



GARMIN®

G1000® Integrated Flight Deck Pilot's Guide



Beechcraft 200/B200 Series

Copyright © 2008-2010 Garmin Ltd. or its subsidiaries. All rights reserved.

This manual reflects the operation of System Software version 0985.03 or later for the Hawker Beechcraft 200/B200 Series. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

Garmin International, Inc., 1200 East 151st Street, Olathe, Kansas 66062, U.S.A.
Tel: 913/397.8200 Fax: 913/397.8282

Garmin AT, Inc., 2345 Turner Road SE, Salem, OR 97302, U.S.A.
Tel: 503/391.3411 Fax: 503/364.2138

Garmin (Europe) Ltd., Liberty House, Bulls Copse Road, Hounsdown Business Park, Southampton, SO40 9RB, U.K
Tel: 44/0870.8501241 Fax: 44/0870.8501251

Garmin Corporation, No. 68, Jangshu 2nd Road, Shijr, Taipei County, Taiwan
Tel: 886/02.2642.9199 Fax: 886/02.2642.9099

For after-hours emergency, aircraft on ground (AOG) technical support for Garmin panel mount and integrated avionics systems, please contact Garmin's AOG Hotline at 913.397.0836.

Website Address: www.garmin.com

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express written permission of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed for personal use, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin® and G1000® are registered trademarks of Garmin Ltd. or its subsidiaries, and ESP™ is a trademark of Garmin Ltd. or its subsidiaries. These trademarks may not be used without the express permission of Garmin.

Bendix/King® and Honeywell® are registered trademarks of Honeywell International, Inc.; Becker® is a registered trademark of Becker Flugfunkwerk GmbH; NavData® is a registered trademark of Jeppesen, Inc.; and XM® is a registered trademark of XM Satellite Radio, Inc..

LIMITED WARRANTY

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, Garmin will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you.

Garmin retains the exclusive right to repair or replace the unit or software, or to offer a full refund of the purchase price, at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, visit the Garmin Website at "<http://www.garmin.com>" or contact Garmin Customer Service at 800-800-1020.



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



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



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



WARNING: Do not use outdated database information. Databases used in the G1000 system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.



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



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



WARNING: NEXRAD weather data is to be used for long-range planning purposes only. Due to inherent delays in data transmission and the relative age of the data, NEXRAD weather data should not be used for short-range weather avoidance.



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



WARNING: The Garmin G1000, as installed in this aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the G1000. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.



WARNING: The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the Garmin G1000 utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the G1000 can be misused or misinterpreted and, therefore, become unsafe.



WARNING: To reduce the risk of unsafe operation, carefully review and understand all aspects of the G1000 Pilot's Guide documentation and the G1000 Integrated Avionics System in the Airplane Flight Manual. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the G1000 to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.



WARNING: The illustrations in this guide are only examples. Never use the G1000 to attempt to penetrate a thunderstorm. Both the FAA Advisory Circular, Subject: Thunderstorms, and the 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 G1000 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 Garmin G1000 does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and the pilot's authority to operate this device under FAA/FCC regulations.



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



NOTE: All visual depictions contained within this document, including screen images of the G1000 panel and displays, are subject to change and may not reflect the most current G1000 system and aviation 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: Interference from GPS repeaters operating inside nearby hangars can cause an intermittent loss of attitude and heading displays while the aircraft is on the ground. Moving the aircraft more than 100 yards away from the source of the interference should alleviate the condition.



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



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

Record of Revisions				
Part Number	Revision	Date	Page Range	Description
190-00928-00	A	12/3/08	i – I-6	Initial Release for GDU 9.12
190-00928-01	A	7/24/09	i – I-6	Added GDU 10.00 changes Added TAWS A functionality Added radar altimeter functionality
190-00928-02	A	10/20/10	i – I-6	Added GDU 11.12 changes Added GTS 820/850 Added GDL 59/GSR 56 Added Worldwide Weather Added Profile View Added Selected Altitude Arc Added Electronic Stabilization & Protection (ESP™)

SECTION 1 SYSTEM OVERVIEW	
1.1	System Description 1
1.2	Line Replaceable Units (LRU) 2
1.3	G1000 Controls 8
	PFD Controls 8
	Controls Associated With the MFD 10
	AFCS Controls 12
	Audio Panel Controls 14
1.4	Secure Digital Cards 16
1.5	System Power-up 17
1.6	System Operation 18
	Normal Operation 18
	Reversionary Mode 19
	AHRS Operation 20
	G1000 System Annunciations 22
	Softkey Function 22
	GPS Receiver Operation 29
1.7	Accessing G1000 Functionality 34
	Menus 34
	MFD Page Groups 34
	MFD System Pages 38
1.8	Display Backlighting 52
SECTION 2 FLIGHT INSTRUMENTS	
2.1	Flight Instruments 56
	Airspeed Indicator 56
	Attitude Indicator 59
	Altimeter 61
	Vertical Speed Indicator (VSI) 64
	Vertical Deviation 64
	Horizontal Situation Indicator (HSI) 65
	Course Deviation Indicator (CDI) 70
2.2	Supplemental Flight Data 78
	Temperature Displays 78
	Wind Data 79
	Vertical Navigation (VNV) Indications 80
2.3	PFD Annunciations and Alerting Functions 81
	G1000 Alerting system 81
	Marker Beacon Annunciations 83
	Traffic Annunciation 83
	TAWS Annunciations 84
	Altitude Alerting 84
	Low Altitude Annunciation 85
	Minimum Descent Altitude/Decision Height Alerting 85
	Radar Altimeter 86
2.4	Abnormal Operations 88
	Abnormal GPS Conditions 88
	Unusual Attitudes 89
SECTION 3 ENGINE INDICATION SYSTEM	
3.1	EIS Display 92
	Interstage Turbine Temperature 94
	Torque 94
	Tachometer (RPM) 95
	Turbine Speed 96
	Fuel Flow 96
	Oil Pressure 97
	Oil Temperature 97
3.2	EIS Display in Reversionary Mode 98
	Reversionary Display 99
SECTION 4 AUDIO PANEL AND CNS	
4.1	Overview 101
	Audio Panel Volume Control 101
	PFD Controls and Frequency Display 102
	Audio Panel Controls 104
	Control Unit 106
4.2	COM Operation 108
	COM Transceiver Selection and Activation 108
	COM Transceiver Manual Tuning 109
	Quick-Tuning and Activating 121.500 MHz 111
	Auto-Tuning the COM Frequency 112
	Frequency Spacing 116
	Automatic Squelch 117
	Volume 117
4.3	NAV Operation 118
	NAV Radio Selection and Activation 118
	NAV Receiver Manual Tuning 119
	Auto-Tuning a NAV Frequency from the MFD 122
	Marker Beacon Receiver 127
	DME Tuning 128
4.4	GTX 33 Mode S Transponders 129
	Transponder Controls 129
	Transponder Mode Selection 130
	Entering a Transponder Code 133
	IDENT Function 135

4.5 Additional Audio Panel Functions	136	5.5 Direct-to-Navigation	200
Power-Up	136	5.6 Flight Planning	207
Mono/Stereo Headsets	136	Flight Plan Creation	208
Speaker	136	Adding Waypoints to an Existing Flight Plan	213
Unmuted Inputs	136	Adding Airways to a Flight Plan	215
Intercom	137	Adding Procedures to a Stored Flight Plan	218
Passenger Address (PA) System	138	Flight Plan Storage	225
Simultaneous COM Operation	138	Flight Plan Editing	227
Clearance Recorder and Player	139	Along Track Offsets	231
4.6 Audio Panels Preflight Procedure	140	Parallel Track	232
4.7 Abnormal Operation	142	Activating a Flight Plan Leg	235
Stuck Microphone	142	Inverting a Flight Plan	236
COM Tuning Failure	142	Flight Plan Views	237
PFD Failure, Dual System	143	Closest Point of FPL	239
Audio Panel Fail-Safe Operation	144	5.7 Vertical Navigation	240
Reversionary Mode	144	Altitude Constraints	242
SECTION 5 FLIGHT MANAGEMENT		5.8 Procedures	246
5.1 Introduction	145	Departures	246
Navigation Status Box	146	Arrivals	249
5.2 Using Map Displays	148	Approaches	251
Map Orientation	148	5.9 Trip Planning	257
Map Range	150	Trip Planning	257
Map Panning	152	Weight Planning	261
Measuring Bearing and Distance	157	Weight Caution And Warning Conditions	263
Topography	158	5.10 RAIM Prediction	264
Map Symbols	161	5.11 Navigating a Flight Plan	268
Airways	167	5.12 Abnormal Operation	297
Track Vector	169	SECTION 6 HAZARD AVOIDANCE	
Wind Vector	170	6.1 XM Satellite Weather	299
Nav Range Ring	171	Activating Services	299
Fuel Range Ring	172	Using XM Satellite Weather Products	301
Field of View (SVS)	173	Weather Softkeys on the Weather Data Link Page	304
Selected Altitude Intercept Arc	174	6.2 Worldwide Weather	331
5.3 Waypoints	175	GFDS Weather Data Requests	338
Airports	176	Worldwide Weather Products	342
Intersections	183	Abnormal Operations	355
NDBs	185	6.3 Airborne Color Weather Radar	357
VORs	187	System Description	357
User Waypoints	189	Principles of Pulsed Airborne Weather Radar	357
5.4 Airspaces	195	Safe Operating Distance	361

Basic Antenna Tilt Setup	362	SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM	
Practical Application Using the Basic Tilt Setup	362	7.1 AFCS Overview	455
Weather Mapping and Interpretation	363	Additional AFCS Controls	457
Ground Mapping and Interpretation	374	7.2 Flight Director Operation	458
6.4 Stormscope	375	Activating the Flight Director	458
Setting Up Stormscope on the Navigation Map	376	AFCS Status Box	459
Selecting the Stormscope Page	379	Flight Director Modes	460
6.5 TAWS-B	381	Switching Flight Directors	460
Displaying TAWS-B Data	382	Command Bars	461
TAWS-B Alerts	386	Underspeed Protection	462
System Status	391	7.3 Vertical Modes	464
6.6 Profile View Terrain	393	Pitch Hold Mode (PIT)	465
Profile View Display	394	Selected Altitude Capture Mode (ALTS)	466
6.7 TAWS-A	397	Altitude Hold Mode (ALT)	467
TAWS-A Page	399	Vertical Speed Mode (VS)	468
TAWS-A Alerts	401	Flight Level Change Mode (FLC)	469
System Status	413	Vertical Navigation Modes (VPTH, ALTV)	471
TAWS-A Abnormal operations	413	Glidepath Mode (GP)	476
6.8 Traffic Information Service (TIS)	415	Glideslope Mode (GS)	478
Traffic Map Page	419	Takeoff (TO) and Go Around (GA) Modes	479
TIS Alerts	420	Level Mode (LVL)	480
System Status	421	7.4 Lateral Modes	481
6.9 Garmin GTS Traffic	424	Roll Hold Mode (ROL)	482
Theory of operation	424	Low Bank Mode	482
Traffic Alerts	427	Heading Select Mode (HDG)	483
System Test	428	Navigation Modes (GPS, VOR, LOC)	484
Operation	429	Approach Modes (GPS, VAPP, LOC)	486
6.10 L-3 Skywatch Traffic	438	Backcourse Mode (BC)	488
TAS Symbology	438	Level Mode (LVL)	489
Operation	439	7.5 Autopilot and Yaw Damper Operation	490
Altitude Display	442	Flight Control	490
Traffic Map Page Display Range	442	Engagement	491
TAS Alerts	444	Control Wheel Steering	491
System Status	444	Disengagement	492
6.11 Honeywell KTA 870 Traffic	446	7.6 Example Flight Plan	493
TAS Symbology	446	Departure	494
Operation	447	Intercepting a VOR Radial	496
Altitude Display	450	Flying a Flight Plan/GPS Course	497
Traffic Map Page Display Range	450	Descent	498
TAS Alerts	452	Approach	504
System Status	453	Go Around/Missed Approach	508

7.7 AFCS Annunciations and Alerts	510
AFCS Status Alerts	510
Overspeed Protection.....	511

SECTION 8 ADDITIONAL FEATURES

8.1 Synthetic Vision System (SVS)	514
SVS Operation	515
SVS Features	517
Field of View	525
8.2 SafeTaxi	527
SafeTaxi Cycle Number and Revision	530
8.3 ChartView	533
ChartView Softkeys.....	533
Terminal Procedures Charts	534
Chart Options.....	542
Day/Night View	548
ChartView Cycle Number and Expiration Date	550
8.4 FliteCharts	553
FliteCharts Softkeys	553
Terminal Procedures Charts	554
Chart Options.....	561
Day/Night View	565
FliteCharts Cycle Number and Expiration Date.....	567
8.5 AOPA Airport Directory	570
AOPA Database Cycle Number and Revision	571
8.6 Satellite Telephone and Data Link Services	573
Registering with garmin flight data Services.....	573
Disable/Enable Iridium Transceiver.....	576
Telephone Communication	577
Text Messaging (SMS).....	590
System Data Logging	606
8.7 XM Radio Entertainment	612
Activating XM Satellite Radio Services.....	612
Using XM Radio	614
8.8 Scheduler	617
8.9 Flight Data Logging	619
8.10 Electronic Stability & Protection (ESP™)	621
Roll Engagement	622
Pitch Engagement.....	624
Angle of Attack Protection.....	625
High Airspeed Protection.....	625

8.11 Abnormal Operation	626
SVS Troubleshooting	626
Reversionary Mode.....	626
Unusual Attitudes	627

APPENDICES

Annunciations and Alerts	631
Alert Level Definitions	632
Aircraft Alerts	633
Comparator Annunciations	635
Reversionary Sensor Annunciations	636
G1000 System Annunciations	636
G1000 System Message Advisories.....	639
AFCS Alerts	651
TAWS ALERTS	652
SD Card Use	655
Jeppesen Databases.....	655
Garmin Databases	658
Glossary	665
Frequently Asked Questions	673
Map Symbols	677

INDEX

Index	I-1
--------------------	-----

SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the G1000 Integrated Flight Deck as installed in the Beechcraft 200/B200 Series. The G1000 system is an integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the pilot through large-format displays. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1040A** Primary Flight Display (PFD)
- **GDU 1500** Multi Function Display (MFD)
- **GIA 63W** Integrated Avionics Unit
- **GDC 74B** Air Data Computer (ADC)
- **GEA 71** Engine/Airframe Unit
- **GRS 77** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer
- **GMA 1347D** Dual Audio System with Integrated Marker Beacon Receiver
- **GTX 33/33D** Extended Squitter Mode S Transponder
- **GDL 69A** Satellite Data Link Receiver
- **GWX 68** Weather Radar
- **GCU 477** MFD Control Unit
- **GDL 59** Data Link
- **GSR 56** Iridium Transceiver
- **GTS 820/850** Traffic Avoidance System (optional)
- **GMC 710** AFCS Control Unit
- **GA 58** Directional Antenna
- **GTP 59** Outside Air Temperature (OAT) Probe
- **GSA 80** AFCS Servos
- **GSM 85A/GSM 86** Servo Gearboxes

A top-level G1000 system block diagram is shown in Figure 1-1 (it does not include the GSM 85A/GSM 86).



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

In the Beechcraft 200/B200 Series, the GFC 700 Automated Flight Control System (AFCS) provides the flight director (FD), autopilot (AP), and yaw damper (YD) functions of the G1000 system.

1.2 LINE REPLACEABLE UNITS (LRU)

- **GDU 1040A** (2) – Each unit is configured as a PFD that features a 10.4-inch LCD with 1024 x 768 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. These units communicate with each other, the MFD, and with the on-side GIA 63W Integrated Avionics Unit through a High-Speed Data Bus (HSDB) connection.



- **GDU 1500** (1) – Features a 15-inch LCD with 1024 x 768 resolution and is configured as an MFD. This unit is linked to both PFDs via HSDB connection.



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



- **GDC 74B (2)** – Processes data from the pitot/static system as well as the OAT probe. This unit provides pressure altitude, airspeed, vertical speed and OAT information to the G1000 system, and it communicates with the on-side GIA 63W, on-side GDU 1040A, GDU 1040A MFD, and on-side GRS 77, using an ARINC 429 digital interface (it also interfaces directly with the on-side GTP 59). The GDC 74B is designed to operate in Reduced Vertical Separation Minimum (RVSM) airspace.



- **GEA 71 (2)** – Receives and processes signals from the engine and airframe sensors. This unit communicates with both GIA 63Ws using an RS-485 digital interface.



- **GRS 77 (2)** – Provides aircraft attitude and heading information via ARINC 429 to both the on-side GDU 1040A, the GDU 1040A MFD, and the on-side GIA 63W. The GRS 77 contains advanced sensors (including accelerometers and rate sensors) and interfaces with the on-side GMU 44 to obtain magnetic field information, with the GDC 74B to obtain air data, and with both GIA 63Ws to obtain GPS information. AHRS modes of operation are discussed later in this document.



- **GMU 44 (2)** – Measures local magnetic field. Data is sent to the GRS 77 for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77 and communicates with the GRS 77, using an RS-485 digital interface.



- **GMA 1347D** (2) – Integrates NAV/COM digital audio, intercom system and marker beacon controls, and is installed in dual configuration on the outboard side of PFD1 and PFD2. This unit also enables the manual control of the display reversionary mode (red **DISPLAY BACKUP** button) and communicates with the on-side GIA 63W, using an RS-232 digital interface.



- **GTX 33/33D** (2) – Solid-state transponders that provide Modes A, C, S and ADS-B capability. Both transponders can be controlled from either PFD, and only one transponder can be active at a time. Each transponder communicates with the on-side GIA 63W through an RS-232 digital interface.



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



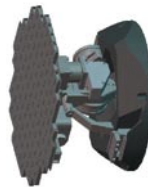
- **GDL 59** (1) – GDL 59 operation is performed with the MFD through the HSDB. Connectivity with the GSR 56 for the Iridium telephone feature is through the RS-232 bus.



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



- **GWX 68** (1) – Provides airborne weather and ground mapped radar data to the MFD, through the GDL 69A, via HSDB connection.



- **GCU 477** (1) – Provides the Flight Management System (FMS) controls for the MFD through an RS-232 digital interface.



- **GMC 710** (1) – Provides the controls for the GFC 700 AFCS through an RS-232 digital interface allowing communication with both PFDs.



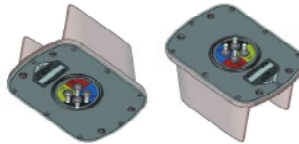
- **GTP 59** (2) – Provides Outside Air Temperature (OAT) data to the on-side GDC 74B.



- **GTS 820/850** – The GTS 820 Traffic Advisory System (TAS) and GTS 850 TCAS I use active interrogations of Mode S and Mode C transponders to provide Traffic Advisories to the pilot independent of the air traffic control system.



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



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



- **GSA 80 (4), and GSM 85A/GSM 86 (4)** – The GSA 80 servos are used for the automatic control of roll, pitch, and yaw, and pitch trim. These units interface with each GIA 63W.

The GSM 85A or GSM 86 servo gearbox is responsible for transferring the output torque of the GSA 80 servo actuator to the mechanical flight-control surface linkage.



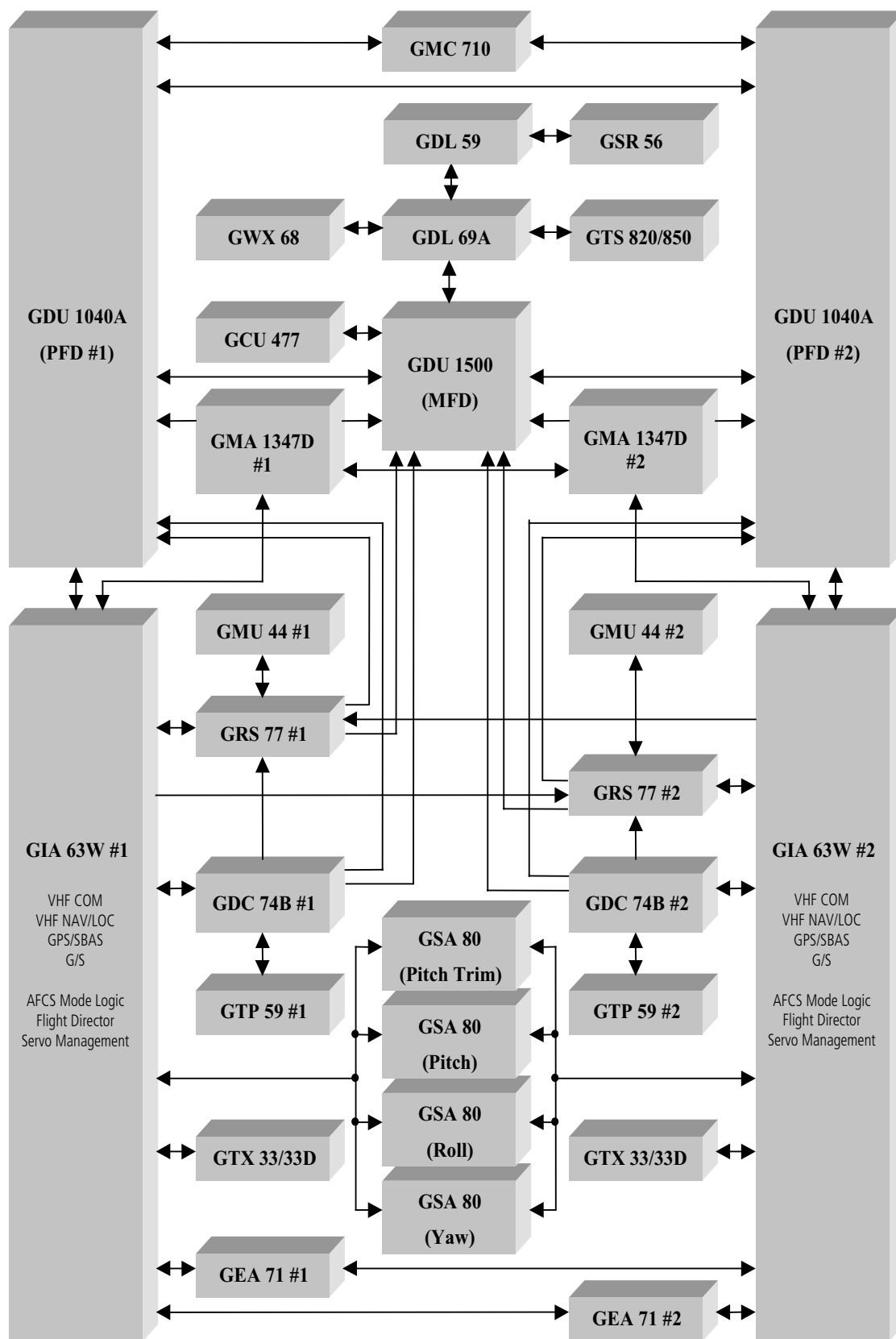


Figure 1-1 G1000 System (LRU Configuration)

1.3 G1000 CONTROLS



NOTE: The Audio Panel (GMA 1347D) and AFCS controls (GMC 710) are described in the CNS & Audio Panel and AFCS sections respectively.

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

PFD CONTROLS

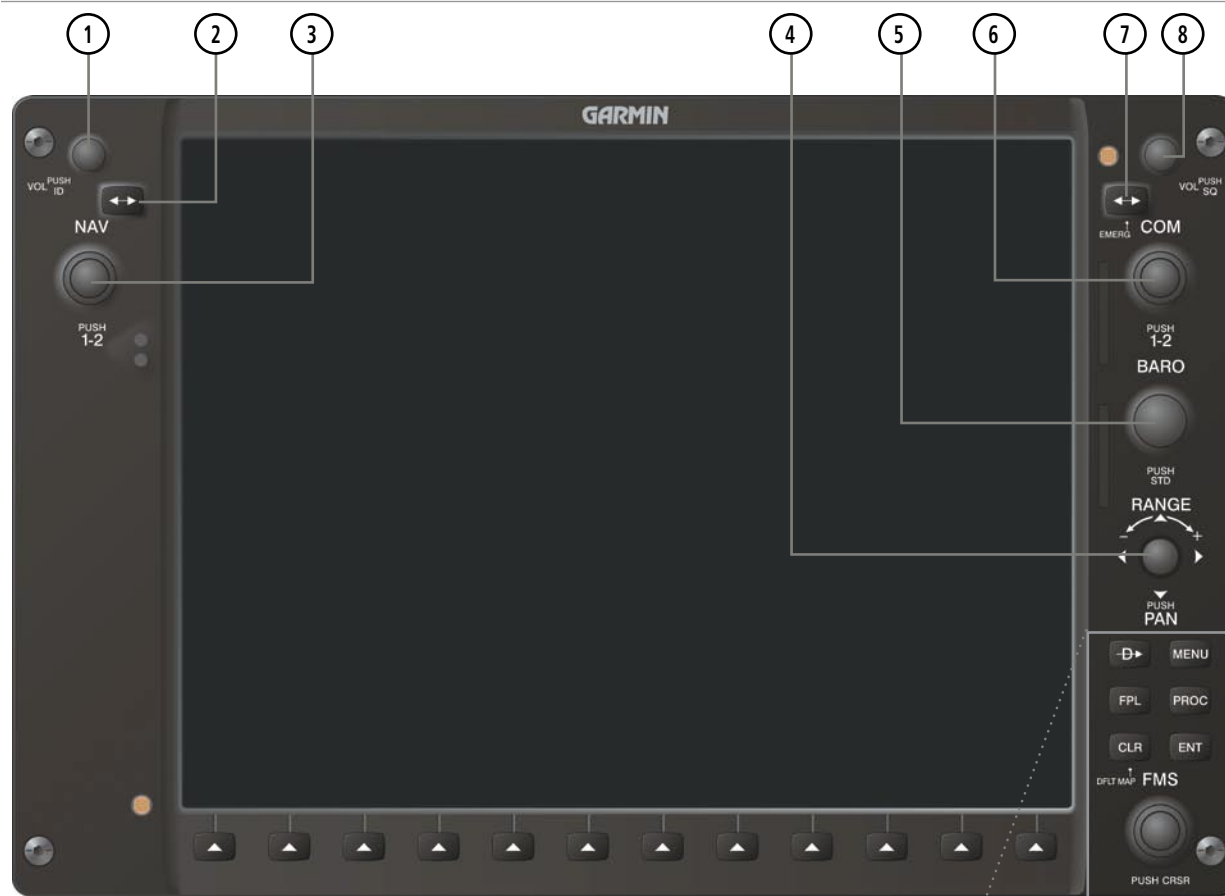
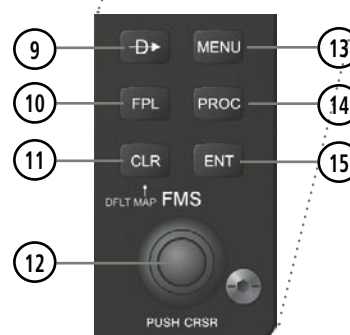



Figure 1-2 PFD Controls



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

- ① **NAV VOL/ID Knob** – Controls NAV audio volume level. Press to toggle the Morse code identifier audio ON and OFF. Volume level is shown in the NAV frequency field as a percentage.
- ② **NAV Frequency Transfer Key** – Toggles the standby and active NAV frequencies.
- ③ **Dual NAV Knob** – Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to switch the tuning box (cyan box) between NAV1 and NAV2.
- ④ **Joystick** – Changes the map range when rotated. Activates the map pointer when pressed.
- ⑤ **BARO Knob** – Sets the altimeter barometric pressure. Press to enter standard pressure (29.92).
- ⑥ **Dual COM Knob** – Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to switch the tuning box (cyan box) between COM1 and COM2.
- ⑦ **COM Frequency Transfer Key** – Toggles the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.
- ⑧ **COM VOL/SQ Knob** – Controls COM audio volume level. Volume level is shown in the COM frequency field as a percentage. Press to turn the COM automatic squelch ON and OFF.
- ⑨ **Direct-to Key** () – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (the destination is either specified by the identifier, chosen from the active route, or taken from the map pointer position).
- ⑩ **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan.
- ⑪ **CLR Key** – Erases information, cancels entries, or removes page menus. Pressing and holding this key displays the Navigation Map Page automatically.
- ⑫ **Dual FMS Knob** – Flight Management System Knob. Press the **FMS** Knob to turn the selection cursor ON and OFF. When the cursor is ON, data may be entered in the applicable window by turning the small and large knobs. The large knob moves the cursor on the page, while the small knob selects individual characters for the highlighted cursor location.
- ⑬ **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features or make setting changes that relate to particular pages.
- ⑭ **PROC Key** – Gives access to IFR departure procedures (DPs), arrival procedures (STARs) and approach procedures (IAPs) for a flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. These procedures can then be loaded into the active flight plan. If a flight plan is not used, both the desired airport and the desired procedure may be selected.
- ⑮ **ENT Key** – Validates or confirms a menu selection or data entry.

CONTROLS ASSOCIATED WITH THE MFD

The controls for the MFD (GDU 1500) are located on both the MFD bezel and the Control Unit (GCU 477). The bottom portion of the MFD bezel features 12 softkeys that are designed to perform various functions depending upon the specific page being displayed. These softkeys are discussed throughout the Pilot's Guide documentation.

The following list provides an overview of the controls located on the Control Unit (see Figure 1-3):

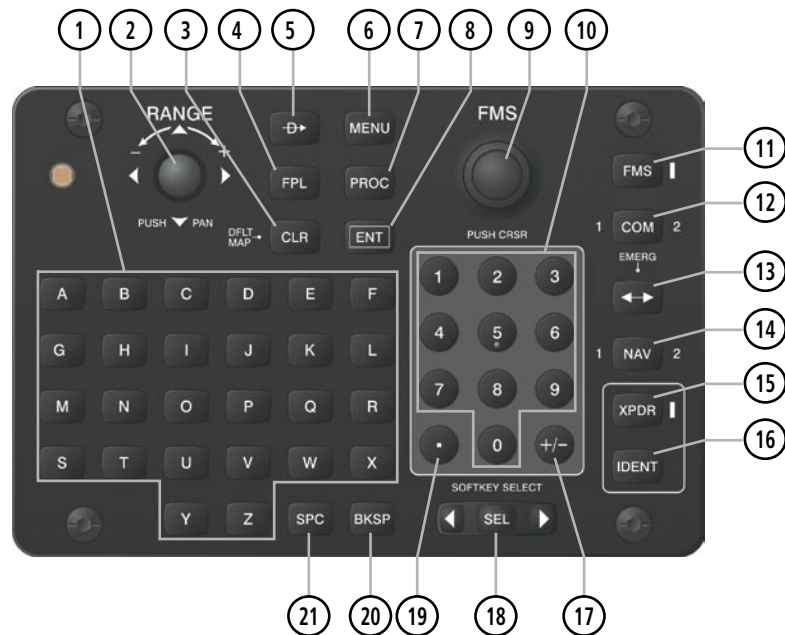



Figure 1-3 Control Unit (GCU 477)

- ① **Alphabetic Keys** – Allow the user to enter letters quickly, without having to select individual characters with the **FMS** Knob.
- ② **Joystick** – Changes the map range when rotated. Activates the map pointer when pressed.
- ③ **CLR Key** – Erases information, cancels entries, or removes page menus. Pressing and holding this key displays the Navigation Map Page automatically.
- ④ **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan, or for accessing stored flight plans.
- ⑤ **Direct-to Key** () – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (the destination is either specified by the identifier, chosen from the active route, or taken from the map pointer position).
- ⑥ **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features or make setting changes that relate to particular pages.
- ⑦ **PROC Key** – Gives access to IFR departure procedures (DPs), arrival procedures (STARs) and approach procedures (IAPs) for a flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. These procedures can then be loaded into the active flight plan. If a flight plan is not used, both the desired airport and the desired procedure may be selected.

- ⑧ **ENT Key** – Validates or confirms a menu selection or data entry.
- ⑨ **Dual FMS Knob** – Flight Management System Knob. When the **FMS** Key is pressed, this knob selects the MFD page to be viewed. The large knob selects a page group (MAP, WPT, AUX, NRST), while the small knob selects a specific page within the page group. Pressing the **FMS** Knob turns the selection cursor ON and OFF. When the cursor is ON, data may be entered in the applicable window by turning the small and large knobs. In this case, the large knob moves the cursor on the page, while the small knob selects individual characters for the highlighted cursor location. This knob also tuning capability for the COM and NAV radios when the appropriate COM or NAV key is pressed. When the **XPDR** Key is pressed, the transponder code may be entered using the **FMS** Knob.
- ⑩ **FMS Key** – Sets the **FMS** Knob to control FMS functions on the MFD. When pressed, an annunciator next to the key illuminates indicating adjustment of the **FMS** Knob will now affect FMS functions.
- ⑪ **Numeric Keys** – Allow the user to enter numbers quickly, without having to select individual characters with the **FMS** Knob.
- ⑫ **COM Key** – Sets the **FMS** Knob to control tuning of the COM radios. The first press will select COM1, as indicated by an illuminated “1” to the left of the key. Press again to select COM2. This is annunciated with a “2” to the right of the key. Each subsequent press of the **COM** Key will switch between COM1 and COM2. Use the **FMS** Knob to tune the selected COM.
- ⑬ **Frequency Transfer Key (EMERG)** – Switches the standby and active COM or NAV frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.
- ⑭ **NAV Key** – Sets the **FMS** Knob to control tuning of the NAV radios. The first press will select NAV1, as indicated by an illuminated “1” to the left of the key. Press again to select NAV2. This is annunciated with a “2” to the right of the key. Each subsequent press of the **NAV** Key will switch between NAV1 and NAV2. Use the **FMS** Knob to tune the selected NAV.
- ⑮ **XPDR Key** – Sets the **FMS** Knob to enter transponders codes. When pressed, an annunciator next to the key illuminates indicating the **FMS** Knob can now be used for transponder code entry.
- ⑯ **IDENT Key** – Activates transponder IDENT function.
- ⑰ **Plus (+) Minus (-) Key** – Toggles a (+) or (-) character.
- ⑱ **SEL Key** – The center of this key activates the selected MFD softkey, while the right and left arrows move the softkey selection box to the right and left, respectively.
- ⑲ **Decimal Key** – Enters a decimal point.
- ⑳ **BKSP Key** – Moves the cursor back one character space.
- ㉑ **SPC Key** – Adds a space character.

AFCS CONTROLS



NOTE: With the exception of the **FD** and **SPD** Keys, if a key is selected, its respective annunciator is illuminated.

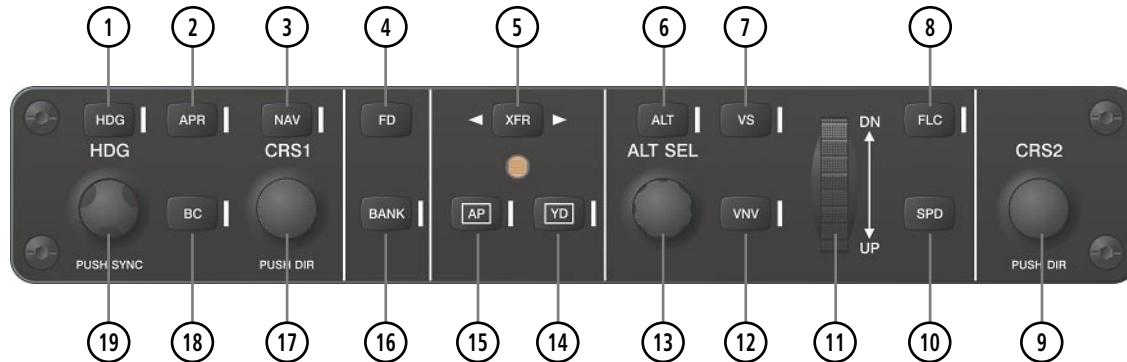


Figure 1-4 AFCS Control Unit (GMC 710)

The GFC 700 AFCS is mainly controlled through the GMC 710 AFCS Control Unit. The AFCS Control Unit consists of the following controls:

- ① **HDG Key** – Selects/deselects Heading Select Mode.
- ② **APR Key** – Selects/deselects Approach Mode.
- ③ **NAV Key** – Selects/deselects Navigation Mode.
- ④ **FD Key** – Activates/deactivates the flight director in the default pitch and roll modes. If the autopilot is engaged, the **FD** Key is disabled.
- ⑤ **XFR Key** – Switches the autopilot between the pilot-side and the copilot-side flight directors. This selection also selects which air data computer is communicating with the active transponder. Upon power-up, the pilot-side FD is selected.
- ⑥ **ALT Key** – Selects/deselects Altitude Hold Mode.
- ⑦ **VS Key** – Selects/deselects Vertical Speed Mode.
- ⑧ **FLC Key** – Selects/deselects Flight Level Change Mode.
- ⑨ **CRS2 Knob** – Sets the copilot-selected course on the HSI of PFD2 when the VOR1, VOR2, or OBS/SUSP mode is selected. Pressing this knob centers the CDI on the currently selected VOR. The copilot-selected course provides course reference to the copilot-side flight director when operating in Navigation and Approach modes.
- ⑩ **SPD Key** – Switches the Flight Level Change mode reference speed between IAS and MACH number.
- ⑪ **NOSE UP/DN Wheel** – Controls the active mode reference for the Pitch, Vertical Speed, and Flight Level Change modes.

- ⑫ **VNV Key** – Selects/deselects Vertical Navigation mode.
- ⑬ **ALT SEL Knob** – Sets the selected altitude in the Selected Altitude Box. In addition to providing the standard G1000 altitude alerter function, selected altitude provides an altitude setting for the Altitude Capture/Hold mode of the AFCS.
- ⑭ **YD Key** – Engages/disengages the yaw damper.
- ⑮ **AP Key** – Engages/disengages the autopilot.
- ⑯ **BANK Key** – Selects/deselects Low Bank Mode.
- ⑰ **CRSI Knob** – Sets the pilot-selected course on the HSI of PFD1 when the VOR1, VOR2, or OBS/SUSP mode is selected. Pressing this knob centers the CDI on the currently selected VOR. The pilot-selected course provides course reference to the pilot-side flight director when operating in Navigation and Approach modes.
- ⑱ **BC Key** – Selects/deselects Back Course Mode.
- ⑲ **HDG Knob** – Sets the selected heading on the HSI. When operating in Heading Select mode, this knob provides the heading reference to the flight director.

ADDITIONAL AFCS CONTROLS

The **AP DISC** (Autopilot Disconnect) Switch, **CWS** (Control Wheel Steering) Button, **GO AROUND** Switch, and **MEPT** (Manual Electric Pitch Trim) Switch are additional AFCS controls and are located in the cockpit, separately from the AFCS Control Unit. These are discussed in detail in the AFCS section.

AUDIO PANEL CONTROLS

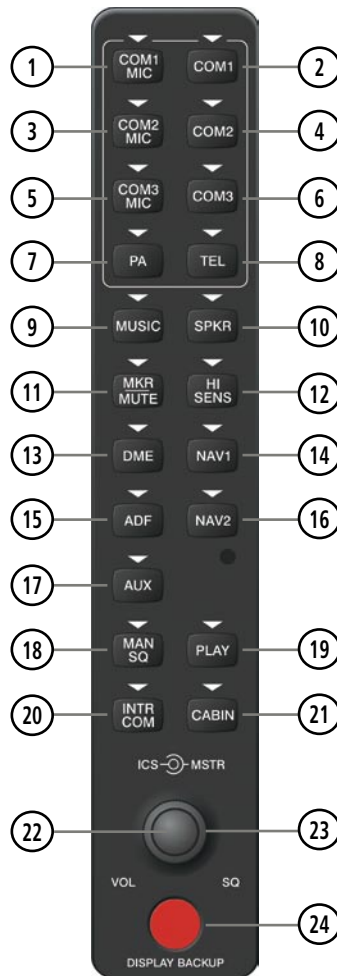


Figure 1-5 Audio Panel Controls (GMA 1347D)



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

- ① **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receiver audio can be added by pressing the **COM2** Key.
- ② **COM1** – When selected, audio from the #1 COM receiver can be heard.
- ③ **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM2 can be deselected by pressing the **COM2** Key, or COM1 can be added by pressing the **COM1** Key.
- ④ **COM2** – When selected, audio from the #2 COM receiver can be heard.
- ⑤ **COM3 MIC** – Selects an optional transmitter for transmitting (if installed). COM3 is simultaneously selected when this key is pressed allowing received audio from the optional receiver to be heard. COM3 can be deselected by pressing the **COM3** Key, or either COM1 or COM2 can be added by pressing the **COM1** or **COM2** Key.

- ⑥ **COM3** – When selected, audio from an optional COM can be heard.
- ⑦ **PA** – Selects the passenger address system. The selected COM transmitter is deselected when the **PA** Key is pressed.
- ⑧ **TEL** – When selected, activates the SATCOM transceiver.
- ⑨ **MUSIC** – Toggles the Music input on or off. Pressing and holding toggles music muting on or off.
- ⑩ **SPKR** – Pressing this key selects and deselects the corresponding cockpit speaker. With **SPKR** selected on, the COM and NAV receiver audio, and alerts are heard on the speaker.
- ⑪ **MKR/MUTE** – Mutes the currently received marker beacon receiver audio. Unmutes when new marker beacon audio is received.
- ⑫ **HI SENS** – Press to increase Marker Beacon Receiver sensitivity. Press again to return to normal.
- ⑬ **DME** – Pressing turns optional DME audio on or off.
- ⑭ **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
- ⑮ **ADF** – Pressing turns on or off the audio from the optional ADF receiver.
- ⑯ **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
- ⑰ **AUX** – Not used on the Beechcraft 200/B200 Series.
- ⑱ **MAN SQ** – Press to enable manual squelch for the intercom. When active, press the **ICS** Knob to illuminate 'SQ'. Turn the **ICS** Knob to adjust squelch.
- ⑲ **PLAY** – Press once to play the last recorded audio. Press again to stop playing. Press twice quickly while audio is playing and the previous block of recorded audio is played. Each subsequent two presses skips back to the previously recorded block.
- ⑳ **INTR COM** – Pressing selects the pilot/copilot intercom on both audio panels. Press again to deselect the intercom.
- ㉑ **CABIN** – Initiates intercom communications with passengers in the cabin.
- ㉒ **ICS Knob** – Turn to adjust intercom volume or squelch. Press to switch between volume and squelch control as indicated by the 'VOL' or 'SQ' being illuminated. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉓ **MSTR Knob** – The Master Volume Control adjusts volume for the blended NAV, COM, and intercom audio.
- ㉔ **Reversionary Mode Button** – Pressing manually selects Reversionary Mode.

1.4 SECURE DIGITAL CARDS



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



NOTE: Ensure that the G1000 system is powered off before inserting the SD card.

The GDU 1040A and GDU 1500 data card slots use Secure Digital (SD) cards and are located on the top right portion of the display bezels. Each display bezel is equipped with two SD card slots. SD cards are used for aviation database and system software updates as well as terrain database storage. Also, flight plans may be imported or exported from an SD card in the MFD.

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.

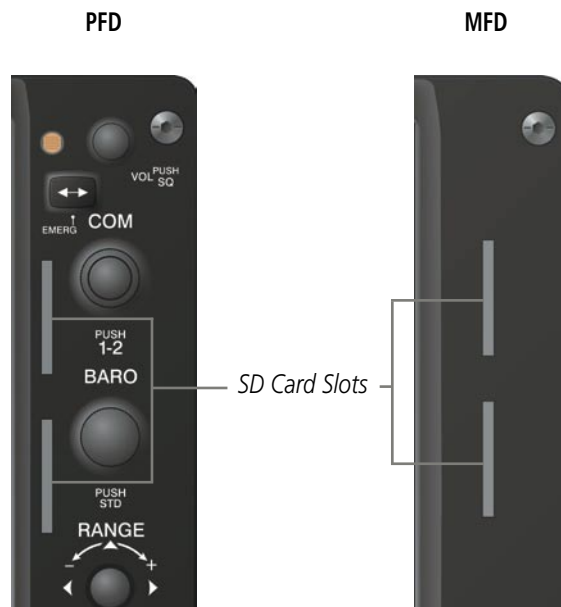


Figure 1-6 Display Bezel SD Card Slots

1.5 SYSTEM POWER-UP



NOTE: Refer to the Appendices for AHRS initialization bank angle limitations.



NOTE: See the Appendices for additional information regarding system-specific annunciations and alerts.



NOTE: See the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (AFM/POH) for specific procedures concerning avionics power application and emergency power supply operation.

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

During system initialization, test annunciations are displayed, as shown in Figure 1-7. All system annunciations should disappear typically within one minute of power-up. Upon power-up, key annunciator lights also become momentarily illuminated on the audio panels, the control units and the display bezels.

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

When the MFD powers up (Figure 1-8), the MFD Power-up Page displays the following information:

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

Current database information includes the valid operating dates, cycle number and database type. When this information has been reviewed for currency (to ensure that no databases have expired), the pilot is prompted to continue. Pressing the **ENT** Key acknowledges this information and displays the Auxiliary (AUX) Weight Planning Page.

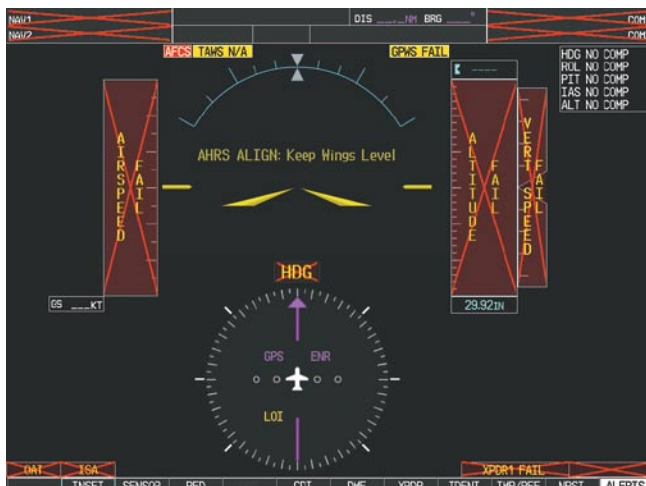


Figure 1-7 PFD Initialization

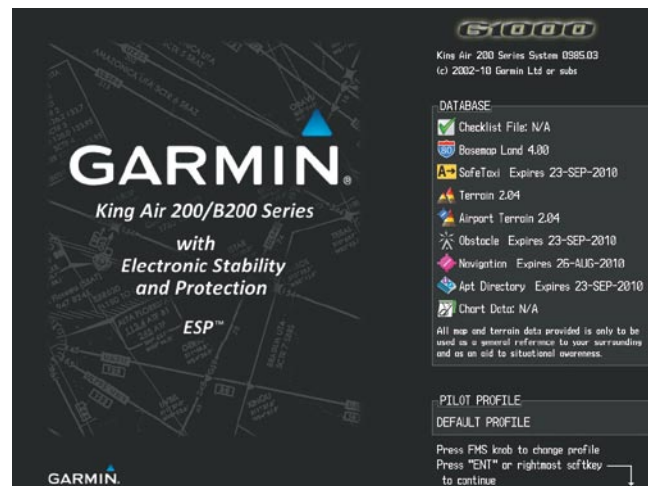


Figure 1-8 MFD Power-up Page

1.6 SYSTEM OPERATION

The displays are connected together via multiple data busses, thus allowing for high-speed communication. As shown in Figure 1-1, each GIA 63W is connected to the on-side PFD. This section discusses the normal and reversionary modes of operation as well as the various AHRS modes of the G1000 system.

NORMAL OPERATION

PFD

In normal mode, the PFD presents graphical flight instrumentation (attitude, heading, airspeed, altitude and vertical speed), thereby replacing the traditional flight instrument cluster. The PFD also offers control for COM and NAV frequency selection.

MFD

In normal mode, the right portion of the MFD displays a full-color moving map with navigation information, while the left portion of the MFD is dedicated to the Engine Indication System (EIS).

Figure 1-9 gives an example of the G1000 displays in normal mode.

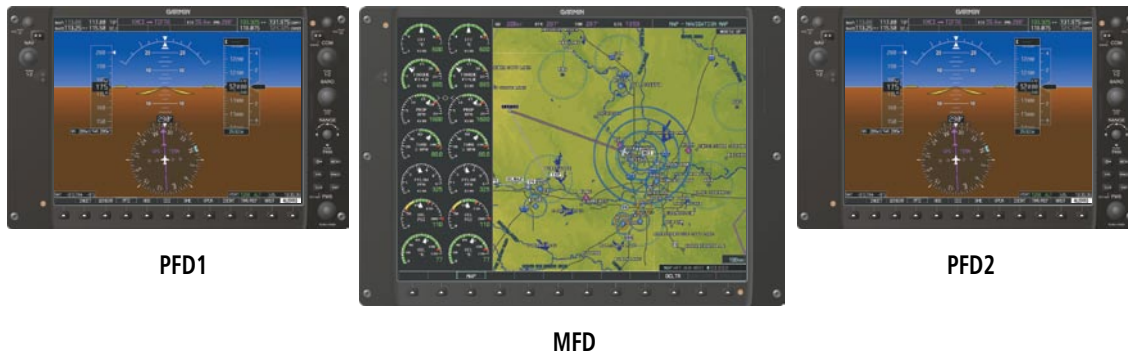


Figure 1-9 Normal Operation

REVERSIONARY MODE



NOTE: The G1000 system alerts the pilot when backup paths are utilized by the LRUs. Refer to the Appendices for further information regarding system-specific alerts.

Reversionary mode is a mode of operation in which all important flight information is presented identically on at least one of the remaining displays (see Figure 1-10). Transition to reversionary mode should be straightforward for the pilot, for flight parameters are presented in the same format as in normal mode.



Figure 1-10 Reversionary Mode (Manual)

Reversionary mode can be activated manually by pressing the dedicated **DISPLAY BACKUP** button at the bottom of the audio panel (see Figure 1-11 and refer to the Audio Panel section for further details). Pressing this button again deactivates reversionary mode.

Pressing the **DISPLAY BACKUP** button activates/deactivates reversionary mode for both the on-side PFD and the MFD.



Figure 1-11 DISPLAY BACKUP Button

Each display can be configured to operate in reversionary mode, as follows:

- **PFD1** – By pressing the **DISPLAY BACKUP** button on the left audio panel.
- **MFD** – By pressing the **DISPLAY BACKUP** button on the left or the right audio panel.
- **PFD2** – By pressing the **DISPLAY BACKUP** button on the right audio panel.

Should the connection between a PFD and the on-side GIA 63W become inoperative, the on-side GIA 63W can no longer communicate with the remaining PFD (refer to Figure 1-1). As a result, the NAV and COM functions provided to the failed PFD by the on-side GIA 63W are flagged as invalid (red “X”) on the remaining PFD (see Figure 1-12).



Figure 1-12 Inoperative Input (NAV1 Shown)

AHRS OPERATION



NOTE: Refer to the Appendices 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 1-13) 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.

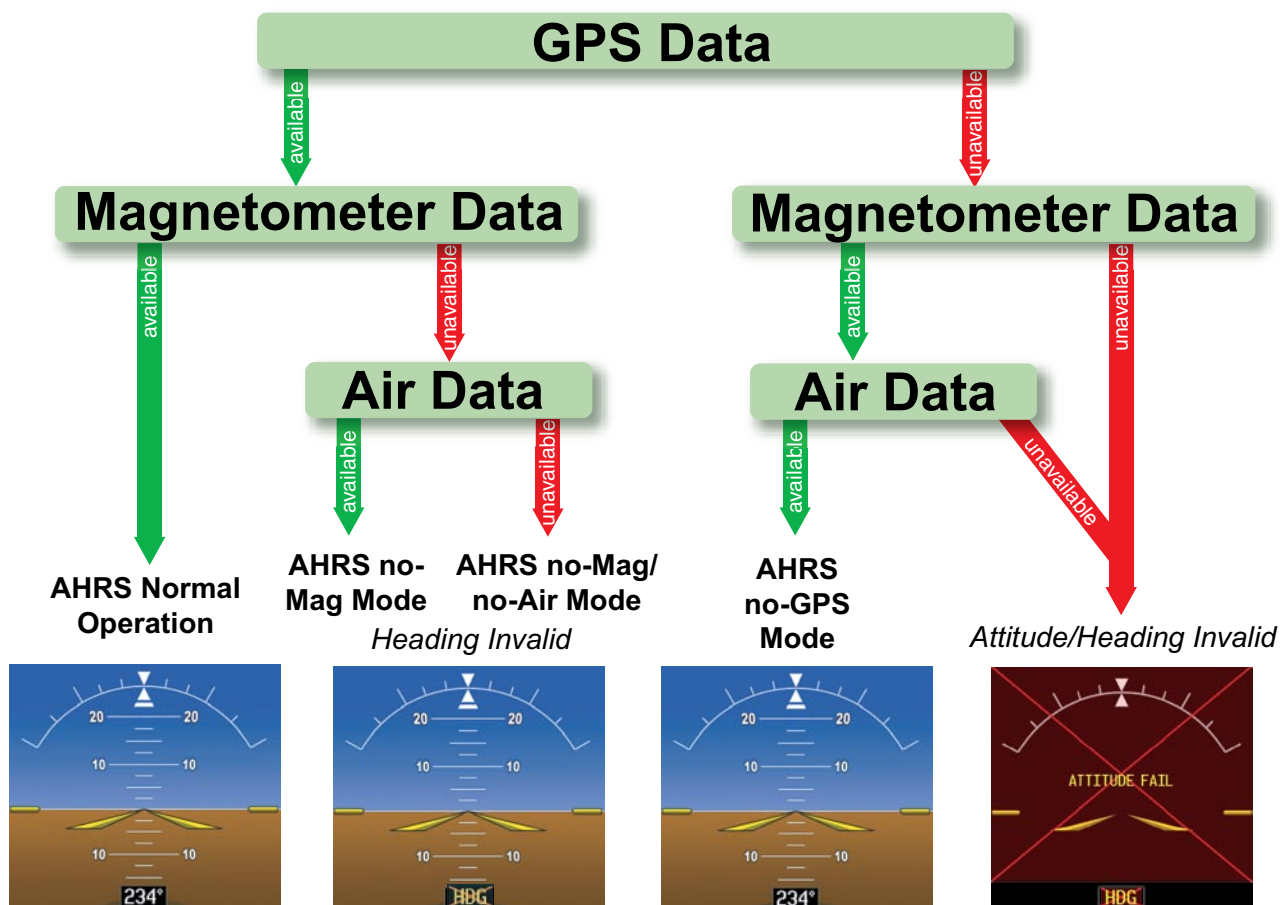


Figure 1-13 AHRS Operation

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.*

The G1000 system provides two sources of GPS information. If a single GPS receiver fails, or if the information provided from one of the GPS receivers is unreliable, the AHRS seamlessly transitions to using the other GPS receiver. An alert message informs the pilot of the use of the backup GPS path. If both GPS inputs fail, the AHRS continues to operate in reversionary No-GPS mode so long as the air data and magnetometer inputs are available and valid.

AIR DATA INPUT FAILURE

A failure of the air data input has no effect on AHRS output while AHRS is operating in normal mode. A failure of the air data input while the AHRS is operating in reversionary No-GPS mode results in invalid attitude and heading information on the PFD (as indicated by red “X” flags).

MAGNETOMETER FAILURE

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

G1000 SYSTEM ANNUNCIATIONS



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

When an LRU or an LRU function fails, a large red “X” is typically displayed on windows associated with the failed data (Figure 1-14 displays all possible flags and responsible LRUs). Upon G1000 power-up, certain windows remain invalid as equipment begins to initialize. All windows should be operational within one minute of power-up. If any window remains flagged, the G1000 system should be serviced by a Garmin-authorized repair facility.

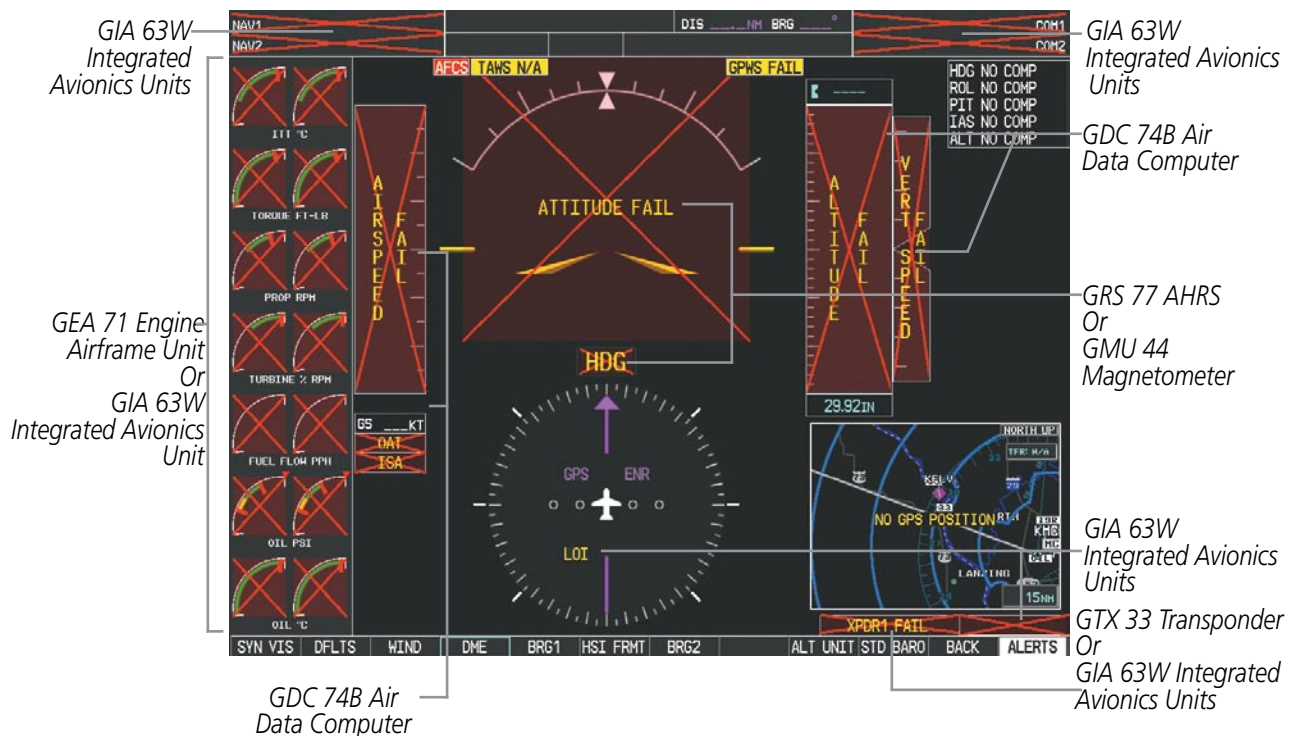


Figure 1-14 G1000 System Failure Annunciations

SOFTKEY FUNCTION

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



Figure 1-15 Softkeys (Second-Level PFD Configuration)

Another means of selecting softkeys on the MFD is by using the GCU 477 Control Unit:

Selecting a softkey using the Control Unit

- 1) Move the softkey selection box to the desired softkey using the arrows of the **SEL** Key.
- 2) Press the center of the **SEL** Key to select the desired softkey.

PFD SOFTKEYS

The **CDI**, **IDENT**, **TMR/REF**, **NRST**, and **ALERTS** Softkeys undergo a momentary change to black text on gray background and automatically switch back to white text on black background when selected. If messages remain after acknowledgement, the **ALERTS** Softkey is black on white.

The PFD softkeys provide control over flight management functions, including GPS, NAV, terrain, traffic, and lightning (optional). Each softkey sublevel has a **BACK** Softkey which can be pressed to return to the previous level. The **ALERTS** Softkey is visible in all softkey levels. For the top level softkeys and the transponder (XPDR) levels, the **IDENT** Softkey remains visible.

INSET	Displays Inset Map in PFD lower left corner
OFF	Removes Inset Map
DCLTR (3)	Selects desired amount of map detail; cycles through declutter levels: <ul style="list-style-type: none"> DCLTR (No Declutter): All map features visible DCLTR-1: Declutters land data DCLTR-2: Declutters land and SUA data DCLTR-3: Removes everything except for the active flight plan
TRAFFIC	Displays traffic information on Inset Map <ul style="list-style-type: none"> TRAFFIC: No Traffic displayed on Inset Map TRFC-1: Traffic displayed on Inset Map TRFC-2: Traffic Only display shown
TOPO	Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Inset Map
TERRAIN	Displays terrain information on Inset Map (not available with TAWS-A)
STRMSCP	Displays Stormscope information on Inset Map (optional)
NEXRAD	Displays XM NEXRAD weather and coverage on Inset Map (optional)
or	
PRECIP	Displays Worldwide Weather precipitation on Inset Map (optional)
XM LTNG	Displays XM lightning information on Inset Map (optional)
or	
DL LTNG	Displays Worldwide Weather lightning information on Inset Map (optional)
METAR	Displays METAR information on Inset Map (optional)

SENSOR	Displays softkeys for selecting the #1 and #2 AHRS and Air Data Computers
ADC1	Selects the #1 Air Data Computer
ADC2	Selects the #2 Air Data Computer
AHRS1	Selects the #1 AHRS
AHRS2	Selects the #2 AHRS
PFD	Displays second-level softkeys for additional PFD configurations
SYN VIS	Displays the softkeys for enabling or disabling Synthetic Vision features
PATHWAY	Displays rectangular boxes representing the horizontal and vertical flight path of the active flight plan
SYN TERR	Enables synthetic terrain depiction
HRZN HDG	Displays compass heading along the Zero-Pitch line
APTSIGNS	Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.
DFLTS	Resets PFD to default settings, including changing units to standard
WIND	Displays softkeys to select wind data parameters
OPTN 1	Wind direction arrow with numeric speed
OPTN 2	Wind direction arrow with numeric direction and magnitude
OPTN 3	Headwind/tailwind and crosswind arrows with numeric speed components
OFF	Information not displayed
DME	Displays DME Information Window
BRG1	Cycles the Bearing 1 Information Window through NAV1 or GPS waypoint identifier and GPS-derived distance information, and ADF/frequency.
HSI FRMT	Displays the softkeys for selecting the two HSI formats
360 HSI	Displays HSI as a 360° compass rose
ARC HSI	Displays HSI as a 140° viewable arc
BRG2	Cycles the Bearing 2 Information Window through NAV2 or GPS waypoint identifier and GPS-derived distance information, and ADF/frequency.
ALT UNIT	Displays softkeys for setting the altimeter and BARO settings to metric units
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
STD BARO	Sets barometric pressure to 29.92 in Hg (1013 hPa if metric units are selected)
OBS	Selects OBS mode on the CDI when navigating by GPS (only available with active leg)
CDI	Cycles through GPS, VOR1, and VOR2 navigation modes on the CDI
DME	Displays the DME Tuning Window, allowing tuning and selection of the DME (optional)

XPDR	Displays transponder mode selection softkeys
XPDR1	Selects the #1 transponder as active
XPDR2	Selects the #2 transponder as active
STBY	Selects standby mode (transponder does not reply to any interrogations)
ON	Selects Mode A (transponder replies to interrogations)
ALT	Selects Mode C – altitude reporting mode (transponder replies to identification and altitude interrogations)
GND	Manually selects Ground Mode, the transponder does not allow Mode A and Mode C replies, but it does permit acquisition squitter and replies to discretely addressed Mode S interrogations
VFR	Automatically enters the VFR code (1200 in the U.S.A. only)
CODE	Displays transponder code selection softkeys 0-7
0 — 7	Use numbers to enter code
BKSP	Removes numbers entered, one at a time
ADS-B TX	Enables/disables automatic transmission of ADS-B position and speed.
IDENT	Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
TMR/REF	Displays Timer/References Window
NRST	Displays Nearest Airports Window
ALERTS	Displays Alerts Window

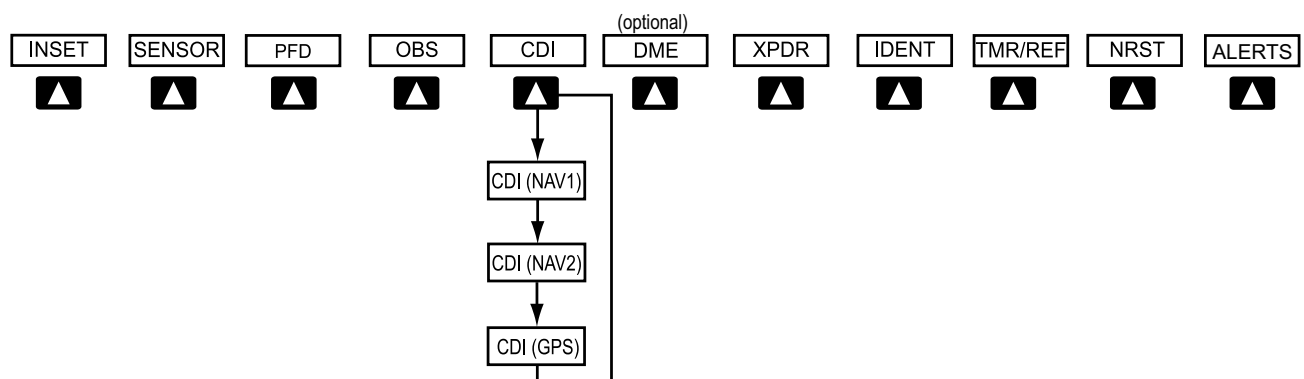


Figure 1-16 Top Level PFD Softkeys

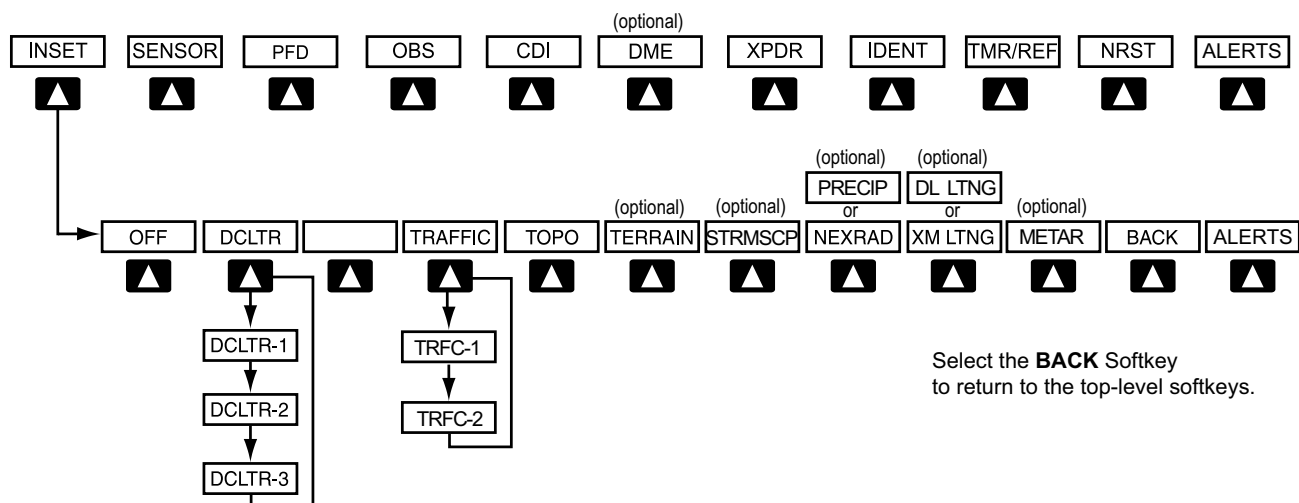


Figure 1-17 INSET Softkeys

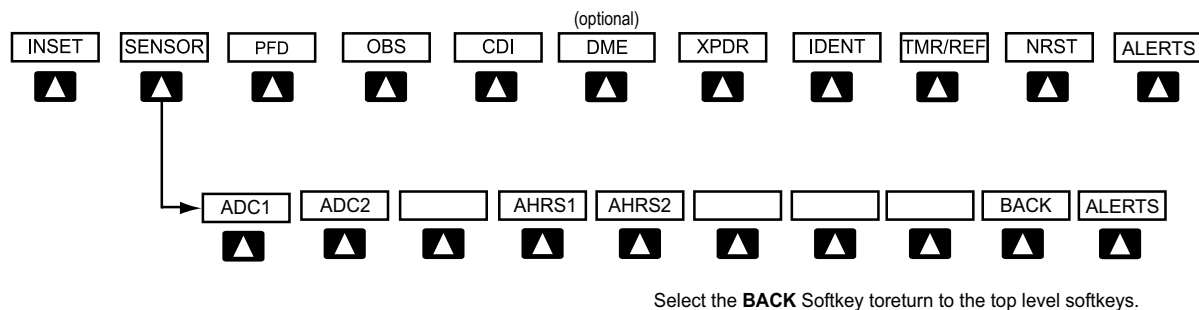


Figure 1-18 SENSOR Softkeys

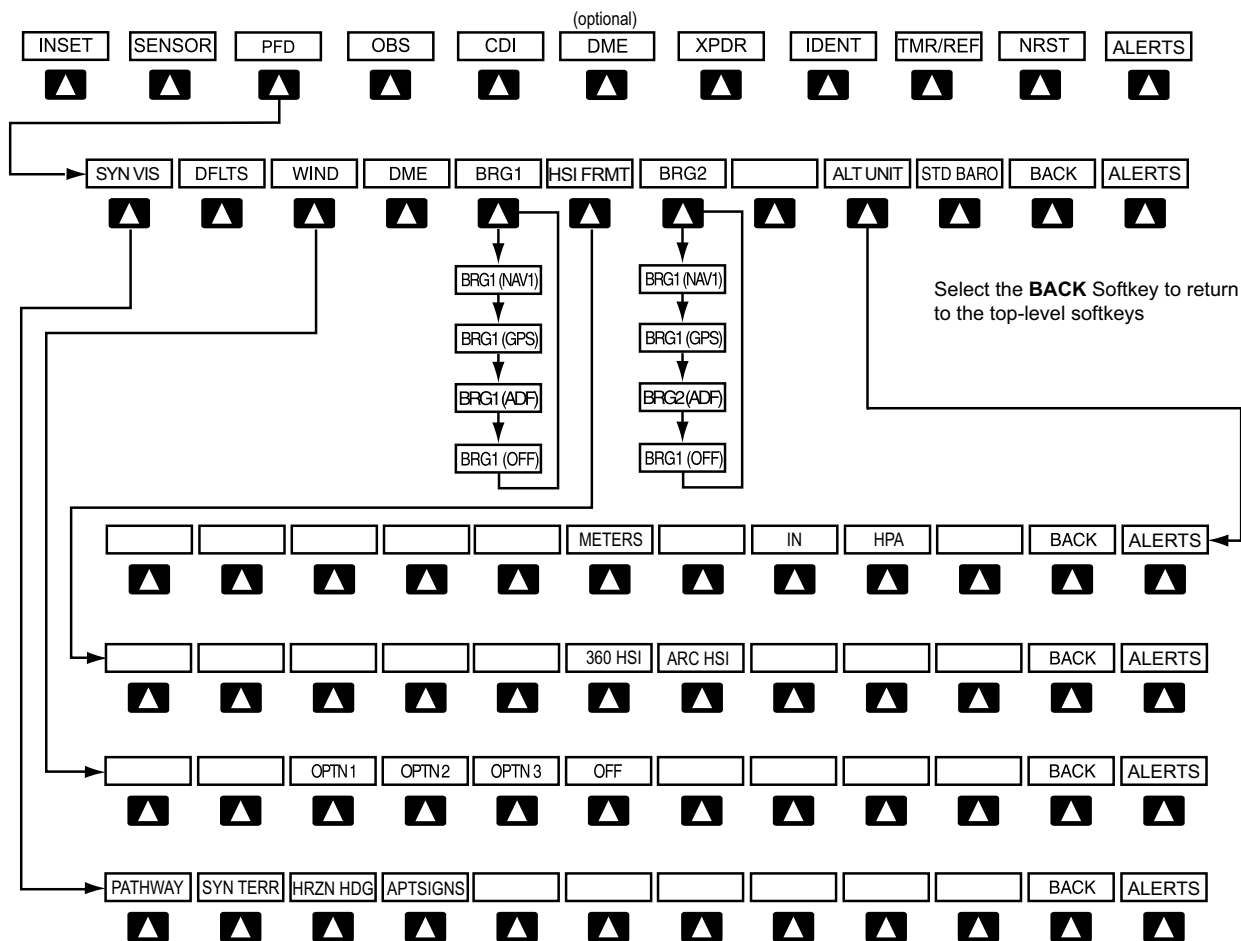


Figure 1-19 PFD Configuration Softkeys

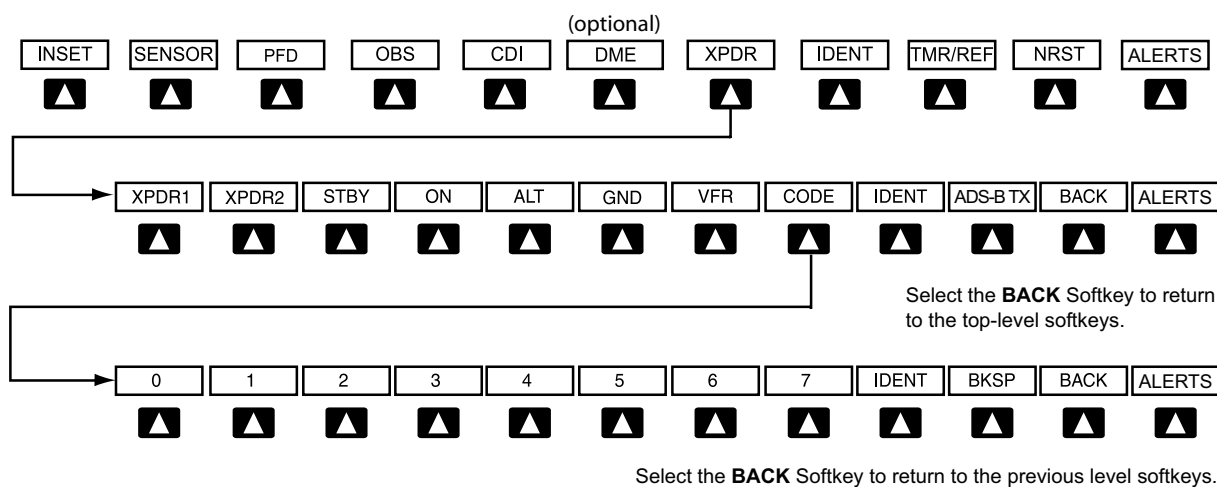


Figure 1-20 XPDR Softkeys

MFD SOFTKEYS

MAP

Enables second-level Navigation Map softkeys

TRAFFIC

Displays traffic information on Navigation Map Page

PROFILE

Displays profile view on Navigation Map Page

TOPO

Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Navigation Map Page

TERRAIN

Displays terrain information on Navigation Map Page (not available with TAWS-A)

AIRWAYS

(Default label is dependent on map setup option selected)

Displays airways on the map; cycles through the following:

AIRWAYS: No airways are displayed

AIRWY ON: All airways are displayed

AIRWY LO: Only low altitude airways are displayed

AIRWY HI: Only high altitude airways are displayed

STRMSCP

Displays Stormscope information on Navigation Map Page (optional)

NEXRAD

Displays NEXRAD weather and coverage information on Navigation Map Page (optional)

XM LTNG

Displays XM lightning information on Navigation Map Page (optional)

NEXRAD

Displays XM NEXRAD weather and coverage on Navigation Map Page (optional)

or

PRECIP

Displays Worldwide Weather precipitation on Navigation Map Page (optional)

XM LTNG

Displays XM lightning information on Navigation Map Page (optional)

or

DL LTNG

Displays Worldwide Weather lightning information on Navigation Map Page (optional)

BACK

Returns to top-level softkeys

DCLTR (3)

Selects desired amount of map detail; cycles through declutter levels:

DCLTR (No Declutter): All map features visible

DCLTR-1: Declutters land data

DCLTR-2: Declutters land and SUA data

DCLTR-3: Removes everything except for the active flight plan

SHW CHRT

When available, displays optional airport and terminal procedure charts

CHKLIST

When available, displays optional checklists

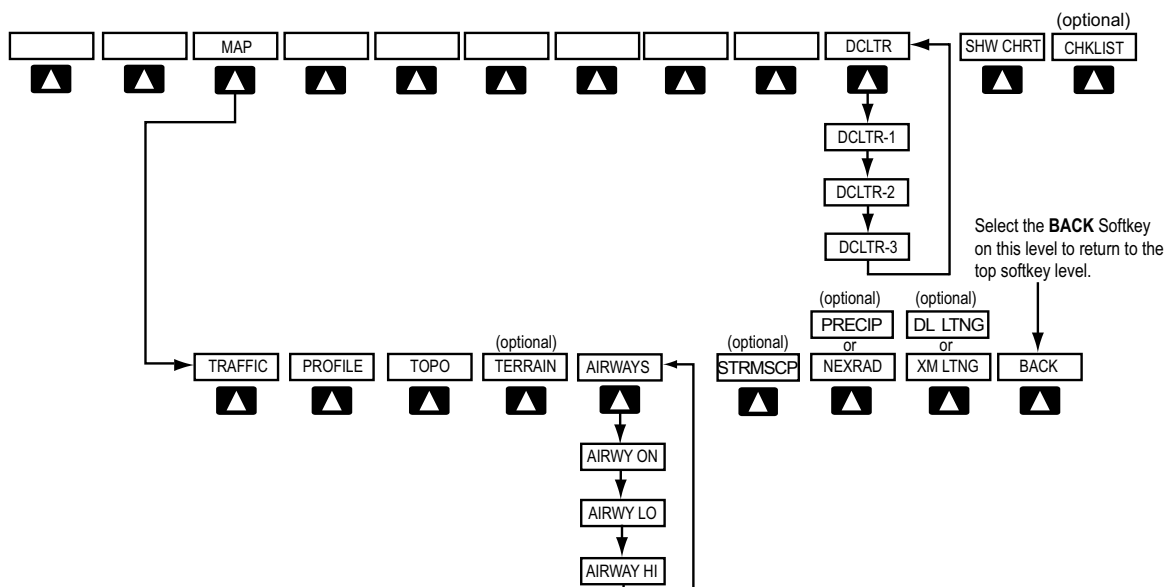


Figure 1-21 MFD Softkeys

GPS RECEIVER OPERATION

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

GPS1 provides information to the pilot-side PFD and GPS2 provides data to the copilot-side PFD. Internal system checking is performed to ensure both GPS receivers are providing accurate data to the PFDs. In some circumstances, both GPS receivers may be providing accurate data, but one receiver may be providing a better GPS solution than the other receiver. In this case the GPS receiver producing the better solution is automatically coupled to both PFDs. “BOTH ON GPS 1” or “BOTH ON GPS 2” is displayed in the Reversionary Sensor Window (see Appendix A) indicating which GPS receiver is being used. Both GPS receivers are still functioning properly, but one receiver is performing better than the other at that particular time.

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 a SBAS signal. While the aircraft is on the ground, the SBAS signal may be blocked by obstructions causing one GPS receiver to have difficulty acquiring a good signal. Also, while airborne, turning the aircraft may result in one of the GPS receivers temporarily losing the SBAS signal.

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

Viewing GPS receiver status information

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

Selecting the GPS receiver for which data may be reviewed

- 1) Use the **FMS** Knob to select the AUX - GPS Status Page.
- 2) To change the selected GPS receiver:
 - a) Select the desired **GPS** Softkey.

Or:

 - a) Press the **MENU** Key.
 - b) Use the **FMS** Knob to highlight the receiver which is not selected and press the **ENT** Key.

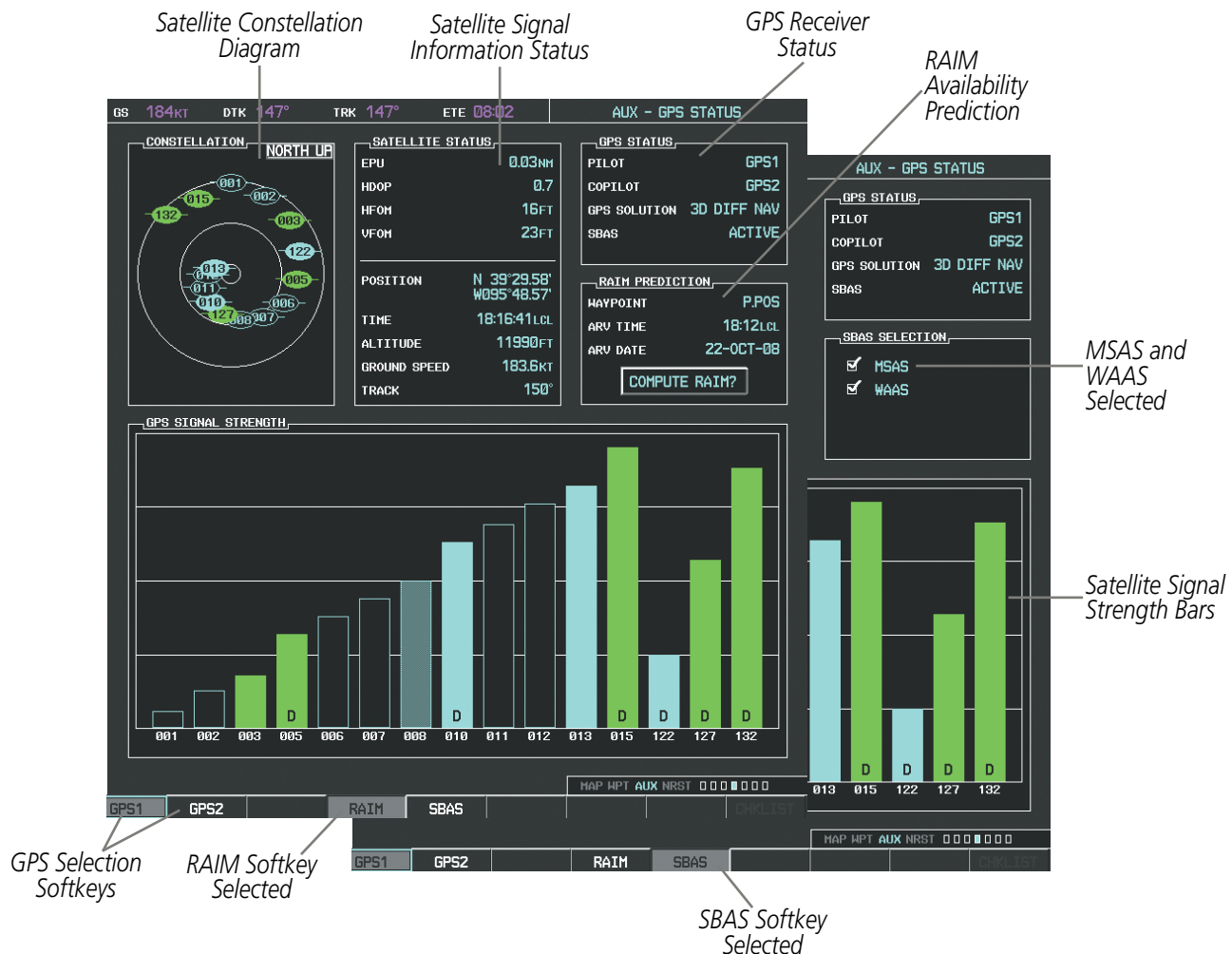


Figure 1-22 GPS Status Page (RAIM or SBAS Selected)

The GPS Status Page provides the following information:

- Satellite constellation diagram

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

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

- Satellite signal information status

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

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

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

- GPS receiver status

The GPS solution type (ACQUIRING, 2D NAV, 2D DIFF NAV, 3D NAV, 3D DIFF NAV) for the active GPS receiver (GPS1 or GPS2) is shown in the upper right of the GPS Status Page. When the receiver is in the process of acquiring enough satellite signals for navigation, the receiver uses satellite orbital data (collected continuously from the satellites) and last known position to determine the satellites that should be in view. ACQUIRING is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

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

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

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

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

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

Because of the tighter protection limit on approaches, there may be times when RAIM is not available. The G1000 automatically monitors RAIM and warns with an alert message when it is not available. If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the messages “Approach is not active” and “RAIM not available from FAF to MAP”. If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

Predicting RAIM availability at a selected waypoint

- 1) Select the GPS Status Page.
- 2) If necessary, select the **RAIM** Softkey.
- 3) Press the **FMS** Knob. The ‘WAYPOINT’ field is highlighted.
- 4) Turn the small **FMS** Knob to display the Waypoint Information Window.
- 5) Enter the desired waypoint:
 - a) Use the **FMS** Knob to enter the desired waypoint by identifier, facility, or city name and press the **ENT** Key. Refer to Section 1.7 for instructions on entering alphanumeric data into the G1000.

Or:

- a) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
 - b) Turn the small **FMS** Knob clockwise to display the NRST, RECENT, or AIRWAY waypoints, if required.
 - c) Turn the large **FMS** Knob clockwise to select the desired waypoint. The G1000 automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.
 - d) Press the **ENT** Key to accept the waypoint entry.
- 6) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
 - 7) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
 - 8) With the cursor highlighting 'COMPUTE RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:
 - 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
 - 'COMPUTING AVAILABILITY'—RAIM calculation in progress
 - 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date
 - 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

Predicting RAIM availability at present position

- 1) Select the GPS Status Page.
- 2) If necessary, select the **RAIM** Softkey.
- 3) Press the **FMS** Knob. The 'WAYPOINT' field is highlighted.
- 4) Press the **MENU** Key.
- 5) With 'Set WPT to Present Position' highlighted, press the **ENT** Key.
- 6) Press the **ENT** Key to accept the waypoint entry.
- 7) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
- 8) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
- 9) With the cursor highlighting 'COMPUTE RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:
 - 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
 - 'COMPUTING AVAILABILITY'—RAIM calculation in progress
 - 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date
 - 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

- SBAS Selection (**SBAS** Softkey is selected)

In certain situations, such as when the aircraft is outside or on the fringe of the SBAS coverage area, it may be desirable to disable WAAS or MSAS (although it is not recommended). When disabled, the SBAS field in the GPS Status box indicates DISABLED. There may be a small delay for the GPS Status box to be updated upon WAAS and MSAS enabling/disabling.

Disabling WAAS or MSAS

- 1) Select the GPS Status Page.
- 2) If necessary, press the **SBAS** Softkey.
- 3) Press the **FMS** Knob, and turn the large FMS Knob to highlight 'MSAS' or 'WAAS'.
- 4) Press the **ENT** Key to uncheck the box.
- 5) Press the **FMS** Knob to remove the cursor.

