIREPS	
All AIREPS	

Figure 6-34 AIREPs & PIREPs Legend

6.2 AIRBORNE COLOR WEATHER RADAR

SYSTEM DESCRIPTION

The Garmin GWX 70 Airborne Color Weather Radar is a solid-state pulsed-Doppler radar with forty watts of output power. It combines excellent range and adjustable scanning profiles with high-definition target displays. The effective pulse length is 27.31 microseconds (μs), and the system optimizes the pulse length to maximize resolution at each range setting. This reduces the targets smearing together on the displays for better target definition at close range.

The Embraer Phenom 300 uses a 12-inch phased array antenna that is fully stabilized to accommodate 30° of pitch and roll.

To focus radar scanning on specific areas, Sector Scanning offers pilot-adjustable horizontal scan angles of 20°, 40°, 60°, or a full 90° scan. A vertical scanning function helps to analyze storm tops, gradients, and cell buildup activity at various altitudes.

Radar features include:

- Extended Sensitivity Time Constant (STC) logic that automatically correlates distance of the return echo with intensity, so cells do not suddenly appear to get larger as they get closer.
- Turbulence Detection (*optional*) presents areas of turbulence associated with precipitation using the color magenta.
- WATCH[®] (Weather ATtenuated Color Highlight) helps identify possible shadowing effects of short-range cell activity, identifying areas where radar return signals are weakened or attenuated by intense precipitation (or large areas of lesser precipitation) and may not fully depict the weather occurring behind a storm.
- Weather Alert that looks ahead for intense cell activity in the 80-320 nm range, even if these ranges beyond the currently selected map range.
- Altitude-Compensated Tilt (ACT) management which automatically adjusts the antenna tilt as the aircraft altitude changes.
- Ground Clutter Suppression (GCS) (*optional*) removes ground clutter from the displays.

PRINCIPLES OF AIRBORNE WEATHER RADAR

The term RADAR is an acronym for RAdio Detecting And Ranging. Pulsed radar locates targets by transmitting a microwave pulse beam that, upon encountering a target, is reflected back to the radar receiver as a return echo. The microwave pulses are focused and radiated by the antenna, with the most intense energy in the center of the beam and decreasing intensity near the edge. The same antenna is used for both transmitting and receiving.

Radar detection is a two-way process that requires 12.36 μs for the transmitted microwave pulses to travel out and back for each nautical mile of target range. It takes 123.6 μs for a transmitted pulse to make the round trip if a target is ten nautical miles away.

The GWX 70, as installed on the Phenom 300, has the capability to detect the velocity of precipitation moving toward or away from the radar antenna. As the radar pulse beam strikes a moving object, the frequency of the returned echo shifts in relation to the speed at which the object is moving. This effect is analogous to the audible pitch change observed when an emergency vehicle's siren gets closer or moves away. Doppler radar

employs this effect to detect areas of precipitation moving at a high rate of speed (indicative of turbulence), and to determine when an object, such as the ground, is stationary. The system can use this information to suppress the display of ground clutter.

Airborne weather radar should be used to avoid severe weather. The decision to fly into an area of radar targets depends on target intensity, spacing between the targets, aircraft capabilities, and crew experience. Airborne weather radar detects rain or hail, not clouds or mist. The display may indicate clear areas between intense returns, but this does not necessarily mean it is safe to fly between them. In addition, Doppler radar measurement of precipitation velocity only occurs when rain or hail is moving along the radar beam and either toward or away from the antenna. This system cannot detect clear air turbulence.

Airborne weather radar has other capabilities beyond weather detection. It also has the ability to detect and provide distance to cities, mountains, coastlines, rivers, lakes, and oceans.

NEXRAD AND AIRBORNE WEATHER RADAR

Both Airborne Weather Radar and NEXRAD measure weather reflectivity in decibels (dB). A decibel is a logarithmic expression of the ratio of two quantities. Airborne Weather Radar measures the ratio of power against the gain of the antenna, while NEXRAD measures the energy reflected back to the radar, or the radar reflectivity ratio.

Both systems use colors to identify the different echo intensities, but the colors are not interchangeable. Airborne color radar values from the GWX 70 not be confused with NEXRAD radar values.

ANTENNA BEAM ILLUMINATION

The radar beam is much like the beam of a spotlight. The further the beam travels, the wider it becomes. The radar is only capable of seeing what is inside the boundaries of the beam. The figure below depicts a radar beam's characteristics. The figure illustrates vertical dimensions of the radar beam, although the same holds true for the horizontal dimensions. In other words, the beam is as wide as it is tall. Note that it is possible to miss areas of precipitation on the radar display because of the antenna tilt setting. With the antenna tilt set to zero in this illustration, the beam overshoots the precipitation at 15 nautical miles.

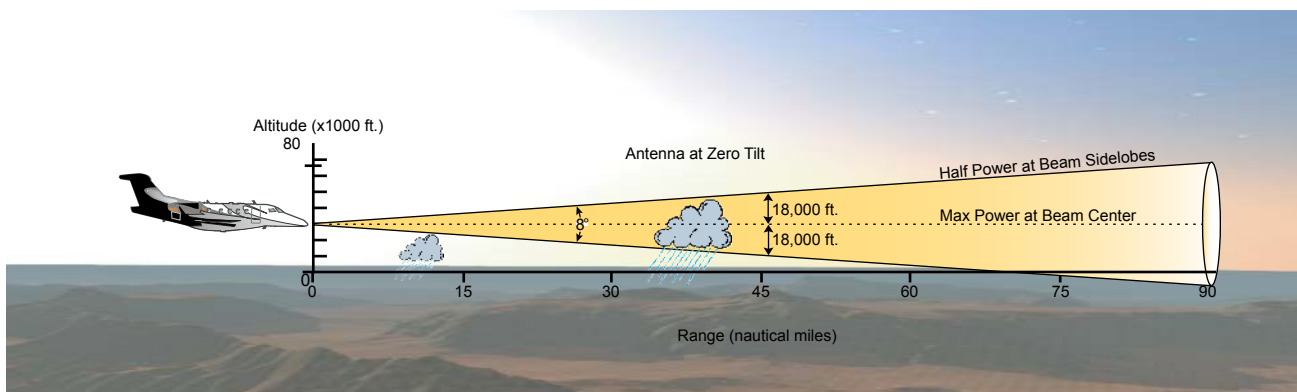


Figure 6-35 Radar Beam from a 12 inch Antenna

The curvature of the earth can also be a factor in missing areas of precipitation, especially at range settings of 150 nautical miles or more. Here the beam overshoots the precipitation at less than 320 nautical miles.

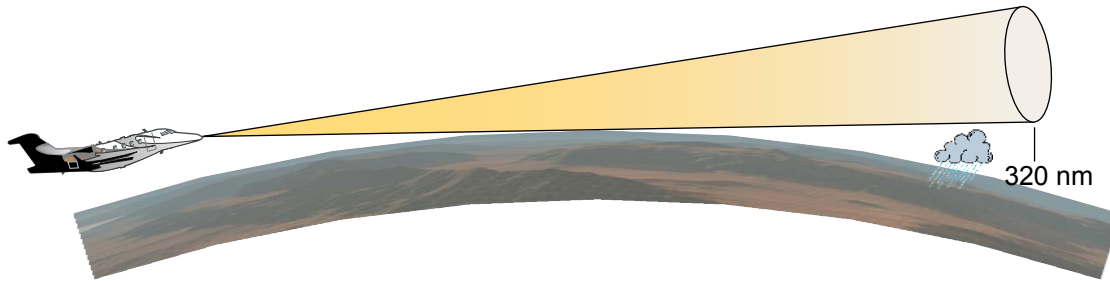


Figure 6-36 Radar Beam in Relation to the Curvature of the Earth

RADAR SIGNAL ATTENUATION

The phenomenon of radar signal attenuation affects the operation of weather radar. When the radar signal is transmitted, it is progressively absorbed and scattered, making the signal weaker. This weakening, or attenuation, is caused by two primary sources, distance and precipitation.

Attenuation because of distance is due to the fact that the radar energy leaving the antenna is inversely proportional to the square of the distance. The reflected radar energy from a target 40 miles away that fills the radar beam is one fourth the energy reflected from an equivalent target 20 miles away. This would appear to the operator that the storm is gaining intensity as the aircraft gets closer. Internal signal processing within the GWX 70 system compensates for much of this distance attenuation.

Attenuation due to precipitation is not as predictable as distance attenuation. It is also more intense. As the radar signal passes through moisture, a portion of the radar energy is reflected back to the antenna. However, much of the energy is absorbed. If precipitation is very heavy, or covers a large area, the signal may not reach completely through the area of precipitation. The weather radar system cannot distinguish between an attenuated signal and an area of no precipitation. If the signal has been fully attenuated, the radar displays a radar shadow. This appears as an end to the precipitation when, in fact, the heavy rain may extend much further. A cell containing heavy precipitation may block another cell located behind the first, preventing it from being displayed on the radar. Never fly into these shadowed areas and never assume that all of the heavy precipitation is being displayed unless another cell or a ground target can be seen beyond the heavy cell. The WATCH® feature of the GWX 70 Weather Radar system can help to identify these shadowed areas. Areas in question appear as shadowed or gray on the radar display. Proper use of the antenna tilt control can also help detect radar shadows.

Attenuation can also be due to poor maintenance or degradation of the radome. Even the smallest amount of wear and scratching, pitting, and pinholes on the radome surface can cause damage and system inefficiency.

RADAR SIGNAL REFLECTIVITY

PRECIPITATION

Precipitation or objects more dense than water, such as the surface of the earth or solid structures, are detected by the weather radar. The weather radar does not detect clouds, thunderstorms, or turbulence directly. It detects precipitation associated with clouds, thunderstorms, and turbulence. The best radar signal reflectors are raindrops, wet snow, or wet hail. The larger the raindrop, the better the reflectivity. The size of the precipitation droplet is the most important factor in radar reflectivity. Because large drops in a small concentrated area are characteristic of a severe thunderstorm, the radar displays the storm as a strong

return. Ice crystals, dry snow, and dry hail have low levels of reflectivity as shown in the illustration, and often not displayed by the radar. Additionally, a cloud that contains only small raindrops, such as fog or drizzle, does not reflect enough radar energy to produce a measurable target return.

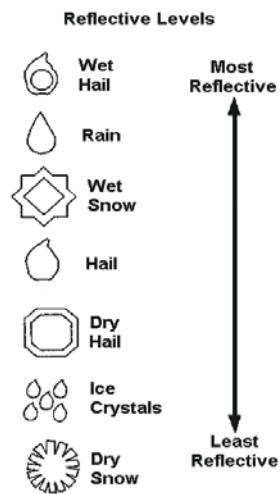


Figure 6-37 Precipitation Type and Reflectivity

GROUND RETURNS

The intensity of ground target returns depends upon the angle at which the radar beam strikes the ground target (Angle of Incidence) and the reflective properties of that target. The gain can be adjusted so shorelines, rivers, lakes, and cities are well defined. Increasing the gain too much causes the display to fill in between targets, thus obscuring some landmarks.

Cities normally provide a strong return signal. While large buildings and structures provide good returns, small buildings can be shadowed from the radar beam by the taller buildings. As the aircraft approaches and shorter ranges are selected, details become more noticeable as the highly reflective regular lines and edges of the city become more defined.

Bodies of water such as lakes, rivers, and oceans are not good reflectors and normally do not provide good returns. The energy is reflected in a forward scatter angle with inadequate energy being returned. They can appear as dark areas on the display. However, rough or choppy water is a better reflector and provides stronger returns from the downwind sides of the waves.

Mountains also provide strong return signals to the antenna, but also block the areas behind. However, over mountainous terrain, the radar beam can be reflected back and forth in the mountain passes or off canyon walls, using up all or most of the radar energy. In this case, no return signal is received from this area, causing the display to show a dark spot which could indicate a pass where no pass exists.

ANGLE OF INCIDENCE

The angle at which the radar beam strikes the target is called the Angle of Incidence. The figure illustrates the incident angle (A). This directly affects the detectable range, the area of illumination, and the intensity of the displayed target returns. A large incident angle gives the radar system a smaller detectable range and lower display intensity due to minimized reflection of the radar energy.

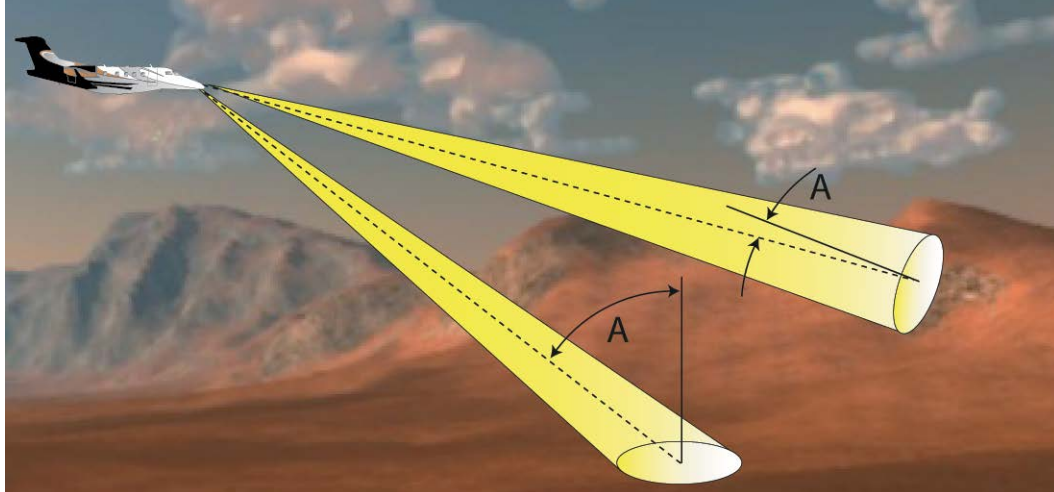


Figure 6-38 Angle of Incidence

A smaller incident angle gives the radar a larger detectable range of operation and the target display shows a higher intensity. Since more radar energy is reflected back to the antenna with a low incident angle, the resulting detectable range is increased for mountainous terrain.

SAFE OPERATING DISTANCE

The following information establishes a minimum safe distance from the antenna for personnel near operating weather radar. The minimum safe distance is based on the FCC's exposure limit at 9.3 to 9.5 GHz for general population/uncontrolled environments, which is 1 mW/cm². See Advisory Circular 20-68B for more information on safe distance determination.

MAXIMUM PERMISSIBLE EXPOSURE LEVEL (MPEL)

The zone in which the radiation level exceeds the US Government standard of 1 mW/cm² is the semicircular area of at least 11 feet from the 12-inch antenna. All personnel must remain outside of this zone. With a scanning or rotating beam, the averaged power density at the MPEL boundary is significantly reduced.

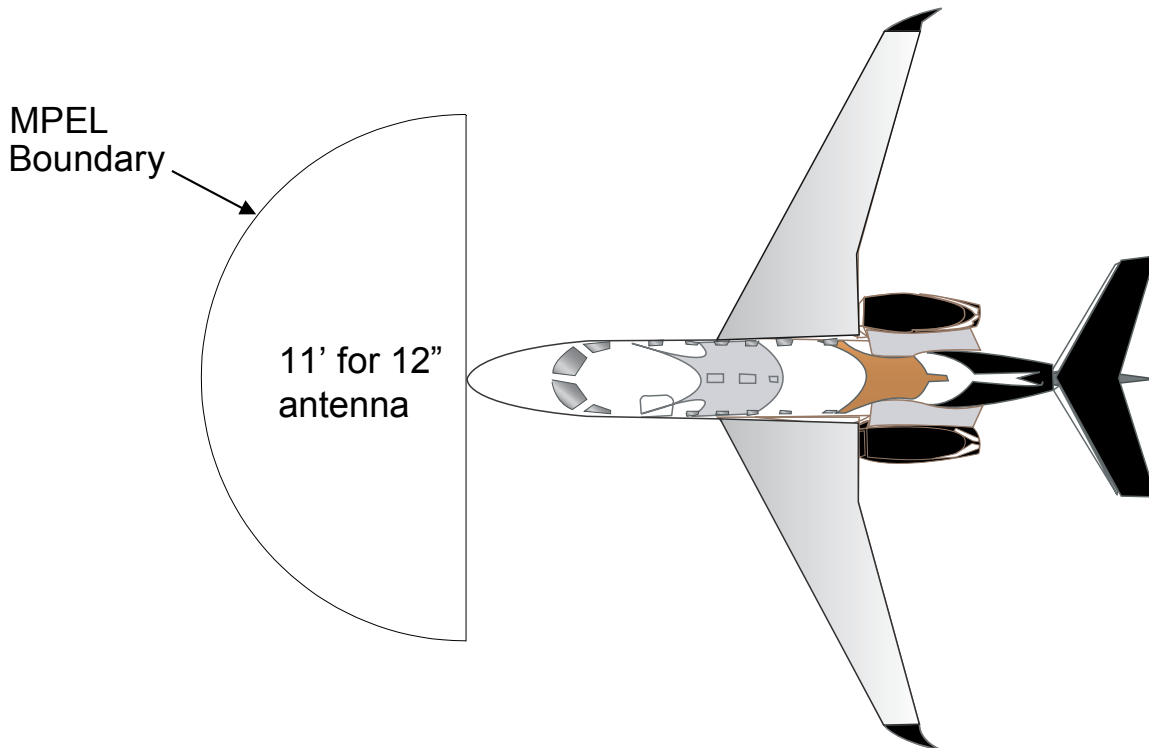


Figure 6-39 MPEL Boundary

BASIC ANTENNA TILT SETUP

The following discussion is a simple method for setting up the weather radar antenna tilt for most situations. It is not to be considered an all encompassing setup that works in all situations, but this method does provide good overall parameters for the monitoring of threats. Ultimately, it is desired to have the antenna tilted so that the bottom of the radar beam is four degrees below parallel with the ground. The following example explains one way of achieving this.

With the aircraft flying level, adjust the antenna tilt so ground returns are displayed at a distance that equals the aircraft's current altitude (AGL) divided by 1,000. For example, if the aircraft is at 14,000 feet, adjust the tilt so the front edge of ground returns are displayed at 14 nautical miles. Note this antenna tilt angle setting. Now, raise the antenna tilt 6 degrees above this setting. The bottom of the radar beam is now angled down 4° from parallel with the ground.

PRACTICAL APPLICATION USING THE BASIC TILT SETUP

With the antenna tilt set as previously described, any displayed target return should be scrutinized when flying at altitudes between 2,000 and 30,000 feet AGL. If the displayed target advances on the screen to within 5 nautical miles of the aircraft, avoid it. This may be either weather or ground returns that are 2,000 feet or less below the aircraft. Raising the antenna tilt 4 degrees can help separate ground returns from weather returns in relatively flat terrain. This aligns the bottom of the radar beam parallel with the ground. Return the antenna tilt to the previous setting after a few sweeps.

If the aircraft is above 29,000 feet, be cautious of any target return that gets to within 30 nautical miles. This is likely a thunderstorm that has a top high enough that the aircraft cannot fly over it safely.

If the aircraft altitude is 15,000 feet or lower, setting the displayed range to 60 miles may be more helpful. Closely monitor anything that enters the display.

Also, after setting up the antenna tilt angle as described previously, ground returns can be monitored for possible threats. The relationship between antenna tilt angle, altitude, and distance is one degree of tilt equals 100 feet of altitude for every one nautical mile.

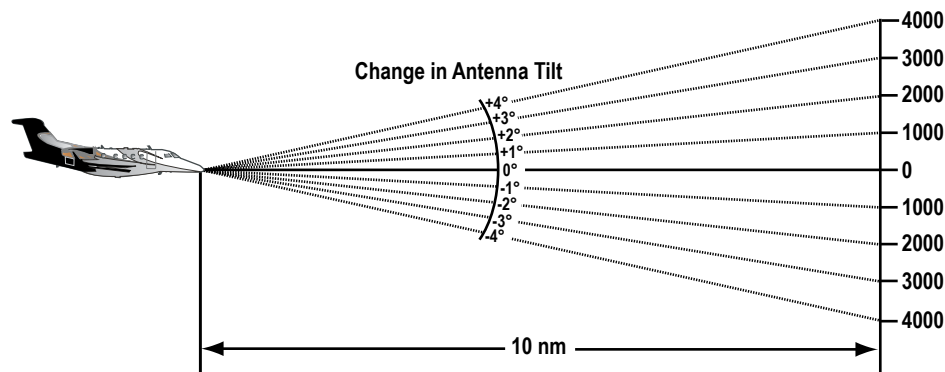


Figure 6-40 Vertical Change in Radar Beam per Nautical Mile

Therefore, with the antenna tilt set so that the bottom of the beam is four degrees below parallel with the ground, a target return at 10 nm is approximately 4,000 feet below the aircraft; at 20 nm, 8,000 feet; at 50 nm, 20,000 feet. In other words, at this tilt setting, a ground return (such as a mountain peak) being displayed at 10 nm would have a maximum distance below the aircraft of 4,000 feet. A ground target return being displayed at 5 nm would have a maximum distance below the aircraft of 2,000 feet. This setup provides a good starting point for practical use of the GWX 70. There are many other factors to consider in order to become proficient at using weather radar in all situations.

ALTITUDE COMPENSATED TILT (ACT)

The Altitude Compensated Tilt feature of the GWX 70 enables the system to automatically adjust the antenna beam tilt angle setting based on changes of the aircraft’s altitude. For example, if the ACT feature is enabled and the aircraft climbs, the system compensates by adjusting the tilt downward. As the aircraft descends with ACT enabled, the system adjusts the antenna tilt upward. The system uses the ground as a reference for adjusting the antenna tilt angle setting with ACT enabled.

WEATHER MAPPING AND INTERPRETATION

WEATHER DISPLAY INTERPRETATION

When evaluating various target returns on the weather radar display, the colors denote precipitation intensity and rates shown in the table.

Weather Mode Color	Intensity (in dBZ)	Approximate Precipitation Rate (in/hr.)
Black	< 23 dBZ	< .01.
Green	23 dBZ to < 33 dBZ	.01 - 0.1.
Yellow	33 dBZ to < 41 dBZ	0.1 - 0.5
Red	41 dBZ and greater	greater than 0.5

Table 6-3 Precipitation Intensity Levels

In addition, when Turbulence Detection feature is enabled on the Touchscreen Controller, the system uses the color magenta to show areas of rain or hail which likely contain turbulence.

THUNDERSTORMS

Updrafts and downdrafts in thunderstorms carry water through the cloud. The more severe the drafts, the greater the number and size of the precipitation droplets. With this in mind, the following interpretations can be made from what is displayed on the weather radar. Avoid these areas by an extra wide margin.

- In areas where the displayed target intensity is red or magenta (indicating large amounts of precipitation), the turbulence is considered severe.
- Areas that show steep color gradients (intense color changes) over thin bands or short distances suggest irregular rainfall rate and strong turbulence.
- Areas that show red or magenta are associated with hail or turbulence, as well as heavy precipitation. Vertical scanning and antenna tilt management may be necessary to identify areas of maximum intensity.

Along squall lines (multiple cells or clusters of cells in a line) individual cells may be in different stages of development. Areas between closely spaced, intense targets may contain developing clouds not having enough moisture to produce a return. However, these areas could have strong updrafts or downdrafts. Targets showing wide areas of green are generally precipitation without severe turbulence.

Irregularities in the target return may also indicate turbulence, appearing as hooks, fingers, or scalloped edges. These irregularities may be present in green areas with no yellow, red, or magenta areas and should be treated as highly dangerous areas. Avoid these areas as if they are red or magenta.

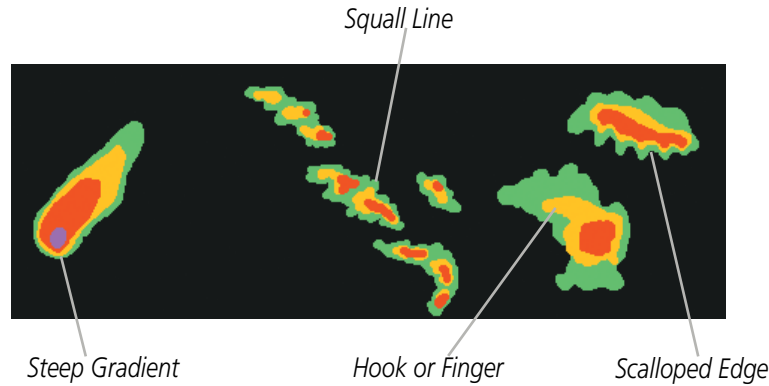


Figure 6-41 Cell Irregularities

Thunderstorm development is rapid. A course may become blocked within a short time. When displaying shorter ranges, periodically select a longer range to see if problems are developing further out. That can help prevent getting trapped in a blind alley or an area that is closed at one end by convective weather.

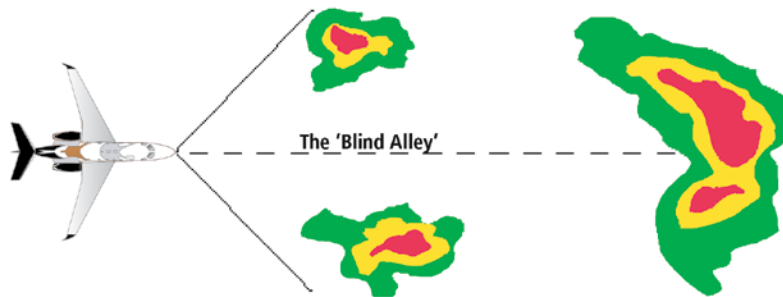
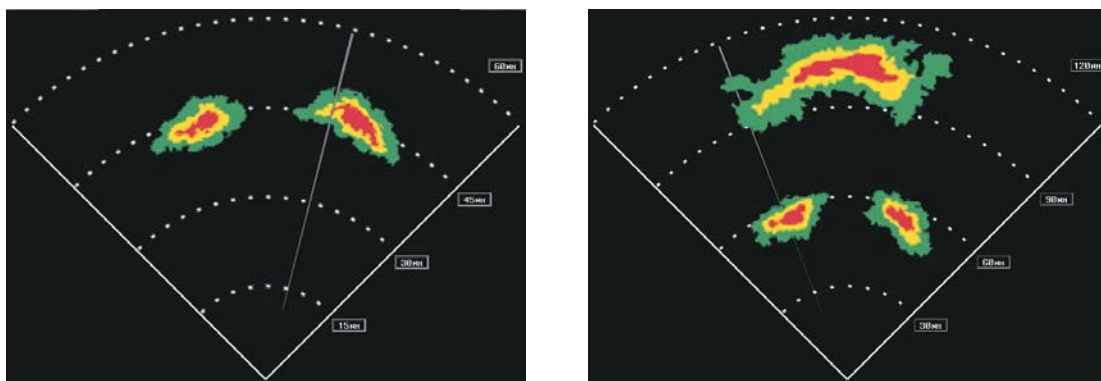


Figure 6-42 The Blind Alley - Horizontal Scan

In areas of multiple heavy cells, use the Vertical Scan feature along with antenna tilt management to examine the areas. Remember to avoid shadowed areas behind targets.



The Blind Alley at Close Range

The Large Storm Behind

Figure 6-43 The Blind Alley

TORNADOES

There are no conclusive radar target return characteristics which identify a tornado. However, tornadoes may be present if the following characteristics are observed:

- A narrow, finger-like portion extends and in a short time curls into a hook and closes on itself.
- A hook, which may be in the general shape of the numeral 6 (numeral 9 in the southern hemisphere), especially if bright and projecting from the southwest quadrant (northeast quadrant in the southern hemisphere) of a major thunderstorm.
- V-shaped notches.
- Doughnut shapes.

These shapes do not always indicate tornadoes, and tornado returns are not limited to these characteristics. Confirmed radar observations of tornadoes most often have not shown shapes different from those of a normal thunderstorm display.

HAIL

Hail results from updrafts carrying water high enough to freeze. Therefore, the higher the top of a thunderstorm, the greater the probability that it contains hail. Vertically scanning the target return can give the radar top of a thunderstorm that contains hail. Radar top is the top of a storm cell as detected by radar. It is not the actual top, or true top of the storm. The actual top of a storm cell is seen with the eyes in clear air and may be much higher than the radar top. The actual top does not indicate the top of the hazardous area.

Hail can fall below the minimum reflectivity threshold for radar detection. It can have a film of water on its surface, making its reflective characteristics similar to a very large water droplet. Because of this film of water, and because hail stones usually are larger than water droplets, thunderstorms with large amounts of wet hail return stronger signals than those with rain. Some hail shafts are extremely narrow (100 yards or less) and make poor radar targets. In the upper regions of a cell where ice particles are dry (no liquid coating), target returns are less intense.

Hail shafts are associated with the same radar target return characteristics as tornados. U-shaped cloud edges three to seven miles across can also indicate hail. These target returns appear quite suddenly along any edge of the cell outline. They also change in intensity and shape in a matter of seconds, making vigilant monitoring essential.

TESTING THE WEATHER RADAR

The weather radar provides a Test Mode which activates the radar antenna sweep movement and generates a test pattern on the selected display pane. The test pattern should display a green filled arc from the first range marker to the second, a yellow arc from the second range marker to the third, and a red arc from the third range marker to the fourth. Each arc should have a uniform color and shape. The test pattern is available in both Horizontal and Vertical scan modes.

Testing the Weather Radar:

- 1) From **Home**, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) If necessary, touch the **Radar On** Button to enable the weather radar and settings buttons. Button annunciator is green when radar is on, and gray when off.

- 3) Touch the **Display Mode** Button.
- 4) Touch the **Test** Button. Radar antenna begins sweep and test pattern appears on the selected display pane.
- 5) Touch the **Scan** Button to view the scan mode selections.
- 6) Touch the **Vertical** or **Horizontal** Button Buttons to view the scan in a Vertical or Horizontal scan mode, respectively.

OPERATION IN WEATHER MODE

WARNING: Begin transmitting only when it is safe to do so. When transmitting while the aircraft is on the ground, no personnel or objects should be within 11 feet of the antenna.

CAUTION: In Standby mode, the antenna is parked at the center line. It is always a good idea to put the radar in Standby mode before taxiing the aircraft to prevent the antenna from bouncing on the bottom stop and possibly causing damage to the radar assembly.

When the weather radar system is in the Weather or Ground Map mode, the system automatically switches to Standby mode on landing.

In Reversionary modes, the weather radar system continues to operate as long as at least one Touchscreen Controller is operating. If both Touchscreen Controllers fail, the radar system automatically switches to Standby Mode and cannot be controlled.

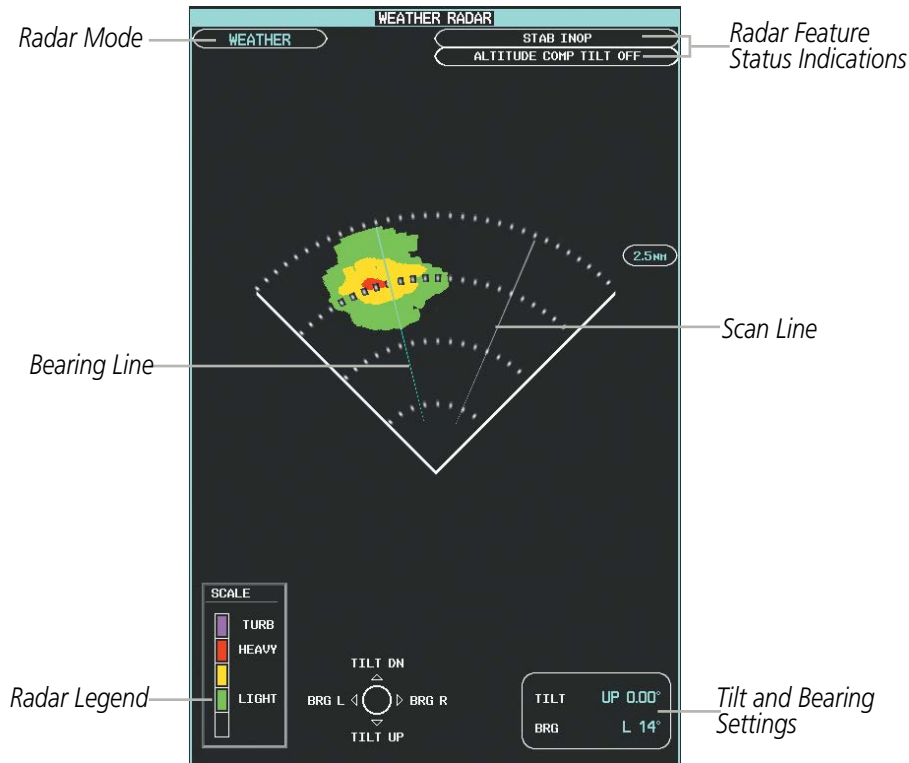


Figure 6-44 Weather Radar Pane with a Horizontal Scan

Showing Weather Radar Information on the Weather Radar Pane:

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) Touch the **Radar On** Button. Radar options are enabled when button annunciator is green, off when gray.
- 3) Touch the **Display Mode** Button.
- 4) Touch the **Weather** Button. If the aircraft is airborne, the radar begins transmitting.
- 5) If the aircraft is on the ground, the Touchscreen Controller displays a prompt shown in the figure below to confirm radar activation. Touch the **OK** Button to begin transmitting, or touch the **Cancel** Button to return to the Weather Radar Settings screen.



Figure 6-45 Confirm Activating Radar while on Ground

- 4) Turn the **Joystick** to select the desired map range.
- 5) The system displays a horizontal scan. To change to a vertical scan, refer to the following procedure, "Vertically scanning a storm cell."

Vertically scanning a storm cell:



NOTE: Vertical scanning of a storm cell should be done with the aircraft wings level to avoid constant adjustment of the Bearing Line.

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) While on a Horizontal Scan view, touch the **Bearing Line** Button if necessary to show the Bearing Line on the Weather Radar Pane.
- 2) Press the **Joystick**. This enables the **Joystick** to set the Bearing Line position and displays a bearing and tilt **Joystick** legend.
- 3) Push the **Joystick** left or right to place the Bearing Line on the desired storm cell or other area to be vertically scanned. When finished, press the **Joystick** again to disable the bearing line adjustment **Joystick** function.

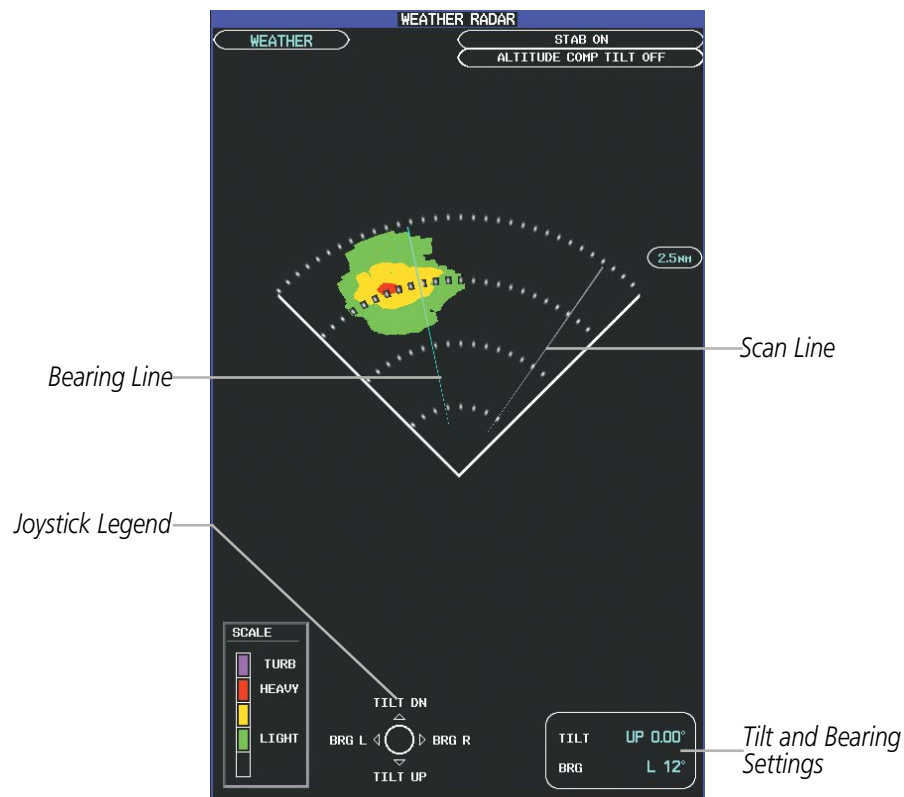


Figure 6-46 Weather Radar Pane with a Horizontal Scan

- 4) Touch the **Scan** Button.
- 5) Touch the **Vertical** Button. The Weather Radar display shows a vertical scan.
- 6) Push the **Joystick** left or right as needed to move the bearing line a few degrees left or right.
- 7) Turn the **Joystick** to adjust the range as needed.

- 8) To select a new area to be vertically scanned, return to the Horizontal scan mode.
 - a) Touch the **Scan** Button.
 - b) Touch the **Horizontal** Button.
 - c) Return to Step 2 of this procedure.

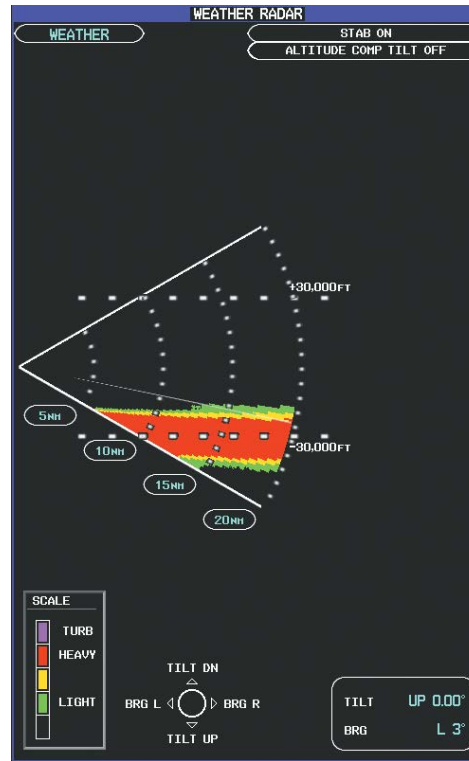


Figure 6-47 Weather Radar Display with Vertical Scan Mode Selected

ADJUSTING ANTENNA TILT ANGLE

In order to make an accurate interpretation of a storm cell, the radar beam should be pointed at the wet part of the weather cell to record the proper rainfall intensity (color level). The ideal aiming point is just below the freezing level of the storm. The best way to find this point is to use the Vertical Scan feature. The antenna tilt angle can be centered on the strongest return area in the vertical scan to get a more accurate view of the coverage and intensity of the target in the horizontal scan.

Adjusting antenna tilt on the Weather Radar Display in Horizontal Scan Mode:

- 1) Push the **Joystick** to activate the tilt adjustment function of the **Joystick**. The Weather Radar displays a bearing and tilt **Joystick** legend.
- 2) Use the Joystick to adjust the antenna tilt angle.
- 3) Press the **Joystick** again to disable the tilt adjustment function of the **Joystick** and remove the legend.

ALTITUDE COMPENSATED TILT (ACT) ANGLE ADJUSTMENT

The Attitude Compensated Tilt feature enables automatic management of the antenna tilt angle as the aircraft altitude changes. With ACT enabled, the antenna beam position remains centered at the set position for the current map range. The system automatically decreases the tilt angle as the aircraft climbs, and increases the tilt angle as the aircraft descends. ACT is available in the Horizontal Scan Mode when the system is operating in Weather Mode and GPS altitude is available.

Enabling/Disabling Altitude Compensated Tilt (ACT):

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) Touch the **Altitude Comp Tilt** Button. Feature is enabled when button annunciator is green, disabled when gray.

Adjusting antenna tilt on the Weather Radar Display in Vertical Scan Mode:

- 1) While in Vertical Scan Mode, press the **Joystick** to activate the tilt adjustment function of the **Joystick** and display the Tilt Line on the Weather Radar Display.
- 2) Use the **Joystick** to adjust the tilt angle.
- 3) Press the **Joystick** to disable the tilt adjustment function of the **Joystick**.

The selected tilt angle applies when Horizontal Scan Mode is enabled again.

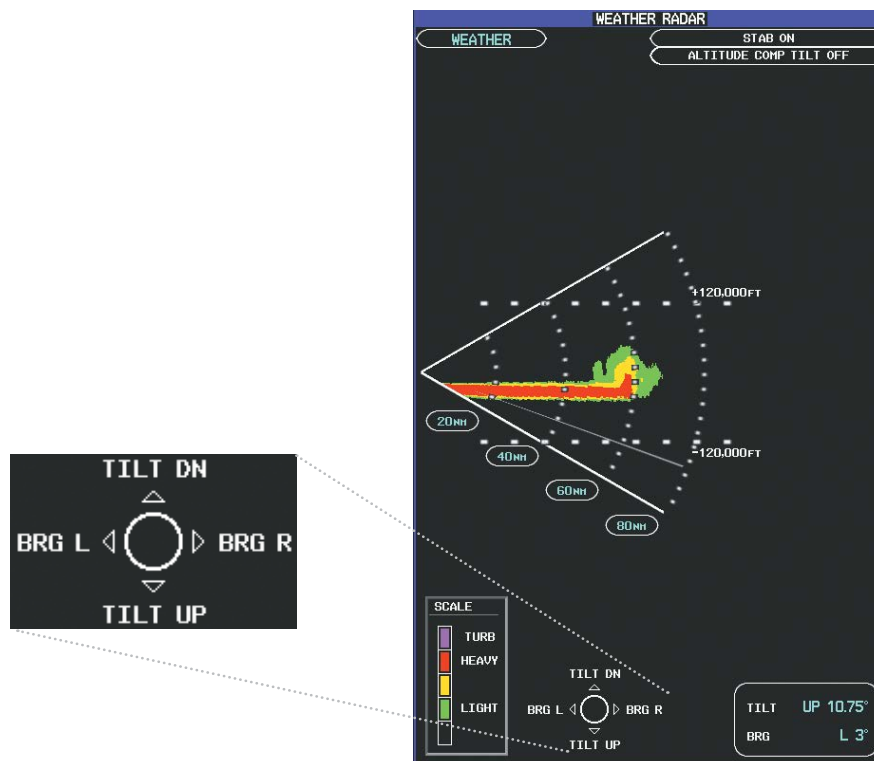


Figure 6-48 Adjusting Tilt During Vertical Scan

ADJUSTING GAIN



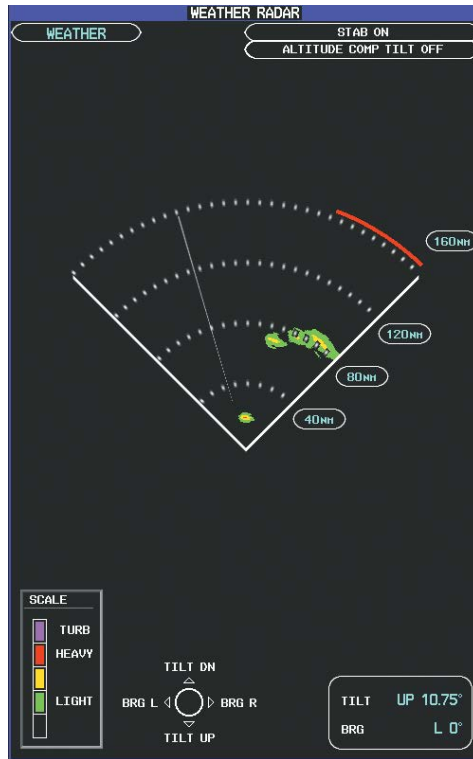
WARNING: *Changing the gain in weather mode causes precipitation intensity to be displayed as a color not representative of the true intensity. Remember to return the gain setting to Calibrated for viewing the actual intensity of precipitation.*

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) If the **Calibrated Gain** button annunciator is green (enabled), touch the **Calibrated Gain** Button to disable Calibrated Gain. **Calibrated Gain** Button annunciator is gray when disabled.
- 3) Touch and slide the Gain slider as shown in Figure 6-50.

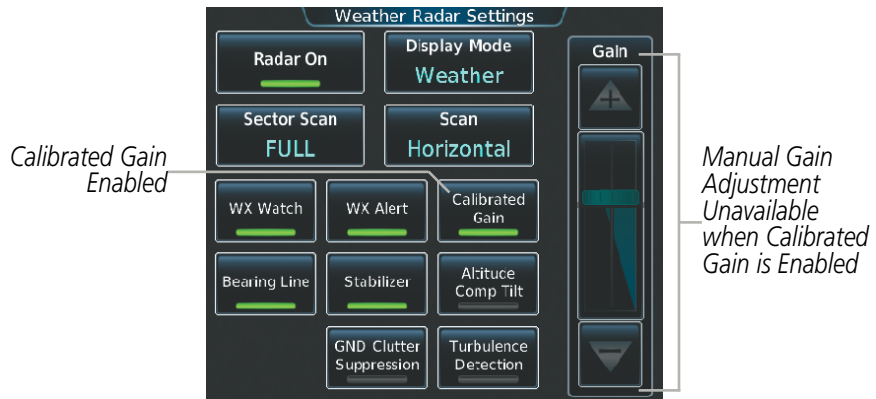
Or:

Touch the **+** pointer to increase gain, or **-** pointer to decrease gain. Each touch increases or decreases the gain by one increment. A gray bar across the slider bar serves as a reference to the calibrated gain setting position.

- 4) To return to the calibrated gain setting, touch the **Calibrated Gain** Button.

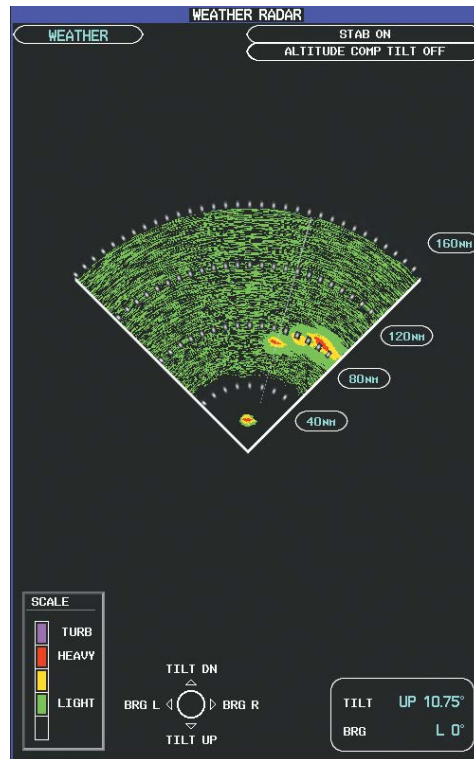


Weather Radar Pane with Calibrated Gain Setting

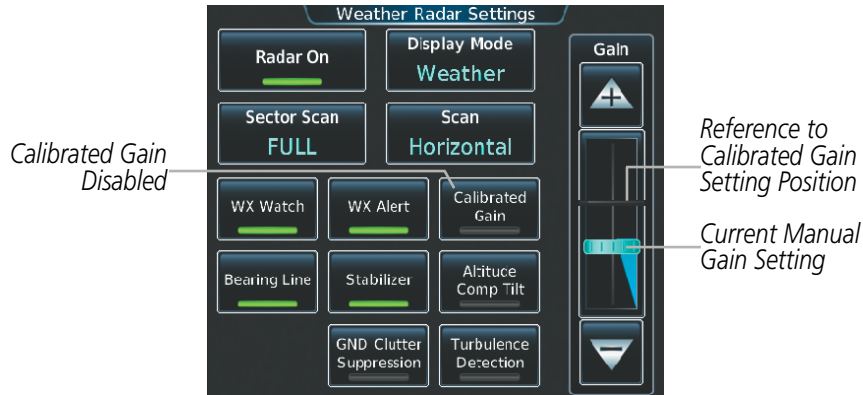


Touchscreen Controller with Calibrated Gain Setting Enabled

Figure 6-49 Calibrated Gain



Weather Radar Pane set Above Calibrated Gain Setting



Touchscreen Controller with Manual Gain Adjustment Enabled

Figure 6-50 Manual Gain

SECTOR SCAN

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) While in Horizontal Scan Mode, touch the **Bearing Line** Button if necessary to show the Bearing Line on the Weather Radar display/.
- 2) Press the **Joystick** to enable bearing pointer adjustment.

- 3) Move the **Joystick** left or right to place the Bearing Line in the desired position. The location of the Bearing Line becomes the center point of the Sector Scan.
- 4) Touch the **Sector Scan** Button.
- 5) Touch a button to select a 20°, 40°, 60°, or touch the **FULL** Button to resume a 90° degree scan.
- 6) If desired, readjust the Bearing Line as discussed previously to change the center of the Sector Scan.
- 7) Press the **Joystick** again to remove the bearing selection function of the Joystick. The bearing reference is reset to 0°.

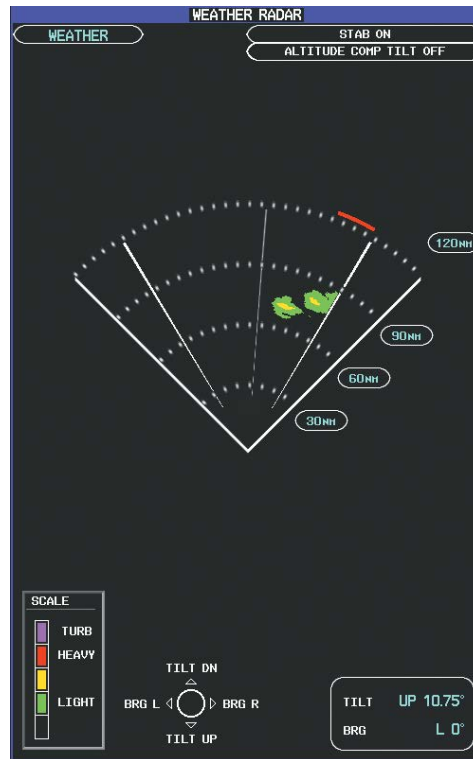


Figure 6-51 Weather Radar Pane on a 60 Degree Sector Scan

ANTENNA STABILIZATION

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To activate or deactivate the antenna stabilization, touch the **Stabilizer** Button. Antenna stabilization is enabled when button annunciator is green; stabilization is disabled when button annunciator is gray. The system indicates the current stabilization condition in the upper right of the Weather Radar Pane.

TURBULENCE DETECTION

The Turbulence Detection feature assists in identifying of areas of turbulence associated with precipitation using the color magenta during a horizontal scan. These magenta areas represent precipitation moving at a high rate of speed either toward or away from the radar antenna, using Doppler radar measurements. This feature cannot detect areas of Clear Air Turbulence. Turbulence Detection is unavailable while performing a vertical scan.

Enabling/Disabling Turbulence Detection during a Horizontal Scan:

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To activate or deactivate the turbulence detection feature, touch the **Turbulence Detection** Button. Turbulence detection is enabled when button annunciator is green; turbulence detection is disabled when button annunciator is gray. The system indicates the current turbulence detection condition in the upper right of the Weather Radar Display.

WEATHER ATTENUATED COLOR HIGHLIGHT (WATCH®)

WATCH® identifies deceptively strong or unknown intensity parts of a storm. While in horizontal scan mode, this feature may assist the crew in determining areas of possible inaccuracies in displayed intensity due to weakening of the radar energy. This weakening is known as attenuation. The radar energy weakens as it passes through areas of intense precipitation, large areas of lesser precipitation, and distance. Imperfections in the with the radome attenuate the radar energy. All these factors have an effect on the return intensity. The more energy that dissipates, the lesser the displayed intensity of the return. Accuracy of the displayed intensity of returns located in the shaded areas are suspect. Make maneuvering decisions with this information in mind. Proper antenna tilt management should still be employed to determine the extent of attenuation in a shaded area.

Enabling/Disabling WATCH display feature:

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To activate or deactivate the WATCH feature, touch the **WX Watch** Button. WATCH is enabled when button annunciator is green; WATCH is disabled when button annunciator is gray.

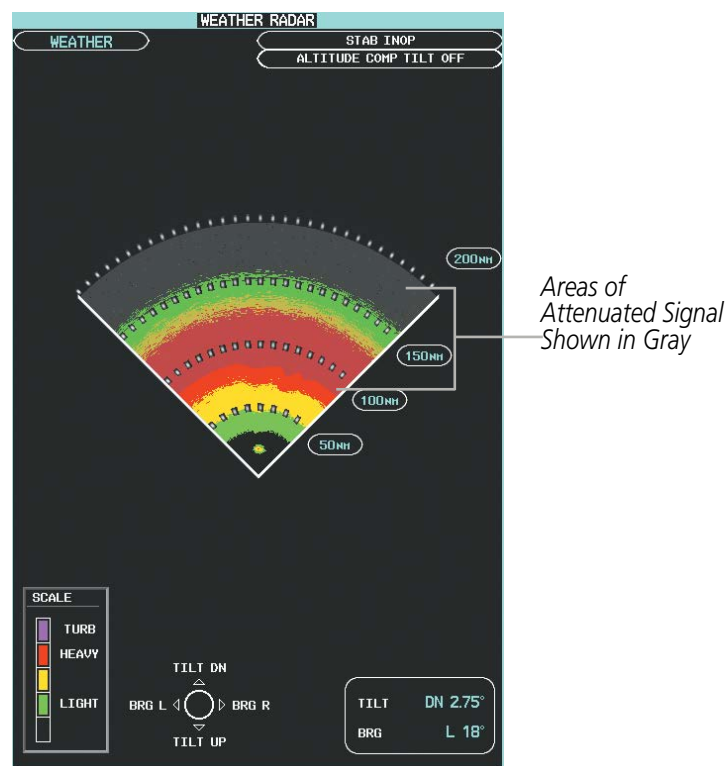


Figure 6-52 Horizontal Scan with WATCH® Enabled

WEATHER ALERT

The Weather Alert feature indicates the presence of heavy precipitation between the ranges of 80 and 320 nm regardless of the currently displayed range. Weather Alert targets appear as red bands along the outer range ring at the approximate azimuth of the detected returns.

When the system detects a Weather Alert target within $\pm 10^\circ$ of the aircraft heading, the Touchscreen Controller may also display a WX Alert system message on the Notifications Screen. The WX Alert system message is enabled/disabled on the Weather Radar Settings Screen.

If the antenna tilt adjustment is too low, ground returns may cause Weather Alert targets or WX Alert system messages to appear. The optional Ground Clutter Suppression feature, discussed later in this section, may reduce the occurrence of ground returns appearing as Weather Alert targets.



Figure 6-53 Weather Alerts on the Weather Radar Pane

Enabling/Disabling WX Alert System Message:

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To enable or disable the WX Alert system message, touch the **WX Alert** Button. WX Alert system messages are enabled when button annunciator is green, and disabled when annunciator is gray.

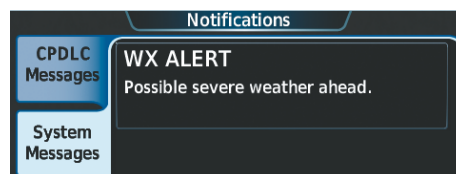


Figure 6-54 WX Alert System Message on the Notifications Screen

REMOVING GROUND CLUTTER



NOTE: *The ground clutter suppression feature is optional.*

The system can distinguish between reflected ground returns (such as terrain features and buildings) and airborne weather phenomena when operating in Weather display mode. Ground clutter may increase when using a low antenna tilt angle, or when approaching mountainous terrain.

When Ground Clutter suppression is enabled, the system removes ground clutter from the display.

Enabling/Disabling Ground Clutter Suppression:

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) To enable or disable the ground clutter suppression feature, touch the **GND Clutter Suppression** Button. Ground clutter suppression is enabled when button annunciator is green; ground clutter suppression is disabled when annunciator is gray.

GROUND MAPPING AND INTERPRETATION

A secondary use of the weather radar system is for the presentation of terrain. This can be a useful tool for verifying aircraft position. A picture of the ground is represented much like a topographical map that can be used as a supplement to the navigation map.

Ground Map mode uses a different gain range than Weather mode. Different colors are also used to represent the intensity levels. The displayed intensity of ground target returns are defined in the table below. Use of the Gain and Tilt controls help improve contrast so that specific ground targets can be recognized more easily. As previously discussed, the type and orientation of the target in relation to the aircraft affects the intensity displayed.

When the weather radar system is in either the Weather or Ground Map mode, the system automatically switches to Standby mode upon landing.

Ground Map Mode Color	Intensity
Black	0 dB
Light blue	> 0 dB to < 13 dB
Yellow	at least 13 dB to less than 21 dB
Magenta	at least 21 dB to less than 29 dB
Blue	29 dB and greater

Table 6-4 Ground Target Return Intensity Levels

Operation in Ground Map Mode

- 1) From Home, touch **Weather > Weather Selection > WX RADAR > WX RADAR Settings**.
- 2) Touch the **Display Mode** Button.
- 3) Touch the **Ground** Button to place the radar in Ground Map mode.
- 4) Press the **Joystick** to activate the antenna tilt selection function.
- 5) Use the **Joystick** to select the desired antenna tilt angle.
- 7) When ground returns are shown at the desired distance, press the **Joystick** to disable the tilt adjustment function of the **Joystick**.

ADDITIONAL RADAR DISPLAYS

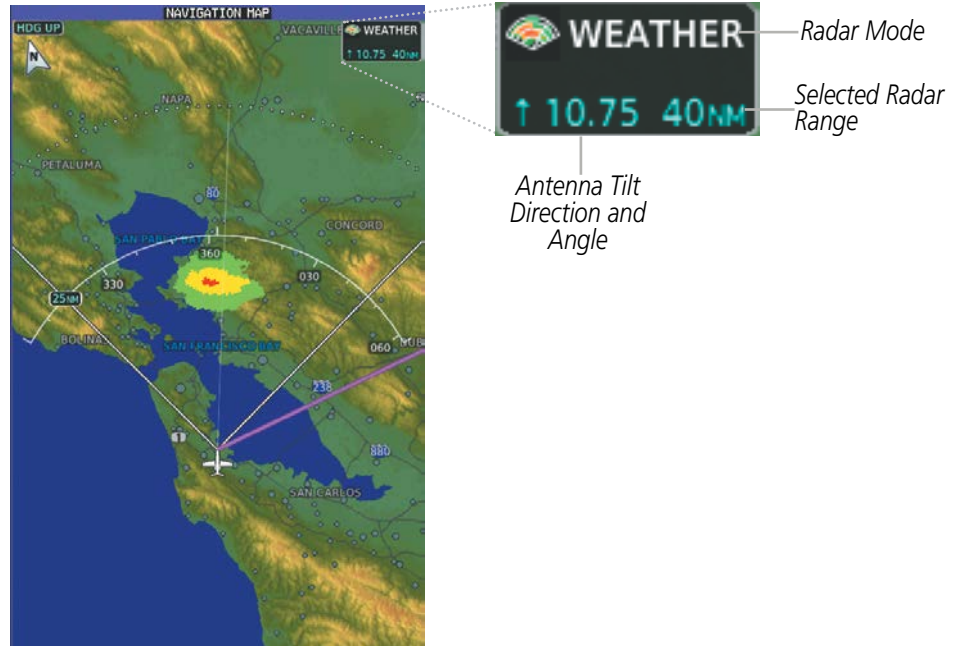


NOTE: *The NEXRAD weather product cannot be displayed simultaneously on the on the Navigation Map Pane with weather radar information.*

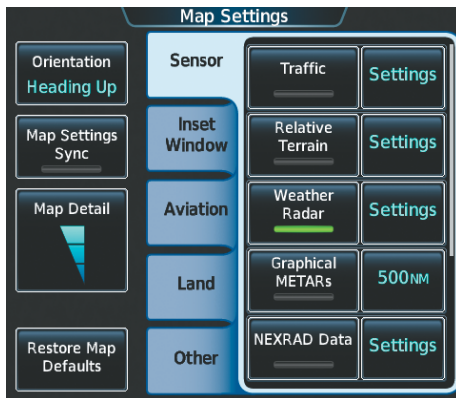
The Weather Radar Pane is the principal map pane for viewing weather radar information. Weather Radar information is also available as an overlay on the Navigation Map Pane.

Enabling/Disabling display of Weather Radar information on the Navigation Maps Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Weather Radar** Button to enable or disable the display of weather radar information.
- 4) If necessary, touch the Weather Radar **Settings** Button to access the Weather Radar Settings screen.



Weather Radar information shown on the Navigation Map Pane



Map Settings Screen with Weather Radar on Navigation Maps Enabled



Weather Radar Settings for the Navigation Maps

Figure 6-55 Displaying Weather Radar Information on the Navigation Map Pane

SYSTEM STATUS

The system displays the radar mode annunciation in the upper left corner of the Weather Radar Display. Additional information may be displayed in the center of the Weather Radar Pane as a banner annunciation.

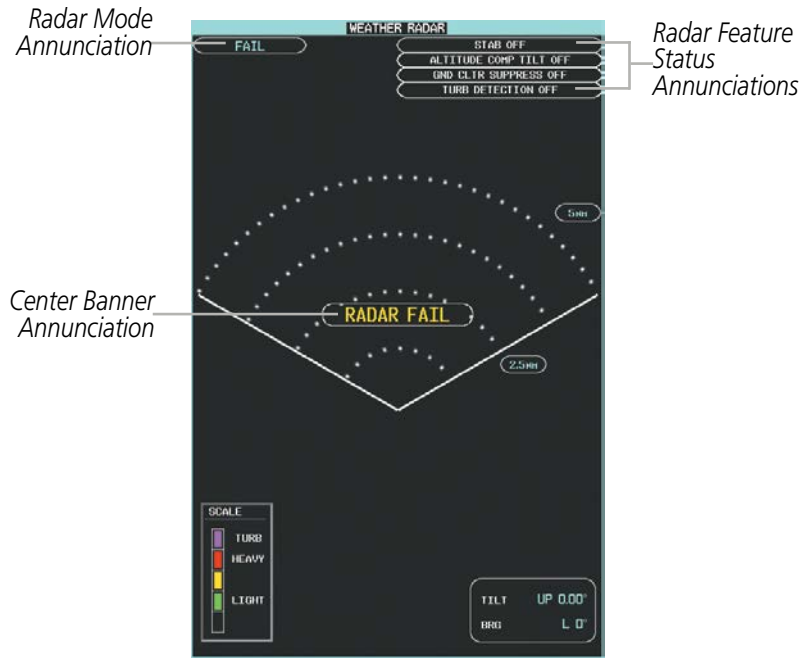


Figure 6-56 Radar System Status on the Weather Radar Pane

Radar Mode	Radar Mode Annunciation Box	Center Banner Annunciation
Standby	STANDBY	STANDBY
Weather	WEATHER	None
Ground Mapping	GROUND MAPPING	None
Off	OFF	OFF
Radar Failed*	FAIL	RADAR FAIL

* See Table 6-7 for additional failure annunciations

Table 6-5 Radar Modes on the Weather Radar Pane

The system displays the status of the weather radar features in the upper-right corner of the Weather Radar Pane.

Radar Antenna Feature Status	Description
STAB ON	Antenna stabilization is selected on.
STAB OFF	Antenna stabilization is selected off.
STAB INOP	The radar is not receiving pitch and roll information. The antenna stabilization feature is inoperative.
ALTITUDE COMP TILT ON	The altitude-compensated tilt feature is selected on.
ALTITUDE COMP TILT OFF	The altitude-compensated tilt feature is selected off.
GND CLTR SUPPRESS ON	The optional ground clutter supersession feature is selected on.
GND CLTR SUPPRESS OFF	The optional ground clutter supersession feature is selected off.
GND CLTR SUPPRESS INACTIVE	The radar scan is not receiving any ground clutter data to suppress.
GND CLTR SUPPRESS UNAVAILABLE	The radar is missing data needed to suppresses ground clutter.
TURB DETECTION ON	The optional turbulence detection feature is selected on.
TURB DETECTION OFF	The optional turbulence detection feature is selected off.
TURB DETECTION INACTIVE	The optional turbulence detection is inactive when map range is greater than 160 nm, or radar is in a mode which cannot support turbulence detection.
TURB DETECTION UNAVAILABLE	The optional turbulence detection feature is missing data necessary to detect turbulence.

Table 6-6 Antenna Stabilization Annunciations on the Weather Radar Pane

If the unit fails, an annunciation as to the cause of the failure is shown as a banner in the center of the Weather Radar Pane.

Weather Radar Pane Center Banner Annunciation	Description
BAD CONFIG	The radar configuration is invalid. The radar should be serviced.
RDR FAULT	The radar unit is reporting a fault. The radar should be serviced.
RADAR FAIL	The system is not receiving valid data from the radar unit. The system should be serviced.

Table 6-7 Abnormal Radar Status Annunciations on the Weather Radar Pane

6.3 TAWS-A



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



NOTE: Government agencies provide data for the TAWS databases. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.



NOTE: Terrain information is not available when the aircraft is outside of the installed terrain database coverage area.

TAWS-A (Terrain Awareness and Warning System - Class A) provides increased situational awareness and aids in reducing controlled flight into terrain (CFIT). TAWS-A provides visual annunciations and voice alerts when terrain and obstacles are within the given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only.

TAWS-A satisfies TSO-C151b Class A and TSO-92c requirements for certification.

TAWS-A requires the following components:

- A valid terrain and obstacle database
- A valid 3-D GPS position solution
- Valid flap and landing gear status inputs
- A valid radar altimeter

TAWS-A uses terrain and obstacle information from government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. The data undergoes verification by Garmin to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

TAWS-A uses information from the GPS receiver to provide a horizontal position and altitude, along with additional altitude input from the radar altimeter. GPS altitude is derived from satellite measurements. GPS altitude is then converted to a height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. GSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS-A are referenced to mean sea level (MSL). Using the GPS position and GSL altitude, TAWS-A displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the GPS position and GSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-A can provide advanced alerts of predicted dangerous terrain conditions.

TAWS-A incorporates radar altimeter input with the GSL altitude to provide a more accurate position reference when at lower altitudes for certain alert types, and to retain a level of ground proximity warning capability in the unlikely event of a terrain or obstacle database failure.

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 GPS-GSL altitude. This variation results in the aircraft's true altitude differing from the baro-corrected altitude.

TAWS-A provides the following alert types:

- Forward Looking Terrain Avoidance (FLTA) Alerting, which consists of:
 - Required Terrain Clearance (RTC) / Required Obstacle Clearance (ROC) Alerting
 - Imminent Terrain Impact (ITI) / Imminent Obstacle Impact (IOI) Alerting
- Premature Descent Alerting (PDA)
- Ground Proximity Warning System (GPWS) Alerting, which consists of:
 - Excessive Descent Rate (EDR) Alerting
 - Excessive Closure Rate (ECR) to Terrain Alerting
 - Flight Into Terrain (FIT) Alerting
 - Negative Climb Rate (NCR) after takeoff Alerting
 - Excessive below Glideslope/Glidepath Deviation (GSD) Alerting
 - Altitude Voice Call Out (VCO) Alerting

DISPLAYING TAWS-A INFORMATION

TAWS-A uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-57 and Tables 6-8 and 6-9 are used to represent terrain, obstacles, and potential impact points.

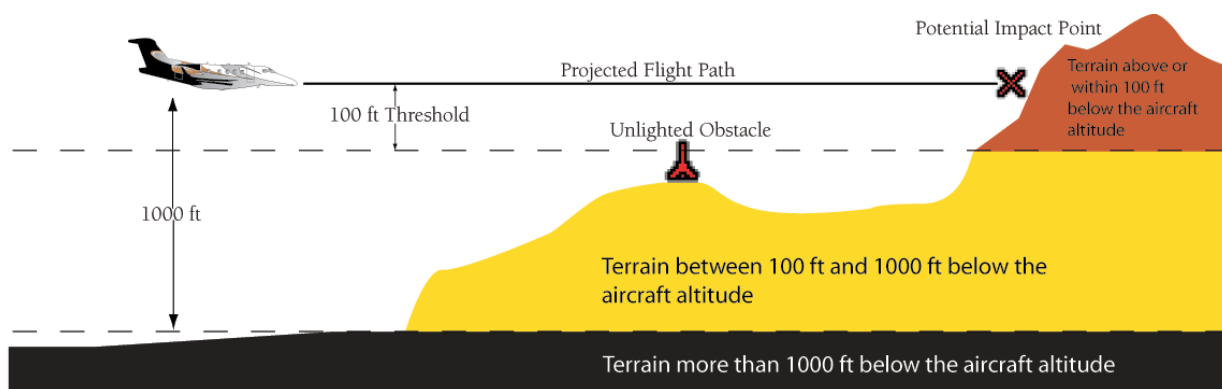


Figure 6-57 Terrain Altitude/Color Correlation for TAWS-A









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

Table 6-8 TAWS-A Obstacle Colors and Symbology





Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	
	Caution	

Table 6-9 TAWS-A Potential Impact Point Symbols with Alert Types

The system shows TAWS-A information on the TAWS Pane, the navigation map panes, and on the PFD Inset Navigation Map.

Enabling/disabling relative terrain information (navigation map panes):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Relative Terrain** Button to display/remove relative terrain information on the selected navigation map pane.

Enabling/Disabling obstacle information (Navigation Map Pane and PFD Inset Navigation Map)

- 1) From Home, touch **Map > Map Settings**
- 2) If necessary, touch the Land Tab.
- 3) Scroll to and touch the **Obstacle Data** Button.

The system can overlay relative terrain and obstacle information on the PFD Inset Navigation Map. If the Inset Map is currently displaying the traffic map (Traffic Map Softkey annunciator is green), the traffic map must first be disabled in order to view the PFD Inset Navigation Map.

Enabling/disabling relative terrain and obstacle information (PFD Inset Navigation Map)

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Terrain** Softkey.

When enabling TAWS-A relative terrain information on maps other than the TAWS Pane, an icon indicates the feature is enabled. A legend for TAWS-A terrain colors will accompany the icon on the navigation map panes (Figure 6-58). The legend is shown without the terrain icon on the TAWS Pane.



Figure 6-58 Terrain Icon and Legend

The Map Settings Screen on the Touchscreen Controller enables adjustment of map range settings above which the system declutters terrain and obstacle data from the display. If the crew selects a map range larger than the map range setting, the system removes the information from the map. For relative terrain information, the enable/disable function applies only to the display panes, while the range setting also affects the PFD Inset Map.

The system can display terrain data independently from obstacle data; however, the system will display obstacles for which cautions or warnings exist when terrain is enabled for display and the map range is within the setting limit.

Maps besides the TAWS Pane use settings based on those selected for the navigation maps. The maximum display ranges for obstacles on each map are dependent on the range setting made for the navigation maps. If the maximum range for obstacle display on the navigation maps is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Selecting a relative terrain display range on the navigation maps:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Relative Terrain **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 6) Touch the Map Terrain Range Button (displays current terrain map range in light blue)
- 7) Scroll in the list of ranges and touch a range button to select the maximum map range at which the system shows terrain information.
- 8) When finished, touch **Back** or **Home**.

Selecting an obstacle display range on the navigation maps:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Land Tab.

- 3) Touch the Obstacle Data Range Button (displays current obstacle range in light blue).
- 4) Scroll in the list of ranges and touch a range button to select the maximum map range at which the system shows obstacle information.

TAWS PANE

The TAWS Pane shows terrain, obstacle, and potential impact point information in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal map pane for viewing TAWS information. The flight crew can also enable/disable the display of aviation data on the TAWS Pane such as the following items:

- Airports
- NDBs
- VORs
- Intersections

If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts the map range if necessary to emphasize the display of the potential impact point(s).

Aircraft orientation on the TAWS pane is always heading up unless there is no valid heading. A box on the map range arc indicates the selected map range. Turn the **Joystick** clockwise to increase the map range, or counter-clockwise to decrease the map range.

Showing the TAWS Pane:

From Home, touch the **TAWS** Button.

Enabling/disabling aviation data on the TAWS Pane:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **Show Aviation Data** Button to display/remove aviation data on the TAWS Pane.

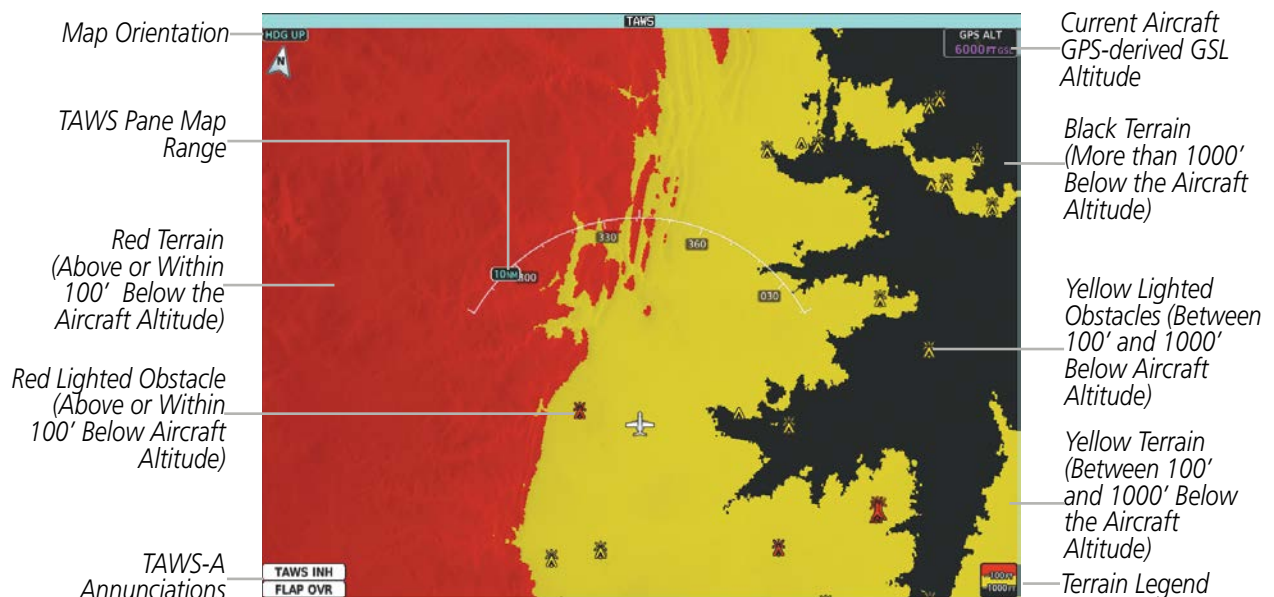


Figure 6-59 TAWS Pane

TAWS-A ALERTS

The system issues TAWS-A alerts when flight conditions meet parameters that are set within TAWS-A software algorithms. TAWS-A alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued. Table 6-10 shows TAWS-A alert types with corresponding annunciations and aural messages.

When the system issues an alert, annunciations appear on the PFDs, the TAWS Pane (if displayed), and on the Touchscreen Controllers. The PFD shows the annunciation to the left of the Altimeter. The TAWS Pane shows the alert in the lower-left corner of the pane. In addition, a pop-up alert appears on each Touchscreen Controller. To acknowledge the pop-up alert:

- Touch the **TAWS** Button (displays the TAWS Pane).
- Touch the **Inhibit TAWS** Button to inhibit TAWS-A alerting.
- Touch the **OK** Button acknowledge the alert and return to the previous screen on the Touchscreen Controller.

Acknowledging the alert on either Touchscreen Controller acknowledges the alert for the TAWS-A system.

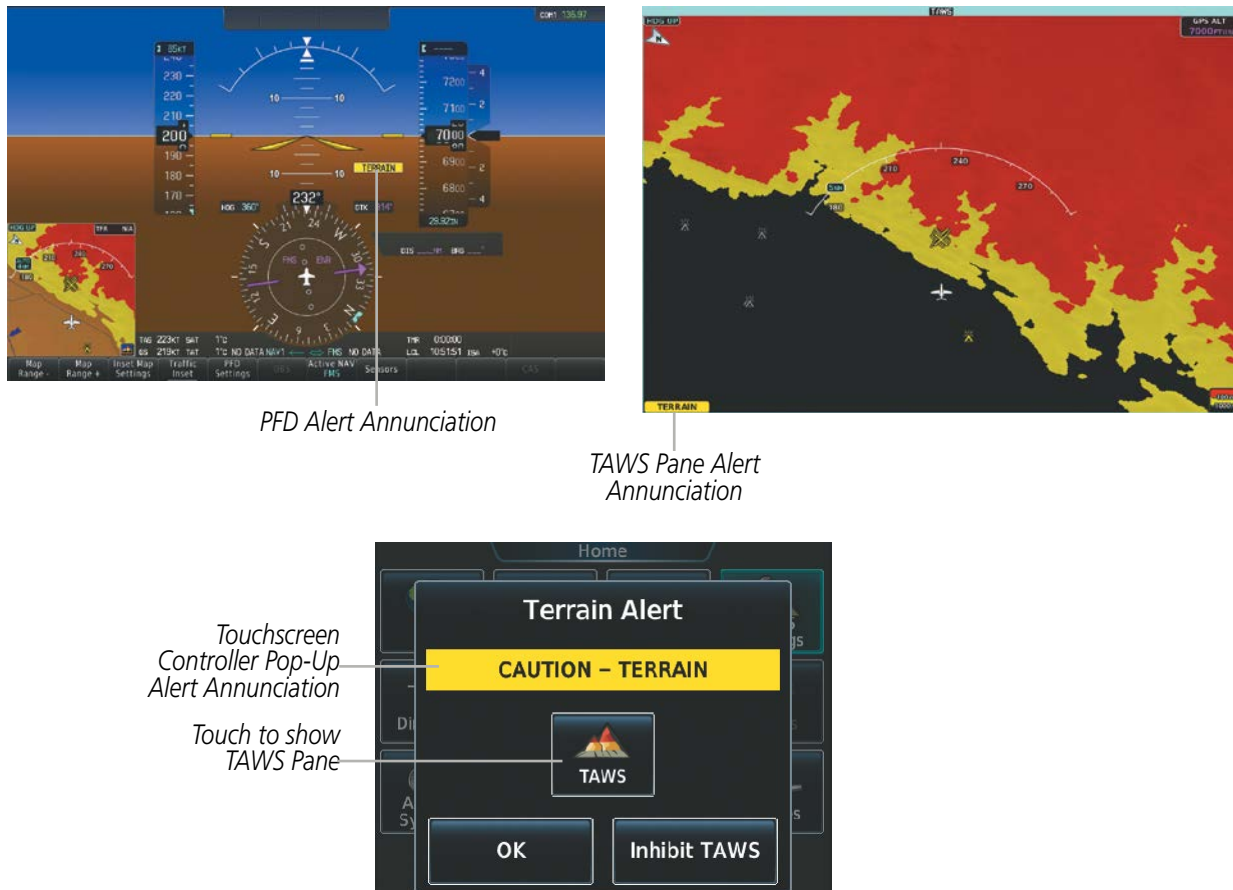


Figure 6-60 TAWS-A Alert Annunciations

Alert Type	PFD/TAWS Pane Annunciation	Touchscreen Controller Pop-Up Alert	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"<whoop> <whoop> Pull Up"
Excessive Closure Rate Warning (ECR)	PULL UP	PULL-UP	"<whoop> <whoop> Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution, Terrain; Caution, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution, Obstacle; Caution, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Excessive Closure Rate Caution (ECR)	TERRAIN	TERRAIN	"Terrain, Terrain"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK	"Don't Sink"
Flight Into Terrain High Speed Caution (FIT)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Flight Into Terrain Gear Caution (FIT)	TERRAIN	TOO LOW - GEAR	"Too Low, Gear"
Flight Into Terrain Flaps Caution (FIT)	TERRAIN	TOO LOW - FLAPS	"Too Low, Flaps"
Flight Into Terrain Takeoff Caution (FIT)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Glide Slope Deviation Caution (GSD) (depends on approach type)	GLIDESLOPE or GLIDEPATH	GLIDESLOPE or GLIDEPATH	"Glideslope" or "Glidepath"
Altitude Voice Callout (VCO)	None	None	"Five-Hundred", "Four-Hundred", "Three-Hundred", "Two-Hundred", "One-Hundred"

Table 6-10 TAWS-A Alerts Summary

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide notification when the aircraft is determined to be closing (descending) upon terrain a rate that is calculated to be excessive relative to height above terrain. Figure 6-61 shows the parameters for the alert as defined by TSO-C151b.

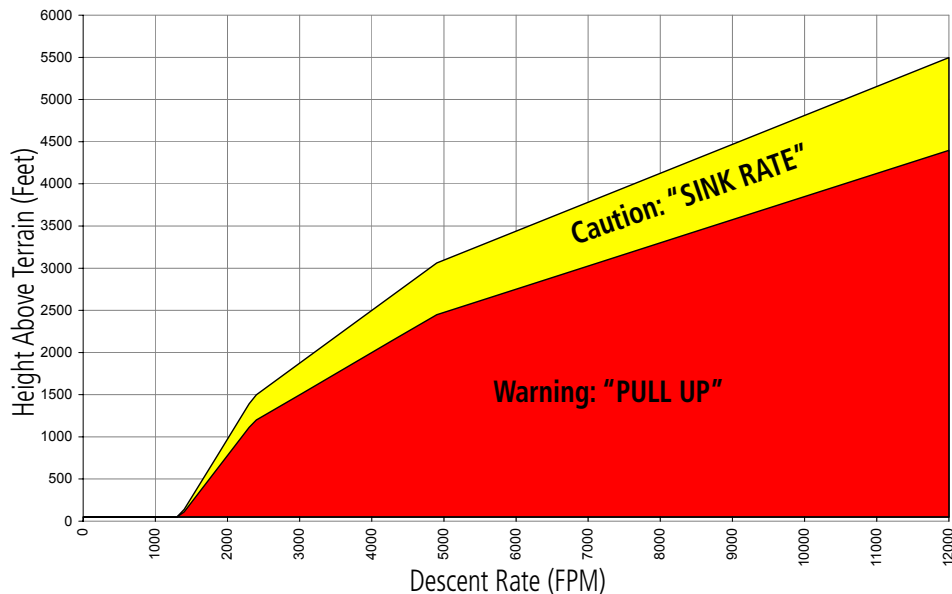


Figure 6-61 Excessive Descent Rate Alert Criteria

FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

The Forward Looking Terrain Avoidance (FLTA) feature of TAWS-A compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. The system issues aural and visual FLTA alerts when the projected flight path conflicts with terrain or obstacles.

The projected flight path is a calculated area ahead of, to the sides, and below the aircraft. The size of the projected flight path varies based on factors including ground speed (the path ahead is larger when the ground speed is higher), whether the aircraft is level, turning, or descending, and the proximity to the nearest runway along the current track. As the aircraft approaches the runway, the projected flight path becomes narrower until the system automatically disables FLTA alerts or the pilot manually inhibits them.

There are two types of FLTA alerts, Reduced Required Terrain/Obstacle Clearance (RTC or ROC respectively) and Imminent Terrain/Obstacle Impact (ITI or IOI respectively).

Reduced Required Terrain Clearance (RTC) and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-62. When an RTC alert is issued, a potential impact point is displayed on the TAWS Pane.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle in the aircraft's projected path. ITI and IOI alerts are

accompanied by a potential impact point displayed on the TAWS Pane. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-62.

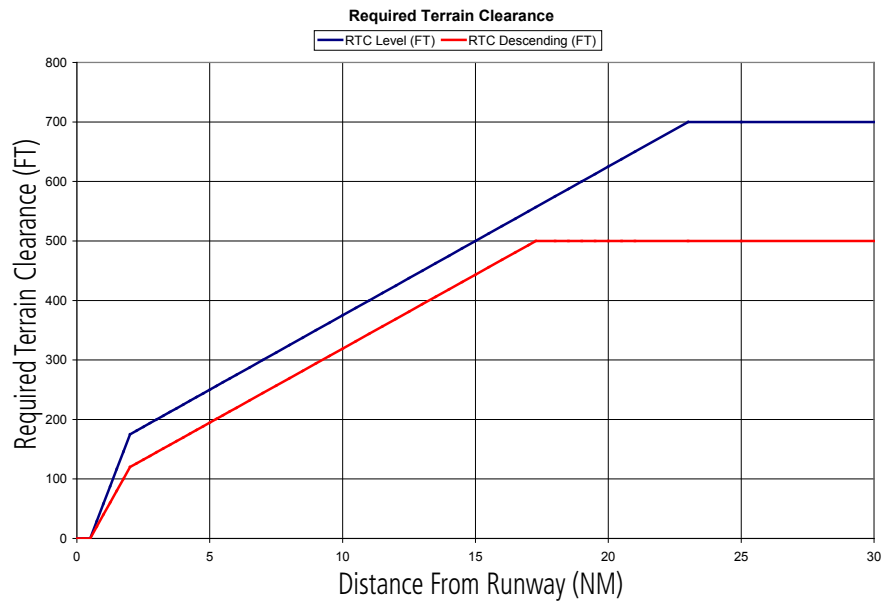


Figure 6-62 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically disabled when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** is issued when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-63).

PDA alerting begins when the aircraft is below 700 feet AGL within 15 nm of the destination airport and ends when the aircraft is 0.5 nm from the runway threshold.

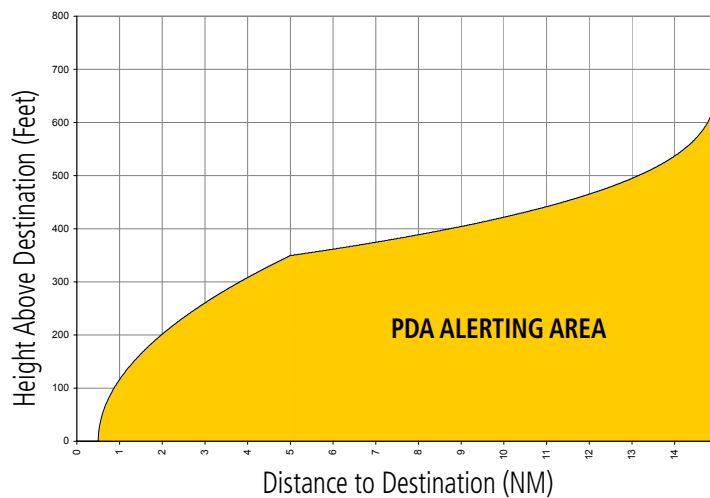


Figure 6-63 PDA Alerting Threshold

INHIBITING FLTA AND PDA ALERTS



NOTE: The 'Inhibit TAWS' function only inhibits FLTA and PDA alerts. Alerting for GPWS alerts (EDR, ECR, NCR, FIT) and GSD is controlled independently from FLTA and PDA alerts.

FLTA and PDA visual annunciations and voice alerts can be manually inhibited. Discretion should be used when inhibiting alerts; they should be enabled when appropriate. When PDA and FLTA alerts are inhibited, the alert annunciation 'TAWS INH' is shown on the PFDs and on the TAWS Pane.

Figure 6-64 TAWS FLTA and PDA Alerting Inhibited Annunciation

Inhibiting/enabling TAWS-A FLTA and PDA alerting:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **TAWS Inhibit** Button. When the annunciator on the button is green, TAWS-A alerting is inhibited. When the button annunciator is gray, TAWS-A alerting is enabled.

Or:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 2) Touch the Relative Terrain **Settings** Button.
- 3) Touch the **TAWS Inhibit** Button. TAWS-A alerting is inhibited when the button annunciator is green, enabled when gray.

Inhibiting TAWS-A alerting while an alert is occurring:

Touch the **Inhibit TAWS** Button on the Terrain Alert pop-up window on either Touchscreen Controller.

If TAWS-A FLTA alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, the system may show a 'LOW ALT' annunciation on the PFDs next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide suitable notification when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 6-65 shows the parameters for the alert as defined by TSO-C151b.

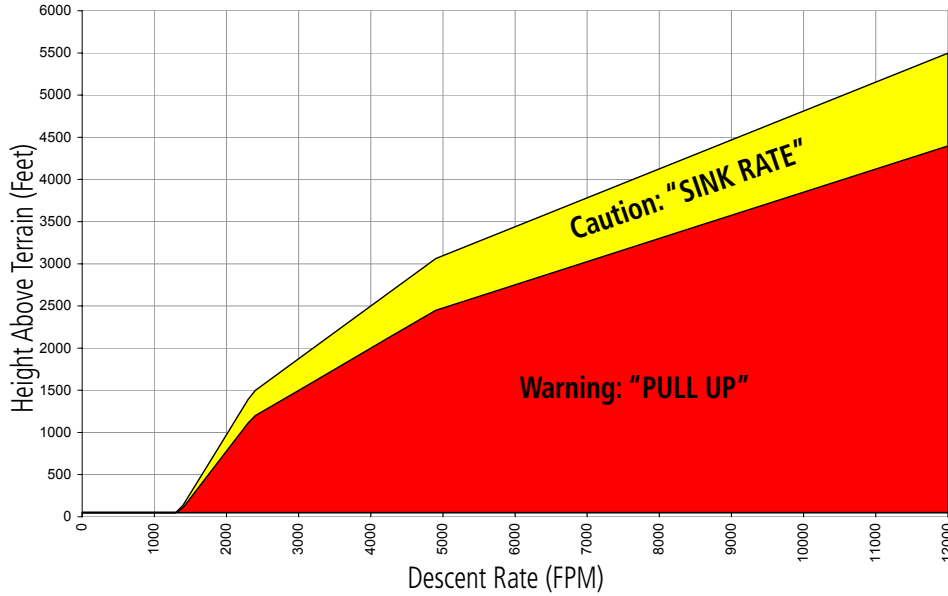


Figure 6-65 Excessive Descent Rate Alert Criteria

EXCESSIVE CLOSURE RATE ALERT

The **Excessive Closure Rate (ECR)** alert provides suitable notification when the aircraft is determined to be closing upon terrain at an excessive speed for a given aircraft gear and flap configuration.

Figures 6-136 and 6-137 show the ECR alerting criteria for flaps in the landing configuration and for all other flight phases respectively.

ECR alerts are automatically disabled when the aircraft is 5 nm from the nearest airport, except when FLTA is not available (causing the TAWS N/A or TAWS FAIL annunciation to be displayed), in which case ECR alerting will remain active until landing.

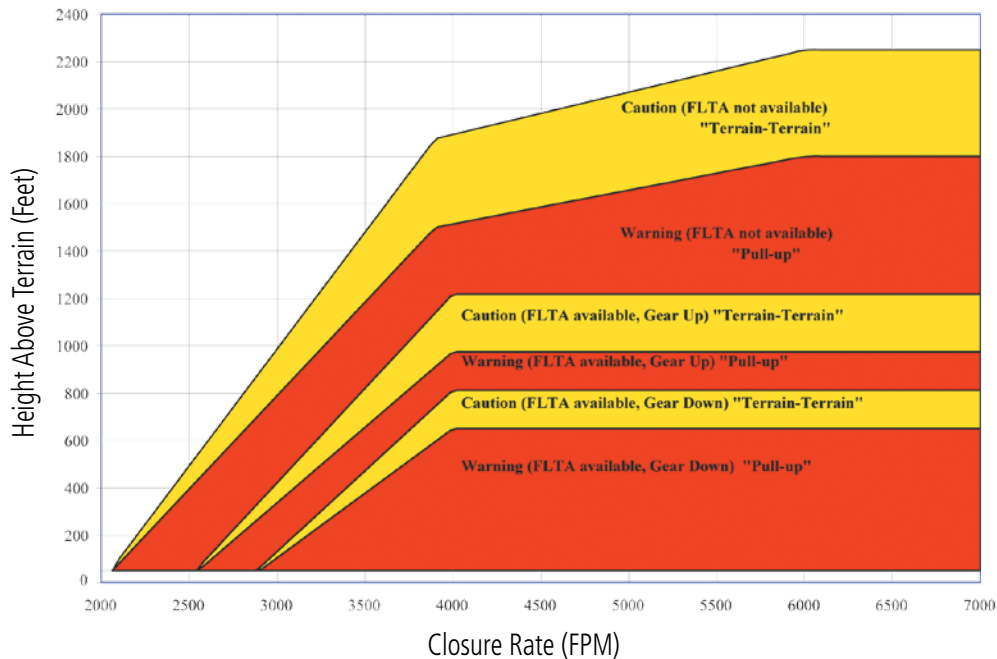


Figure 6-66 Excessive Closure Rate Alert Criteria (Flaps Up or Takeoff Configuration)

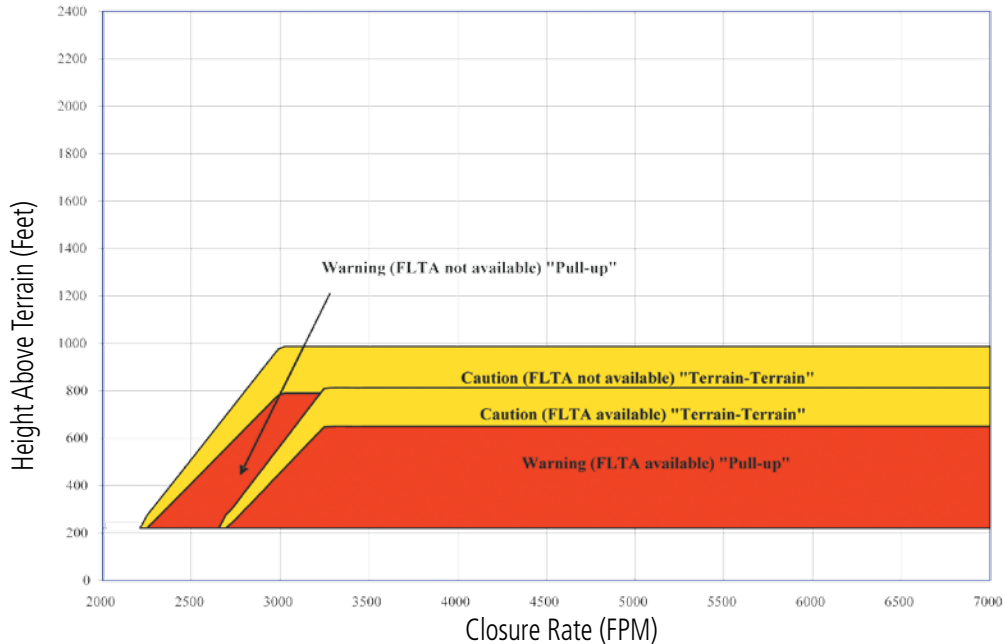
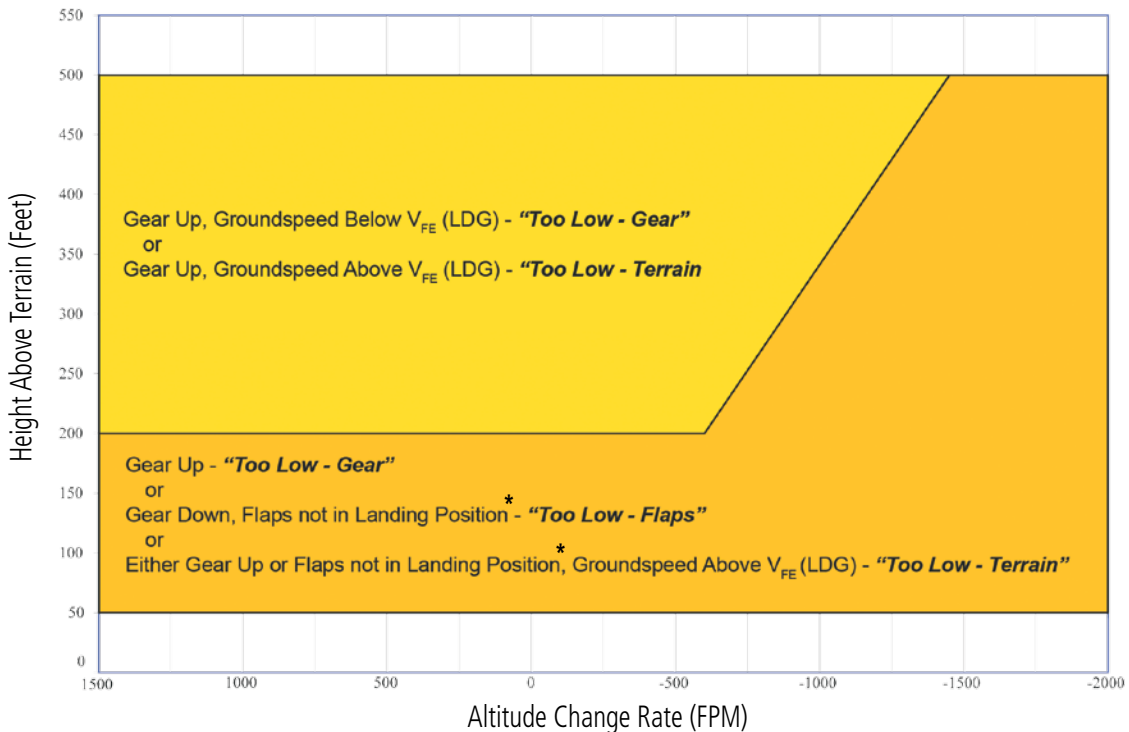


Figure 6-67 Excessive Closure Rate Alert Criteria (Flaps in Landing Configuration)

FLIGHT INTO TERRAIN ALERT

Flight Into Terrain (FIT) alerts occur when the aircraft is too low with respect to terrain based on landing gear status, flap position, and groundspeed. FIT caution alerts are issued when flight conditions meet the criteria shown in Figure 6-68.



* Flap position will not trigger alert if Flap Override option is enabled; see discussion below.

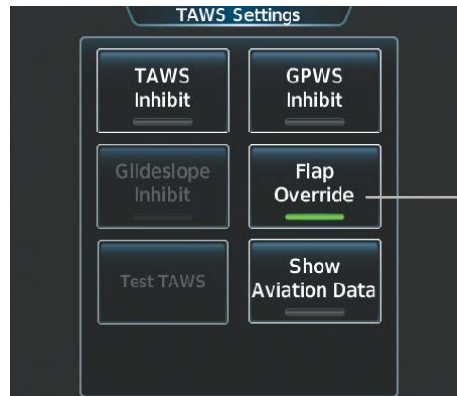
Figure 6-68 Flight Into Terrain Caution Alert Criteria

To reduce nuisance FIT alerts on approaches where flap extension is not desired (or is intentionally delayed), the pilot may override FIT alerting based on the flap position, while all other FIT alerting remains in effect.

PFD Flap Override Annunciation



*TAWS Pane
Flap Override
Annunciation*



*"Too Low - Flaps"
Warning Inhibited when
Flap Override Button is
Enabled*

**Figure 6-69 Overriding Flaps
Configuration-Based FIT Alerts**

Overriding Flaps-based FIT alerting:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **Flap Override** button. FIT alerts based on flap position are overridden (disabled) when button annunciator is green, available when gray.

When the Flaps Override option is enabled, the annunciation 'FLAP OVR' is annunciated on the PFDs and on the TAWS Pane (Figure 6-69). If GPWS alerts are also inhibited (which include FIT), the 'FLAP OVR' annunciation is not shown.

FIT alerts also occur during takeoff or go-around if the aircraft's height above ground level (as determined by the radar altimeter) is too close to rising terrain. The system displays a 'TERRAIN' caution or warning annunciation on the PFDs, and a 'TOO LOW - TERRAIN' pop-up annunciation on the Touchscreen Controllers. The system also issues a "Too Low, Terrain" voice alert.

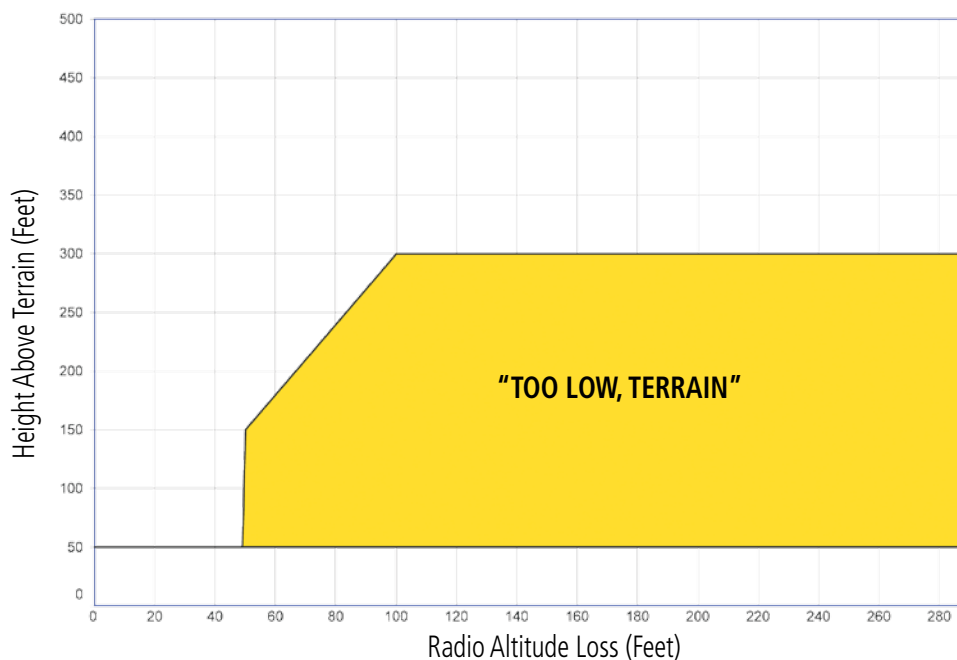


Figure 6-70 FIT Alerting After Takeoff

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT

The **Negative Climb Rate (NCR) After Takeoff** alert (also referred to as "Altitude Loss After Takeoff") provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. The system displays a 'TERRAIN' caution annunciation on the PFDs, and a 'DON'T SINK' pop-up annunciation on the Touchscreen Controllers. The system also generates a "Don't Sink" voice alert.

NCR alerting for TAWS-A is only active when departing from an airport and when the following conditions are met:

- Height above the terrain is less than 700 feet
- Distance from the departure airport is 5 nm or less

- Heading change from the departure heading is less than 110 degrees
- Landing gear or flaps are configured for takeoff

NCR alerts can be triggered by either altitude loss (Figure 6-71) or sink rate (6-72).

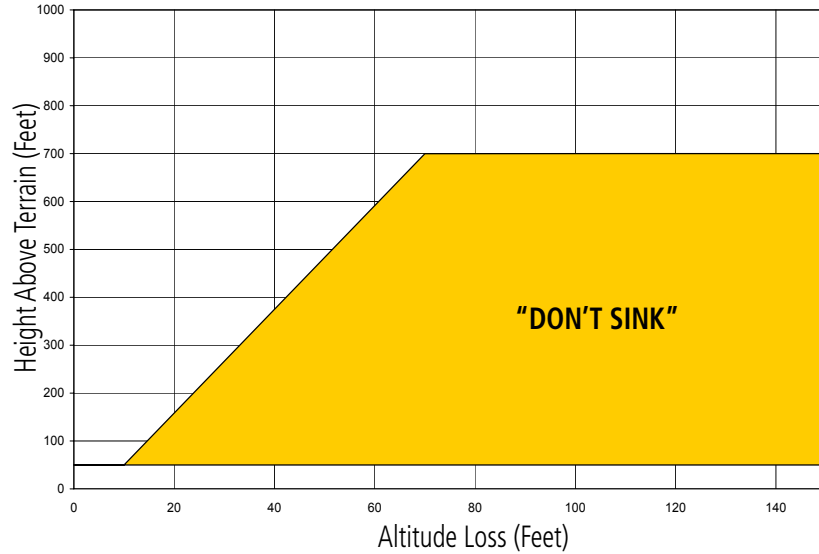


Figure 6-71 Negative Climb Rate (NCR) Altitude Loss

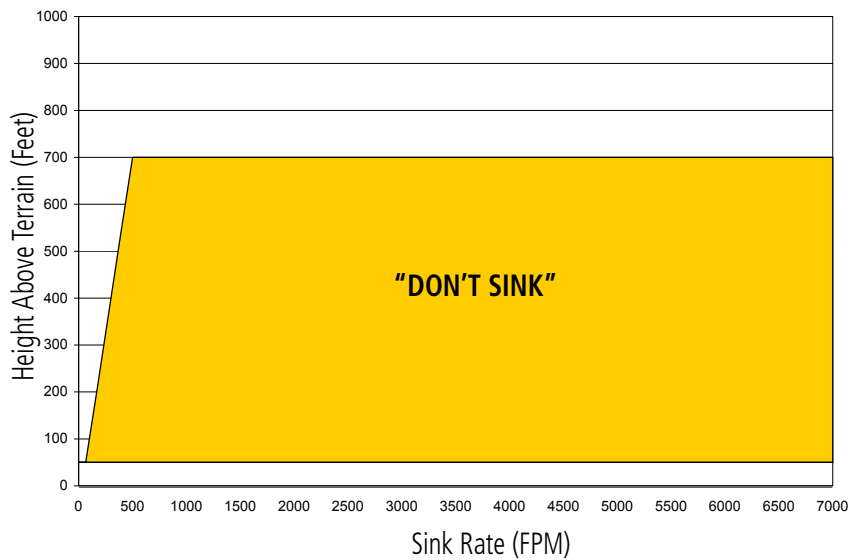


Figure 6-72 Negative Climb Rate (NCR) Sink Rate

INHIBITING GPWS ALERTS (EDR, ECR, FIT, AND NCR)



NOTE: The 'Inhibit GPWS' function only affects GPWS alerts (EDR, ECR, NCR, and FIT). Alerting for FLTA, PDA, and GSD is controlled independently from the GPWS alerts listed below.

EDR, ECR, FIT, and NCR alerts can be manually inhibited as a group. Discretion should be used when inhibiting alerts, and the GPWS system should be enabled when appropriate. When these alerts are inhibited, the status annunciation 'GPWS INH' is shown on the PFDs and on the TAWS Pane (Figure 6-73).

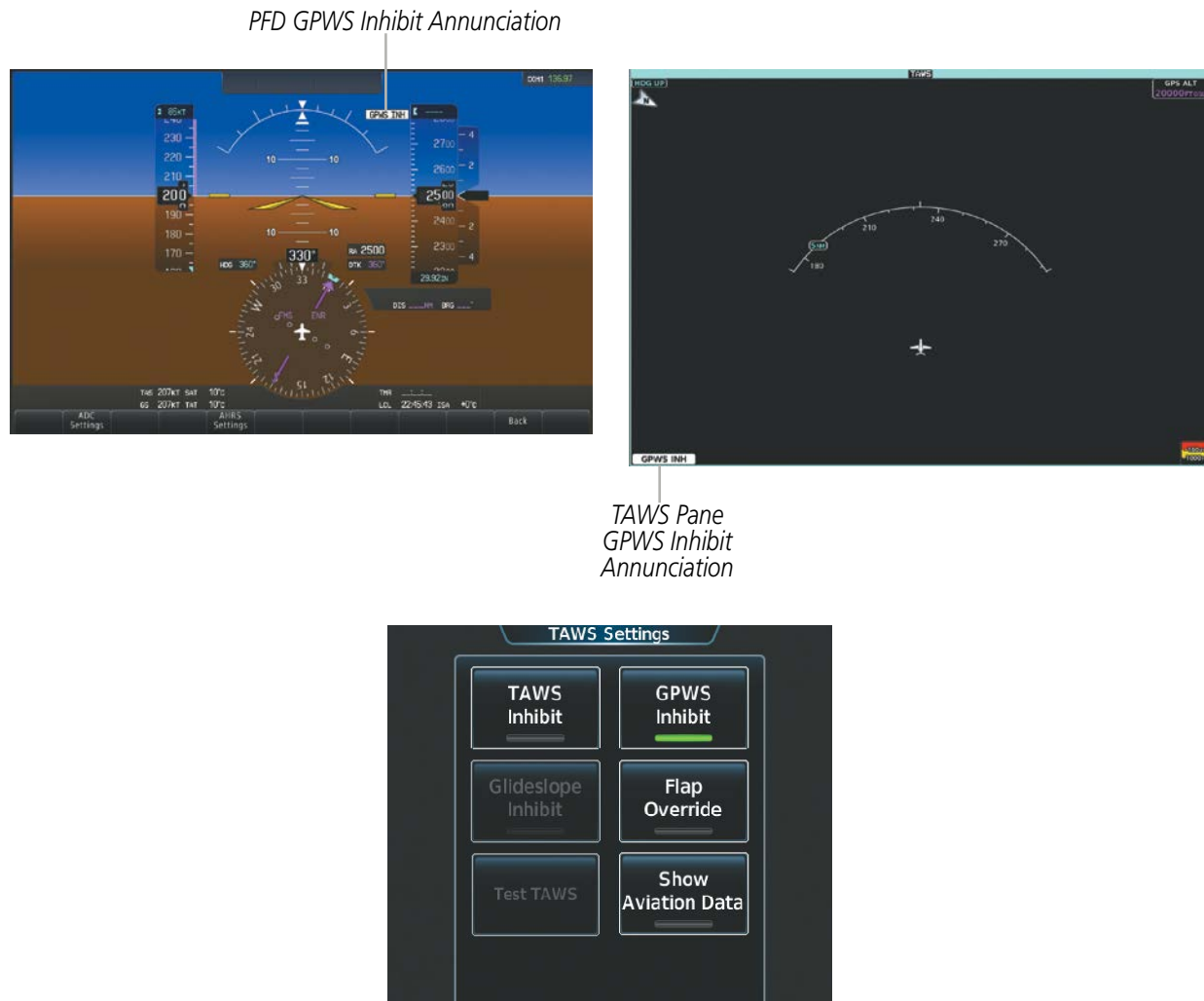


Figure 6-73 Inhibiting GPWS Alerts

Inhibiting/enabling GPWS alerting:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **GPWS Inhibit** button. Button annunciator is green when GPWS alerts are inhibited, gray when alerting is enabled.

EXCESSIVE BELOW GLIDESLOPE/GLIDEPATH DEVIATION ALERT

A **Glideslope Deviation** or **Glidepath Deviation (GSD)** caution alert is issued when the system detects that the aircraft is significantly below the glidepath for the selected approach in relation to the aircraft's height above terrain (Figure 6-74).

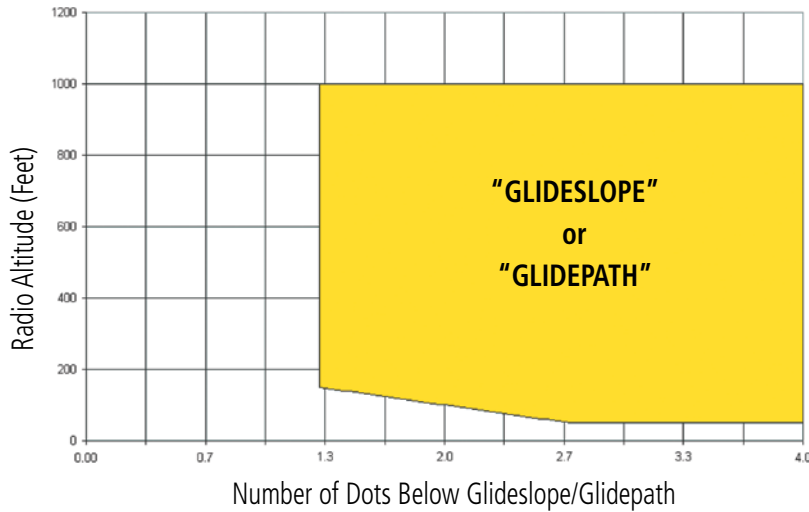


Figure 6-74 Excessive Below Glideslope/Glidepath Deviation Alert Criteria

GSD alerting is only active after departure and the following conditions are met:

- An ILS, LPV, LNAV/VNAV, or LNAV+V approach is active and vertical navigation indications are being displayed.
- Aircraft is below 1000 feet AGL
- Gear is in the landing configuration.

When a GSD caution alert occurs on an ILS approach, the system displays a 'GLIDESLOPE' annunciation on the PFDs and Touchscreen Controllers and provides a **“Glideslope”** voice alert. If a GSD caution alert occurs on an LPV, LNAV/VNAV, or LNAV+V approach, the system displays a 'GLIDEPATH' annunciation and provides a **“Glidepath”** voice alert (Figure 6-75).

INHIBITING GSD ALERTS



NOTE: GSD alerting may only be inhibited while a GSD alert is occurring. GSD alerts are inhibited independently from all other FLTA, PDA, and GPWS alerts.

GSD Alerts may be inhibited on either Touchscreen Controller.

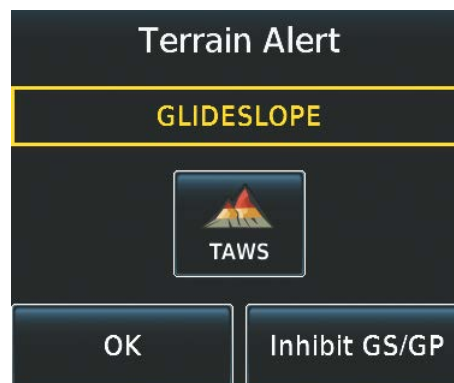


Figure 6-75 GSD Alerts on PFD and Touchscreen Controller

Inhibiting an active GSD Pop-Up alert:

- 1) Touch the **Inhibit GS/GP** Button.
- 2) Touch the **OK** Button to confirm and inhibit Glideslope and Glidepath alerts, or touch **Cancel**.

Inhibiting an active GSD Alert (TAWS Settings Screen):

- 1) From Home, touch **TAWS** > **TAWS Settings**.
- 2) Touch the **Glideslope Inhibit** or **Glidepath Inhibit** Button (button name dependent type of alert occurring). GSD alerting is inhibited when button annunciator is green, enabled when gray.

ALTITUDE VOICE CALLOUT (VCO)

TAWS-A provides voice alerts as the aircraft descends, beginning at 500 feet above the terrain, as determined by the radar altimeter (if greater than 5 nm from the nearest airport) or 500 feet above the nearest runway threshold elevation (if less than 5 nm from the nearest airport). Upon descent to this altitude, TAWS-A issues a **“Five-hundred”** voice alert. This system also issues voice alerts corresponding to 400, 300, 200, and 100 feet. There are no display annunciations or pop-up alerts that accompany the aural message(s). VCO alerts cannot be inhibited.

SYSTEM STATUS

During power-up, TAWS-A conducts a self-test of its visual annunciations and voice alerts. The system test can also be manually initiated. The system issues a voice alert when the test has concluded. TAWS-A System Testing is disabled when ground speed exceeds 30 knots. TAWS-A terrain alerts will not be issued while a test is in progress.

Alert Type	PFD/TAWS Pane Annunciation	TAWS Pane Center Banner Annunciation	Voice Alert
TAWS System Fail	TAWS FAIL	TAWS FAIL	“TAWS System Failure”
GPWS System Fail	GPWS FAIL	None	“GPWS System Failure”
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	“TAWS System Test OK”

Table 6-11 TAWS-A System Test Status Annunciations

Manually testing the TAWS-A System:

- 1) From Home, touch **TAWS > TAWS Settings**.
- 2) Touch the **Test TAWS** Button.