- GPS Satellite Signal Strengths

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

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

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

1.7 ACCESSING G1000 FUNCTIONALITY

MENUS

The G1000 has a MENU Key that, when pressed, displays a context-sensitive list of options. This options list allows the user to access additional features or make settings changes which specifically relate to the currently displayed window/page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display 'NO OPTIONS' when there are no options for the window/page selected. The main controls used in association with all window/page group operations are described in section 1.3. Softkey selection does not display menus or submenus.

Navigating the Page Menu Window

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

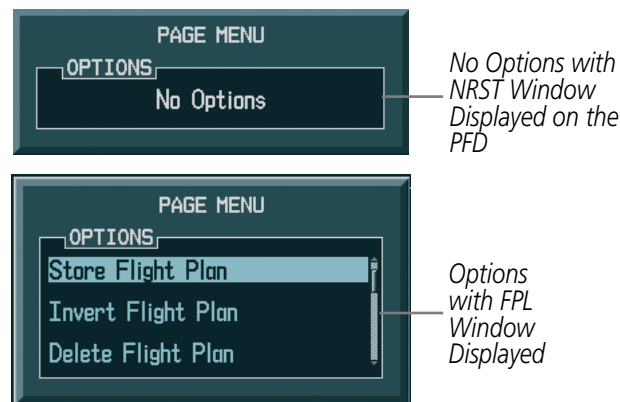


Figure 1-23 Page Menu Examples

MFD PAGE GROUPS



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

The page group and active page title box are displayed in the upper right of the screen.



Figure 1-24 Page Title Box

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

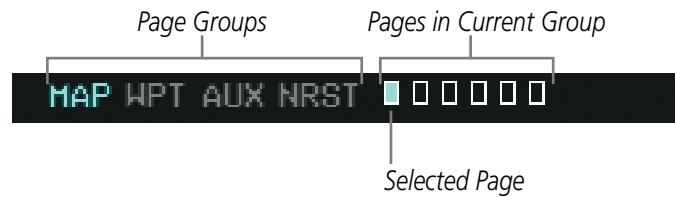


Figure 1-25 Page Group Icons

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

Selecting a page using the FMS Knob

- 1) Turn the large **FMS** Knob until the desired page group is selected.
- 2) Turn the small **FMS** Knob until the desired page is selected.

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

Map Page Group (MAP)

Navigation Map

Traffic Map

Weather Radar

Stormscope®(optional)

Weather Data Link (*service optional*)

TAWS

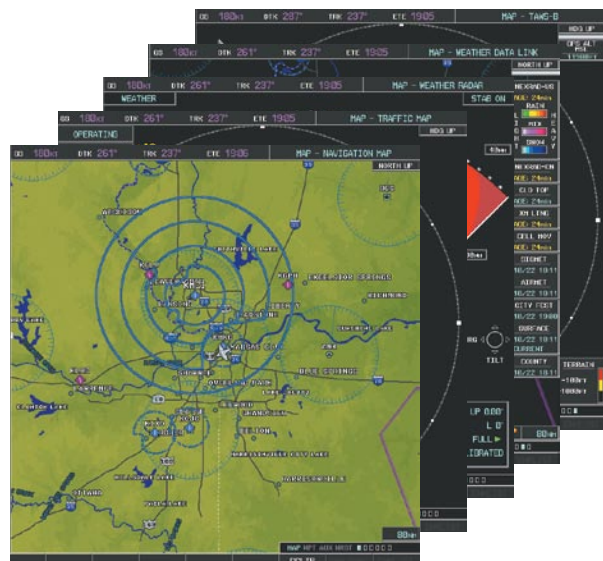


Figure 1-26 Map Pages

Waypoint Page Group (WPT)

Airport/Procedures/Weather Information Pages

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

Intersection Information

NDB Information

VOR Information

User Waypoint Information

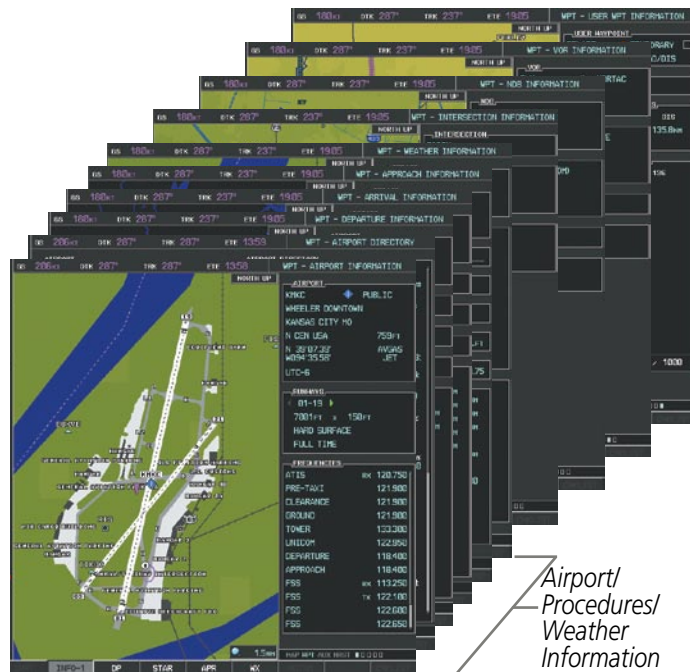


Figure 1-27 Waypoint Pages

Airport/
Procedures/
Weather
Information
Pages

Auxiliary Page Group (AUX)

Weight Planning

Trip Planning

Utility

GPS Status

System Setup 1/2

XM Satellite pages

- XM Information (**INFO** Softkey)
- XM Radio (**RADIO** Softkey)

Satellite Comm pages

- Telephone (**TEL** Softkey)
- Text Messaging (**SMS** Softkey)

Report Status/WiFi Setup

- Telephone (**REPORT** Softkey)
- Text Messaging (**WI-FI** Softkey)

System Status

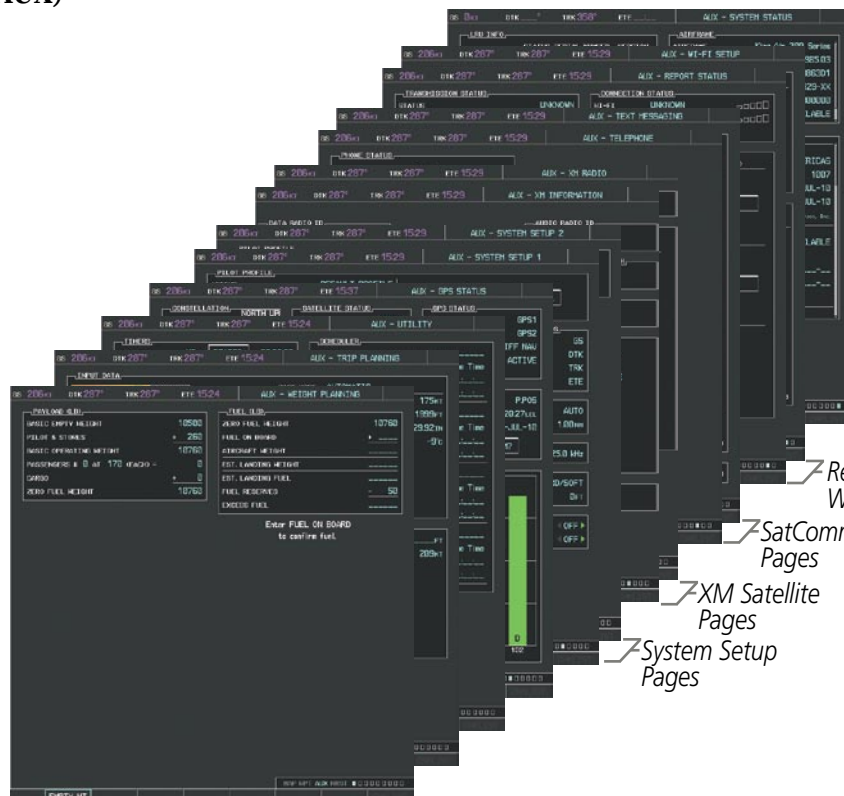


Figure 1-28 Auxiliary Pages

Report/
Wi-Fi Pages

SatComm
Pages

XM Satellite
Pages

System Setup
Pages

Nearest Page Group (NRST)

Nearest Airports

Nearest Intersections

Nearest NDB

Nearest VOR

Nearest User Waypoints

Nearest Frequencies

Nearest Airspaces

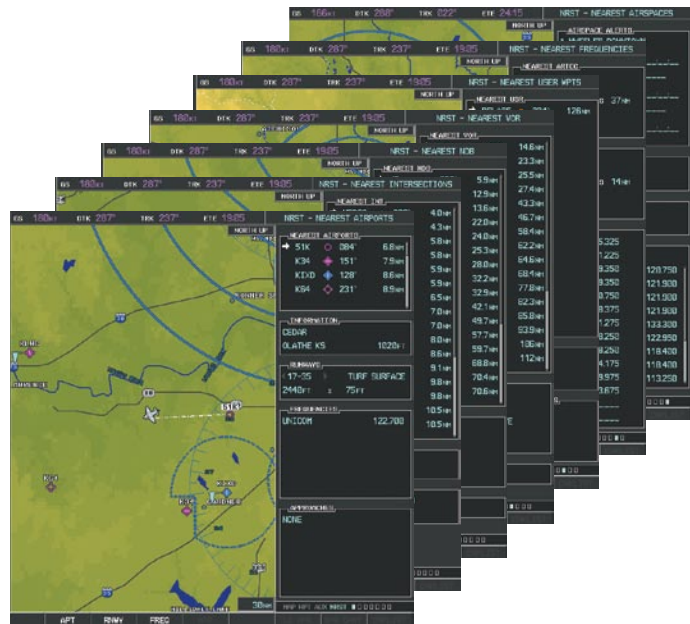


Figure 1-29 Nearest Pages

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

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

Flight Plan Pages (FPL)

Active Flight Plan

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

Flight Plan Catalog

Stored Flight Plan (via **NEW** Softkey on Flight Plan Catalog Page)

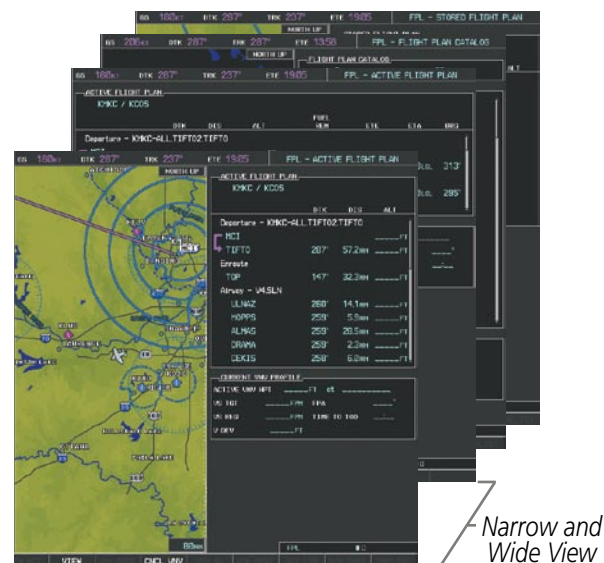


Figure 1-30 Flight Plan Pages

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

Procedure Pages (PROC)

Departure Loading

Arrival Loading

Approach Loading

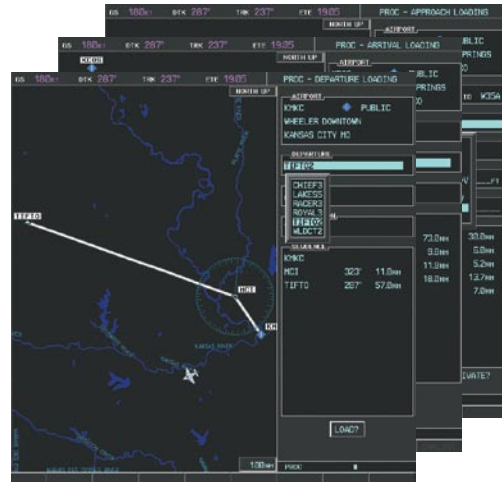


Figure 1-31 Procedure Pages

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

MFD SYSTEM PAGES

In the Auxiliary (AUX) Page Group, there are two system pages: System Setup (page 5 of 7) and System Status (page 7 of 7). The System Setup Page allows management of various system parameters, while the System Status Page displays the status of all G1000 system LRUs.

SYSTEM SETUP PAGE

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

- Time display format (local or UTC)
- Displayed measurement units
- Barometric Transition Alert
(see the Flight Instruments Section)
- Airspace alerts
(see the Flight Management Section)
- Arrival alert
- Audio alert voice
- Flight Director Format
(see the Flight Instruments Section)
- MFD Data Bar (Navigation Status Box) fields
(see the Flight Management Section)
- GPS Course Deviation Indicator (CDI) range
(see the Flight Instruments Section)
- COM transceiver channel spacing
(see the Audio Panel and CNS Section)
- Displayed nearest airports
(see the Flight Management Section)
- CDI/Baro Synchronization
(see the Flight Instruments Section)

Restoring system setup defaults:

- 1) Select the AUX - System Setup Page.
- 2) Select the **DFLT** Softkey; or press the **MENU** Key, highlight 'Restore Defaults', and press the **ENT** Key.



Figure 1-32 System Setup Page

DATE/TIME

The G1000 obtains the current Universal Coordinated Time (UTC) date and time directly from the GPS satellite signals (shown on the AUX - GPS Status Page, Figure 1-22). System time (displayed in the lower right corner of the PFD) can be displayed in three formats: local 12-hr, local 24-hr, or UTC. Local time is set by adding/subtracting an offset (hours:minutes) to/from UTC.

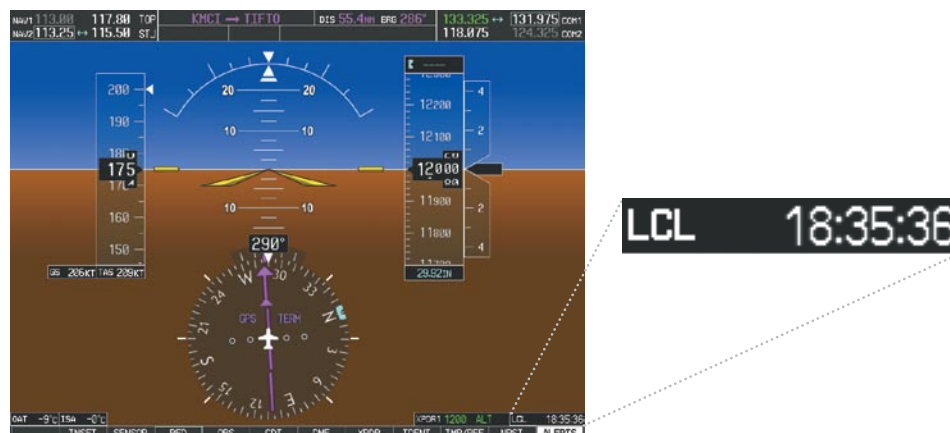


Figure 1-33 System Time (Local 24-hr Format)

Configuring the system time:

- 1) Select the AUX - System Setup Page.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the 'Time Format' field.
- 4) Turn the small **FMS** Knob to select the desired format and press the **ENT** Key to confirm selection. The 'Time Offset' field is highlighted.
- 5) Use the **FMS** Knob to enter the desired time offset (\pm HH:MM) and press the **ENT** Key to confirm selection.

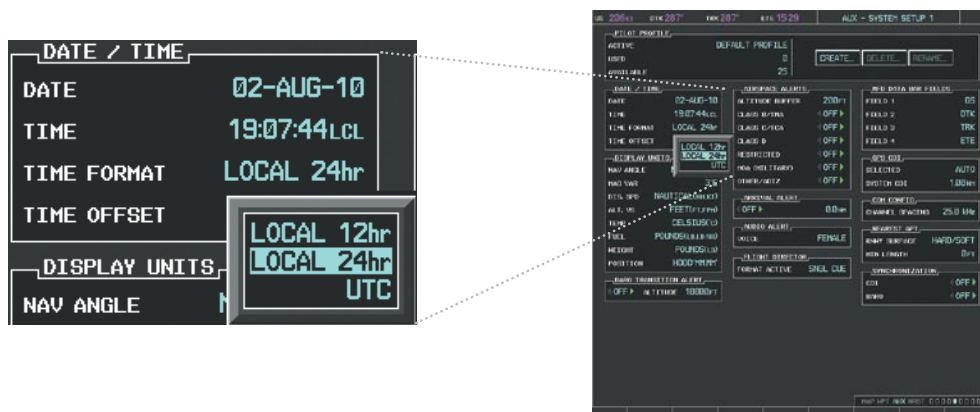


Figure 1-34 Date/Time Settings (System Setup Page)

PILOT PROFILES

System settings may be saved under a pilot profile. When the system is powered on, the last selected pilot profile is shown on the MFD Power-up Splash Screen (Figure 1-8). The G1000 can store up to 25 profiles; the currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the System Setup Page in the box labeled 'Pilot Profile'. From here, pilot profiles may be created, selected, renamed, or deleted.

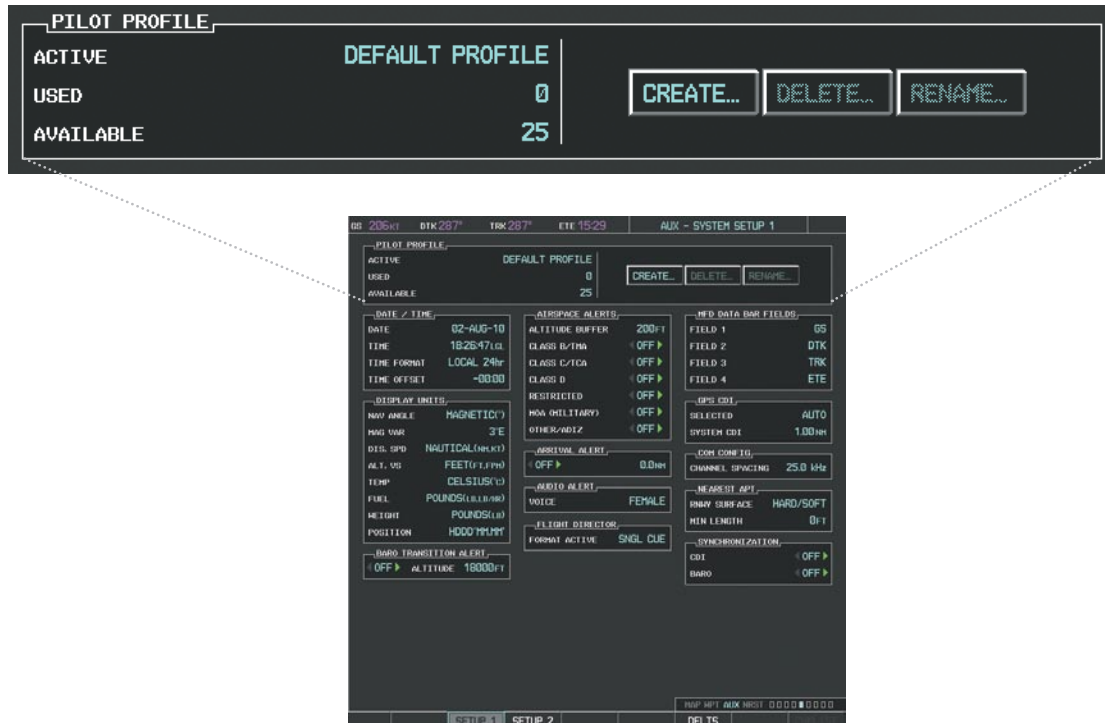


Figure 1-35 Pilot Profile Management (System Setup Page)

Creating a profile:

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

Or:

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

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

Selecting an active profile:

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

Renaming a profile:

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

Deleting a profile:

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

DISPLAY UNITS

Units in which various quantities are displayed on the G1000 screens are listed on the System Setup Page. The Navigation Angle reference, the Temperature units, and the Position units can be set from here.

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

* Default setting

** Contact a Garmin-authorized service center to change this setting

*** Not configurable

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

Changing a display unit setting

- 1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.
- 2) Turn the large **FMS** Knob to highlight the desired field in the Display Units Box.
- 3) Turn the small **FMS** Knob to select the desired units.
- 4) Press the **ENT** Key. Press the **CLR** Key to cancel the action without changing the units.

ARRIVAL ALERTS

The Arrival Alert Box on the System Setup Page allows the Alerts Window arrival alerts to be turned ON/OFF, and the alert trigger distance (up to 99.9 units) set for alerts in the Alerts Window and the PFD Navigation Status Box. An arrival alert can be set to notify the pilot with a message upon reaching a user-specified distance from the final destination (the direct-to waypoint or the last waypoint in a flight plan). When Arrival Alerts is set to ON, and the set distance is reached, an “Arrival at waypoint” message is displayed in the PFD Navigation Status Box, and a “WPT ARRIVAL - Arriving at waypoint - [xxxx]” is displayed in the Alerts Window. When Arrival Alerts is set to OFF, only the PFD Navigation Status Box message “Arriving at waypoint” is displayed, and it is displayed when the time to the final destination is approximately ten seconds.

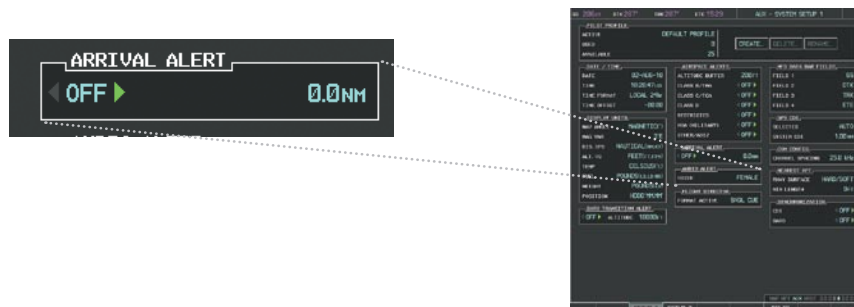


Figure 1-36 Arrival Alert Settings (System Setup Page)

Enabling/disabling the Alerts Window arrival alert:

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

Changing the arrival alert trigger distance:

- 1) Use the **FMS** Knob to select the AUX - System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the distance field in the Arrival Alert Box.
- 4) Use the **FMS** Knob to enter a trigger distance and press the **ENT** Key.

AUDIO ALERTS

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

Changing the audio alert voice

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

SYSTEM STATUS PAGE

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

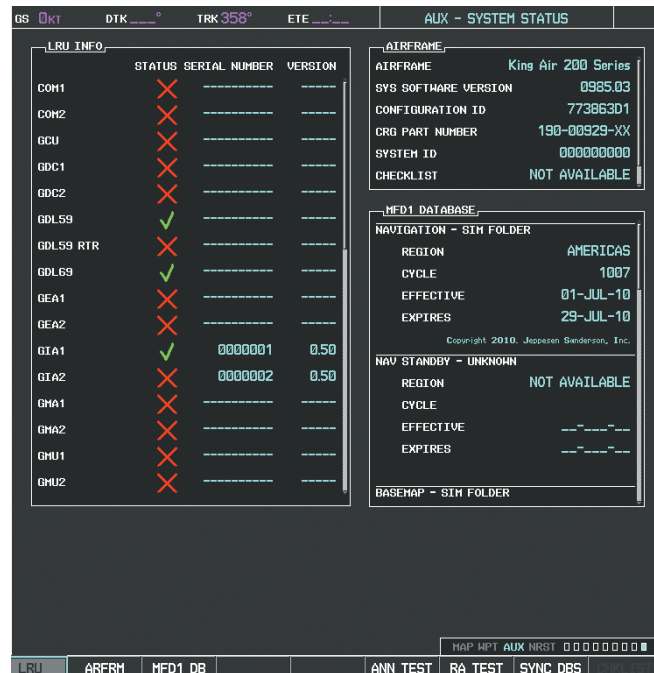


Figure 1-37 Example System Status Page

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

Selecting the **MFD1 DB** Softkey (label background changes to grey indicating the softkey is selected) places the cursor in the database window. Use the **FMS** Knob to scroll through database information for the MFD. Selecting the softkey again will change the softkey label to **PFD1 DB**. PFD 1 database information is now displayed in the database window. Selecting the softkey a third time will change the softkey label to **PFD2 DB**. PFD 2 database information is now displayed in the database window.

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

The **RA TEST** Softkey, when selected, initiates the Radar Altimeter test mode. For more information, see the Flight Instruments section.

Selecting the **SYNC DBS** Softkey (label background changes to grey indicating the softkey is selected) activates the Automatic Database Synchronization feature. When this feature is active, databases are updated automatically in the MFD and both PFDs from one SD card. For a detailed discussion on database synchronization, see the SD Card Use section in the Appendices.

UTILITY PAGE

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



Figure 1-38 Utility Page

TIMERS

The G1000 timers available include:

- Stopwatch-like generic timers (available from the PFD Timer/References Window and on the MFD AUX - Utility Page)
- Total-time-in-flight timer (MFD AUX - Utility Page)
- Time since departure (MFD AUX - Utility Page)

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.

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

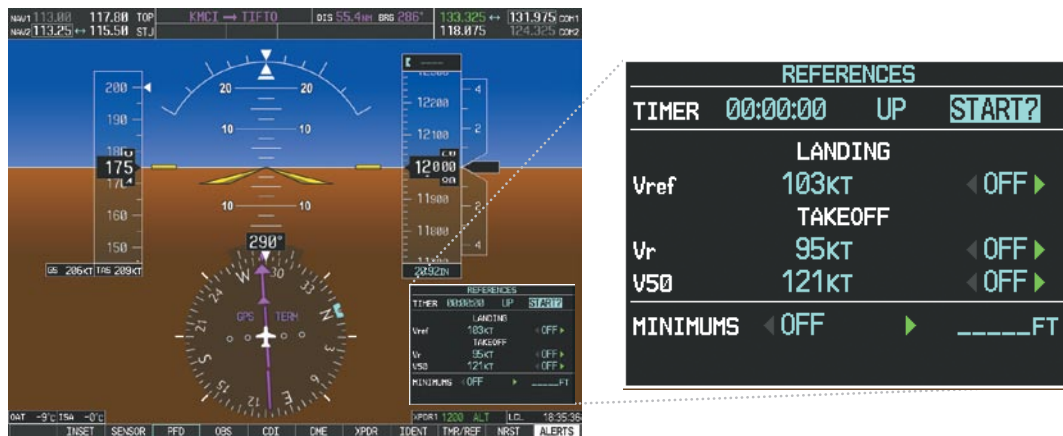


Figure 1-39 Generic Timer (PFD Timer/References Window)

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

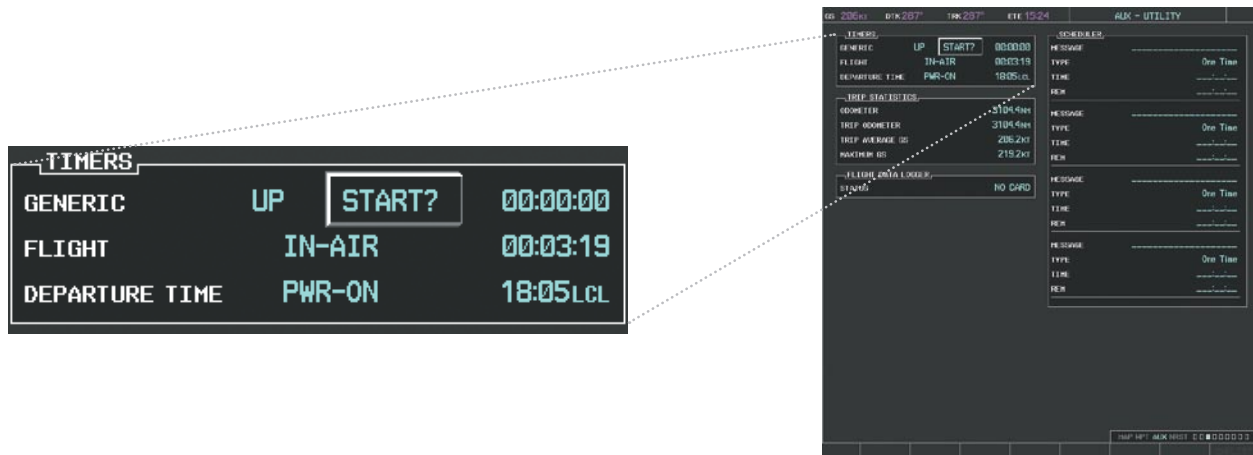


Figure 1-40 Timers (MFD AUX - Utility Page)

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

Setting the flight timer starting criterion

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

Resetting the flight timer

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

The G1000 records the time at which departure occurs, depending on whether the pilot prefers the time to be recorded from system power-up or from aircraft lift off. The displayed departure time can also be reset to display the current time at the point of reset. The format in which the time is displayed is controlled from the System Setup Page.

Setting the departure timer starting criterion

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

Resetting the departure time

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

TRIP STATISTICS

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

Resetting trip statistics readouts

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

SCHEDULER

The G1000's Scheduler feature can be used to enter and display reminder messages (e.g., "Change oil", "Switch fuel tanks", "Overhaul") in the Alerts Window on the PFD. Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), or recurrently whenever the message timer reaches zero (periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, messages are retained until deleted, and message timer countdown is restarted.



Figure 1-41 Scheduler (Utility Page)

Entering a scheduler message:

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the first empty scheduler message naming field.
- 4) Use the **FMS** Knob to enter the message text to be displayed in the Alerts Window and press the **ENT** Key.
- 5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the field next to 'Type'.
- 6) Turn the small **FMS** Knob to select set the message alert type:
 - Event—Message issued at the specified date/time
 - One-time—Message issued when the message timer reaches zero (default setting)
 - Periodic—Message issued each time the message timer reaches zero
- 7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
- 8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HHH:MM:SS) from which to countdown and press the **ENT** Key.

- 9) For event-based messages:
 - a) Use the **FMS** Knob to enter the desired date (DD-MMM-YYY) and press the **ENT** Key.
 - b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
 - c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.
- 10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

Deleting a scheduler message:

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the name field of the scheduler message to be deleted.
- 4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.
- 5) Press the **ENT** Key to confirm message deletion.

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

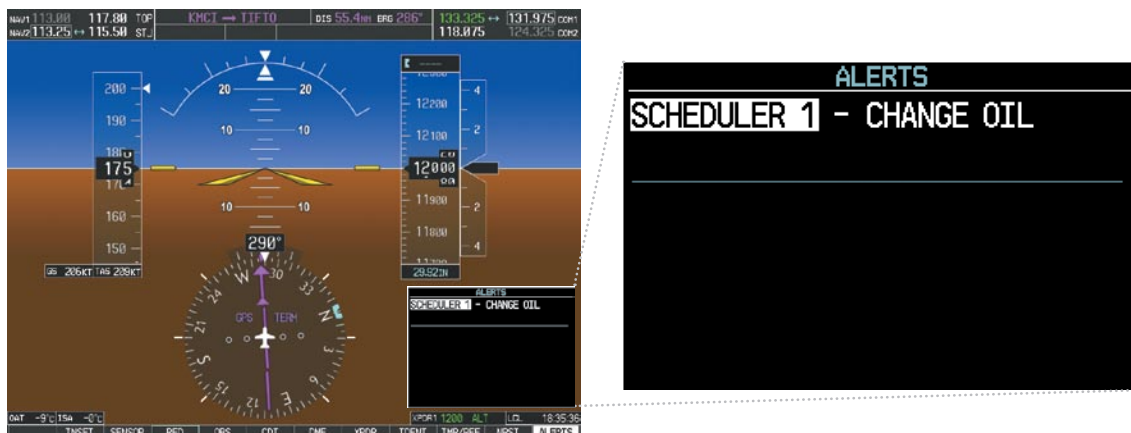


Figure 1-42 PFD Alerts Window

1.8 DISPLAY BACKLIGHTING

The PFD and MFD display backlighting, the PFD and MFD bezel, and the Audio Panel keys can be adjusted manually in one of two ways:

- Using the individual dimmer bus control for the desired display, or
- Using the PFD Setup Menu and the following procedures. In normal operating mode, backlighting can only be adjusted from the PFDs. In reversionary mode, adjustments can be made from any remaining displays.

Adjusting display backlighting:

- 1) Press either PFD **MENU** Key to display the PFD Setup Menu. 'AUTO' is now highlighted next to 'PFD1 DSPL'. If desired, turn the large **FMS** Knob to select 'AUTO' next to 'MFD DSPL' or 'PFD2 DSPL'.
- 2) Turn the small **FMS** Knob to select 'MANUAL' and press the **ENT** Key. The intensity value is now highlighted.
- 3) Use the **FMS** Knob to enter the desired backlighting then press the **ENT** Key.
- 4) To remove the menu, press the **CLR** or **MENU** Key.

Adjusting key backlighting:

- 1) Press either PFD **MENU** Key to display the PFD Setup Menu. 'AUTO' is now highlighted next to 'PFD1 DSPL'.
- 2) Turn the large **FMS** Knob to highlight 'PFD DSPL', 'MFD DSPL', or 'PFD2 DSPL', as desired.
- 3) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD1 KEY', 'MFD KEY', or 'PFD2 KEY'.
- 4) Turn the large **FMS** Knob to highlight 'AUTO'.
- 5) Turn the small **FMS** Knob to select 'MANUAL' and press the **ENT** Key. The intensity value is now highlighted.
- 6) Use the **FMS** Knob to enter the desired backlighting and press the **ENT** Key.
- 7) To remove the menu, press the **CLR** or **MENU** Key.

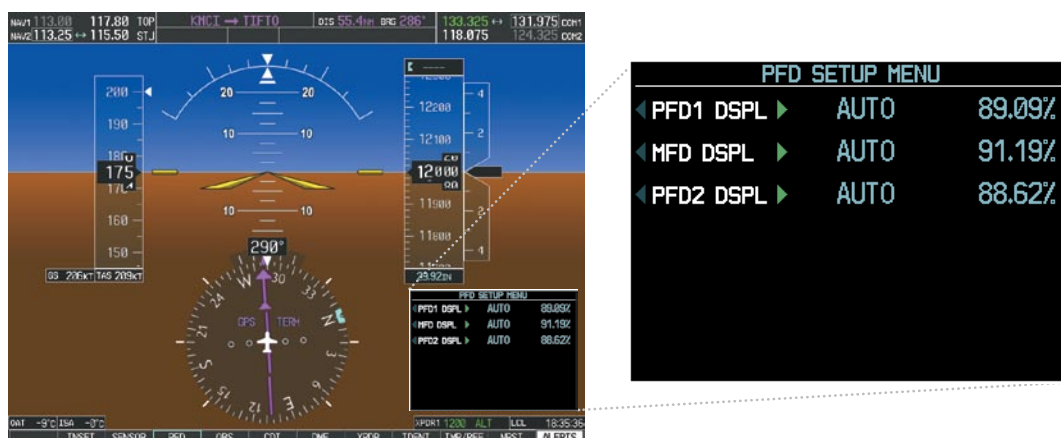


Figure 1-43 PFD Setup Menu

SECTION 2 FLIGHT INSTRUMENTS



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



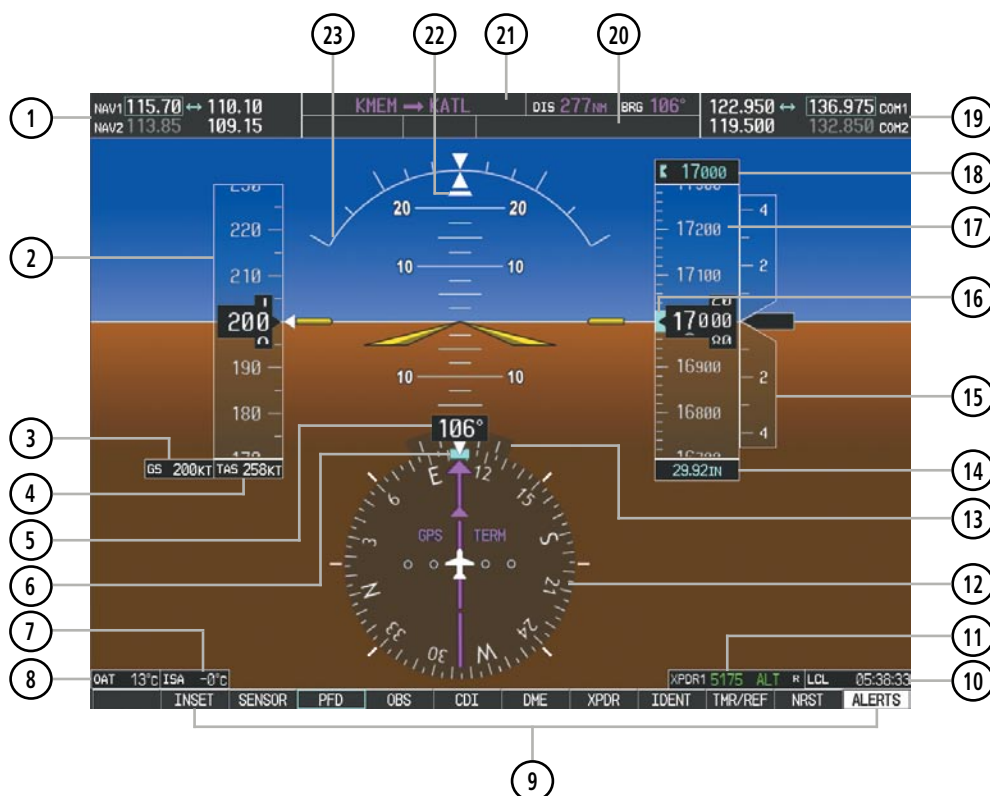
NOTE: The Automatic Flight Control System (AFCS) provides additional readouts and bugs on selected flight instruments. Refer to the AFCS Section for details on these bugs and readouts, as they appear on the display during certain AFCS modes.

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

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

- Airspeed Indicator, showing
 - True Airspeed
 - Ground Speed
 - Mach number
 - Airspeed awareness ranges
 - Reference flags
- Attitude Indicator with slip/skid indication
- Altimeter, showing
 - Barometric setting
 - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Horizontal Situation Indicator, showing
 - Turn Rate Indicator
 - Bearing pointers and information windows
 - DME Information Window (optional)
 - Course Deviation Indicator (CDI)
- DME Tuning Window
- Outside Air Temperature (OAT)
- International Standard Atmosphere (ISA) temperature deviation
- System time
- Wind data
- Vertical Navigation indications
- Radar altimeter (optional)

The PFDs also display various alerts and annunciations.



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

Figure 2-1 Primary Flight Display (Default)



- | | |
|--|--------------------------------------|
| ① Traffic Annunciation | ⑩ Selected Course |
| ② Selected Heading | ⑪ Radar Altimeter (optional) |
| ③ Wind Data | ⑫ Current Vertical Speed |
| ④ Inset Map | ⑬ Vertical Deviation Indicator (VDI) |
| ⑤ DME Information Window (optional) | ⑭ Reversionary Sensor Window |
| ⑥ Bearing Information Windows | ⑮ Comparator Window |
| ⑦ Minimum Descent Altitude/
Decision Height | ⑯ Current VNV Target Altitude |
| ⑧ Flight Plan Window | ⑰ Terrain Annunciation |
| ⑨ Annunciation Window | ⑱ AFCS Status Annunciation |

Figure 2-2 Additional PFD Information

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR



NOTE: Refer to the Pilot's Operating Handbook (POH) and FAA Approved Airplane Flight Manual (AFM) for speed criteria and Vspeed values.

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The true airspeed (TAS) is displayed in knots below the Airspeed Indicator. When displayed, the Mach number appears in place of the TAS. The ground speed is displayed to the left of the TAS. The numeric labels and major tick marks on the moving tape are marked at intervals of 10 knots, while minor tick marks on the moving tape are indicated at intervals of 5 knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The actual airspeed is displayed inside the black pointer. The pointer remains black until reaching the high airspeed limit, at which point it turns red.

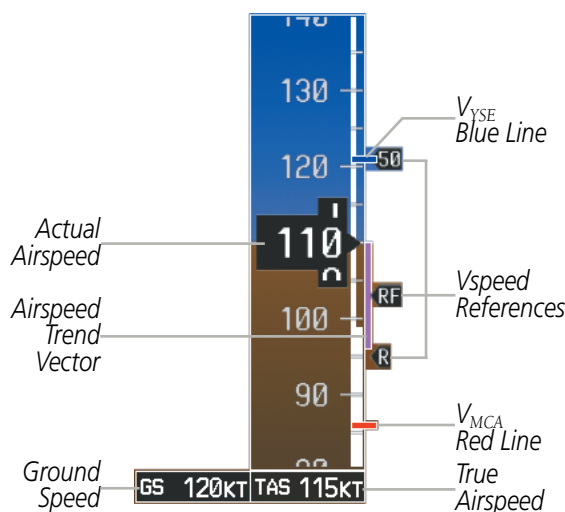


Figure 2-3 Airspeed Indicator



Figure 2-4 Red Pointer
Showing Airspeed Above V_{MO}

Speeds above the maximum operating speed, V_{MO} or M_{MO} depending on aircraft altitude, appear in the high speed warning range, represented on the airspeed tape by red/white "barber pole" coloration.

A red low speed awareness range extends up to the low speed awareness velocity, V_{LSA} . An aural stall warning is generated as the aircraft approaches a stall condition.

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 text of the actual airspeed readout changes to yellow while the pointer remains black. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.

Vspeeds 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 _R	R
	V ₅₀	50
Landing	V _{REF}	RF

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.

The maximum speed with approach flaps is displayed as a solid white triangle to the right of the airspeed scale. This indication is always displayed and cannot be turned off by the pilot.

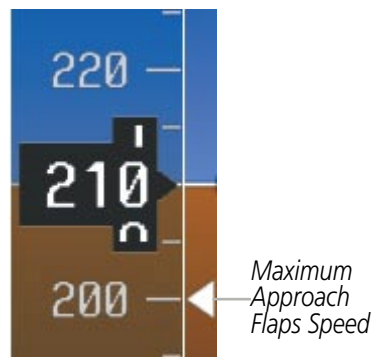


Figure 2-5 Maximum Flaps Extended Speed Reference

Changing Vspeeds and turning Vspeed flags on/off:

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



Figure 2-6 Takeoff and Landing Vspeeds
(Timer/References Window)

Vspeed flags can be turned on or off and values restored all at once or by category (takeoff and landing).

Modifying Vspeeds (on, off, restore defaults):

- 1) Press the **TMR/REF** Softkey.
- 2) Press the **MENU** Key.
- 3) Turn the **FMS** Knob to highlight the desired selection.
- 4) Press the **ENT** Key.
- 5) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

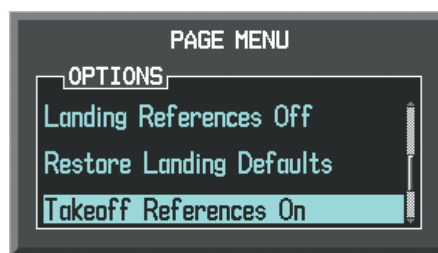


Figure 2-7 Page Menu
(Timer/References Window)

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.

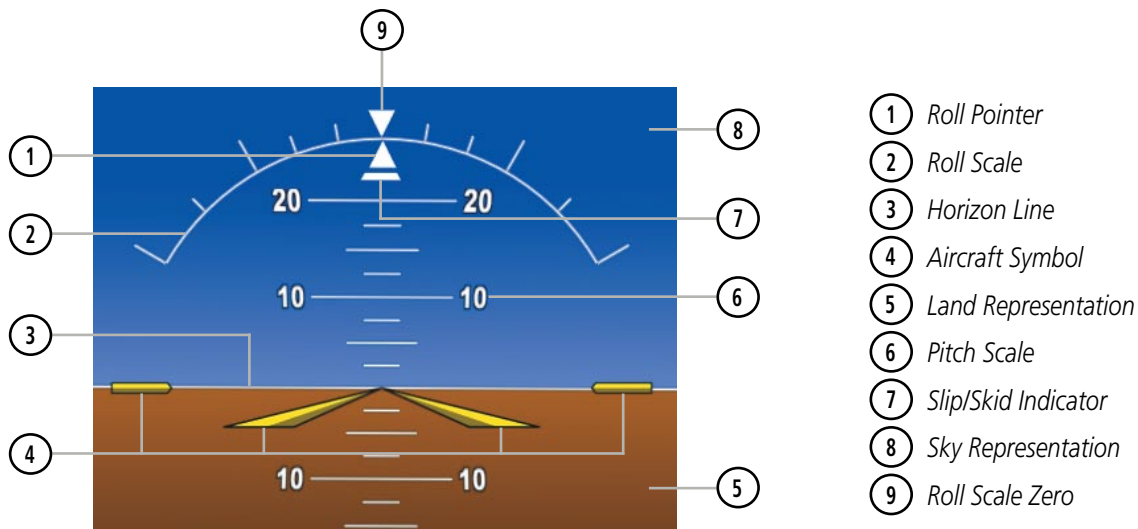


Figure 2-8 Attitude Indicator

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 (SVS) is activated, the pitch scale is reduced to 10° up and 7.5° down; refer to the Additional Features section for more information about SVS.

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.

When the optional Electronic Stability and Protection (ESP) system is available, additional indications may appear on the pitch and roll scales; refer to the Additional Features and AFCS Sections for more information about ESP.

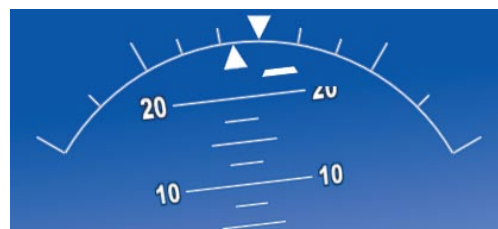


Figure 2-9 Slip/Skid Indication

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 cross-pointer) may be selected from the AUX - System Setup 1 Page (Figure 2-10).

Changing Command Bar format:

- 1) Turn the large **FMS** Knob to select the AUX page group on the MFD.
- 2) Turn the small **FMS** Knob to select the System Setup Page.
- 3) If necessary, press the **SETUP 1** Softkey to display the System Setup 1 Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight 'Format Active' in the 'Flight Director' box.
- 6) Turn the small **FMS** Knob to highlight the desired format.

'SNGL CUE' to display Command Bars as a single cue (Aircraft Symbol in Figure 2-10).

Or:

'X-POINTER' to display Command Bars as a cross pointer (Aircraft Symbol in Figure 2-10).

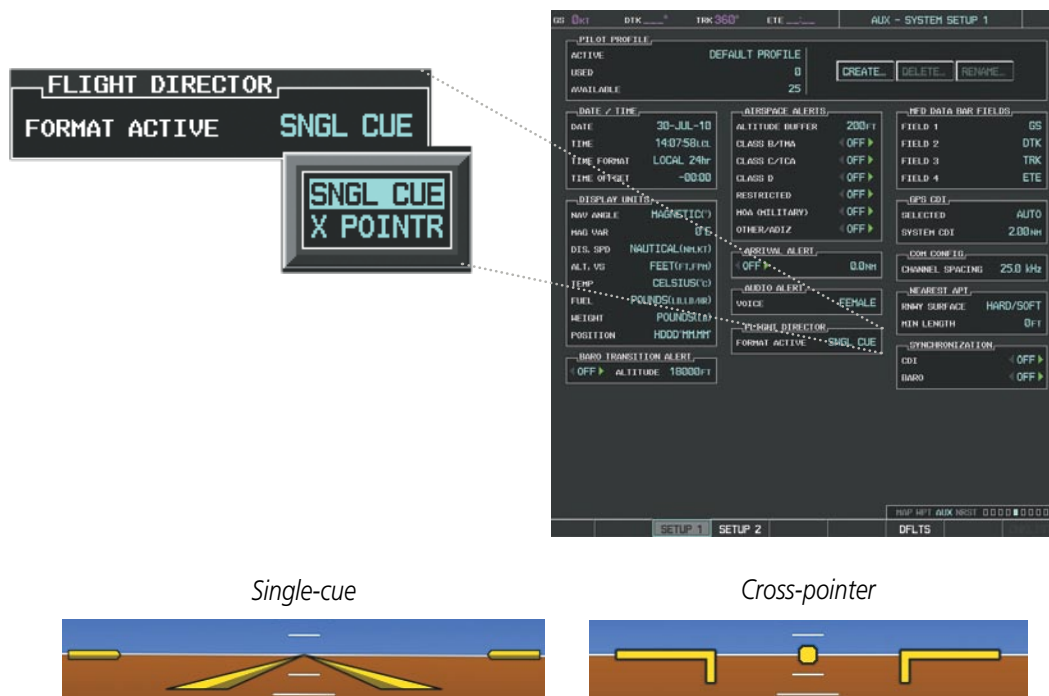


Figure 2-10 Flight Director Format
(AUX - System Setup Page)

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 indicated altitude is displayed inside 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 upper or lower edge of the tape. When the metric value is selected it is displayed in a separate box above the Selected and Indicated Altitudes (Figure 2-12). See the AFCS Section for more information about Selected Altitude.

The Altitude Trend Vector is a vertical magenta line that appears to the left of the altitude range strip when the aircraft is either climbing or descending. One end of the magenta line is anchored to the tip of the altitude pointer while the other end moves continuously up or down according to the rate of vertical speed. For any constant rate of vertical speed, the moving end of the line shows approximately what the indicated altitude value will be in six seconds. The trend vector is absent if the altitude remains constant or if data needed for calculation is not available due to a system failure.

Setting the Selected Altitude:

Turn the **ALT SEL** Knob to set the Selected Altitude in 100-ft increments.

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

When the altimeter is configured for metric units, the selected altitude is adjusted in 50 meter increments.

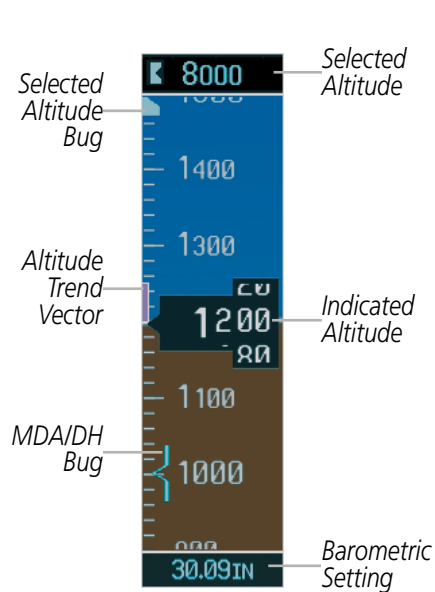


Figure 2-11 Altimeter

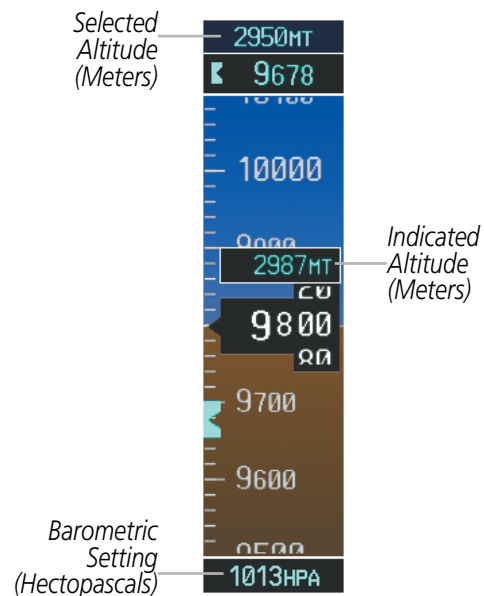


Figure 2-12 Altimeter (Metric Units)

Displaying altitude in meters:

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

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

Selecting the altimeter barometric pressure setting:

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

Selecting standard barometric pressure:

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

Or:

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



Figure 2-13 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

- 1) Press the **PFD** Softkey to display the second-level softkeys.
- 2) Press the **ALT UNIT** Softkey.
- 3) Press the **IN** Softkey to display the barometric pressure setting in inches of mercury (in Hg).
Or, press the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa; see Figure 2-12).
- 4) Press the **BACK** Softkey to return to the top-level softkeys.

If the barometric altimeter settings differ between PFDs by more than 0.02 in Hg, the readouts turn yellow. The settings can be synchronized from the PFD Setup Menu. Once the settings are synchronized (BARO SYNC turned on), they remain synchronized until the setting is turned off.

Synchronizing the altimeter barometric pressure settings:

- 1) Turn the large **FMS** Knob to select the AUX page group on the MFD.
- 2) Turn the small **FMS** Knob to select the System Setup Page.
- 3) If necessary, press the **SETUP 1** Softkey to display the System Setup 1 Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight 'BARO' in the Synchronization box.
- 6) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.



Figure 2-14 System Setup Page, Barometric Pressure Synchronization

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed using a non-moving tape labeled at 2000 and 4000 fpm with minor tick marks every 1000 fpm. The current vertical speed is displayed in the pointer along the tape. 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 corresponding edge of the tape and the rate appears inside the pointer.

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

VERTICAL DEVIATION



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

The Vertical Deviation Indicator (VDI; Figure 2-15) uses a magenta chevron to indicate the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used; the VDI appears in conjunction with the “TOD within 1 minute” alert. Full-scale deflection (two dots) is 1000 feet. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management and AFCS sections for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

The Glideslope Indicator (Figure 2-16) appears to the left of the Altimeter whenever an ILS frequency is tuned in the active NAV field and the aircraft heading and selected course are within 107°. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator. If a localizer frequency is tuned and there is no glideslope, “NO GS” is displayed in place of the diamond.

The glideslope is analogous to the glideslope for GPS approaches supporting SBAS vertical guidance (LNAV+V, L/VNV, LPV). When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glideslope Indicator (Figure 2-17) appears as a magenta diamond during the approach. If the approach type downgrades past the final approach fix (FAF), “NO GP” is displayed in place of the diamond.

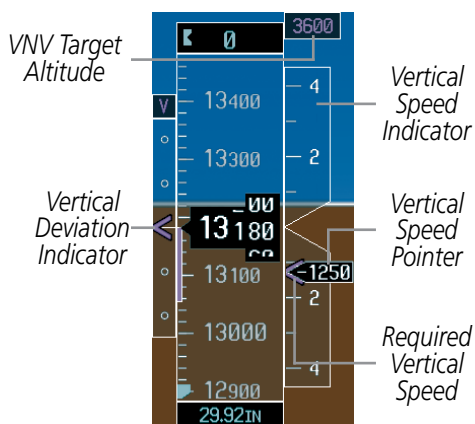


Figure 2-15 Vertical Speed and Deviation Indicators (VSI and VDI)

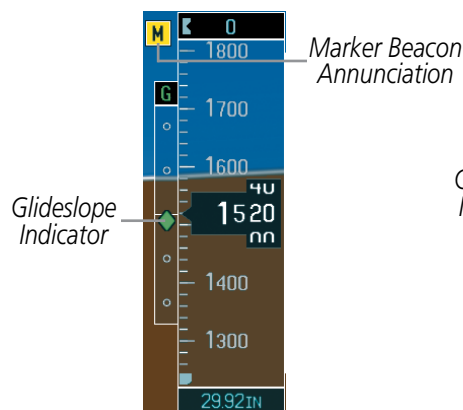


Figure 2-16 Glideslope Indicator

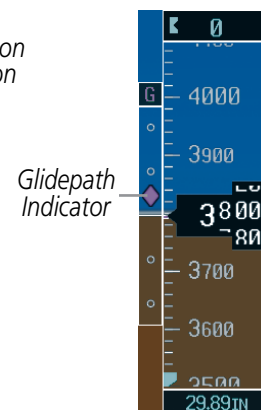


Figure 2-17 Glideslope Indicator

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 indicator. The HSI also presents turn rate, course deviation, bearing, and navigation source information and is available in two formats (360° compass rose and 140° arc).

Changing the HSI display format:

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

The 360° 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 (GPS, VOR1, and LOC1) or a double line arrow (VOR2 and LOC2) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.

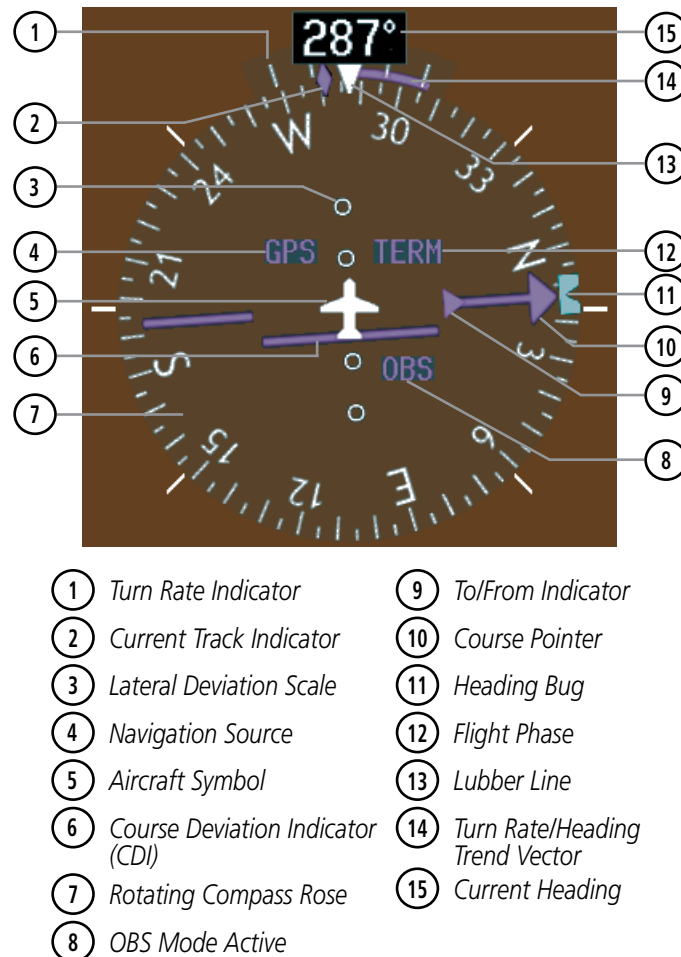


Figure 2-18 Horizontal Situation Indicator (HSI)

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



Figure 2-19 Arc HSI

The Selected Heading is shown to the upper left of the HSI for 3 seconds after being adjusted. The light blue bug on the compass rose corresponds to the Selected Heading. While the HSI is displayed as an arc, if the Selected Heading Bug is adjusted off the shown portion of the compass rose, the digital reading is displayed.

Adjusting the Selected Heading:

Turn the **HDG** Knob to set the Selected Heading.

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

The Selected Course is shown to the upper right of the HSI for 3 seconds after being adjusted. While the HSI is displayed as an arc, the Selected Course is displayed whenever the Course Pointer is not within the 140° currently shown.

Adjusting the Selected Course:

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

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



Figure 2-20 Heading and Course Indications

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation ('Mag Var') or referenced to true north (denoted 'T'), set on the AUX - System Setup 1 Page. 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 2-21 Heading and Course Indications (True)

Changing the navigation angle setting:

- 1) Turn the large **FMS** Knob to select the AUX page group on the MFD.
- 2) Turn the small **FMS** Knob to select the System Setup Page.
- 3) If necessary, press the **SETUP 1** Softkey to display the System Setup 1 Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight 'Nav Angle' in the 'Display Units' box (Figure 2-22).
- 6) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
 - TRUE - References angles to true north (denoted with 'T')
 - MAGNETIC - Angles corrected to the computed magnetic variation ('Mag Var')

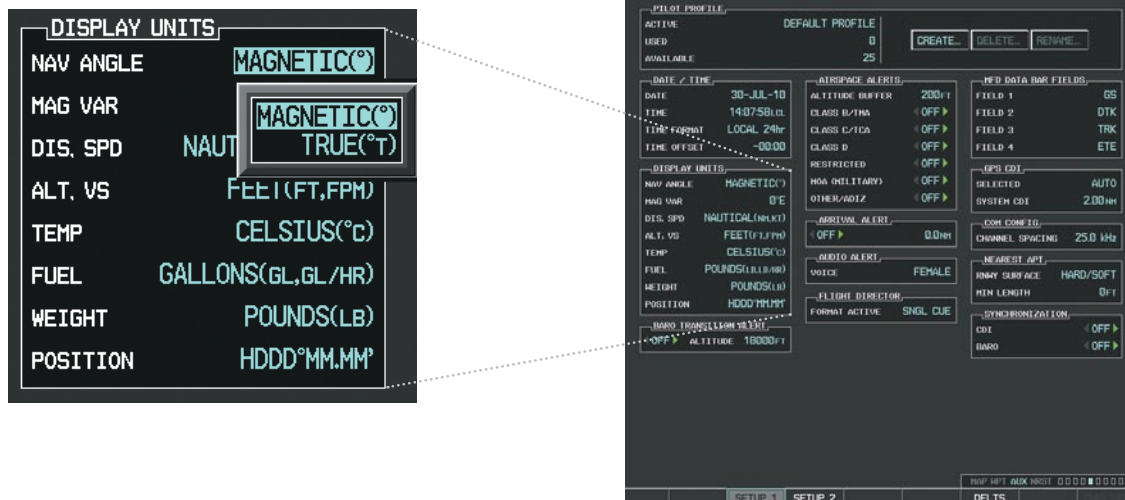


Figure 2-22 System Setup Page, Navigation Angle Settings

TURN RATE INDICATOR

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



Figure 2-23 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS



NOTE: When the Arc HSI is displayed, the Bearing Information windows and pointers are disabled.

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

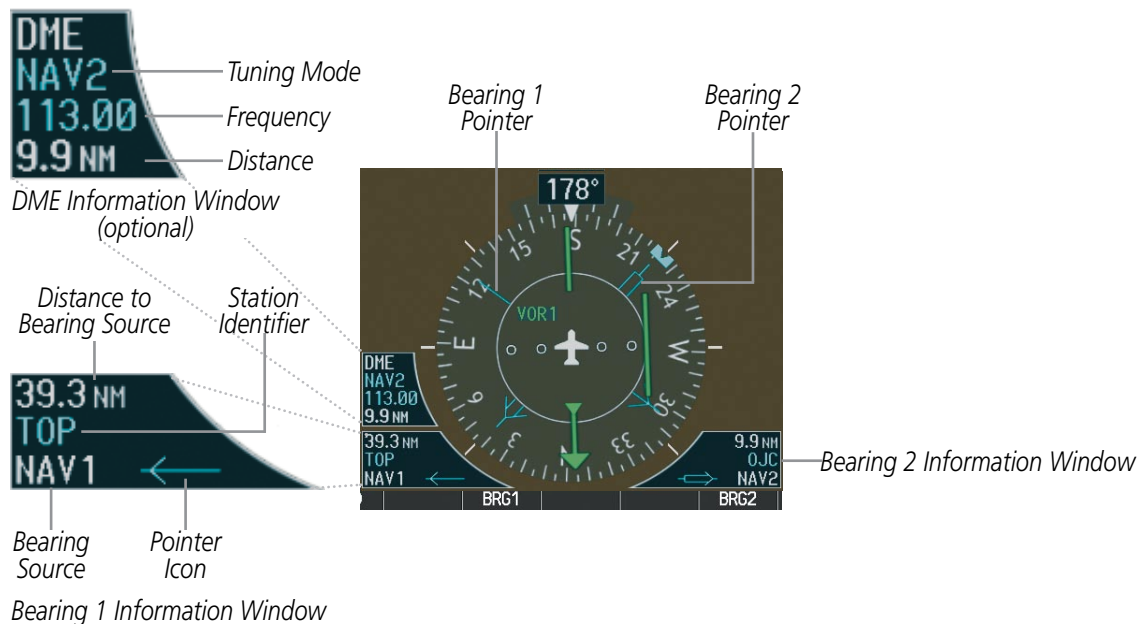


Figure 2-24 HSI with Bearing and DME Information

When a bearing pointer is displayed, its associated information window is also displayed. The Bearing Information windows (Figure 2-24) are displayed to the lower sides of the HSI and show:

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

If the NAV radio is the bearing source and is tuned to an ILS frequency (refer to the Audio Panel and CNS Section for information on tuning the radios), the bearing pointer is removed from the HSI and the frequency is replaced with “ILS”. When NAV1 or NAV2 is the selected bearing source, the frequency is replaced by the station identifier when the station is within range. If GPS is the bearing source, the active waypoint identifier is displayed in lieu of a frequency.

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
- GPS is the bearing source and an active waypoint is not selected

Selecting bearing display and changing sources:

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

DME INFORMATION WINDOW



NOTE: DME radio installation is optional.

The DME Information Window is displayed above the BRG1 Information Window and shows the DME label, tuning mode (NAV1, NAV2, or HOLD), frequency, and distance. When a signal is invalid, the distance is replaced by “-- NM”. Refer to the Audio Panel and CNS Section for information on tuning the radios.

Displaying the DME Information Window:

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

COURSE DEVIATION INDICATOR (CDI)



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

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

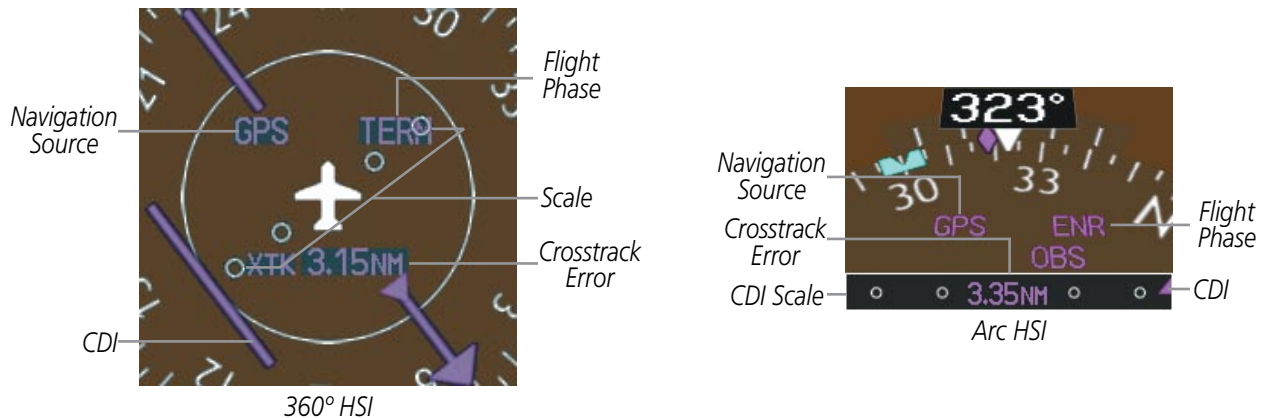


Figure 2-25 Course Deviation Indicator

The CDI can display two sources of navigation: GPS or NAV (VOR, localizer). Color indicates the current navigation source: magenta (for GPS) or green (for VOR and LOC); the Selected Course readout also follows these color indications. When coupled to GPS, the full scale limits for the CDI are defined by a GPS-derived distance. When coupled to a VOR or localizer (LOC), the CDI has the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while coupled to GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.

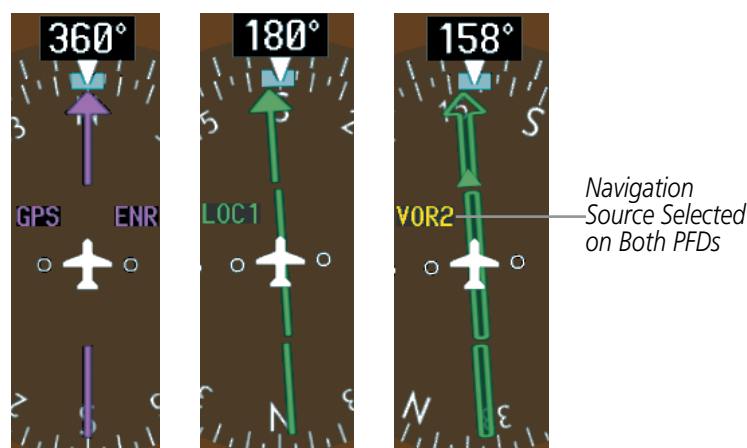


Figure 2-26 Navigation Sources

Changing navigation sources:

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

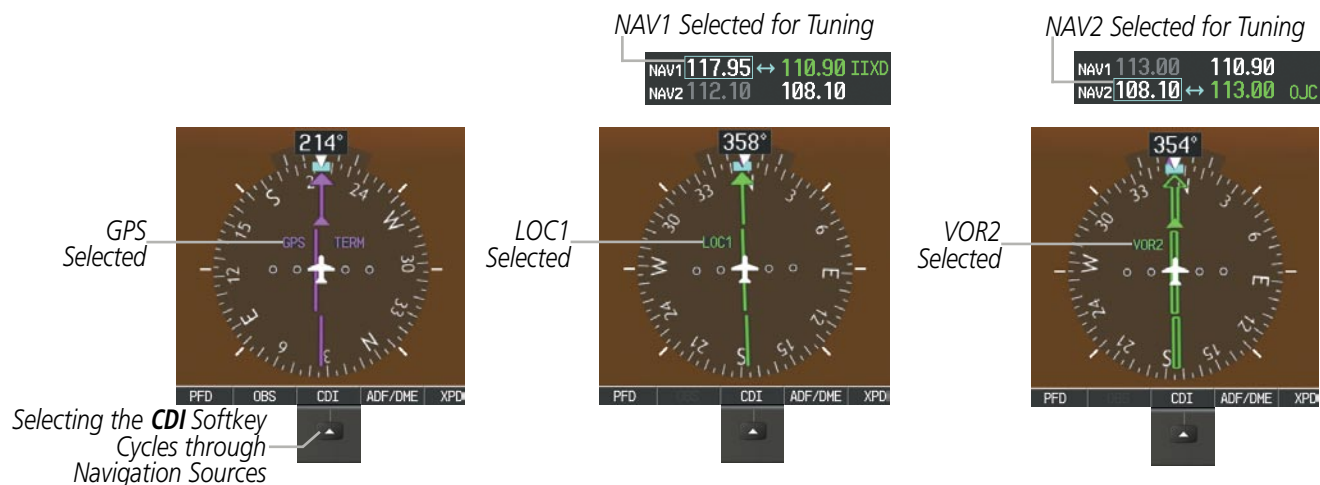


Figure 2-27 Selecting a Navigation Source

If the same VOR/LOC navigation source is selected on both PFDs, the navigation source annunciation turns yellow on both displays (unless synchronized). Once the CDIs are synchronized (CDI SYNC turned on), they remain synchronized until the setting is turned off.

Synchronizing the CDIs:

- 1) Turn the large **FMS** Knob to select the AUX page group on the MFD.
- 2) Turn the small **FMS** Knob to select the System Setup Page.
- 3) If necessary, press the **SETUP 1** Softkey to display the System Setup 1 Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight the 'CDI Sync' in the Synchronization box.
- 6) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.

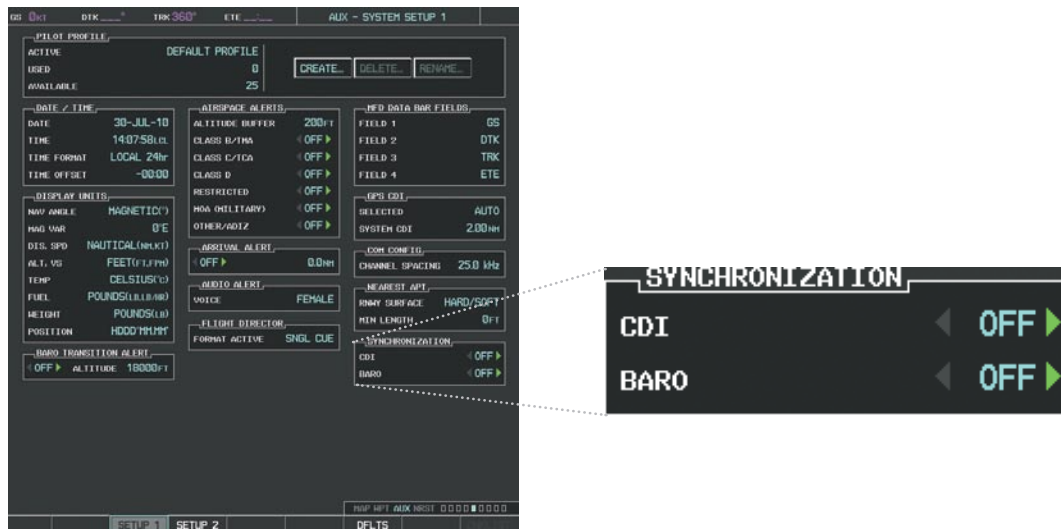


Figure 2-28 System Setup Page, CDI Synchronization

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

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

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

GPS CDI SCALING

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

The current GPS CDI scale setting is displayed as 'System CDI' on the AUX - System Setup 1 Page and the full-scale deflection setting may also be changed (2.0 nm, 1.0 nm, 0.3 nm, or Auto) from this page (Figure 2-29). If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is displayed rather than the flight phase annunciation.

Changing the selected GPS CDI setting:

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



Figure 2-29 System Setup Page, 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 2-30, 2-31, 2-32, Table 2-2).

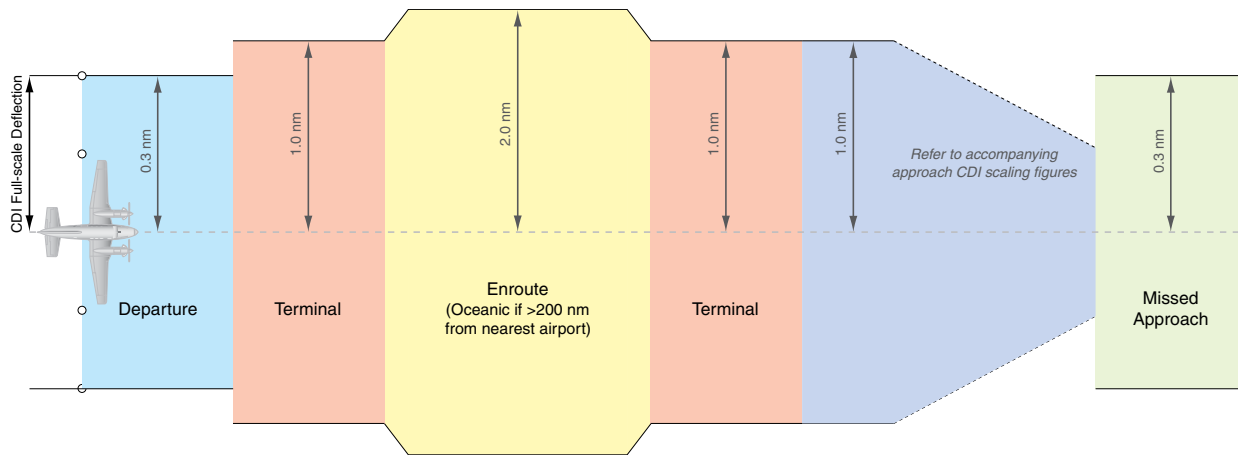


Figure 2-30 Automatic CDI Scaling

- When a departure procedure is active, the CDI is scaled for **departure** (0.3 nm).
- The system switches from departure to **terminal** CDI scaling (1.0 nm) under the following conditions:
 - The next leg in the procedure is not aligned with the departure runway
 - The next leg in the departure procedure is not CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF (see Glossary for leg type definitions)
 - After any leg in the departure procedure that is not CA or FA
- At 30 nm from the departure airport the **enroute** phase of flight is automatically entered and CDI scaling changes to 2.0 nm over a distance of 1.0 nm, except under the following conditions:
 - When navigating with an active departure procedure, the flight phase and CDI scale does not change until the aircraft arrives at the last departure waypoint (if more than 30 nm from the departure airport) or the leg after the last departure waypoint has been activated or a direct-to waypoint is activated.
- If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for **oceanic** flight (2.0 nm).
- Within 31 nm of the destination airport (**terminal** area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm; except under the following conditions:
 - When navigating with an active arrival route, the flight phase and CDI scale does not change until the aircraft arrives at the first waypoint in the arrival route (if within 31 nm from the destination airport).
- During **approach**, the CDI scale ramps down even further (see Figures 2-32 and 2-33). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is activated or if Vector-to-Final (VTF) is selected.
 - If the active waypoint is the FAF, the ground track and the bearing to the FAF must be within 45° of the final approach segment course.
 - If the active waypoint is part of the missed approach procedure, the active leg and preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

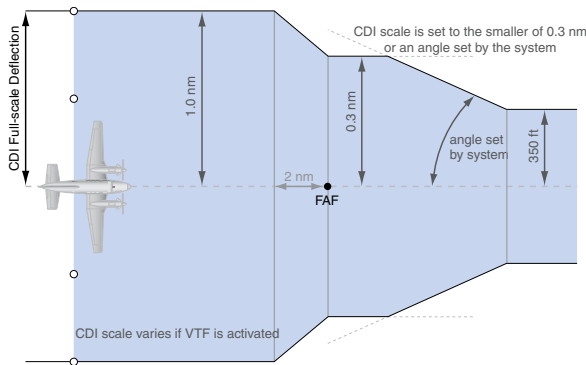


Figure 2-31 Typical LNAV and LNAV+V Approach CDI Scaling

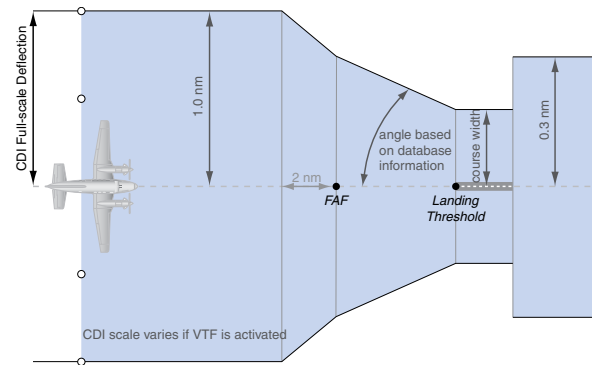


Figure 2-32 Typical LNAV/VNAV and LPV Approach CDI Scaling

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

Flight Phase	Annunciation	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	2.0 nm
Approach (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-30)
Approach (Non-precision with Vertical Guidance)	LNAV + V	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-31)
Approach (LPV)	LPV	
Missed Approach	MAPR	0.3 nm

Table 2-2 Automatic GPS CDI Scaling

OBS MODE



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

Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan (GPS must be the selected navigation source), but retains the current “active-to” waypoint as the navigation reference even after passing the waypoint. ‘OBS’ is annunciated to the lower right of the aircraft symbol when OBS Mode is selected (see Figure 2-33).

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

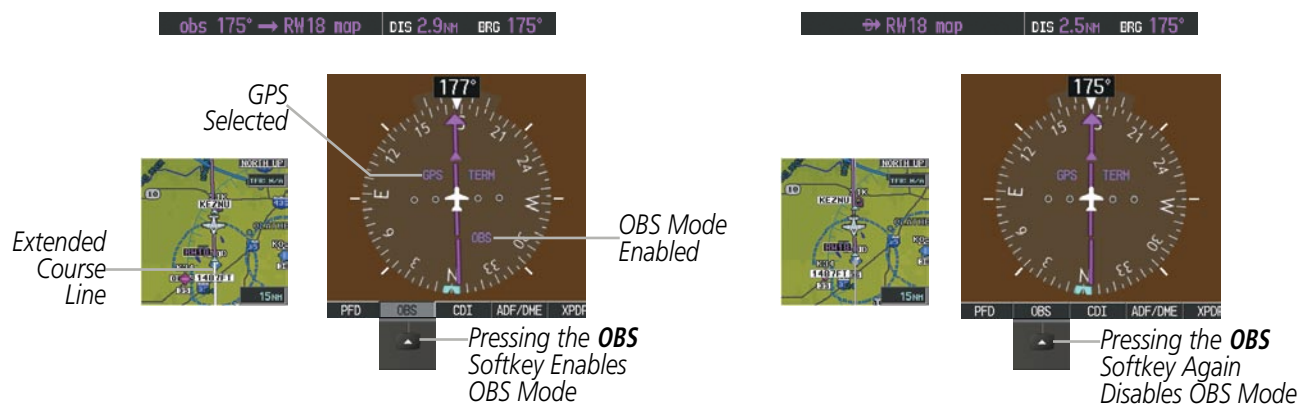


Figure 2-33 Omni-bearing Selector (OBS) Mode

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

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

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. **SUSP** appears on the HSI at the lower right of the aircraft symbol. The **OBS** Softkey label changes to indicate the suspension is active as shown in Figure 2-34. Pressing the **SUSP** Softkey deactivates the suspension and resumes automatic sequencing of approach waypoints.

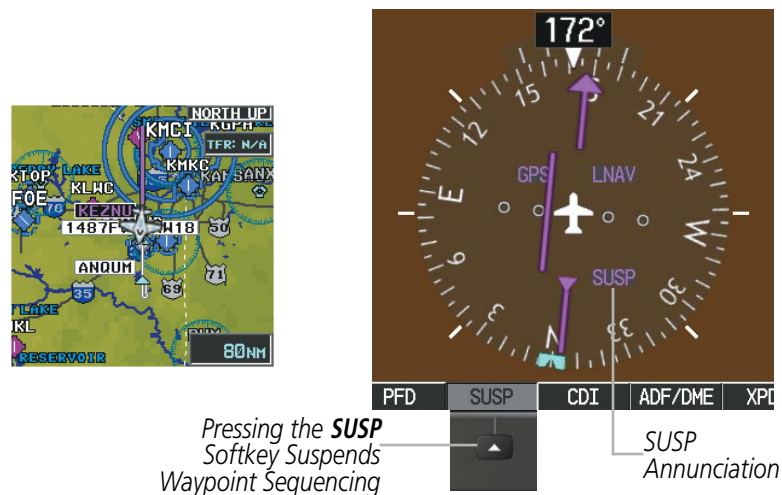


Figure 2-34 Suspending Automatic Waypoint Sequencing

2.2 SUPPLEMENTAL FLIGHT DATA



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

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

TEMPERATURE DISPLAYS

The G1000 Outside Air Temperature display (OAT), which is adjusted for compressibility effects, and the deviation from International Standard Atmosphere Temperature display (ISA) are shown in degrees Celsius (°C) by default in the lower left of the PFD under normal display conditions, or below the true airspeed in reversionary mode.

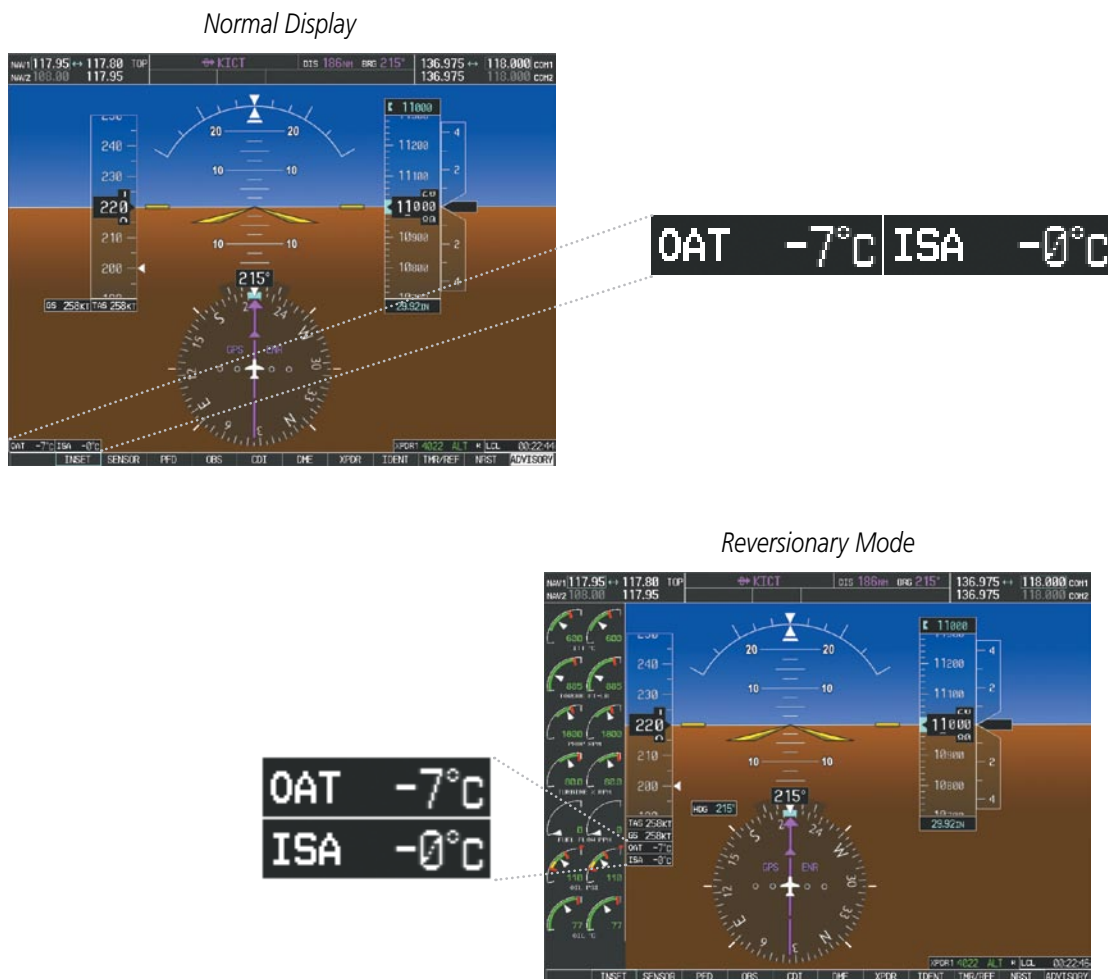


Figure 2-35 Outside Air Temperature

WIND DATA

Wind direction and speed 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:

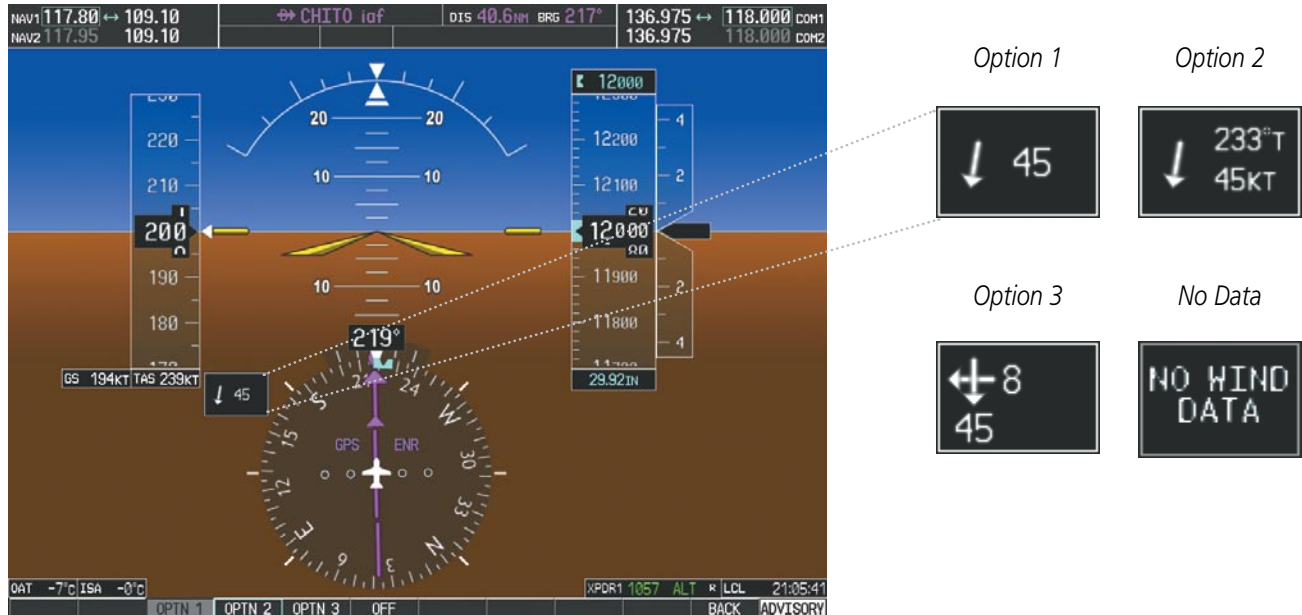


Figure 2-36 Wind Data

Displaying wind data:

- 1) Press the **PFD** Softkey.
- 2) Press the **WIND** Softkey to display wind data below the Selected Heading.
- 3) Press one of the **OPTN** softkeys to change how wind data is displayed:
 - **OPTN 1**: Wind direction arrow and speed
 - **OPTN 2**: Wind direction arrow with true digital direction and speed
 - **OPTN 3**: Wind direction arrows with headwind, tailwind, and crosswind speed components
- 4) To remove the window, press the **OFF** Softkey.