Or:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Relative Terrain **Settings** Button.
- 4) Touch the **Test TAWS** Button.

TAWS-A ABNORMAL OPERATIONS

The TAWS-A system continually monitors several system-critical items such as database validity, flap and landing gear position, altitude inputs, and GPS accuracy and position.

If any alerts are unavailable due to an abnormal condition, the system displays annunciation(s) on the PFDs and on the TAWS Pane. In addition, the system generates voice alert(s), provided the audio alerting system is available.

Conditions which may be automatically recoverable (such as a excessive vertical position error) are typically accompanied by a ‘TAWS N/A’ annunciation and **“TAWS Not Available”** voice alert. While the aircraft is in the air, if the condition(s) which caused the ‘TAWS N/A’ annunciation are no longer applicable, the system issues a **“TAWS Available”** voice alert.


Alert Cause(s)	PFD/TAWS Pane Annunciation(s)	TAWS Pane Center Banner Annunciation	Voice Alert(s)	TAWS Alert Types Not Available
No GPS Position	TAWS N/A	NO GPS POSITION	“TAWS Not Available”	PDA, FLTA, GSD, VCO
Excessive vertical position error	TAWS N/A	None	“TAWS Not Available”	PDA, FLTA
LRU software mismatch, TAWS configuration mismatch, or audio alerting system failed or is unavailable, or GPS and barometric altitude invalid or unavailable	TAWS FAIL and GPWS FAIL	TAWS FAIL	“TAWS System Failure” and “GPWS System Failure”	All Alerts Unavailable
Vertical Speed and Barometric Altitude invalid or unavailable	TAWS N/A and GPWS FAIL	None	“TAWS Not Available” and “GPWS System Failure”	All alerts unavailable
Radar altimeter is invalid or unavailable	GPWS FAIL	None	“GPWS System Failure”	EDR, ECR, NCR, FIT, GSD, VCO*
TAWS Database Mismatch or Failure	TAWS FAIL	TAWS FAIL	“TAWS System Failure”	PDA, FLTA
Terrain elevation from database unavailable or Aircraft is outside of terrain/obstacle coverage area for the installed database	TAWS N/A		“TAWS Not Available”	PDA, FLTA,
Terrain or Obstacle databases from the MFD unavailable or invalid. System operating with PFD databases	None	TERRAIN DATABASE FAILURE	None	Not applicable


* Alert fails if GPS position and terrain database elevation is also unavailable.


Table 6-12 TAWS-A Abnormal Conditions and Alert Failures

If the aircraft bank angle exceeds 30°, TAWS-A will disable ECR alerts. ECR alert availability returns when the bank angle is reduced for at least eight seconds.

6.4 TCAS II TRAFFIC

 **WARNING:** Traffic information shown on system displays is provided as an aid in visually acquiring traffic. Traffic avoidance maneuvers are based upon TCAS II Resolution Advisories, ATC guidance, or positive visual acquisition of conflicting traffic.

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

 **NOTE:** Refer to the documentation from the manufacturer for a complete discussion of the TCAS II system.

The ACSS TCAS 3000SP is a Traffic Alert and Collision Avoidance System II (TCAS II) device. It monitors the airspace and detects the presence of other aircraft in the vicinity equipped with operating Mode A, C, and S transponders. It also provides traffic advisory (TA) and resolution advisory (RA) alerts to the flight crew. The system displays traffic information using the symbology shown below.







Traffic Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale
	Resolution Advisory (RA)
	Resolution Advisory Off Scale

Table 6-13 TCAS II Traffic Symbol Description

Non-Threat Traffic, shown as an open white diamond, indicates that an intruding aircraft is at greater than ± 1200 feet relative altitude or the distance is beyond 5 nm.

A Proximity Advisory indicates that the intruding aircraft is within ± 1200 feet and is within a 6 nm range, but is still not considered a threat.

A Traffic Advisory (TA) alerts the crew to a potentially hazardous intruding aircraft closing to within 20-48 seconds of a potential collision area. A Traffic Advisory beyond the selected display range is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.

A Resolution Advisory (RA) alerts the crew to an intruding aircraft that is closing to within 15 to 35 seconds of a potential collision area. RAs include vertical guidance maneuvers designed to increase or maintain vertical separation from intruding aircraft. An RA beyond the selected map display range (off scale) is indicated by a half RA symbol at the edge of the screen at the relative bearing of the intruder.

TCAS II ALERTS

NOTE: Refer to TCAS II manufacturer's documentation for information on the types of resolution advisories and voice alerts generated by the TCAS II system.

When the TCAS II system issues a TA or RA, the following occur:

- The TCAS II unit issues a voice alert.
- A 'TRAFFIC' annunciation appears at the bottom right of the airspeed indicator on the PFDs, flashes for 5 seconds, and remains displayed until no TAs or RAs are detected in the area. RA 'TRAFFIC' annunciations are white text with red backgrounds; TA 'TRAFFIC' annunciations are black text with yellow backgrounds. If a TA and RA occur simultaneously, only the RA 'TRAFFIC' annunciation is shown.
- If the PFD is operating in FULL mode, the PFD automatically displays an inset map. If no inset map was enabled prior to the TA or RA, the system displays the PFD Inset Traffic Map. If the PFD Inset Navigation Map was enabled prior to the TA or RA, the system displays the PFD Inset Navigation Map with the traffic overlay enabled.
- During an RA only, voice alert(s) from the TCAS II unit provide vertical guidance to resolve the traffic conflict. The Vertical Speed Indicator displays a range of vertical speeds to fly to or avoid as applicable (Figure 6-76). Additional voice alerts occur to denote changes in the RA status or when the aircraft is clear of the conflict.



Figure 6-76 Traffic Annunciation with Resolution Advisory (PFD in FULL Mode)

RESOLUTION ADVISORIES



NOTE: Refer to TCAS II manufacturer's documentation for information on the types of resolution advisories and voice alerts generated by the TCAS II system.

During an RA, vertical guidance indications appear on the Attitude Indicator and Vertical Speed Indicator of the PFDs to provide visual pitch cues for the flight crew to use in order to achieve (or maintain) vertical separation from intruding traffic (Figure 6-77).

The Attitude Indicator depicts a range of pitch attitudes to avoid using one or two no-fly pitch cues positioned on the pitch ladder. The no-fly pitch cues are indicated by red open trapezoid-shaped areas encompassing the range of pitch attitudes to be avoided during an RA. If an RA requires a change in existing pitch attitude, a green rectangular fly-to pitch cue appears above or below the no-fly pitch cue to indicate a recommended pitch attitude. If multiple intruding aircraft limit available pitch travel in both directions, two no-fly pitch cues appear on the pitch ladder, indicating the appropriate pitch attitude is between the two no-fly pitch cues.

While an RA is occurring, the Vertical Speed Indicator (VSI) shows vertical speeds required to resolve the traffic conflict. A red vertical bar appears on the VSI scale to indicate the range of vertical speeds to be avoided during the RA. If the current aircraft vertical speed is within this red range, the pointer on the VSI appears red. The vertical speed readout appears in white when shown within the red VSI range. When an RA directs the flight crew to fly to (or maintain) a vertical speed range, a green vertical bar appears on the VSI scale at the recommended vertical speed range.

The system removes the pitch cues on the Attitude Indicator and vertical bars on the Vertical Speed Indicator when the RA condition has been resolved. The TCAS II system issues a voice alert when the aircraft is clear of the RA conflict.



Climb



Descend



Maintain, Don't Climb



Maintain, Don't Descend



Maintain, Don't Climb and Don't Descend



Increase Climb

Figure 6-77 Example Resolution Advisory Displays

DISPLAYING TCAS II TRAFFIC

TRAFFIC MAP PANE

The Traffic Map Pane shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal map pane for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Range rings indicate map ranges. Turn the **Joystick** counter-clockwise to decrease the map range, or clockwise to increase the range.

The traffic operating mode and altitude display mode appear in the upper right corner of the Traffic Map Pane.

To show the Traffic Map Pane, touch the **Traffic** Button on the Home Screen of the Touchscreen Controller. In addition, when the PFD is operating in Split Mode, pressing the **Traffic** Softkey also displays the Traffic Map Pane on the PFD.

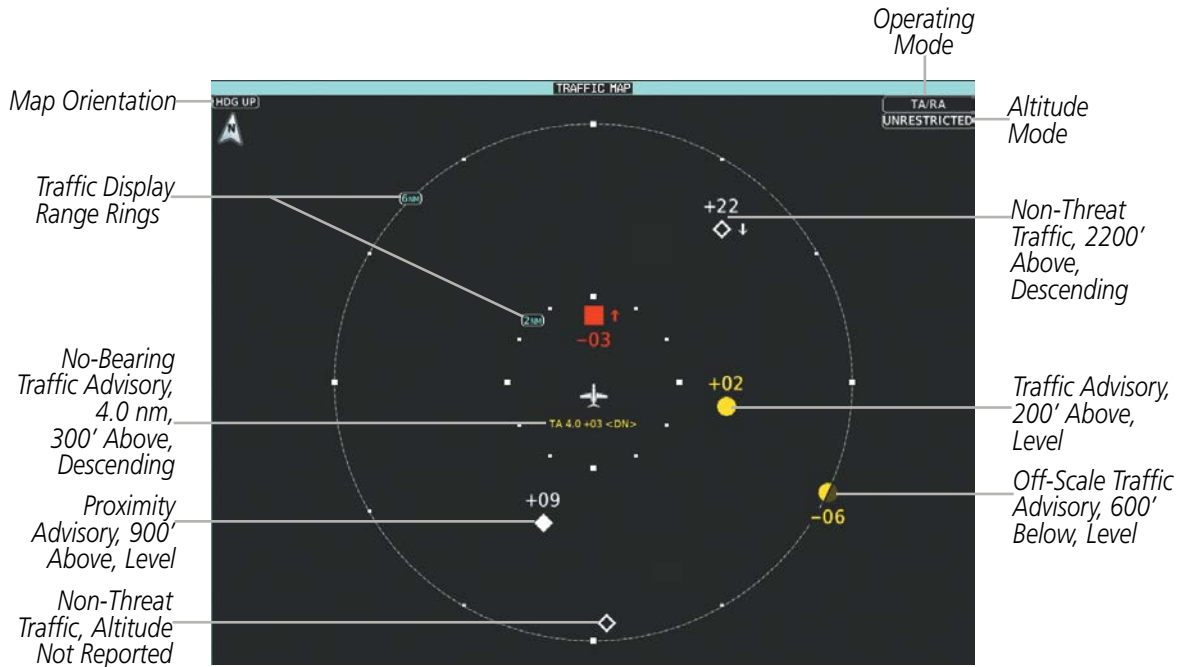


Figure 6-78 Traffic Map Pane (MFD in Full Mode)



Figure 6-79 Using the Traffic Softkey to show Traffic Map Pane (PFD in Split Mode)

ADDITIONAL TRAFFIC DISPLAYS

The system can overlay traffic information on the Navigation Map Pane as well as the PFD Inset Navigation Map. Traffic information is also available on the PFD when the Synthetic Vision Technology (SVT) display is enabled. See the Additional Features Section for details.

Enabling/disabling display of traffic information (Navigation Map Pane):

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Traffic** Button to enable/disable the traffic overlay on the Navigation Map Pane.

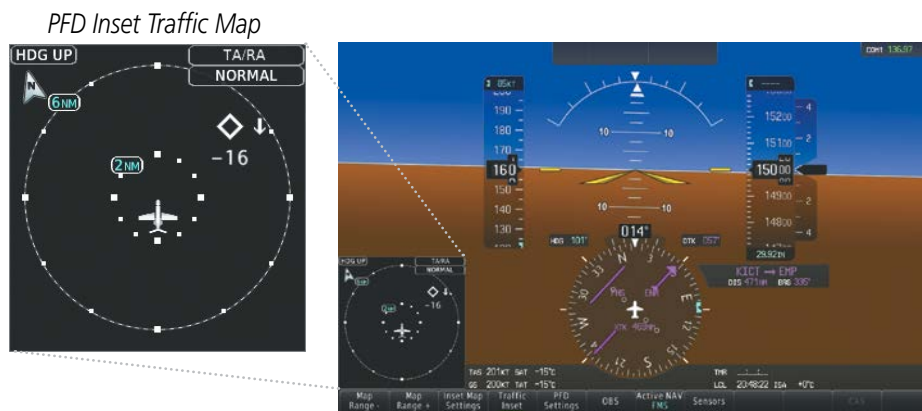
When the display of traffic is enabled on maps other than the Traffic Map Pane, the system shows a traffic status icon in the lower right corner of the map (Figure 6-80).



Figure 6-80 TCAS II Traffic on Navigation Map Pane

Displaying/removing the PFD Inset Traffic Map (available when PFD is in Full Mode)

Press the **Traffic Inset** Softkey to display/remove the PFD Traffic Inset Map.



Enables/Disables PFD Inset Traffic Map

Figure 6-81 Displaying the PFD Inset Traffic Map

OPERATION

The Traffic Settings screen on the Touchscreen Controller provides controls for selecting the traffic system mode, selecting the altitude ranges of traffic to display, and controlling whether the system displays relative or absolute altitude of traffic.

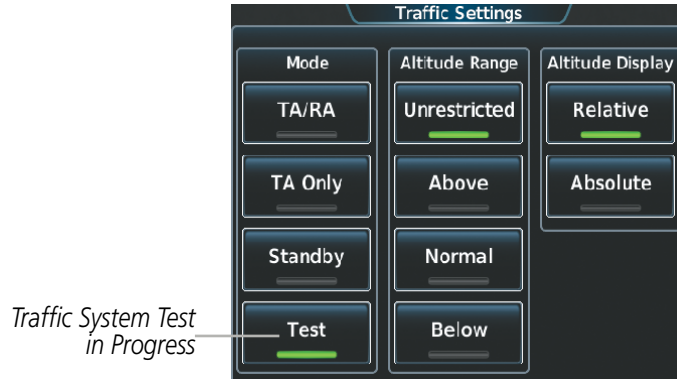


Figure 6-82 Testing the Traffic System (Traffic Settings Screen)

Testing the Traffic System:

- 1) From Home, touch **Traffic > Traffic Settings**.
- 2) Turn the **Joystick** as necessary to set the Traffic Map Pane range so the outer ring indicates '6 NM'. This will allow the system to show all traffic symbols in the traffic test pattern.
- 3) Touch the **Test** Button. Button annunciator is green while test is in progress. If system test is successful, the traffic maps show a test pattern of traffic symbols, the PFDs show pitch cues and vertical speed ranges indicating not to climb or descend greater than 2000 feet per minute, and the TCAS II system issues a voice alert indicating the system test has passed. If the test fails, the traffic system issues the voice alert indicating the system test has failed, and the system enters Standby mode.

Or:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor tab.
- 3) Touch the Traffic **Settings** Button.
- 4) Touch the **Test** Button. Button annunciator is green while test is in progress. If system test is successful, the traffic maps show a test pattern of traffic symbols, the PFDs show pitch cues and vertical speed ranges indicating not to climb or descend greater than 2000 feet per minute, and the TCAS II system issues a voice alert indicating the system test has passed. If the test fails, the traffic system issues the voice alert indicating the system test has failed, and the system enters Standby mode.

Selecting a TCAS II Mode (Traffic Settings Screen):

- 1) From Home, touch **Traffic > Traffic Settings**.
- 2) In the Operating Mode Window, touch one of the following buttons:

- **TA/RA:** Display traffic information and issues RA vertical guidance when applicable to resolve traffic conflicts.
- **TA Only:** Displays traffic information without RA vertical guidance. RA traffic will be classified and displayed as TA traffic in this mode.
- **Standby:** Traffic system enters Standby Mode and does not interrogate or display traffic.

The TCAS II modes can also be selected on the Transponder Screen. Selecting the Standby mode on the Transponder screen also selects the Standby mode for the active transponder; selecting the TA/RA or TA Only modes on this screen will cause the transponder to operate in Altitude Reporting mode, if it is not already selected. Refer to the Audio & CNS section for more information about transponder modes.

Selecting a TCAS II Mode (Transponder Screen):

- 1) In the CNS Bar, touch the transponder settings button.
- 2) Touch the **TCAS Mode** Button (current mode displayed in light blue)
- 3) Touch one of the following buttons: **TA/RA**, **TA Only**, or **Standby**.

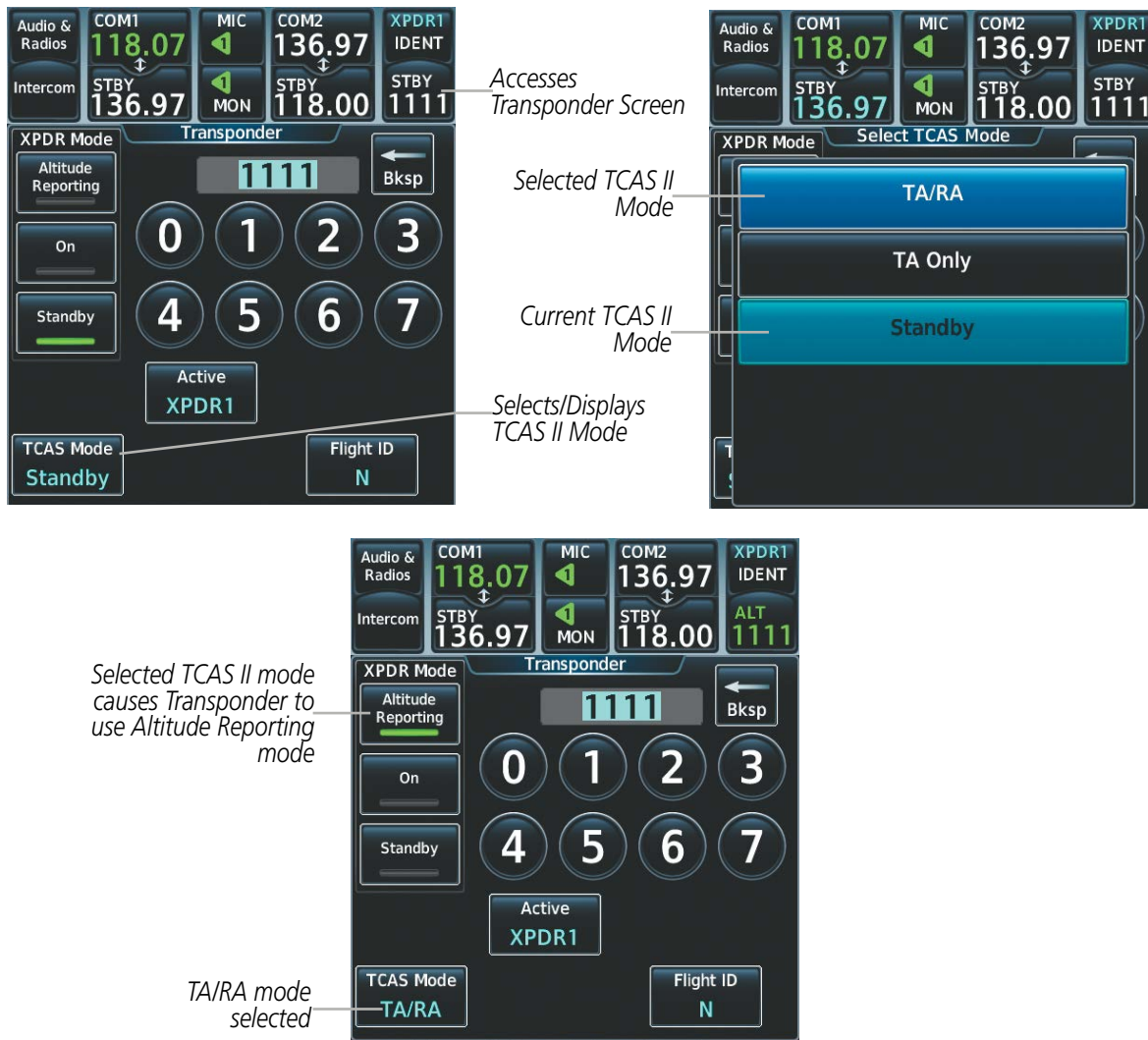


Figure 6-83 Selecting a TCAS II Mode on the Transponder Screen

ALTITUDE RANGE

The altitude range selection features allows flight crew to select the volume of airspace in which non-threat and proximity traffic is displayed. Note the system will still show RAs and TAs occurring outside of these limits regardless of the selected altitude range.

Changing the altitude range:

- 1) From Home, touch **Traffic > Traffic Settings**.
- 2) Touch one of the following Altitude Range Buttons:
 - **Unrestricted:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
 - **Above:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during the climb phase of flight.
 - **Normal:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
 - **Below:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.

Changing the display of Intruding Traffic Altitude:

- 1) From Home, touch **Traffic > Traffic Settings**.
- 2) If desired, touch the **Relative** Button to display the altitude of intruding aircraft relative to own aircraft altitude.
- 3) If desired, touch the **Absolute** Button to display the absolute altitude of intruding aircraft. The system may revert to displaying relative altitude after 30 seconds if the TCAS II system is providing altitude which is not corrected for the local barometric pressure setting.

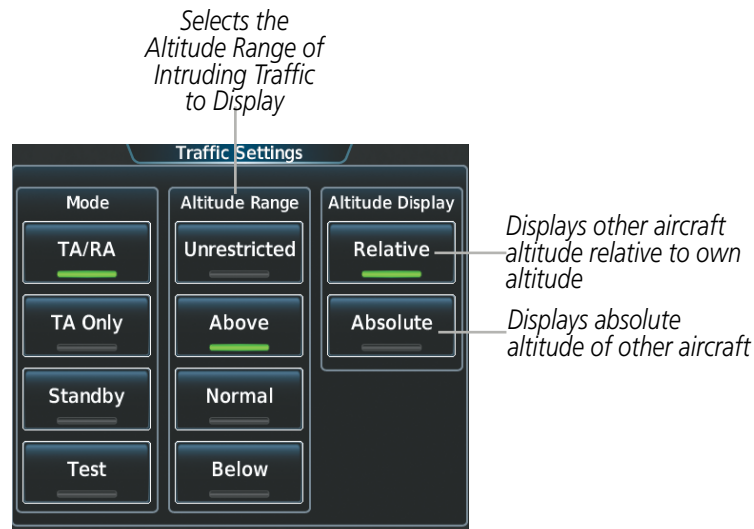


Figure 6-84 Selecting Altitude Range and Altitude Mode for displaying traffic

Enabling/disabling display of traffic information on the Navigation Map Pane:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the **Traffic** Button to enable/disable overlay of traffic information.

Displaying/removing the Traffic Inset Map on the PFD:

Press the **Traffic Inset** Softkey to show or hide the PFD Traffic Inset Map.

Enabling/disabling display of traffic information on the PFD Inset Navigation Map

- 1) Press the **Inset Map Settings** Softkey.
- 2) Press the **Traffic** Softkey to enable/disable the overlay of traffic information on the map.

Customizing the display of traffic on the Navigation Map Panes:

- 1) From Home, touch **Map > Map Settings**.
- 2) If necessary, touch the Sensor Tab.
- 3) Touch the Traffic **Settings** Button.
- 4) Touch the **Map Settings** Button.
- 5) To change the map range above which the system removes traffic symbols from the display, touch the **Symbols** Button, then scroll to and touch to select maximum map range to show traffic symbols.
- 6) Touch the **Labels** Annunciator Button to enable/disable the display of labels on traffic (such as altitude).
- 7) To change the map range at which the system removes traffic labels from the display, touch the Labels range button, then scroll to and touch to select the maximum map range to show traffic labels.
- 8) When finished, touch the **Back** or **Home** Button.

SYSTEM STATUS

The traffic mode is annunciated in the upper right corner of the Traffic Map Pane

Mode	PFD Mode Annunciation	Traffic Map Pane Mode Annunciation	Traffic Display Status Icon (Other Maps)
TCAS II System Test In Progress	None	TEST (‘TEST MODE’ also shown in white on top center of pane)	
Traffic Advisory and Resolution Advisory (TA/RA)	None	TA/RA	
Traffic Advisory Only (TA Only)	TA ONLY	TA ONLY	
TCAS II Standby	TCAS STBY Or: TCAS STBY *	STANDBY (shown in white in center of pane on ground, yellow in the air)	
TCAS II Failed**	TCAS FAIL	FAIL	

* Annunciation appears in yellow while in the air.
 ** See Table 6-15 for additional failure annunciations.

Table 6-14 TCAS II Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Pane.

Traffic Map Pane Annunciation	Description
NO DATA	Data is not being received from the TCAS II unit
DATA FAILED	Data is being received from the TCAS II unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TCAS II unit

Table 6-15 TCAS II Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
RA OFF SCALE	A Resolution Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
RA X.X ± XX <UP> or <DN>	System cannot determine bearing of Resolution Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend <UP> for climbing <DN> for descending traffic.
TA X.X ± XX <UP> or <DN>	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend <UP> for climbing or <DN> for descending traffic.
TRFC FAIL	TCAS II unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TCAS DATA	Data is not being received from the TCAS II unit

*Shown as symbol on Traffic Map Pane

**Shown in center of Traffic Map Pane

Table 6-16 TCAS II Traffic Status Annunciations

SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM



NOTE: *The approved Airplane Flight Manual (AFM) always supersedes the information in this Pilot's Guide.*



NOTE: *A failure of the primary (#1) GIA 63W Integrated Avionics Unit (IAU) results in loss of the flight director. Any IAU failure results in loss of the autopilot and manual electric trim.*

The GFC 700 is a digital Automatic Flight Control System (AFCS), fully integrated within the avionics architecture. The System Overview section provides a block diagram to support this system description. GFC 700 AFCS functionality is distributed across the following Line Replaceable Units (LRUs):

- GDU 1400W Primary Flight Displays (2) (PFD)
- GIA 63W Integrated Avionics Units (2)
- GMC 715 AFCS Control Unit
- GSA 81 AFCS Servos (3)
- GSM 85A Servo Gearboxes (3)
- GSA 80 AFCS Servo (1)

The GFC 700 AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — The GFC 700 flight director function can be coupled to either the pilot-side or copilot-side PFD data. The **CPL** Key selects the PFD source for the Flight Director. Commands for the selected flight director source are displayed on both PFDs. The flight director provides:
 - Vertical/lateral mode selection and processing
 - Command Bars showing pitch/roll guidance
 - Pitch and roll commands to the autopilot
- **Autopilot (AP)** — Autopilot operation occurs within the pitch and roll servos. It provides automatic flight control in response to flight director steering commands, Attitude and Heading Reference System (AHRS) attitude and rate information, and airspeed.
- **Yaw Damper (YD)** — The yaw servo provides Dutch roll damping and turn coordination in response to yaw rate, roll angle, lateral acceleration, and airspeed.
- **Manual Electric Pitch Trim (MEPT)** — The pitch trim system provides manual electric pitch trim capability.
- **Automatic Pitch Trim (APT)/Mach Trim (MT)** — The pitch trim system provides automatic pitch trim when the autopilot is engaged and Mach trim when the autopilot is not engaged.

BASIC AUTOPILOT OPERATION

This section provides an overview for autopilot engagement and disengagement. A more detailed description follows in Section 7.5.

- **Autopilot Engagement** — The autopilot may be engaged by pushing the **AP Key** on the AFCS Control Unit. Annunciations regarding the engagement are indicated on the PFDs.
- **Autopilot Engagement with Flight Director Off** — Upon engagement, the autopilot will be set to hold the current attitude of the airplane, if the flight director was not previously on. In this case, 'PIT' and 'ROL' will be annunciated.
- **Autopilot Engagement with Flight Director On** — If the flight director is on, the autopilot will smoothly pitch and roll the airplane to capture the FD command bars. The prior flight director modes remain unchanged.
- **Autopilot Disengagement** — The most common way to disconnect the autopilot is to press and release the **AP DISC Switch**, which is located on each control wheel. An autopilot disconnect tone will be heard and annunciated on the PFDs. Other ways to disconnect the autopilot include:
 - Pressing the **AP Key** on the AFCS Control Unit
 - Pressing the **GA Switch** (located on the throttle handle)
 - Operating the **MEPT Switch** (located on each control wheel)
 - Pulling the autopilot circuit breaker

In the event of unexpected autopilot behavior, pressing and holding the **AP DISC Switch** will disconnect the autopilot and remove all power to the servos.

7.1 AFCS CONTROLS

The AFCS Control Unit is positioned above the MFD, and has the following controls:

- ① ⑩ **FD Keys** Activate/deactivate the selected flight director (pilot- or copilot-side) in default vertical and lateral modes

Press the other **FD** Key to toggle the corresponding PFD's Command Bars off/on
- ② **NAV Key** Selects/deselects Navigation Mode
- ③ **HDG Key** Selects/deselects Heading Select Mode
- ④ **AP Key** Engages/disengages the autopilot
- ⑤ **YD Key** Engages/disengages the yaw damper
- ⑥ **ALT Key** Selects/deselects Altitude Hold Mode
- ⑦ **VNV Key** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- ⑧ **VS Key** Selects/deselects Vertical Speed Mode
- ⑨ **FLC Key** Selects/deselects Flight Level Change Mode
- ⑪ ⑳ **CRS Knobs** Adjust the Selected Course (while in VOR, LOC, or OBS Mode) in 1° increments on the Horizontal Situation Indicator (HSI) of the corresponding PFD

Press to re-center the Course Deviation Indicator (CDI) and return course pointer directly TO the bearing of the active waypoint/station
- ⑫ **SPD SEL Knob** Adjusts the Airspeed Reference and bug in 1-kt (0.01 M) increments

Press to toggle the Airspeed Reference units from IAS to Mach
- ⑬ **UP/DN Wheel** Adjusts the Vertical Speed Reference and bug in 100-fpm increments
- ⑭ **ALT SEL Knob** Adjusts the Selected Altitude and bug in 100-ft increments (a finer resolution of 10 feet is available under approach conditions)
- ⑮ **CSC Key** Selects/deselects Current Speed Control (if available) when Altitude Hold Mode is active
- ⑯ **CPL Key** Selects the PFD data source (pilot-side or copilot-side) for the Flight Director.

When the flight director source is switched, the modes revert to default. An arrow in the AFCS Status Box indicates the active FD source (pilot- or copilot-side).
- ⑰ **HDG SEL Knob** Adjusts the Selected Heading and bug in 1° increments on the HSI (both PFDs)

Press to synchronize the Selected Heading to the current heading on the pilot-side PFD
- ⑱ **APR Key** Selects/deselects Approach Mode
- ⑲ **BANK Key** Manually selects/deselects Low Bank Mode



Figure 7-1 GMC 715 AFCS Control Unit

The following AFCS controls are located separately from the AFCS Control Unit:

AP DISC Switch (Autopilot Disconnect) Disengages the autopilot, yaw damper, and flight director and interrupts pitch trim operation
 An **AP DISC** Switch is located on each control wheel.

This switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural alert.

CWS Button (Control Wheel Steering) While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope or Glidepath Mode) and roll (if in Roll Hold Mode)

A **CWS** Button is located on each control wheel.

Upon release of the **CWS** Button, the flight director may establish new pitch and roll references, depending on the current vertical and lateral modes. CWS operation details are discussed in the respective mode sections of this manual.

GA Switch (Go Around) Disengages the autopilot, if engaged, and selects flight director Takeoff Mode (on ground) or Go Around Mode (in air)

This switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.

The **GA** Switch is located on the throttle handle.

MEPT Switch (Manual Electric Pitch Trim) Used to command manual electric pitch trim
 An **MEPT** Switch is located on each control wheel.

The pilot side **MEPT** Switch has priority over the copilot side **MEPT** Switch.

This composite switch is split into left and right sides. The left switch is the ARM contact and the right switch controls the DN (forward) and UP (rearward) contacts. Manual trim commands are generated only when both sides of the switch are operated simultaneously. Pushing either **MEPT** Switch disengages the autopilot, if engaged, but does not affect yaw damper operation.

7.2 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFDs. With the flight director active, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch ($\pm 20^\circ$) and roll (25°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in Table 7-1 activates the flight director in the listed modes.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key (pilot-side)*	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
FD Key (copilot-side)*	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
AP Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
CWS Button	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
GA Switch	Roll Hold (default)	ROL	Takeoff (on ground)	TO
	Roll Hold (default)	ROL	Go Around (in air)	GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking**	VPTH
NAV Key	Navigation***	FMS VOR LOC BC	Pitch Hold (default)	PIT
APR Key	Approach***	FMS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT

*Subsequent presses of the **FD** Key will toggle the flight director on/off on its respective side. However, pressing the **FD** Key for the inactive flight director only removes the Command Bars from the corresponding display. The **FD** Keys are disabled when the autopilot is engaged.

** Valid VNAV flight plan must be entered before **VNV** Key press activates flight director.

***The selected navigation receiver must have a valid VOR or LOC signal or active FMS course before **NAV** or **APR** Key press activates flight director.

Table 7-1 Flight Director Activation

FLIGHT DIRECTOR SELECTION

The GFC 700 flight director can be coupled to either the pilot-side or copilot-side PFD data using the **CPL** Key. When the pilot-side or copilot-side data source is changed, the vertical and lateral modes revert to default. The autopilot follows the selected flight director only, indicated by an arrow pointing toward either the pilot or copilot side, in the center of the AFCS Status Box.

The currently active flight director may be turned off and the Command Bars removed from the displays by pressing the active **FD** Key again. Pressing the **FD** Key for the inactive flight director only removes the Command Bars from the corresponding display. The **FD** key for the selected flight director is disabled when the autopilot is engaged.



Figure 7-2 Flight Director Selection Indications

AFCS STATUS BOX

Flight director mode annunciations are displayed on the PFDs when the flight director is active. Flight director selection and autopilot and yaw damper statuses are shown in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical modes on the right. Armed modes are displayed in white. Active modes are displayed in magenta when using FMS navigation, or green when using other navigation sources.

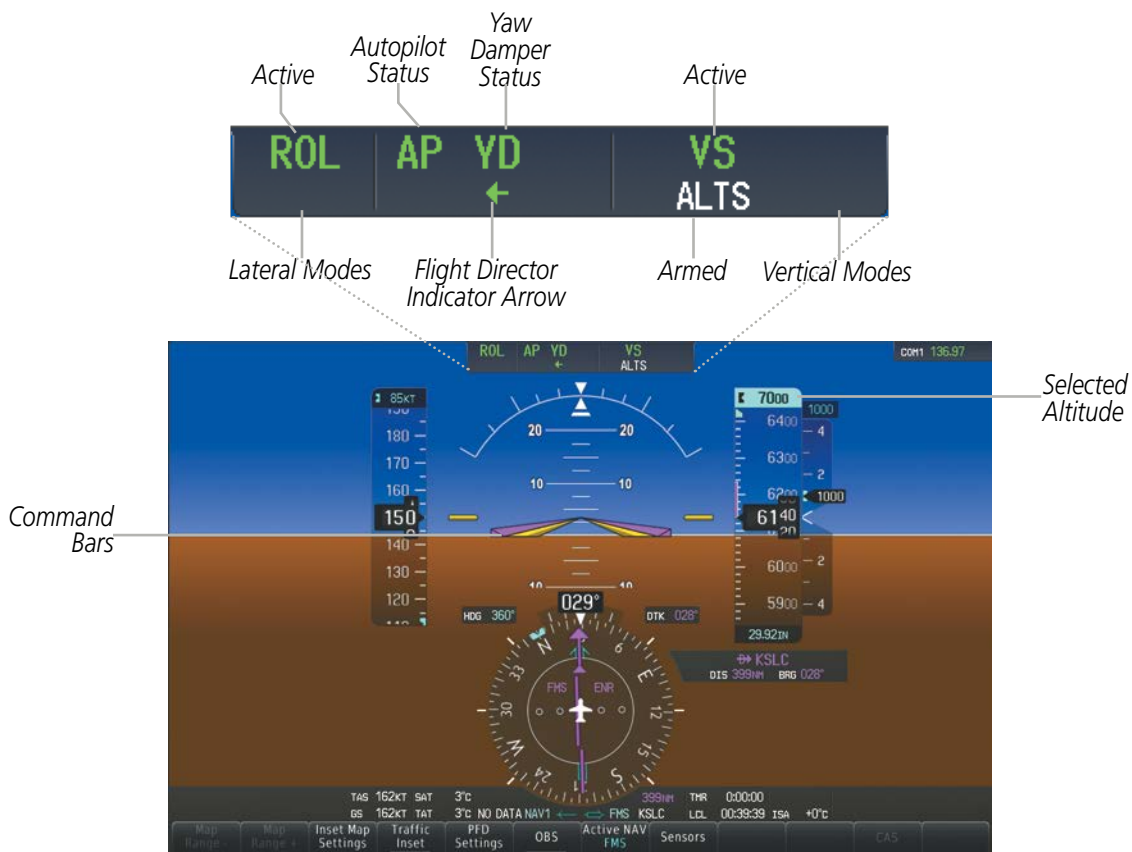


Figure 7-3 PFD AFCS Display

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed in magenta on the PFDs as single cue or dual cue. The aircraft symbol (in yellow) changes to accommodate the Command Bar format; the Command Bars do not override the aircraft symbol. The single cue Command Bars (Figure 7-4) move together vertically to indicate pitch commands and bank left or right to indicate roll commands. Command Bars displayed as a cross pointer (Figure 7-5) move independently to indicate pitch (horizontal bar) and roll (vertical bar) commands. Both PFDs show the same Command Bar format.



NOTE: *Dual cue command bars are not available when SVS is installed.*

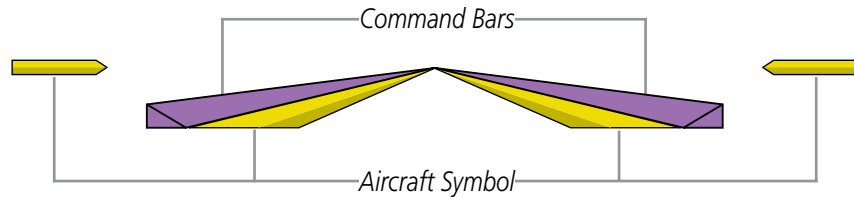


Figure 7-4 Single Cue Command Bars

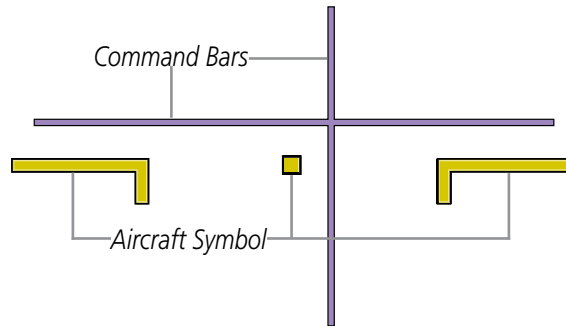


Figure 7-5 Dual Cue Command Bars

Changing the selected Flight Director format:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Settings**.
- 3) Touch the **System** Tab.
- 4) Touch the **Flight Director Active Format** Data Field.
- 5) Touch desired setting (**Single Cue** or **Dual Cue**).



Figure 7-6 Flight Director Format Settings

FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll modes(s).

Under normal operation when the control for the active flight director mode is pressed, the flight director reverts to the default modes(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green or magenta active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, FMS, SBAS) required to compute commands. When such a loss occurs, the system automatically rolls the wings level and then enters Roll Hold Mode, or maintains the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.



Figure 7-7 Loss of VOR Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

7.3 VERTICAL MODES

Table 7-2 lists the vertical modes with their corresponding controls and annunciations. The mode reference is displayed next to the active mode annunciation for Altitude Hold, Vertical Speed, and Flight Level Change modes. The **UP/DN** Wheel can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **UP/DN** Wheel are also listed in the table.

Vertical Mode	Description	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	Holds aircraft pitch attitude; may be used to climb/descend to the Selected Altitude	(default)	PIT	-15° to +20°	0.5°
Selected Altitude Capture	Captures the Selected Altitude	*	ALTS		
Altitude Hold	Holds current Altitude Reference	ALT Key	ALT nnnnn FT		
Vertical Speed	Holds aircraft vertical speed; may be used to climb/descend to the Selected Altitude	VS Key	VS nnnn FPM	-2000 to +1500 fpm	100 fpm
Flight Level Change	Holds aircraft airspeed while aircraft is climbing/descending to the Selected Altitude	FLC Key	FLC nnn KT	80 to 200 kts (350) 80 to 210 kts (400)	1 kt
Vertical Path Tracking	Captures and tracks descent legs of an active vertical profile	VNV Key	VPTH		
VNAV Target Altitude Capture	Captures the Vertical Navigation (VNAV) Target Altitude	**	ALTV		
Glidepath	Captures and tracks the SBAS or baro-VNAV glidepath on approach	APR Key	GP		
Glideslope	Captures and tracks the ILS glideslope on approach		GS		
Takeoff	Commands a constant pitch angle and wings level on the ground in preparation for takeoff	GA Switch	TO	8°	
Go Around	Commands a constant pitch angle and wings level		GA	7°	

* *ALTS is armed automatically when PIT, VS, FLC, TO, or GA is active, and under VPTH when the Selected Altitude is to be captured instead of the VNAV Target Altitude.*

** *ALTV is armed automatically under VPTH when the VNAV Target Altitude is to be captured instead of the Selected Altitude.*

Table 7-2 Flight Director Vertical Modes

PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active pitch mode by the green annunciation ‘PIT’. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

CHANGING THE PITCH REFERENCE

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **UP/ DN** Wheel
- By pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

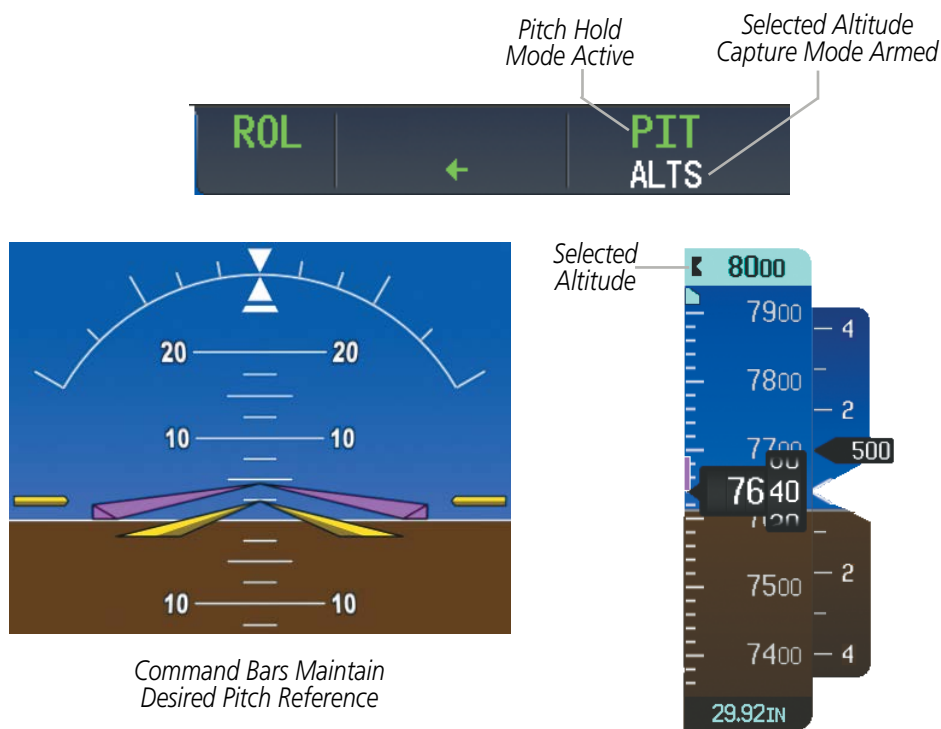


Figure 7-8 Pitch Hold Mode

SELECTED ALTITUDE CAPTURE MODE (ALTS)

Selected Altitude Capture Mode is automatically armed with activation of the following modes:

- Pitch Hold
- Vertical Speed
- Flight Level Change
- Takeoff/Go Around (if the Selected Altitude is at least 400 feet above the current aircraft altitude)
- Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNAV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-2 for example). The **ALT SEL** Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed (Figure 7-8). This automatic transition is indicated by the green 'ALTS' annunciation flashing for up to 5 seconds and the appearance of the white 'ALT' annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude. As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes green for 5 seconds to indicate the automatic transition.

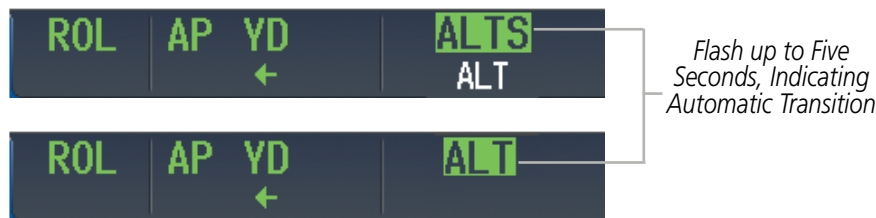


Figure 7-9 Automatic Mode Transitions During Altitude Capture

CHANGING THE SELECTED ALTITUDE



NOTE: Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.

Use of the **ALT SEL** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

ALTITUDE HOLD MODE (ALT)

If Altitude Hold Mode is activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet). Altitude Hold Mode active is indicated by an 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in either of the following modes:

- Selected Altitude Capture
- VNV Target Altitude Capture

The transition to Altitude Hold Mode automatically occurs when the altitude error is less than 50 feet. In this case, the Selected or VNV Target Altitude becomes the flight director's altitude reference. The active mode annunciation 'ALT' appears if the transition was made from VNV Target Altitude Capture Mode.

CHANGING THE ALTITUDE REFERENCE

NOTE: Turning the **ALT SEL Knob** while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's altitude reference, and does not cancel the mode.

With the **CWS Button** pressed, the aircraft can be hand-flown to a new altitude reference. When the **CWS Button** is released at the desired altitude, the new altitude is established as the altitude reference.

CURRENT SPEED CONTROL (IF AVAILABLE)

Current Speed Control (if available) can be engaged if the autopilot is engaged and Altitude Hold Mode (ALT) or VNV Target Altitude Capture (ALTV) Mode is active. When the **CSC Key** is pressed, the Full Authority Digital Engine Control (FADEC) varies engine thrust to maintain the desired Airspeed Reference (green Airspeed Reference Bug), within a certain control range.

NOTE: For CSC engagement and disengagement detailed conditions, see the approved Pilot's Operating Handbook (POH).

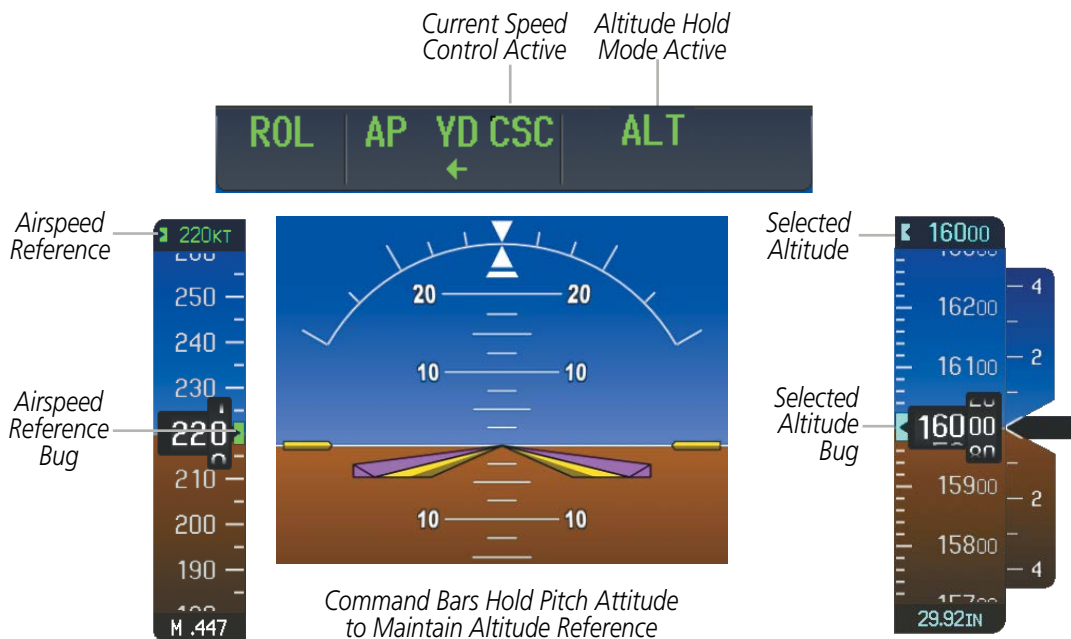


Figure 7-10 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference (shown above the Vertical Speed Indicator). Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box. The Vertical Speed Reference is displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug is shown on the indicator.

CHANGING THE VERTICAL SPEED REFERENCE

The Vertical Speed Reference (shown above the Vertical Speed Indicator) may be changed by:

- Using the **UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the **CWS** Button

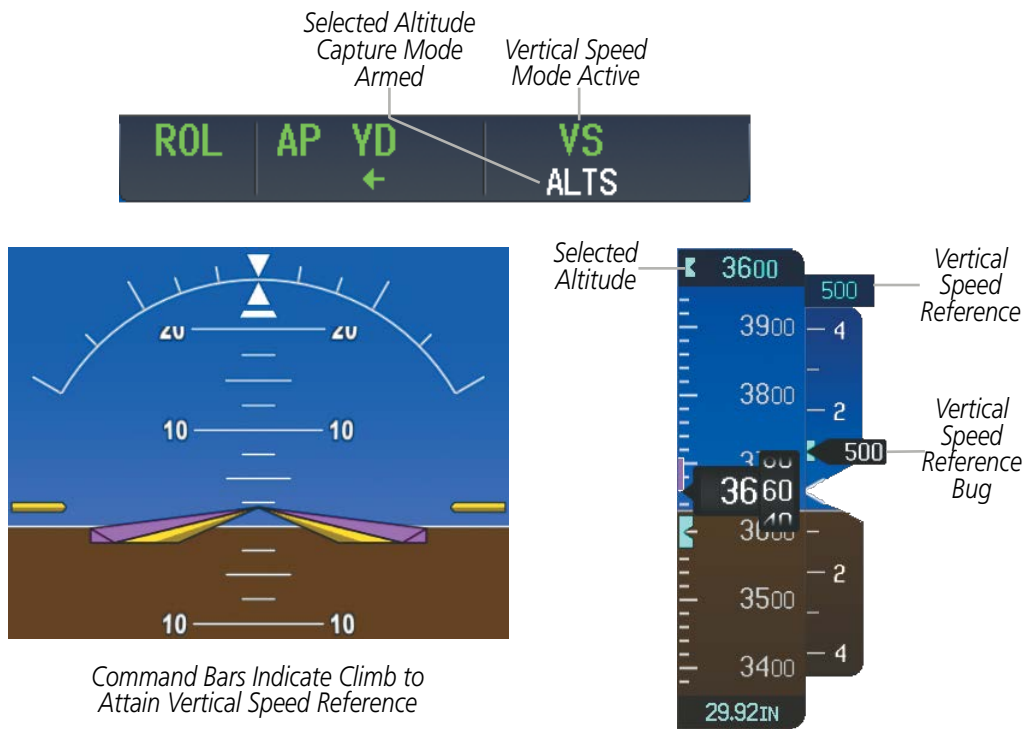


Figure 7-11 Vertical Speed Mode

FLIGHT LEVEL CHANGE MODE (FLC)

NOTE: The Selected Altitude should be set before selecting Flight Level Change Mode.

Flight Level Change Mode is selected by pressing the **FLC** Key. This mode acquires and maintains the Airspeed Reference (in IAS or Mach) while climbing or descending to the Selected Altitude (shown above the Altimeter). When Flight Level Change Mode is active, the flight director continuously monitors Selected Altitude, airspeed, Mach, and altitude.

The Airspeed Reference is set to the current airspeed upon mode activation. Flight Level Change Mode is indicated by a green 'FLC' annunciation in the AFCS Status Box. The Airspeed Reference is displayed directly above the Airspeed Indicator, along with a cyan Airspeed Reference Bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

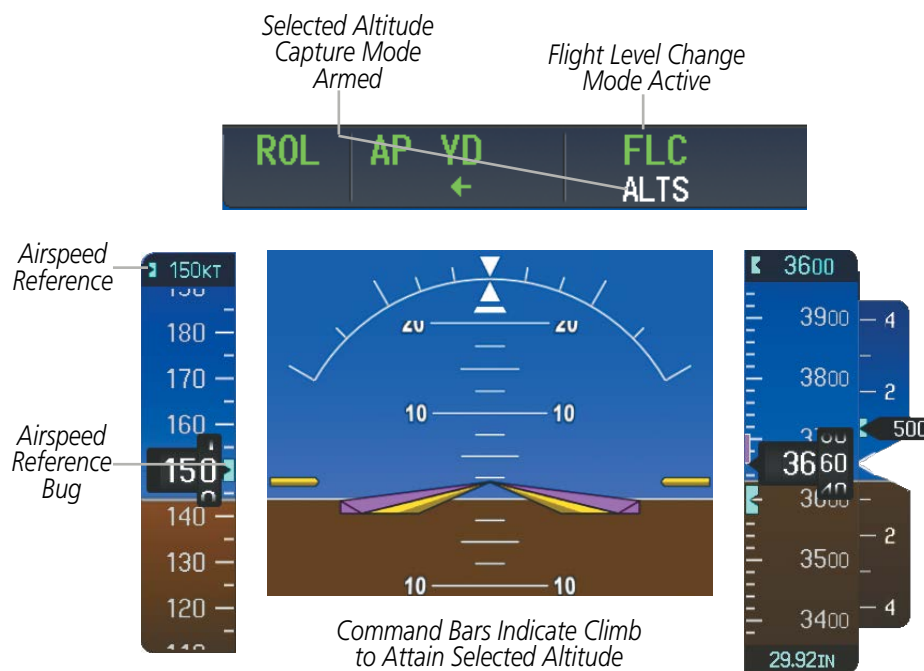


Figure 7-12 Flight Level Change Mode

CHANGING THE AIRSPEED REFERENCE (FLC MODE)

The Airspeed Reference (shown above the Airspeed Indicator) may be adjusted by:

- Using the **SPD SEL** Knob
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Airspeed Reference, then releasing the **CWS** Button

During climb, the Airspeed Reference units automatically change from IAS to Mach when either the altitude or the airspeed listed in Table 7-3 are attained. For descent, the units switch back at the specified altitude or airspeed. The system determines aircraft climb or descent by the relationship between the current and Selected altitudes.

	Airspeed Reference Units		Unit Type Changes At:	
	Default Units	Change To:	Altitude	Airspeed
Climb	IAS	Mach	> 31,500 ft	> M 0.55
Descent	Mach	IAS	< 30,500 ft	< 250 kt

Table 7-3 FLC Mode Unit Changes

Airspeed Reference units can be manually toggled between IAS and Mach units by pressing the **SPD SEL** Knob. When the FLC Airspeed Reference is displayed in Mach, the Airspeed Reference Bug is displayed on the Airspeed Indicator at the IAS corresponding to the selected Mach target speed and the current Mach number is shown below the Airspeed Indicator.

The Airspeed Reference Bug can be set at all times (to be used as a visual reference) except when CSC is engaged. In CSC mode the Airspeed Reference Bug is fixed and set at the airspeed existing at the time of CSC engagement. While the bug can be set during these modes it is only being controlled when in FLC mode, when CSC is engaged, etc.

VERTICAL NAVIGATION MODES (VPTH , ALTV)



NOTE: *VNAV is disabled when parallel track or dead reckoning mode is active.*



NOTE: *The Selected Altitude takes precedence over any other vertical constraints.*

Vertical Navigation (VNAV) flight control is available for enroute/terminal cruise and descent operations when VNAV flight planning is available. Refer to the Flight Management Section for more information on VNAV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is FMS.
- A VNAV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNAV is enabled.
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNAV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.
- Parallel track is not active.

The flight director may be armed for VNAV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNAV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNAV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNAV modes.

VERTICAL PATH TRACKING MODE (VPTH)

NOTE: If another pitch mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.

NOTE: Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.

When a vertical profile (VNAV flight plan) is active and the **VNV** Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. 'VPTH' (or 'V' when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNAV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.



Figure 7-13 Vertical Path Tracking Armed Annunciations

Prior to descent path interception, the Selected Altitude must be set below the current aircraft altitude by at least 75 feet. For the flight director to transition from Altitude Hold to Vertical Path Tracking Mode, acknowledgment is required within 5 minutes of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received within 1 minute of descent path interception, the white 'VPTH' annunciation starts to flash. Flashing continues until acknowledged or the descent path is intercepted. If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

In conjunction with the "TOD [top of descent] within 1 minute" annunciation in the Navigation Status Box and the "Vertical track" voice message, VNAV indications (VNAV Target Altitude, vertical deviation, and vertical speed required) appear on the PFDs in magenta (Figure 7-14).

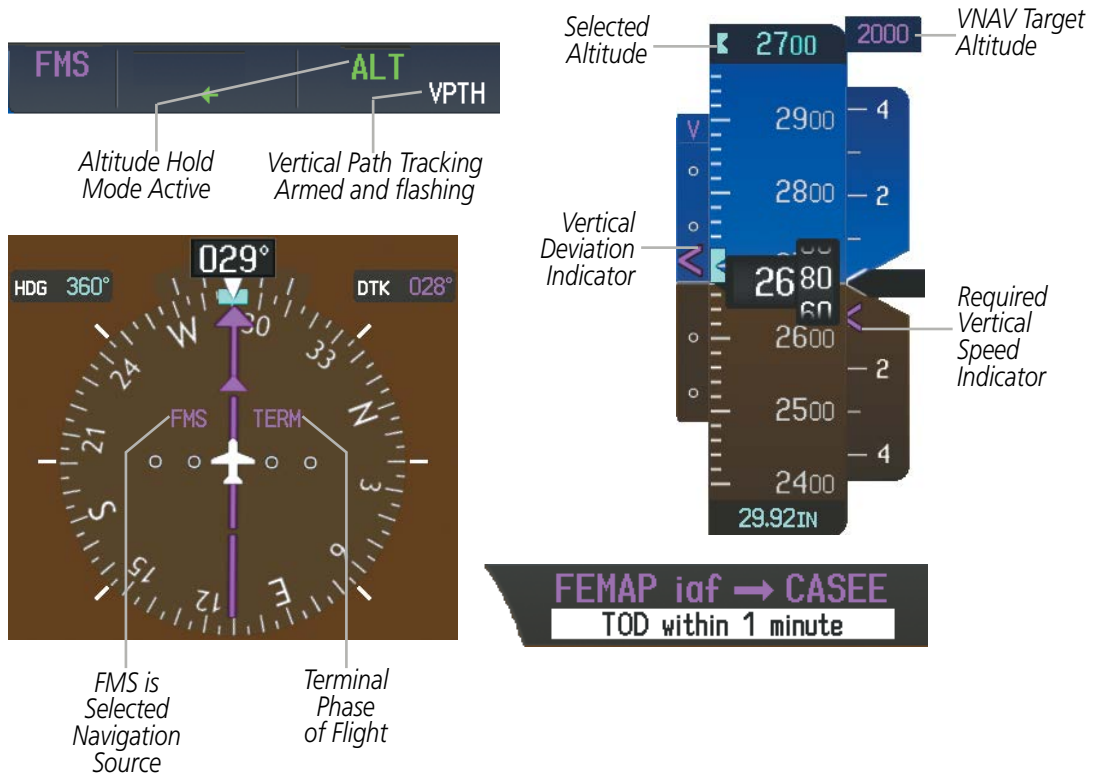


Figure 7-14 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (Figure 7-15). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

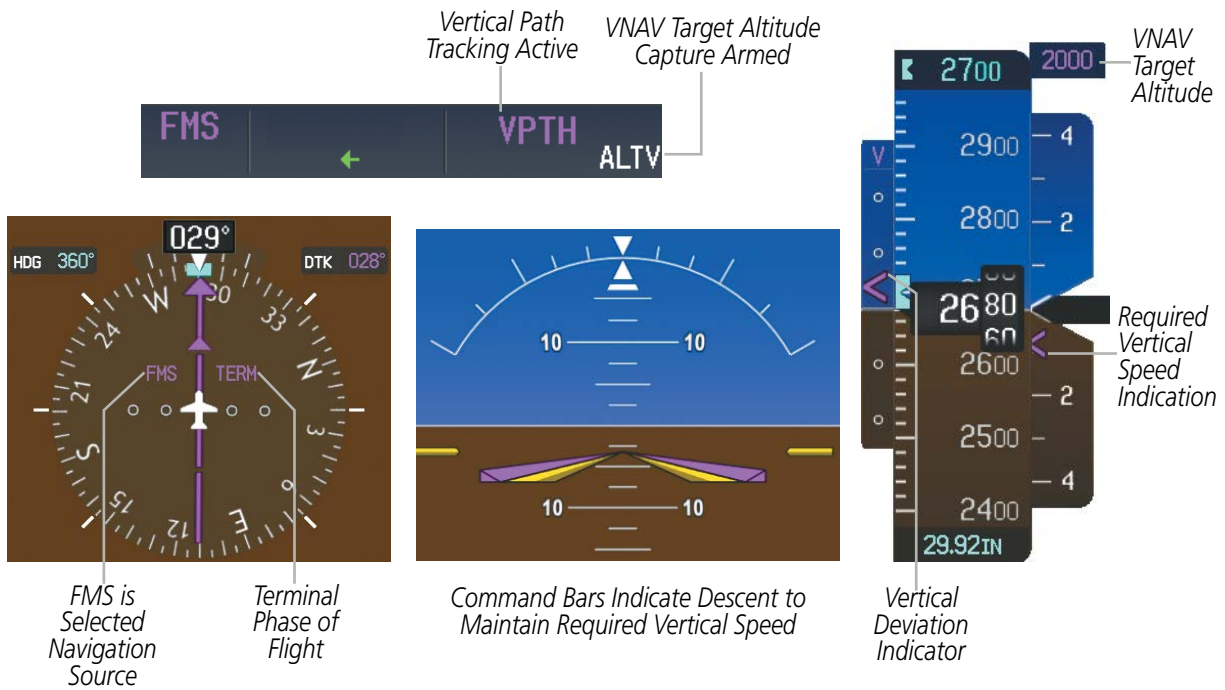


Figure 7-15 Vertical Path Tracking Mode

If the Altimeter's barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNAV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNAV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

AUTOMATIC REVERSION TO PITCH HOLD MODE

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNAV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

NON-PATH DESCENTS

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNAV flight control is selected. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.



Figure 7-16 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

VNAV TARGET ALTITUDE CAPTURE MODE (ALTV)

NOTE: Armed VNAV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNAV Target Altitude Capture Mode is armed.

VNAV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNAV Target Altitude is to be intercepted before the Selected Altitude. The annunciation 'ALTV' indicates that the VNAV Target Altitude is to be captured. VNAV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the FMS Navigation Section for details). At the same time as "TOD within 1 minute" is annunciated in the Navigation Status Box, the active VNAV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-14).

As the aircraft nears the VNAV Target Altitude, the flight director automatically transitions to VNAV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the magenta 'ALTV' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT' annunciation. The VNAV Target Altitude is shown as the Altitude Reference beside the 'ALTV' annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RVSI) is removed once VNAV Target Altitude Capture Mode becomes active.

At 50 feet from the VNAV Target Altitude, the flight director automatically transitions from VNAV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes magenta for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.



Figure 7-17 Automatic Mode Transitions During Altitude Capture

CHANGING THE VNAV TARGET ALTITUDE

NOTE: Pressing the **CWS** Button while in VNAV Target Altitude Capture Mode does not cancel the mode.

Changing the current VNAV Target Altitude while VNAV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNAV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNAV target altitudes can be changed while editing the active flight plan (see the Flight Management Section for details).

GLIDEPATH MODE (GP)



NOTE: Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.

Glidepath Mode is used to track the SBAS or baro-VNAV glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting Glidepath Mode:

- 1) Ensure a FMS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
- 3) Press the **APR** Key.



NOTE: Some RNAV (FMS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are **NOT** considered Approaches with Vertical Guidance (APV). Approaches that are annunciated on the HSI as LNAV or LNAV+V are considered Nonprecision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided.



WARNING: When flying an LNAV approach (with vertical descent angle) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.

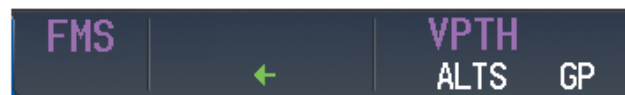


Figure 7-18 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- A GPS approach with vertical guidance (LPV, LNAV/VNAV, LNAV+V) is loaded into the active flight plan.
- The active waypoint is at or after the final approach fix (FAF).
- Vertical deviation is valid.
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)

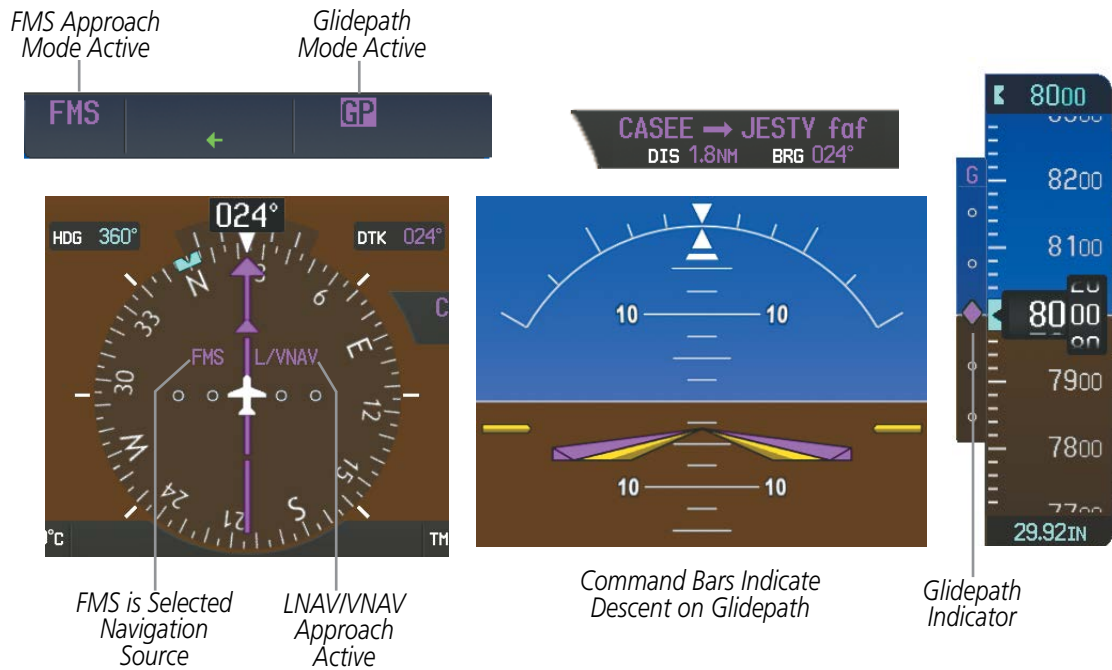


Figure 7-19 Glidepath Mode

GLIDESLOPE MODE (GS)



NOTE: Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as ‘GS’ in white), LOC Approach Mode is armed as the lateral flight director mode.

Selecting Glideslope Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
- 3) Press the **APR** Key.

Or:

- 1) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

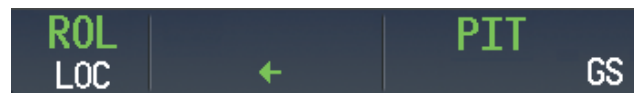


Figure 7-20 Glideslope Mode Armed

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to intercept and track the glideslope.

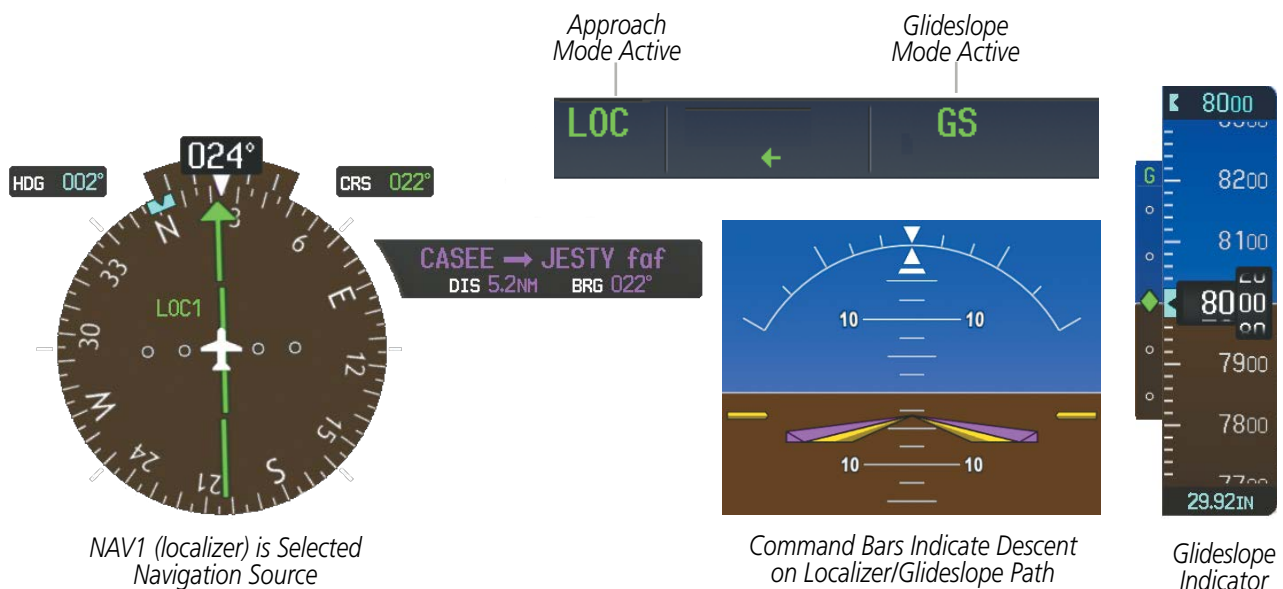


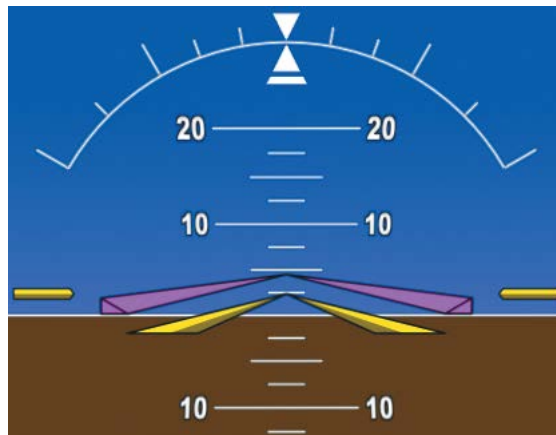
Figure 7- 21 Glideslope Mode

TAKEOFF (TO) AND GO AROUND (GA) MODES

In Go Around and Takeoff modes, the flight director commands a constant set pitch attitude. The **TO/GA** Switch is used to select both modes. The mode entered by the flight director depends on whether the aircraft is on the ground. Selected Altitude Capture Mode is automatically armed when the aircraft is at least 400 feet below the Selected Altitude at the time Takeoff or Go Around Mode is selected. When Takeoff or Go Around mode is activated, the lateral mode is annunciated as ‘ROL’.

Takeoff Mode provides an attitude reference during rotation and takeoff. This mode can be selected only while on the ground by pushing the **TO/GA** Switch. The flight director Command Bars assume a wings-level, pitch-up attitude. Autopilot engagement while Takeoff Mode is active is inhibited while the aircraft is on the ground.

Pressing the **TO/GA** Switch while in the air activates the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around. Selecting Go Around Mode disengages the autopilot; however, subsequent autopilot engagement is allowed. Attempts to modify the aircraft attitude (i.e., with the **CWS** Button) result in reversion to Pitch Hold Mode.



Command Bars Indicate Climb

Figure 7-22 Takeoff and Go Around Modes

7.4 LATERAL MODES

The following table relates each GFC 700 lateral mode to its respective control and annunciation. Refer to the vertical modes section for information regarding Takeoff and Go Around mode.

Lateral Mode	Description	Control	Annunciation	Maximum Roll Command Limit
Roll Hold	Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle	(default)	ROL	30°
Low Bank	Limits the maximum commanded roll angle	BANK Key	*	15°
Heading Select **	Captures and tracks the Selected Heading	HDG Key	HDG	30°
Navigation, FMS **	Captures and tracks the selected navigation source (FMS, VOR, LOC)	NAV Key	FMS	30°
Navigation, VOR Enroute Capture/Track **			VOR	25° Capture 10° Track
Navigation, LOC Capture/Track (No Glideslope)			LOC	25° Capture 10° Track
Navigation, Backcourse Arm/Capture/Track			BC	25° Capture 10° Track
Approach, FMS	Captures and tracks the selected navigation source (FMS, VOR, LOC)	APR Key	FMS	30°
Approach, VOR Capture/Track			VAPP	25° Capture 10° Track
Approach, LOC Capture/Track (Glideslope Mode automatically armed)			LOC	25° Capture 10° Track

* No annunciation appears in the AFCS Status Box. The acceptable bank angle range is indicated in green along the Roll Scale of the Attitude Indicator.

** The Heading, Navigation FMS and Navigation VOR mode maximum roll command limit will be limited to the Low Bank mode value if it is engaged.

The GFC 700 limits turn rate to 3 degrees per second (standard rate turn).

Table 7-3 Flight Director Lateral Modes

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach modes. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the **CWS** Button.

ROLL HOLD MODE (ROL)

NOTE: *If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.*

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle conditions listed in Table 7-4.

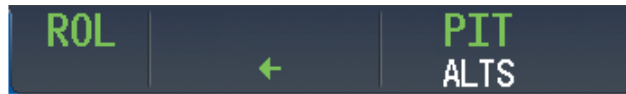


Figure 7-23 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6° to 30°	Maintains current aircraft roll attitude
> 30°	Limits bank to 30°

Table 7-4 Roll Hold Mode Responses

CHANGING THE ROLL REFERENCE

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

LOW BANK MODE

When in Low Bank Mode, the flight director limits the maximum commanded roll angle to 15°. Low bank arc limits are displayed in green along the Roll Scale. Low Bank Mode can be manually selected/deselected by pressing the **BANK** Key while in Heading Select or Navigation Modes (FMS and VOR).

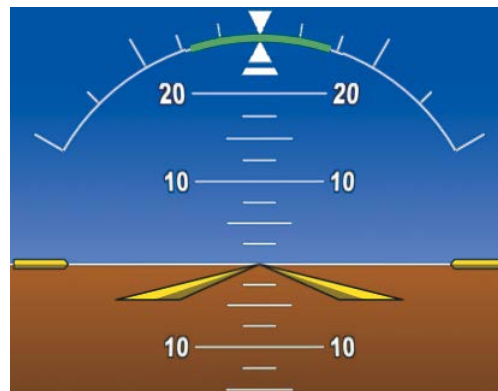


Figure 7-24 Low Bank Mode Limits

HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the **HDG** Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a light blue bug on the HSI and in the box to the upper left of the HSI.

CHANGING THE SELECTED HEADING



NOTE: Pressing the **HDG** Knob synchronizes the Selected Heading to the current heading.

The Selected Heading is adjusted using the **HDG** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the **CWS** Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the Bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 340° at a time result in turn reversals.



Figure 7-25 Heading Select Mode

NAVIGATION MODES (FMS, VOR, LOC, BC)

NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active FMS course for the flight director to enter Navigation Mode.

NOTE: When intercepting a flight plan leg, the flight director gives commands to capture the active leg at approximately a 45° angle to the track between the waypoints defining the active leg. The flight director does not give commands fly to the starting waypoint of the active leg.

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (FMS, VOR, LOC). The flight director follows FMS roll steering commands when FMS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision FMS and LOC approaches where glideslope capture is not required.

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **NAV** Key. When making a backcourse approach, set the Selected Course to the localizer front course. The flight director creates roll steering commands from the Selected Course and deviation.

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. If the CDI is less than one dot, Navigation Mode is automatically captured when the **NAV** Key is pressed. The armed annunciation appears in white to the left of the active roll mode.

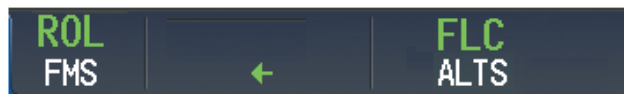


Figure 7-26 FMS Navigation Mode Armed

When the CDI has automatically switched from FMS to LOC during a LOC/ILS approach, FMS Navigation Mode remains active, providing FMS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed when the automatic navigation source switch takes place. If the **APR** Key is pressed prior to the automatic navigation source switch, LOC Navigation Mode is armed.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the **Active Nav** Softkey)
- During a LOC/ILS approach, the FAF is crossed while in FMS Navigation Mode after the automatic navigation source switch from FMS to LOC.

CHANGING THE SELECTED COURSE

If the navigation source is VOR or LOC, or OBS Mode has been enabled when using FMS, the Selected Course is controlled using the **CRS** Knob corresponding to the selected flight director (**CRS1** for the pilot side, **CRS2** for the copilot side).

Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or FMS flight plan) when the **CWS** Button is released.

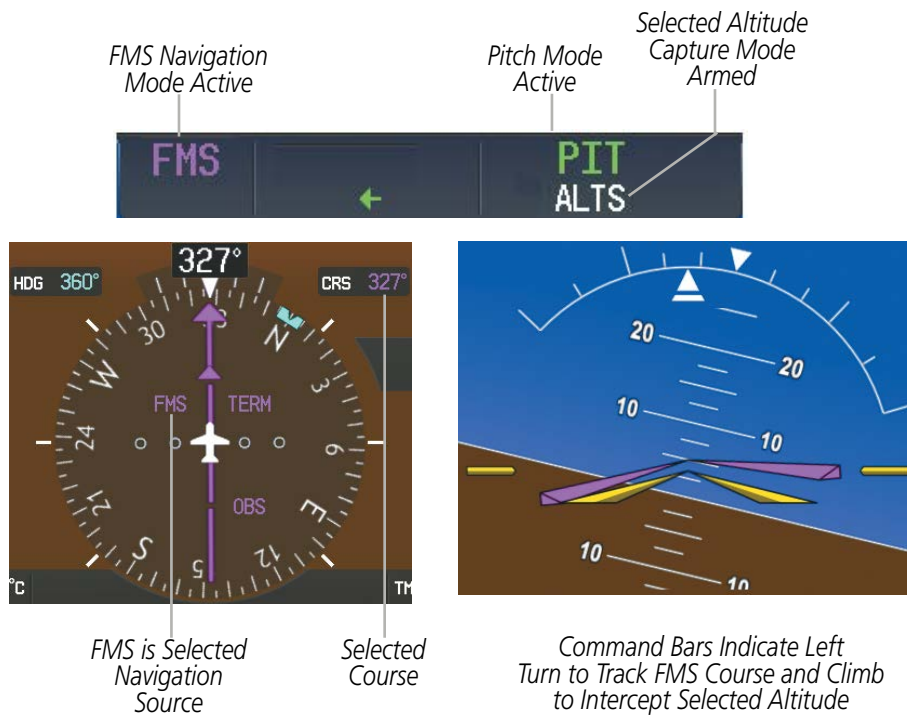


Figure 7-27 FMS Navigation Mode

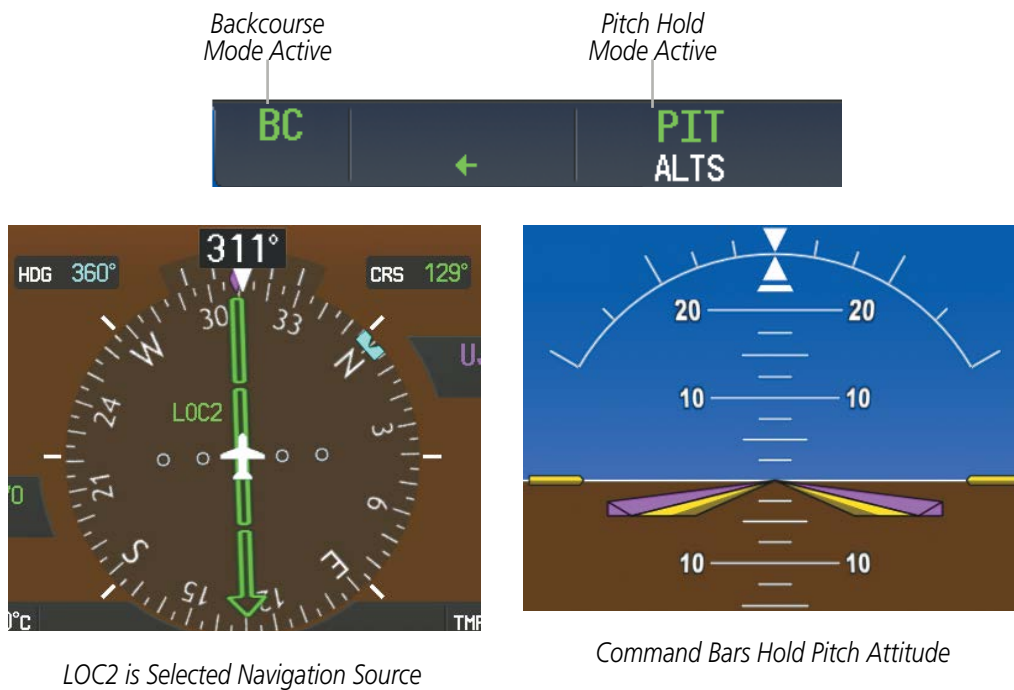


Figure 7-28 Navigation Backcourse Mode

APPROACH MODES (FMS, VAPP, LOC)

NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active FMS course for the flight director to enter Approach Mode.

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (FMS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less than one dot, the LOC is automatically captured when the **APR** Key is pressed.

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode .

Selecting VOR Approach Mode:

- 1) Ensure a valid VOR frequency is tuned.
- 2) Ensure that VOR is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

When FMS Approach Mode is armed, Glidepath Mode is also armed.

Selecting FMS Approach Mode:

- 1) Ensure a FMS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

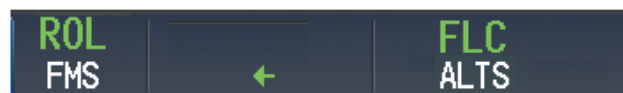


Figure 7-29 Navigation/Approach Mode Armed

LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

Selecting LOC Approach Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

Or:

- 1) Ensure that FMS is the selected navigation source (use the **Active Nav** Softkey to cycle through navigation sources if necessary).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

- Approach Mode is active and a Vectors-To-Final is activated
- Approach Mode is active and Navigation source is manually switched
- During a LOC/ILS approach, FMS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from FMS to LOC

CHANGING THE SELECTED COURSE

If the navigation source is VOR or LOC, or OBS Mode has been enabled when using FMS, the Selected Course is controlled using the **CRS** Knob corresponding to the selected flight director (**CRS1** for the pilot side, **CRS2** for the copilot side).

Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or FMS flight plan) when the **CWS** Button is released.

INTERCEPTING AND FLYING A DME ARC

The AFCS will intercept and track a DME arc that is part of the active flight plan provided that FMS Navigation Mode is engaged, FMS is the active navigation source on the CDI, and the DME arc segment is the active flight plan leg. It is important to note that automatic navigation of DME arcs is based on FMS. Thus, even if the **APR** key is pressed and LOC or VOR Approach Mode is armed prior to reaching the Initial Approach Fix (IAF), Approach Mode will not activate until the arc segment is completed.

If the pilot decides to intercept the arc at a location other than the published IAF (i.e. ATC provides vectors to intercept the arc) and subsequently selects Heading Mode or Roll Mode, the AFCS will not automatically intercept or track the arc unless the pilot activates the arc leg of the flight plan and arms FMS Navigation Mode. The AFCS will not intercept and fly a DME arc before reaching an IAF that defines the beginning of the arc segment. Likewise, if at any point while established on the DME arc the pilot deselects FMS Navigation Mode, the AFCS will no longer track the arc.

7.5 AUTOPILOT AND YAW DAMPER OPERATION



NOTE: Refer to the Airplane Flight Manual (AFM) for specific instructions regarding emergency procedures.

The autopilot and yaw damper operate the flight control surface servos to provide automatic flight control. The autopilot controls the aircraft pitch and roll attitudes following commands received from the flight director. Pitch autotrim provides trim commands to the pitch trim actuator to relieve any sustained effort required by the pitch servo.

The yaw damper reduces Dutch roll tendencies and coordinates turns. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. Yaw rate commands are limited by the yaw damper.

FLIGHT CONTROL

Pitch and roll commands are provided to the servos based on the active flight director modes. Yaw damping is provided by the yaw servo. Servo motor control limits the maximum servo speed and torque. The servo gearboxes are equipped with slip-clutches that 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 and airspeed is within a certain range, the pitch trim system provides Mach trim (MT).

Manual electric pitch trim (MEPT) functionality is available at any time via the pilot and copilot **MEPT** Switches. Manual trim commands are generated only when both halves of the **MEPT** Switch are operated simultaneously. Operating the **MEPT** Switches when the autopilot is engaged will cause the autopilot to disconnect. Trim speeds are scheduled with airspeed to provide more consistent response.

The pilot side **MEPT** Switch has priority over the copilot side **MEPT** Switch.

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 yaw damper uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. It also uses lateral acceleration to coordinate turns. Yaw damper operation is independent of autopilot engagement.

ENGAGING THE AUTOPILOT AND YAW DAMPER

NOTE: Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the **CWS** Button to disengage the pitch and roll servos while the autopilot remains active.

When the **AP** Key is pressed, the autopilot, yaw damper, and flight director (if not already active) are activated. The flight director engages in Pitch and Roll Hold Modes when initially activated. When the **YD** Key is pressed, the system engages the yaw damper independently of the autopilot. Autopilot and yaw damper status are displayed in the center of the AFCS Status Box. Engagement is indicated by green 'AP' and 'YD' annunciations, respectively.



Figure 7-30 Autopilot and Yaw Damper Engaged

CONTROL WHEEL STEERING

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the **CWS** Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. Pitch trim operation is interrupted during CWS activity; yaw damper engagement is unaffected.

The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.

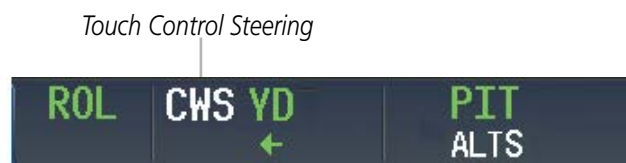


Figure 7-31 TCS Annunciation

DISENGAGING THE AUTOPILOT AND YAW DAMPER

NOTE: Pressing the **AP** Key does not disengage the yaw damper.

Manual autopilot disengagement is indicated by a five-second flashing red 'AP' annunciation and an autopilot disconnect aural alert, "Autopilot". The autopilot is manually disengaged by pushing the **AP** Key on the AFCS Control Unit, the **GA** Switch, the **MEPT** Switches, or the **AP DISC** Switch (also disengages the yaw damper, if engaged). Pressing the **YD** Key disengages the yaw damper independently of the autopilot. The 'YD' annunciation is removed upon disengagement.

After manual disengagement, the autopilot disconnect aural alert and flashing 'AP' annunciation may be cancelled by pushing the **AP DISC** Switch.



Figure 7-32 Manual Autopilot Disengagement

Automatic autopilot disengagement is indicated by a flashing red and white ‘AP’ annunciation and the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** Switch. Automatic autopilot disengagement occurs due to:

- System failure
- Invalid sensor data
- Stall warning (YD also disengages)
- Inability to compute default flight director modes (FD also disengages automatically)

Automatic yaw damper disengagement is indicated by a five-second flashing yellow ‘YD’ annunciation. The yaw damper automatically disengages when autopilot disengagement is caused by failure in a parameter also affecting the yaw damper. This means the yaw damper can remain operational in some cases where the autopilot automatically disengages. A localized failure in the yaw damper system or invalid sensor data also cause yaw damper disengagement.



Figure 7-33 Automatic Autopilot and Yaw Damper Disengagement

7.6 EXAMPLE PROCEDURES



NOTE: The following example flight plan and diagrams (not to be used for navigation) in this section are for instructional purposes only and should be considered not current. Numbered portions of accompanying diagrams correspond to numbered procedure steps.

This section provides a scenario-based set of procedures showing various GFC 700 AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using FMS Navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

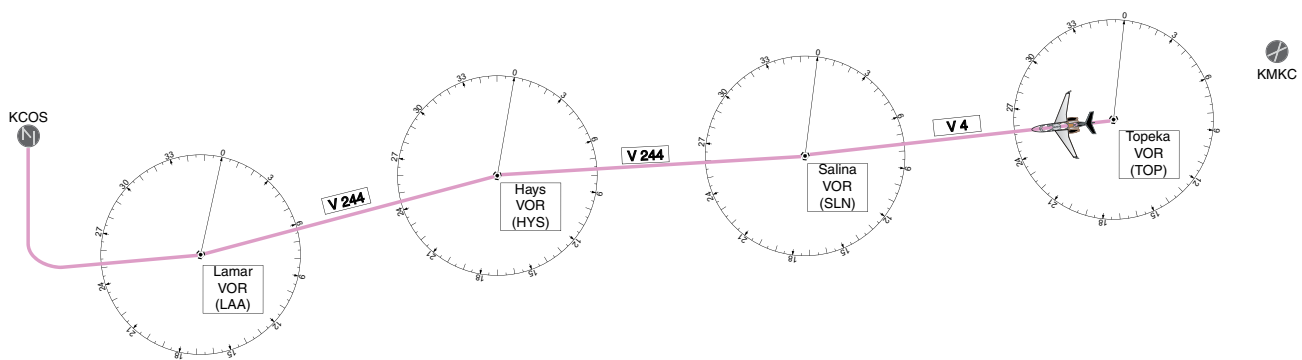


Figure 7-34 Flight Plan Overview

DEPARTURE

Climbing to the Selected Altitude and flying an assigned heading:

- 1) Before takeoff:
 - a) Use the **ALT SEL** Knob to set the Selected Altitude to 12,000 feet.
 - b) Push the **GA** Switch to activate Takeoff Mode. The flight director Command Bars establish a pitch up attitude to follow.



c) Press the **AP** Key to engage the autopilot in a climb, holding the pitch angle commanded in Takeoff Mode and wings level.



2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).

a) Press the **VS** Key to activate Vertical Speed and Roll Hold modes and arm Selected Altitude Capture Mode.

The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **UP/DN** Wheel or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.



3) Use the **HDG** Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4.

Press the **HDG** Key to activate Heading Select Mode while the autopilot is engaged in the climb. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.



4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



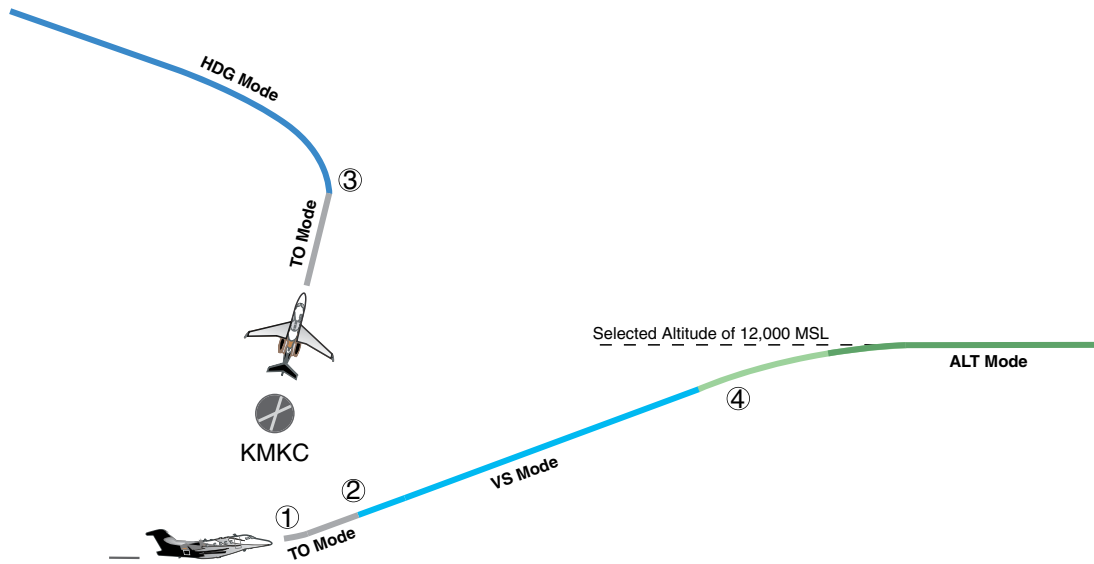


Figure 7-35 Departure

INTERCEPTING A VOR RADIAL

During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or FMS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

- 1) Arm VOR Navigation Mode:
 - a) Tune the VOR frequency.
 - b) Press the **Active Nav** Softkey to set the navigation source to VOR.
 - c) Use the **CRS1** or **CRS2** Knob to set the Selected Course to the desired value, 255°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly the Selected Heading, 290°.
 - d) Press the **NAV** Key. This arms VOR Navigation Mode and the white 'VOR' annunciation appears below the active lateral mode.



- 2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the 'VOR' annunciation flashes green. The autopilot begins turning to intercept the Selected Course.



- 3) The autopilot continues the turn until the aircraft is established on the Selected Course.

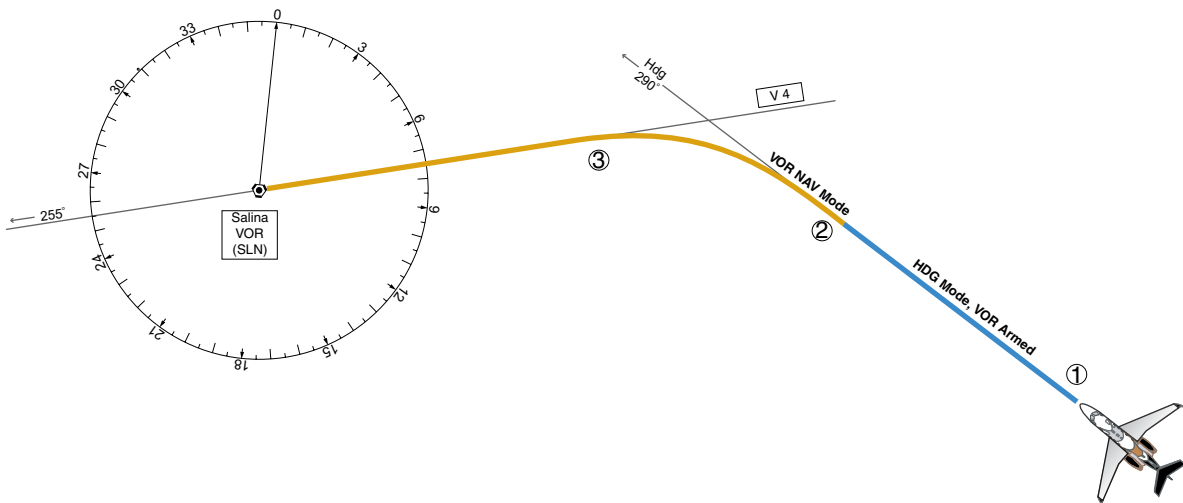


Figure 7-36 Intercepting a VOR Radial

FLYING A FLIGHT PLAN/FMS COURSE



NOTE: Changing the navigation source cancels Navigation Mode and causes the flight director to revert to Roll Hold Mode (wings rolled level).

As the aircraft closes on Salina VOR, FMS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying a FMS flight plan:

- 1) Transition from VOR to FMS Navigation Mode:
 - a) Press the **Active Nav** Softkey until FMS is the selected navigation source.
 - b) Press the **NAV** Key to activate FMS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.



- 2) Following the flight plan, the autopilot continues to steer the aircraft under FMS guidance. Note that in FMS Navigation Mode, course changes defined by the flight plan are automatically made without pilot action required.

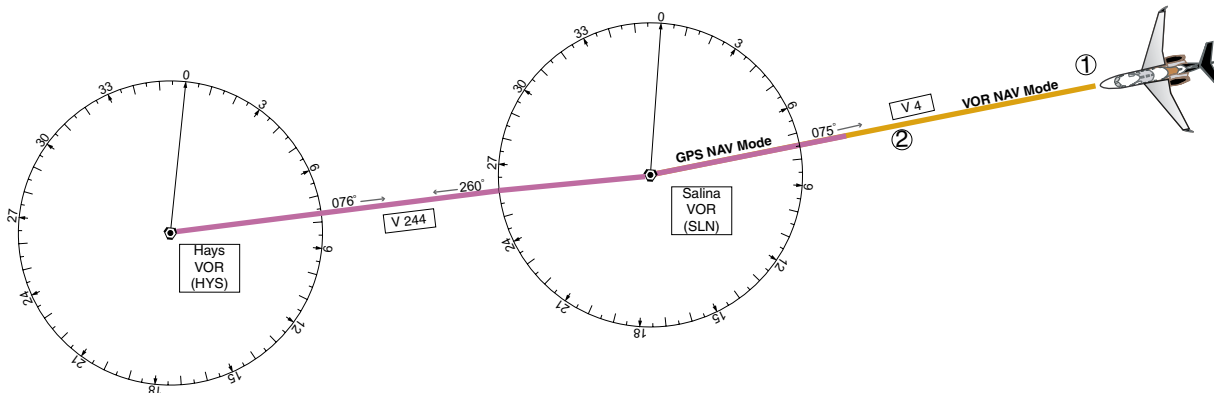


Figure 7-37 Transition to GPS Flight Plan

DESCENT

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for descent:

- Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.
- Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the FMS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNAV flight control can provide vertical profile guidance, a VNAV flight plan must be entered and enabled.
- Non-path descent in a VNAV scenario – A VNAV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNAV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Flight Level Change descent:

- 1) Select Flight Level Change Mode:
 - a) Using the **ALT SEL** Knob, set the Selected Altitude to 10,000 feet.
 - b) Press the **FLC** Key to activate Flight Level Change Mode. The annunciation ‘FLC’ appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.



- 2) Use the **UP/DN** Wheel or push the **CWS** Button while hand-flying the aircraft to adjust the commanded airspeed while maintaining the same power, or reduce power to allow descent in Flight Level Change Mode while the autopilot maintains the current airspeed.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green ‘ALTS’ annunciation flashing for up to 10 seconds.



The green ‘ALT’ annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



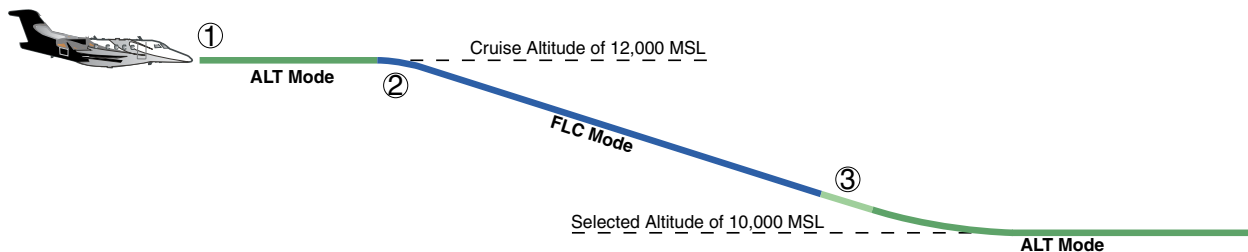


Figure 7-38 FLC Descent

Vertical Path Tracking descent to VNAV Target Altitude:

- 1) Select coupled VNAV:
 - a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'VPTH' appears.



- b) Using the **ALT SEL** Knob, set the Selected Altitude 75 feet below the flight plan's VNAV Target Altitude of 10,000 feet.

If the Selected Altitude is not at least 75 feet below the VNAV Target Altitude, the flight director captures the Selected Altitude rather than the VNAV Target Altitude once Vertical Path Tracking Mode becomes active (ALTS is armed rather than ALTV).

- c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with descent path capture if the white 'VPTH' annunciation begins flashing, do one of the following
 - Press the **VNV** Key
 - Turn the **ALT SEL** Knob to adjust the Selected Altitude

If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

- 2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and begins the descent to the VNAV Target Altitude. Intention to capture the VNAV Target Altitude is indicated by the white 'ALTV' annunciation.



- 3) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the magenta 'ALTV' annunciation flashing for up to 10 seconds.



The magenta 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

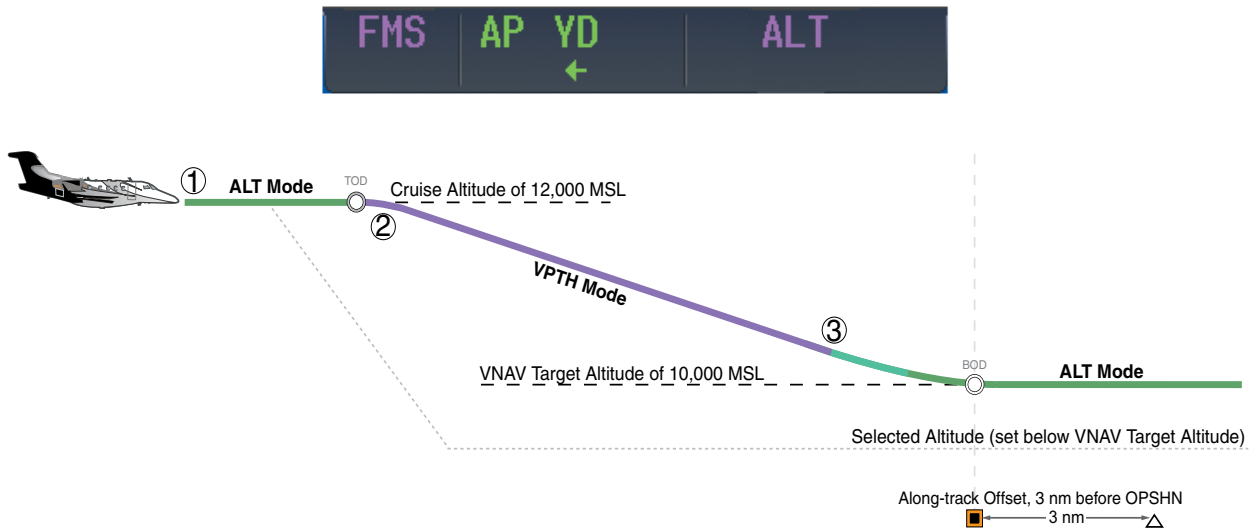


Figure 7-39 VPTH Descent

Non-path descent using Flight Level Change Mode:

- 1) Using Flight Level Change Mode, command a non-path descent to an intermediate altitude above the next VNAV flight plan altitude.:
 - a) Using the **ALT SEL** Knob, set the Selected Altitude below the current aircraft altitude to an altitude (in this case, 9,400 feet) at which to level off between VNAV flight plan altitudes.
 - b) Press the **FLC** Key before the planned TOD during an altitude hold while VPTH is armed. The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode are armed automatically.



- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off, reset selected altitude at or below 9,000 ft.



- 4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).



- 5) As the aircraft nears the VNAV Target Altitude, the flight director transitions to VNAV Target Altitude Capture Mode, indicated by the magenta 'ALTV' annunciation flashing for up to 10 seconds.



The magenta 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNAV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

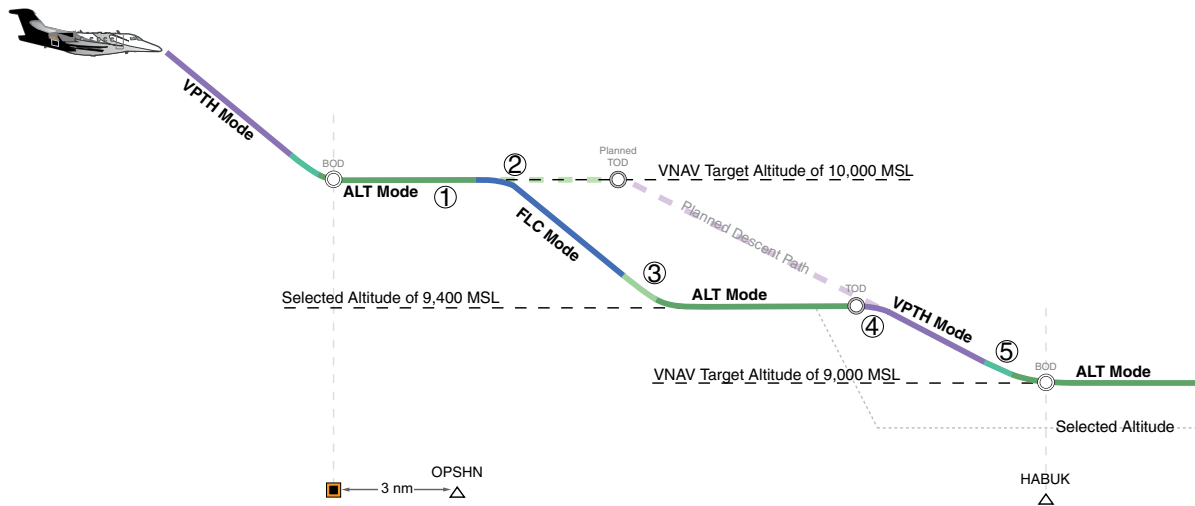


Figure 7-40 Non-path Descent

APPROACH

Flying an ILS approach:

- 1) Transition from FMS Navigation Mode to Heading Select Mode.
 - a) Select the Runway 35L ILS approach for KCOS and select 'VECTORS' for the transition. Load and activate the approach into the flight plan.
 - b) Use the **HDG** Knob to set the Selected Heading after getting vectors from ATC.
 - c) Press the **HDG** Key. The autopilot turns the aircraft to the desired heading.
 - d) Use Heading Select Mode to comply with ATC vectors as requested.



- 2) Arm LOC Approach and Glideslope modes.
 - a) Ensure the appropriate localizer frequency is tuned.
 - b) Press the **APR** Key when cleared for approach to arm Approach and Glideslope modes. 'LOC' and 'GS' appear in white as armed mode annunciations.



- c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determine when to begin the turn to intercept the final approach course. The flight director now provides guidance to the missed approach point.
- 3) There are two options available at this point, as the autopilot flies the ILS approach:
 - Push the **AP DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

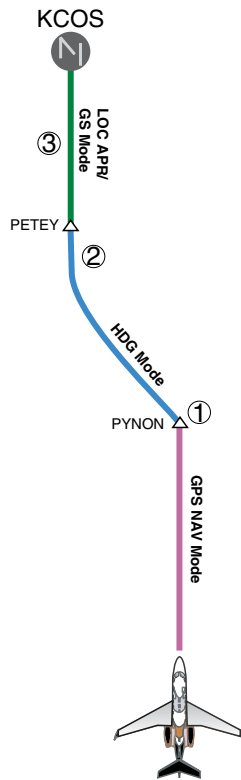
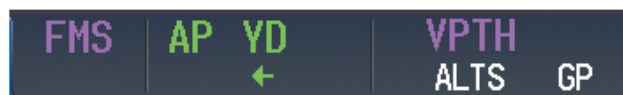


Figure 7-41 ILS Approach to KCOS

Flying a RNAV FMS approach with vertical guidance:

- 1) Arm flight director modes for a RNAV FMS approach with vertical guidance:
 - a) Make sure the navigation source is set to FMS (use **Active Nav** Softkey to change navigation source).
 - b) Select the Runway 35R LPV approach for KCOS. Load and activate the approach into the flight plan.
- 2) Press the **APR** Key once clearance for approach has been received. FMS Approach Mode is activated and Glidepath Mode is armed.



- 3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.



- 4) There are two options available at this point, as the autopilot flies the approach:
 - Push the **AP DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Switch to execute a missed approach.

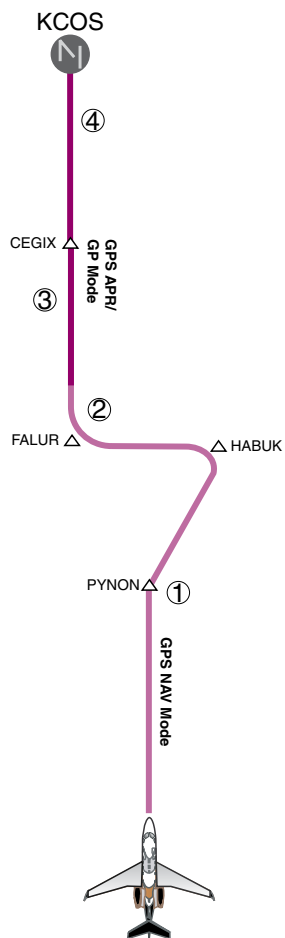


Figure 7-42 LPV Approach to KCOS

GO AROUND/MISSED APPROACH

NOTE: As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern as depicted on the PFD and MFD.

Flying a missed approach:

- 1) Push the **GA** Switch at the Decision height and apply go-around power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow. If flying an ILS or LOC approach the CDI also switches to FMS as the navigation source.

Note that when the **GA** Switch is pushed, the missed approach is activated and the autopilot disconnects, indicated by the 'AP' annunciation flashing yellow for 5 seconds and the autopilot disconnect aural alert.



- 2) Start the climb to the prescribed altitude in the published Missed Approach Procedure.
 - a) Press the **AP** Key to re-engage the autopilot.
 - b) Press the **NAV** Key to have the autopilot fly to the hold.



- 3) Use the **ALT SEL** Knob to set a Selected Altitude to hold.

To hold the current airspeed during the climb, press the **FLC** Key.



As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



- 4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box.

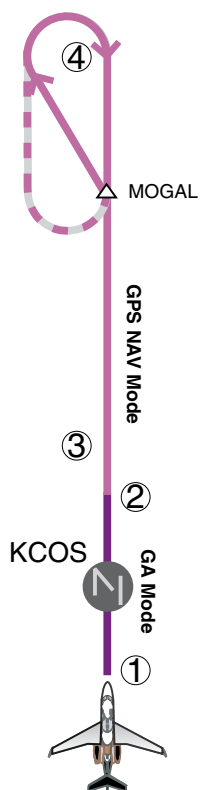
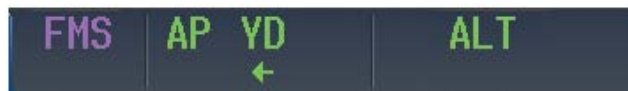


Figure 7-43 Go Around/Missed Approach

7.7 AFCS ANNUNCIATIONS AND ALERTS

AFCS CAS MESSAGES

Crew Alerting System (CAS) messages related to the AFCS are listed in Table 7-5. CAS messages appear on the PFDs in the window to the right of the Altimeter. Refer to the EAS Section for details.

CAS Message	Description
AP FAIL	Loss of AP function
AUTO PTRIM FAIL	Auto pitch trim failure; other pitch trim functions still available
AP PITCH MISTRIM	Airplane mistrimmed in pitch axis when AP is engaged
AP ROLL MISTRIM	Airplane mistrimmed in roll axis when AP is engaged
YD FAIL	Loss of yaw damper function
YD MISTRIM	Airplane mistrimmed in yaw axis when YD is engaged
PTRIM NML FAIL	Loss of normally-operating pitch trim actuator
PTRIM BKP FAIL	Loss of backup pitch trim actuator
PTRIM SW1 FAIL	Failure of pilot pitch trim switch
PTRIM SW2 FAIL	Failure of copilot pitch trim switch

Table 7-5 AFCS CAS Messages

AFCS VOICE ALERTS

The voice alerts listed in Table 7-6 relate to the AFCS; for a complete list of voice alerts, see Appendix A.

Voice Alert	Description
"Autopilot"	Warning – Autopilot is disengaged Single alert for manual AP disengagement Continuous alert for automatic AP disengagement; cancelled with AP DISC Switch
"Flight Director"	Single warning – Flight director has reverted to a default mode
"Trim, Trim, Trim"	Continuous advisory (stops after 6 seconds) – MEPT Switch malfunction

Table 7-6 AFCS Voice Alerts

OVERSPEED PROTECTION

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director and pitch commands are limited for overspeed protection. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, a flashing yellow ‘MAXSPD’ annunciation appears above the Airspeed Indicator and the voice alert “High Speed” is generated. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.

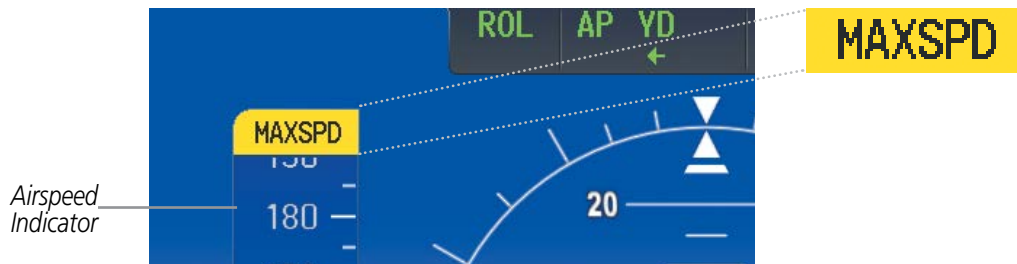


Figure 7-45 Overspeed Annunciation

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SECTION 8 ADDITIONAL FEATURES



NOTE: *Regardless of the availability of SafeTaxi®, ChartView, or FliteCharts®, it may be necessary to carry another source of charts on-board the aircraft.*

Additional features of the Vision Flight Deck include the following:

- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- Airport Directory (AOPA or AC-U-KWIK)
- Iridium satellite telephone
- Data Link Services
- SiriusXM Satellite Radio entertainment
- Scheduler
- Electronic Documents
- Flight Data Logging
- Electronic Checklists

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

FliteCharts and optional ChartView provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information. Either ChartView or FliteCharts may be configured in the system, but not both.

The AOPA or AC-U-KWIK Airport Directory offer detailed information for a selected airport, such as available services, hours of operation, and lodging options.

Telephone and Data Link Services are optional subscription services offered through Garmin Flight Data Services and Iridium Satellite LLC. Voice and SMS messaging communications are through the Iridium Satellite Network. Data communications are through Iridium Data Services, or a wireless network (Wi-Fi) when the aircraft is on the ground. Incorporated in this feature set is a System Data Logging function which records aircraft system parameters specified by the aircraft manufacturer. This data is then uploaded to Garmin Flight Data Services through one of the data communications options.

The optional SiriusXM Satellite Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. SiriusXM Satellite Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as Switch fuel tanks, Change oil, or Altimeter-Transponder Check in the Messages display on the Touchscreen Controller.

The Electronic Document function allows viewing of electronic documents on PFD and/or MFD displays.

Optional electronic checklists help to quickly find the proper procedure on the ground or during flight.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

8.1 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range on the Navigation Map or the Inset Map on the PFD. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the aircraft's current position is within the SafeTaxi view, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map display that show the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of displays where the SafeTaxi feature can be seen:

- Navigation Map
- Inset Map (PFD)
- Weather Datalink
- Airport Information
- Intersection Information
- NDB Information
- VOR Information
- User Waypoint Information
- Trip Planning
- Nearest
- Active Flight Plan
- Stored Flight Plan

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Charlie approaching a designated Airport Hot Spot boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



Figure 8-1 SafeTaxi Depiction on the Navigation Map Display

Enabling/Disabling SafeTaxi:

- 1) From the **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Annunciator Button.
- 4) Touch the **SafeTaxi** Button to enable or disable the display of SafeTaxi on the Navigation and Inset maps. A green annunciator on the button indicates SafeTaxi is enabled.