VERTICAL NAVIGATION (VNV) INDICATIONS

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



Figure 2-37 Vertical Navigation Indications (PFD)

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

Table 2-3 VNV Indication Removal Criteria

2.3 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

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

G1000 ALERTING SYSTEM

Messages appear in the Alerts Window (in the lower right corner of the PFD; Figure 2-38) when a warning, caution, advisory alert, or G1000 message advisory occurs. System alert messages are provided for awareness of G1000 system problems or status and may not require pilot action. The Alerts Window allows system alerts to be displayed simultaneously. The **FMS** Knob can be used to scroll through the alert messages. The Alerts Window is enabled/disabled by selecting the **ALERTS** Softkey. If the window is already open when a new message is generated, selecting the **ALERTS** Softkey to acknowledge the message causes it to turn gray.

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

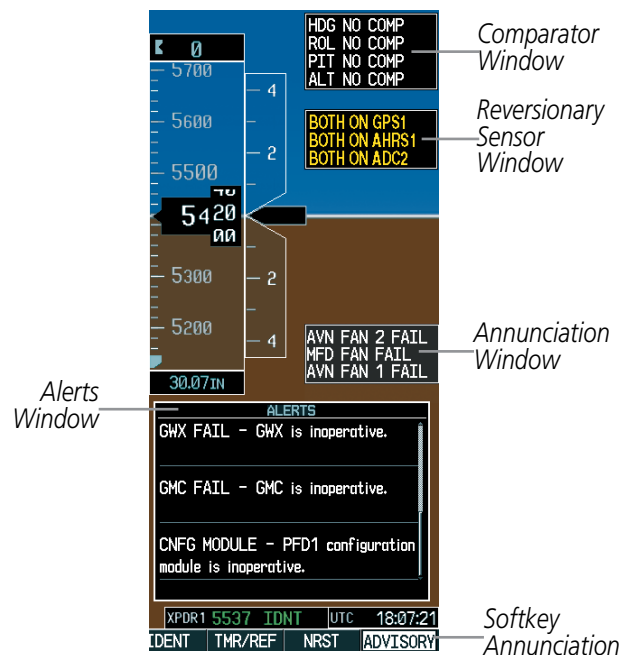


Figure 2-38 G1000 Alerting System

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



Figure 2-39 Softkey Annunciation

Critical values generated by redundant sensors are monitored by comparators. If differences in the sensors exceed a specified amount, the Comparator Window appears in the upper right corner of the PFD and the discrepancy is annunciated in the Comparator Window as a 'MISCOMP' (miscompare). If one or both of the sensed values are unavailable, it is annunciated as a 'NO COMP' (no compare).



Figure 2-40 Comparator Window

Reversionary sensor selection is annunciated in a window on the right side of the PFD. These annunciations reflect reversionary sensors selected on one or both PFDs. Pressing the **SENSOR** Softkey accesses the **ADC1**, **ADC2**, **AHRS1**, and **AHRS2** softkeys. These softkeys allow switching of the sensors being viewed on each PFD. With certain types of sensor failures, the G1000 may make some sensor selections automatically. The GPS sensor cannot be switched manually.



Figure 2-41 Reversionary Sensor Window

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.

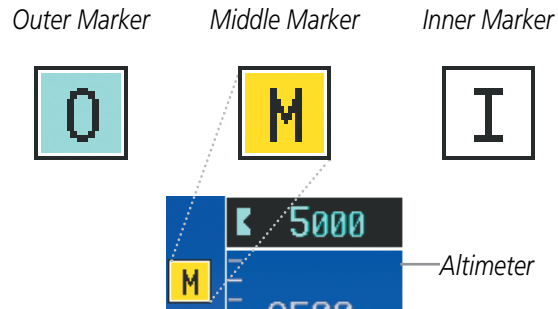


Figure 2-42 Marker Beacon Annunciations

TRAFFIC ANNUNCIATION

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

- The PFD Inset Map is enabled, displaying traffic (Figure 2-43)
- A flashing black-on-yellow TRAFFIC annunciation (Figure 2-44) appears to the top left of the Attitude Indicator for five seconds and remains displayed until no TAs are detected in the area
- A single “Traffic” aural alert is generated, unless an optional Traffic Advisory System (TAS) is installed (refer to the applicable TAS documentation for alerts generated by TAS equipment)

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

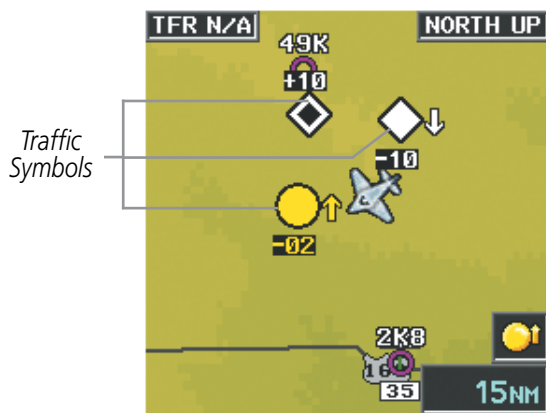


Figure 2-43 Inset Map with Traffic Displayed



Figure 2-44 Traffic Annunciation

TAWS ANNUNCIATIONS

Terrain Awareness and Warning System (TAWS) annunciations appear on the PFD to the upper left of the Altimeter. In TAWS-A installations, annunciations also appear to the upper right of the Airspeed Indicator. Refer to the Hazard Avoidance Section and Appendix A for information on TAWS alerts and annunciations.



Figure 2-45 Example TAWS-A Annunciations

ALTITUDE ALERTING

The Altitude Alerting function 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 Altitude Alerter is independent of the GFC 700 AFCS, but alerting tones are generated only when the GFC 700 is installed. The following occur when approaching the Selected Altitude:

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



Figure 2-46 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION



NOTE: The Low Altitude Annunciation is available only when an SBAS signal (such as WAAS, EGNOS, or MSAS) is available and the pilot has inhibited TAWS alerts.

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 right of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.

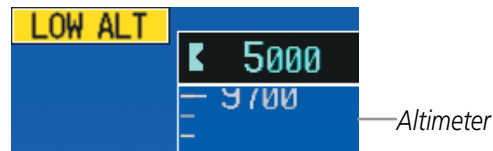


Figure 2-47 Low Altitude on GPS SBAS Approach

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

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

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

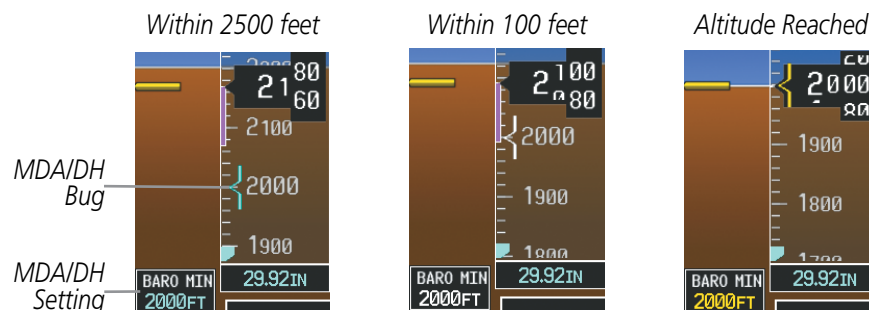


Figure 2-48 Barometric MDA/DH Alerting Visual Annunciations

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

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

Setting the barometric or radar minimum descent altitude and bug:

- 1) Press the **TMR/REF** Softkey.
- 2) Turn the large **FMS** Knob to highlight the Minimums field.
- 3) Turn the small FMS Knob to highlight 'BARO' or 'RAD ALT'. 'OFF' is selected by default. Press the **ENT** Key or turn the large **FMS** Knob to highlight the next field.
- 4) Use the small **FMS** Knob to enter the desired altitude (from zero to 16,000 feet when 'BARO' is selected, or up to 2,500 feet when 'RAD ALT' is selected).
- 5) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.

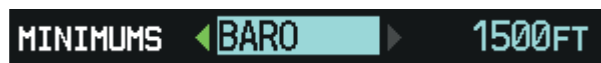


Figure 2-49 Timer/References Window, MDA/DH Setting

RADAR ALTIMETER

When the radar height (the aircraft altitude above ground level detected by the radar altimeter) is between -40 and 2500 feet, the current value is displayed in green to the right of the current aircraft heading (Figure 2-50). Display of radar height becomes more sensitive as the height above ground decreases (Table 2-4).

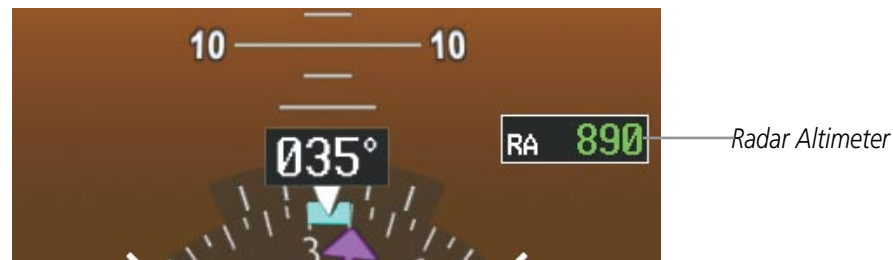


Figure 2-50 Current Radar Height

Radar Height Range	Shown to Nearest
-40 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 alerting function (Figure 2-51), the color of the radar height changes to yellow (Figure 2-52).

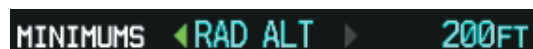


Figure 2-51 RAD ALT Setting
(Timer/References Window)

A digital display showing 'RA' in white and '195' in yellow on a black background.

Figure 2-52 RA as Altitude Source for MDA/DH

A ground line (Figure 2-53) 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 the RA box (Figure 2-54). The Radar Altimeter test is done on the MFD but is displayed on the PFDs to the right of the current heading (Figure 2-55).

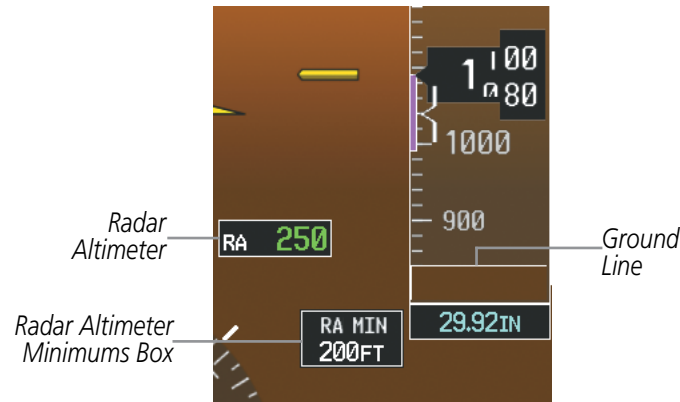


Figure 2-53 Altimeter Displaying the Ground Line (RAD ALT)

A digital display showing 'RA FAIL' in yellow on a black background.

Figure 2-54 Radar Altimeter with Invalid Data

Enabling/Disabling the Radar Altimeter Test Mode:

- 1) Turn the large **FMS** Knob to select the AUX page group on the MFD.
- 2) Turn the small **FMS** Knob to select the AUX - System Status Page.
- 3) Press the **RA TEST** Softkey to enable or disable the test.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the small **FMS** Knob to choose 'Enable RA Test Mode' or 'Disable RA Test Mode' (choice dependent on current state).
- 3) Press the **ENT** Key.

When test mode is active, 'RA TEST' is annunciated above the RA box and 50 feet will be displayed in the RA box.

A digital display showing 'RA TEST' in white above a box containing 'RA' in white and '50' in green on a black background.

Figure 2-55 Radar Altimeter with Test Annunciation

2.4 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-5 can appear on the HSI when abnormal GPS conditions occur; see Figure 2-56 for examples. Refer to the Flight Management Section for more information on Dead Reckoning (DR) Mode.

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

Table 2-5 Abnormal GPS Conditions Annunciated on HSI



Figure 2-56 Example HSI Annunciations

DR Mode causes the following items on the PFD to be shown in yellow:

- CDI (when GPS is the selected navigation source; removed after 20 minutes in DR mode operation)
- Current Track Indicator
- Wind data and pointers in the Wind Data Box on the PFD
- GPS bearing pointers
- Distances in the Bearing Information windows
- Active Flight Plan distances, bearings, and ETE values

The accuracy items should be verified when operating in DR Mode.

UNUSUAL ATTITUDES

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

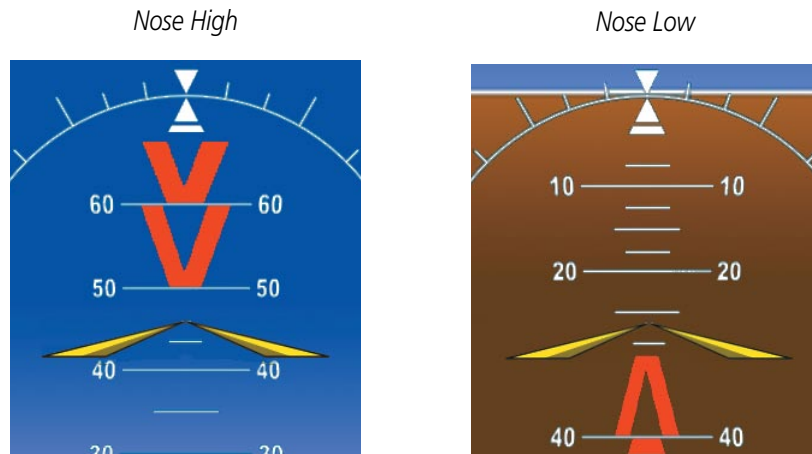


Figure 2-57 Pitch Attitude Warnings

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

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

BLANK PAGE

SECTION 3 ENGINE INDICATION SYSTEM

The G1000 Engine Indication System (EIS) displays critical engine and fuel flow parameters on the left side of the Multi Function Display (MFD) during normal operations (Figure 3-1). In Reversionary Mode, the display(s) are configured to combine the Primary Flight Display (PFD) symbology with the EIS (Figure 3-12).

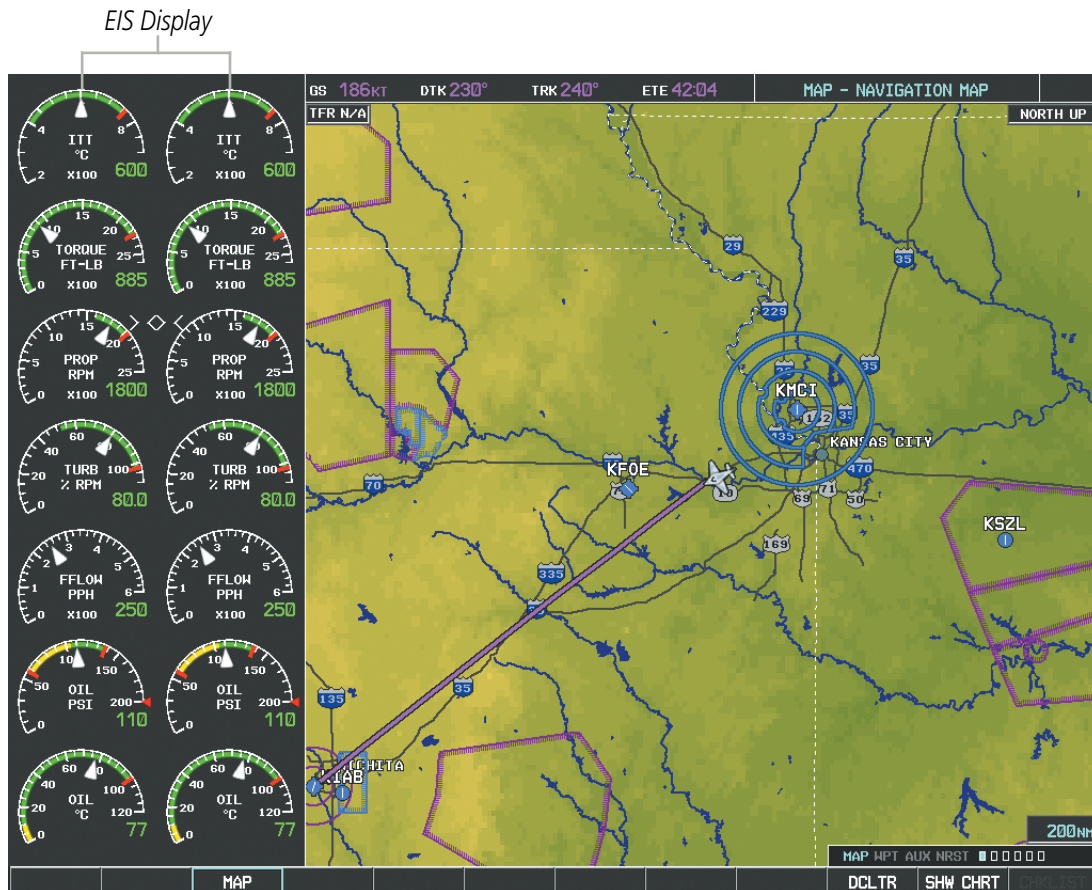


Figure 3-1 MFD (Normal Mode)

EIS information is presented using gauges and digital readouts. Green bands on the instrument scales indicate normal ranges of operation; yellow and red bands indicate caution and warning, respectively. White or uncolored bands indicate areas outside of normal operation not yet in the caution or warning ranges (except for the Fuel Flow gauges, which do not display bands). During normal operating conditions, an instrument's pointer appears in white and the readout text is green.

When an unsafe operating condition occurs, the pointer and readout color change to yellow or red, indicating a caution or warning. If a cautionary time limit is exceeded, the pointers and digits may flash red, even if the parameter is still within the cautionary range. If the sensor data for a parameter becomes invalid or unavailable, a red 'X' is displayed across the indicator and/or readout. If the sensor data for a parameter is out of range, dashes '---' are displayed instead of a readout.

3.1 EIS DISPLAY



NOTE: The gauges displayed and the values shown in this section are taken from an example Beechcraft 200/B200 configuration. Refer to the Pilot's Operating Handbook (POH) and FAA Approved Airplane Flight Manual (AFM) for specific values and operating limitations.

- | | | |
|---|---|---|
| ① | Interstage Turbine Temperature (ITT) | Displays Interstage Turbine Temperature in degrees Celsius (°C) |
| ② | Torque (FT-LB) | Displays torque in foot-pounds |
| ③ | Tachometer (PROP RPM) | Displays propeller speed in revolutions per minute (rpm); the red band indicates propeller overspeed |
| ④ | Propeller Sync | Displays a diamond when propellers are in sync. Indicates when propellers are out of sync by the diamond transitioning to an arrowhead. The arrowhead points towards the propeller turning at a higher-speed. |
| ⑤ | Turbine Speed (% RPM) | Displays turbine speed in a percentage of the revolutions per minute (rpm) |
| ⑥ | Fuel Flow (FFLOW PPH) | Displays current fuel flow in pounds per hour (pph) |
| ⑦ | Oil Pressure (OIL PSI) | Displays pressure of oil supplied to the engines in pounds per square inch (psi) |
| ⑧ | Oil Temperature (OIL °C) | Displays the oil temperature in degrees Celsius (°C) |

200/B200 Example Configuration

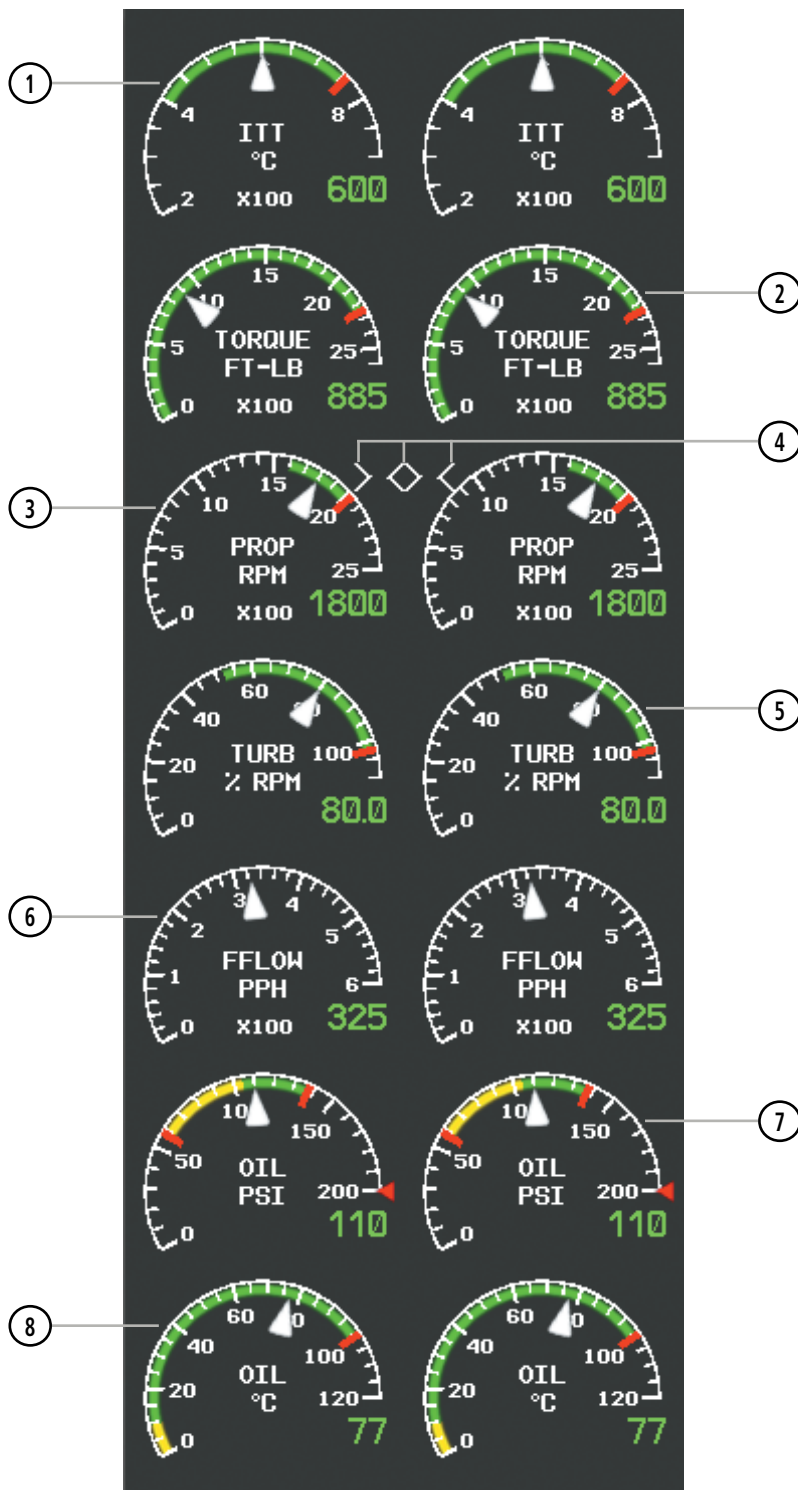


Figure 3-2 EIS Display (Normal Mode)

INTERSTAGE TURBINE TEMPERATURE

The Interstage Turbine Temperature (ITT) Gauge is displayed at the top of the EIS strip. This gauge differs for engine start and running conditions. Values between 200 and 1200 degrees Celsius (°C) are shown at engine start; values change to 200 to 900 °C once the engine has stabilized. A red triangle is displayed at 1000 °C during engine start to indicate maximum starting ITT. This is available in both normal and reversionary modes.



Figure 3-3 ITT Gauge

TORQUE

The Torque Gauge displays engine power in foot-pounds and is located beneath the ITT gauge. The values range from 0 FT-LB to 2600 FT-LB. If the torque remains above 2230 FT-LB for more than 5 seconds, a warning condition occurs.



Figure 3-4 Torque Gauge

TACHOMETER (RPM)

The Tachometer is located beneath the Torque gauge and displays the propeller speed in revolutions per minute (RPM) from 0 to 2500. A propeller overspeed is indicated if the propeller speed exceeds the maximum safe operating speed (red tick mark). The Tachometer is equipped with a propeller sync indicator, which points towards the higher-speed propeller when propellers are out of sync. The indicator changes linearly with RPM difference between the left and right propellers. A full diamond is displayed when the propellers are synchronized and transitions to a full arrowhead when the difference is greater or equal to 50 rpm.



Figure 3-5 Propellers Synchronized



Figure 3-6 Propellers Out of Sync (less than 50 rpm)



Figure 3-7 Propellers Out of Sync
(greater than or equal to 50 rpm)

TURBINE SPEED

The Turbine Speed Gauge is located beneath the Tachometer. The gauge range is from 0 to 110%.

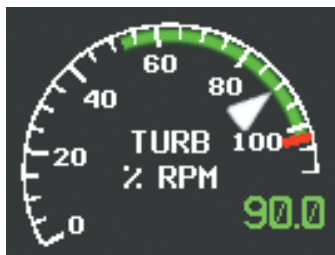


Figure 3-8 Turbine Speed Gauge

FUEL FLOW

The Fuel Flow Gauge is displayed beneath the Turbine Speed gauge. Fuel Flow is displayed in pounds per hour (pph) from 0 to 600 pph.



Figure 3-9 Fuel Flow Gauge

OIL PRESSURE

The Oil Pressure Gauge is located beneath the Fuel Flow gauge. Oil pressure is displayed in pounds per square inch (psi) from 0 to 200 psi. Safe operating pressure is more than 90 psi and less than 135 psi (*varies based on altitude above FL210 and type of engines installed; refer to the AFM*). A red triangle represents the maximum oil transient pressure at 200 psi.

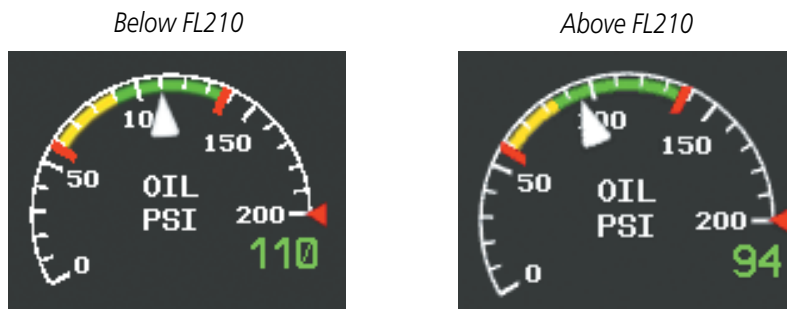


Figure 3-10 Oil Pressure Gauge

OIL TEMPERATURE

The Oil Temperature Gauge is located beneath the Oil Pressure gauge. Oil temperature is displayed in degrees Celsius (°C).

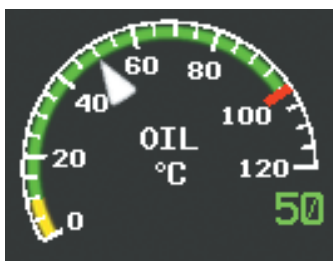


Figure 3-11 Oil Temperature Gauge

3.2 EIS DISPLAY IN REVERSIONARY MODE

In the event of PFD1, PFD2 or MFD failure, the Display Backup button must be pressed to enter reversionary (or backup) mode. Reversionary mode is a mode of operation in which all important flight information is presented identically on at least one of the operating displays (see Figure 3-12). Transition to reversionary mode should be straightforward for the pilot, for flight parameters are presented in the same format as in normal mode (refer to the System Overview for information about display Reversionary Mode).



Figure 3-12 Reversionary Mode (200/B200)

In the event of display failure, the display modes are as follows:

- **PFD1 failure** – Press the Display Backup button on the left Audio Panel. MFD enters reversionary mode; PFD2 remains in normal mode.
- **MFD failure** – Press the Display Backup buttons on both Audio Panels. PFD1 and PFD2 enter reversionary mode.
- **PFD2 failure** – Press the Display Backup button on the right Audio Panel. MFD enters reversionary mode; PFD1 remains in normal mode.



Figure 3-13 Display Backup Button

REVERSIONARY DISPLAY

The EIS Reversionary Mode Display gauges have a different shape and share one title (i.e. ITT, FFLOW) for each pair of gauges. Major white tick marks are displayed only at the minimum and maximum values. No minor tick marks or numeric labels are displayed. Prop Synchronization information is not displayed while in Reversionary Mode.



NOTE: The gauges displayed and the values shown in this section are taken from an example Beechcraft 200/B200 configuration. Refer to the Pilot's Operating Handbook (POH) and FAA Approved Airplane Flight Manual (AFM) for specific values and operating limitations.

200/B200 Example Configuration

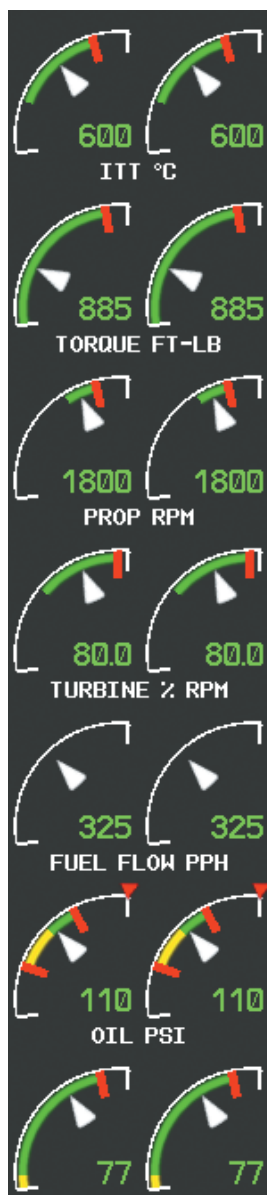


Figure 3-14 EIS Reversionary Mode Display

BLANK PAGE

SECTION 4 AUDIO PANEL AND CNS

4.1 OVERVIEW

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

CNS operation in the Beechcraft 200/B200 Series is performed by the following Line Replaceable Units (LRUs):

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

The PFD and Control Unit controls are used to tune the communication transceivers and navigation radios.

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

The Mode S Transponders are controlled with softkeys and the **FMS** Knobs. The Transponder Data Box is located to the left of the System Time Box. The data box displays the selected transponder, the active four-digit code, mode, and a reply status (Figure 4-1).

AUDIO PANEL VOLUME CONTROL

Adjusting the master volume control affects all radio audio volume and airframe type warnings that are heard in the headsets (not the speaker) for the pilot or copilot side Audio Panel. Radio adjustments made on the PFD controls to compensate for the master volume change on the Audio Panel also affect the radio levels for the other pilot. Independent radio volume adjustments made using the Audio Panel Master Volume controls affect only the audio heard in the corresponding crew position headset.

Radio volume adjustments may be overridden by each crew position independently using the master volume control on the Audio Panel for the respective crew position. In addition, the master volume control for each Audio Panel affects all other system audio output to its designated crew position headset much like volume adjustments found on many aviation headsets.

PFD CONTROLS AND FREQUENCY DISPLAY



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

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

AUDIO PANEL CONTROLS



Figure 4-2 Audio Panel Controls



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

- ① **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receive can be added by pressing the **COM2** Key.
- ② **COM1** – When selected, audio from the #1 COM receiver can be heard.
- ③ **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 receive can be added by pressing the **COM1** Key.
- ④ **COM2** – When selected, audio from the #2 COM receiver can be heard.
- ⑤ **COM3 MIC** – Reserved for optional COM radio.

- ⑥ **COM3** – Reserved for optional COM radio.
- ⑦ **PA** – Selects the passenger address system. The selected COM transmitter is deselected when the **PA** Key is pressed.
- ⑧ **TEL** – When selected, activates the SATCOM transceiver.
- ⑨ **MUSIC** – Toggles the Music 1 input on or off. Pressing and holding toggles music muting on or off.
- ⑩ **SPKR** – Selects and deselects the on-side flight deck speaker. COM and NAV receiver audio can be heard on the speaker.
- ⑪ **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received.
- ⑫ **HI SENS** – Press to increase marker beacon receiver sensitivity. Press again to return to low sensitivity.
- ⑬ **DME** – Turns optional DME audio on or off.
- ⑭ **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
- ⑮ **ADF** – Turns optional ADF receiver audio on or off.
- ⑯ **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
- ⑰ **AUX** – Not used in Beechcraft 200/B200 Series aircraft.
- ⑱ **MAN SQ** – Enables manual squelch for the intercom. When the intercom is active, press the **ICS** Knob to illuminate SQ. Turn the **ICS** Knob to adjust squelch.
- ⑲ **PLAY** – Press once to play the last recorded COM audio. Press again to stop playing. Press twice within 0.5 second while audio is playing and the previous block of recorded audio will be played. Each subsequent two presses within 0.5 second plays each previously recorded block.
- ⑳ **INTR COM** – Selects and deselects the pilot/copilot intercom on both Audio Panels.
- ㉑ **CABIN** – Initiates intercom communications with passengers in the cabin.
- ㉒ **ICS Knob** – Turn to adjust intercom volume or squelch. Press to switch between volume and squelch control as indicated by illumination of VOL or SQ. The **MAN SQ** Key must be selected to allow squelch adjustment.
- ㉓ **MSTR Knob** – The Master Volume Control adjusts volume for the blended NAV, COM, intercom audio, and alert warnings.
- ㉔ **DISPLAY BACKUP Button** – Manually selects PFD/MFD Reversionary Mode.

CONTROL UNIT

The Control Unit is a pedestal-mounted interface allowing MFD operation, data entry, COM and NAV tuning, and transponder control. Many procedures can be performed using the Control Unit rather than the display bezel controls. Annunciators beside the **FMS**, **XPDR**, **COM**, and **NAV** keys illuminate when their respective control modes are selected. The unit is in FMS control mode by default on system power-up.

The appropriate frequency box on the selected display is outlined by a light blue selection box, which flashes for a few seconds to indicate control unit activity. Selection of a different display control or radio tuning mode results in cancelation of the previous radio tuning mode.



Figure 4-3 Control Unit



Figure 4-4 Frequency Tuning with the Control Unit

- ① **CLR Key** – Erases information, cancels entries, or removes menus.
- ② **MENU Key** – Displays a list of options for accessing additional features or making setting changes.
- ③ **ENT Key** – Validates or confirms a menu selection or data entry.
- ④ **FMS Knob** – Flight Management System Knob. This knob provides tuning capability for the COM and NAV radios when the appropriate **COM** or **NAV** key is pressed. When the **XPDR** Key is pressed, the transponder code may be entered using the **FMS** Knob. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.
- ⑤ **FMS Key** – Sets the **FMS** Knob to control FMS functions on the MFD. When pressed, an annunciator next to the key illuminates indicating adjustment of the **FMS** Knob will now affect FMS functions.
- ⑥ **COM Key** – Sets the **FMS** Knob to control tuning of the COM radios. The first press will select COM1, as indicated by an illuminated “1” to the left of the key. Press again to select COM2. This is annunciated with a “2” to the right of the key. Each subsequent press of the **COM** Key will switch between COM1 and COM2. Use the **FMS** Knob to tune the selected COM. The COM Tuning Selection Box is outlined with a light blue line when the COM frequency is active on the control unit (Figure 4-4).
- ⑦ **Frequency Transfer Key (EMERG)** – Transfers the standby and active COM or NAV frequencies. Press and hold for two seconds to tune the emergency frequency (121.500 MHz) automatically into the COM active frequency field.
- ⑧ **NAV Key** – Sets the **FMS** Knob to control tuning of the NAV radios. The first press will select NAV1, as indicated by an illuminated “1” to the left of the key. Press again to select NAV2. This is annunciated with a “2” to the right of the key. Each subsequent press of the **NAV** Key will switch between NAV1 and NAV2. Use the **FMS** Knob to tune the selected NAV. The NAV Tuning Selection Box is outlined with a light blue line when the NAV frequency is active on the control unit.
- ⑨ **XPDR Key** – Sets the **FMS** Knob to enter transponder codes. When pressed, an annunciator next to the key illuminates indicating the **FMS** Knob can now be used for transponder code entry. Transponder code entry can be performed with either the number keypad or **FMS** Knob.
- ⑩ **IDENT Key** – Press to activate the IDENT function of the transponder. When the **IDENT** Key is pressed, a green IDNT indication is displayed in the mode field of the Transponder Data Box for 18 seconds.
- ⑪ **SEL Key** – The center of this key activates the selected MFD softkey, while the right and left arrows move the softkey selection box to the right and left, respectively.
- ⑫ **Decimal Key** – Enters a decimal point.
- ⑬ **BKSP Key** – Moves cursor back one character space and removes last character entered.
- ⑭ **Alphanumeric Keys** – Allows data entry (rather than using the **FMS** Knob to select characters/numbers).

4.2 COM OPERATION

COM TRANSCIVER SELECTION AND ACTIVATION



NOTE: During PA Mode, the COM MIC Annunciator is extinguished and the COM active frequency color changes to white, indicating that neither COM transmitter is active.



NOTE: When turning on the G1000 for use, the system remembers the last frequencies used and the active COM transceiver state prior to shutdown.

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

An active COM frequency displayed in green indicates that the COM transceiver is selected on the Audio Panel (**COM1 MIC** or **COM2 MIC** Key). Both active COM frequencies appearing in white indicate that no COM radio is selected for transmitting (**PA** Key is selected on the Audio Panel).

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

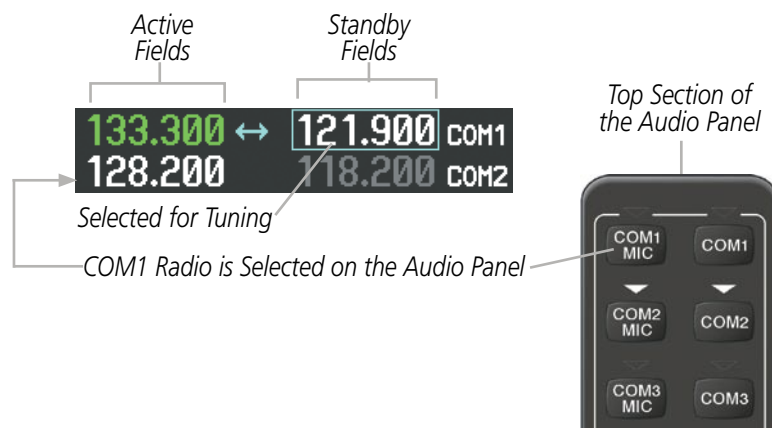


Figure 4-5 Selecting a COM Radio for Transmit

COM3 is reserved for an optional COM radio.

TRANSMIT/RECEIVE INDICATIONS

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

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



Figure 4-6 COM Radio Transmit and Receive Indications

When the same COM radio is selected on both Audio Panels, the pilot has transmit priority on COM1, the copilot has transmit priority on COM2.

COM TRANSCIVER MANUAL TUNING

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

Manually tuning a COM frequency:

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



Figure 4-7 COM Frequency Tuning

Manual COM frequency tuning from the Control Unit

- 1) Press the **COM** Key to enable the **FMS** Knob for COM tuning. The COM Tuning Selection Box is shown.
- 2) Press the **COM** Key again, if needed, to select the desired COM radio (1 or 2).
- 3) Turn the **FMS** Knob to tune the desired frequency in the COM Tuning Box (large knob for MHz; small knob for kHz).

Or:

Press the numeric keys on the keypad to enter a Frequency.

- 4) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

If an error is made during frequency entry with the numeric keypad, pressing the **BKSP** Key moves the cursor back one space. If an incorrect frequency is entered, reenter the correct one using the same procedure.

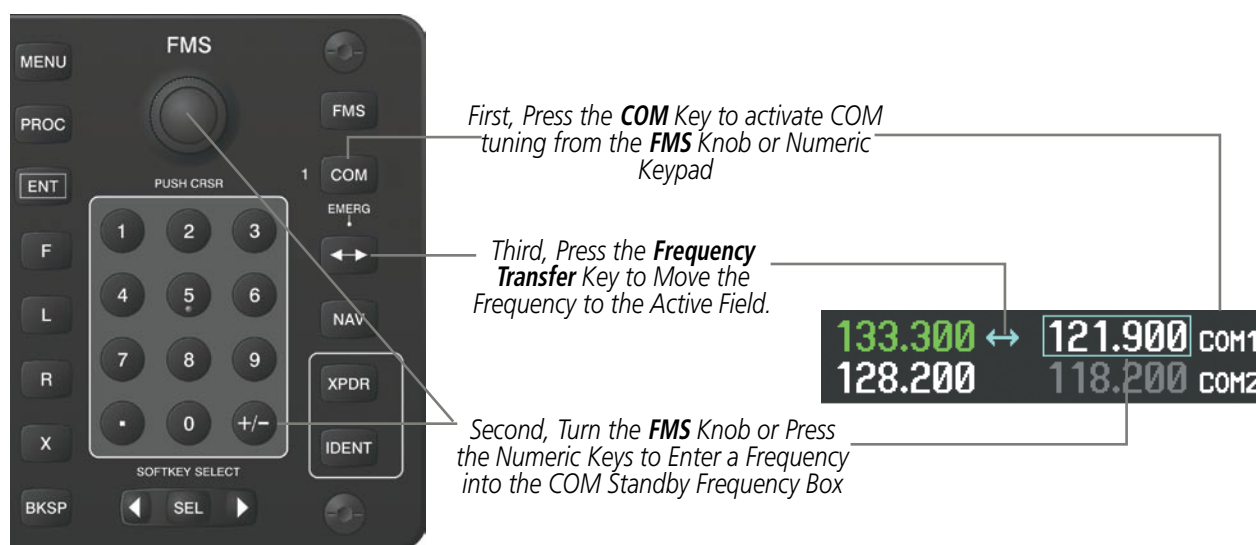


Figure 4-8 Frequency Tuning from the Control Unit

SELECTING THE RADIO TO BE TUNED

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

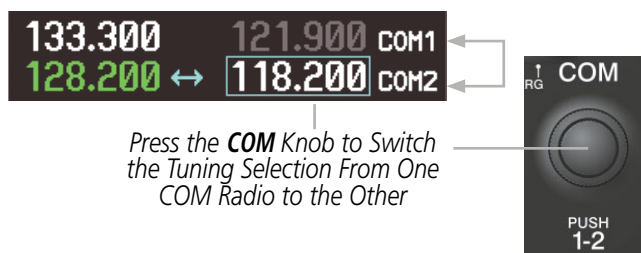


Figure 4-9 Switching COM Tuning Boxes

QUICK-TUNING AND ACTIVATING 121.500 MHZ

Pressing and holding the COM **Frequency Transfer** Key for two seconds automatically loads the emergency COM frequency (121.500 MHz) in the active field of the COM radio selected for tuning (the one with the transfer arrow). In the example shown, pressing the Audio Panel **COM2 MIC** Key activates the transceiver.

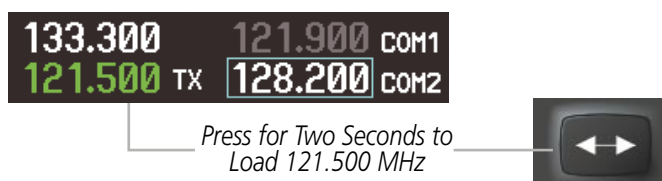


Figure 4-10 Quickly Tuning 121.500 MHz

AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

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

AUTO-TUNING FROM THE PFD

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

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

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



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

Figure 4-11 Nearest Airports Window (PFD)

AUTO-TUNING FROM THE MFD

Frequencies can be automatically loaded into the COM Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-12, 4-13, and 4-14).

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

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

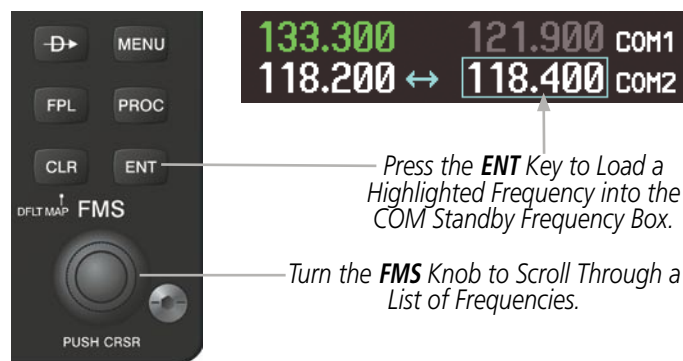


Figure 4-12 Frequency Auto-Tuning from the MFD

Or:

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

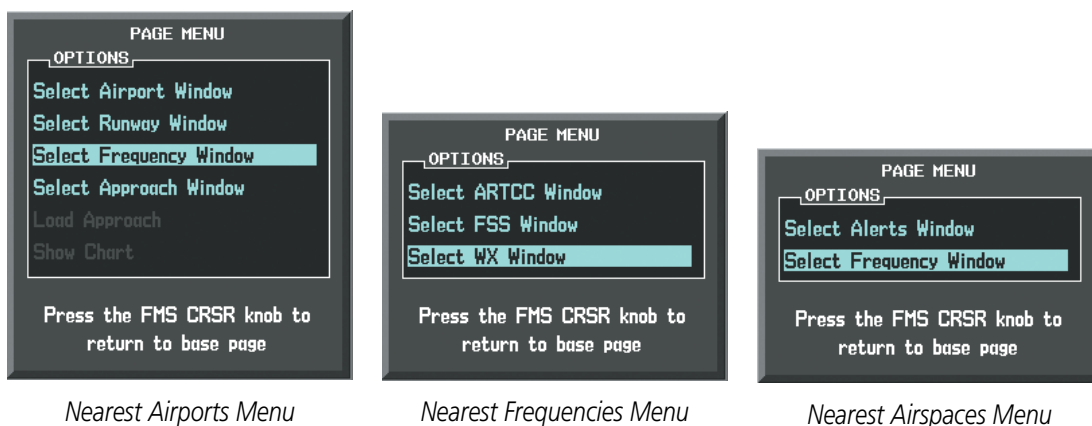


Figure 4-13 Nearest Pages Menus

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

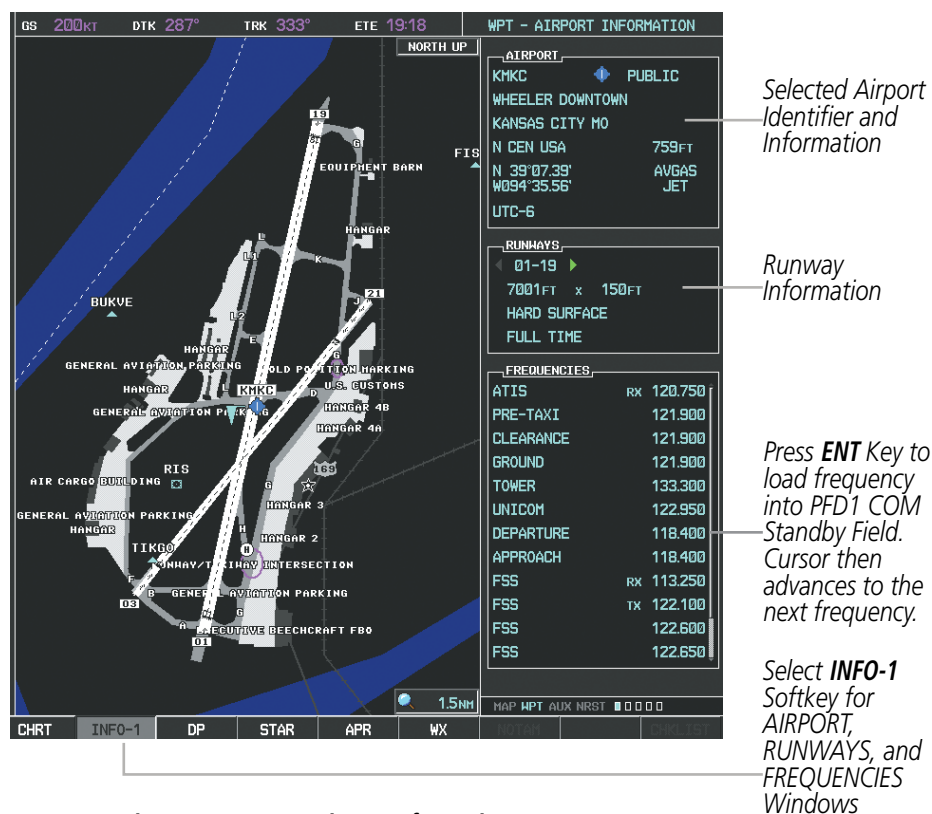


Figure 4-14 WPT – Airport Information Page

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



Figure 4-15 NRST – Nearest Airspaces, NRST – Nearest Airports, and NRST – Nearest Frequencies Pages

FREQUENCY SPACING

The G1000 COM radios can tune either 25-kHz spacing (118.000 to 136.975 MHz) or 8.33-kHz spacing (118.000 to 136.990 MHz) for 760-channel or 3040-channel configuration. When 8.33-kHz channel spacing is selected, all of the 25-kHz channel spacing frequencies are also available in the complete 3040-channel list.

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



Figure 4-16 COM Channel Spacing

Changing COM frequency channel spacing:

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

While the COM CONFIG Window is selected, the G1000 softkeys are blank.

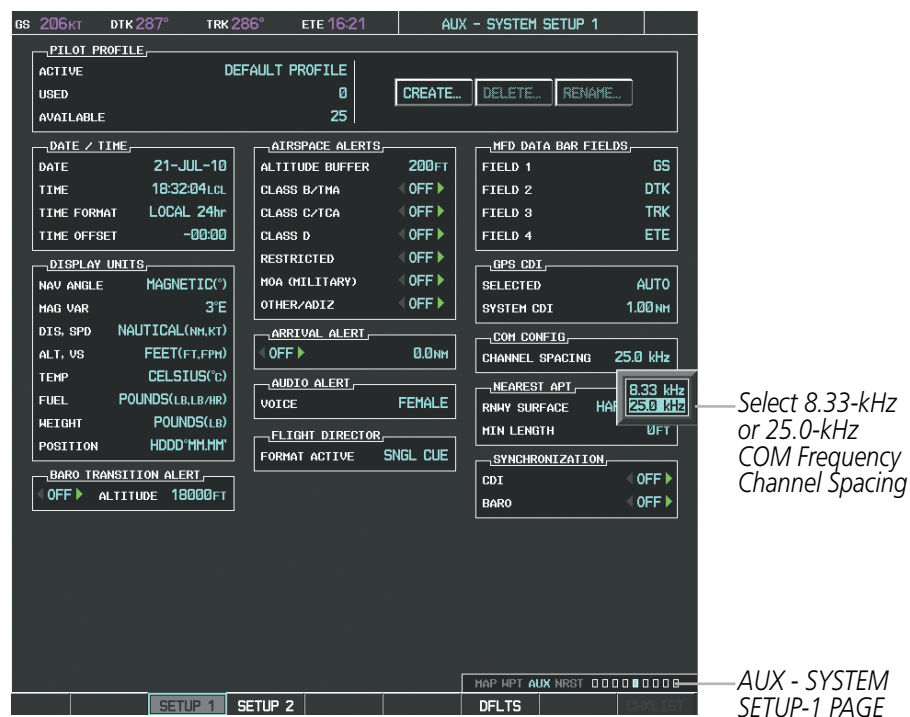


Figure 4-17 AUX – System Setup Page

AUTOMATIC SQUELCH

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

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



Figure 4-18 Overriding Automatic Squelch

VOLUME

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

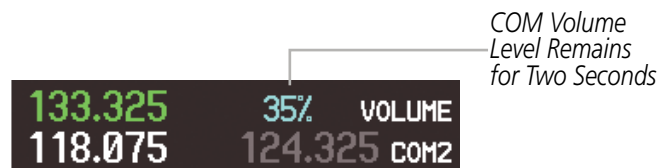


Figure 4-19 COM Volume Level

4.3 NAV OPERATION

NAV RADIO SELECTION AND ACTIVATION

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

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

While cycling through the **CDI** Softkey selections, the selected NAV standby frequency is selected for tuning, the Frequency Transfer Arrow is placed in the selected NAV Frequency Field, and the active NAV frequency color changes to green.

The three navigation modes that can be cycled through are:

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

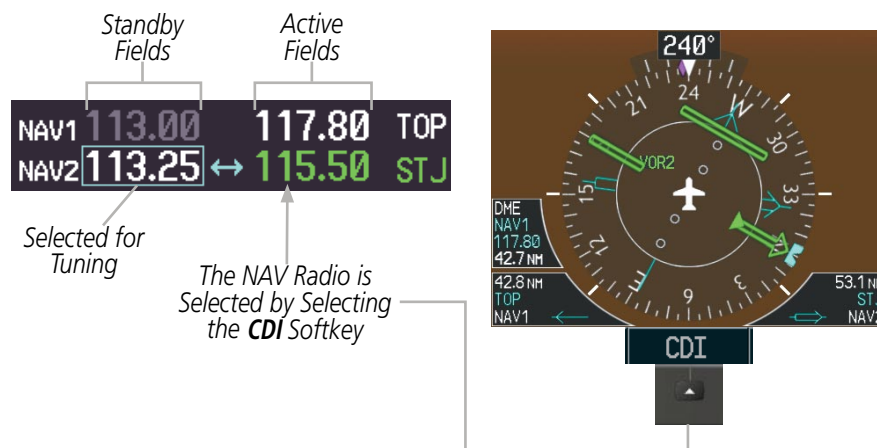


Figure 4-20 Selecting a NAV Radio for Navigation

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 keys on the Audio Panel. Pressing the **NAV1**, **NAV2**, **ADF**, or **DME** Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speakers (if selected). All radios can be selected individually or simultaneously.



Figure 4-21 Selecting a NAV Radio Receiver

NAV RECEIVER MANUAL TUNING

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

Manually tuning a NAV frequency:

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

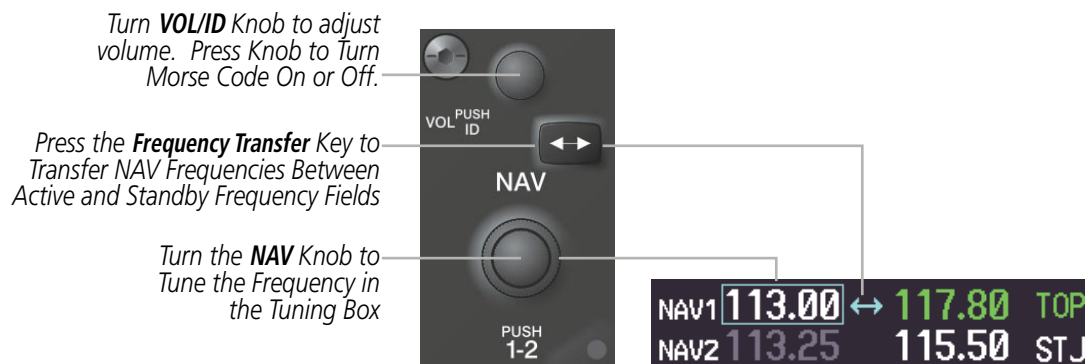


Figure 4-22 NAV Frequency Tuning

Manual NAV frequency tuning from the Control Unit

- 1) Press the **NAV** Key to enable the **FMS** Knob for NAV tuning. The NAV Tuning Selection Box is shown.
- 2) Press the **NAV** Key again, if needed, to select the desired NAV radio (1 or 2).
- 3) Turn the **FMS** Knob to tune the desired frequency in the NAV Tuning Box (large knob for MHz; small knob for kHz).

Or:

Press the numeric keys on the keypad to enter a Frequency.

- 4) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

If an error is made during frequency entry with the numeric keypad, pressing the **BKSP** Key moves the cursor back one space. If an incorrect frequency is entered, reenter the correct one using the same procedure.

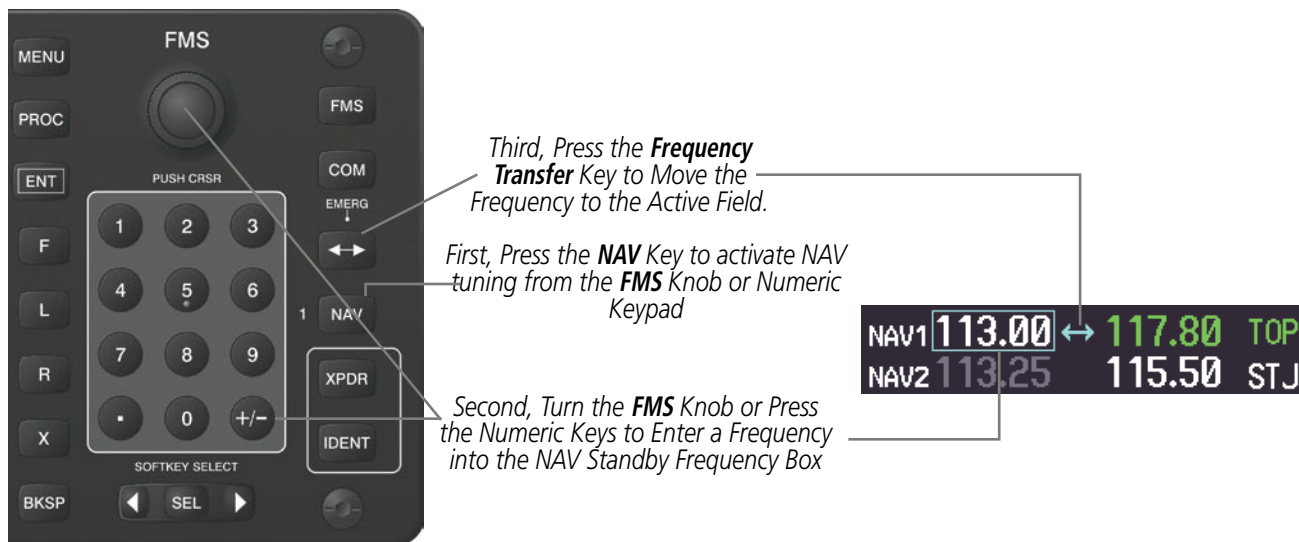


Figure 4-23 Frequency Tuning from the Control Unit

SELECTING THE RADIO TO BE TUNED

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

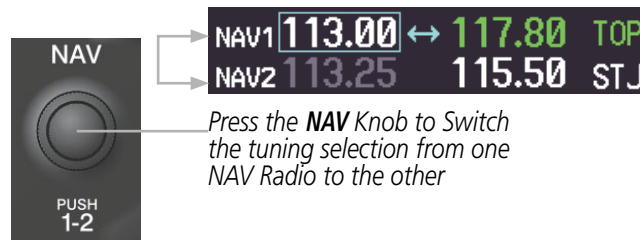


Figure 4-24 Switching NAV Tuning Boxes

VOR/LOC ID

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

In the example shown, in order to listen to either station identifier, press the **NAV1** or **NAV2** Key on the Audio Panel. Pressing the **VOL/ID** Knob turns off the Morse code audio only in the radio selected for tuning (light blue numbers). To turn off both NAV IDs, transfer the tuning selection between NAV1 and NAV2 with the small **NAV** Knob and press the **VOL/ID** Knob again to turn the Morse code off in the other radio.

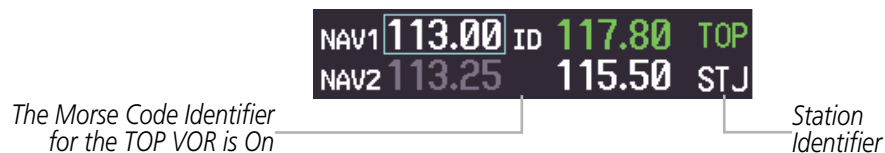


Figure 4-25 NAV Radio ID Indication

VOLUME

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

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



Figure 4-26 NAV Volume Level

AUTO-TUNING A NAV FREQUENCY FROM THE MFD

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

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

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

Frequencies can be automatically loaded into the NAV Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-27, 4-28, and 4-29).

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

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

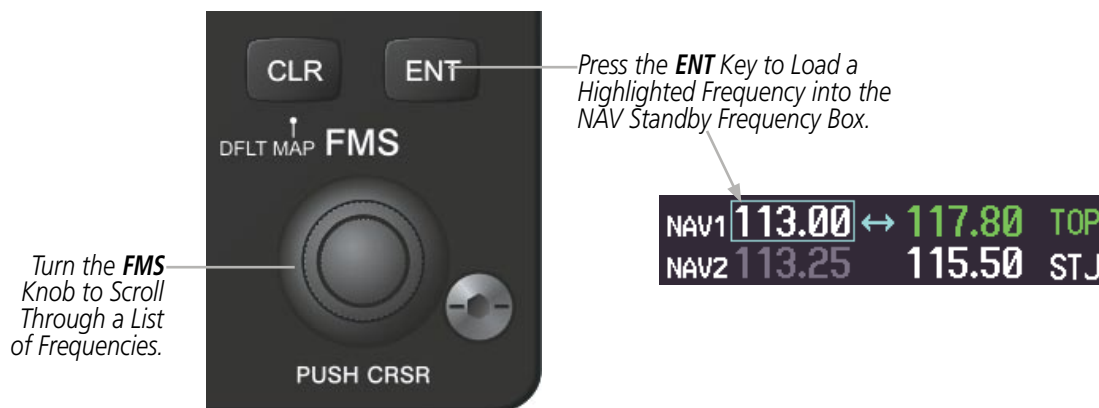


Figure 4-27 NAV Frequency Auto-Tuning from the MFD

Or:

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

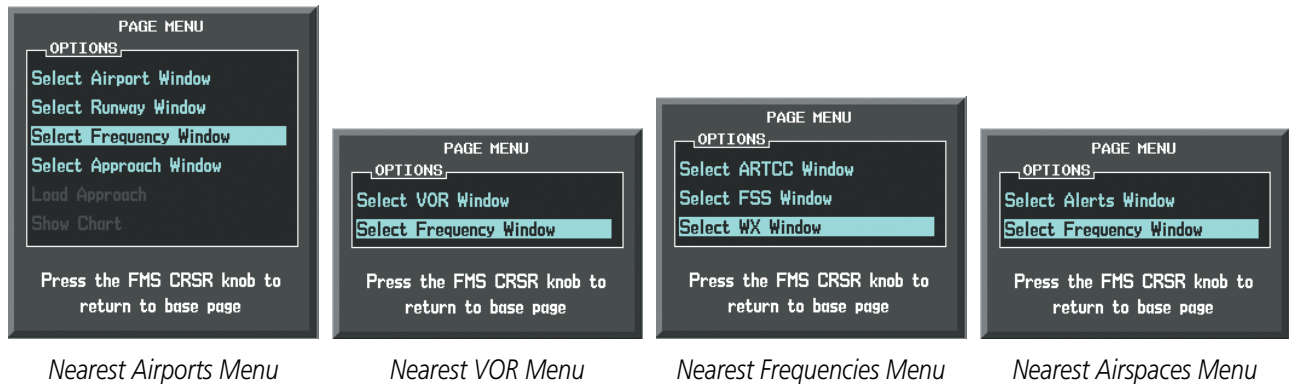


Figure 4-28 Nearest Pages Menus

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

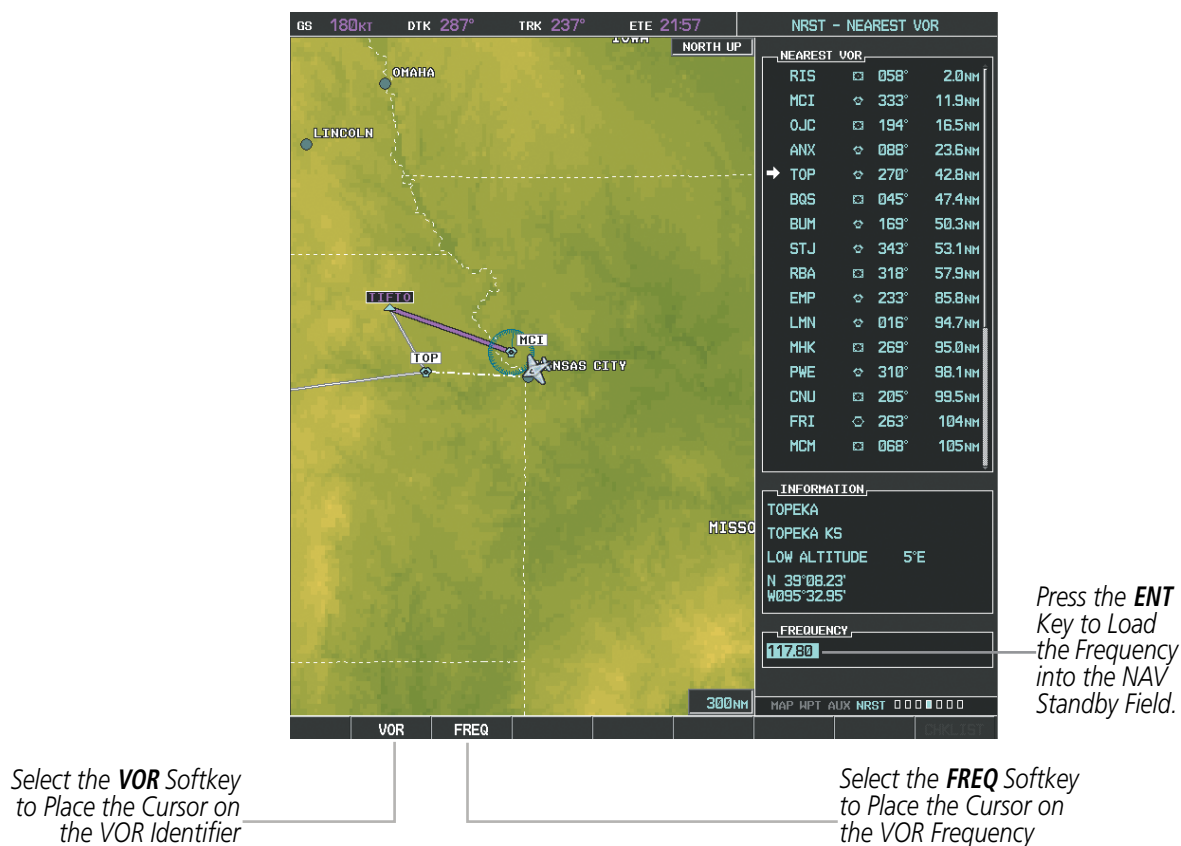


Figure 4-29 Loading the NAV Frequency from the NRST – Nearest VOR Page

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

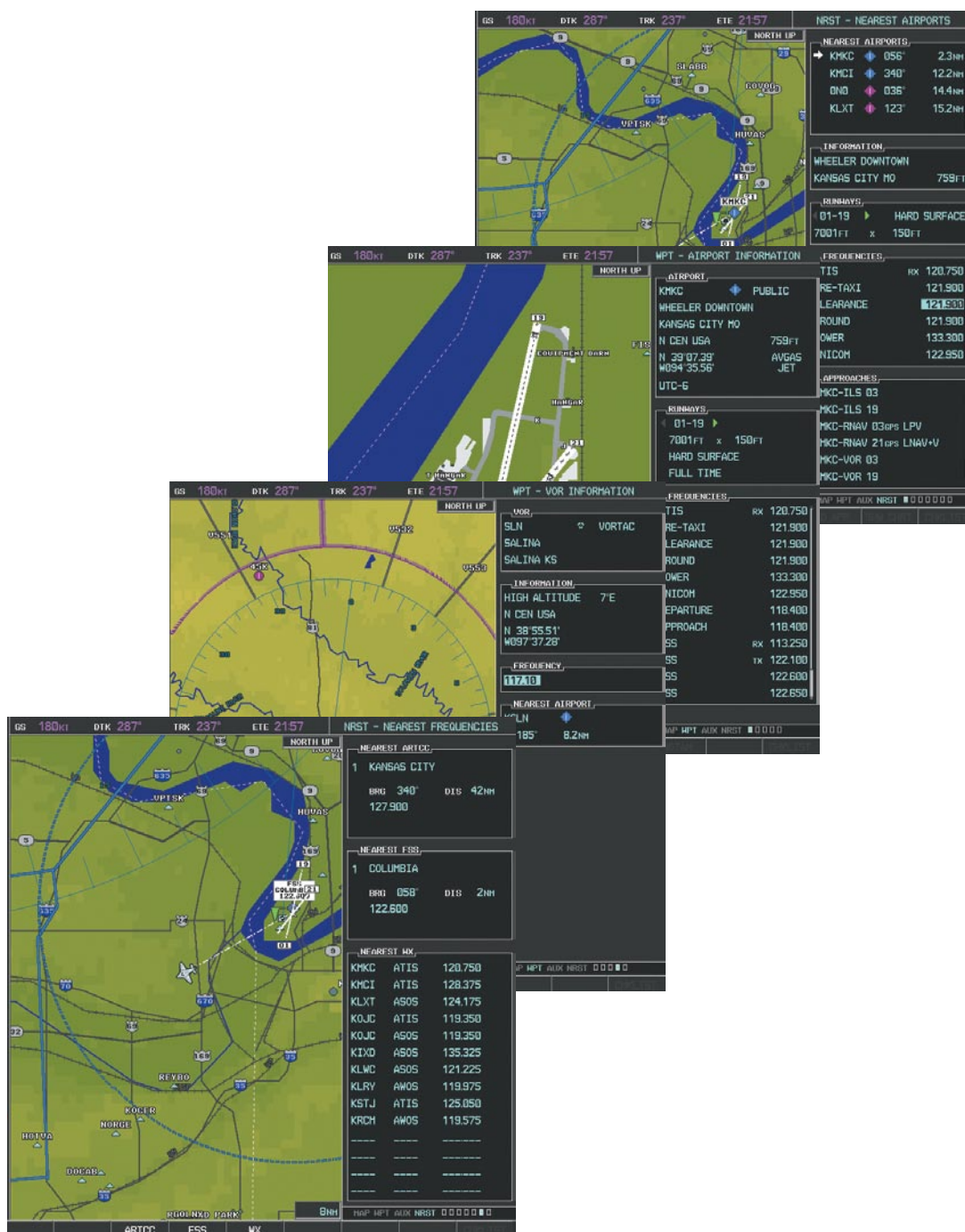


Figure 4-30 NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages

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 GPS 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 field on approach activation, on both PFD1 and PFD2.

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

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

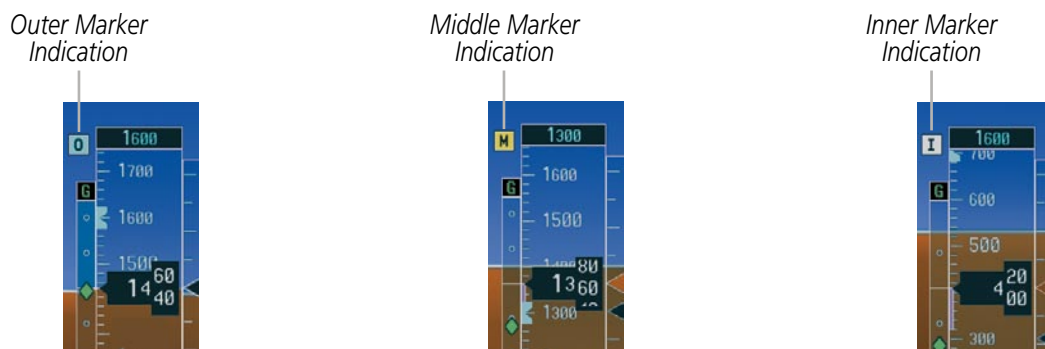


Figure 4-31 Marker Beacon Annunciations on the PFD



Figure 4-32 Marker Beacon Keys

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

During marker beacon audio reception, pressing the **MKR/MUTE** Key mutes the audio but does not affect the marker annunciations (Figure 4-31). The marker tone is silenced, then waits for the next marker tone. The **MKR/MUTE** Key Annunciator is illuminated, indicating audio muting. The audio returns when the next marker beacon signal is received. If the **MKR/MUTE** Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the **MKR/MUTE** Key Annunciator is extinguished.

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

DME TUNING



NOTE: When turning on the G1000 for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.

The G1000 System tunes the optional DME transceiver. The UHF DME frequency is tuned by pairing with a VHF NAV frequency. DME frequency pairing is automatic and only the VHF NAV frequency is shown.

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

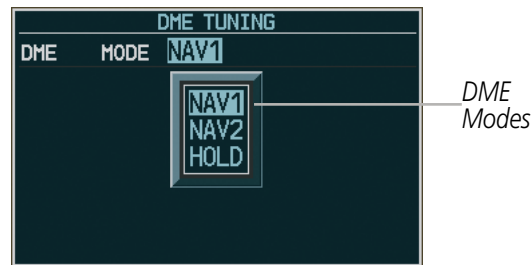


Figure 4-33 DME Tuning Window

The following DME transceiver pairing can be selected:

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

Selecting DME transceiver pairing:

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

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

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

4.4 GTX 33 MODE S TRANSPONDERS

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

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

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

TRANSPONDER CONTROLS

Transponder function is displayed on three levels of softkeys on the PFD: Top-level, Mode Selection, and Code Selection. When the top-level **XPDR** Softkey is selected, the Mode Selection softkeys appear: **XPDR1**, **XPDR2**, **STBY**, **ON**, **ALT**, **VFR**, **CODE**, **IDENT**, **ADS-B TX**, **BACK**.

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

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

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

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

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

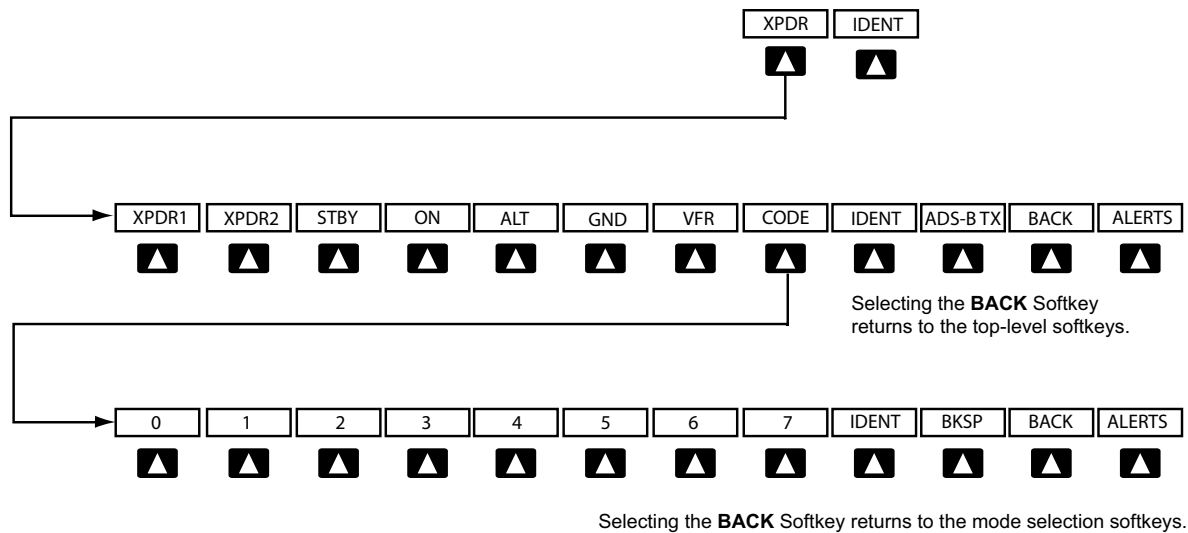


Figure 4-34 Transponder Softkeys (PFD)

Selecting and activating Transponder 1 or Transponder 2:

- 1) Select the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
- 2) Select the **XPDR1** or **XPDR2** Softkey to select and activate the desired transponder.

When turning on the G1000 for use, the system activates Transponder 1 as the default unit, regardless of which transponder was active prior to shutdown. When switching between Transponder 1 and Transponder 2, the code and mode remain the same. If a new code is entered in the active transponder, switching transponders does not bring back the previous code.

TRANSPONDER MODE SELECTION

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

Selecting a transponder mode:

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

GROUND MODE

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

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



Figure 4-35 Ground Mode

STANDBY MODE (MANUAL)



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

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



Figure 4-36 Standby Mode

MANUAL ON MODE

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



Figure 4-37 ON Mode

ALTITUDE MODE (AUTOMATIC OR MANUAL)

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

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



Figure 4-38 Altitude Mode

REPLY STATUS

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



Figure 4-39 Reply Indication

ADS-B TX MODE

The transmission of the ADS-B information is enabled/disabled by pressing the **ADS-B TX** Softkey. ADS-B transmission defaults to enabled at each power cycle. Do not disable ADS-B transmission unless requested by ATC.

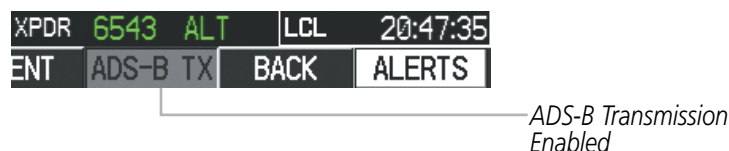


Figure 4-40 Altitude Mode

ENTERING A TRANSPONDER CODE

Entering a transponder code with softkeys:

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

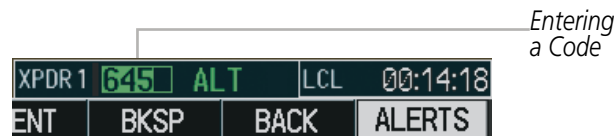


Figure 4-41 Entering a Code

Entering a transponder code with the PFD FMS Knob:

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

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

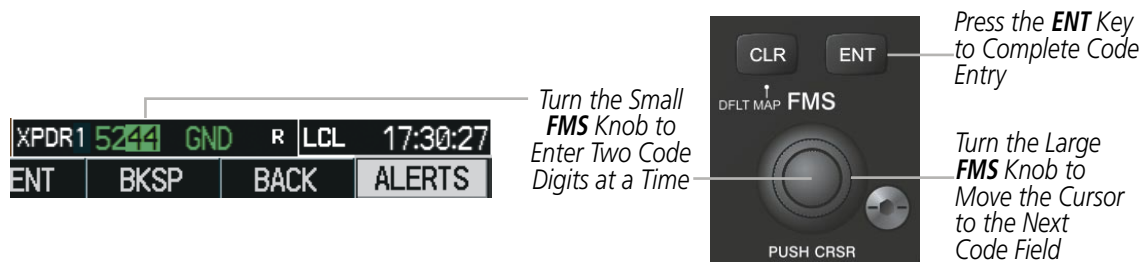


Figure 4-42 Entering a Code with the FMS Knob

Manual code entry from the Control Unit

- 1) Press the **XPDR** Key to select the transponder code field.
- 2) Turn the small **FMS** Knob on the PFD to enter the first two code digits, turn the large **FMS** Knob to select the last two digits, and turn the small **FMS** Knob to enter the last two code digits.

Or:

Press the numeric keys on the keypad to enter a code.

If an error is made during code entry with the numeric keypad, pressing the **BKSP** Key moves the cursor back one space. If an incorrect code is entered, reenter the correct one using the same procedure.

Third, Press **ENT** Key to Complete Code Entry



Second, Turn the **FMS** Knob, Small Knob to Enter Two Code Digits at a Time, Large Knob to Move the Cursor to the Next Code Field, or Press the Numeric Keys to Enter a Code into the Transponder Data Box

First, Press the **XPDR** Key to Activate Code Entry from the **FMS** Knob or Numeric Keypad into the Transponder Data Box

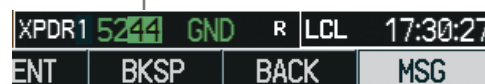


Figure 4-43 Transponder Code Entry from the Control Unit

VFR CODE

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

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



Figure 4-44 VFR Code

IDENT FUNCTION



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

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

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



Figure 4-45 IDENT Softkey and Indication

4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER-UP

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

MONO/STEREO HEADSETS

Stereo headsets are recommended for use in this aircraft.

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

SPEAKER



NOTE: When the oxygen mask switch on the instrument panel is selected, each pilot's microphone audio is heard on the cross-side speaker. The on-side speaker is also enabled and cannot be deselected.

Each Audio Panel is connected to a separate flight deck speaker for listening to all of the radios. Each **SPKR** Key controls the on-side speaker unless oxygen masks are in use. During oxygen mask use the on-side speaker is always enabled.

Pressing the **SPKR** Key selects and deselects the speaker. Except for oxygen mask use, speaker audio is muted when the PTT Key is pressed.



Figure 4-46 Speaker Key

UNMUTED INPUTS

Aural alerts are always present on the headset and are on the speaker when the SPKR is selected. These warnings and the aircraft radios are not heard on the passenger headphones.

INTERCOM

Pressing the **INTR COM** Key on either Audio Panel selects and deselects the intercom on both Audio Panels. The annunciator is lit when the intercom is active. The intercom connects the pilot and copilot together. Either the pilot or copilot may select or deselect the intercom.

The **CABIN** Key initiates two way communication between the pilot or copilot and the passengers in the cabin. The annunciator is lit when the cabin intercom is active on either Audio Panel.

When the flight crew wants to communicate with the passengers, the pilot or copilot presses the **CABIN** Key to signal that communication is desired. The cabin signal must be acknowledged to begin intercom conversation.

When the passengers want to communicate with the pilot/copilot, they press the HAIL Key at their seat in the cabin. The CABIN annunciator flashes on both Audio Panels to signal the pilot and copilot that cabin communication is desired. The hail signal must be acknowledged by pressing the **CABIN** Key to begin intercom conversation.

The **MAN SQ** Key allows either automatic or manual control of the intercom squelch setting. Pressing the **MAN SQ** Key enables manual squelch control, indicated by the MAN SQ annunciator.

- When the MAN SQ Annunciator is extinguished (Automatic Squelch is on), the **ICS** Knob controls only the volume (pressing the **ICS** Knob has no effect on the VOL/SQ selection).
- When the MAN SQ Annunciator is illuminated (Manual Squelch), the **ICS** Knob controls either volume or squelch (selected by pressing the **ICS** Knob and indicated by the VOL or SQ annunciation).

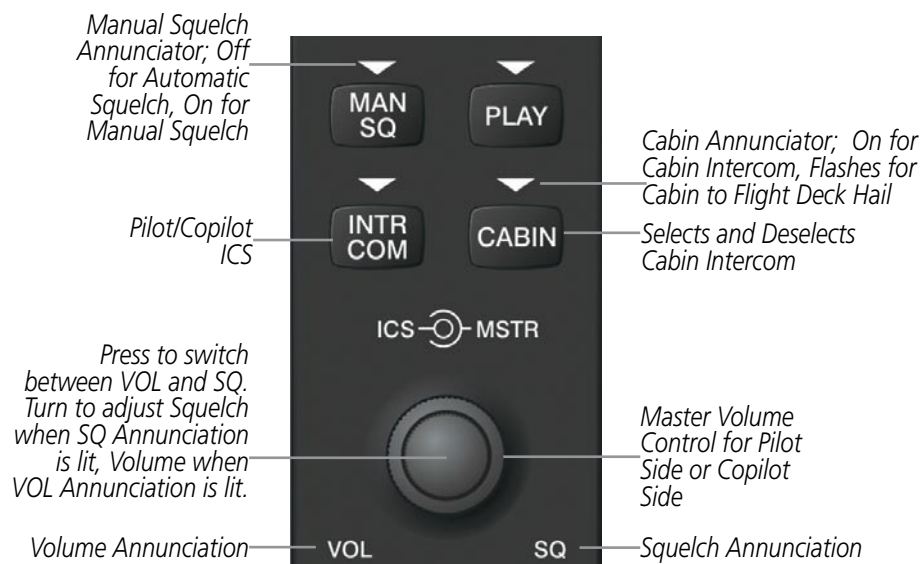


Figure 4-47 Intercom Controls

PASSENGER ADDRESS (PA) SYSTEM

A passenger address system is provided by pressing the **PA** Key to deliver messages to the passengers. The message is heard by the other pilot on the headset only if the **INTR COM** Key is enabled. PA messages are one way from the flight deck to the passengers.

A Push-to-talk (PTT) must be pressed to deliver PA announcements to the passengers over their headphones.

When PA is selected on the Audio Panel, the annunciator flashes about once per second while pressing the PTT, the COM MIC annunciator is no longer lit, and the active COM frequency for that Audio Panel changes to white, indicating that there is no COM selected.