Configuring SafeTaxi range:

- 1) From the **Home** Screen, touch **Map > Map Settings**.
- 2) If not already selected, touch the **Aviation** Tab.
- 3) If necessary, scroll to display the **SafeTaxi** Range Button.
- 4) Touch the SafeTaxi Range Button. A selection of ranges is displayed.
- 5) Touch the desired range. In Figure 8-2, 4 NM has been selected. With this setting, SafeTaxi will be displayed on the Navigation Map for range settings up to, and including 4 NM.



Figure 8-2 SafeTaxi Map Settings

SAFETAXI DATABASE INFORMATION

The SafeTaxi database is revised every 56 days. SafeTaxi is available for use after the expiration date. When turning on the system, the MFD Power-up Display indicates the expiration date and status of the database.

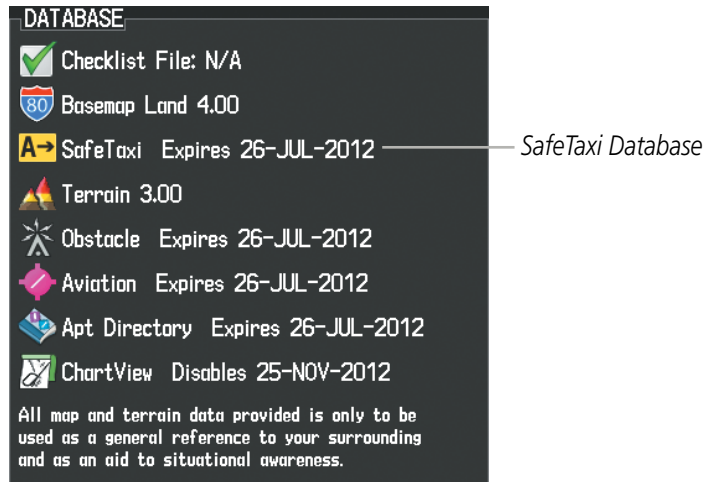


Figure 8-3 Power-up Page, SafeTaxi Database

Power-up Page Display	Definition
A→ SafeTaxi Expires 26-JUL-2012	Normal operation. SafeTaxi database is valid and within current cycle.
A→ SafeTaxi Expires 26-JUL-2012	SafeTaxi database has expired.
A→ SafeTaxi: N/A	Database card contains no SafeTaxi data.

Table 8-1 SafeTaxi Annunciation Definitions

The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can be viewed by selecting the MFD1, PFD1, and PFD2 Databases Screen.

Viewing SafeTaxi database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If not already selected, touch the **Database** Tab.
- 3) Touch the desired button (**PFD1, PFD2, or MFD1**).
- 4) Scroll to view the SafeTaxi database information, as shown in Figure 8-4.



Figure 8-4 MFD SafeTaxi Database Information

The SafeTaxi database cycle number shown in the figure, 12S3, is deciphered as follows:

12 – Indicates the year 2012

S – Indicates the data is for SafeTaxi

3 – Indicates the third issue of the SafeTaxi database for the year

The SafeTaxi ‘Effective’ date 3-MAY-2012 is the beginning date for the current database cycle. The SafeTaxi ‘Expires’ date 26-JUL-2012 is the revision date for the next database cycle.

The ‘Effective’ date is the beginning date for this database cycle. The ‘Effective’ date appears in yellow when the current date is before the effective date (Figure 8-5). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired. ‘Not Available’ indicates the SafeTaxi database is not available on the database card or no database card is inserted. An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Refer to Appendix B for instructions on revising the SafeTaxi database.

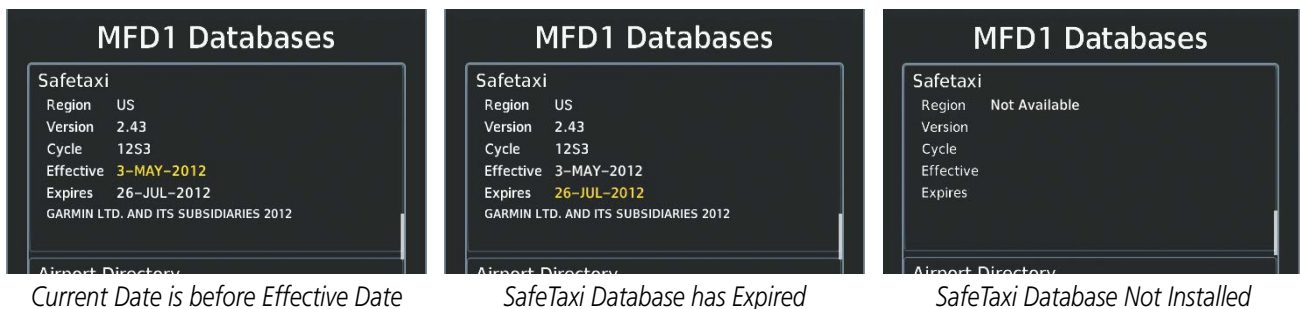


Figure 8-5 SafeTaxi Database Status

8.2 CHARTVIEW (OPTIONAL)

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The Display Pane depiction shows the aircraft position on the moving map in the planview of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes (Figure 8-6) are not considered within the chart boundaries. Therefore, when the aircraft symbol reaches a chart boundary line, or inset box, the aircraft symbol is removed from the display.

Figure 8-6 shows examples of off-scale areas, indicated by the grey shading. Note, the grey shading is for illustrative purposes only and will not appear on the published chart or Display Pane. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

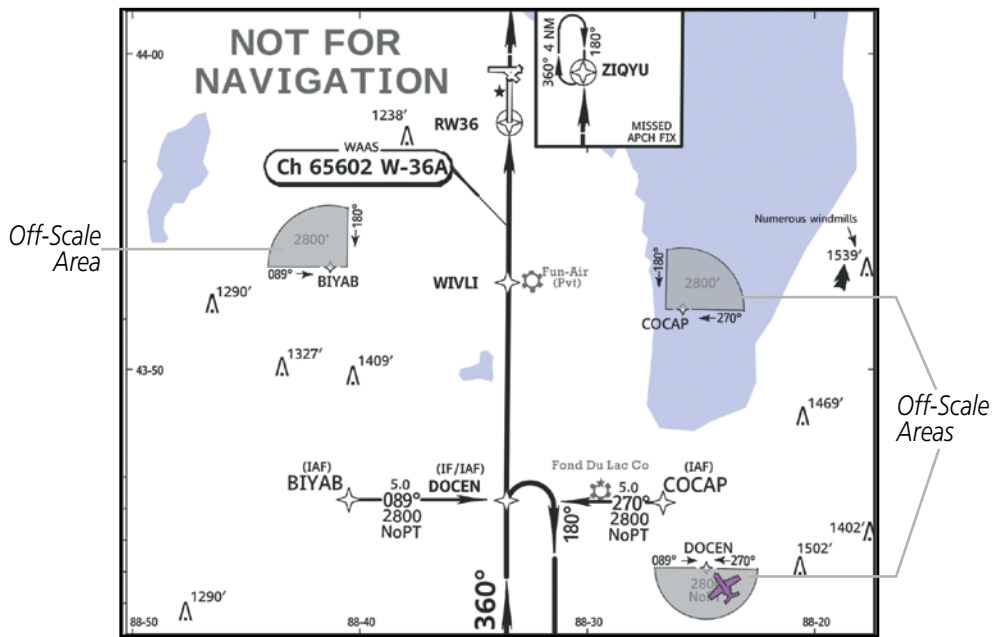


Figure 8-6 Sample Chart Indicating Off-Scale Areas



NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

- The ChartView database subscription is available from Jeppesen, Inc. Available data includes:
- Arrivals (STAR)
 - Departure Procedures (DP)
 - Approaches
 - Airport Diagrams
 - Chart NOTAMs



NOTE: Only NOTAMs applicable to specific information conveyed on the displayed Jeppesen chart are available. There may be other NOTAMs available pertaining to the flight that may not be displayed. Contact Jeppesen for more information regarding Jeppesen database-published NOTAMs.

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertain to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-7).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the selected Display Pane.

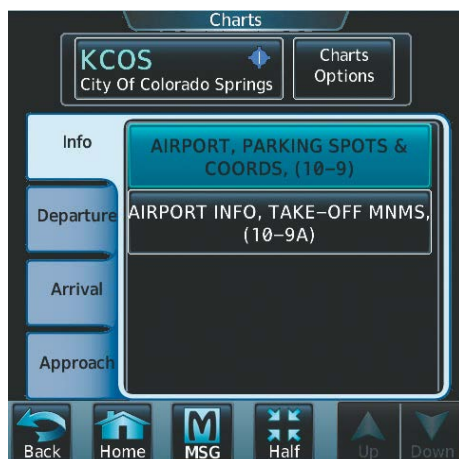


Figure 8-7 Airport Diagram Selection



Figure 8-8 Airport Diagram View Options

- 5) Touch the **Charts Options** Button to select the desired display option for the selected chart (Figure 8-8).
- 6) Touch **All** to display the complete Airport Diagram. **Fit Width** displays the full width of the Airport Diagram. **Plan** displays only the diagram portion of the chart. **Minimums** displays only the approach minimums on an approach chart. **Profile** displays only the descent profile on the approach chart. **Header** displays the chart heading. Only appropriate views are available for the selected chart.
- 7) Touch **Back** to return to the Charts Screen.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the **Home** Screen, touch **Nearest > Airport**.
- 2) Touch the desired airport button. KCOS is selected in this example. The **Waypoint Options** buttons are displayed as shown in Figure 8-9.



Figure 8-9 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-9) and the Airport Diagram is displayed on the selected Display Pane (Figure 8-10).

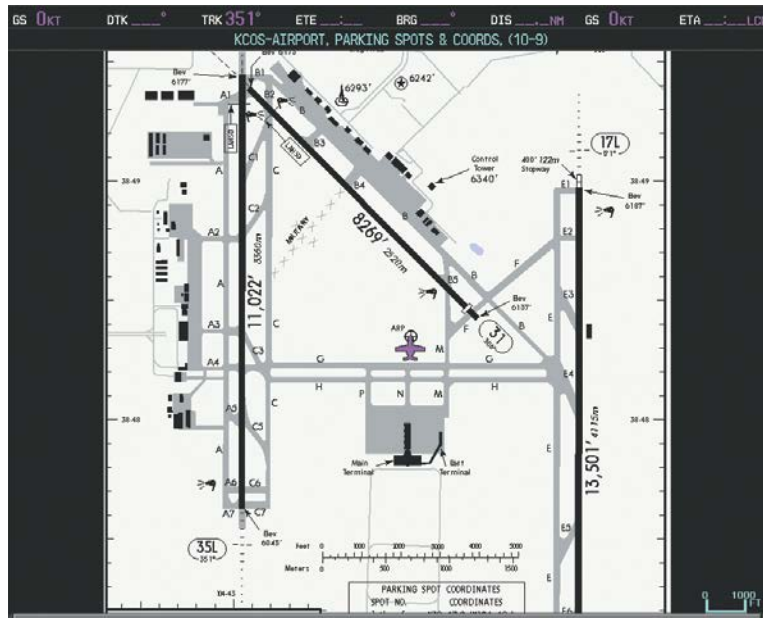


Figure 8-10 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner 'CHART NOT AVAILABLE' appears on the screen. The 'CHART NOT AVAILABLE' banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-11 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner 'UNABLE TO DISPLAY CHART' is then displayed.



Figure 8-12 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the **Home** Screen, touch **Charts > Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-8).
- 3) Touch the **Day**, **Night**, or **Auto** button (Figure 8-13). The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.



Figure 8-13 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-14). The Auto Light Mode Threshold window is displayed.

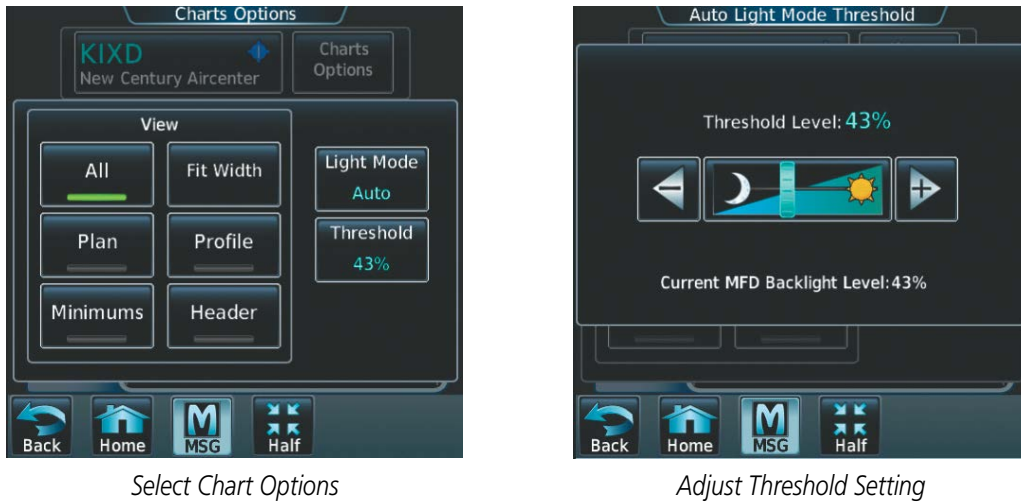


Figure 8-14 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.

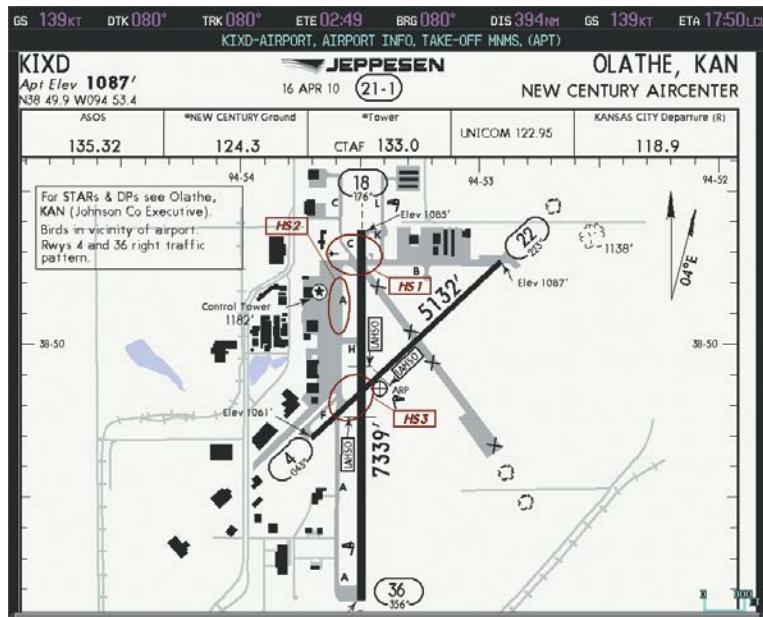


Figure 8-15 Airport Diagram, Day View



Figure 8-16 Airport Diagram, Night View

CHARTVIEW DATABASE INFORMATION

The ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing. When turning on the system, the MFD Power-up Display shows the current status of the ChartView database. See the following table for the various ChartView Power-up Display annunciations and the definition of each.

DATABASE	
✓	Checklist File: N/A
80	Basemap Land 4.00
A→	SafeTaxi Expires 26-JUL-2012
🔥	Terrain 3.00
⚡	Obstacle Expires 26-JUL-2012
✈️	Aviation Expires 26-JUL-2012
📁	Apt Directory Expires 26-JUL-2012
🗺️	ChartView Disables 25-NOV-2012

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.

ChartView Database

Figure 8-17 Power-up Page, ChartView Database

Power-up Display	Definition
Blank Line	System is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
ChartView Disables 25-NOV-2012	Normal operation. ChartView database is valid and within current cycle.
Chart data update available.	ChartView database is within 1 week after expiration date. A new cycle is available for update.
Chart data is out of date!	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
Chart data is disabled.	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
Verify chart database cycle.	System time is not available. GPS satellite data is unknown or the system has not yet locked onto satellites. Check database cycle number for effectivity.
Verifying Chart data	System is verifying chart database when new cycle is installed for the first time.
Chart Data is Corrupt!	After verifying, chart database is found to be corrupt. ChartView is not available.

Table 8-2 ChartView Annunciations and Definitions

The ChartView status information can be found on the MFD1, PFD1, PFD2, GTC1, and GTC2 Databases Screen (Figure 8-18). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired. ChartView becomes inoperative 70 days after the ChartView ‘Expires’ date is reached. This is shown as the ‘Disables’ date. When the disables date is reached, the date is displayed in yellow. Also, the **Charts** Button on the Home Screen appears subdued and is disabled until a new issue of ChartView is installed.

Viewing ChartView database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, PFD2, GTC1, or GTC2) for which the database information will be viewed.
- 4) Scroll to display the ChartView database information as shown in Figure 8-18.



Figure 8-18 MFD ChartView Database Information

The ChartView database cycle number shown in Figure 8-18, 1218, is deciphered as follows:

12 – Indicates the year 2012

18 – Indicates the eighteenth issue of the ChartView database for the year

The 'Expires' date 16-SEP-2012 is the date that this database should be replaced with the next issue.

The 'Disables' date 25-NOV-2012 is the date that this database becomes inoperative.

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

Example database currency conditions are shown in Figure 8-19. The ‘Expires’ date, in yellow, is the revision date for the next database cycle. The ‘Disables’ date, in yellow, is the date that this database cycle is no longer viewable. ‘Not Available’ indicates no ChartView data is available on the database card or no database card is inserted.

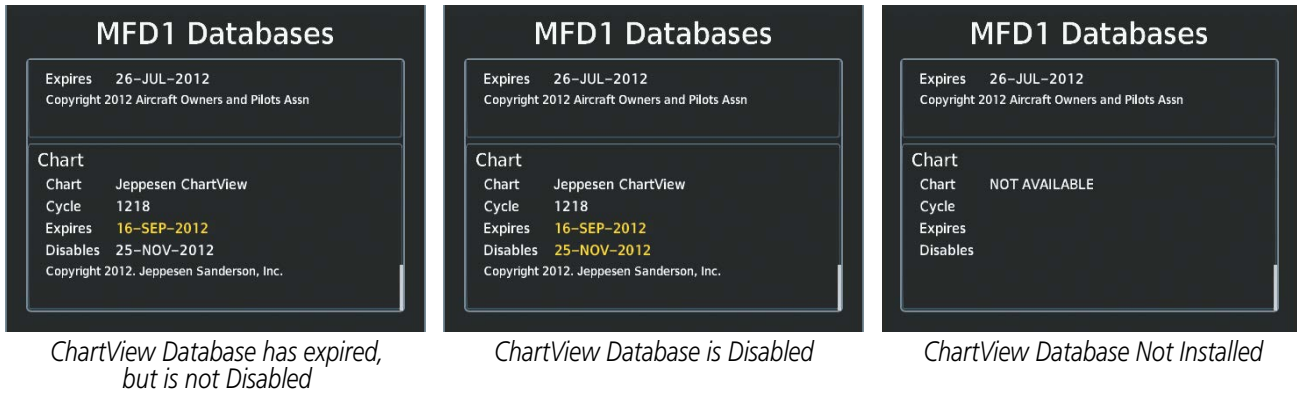


Figure 8-19 ChartView Database Status

8.3 FLITECHARTS

FliteCharts resemble the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. An aircraft symbol may be displayed within an off-scale area depicted on some charts.

Figure 8-20 shows examples of off-scale areas, indicated by the grey shading. Note, these areas are not shaded on the published chart. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Approaches
- Departure Procedures (DP)
- Airport Diagrams

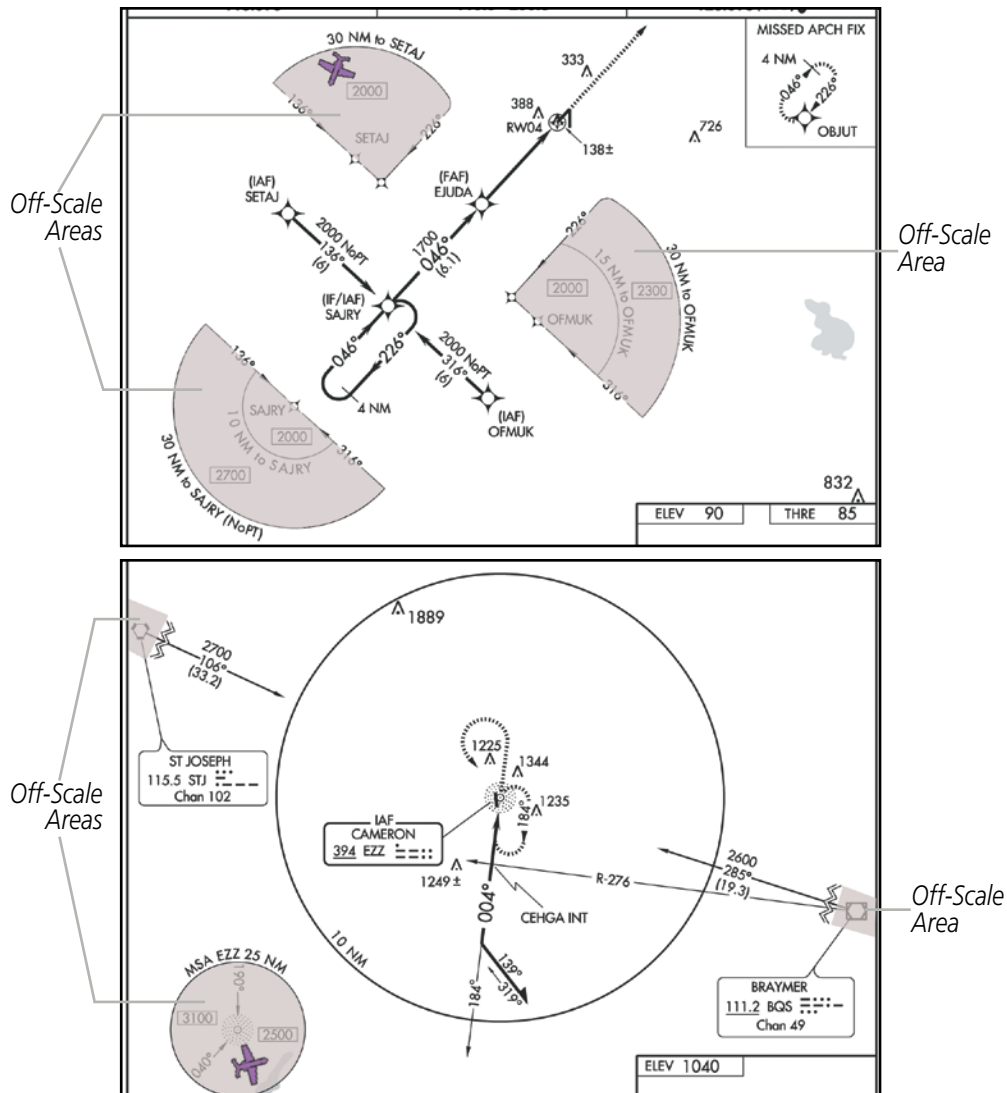


Figure 8-20 Sample Chart Indicating Off-Scale Areas



NOTE: Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.

CHART SELECTION

When a flight plan is active, or when flying direct-to a destination, the initial set of charts made available pertains to the departure airport. After departing the airport environment, the initial chart set made available pertains to the destination airport. When no flight plan is active, or when not flying to a direct-to destination, the initial chart set is made available for the nearest airport.

Selecting Charts using the Charts Screen:

- 1) From the **Home** Screen, touch **Charts**.
- 2) The airport for which charts will be displayed is shown at the top of the Charts Screen. Touch the Airport Button to enter another airport.
- 3) Touch the **Info** Tab to display the airport information selection buttons for the selected airport (Figure 8-21).
 - **Departure** Tab to display a list of possible departures for the selected airport.
 - **Arrival** Tab to display a list of possible arrivals for the selected airport.
 - **Approach** Tab to display a list of possible approaches for the selected airport.
- 4) Touch the desired information button in any of these lists to display the applicable chart on the selected Display Pane.

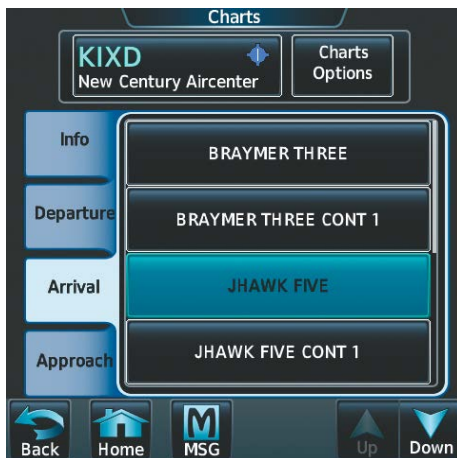


Figure 8-21 Airport Diagram Selection

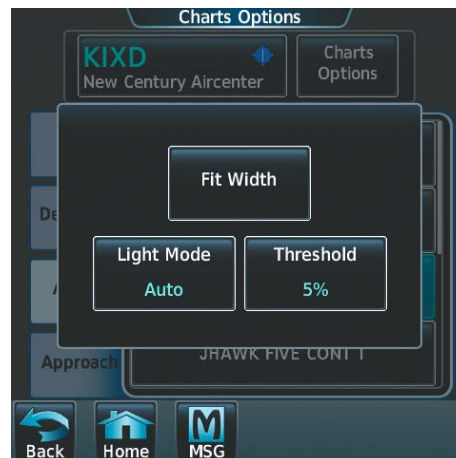


Figure 8-22 Airport Diagram Viewing Options

- 5) Touch the **Charts Options** Button to display the viewing options available for the selected chart (Figure 8-22).
- 6) Touch **Fit Width** to display the full width of the chart.
- 7) Touch **Back** to return to the Charts Screen.

Selecting Airport Diagrams from the Nearest Airports Screen:

- 1) From the **Home** Screen, touch **Nearest > Airport**.
- 2) Touch the desired airport button. KCOS is selected in Figure 8-23. The **Waypoint Options** buttons are now displayed.

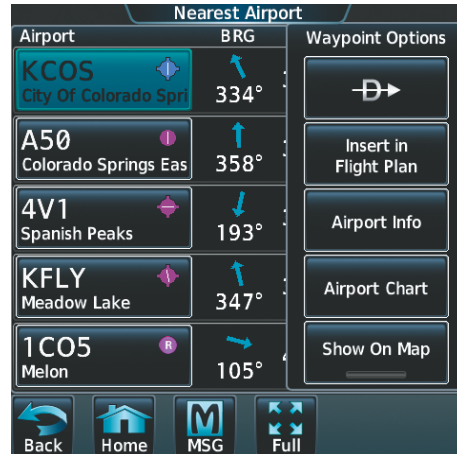


Figure 8-23 Airport Diagram Selection

- 3) Touch the **Airport Chart** Button. The **Info** Tab selections are displayed on the Touchscreen Controller (Figure 8-23) and the Airport Diagram is displayed on the selected Display Pane (Figure 8-24).

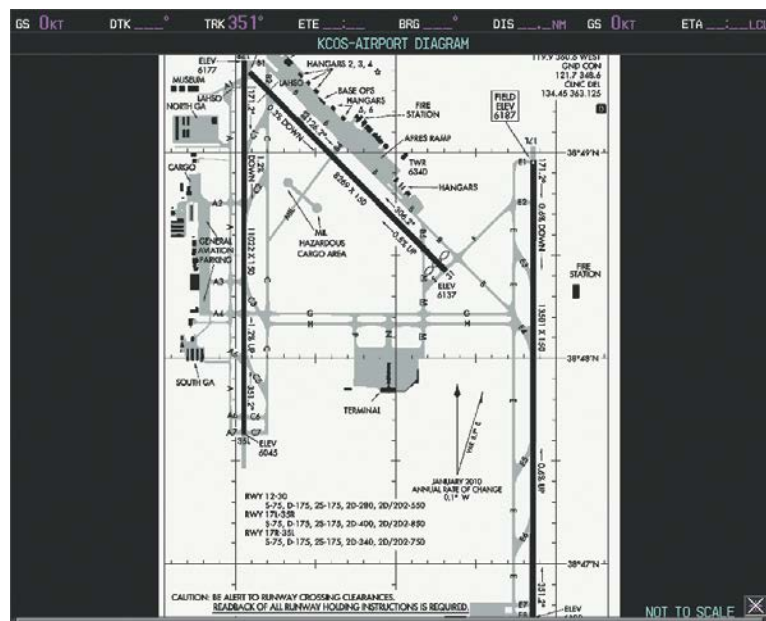


Figure 8-24 Airport Chart for Selected Airport

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears. If the Chart Scale Box displays a banner 'NOT TO SCALE', the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner ‘CHART NOT AVAILABLE’ appears on the screen. The ‘CHART NOT AVAILABLE’ banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-25 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner ‘UNABLE TO DISPLAY CHART’ is then displayed.



Figure 8-26 Unable To Display Chart Banner

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment.

Selecting Day, Night, or Auto View:

- 1) From the **Home** Screen, touch **Charts > Charts Options**.
- 2) Touch the **Light Mode** Button (Figure 8-28).
- 3) Touch the **Day, Night, or Auto** button. The selection is annunciated on the **Light Mode** Button. When **Auto** is selected, the display will change to the appropriate day or night setting, dependent on ambient lighting.

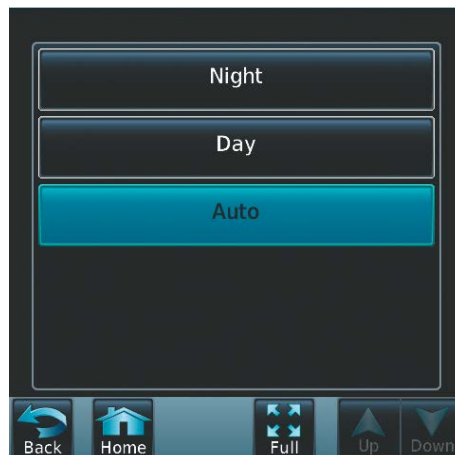


Figure 8-27 Selecting Day/Night View

- 4) Touch the **Threshold** button (Figure 8-28). The Auto Light Mode Threshold window is displayed.

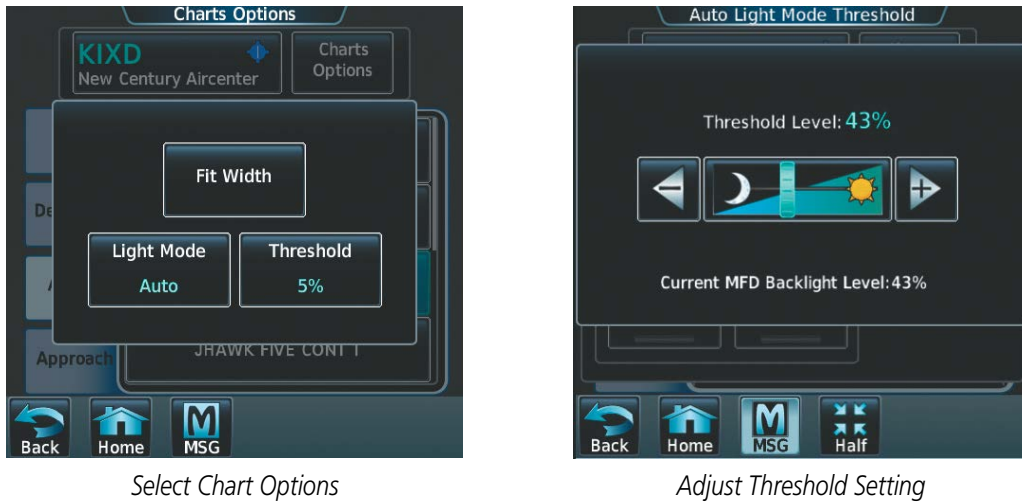


Figure 8-28 Setting Day/Night Switching Threshold

- 5) Move the slider left or right to set the desired threshold. Setting the Threshold Level percentage to the same percentage shown as the Current MFD Backlight Level will cause the Day/Night view to switch at the current backlight setting. Adjusting the Threshold Level setting larger than the Current MFD Backlight Level will cause the display to remain in Night Mode longer. Adjusting the Threshold Level setting smaller than the Current MFD Backlight Level will cause the display to change to Day Mode sooner.



Figure 8-29 Airport Diagram, Day View

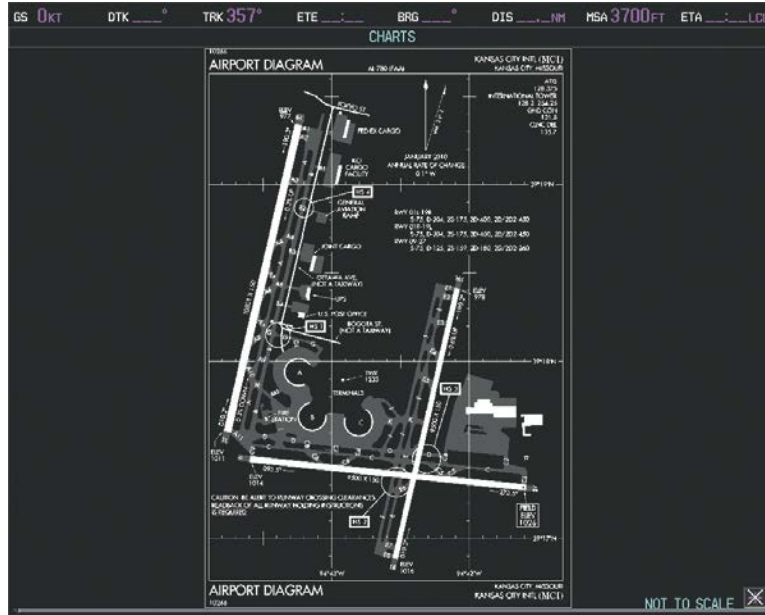
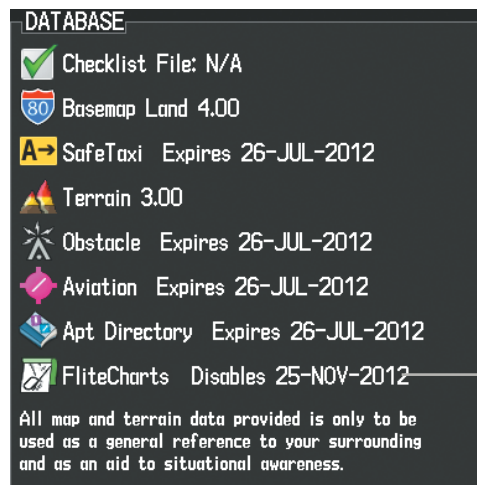


Figure 8-30 Airport Diagram, Night View

FLITECHARTS CYCLE NUMBER AND EXPIRATION DATE

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts is disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date. When turning on the system, the MFD Power-up Display shows the current status of the FliteCharts database. See the following table for the various FliteCharts Power-up Display annunciations and the definition of each.



FliteCharts Database

Figure 8-31 Power-up Display, FliteCharts Database






Power-up Display	Definition
	Blank Line. System is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database
	Normal operation. FliteCharts database is valid and within current cycle.
	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

Table 8-3 FliteCharts Annunciations and Definitions

‘FliteCharts Expires’ plus a date in white, indicates the chart database is current. ‘Chart data is out of date!’ in yellow, indicates charts are still viewable, but approaching the disable date.

When the 180 day grace period has expired, ‘Chart data is disabled.’ in yellow indicates that the FliteCharts database has expired and is no longer viewable. ‘Chart Data: N/A’ appears in white if no FliteCharts data is available on the database card or no database card is inserted.

FliteCharts status information can be found on the MFD1, PFD1, PFD2, GTC1, and GTC2 Databases Screen (Figure 8-32). The ‘Expires’ date is the revision date for the next database cycle. The ‘Expires’ date appears in yellow when expired.

FliteCharts becomes inoperative 180 days after the FliteCharts ‘Expires’ date is reached, and is no longer available for viewing. This date is shown as the ‘Disables’ date. When the disables date is attained, the date is displayed in yellow. Also, **Charts** Button on the Home Screen then appears subdued and is disabled until a new issue of FliteCharts is installed.

Viewing FliteCharts database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, PFD2, GTC1, or GTC2) for which the database information will be viewed.
- 4) Scroll to display the FliteCharts database information as shown in Figure 8-32.

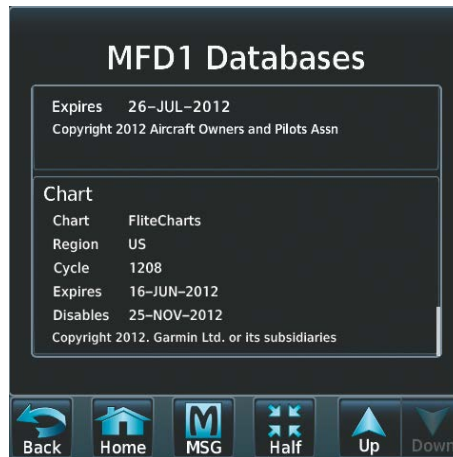


Figure 8-32 MFD FliteCharts Database Information

The FliteCharts database cycle number shown in the figure, 1208, is deciphered as follows:

12 – Indicates the year 2012

08 – Indicates the eighth issue of the FliteCharts database for the year

The FliteCharts ‘Expires’ date 16–JUN–12 is the last date that this database is current.

The ‘Disables’ date 25–NOV–12 is the date that this database becomes inoperative.

The FliteCharts database is obtained from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

Example database currency conditions are shown in Figure 8-33. The ‘Expires’ date, in yellow, is the revision date for the next database cycle. The ‘Disables’ date, in yellow, is the date that this database cycle is no longer viewable. ‘Not Available’ indicates no FliteCharts data is available on the database card or no database card is inserted.



FliteCharts Database has expired, but is not Disabled

FliteCharts Database is Disabled

FliteCharts Database Not Installed

Figure 8-33 FliteCharts Database Status

8.4 AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) or AC-U-KWIK Airport Directory databases offer detailed information regarding services, hours of operation, lodging options, and more for various airports. This information is viewed on the Airport Directory Info Screen as shown in Figure 8-35.

Selecting the Airport Directory Info Screen:

- 1) From the **Home** Screen, touch **Nearest > Airports**.
- 2) A list of the nearest airports to the aircraft present position is displayed, beginning with the closest. Touch the desired airport, in this case **KCOS**. The **Waypoint Options** buttons are displayed as shown in Figure 8-34.
- 3) Touch the **Airport Info** Button to display the Airport Directory Info Screen.
- 4) Touch the **AOPA** Tab to display the Airport Directory information for the selected airport as shown in Figure 8-35.



Figure 8-34 Nearest Airport Selection

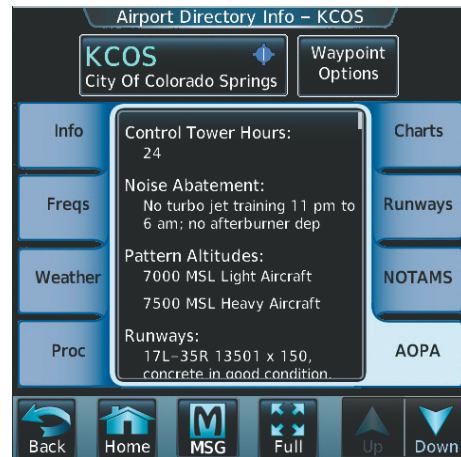


Figure 8-35 AOPA Airport Directory Information

AIRPORT DIRECTORY DATABASE CYCLE NUMBER & REVISION

The Airport Directory database is revised every 56 days. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date. When turning on the system, the Power-up Display indicates whether the databases are current, out of date, or not available.

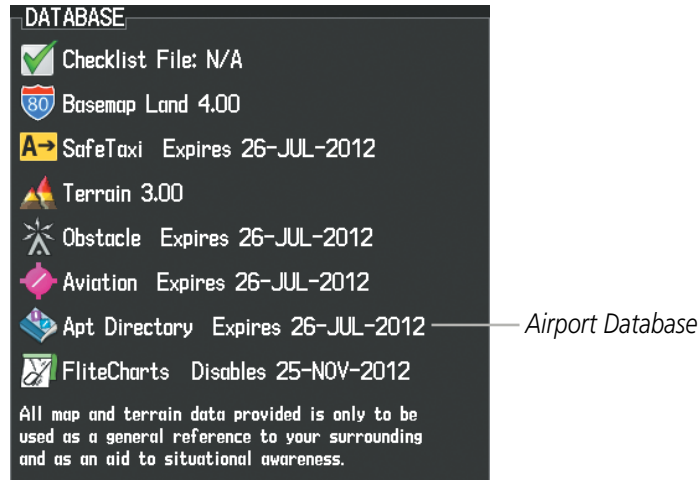


Figure 8-36 Power-up Page, Airport Directory Database

Power-up Display	Definition
Apt Directory Expires 26-JUL-2012	Normal operation. Airport Directory database is valid and within current cycle.
Apt Directory Expires 26-JUL-2012	Airport Directory database has expired.
Apt Directory N/A	Database card contains no Airport Directory data.

Table 8-4 Airport Directory Annunciation Definitions

The Airport Directory ‘Region’, ‘Version’, ‘Cycle’, ‘Effective’ date and ‘Expires’ date of the database cycle can also be found on the Touchscreen Controller, as seen in Figure 8-37.

Viewing Airport Directory database information:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) Touch the **Database** Tab.
- 3) Touch the button corresponding to the display (MFD1, PFD1, PFD2, GTC1, or GTC2) for which the database information will be viewed.
- 4) Scroll to display the Airport Directory database information as shown in Figure 8-37.



Figure 8-37 MFD Airport Directory Database Information

The Airport Directory database cycle number shown in the figure, 12D3, is deciphered as follows:

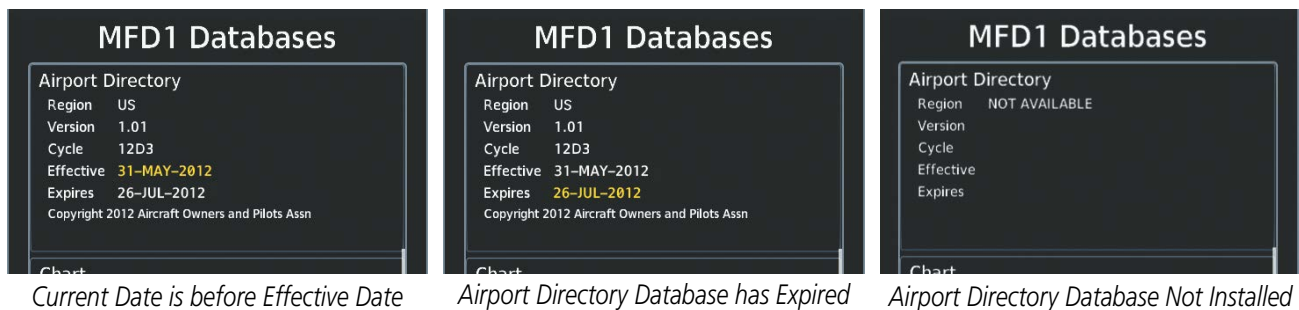
12 – Indicates the year 2012

D – Indicates the data is for Airport Directory

3 – Indicates the third issue of the Airport Directory database for the year

The Airport Directory ‘Effective’ date 31–MAY–2012 is the beginning date for the current database cycle. The Airport Directory ‘Expires’ date 26–JUL–2012 is the revision date for the next database cycle.

The ‘Effective’ date appears in yellow when the current date is before the effective date. The ‘Expires’ date appears in yellow when expired (Table 8-4). ‘Not Available’ appears in the ‘Region’ field if Airport Directory data is not available on the database card. An expired Airport Directory database is not disabled and will continue to function indefinitely.



Current Date is before Effective Date

Airport Directory Database has Expired

Airport Directory Database Not Installed

Figure 8-38 Airport Directory Airport Database Status

8.5 SATELLITE TELEPHONE AND DATALINK SERVICES



NOTE: Separate accounts must be established to access the Iridium satellite network for voice and Garmin Flight Data Services for data transmission of maintenance reports.

The optional GDL 59 Data Link provides an aircraft systems data logger for communication of potential maintenance issues and, while the aircraft is on the ground, a high speed (IEEE 802.11g) Wi-Fi data link between the aircraft and a ground computer network. The GDL 59 can also be paired with an optional GSR 56 Iridium Transceiver providing an airborne low speed data link, Iridium Satellite Telephone service and SMS text messaging.

REGISTERING WITH CONNEXT

A subscriber account must be established prior to using the Iridium Satellite System. Before setting up an Iridium account, obtain the System ID and serial number of the Iridium Transceiver (GSR1) by performing the following procedure. Contact Garmin International Aviation Product Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135.

Registering the system for data link services:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Airframe** Tab. Note the System ID number as seen in Figure 8-39. This number will be needed when contacting Garmin Connex Services to establish the account.



Figure 8-39 System ID Number

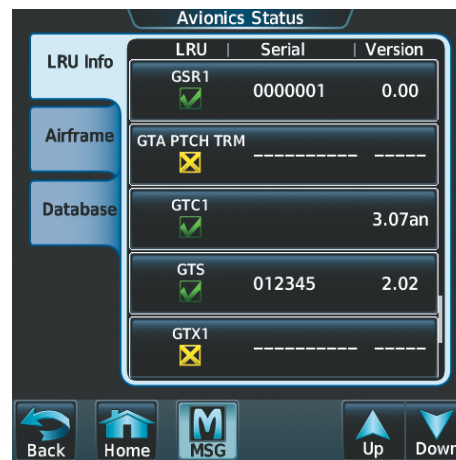


Figure 8-40 Iridium Transceiver Serial Number (GSR1)

- 3) Touch the **LRU Info** Tab. Scroll to view 'GSR1' and note the serial number (Figure 8-40), which will also be needed when contacting Garmin Flight Data Services.
- 4) Contact Garmin International Aviation Product Services to establish an account and receive an access code.

- From the **Home** Screen, touch **Utilities > Setup > Connex Registration > Register** (Figure 8-41).

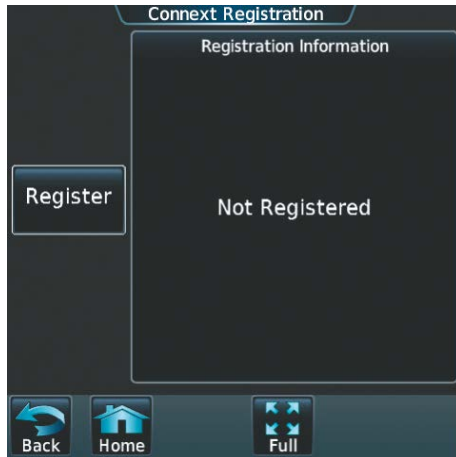


Figure 8-41 Connex Registration Display

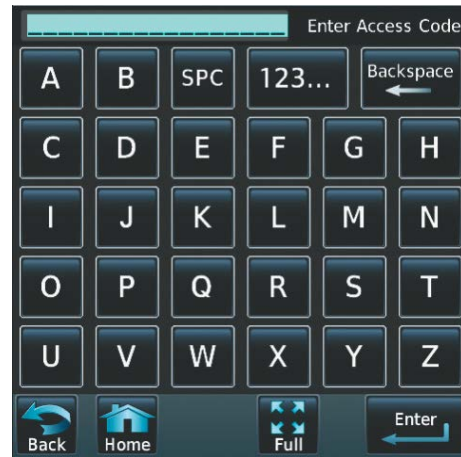


Figure 8-42 Entering the Access Code

- Enter the access code as shown in Figure 8-42.
- Touch the **Enter** Button.

CONTACTS

Names, telephone numbers, and email addresses may be entered and stored. These contacts may be used to place telephone calls or send email and text messages.

Creating a new contact:

- From the **Home** Screen, touch **Services > Contacts**.
- The Contacts Screen is displayed as shown in Figure 8-44.

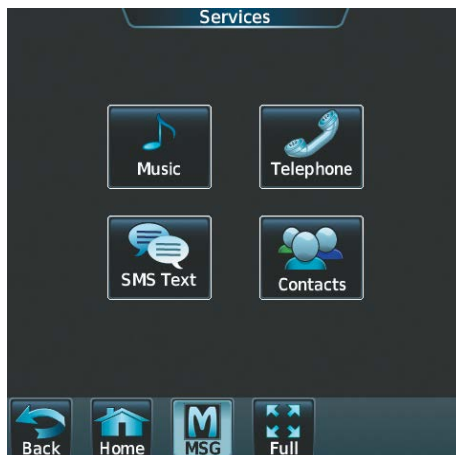


Figure 8-43 Services Menu

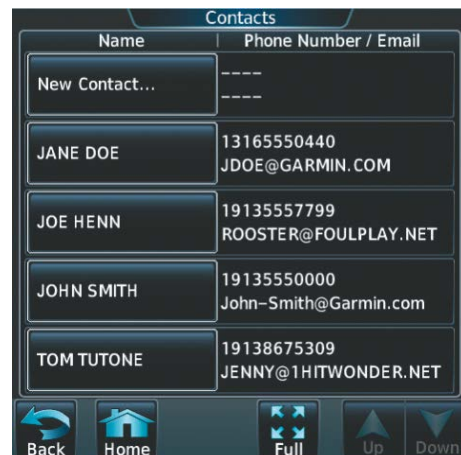


Figure 8-44 Contact List

- Touch **New Contact...** at the top of the list (Figure 8-44).

- 4) Touch **Name**, shown in Figure 8-45. The Contact Name entry screen is displayed.



Figure 8-45 Enter New Contact Information



Figure 8-46 Enter Name

- 5) Enter the name of the new contact as the example shows in Figure 8-46.
- 6) Touch **Enter**.
- 7) Touch **Telephone Number**. The Telephone Number entry screen is displayed.



Figure 8-47 Select Telephone Number

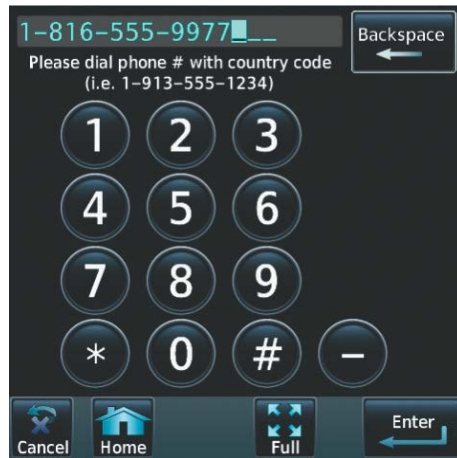


Figure 8-48 Enter Telephone Number

- 8) Enter the telephone number of the new contact as the example shows in Figure 8-48.
- 9) Touch **Enter**.

10) Touch **Email Address**. The Email Address entry screen is displayed.



Figure 8-49 Select Email Address



Figure 8-50 Enter Email Address

11) Enter the email address of the new contact as the example shows in Figure 8-50.

12) Touch **Enter**.

13) Touch **Create**. The new contact is created and appears in the list of contacts as shown in Figure 8-52.



Figure 8-51 New Contact Info Complete

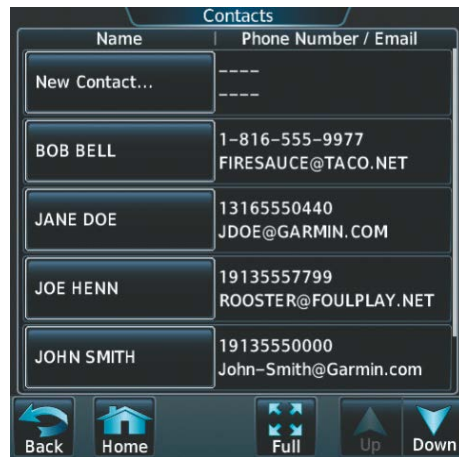


Figure 8-52 Enter Email Address

TELEPHONE COMMUNICATION (OPTIONAL)

The pilot or copilot can place and answer calls on the Iridium satellite network.

Viewing the Telephone Status:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) The Telephone Screen is displayed as shown in Figure 8-54.

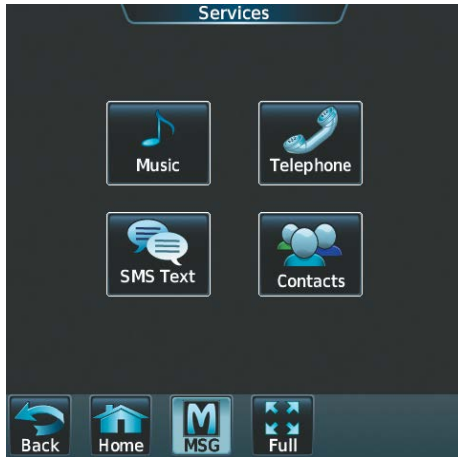


Figure 8-53 Telephone Service Selection



Figure 8-54 Telephone Status Information

The Telephone Screen, as shown in Figure 8-54, gives a graphical representation of the current disposition of voice and/or data transmissions.

ENABLE/DISABLE THE IRIDIUM SYSTEM CONNECTION

Connection with the Iridium Satellite System may be turned on or off by using the page menu.

To enable/disable the Iridium system connection:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Iridium #1** Button to display the Iridium #1 Transceiver Screen, as shown in Figure 8-55.
- 3) Touch the **Disable Iridium Transmission** Annunciator Button to disable (green annunciator as in Figure 8-56) the transceiver. Touch the button again to enable (gray annunciator) the transceiver.

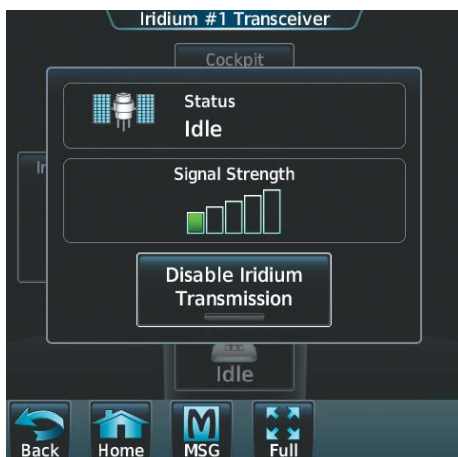


Figure 8-55 Iridium Transceiver Enabled

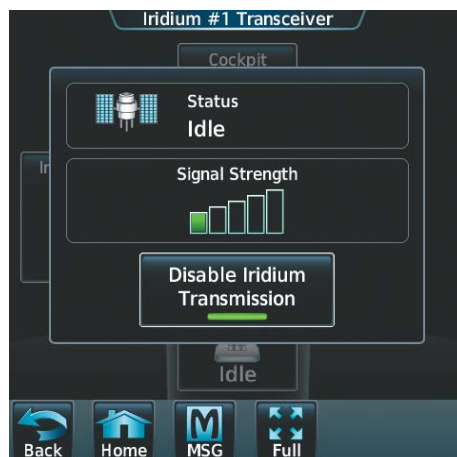


Figure 8-56 Iridium Transceiver Disabled

INCOMING CALLS

Incoming voice calls from an external telephone through the Iridium Satellite Network, or the cabin telephone, are annunciated by a flashing **TEL** Button on the GTC Button Bar, as shown in Figure 8-57, and an “Incoming Call” voice alert. Incoming external calls can be answered by either the cockpit or cabin phone.

To answer a call from the cockpit:

- 1) Touch the flashing **TEL** Button. The Notifications Screen is displayed as in Figure 8-58.
- 2) Touch the **Answer** Button. The call is now connected as indicated in Figure 8-60. Touching the **Ignore** Button extinguishes the new call annunciation and the call remains disconnected. Touching **Telephone** will display the Telephone Screen as shown in Figure 8-59.

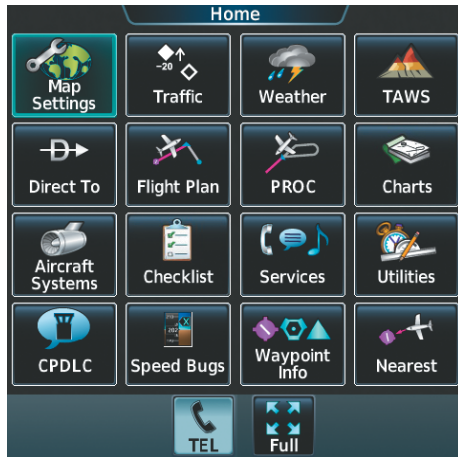


Figure 8-57 Incoming Call Notification



Figure 8-58 Telephone Notification Selected

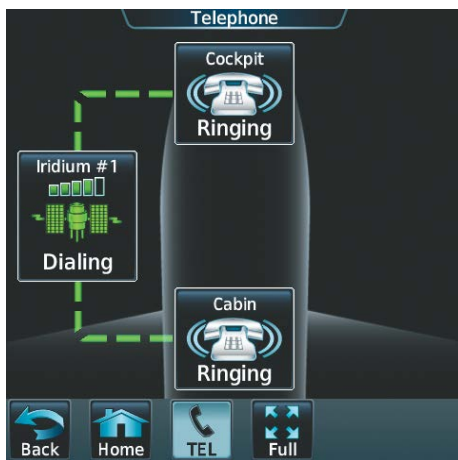


Figure 8-59 Incoming Call on Telephone Screen



Figure 8-60 Ending the Connected Call

- 3) When the call is finished, touch **End Call** (Figure 8-60) to disconnect the call.