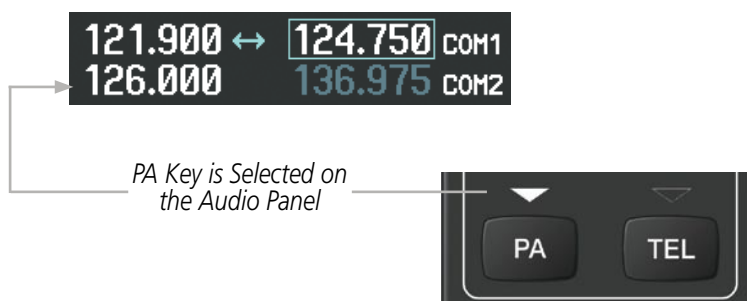


Figure 4-48 PA Key Selected for Cabin Announcements

SIMULTANEOUS COM OPERATION

Both 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.

CLEARANCE RECORDER AND PLAYER



NOTE: Pressing the play key on the pilot's Audio Panel plays recorded audio to the Pilot. Pressing the play key on the Copilot's Audio Panel plays recorded audio to the Copilot.

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

The **PLAY** Key controls the play function. The PLAY annunciator remains lit to indicate when play is in progress. The PLAY annunciator turns off after playback is finished.

Pressing the **PLAY** Key once plays the latest recorded memory block and then returns to normal operation. Pressing the **PLAY** Key again during play of a memory block stops play. If a COM input signal is detected during play of a recorded memory block, play is halted.

Pressing the **PLAY** Key twice within one-half second while audio is playing plays the previous block of recorded audio. Each subsequent two presses of the **PLAY** Key within one-half second backtracks through the recorded memory blocks to reach and play any recorded block.

Powering off the unit automatically clears all recorded blocks.



Figure 4-49 Play Key

4.6 AUDIO PANELS PREFLIGHT PROCEDURE

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

NOTE: When the **MAN SQ** Key is pressed, the flight crew is now able to set the ICS squelch manually. If manual squelch is set to full open (SQ annunciated and the small knob turned counterclockwise) background noise is heard in the ICS system as well as during COM transmissions.

After powering up the G1000 system the following steps aid the flight crew in maximizing the use of the Audio Panels as well as prevent flight crew induced issues. These preflight procedures should be performed each time a flight crew boards the aircraft to insure awareness of all audio levels in the Audio Panels and radios.



Figure 4-50 Audio Panel Controls

Independent radio volume adjustments made using the PFD controls affect only the audio output for each radio selected for adjustment. Radio volume adjustment affects both crew positions equally for each radio that is adjusted. Turning the master volume control located on either Audio Panel affects only the audio heard in the corresponding crew position headset. Thus, radio volume adjustments may be overridden by each crew position independently using the master volume control on the Audio Panel for the respective crew position. The master volume control for each Audio Panel affects all other system audio output for the pilot or copilot headset.

Setting the Audio Panels during preflight:

- 1) Verify that the **INTR COM** Key is selected.
- 2) Verify manual squelch is set to minimum.
- 3) Turn the **MSTR** Knob (Master Volume Control) on both Audio Panels clockwise two full turns. This sets the headset audio level to max volume (least amount of attenuation).
- 4) Adjust radio volume levels (COM, NAV, etc.) to a suitable level.
- 5) Adjust the **ICS** volume Knob on each Audio Panel to the desired intercom level.
- 6) Reset squelch to automatic, or adjust to the appropriate level manually.

Once this procedure has been completed, the master volume controls on both Audio Panels may now be adjusted. The flight crew can change settings, keeping in mind the notes above.

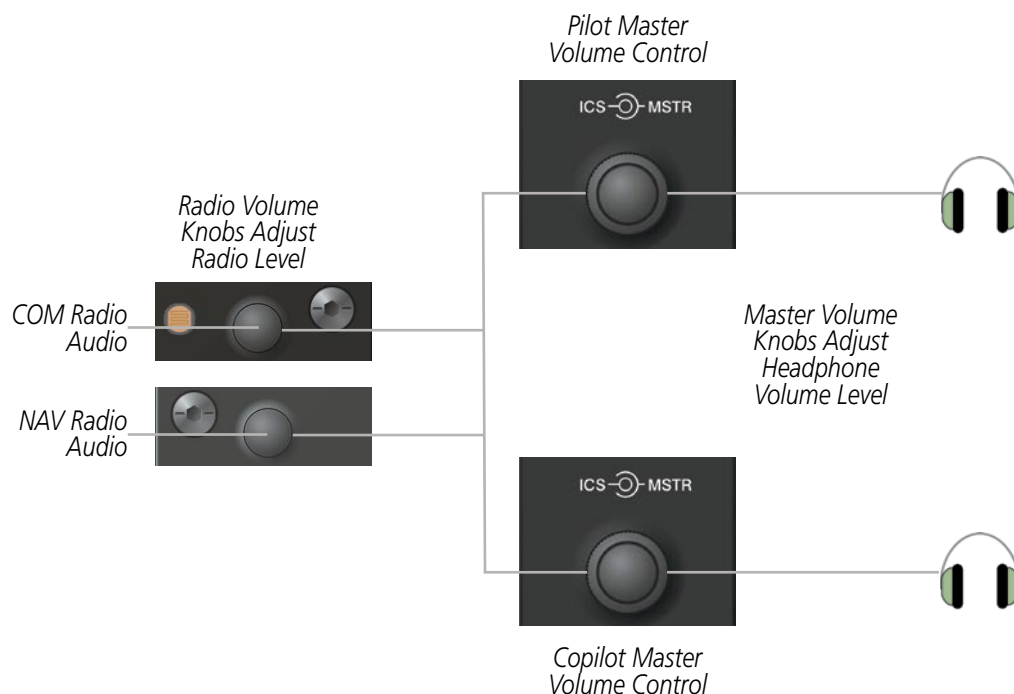


Figure 4-51 Radio and Headphone Volume Controls

4.7 ABNORMAL OPERATION

Abnormal operation of the G1000 includes equipment failures of the G1000 components and failure of associated equipment, including switches and external devices.

STUCK MICROPHONE

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

The **COM1 MIC** or **COM2 MIC** Key Annunciator on the Audio Panel flashes as long as the PTT Key remains stuck.

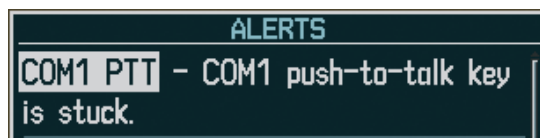


Figure 4-52 Stuck Microphone Alert

COM TUNING FAILURE

In case of a COM system tuning failure, the emergency frequency (121.500 MHz) is automatically tuned in the radio in which the tuning failure occurred.



Figure 4-53 COM Tuning Failure

PFD FAILURE, DUAL SYSTEM

If PFD1 fails, COM1 and NAV1 display a red X on both remaining displays. NAV1 is unavailable. COM1 automatically tunes 121.500 MHz, but the frequency is not shown. The COM1 emergency frequency is available to both the copilot and pilot.



Figure 4-54 Frequency Section of PFD2 Display after PFD1 Failure

If PFD2 fails, COM2 and NAV2 display a red X on the remaining PFD display. NAV2 is unavailable. COM2 tunes 121.500 MHz, but the frequency is not shown. The COM2 emergency frequency is available to both the copilot and pilot.



Figure 4-55 PFD1 Display after PFD2 Failure

AUDIO PANEL FAIL-SAFE OPERATION

If there is a failure of both Audio Panels, a fail-safe circuit connects the pilot's headset and microphone directly to the COM1 transceiver and the copilot's headset directly to the COM2 transceiver. Audio is not available on the speakers.

If there is a failure of one Audio Panel, the remaining one does not have access to the other's side's COM and NAV. For example, if the pilot side Audio Panel fails, the copilot side Audio Panel has access to all the radios except for COM1 and NAV1.

REVERSIONARY MODE

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

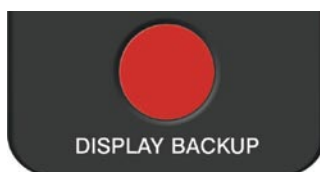


Figure 4-56 Reversionary Mode Button

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G1000 is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains flight management using the G1000.

The most prominent part of the G1000 are the three full color displays: two Primary Flight Displays (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD. 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, or LPV), or Missed Approach (MAPR)).

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

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

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

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

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












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



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

The symbols used in the PFD status bar are:

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

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

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



MFD Navigation Status Box

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

Changing a field in the MFD Navigation Status Box:

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

5.2 USING MAP DISPLAYS

Map displays are used extensively in the G1000 to provide situational awareness in flight. Most G1000 maps can display the following information:

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

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

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

MAP ORIENTATION

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



Figure 5-3 Map Orientation

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

- Desired track up (DTK UP) aligns the top of the map display to the desired course.
- Heading up (HDG UP) aligns the top of the map display to the current aircraft heading.



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



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

Changing the Navigation Map orientation:

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



Figure 5-4 Navigation Map Page Menu Window

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

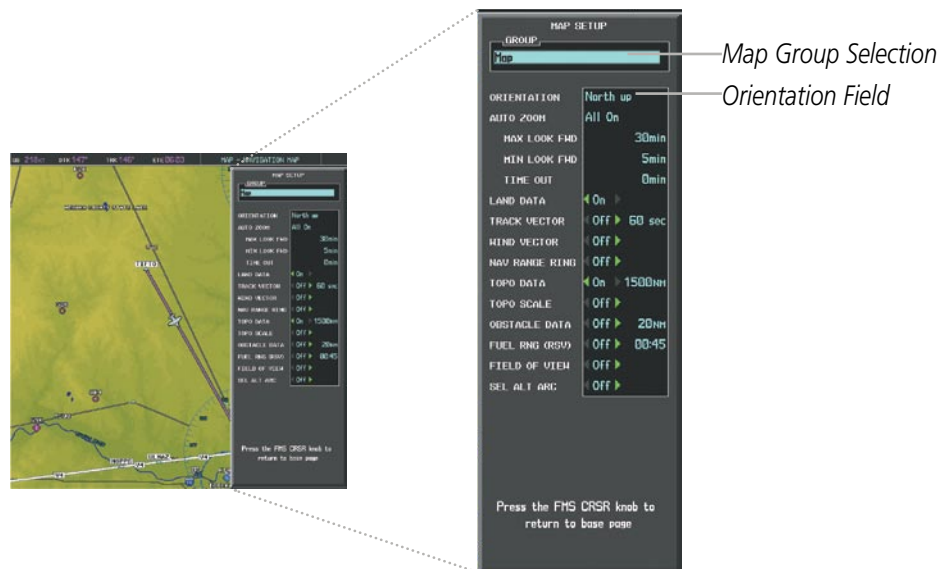


Figure 5-5 Map Setup Menu Window - Map Group

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

MAP RANGE

There are 28 different map ranges available, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. When the map range is decreased to a point that exceeds the capability of the G1000 to accurately represent the map, a magnifying glass icon is shown to the left of the map range. To change the map range turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range.

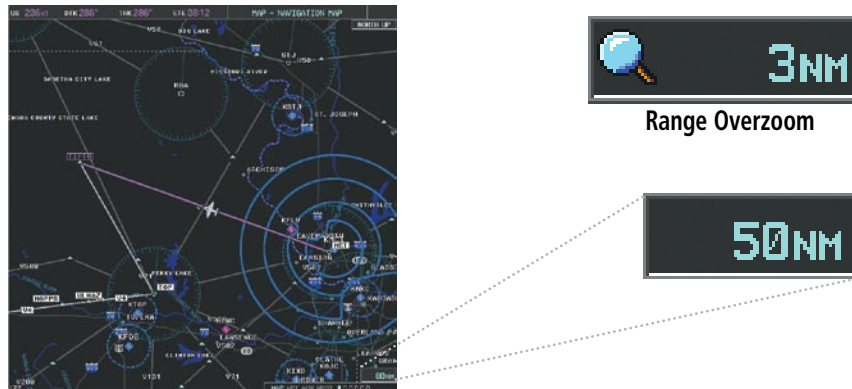


Figure 5-6 Map Range

AUTO ZOOM

Auto zoom allows the G1000 to change the map display range to the smallest range clearly showing the active waypoint. Auto zoom can be overridden by adjusting the range with the Joystick, and remains until the active waypoint changes, a terrain or traffic alert occurs, the aircraft takes off, or the manual override times out (timer set on Map Setup Window).

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

The auto zoom function can be turned on or off independently for the PFDs and MFD. Control of the ranges at which the auto zoom occurs is done by setting the minimum and maximum 'look forward' times (set on the Map Setup Window for the Map Group). These settings 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 Map Setup Page for the Map Group) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the 'time out' value to zero causes the manual override to never time out.
- When the maximum 'look forward' time is set to zero, the upper limit becomes the maximum range available (2000 nm).
- When the minimum 'look forward' time is set to zero, the lower limit becomes 1.5 nm.

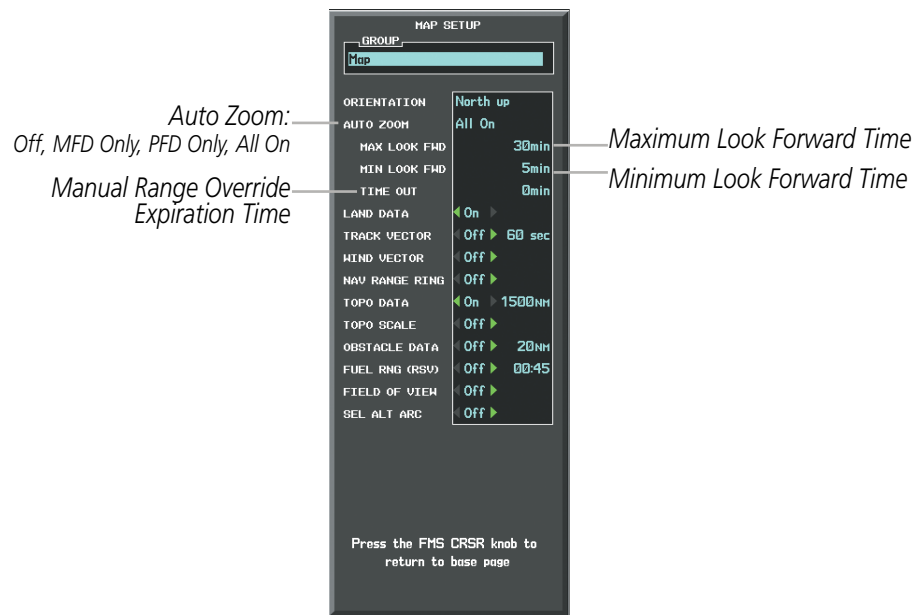


Figure 5-7 Map Setup Menu Window - Map Group, Auto Zoom

Configuring automatic zoom:

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

MAP PANNING

Map panning allows the pilot to:

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

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

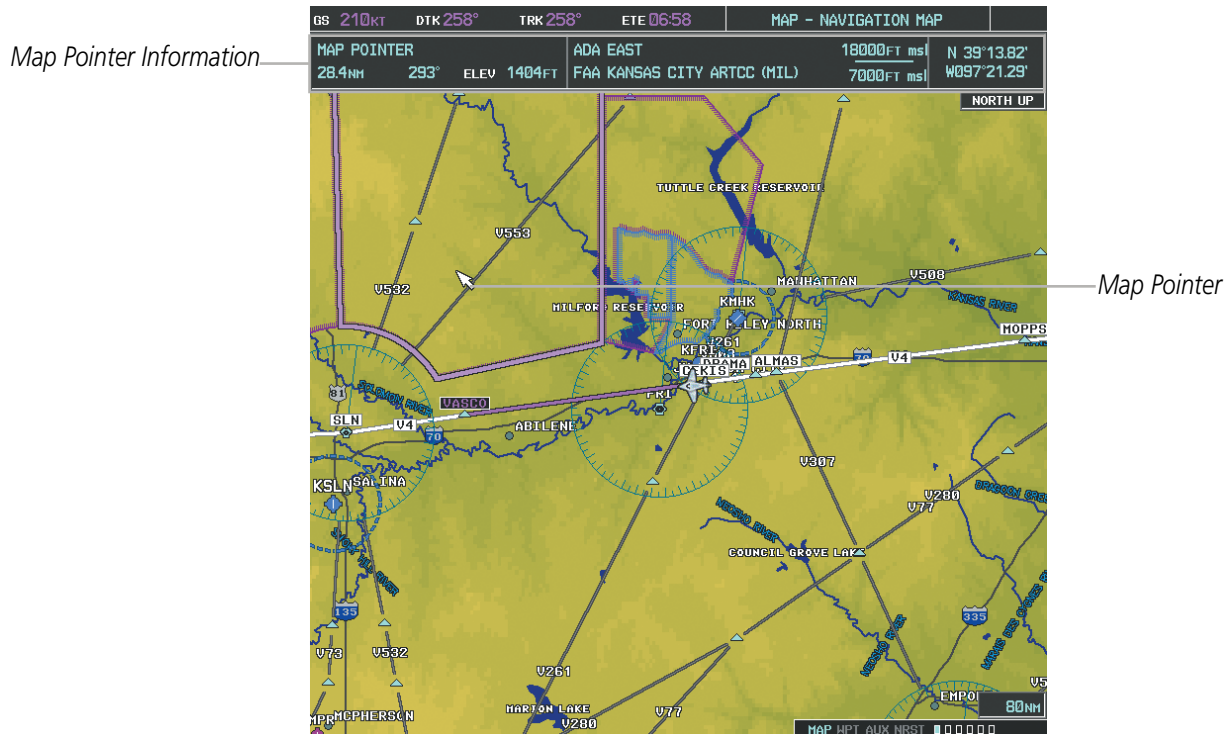


Figure 5-8 Navigation Map - Map Pointer Activated



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

Information about Point of Interest



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

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

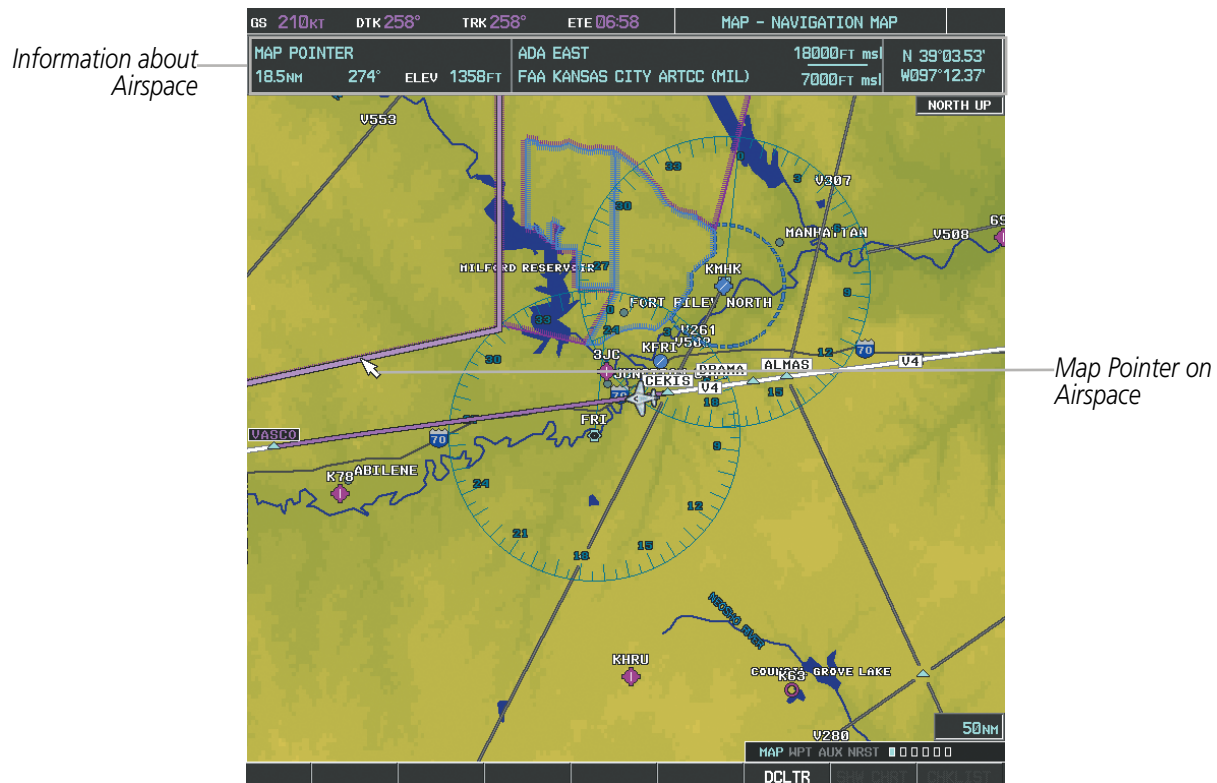


Figure 5-10 Navigation Map - Map Pointer on Airspace

Panning the map:

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

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

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

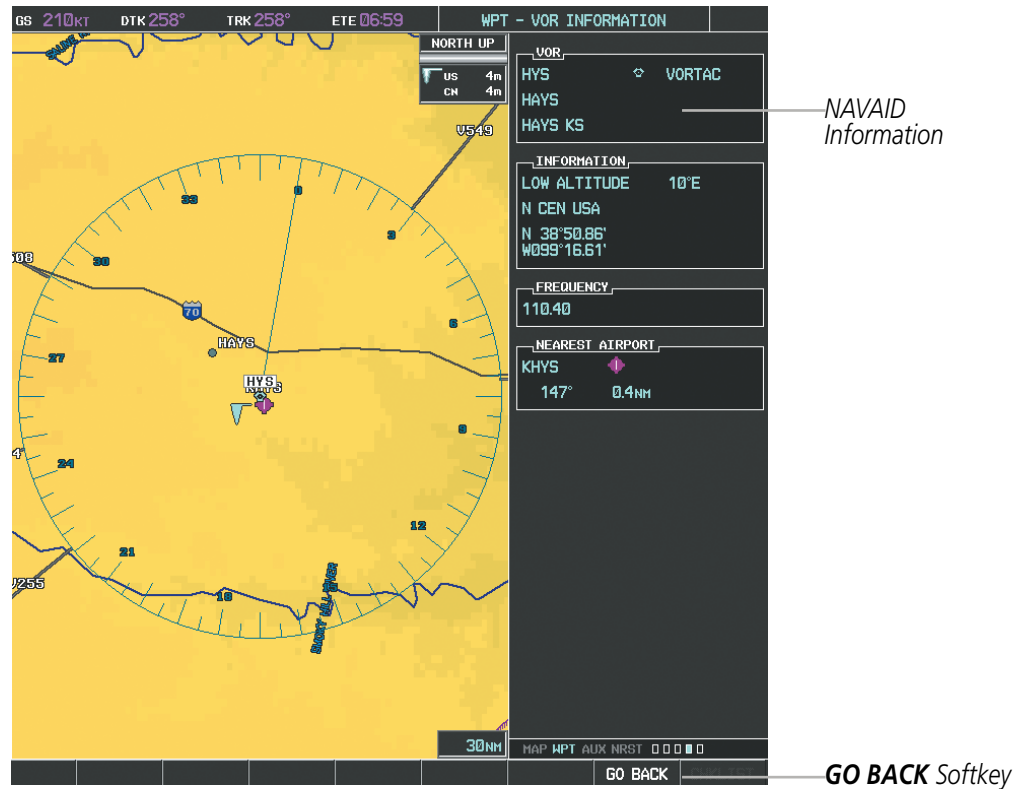


Figure 5-11 Navigation Map - Information Window - NAVAID

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

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

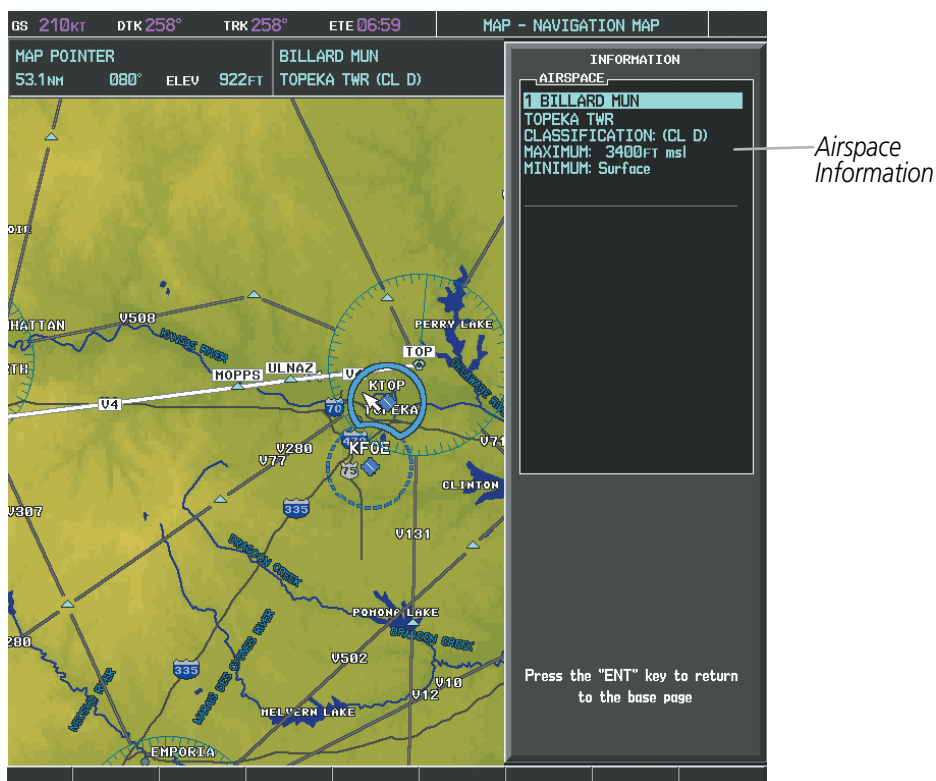


Figure 5-12 Navigation Map - Information Window - Airspace

MEASURING BEARING AND DISTANCE

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

Measuring bearing and distance between any two points:

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



Figure 5-13 Navigation Map - Measuring Bearing and Distance

TOPOGRAPHY

All navigation maps can display various shades of topography colors representing land elevation, similar to aviation sectional charts. Topographic data can be displayed or removed as described in the following procedures. Topographic data can also be displayed on the selectable profile map at the bottom of the navigation map (the profile map is not available if TAWS-A is configured).

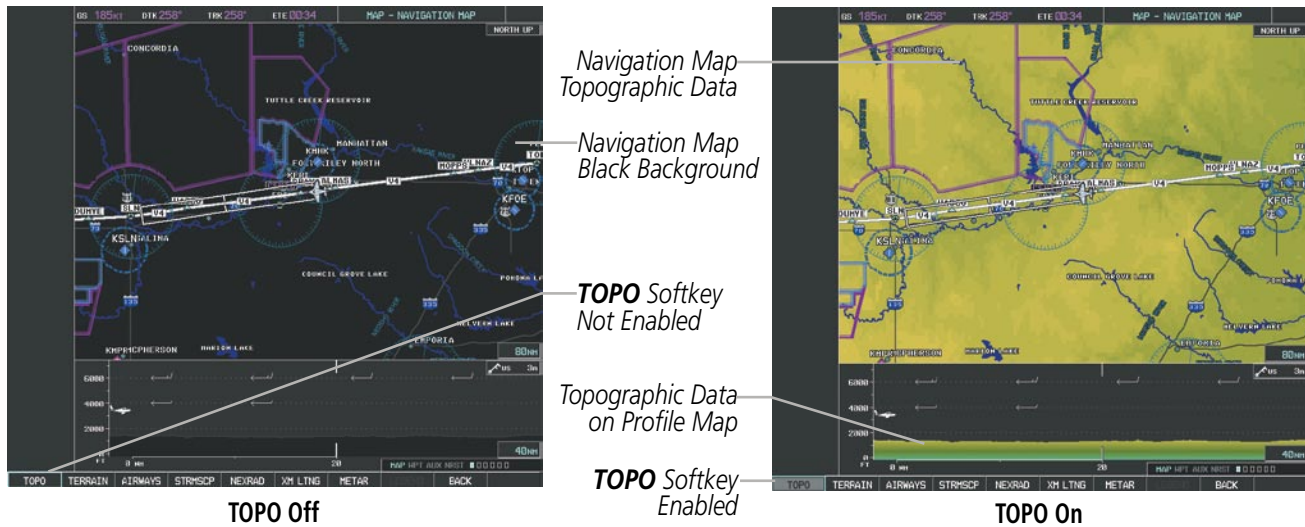


Figure 5-14 Navigation Map - Topographic Data

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

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

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

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

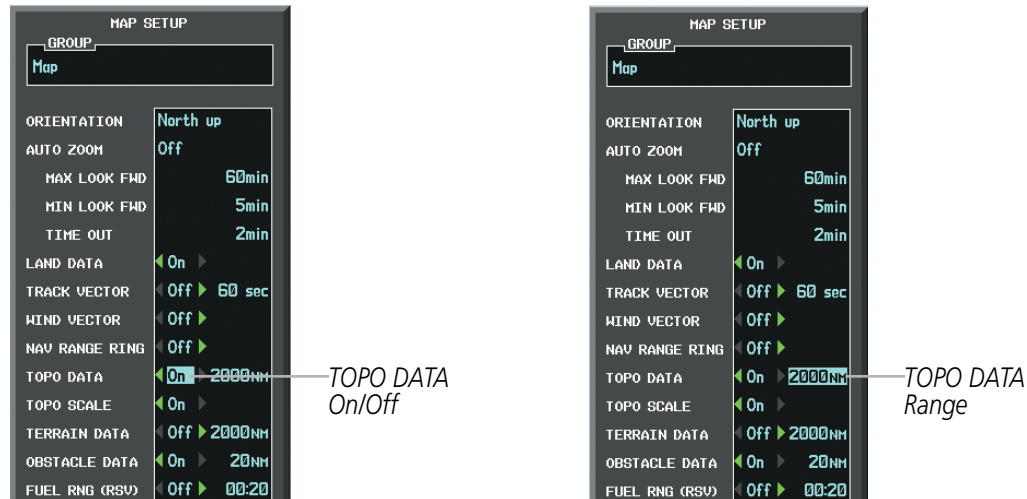


Figure 5-15 Navigation Map Setup Menu - TOPO DATA Setup

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



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

Selecting a topographical data range (TOPO DATA):

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

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

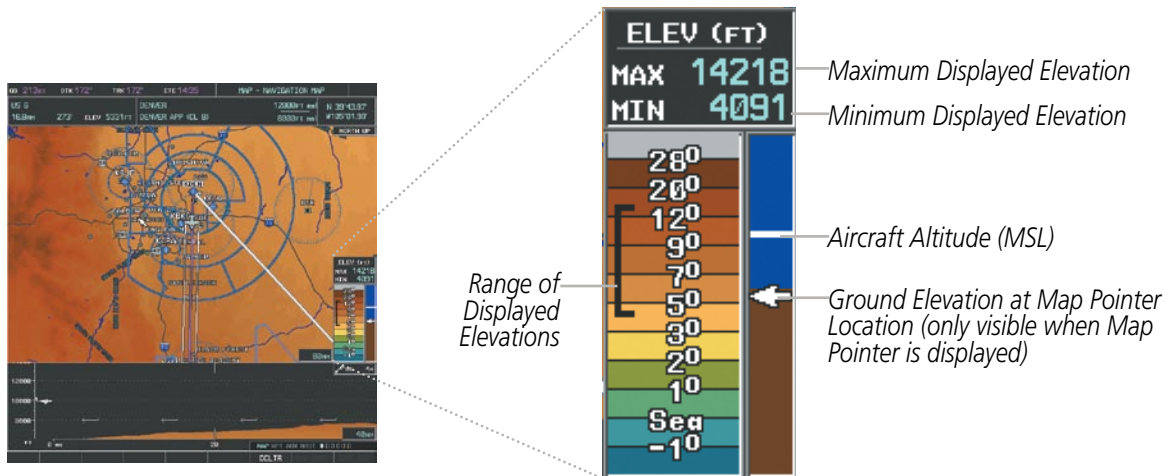


Figure 5-16 Navigation Map - TOPO SCALE

Displaying/removing the topographic scale (TOPO SCALE):

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

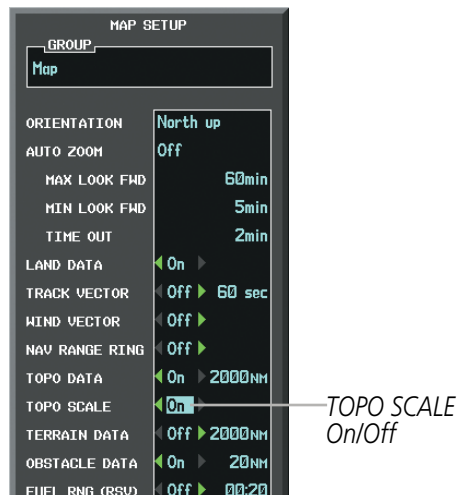


Figure 5-17 Navigation Map Setup Menu - TOPO SCALE Setup

MAP SYMBOLS

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

LAND SYMBOLS

The following items are configured on the land menu:

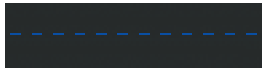












Land Symbols (Text label size can be None, Small, Medium (Med), or Large (Lrg))	Symbol	Default Range (nm)	Maximum Range (nm)
Latitude/Longitude (LAT/LON)		Off	2000
Highways and Roads			
Interstate Highway (FREEWAY)		300	800
International Highway (FREEWAY)		300	800
US Highway (NATIONAL HWY)		30	80
State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

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the aviation menu:


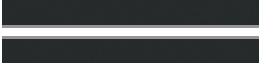





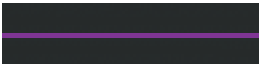





Aviation Symbols (Text label size can be None, Small, Medium (Med), or Large (Lrg))	Symbol	Default Range (nm)	Maximum Range (nm)
Active Flight Plan Leg (ACTIVE FPL)		2000	2000
Non-active Flight Plan Leg (ACTIVE FPL)		2000	2000
Active Flight Plan Waypoint (ACTIVE FPL WPT)	See Airports, NAVAIDs	2000	2000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

Table 5-2 Aviation Symbol Information

SYMBOL SETUP

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

Displaying/removing all land symbols:

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

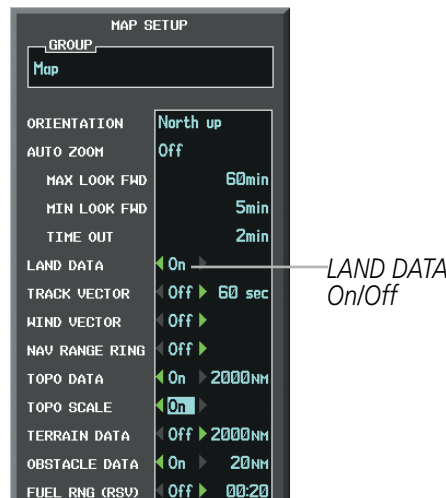


Figure 5-18 Navigation Map Setup Menu - LAND DATA Setup

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

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

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

- 9) Press the **ENT** Key to accept the selected range.
- 10) Press the **FMS** Knob to return to the Navigation Map Page.

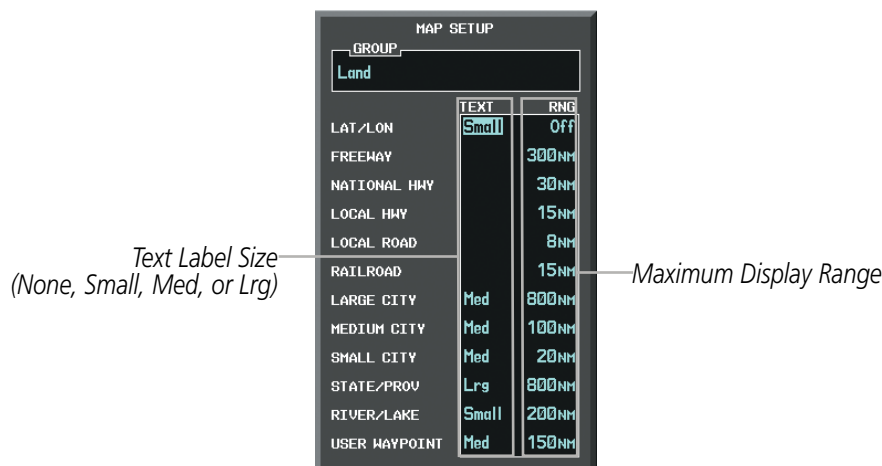


Figure 5-19 Navigation Map Setup Menu - LAND GROUP Setup

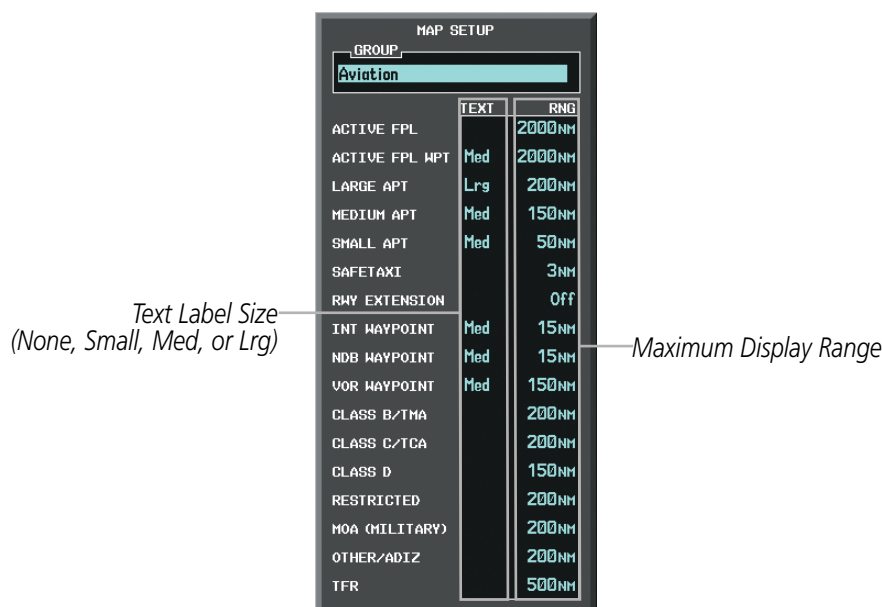


Figure 5-20 Navigation Map Setup Menu - AVIATION GROUP Setup



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

MAP DECLUTTER

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

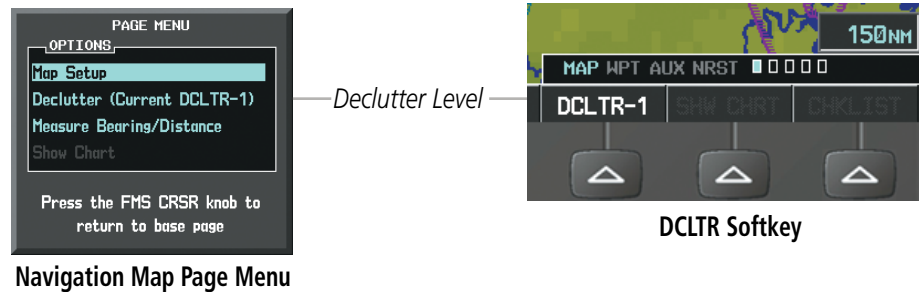


Figure 5-21 Navigation Map - Declutter Level Indications

Decluttering the map:

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

Or:

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

Decluttering the PFD Inset Map:

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

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

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

Table 5-3 Navigation Map Items Displayed by Declutter Level

AIRWAYS

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

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

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

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

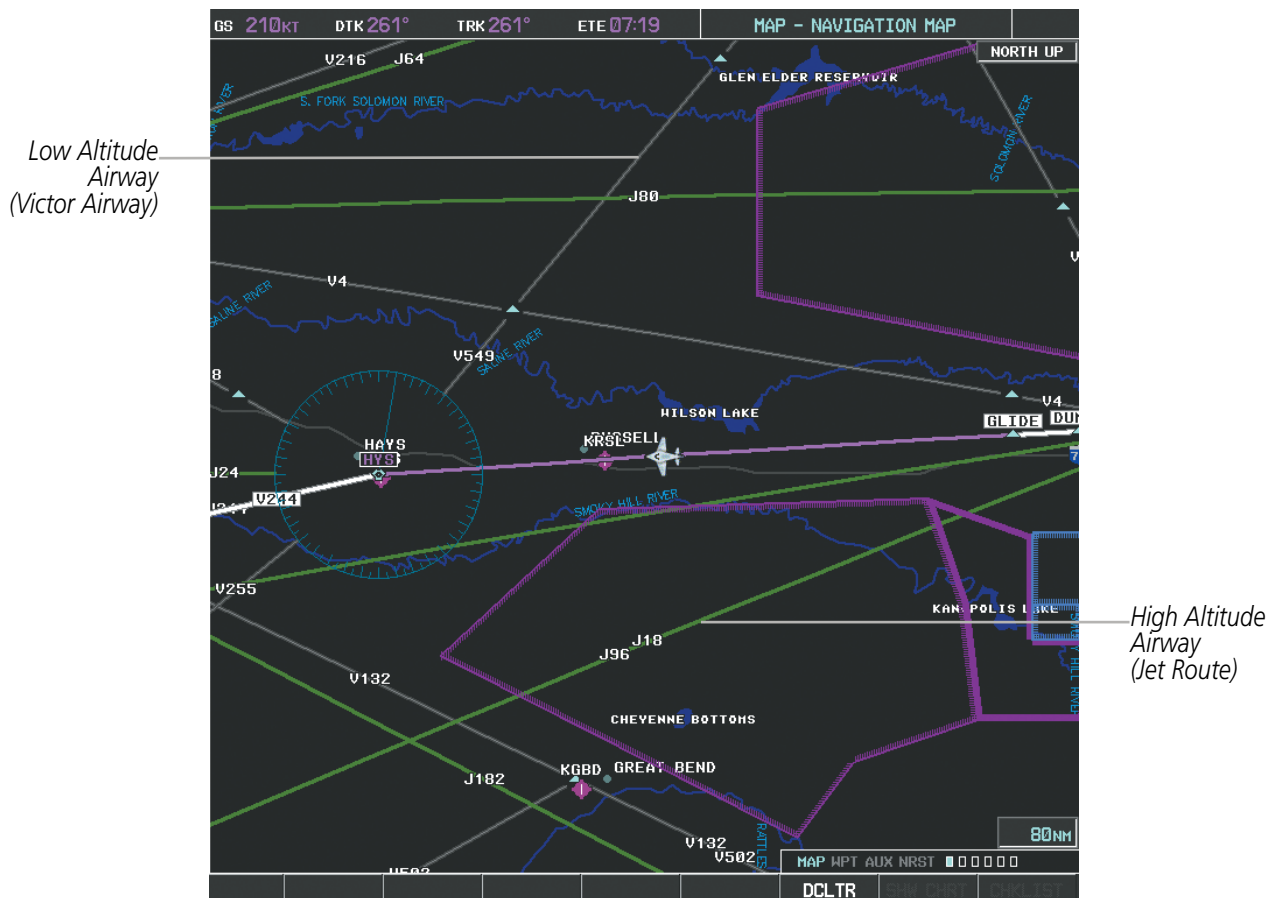


Figure 5-22 Airways on MFD Navigation Page

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

Displaying/removing airways:

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

Or:

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

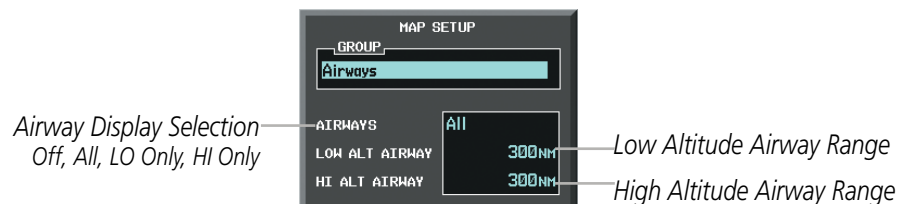


Figure 5-23 Navigation Map Setup Menu - AIRWAYS Setup

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

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

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

The following range items are configurable on the airways menu:


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

Table 5-4 Airway Range Information

TRACK VECTOR

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

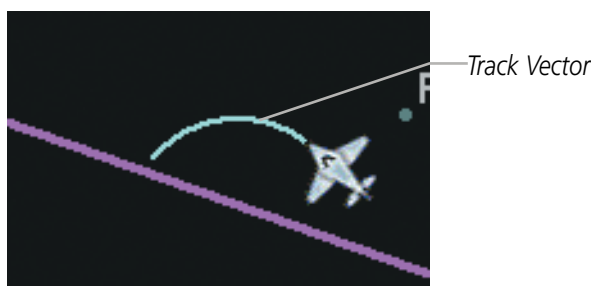


Figure 5-24 Navigation Map -Track Vector

Displaying/removing the track vector:

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

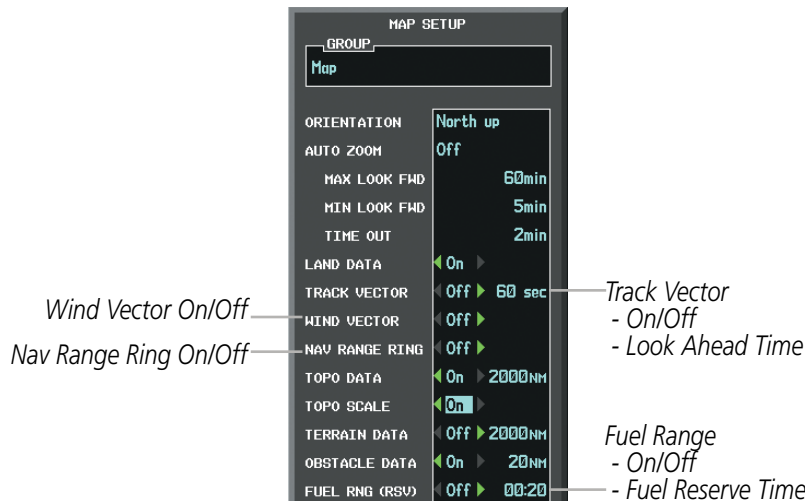


Figure 5-25 Navigation Map Setup Menu -TRACK VECTOR, WIND VECTOR, NAV RANGE RING, FUEL RANGE RING Setup

WIND VECTOR

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

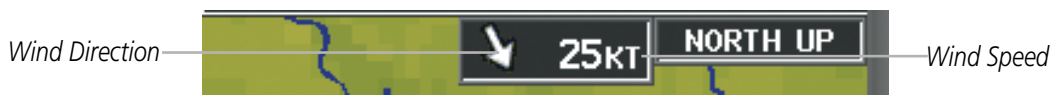


Figure 5-26 Navigation Map - Wind Vector



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

Displaying/removing the wind vector:

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

NAV RANGE RING

The Nav Range Ring shows the direction of travel (ground track) on a rotating compass card. The range is determined by the map range. The range is 1/4 of the map range (e.g., 7.5 nm on a 30 nm map).

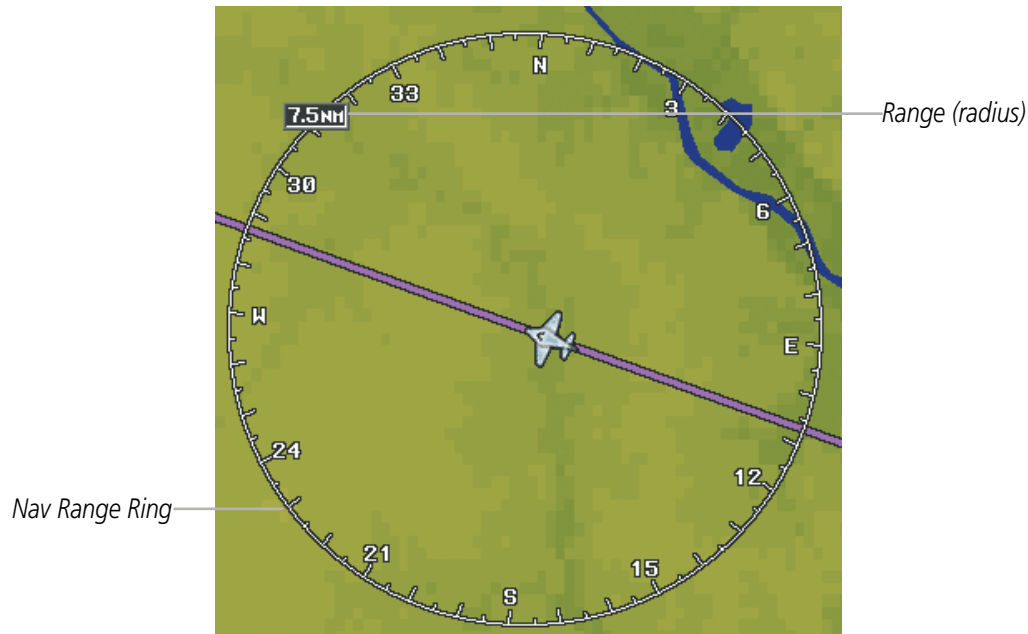


Figure 5-27 Navigation Map - Nav Range Ring



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

Displaying/removing the Nav Range Ring:

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



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

FUEL RANGE RING

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

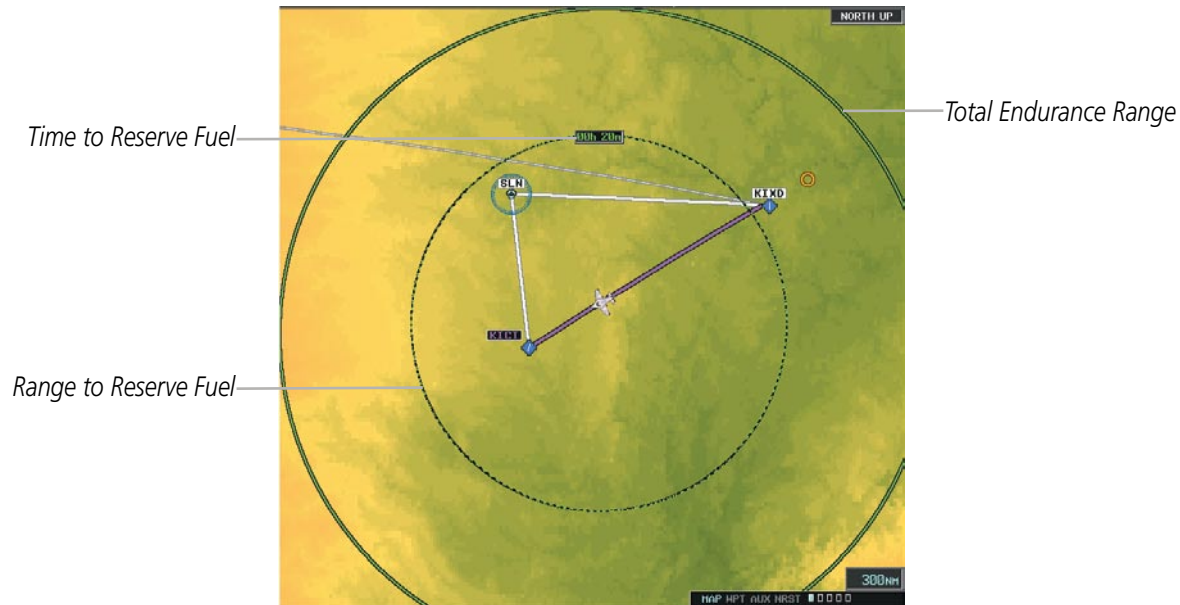


Figure 5-28 Navigation Map - Fuel Range Ring

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

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

FIELD OF VIEW (SVS)

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

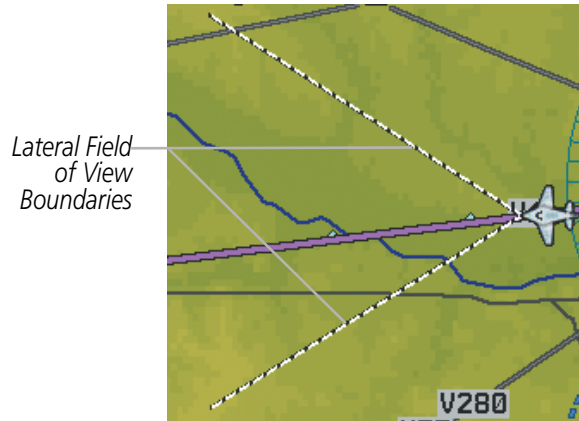


Figure 5-29 Navigation Map - Field of View

Displaying/removing the field of view:

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

SELECTED ALTITUDE INTERCEPT ARC

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

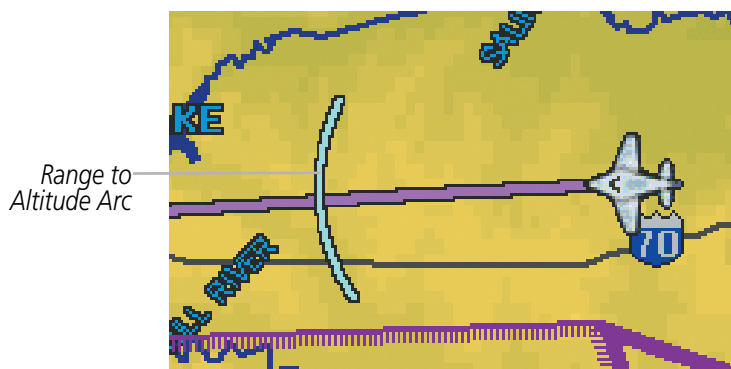


Figure 5-30 Navigation Map - Range to Altitude Arc

Displaying/removing the selected altitude intercept arc:

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

5.3 WAYPOINTS

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

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

Waypoints can be selected by entering the ICAO identifier, entering the name of the facility, or by entering the city name. See the System Overview section for detailed instructions on entering data in the G1000. As a waypoint identifier, facility name, or location is entered, the G1000's Spell'N'Find™ feature scrolls through the database, displaying those waypoints matching the characters which have been entered to that point. A direct-to navigation leg to the selected waypoint can be initiated by pressing the **Direct-to** Key on any of the waypoint pages.



Figure 5-31 Waypoint Information Window

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



Figure 5-32 Waypoint Information Window - Duplicate Identifier

AIRPORTS



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

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

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

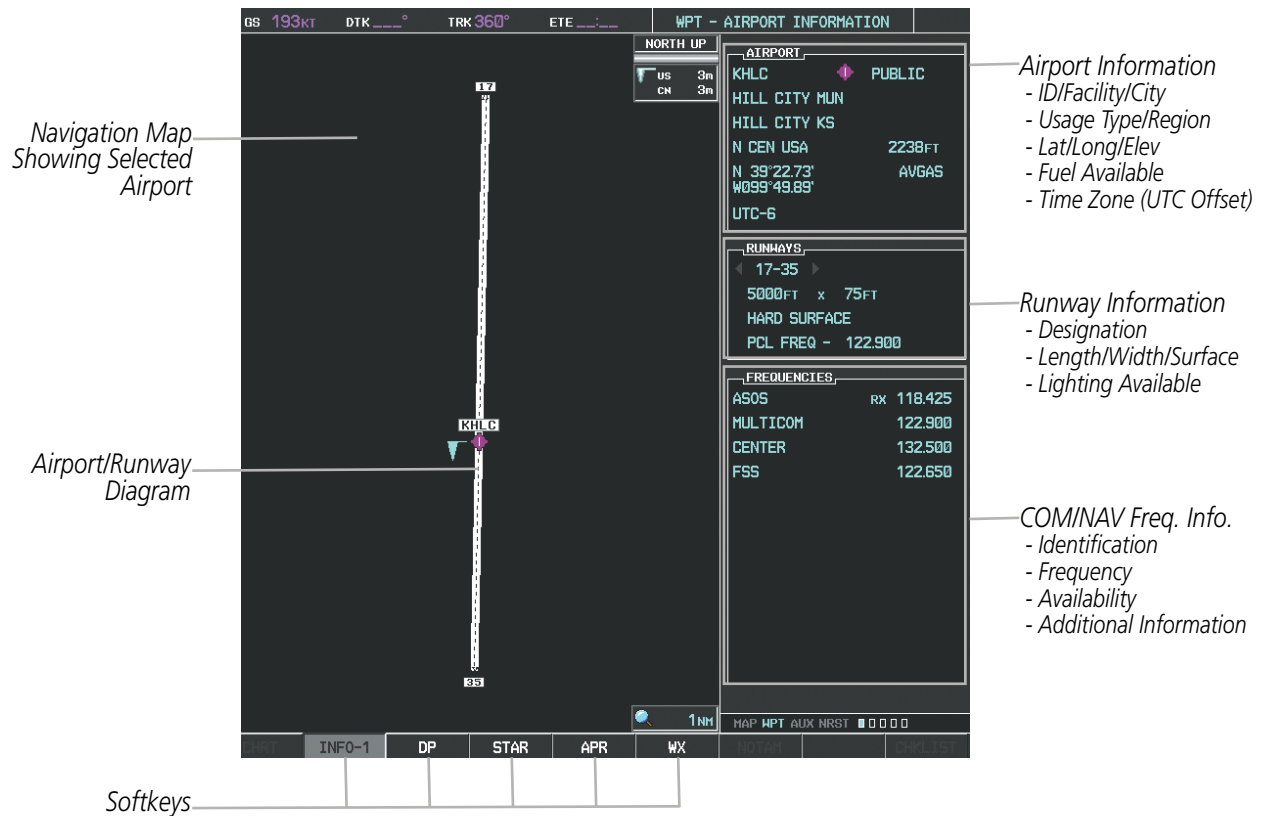


Figure 5-33 Airport Information Page

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

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

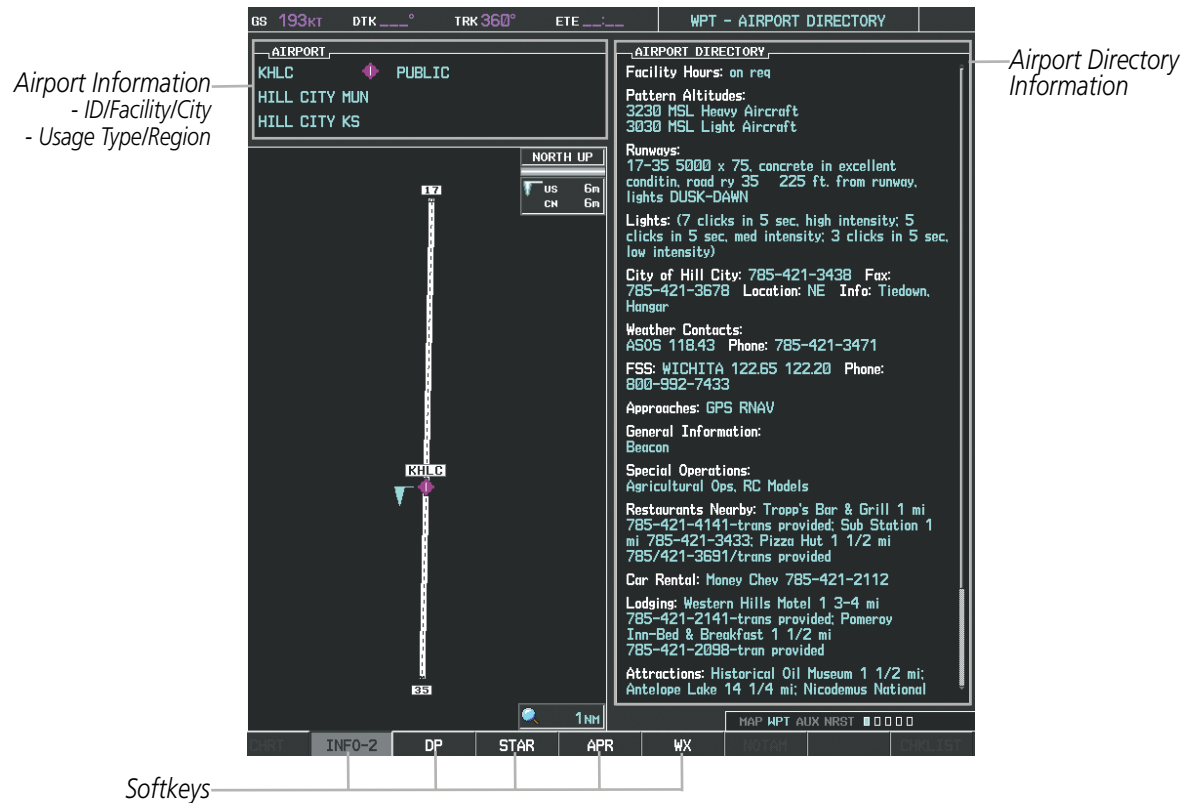


Figure 5-34 Airport Directory Page Example

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

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

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

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

Selecting a runway:

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

Viewing a destination airport:

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

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

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

Table 5-5 Airport Frequency Abbreviations

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

The G1000 provides a **NRST** Softkey on the PFD, which gives the pilot quick access to nearest airport information (very useful if an immediate landing is required). The Nearest Airports Window displays a list of up to 25 of the nearest airports (three entries can be displayed at one time). If there are more than three they are displayed in a scrollable list. If there are no nearest airports available, "NONE WITHIN 200NM" is displayed.

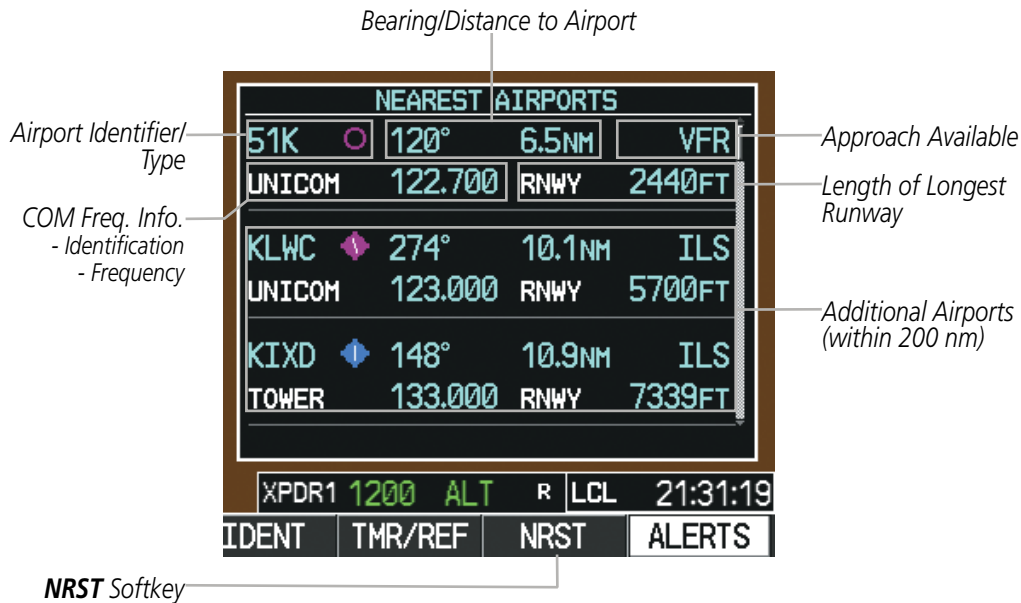


Figure 5-35 Nearest Airports Window on PFD

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

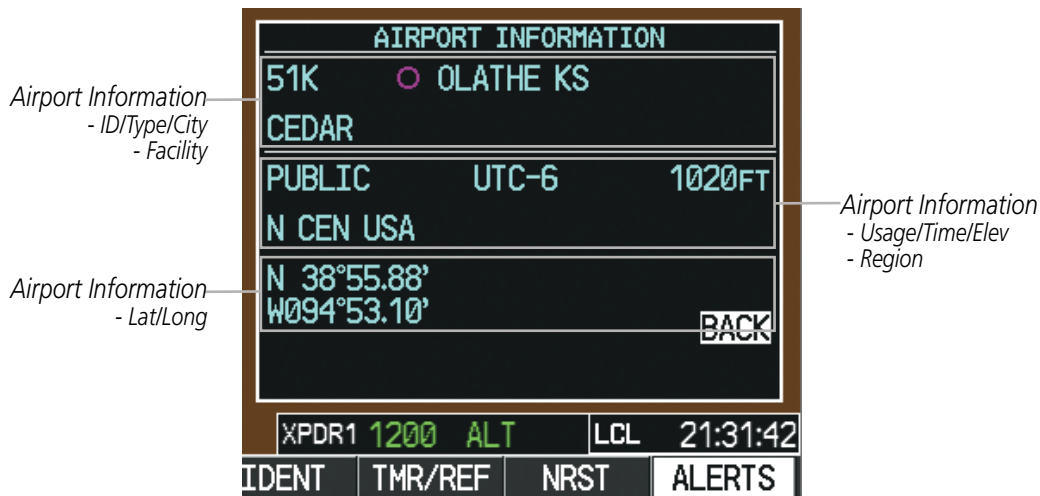


Figure 5-36 Airport Information Window on PFD

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

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

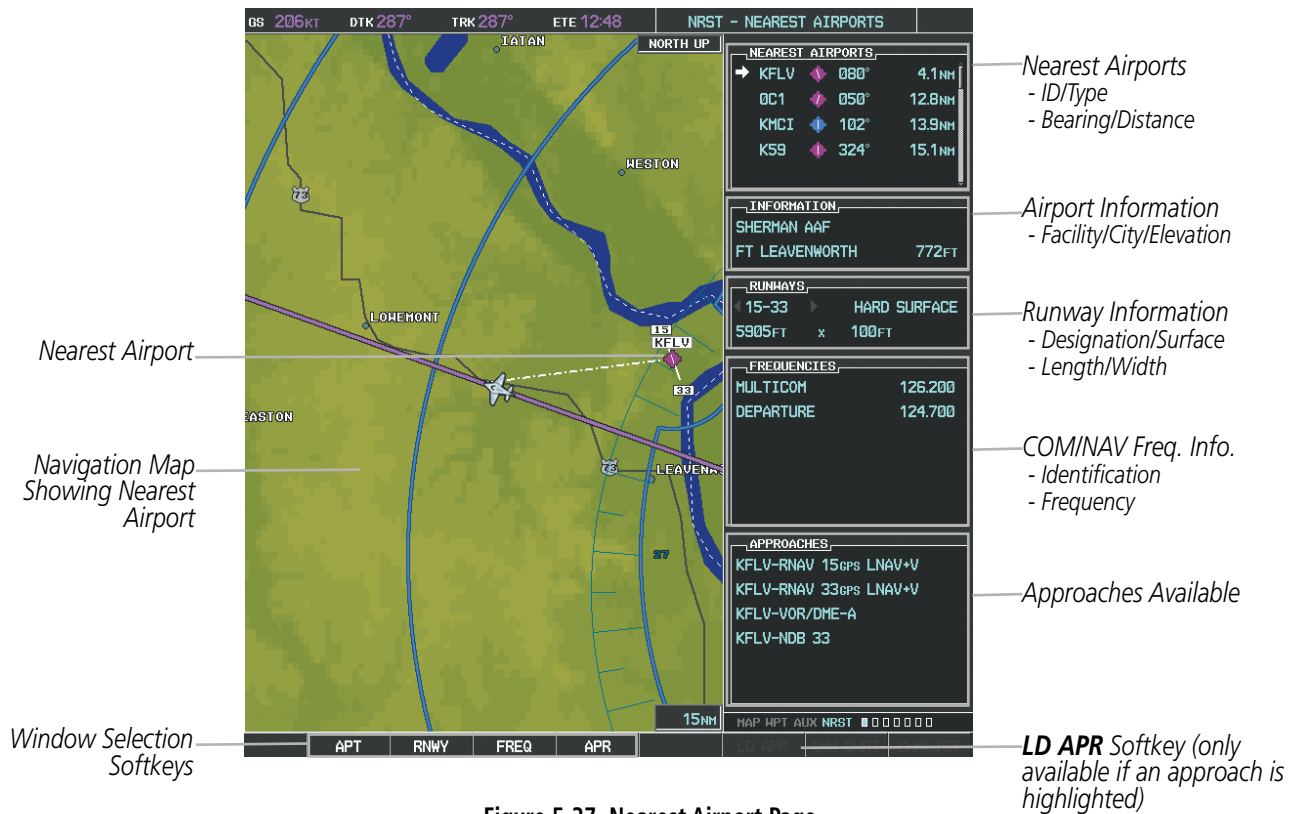


Figure 5-37 Nearest Airport Page

Viewing information for a nearest airport on the PFD:

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

Viewing information for a nearest airport on the MFD:

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

Viewing runway information for a specific airport:

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

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

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

Selecting nearest airport surface matching criteria:

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

Selecting nearest airport minimum runway length matching criteria:

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

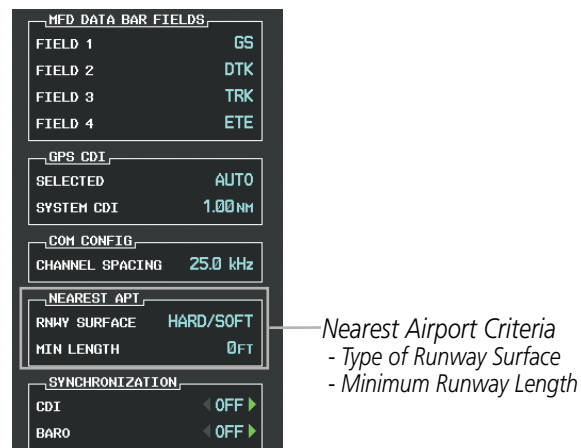


Figure 5-38 System Setup Page - Nearest Airport Selection Criteria

INTERSECTIONS



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

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

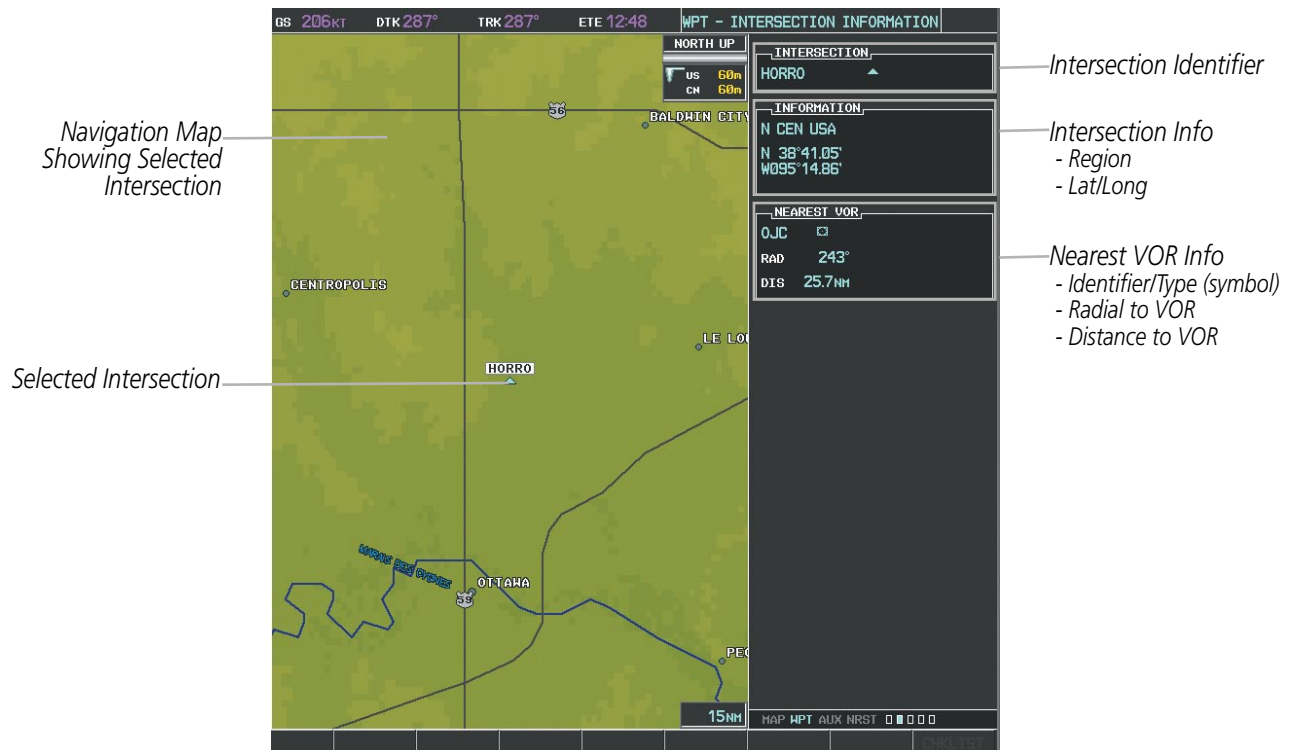


Figure 5-39 Intersection Information Page

Selecting an intersection:

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

Or:

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

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

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



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

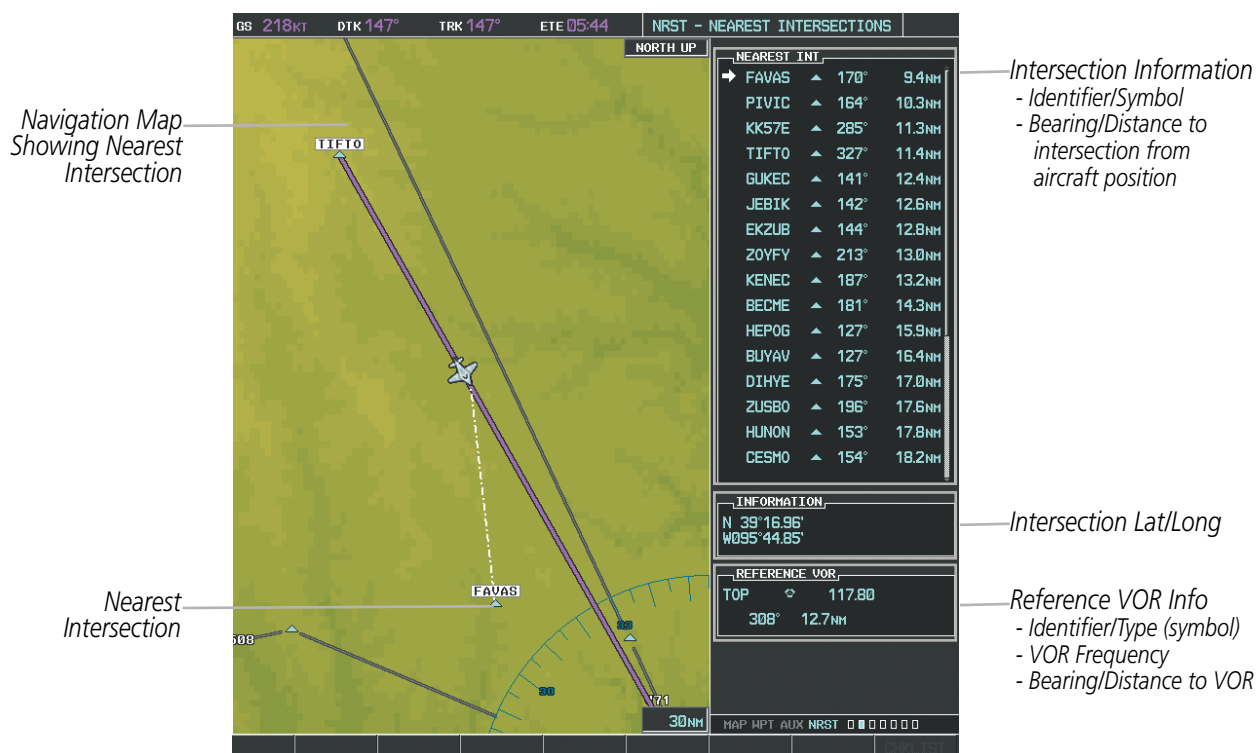


Figure 5-40 Nearest Intersections Page

NDBs

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

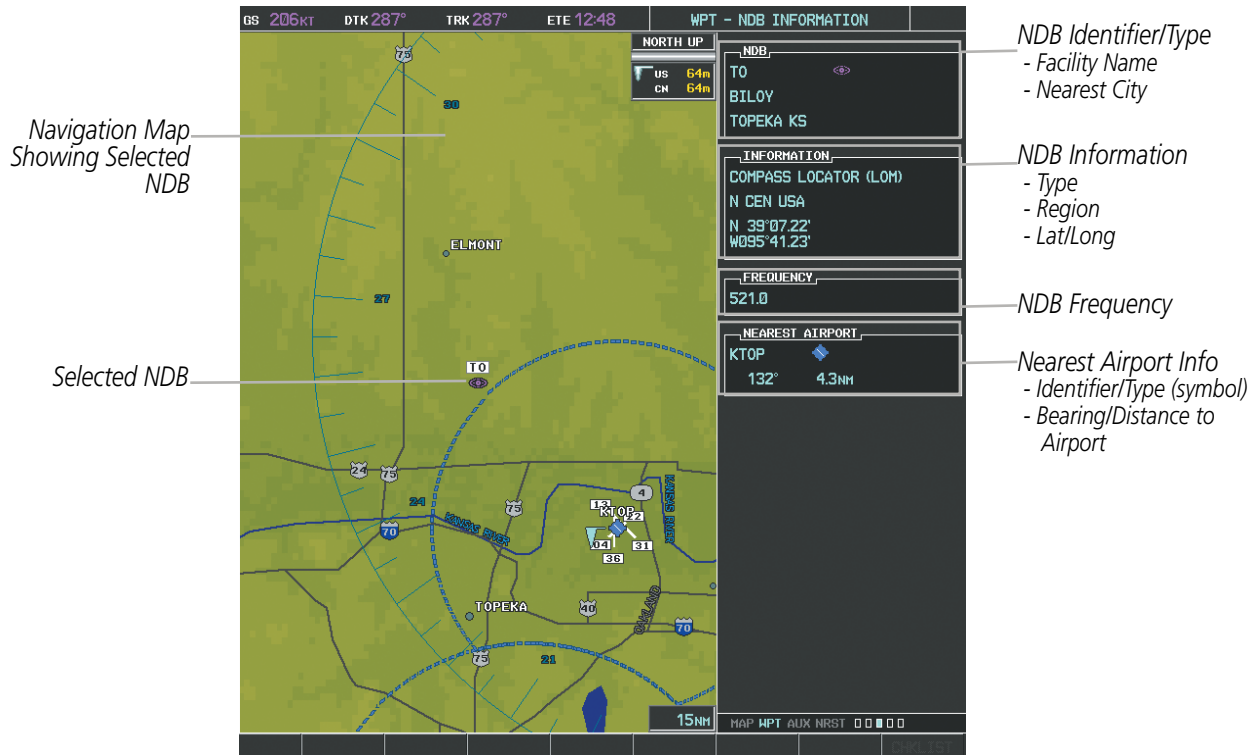


Figure 5-41 NDB Information Page



NOTE: Compass locator (LOM, LMM): a low power, low or medium frequency radio beacon installed in conjunction with the instrument landing system. When LOM is used, the locator is at the Outer Marker; when LMM is used, the locator is at the Middle Marker.

Selecting an NDB:

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

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

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

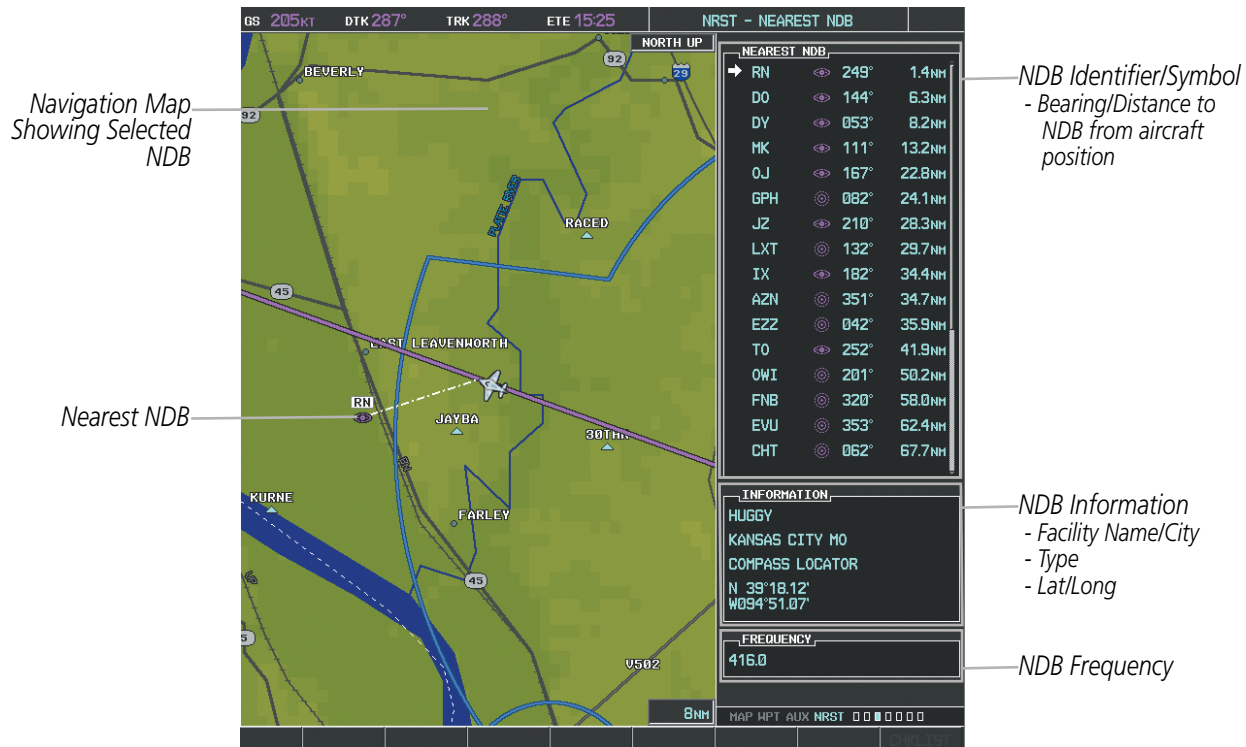


Figure 5-42 Nearest NDB Page

VORs

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

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

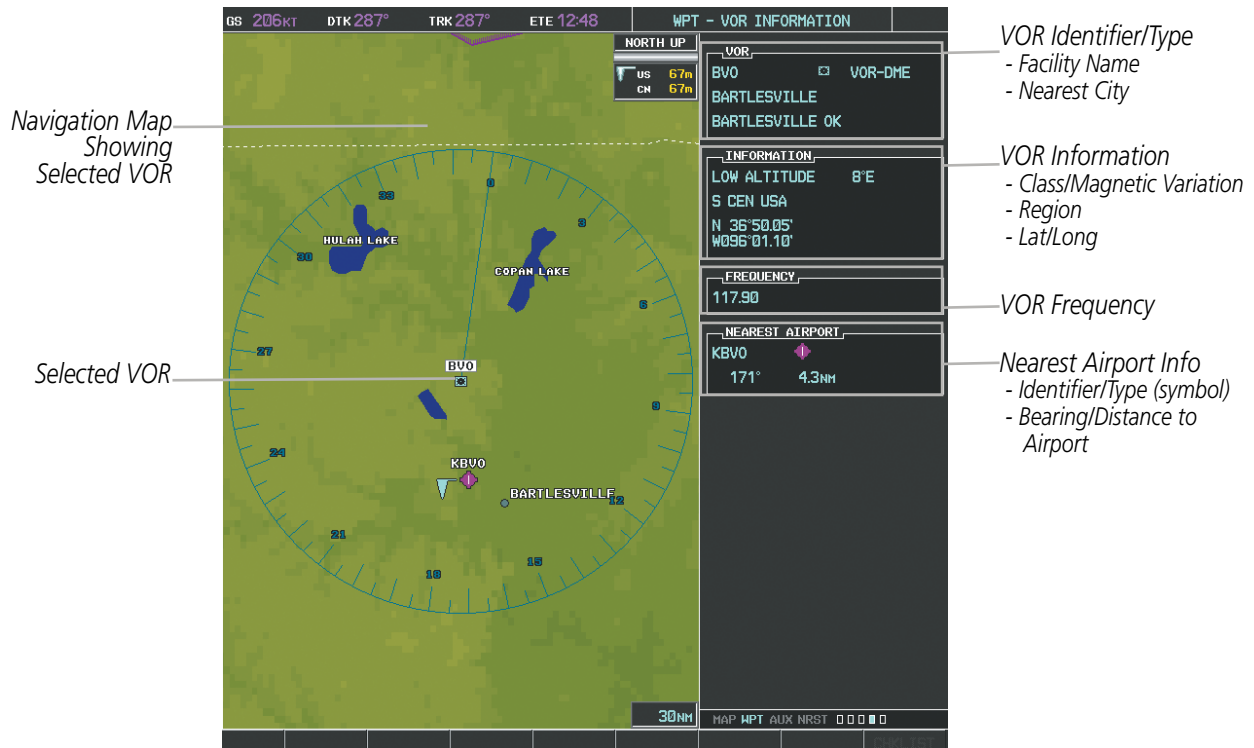


Figure 5-43 VOR Information Page

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

Selecting a VOR:

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

Or:

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

3) Press the **FMS** Knob to remove the flashing cursor.