OUTGOING CALLS

Voice calls can be made from the cockpit or the cabin to an external telephone through the Iridium Satellite Network. Calls are made from the cabin are made using the cabin handset.

To make an external call from the cockpit:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-61.
- 3) Touch **Dial**. The phone number entry screen is displayed as shown in Figure 8-62.



Figure 8-61 Cockpit Telephone Status



Figure 8-62 Telephone Number Entry

- 5) Using the number keys, enter the phone number. Touch **Find** to select a phone number from the Contact List.

The International dialing sequence is necessary to place a call from the cockpit to an external phone: Country Code + City/Area Code (if any) + Telephone Number. The following country codes may be used when calling other satellite telephone systems.

Satellite System	Country Code
Inmarsat	870
ICO	8810 or 8811
Ellipso	8812 or 8813
Iridium	8816 or 8817
Globalstar	8818 or 8819

- 6) Touch **Enter**. The system now begins establishing a connection as indicated in Figure 8-63. The system will indicate a completed connection, as shown in Figure 8-64, when the telephone to which the call is made is answered.



Figure 8-63 Establishing a Connection

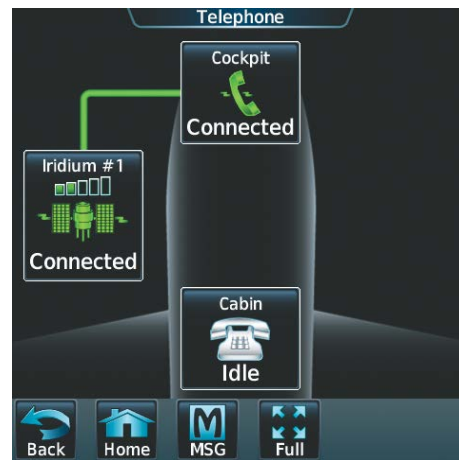


Figure 8-64 Telephone Connected

To end a call:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-65.
- 3) Touch **End Call**.



Figure 8-65 Ending the Call

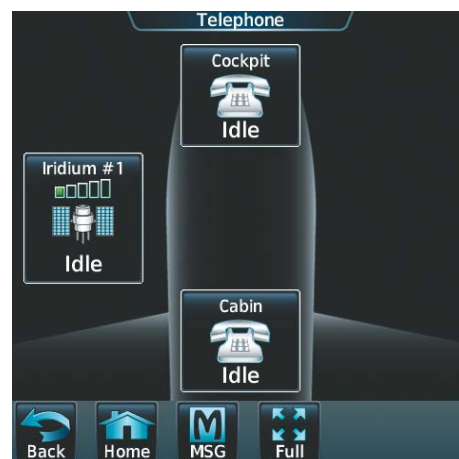


Figure 8-66 System is Idle After Ending Call

MAKING A CALL TO THE CABIN

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-65.
- 2) Touch **Call Cabin**. A display similar to Figure 8-67 will be shown.



Figure 8-67 Connecting to the Cabin Telephone

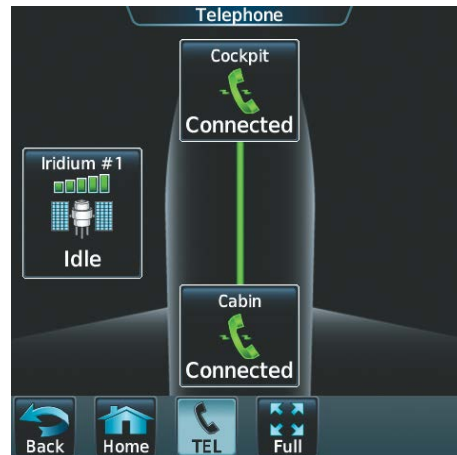


Figure 8-68 Cabin Telephone Connected

- 3) When the cabin phone is answered, the connection is indicated as seen in Figure 8-68.

PLACING THE COCKPIT PHONE ON HOLD

A call connected to the cockpit phone can be placed on hold from the Telephone Screen. The cabin phone cannot be placed on hold using the Touchscreen Controller, however, the cabin handset may be used to place a cabin call on hold.

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as in Figure 8-69.
- 3) Touch **Hold**. The Telephone Screen indicates the call is on hold as in Figure 8-70.



Figure 8-69 Selecting the Cockpit Phone for Hold



Figure 8-70 Hold Activated

- 4) Touch **Hold** again to return to the call.

TRANSFERRING A CALL FROM THE COCKPIT

From the cockpit phone, an external call can be transferred to the cabin phone, or a call with the cabin phone can be transferred to an external phone.

Transferring a call:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as in Figure 8-72.
- 3) Touch the **Transfer to Cabin** or **Transfer to Iridium** Button. When the cockpit phone is connected to an external call, the **Transfer to Cabin** Button is displayed. When the cockpit phone is connected to the cabin phone, the **Transfer to Iridium** Button is displayed. In this example, the call is transferred to the cabin phone by selecting the **Transfer to Cabin** Button. The Telephone Screen indicates a connection is being established with the cabin phone as in Figure 8-73.
- 4) When the cabin phone is answered, the transfer is completed as shown in Figure 8-74.

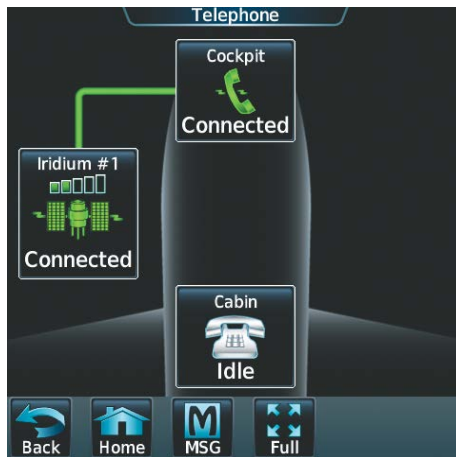


Figure 8-71 Cockpit Phone Connected to Iridium Call



Figure 8-72 Transfer Call to Cabin Phone



Figure 8-73 Connecting Call to Cabin Phone

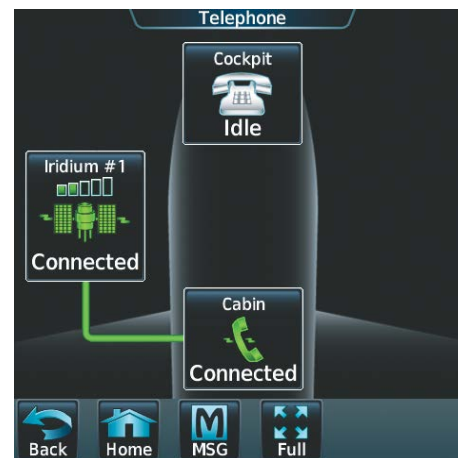


Figure 8-74 Transfer to Cabin Phone Complete

MAKING A CONFERENCE CALL FROM THE COCKPIT

The cabin or an external phone can be added to a call already in progress.

Adding another phone to an active call:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. In this example, the cabin phone is conferenced in with an external call connected to the cockpit phone. The **Cockpit** Button is touched, displaying the Cockpit Phone Screen as in Figure 8-76.
- 3) Touch the **Conference with Cabin** or **Conference with Iridium** Button. When the cockpit phone is connected to an external call, the **Conference with Cabin** Button is displayed. When the cockpit phone is connected to the cabin phone, the **Conference with Iridium** Button is displayed. In this example, the call is conferenced with the cabin phone by selecting the **Conference with Cabin** Button. The Telephone Screen indicates a connection is being established with the cabin phone as in Figure 8-77.
- 4) When the cabin phone is answered, the conference call is completed as shown in Figure 8-78.



Figure 8-75 Cockpit Phone Connected to Iridium Call



Figure 8-76 Conferencing in Cabin Phone

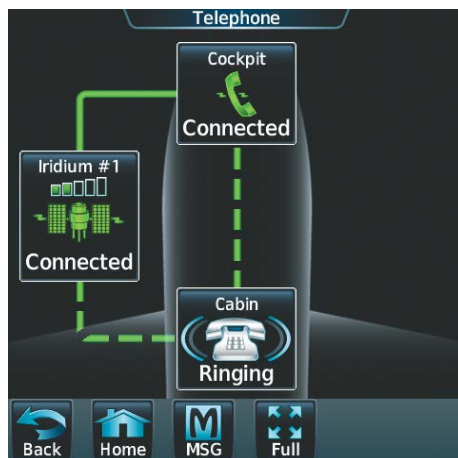


Figure 8-77 Connecting to Cabin Phone

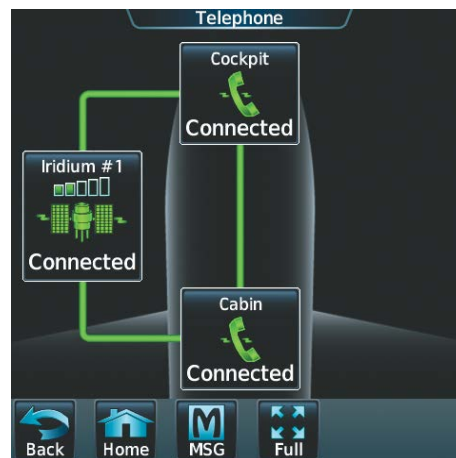


Figure 8-78 Cabin Phone Conference Complete

MANAGING TELEPHONE AUDIO



NOTE: The Push-to-Talk switch is not utilized for telephone communication. The microphone is active whenever a call is connected and telephone audio is enabled.

When an incoming call is received, or an outgoing call is made, telephone audio (which includes headset and microphone) is automatically enabled for either the pilot or copilot, depending on which Touchscreen Controller was used to make or answer the call. If the pilot or copilot wishes to join an existing call, the telephone audio must be enabled manually on the appropriate Touchscreen Controller. When the call is ended, telephone audio is automatically disabled. The green **Pilot Audio** Annunciator Button in Figure 8-79 indicates the enabled pilot audio on the pilot-side Touchscreen Controller. The copilot-side controller will, likewise, indicate a green **Copilot Audio** Annunciator Button. Pilot and copilot telephone audio can be enabled and disabled manually by performing the following steps.

To enable/disable telephone audio and adjust volume:

- 1) From the **Home** Screen, touch **Services > Telephone**.
- 2) Touch the **Cockpit** Phone Button. The Cockpit Phone Screen is displayed as shown in Figure 8-79.



Figure 8-79 Conferencing in Cabin Phone

- 3) Touch the **Pilot Audio** or **Copilot Audio** Annunciator Button to disable telephone audio, including microphone (gray annunciator).
- 4) Touch the Annunciator Button again to enable telephone audio, including microphone (green annunciator).
- 5) Touch and move the **Volume** Slider on the appropriate Touchscreen Controller to adjust the telephone volume.

TEXT MESSAGING (SMS)

The pilot or copilot can send and receive text messages on the Iridium satellite network. Messages may be sent to an email address or text message capable cellular telephone. Message length is limited to 160 characters, including the email address.

VIEWING A TEXT MESSAGE WHEN RECEIVED

- 1) Touch the flashing **SMS** Button as shown in Figure 8-80. The **SMS Text Inbox** Tab is automatically selected and the newly received text message is shown at the top of the list, as in Figure 8-81.



Figure 8-80 New SMS Text Message Annunciation

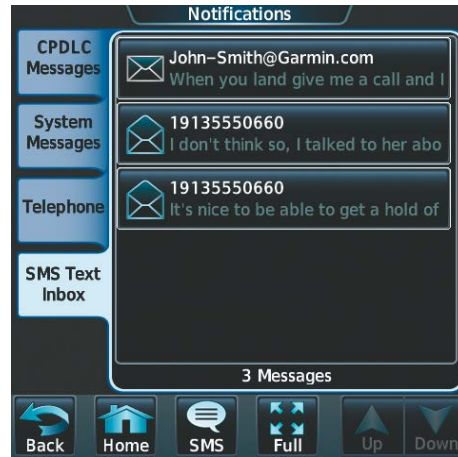


Figure 8-81 New Text Message at Top of List

- 2) Touch the desired message to display its contents as seen in Figure 8-82.

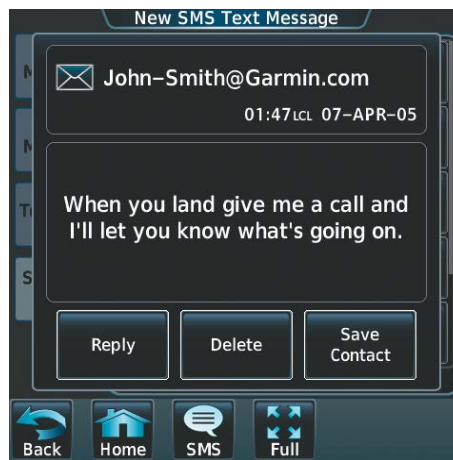


Figure 8-82 New Text Message Contents

- 3) If desired, touch **Reply** to create a reply to the message.
- 4) Touch **Delete** to delete the message from the list.
- 5) Touching **Save Contact** saves the contact information in the system contact list.

REPLY TO A TEXT MESSAGE

While viewing the text message content, touch the **REPLY** Button.

Or:

- 1) From the **Home** Screen, touch **Services** > **SMS Text** (Figure 8-83).

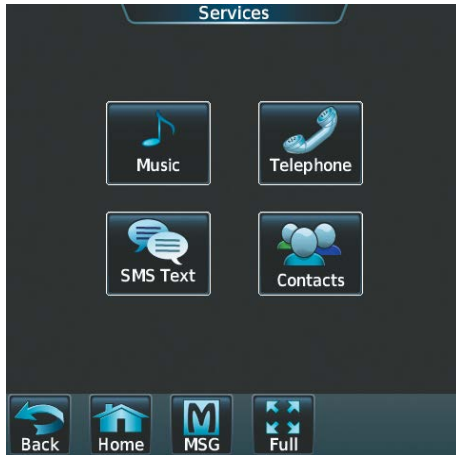


Figure 8-83 SMS Text Services Selection

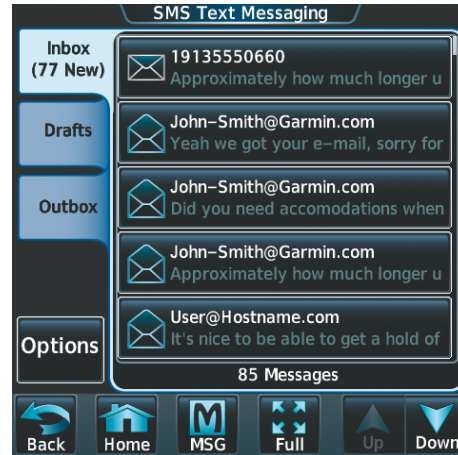


Figure 8-84 Touch Desired Message

- 2) Touch the desired text message in the Inbox list as in Figure 8-84. If necessary, scroll to the desired message. The text message is displayed as in Figure 8-85.
- 3) Touch the **REPLY** Button. The Opened SMS Text Message Screen is displayed as shown in Figure 8-86.

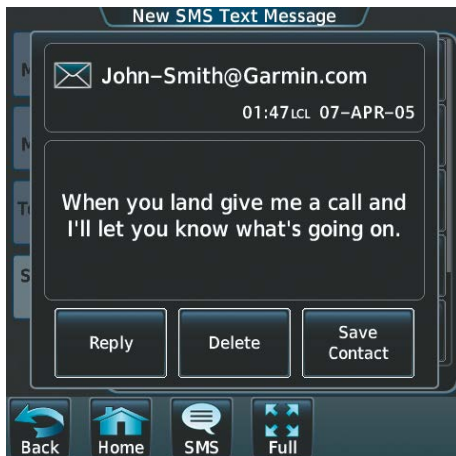


Figure 8-85 Message Content



Figure 8-86 New Reply Message Screen

- 4) Touch the 'Message' Window to display the alphanumeric buttons.



Figure 8-87 Message Content



Figure 8-88 Reply Message

- 5) Enter the reply text as seen in Figure 8-87.
- 6) Touch the **Enter** Button. The reply message is displayed as in Figure 8-88.
- 7) Touch the **Send** Button. The SMS Message Replied To Screen is displayed as seen in Figure 8-89.



Figure 8-89 Reply Message Sent

- 8) If desired, touch the **Reply Again** Button to resend the reply.
- 9) Touch **Delete** to delete the message from the list.
- 10) Touching **Save Contact** saves the contact information in the system contact list.

SENDING A TEXT MESSAGE

- 1) From the **Home Screen**, touch **Services > SMS Text**.

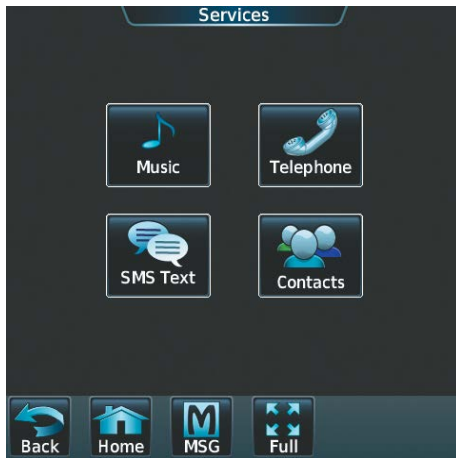


Figure 8-90 SMS Text Services Selection



Figure 8-91 Select Options

- 2) Touch the **Options** Button as seen in Figure 8-91. The available options are displayed as in Figure 8-92.
- 3) Touch the **Draft New Message** Button. The SMS Text Message Draft Screen is displayed as shown in Figure 8-93. The Draft New Message option is also available from within the **Drafts** and **Outbox** Tabs.

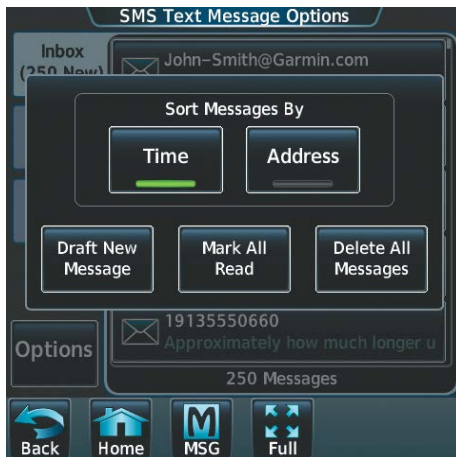


Figure 8-92 Select Draft New Message

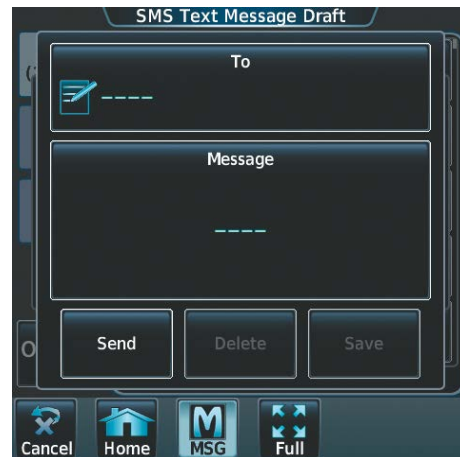


Figure 8-93 Touch 'To' Window

- 4) Touch the 'To' Window. A selection screen is displayed like in Figure 8-94. If the text message is to be sent to SMS compatible telephone, touch the **Phone** Button. If the message is to be sent to an email address, touch **Email**.



Figure 8-94 Select Message Destination



Figure 8-95 Enter Number or Address

- 5) Enter the telephone number or email address as seen in Figure 8-95. The number or address may be obtained from the Contacts by touching the **Find** Button.
- 6) Touch the **Enter** Button. The number or address is now displayed as in Figure 8-96.
- 7) Touch the 'Message' Window. The alphanumeric buttons are displayed as in Figure 8-97.

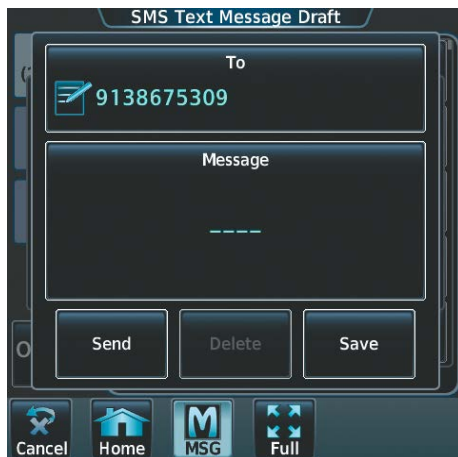


Figure 8-96 Touch Message Window



Figure 8-97 Reply Message

- 8) Enter the message text.

- 9) Touch the **Enter** Button. The message text is displayed in the 'Message' Window as shown in Figure 8-98.

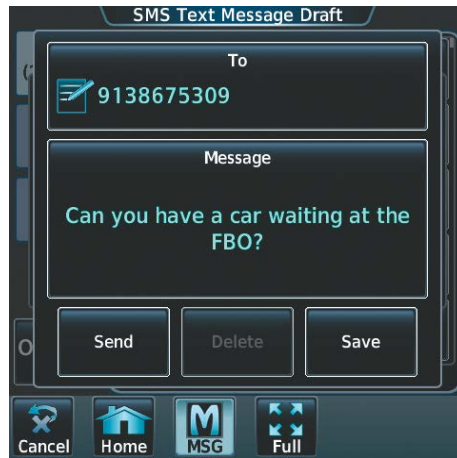


Figure 8-98 Message Ready to Send

- 10) Touch the **Send** Button.

TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent' and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts.

View Inbox messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Inbox** Tab. A list of received messages is displayed as in Figure 8-99. The **Inbox** Tab is selected by default when accessing the SMS Text Messaging Screen.



Figure 8-99 SMS Text Inbox

View Draft messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Draft** Tab. A list of draft messages is displayed as in Figure 8-100, provided messages have been previously saved.
- 3) Touch a message to access the **Send** or **Delete** Buttons.



Figure 8-100 SMS Text Drafts

View Outbox messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Outbox** Tab. A list of sent or unsent messages is displayed as in Figure 8-101.
- 3) Touch a message to access the **Send Again**, **Delete**, and **Save Contact** Buttons.

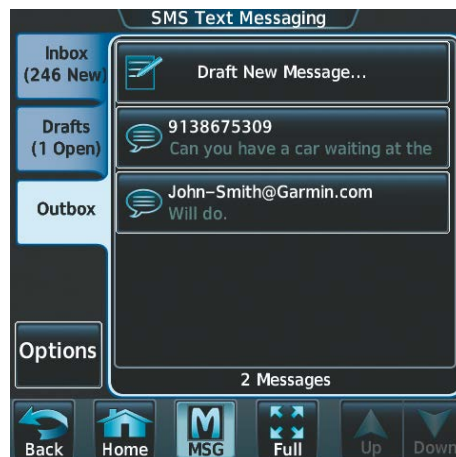


Figure 8-101 SMS Text Outbox

MANAGING TEXT MESSAGES

The following table illustrates the various message status icons.








Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	A reply has been sent for this text message
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message

Table 8-5 Text Message Symbols

The viewed messages in the Inbox, Outbox, or Drafts may be listed according to the date/time the message was sent or received or by message address.

Viewing messages sorted by message date/time:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The 'Sort Messages By' selections are displayed as in Figure 8-102.

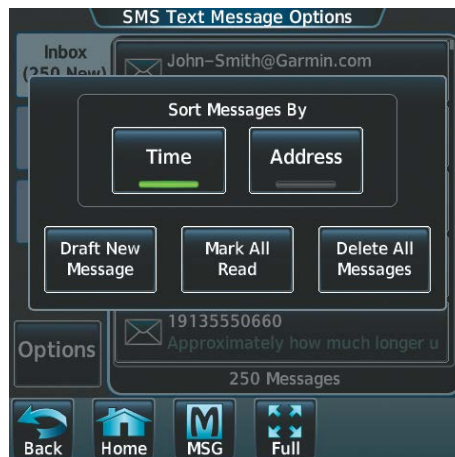


Figure 8-102 Message Sort Options

- 3) Touch the **Time** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Viewing messages sorted by address:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The 'Sort Messages By' selections are displayed as in Figure 8-102.
- 3) Touch the **Address** Button. A green annunciator indicates an active selection.
- 4) Touch the **Back** Button to return to the previously selected message box.

Marking all messages as read:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The selection buttons are displayed as in Figure 8-102.
- 3) Touch the **Mark All Read** Button.
- 4) Touch the **Back** Button to return to the Inbox. All messages in the Inbox now indicate they have been opened.

Delete all messages:

- 1) From the **Home** Screen, touch **Services > SMS Text**.
- 2) Touch the **Options** Tab. The selection buttons are displayed as in Figure 8-102.
- 3) Touch the **Delete All Messages** Button. A confirmation screen is displayed as in Figure 8-103.

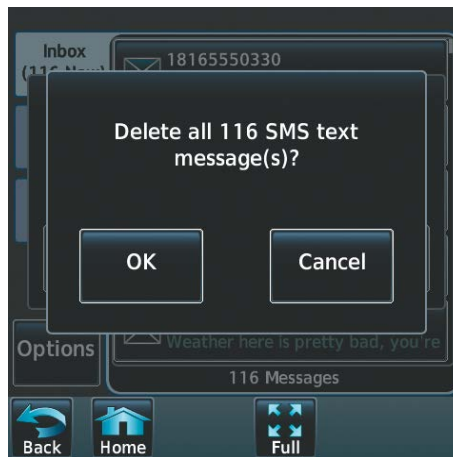


Figure 8-103 Confirm Deletion of Messages

- 4) Touch the **OK** Button.

WIFI CONNECTIONS (OPTIONAL)

Wi-Fi connections are used for transferring maintenance data to the aircraft manufacturer. The system can connect to a IEEE 802.11g compatible network provided the aircraft is on the ground and located within range of a network. The system is capable of WEP64, WEP128, WPA-PSK, and WPA2-PSK encryption formats. WPA-Enterprise and WPA2-Enterprise are not supported. Connections that require web proxies, captive portals, or other elements that require user credentials, including a username and password or a redemption or access code; or require action such as accepting a user agreement, are not supported.

Connecting to a Wi-Fi network:

- 1) From the **Home** Screen, touch **Utilities > Setup > Wi-Fi Setup**.
- 2) A list of available Wi-Fi networks is displayed as in Figure 8-104. If necessary, scroll the displayed list of networks to find the desired network. If a specific network is expected to be present in the list, but is not displayed, try rescanning networks by performing the following steps:
 - a) Touch the **Wi-Fi Options** Button.
 - b) Touch **Rescan** as seen in Figure 8-105.



Figure 8-104 Wi-Fi Networks Available for Connection



Figure 8-105 Rescan Networks

- 3) Touch the network to be connected. In this example, GarminGuests is selected. A confirmation screen is displayed as in Figure 8-106.



Figure 8-106 Confirm Network Connection



Figure 8-107 Confirm Favorite Selection

- 4) Touch **OK**.
- 5) The system now asks if it is desired to make the connected network a Favorite network, as shown in Figure 8-107.
- 6) Touch **OK** to place the network in the Favorites list, or touch **Cancel** to connect to the selected network without make it a Favorite network. Networks shown in the Available networks list which have been designated as a Favorite network are indicated by a star, as shown in Figure 8-108. Connected networks are indicated by a green antenna symbol as seen in Figure 8-109.



Figure 8-108 Favorite Network Indication



Figure 8-109 Connected Network Indication

Disconnecting a Wi-Fi network:

- 1) From the **Home** Screen, touch **Utilities** > **Setup** > **Wi-Fi Setup**.
- 2) Touch the **Wi-Fi Options** Button.
- 3) Touch **Disconnect**.

Making changes a Favorite network:

- 1) From the **Home** Screen, touch **Utilities** > **Setup** > **Wi-Fi Setup**.
- 2) Touch the **Favorites** Tab to display the Favorite networks list, as in Figure 8-110.
- 3) Touch the network to which changes will be made. The Network Options are displayed as shown in Figure 8-111.



Figure 8-110 Favorite Networks List



Figure 8-111 Network Options

- 4) Touch **Auto Connect**, as in Figure 8-111 to enable (green annunciator) an automatic connection to this network whenever the aircraft is on the ground and in range of the network.
- 5) Touch **Edit** to display the edit screen as in Figure 8-112.



Figure 8-112 Favorite Network Indication

- 6) Touch the desired parameter for editing and make selections accordingly.
- 7) When finished making desired changes, touch **Save**.

8.6 SIRIUSXM SATELLITE RADIO (OPTIONAL)



NOTE: Refer to the Hazard Avoidance Section for information and activation of SiriusXM Weather products.

The optional SiriusXM Satellite Radio entertainment feature of the GDL 69A Data Link Receiver provides audio entertainment for passengers and crew. The GDL 69A can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental United States.

SiriusXM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. SiriusXM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SIRIUSXM SATELLITE SERVICES

The SiriusXM Weather and/or SiriusXM Radio services are activated by first establishing an account with SiriusXM Satellite Radio. The Audio Radio ID and/or Data Radio ID must be provided to SiriusXM Satellite Radio to activate the weather and/or entertainment subscription.

SiriusXM Satellite Radio uses the coded radio ID to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming and display weather data.

These radio IDs is located:

- On the label on the back of the Data Link Receiver
- On the SiriusXM Info Screen on the Touchscreen Controller (Figure 8-113)

Contact the installer if the radio ID cannot be located.

Establishing a SiriusXM Satellite Radio account:

- 1) From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info**.
- 2) Note the Audio Radio ID and/or Data Radio ID as seen in Figure 8-113.
- 3) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.



Figure 8-113 SiriusXM Information Display



NOTE: The **LOCK** Button on the SiriusXM Info Screen is used to save GDL 69A activation data when the SiriusXM services are initially set up. It is not used during normal SiriusXM Radio operation, but there should be no adverse effects if inadvertently selected during flight.

Activating SiriusXM Satellite services on the system:

- 1) From the **Home** Screen, touch **Utilities > Setup > SiriusXM Info**.
- 2) Verify the Data Radio and/or Audio Radio show a signal strength, indicating the system is communicating with the satellite.
- 3) Touch the **Start** Button in the Activation field (Figure 8-114).



Figure 8-114 Activating Radios

- 4) Touch the **LOCK** Button in the Activation field as seen in Figure 8-115. The system is now activated and ready for use.



Figure 8-115 Locking Activation Settings

USING SIRIUSXM RADIO

The Music Screen provides information and control of the audio entertainment features of the SiriusXM Satellite Radio.



Figure 8-116 SiriusXM Satellite Radio Controls

SELECTING CHANNELS

The Channel field on the Music Screen shows the available channels for the selected audio entertainment category. The Now Playing field shows information for the currently active channel.

Selecting a channel from the channel list:

- 1) From the **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-116.
- 2) Touch the desired channel in the channel list. The selected channel is now shown in the Now Playing field.

Selecting a channel directly:

- 1) From the **Home** Screen, touch **Services > Music > Channel**.
- 2) The numeric keypad is displayed. Enter the desired channel number.
- 3) Press the **Enter** Button. The selected channel is now shown in the Now Playing field.

ENTERTAINMENT CATEGORIES

The Category field on the Music Screen shows the currently selected entertainment category. Categories of audio entertainment, such as jazz, rock, talk/news, sports, etc., can be selected to list the available channels for a type of music or other contents.

Selecting a category:

- 1) From the **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-117.



Figure 8-117 Channel Categories

- 3) Scroll to view the available categories.
- 4) Touch the desired category to select. The selected category is displayed on the **Category** Button and the channel list displays channels available for the selected category.

FAVORITES

Channels can be saved to a list of favorites and recalled for listening later.

Save a channel to favorites list:

- 1) From the **Home** Screen, touch **Services > Music** to access the Music Screen as in Figure 8-116.
- 2) Select a desired channel as the 'Now Playing' channel.
- 3) Touch the **Favorite** Annunciator Button. The current channel is placed in the favorites list. Note, a green annunciator indicates a favorite channel is 'Now Playing'.

Select a favorite channel for listening:

- 1) From the **Home** Screen, touch **Services > Music > Category**.
- 2) The list of categories is displayed as shown in Figure 8-117.
- 3) If necessary, scroll to view the **Favorites** Button.
- 4) Touch the **Favorites** Button to view the favorite channel list.
- 5) Touch the desired channel in the list. The channel is now displayed in the Now Playing field.

ADJUSTING VOLUME

Entertainment audio volume is shown in the **Volume** field (Figure 8-118) as a percentage of full volume.

Adjusting the volume:

- 1) From the **Home** Screen, touch **Services > Music > Volume**.
- 2) The volume adjustment slider is displayed as shown in Figure 8-118.
- 3) Touch and drag the slider to the right or left to adjust the volume. Drag to the right increases volume. Drag to the left to decrease the volume.



Figure 8-118 Adjusting Volume

Muting or unmuting the volume:

- 1) From the **Home** Screen, touch **Services > Music > Volume**.
- 2) Touch the **Music** Annunciator Button to mute or unmute the volume. Muted volume is indicated by a gray annunciator. Unmuted volume is indicated by a green annunciator.
- 3) Touch the **Back** Button to return to the Music Screen. When the volume is muted, 'Muted' is displayed in the Volume field.

8.7 SCHEDULED MESSAGES

The Scheduled Messages feature can be used to enter and display reminder messages (e.g., Change oil, Switch fuel tanks, or Altimeter-Transponder Check) on the Messages Screen of the Touchscreen Controller. Messages can be set to display based on a specific date and time (Event), once the message timer reaches zero (One Time), or recurrently whenever the message timer reaches zero (Periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, all messages are retained until deleted, and message timer countdown is resumed.

Entering a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the **Add Message** Button as shown in Figure 8-119.
- 3) Touch the **Message** Button as shown in Figure 8-120.

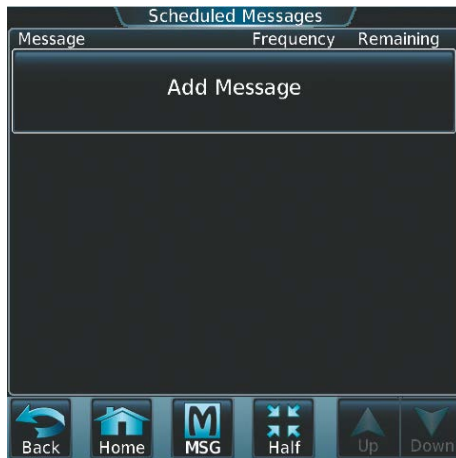


Figure 8-119 Touch Add Message

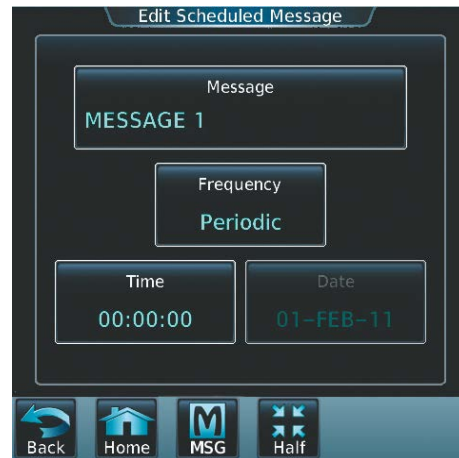


Figure 8-120 Touch Message Button

- 4) The keypad is displayed as in Figure 8-121. Enter the message name using the keypad. The large and small Right Knob can also be used to enter the characters.
- 5) Touch the **Enter** Button. The message name is displayed on the **Message** Button.
- 6) Touch the **Frequency** Button as shown in Figure 8-122.

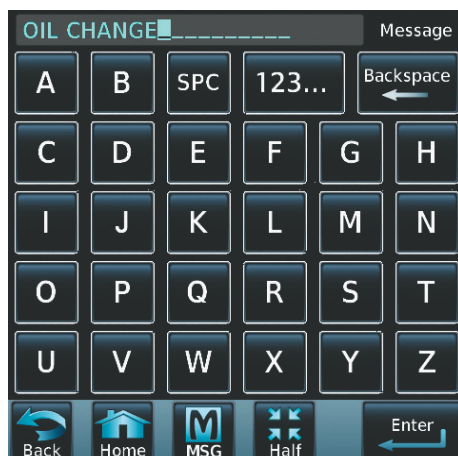


Figure 8-121 Enter Message Name



Figure 8-122 Touch Frequency Button

- 7) Touch **Event**, **One Time**, or **Periodic**. The selection is displayed on the **Frequency** Button as in Figure 8-124.



Figure 8-123 Touch One Time Button

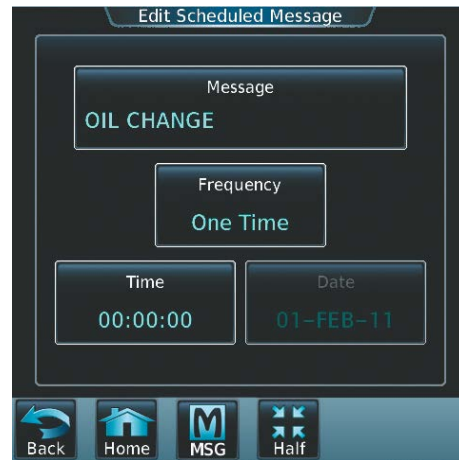


Figure 8-124 Touch Time Button

- 8) Touch the **Time** Button as seen in Figure 8-124.
- 9) The numeric keypad is displayed as in Figure 8-125. Enter the time value using the keypad. If **One Time** or **Periodic** were selected in step 7, the time is entered in a HH:MM:SS format. If **Event** was selected in step 7, time is entered in a clock format (HH:MM \llcorner) as local time.
- 10) Touch the **Enter** Button. The time is displayed on the **Time** Button.



Figure 8-125 Enter Time



Figure 8-126 Message

- 11) If **Event** was selected in step 7, touch the **Date** Button. The **Date** Button is subdued and disabled when **One Time** or **Periodic** were selected in step 7.

12) Touch the desired year, as in Figure 8-127, then the month followed by the day.

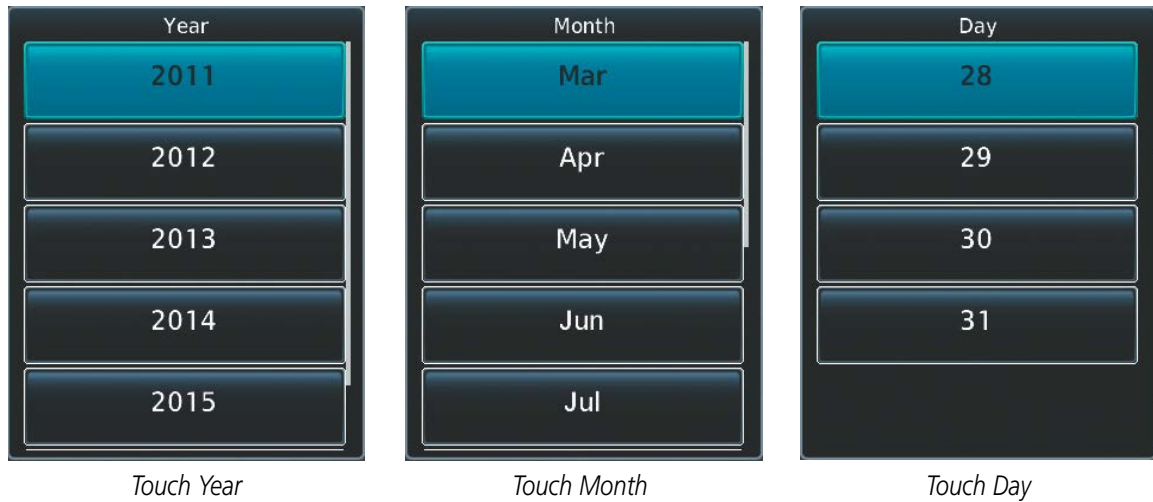


Figure 8-127 Event Date Entry

Edit a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the name of the message to be edited. The Message Options Window is displayed as in Figure 8-129.
- 3) Touch the **Edit Message** Button.
- 4) Select the desired message parameter to be edited and perform the needed steps as discussed previously for entering a scheduled message.



Figure 8-128 Select Message for Editing



Figure 8-129 Select Edit Option

Deleting a scheduled message:

- 1) From the **Home** Screen, touch **Utilities > Scheduled Messages**.
- 2) Touch the name of the message to be deleted. The Message Options Window is displayed as in Figure 8-129.
- 3) Touch the **Delete Message** Button. Touch the **Delete All Messages** Button to delete all saved messages.

When a scheduled message is activated, the **MSG** Button flashes inverse video (Figure 8-130). Touching the **MSG** Button on the Touchscreen Controller opens the Messages Screen (Figure 8-131) and acknowledges the message, indicated by the **MSG** Button ceasing to flash. Touching the **MSG** Button again removes the Messages Screen from view, and the scheduled message is deleted from the message queue.

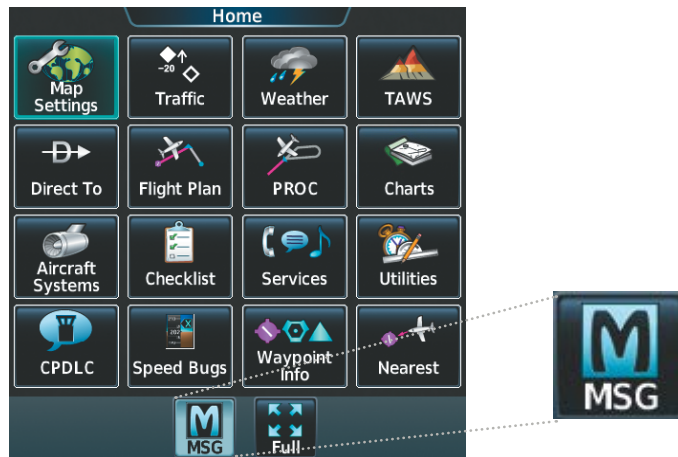


Figure 8-130 Message Annunciation on Touchscreen Controller

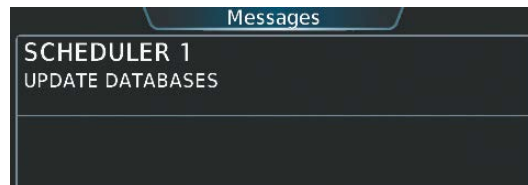


Figure 8-131 Scheduled Message Example

8.8 ELECTRONIC DOCUMENTS

The Electronic Document function allows viewing of electronic documents on MFD and/or PFD displays. The system allows the display of electronic documents from two sources. These sources are Installed and User documents.

INSTALLED DOCUMENTS

'Installed' Documents are typically provided by the aircraft manufacturer. These documents are stored on the Supplemental Data Cards, along with the databases, located in the bottom SD Card slot of each PFD and the MFD. Each Supplemental Data Card contains identical document files.

USER DOCUMENTS

'User' Documents are those loaded by the crew. User Documents must be in .pdf format and reside on an SD Card no larger than 16GB. The Maximum document file size is 1.5GB. The maximum number of pages per document is limited to 9,999. Pages with large and/or numerous images may exceed RAM memory limits, therefore, may not be displayed correctly or not displayed at all.

An SD card must be inserted into the top card slot of each display on which it is desired to view the user documents. Each display can only access electronic documents on the SD Cards that are inserted in that display.

User Documents can be unique to the display on which they are viewed.

SUPPORTED PDF FEATURES

User Documents must be in .pdf format. The following .pdf features are not supported. If a file contains any of these features, the system will ignore the feature and display the document.

- Embedded files (attachments)
- Alternate images (using a different image for display and printing)
- Page labels (alternate page numbers; e.g. for i, ii, iii, iv for table of contents)
- Additional annotations, including file attachment annotation, sound annotation, movie annotation, widget annotation, and trap network annotation.
- Digital signatures
- Javascript
- Logical structure (structuring documents into chapters, paragraphs, headings, footnotes)
- Web capture information (annotations for search engines)
- Prepress support (annotations for newspapers, etc.)

SD CARD FILE STRUCTURE FOR USER DOCUMENTS

User document files must reside on the SD card in a directory named "Documents". The list of available User Documents is limited to 100 documents and are shown in alphabetical order based on filename.

VIEWING ELECTRONIC DOCUMENTS

To select a document:

- 1) From the **Home** Screen, touch **Utilities > Documents**. The Document Viewer is now displayed as in Figure 8-132.



Figure 8-132 Electronic Document Viewer

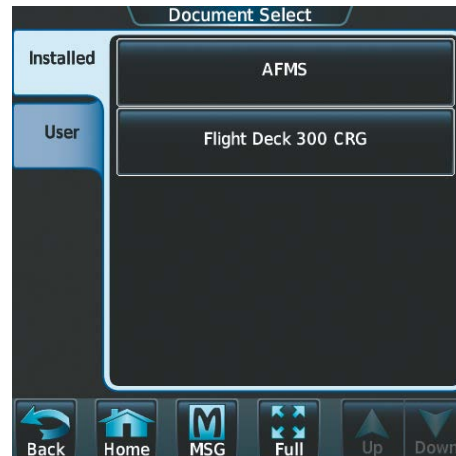


Figure 8-133 Document Selection

- 2) Touch the **Selected Document** Button.
- 3) Touch the **Installed** or **User** Tab to select the desired document source as seen in Figure 8-133. In this example, Installed documents is selected.
- 4) Touch the desired document button. The selected document name is displayed in the **Selected Document** Button, as shown in Figure 8-134. The document is displayed in the selected pane, such as the MFD as shown in Figure 8-135.

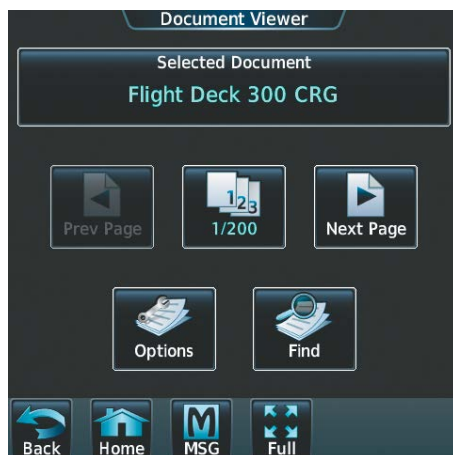


Figure 8-134 Selected Document Indicated

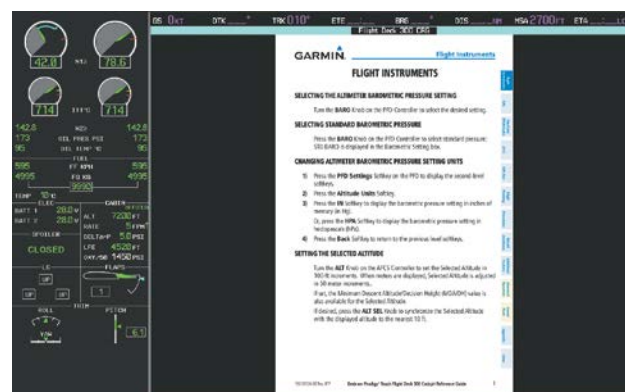


Figure 8-135 Document Viewed on MFD

To change Document Viewer options:

- 1) From the **Home** Screen, touch **Utilities > Documents > Options**. Document Viewer Options is displayed as in Figure 8-136.
- 2) Touch **Document Info** to view information pertaining to the document, such as files size and creation date as seen in Figure 8-137.



Figure 8-136 Document Viewer Options



Figure 8-137 Document Information

- 3) Touch **Fit Page** to view the complete page in the selected pane (Figure 8-136).
- 4) Touch **Fit Width** to enlarge the displayed page to fill the width of the selected pane.
- 5) Touching the Rotate Page Buttons will rotate the displayed page 90 degrees to the right or left (depending on button touched) within the selected pane. Each subsequent touch will rotate the page another 90 degrees.
- 6) Touch the Brightness Slider to adjust the brightness of the displayed page.

To browse the document:

- 1) After selecting the desired document, touch the **Next Page** and **Prev Page** buttons to increment and decrement one page with each touch.
- 2) The Page Select Button (Figure 8-138) shows the number of pages contained in the document and the page currently being displayed. Touch the Page Select Button (Figure 8-138) to jump to a specific page number. The Enter Page Number screen is displayed, as in Figure 8-139.

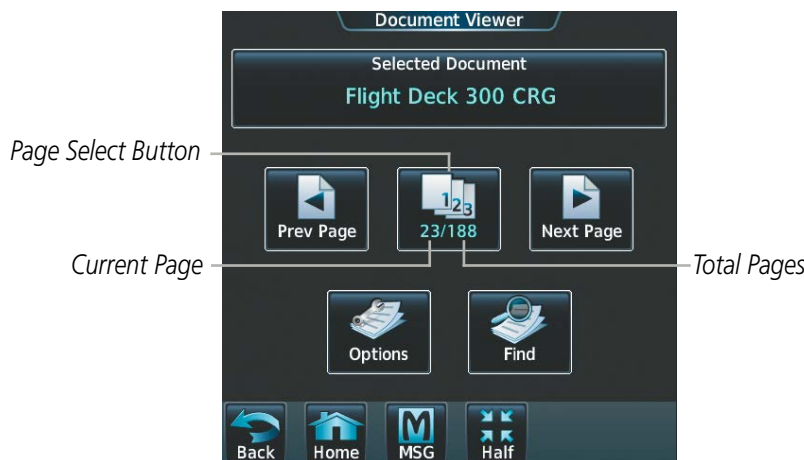


Figure 8-138 Document Browsing Options



Figure 8-139 Enter Document Page Number

- 3) Touch the **Find** Button to display the Document Viewer Find screen as shown in Figure 8-140.



Figure 8-140 Table of Contents



Figure 8-141 Flight Instruments Section Displayed

- 4) If necessary, touch the **Table of Contents** Tab to display the document Table of Contents (Figure 8-140).
- 5) Touch **[+]** to expand a topic. Touch **[-]** to return to the collapsed view of the topic.
- 6) Touch the desired topic to jump to that portion of the document. In this example, Flight Instruments is selected and the Flight Instruments section is displayed (Figure 8-141).

Creating bookmarks in the document:

- 1) While viewing the page to bookmark, touch the **Find** Button on the appropriate Touchscreen Controller.
- 2) Touch the **Bookmark** Tab to display the Bookmark Window as in Figure 8-142.

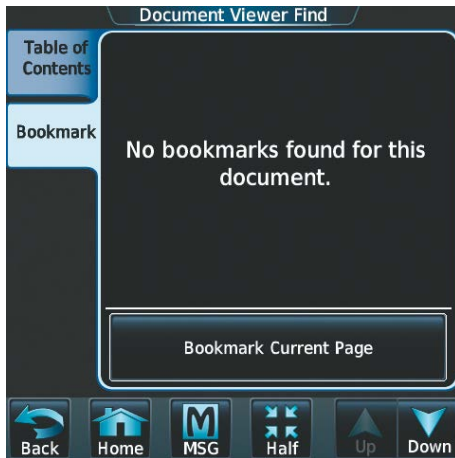


Figure 8-142 Select Bookmark Tab



Figure 8-143 Enter Bookmark Name

- 3) Touch the **Bookmark Current Page** Button. The Enter Bookmark Name Screen is displayed as shown in Figure 8-143.

- 4) Touch **Enter**. A confirmation screen is displayed as seen in Figure 8-144.



Figure 8-144 Bookmark Created

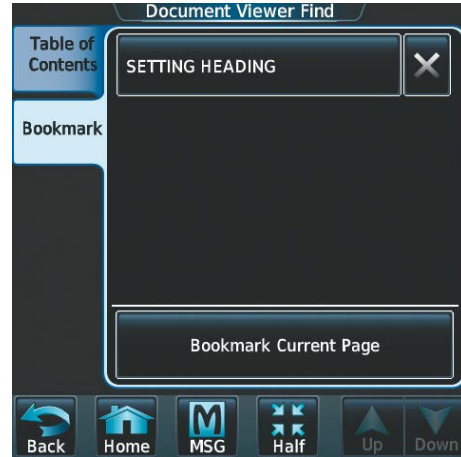


Figure 8-145 Bookmark Created

- 5) Touch **OK**. The newly created bookmark is displayed as in Figure 8-145.

Deleting document bookmarks:

- 1) With the desired document displayed, touch the **Find** Button (Figure 8-138) to display the Document Viewer Find Screen.
- 2) Touch the **Bookmark** Tab to display the Bookmark Window.
- 3) Touch the **X** Button next to the bookmark to be deleted (Figure 8-145).

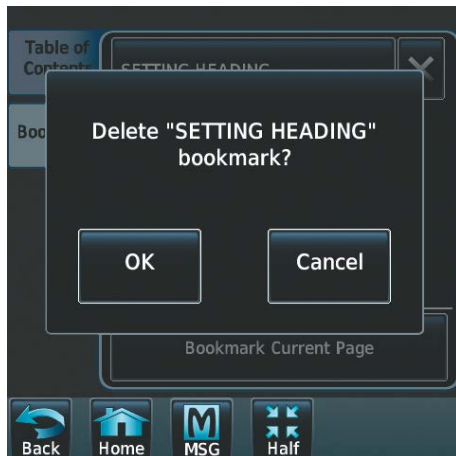


Figure 8-146 Delete Bookmark

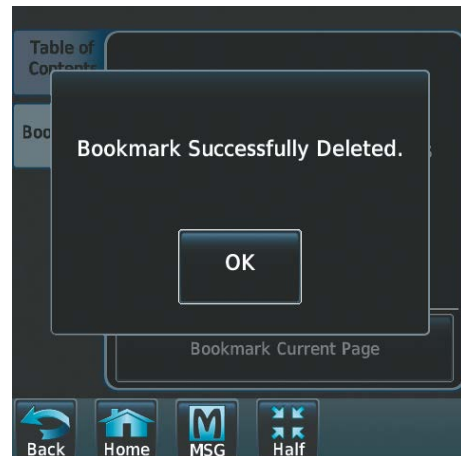


Figure 8-147 Bookmark Deleted

- 4) Touch **OK** on the confirmation screen as in Figure 8-146.
- 5) Again, touch **OK**.

8.9 FLIGHT DATA LOGGING



NOTE: Some aircraft installations may not provide all aircraft/engine data capable of being logged by the system.

The Flight Data Logging feature will automatically store critical flight and engine data on an SD data card (up to 16GB) inserted into the top card slot of the MFD. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

Data is written to the SD card once each second while the MFD is powered on. All flight data logged on a specific date is stored in a file named in a format which includes the date, time, and nearest airport identifier. The file is created automatically each time the system is powered on, provided an SD card has been inserted.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the system is capable of logging for the Phenom 300 aircraft.

- Date
- Time
- GPS altitude (MSL)
- GPS altitude (WGS84 datum)
- Baro-Corrected altitude (feet)
- Baro Correction (in/Hg)
- Indicated airspeed (kts)
- Vertical speed (fpm)
- GPS vertical speed (fpm)
- OAT (degrees C)
- True airspeed (knots)
- Pitch Attitude Angle (degrees)
- Roll Attitude Angle (degrees)
- Lateral and Vertical G Force (g)
- Ground Speed (kts)
- Ground Track (degrees magnetic)
- Latitude (degrees; geodetic; +North)
- Longitude (degrees; geodetic; +East)
- Magnetic Heading (degrees)
- HSI source
- Selected course
- Com1/Com2 frequency
- Nav1/Nav2 frequency
- CDI deflection
- VDI/GP/GS deflection
- Wind Direction (degrees)
- Wind Speed (knots)
- Active Waypoint Identifier
- Distance to next waypoint (nm)
- Bearing to next waypoint (degrees)
- Magnetic variation (degrees)
- Autopilot On/Off
- AFCS roll/pitch modes
- AFCS roll/pitch commands
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (gal.)
- Fuel Flow (gph)
- Fuel Pressure (psi)
- Voltage 1 and/or 2
- Amps 1 and/or 2
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- TIT (deg. F)
- Manifold Pressure (in. Hg)

The file containing the recorded data will appear in the format shown in Figure 8-148. This file can be imported into most computer spreadsheet applications.

*Local Date
YYMMDD*

*Local 24hr Time
HHMMSS*

*Nearest Airport
(A blank will be
inserted if no
airport is found)*

log_130210_104506_KIXD.csv

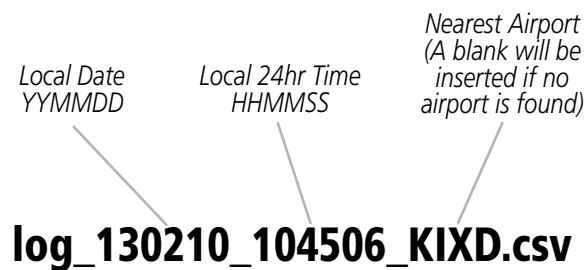


Figure 8-148 Log File Format

8.10 CHECKLISTS



NOTE: The checklist shown in the following illustrations are examples only.

The Display Panes are able to display optional electronic checklists (supplied by the manufacturer) which allow the pilot to quickly find the proper procedure on the ground and during each phase of flight. The system accesses the checklists from the Supplemental Data Cards located in the bottom card slot of each GDU.

The following colors are used for checklist items:

- Light Blue - Items not selected or checked
- White - Item is selected
- Green - Item has been checked
- Gray - General notes
- Yellow - Caution notes
- Red - Warning notes

Accessing and navigating checklists:

1) From the **Home** Screen, touch **Checklist**. The checklist structure is displayed as shown in Figure 8-150.



Figure 8-149 Home Screen



Figure 8-150 List of Checklists

- 2) Touch the desired checklist group tab on the left side of the screen. In Figure 8-150, **Normal** is selected in this example.
- 3) Touch the desired checklist from those listed in the center of the screen. If necessary, scroll through the list to see all the available checklists for the selected group. In Figure 8-150, **BEFORE TAKEOFF** is selected and the checklist is displayed in the previously selected GDU Display Pane as in Figure 8-151. The first checklist item is selected as indicated by the white text surrounded by a white box.