Or:

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

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

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

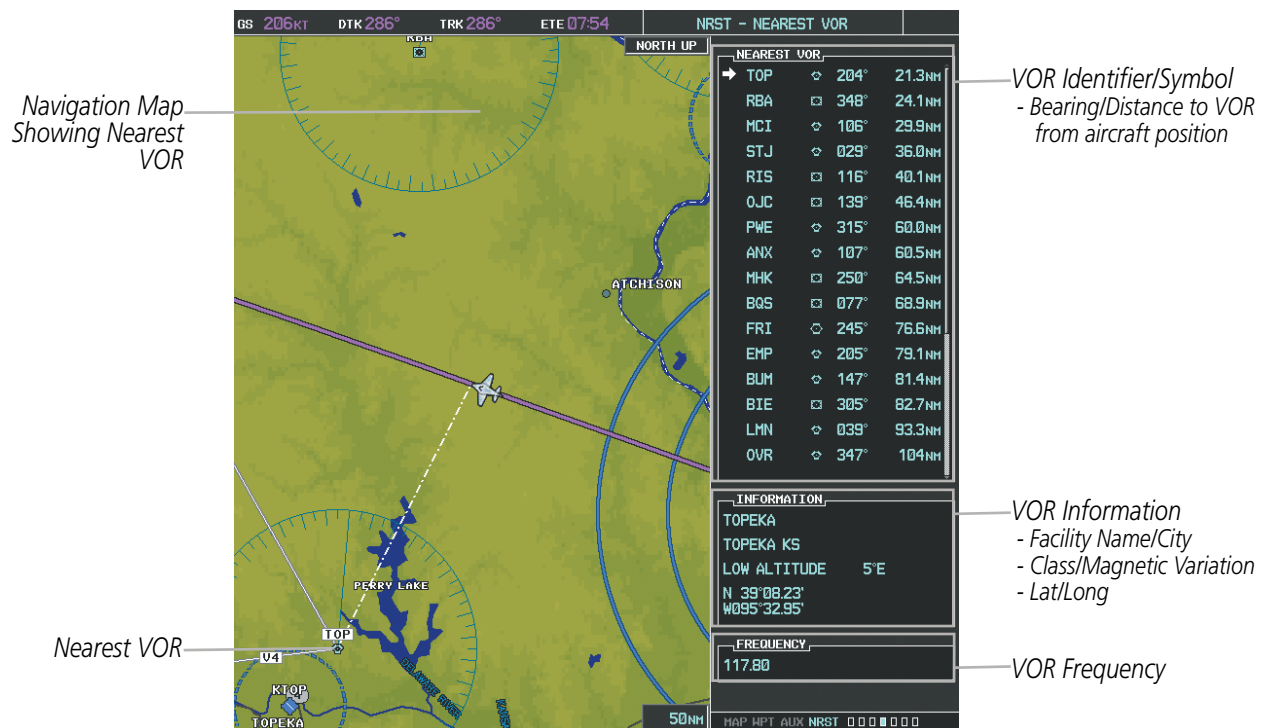
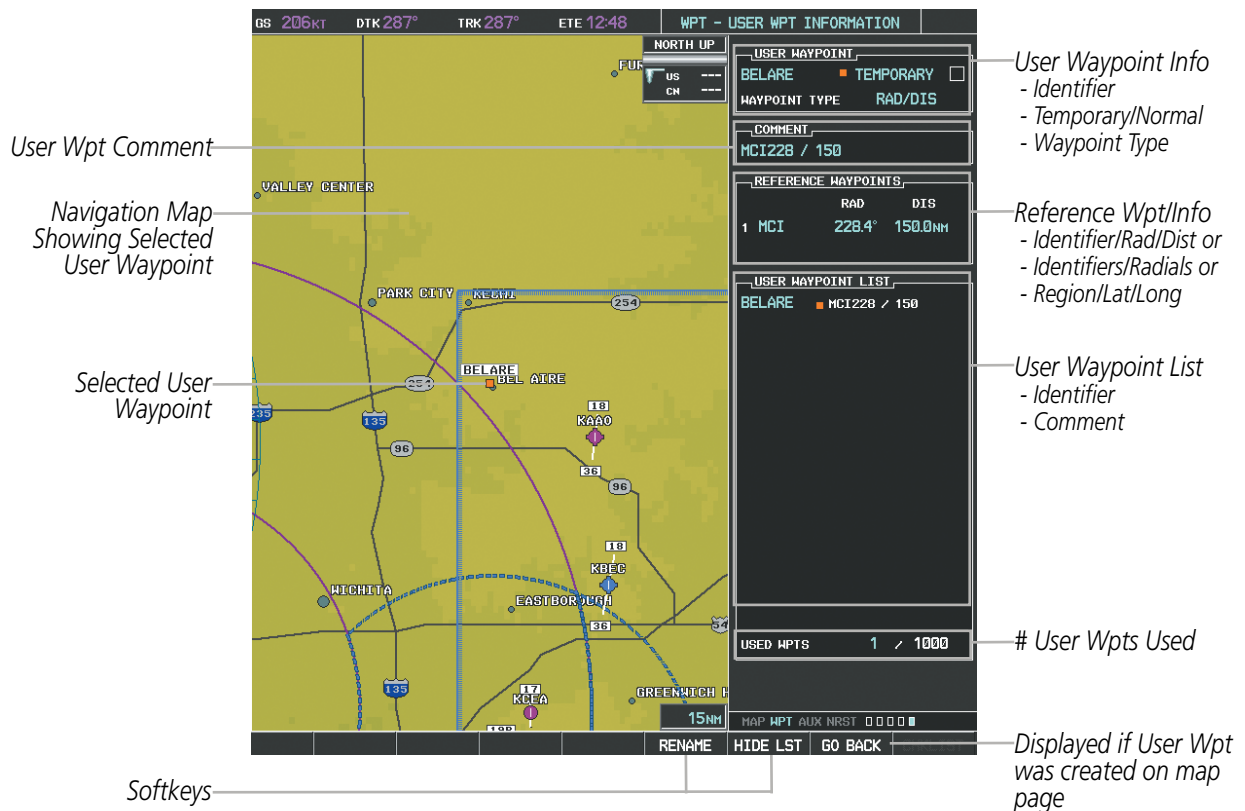


Figure 5-44 Nearest VOR Page

USER WAYPOINTS

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



Selecting a User Waypoint:

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

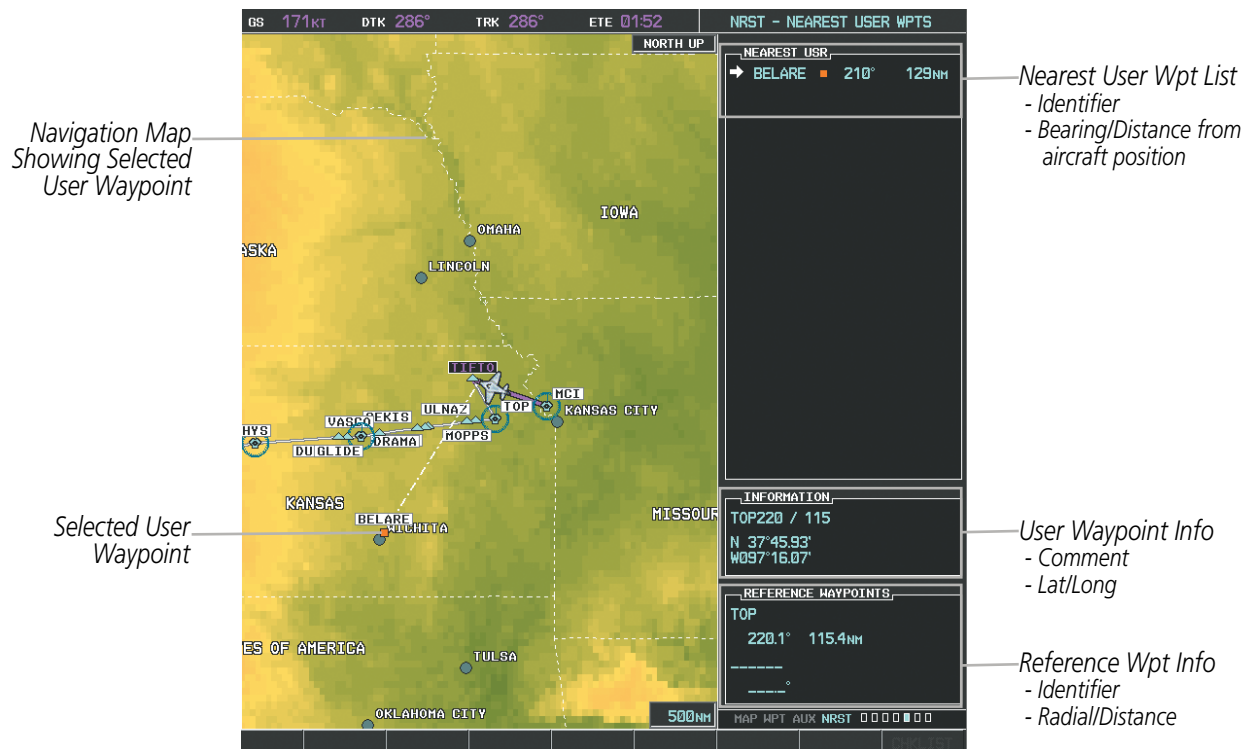


Figure 5-46 Nearest User Waypoint Page

CREATING USER WAYPOINTS

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

Creating user waypoints from the User Waypoint Information Page:

- 1) Select the **NEW** Softkey, or press the **MENU** Key and select 'Create New User Waypoint'.
- 2) Enter a user waypoint name (up to six characters).
- 3) Press the **ENT** Key. The current aircraft position is the default location of the new waypoint.
- 4) If desired, define the type and location of the waypoint in one of the following ways:
 - a) Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

Or:

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

Or:

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

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

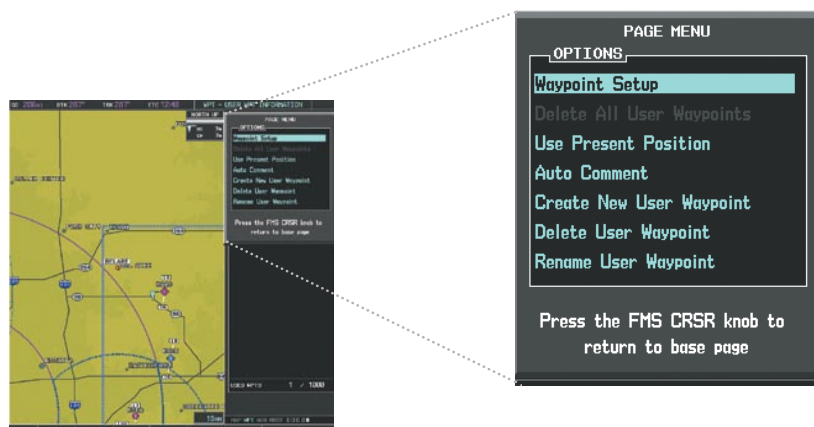


Figure 5-47 User Waypoint Information Page Menu

Creating user waypoints from map pages:

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



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

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

EDITING USER WAYPOINTS**Editing a user waypoint comment or location:**

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

Renaming user waypoints:

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

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

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

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

Resetting the comment field to the system generated comment:

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

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

Changing the user waypoint storage duration default setting:

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

DELETING USER WAYPOINTS

Deleting a single user waypoint:

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

Or:

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



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

Deleting all user waypoints:

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

5.4 AIRSPACES

The G1000 can display the following types of airspace: Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), Other Airspace, Air Defense Identification Zone (ADIZ), and Temporary Flight Restriction (TFR).

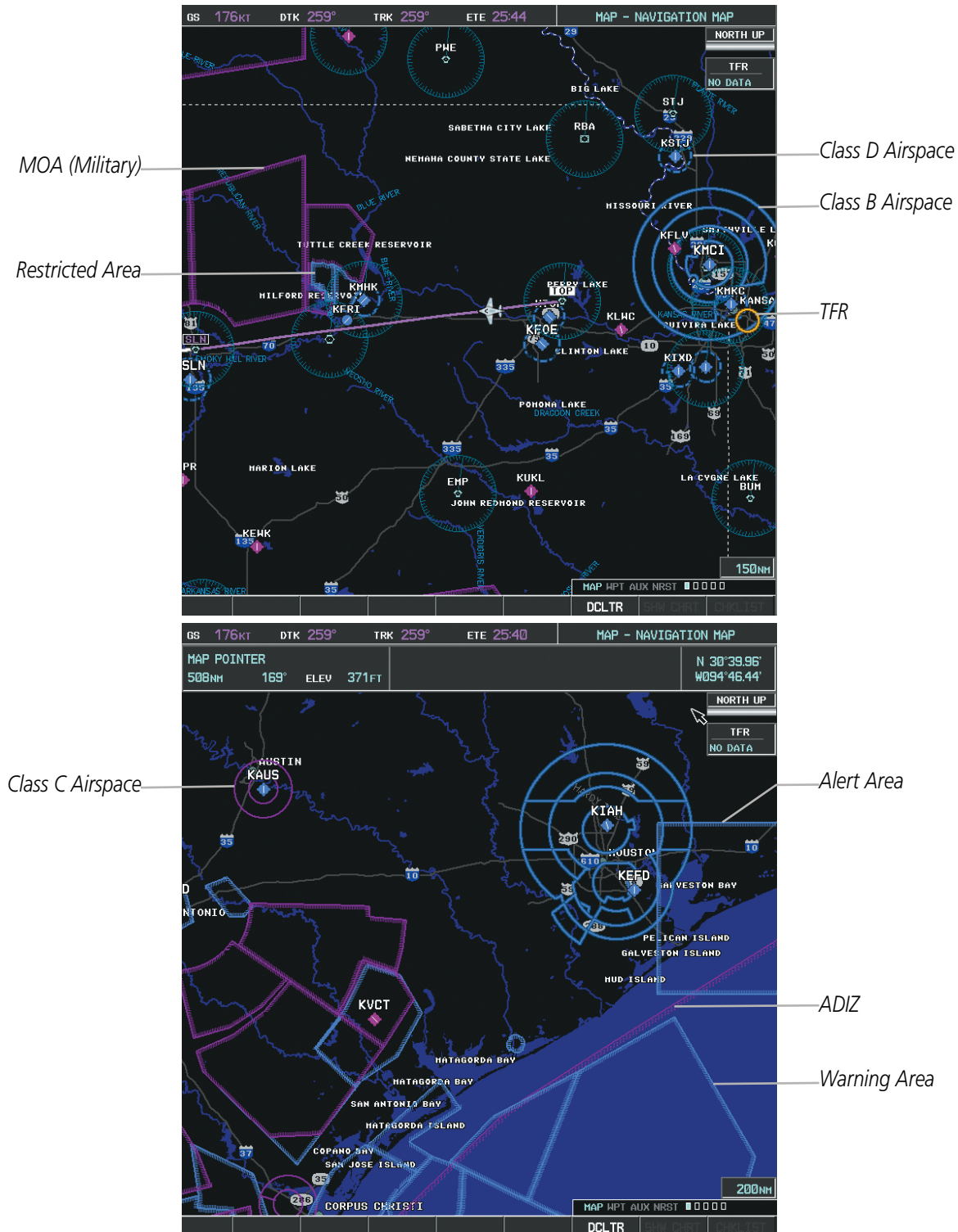


Figure 5-48 Airspaces

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

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

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

Changing the altitude buffer distance setting:

- 1) Use the **FMS** Knob to select the AUX - System Setup Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the altitude buffer field in the Airspace Alerts Box.
- 4) Use the **FMS** Knob to enter an altitude buffer value and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Turning an airspace alert on or off:

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

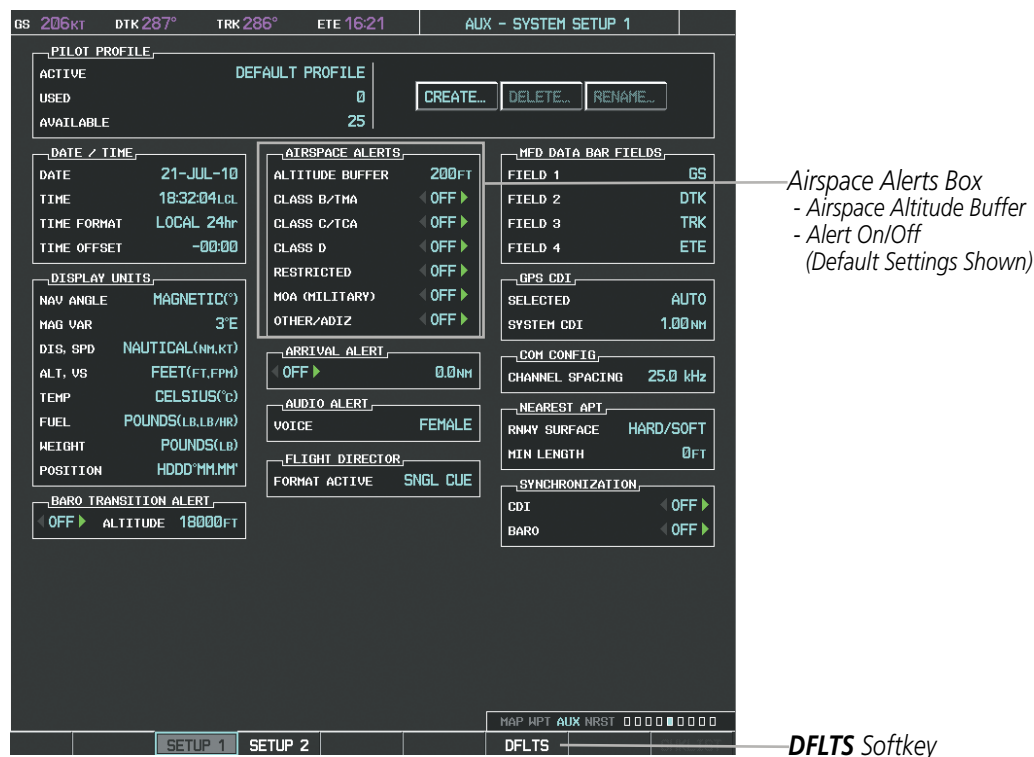
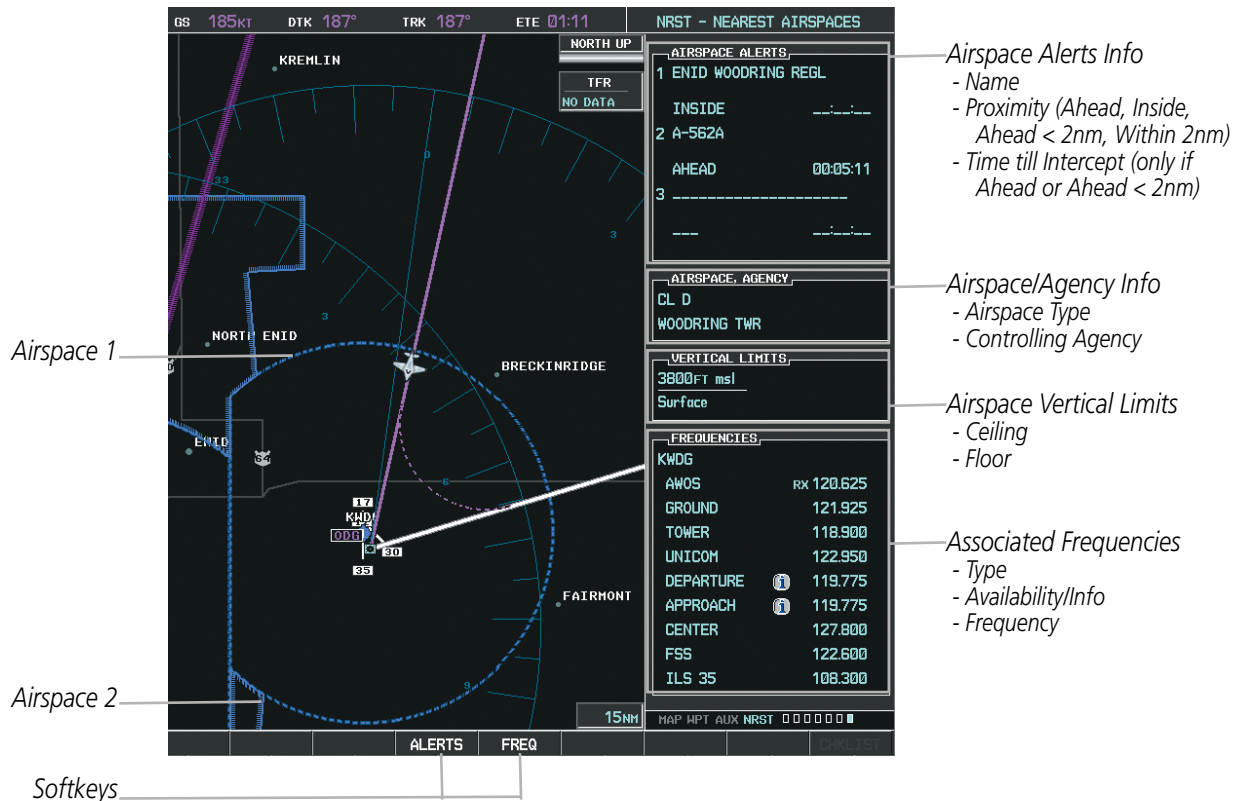


Figure 5-49 System Setup Page - Airspace Alerts

Map ranges for the airspace boundaries are selected from the Aviation Group in the Map Setup Menu. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

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



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

Selecting and viewing an airspace alert with its associated information:

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

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

Message	Comments
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 PFD Airspace Alert Messages

5.5 DIRECT-TO-NAVIGATION

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

Once a direct-to is activated, the G1000 establishes a point-to-point course line from the present position to the selected direct-to destination. Course guidance is provided until the direct-to is replaced with a new direct-to or flight plan, or cancelled.

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

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

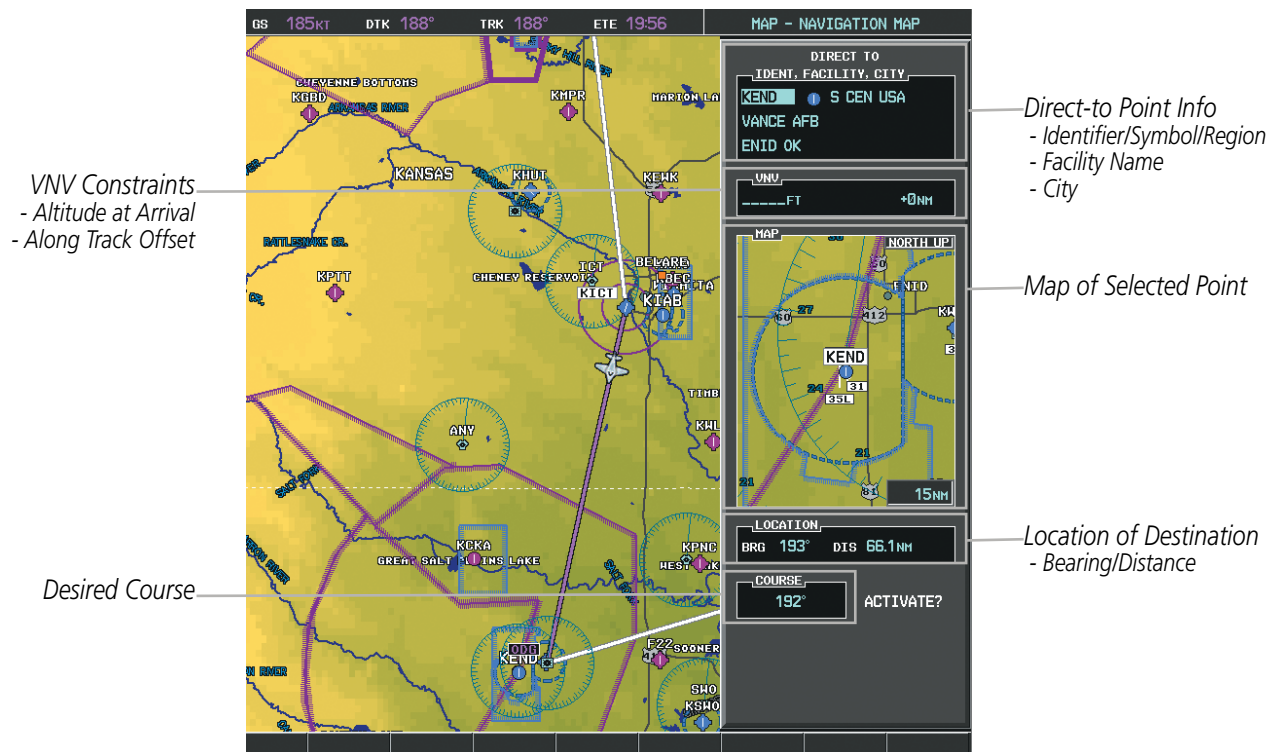


Figure 5-51 Direct-to Window - MFD



Figure 5-52 Direct-to Window - PFD

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

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

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

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

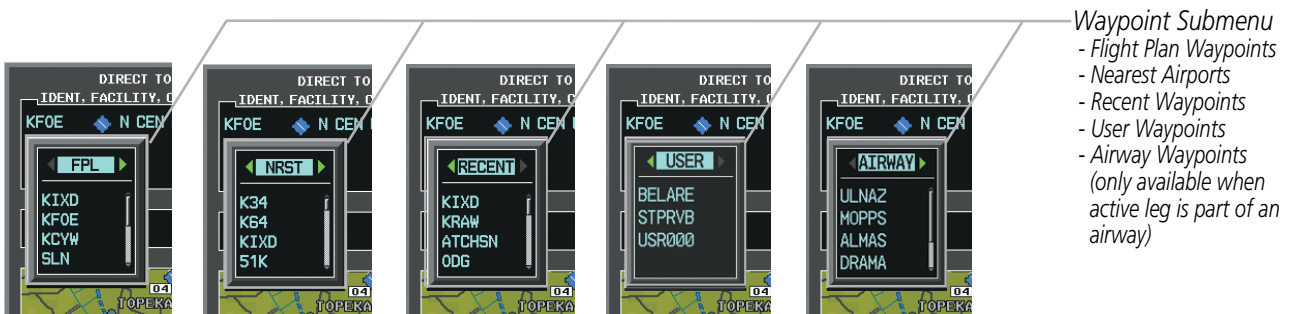


Figure 5-53 Waypoint Submenu

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

- 1) While navigating an active flight plan, press the **Direct-to** Key. The Direct-to Window is displayed with the active flight plan waypoint as the default selection.
- 2) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
- 3) Select the desired waypoint.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
- 5) Press the **ENT** Key again to activate the direct-to.

Or:

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

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

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

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

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

Selecting any waypoint as a direct-to destination:

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

Selecting a nearby airport as a direct-to destination:

- 1) Select the **NRST** Softkey on the PFD; or turn the **FMS** Knob to display the Nearest Airports Page and press the **FMS** Knob.
- 2) Select the desired airport (the nearest one is already selected).
- 3) Press the **Direct-to** Key.
- 4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
 5) Press the **ENT** Key again to activate the direct-to.

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

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

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

Cancelling a Direct-to:

- 1) Press the **Direct-to** Key to display the Direct-to Window.
- 2) Press the **MENU** Key.
- 3) With 'Cancel Direct-To NAV' highlighted, press the **ENT** Key. If a flight plan is still active, the G1000 resumes navigating the flight plan along the closest leg.

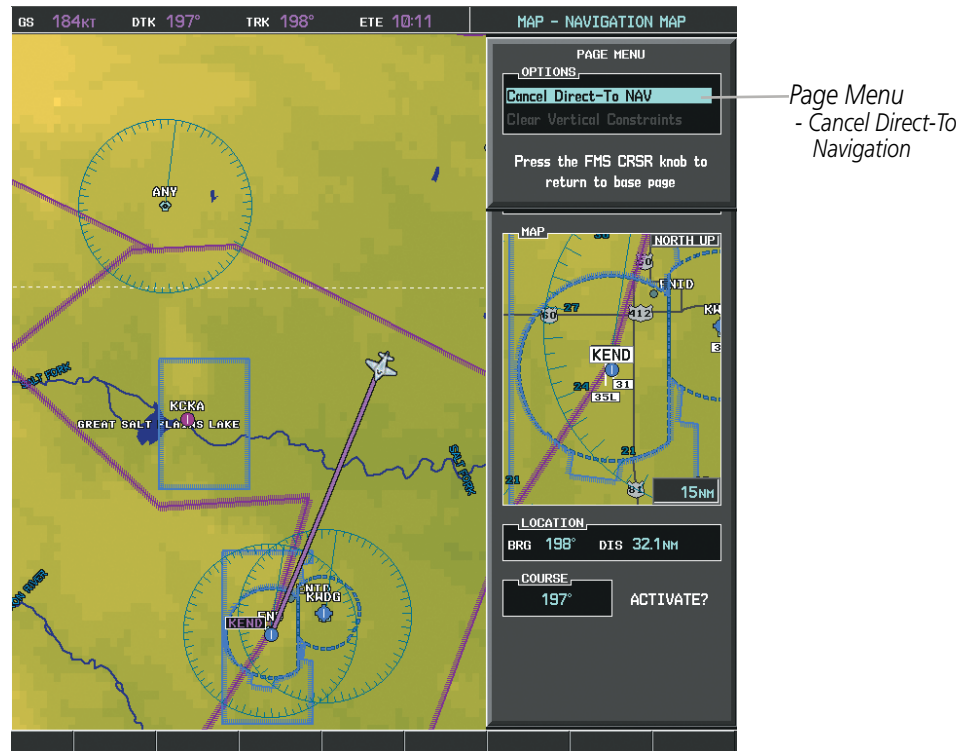


Figure 5-54 Direct-to Window - Cancelling Direct-to Navigation

When navigating a direct-to, the G1000 sets a direct great circle course to the selected destination. The course to a destination can also be manually selected using the course field ('COURSE') on the Direct-to Window.

Selecting a manual direct-to course:

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

Reselecting the direct course from the current position:

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

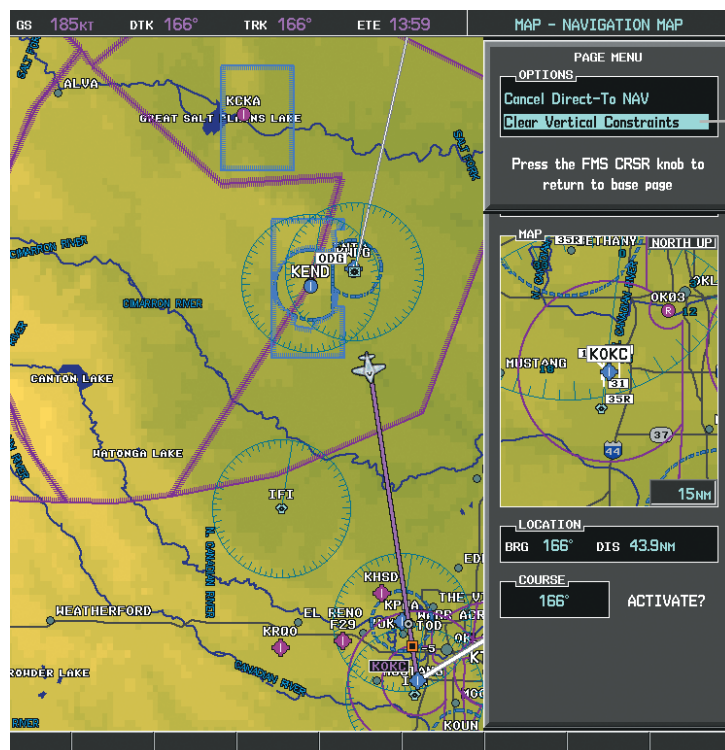
A direct-to with altitude constraints creates a descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has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

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

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

Removing a VNV altitude constraint:

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



Page Menu
- Clear Vertical Navigation
Constraints

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

5.6 FLIGHT PLANNING

Flight planning on the G1000 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 G1000 allows flight planning information to be entered from either the MFD or PFD. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment of the flight plan currently being flown (departure, enroute, arrival, approach, or missed approach).






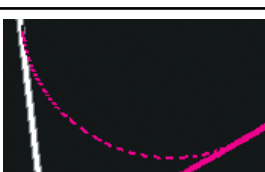
Flight Plan Leg Type	Symbol
Active non-heading Leg	
Active heading Leg	
Non-heading Leg in the current flight segment	
Heading Leg not in the current flight segment	
Non-heading Leg not in the active flight segment	
Turn Anticipation Arc	

Table 5-7 Flight Plan Leg Symbols

Up to 99 flight plans with up to 99 waypoints each can be created and stored in memory. One flight plan can be activated at a time and becomes the active flight plan. The active flight plan is erased when the system is turned off and overwritten when another flight plan is activated. When storing flight plans with an approach, departure, or arrival, the G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 automatically updates the information if the procedure has not been modified. If an approach, departure, or arrival procedure is no longer available, the procedure is deleted from the affected stored flight plan(s), and an alert is displayed (see Miscellaneous Messages in Appendix A) advising that one or more stored flight plans need to be edited.

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

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

The following could cause the airway update to fail:

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

FLIGHT PLAN CREATION

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

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

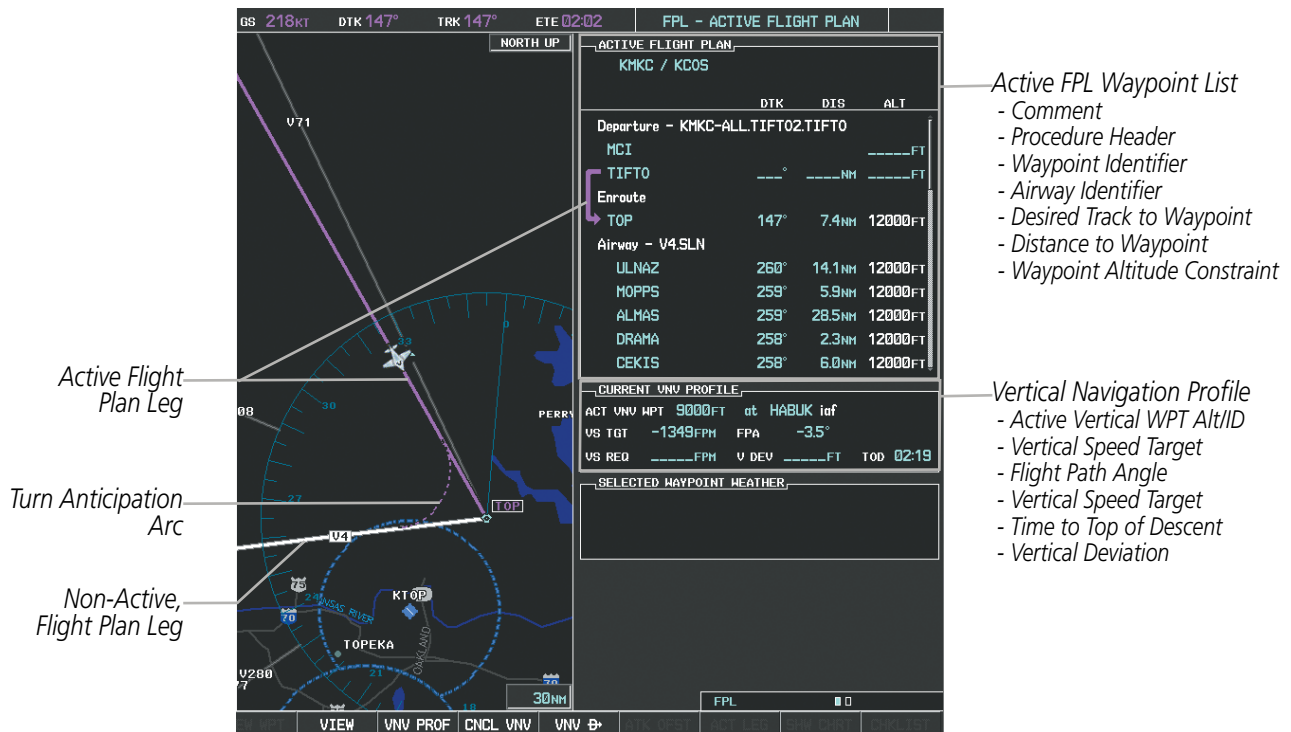


Figure 5-56 Active Flight Plan Page

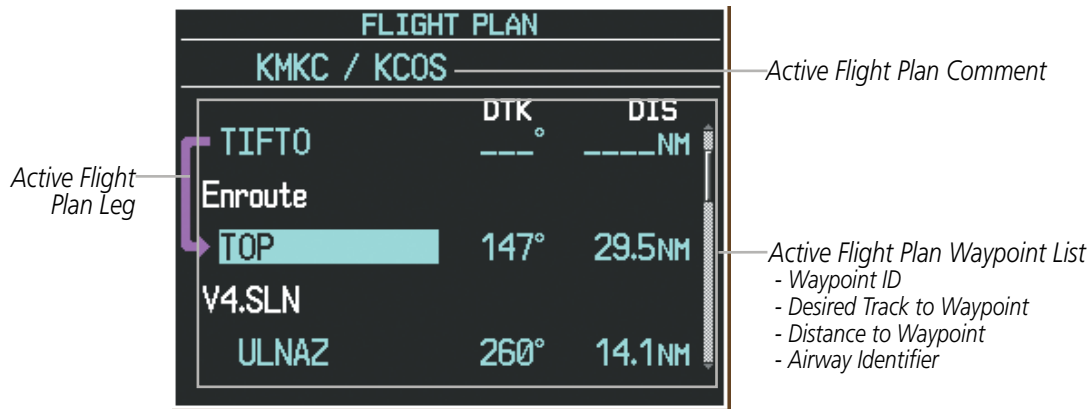


Figure 5-57 Active Flight Plan Window on PFD

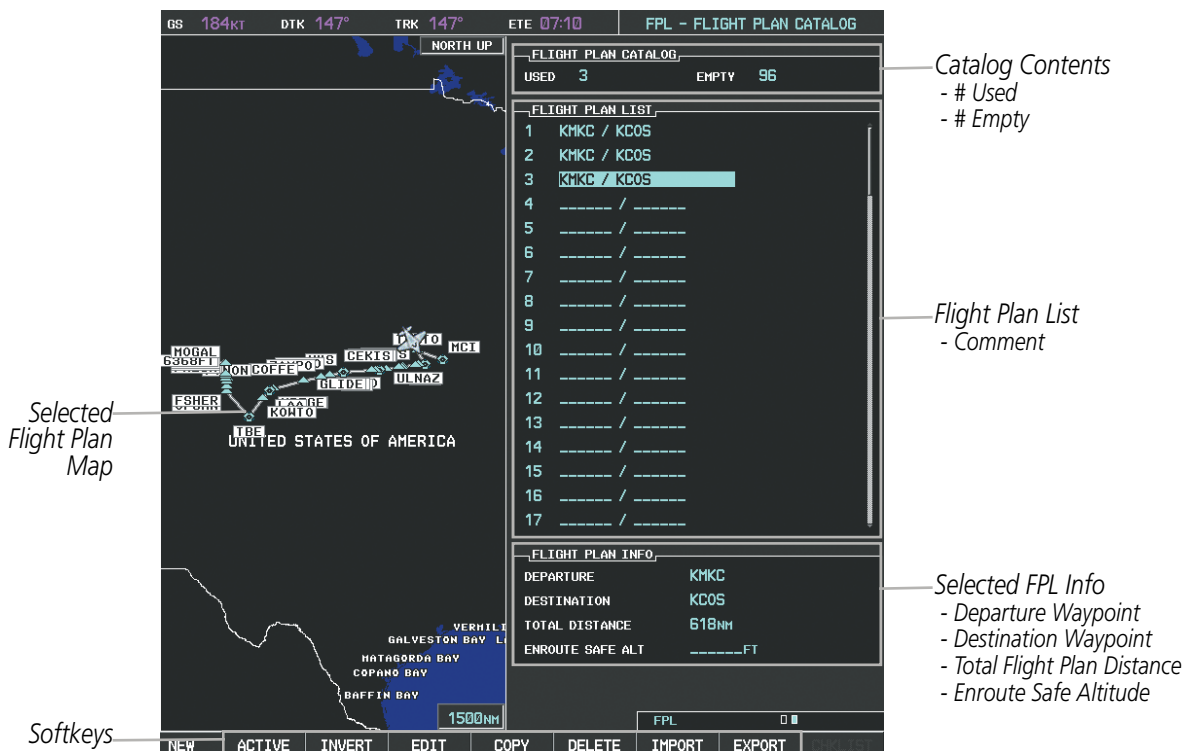


Figure 5-58 Flight Plan Catalog Page

The active flight plan is listed on the active Flight Plan Page on the MFD, and in the Active Flight Plan Window on the PFD. It is the flight plan to which the G1000 is currently providing guidance, and is shown on the navigation maps. Stored flight plans are listed on the Flight Plan Catalog Page, and are available for activation (becomes the active flight plan).

Creating an active flight plan:

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (only on MFD).

- 3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.
- 5) Repeat step numbers 3 and 4 to enter each additional flight plan waypoint.
- 6) When all waypoints have been entered, press the **FMS** Knob to remove the cursor.

Creating a stored flight plan:

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

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

Importing a Flight Plan from an SD Card

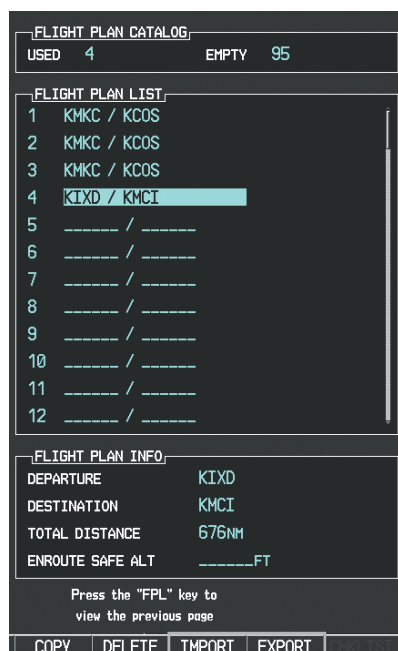
- 1) Insert the SD card containing the flight plan in the top card slot on the MFD.
- 2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn either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

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

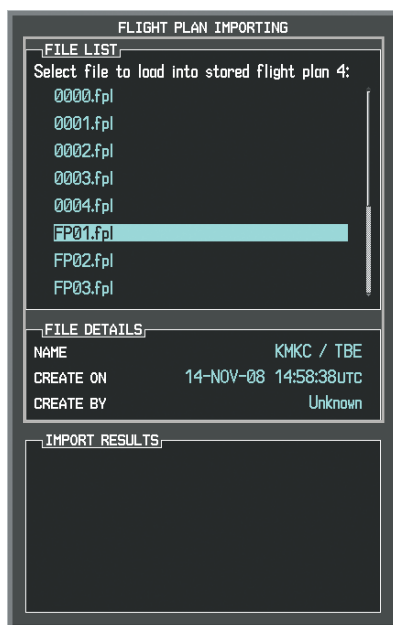
Or:

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

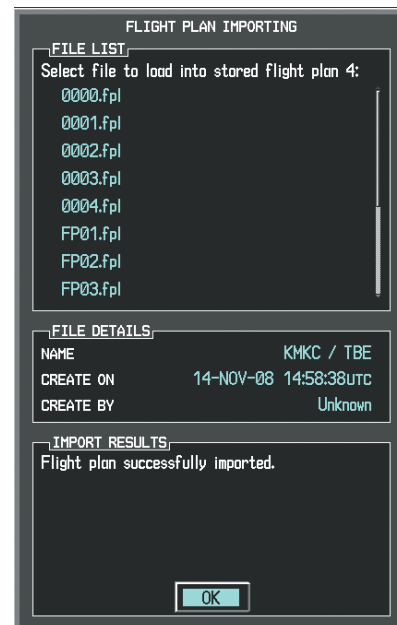
- 7) Turn the small **FMS** Knob to highlight the desired flight plan for importing.
- 8) Press the **ENT** Key to initiate the import.
- 9) Press the **ENT** Key again to confirm the import.



Import/Export Softkeys



List of Flight Plans to Import & Details for the Selected File



Import Successful

Figure 5-59 Flight Plan Import



NOTE: If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.

Exporting a Flight Plan to an SD Card

- 1) Insert the SD card into the top card slot on the MFD.
- 2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to highlight the flight plan to be exported.
- 6) Press the **EXPORT** Softkey; or press the **MENU** Key, select "Export Flight Plan".
- 7) If desired, change the name for the exported file by turning the large **FMS** Knob to the left to highlight the name, then use the small and large **FMS** knobs to enter the new name, and press the **ENT** Key.
- 8) Press the **ENT** Key to initiate the export.
- 9) Press the **ENT** Key to confirm the export.



NOTE: The exported flight plan will not contain any procedures or airways.

FLIGHT PLAN CATALOG
USED 4 EMPTY 95

FLIGHT PLAN LIST

1	KMCC / KCOS
2	KMCC / KCOS
3	KMCC / KCOS
4	KIXD / KMCI
5	----- / -----
6	----- / -----
7	----- / -----
8	----- / -----
9	----- / -----
10	----- / -----
11	----- / -----
12	----- / -----

FLIGHT PLAN INFO

DEPARTURE KIXD
DESTINATION KMCI
TOTAL DISTANCE 676NM
ENROUTE SAFE ALT -----FT

Press the "FPL" key to view the previous page

COPY DELETE IMPORT EXPORT

Import/Export Softkeys

FLIGHT PLAN EXPORTING

FILE NAME
Export stored flight plan 4 to file name:
0005.fpl

EXPORT

EXPORT RESULTS

10 ----- / -----
11 ----- / -----
12 ----- / -----

FLIGHT PLAN INFO

DEPARTURE KIXD
DESTINATION KMCI
TOTAL DISTANCE 676NM
ENROUTE SAFE ALT -----FT

Press the "FPL" key to view the previous page

Stored Flight Plan to be Exported & Exported Flight Plan Name

FLIGHT PLAN EXPORTING

FILE NAME
Export stored flight plan 4 to file name:
0005.fpl

EXPORT RESULTS
Flight plan successfully exported.

OK

10 ----- / -----
11 ----- / -----
12 ----- / -----

FLIGHT PLAN INFO

DEPARTURE KIXD
DESTINATION KMCI
TOTAL DISTANCE 676NM
ENROUTE SAFE ALT -----FT

Press the "FPL" key to view the previous page

Export Successful

Figure 5-60 Flight Plan Export

ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

Waypoints can be added to the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added in front of the selected waypoint. Flight plans are limited to 99 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 99, the message “Flight plan is full. Remove unnecessary waypoints.” appears and the new waypoint(s) are not added to the flight plan.

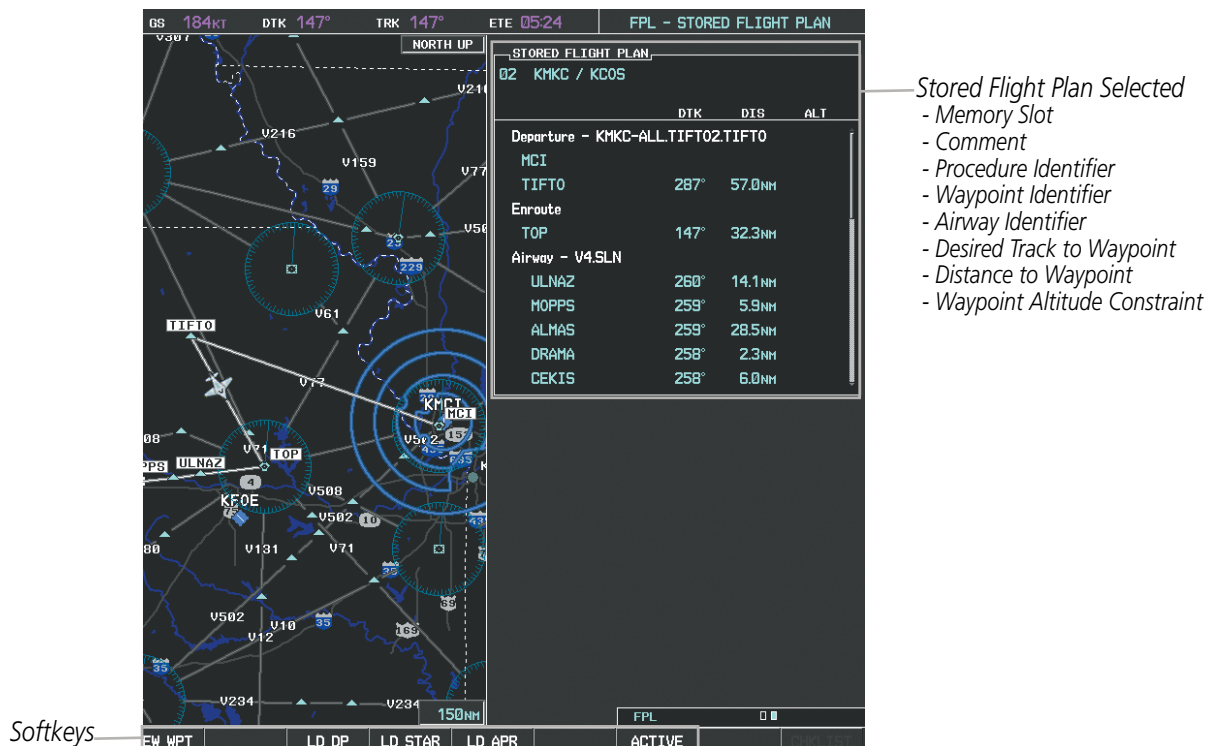


Figure 5-61 Stored Flight Plan Page

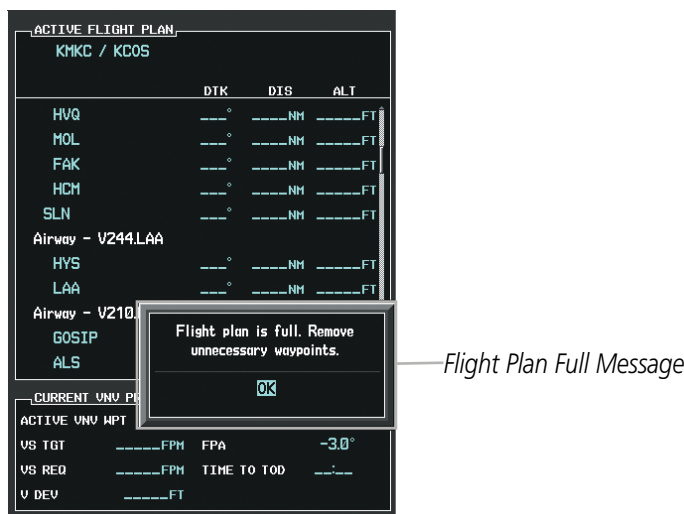


Figure 5-62 Active Flight Plan Page - FPL Full

Adding a waypoint to a stored flight plan:

- 1) On the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
- 2) Highlight the desired flight plan.
- 3) Select the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select "EDIT" and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
- 5) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 6) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The new waypoint now exists in the flight plan.



NOTE: If the identifier entered in the Waypoint Information Window has duplicates, a Duplicate Waypoint Window is displayed. Use the FMS Knob to select the correct waypoint.

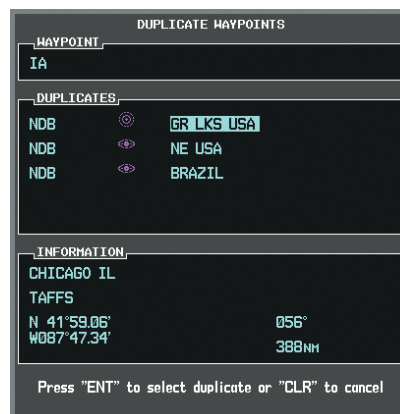


Figure 5-63 Duplicate Waypoints Window

Adding a waypoint to the active flight plan:

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD).
- 3) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
- 4) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 5) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.

Creating and adding user waypoints to the active flight plan:

- 1) Press the **Joystick** to activate the panning function on the Active Flight Plan Page and pan to the map location of the desired user waypoint.
- 2) Select the **LD WPT** Softkey; or press the **MENU** Key, select 'Load Waypoint', and press the **ENT** Key. The user waypoint is created with a name of USRxxx (using the next available in sequence) and is added to the end of the active flight plan.

ADDING AIRWAYS TO A FLIGHT PLAN

Airways can be added to the active flight plan or any stored flight plan. Choose a flight plan (add the desired airway entry point if not already in the flight plan), select the waypoint after the desired airway entry point, select the airway, and it is added in front of the selected waypoint. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The G1000 also anticipates the desired airway and exit point based on loaded flight plan waypoints.

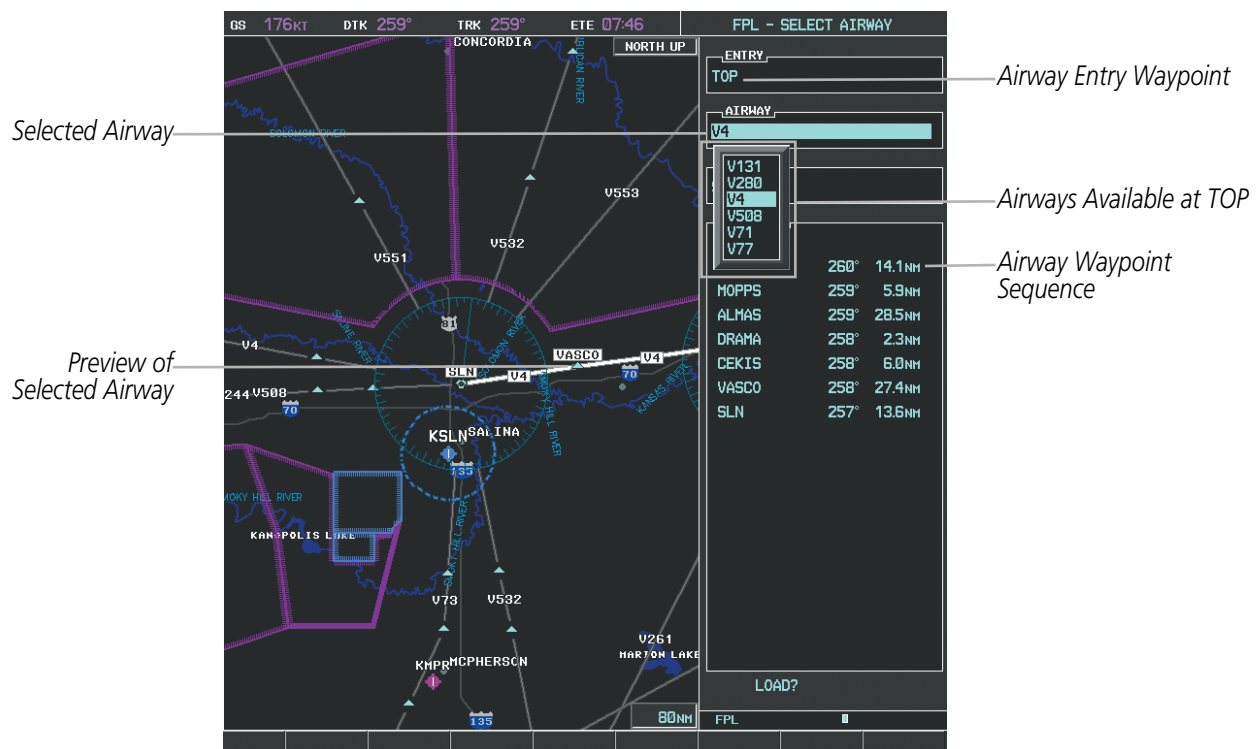


Figure 5-64 Select Airway Page - Selecting Airway

Adding an airway to a flight plan:

- 1) Press the **FPL** Key.
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD).
- 3) Turn the large **FMS** Knob to highlight the waypoint after the desired airway entry point. If this waypoint is not a valid airway entry point, a valid entry point should be entered at this time.

- 4) Turn the small **FMS** Knob one click clockwise and select the **LD AIRWY** Softkey, or press the **MENU** Key and select "Load Airway". The Select Airway Page is displayed. The **LD AIRWY** Softkey or the "Load Airway" menu item is available only when a valid airway entry waypoint has been chosen (the waypoint ahead of the cursor position).
- 5) Turn the **FMS** Knob to select the desired airway from the list, and press the **ENT** Key. Low altitude airways are shown first in the list, followed by "all" altitude airways, and then high altitude airways.
- 6) Turn the **FMS** Knob to select the desired airway exit point from the list, and press the **ENT** Key. 'LOAD?' is highlighted.
- 7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.

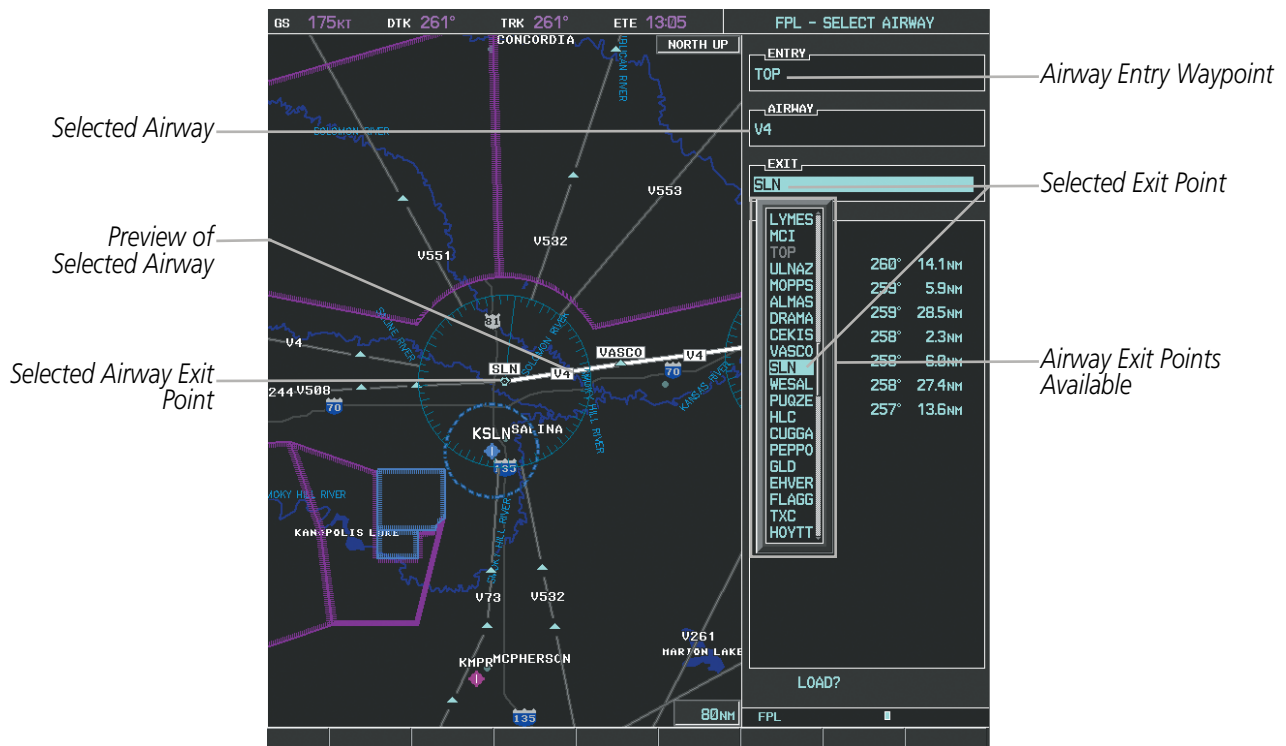


Figure 5-65 Select Airway Page - Selecting Exit Point

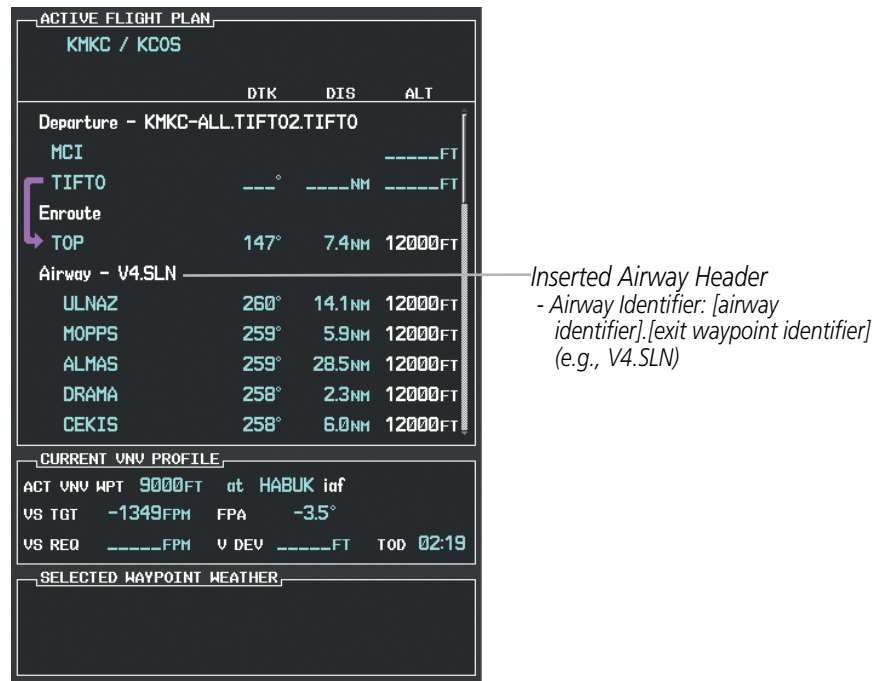


Figure 5-66 Active Flight Plan Page - Airway Inserted

RESTRICTIONS ON ADDING AIRWAYS

Some airways have directional restrictions on all or part of the route. For example, 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 G1000 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 G1000 allows the pilot to insert pre-defined instrument procedures from the navigation database into a flight plan. The procedures are designed to facilitate routing of traffic leaving an airport (departure), arriving at an airport (arrival), and landing at an airport (approach). See the procedures section for more details.

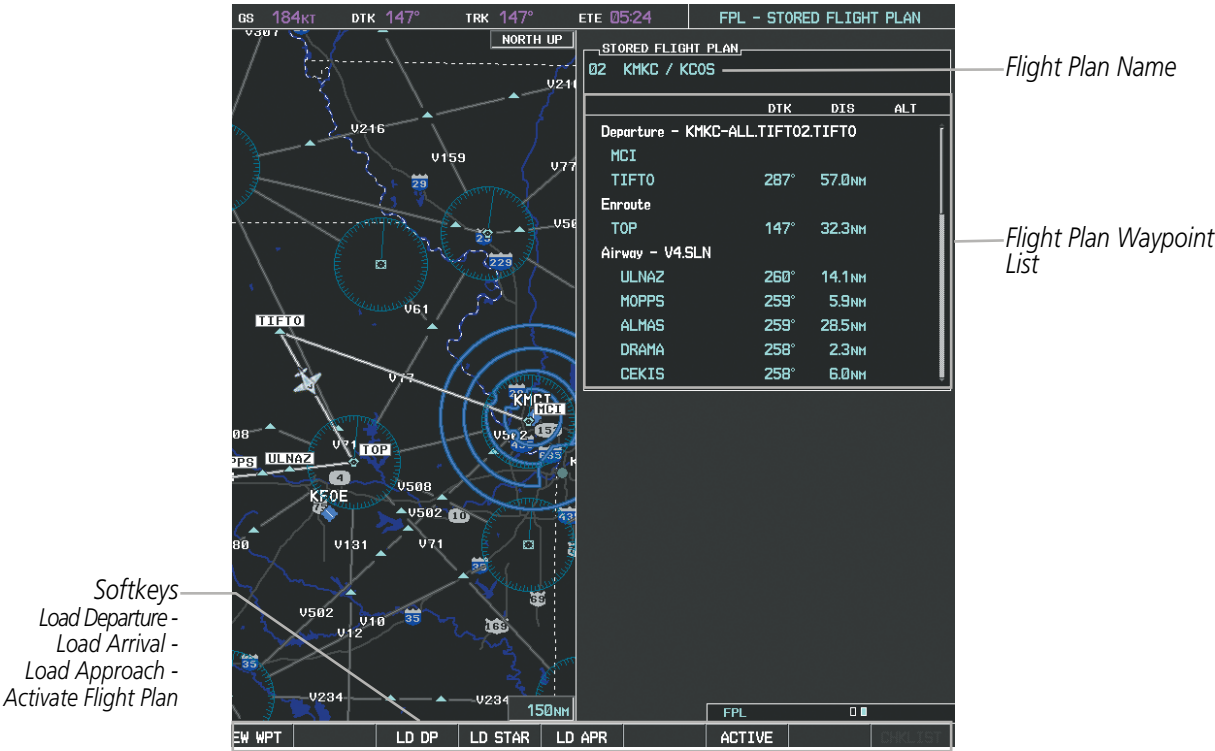


Figure 5-67 Stored Flight Plan Page

DEPARTURE (DP)

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. The route is defined by selection of a departure, the transition waypoints, and a runway.

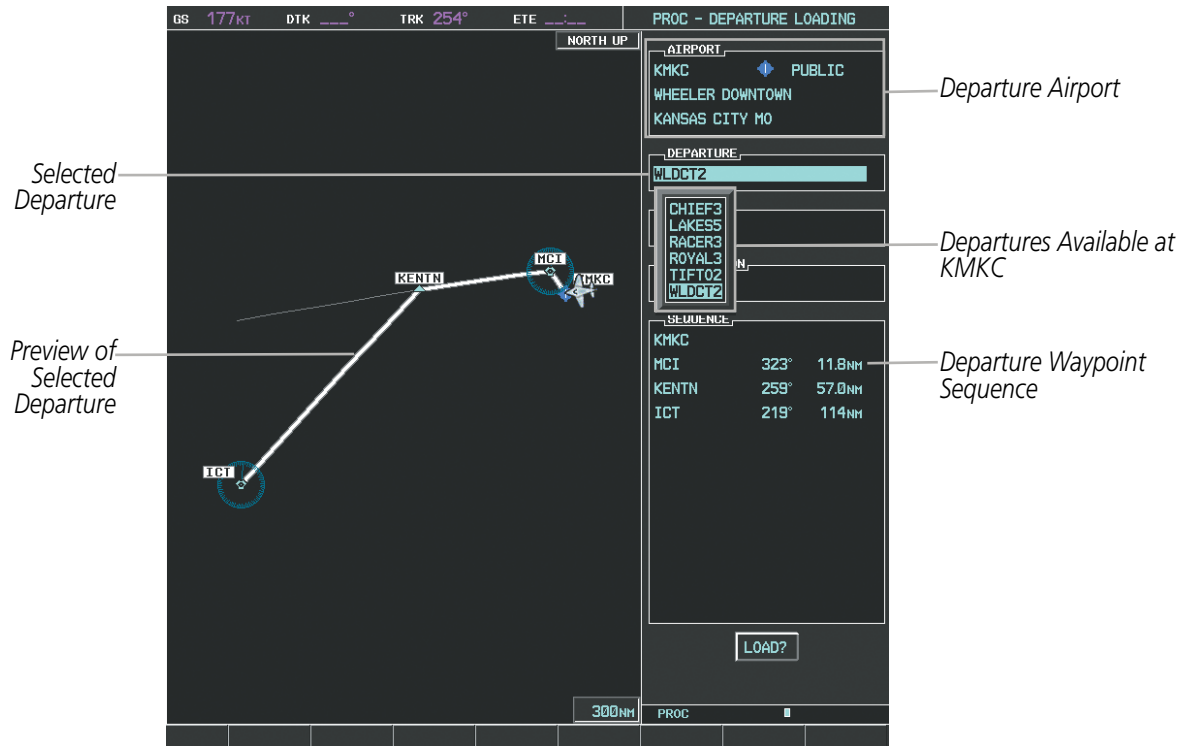


Figure 5-68 Departure Loading Page - Selecting the Departure

Loading a departure procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD DP** Softkey; or press the **MENU** Key, select "Load Departure", and press the **ENT** Key. The Departure Loading Page is displayed.
- 4) Select a departure. Press the **ENT** Key.
- 5) Select a runway served by the selected departure, if required. Press the **ENT** Key.
- 6) Select a transition for the selected departure. Press the **ENT** Key.
- 7) Press the **ENT** Key to load the selected departure procedure.

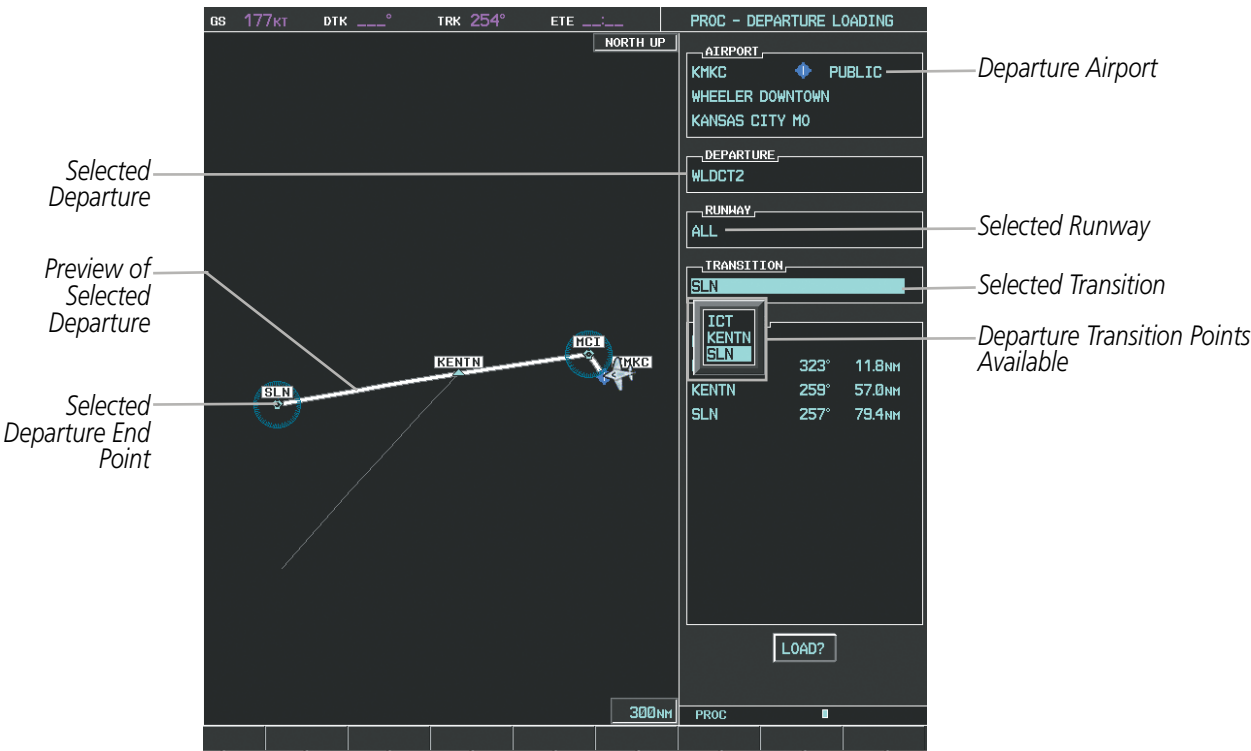


Figure 5-69 Departure Loading Page - Selecting Transition

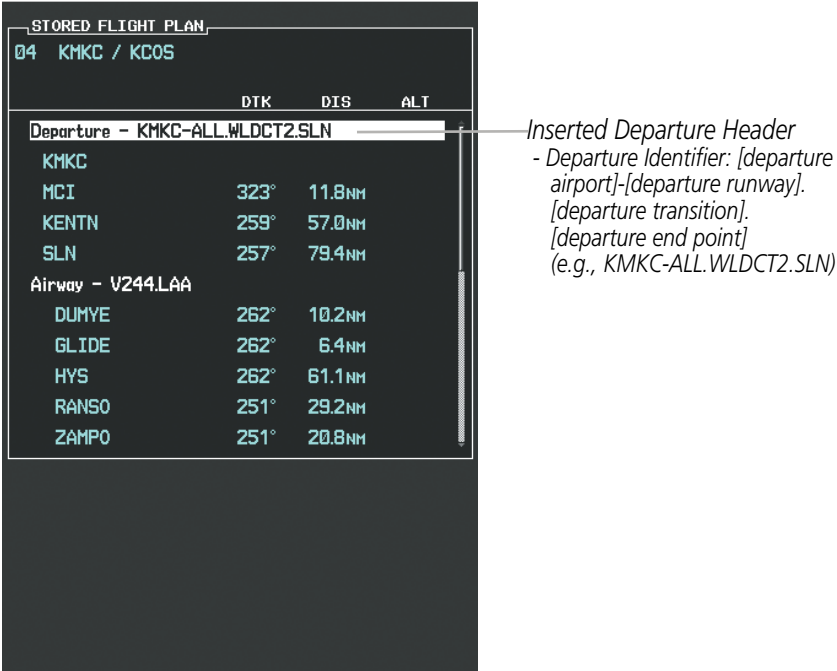


Figure 5-70 Stored Flight Plan Page - Departure Inserted

ARRIVAL (STAR)

A Standard Terminal Arrival (STAR) is loaded at the destination airport in the flight plan. Only one arrival can be loaded at a time in a flight plan. The route is defined by selection of an arrival, the transition waypoints, and a runway.

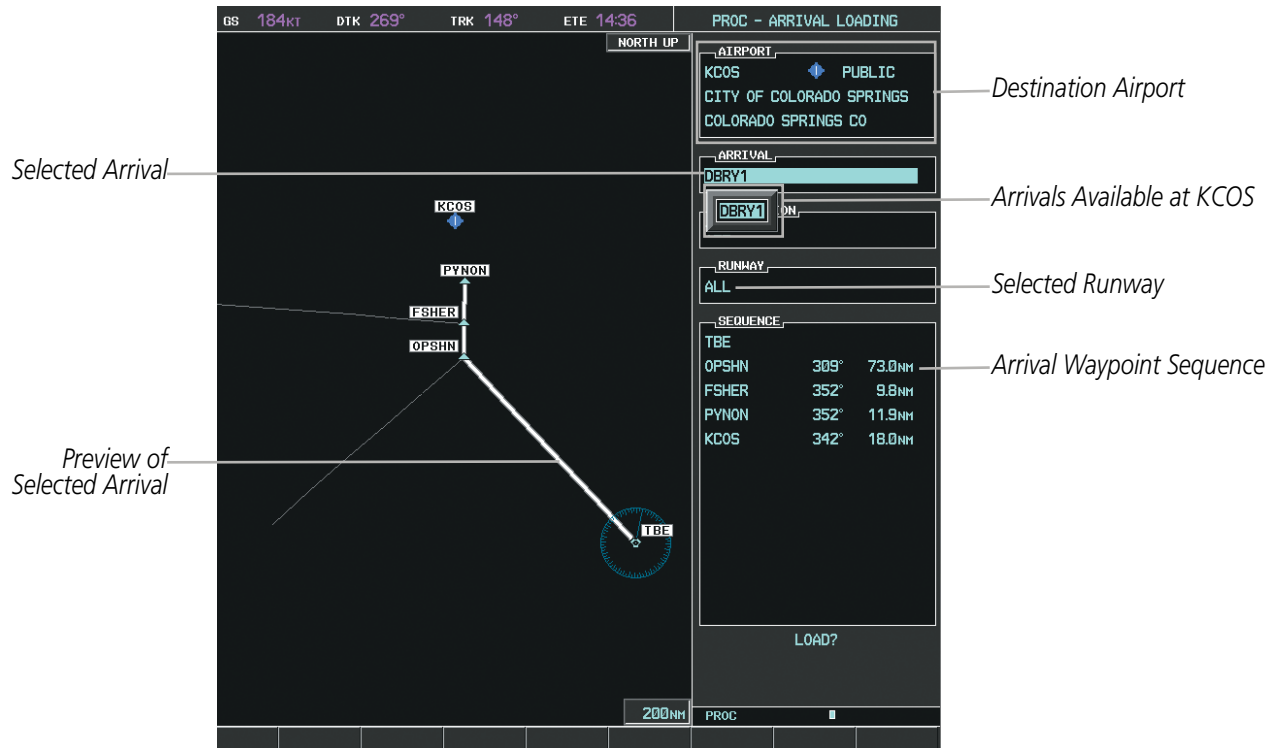


Figure 5-71 Arrival Loading Page - Selecting the Arrival

Loading an arrival procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD STAR** Softkey; or press the **MENU** Key, select "Load Arrival", and press the **ENT** Key. The Arrival Loading Page is displayed.
- 4) Select an arrival. Press the **ENT** Key.
- 5) Select a transition for the selected arrival. Press the **ENT** Key.
- 6) Select a runway served by the selected arrival, if required. Press the **ENT** Key.
- 7) Press the **ENT** Key to load the selected arrival procedure.

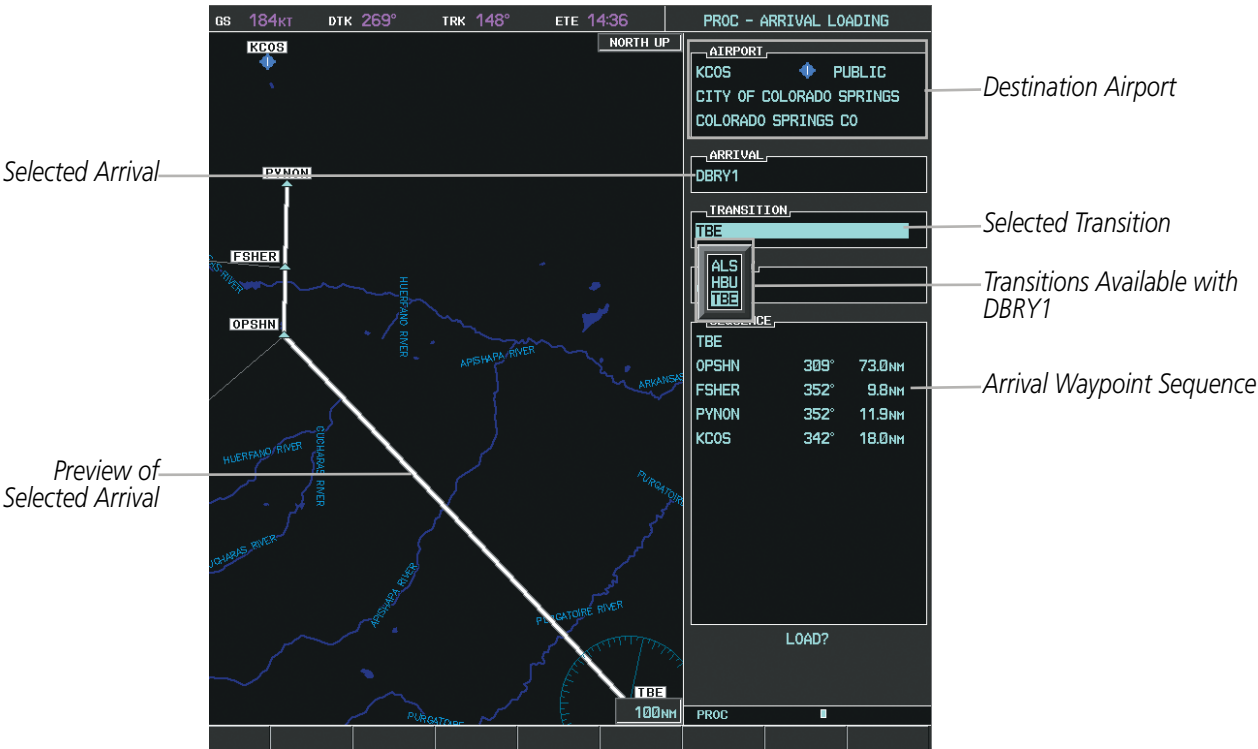


Figure 5-72 Arrival Loading Page - Selecting the Transition

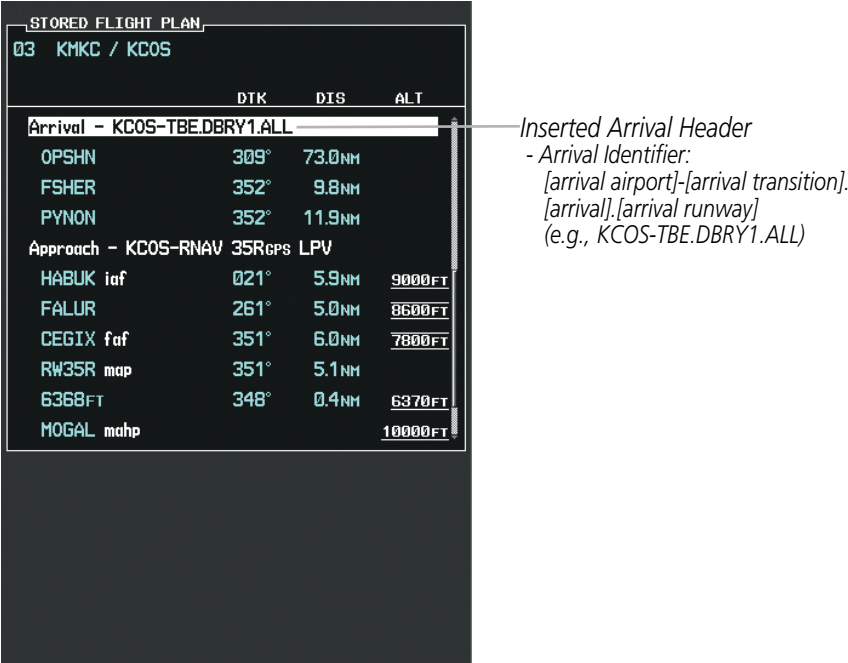


Figure 5-73 Stored Flight Plan Page - Arrival Inserted

APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a flight plan. The route for a selected approach is defined by designating transition waypoints.

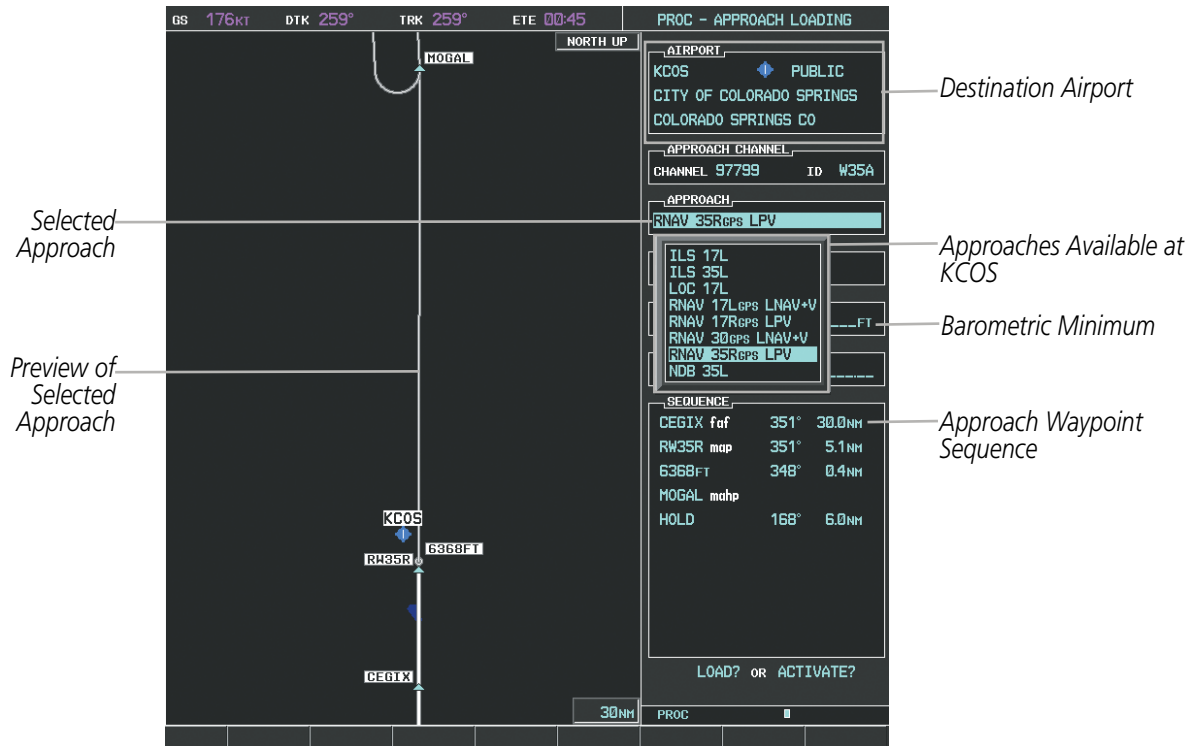


Figure 5-74 Approach Loading Page - Selecting the Approach

Loading an approach procedure into a stored flight plan:

- 1) Select a stored flight plan from the Flight Plan Catalog Page.
- 2) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 3) Select the **LD APR** Softkey; or press the **MENU** Key, select "Load Approach", and press the **ENT** Key. The Approach Loading Page is displayed.
- 4) Select an approach. Press the **ENT** Key.
- 5) Select a transition for the selected approach. Press the **ENT** Key.
- 6) Press the **ENT** Key to load the selected approach procedure.

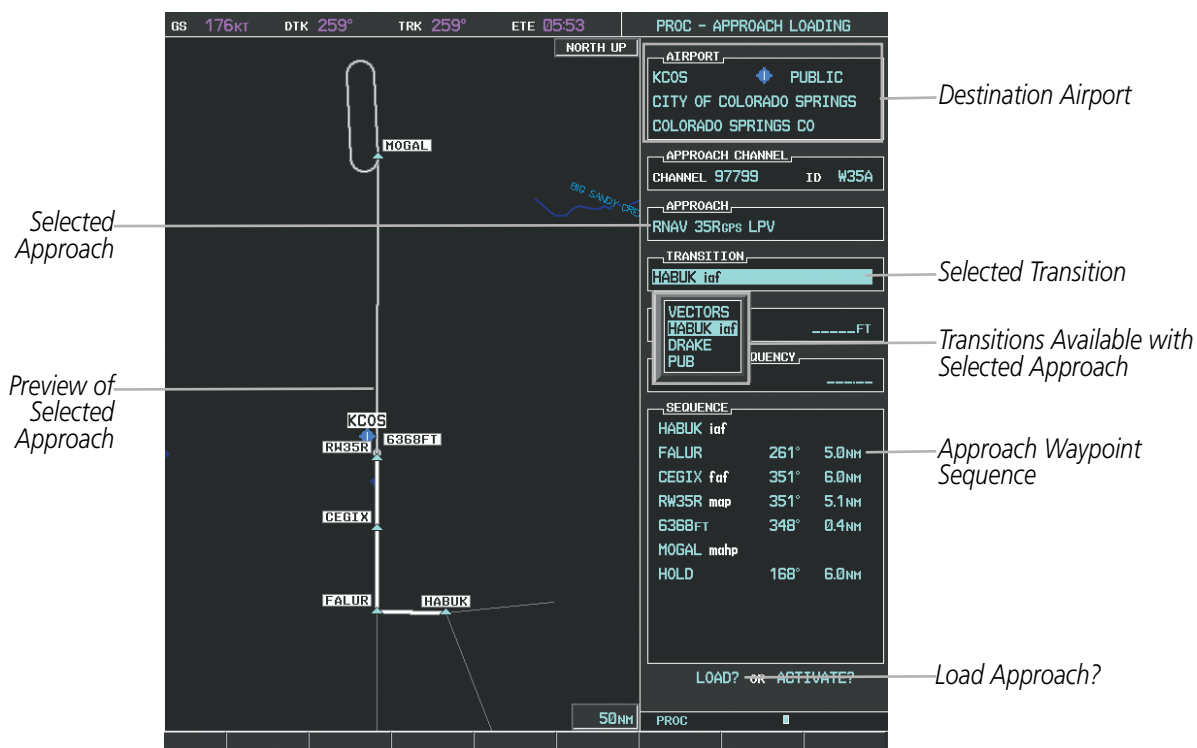


Figure 5-75 Approach Loading Page - Selecting the Transition

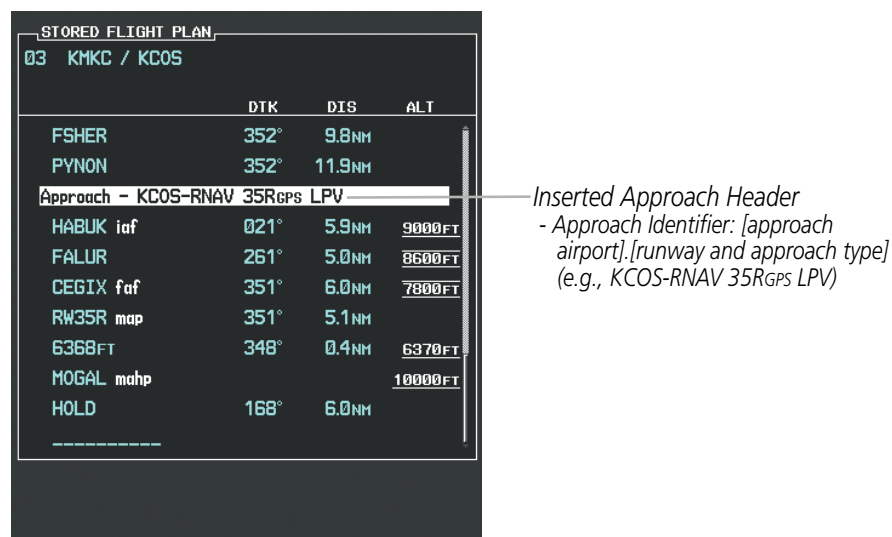


Figure 5-76 Stored Flight Plan Page - Approach Inserted

FLIGHT PLAN STORAGE

The G1000 can store up to 99 flight plans, numbered 1 through 99. The active flight plan is erased when the G1000 is powered off or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Page and on the Stored Flight Plan Page.

Viewing information about a stored flight plan:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired flight plan.
- 4) The Flight Plan Information is displayed showing departure, destination, total distance, and enroute safe altitude information for the selected Flight Plan.
- 5) Select the **EDIT** Softkey to open the Stored Flight Plan Page and view the waypoints in the flight plan.
- 6) Press the **FMS** Knob to exit the Stored Flight Plan Page.

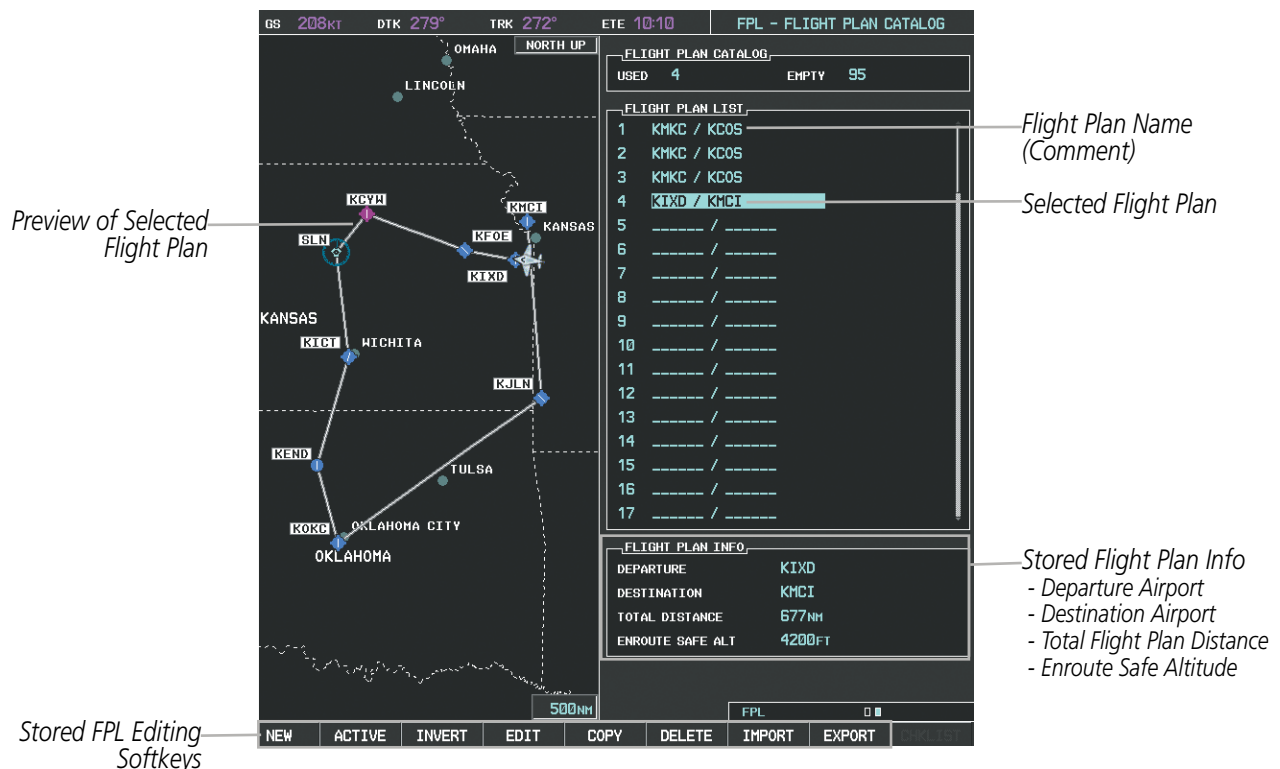


Figure 5-77 Stored Flight Plan Information

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

- 1) Press the **MENU** Key.
- 2) Highlight 'Store Flight Plan'.
- 3) Press the **ENT** Key.
- 4) With 'OK' highlighted, press the **ENT** Key. The flight plan is stored in the next available position in the flight plan list on the Flight Plan Catalog Page.

SORT FLIGHT PLANS

The stored flight plans can be sorted alphanumerically based on the flight plan name (comment) assigned to each flight plan.

Sorting by flight plan name (comment):

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'Sort By Comment' and press the **ENT** Key. A confirmation window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to change flight plan ordering. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

Activating a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **ACTIVE** Softkey; or press the **ENT** Key twice; or press the **MENU** Key, highlight 'Activate Flight Plan', and press the **ENT** Key. The 'Activate Stored Flight Plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Inverting and activating a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

COPY A FLIGHT PLAN

The G1000 allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

Copying a stored flight plan on the MFD:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.

- 3) Select the **COPY** Softkey; or press the **MENU** Key, highlight 'Copy Flight Plan', and press the **ENT** Key. The 'Copy to Flight Plan XX?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

DELETE A STORED FLIGHT PLAN

Individual or all stored flight plans can be deleted from the G1000 memory.

Deleting a stored flight plan:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **DELETE** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.



NOTE: The option to delete all stored flight plans is not available while the aircraft is in flight.

Deleting all stored flight plans:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **MENU** Key.
- 3) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key to delete all flight plans. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

FLIGHT PLAN EDITING

The active flight plan or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

DELETING THE ACTIVE FLIGHT PLAN

The G1000 allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the G1000.

Deleting the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete all waypoints in flight plan?' window is displayed.
- 3) With 'OK' highlighted, press the **ENT** Key to delete the active flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

DELETING FLIGHT PLAN ITEMS

Individual waypoints, entire airways, and entire procedures can be deleted from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be deleted individually. Attempting to delete a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification.'

Deleting an individual waypoint from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint to be deleted.
- 3) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire airway from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the airway to be deleted.
- 3) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire procedure from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.
- 3) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.
3) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Deleting an individual waypoint from a stored flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the waypoint to be deleted.
- 6) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire airway from a stored flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the white header of the airway to be deleted.
- 6) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire procedure from a stored flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.
- 6) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.
6) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
- 7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
- 8) Press the **FMS** Knob to remove the flashing cursor.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification and sorting.

Changing the active flight plan comment:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Press the **FMS** Knob to activate the cursor and turn the large **FMS** Knob to highlight the comment field.
- 3) Use the **FMS** Knobs to edit the comment.
- 4) Press the **ENT** Key to accept the changes.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Changing a stored flight plan comment:

- 1) Press the **FPL** Key to display the Active Flight Plan Page.
- 2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
- 3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
- 4) Select the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
- 5) Turn the large **FMS** Knob to highlight the comment field.
- 6) Use the **FMS** Knobs to edit the comment.
- 7) Press the **ENT** Key to accept the changes.
- 8) Press the **FMS** Knob to remove the flashing cursor.

ALONG TRACK OFFSETS

A waypoint having an “along track offset” distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 99 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

A waypoint must be adjacent to its parent waypoint in the flight plan, so the system limits the along-track distance to less than the length of the leg before or after the selected waypoint. If the selected waypoint is the active waypoint, the distance is limited to less than the distance to go to the active waypoint. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed at or after the final approach fix of an approach.

An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.

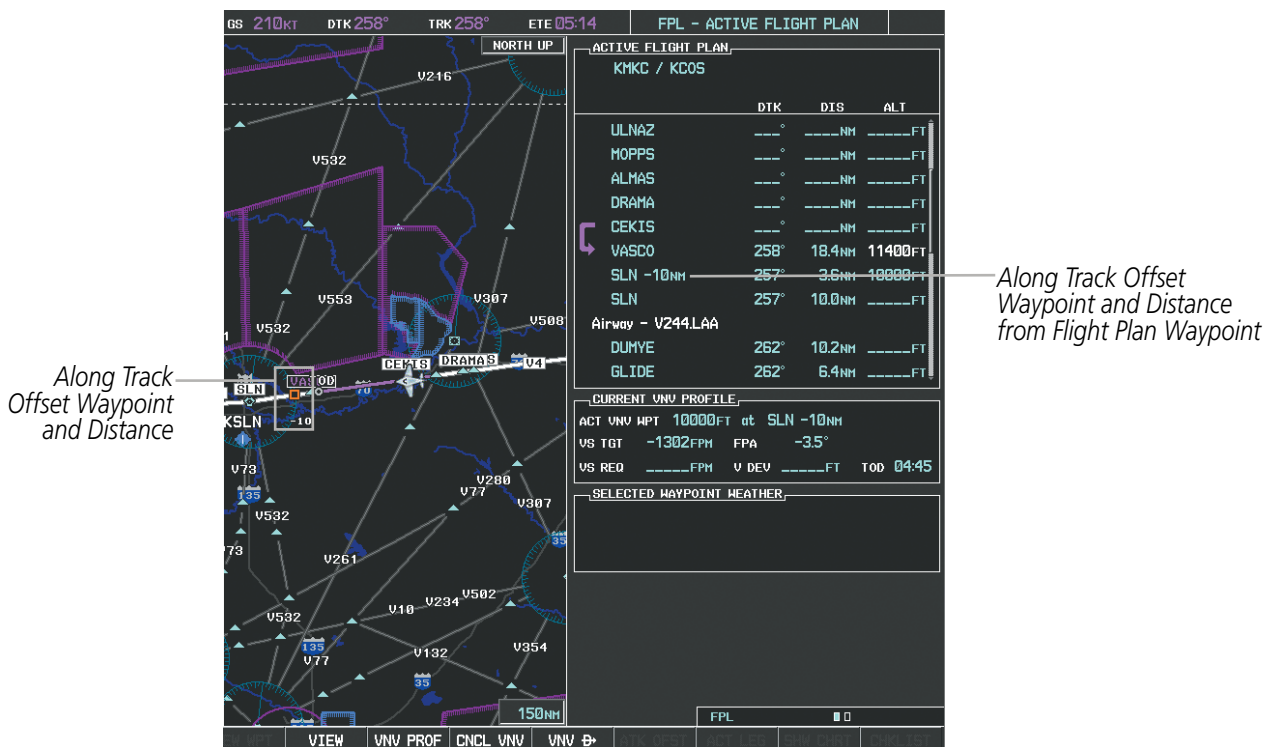


Figure 5-78 Along Track Offset

Entering an along track offset distance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the along track offset.
- 3) Select the **ATK OFST** Softkey (MFD only); or press the **MENU** Key, highlight 'Create ATK Offset Waypoint', and press the **ENT** Key.

- 4) Enter a positive or negative offset distance in the range of +/- 1 to 99 nm (limited by leg distances).
- 5) Press the **ENT** Key to create the offset waypoint.
- 6) Press the **FMS** Knob to remove the flashing cursor.

PARALLEL TRACK

The Parallel Track (PTK) feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case “p” placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.



NOTE: Vertical navigation is unavailable while the Parallel Track feature is active.

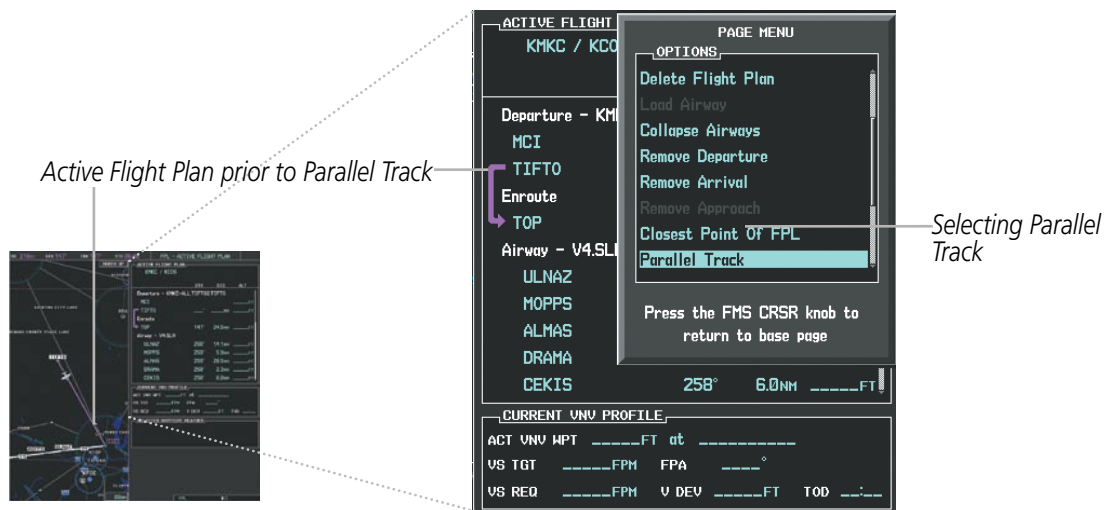


Figure 5-79 Active Flight Plan Window - Selecting Parallel Track

Activating parallel track:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with the direction field highlighted.
- 3) Turn the small **FMS** Knob to select 'Left' or 'Right' and press the **ENT** Key. The 'DISTANCE' field is highlighted.
- 4) Turn the small **FMS** Knob to enter a distance from 1-99 nm and press the **ENT** Key. 'ACTIVATE PARALLEL TRACK' is highlighted.
- 5) Press the **ENT** Key to activate parallel track. Press the **FMS** Knob or the **CLR** Key to cancel the parallel track activation.

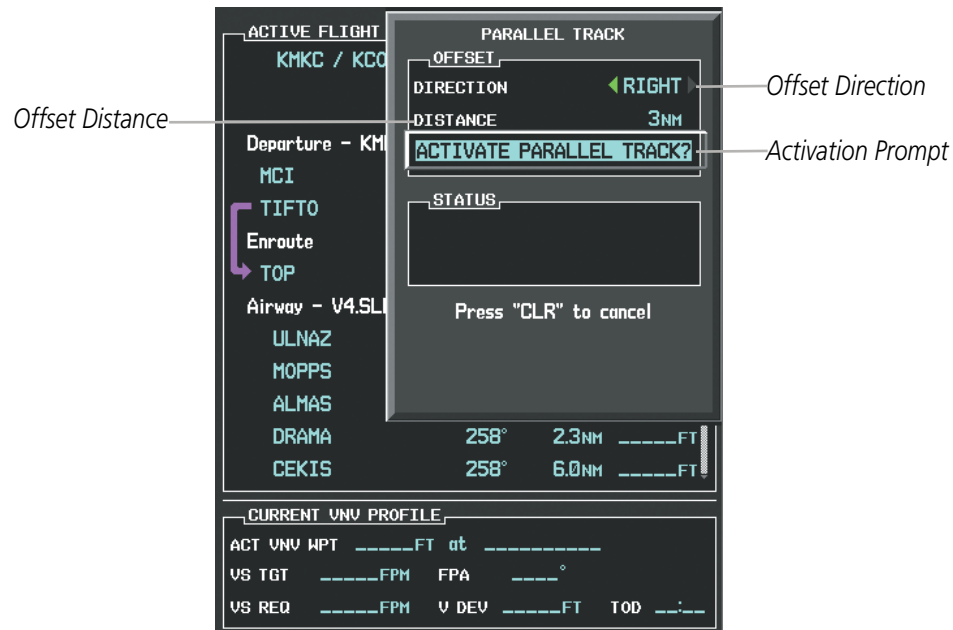


Figure 5-80 Parallel Track Window

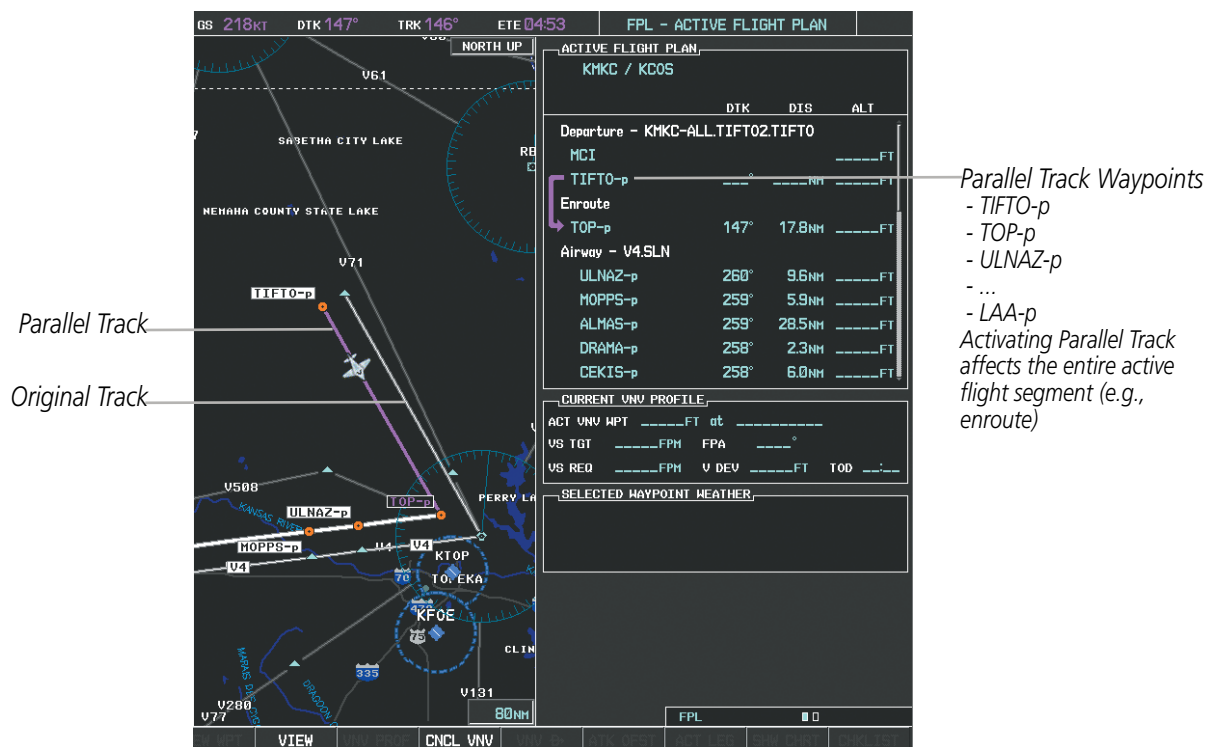


Figure 5-81 Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable'.

Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates that the system is unable to activate the parallel track because of invalid geometry.

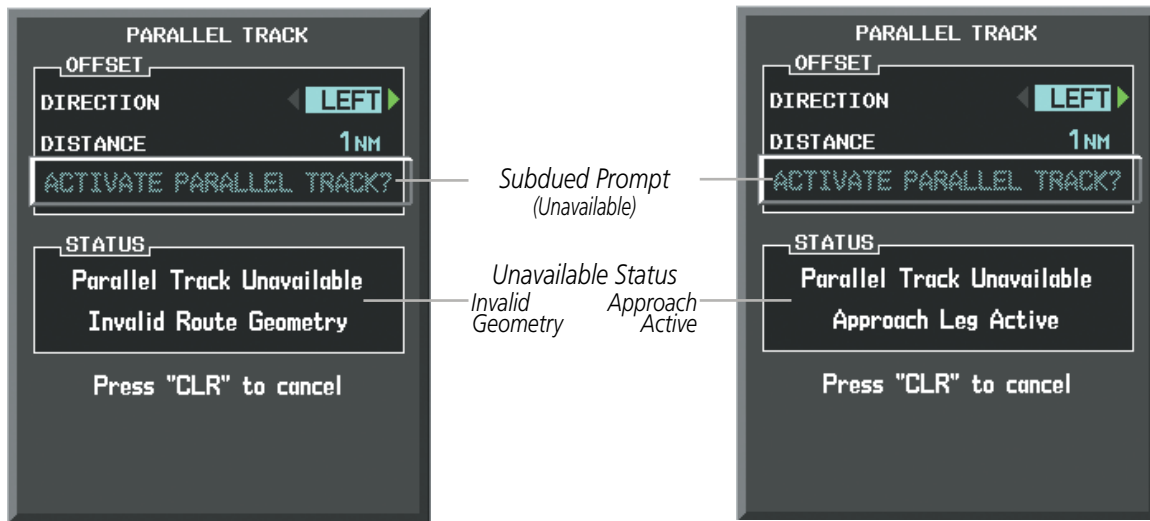


Figure 5-82 Parallel Track Unavailable

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type.

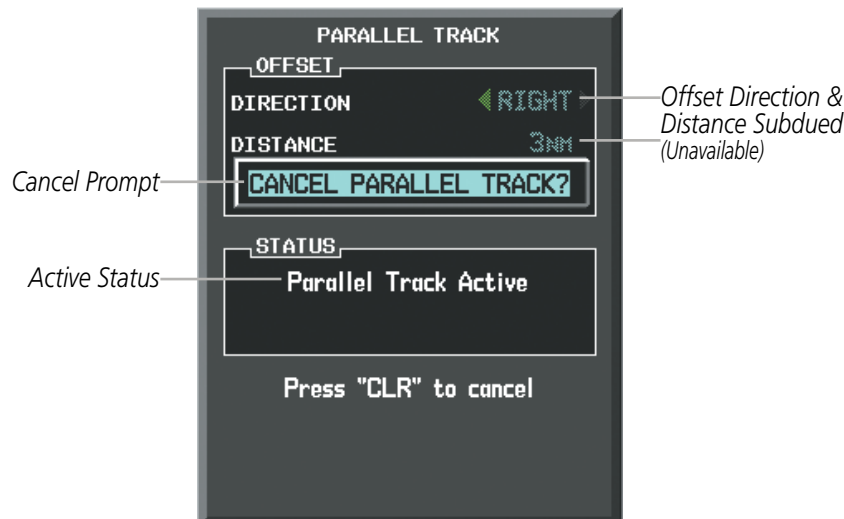


Figure 5-83 Cancelling Parallel Track

Cancelling parallel track:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with 'CANCEL PARALLEL TRACK?' highlighted.
- 3) Press the **ENT** Key.

ACTIVATING A FLIGHT PLAN LEG

The G1000 allows selection of a highlighted leg as the “active leg” (the flight plan leg which is currently used for navigation guidance).

Activating a flight plan leg:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the destination waypoint for the desired leg.
- 3) Select the **ACT LEG** Softkey (MFD only); or press the **MENU** Key, highlight ‘Activate Leg’, and press the **ENT** Key. A confirmation window is displayed with ‘ACTIVATE’ highlighted.
- 4) Press the **ENT** Key to activate the flight plan leg. To cancel, press the **CLR** Key, or highlight ‘CANCEL’ and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

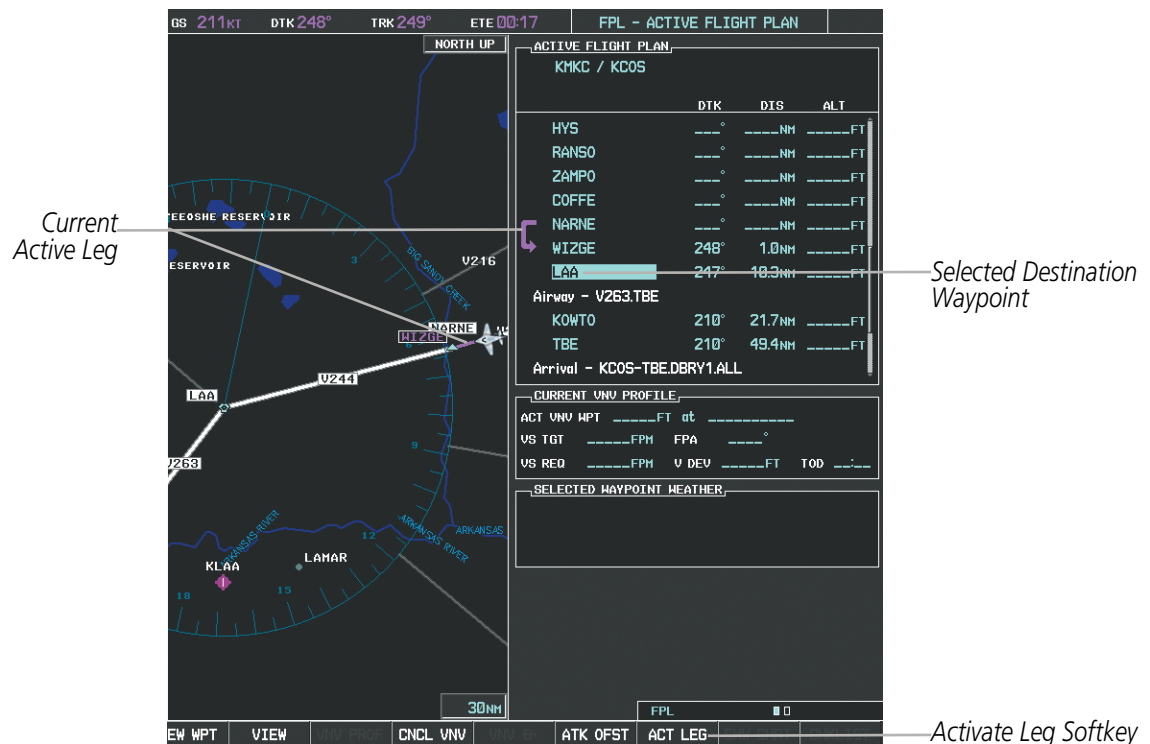


Figure 5-84 Active Flight Plan Page - Selecting the Leg Destination Waypoint



Figure 5-85 Active Flight Plan Page - New Active Leg

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

Inverting the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Invert Flight Plan', and press the **ENT** Key. An 'Invert Active Flight Plan?' confirmation window is displayed.
- 3) Select 'OK'.
- 4) Press the **ENT** Key to invert and activate the active flight plan. To cancel, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Inverting and activating a stored flight plan:

- 1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
- 2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
- 3) Select the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

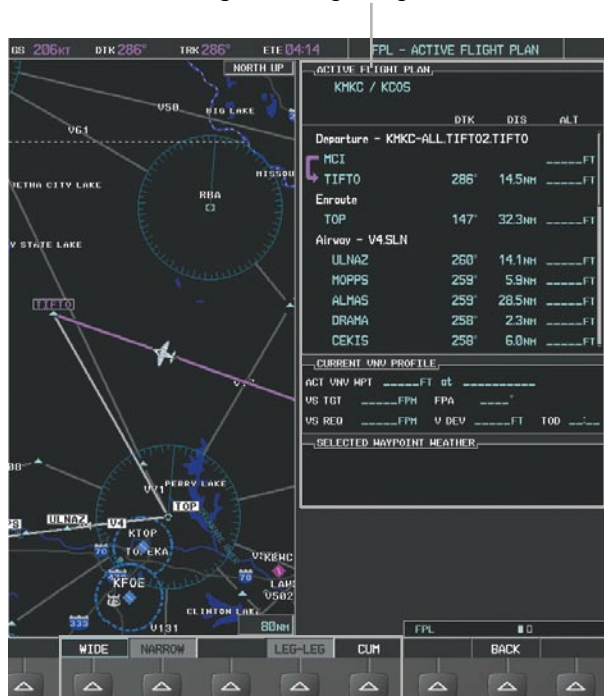
FLIGHT PLAN VIEWS

Information about flight plans can be viewed in more than one way. The active flight plan can be configured to show cumulative distance over the length of the flight plan or the distance for each leg of the flight plan; and the active flight plan can be viewed in a narrow or wide view. In the wide view, additional information is displayed: Fuel Remaining (FUEL REM), Estimated Time Enroute (ETE), Estimated Time of Arrival (ETA), and Bearing to the waypoint (BRG).

Switching between leg-to-leg waypoint distance and cumulative waypoint distance:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Select the **VIEW** Softkey to display the **CUM** and **LEG-LEG** Softkeys.
- 3) Select the **CUM** Softkey to view cumulative waypoint distance, or select the **LEG-LEG** Softkey to view leg-to-leg waypoint distance.
- 4) Select the **BACK** Softkey to return to the top level active flight plan softkeys.

Active Flight Plan Leg to Leg Distance



Active Flight Plan Cumulative Distance



WIDE Softkey, **NARROW** Softkey, **LEG-LEG** Softkey, **CUM** Softkey

Figure 5-86 Active Flight Plan - Leg to Leg vs. Cumulative Distance

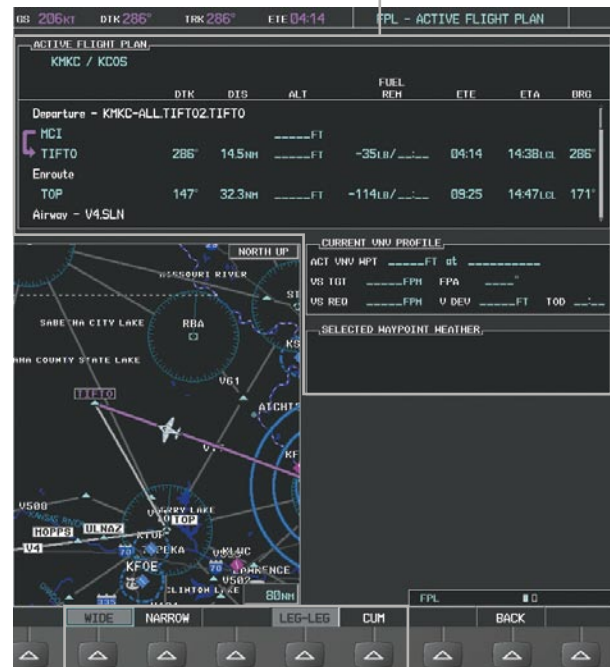
Switching between wide and narrow view:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) Select the **VIEW** Softkey to display the **WIDE** and **NARROW** Softkeys.
- 3) Select the **WIDE** Softkey to display the wide view, or select the **NARROW** Softkey to display the narrow view.
- 4) Select the **BACK** Softkey to return to the top level active flight plan softkeys.

Active Flight Plan Narrow View



Active Flight Plan Wide View



WIDE Softkey, NARROW Softkey, LEG-LEG Softkey, CUM Softkey

Figure 5-87 Active Flight Plan - Wide vs. Narrow View

COLLAPSING AIRWAYS

The G1000 allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page/Window. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: “From” waypoint, “To” waypoint, and “Next” waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the “To” or the “Next” waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.

ACTIVE FLIGHT PLAN			
KMKC / KSEA			
	DTK	DIS	ALT
Airway - Q3.FEPOT			
FOWND	341°	61.1NM	9500FT
FINER	344°	134NM	9500FT
FRFLY	343°	68.7NM	9500FT
FAMUK	343°	121NM	9500FT
FEPOT	342°	155NM	9500FT
Approach - KSEA-ILS 16C			
PAE iaf	019°	63.3NM	7700FT
ERYKA	167°	11.1NM	5000FT
MGNUM	161°	4.0NM	4000FT
ANVIL	161°	3.0NM	3200FT

Expanded View

ACTIVE FLIGHT PLAN			
KMKC / KSEA			
	DTK	DIS	ALT
Airway - Q3.FEPOT (collapsed)			
FEPOT	---	540NM	9500FT
Approach - KSEA-ILS 16C			
PAE iaf	019°	63.3NM	7700FT
ERYKA	167°	11.1NM	5000FT
MGNUM	161°	4.0NM	4000FT
ANVIL	161°	3.0NM	3200FT
SODOE faf	161°	4.9NM	1900FT
RW16C map	161°	4.4NM	830FT
833FT	161°	0.7NM	2000FT
OTLIE			2000FT

Collapsed View

Figure 5-88 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Collapse Airways' or 'Expand Airways', and press the **ENT** Key. The airways are collapsed/expanded.

CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a reference waypoint, and creates a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

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

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, highlight 'Closest Point Of FPL', and press the **ENT** Key. A window appears with the reference waypoint field highlighted.
- 3) Enter the identifier of the reference waypoint and press the **ENT** Key. The G1000 displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan to the selected reference waypoint and creates a user waypoint at this location. The name for the new user waypoint is derived from the identifier of the reference waypoint.

5.7 VERTICAL NAVIGATION



NOTE: The G1000 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 G1000 system Vertical Navigation (VNV) feature provides vertical profile guidance during the enroute and terminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan. Both manual and autopilot-coupled guidance are supported.

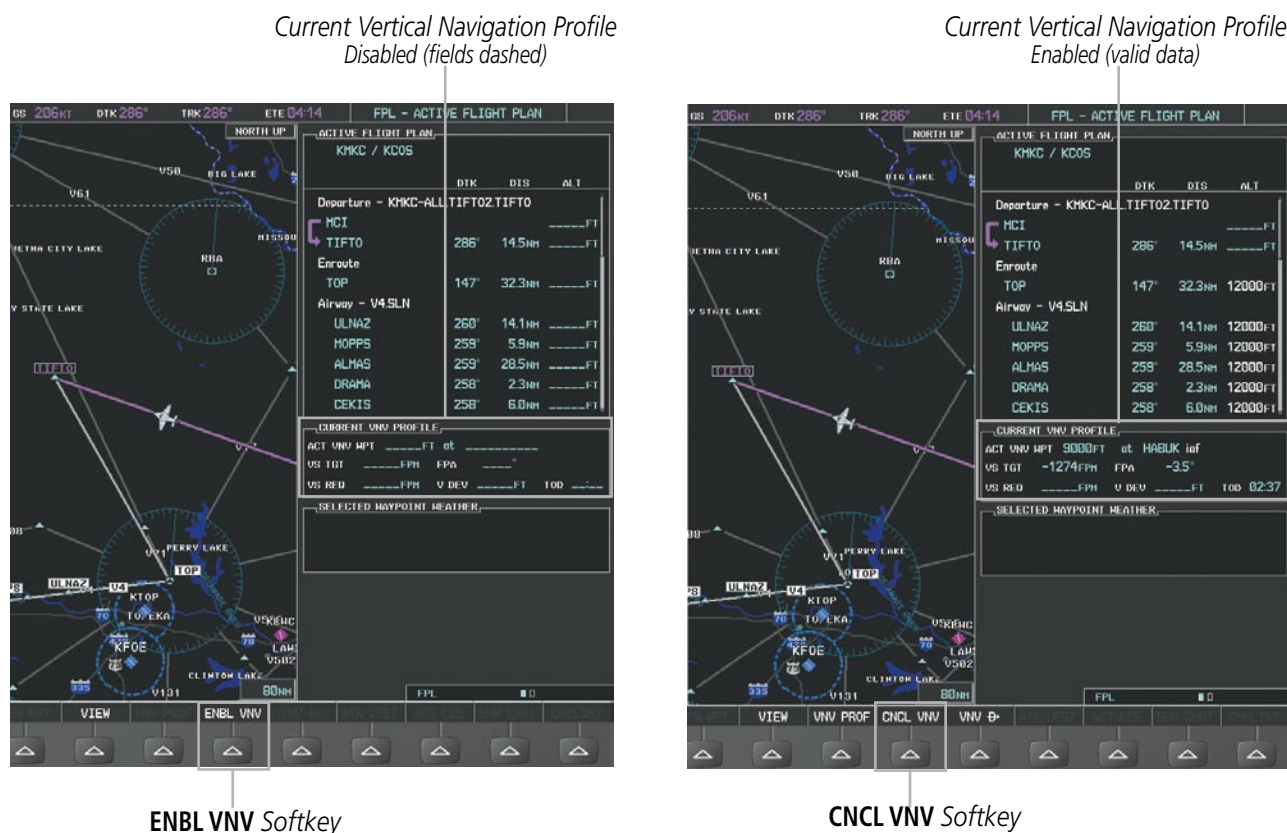


Figure 5-89 Enabling/Disabling Vertical Navigation

Enabling VNV guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Select the **ENBL VNV** Softkey; or press the **MENU** Key, highlight 'Enable VNV', and press the **ENT** Key. Vertical navigation is enabled, and vertical guidance begins with the waypoint shown in the CURRENT VNV PROFILE box (defaults first waypoint in the active flight plan with an altitude enabled for vertical navigation (e.g., HABUK)).

Disabling VNV guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Select the **CNCL VNV** Softkey; or press the **MENU** Key, highlight 'Cancel VNV', and press the **ENT** Key. Vertical navigation is disabled.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indicator (RVS I) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNV PROFILE box are dashed. VNV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The G1000 allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Selecting the **VNV Direct-to** Softkey on the Active Flight Plan Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the **Direct-to** Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

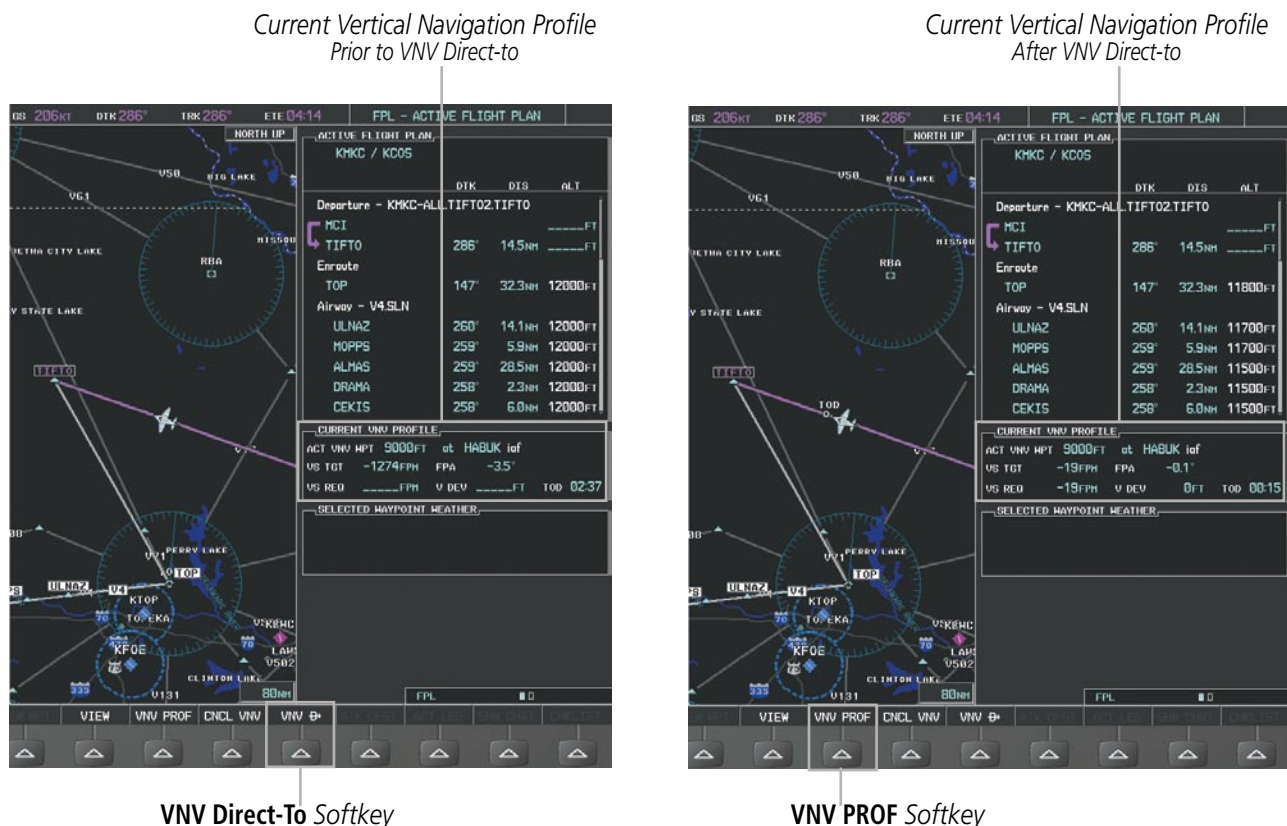


Figure 5-90 Vertical Navigation Direct-To

Activating a vertical navigation direct-to:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired waypoint.



NOTE: The selected waypoint must have a designated altitude constraint (light blue number) to be used. If not, the first waypoint in the flight plan with a designated altitude constraint is selected.

- 3) Select the **VNV Direct-To** Softkey; or press the **MENU** Key, highlight 'VNV Direct-To', and press the **ENT** Key. An 'Activate vertical Direct-to to: NNNNNFT at XXXXXX?' confirmation window is displayed.
- 4) Press the **ENT** Key. Vertical guidance begins to the altitude constraint for the selected waypoint.
- 5) Press the **FMS** Knob to remove the flashing cursor.

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) in the CURRENT VNV PROFILE box.

Modifying the VS TGT and FPA:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Select the **VNV PROF** Softkey; or press the **MENU** Key, highlight 'Select VNV Profile Window', and press the **ENT** Key. The cursor is now located in the CURRENT VNV PROFILE box.
- 3) Turn the **FMS** Knobs as needed to edit the values.
- 4) Press the **FMS** Knob to remove the flashing cursor.

ALTITUDE CONSTRAINTS

The G1000 system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for "Cross at" altitudes. If the procedure states "Expect to cross at," then the altitude is not in the database. In this case the altitude may be entered manually.

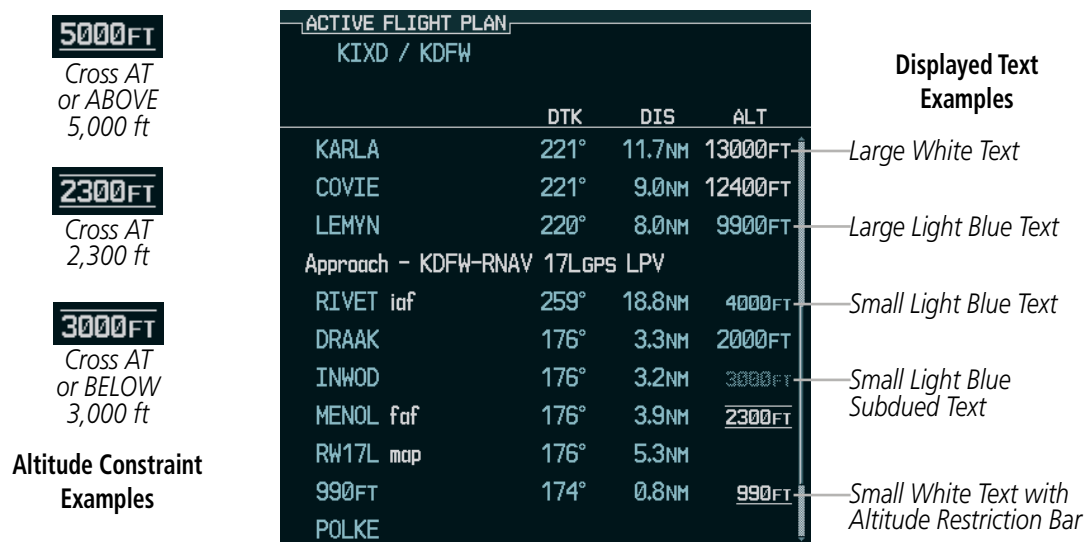


Figure 5-91 Waypoint Altitude Constraints

	White Text	Light Blue Text	Light Blue Subdued Text
Large Text	Altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point. This altitude is provided as a reference and is not designated to be used in determining vertical speed and deviation guidance.	Altitude has been entered manually. Altitude is designated for use in giving vertical speed and deviation guidance. Altitude does not match the published altitude in navigation database or no published altitude exists.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.
Small Text	Altitude is not designated to be used in determining vertical speed and deviation guidance. Altitude has been retrieved from the navigation database and is provided as a reference.	Altitude is designated for use in giving vertical speed and deviation guidance. Altitude has been retrieved from the navigation database or has been entered manually and matches a published altitude in the navigation database.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.

Table 5-8 Altitude Constraint Size and Color Coding

Altitudes associated with 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” using the **CLR** Key. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

Designating a waypoint altitude to be used for vertical guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
- 3) Turn the small **FMS** Knob to enter editing mode.
- 4) Press the **ENT** Key. The altitude is now shown in blue, indicating it is usable for vertical guidance.

Designating a procedure waypoint altitude to be used for vertical guidance:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
- 3) Press the **ENT** Key. The altitude is now shown in blue, indicating it is usable for vertical guidance.

Altitude constraints are displayed and entered in feet mean sea level (MSL) values to the nearest hundred. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the G1000 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 (6° down) or maximum vertical speed (-6000 fpm) to be exceeded
- The altitude constraint results in a TOD behind the aircraft present position
- The constraint is within a leg type for which altitude constraints are not supported
- The altitude constraint is added to the FAF of an approach that provides vertical guidance (i.e., ILS or GPS SBAS approach)
- The altitude constraint is added to a waypoint past the FAF

Entering/modifying an altitude constraint:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Enter an altitude constraint value using the **FMS** Knobs. To enter altitudes as a flight level, turn the small **FMS** Knob counter-clockwise past zero or clockwise past 9 on the first character, and the system automatically changes to show units of Flight Level. Turn the large **FMS** Knob clockwise to highlight the first zero and enter the three digit flight level.
- 4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an airport, an additional choice is displayed. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude.

Altitude constraints can be modified or deleted after having been added to the flight plan. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the G1000 displays the altitude restriction from the database provided no predicted altitude can be provided. The G1000 also provides a way to reinstate a published altitude constraint that has been edited.

Deleting an altitude constraint provided by the navigation database:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove VNV altitude constraint?' confirmation window is displayed.
- 4) Select 'OK' and press the **ENT** Key.

Deleting an altitude constraint that has been manually entered:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'REMOVE' and press the **ENT** Key. The manually entered altitude is deleted (it is replaced by a system calculated altitude, if available).

Reverting a manually entered altitude constraint back to the navigation database value:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'REVERT' and press the **ENT** Key. The altitude is changed to the navigation database value.
- 5) Press the **FMS** Knob to remove the flashing cursor.

Modifying a system calculated altitude constraint:

- 1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
- 2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
- 3) Press the **CLR** Key. An 'Edit or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
- 4) Select 'EDIT' and press the **ENT** Key.
- 5) Edit the value using the **FMS** Knobs, and press the **ENT** Key.
- 6) Press the **FMS** Knob to remove the flashing cursor.

5.8 PROCEDURES

The G1000 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 any Procedures (**PROC**) Key.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure loading window defaults to the appropriate airport, saving some time selecting the correct airport on the Procedure Loading Page. Whenever an approach is selected, the choice to either “load” or “activate” is given. “Loading” adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. “Activating” also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

DEPARTURES

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. If a departure is loaded when another departure is already in the active flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

LOADING A DEPARTURE INTO THE ACTIVE FLIGHT PLAN

Loading a departure into the active flight plan using the PROC Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight ‘SELECT DEPARTURE’.
- 3) Press the **ENT** Key. The Departure Loading Page is displayed.
- 4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 5) Select a departure from the list and press the **ENT** Key.
- 6) Select a runway (if required) and press the **ENT** Key.
- 7) Select a transition (if required) and press the **ENT** Key. ‘LOAD?’ is highlighted.
- 8) Press the **ENT** Key to load the departure procedure.

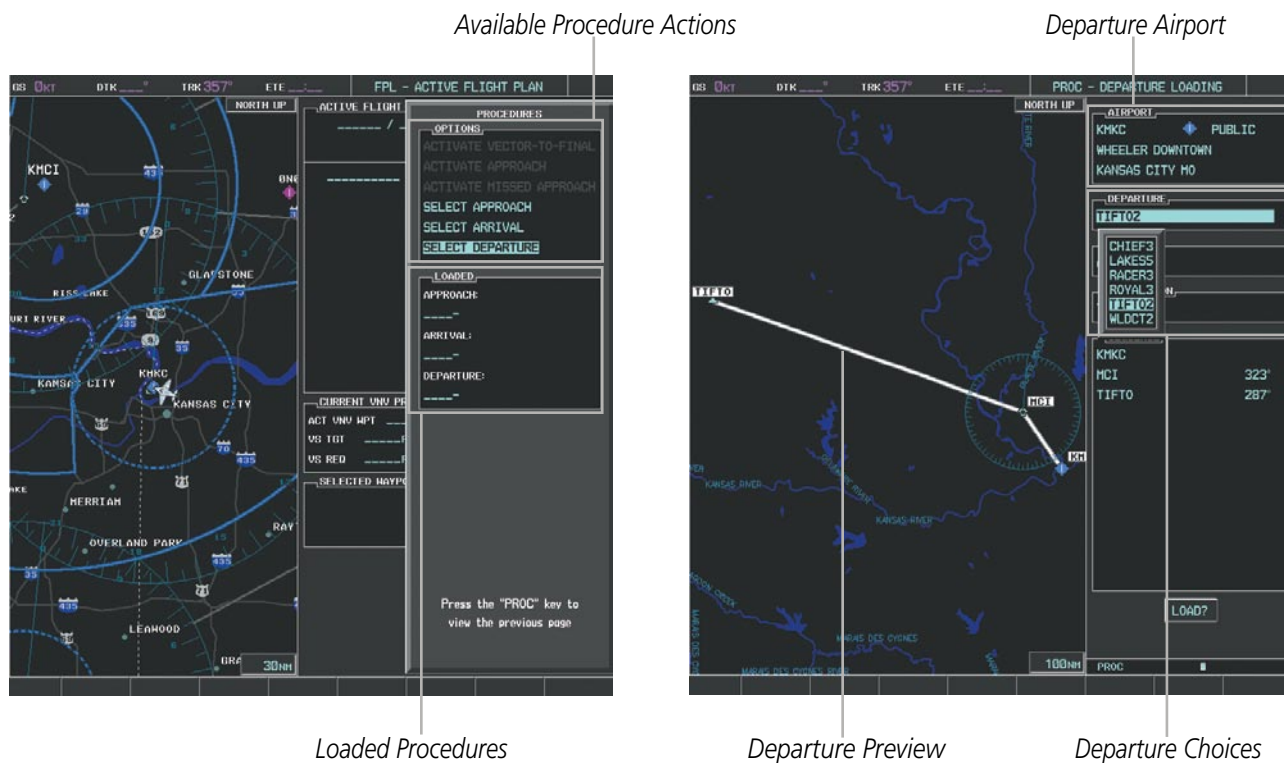


Figure 5-92 Departure Selection

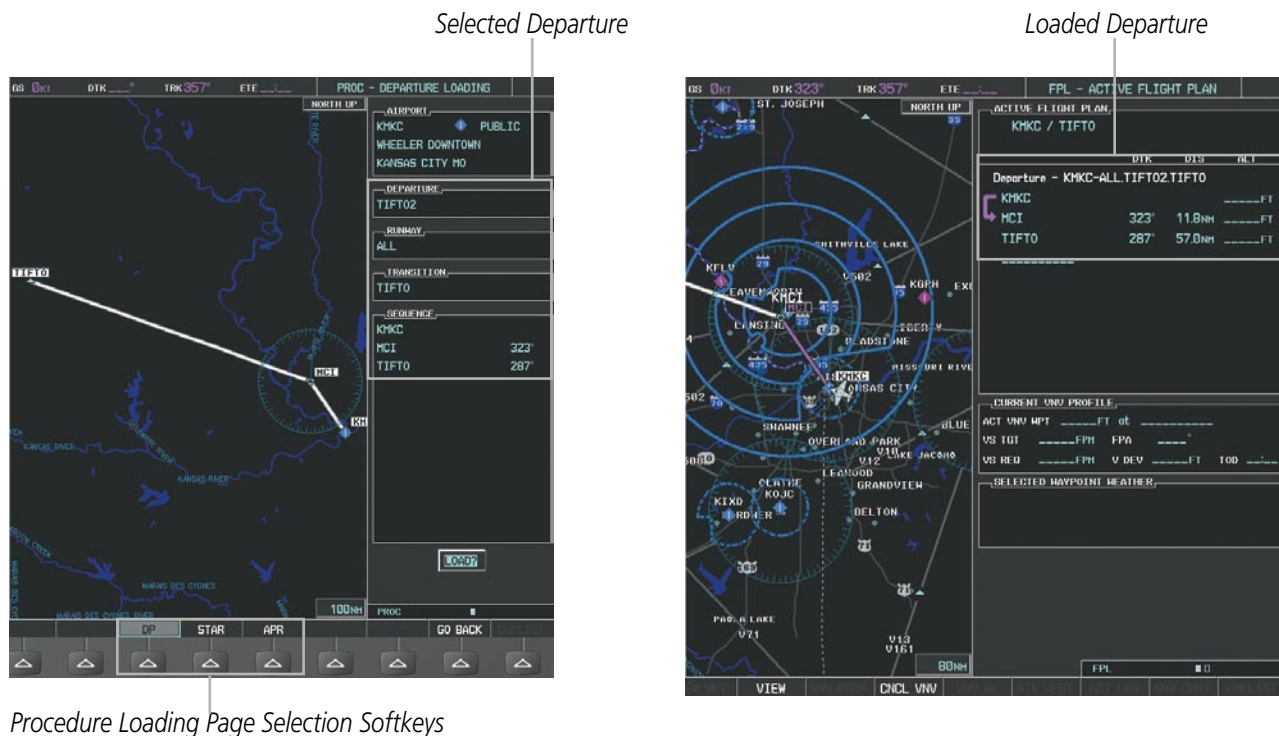


Figure 5-93 Departure Loading

Viewing available departures at an airport:

- 1) From the Airport Information Page (first page in the WPT group), select the **DP** Softkey. The Departure Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to highlight the Departure. The departure is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available departures. Press the **ENT** Key to select the departure. The cursor moves to the Runway box. The departure is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Transition box (only if there are available transitions). The departure is previewed on the map.
- 6) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Sequence box. The departure is previewed on the map.
- 7) Select the **INFO-x** Softkey to return to the Airport Information Page.

REMOVING A DEPARTURE FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

Removing a departure procedure from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Departure'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the departure procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob, and turn to highlight the departure header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the departure procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded at any airport that has one available. Only one arrival can be loaded at a time in a flight plan. If an arrival is loaded when another arrival is already in the active flight plan, the new arrival replaces the previous arrival. The route is defined by selection of an arrival, the transition waypoints, and a runway.

LOADING AN ARRIVAL INTO THE ACTIVE FLIGHT PLAN

Loading an arrival into the active flight plan using the **PROC** Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT ARRIVAL'.
- 3) Press the **ENT** Key. The Arrival Loading Page is displayed.
- 4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 5) Select an arrival from the list and press the **ENT** Key.
- 6) Select a transition (if required) and press the **ENT** Key.
- 7) Select a runway (if required) and press the **ENT** Key. 'LOAD?' is highlighted.
- 8) Press the **ENT** Key to load the arrival procedure.

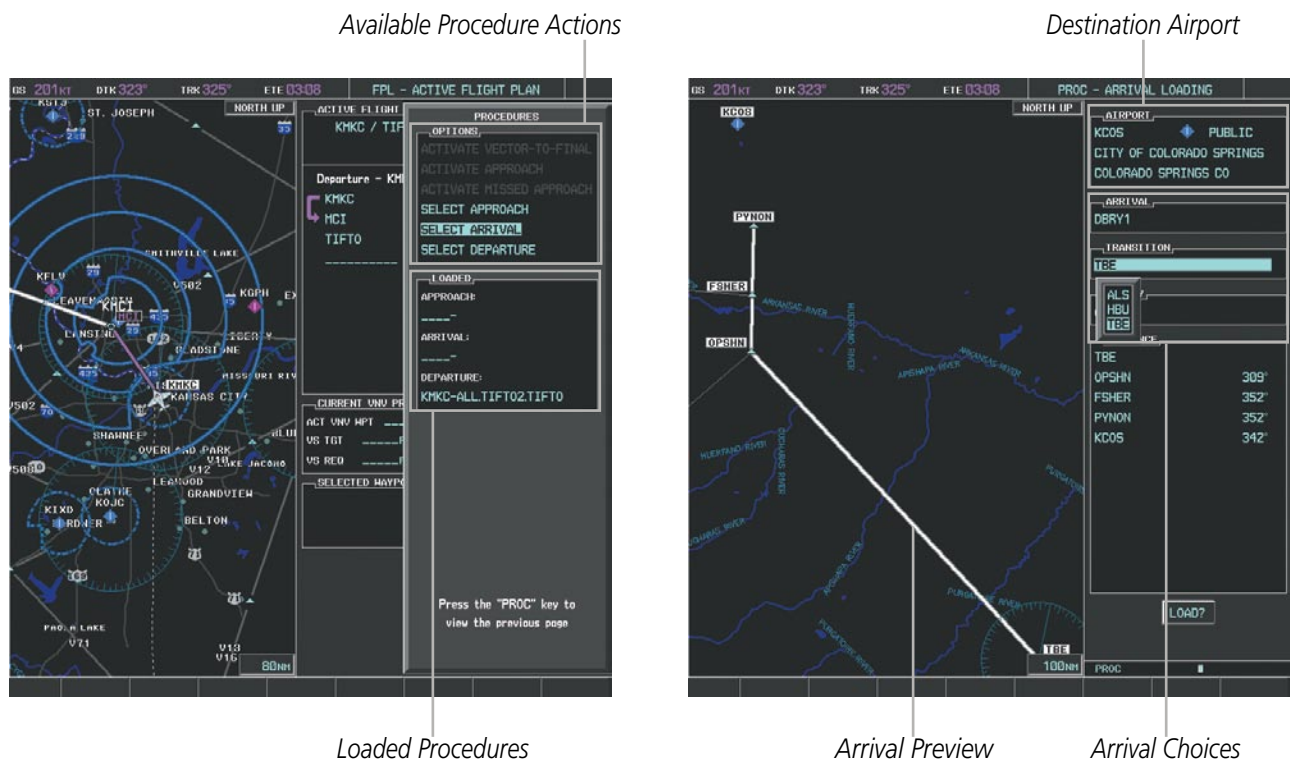


Figure 5-94 Arrival Selection

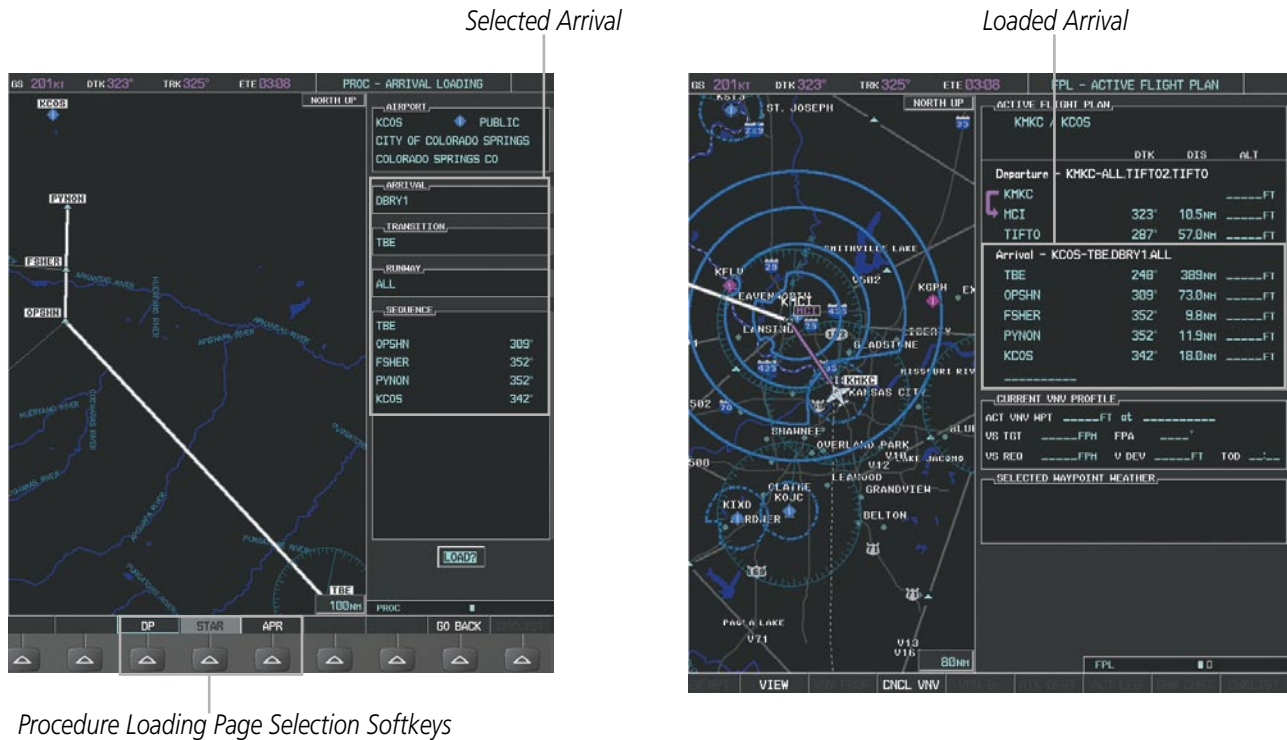


Figure 5-95 Arrival Loading

Viewing available arrivals at an airport:

- 1) From the Airport Information Page (first page in the WPT group), select the **STAR** Softkey. The Arrival Information Page is displayed, defaulting to the airport displayed on the Airport Information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to highlight the Arrival. The arrival is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available arrivals. Press the **ENT** Key to select the arrival. The cursor moves to the Transition box. The arrival is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Runway box. The arrival is previewed on the map.
- 6) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Sequence box. The arrival is previewed on the map.
- 7) Select the **INFO-x** Softkey to return to the Airport Information Page.

REMOVING AN ARRIVAL FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the Active Flight Plan.

Removing an arrival from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Arrival'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the arrival procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob, and turn to highlight the arrival header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the arrival procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

APPROACHES



NOTE: *If certain GPS parameters (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 "activate" is given. "Loading" adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. "Activating" also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a "GPS" designation to the right of the procedure name indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown by tuning the NAV receiver to the proper frequency and selecting that NAV receiver on the CDI.

The G1000 SBAS GPS allows for flying LNAV, LNAV/VNAV, and LPV approaches according to the published chart. LNAV+V is a standard LNAV approach with advisory vertical guidance provided for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the G1000 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 - LPV
LNAV+V	GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV	GPS approach using published LNAV/VNAV minima	
LPV	GPS approach using published LPV minima	

Table 5-9 Approach Types

LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

Loading an approach into the active flight plan using the PROC Key:

- 1) Press the **PROC** Key. The Procedures Window is displayed.
- 2) Highlight 'SELECT APPROACH', and press the **ENT** Key. The Approach Loading Page is displayed.
- 3) Use the **FMS** Knob to select an airport and press the **ENT** Key.
- 4) Select an approach from the list and press the **ENT** Key.
- 5) Select a transition (if required) and press the **ENT** Key.
- 6) Barometric Minimums
 - a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
- Or:
- b) To skip setting minimums, press the **ENT** Key.
- 7) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure.



NOTE: When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

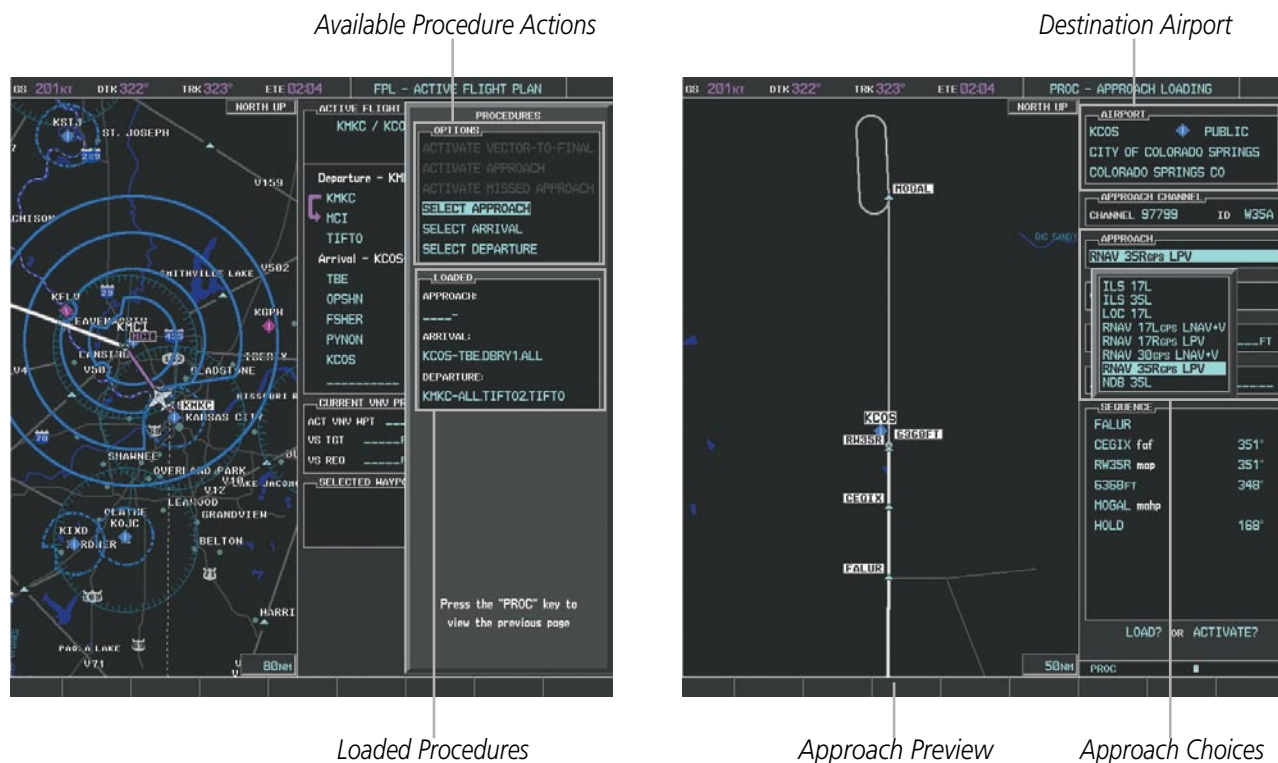


Figure 5-96 Approach Selection

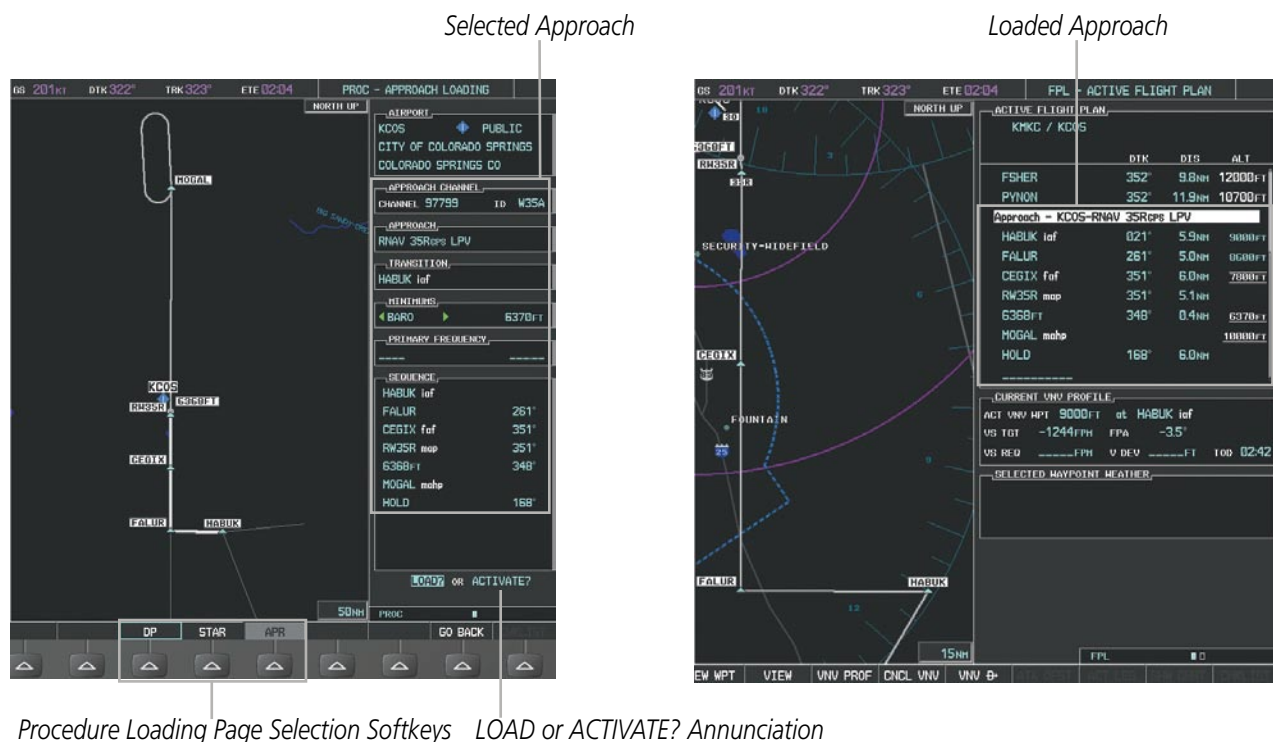


Figure 5-97 Approach Loading

Viewing available approaches at an airport:

- 1) From the Airport Information Page (first page in the WPT group), select the **APR** Softkey. The Approach Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
- 2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
- 3) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the Approach. The approach is previewed on the map.
- 4) Turn the small **FMS** Knob to view the available approaches. Press the **ENT** Key to select the approach. The cursor moves to the Transition box. The approach is previewed on the map.
- 5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Minimums box. The approach is previewed on the map.
- 6) Turn the small **FMS** Knob to select BARO or 'RAD ALT' (optional) minimums on or off. Press the **ENT** Key.
 - a) When minimums are selected on, the cursor moves to the minimum altitude field. Use the small FMS Knob to select the altitude. Press the **ENT** Key. The cursor moves to the Sequence box. The approach is previewed on the map.
- Or:**
 - b) When minimums are selected off, the cursor moves to the Sequence box. The approach is previewed on the map.
- 7) Press the **INFO-x** Softkey to return to the Airport Information Page.

Loading an approach into the active flight plan from the Nearest Airport Page:

- 1) Select the Nearest Airports Page.
- 2) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the desired nearest airport. The airport is previewed on the map.
- 3) Select the **APR** Softkey; or press the **MENU** Key, highlight 'Select Approach Window', and press the **ENT** Key.
- 4) Turn the **FMS** Knob to highlight the desired approach.
- 5) Select the **LD APR** Softkey; or press the **MENU** Key, highlight 'Load Approach', and press the **ENT** Key. The Approach Loading Page is displayed with the transitions field highlighted.
- 6) Turn the **FMS** Knob to highlight the desired transition, and press the **ENT** Key.
- 5) Minimums
 - a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO' or 'RAD ALT' (optional), and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
- Or:**
 - b) To skip setting minimums, press the **ENT** Key. The 'LOAD?' field is highlighted.
- 8) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure. The system continues navigating the current flight plan until the approach is activated. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.

ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Window.

Activating a previously loaded approach:

- 1) Press the **PROC** Key. The Procedures Window is displayed with 'Activate Approach' highlighted.
- 2) Press the **ENT** Key to activate the approach.

In many cases, it may be easiest to "load" the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, use the steps above to select 'Activate Vector-To-Final' — which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final:

- 1) Press the **PROC** Key to display the Procedures Window.
- 2) Highlight 'ACTIVATE VECTOR-TO-FINAL' and press the **ENT** Key.

Loading and activating an approach using the MENU Key:

- 1) From the Approach Loading Page, press the **MENU** Key. The page menu is displayed with 'Load & Activate Approach' highlighted.
- 2) Press the **ENT** Key. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must be switched to a NAV receiver to fly the final course of the approach.

REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

Removing an approach from the active flight plan:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **MENU** Key, and highlight 'Remove Approach'.
- 3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.

Or:

- 1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
- 2) Press the **FMS** Knob, and turn to highlight the approach header in the active flight plan.
- 3) Press the **CLR** Key. A confirmation window is displayed listing the approach procedure.
- 4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.
- 5) Press the **FMS** Knob to remove the flashing cursor.

MISSED APPROACH

Activating a missed approach in the active flight plan:

- 1) Press the **PROC** Key.
- 2) Turn the **FMS** Knob to highlight 'ACTIVATE MISSED APPROACH'.
- 3) Press the **ENT** Key. The aircraft automatically sequences to the MAHP.

Or:

Press the Go-Around Button.

COURSE TO ALTITUDE

In this missed approach procedure, the altitude immediately following the MAP (in this case '6368ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by Jeppesen, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,368 feet is reached. After reaching 6,368 feet, a direct-to is established to the published MAHP (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (MOGAL) to begin the missed approach procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, a procedure may dictate a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would appear in the list of waypoints as '5500ft'. Again, if the aircraft altitude is lower than the prescribed altitude, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.

ACTIVE FLIGHT PLAN			
KM KC / KCOS			
	DTK	DIS	ALT
FSHER	352°	9.8NM	9500FT
PYNON	352°	11.9NM	9500FT
Approach - KCOS-RNAV 35RcPS LPV			
HABUK iaf	021°	5.9NM	9000FT
FALUR	261°	5.0NM	8600FT
CEGIX faf	351°	6.0NM	7800FT
RW35R map	351°	5.1NM	
6368FT	348°	0.4NM	6370FT
MOGAL mahp			10000FT
HOLD	168°	6.0NM	

Course to Altitude Leg

Figure 5-98 Course to Altitude

5.9 TRIP PLANNING

The G1000 allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data. Weight planning is also available, based on manually entered fuel data and the active flight plan (to estimate remaining fuel).

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Page located in the AUX Page Group.

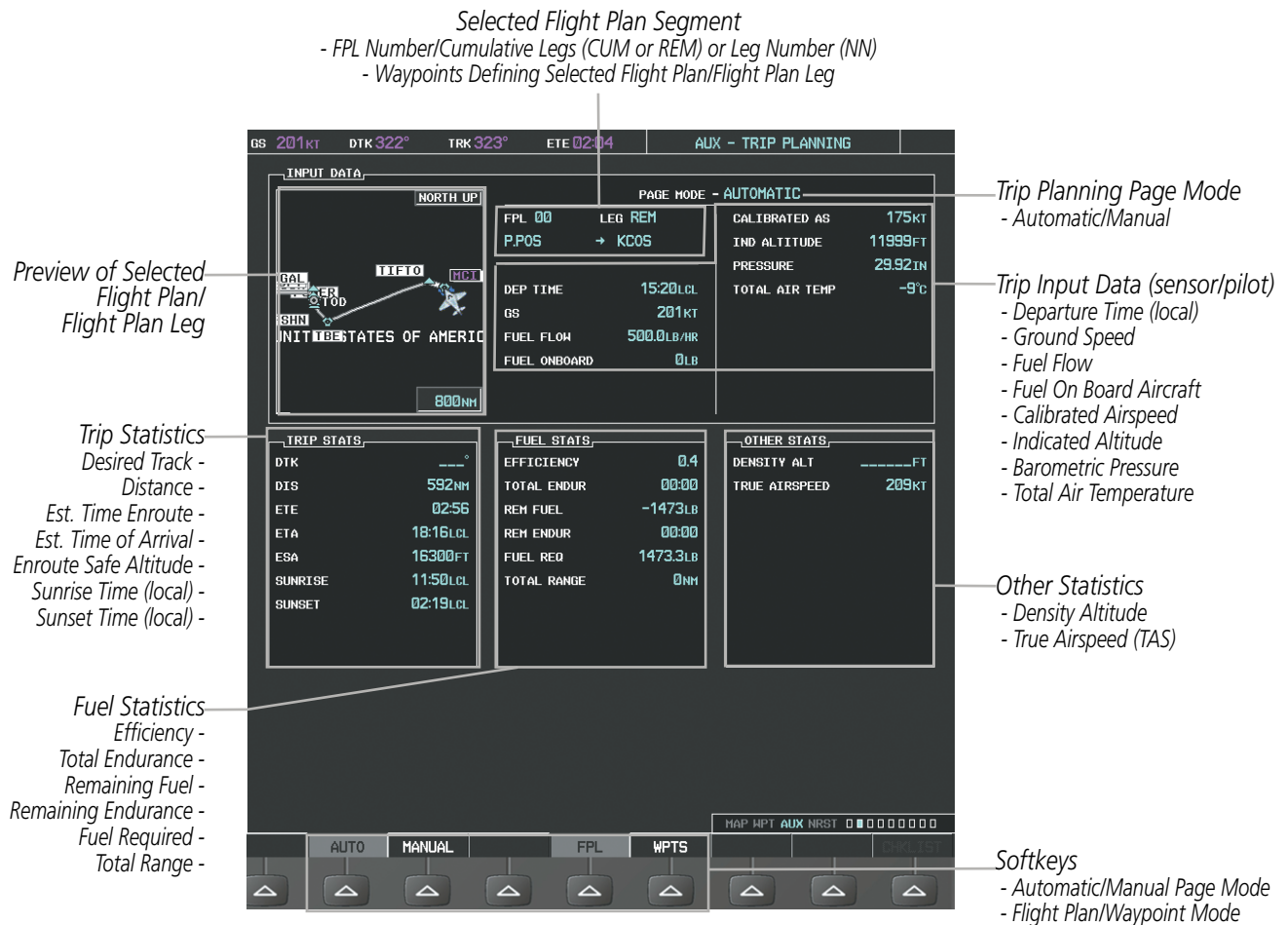


Figure 5-99 Trip Planning Page

The trip planning inputs are based on sensor inputs (automatic page mode) or on pilot inputs (manual page mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (DEP TIME) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.

- Calibrated airspeed (CALIBRATED AS) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (IND ALTITUDE) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs.

In flight plan mode (FPL) with a stored flight plan selected (NN), and the entire flight plan (CUM) selected, the waypoints are the starting and ending waypoints of the selected flight plan.

In flight plan mode (FPL) with a stored flight plan selected (NN), and a specific leg (NN) selected, the waypoints are the endpoints of the selected leg.

In flight plan mode (FPL) with the active flight plan selected (00), and the remaining flight plan (REM) selected, the 'from' waypoint is the present position of the aircraft and the 'to' waypoint is the endpoint of the active flight plan.

In flight plan mode (FPL) with the active flight plan selected (00), and a specific leg (NN) selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint (WPTS) mode these are manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes and is the local time at the destination.
 - If in waypoint mode then the ETA is the ETE added to the departure time.
 - If a flight plan other than the active flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
 - If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to and including the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes and are the local time at the destination.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

The pilot may select automatic (AUTO) or manual (MANUAL) page mode, and flight plan (FPL) or waypoint (WPTS) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTS selection).

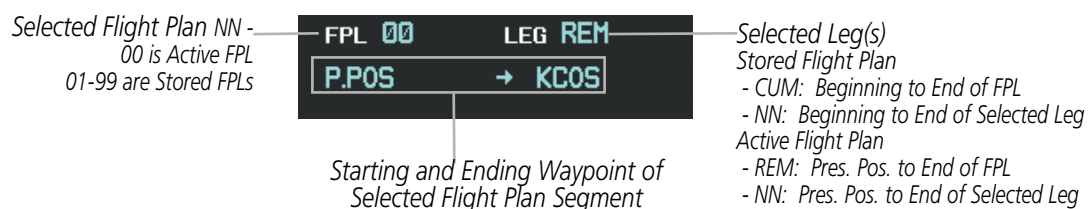


Figure 5-100 Trip Planning Page - Flight Plan Mode

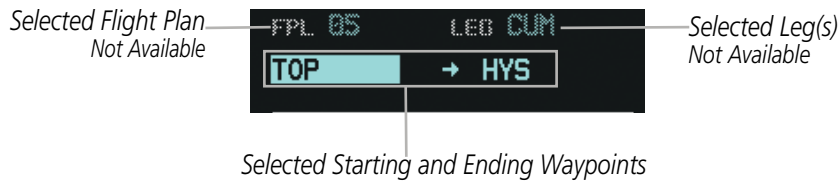


Figure 5-101 Trip Planning Page - Waypoint Mode

Selecting automatic or manual page mode:

Select the **AUTO** Softkey or the **MANUAL** Softkey; or press the **MENU** Key, highlight 'Auto Mode' or 'Manual Mode', and press the **ENT** Key.

Selecting flight plan or waypoint mode:

Select the **FPL** Softkey or the **WPTS** Softkey; or press the **MENU** Key, highlight 'Flight Plan Mode' or 'Waypoints Mode', and press the **ENT** Key.

Selecting a flight plan and leg for trip statistics:

- 1) Press the **FMS** Knob to activate the cursor in the flight plan number field.
- 2) Turn the small **FMS** Knob to select the desired flight plan number.
- 3) Turn the large **FMS** Knob to highlight 'CUM' or 'REM'. The statistics for each leg can be viewed by turning the small **FMS** Knob to select the desired leg. The Inset Map also displays the selected data.

Selecting waypoints for waypoint mode:

- 1) Select the **WPTS** Softkey; or press the **MENU** Key, highlight 'Waypoints Mode', and press the **ENT** Key. The cursor is positioned in the waypoint field directly below the FPL field.
- 2) Turn the **FMS** knobs to select the desired waypoint (or select from the Page Menu 'Set WPT to Present Position' if that is what is desired), and press the **ENT** Key. The cursor moves to the second waypoint field.
- 3) Turn the **FMS** knobs to select the desired waypoint, and press the **ENT** Key. The statistics for the selected leg are displayed.

In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

- 1) Select the **MANUAL** Softkey or select 'Manual Mode' from the Page Menu, and press the **ENT** Key. The cursor may now be positioned in any field in the top right two boxes.
- 2) Turn the **FMS** Knobs to move the cursor onto the DEP TIME field and enter the desired value. Press the **ENT** Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.

WEIGHT PLANNING



NOTE: All weight planning page data fields display data rounded to the nearest 10 pounds or 5 kilograms.



Figure 5-102 Weight Planning Page

Entering basic empty weight:

- 1) Select the **EMPTY WT** Softkey; or press the **MENU** Key, highlight 'Set Basic Empty Weight', and press the **ENT** Key to select the 'BASIC EMPTY WEIGHT' field.
- 2) Turn the small **FMS** Knob to enter the basic empty weight.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

Entering a pilot and stores weight:

- 1) Press the **FMS** Knob to activate the cursor and highlight the 'PILOT AND STORES' field.
- 2) Turn the small **FMS** Knob to enter the pilot and stores weight.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

The basic operating weight is calculated by adding the basic empty weight and the pilot and stores weight.

Entering the number of passengers:

- 1) Press the **FMS** Knob to activate the cursor and highlight the 'PASSENGERS #' field.
- 2) Turn the small **FMS** Knob to enter the number of passengers.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

Entering the average passenger weight:

- 1) Press the **FMS** Knob to activate the cursor and highlight the passenger weight field.
- 2) Turn the small **FMS** Knob to enter the average passenger weight.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

The total weight of passengers is calculated by multiplying the number of passengers by the average passenger weight.

Entering the cargo weight:

- 1) Press the **FMS** Knob to activate the cursor and highlight the 'CARGO' field.
- 2) Turn the small **FMS** Knob to enter the cargo weight.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

The 'ZERO FUEL WEIGHT' is calculated by adding the basic empty, pilot and stores, passenger, and cargo weights.

Entering a fuel on board weight:

- 1) Press the **FMS** Knob to activate the cursor and highlight the 'FUEL ON BOARD' field.
- 2) Turn the small **FMS** Knob to enter the fuel on board.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

Entering fuel reserve:

- 1) Press the **FMS** Knob to activate the cursor and highlight the 'FUEL RESERVES' field.
- 2) Turn the small **FMS** Knob to enter the fuel reserves amount.
- 3) Press the **ENT** Key to confirm the entry.
- 4) Press the **FMS** Knob to remove the flashing cursor.