Figure 8-151 First Checklist Item Selected

- 4) Press the **FMS** Knob to check the selected checklist item. The line item turns green and a checkmark is placed in the associated box as shown in Figure 8-152. The next line item is automatically selected for checking.



Figure 8-152 First Checklist Item Completed and Checked

Either **FMS** Knob can be used to scroll through the checklist and select the desired checklist item.

Selecting a checked item and pressing the **FMS** Knob will return the item to the unchecked state.

- 5) When all checklist items have been checked, ***Checklist Finished*** is displayed in green text at the bottom left of the checklist window and **'GO TO NEXT CHECKLIST?'** is highlighted as in Figure 8-153. If **'GO TO NEXT CHECKLIST?'** is selected prior to checking all the checklist items, ***CHECKLIST NOT FINISHED*** will be displayed in yellow text.



Figure 8-153 Checklist Complete

- 6) Press the **FMS** Knob to display the next checklist in the group or choose another by touching the desired checklist on the Touchscreen Controller.

Resetting A Specific Checklist:

- 1) From the **Home** Screen, touch **Checklist**.
- 2) Touch the desired checklist to reset. **DC BUS 1 OFF** is selected in Figure 8-154.
- 3) Touch the **Checklist Options** Button.
- 4) Touch **Reset Current Checklist** as seen in Figure 8-155.



Figure 8-154 Checklist Screen



Figure 8-155 Checklist Options

Resetting All Checklists:

- 1) From the **Home** Screen, touch **Checklist**.
- 2) Touch the **Checklist Options** Button shown in Figure 8-154.
- 3) Touch **Reset All Checklists** as seen in Figure 8-155.

8.11 ABNORMAL OPERATION

GDL 69A DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to SiriusXM
- Ensure the SiriusXM subscription has been activated
- Check the circuit breakers to ensure that power is applied to the Data Link Receiver

For troubleshooting purposes, check the LRU Information for Data Link Receiver (GDL 69A) status, serial number, and software version number. If a failure has been detected in the GDL 69A the status is marked with a red X.

To check LRU status:

- 1) From the **Home** Screen, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **LRU Info** Tab.
- 3) Scroll to display the **GDL69A** field as shown in Figure 8-156.

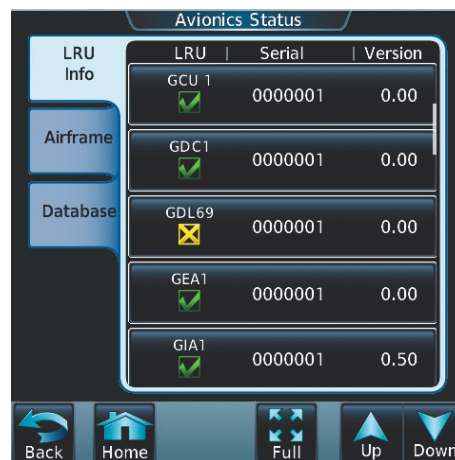


Figure 8-156 Detected Failure in Data Link Receiver

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	SiriusXM Info Screen (Touchscreen Controller)	Data Link Receiver antenna error; service required
UPDATING	SiriusXM Info (Touchscreen Controller)	Data Link Receiver updating encryption code
NO SIGNAL	SiriusXM Info (Touchscreen Controller) Weather Datalink Display (MFD)	Loss of signal; signal strength too low for receiver
LOADING	Music Screen (Touchscreen Controller)	Acquiring channel audio or information
OFF AIR	Music Screen (Touchscreen Controller)	Channel not in service
---	Music Screen (Touchscreen Controller)	Missing channel information
WEATHER DATA LINK FAILURE	Weather Datalink Display (MFD)	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	SiriusXM Info Screen (Touchscreen Controller) Weather Datalink Display (MFD)	SiriusXM subscription is not activated

Table 8-6 GDL 69A Data Link Receiver Messages

ANNUNCIATIONS AND ALERTS

CREW ALERTING SYSTEM (CAS)

NOTE: Aural alerts associated with abnormal conditions and advisories are managed through the audio panels. Refer to the Audio Panel and CNS Section for more information.

When Crew Alerting System (CAS) messages are generated, the CAS Window opens to the right of the Altimeter (on the PFDs). Up to 14 messages can be displayed; when more than 14 messages accumulate, the **CAS** Softkey becomes available. Pressing the **CAS** Softkey displays softkeys for scrolling up and down through the messages in the CAS Window.

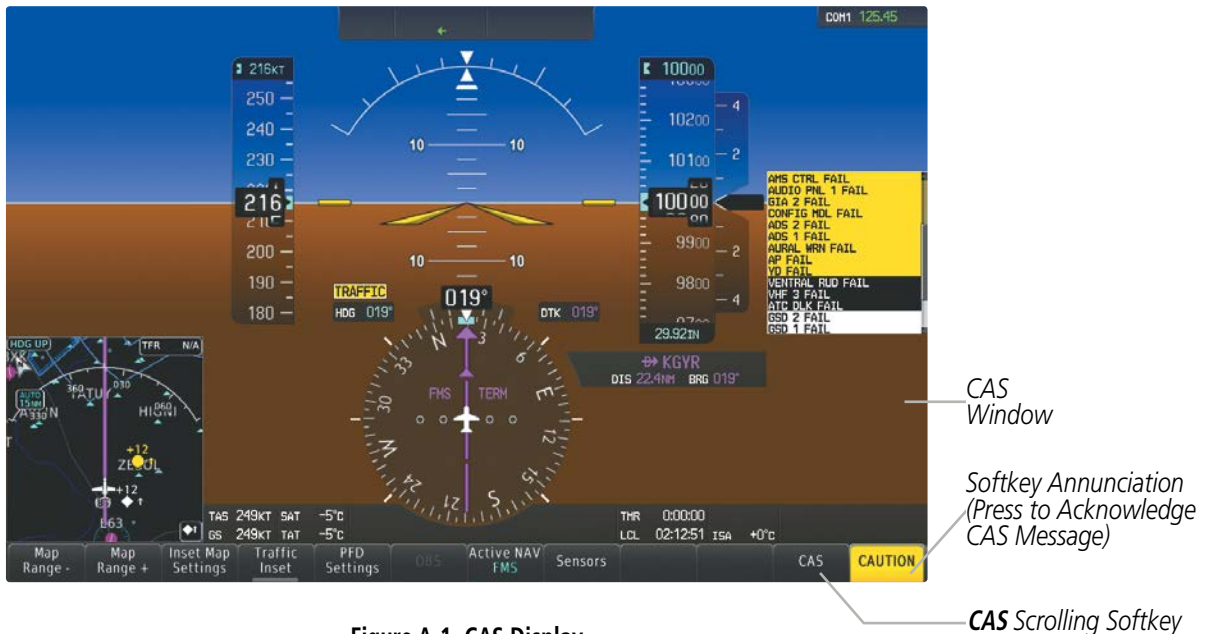


Figure A-1 CAS Display

CAS messages are grouped by criticality (warning, caution, advisory) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action, and the softkey label changes to display the appropriate annunciation when a CAS message is generated.

- **Warning** (red) – Immediate crew awareness and action required; accompanied by an aural tone (triple chime every 3 seconds) and flashing ‘WARNING’ softkey annunciation.
- **Caution** (yellow) – Immediate crew awareness and possible future corrective action required; accompanied by an aural tone (single chime every 5 seconds) and flashing ‘CAUTION’ softkey annunciation.
- **Advisory** (white) – Crew awareness required and subsequent action may be required; accompanied by a flashing ‘ADVISORY’ softkey.

The softkey annunciation flashes and the corresponding aural alert sounds until acknowledged by depressing the softkey.



Figure A-2 Softkey Annunciations (MSG Softkey Labels)

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated, and continue to flash until acknowledged. Advisory CAS messages, flash for 5 seconds or until acknowledged.

Some CAS messages are differentiated as root causes of other failures and should be considered first during the decision-making process when multiple CAS messages are displayed. These “golden” messages flash until acknowledged and remain in inverse video after being acknowledged manually.

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

CAS messages listed in tables 3-9 through 3-12 are shown in the acknowledged state (colored text on black backgrounds), with Caution and Advisory “golden” CAS messages shown in black text on colored backgrounds corresponding to their alert levels.

CAS MESSAGES



NOTE: The Airplane Flight Manual (AFM) supersedes information found in this document. Refer to the AFM for recommended pilot actions.

WARNING MESSAGES

See the Airplane Flight Manual (AFM) for recommended pilot actions. Accompanied by a triple chime tone which repeats until acknowledged.

Message	Description
BAG SMK	Smoke detected in baggage compartment
CAB ALTITUDE HI	Cabin altitude pressure altitude high
DOOR EMER OPEN	Emergency door open
DOOR PAX OPEN	Passenger door open
E1 FIRE	Fire in engine 1
E2 FIRE	Fire in engine 2
E1 OIL LO PRES	Low oil pressure in engine 1
E2 OIL LO PRES	Low oil pressure in engine 2
ELEC EMERGENCY	Generators offline
ELEC XFR FAIL	Generators offline and electrical emergency transfer has failed
LG LEVER DISAG	Landing gear position and control lever disagreement
NO TO CONFIG	No takeoff configuration

CAUTION MESSAGES

See the Airplane Flight Manual (AFM) for recommended pilot actions. Accompanied by a single chime tone which repeats until acknowledged.

Message	Description
ADS 1 FAIL	ADS 1 offline or failed
ADS 2 FAIL	ADS 2 offline or failed
ADS 1 HTR FAIL	Pitot heater 1 offline or heater element failed
ADS 2 HTR FAIL	Pitot heater 2 offline or heater element failed
AHRS 1 FAIL	AHRS 1 failure
AHRS 2 FAIL	AHRS 2 failure
A-I E1 FAIL	Anti-ice system failure in engine 1
A-I E2 FAIL	Anti-ice system failure in engine 2
A-I LO CAPACITY	Not enough thermal energy available for WHSAIS (Wing and Horizontal Stabilizer Anti-ice System) operation
A-I WINGSTB FAIL	Component failure (AIV, pressure transducers, AMS Controller, other)
A-I WINGSTB INHB	WHSAIS switched ON outside the icing envelope. Or, aircraft is in single bleed configuration and above the 15,000 ft. icing envelope when WHSAIS is switched on.
A-I WINGSTB LEAK	Bleed hot air leakage at WHSAIS pneumatic ducting
AMS CTRL FAIL	Pneumatic sources and icing protection are not available
ANTI-SKID FAIL	Anti-skid function lost; main brake still available
AP FAIL	Loss of AP function
AP PITCH MISTRIM	Airplane mistrimmed in pitch axis when AP is engaged
AP ROLL MISTRIM	Airplane mistrimmed in roll axis when AP is engaged
AUDIO PNL 1 FAIL	Audio panel 1 is offline
AUDIO PNL 2 FAIL	Audio panel 2 is offline
AURAL WRN FAIL	Aural warning system failure due to non-communicating LRUs
AUTO PTRIM FAIL	Auto pitch trim failure; other pitch trim functions still available
BAG SMK FAIL	Baggage compartment smoke detector has failed
BATT DISCHARGE	Battery discharging under normal operation
BATT 1 OFF BUS	Battery 1 offline
BATT 2 OFF BUS	Battery 2 offline
BATT EXCEEDANCE	Battery voltage has exceeded 29 VDC
BLEED 1 FAIL	Bleed 1 system not under control.
BLEED 2 FAIL	Bleed 2 system not under control.
BLEED 1 LEAK	Bleed 1 hot air leakage at some region of the ducting
BLEED 2 LEAK	Bleed 2 hot air leakage at some region of the ducting
BLEED 1 OVERPRES	Pressure in bleed ducting is higher than an acceptable value chosen to not compromise ECS and Anti-ice components integrity
BLEED 2 OVERPRES	Pressure in bleed ducting is higher than an acceptable value chosen to not compromise ECS and Anti-ice components integrity
BRK FAIL	Main brake system lost
CAB DELTA-P FAIL	Excessive cabin pressure differential
CLUTCH PIT FAIL	Slip clutch maintenance test failed
CLUTCH ROL FAIL	Slip clutch maintenance test failed
CLUTCH VNTRL FAIL	Ventral slip clutch maintenance test failed
CLUTCH YAW FAIL	Slip clutch maintenance test failed
CONFIG MDL FAIL	Master Configuration Module failed or non-communicative
DOORBAG AFT OPEN	Crew baggage door open
DOORBAG LH OPEN	Forward left-hand baggage door open
DOORBAG RH OPEN	Forward right-hand baggage door open
DUCT 1 OVERTEMP	Duct 1 temperature over specified safe value

Message	Description
DUCT 2 OVERTEMP	Duct 2 temperature over specified safe value
E1 CTRL FAULT	Engine 1 responds slowly or not at all to thrust commands
E2 CTRL FAULT	Engine 2 responds slowly or not at all to thrust commands
E1 FAIL	Uncommanded shutdown detected for engine 1
E2 FAIL	Uncommanded shutdown detected for engine 2
E1 FIRE DET FAIL	Fire detection system failure in engine 1
E2 FIRE DET FAIL	Fire detection system failure in engine 2
E1 FIREX FAIL	Fire extinguisher failure in engine 1
E2 FIREX FAIL	Fire extinguisher failure in engine 2
E1 FUEL IMP BYP	Fuel filter impending bypass condition for engine 1
E2 FUEL IMP BYP	Fuel filter impending bypass condition for engine 2
E1 TLA FAIL	Thrust Lever Angle failure for engine 1
E2 TLA FAIL	Thrust Lever Angle failure for engine 2
E1 TTO HTR FAIL	Heater failure in engine 1
E2 TTO HTR FAIL	Heater failure in engine 2
E1 TTO PROBE ICE FAIL	Engine 1 probe frozen
E2 TTO PROBE ICE FAIL	Engine 2 probe frozen
EBAY LEAK	Leak inside E-Bay
EBAY OVHT	Electrical bay over temperature
ECS 1 VALVE FAIL	Flow control valve monitor for ECS 1 detected improper valve operation
ECS 2 VALVE FAIL	Flow control valve monitor for ECS 2 detected improper valve operation
EMER BRK LO PRES	Few emergency brake functions available
EMER LT NOT ARM	Emergency lights switch not in ARMED position
ENG EXCEEDANCE	Limit exceeded in engine(s) during flight
ENG NO DISPATCH	FADEC detected no dispatch fault condition in engine(s)
ENG NO TO DATA	No takeoff data entered
FLAP FAIL	Loss of flaps deployment or retraction
FUEL 1 LO LEVEL	Low fuel level in tank 1
FUEL 2 LO LEVEL	Low fuel level in tank 2
FUEL 1 LO PRES	Fuel pressure low in engine 1 feed line
FUEL 2 LO PRES	Fuel pressure low in engine 2 feed line
FUEL 1 SOV FAIL	Fuel feed SOV 1 closed or unavailable
FUEL 2 SOV FAIL	Fuel feed SOV 2 closed or unavailable
FUEL IMBALANCE	Fuel is imbalanced between the tanks
FUEL PUMP 1 FAIL	Fuel pump 1 failure
FUEL PUMP 2 FAIL	Fuel pump 2 failure
FUEL XFEED FAIL	Disagreement between valve command and its feedback
GEN 1 OFF BUS	Generator 1 offline
GEN 2 OFF BUS	Generator 2 offline
GEN OVLD	Generator(s) overload
GEN START FAULT	Generator start fault
GIA 1 FAIL	Failure of GIA 1
GIA 2 FAIL	Failure of GIA 2
GIA 1 OVHT	GIA 1 over temperature
GIA 2 OVHT	GIA 2 over temperature
GND SPLR FAIL	Loss of ground spoilers
GTC 1 OVHT	GTC 1 over temperature
GTC 2 OVHT	GTC 2 over temperature
HYD HI TEMP	Hydraulic temperature high
HYD LO PRES	Hydraulic pressure low

Message	Description
HYD SOV 1 FAIL	EDP 1 Fire Shutoff valve was commanded to close, but failed to close
HYD SOV 2 FAIL	EDP 2 Fire Shutoff valve was commanded to close, but failed to close
ICE CONDITION*	Aircraft is flying in icing conditions
LG WOW SYS FAIL	Landing gear weight-on-wheels system failure
MFD CONFIG	MFD configuration error
MFD FAULT	Fault with the MFD
MFD OVHT	MFD over temperature
OXY LO PRES	Oxygen system pressure low
PARK BRK NOT REL	Parking brake not released
PAX OXY NO PRES	Cabin altitude high and passenger oxygen system pressure low
PFD 1 CONFIG	PFD 1 configuration error
PFD 2 CONFIG	PFD 2 configuration error
PFD 1 FAULT	Fault with PFD 1
PFD 2 FAULT	Fault with PFD 2
PFD 1 OVHT	PFD 1 over temperature
PFD 2 OVHT	PFD 2 over temperature
PRESN AUTO FAIL	Pressurization controller failure
PTRIM BKP FAIL	Loss of backup pitch trim actuator
PTRIM NML FAIL	Loss of normally-operating pitch trim actuator
PUSHER FAIL	Stall Warning & Protection System pusher has failed
PUSHER OFF	Stall Warning Pusher is off
RUD OVERBOOST	SLRB (Spring Loaded Rudder Booster) uncommanded actuation
STBY HTR FAIL	Failure of standby heater
STEEP FAIL*	Steep approach mode has failed
SWPS FAIL	Stall Warning & Protection System inoperative
SWPS FAULT	Stall Warning & Protection System activation angles anticipated to conservative settings
SWPS UNTESTED	Stall Warning & Protection System has not been tested
TCAS FAIL*	Traffic & Collision Avoidance System failure. TCASII installations only.
WSHLD 1 HTR FAIL	Windshield 1 heater failure
WSHLD 2 HTR FAIL	Windshield 2 heater failure
YD FAIL	Loss of yaw damper function
YD MISTRIM	Airplane mistrimmed in yaw axis when YD is engaged

* Optional

ADVISORY MESSAGES

See the Airplane Flight Manual (AFM) for recommended pilot actions.

Message	Description
A-I E1 FAULT	Engine 1 Anti-ice system valve failed when commanded to close
A-I E2 FAULT	Engine 2 Anti-ice system valve failed when commanded to close
A-I E1 ON	Anti-ice system on in engine 1
A-I E2 ON	Anti-ice system on in engine 2
A-I WINGSTB ARM	WINGSTAB toggle switch has been armed prior to takeoff
A-I WINGSTB ON	WHSAIS is operating
ADS 1 SLIP FAIL	ADS 1 side-slip compensation is off
ADS 2 SLIP FAIL	ADS 2 side-slip compensation is off
ADS HTR SW ON	ADS Probe switch is on
AHRS 1 FAULT	Fault with AHRS 1
AHRS 2 FAULT	Fault with AHRS 2
AMS CTRL FAULT	One pneumatic and Anti-ice controller channel is inoperative

Message	Description
ATC DLK FAIL	CPDLC system failure
AUDIO PNL 1 FAULT	Fault with audio panel 1
AUDIO PNL 2 FAULT	Fault with audio panel 2
AURAL WRN FAULT	Partial loss of aural warning function
AVNX FAN FAIL	Avionics fan failure
BAG SMK FAULT	Two baggage compartment smoke detectors have failed
BLEED 1 OFF	Bleed pressure regulator 1 and shut-off valve closed
BLEED 2 OFF	Bleed pressure regulator 2 and shut-off valve closed
CLUTCH PIT PASS	Pitch slip clutch maintenance test passed
CLUTCH PIT PROG	Pitch slip clutch maintenance test in progress
CLUTCH ROLL PASS	Roll slip clutch maintenance test passed
CLUTCH ROLL PROG	Roll slip clutch maintenance test in progress
CLUTCH VNTRL PASS	Ventral slip clutch maintenance test passed
CLUTCH VNTRL PROG	Ventral slip clutch maintenance test in progress
CLUTCH YAW PASS	Yaw slip clutch maintenance test passed
CLUTCH YAW PROG	Yaw slip clutch maintenance test in progress
DC BUS 1 OFF	DC bus 1 offline
DC BUS 2 OFF	DC bus 2 offline
DOOR REFUEL OPEN	Refueling door is open
E1 CHIP DETECTED	Chip detected by engine 1 oil chip detector
E2 CHIP DETECTED	Chip detected by engine 2 oil chip detector
E1 FADEC FAULT	FADEC fault in engine 1
E2 FADEC FAULT	FADEC fault in engine 2
E1 OIL IMP BYP	Engine 1 oil filter impending bypass set
E2 OIL IMP BYP	Engine 2 oil filter impending bypass set
ECS 1 OFF	Flow control valve monitor detected improper valve operation
ECS 2 OFF	Flow control valve monitor detected improper valve operation
ELEC SYS FAULT	Electrical system fault
EMER BUS OFF	Emergency bus OFF
ENG FIREX DISCH	Engine fire extinguisher discharge
FLAP NOT AVAIL	Flaps not available
FUEL EQUAL	Fuel quantity asymmetry corrected; XFEED SOV is open
FUEL 1 FEED FAULT	DC pump on due to low fuel pressure
FUEL 2 FEED FAULT	DC pump on due to low fuel pressure
FUEL 1 PSW FAIL	Fuel pressure switch stuck in "high" position
FUEL 2 PSW FAIL	Fuel pressure switch stuck in "high" position
GEA 1 FAIL	Failure of GEA 1
GEA 2 FAIL	Failure of GEA 2
GEA 3 FAIL	Failure of GEA 3
GPU CONNECTED	Ground power unit connected to the aircraft
GSD 1 FAIL	GSD 1 non-communicative
GSD 2 FAIL	GSD 2 non-communicative
GTC 1 FAN FAIL	Failure of GTC 1 fan
GTC 2 FAN FAIL	Failure of GTC 2 fan
GTC 1 FAULT	Fault with GTC 1
GTC 2 FAULT	Fault with GTC 2
HSDB FAULT	An LRU has stopped communicating over an HSDB
HSDB SW REV POS	HSDB switch in reversionary position
HYD SYS FAULT	Degradation of hydraulic system available power
ICE DET FAIL*	Ice Detector failure

Message	Description
MFD FAN FAIL	Failure of MFD fan
NAV 1 FAIL	Failure of NAV 1
NAV 2 FAIL	Failure of NAV 2
OXY SW NOT AUTO	Oxygen system switch in manual mode
PFD 1 FAN FAIL	Failure of PFD 1 fan
PFD 2 FAN FAIL	Failure of PFD 2 fan
PTRIM LO RATE	Pitch trim is being actuated in low rate
PTRIM SW1 FAIL	Failure of pilot pitch trim switch
PTRIM SW2 FAIL	Failure of copilot pitch trim switch
RALT FAIL*	Radar altitude failure
RAM AIR FAIL	Ram air valve failure
RUD BOOST FAIL	Loss of SLRB (Spring Loaded Rudder Booster) force assistance in case of thrust asymmetry
SHED BUS OFF	Shed bus off
SPDBRK SW DISAG	Speed brake switch position is in disagreement with the spoiler surfaces position
SPOILER FAULT	Ground Spoiler arm logic failed
	Ground Spoiler command disagree
	Spoiler position disagree
	Ground Spoiler Control Valve failed
	Speed brake command failed
	Speed brake command inhibit failed
STEEP NOT AVAIL	Steep Approach Mode is not available
SWPS ICE SPEED	Stall Warning System activation angles anticipated due to icing conditions
VENTRAL RUD FAIL	Ventral rudder has failed
VHF3 FAIL	Failure of VHF3
XBLEED FAIL	Cross bleed valve has failed closed or open
XBLEED SW OFF	Cross bleed switch is in the OFF position
XPDR 1 FAIL	Failure of XPDR 1
XPDR 2 FAIL	Failure of XPDR 2

* Optional

COMPARATOR ANNUNCIATIONS

The Comparator monitors critical values generated by redundant sensors. If differences in the sensors exceed a specified amount, this discrepancy is annunciated in the Comparator Window as a ‘MISCOMP’ (miscompare) as seen in Figure A-3. If one or both of the sensed values are unavailable, it is annunciated as a ‘NO COMP’ (no compare). The following is a list of the possible annunciations:



Figure A-3 Miscompare Annunciations (PFD)

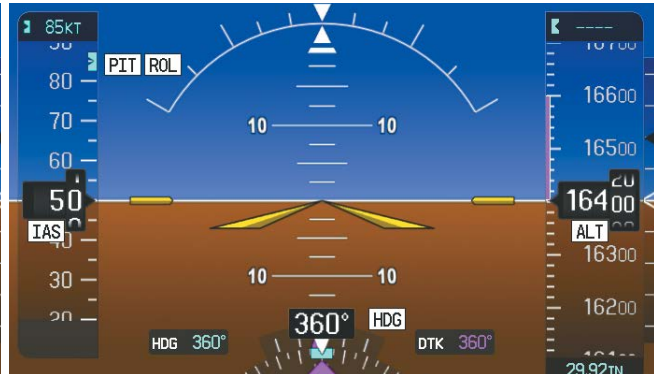


Figure A-4 No Compare Annunciations (PFD)

Annunciation	Description	Condition
ALT	Altitude Miscompare	Difference in altitude sensors is ≥ 200 ft.
IAS	Indicated Airspeed Miscompare	If both airspeed sensors detect < 35 knots, this is inhibited.
		If either airspeed sensor detects ≥ 35 knots, and the difference in sensors is > 10 knots.
		If either airspeed sensor detects ≥ 80 knots, and the difference in sensors is > 7 knots.
HDG	Heading Miscompare	Difference in heading sensors is > 6 degrees.
PIT	Pitch Miscompare	Difference in pitch sensors is > 5 degrees.
ROL	Roll Miscompare	Difference in roll sensors is > 6 degrees.
ALT	Altitude No Compare	No data from one or both altitude sensors.
IAS	Indicated Airspeed No Compare	No data from one or both airspeed sensors.
HDG	Heading No Compare	No data from one or both heading sensors.
PIT	Pitch No Compare	No data from one or both pitch sensors.
ROL	Roll No Compare	No data from one or both roll sensors..

REVERSIONARY SENSOR ANNUNCIATIONS

Reversionary AHRS and Air Data Computer selection is annunciated in the Reversionary Sensor Window, as shown in Figure A-5. These annunciations reflect reversionary sensors selected on one or both PFDs. Selecting the **SENSOR** Softkey gives access to **ADC1**, **ADC2**, **ADC STBY**, **AHRS1**, **AHRS2**, and **AHRS STBY** Softkeys. These softkeys allow manual switching of sensors. In the case of certain types of sensor failures, the system may make some sensor selections automatically. The GPS sensor cannot be switched manually.

The **ADC STBY** and **AHRS STBY** Softkeys are normally dimmed and unavailable for manual selection. If the system detects that inputs for both the #1 and #2 AHRS or both the #1 and #2 ADC are invalid, the respective standby sensor mode is automatically selected. The softkey label is no longer dimmed, and a green annunciator is displayed, indicating the mode is active.

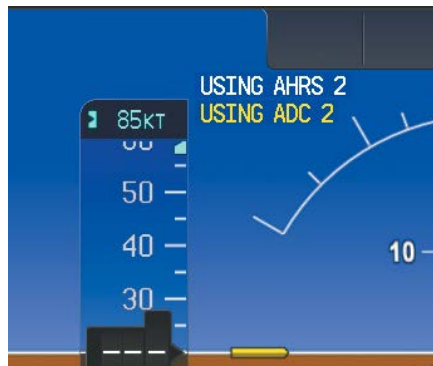


Figure A-5 Reversionary Sensor Annunciations

Reversionary Sensor Window Text	Condition
BOTH ON ADC 1	Both PFDs are displaying data from the #1 Air Data Computer.
BOTH ON ADC 2	Both PFDs are displaying data from the #2 Air Data Computer.
BOTH ON ADC STBY	Both PFDs are displaying data from the standby air data input.
BOTH ON AHRS 1	Both PFDs are displaying data from the #1 AHRS.
BOTH ON AHRS 2	Both PFDs are displaying data from the #2 AHRS.
BOTH ON ATT STBY	Both PFDs are displaying data from the standby attitude and heading reference input.
BOTH ON GPS 1	Both PFDs are displaying data from the #1 GPS receiver.
BOTH ON GPS 2	Both PFDs are displaying data from the #2 GPS receiver.
USING ADC 1	PFD2 is displaying data from the #1 Air Data Computer.
USING ADC 2	PFD1 is displaying data from the #2 Air Data Computer.
USING ADC STBY	PFD1 or PFD2 is displaying data from the standby air data input.
USING AHRS 1	PFD2 is displaying data from the #1 AHRS.
USING AHRS 2	PFD1 is displaying data from the #2 AHRS.
USING ATT STBY	PFD1 or PFD2 is displaying data from the standby attitude and heading reference input.
USING GPS 1	PFD2 is displaying data from the #1 GPS.
USING GPS 2	PFD1 is displaying data from the #2 GPS.

PRODIGY® TOUCH FLIGHT DECK 300 SYSTEM ANNUNCIATIONS

When the system issues a message, the **MSG** Button flashes on the Touchscreen Controllers to alert the pilot and copilot of a new message. The buttons continue to flash until acknowledged by touching the **MSG** Button on either the Touchscreen Controller. Active messages are displayed in white text. Messages that have become inactive change to gray text. The **MSG** Button flashes if the state of a displayed alert changes or a new message is displayed.

When an LRU or an LRU function fails, a yellow 'X' is typically displayed on items associated with the failed data. The following section describes various system annunciations. Refer to the Airplane Flight Manual (AFM) for additional information regarding pilot responses to these annunciations.

NOTE: Upon power-up of the system, certain windows remain invalid as the equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the system should be serviced by a Garmin-authorized repair facility.

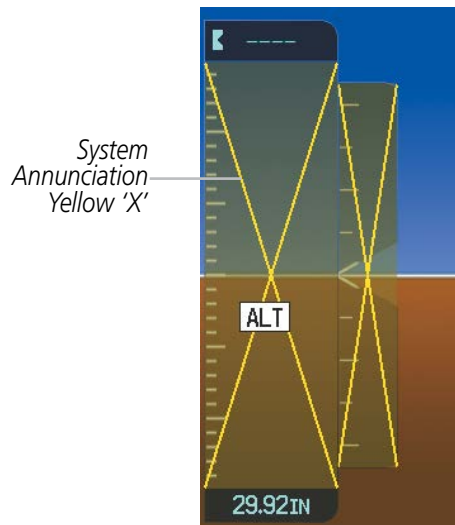


Figure A-6 System Annunciations (PFD)



Figure A-7 System Messages Annunciation (Touchscreen Controller)

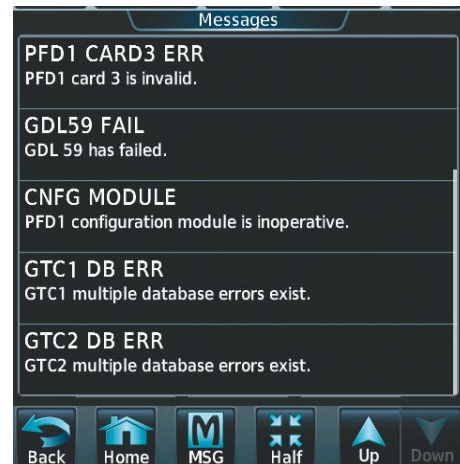


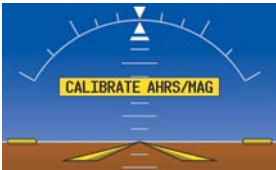












Figure A-8 System Messages Screen After MSG Button Touched (Touchscreen Controller)

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	AHRS calibration incomplete or configuration module failure.
	This annunciation is seen only when the autopilot is engaged. The annunciation indicates an AHRS monitor has detected an abnormal flight parameter, possibly caused by strong turbulence. In this case, the situation should correct itself within a few seconds. If there is an actual failure, a yellow "X" soon appears over the Attitude Indicator.
	'GPS LOI' Indicates Loss of Integrity of GPS information. GPS information is either not present or is invalid for navigation use. Note that AHRS uses GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFM).
	Display system is not receiving valid ISA information from air data computer.

System Annunciation	Comment
	Display system is not receiving airspeed input from air data computer.
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving heading input from the AHRS.
	Display system is not receiving altitude input from the air data computer.
	Display system is not receiving valid SAT information from air data computer.
	Display system is not receiving valid TAT information from air data computer.
	Display system is not receiving valid transponder information.
Other Various Yellow X Indications	A yellow 'X' through any other display field indicates the field is not receiving valid data.

PRODIGY® TOUCH VOICE ALERTS

The system issues voice messages when specific system conditions are met. Other voice alerts associated with the TAWS and traffic avoidance systems are listed in their respective discussions.

Message	Priority	Description
"Autopilot"	Warning	Warning – Autopilot is disengaged Single alert for manual AP disengagement Continuous alert for automatic AP disengagement; cancelled with AP DISC Switch
"Cabin"		High cabin altitude
"Fire, Fire"		Engine fire
"High Speed"		Maximum operating speed exceeded
"Landing Gear"		Gear up in landing condition
"No Takeoff Brake"		No Takeoff Configuration due to brake status
"No Takeoff Flaps"		No Takeoff Configuration due to flap status
"No Takeoff Spoilers"		No Takeoff Configuration due to spoiler status
"No Takeoff Trim"		No Takeoff Configuration due to trim status
"Stall, Stall"		Airplane in stall condition
"Altitude"	Advisory	Aircraft has deviated ± 200 feet of the selected altitude
"Minimums, minimums"		The aircraft has descended below the preset barometric minimum descent altitude.
"Rudder Overboost"		SLRB (Spring Loaded Rudder Booster) uncommanded actuation
"Thrust, Thrust"		CSC (if available) disengaged abnormally
"Trim Trim Trim"		Trim switch malfunction
"Vertical track"		The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Aural Warning OK"	Status	Aural warning system test passes
"Aural Warning One Channel"		Aural warning system test detects failure in one channel
"Flight Director"		Flight director has reverted to pitch or roll default mode
"Incoming Call"		Satellite telephone is receiving a call
"Message ATC"		New Data Link message received from ATC
"SelCal"		Incoming communication through the HF radio
"Takeoff OK"		Takeoff configuration test passed
"Timer Expired"		Countdown timer on the PFD has reached zero

PRODIGY® TOUCH FLIGHT DECK 300 SYSTEM MESSAGES



NOTE: This Section provides information regarding system message advisories that may be displayed by the system. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message. Always use sound pilot judgment. The Airplane Flight Manual (AFM) takes precedence over any conflicting guidance found in this section.

This section describes various system message advisories. Certain messages are issued due to an LRU or LRU function failure. Such messages are normally accompanied by a corresponding yellow 'X' annunciation as shown previously in the Prodigy® Touch Flight Deck 300 System Annunciations section.

GDU 1400W PRIMARY FLIGHT DISPLAY & MULTI FUNCTION DISPLAY

System Message	Comments
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD, PFD and GTC are not communicating with each other. The system should be serviced.
PFD1 SERVICE – PFD1 needs service. Return unit for repair.	The PFD and/or MFD self-test has detected a problem. The system should be serviced.
PFD2 SERVICE – PFD2 needs service. Return unit for repair.	
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	
PFD1 MANIFEST – PFD 1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
PFD2 MANIFEST – PFD 2 software mismatch, communication halted.	
MFD1 MANIFEST – MFD 1 software mismatch, communication halted.	
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
PFD2 CONFIG – PFD2 config error. Config service req'd.	
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
PFD1 SOFTWARE – PFD1 mismatch, communication halted.	The specified GDU has different software versions installed. The system should be serviced.
PFD2 SOFTWARE – PFD2 mismatch, communication halted.	
MFD1 SOFTWARE – MFD1 mismatch, communication halted.	
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
PFD2 COOLING – PFD2 has poor cooling. Reducing power usage.	
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	
PFD1 FAN FAIL – PFD1 internal fan failure. Unit needs service.	The PFD and/or MFD internal cooling fan has failed. The system should be serviced.
PFD2 FAN FAIL – PFD2 internal fan failure. Unit needs service.	
MFD1 FAN FAIL – MFD1 internal fan failure. Unit needs service.	
PFD1 BKLT CAL INV – PFD1 bklt cal lost or mismatch. Return for repair.	The PFD and/or MFD backlight calibration cannot be found or found or is invalid. The system should be serviced.
PFD2 BKLT CAL INV – PFD2 bklt cal lost or mismatch. Return for repair.	
MFD1 BKLT CAL INV – MFD1 bklt cal lost or mismatch. Return for repair.	

System Message	Comments
PFD1 KEYSTK – PFD1 [key name] is stuck.	A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
PFD2 KEYSTK – PFD2 [key name] is stuck.	
MFD1 KEYSTK – MFD1 [key name] is stuck.	
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
PFD2 VOLTAGE – PFD2 has low voltage. Reducing power usage	The PFD2 voltage is low. The system should be serviced.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.
PFD1 CARD1 REM – PFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD. The SD card needs to be reinserted.
PFD1 CARD2 REM – PFD1 card 2 was removed. Reinsert card.	
PFD1 CARD3 REM – PFD1 card 3 was removed. Reinsert card.	
PFD2 CARD1 REM – PFD2 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD. The SD card needs to be reinserted.
PFD2 CARD2 REM – PFD2 card 2 was removed. Reinsert card.	
PFD2 CARD3 REM – PFD2 card 3 was removed. Reinsert card.	
MFD1 CARD1 REM – MFD1 card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the MFD. The SD card needs to be reinserted.
MFD1 CARD2 REM – MFD1 card 2 was removed. Reinsert card.	
MFD1 CARD3 REM – MFD1 card 3 was removed. Reinsert card.	
PFD1 CARD1 ERR – PFD1 card 1 is invalid.	The SD card in the top card slot of the specified PFD is invalid.
PFD1 CARD2 ERR – PFD1 card 2 is invalid.	
PFD1 CARD3 ERR – PFD1 card 3 is invalid.	
PFD2 CARD1 ERR – PFD2 card 1 is invalid.	The SD card in the top card slot of the specified PFD is invalid.
PFD2 CARD2 ERR – PFD2 card 2 is invalid.	
PFD2 CARD3 ERR – PFD2 card 3 is invalid.	
MFD1 CARD1 ERR – MFD1 card 1 is invalid.	The SD card in the top card slot of the MFD is invalid.
MFD1 CARD2 ERR – MFD1 card 2 is invalid.	
MFD1 CARD3 ERR – MFD1 card 3 is invalid.	

DATABASE SYSTEM MESSAGES

Message	Comments
MFD1 DB ERR – MFD1 navigation database error exists.	The specified PFD or MFD detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 navigation database error exists.	
PFD2 DB ERR – PFD2 navigation database error exists.	
GTC1 DB ERR – GTC1 database error exists.	The GTC detected a failure in one or more databases. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
GTC2 DB ERR – GTC2 database error exists.	
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions or regions installed. Crossfill is off. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Standby Navigation database mismatch.	The PFDs and MFD have different standby navigation database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Terrain database mismatch.	The PFDs and MFD have different terrain database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Obstacle database mismatch.	The PFDs and MFD have different obstacle database versions or regions installed. Check the Avionics Status Screen to determine versions or regions. Also, check the Avionics Status Screen for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
PFD1 TERRAIN DSP – [PFD1 Terrain awareness display unavailable.	One of the terrain, airport terrain, or obstacle databases required for TAWS in the specified PFD or MFD is missing or invalid.
PFD2 TERRAIN DSP – PFD2 Terrain awareness display unavailable.	
MFD1 TERRAIN DSP – MFD1 Terrain awareness display unavailable.	

GIA 63W INTEGRATED AVIONICS UNIT SYSTEM MESSAGES

System Message	Comments
GIA1 CONFIG – GIA1 config error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The system should be serviced.
GIA2 CONFIG – GIA2 config error. Config service req'd.	
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The GIA1 and/or GIA2 have an error in the audio configuration. The system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	
GIA1 COOLING – GIA1 temperature too low.	The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA2 COOLING – GIA2 temperature too low.	
GIA1 COOLING – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the system should be serviced.
GIA2 COOLING – GIA2 over temperature.	
GIA1 SERVICE – GIA1 needs service. Return the unit for repair.	The GIA1 and/or GIA2 self-test has detected a problem in the unit. The system should be serviced.
GIA2 SERVICE – GIA2 needs service. Return the unit for repair.	
HW MISMATCH – GIA1 hardware mismatch, GIA1 communication halted.	A GIA mismatch has been detected, where only one is WAAS capable.
HW MISMATCH – GIA hardware mismatch, GIA2 communication halted.	
GIA1 MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The system should be serviced.
GIA2 MANIFEST – GIA2 software mismatch, communication halted.	
GFC MANIFEST – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1 and/or COM2. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	
COM1 CONFIG – COM1 config error. Config service req'd.	The COM1 and/or COM2 configuration settings do not match backup configuration memory. The system should be serviced.
COM2 CONFIG – COM2 config error. Config service req'd.	

System Message	Comments
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The system should be serviced when possible.
COM2 SERVICE – COM2 needs service. Return unit for repair.	
COM1 MANIFEST – COM1 software mismatch, communication halted.	The COM 1 and/or COM 2 has incorrect software installed. The system should be serviced.
COM2 MANIFEST – COM2 software mismatch, communication halted.	
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 and/or COM2 external push-to-talk switch is stuck in the enable (or “pressed”) position. Press the PTT switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 PTT – COM2 push-to-talk key is stuck.	
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 and/or COM2 transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 RMT XFR – COM2 remote transfer key is stuck.	
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellite coverage.
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
GPS NAV LOST – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
APR DWNGRADE – Apr downgraded.	Vertical guidance generated by SBAS is unavailable. Use only LNAV minimums.
TRUE APR – True north approach. Change HDG reference to true.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to ‘AUTO’.
RAIM UNAVAIL – RAIM is not available from FAF to MAP waypoints.	GPS satellite coverage is insufficient to perform Receiver Autonomous Integrity Monitoring (RAIM) from the FAF to the MAP waypoints.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	
GPS1 FAIL – GPS1 is inoperative.	A failure has been detected in GPS receiver #1 and/or GPS receiver #2. The system should be serviced.
GPS2 FAIL – GPS2 is inoperative.	

System Message	Comments
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 and/or NAV2 receiver. The receiver may still be available. The system should be serviced.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The remote NAV1 and/or NAV2 transfer switch is stuck in the enabled (or “pressed”) state. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	
NAV1 MANIFEST – NAV1 software mismatch, communication halted.	The NAV 1 and/or NAV 2 has incorrect software installed. The system should be serviced.
NAV2 MANIFEST – NAV2 software mismatch, communication halted.	
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The system should be serviced.
G/S2 FAIL – G/S2 is inoperative.	
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The receiver may still be available. The system should be serviced when possible.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	

GEA 71 ENGINE/AIRFRAME UNIT SYSTEM MESSAGES

Message	Comments
GEA1 CONFIG – GEA1 config error. Config service req’d.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA2 CONFIG – GEA2 config error. Config service req’d.	The GEA2 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA3 CONFIG – GEA3 config error. Config service req’d.	The GEA3 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA1 MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The system should be serviced.
GEA2 MANIFEST – GEA2 software mismatch, communication halted.	The #2 GEA 71 has incorrect software installed. The system should be serviced.
GEA3 MANIFEST – GEA3 software mismatch, communication halted.	The #3 GEA 71 has incorrect software installed. The system should be serviced.

GSD 41 MESSAGE ADVISORIES

Message	Comments
GSD1 CONFIG – GSD1 config error. Config service req'd.	GSD1 and the CDU have different copies of the GSD1 configuration.
GSD2 CONFIG – GSD2 config error. Config service req'd.	GSD2 and the CDU have different copies of the GSD2 configuration.
GSD1 COOLING – GSD1 temperature too low.	GSD1 is reporting a low temperature condition.
GSD1 COOLING – GSD1 over temperature.	GSD1 is reporting an over-temperature condition.
GSD2 COOLING – GSD2 temperature too low.	GSD2 is reporting a low temperature condition.
GSD2 COOLING – GSD2 over temperature.	GSD2 is reporting an over-temperature condition.
GSD1 SERVICE – GSD1 needs service. Return unit for repair.	GSD1 is reporting an internal error condition. The GSD may still be usable.
GSD2 SERVICE – GSD2 needs service. Return unit for repair.	GSD2 is reporting an internal error condition. The GSD may still be usable.
GSD1 MANIFEST – GSD1 software mismatch. Communication halted.	GSD1 has incorrect software installed. The system should be serviced.
GSD2 MANIFEST – GSD2 software mismatch. Communication halted.	GSD2 has incorrect software installed. The system should be serviced.

GMU 44 MAGNETOMETER SYSTEM MESSAGES

Message	Comments
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HDG FAULT – AHRS2 magnetometer fault has occurred.	A fault has occurred in the #2 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
GMU1 MANIFEST – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The system should be serviced.
GMU2 MANIFEST – GMU2 software mismatch, communication halted.	

GRS 77 ATTITUDE AND HEADING REFERENCE SYSTEM MESSAGES

System Message	Comments
AHRS1 TAS – AHRS1 not receiving airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS2 TAS – AHRS2 not receiving airspeed.	The #2 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS1 GPS – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.

System Message	Comments
AHRS2 GPS – AHRS2 using backup GPS source.	The #2 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving any GPS information.	The #2 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The #2 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The #2 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
AHRS1 SRVC – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS2 SRVC – AHRS2 Magnetic-field model needs update.	The #2 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
GRS1 SERVICE – GRS1 needs service. Return unit for repair.	The #1 AHRS should be serviced when possible.
GRS2 SERVICE – GRS2 needs service. Return unit for repair.	The #2 AHRS should be serviced when possible.
GEO LIMITS – AHRS1 too far north/south, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is annunciated as invalid.
GEO LIMITS – AHRS2 too far north/south, no magnetic compass.	
GRS1 CONFIG – GRS1 config error. Config service req'd.	GRS configuration settings do not match those of backup configuration memory. The system should be serviced.
GRS2 CONFIG – GRS2 config error. Config service req'd.	
GRS1 MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The system should be serviced.
GRS2 MANIFEST – GRS2 software mismatch, communication halted.	The #2 AHRS has incorrect software installed. The system should be serviced.

GTC 570 TOUCHSCREEN CONTROLLER SYSTEM MESSAGES

System Message	Comments
GTC1 CONFIG – GTC1 config error. Config service req'd.	GTC configuration settings do not match those of backup configuration memory. The system should be serviced.
GTC2 CONFIG – GTC2 config error. Config service req'd.	

System Message	Comments
GTC1 SERVICE – GTC1 needs service. Return unit for repair.	The GTC should be serviced..
GTC2 SERVICE – GTC2 needs service. Return unit for repair.	
GTC1 COOLING – GTC1 has poor cooling. Reducing power usage.	The GTC has insufficient cooling. If the problem persists, the system should be serviced.
GTC2 COOLING – GTC2 has poor cooling. Reducing power usage.	
GTC1 VOLTAGE – GTC1 has low voltage. Reducing power usage	The GTC voltage is low. The system should be serviced.
GTC2 VOLTAGE – GTC2 has low voltage. Reducing power usage	
GTC1 FAN FAIL – GTC1 internal fan failure. Unit needs service.	The internal fan in the GTC has failed. The system should be serviced.
GTC2 FAN FAIL – GTC2 internal fan failure. Unit needs service.	
GTC1 MANIFEST – GTC 1 software mismatch, communication halted.	The GTC has incorrect software installed. The system should be serviced.
GTC2 MANIFEST – GTC 2 software mismatch, communication halted.	
GTC1 CARD1 ERR – GTC1 card 1 is invalid.	The internal SD card in the GTC contains invalid data. The system should be serviced.
GTC2 CARD1 ERR – GTC2 card 1 is invalid.	
GTC1 CARD1 REM – GTC1 card 1 was removed. Reinsert card.	The internal SD card in the GTC was removed. The system should be serviced.
GTC2 CARD1 REM – GTC2 card 1 was removed. Reinsert card.	
GTC1 KEYSTK – GTC1 [key name] key is stuck.	A knob or joystick is stuck on the GTC bezel. Attempt to free the stuck control by pushing or turning it several times. The system should be serviced if the problem persists.
GTC2 KEYSTK – GTC2 [key name] key is stuck.	

GSR 56 MESSAGE ADVISORIES

Message	Comments
GSR1 FAIL – GSR1 has failed.	A failure has been detected in GSR1. The system should be serviced.
MANIFEST – GSR1 software mismatch, communication halted.	The GSR1 has incorrect software installed. The system should be serviced.

GDL 59 MESSAGE ADVISORIES

Message	Comments
GDL59 CONFIG – GDL 59 config error. Config service req'd.	GDL 59 configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL59 FAIL – GDL 59 has failed.	A failure has been detected in the GDL 59. The receiver is unavailable. The system should be serviced.
GDL59 SERVICE – GDL 59 needs service. Return unit for repair.	A failure has been detected in the GDL 59. The system should be serviced.
GDL59 RTR FAIL – The GDL 59 router has failed.	A failure has been detected in the GDL 59 router. The system should be serviced.
REGISTER CONNEXT – Data services are inoperative, register w/Connex.	The GDL 59 is not registered with Connex Services, or its current registration data has failed authentication.
GDL59 MANIFEST – GDL59 software mismatch, communication halted.	The GDL 59 has incorrect software installed. The system should be serviced.

GDR 66 VHF DATALINK TRANSCEIVER SYSTEM MESSAGES

System Message	Comments
ATC MESSAGE – <message>.	Message has been received from ATC via CPDLC.
CPDLC – CPDLC is available.	Logon successful. Data link is available for use.
CPDLC – CPDLC connection lost. Establish new connection.	Data link connection has been lost.
CPDLC – CPDLC facility logon failed.	Logon failed. Check pertinent entries for accuracy.
CPDLC – CPDLC data link available. Logon is still required.	The data link is ready for use, but logon to the facility has not yet taken place.
GDR TEMP – GDR over temp. Reducing transmitter power.	The system has detected an over temperature condition in the GDR. The transmitter operates at reduced power. If the problem persists, the system should be serviced.
GDR FAIL – GDR is inoperative.	A failure has been detected in the GDR. The system should be serviced.
GDR TX FAIL – GDR transmitter is inoperative.	The system should be serviced.
GDR PTT – GDR push-to-talk key is stuck.	The GDR push-to-talk switch is stuck in the enable (or “pressed”) position. Press the PTT switch again to cycle its operation. If the problem persists, the system should be serviced.
GDR RMT XFR – GDR remote transfer key is stuck.	The GDR transfer switch is stuck in the enabled (or “pressed”) position. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
GDR SERVICE – GDR needs service. Return unit for repair.	The GDR should be serviced when possible.
GDR CONFIG – GDR config error. Config service req'd.	GDR configuration settings do not match those of backup configuration memory. The system should be serviced.
GDR MANIFEST – GDR software mismatch, communication halted.	The GDR has incorrect software installed. The system should be serviced.
GDR AUX MANIFEST – GDR AUX software mismatch, communication halted.	The GDR secondary processor has incorrect software installed. The system should be serviced.

GDL 69A SATELLITE DATALINK RECEIVER SYSTEM MESSAGES

System Message	Comments
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69 configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69. The receiver is unavailable. The system should be serviced.
GDL69 MANIFEST – GDL69 software mismatch, communication halted.	The GDL 69 has incorrect software installed. The system should be serviced.

GWX 70 AIRBORNE COLOR WEATHER RADAR SYSTEM MESSAGES

Message	Comments
GWX CONFIG – GWX config error. Config service req'd.	GWX configuration settings do not match those of the GDU configuration. The system should be serviced.
GWX FAIL – GWX is inoperative.	The GDU is not receiving status packet from the GWX or the GWX is reporting a fault. The radar system should be serviced.
GWX SERVICE – GWX needs service. Return unit for repair.	A failure has been detected in the GWX. The GWX may still be usable.
GWX MANIFEST – GWX software mismatch, communication halted.	The GWX has incorrect software installed. The system should be serviced.
WX ALERT – Possible severe weather ahead.	Possible severe weather detected within +/- 10 degrees of the aircraft heading at a range of 80 to 320 nm.

GMA 36 REMOTE AUDIO CONTROLLER SYSTEM MESSAGES

System Message	Comments
GMA1 FAIL – GMA1 is inoperative.	The audio controller has detected a failure. The audio controller is unavailable. The system should be serviced.
GMA2 FAIL – GMA2 is inoperative.	
GMA1 CONFIG – GMA1 config error. Config service req'd.	The audio controller configuration settings do not match backup configuration memory. The system should be serviced.
GMA2 CONFIG – GMA2 config error. Config service req'd.	
GMA XTALK – GMA crosstalk error has occurred.	The GMA Audio Controllers are not communicating with each other. The system should be serviced.
DIG GMA1 MANIFEST – DIG GMA 1 software mismatch, communication halted.	The digital audio controller has incorrect software installed. The system should be serviced.
DIG GMA2 MANIFEST – DIG GMA 2 software mismatch, communication halted.	
GMA1 AUDIO MANIFEST – GMA1 audio software mismatch, communication halted.	The audio system has incorrect software installed. The system should be serviced.
GMA2 AUDIO MANIFEST – GMA2 audio software mismatch, communication halted.	

System Message	Comments
GMA1 AUX MANIFEST – GMA 1 AUX software mismatch, communication halted.	The digital audio controller has incorrect software installed. The system should be serviced.
GMA2 AUX MANIFEST – GMA 2 AUX software mismatch, communication halted.	
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio controller self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio controller may still be usable. The system should be serviced when possible.
GMA2 SERVICE – GMA2 needs service. Return unit for repair.	

GMC 715 AFCS CONTROLLER SYSTEM MESSAGES

System Message	Comments
GMC CONFIG – GMC Config error. Config service req'd.	Error in the configuration of the GMC.
GMC FAIL – GMC is inoperative.	A failure has been detected in the GMC. The GMC is unavailable.
GMC MANIFEST – GMC software mismatch. Communication halted.	The GMC has incorrect software installed. The system should be serviced.
GMC KEYSTK – GMC [key name] key is stuck.	A key is stuck on the GMC bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.

MISCELLANEOUS SYSTEM MESSAGES

System Message	Comments
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-up, The system detects that a stored flight plan waypoint is locked. This occurs when an aviation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in flight plans that are deleted. Remove the waypoint from the flight plan if it no longer exists in any database, or update the waypoint name/identifier to reflect the new information.
FPL WPT MOVE – Flight plan waypoint moved.	The system has detected that a waypoint coordinate has changed due to a new navigation database update. Verify that stored flight plans contain correct waypoint locations.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot the timer has expired.
DB CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after a navigation database update. Verify the user-modified procedures in stored flight plans are correct and current.
DB CHANGE – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after a navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
FPL TRUNC – Flight plan has been truncated.	This occurs when a newly installed navigation database eliminates an obsolete approach or arrival used by a stored flight plan. The obsolete procedure is removed from the flight plan. Update flight plan with current arrival or approach.
WPT ARRIVAL – Arriving at waypoint - [xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.

System Message	Comments
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
ARSPC AHEAD – Airspace ahead - less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
APR INACTV – Approach is not active.	The system notifies the pilot the loaded approach is not active. Activate approach when required.
SLCT FREQ – Select appropriate frequency for approach.	The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.
SLCT NAV – Select NAV on CDI for approach.	The system notifies the pilot to set the CDI to the correct NAV receiver. Set the CDI to the correct NAV receiver.
UNABLE V WPT – Can't reach current vertical waypoint.	The current vertical waypoint can not be reached within the maximum flight path angle and vertical speed constraints. The system automatically transitions to the next vertical waypoint.
VNV – Unavailable: Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.
VNV – Unavailable: Excessive cross-track error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
VNV – Unavailable: Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
VNV – Unavailable: Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
BARO MISMATCH – Correct baro mismatch for VNAV guidance.	Altimeter setting is not the same on PFD1 and PFD2. Synchronize settings for VNAV guidance.
NON WGS84 WPT – Do not use GPS for navigation to [xxxx]	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint.
TRAFFIC FAIL – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA has failed.
MAG VAR WARN – Large magnetic variance. Verify all course angles.	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°.
USER MAG VAR – User magnetic variation is active.	User entered magnetic variation is being used for system calculations.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
SVT DISABLED – Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVT DISABLED – Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.
TERRAIN DISABLED – Terrain Awareness DB resolution too low.	TAWS is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.

System Message	Comments
TRN AUD FAIL – Trn Awareness audio source unavailable.	TAWS is disabled because an aural alert audio source is unavailable.
TERRAIN AUD CFG – Trn Awareness audio config error. Service req'd.	TAWS is disabled because the audio configuration is invalid. The system should be serviced.
CHECK CRS – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
CHECK CRS – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
[PFD1, PFD2, or MFD1] CARD 1 REM – [PFD1, PFD2, or MFD1] card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 1 ERR – [PDF1 or MFD1] card 1 is invalid.	The SD card in the top card slot of the PFD or MFD contains invalid data.
[PFD1, PFD2, or MFD1] CARD 2 ERR – [PFD1 or MFD1] Card 2 is invalid.	The SD card in the bottom card slot of the PFD or MFD contains invalid data.
[PFD1, PFD2, or MFD1] CARD 3 REM – Card 3 was removed. Reinsert card.	The internal SD card was removed from the PFD or MFD. The system should be serviced.
[PFD1, PFD2, or MFD1] CARD 3 ERR – [PDF1 or MFD1] card 3 is invalid.	The internal SD card in the PFD or MFD contains invalid data. The system should be serviced.
DATA LOST – Pilot stored data was lost. Recheck settings.	The system was unable to save pilot data. Verify settings.

FLIGHT PLAN IMPORT/EXPORT MESSAGES

In some circumstances, some messages may appear in conjunction with others.