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

If the aircraft is on the ground or a destination waypoint has not been entered, the following fields display invalid values consisting of six dashes:

- Estimated landing weight
- Estimated landing fuel weight
- Excess fuel weight

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 aircraft 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 fuel at landing weight
- Excess fuel weight

If the estimated landing fuel weight is zero or negative, then the following values are displayed in red:

- Estimated fuel at landing weight
- Excess fuel weight

5.10 RAIM PREDICTION

RAIM (Receiver Autonomous Integrity Monitoring) is a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nm for oceanic, 2.0 nm for enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). During oceanic, enroute, and terminal phases of flight, RAIM is available nearly 100% of the time. The RAIM prediction function also indicates whether RAIM is available at a specified date and time. RAIM computations predict satellite coverage within ± 15 min of the specified arrival date and time. Because of the tighter protection limit on approaches, there may be times when RAIM is not available. RAIM prediction must be initiated manually if there is concern over SBAS coverage at the destination or some other reason that compromises navigation precision. If RAIM is not predicted to be available for the final approach course, the approach does not become active. If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

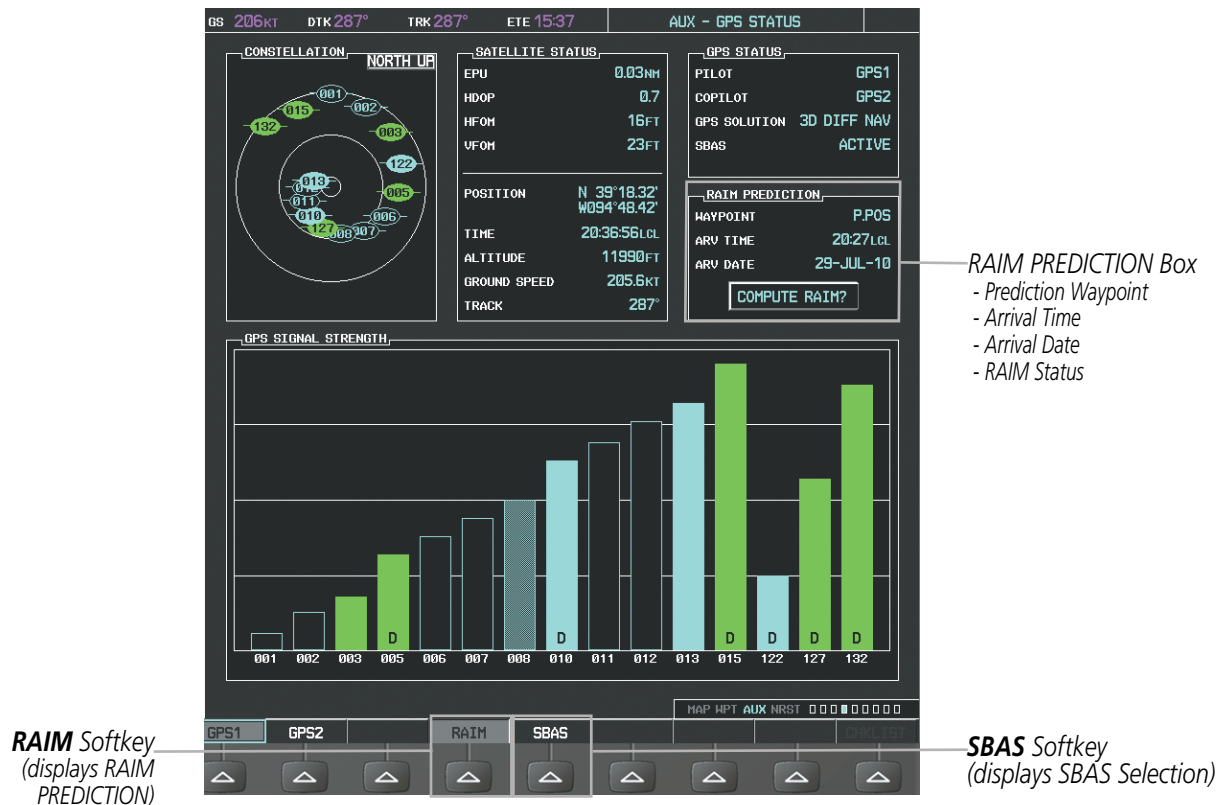


Figure 5-103 RAIM Prediction

Predicting RAIM availability at a selected waypoint:

- 1) Select the AUX-GPS Status Page.
- 2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.

- 3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
- 4) Enter the identifier, facility, or city name of the departure waypoint; or select a waypoint from the submenu of waypoints and press the **ENT** Key to accept the waypoint entry.
- 5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
- 6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
- 7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

Predicting RAIM availability at the aircraft present position:

- 1) Select the AUX-GPS Status Page.
- 2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.
- 3) Press the **MENU** Key, highlight 'Set WPT to Present Position', and press the **ENT** Key.
- 4) Press the **ENT** Key to accept the waypoint entry.
- 5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
- 6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
- 7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

Status of the RAIM computation for the selected waypoint, time, and date is displayed at the bottom of the RAIM PREDICTION Box as follows:

- 'COMPUTE RAIM?' - RAIM has not been computed.
- 'COMPUTING AVAILABILITY' - RAIM calculation is in progress.
- 'RAIM AVAILABLE' - RAIM is predicted to be available.
- 'RAIM NOT AVAILABLE' - RAIM is predicted to be unavailable.

The Satellite Based Augmentation System (SBAS) provides increased navigation accuracy when available. SBAS can be enabled or disabled manually on the GPS Status Page.

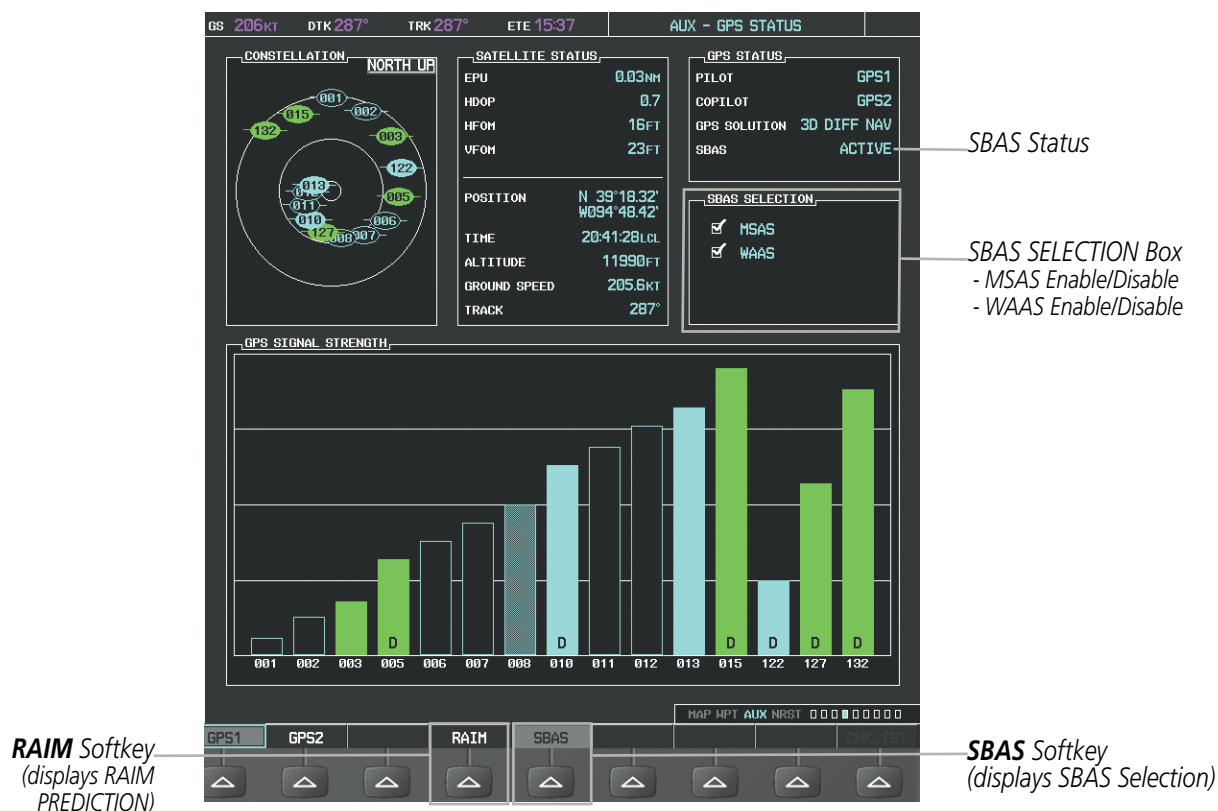


Figure 5-104 SBAS Display - Active

Enabling/Disabling SBAS:

- 1) Select the AUX-GPS Status Page.
- 2) Press the **SBAS** softkey.
- 3) Press the **FMS** Knob, and turn the large FMS Knob to highlight 'MSAS' or 'WAAS'.
- 4) Press the **ENT** Key to disable SBAS. Press the **ENT** Key again to enable SBAS.

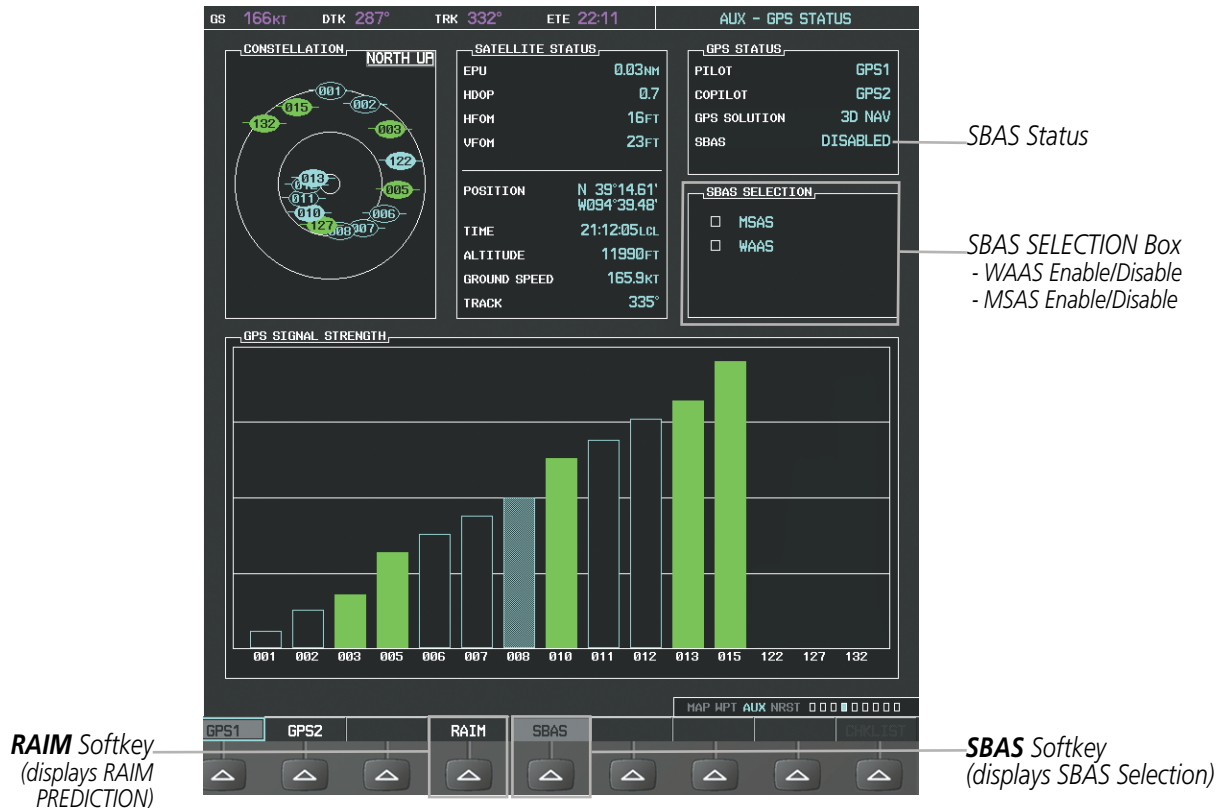


Figure 5-105 SBAS Display - Disabled

5.11 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the SBAS capable GPS system while the G1000 provides vertical guidance through descents. A lateral flight plan (LNAV) would be navigated in much the same way, but would not include vertical guidance when the final approach course is active.



NOTE: The following example flight plan is for instructional purposes only. All database information depicted should be considered not current.

The example is a flight plan from KMKC to KCOS filed using the TIFTO2 departure, various Victor Airways, and the DBRY1 arrival with the transition at TBE. The flight plan includes an enroute altitude of 12,000 feet, an LPV (WAAS) approach selected for runway 35R, and a missed approach executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.

- 1) Prior to departure, the TIFTO2 departure, the airways, and the DBRY1 arrival at KCOS are loaded. See the Procedures section for loading departures and arrivals. Note the magenta arrow in Figure 5-106 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

- 2) Figure 5-106 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.

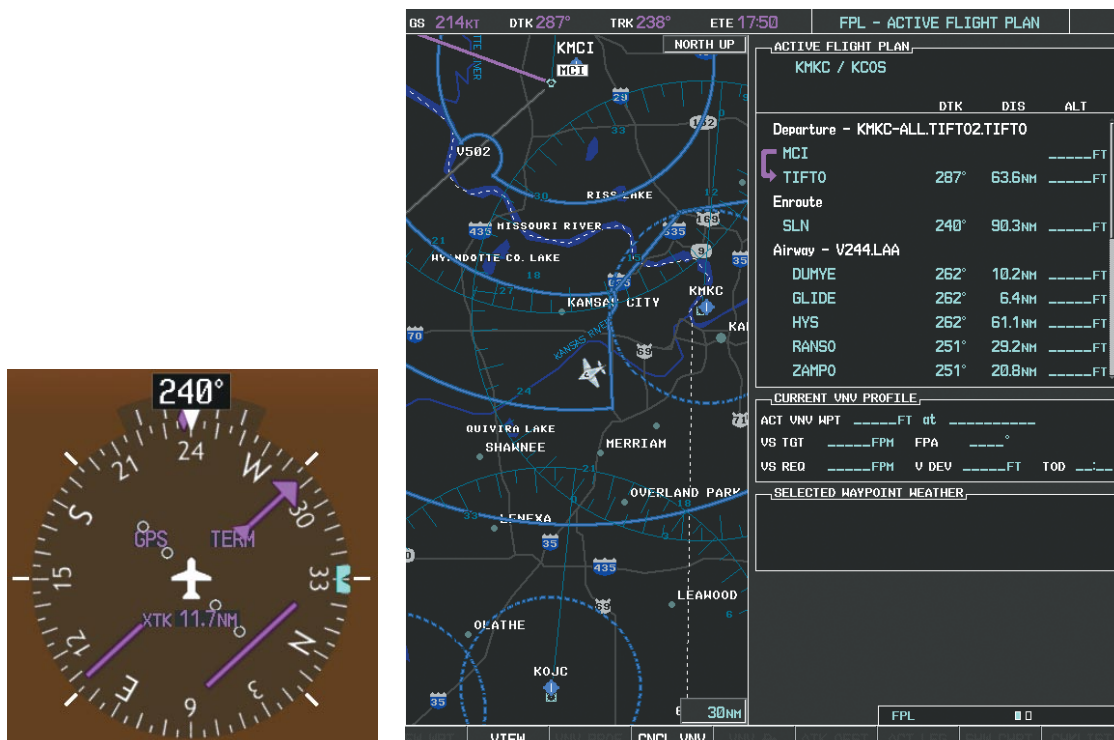


Figure 5-106 Assigned Heading of 240°

- 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 5-107.

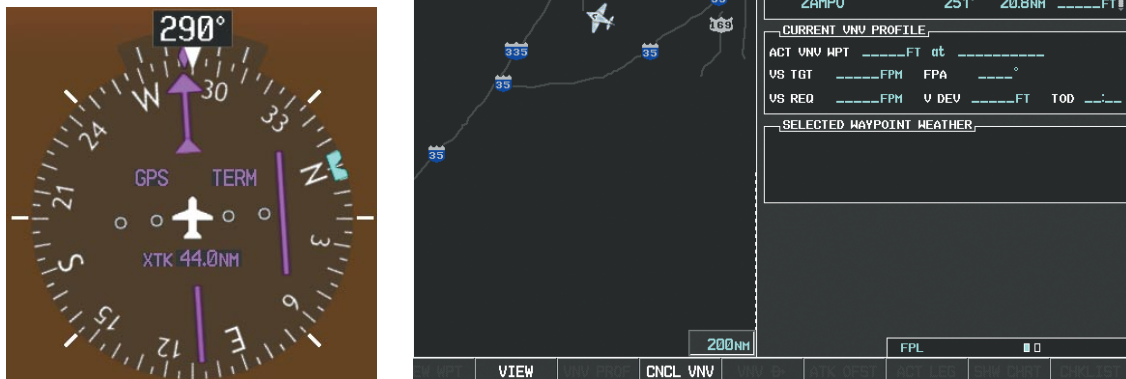


Figure 5-107 Assigned Heading of 290°

- 4) Enter V4 into the flight plan.
a) Press the **FMS** Knob to activate the cursor.

- b) The desired entry point for V4 (TOP) must be entered. Turn the large **FMS** Knob to highlight the desired flight plan insertion point (SLN) as shown in Figure 5-108. When the V4 entry point (TOP) is inserted, it is placed immediately above the highlighted waypoint (SLN).

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
Departure - KMKC-ALL.TIFT02.TIFT0			
MCI			-----FT
TIFT0	286°	51.0NM	-----FT
Enroute			
SLN	240°	90.3NM	-----FT
Airway - V244.LAA			
DUMYE	262°	10.2NM	-----FT
GLIDE	262°	6.4NM	-----FT
HYS	262°	61.1NM	-----FT
RANSO	251°	29.2NM	-----FT
ZAMPO	251°	20.8NM	-----FT
CURRENT UNV PROFILE			
ACT UNV WPT	-----FT	at	-----
VS TGT	-----FPM	FPA	-----°
VS REQ	-----FPM	V DEV	-----FT TOD -----

Figure 5-108 Begin Adding V4 to the Flight Plan

- c) Turn the small **FMS** Knob to display the Waypoint Information Window. Enter the desired entry point for V4, Topeka VOR (TOP), as shown in Figure 5-109.

WAYPOINT INFORMATION	
IDENT, FACILITY, CITY	
TOP	
TOPEKA	
TOPEKA KS	
MAP	
	
LOCATION	
BRG 031°	N CEN USA
DIS 21.7NM	N 39°08.23'
	W095°32.95'
Press "ENT" to accept	

Figure 5-109 Entering V4 Entry Point

d) Press the **ENT** Key. TOP is inserted into the flight plan as in Figure 5-110.

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
Departure - KMKC-ALL.TIFT02.TIFT0			
MCI			_____FT
TIFT0	286°	51.0NM	_____FT
Enroute			
TOP	147°	32.3NM	_____FT
SLN	260°	97.7NM	_____FT
Airway - V244.LAA			
DUMYE	262°	10.2NM	_____FT
GLIDE	262°	6.4NM	_____FT
HYS	262°	61.1NM	_____FT
RANSO	251°	29.2NM	_____FT
CURRENT UNV PROFILE			
ACT UNV HPT	_____FT	at	_____
VS TGT	_____FPM	FPA	_____°
VS REQ	_____FPM	V DEV	_____FT TOD _____

Figure 5-110 TOP Inserted into the Flight Plan

e) With SLN still highlighted as in Figure 5-110, turn the small **FMS** Knob clockwise. The Waypoint Information Page is displayed and the **LD AIRWY** Softkey is now available.

f) Select the **LD AIRWY** Softkey to display the list of available airways for TOP as seen in Figure 5-111.

ENTRY	
TOP	
AIRWAY	
V4	
V131	
V280	
V4	
V508	
V71	
V77	
	260° 14.1NM
HOPPS	258° 5.9NM
ALMAS	258° 28.5NM
DRAMA	258° 2.3NM
DEKIS	258° 6.0NM
VASCO	258° 27.4NM
SLN	257° 13.6NM
LOAD?	

Figure 5-111 List of Available Airways for TOP

g) Turn either **FMS** Knob to highlight V4 in the list as seen in Figure 5-111.

h) Press the **ENT** Key. The list of available exits for V4 is now displayed as in Figure 5-112.

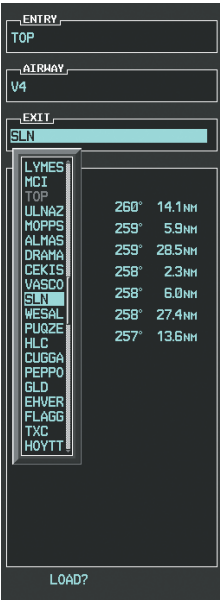


Figure 5-112 List of Available Exits for V4

- i) If necessary, turn either **FMS** Knob to select the desired exit. In this case Salina VOR (SLN) is selected as in Figure 5-112.
- j) Press the **ENT** Key. The selected airway and exit are displayed, and the prompt “LOAD?” highlighted as in Figure 5-113.

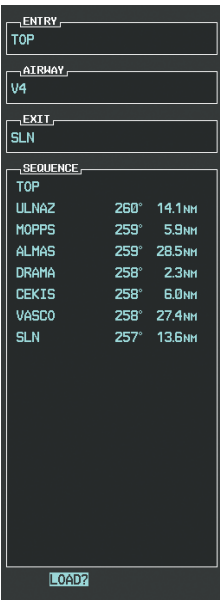


Figure 5-113 Ready to Load V4

k) Press the **ENT** Key.

I) V4 is now loaded into the flight plan as shown in Figure 5-114.

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
Enroute			
TOP	147°	32.3NM	_____FT
Airway - V4.SLN			
ULNAZ	260°	14.1NM	_____FT
MOPPS	259°	5.9NM	_____FT
ALMAS	259°	28.5NM	_____FT
DRAMA	258°	2.3NM	_____FT
CEKIS	258°	6.0NM	_____FT
VASCO	258°	27.4NM	_____FT
SLN	257°	13.6NM	_____FT
Airway - V244.LAA			
CURRENT UNV PROFILE			
ACT UNV HPT	_____FT	at	_____
VS TGT	_____FPM	FPA	_____°
VS REQ	_____FPM	V DEV	_____FT TOD _____

Figure 5-114 V4 is Loaded in the Flight Plan

- 5) Making V4 the active leg of the flight plan.
 - a) Press the **FMS** Knob to activate the cursor.
 - b) Turn the large **FMS** Knob to highlight ULNAZ. The TO waypoint of the leg is selected in order to activate the leg.
 - c) Select the **ACT LEG** Softkey. The confirmation window is now displayed as in Figure 5-115. Note the TOP to ULNAZ leg is actually part of V4.

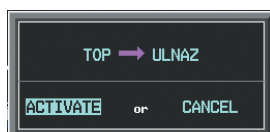


Figure 5-115 Confirm Active Leg

- d) Verify the displayed leg is the desired leg and press the **ENT** Key. Note in Figure 5-116, 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.

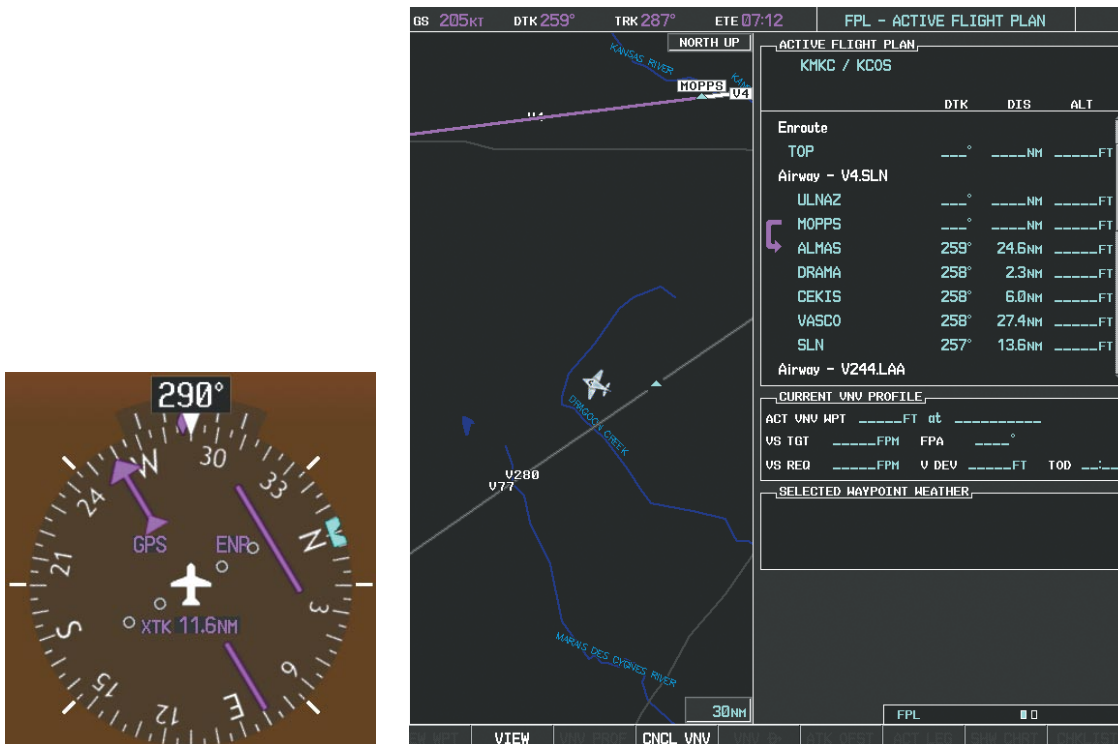


Figure 5-116 V4 Now Active Leg

- 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 5-117.

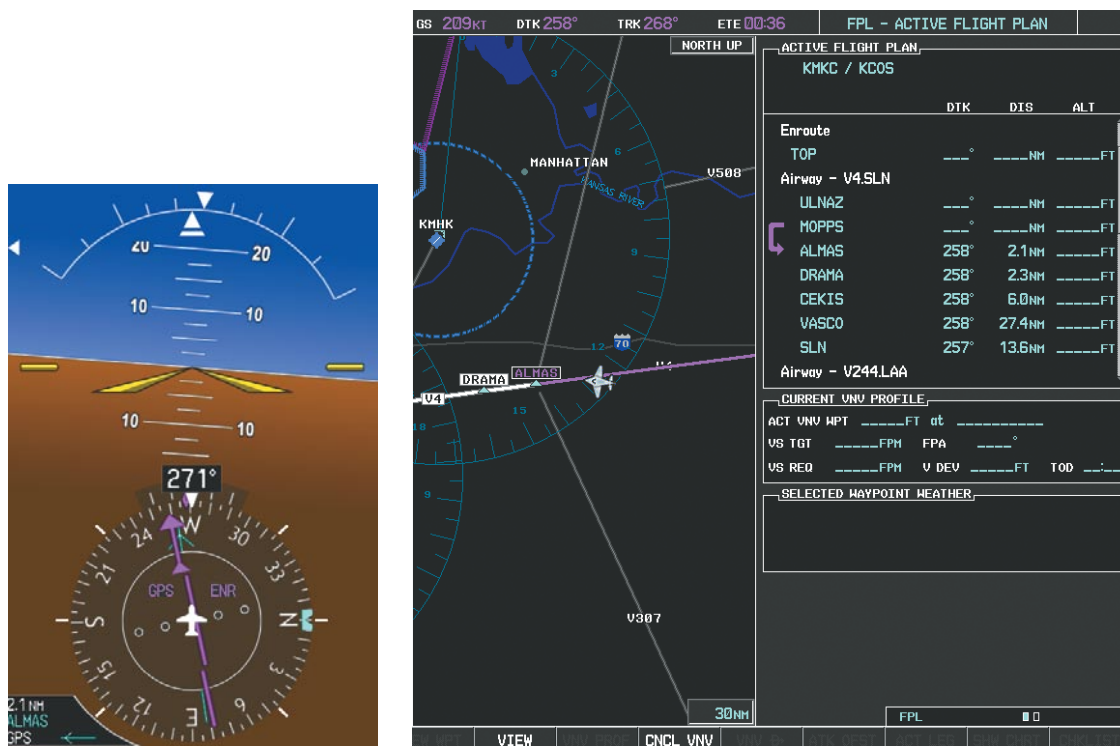


Figure 5-117 Turn on to Active Leg

- 8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-118.



Figure 5-118 Turn to Intercept V244

9) As seen in Figure 5-119, V244 is now the active flight plan leg.

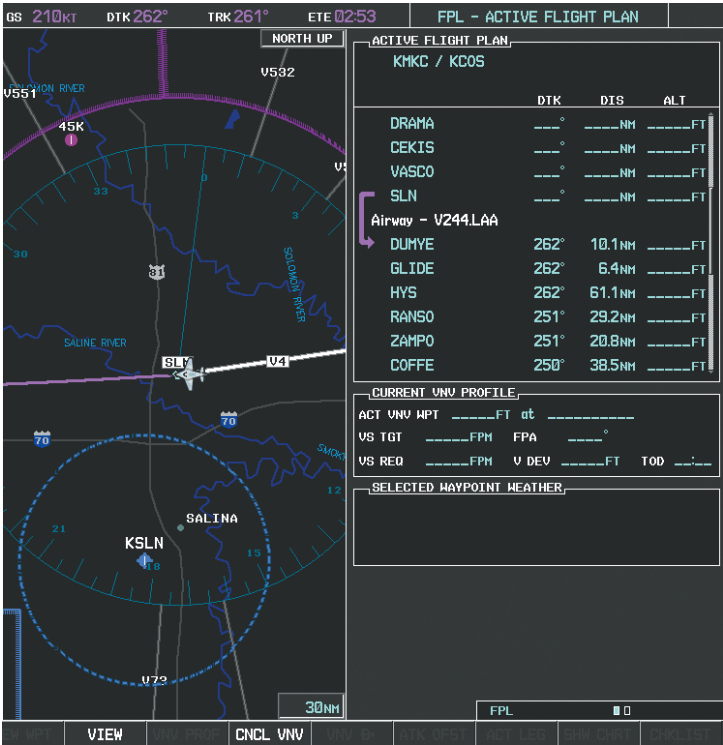


Figure 5-119 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-120.

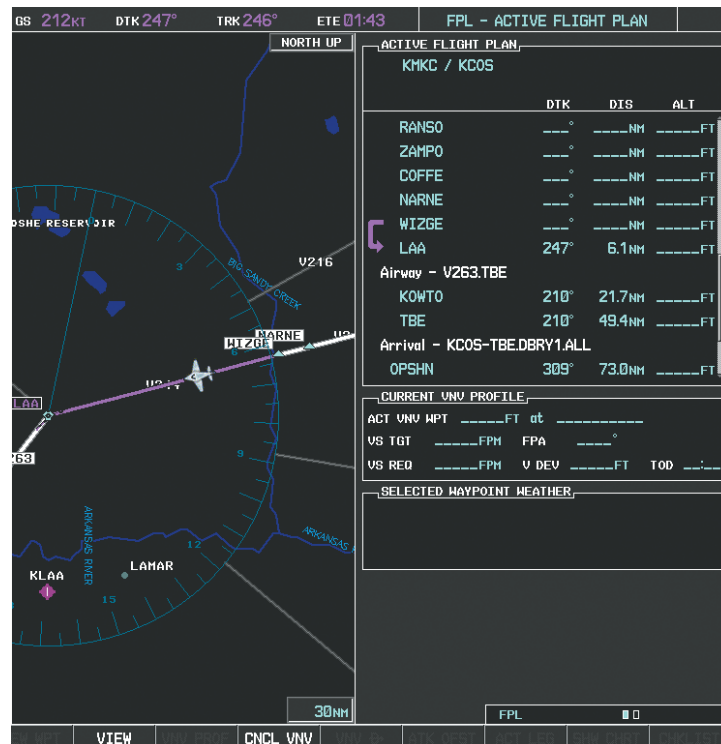


Figure 5-120 WIZGE to LAA Leg Active

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.

- Press the **FMS** Knob to activate the cursor.
- Turn the large **FMS** Knob to select OPSHN in the flight plan list.

c) Press the **Direct-to** (D➤) Key. The Direct-to Window is now displayed as shown in Figure 5-121.

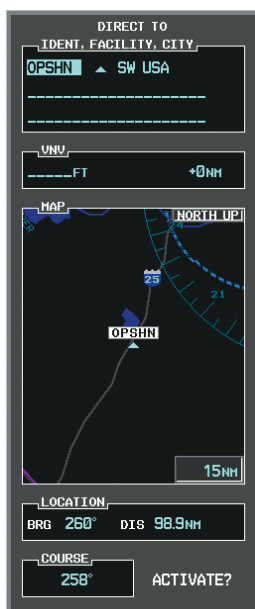


Figure 5-121 Direct To OPSHN

d) Turn the large **FMS** Knob to place the cursor in the VNV altitude field as shown in Figure 5-122.

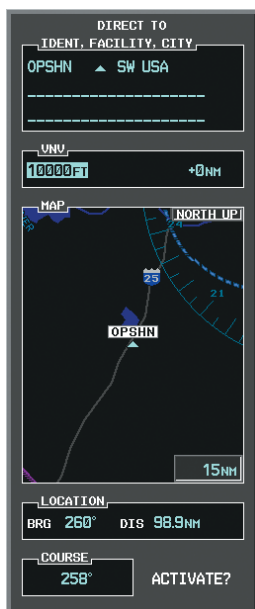


Figure 5-122 Enter VNV Altitude

e) An altitude of 10,000 feet is entered as requested by ATC.

- f) Press the **ENT** Key. The cursor is now displayed in the VNV offset field as shown in Figure 5-123.

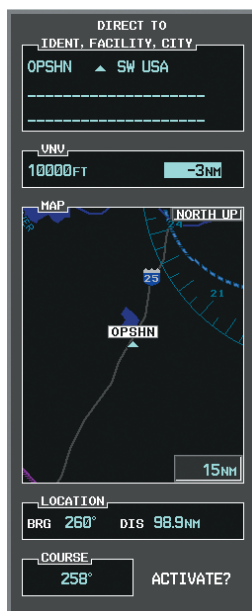


Figure 5-123 Enter VNV Offset Distance

- g) Enter the offset, or distance from the waypoint at which to reach the selected altitude. In this case, three miles prior to OPSHN is entered. In other words, the G1000 gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPSHN.

- h) Press the **ENT** Key twice to activate the direct-to. Note, in Figure 5-124, the magenta arrow indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that were previously entered. The remaining waypoints in the loaded arrival procedure have no database specified altitudes, therefore, dashes are displayed. Keep the CDI centered and maintain a track along the magenta line to OPSHN.

Note the Direct-to waypoint is within the loaded arrival procedure, therefore, phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.



NOTE: If the loaded arrival procedure has waypoints with altitude constraints retrieved from the database to be used as is, the altitude must be manually accepted by placing the cursor over the desired altitude, then pressing the ENT Key. The altitude is now displayed as light blue meaning it is used by the system to determine vertical speed and deviation guidance.

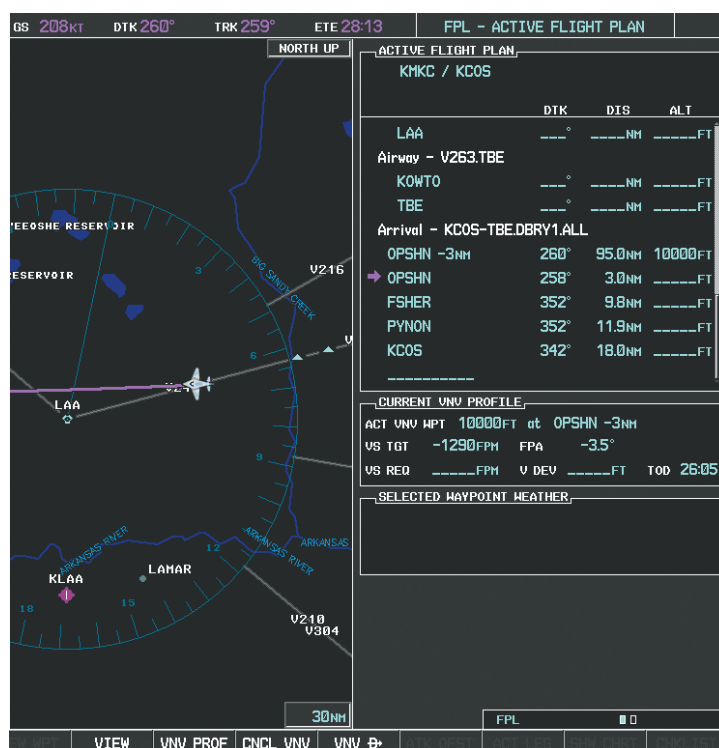


Figure 5-124 Direct-to Active

- 12) The aircraft is proceeding to OPSHN. The expected approach is the RNAV LPV approach to runway 35R, so it is selected.
- a) Press the **PROC** Key to display the Procedures Window.

- b) 'SELECT APPROACH' should be highlighted as shown in Figure 5-125.

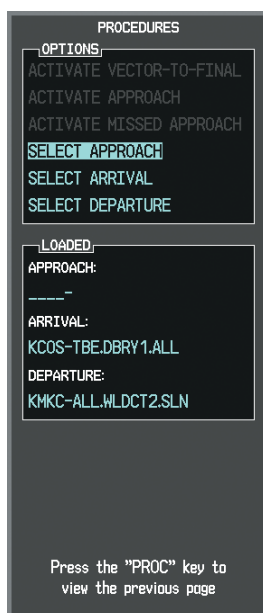


Figure 5-125 Procedures Window

- c) Press the **ENT** Key. A list of available approaches for the destination airport is displayed as in Figure 5-126.

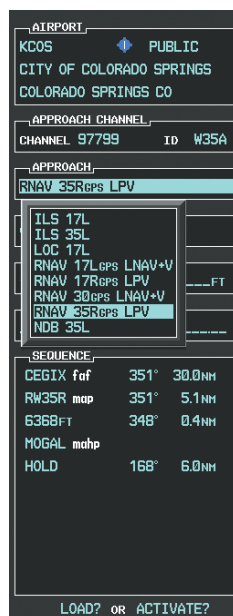


Figure 5-126 List of Available Approaches

- d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-126.

e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as in Figure 5-127.

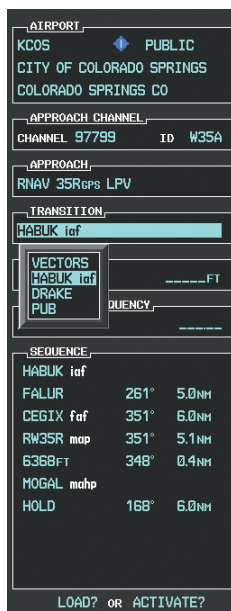


Figure 5-127 List of Available Transitions

f) Turn either **FMS** Knob to select the desired transition. In this case, the Initial Approach Fix (IAF) at HABUK is used.

g) Press the **ENT** Key.

h) Barometric Minimums

To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.

Or:

To skip setting minimums, press the **ENT** Key.

Figure 5-128 Barometric Minimums Set

- [illegible]

283

- 13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-130. These altitudes are loaded from the database and are displayed as light blue text, indicating these values are “designated” for use in computing vertical deviation guidance.

Note: To no longer use the displayed altitude for calculating vertical deviation guidance, perform the following:

- a) Press the **FMS** Knob to activate the cursor.
- b) Turn the small **FMS** Knob to highlight the desired altitude.
- c) Press the **CLR** Key.
- d) Press the **FMS** Knob to deactivate the cursor.

After making the altitude “non-designated”, it is displayed as white text.

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-130. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the SBAS GPS altitude source, therefore, the displayed altitude values are for reference only.

ACTIVE FLIGHT PLAN			
KMKC / KCOS			
	DTK	DIS	ALT
FSHER	352°	9.8NM	10000FT
PYNON	352°	11.9NM	10000FT
Approach - KCOS-RNAV 3SRGPS LPV			
HABUK iaf	021°	5.9NM	9000FT
FALUR	261°	5.0NM	8600FT
CEGIX faf	351°	6.0NM	7800FT
RW3SR map	351°	5.1NM	
6368FT	348°	0.4NM	6370FT
MOGAL mahp			10000FT
HOLD	168°	6.0NM	

CURRENT VNU PROFILE			
ACT VNU WPT 10000FT at OP SHN -3NM			
VS TGT	-1289FPM	FPA	-3.5°
VS REQ	-----FPM	V DEV	-----FT TOD 24:53

Figure 5-130 Vertical Guidance is Active to the FAF

- 14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -3.5 degrees and a required vertical speed is computed to maintain the -3.5 FPA. To change the vertical flight path, perform the following steps.
- Select the **VNV PROF** Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-131.
 - At this point, the descent vertical speed can be selected, or the FPA can be selected. Turn the large **FMS** Knob to select the desired selection field, then turn the small **FMS** Knob to enter the desired value.

Note the information now displayed in the 'CURRENT VNV PROFILE' box. Also, note the offset waypoint (orange box) and gray circle are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, vertical guidance is provided at the TOD that results in a -3.0 degree FPA descent to an altitude of 10,000 feet upon reaching the offset waypoint.

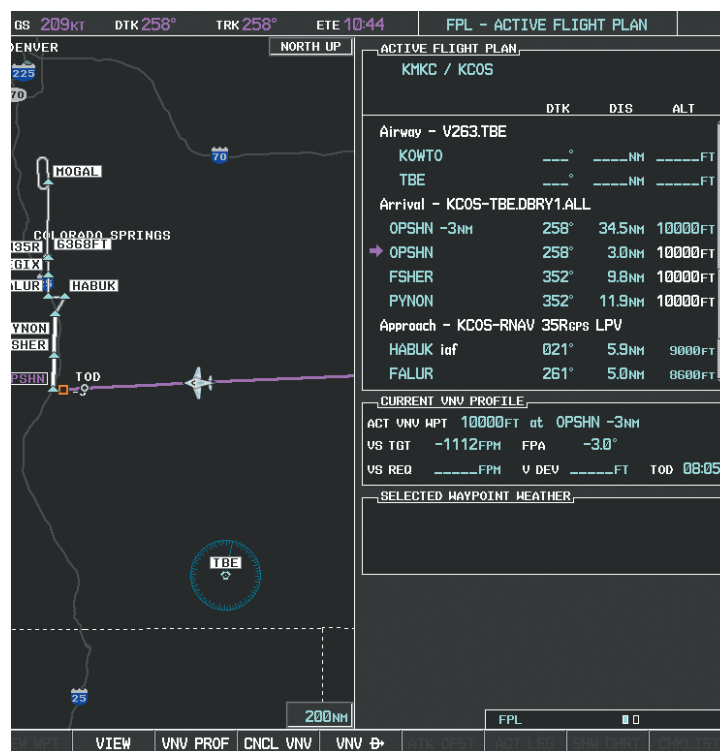


Figure 5-131 Adjusting the Descent

- Press the **ENT** Key.

- 15) As seen in Figure 5-132, the aircraft is approaching TOD. Note the target vertical speed required to reach the selected altitude. The Vertical Deviation Indicator (VDI) and the Required Vertical Speed Indicator (RVSI) are now displayed on the PFD as shown in Figure 5-133. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-133, and an aural alert 'Vertical track' will be heard.

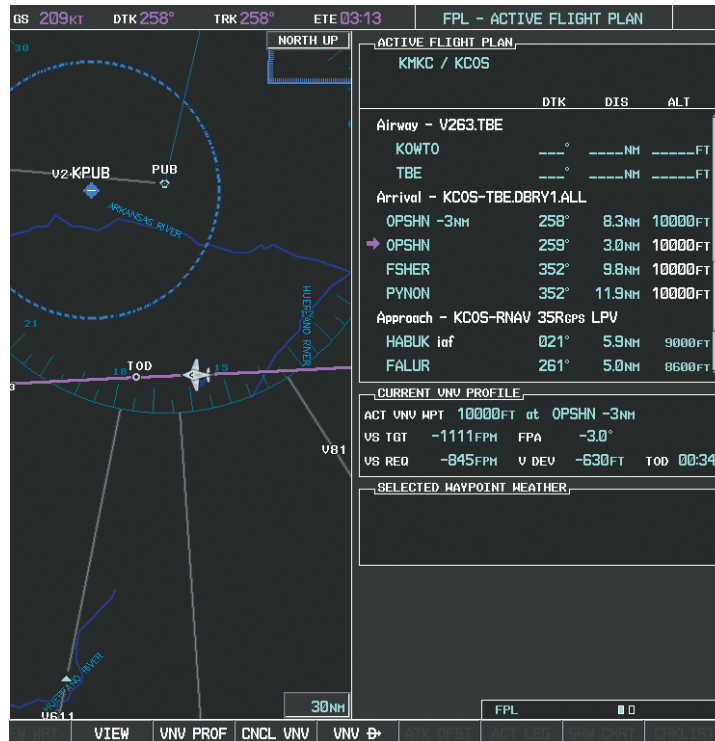


Figure 5-132 Approaching Top of Descent (TOD)

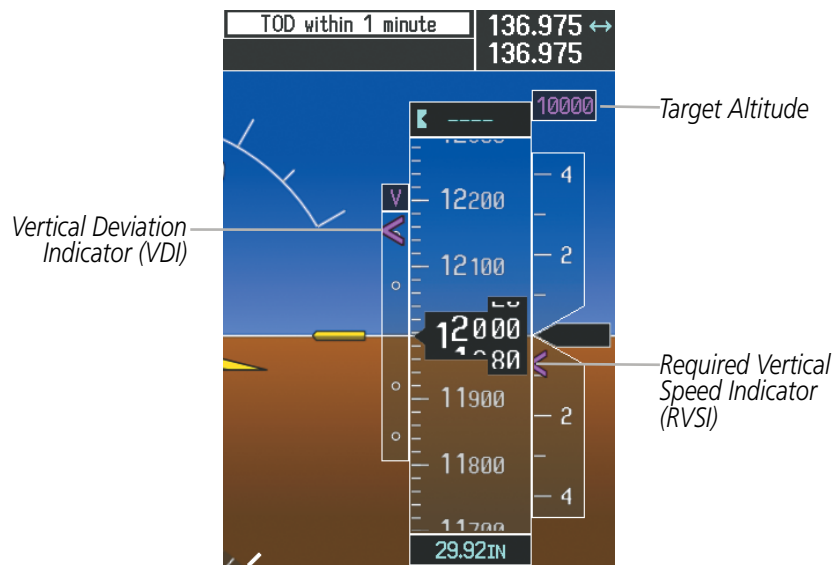


Figure 5-133 VDI & RVSI Upon Reaching Top of Descent (TOD)

- 16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-134.

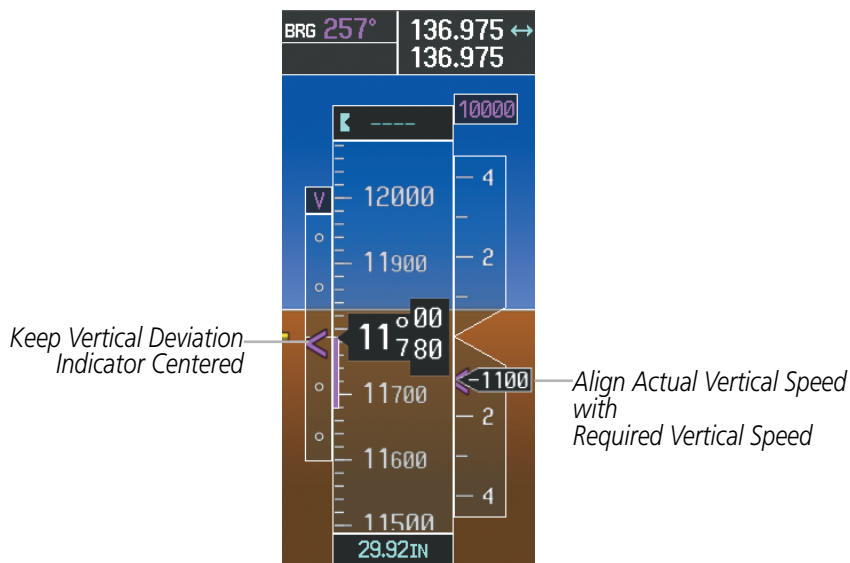


Figure 5-134 VDI & RVSI Showing Correctly Established Descent

- 17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-135. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

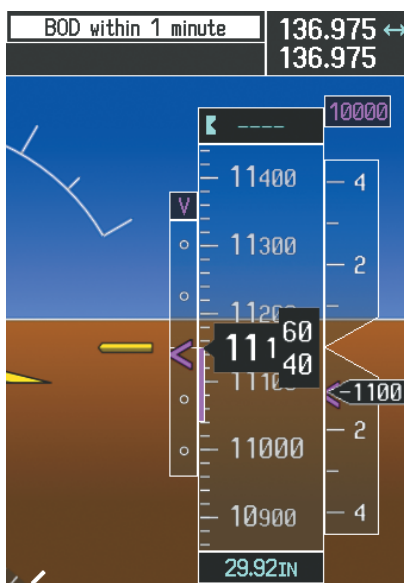


Figure 5-135 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

- 18) The aircraft is approaching OPSHN. The upcoming turn and next heading are annunciated at the top left of the PFD as seen in Figure 5-136. 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.

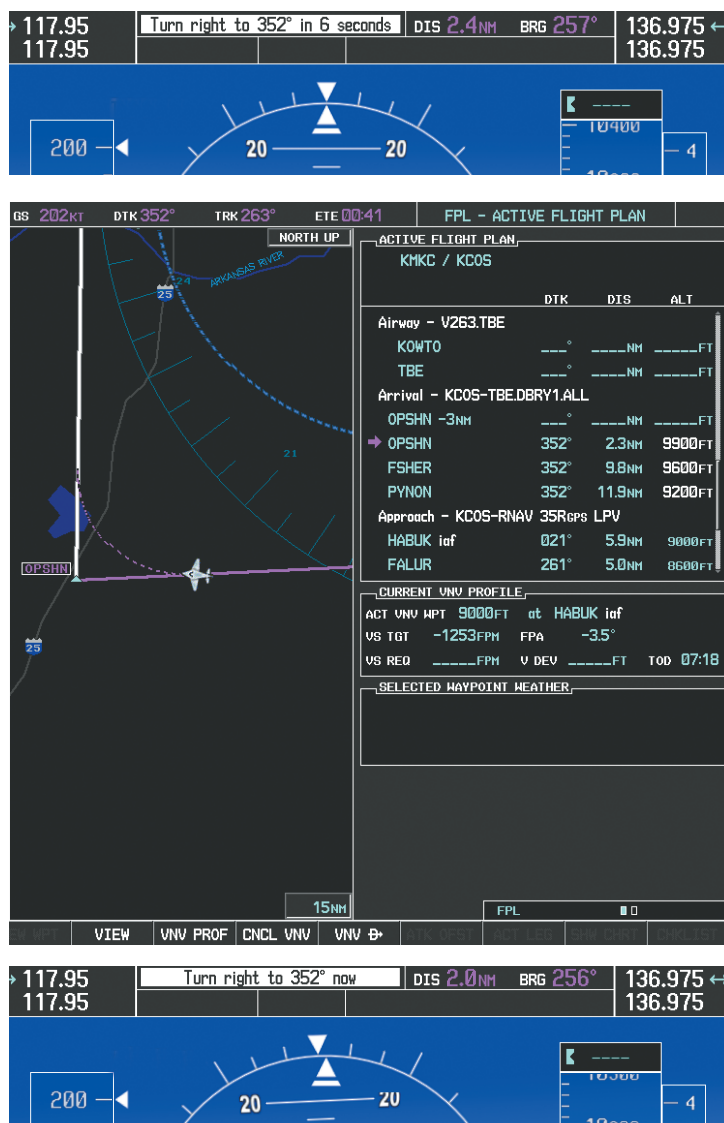


Figure 5-136 Turn to intercept OPSHN to FSHER Leg

- 19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-137. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.

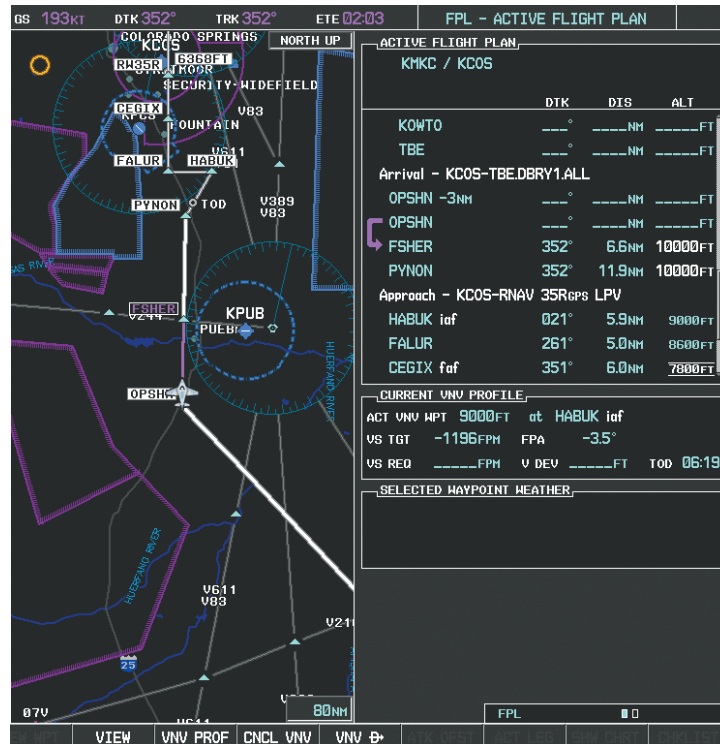


Figure 5-137 Tracking the OPSHN to FSHER Leg

- 20) The flight continues through the arrival procedure to PYNON (see Figure 5-138). At a point 31 nm from the destination airport, the phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

A descent to HABUK is in the next leg. Note the TOD point on the map. Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.

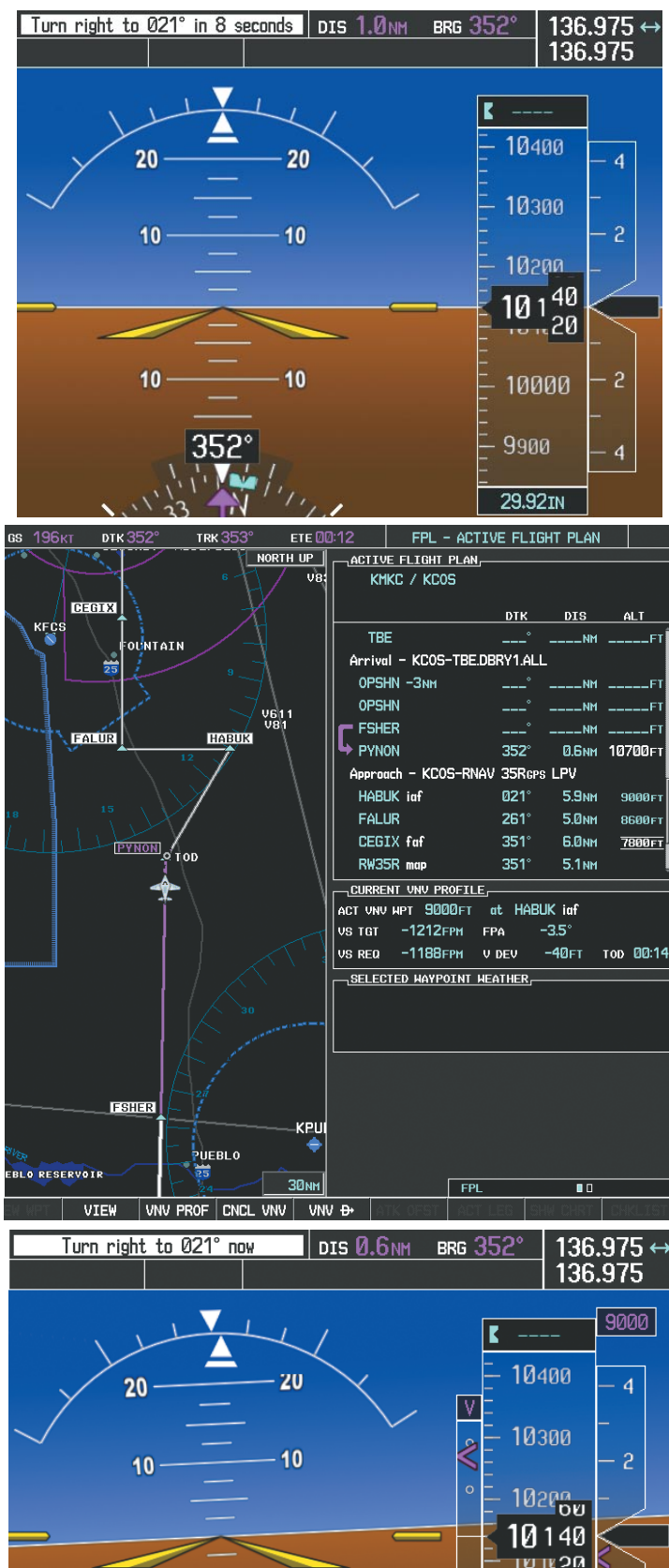


Figure 5-138 Approaching PYNON

- 21) Upon passing PYNON the approach procedure automatically becomes active. The approach may be activated at any point to proceed directly to the IAF. In this example, the aircraft has progressed through the final waypoint of the arrival and the flight plan has automatically sequenced to the IAF as the active leg, activating the approach procedure (see Figure 5-139).

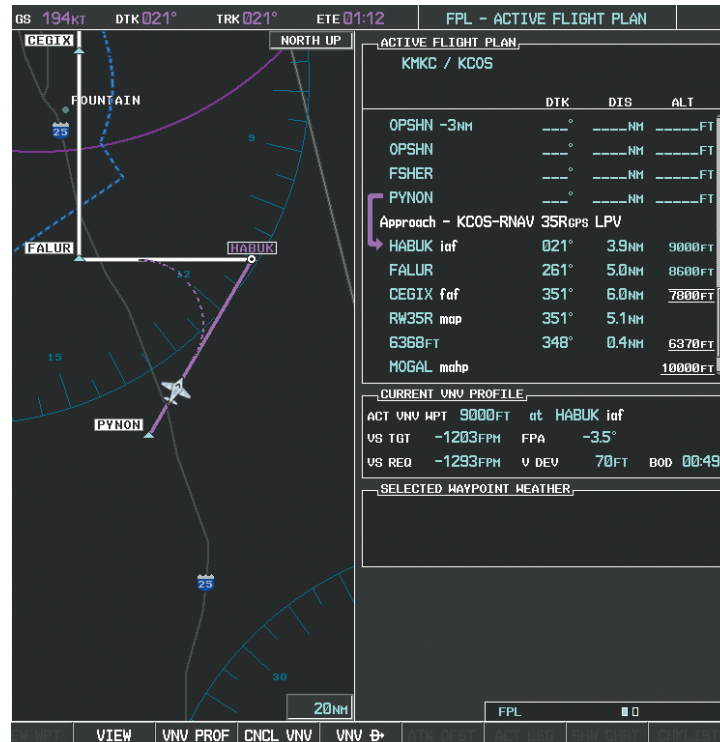


Figure 5-139 Approach is Now Active

Note: To manually activate the approach procedure, perform the following steps:

- Press the **PROC** Key.
- Turn the large **FMS** Knob to highlight 'ACTIVATE APPROACH' as shown in Figure 5-140.
- Press the **ENT** Key to activate the approach.

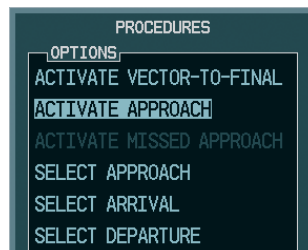


Figure 5-140 Manually Activate Approach

- 22) The IAF is the next waypoint. At the TOD, establish a descent vertical speed as previously discussed in Step 16. The aircraft altitude is 9,000 feet upon reaching HABUK.

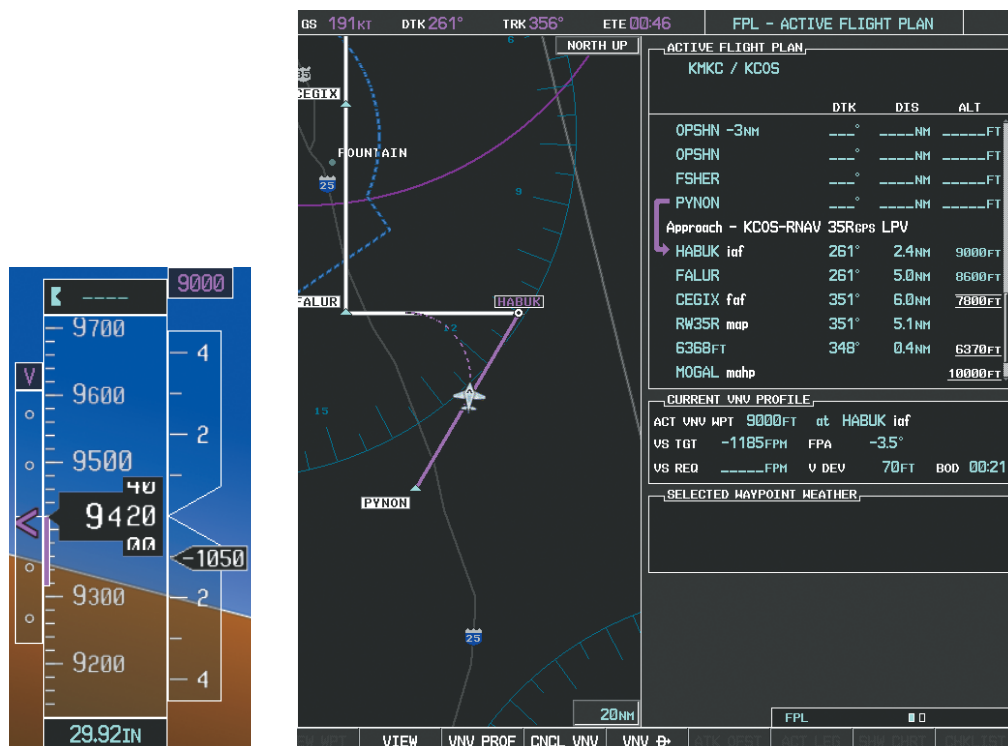


Figure 5-141 Descending Turn to the Initial Approach Fix (IAF)

- 23) After crossing FALUR the next waypoint is the FAF. The flight phase changes to LPV on the HSI indicating the current phase of flight is in Approach Mode and the approach type is LPV. CDI scaling changes accordingly and is used much like a localizer when flying an ILS approach. The RVSI is no longer displayed and the VDI changes to the Glidepath Indicator (as shown in Figure 5-142) when the final approach course becomes active.

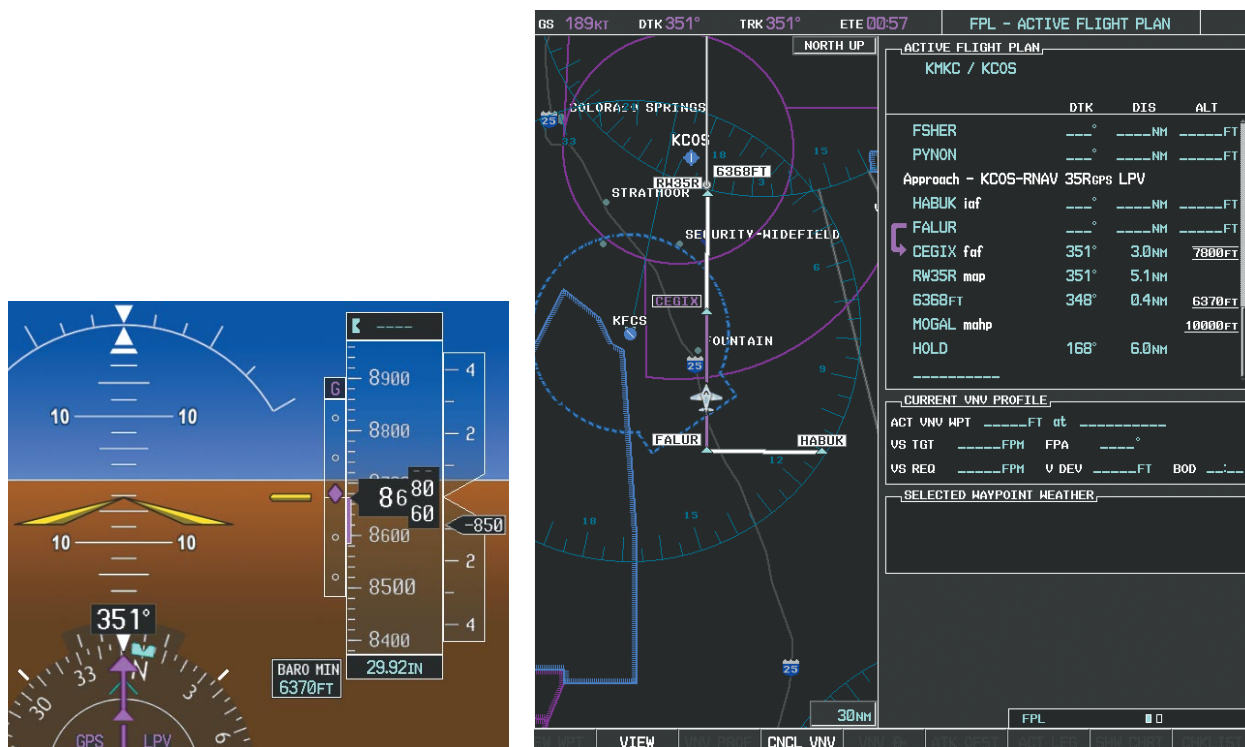


Figure 5-142 Descending to the FAF

The descent continues through the FAF (CEGIX) using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude "AT" 7,800 feet at the FAF. Note the altitude restriction lines over and under (At) the altitude in the 'ALT' field in Figure 5-142.

- 24) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to “AT or ABOVE” 6,370 feet at the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-143.

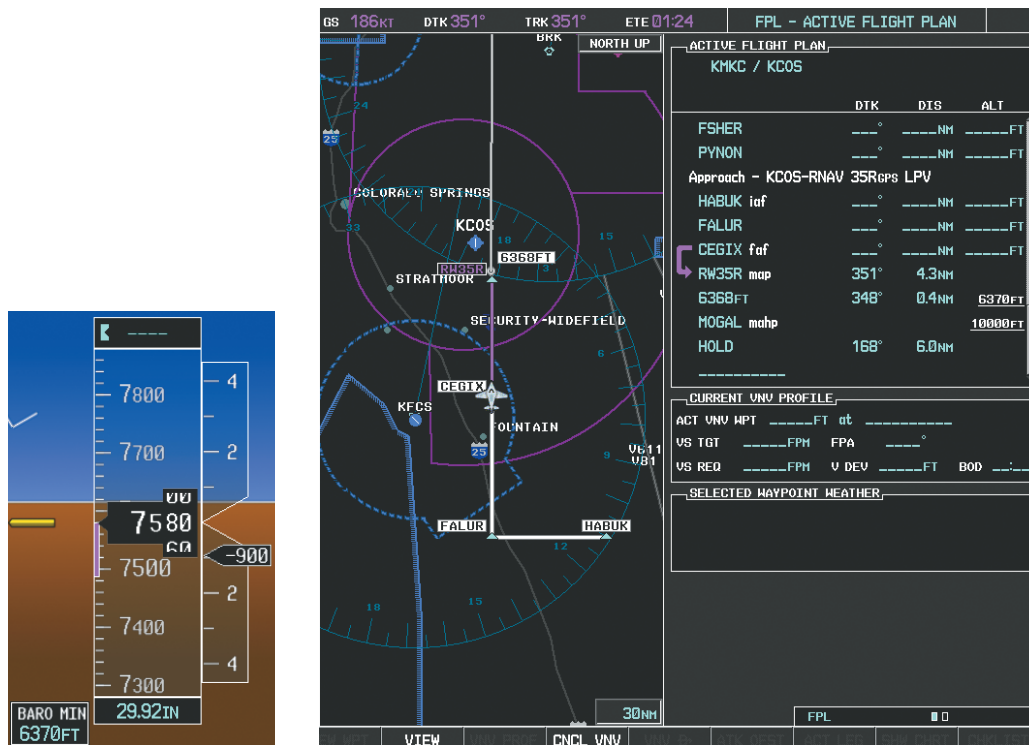


Figure 5-143 Descending to the Missed Approach Point

In this missed approach procedure, the altitude immediately following the MAP (in this case '6368ft') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by Jeppesen, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,368 feet is reached. After reaching 6,368 feet, a direct-to is established to the published MAHP (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (MOGAL) to begin the missed approach procedure.

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, a procedure may dictate a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would appear in the list of waypoints as '5500ft'. Again, if the aircraft altitude is lower than the prescribed altitude, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.

- 25) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Select the **SUSP** Softkey on the PFD to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to MOGAL, which is the Missed Approach Hold Point (MAHP) as seen in Figure 5-144. The aircraft is climbing to 10,000 feet. The CDI flight phase now changes from LPV to MAPR as seen on the HSI.

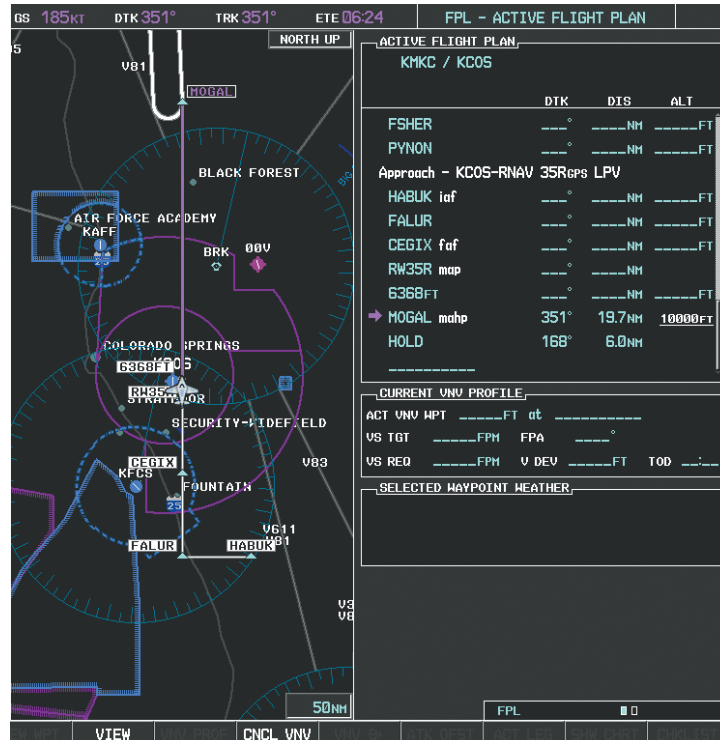


Figure 5-144 Missed Approach Active

- 26) The aircraft continues climbing to “AT or ABOVE” 10,000 feet at MOGAL. A holding pattern is established at the MAHP (MOGAL) as shown in Figure 5-145.

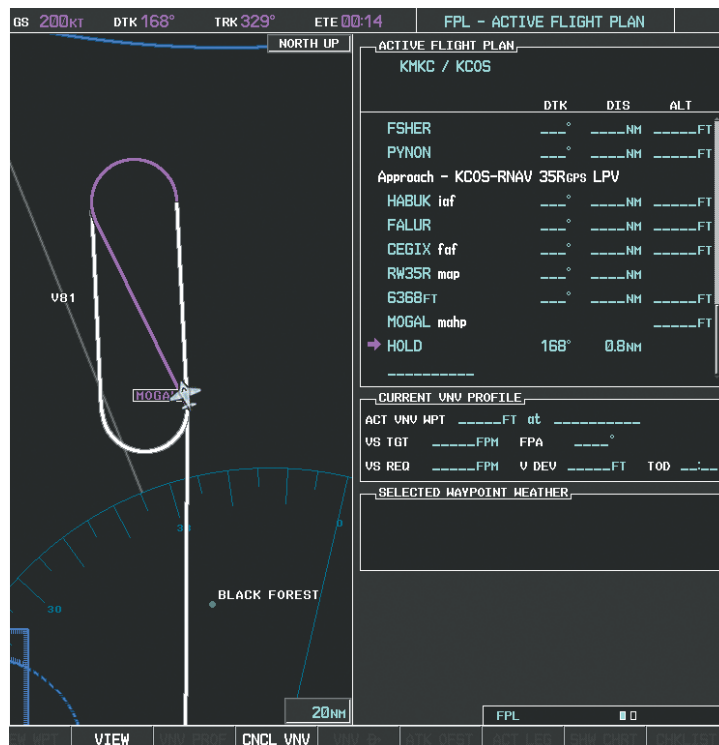


Figure 5-145 Establishing the Holding Pattern

- 27) The aircraft maintains 10,000 feet while following the magenta line through the hold as in Figure 5-146.

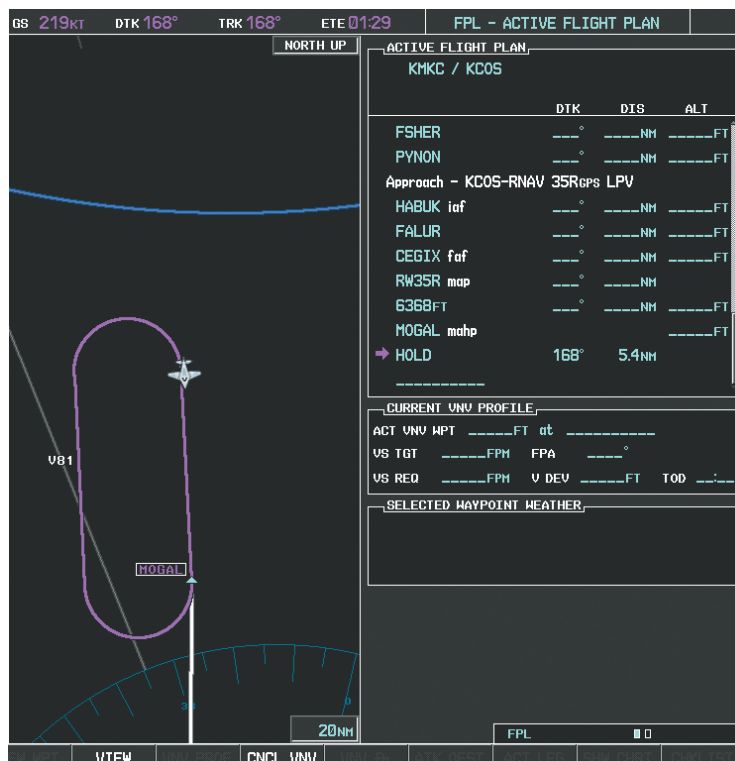


Figure 5-146 Hold Established

5.12 ABNORMAL OPERATION

This section discusses the Dead Reckoning mode of operation and the subsequent indications.



NOTE: *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the G1000 stops using GPS.*

While in Enroute or Oceanic phase of flight, if the G1000 detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the G1000 uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the G1000 in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the G1000 through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/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 G1000 by the appearance of the letters 'DR' superimposed in yellow over the 'own aircraft' symbol as shown in Figure 5-147. In addition, 'DR' is prominently displayed in yellow on the HSI slightly above and to the right of the aircraft symbol on the CDI as shown in Figure 5-147. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR Mode. The autopilot will remain coupled in DR mode as long as the deviation info is available (20 min.) Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the PFD. Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as yellow text on the display to denote degraded navigation source information as shown in Figure 5-147.

Also, while the G1000 is in DR Mode, some terrain functions are not available. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

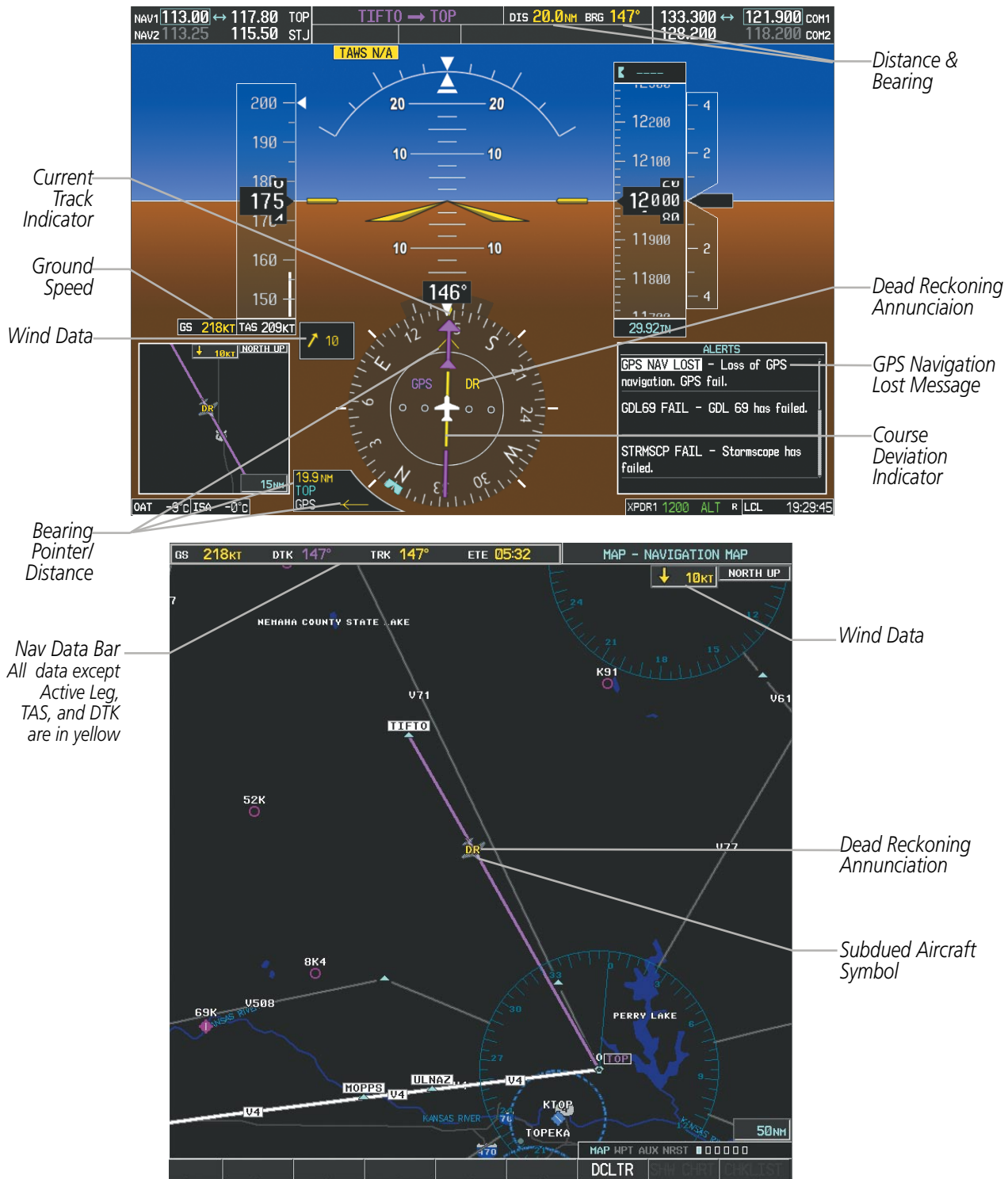


Figure 5-147 Dead Reckoning Mode - GPS Derived Data Shown in Yellow



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

SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the G1000 are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- GDL 69/69A XM® Satellite Weather (Subscription optional)
- GSR 56 GFDS Worldwide Weather (Optional)
- GWX 68 Airborne Color Weather Radar
- L-3 STORMSCOPE® WX-500 Series II Weather Mapping Sensor (Optional)

Terrain Avoidance

- TAWS-B (Terrain Awareness Warning System - TSO-C151b certified)
- Profile View Terrain (standard with TAWS-B)
- TAWS-A (Terrain Awareness Warning System - TSO-C151b and TSO-92c certified) (Optional)

Traffic

- Traffic Information Service (TIS)
- Garmin GTS 820 Traffic Advisory System (TAS) (Optional)
- Garmin GTS 850 Traffic Alert and Collision Avoidance System (TCAS) (Optional)
- L-3 SKYWATCH® SKY 497 TAS (Optional)
- L-3 SKYWATCH® HP SKY 899 TAS/TCAS (Optional)
- Honeywell® KTA 870 Traffic Advisory System (TAS) (Optional)

6.1 XM SATELLITE WEATHER



NOTE: XM Satellite Weather data provides information for avoiding hazardous weather. Do not utilize XM Weather information to penetrate hazardous weather.

XM Satellite Weather is provided through the GDL 69A, a remote-mounted data-link satellite receiver. Received graphical weather information and associated text is displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69A can also receive XM Satellite Radio® entertainment services. Both weather data and entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

XM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.xmradio.com.

ACTIVATING SERVICES

Before XM Satellite Weather can be used, the service must be activated. Service is activated by providing XM Satellite Radio with coded IDs unique to the installed GDL 69A. XM Satellite Radio and XM Satellite Weather

services each have coded IDs. The Data and Audio Radio IDs must be provided to XM Satellite Radio to activate the weather service and entertainment subscriptions, respectively. These IDs are located on:

- The label on the back of the Data Link Receiver
- The XM Information Page on the MFD (Figure 6-1)
- The XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Audio and Data Radio IDs cannot be located.

XM Satellite Radio uses the coded IDs to send an activation signal that allows the G1000 to display weather data and/or entertainment programming provided through the GDL 69A.

Activating XM Satellite Weather and XM Satellite Radio services:

- 1) Contact XM Satellite Radio by email (address listed on their website, www.xmradio.com) or by the customer service phone number listed on the website. Follow the instructions provided by XM Satellite Radio services.
- 2) Select the XM page in the Auxiliary Page Group.
- 3) Select the **INFO** Softkey to display the XM Information Page (if page is not already displayed).
- 4) Verify that the desired services are activated.
- 5) Select the **LOCK** Softkey.
- 6) Turn the large **FMS** Knob to highlight 'YES'.
- 7) To complete activation, press the **ENT** Key

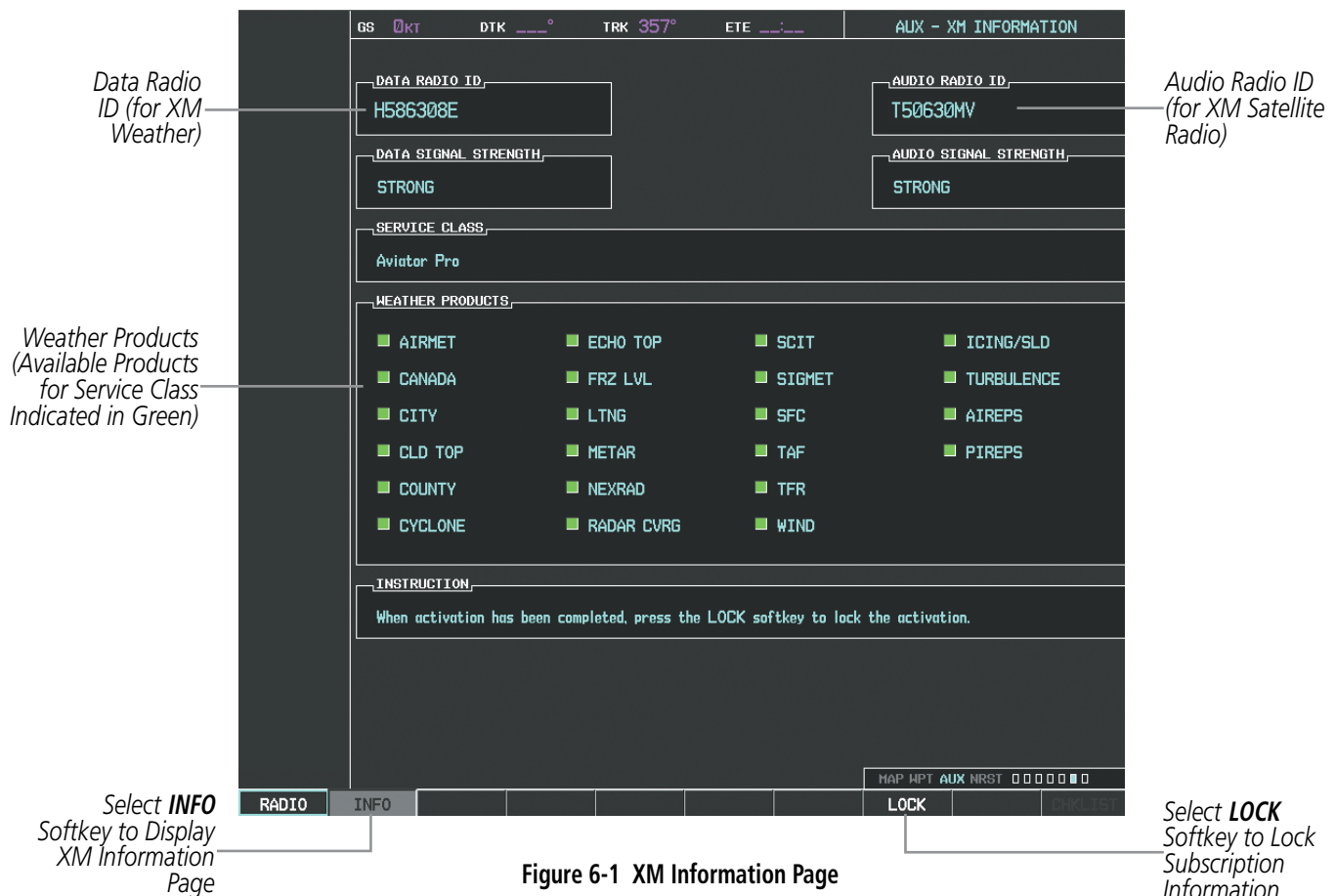


Figure 6-1 XM Information Page

USING XM SATELLITE WEATHER PRODUCTS

The primary map for viewing XM Weather data is the Weather Data Link Page in the Map Page Group. This is the only G1000 map display capable of showing information for all available XM weather products.

Viewing the Weather Data Link Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Weather Data Link Page.

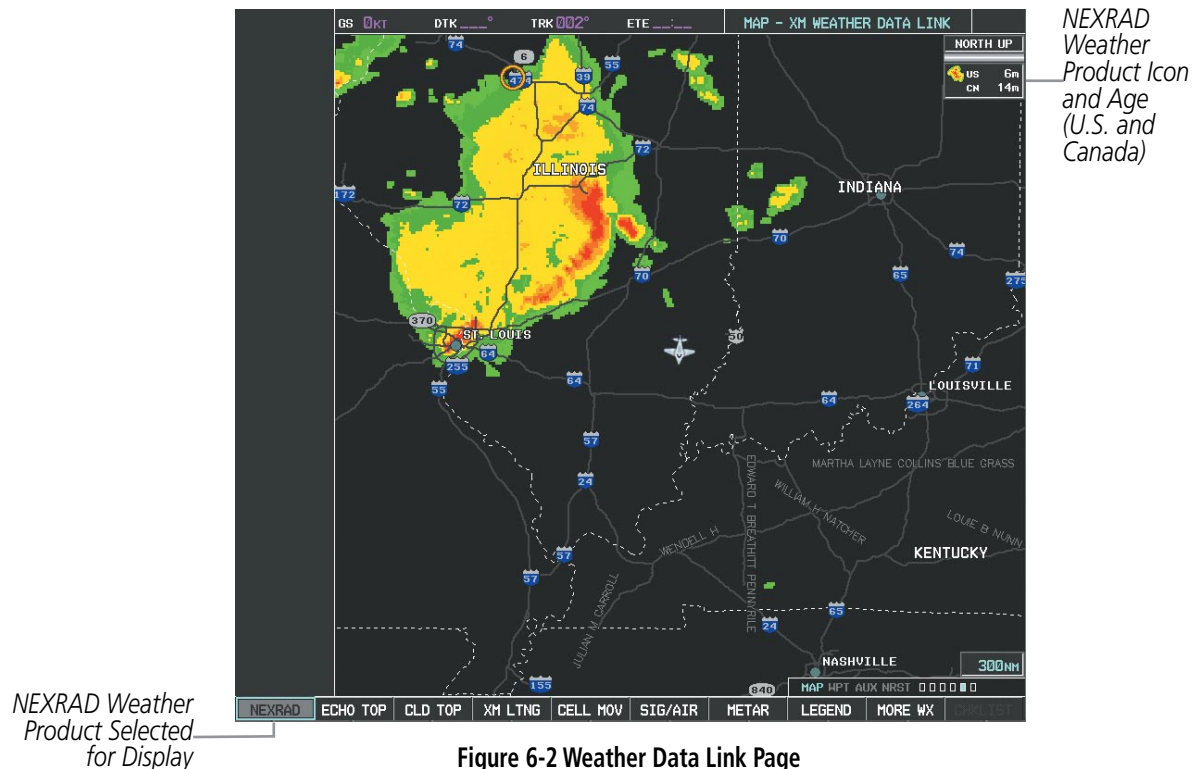


Figure 6-2 Weather Data Link Page

When a weather product is active on the Weather Data Link Page or the Navigation Map Page, the age of the data is displayed on the screen next to the weather product icon (Figure 6-2). The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-1).