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. In addition, one or more of these waypoints may not have imported successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.

Flight Plan Import/Export Results	Description
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight plan export failed.'	The stored flight plan was not successfully exported to the SD card. The SD card may not have sufficient available memory or the card may have been removed prematurely.







PILOT PROFILE IMPORT/EXPORT MESSAGES

The following messages may be displayed when importing and exporting Pilot Profiles.

Pilot Profile Import/Export Results	Description
'No pilot profile plan files found to import.'	Displayed if the SD card does not have one or more valid pilot profile filenames.
'Overwrite existing profile?'	Displayed if the profile name matches the name of existing profile.
'Profile name invalid. Enter a different profile name.'	Displayed if the profile name is invalid.
'All available pilot profiles in use. Delete a profile before importing another.'	Displayed if the maximum number for pilot profiles has been reached.
'Pilot profile import failed.'	Displayed if the importing operation fails for any other reason.
'Pilot profile import succeeded.'	Displayed if the importing operation succeeds.
'Overwrite existing file?'	Displayed if the filename matches the name of an existing file on the SD card.
'Pilot profile export failed.'	Displayed if the export operation fails.
'Pilot profile export succeeded.'	Displayed if the export operation succeeds.

TAWS-A ALERTS

Annunciations appear on the PFDs and the Touchscreen Controllers. Pop-up alerts appear only on the Touchscreen Controllers.

Alert Type	PFD/MFD TAWS-A Display Annunciation	Touchscreen Controller Pop-Up Alert	Voice Message
Reduced Required Terrain Clearance Warning (RTC)			"Terrain, Terrain; Pull Up, Pull Up"
Imminent Terrain Impact Warning (ITI)			"Terrain, Terrain; Pull Up, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)			"Obstacle, Obstacle; Pull Up, Pull Up"

Alert Type	PFD/MFD TAWS-A Display Annunciation	Touchscreen Controller Pop-Up Alert	Voice Message
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"<whoop><whoop> Pull Up"
Excessive Closure Rate Warning (ECR)	PULL UP	PULL-UP	"<whoop><whoop> Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution, Terrain; Caution, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution, Terrain; Caution, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution, Obstacle; Caution, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution, Obstacle; Caution, Obstacle"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Excessive Closure Rate Caution (ECR)	TERRAIN	TERRAIN	"Terrain, Terrain"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK	"Don't Sink"
Flight Into Terrain High Speed Caution (FIT)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Flight Into Terrain Gear Caution (FIT)	TERRAIN	TOO LOW - GEAR	"Too Low, Gear"
Flight Into Terrain Flaps Caution (FIT)	TERRAIN	TOO LOW - FLAPS	"Too Low, Flaps"
Flight Into Terrain Takeoff Caution (FIT)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Glide Slope/Glide Path Deviation Caution (GSD) (depends on approach type)	GLIDESLOPE or GLIDEPATH	GLIDESLOPE or GLIDEPATH	"Glide Slope" or "Glide Path"
Altitude Voice Callout (VCO)	None	None	"Five-Hundred" "Four-Hundred" "Three-Hundred" "Two-Hundred" "One-Hundred"

TAWS-A SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD TAWS-A Page Annunciation	Additional TAWS-A Page Annunciation	Voice Alert
TAWS System Fail, Terrain or Obstacle database unavailable or invalid, invalid software configuration, system audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
GPWS System Fail	GPWS FAIL	None	"GPWS System Failure"
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	"TAWS System Test OK"

Alert Type	PFD/MFD TAWS-A Page Annunciation	Additional TAWS-A Page Annunciation	Voice Alert
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
GPWS System Fail, Radar Altimeter invalid, Altitude or Vertical Speed unavailable	GPWS FAIL	None	"GPWS System Failure"
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"
Excessively degraded GPS signal, Out of database coverage area	TAWS N/A	None	"TAWS Not Available"
Out of database coverage area	TAWS N/A	None	"TAWS Not Available" "TAWS Available" when aircraft enters database coverage area.

TCAS II ALERTS AND ANNUNCIATIONS

Mode	PFD Mode Annunciation	Traffic Map Pane Mode Annunciation	Traffic Display Status Icon (Other Map Displays)
TCAS II System Test In Progress	None	TEST (‘TEST MODE’ also shown in white on top center of pane)	
Traffic Advisory and Resolution Advisory (TA/RA)	None	TA/RA	
Traffic Advisory Only (TA Only)	TA ONLY	TA ONLY	
TCAS II Standby	TCAS STBY Or: TCAS STBY*	STANDBY (shown in white in center of pane on ground, yellow in the air)	
TCAS II Failed	TCAS FAIL	FAIL	

* Annunciation appears in yellow while in the air.

TCAS II Modes

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TCAS II unit
DATA FAILED	Data is being received from the TCAS II unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TCAS II unit

TCAS II Failure Annunciations

Traffic Status Banner Annunciation	Description
RA OFF SCALE	A Resolution Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
RA X.X ± XX ↓	System cannot determine bearing of Resolution Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TA X.X ± XX ↓	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	TCAS II unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TCAS DATA	Data is not being received from the TCAS II unit

*Shown as symbol on Traffic Map Page

**Shown in center of Traffic Map Page

TCAS II Traffic Status Annunciations

DATABASE MANAGEMENT



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

The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as Jeppesen navigation and ChartView database updates. Not all SD cards are compatible with the Prodigy® Touch Flight Deck 300. Use only SD cards supplied by Garmin or the aircraft manufacturer.



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



NOTE: When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the Avionics Status Screen on the Touchscreen Controller.



NOTE: Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the Avionics Status Screen being displayed in yellow.



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

JEPPESEN DATABASES

The Jeppesen navigation database is updated on a 28-day cycle. The ChartView database is updated on a 14-day cycle. If the ChartView database is not updated within 70 days of the expiration date, ChartView will no longer function. Both of these databases are provided directly from Jeppesen.

The ChartView database should be copied to the Garmin supplied Supplemental Data Card which will reside in the bottom card slot on the MFD. The navigation database must be installed from the Jeppesen or user supplied SD data card. Contact Jeppesen (www.jeppesen.com) for subscription and update information.



NOTE: After the navigation database is installed, the card may be removed.

Updating the active Jeppesen navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the display (PFD1, PFD2, or MFD) to be updated (label of SD card facing left).
- 2) Turn the system ON. A prompt is displayed in the upper left corner of the display:

```

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1204 1205
EFFECTIVE: 09-APR-2012 07-MAY-2012
EXPIRES: 07-MAY-2012 04-JUN-2012

NO WILL BE ASSUMED IN 21 SECONDS.

```

Figure B-1 Standby Navigation Database Prompt

- 3) Press the **NO** Softkey to proceed to loading the active database.
- 4) A prompt similar to the following is displayed. Press the **YES** Softkey to update the active navigation database.

```

DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 1204 1205
EFFECTIVE: 09-APR-2012 07-MAY-2012
EXPIRES: 07-MAY-2012 04-JUN-2012

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.

```

Figure B-2 Database Update Confirmation

- 5) After the update completes, the display starts in normal mode.
- 6) Turn the system OFF and remove the SD card from the top card slot.
- 7) Repeat steps 1 through 6 for the remaining displays (PFD1, PFD2, or MFD).
- 8) Apply power to the system and press the right most softkey to acknowledge the startup screen.
- 9) From the **Home** Screen on the Touchscreen Controller, touch **Setup > Avionics Status**.
- 10) Touch the **Database** Tab.
- 11) Touch the **PFD1** Button. Check the active navigation database information to verify the database has been updated.
- 12) Touch the **Back** Button.
- 13) Touch the **PFD2** Button. Check the active navigation database information to verify the database has been updated.
- 14) Touch the **Back** Button.
- 15) Touch the **MFD1** Button. Check the active navigation database information to verify the database has been updated.
- 16) Touch the **Back** Button.
- 17) Touch the **GTC1** Button. Check the database information to verify databases have been updated.

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so that the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (upon on-ground power up) as to whether the database should be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-up. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Uploading the standby database to the active location takes approximately 45-55 seconds. The pilot is alerted that the update is complete by a system alert message, 'NAV DB UPDATED'.

Loading a standby navigation database:



NOTE: After the navigation database is loaded or copied, the top SD card may be removed.

- 1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the MFD.
- 2) Verify that an SD card is inserted in the bottom slot of each PFD and the MFD.
- 3) Turn the system ON. A prompt is displayed.

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
      FROM          TO
REGION:  WORLDWIDE  WORLDWIDE
CYCLE:   1204        1205
EFFECTIVE: 09-APR-2012  07-MAY-2012
EXPIRES:  07-MAY-2012  04-JUN-2012
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-3 Standby Navigation Database Prompt

- 4) Press the **YES** Softkey. The navigation database is copied to the SD card in the bottom card slot of the MFD.
- 5) After the navigation database files are copied to the bottom SD card, press any key to continue, as instructed.

```

INITIALIZING SYSTEM

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM          TO
REGION:      WORLDWIDE      WORLDWIDE
CYCLE:       1009            1012
EFFECTIVE:   09-APR-2012     07-MAY-2012
EXPIRES:    07-MAY-2012     04-JUN-2012

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.

```

Figure B-4 Standby Navigation Database Update Complete

- 6) Again, press any key to continue as instructed on the display.

```

DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.

```

Figure B-5 Navigation Database Verification Prompt

- 7) Press the **NO** Softkey. The display now starts in normal mode. Since the database effective date is not yet valid, it should not be loaded as the active database. The display now starts in normal mode. Do not remove power while the display is starting.

```

.
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM          TO
REGION:      WORLDWIDE      WORLDWIDE
CYCLE:       1204            1205
EFFECTIVE:   09-APR-2012     07-MAY-2012
EXPIRES:    07-MAY-2012     04-JUN-2012

NO WILL BE ASSUMED IN 8 SECONDS.

```

Figure B-6 Active Navigation Database Prompt

- 8) Press the right most softkey to acknowledge the startup screen.
- 9) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 10) Touch the **Database** Tab.
- 11) Touch the **PFD1** Button. Verify the PFD1 Database screen indicates the standby navigation database is synchronizing. When synchronization has finished, 'Complete' is displayed. Check the standby navigation database information to verify database have been updated.
- 12) Touch the **Back** Button.

- 13) Touch the **PFD2** Button. Verify the PFD2 Database screen indicates the standby navigation database is synchronizing. When synchronization has finished, 'Complete' is displayed. Check the standby navigation database information to verify database have been updated.
- 14) Touch the **Back** Button.
- 15) Touch the **MFD1** Button. Check the standby navigation database information to verify the database has been updated.
- 16) Touch the **Back** Button.
- 17) Touch the **GTC1** Button. Check the standby navigation database information to verify databases have been updated.



NOTE: *During the synchronization process, version differences between standby navigation databases will exist. This will result in the system displaying a 'DB Mismatch' alert for the standby navigation databases. This alert will remain until the next power cycle.*

- 18) Turn system power OFF.
- 19) Remove the SD card from the top card slot of the MFD.
- 20) Turn system power ON.
- 21) Acknowledge the Power-up Display agreement by pressing the right most softkey as indicated on the display.
- 22) From the **Home** Screen on the Touchscreen Controller, touch **Setup > Avionics Status**.
- 23) Touch the **Database** Tab.
- 24) Touch the **PFD1** Button. Check the standby navigation database information to verify database have been updated.
- 25) Touch the **Back** Button.
- 26) Touch the **PFD1** Button. Check the standby navigation database information to verify database have been updated.
- 27) Touch the **Back** Button.
- 28) Touch the **MFD1** Button. Check the standby navigation database information to verify the database has been updated.
- 29) Touch the **Back** Button.
- 30) Touch the **GTC1** Button. Check the standby navigation database information to verify databases have been updated.

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

When updating the active navigation database, the automatic database synchronization feature automatically transfers the navigation database from a single SD Card to the internal memory of all GDUs and GTCs. When updating all other databases (including the standby navigation database) the data is transferred from a single SD card to the remaining SD cards on each GDU, as well as the internal memory of each GTC. After power-up, the system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Navigation, Basemap, Safetaxi, Terrain, Obstacle, FliteCharts, ChartView, and Airport Directory.



NOTE: The terrain database may take as long as 100 minutes to synchronize using this method. Therefore the user may want to transfer the data using a PC, or connect the system to a ground power source while performing the database synchronization.

The synchronization progress may be monitored on the Database Status Screen on the Touchscreen Controller (Figure B-7). This screen shows the synchronization status of each applicable database as follows:

- ‘Sync in Progress’ with percent complete and time remaining
- ‘Sync Complete’
- ‘Sync Error’

While database synchronization is occurring, ‘Sync in Progress’ is displayed along with percent complete and time remaining. When the synchronization is complete for the selected GDU or GTC Database Status Screen, the status is listed as ‘Sync Complete’ (Figure B-8). The synchronization status is only present when a sync is occurring or has occurred on the current power-up.

An indication of ‘Sync Complete’ still requires a power cycle before the synchronized databases will be used by the system.

To view database status:

- 1) From the **Home** Screen on the Touchscreen Controller, touch **Utilities > Setup > Avionics Status**.
- 2) If necessary, touch the **Database** Tab. The Touchscreen Controller shows a list of displays on which databases reside.
- 3) Touch a button from the list to view database information associated with that display (**MFD1, PFD1, PFD2, GTC1, GTC2**).
- 4) Scroll through the database information to view database status.



Figure B-7 Avionics Status Screen, Database Information Window, Navigation Database Sync in Progress



Figure B-8 Avionics Status Screen, Database Information Window, Navigation Database Sync Complete

If an error occurs during the synchronization, 'Sync Error' is displayed in the synchronization status field (Figure B-9). If synchronization completes for one GDU or GTC, but an error occurs for another, the error message will be displayed on the Database Status Screen for the affected GDU or GTC. When an error message is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization.



Figure B-9 Synchronization Error Message

GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- Obstacle
- SafeTaxi
- FliteCharts
- Airport Directory (AOPA or AC-U-KWIK)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on three Supplemental Data Cards. A Supplemental Data Card resides in the bottom card slot of each GDU, as shown in Figure B-10.

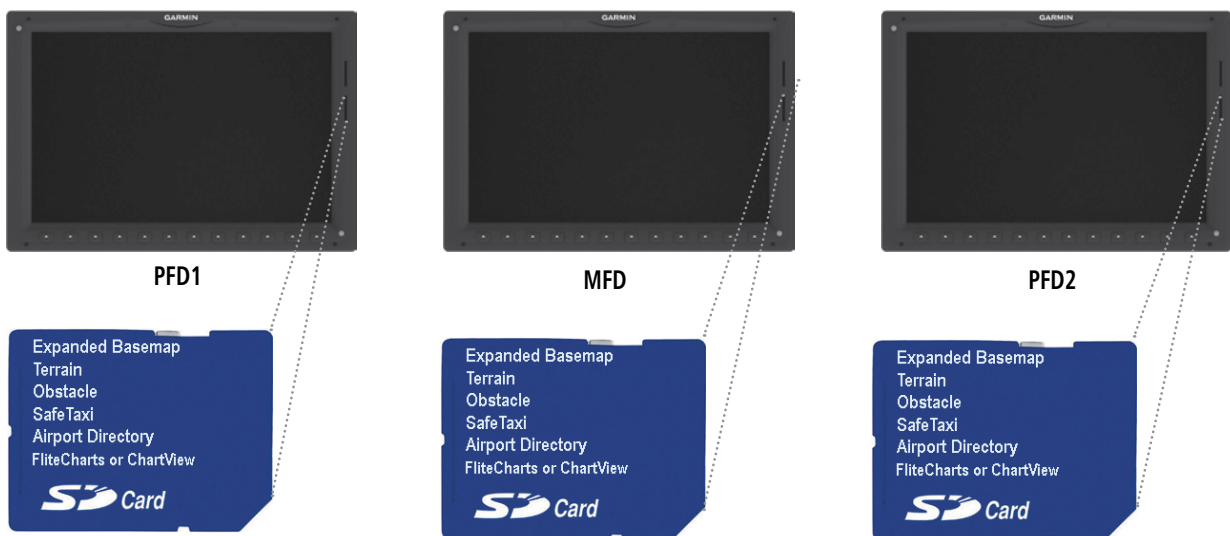


Figure B-10 Correct Database Locations

Databases residing on Supplemental Data Cards are not stored internally in the displays (except for the Touchscreen Controllers), therefore, a Supplemental Data Card containing identical database versions must be kept in the bottom card slot each GDU.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. This database is updated periodically and has no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.



NOTE: *The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.*

The SafeTaxi database contains detailed airport diagrams for selected airports. These diagrams aid in following ground control instructions by accurately displaying the aircraft position on the map in relation to taxiways, ramps, runways, terminals, and services. This database is updated on a 56-day cycle.

The AOPA or AC-U-KWIK Airport Directory provides data on airports and heliports throughout the U.S., and offers detailed information for over 5,300 U. S. airports, along with the names and phone numbers of thousands of FBOs. These databases are updated every 56 days.

The FliteCharts database contains procedure charts for the United States only. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

The Garmin database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website (fly.garmin.com). Once the updated files have been downloaded from the website, a PC equipped with an appropriate SD card reader is used to unpack and program the new databases onto an existing Supplemental Data Card. Equipment required to perform the update is as follows:

- Windows-compatible PC computer (running Windows XP, Vista, or Windows 7)
- SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
- Updated database obtained from the Garmin website
- Existing Supplemental Database SD Cards (010-00474-44) from both PFDs and MFD

In some cases it may be necessary to obtain an unlock code from Garmin in order to make the database product functional. It may also be necessary to have the system configured by a Garmin authorized service facility in order to use some database features.

After the data has been copied to the appropriate data card, perform the following steps:

- 1) With system power OFF, remove the MFD database card from the bottom card slot of the MFD.
- 2) Update the Garmin databases on the MFD card.

- 3) Insert the MFD database card into the bottom card slot of the MFD.
- 4) Apply power to the system, check that the databases are initialized and displayed on the power-up screen (Figure B-11). When updating the terrain and FliteCharts databases, a 'Verifying' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.



Figure B-11 Database Information on the Power-up Screen

- 5) From the Home Screen on the Touchscreen Controller, touch **Setup > Avionics Status**.
- 6) If necessary, touch the Database tab.
- 7) Turn the small **FMS** Knob to select the System Status Page.
- 8) Monitor the Sync Status in the Database Window. Wait for all databases to complete syncing, indicated by 'Complete' being displayed as seen in Figure B-8.
- 9) Remove and reapply power to the system.
- 10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 11) Turn the small **FMS** Knob to select the System Status Page.
- 12) Press the Display Database Selection Softkey to show database information for each display (**MFD1 DB, PFD1 DB, PFD2 DB**). Verify the correct database cycle information is shown for each database for each display.



Figure B-12 Display Database Softkey

MAGNETIC FIELD VARIATION DATABASE UPDATE

The Magnetic Field Variation Database is loaded as part of the navigation database, but is copied to, and resides within each AHRS (GRS1 and GRS2). At startup, the system compares the MV DB within the navigation database to that presently residing in each AHRS (GRS1 and GRS2). When a new navigation database is loaded, the system may determine the newly loaded MV DB within the navigation database is newer than that residing in each AHRS. In this case, the system will prompt for an update. This prompt is displayed on the Touchscreen Controller (GTC), as shown in Figure B-13. Note, in this example, GRS1 is the first AHRS to indicate an update is available. In actuality, this is dependent on which AHRS is the first to report status to the system. GRS2 may be displayed before GRS1. The order is not important, only that both AHRS be updated.



Figure B-13 GRS1 Magnetic Field Variation Database Update Prompt (Touchscreen Controller)

Loading the Magnetic Field Variation Database update:

- 1) With the MV DB prompt displayed, as shown in Figure B-13, touch the **OK** Button. A progress monitor is displayed as shown in Figure B-14.



Figure B-14 Uploading Database to GRS1

- 2) When the upload is complete, the prompt for the next GRS upload is displayed, as seen in Figure B-15. A database mismatch message, as seen in Figure B-16, indicates the second GRS has not yet been updated.



Figure B-15 GRS2 Magnetic Field Variation Database Update Prompt



Figure B-16 Database Mismatch Message is Annunciated Before Second GRS is Updated

- 3) Touch the **OK** Button. A progress monitor for the next GRS is displayed as in step 1. When the upload is complete, the system is ready for use.

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GLOSSARY

ACC	accuracy	Bearing	The compass direction from the present position to a destination waypoint
ACT, ACTV	active, activate, Altitude Compensated Tilt	BFO	beat frequency oscillator
ADC	air data computer	BKSP	backspace
ADF	Automatic Direction Finder	BRG	bearing
ADI	Attitude Direction Indicator	C	center runway
AF	Arc to fix	°C	degrees Celsius
AFCS	Automatic Flight Control System	CA	Course to Altitude
AFM	Airplane Flight Manual	CALC	calculator
AFMS	Airplane Flight Manual Supplement	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
AFRM	airframe	CD	Course to DME distance
AGL	Above Ground Level	CDI	Course Deviation Indicator
AHRS	Attitude and Heading Reference System	CDU	Control Display Unit
AIM	Aeronautical Information Manual	CF	Course to Fix
AIRMET	Airman's Meteorological Information	CHT	Cylinder Head Temperature
ALRT	alert	CHKLIST	checklist
ALT	altitude	CHNL	channel
ALT, ALTN	alternator	CI	Course to Intercept
AMPS	amperes	CLD	cloud
ANNUNC	annunciation	CLR	clear
ANT	antenna	cm	centimeter
AP	autopilot	CNS	Communication, Navigation, & Surveillance
AP DISC	autopilot disconnect	CO	carbon monoxide
APR	approach	COM	communication radio
APT	airport, aerodrome	CONFIG	configuration
ARINC	Aeronautical Radio Incorporated	COOL	coolant
ARSPC	airspace	COPLT	co-pilot
ARTCC	Air Route Traffic Control Center	Course	The line between two points to be followed by the aircraft
ARV	arrival	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
AS	airspeed	CPDLC	Controller Pilot Datalink Communications
ASB	Aviation Support Branch	CR	Course to Radial
ASOS	Automated Surface Observing System	CRG	Cockpit Reference Guide
ATC	Air Traffic Control	CRNT	current
ATCRBS	ATC Radar Beacon System	Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right
ATIS	Automatic Terminal Information Service	CRS	course
ATK	along-track	CRS	Course to Steer
AUTOSEQ	automatic sequence	CRSR	cursor
AUX	auxiliary		
AWOS	Automated Weather Observing System		
B ALT	barometric altitude		
BARO	barometric setting		
BATT	battery		
BC	backcourse		

CTA	Control Area	ELEV	elevator
CTRL	control	EMERGNY	emergency
Cumulative	The total of all legs in a flight plan.	EMI	Electromagnetic Interference
CVR	Cockpit Voice Recorder	ENDUR	endurance
CVRG	coverage	Endurance	Flight endurance, or total possible flight time based on available fuel on board
CWS	control wheel steering		
CYL	cylinder		
		ENG	engine
D ALT	density altitude	ENGD	engaged
DB, DBASE	database	ENR	enroute
dBZ	decibels 'Z' (radar return)	Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan or direct-to
DCLTR, DECLTR	declutter		
DEC FUEL	decrease fuel		
deg	degree	EPE	Estimated Position Error
DEIC, DEICE	de-icing	EPU	Estimated Position Uncertainty
DEP	departure	ERR	error
Desired Track	The desired course between the active "from" and "to" waypoints	ESA	Enroute Safe Altitude
		ESP	Electronic Stability and Protection
DEST	destination	Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors
DF	Direct to Fix		
DFLT	default	Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track
DGRD	degrade		
DH	decision height	Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed
Dilution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry)		
		ETA	Estimated Time of Arrival
DIR	direction	ETE	Estimated Time Enroute
DIS	distance	EXPIRD	expired
Distance	The 'great circle' distance from the present position to a destination waypoint		
		°F	degrees Fahrenheit
DME	Distance Measuring Equipment	FA	Course From Fix to Altitude
DOP	Dilution of Precision	FAA	Federal Aviation Administration
DP	Departure Procedure	FADEC	Full Authority Digital Engine Control
DPRT	departure	FAF	Final Approach Fix
DR	dead reckoning	FAIL	failure
DSBL	disabled	FC	Course From Fix to Distance
DTK	Desired Track	FCC	Federal Communication Commission
		FCST	forecast
E	empty, east	FD	Course From Fix to DME Distance
ECU	Engine Control Unit	FD	flight director
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel	FDE	Fault Detection and Exclusion
		FFLOW	fuel flow
EGNOS	European Geostationary Navigation Overlay Service	FIS-B	Flight Information Services-Broadcast
		FISDL	Flight Information Service Data Link
EGT	Exhaust Gas Temperature	FL	flight level
EIS	Engine Indication System		
ELEV	elevation		

FLC	Flight Level Change	HA	Hold Terminating at Altitude
FM	Course From Fix to Manual Termination	HDG	heading
FMS	Flight Management System	Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro
FOB	Fuel On Board		
FPL	flight plan		
fpm	feet per minute	HF	Hold Terminating at Fix
FREQ	frequency	HFOM	Horizontal Figure of Merit
FRZ	freezing	Hg	mercury
FSS	Flight Service Station	HI	high
ft	foot/feet	HI SENS	High Sensitivity
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour	HM	Hold with Manual Termination
Fuel On Board	The total amount of usable fuel on board the aircraft	Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position
		hPa	hectopascal
		HPL	Horizontal Protection Level
G/S, GS	glideslope	hr	hour
GA	go-around	HSDB	High-Speed Data Bus
gal, gl	gallon(s)	HSI	Horizontal Situation Indicator
GBOX	gearbox	HT	heat
GDC	Garmin Air Data Computer	HUL	Horizontal Uncertainty Level
GDL	Garmin Satellite Data Link	Hz	Hertz
GDU	Garmin Display Unit	I	Inner Marker
GEA	Garmin Engine/Airframe Unit	IAF	Initial Approach Fix
GCS	Ground Clutter Suppression	IAT	Indicated Air Temperature
GEO	geographic	IAU	Integrated Avionics Unit
GFC	Garmin Flight Control	ICAO	International Civil Aviation Organization
GIA	Garmin Integrated Avionics Unit		
GLS	Global Navigation Satellite Landing System	ICS	Intercom System
		ID	Identification/Morse Code Identifier
GMA	Garmin Audio Panel System	IDENT, IDNT	identification
GMT	Greenwich Mean Time	IF	Initial Fix
GMU	Garmin Magnetometer Unit	IFR	Instrument Flight Rules
GND	ground	IG	Imperial gallon
gph	gallons per hour	ILS	Instrument Landing System
GPS	Global Positioning System	IMC	Instrument Meteorological Conditions
Grid MORA	Grid Minimum Off-Route Altitude; one degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by 1000 feet for all areas of the grid	in	inch
		INACTV	inactive
		INC FUEL	increase fuel
		IND	indicated
Groundspeed	The velocity the aircraft is travelling relative to a ground position	Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel
Ground Track	<i>see Track</i>		
GRS	Garmin Reference System	INFO	information
GS	Ground speed	in HG	inches of mercury
GTC	Garmin Touchscreen Controller	INT	intersection(s)
GTX	Garmin Transponder	INTEG	integrity (RAIM unavailable)
		IrDA, IRDA	Infrared Data Association

KEYSTK	key stuck	MET	manual electric trim
kg	kilogram	METAR	Meteorological Aviation Routine
kHz	kilohertz	MEPT	manual electric pitch trim
km	kilometer	MFD	Multi Function Display
kt	knot	MFW	Multi Function Window
		MGRS	Military Grid Reference System
L	left, left runway	MHz	megahertz
LAT	latitude	MIC	microphone
LBL	label	MIN	minimum
lb	pound	Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position
LCD	Liquid Crystal Display		
LCL	local	MKR	marker beacon
LED	Light Emitting Diode	MOA	Military Operations Area
Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to	MOV	movement
Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate	mpm	meters per minute
		MSA	Minimum Safe Altitude
		MSAS	Multi-functional Satellite Augmentation System
Leg	The portion of a flight plan between two waypoints	MSG	message
		MSL	Mean Sea Level
LIFR	Low Instrument Flight Rules	MT	meter
LNAV	Lateral Navigation	mV	millivolt(s)
LO	low	MVFR	Marginal Visual Flight Rules
LOC	localizer		
LOI	loss of integrity (GPS)	N	north
LON	longitude	NAV	navigation
LPV	Localizer Performance with Vertical guidance	NAVAID	NAVigation AID
		NDB	Non-directional Beacon
LRU	Line Replacement Unit	NEXRAD	Next Generation Radar
LT	left	nm	nautical mile(s)
LTNG	lightning	NPT	
LVL	level	NRST	nearest
		O	Outer Marker
M	Middle Marker	OAT	Outside Air Temperature
m	meter	OBS	Omni Bearing Selector
MAG	Magnetic	OFST	offset
MAG VAR	Magnetic Variation	OXY	oxygen
MAHP	Missed Approach Hold Point	P ALT	pressure altitude
MAN IN	manifold pressure (inches Hg)	PA	Passenger Address
MAN SQ	Manual Squelch	PA	Proximity Advisory
MAP	Missed Approach Point	PASS	passenger(s)
MASQ	Master Avionics Squelch	PC	personal computer
MAX	maximum	PFD	Primary Flight Display
MAXSPD	maximum speed (overspeed)	PI	Procedure Turn to Course Intercept
MDA	barometric minimum descent altitude	PIT, PTCH	pitch
		POSN	position
		PPM	parts per million

P. POS	Present Position	SIAP	Standard Instrument Approach Procedures
PRES, PRESS	pressure	SID	Standard Instrument Departure
PROC	procedure(s), procedure turn	SIGMET	Significant Meteorological Information
psi	pounds per square inch	Sim	simulator
PT	Procedure Turn	SLP/SKD	slip/skid
PTK	parallel track	SMBL	symbol
PTT	Push-to-Talk	SPD	speed
PWR	power	SPI	Special Position Identification
QTY	quantity	SPKR	speaker
R	right, right runway	SQ	squelch
RAD	radial	SRVC, SVC	service
RAIM	Receiver Autonomous Integrity Monitoring	STAL	stall
RAM	random access memory	STAR	Standard Terminal Arrival Route
REF	reference	STATS	statistics
REM	remaining (fuel remaining)	STBY	standby
REQ	required	STD	standard
RES	reserve (fuel reserve entered by pilot)	STRMSCP	Stormscope
REV	reverse, revision, revise	SUA	Special Use Airspace
RF	Constant Radius Turn to Fix	SUSP	suspend
RMI	Radio Magnetic Indicator	SVS	Synthetic Vision System
RMT	remote	SW	software
RNG	range	SYS	system
RNWX	runway	T	true
ROL	roll	TA	Traffic Advisory
ROM	read only memory	TACAN	Tactical Air Navigation System
rpm	revolutions per minute	TAF	Terminal Aerodrome Forecast
RST FUEL	reset fuel	TAS	True Airspeed
RSV	reserve (fuel reserve entered by pilot)	TAS	Traffic Advisory System
RT	right	TAT	Total Air Temperature
RVRSNRY	reversionary	TAWS	Terrain Awareness and Warning System
RX	receive	TCA	Terminal Control Area
S	south	TCAS	Traffic Collision Avoidance System
SA	Selective Availability	TEL	telephone
SAT	Static Air Temperature	TEMP	temperature
SBAS	Satellite-Based Augmentation System	TERM	terminal
SCIT	Storm Cell Identification and Tracking	TF	Track Between Two Fixes
SD	Secure Digital	TFR	Temporary Flight Restriction
sec	second(s)	T HDG	True Heading
SEL, SLCT	select	TIS	Traffic Information System
SELCAL	Selective Calling	TIT	Turbine Inlet Temperature
SFC	surface	TKE	Track Angle Error
		TMA	Terminal Maneuvering Area
		TMR/REF	Timer/Reference
		TOLD	Takeoff and Landing Data
		Topo	topographic

Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'	VS VSI VSR VTF	vertical speed Vertical Speed Indicator Vertical Speed Required vector to final
Track Angle Error	The angle difference between the desired track and the current track		
TRG	target	W	watt(s), west
TRK	track	WAAS	Wide Area Augmentation System
TRSA	Terminal Radar Service Area	WGS-84	World Geodetic System - 1984
TRUNC	truncated	WPT	waypoint(s)
TTL	total	WW	world wide
TURN	procedure turn	WX	weather
TX	transmit		
UNAVAIL	unavailable	XFER, XFR	transfer
USR	user	XPDR	transponder
UTC	Coordinated Universal Time	XTALK	cross-talk
UTM/UPS	Universal Transverse Mercator/Universal Polar Stereographic Grid	XTK	cross-track
V, Vspeed	velocity (airspeed)		
VA	Heading Vector to Altitude		
VAPP	VOR approach		
VAR	variation		
VD	Heading Vector to DME Distance		
Vdc	volts, direct current		
VERT	vertical		
Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position		
Vertical Speed Required	The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed		
VFOM	Vertical Figure of Merit		
VFR	Visual Flight Rules		
VHF	Very High Frequency		
VI	Heading Vector to Intercept		
VLOC	VOR/Localizer Receiver		
VM	Heading Vector to Manual Termination		
VMC	Visual Meteorological Conditions		
VNAV, VNV	vertical navigation		
VOL	volume		
VOR	VHF Omni-directional Range		
VORTAC	very high frequency omnidirectional range station and tactical air navigation		
VPL	Vertical Protection Level		
VPROF	VNV profile, vertical profile		
VPTH	VNV path, vertical path		
VR	Heading Vector to Radial		

FREQUENTLY ASKED QUESTIONS

If a particular aspect of the Prodigy® Touch Flight Deck 300 operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

WHAT IS SBAS?

The Satellite Based Augmentation System (SBAS) uses a system of ground stations to correct any GPS signal errors. These ground stations correct for errors caused by ionospheric disturbances, timing, and satellite orbit errors. It also provides vital integrity information regarding the health of each GPS satellite. The signal correction is then broadcast through geostationary satellites. This correction information can then be received by any SBAS-enabled GPS receiver.

SBAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight.

There are several SBAS systems serving different parts of the world. The Wide Area Augmentation System (WAAS) is currently available in the United States, including Alaska and Hawaii. The European Geostationary Navigation Overlay Service (EGNOS) offers coverage of Europe, parts of the middle east and northern Africa. The Multi-functional Satellite Augmentation System (MSAS) covers mainly Japan and parts of northern Australia.

HOW DOES SBAS AFFECT APPROACH OPERATIONS?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

WHAT IS RAIM AND HOW DOES IT AFFECT APPROACH OPERATIONS?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements



NOTE: *If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.*

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The system monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

WHY MIGHT THERE BE NO APPROACHES AVAILABLE FOR A FLIGHT PLAN?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the system indicates “NONE” for the available procedures.

WHAT HAPPENS WHEN AN APPROACH IS SELECTED? CAN A FLIGHT PLAN WITH AN APPROACH, A DEPARTURE, OR AN ARRIVAL BE STORED?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original enroute portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

CAN “SLANT GOLF” (“/G”) BE FILED USING THE PRODIGY® TOUCH FLIGHT DECK 300?

“/G” may be filed for a flight plan. GPS approaches are not to be flown with an expired database. See the approved Airplane Flight Manual (AFM) as well as the Aeronautical Information Manual (AIM) for more information.

WHAT DOES THE OBS SOFTKEY DO?

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the system automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)

- Automatic sequencing of waypoints
- Manual course change on HSI not possible
- Always navigates 'TO' the active waypoint
- Must be in this mode for final approach course

OBS

- Manual sequencing - 'holds' on selected waypoint
- Manually select course to waypoint from HSI
- Indicates 'TO' or 'FROM' waypoint
- Cannot be set for final approach course or published holding patterns

WHY MIGHT THE PRODIGY® TOUCH FLIGHT DECK 300 NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?

The system only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no 'OBS' or 'SUSP' annunciation on the HSI). For automatic sequencing to occur, the aircraft must also cross the *bisector* of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

WHEN DOES TURN ANTICIPATION BEGIN?

The system smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ####° in # seconds' or 'Next HDG ####° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ####° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ####° now' or 'Next [DTK/HDG] to ####° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate the midpoint of the turn has been crossed.

WHEN DOES THE CDI SCALE CHANGE?

Once a departure is activated, the system Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

HOW DO I ACTIVATE A MISSED APPROACH PROCEDURE?

To comply with TSO specifications, the system does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Button is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the published approach.

To execute the missed approach procedure prior to the MAP (not recommended), touch the **PROC** Button on the Home Screen or the Active Flight Plan Screen. Touch the **Activate Missed Approach** Button to activate the missed approach portion of the procedure.

AFTER A MISSED APPROACH, HOW CAN THE SAME APPROACH BE RE-SELECTED? HOW CAN A NEW APPROACH BE ACTIVATED?



NOTE: Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message “Are you sure you want to discontinue the current approach?” appears. The system directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by touching the **PROC** Button on the Home Screen, followed by the **Activate Approach** Button. The system provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by touching the **PROC** Button, then touch the **Approach** Button to access the Approach Selection Screen. Then touch the **Approach** Button. The Touchscreen Controller displays a list of approaches as buttons. Scroll as needed and touch the desired approach button, then touch a transition button. The Touchscreen Controller returns to the Approach Selection Screen. To activate the selected approach, touch the **Load & Activate** Button.

To activate a new approach to a different airport, touch the **Direct To** Button to access the Direct To Screen. Then touch the waypoint point and enter the desired airport using the keypad or large and small right knobs. Touch the **Enter** Button or push the **Right Knob** to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

MAP SYMBOLS

AIRPORTS

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	

NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (non-directional radio beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	

BASEMAP

Item	Symbol
Interstate Highway	
State Highway	
US Highway	
National Highway	
City	
State/Province Border	
International Border	
Road	
Railroad	
Latitude/Longitude	

AIRSPACE BOUNDARIES

Item	Symbol
ICAO Control Area	
Class B Airspace	
Mode C Tower Area	
Warning Area	
Alert Area	
Caution Area	
Danger Area	
Prohibited Area	
Restricted Area	
Training Area	
Unknown Area	
Class C	
Terminal Radar Service Area	
Mode C Area	
Military Operations Area (MOA)	

HAZARD AVOIDANCE FEATURES

Feature	Symbol
Terrain Proximity/TAWS display enabled	
Traffic display enabled	
NEXRAD display enabled	
Cloud Top display enabled	
Echo Top display enabled	
XM Lightning display enabled	
Cell Movement display enabled	
SIGMETs/AIRMETs display enabled	
METARs display enabled	
City Forecast display enabled	
Surface Analysis display enabled	
Freezing Levels display enabled	
Winds Aloft display enabled	
County Warnings display enabled	
Cyclone Warnings display enabled	
Loss of hazard avoidance feature (loss of GPS position)	

TRAFFIC

Item	Symbol
Non-threat Traffic	
Proximity Advisory	
Traffic Advisory, Out of Range	
Traffic Advisory	

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Map Pointer (when panning)	
Elevation Pointer (on Topography Scale when panning)	
Measuring Pointer	
Wind Vector	
Overzoom Indicator	
User Waypoint	
Vertical Navigation Along Track Waypoint	
Parallel Track Waypoint	
Unanchored Flight Path Waypoint	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

OBSTACLE DATABASE

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

Table F-1 Obstacle Colors

TAWS-A COLORS AND SYMBOLS

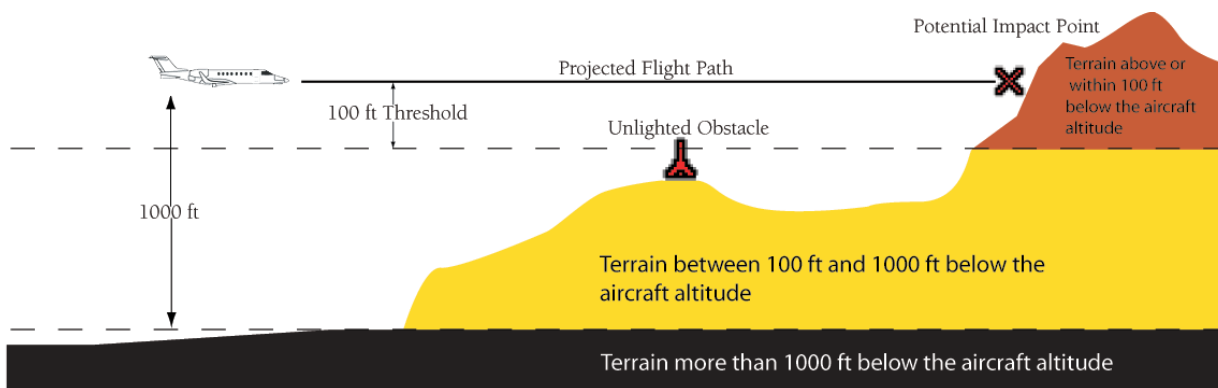


Figure 6-138 Terrain Altitude/Color Correlation for TAWS-A



Figure F-2 TAWS-A Potential Impact Points

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A

AAirport Directory	587, 588
Abnormal engine operations	129
Activate a Flight Plan	274
Active database	582, 583
Active frequency	
ADF	159
AC-U-KWIK	587, 588
ADF	
ADF mode	159, 162
ANT mode	162
Volume	159
ADF/BFO	162
ADF frequency tuning	160
Advisories, CAS	555–556
AFCS status box	62
AHRS	36, 569, 570, 574
Airborne Color Weather Radar	373
Aircraft symbol	68
Air Data Computer	559
Airport Directory	588
Airport Hot Spots	482
Airport Signs	85, 86, 87, 93
Airspace Alerts	247
Airspeed bug	442
Airspeed Indicator	64
Airspeed Reference	62, 65, 444–445
Airspeed Reference Bug	62
Alerts	
Arrival	50
Audio voice	50
Alerts, Aircraft	552
Along Track Offset	278, 279
ALT	338
Altimeter	62, 69–70
Altimeter barometric setting	70
Altitude alerting	101
Altitude capture	449
Altitude constraints	293
Altitude Hold Mode	441
Altitude Hold Mode (ALT)	441
Altitude Reference	449
ANT/BFO	162
Antenna stabilization	391, 392
Antenna tilt	387
AOPA	587, 588
AOPA airport directory	481
AOPA Airport Directory	503, 504, 505
Approach	600
Activating	303, 304
ILS	473
Loading	271, 303
Missed	476

Removing	304
WAAS	474
Approach Mode, AFCS	473, 474
Approach Mode (GPS, VAPP, LOC)	459
Arrival procedure	254, 269, 325, 327, 337
Attitude and Heading Reference System (AHRS)	1, 4, 36–37
Attitude & Heading Reference System	559
Attitude indicator	62, 66, 66–67
Attitude Indicator	421
Audio Controller fail-safe operation	188
Audio controls	
SPKR	169
Aural alerts	562
Automatic Flight Control System (AFCS)	2, 431–480
Alerts and annunciations	478–479
Controls	433–434
Example procedures	464–471
Automatic squelch	147
Automatic Thrust Reserve (ATR)	112–113
Autopilot	431, 461–463
Autopilot Disconnect	434
Auto-tuning	157
Auto Zoom	196
Aviation Symbols	207, 254

B

Barometric Altimeter Setting	62
Barometric setting, Altimeter	70
Basic Empty Weight	307
Basic Operating Weight	307
Battery indications	111, 115
Bearing information windows	63
Bearing pointer	77
Bearing source	77

C

Calibrated Airspeed	312
Cargo	308
CAS Window	63
Cautions, CAS	553–555
CDI	300, 316, 327, 336, 340
Chart Not Available	489, 498
ChartView	481, 486, 492
ChartView database	493
Checklists	546–547
CLD TOP Softkey	359
Closest Point	285
COM frequency box	136, 149
COM Frequency Box	62
COM Frequency Tuning	139
Command Bars	437
Comparator	558
COM tuning failure	187

- Controls
 - PFD/MFD -----6–7
 - Control Wheel Steering (CWS)----- 434, 462
 - Copy a Flight Plan -----275
 - Course deviation indicator (CDI) ----- 62
 - Course Deviation Indicator (CDI)----- 78–82
 - Changing scale -----601
 - Course To Altitude -----306
 - Crew Alerting System (CAS)----- 128–132
 - Messages----- 128–132
 - Cruise Speed Control (CSC)----- 115
- D**
 - Data Bar fields, MFD -----49, 50
 - Databases-----4, 581
 - Database Synchronization----- 581, 586
 - Data entry----- 30–31
 - Data Link Receiver-----2, 481, 530, 549, 550
 - Datalink receiver troubleshooting-----549
 - Data Logging ----- 481, 544
 - Day/Night views----- 489, 498
 - Day view ----- 489, 490, 491, 498, 499, 500
 - DB Mismatch ----- 581, 585
 - Dead Reckoning----- 105
 - Decision Height ----- 63
 - Decision Height (DH)-----102
 - Declutter, display-----106
 - Delete Flight Plans-----275
 - Density Altitude -----314
 - Departure procedure -----267, 281, 296, 298
 - Departure Time-----312
 - Dilution of Precision (DOP)----- 39
 - Direct-to----- 248, 250, 251, 252, 289, 290, 327, 340
 - Display controls ----- 6–13
 - DME
 - HOLD mode -----163
 - NAV1 mode -----163
 - NAV2 mode -----163
 - Tuning mode ----- 159, 163
 - DME information----- 77
 - Dual navigation database -----583
- E**
 - ECHO TOP Softkey -----358
 - Electrical indications----- 115, 123
 - Electronic checklists ----- 481–482, 546, 547
 - Emergency frequency-----187
 - Engine Airframe Unit----- 1
 - Engine failure-----129
 - Engine fire -----129
 - Engine Indication System (EIS)----- 111–118
 - Engine maintenance-----127
 - Engine rotation speeds ----- 111, 113
 - Entering Flight ID ----- 164
 - Entertainment audio -----534
 - Entertainment inputs-----179
 - Environmental Control System (ECS) ----- 121–122
 - Estimated Landing Fuel ----- 309, 310
 - Estimated Position Error (EPE) ----- 39
 - Excess Fuel Weight ----- 309, 310, 311
 - Excessive Descent Rate Alert-----408
- F**
 - Fan speed -----388
 - Field of view -----85, 89, 90, 96, 217
 - Field of View (SVS)-----217
 - Flap Indicator----- 111, 118
 - Flight director-----431, 435–436
 - Pitch modes-----439–445
 - Roll modes -----454–456
 - Switching----- 432, 436
 - Flight ID ----- 168
 - Flight instruments----- 61–76
 - Flight Level Change Mode-----444
 - Flight Level Change Mode (FLC) ----- 469, 471
 - Flight Path Marker ----- 85, 87, 91, 92
 - Flight plan
 - Closest point to reference -----285
 - Storing -----600
 - Flight plan data fields: -----278
 - Flight plan import/export messages -----576
 - Flight timer-----55, 56
 - FliteCharts®----- 481, 495, 500, 501, 502
 - FliteCharts expiration -----501
 - FPA ----- 292, 333
 - FPM -----91, 92
 - Frequency
 - Nearest -----244
 - Frequency spacing -----146
 - Frequently asked questions-----599
 - Fuel
 - Efficiency -----314
 - Endurance -----314
 - Remaining-----314
 - Required-----314
 - Fuel indications ----- 111, 115, 124
 - Fuel on Board ----- 309, 314
 - Fuel Statistics-----314
 - Full Mode -----6, 7, 27, 28, 29, 30, 33, 34, 35
- G**
 - Garmin Flight Data Services-----481
 - Garmin SVT™----- 85, 481
 - GFC 700-----431
 - Glidepath-----338
 - Glidepath indicator ----- 63

Glidepath Indicator ----- 72
 Glidepath Mode (GP)----- 450, 459, 474
 Glideslope-----338
 Glideslope Indicator ----- 72
 Glideslope Mode (GS)----- 452, 473
 Global Positioning System (GPS)
 Navigation ----- 248–344
 Receiver information----- 38–40
 Go Around Mode -----453
 Go Around Mode (GA)----- 476–477
 GTX 33 Transponder----- 164

H

Heading Bug----- 62
 Heading indicator----- 62
 Heading Select Mode (HDG)----- 456, 465
 HI SENS-----159
 Horizon Heading ----- 85, 86, 87, 92
 Horizontal scan----- 386, 387
 Horizontal situation indicator (HSI) ----- 62
 Horizontal Situation Indicator (HSI)----- 74–84
 HSI double green arrow----- 151
 HSI magenta arrow----- 151
 HSI single green arrow----- 151

I

IDENT function ----- 168
 ID indicator ----- 156
 ILS approach-----473
 Indicated airspeed ----- 64
 Indicated Altitude-----312
 Inset map ----- 63
 Integrated Avionics Unit (IAU) ----- 1
 Intersection
 Information ----- 227–228
 Interstage Turbine Temperature (ITT)----- 111, 129
 Inverting a flight plan -----274
 IOI ----- 405, 578
 Iridium -----506, 510, 511, 512
 Iridium satellite network----- 506, 510, 518

J

Jeppesen aviation database-----581

L

Landing Field Elevation (LFE) ----- 116
 Landing gear status ----- 111, 117
 Land Symbols-----206
 LNAV-----316
 Log File -----545
 LO SENS -----159
 Low Altitude Annunciation -----102
 Low speed data -----506

LPV ----- 316, 340
 LPV approach-----464

M

Mach number----- 64
 Mach number indicator ----- 62
 Magnetometer ----- 37
 Map Panning ----- 198
 Map symbols -----603
 Marker beacon ----- 158
 Marker Beacon Annunciations----- 100
 Measurement units, changing displayed -----42, 45
 Message advisories-----563, 569, 573, 574
 Metric display, Altimeter ----- 69–70
 MFD Data Bar fields -----49, 50
 MFD/PFD Control Unit ----- 30–31
 Minimum Anti-Ice N1 Bug----- 113, 114, 126
 Minimum Descent Altitude ----- 63
 Minimum Descent Altitude (MDA) -----102
 MISCAMP -----558
 Missed Approach----- 254, 305, 316, 340, 476
 Mode S ----- 164
 Mode S Transponder
 TCAS II Transponder Controls ----- 164
 TCAS II Transponder Mode Selection----- 165
 Morse code identifier----- 156
 Multi Function Display (MFD)
 Controls -----6–7
 Music 1 ----- 179

N

N1 gauge ----- 113–114, 129
 N1 Transient Limit----- 113
 N2 indications----- 113
 National Weather Service-----368
 NAV1 audio-----152
 NAV2 audio-----152
 NAV frequency box -----133
 Navigation database -----293
 Navigation Map-----251
 Navigation Mode, AFCS----- 467–468
 Navigation mode selection----- 151
 Navigation Mode (VOR, GPS, LOC, BC) -----457
 Navigation source ----- 78–80
 Nav radio selection ----- 151
 NAV Receiver Tuning ----- 152
 Nearest
 Airports ----- 244–247
 VOR ----- 244–245
 nearest airport----- 225, 229, 232, 235, 239
 Nearest Airport----- 225, 226, 229, 232, 235, 239
 Minimum Runway Length ----- 225, 226
 Surface Matching -----226

NEXRAD Softkey	355
Night view	489, 498
NO COMP	558
Non-path descent	448, 471–472
Normal display operation	32
NOTAMs	486
O	
OBS Mode	83–84
Obstacles	565, 566
Odometer	55, 57
Oil, engine	111, 113
Omni Bearing Selector (OBS)	600–601
Other Statistics	312, 314
Outside Air Temperature (OAT)	112
P	
Parallel Track	279, 281
Passenger address	176
Passenger(s)	308
PA system	176
Pathways	86, 87, 88, 89, 90, 91
PFD mode switch	32
Pilot and Stores Weight	307
Pitch Hold Mode (PIT)	440
Pitch indication	66
Pitch modes, flight director	439–445
Pitch Reference	440
Power-up, system	4
Pressure, oil	111, 113
Pressurization	116
Primary Flight Display (PFD)	
Controls	6–7
Procedure examples, AFCS	464–471
R	
RA	420
Radar altitude	103
RAIM	300
Receiver Autonomous Integrity Monitoring (RAIM)	40–41, 599
Removing Flight Plan Items	276
Required Vertical Speed	334
Required Vertical Speed Indicator	334
Reversionary Mode	85, 107
Reversionary sensor	559
Reversionary Sensor Window	63
ROC	405, 577, 578
Roll Hold Mode (ROL)	455
Roll modes, flight director	454–457
Roll Reference	455
Runway	85, 93, 94
Minimum length	45
RX Indicator	138
S	
SafeTaxi®	481, 482, 483, 484, 485
SafeTaxi database	485
Satellite Radio	530, 531, 532
SBAS	599
Scheduler	481–482, 535
SD card	59
Sector scan	390
Secure Digital (SD) card	581
Selected Altitude	62, 101, 443, 444, 445, 449, 464
Selected altitude bug	62
Selected Altitude Capture Mode	441, 443
Selected Altitude Capture Mode (ALTS)	446
Selected Altitude Intercept Arc	218
Selected course	63
Selected Course	457, 460
Selected heading	63, 74
Selected Heading	433
Selecting a COM radio	136, 149
Sensor	559
Sequencing, automatic	601
Sequencing waypoints, suspend	84
Servos	2
Servos, AFCS	431
Simultaneous COM Operation	178
SiriusXM	
Radio	346
Receiver troubleshooting	549
SiriusXM Weather	346
NEXRAD	355
XM Satellite Weather	
Activating	346
SiriusXM radio entertainment	179
SiriusXM radio volume	534
SiriusXM Satellite Radio	2
SiriusXM Weather	
AIREPs	372
Icing	370
PIREPs	372
Turbulence	370, 371
Slip/Skid indicator	62, 67
Softkeys	63
Speaker	169
Speed brake status	111, 117
Split Mode	6, 27, 28, 32, 33, 34, 35
Standby frequency	
ADF	159
Standby Navigation Database	583
Static air temperature (SAT)	63, 97
Stereo headsets	169

Stuck microphone----- 187
 Sunrise----- 313
 Sunset ----- 313
 SVT ----- 575
 SVT troubleshooting----- 107
 Symbols, map----- 603
 Synoptics ----- 119–126
 Synthetic vision (SVT) ----- 85
 System alerting----- 100
 System annunciations ----- 560
 System ID----- 506
 System power-up ----- 4
 System Status Page----- 52
 System time----- 62

T

TA ----- 420
 Takeoff Mode----- 453
 TAS ----- 569
 TAS Traffic
 Non-Threat Traffic ----- 419
 PA----- 419
 Proximity Advisory----- 419
 TAWS ----- 101, 418, 577, 578
 TAWS-A ----- 578
 TAWS Annunciation ----- 63
 TAWS-B----- 399
 TCAS II Traffic
 Operation----- 425
 TCAS II Alerts ----- 420
 Telephone----- 2, 481, 506, 510
 Temperature, oil----- 111, 113
 Temperature, Outside Air (OAT)----- 112
 Terrain ----- 405, 565, 577, 578
 Color indications ----- 605
 Terrain Awareness and Warning System----- 399
 Terrain Awareness and Warning System (TAWS)----- 100
 Text message ----- 518, 523
 Thrust rating ----- 114
 Timer
 Flight----- 58
 Timer, PFD generic ----- 55
 TOD ----- 333, 334
 Top of Descent ----- 333, 334
 Total air temperature (TAT)----- 62, 97
 Track ----- 74
 Track indicator----- 62, 74
 Traffic
 Voice alerts----- 100
 Traffic annunciation----- 63, 100
 Traffic symbols----- 92

Transponder code entry----- 166
 Transponder data box ----- 133
 Transponder standby mode ----- 165
 Transponder status box ----- 62
 Trend Vector
 Turn Rate ----- 76
 Trend vector, airspeed ----- 64
 Trim Indicator----- 111, 118, 131
 Trip Planning----- 307, 312, 313, 314
 Trip Statistics----- 313, 314
 True Airspeed ----- 314
 True airspeed (TAS) ----- 62
 Turn anticipation ----- 601
 Turn Rate Indicator ----- 62, 76
 TX indicator----- 138

U

Unable to display chart ----- 489, 498
 Updating Jeppesen databases ----- 493

V

VDI ----- 334, 335
 Vertical deviation ----- 448
 Vertical deviation guidance ----- 293
 Vertical Deviation Indicator ----- 334
 Vertical Deviation Indicator (VDI)----- 72
 Vertical navigation----- 293
 Direct-to ----- 291
 Vertical Navigation (VNV)
 Flight control----- 445–449
 Vertical Path Tracking Mode (VPTH) ----- 446–447, 470
 Vertical speed guidance----- 293
 Vertical Speed Indicator----- 62, 63, 421
 Vertical speed indicator (VSI) ----- 71
 Vertical Speed Mode ----- 443
 VNV ----- 333, 598
 VNV guidance
 Enabling ----- 290
 VNV indications, PFD----- 99
 VNV Target Altitude ----- 446–449
 VNV Target Altitude Capture Mode (ALTV) ----- 449
 Voltmeter, battery----- 111, 115
 Volume level
 ADF----- 159
 VOR
 Nearest ----- 244–245
 VOR selection----- 151
 VSI----- 335
 Vspeeds ----- 63, 65–66
 VS TGT----- 292

W

WAAS-----	316, 464, 566, 599
WAAS precision approach-----	474
WATCH-----	392
Waypoint	
Automatic sequencing-----	601
Weather Attenuated Color Highlight-----	392
Wi-Fi-----	2, 481, 506, 527
Wind-----	193, 215
Wind data-----	63
Wings level-----	455

Z

Zero Pitch Line-----	87, 92
Zoom	
Auto-----	196

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