If for any reason, a weather product is not refreshed within the designated **Expiration Time** intervals (see Table 6-1), the data is considered expired and is removed from the display, and the product age display is replaced by dashes. This ensures that the displayed data is consistent with what is currently being broadcast by XM Satellite Radio services. If more than half of the expiration time has elapsed, the color of the product age changes to yellow. If no data is available for a weather product, 'N/A' is displayed next to the weather product icon.

Table 6-1 shows the weather product symbols, the expiration time and the refresh rate. The refresh rate represents the interval at which XM Satellite Radio broadcasts new signals that may or may not contain new weather data. It does not represent the rate at which weather data is updated or new content is received by the Data Link Receiver. Weather data is refreshed at intervals that are defined and controlled by XM Satellite Radio and its data vendors.

Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
NEXRAD		30	5 (U.S.) 10 (Canada)
Cloud Top (CLD TOP)		60	15
Echo Top (ECHO TOP)		30	7.5
XM Lightning (LTNG)		30	5
Cell Movement (CELL MOV)		30	1.25
SIGMETs/AIRMETs (SIG/AIR)		60	12
METARs		90	12
City Forecast (CITY)		90	12
Surface Analysis (SFC)		60	12
Freezing Levels (FRZ LVL)		60	12
Winds Aloft (WIND)		60	12
County Warnings (COUNTY)		60	5
Cyclone Warnings (CYCLONE)		60	12
Icing Potential (CIP and SLD) (ICNG)		90	22
Pilot Weather Report (PIREPs)		90	12
Air Report (AIREPs)		90	12
Turbulence (TURB)		180	12
Radar Coverage Not Available	No product image	30	5
TFRs	No product image	60	12
TAFs	No product image	60	12

Table 6-1 Weather Product Symbols and Data Timing

Table 6-2 shows which XM products can be displayed (indicated with a ‘+’ symbol) on specific maps.

Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link Page	Weather Information Page	AUX - Trip Planning Page	Nearest Page Group	Flight Plan Pages
NEXRAD	+	+	+		+	+	+
Cloud Top (CLD TOP)			+				
Echo Top (ECHO TOP)			+				
XM Lightning (LTNG)	+	+	+		+	+	+
Cell Movement (CELL MOV)		+	+		+		
SIGMETs/AIRMETs (SIG/AIR)			+				
METARs	+	+	+	+	+	+	+
City Forecast (CITY)			+				
Surface Analysis (SFC)			+				
Freezing Levels (FRZ LVL)			+				
Winds Aloft (WIND)			+				
County Warnings (COUNTY)			+				
Cyclone Warnings (CYCLONE)			+				
Icing Potential (ICNG)			+				
PIREPs			+	+			
AIREPs			+	+			
Turbulence (TURB)			+				
Radar Coverage		+	+				
TFRs	+	+	+	+	+	+	+
TAFs			+	+			

Table 6-2 Weather Product Display Maps

WEATHER SOFTKEYS ON THE WEATHER DATA LINK PAGE

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-3 shows the weather product softkeys for the Weather Data Link Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product is enabled. Unavailable weather products have subdued softkey labels (softkeys are disabled from selection).

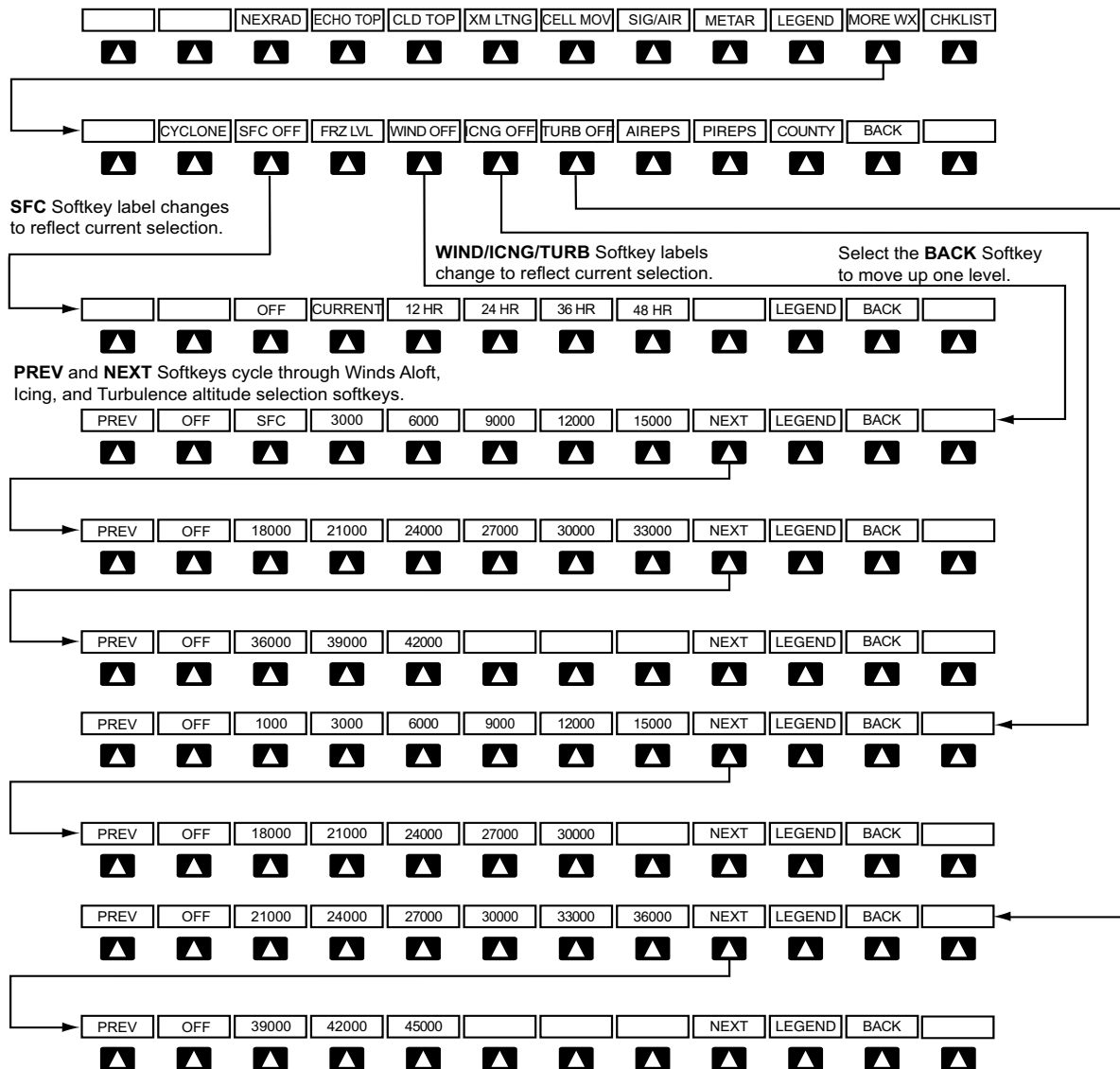


Figure 6-3 Weather Data Link Weather Product Softkeys

The setup menus for the Navigation Map Page and the Weather Data Link Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the Weather Data Link Page:

- 1) Select the Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-4).
- 4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1' or 'PRODUCT GROUP 2', and press the **ENT** Key (Figure 6-5).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link Page with the changed settings.



Figure 6-4 Weather Data Link Page Menu

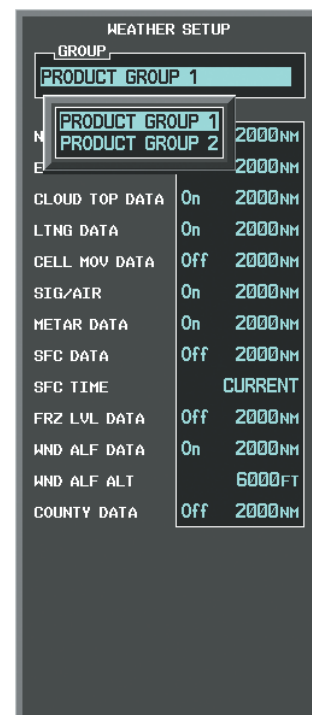


Figure 6-5 Weather Data Link Page Setup Menu

Restoring default Weather Data Link Page settings:

- 1) Select the Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key.
- 4) Press the **MENU** Key.
- 5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

Maps besides the Weather Data Link Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing weather data for the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-6).
- 4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-7).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-8).
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

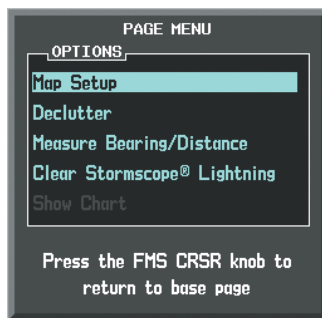


Figure 6-6 Navigation Map Page Menu



Figure 6-7 Navigation Map Page Setup Menu

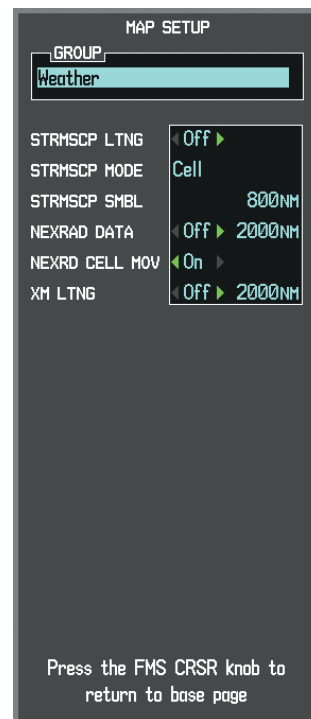


Figure 6-8 Navigation Map Page Setup Menu, Weather Group

Each active weather product has an associated legend which can be displayed on the Weather Data Link Page.

Viewing legends for displayed weather products

- 1) Select the Weather Data Link Page.
- 2) Select the **LEGEND** Softkey to display the legends for the displayed weather products.
- Or:
 - a) Press the **MENU** Key.
 - b) Select 'Weather Legend' and press the **ENT** Key.
- 3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
- 4) To remove the Legend Window, select the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Echo Tops
- Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- AIREPs
- PIREPs

The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

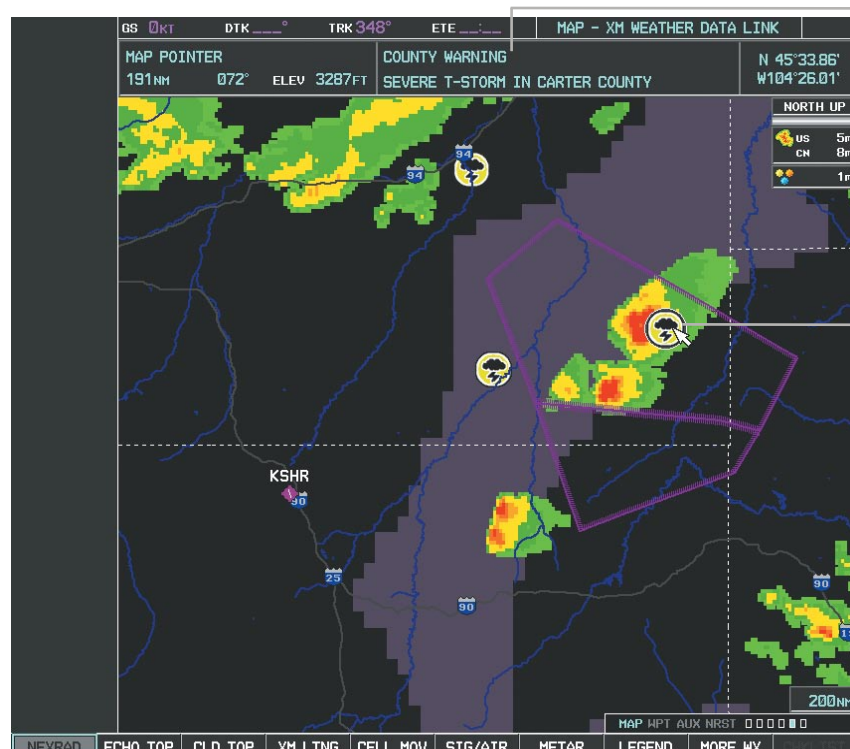


Figure 6-9 Panning on the Weather Data Link Page

NEXRAD



NOTE: NEXRAD data cannot be displayed at the same time as terrain, echo tops, icing, turbulence, or Stormscope.

WSR-88D, or NEXRAD (NEXt-generation RADar), is a network of 158 high-resolution Doppler radar systems that are operated by the National Weather Service (NWS). NEXRAD data provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD radar site is 250 nm. In addition to a wide array of services, the NEXRAD network provides important information about severe weather for air traffic safety.

NEXRAD data is not real-time. The lapsed time between collection, processing, and dissemination of NEXRAD images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only. Never use NEXRAD data or any radar data to penetrate hazardous weather.

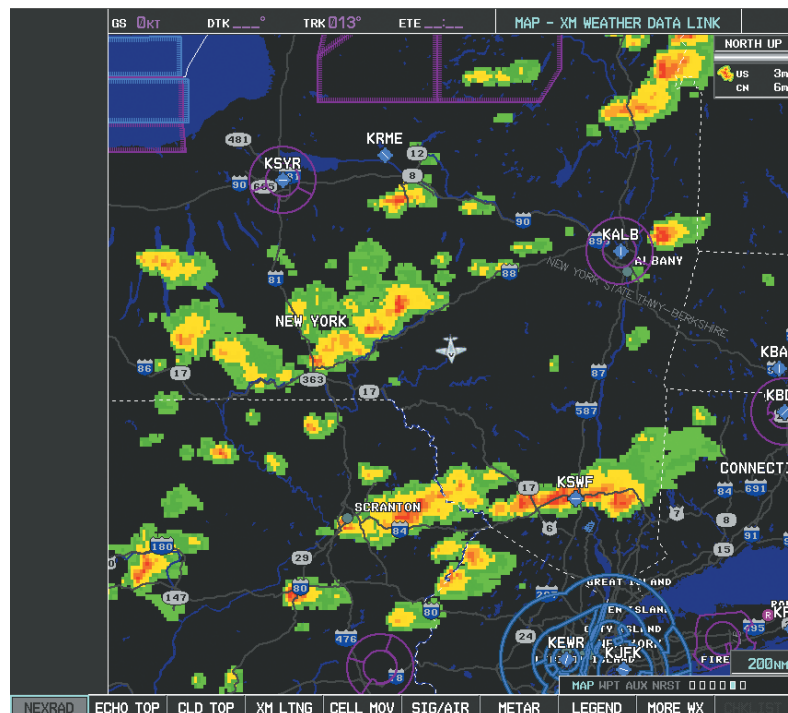


Figure 6-10 NEXRAD Data on the Weather Data Link Page

NEXRAD data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying NEXRAD weather information:

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the Weather Data Link Page.
- 2) Select the **NEXRAD** Softkey.

Composite data from all the NEXRAD radar sites in the United States is shown. This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Weather Data Link Page. For the NEXRAD legend (Figure 6-11), select the **LEGEND** Softkey when NEXRAD is selected for display.

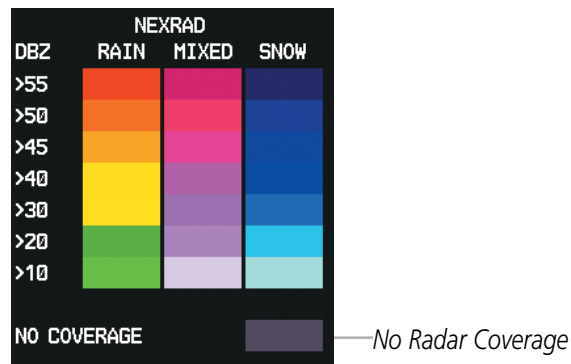


Figure 6-11 NEXRAD Data with Legend

The display of radar coverage is always active when either NEXRAD or ECHO TOPS is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in gray shade of purple.

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD LIMITATIONS

NEXRAD radar images may have certain limitations:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.
- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area (Figure 6-12).

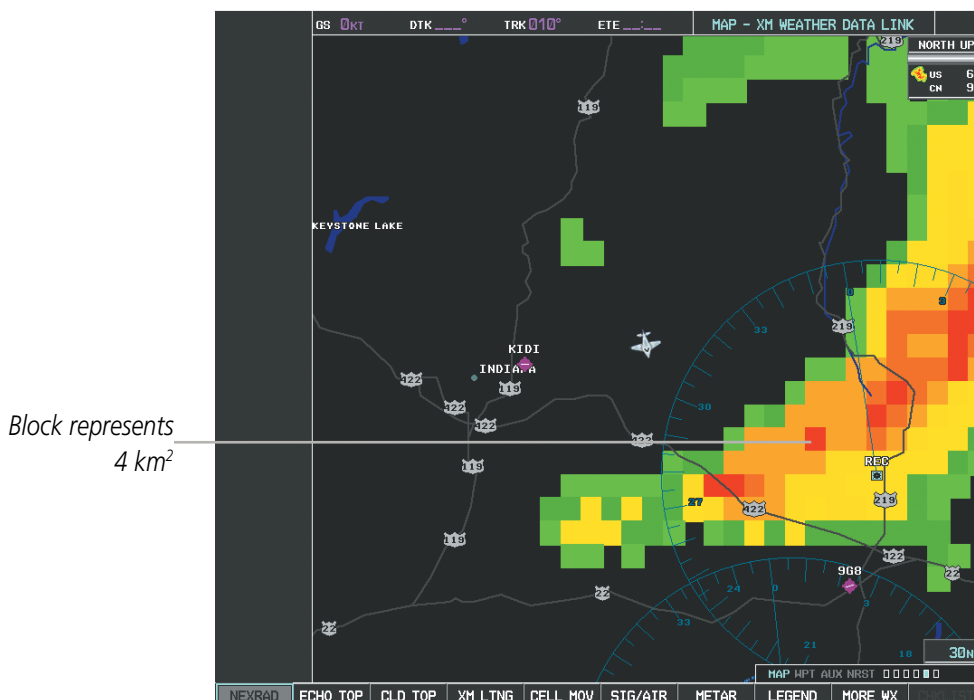


Figure 6-12 NEXRAD Data - Zoomed

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

NEXRAD LIMITATIONS (CANADA)

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed because the type is unknown.

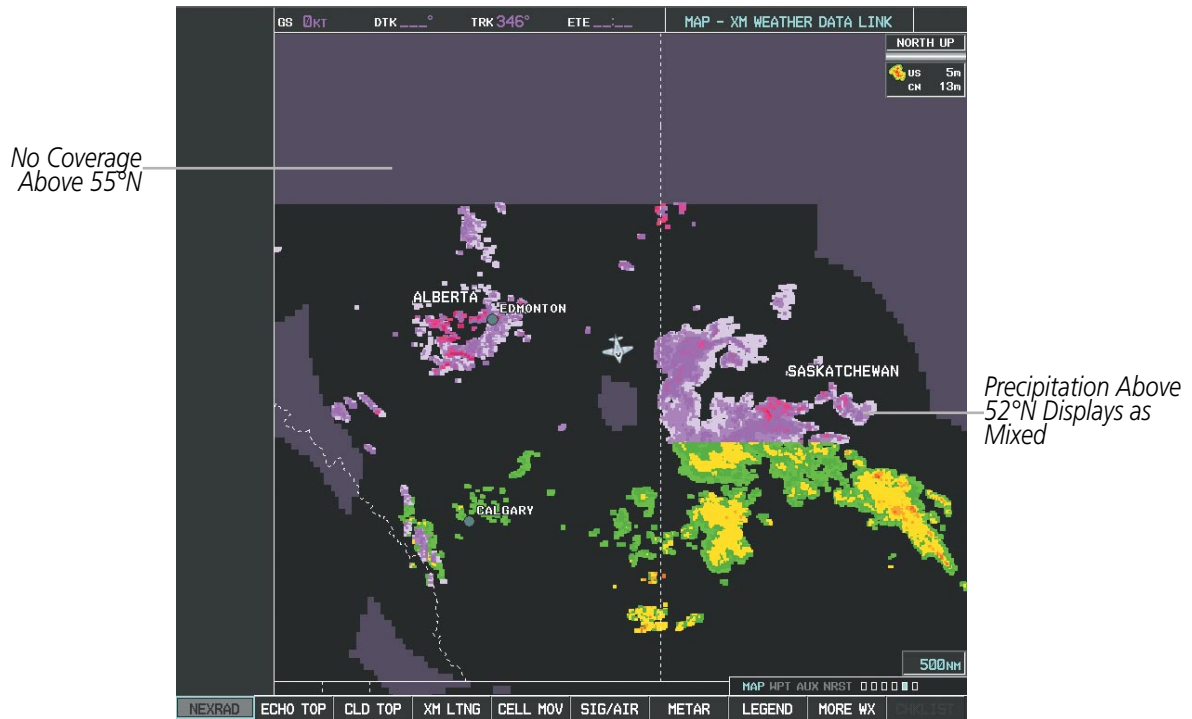


Figure 6-13 NEXRAD Data - Canada

ECHO TOPS



NOTE: Echo Tops cannot be displayed at the same time as Cloud Tops or NEXRAD data is displayed.

Echo Tops data (Figure 6-14) shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

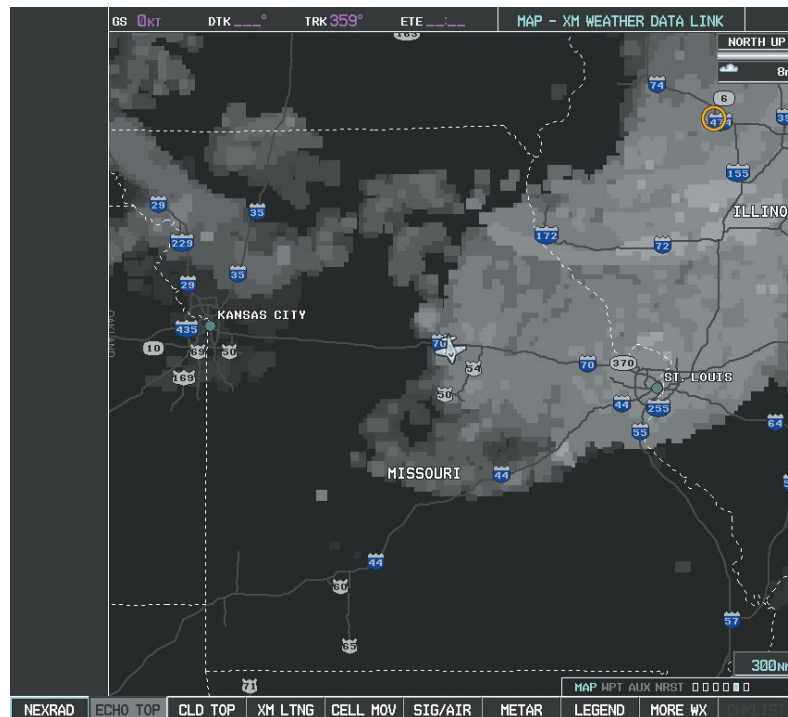


Figure 6-14 Echo Tops Data

Displaying Echo Tops information:

- 1) Select the XM Weather Data Link Page.
- 2) Press the **ECHO TOPS** Softkey.

To display the Echo Tops legend (Figure 6-15), select the **LEGEND** Softkey when Echo Tops is selected for display. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is activated, NEXRAD and Cloud Tops data are removed.

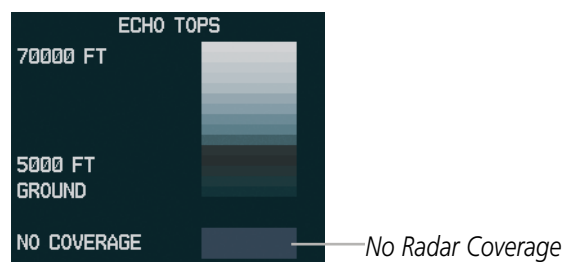


Figure 6-15 Echo Tops Legend

CLOUD TOPS



NOTE: *Cloud Tops and Echo Tops cannot be displayed at the same time.*

Cloud Tops data (Figure 6-16) depicts cloud top altitudes as determined from satellite imagery.

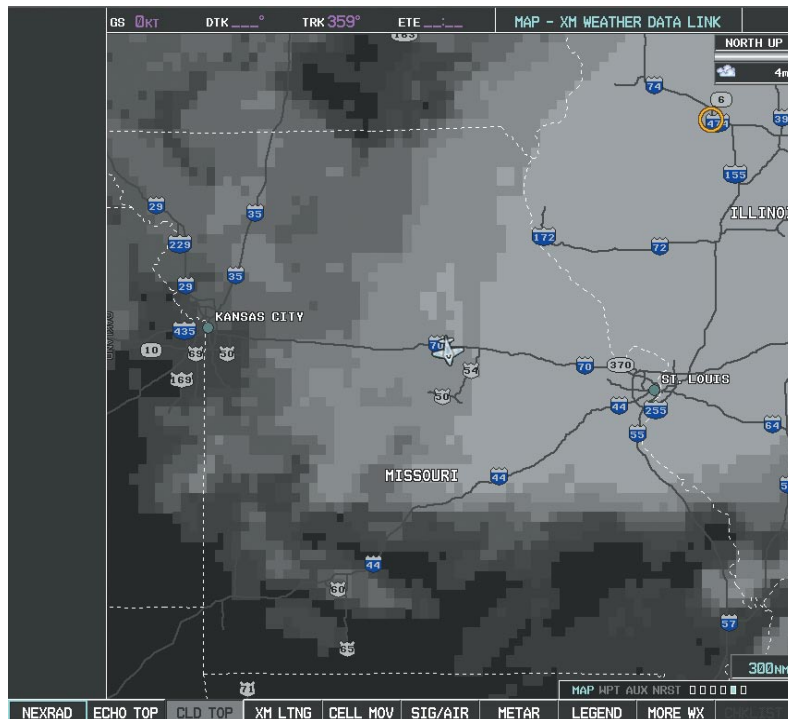


Figure 6-16 Cloud Tops Data

Displaying Cloud Tops information:

- 1) Select the XM Weather Data Link Page with the **FMS** Knob.
- 2) Select the **CLD TOP** Softkey.

To display the Cloud Tops legend (Figure 6-17), select the **LEGEND** Softkey when Cloud Tops is selected for display. Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated, Echo Tops data is removed.

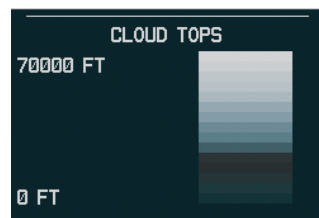


Figure 6-17 Cloud Tops Legend

XM LIGHTNING



NOTE: XM Lightning and optional L-3 STORMSCOPE® WX-500 Lightning cannot be displayed at the same time.

Lightning data (Figure 6-18) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

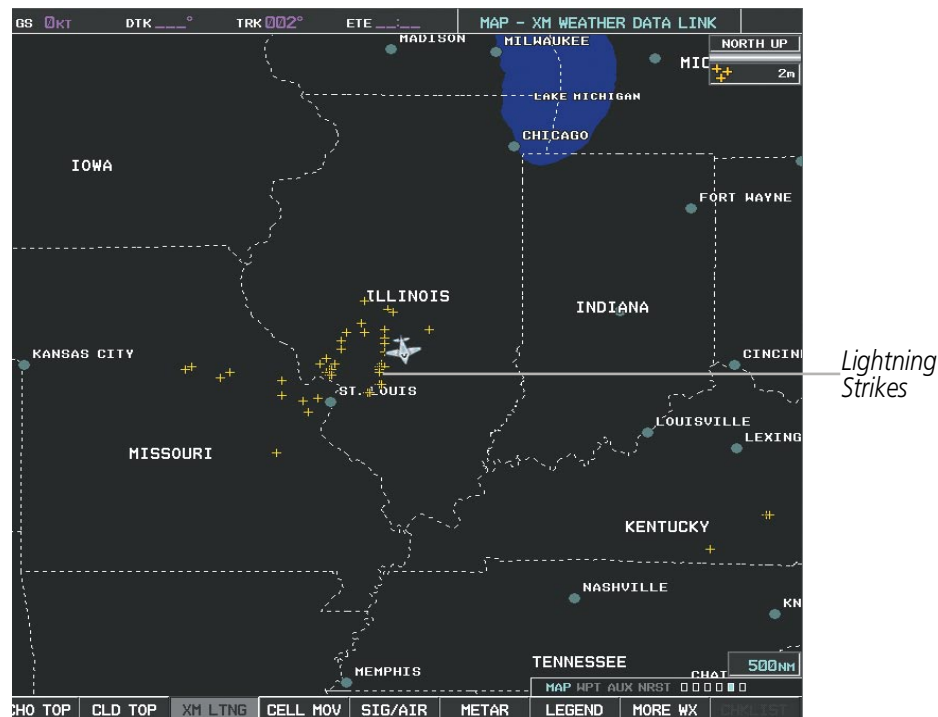


Figure 6-18 Lightning Data

XM Lightning data displays on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying XM Lightning information:

- 1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the XM Weather Data Link Page.
- 2) Press the **XM LTNG** Softkey (**LTNG** Softkey on the XM Weather Data Link Page).

To display the XM Lightning legend on the XM Weather Data Link Page (Figure 6-19), select the **LEGEND** Softkey when XM Lightning is selected for display.

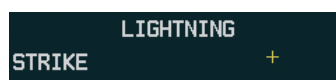


Figure 6-19 Lightning Legend

CELL MOVEMENT

Cell Movement data (Figure 6-20) shows the location and movement of storm cells as identified by the ground-based system. Cells are represented by yellow squares, with direction of movement indicated with short, orange arrows.

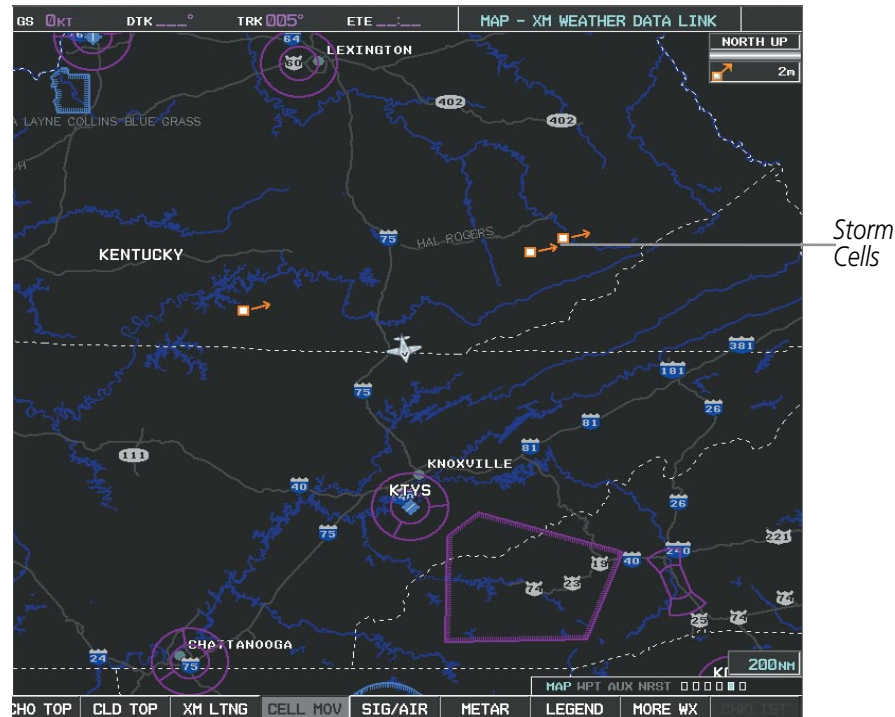


Figure 6-20 Cell Movement Data

On most applicable maps, Cell Movement data is selected for display along with NEXRAD. On the XM Weather Data Link Page, Cell Movement data can be selected independently. Cell Movement data can be displayed on the following maps:

- Navigation Map
- Nearest Pages
- AUX - Trip Planning Page
- Weather Data Link Page

Displaying Cell Movement information:

- 1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the XM Weather Data Link Page.
- 2) Press the **NEXRAD** Softkey (**CEL MOV** Softkey on the XM Weather Data Link Page). For Cell Movement to be displayed on maps other than the XM Weather Data Link Page, Cell Movement must be turned on in the Navigation Map Setup Menu (see "Setting Up XM Satellite Weather").

To display the Cell Movement legend on the XM Weather Data Link Page, (Figure 6-21), select the **LEGEND** Softkey when Cell Movement is selected for display.

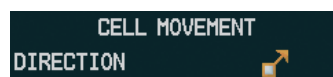


Figure 6-21 Cell Movement Legend

SIGMETS AND AIRMETS

SIGMET (SIGNificant METeorological Information) and AIRMET (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

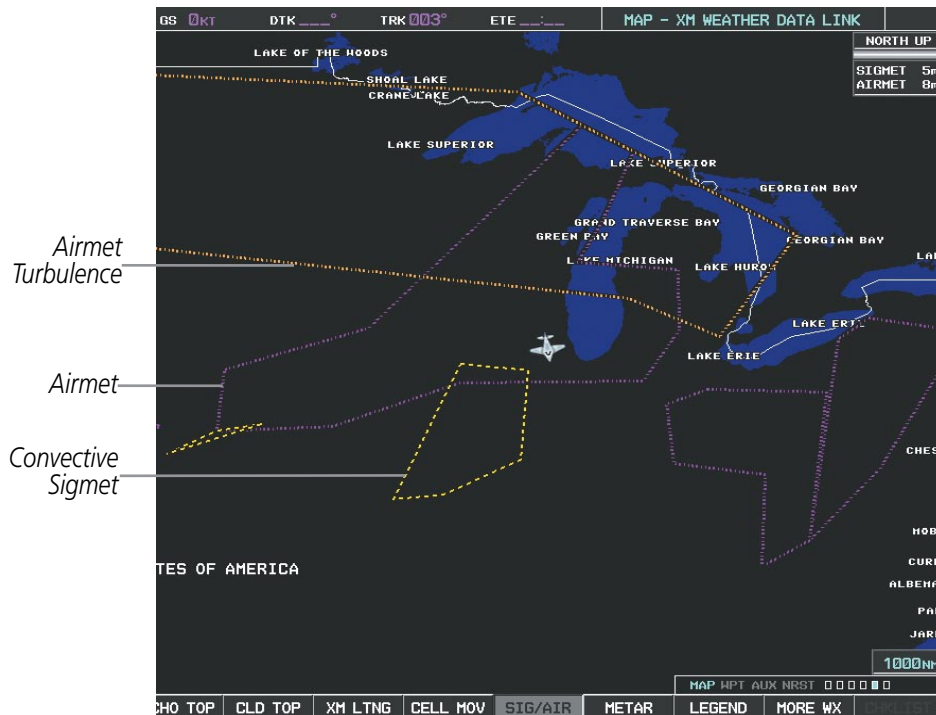


Figure 6-22 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

- 1) Select the XM Weather Data Link Page.
- 2) Press the **SIG/AIR** Softkey.
- 3) To view the text of the SIGMET or AIRMET, press the **RANGE** Knob and move the Map Pointer over the icon.
- 4) Press the **ENT** key. Figure 6-23 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-23), select the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.

```

INFORMATION
SIGMET / AIRMET
CONVECTIVE SIGMET
76CVALID UNTIL
2055ZLA AND MS LA
CSTL WTRSFROM 20SSE
LCH-40SSW BTR-60E
LEVLINE TS 40 NM
WIDE MOV LTL TOPS
TO FL420.HAIL TO 1.5
IN..WIND GUSTS TO
50KT POSS..
  
```

Sample SIGMET Text

```

SIGMET / AIRMET
SIGMET -----
LOCALIZED SIGMET  ◆
ICING               ■■■■■■■■
TURBULENCE         ■■■■■■■■
IFR                 ■■■■■■■■
MTN OBSCR          ■■■■■■■■
SURFACE WINDS      ■■■■■■■■
  
```

SIGMET/AIRMET Legend

Figure 6-23 SIGMET/AIRMET Text and Legend

METARS AND TAFS



NOTE: Atmospheric pressure as reported for METARs is given in hectopascals (hPa), except for in the United States, where it is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.



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

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports that provide them.

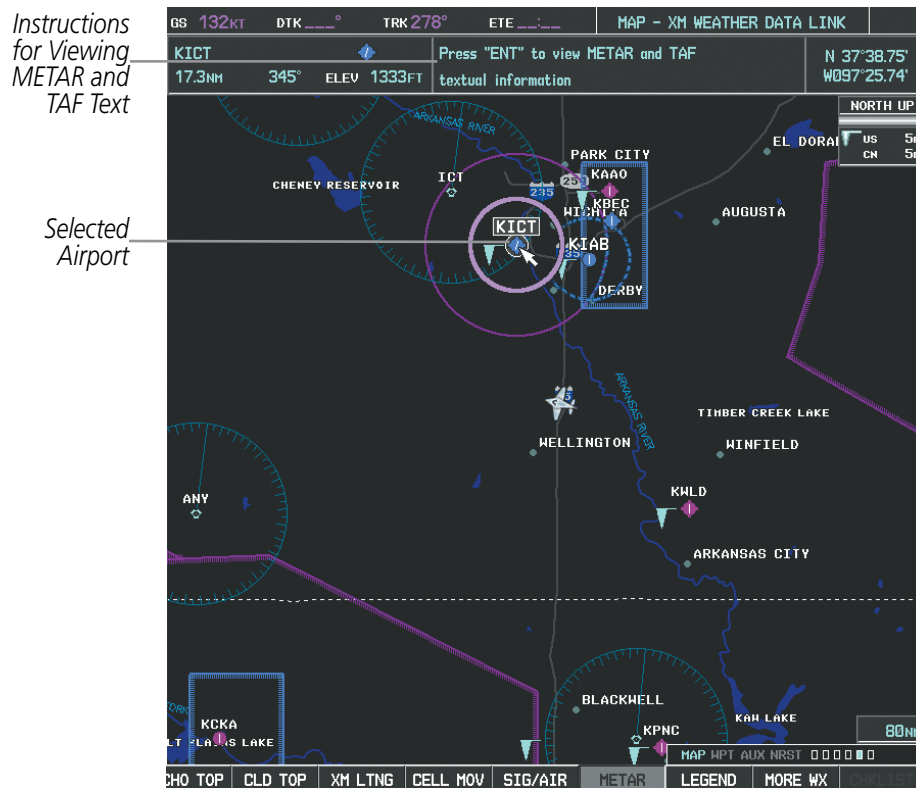


Figure 6-24 METAR Flags on the Weather Data Link Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, then as raw text. TAF information is displayed only in its raw form when it is available

Displaying METAR and TAF text:

- 1) On the XM Weather Data Link Page, select the **METAR** Softkey.
- 2) Press the **RANGE** Knob and pan to the desired airport.
- 3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
- 5) Press the **FMS** Knob or the **CLR** Key to return to the XM Weather Data Link Page.

Or:

- 1) Select the Weather Information Page.
 - a) Turn the large **FMS** Knob to select the Waypoint Page Group.
 - b) Press the **WX** Softkey to select the Weather Information Page.
- 2) Press the **FMS** Knob to display the cursor.
- 3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

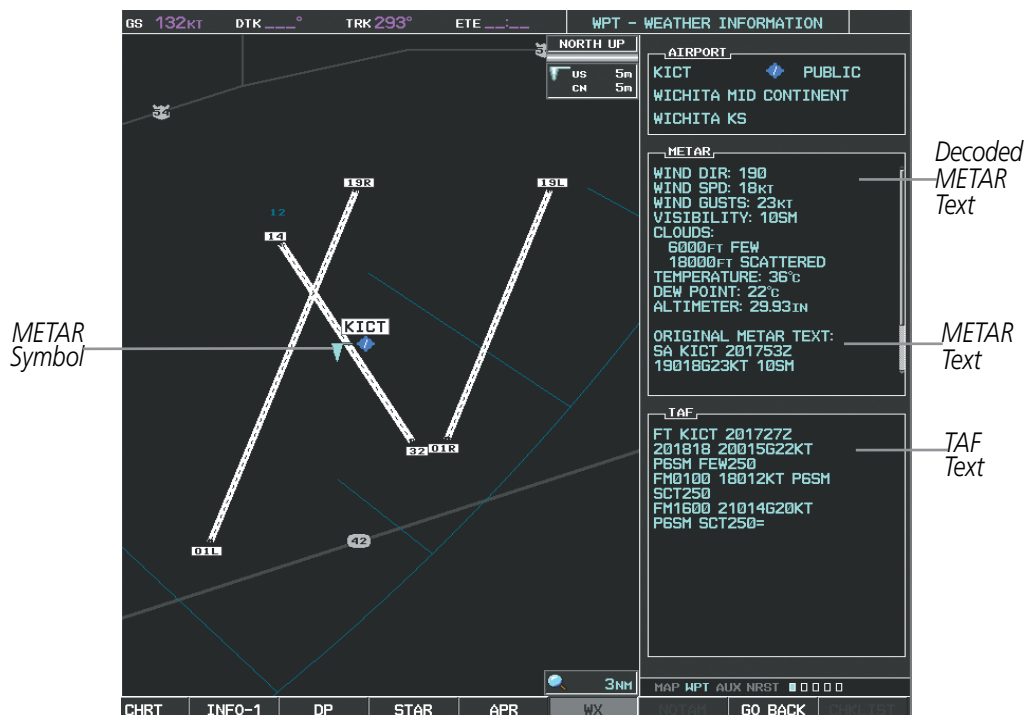


Figure 6-25 METAR with Text

To display the METAR legend (Figure 6-26) on the XM Weather Data Link Page, select the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.

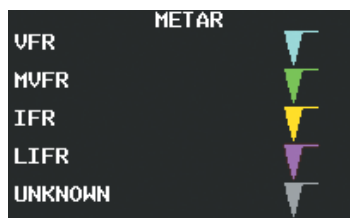


Figure 6-26 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST



NOTE: Surface Analysis and City Forecast data are displayed only within the installed Aviation Database service area.

Surface Analysis and City Forecast (Figure 6-27) information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

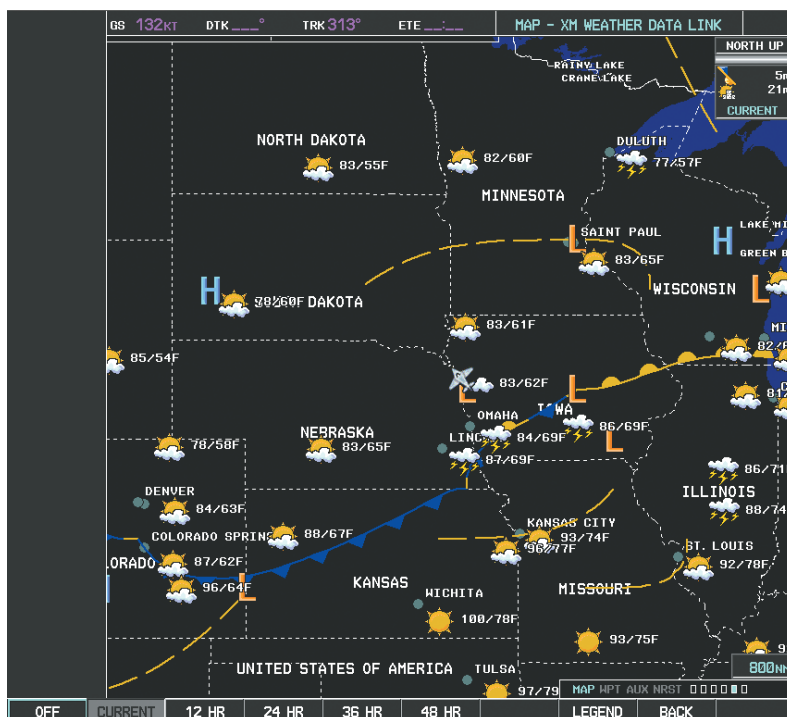


Figure 6-27 Surface Analysis Data - 24-Hour

Displaying Surface Analysis and City Forecast information:

- 1) Select the XM Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **SFC** Softkey.
- 4) Select the desired forecast time: **CURRENT, 12 HR, 24 HR, 36 HR, or 48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

To display the Surface Analysis and City Forecast legend (Figure 6-28), select the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.

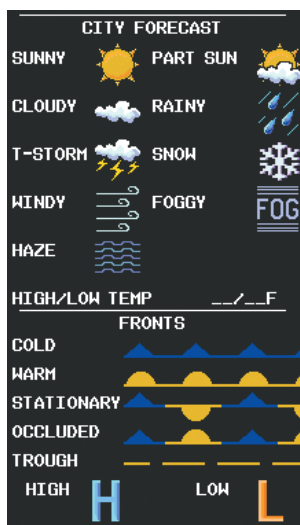


Figure 6-28 Surface Analysis Legend

FREEZING LEVEL

Freezing Level data (Figure 6-29) shows the color-coded contour lines for the altitude and location at which the first isotherm is found. When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data appears at the next update.

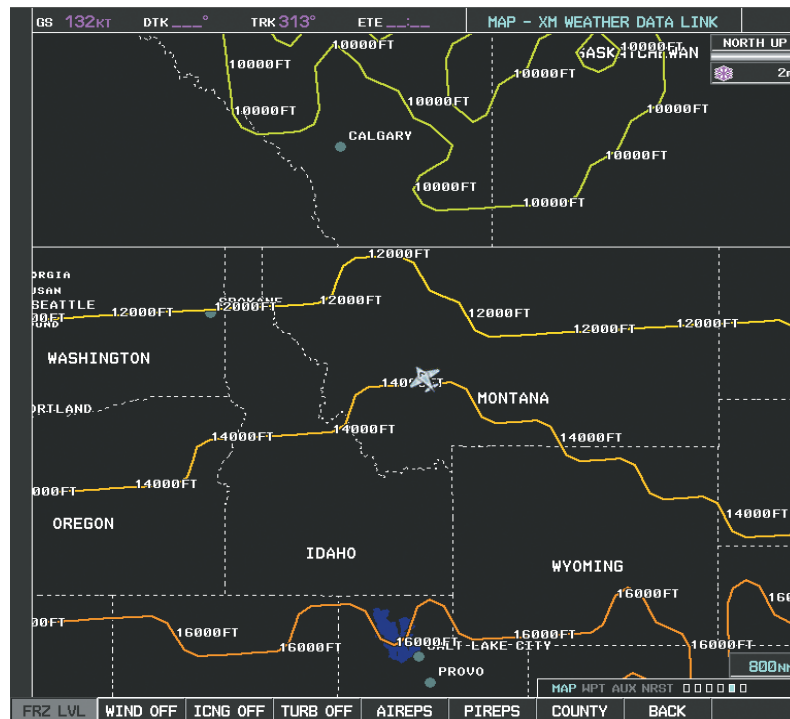


Figure 6-29 Freeze Level Data

Displaying Freezing Level information:

- 1) Select the XM Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **FRZ LVL** Softkey.

To display the Freezing Level legend (Figure 6-30), select the **LEGEND** Softkey when Freezing Level data is selected to be displayed.



Figure 6-30 Freezing Level Legend

WINDS ALOFT

Winds Aloft data (Figure 6-31) shows the forecast wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3000-foot increments up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) Select the XM Weather Data Link Page with the **FMS** Knob.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **WIND** Softkey.
- 4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Select the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

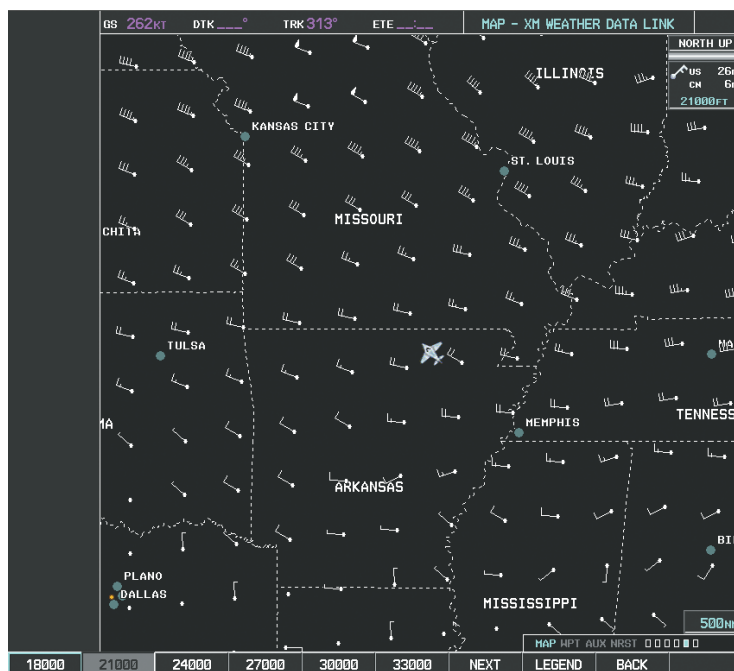


Figure 6-31 Winds Aloft at 21,000 Feet

To display the Winds Aloft legend (Figure 6-32), select the **LEGEND** Softkey when Winds Aloft is selected for display.

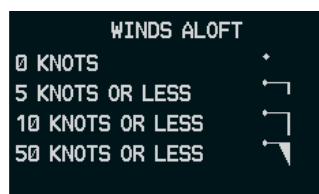


Figure 6-32 Winds Aloft Data with Legend



NOTE: Profile View is only available if TAWS-B is installed.

Winds Aloft data can also be shown inside the Profile View (Figure 6-33) on the Navigation Map Page. Wind direction arrows indicate headwind or tailwind components of at least five knots along the altitude scale using symbols comparable to those shown in the Winds Aloft legend (Figure 6-32). Refer to section 6.7 for additional information about Profile View.

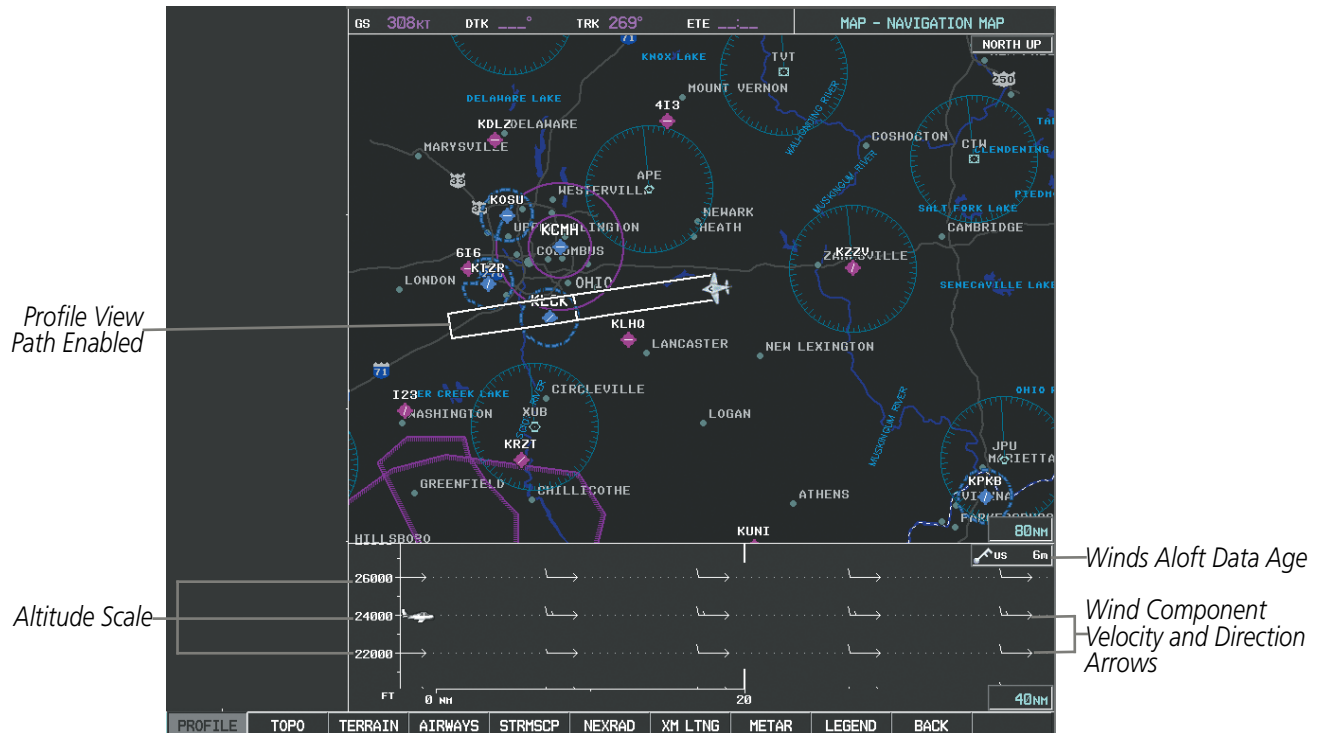


Figure 6-33 Navigation Map Page with Winds Aloft Data on Profile View

Showing/Hiding Profile View (containing winds aloft data)

- 1) Select the Navigation Map Page.
- 2) Select the **PROFILE** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the Navigation Map Page. This behavior can be changed on the Navigation Map Page.

Enabling/disabling winds aloft data display in Profile View:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-34).
- 4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key (Figure 6-35).
- 5) Turn the large **FMS** Knob to select 'Profile Winds' (Figure 6-36).
- 6) Turn the small **FMS** Knob to select 'On' or 'Off'.
- 7) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

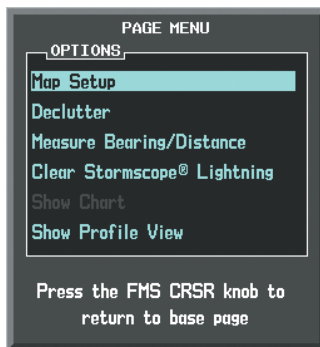


Figure 6-34 Navigation Map Page Menu

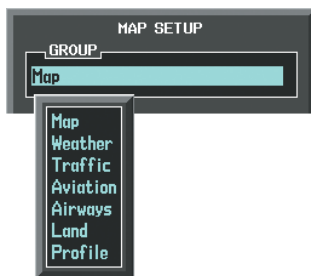


Figure 6-35 Navigation Map Page Setup Menu



Figure 6-36 Navigation Map Page Setup Menu, Weather Group

COUNTY WARNINGS

County warning data (Figure 6-37) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on fires, tornadoes, severe thunderstorms, flood conditions, and other natural disasters.

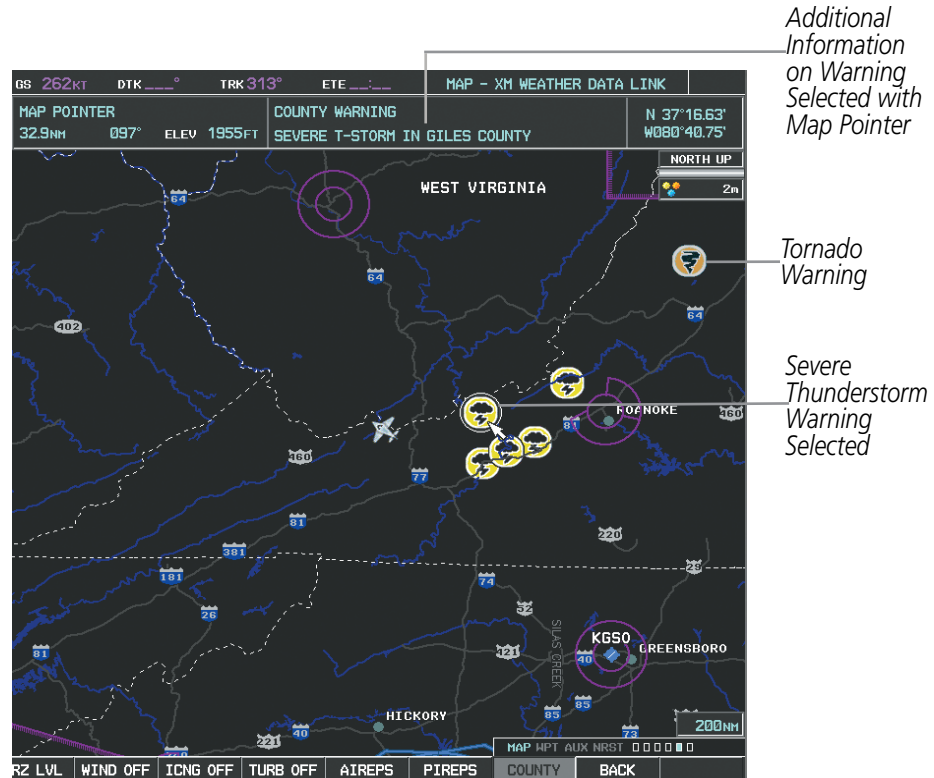


Figure 6-37 County Flood and Severe Weather Warnings

Displaying County Warning information:

- 1) Select the XM Weather Data Link Page with the **FMS** Knob.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **COUNTY** Softkey.

To display the County Warnings legend (Figure 6-38), select the **LEGEND** Softkey when County Warnings are selected to be displayed.

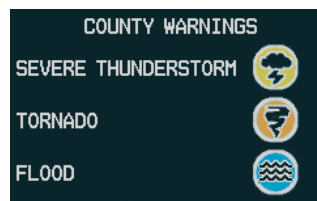


Figure 6-38 County Warnings Legend

CYCLONE

The Cyclone weather product (Figure 6-39) shows the current location of cyclones (hurricanes) and their projected tracks.

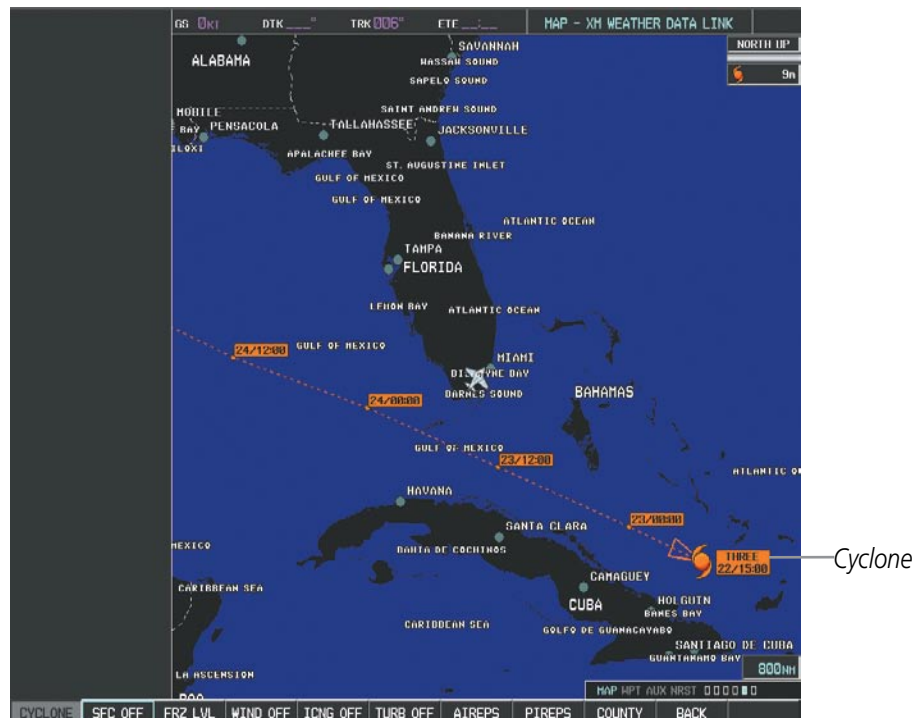


Figure 6-39 Cyclone Data Selected for Display

Displaying cyclone (hurricane) track information:

- 1) Select the XM Weather Data Link Page with the **FMS** Knob.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **CYCLONE** Softkey.

To display the Cyclone legend (Figure 6-40), select the **LEGEND** Softkey when Cyclones are selected to be displayed.

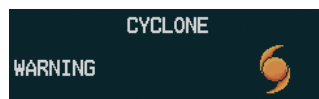


Figure 6-40 Cyclone Legend

ICING (CIP & SLD)

Current Icing Product (CIP) data (Figure 6-41) shows a graphical view of the current 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 current conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors.

Displaying Icing data:

- 1) Select the XM Weather Data Link Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **ICNG** Softkey.
- 4) Select the desired altitude level: 1,000 feet up to 30,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **ICNG** Softkey label changes to indicate the altitude selected.

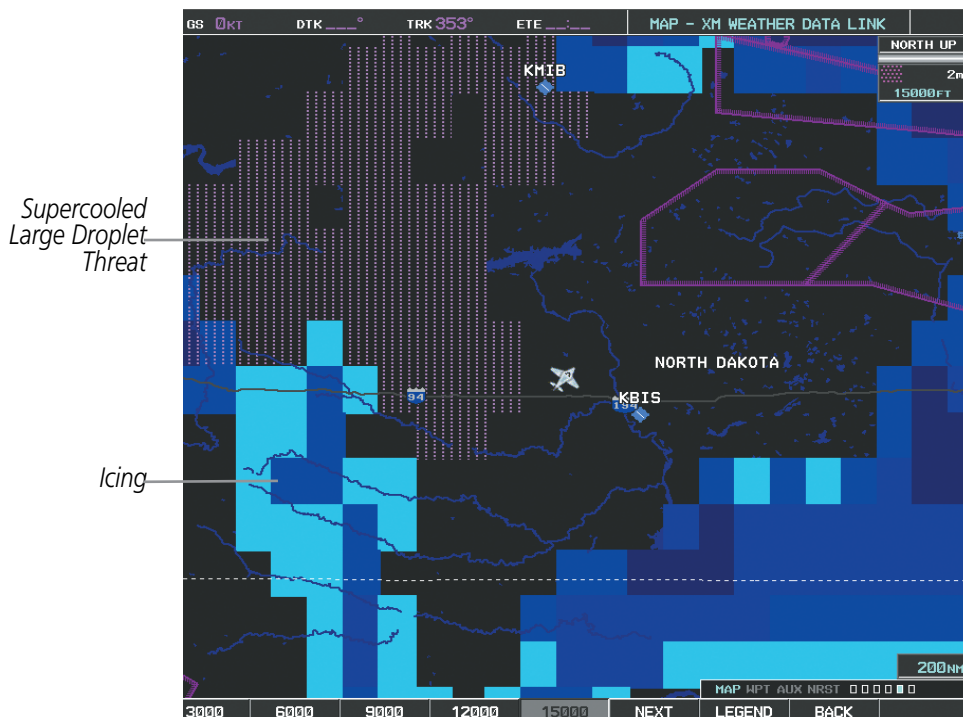


Figure 6-41 Icing Data at 15,000 Feet

To display the Icing Potential legend (Figure 6-42), select the **LEGEND** Softkey when Icing is selected for display.

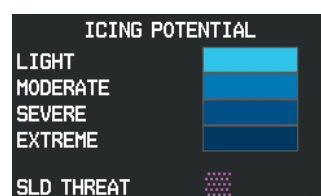


Figure 6-42 Icing Potential Legend

TURBULENCE

Turbulence data (Figure 6-43) identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence data is intended to supplement AIRMETs and SIGMETs.

Displaying Turbulence data:

- 1) Select the XM Weather Data Link Page.
- 2) Select the **MORE WX** Softkey.
- 3) Select the **TURB** Softkey.
- 4) Select the desired altitude level: 21,000 feet up to 45,000 feet. Selects the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **TURB** Softkey label changes to indicate the altitude selected.

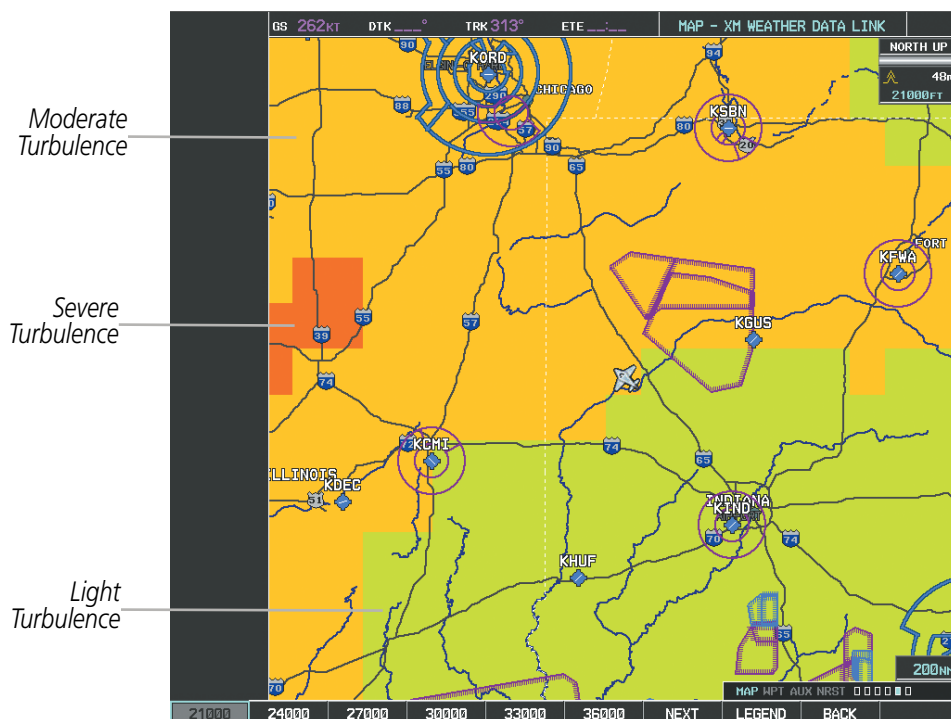


Figure 6-43 Turbulence Data at 21,000 Feet

To display the Turbulence legend (Figure 6-44), select the **LEGEND** Softkey when Turbulence is selected for display.

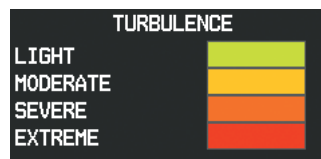


Figure 6-44 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) (Figure 6-45) provide timely weather information for a particular route of flight. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain unforecast adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). AIREPs are used almost exclusively by commercial airlines.

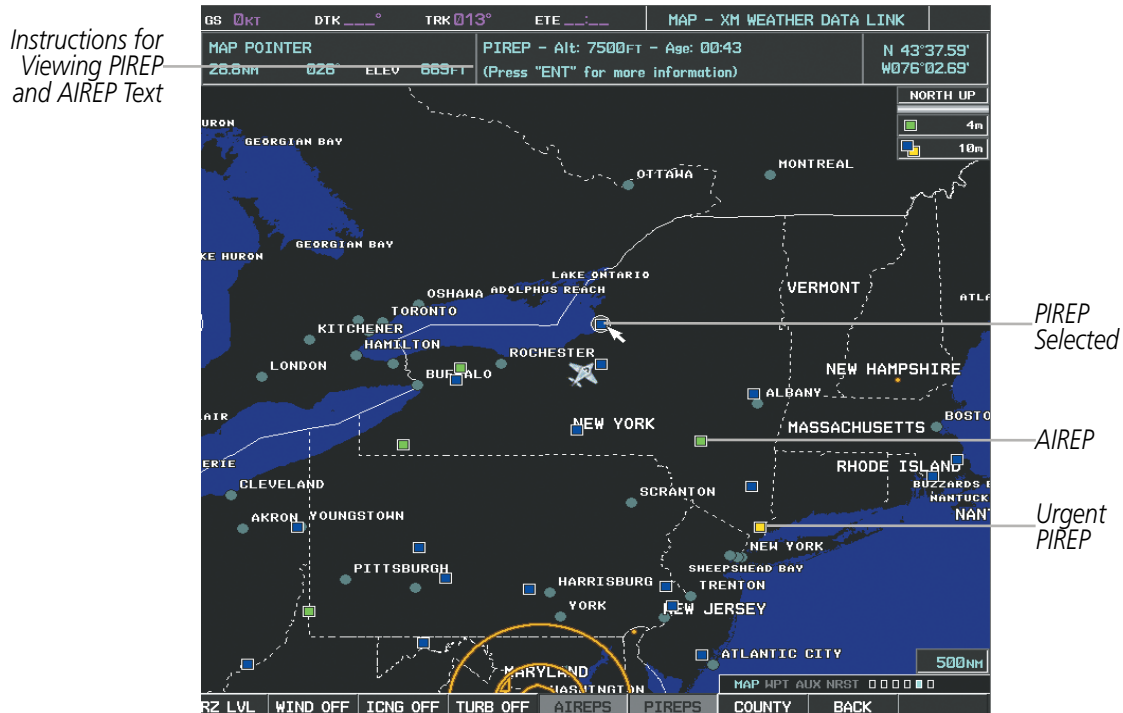


Figure 6-45 AIREPs and PIREPs on the Weather Data Link Page

Displaying PIREP and AIREP text:

- 1) Select the XM Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **AIREPS** or **PIREPS** Softkey.
- 4) Press the **RANGE** Knob and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
- 5) Press the **ENT** Key. The Weather Information Page is shown with PIREP or AIREP text. The data is first displayed in a decoded fashion, then as raw text.
- 6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP or AIREP text.
- 7) Press the **FMS** Knob or the **CLR** Key to return to the XM Weather Data Link Page.

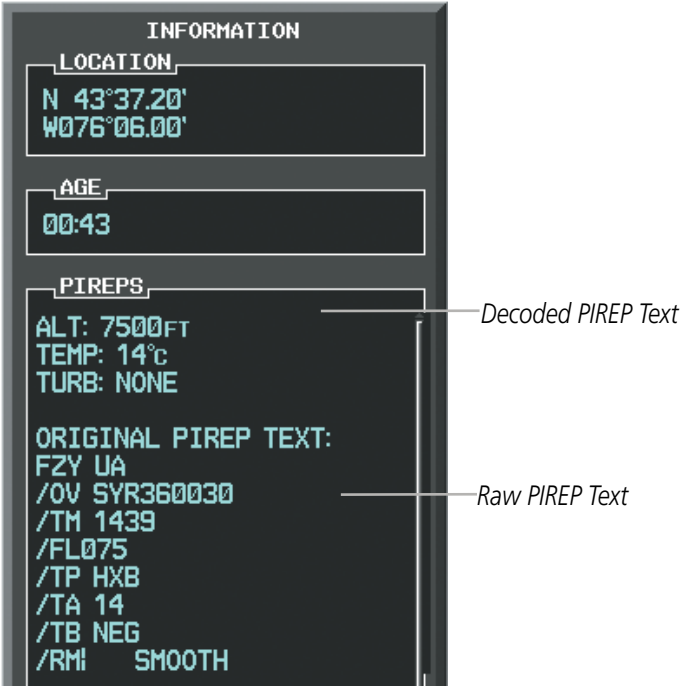


Figure 6-46 PIREP Text on the Weather Data Link Page

To display the PIREP or AIREP legend (Figure 6-47), select the **LEGEND** Softkey when PIREPs or AIREPs are selected for display.

The PIREP color is determined by the type (routine or urgent).



Figure 6-47 AIREPs & PIREPs Legend

6.2 WORLDWIDE WEATHER



NOTE: Garmin Flight Data Services Worldwide Weather provides information for avoiding hazardous weather. Do not utilize Worldwide Weather information to penetrate hazardous weather.

Garmin Flight Data Services (GFDS) provides Worldwide Weather reception capabilities to the G1000 through the optional GSR 56 Iridium satellite datalink. Graphical weather information and associated text are displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map.

Weather data are provided after the pilot initiates either a manual or automatic GFDS data request on the GFDS Weather Data Link Page on the MFD.

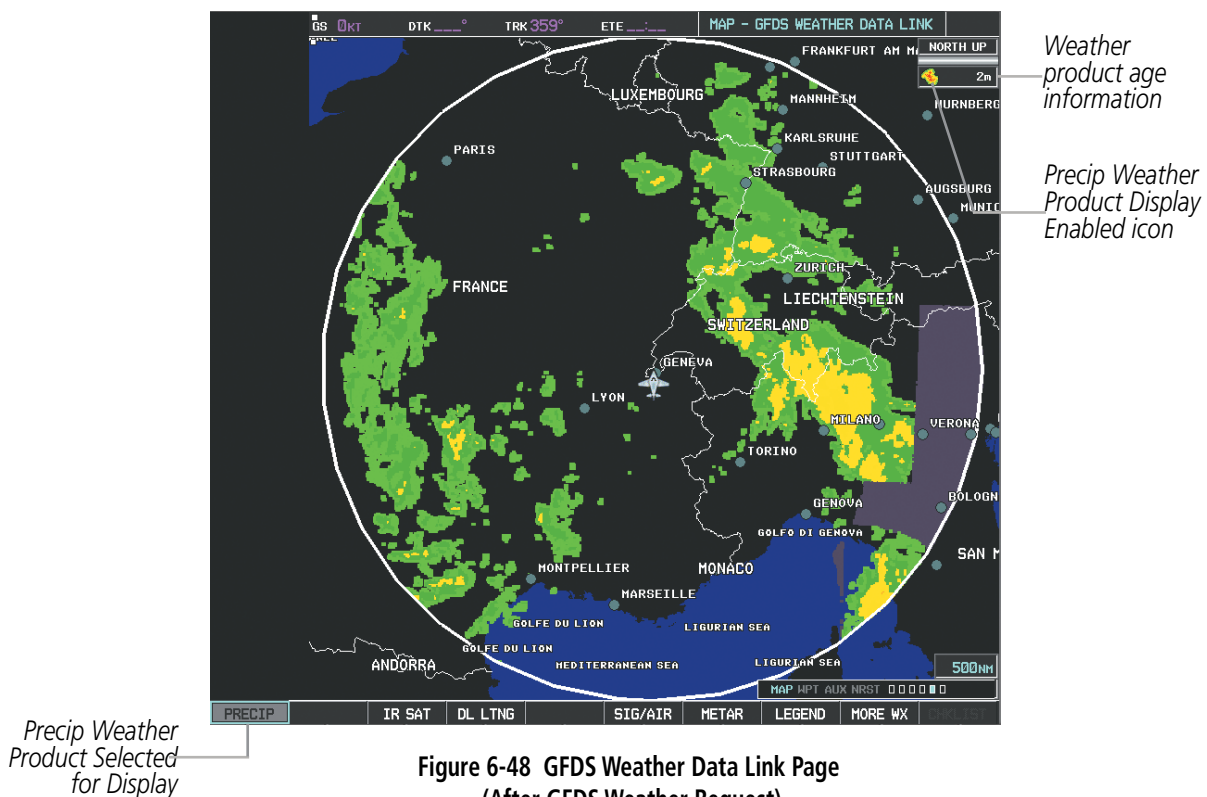
Worldwide Weather requires an active GFDS subscription. Refer to the Additional Features section for information on registering with GFDS prior to accessing Worldwide Weather products.

ACCESSING GFDS WORLDWIDE WEATHER PRODUCTS

The primary map for viewing GFDS Weather data is the GFDS Weather Data Link Page in the Map Page Group (Figure 6-48). This is the only map display capable of showing information for all available GFDS Worldwide Weather products. No weather data is displayed until the first GFDS Weather Data Request is made.

Viewing the GFDS Weather Data Link Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the GFDS Weather Data Link Page.










When a weather product is selected for display on the GFDS Weather Data Link Page, a box containing a symbol for the product and its age (in minutes) are shown in the upper right (Figure 6-48). If weather data has not been requested yet or is not available, 'N/A' is shown next to the product symbol instead of age. The age of the weather product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are updated continuously or refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-3).

If for any reason, a weather product is not refreshed within the defined **Expiration Time** intervals (see Table 6-3), the data is considered expired and is removed from the display. The age of the expired product is replaced by dashes. If more than half of the expiration time has elapsed, the color of the product age changes to yellow.

Table 6-3 shows the GFDS weather product symbols, the expiration time and the refresh rates. The refresh rate represents the interval at which the GFDS servers make available the most current known weather data. It does not necessarily represent the rate at which new content is received from weather sources.



NOTE: The availability of specific Worldwide Weather products varies from region to region.

Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Radar Precipitation (PRECIP)		30	U.S.: 3* Canada: 3*† Europe: 15
Infrared Satellite (IR SAT)		60	30
Datalink Lightning (DL LTNG)		30	Continuous
SIGMETs/AIRMETs (SIG/AIR)		60	Continuous
Meteorological Aerodrome Report (METARs)		90	Continuous
Winds Aloft (WIND)		60	Continuous
Pilot Weather Report (PIREPs)		90	Continuous
Temporary Flight Restrictions (TFRs)	no product image	60	Continuous
Terminal Aerodrome Reports (TAFs)	no product image	60	Continuous

* The composite precipitation image is updated every 3 minutes, but individual radar sites may take between 3 and 10 minutes to provide new data.

† Canadian radar precipitation data provided by Environment Canada.

Table 6-3 GFDS Weather Product Symbols and Data Timing

Table 6-4 shows which GFDS Weather products can be displayed (indicated with a ‘+’ symbol) on specific G1000 maps.

GFDS Weather Product	PFD Inset Map	Navigation Map Page	Navigation Map Page Profile View*	GFDS Weather Data Link Page	Weather Information Page	AUX - Trip Planning Page	Nearest Page Group	Flight Plan Pages
Precipitation (PRECIP)	+	+		+		+	+	+
Infrared Satellite (IR SAT)				+				
Datalink Lightning (LTNG)	+	+		+		+	+	+
SIGMETs/AIRMETs (SIG/AIR)				+				
METARs	+	+		+	+	+	+	+
Winds Aloft (WIND)			+	+				
PIREPs				+	+			
Radar Coverage	+	+		+				
TFRs	+	+		+	+	+	+	+
TAFs				+	+			

* Only available if TAWS-B is installed.

Table 6-4 GFDS Weather Product Display Maps

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-49 shows the weather product softkeys for the GFDS Weather Data Link Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product display is enabled.

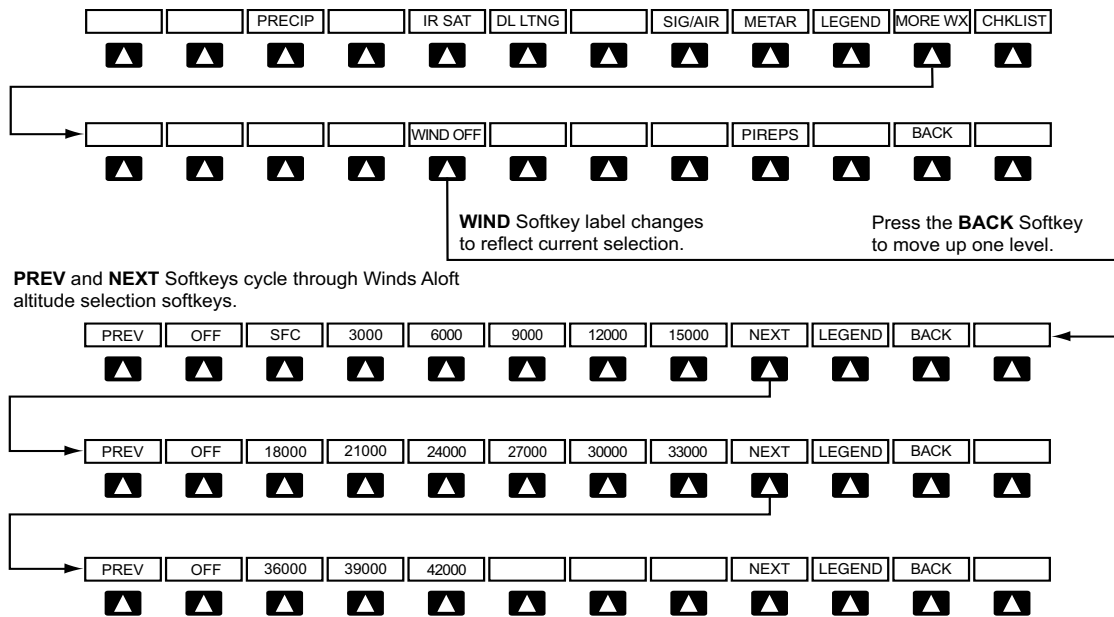


Figure 6-49 GFDS Weather Product Softkeys (MFD)

The setup menus for the Navigation Map Page and the GFDS Weather Data Link Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the GFDS Weather Data Link Page:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-50).
- 4) Turn the small **FMS** Knob to select 'Product Group 1' or 'Product Group 2', and press the **ENT** Key (Figure 6-51).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the GFDS Weather Data Link Page with the changed settings.



Figure 6-50 GFDS Weather Data Link Page Menu



Figure 6-51 GFDS Weather Data Link Page Setup Menu

Restoring default GFDS Weather Data Link Page settings:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'Weather Setup' highlighted, press the **ENT** Key.
- 4) Press the **MENU** Key.
- 5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

The G1000 supports dual datalink installation of both the GSR56 for Worldwide Weather and the GDL69A for XM® Satellite Weather. Only one set of datalink weather products (GFDS or XM) can be displayed at a time.

Switching between GFDS and XM weather sources:

- 1) Turn the large **FMS** Knob on the MFD to select the MAP page group.
- 2) Turn the small **FMS** Knob to select the GFDS (or XM) Weather Data Link Page.
- 3) Press the **MENU** Key.
- 4) Turn the large **FMS** Knob to select 'Display GFDS Weather' or 'Display XM' Weather' (choice dependent on current weather source) and press the **ENT** Key.

If both GFDS and XM weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-5 will result in identical settings for both services.

XM Weather Product	GFDS Worldwide Weather Product
Next-generation Radar (NEXRAD)	Precipitation (PRECIP)
Cloud Top (CLD TOP)	Infrared Satellite (IR SAT)
XM Lightning (XM LTNG)	GFDS Lightning (DL LTNG)
SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft (WIND)	Winds Aloft (WIND)
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)

Table 6-5 Corresponding XM and GFDS Weather Products

Maps besides the GFDS Weather Data Link Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing weather data for the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-52).
- 4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-53).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-54).
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

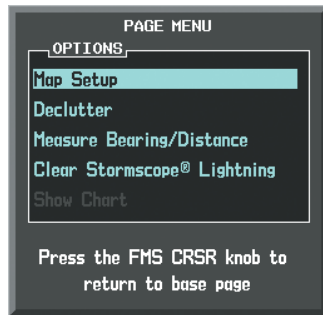


Figure 6-52 Navigation Map Page Menu



Figure 6-53 Navigation Map Page Setup Menu

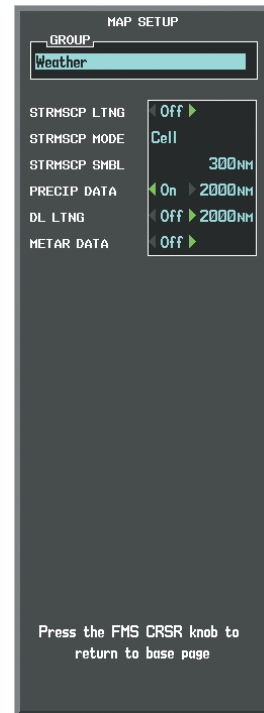


Figure 6-54 Navigation Map Page Setup Menu, Weather Group

Each active weather product has an associated legend which can be displayed on the GFDS Weather Data Link Page. If no weather product softkeys are selected, the **LEGEND** Softkey will be unavailable.

Viewing legends for displayed weather products

- 1) Select the GFDS Weather Data Link Page.
 - 2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.
- Or:
- a) Press the **MENU** Key.
 - b) Select 'Weather Legend' and press the **ENT** Key.
- 3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
 - 4) To remove the Legend Window, select the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Infrared Satellite (IR SAT)
- SIGMETs
- AIRMETs
- METARs
- TFRs
- PIREPs

The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.



Additional Information on TFR Selected with Map Pointer

TFR Selected with Map Pointer

Figure 6-55 Panning on the GFDS Data Link Page

GFDS WEATHER DATA REQUESTS

The GFDS Data Request window provides the flight crew with the options to enable or disable the requested weather coverage area(s), choose automatic weather update intervals (if desired), and the ability to send or cancel weather data requests. The status of the GFDS data request process is also displayed.

Before a GFDS data request can occur, a valid request coverage area must be defined from which all currently available GFDS weather products will be retrieved. At a minimum, either the aircraft's present position or a waypoint (as part of a flight plan or entered directly in the 'WAYPOINT' coverage field) must be part of the request coverage area, otherwise the request status window will indicate 'INVALID COVERAGE AREA' and the system will not allow a request to occur.

It is not necessary for a destination (based on an active flight plan), a flight plan, or waypoint to be specified prior to enabling these coverage areas; however no weather data will be retrieved for these option(s) until a flight plan or waypoint is provided, respectively.

Requesting GFDS weather data manually:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Data Request' highlighted, press the **ENT** Key (Figure 6-56).

- 4) Turn the large **FMS** Knob to highlight the desired coverage option(s) and press the **ENT** Key to check or uncheck one of more of the following coverage selections (Figures 6-57, 6-58):
 - PRESENT POSITION – Requests data based on current location.
 - DESTINATION – Requests data based on the active flight plan destination (Direct-To destinations excluded). See the Flight Management section for more information about entering and activating flight plans.
 - FPL – Requests data along an active flight plan, if one exists. Turn the small **FMS** Knob to select the desired flight plan look-ahead distance option (or choose 'REMAINING FPL' to request the remainder of the flight plan), then press the **ENT** Key.
 - WAYPOINT – Requests data based on a waypoint (which may be off-route). Turn the large and small **FMS** Knobs to enter a waypoint, then press the **ENT** Key.
- 5) Turn the large **FMS** Knob highlight to the 'DIAMETER / RTE WIDTH' (diameter/route width) distance field and turn the small **FMS** Knob to select the desired diameter and route width of the request, then press the **ENT** Key.
- 6) Turn the large **FMS** Knob until the 'SEND REQ' button is highlighted. Press the **ENT** Key to initiate the request immediately or press the **FMS** Knob to return to the GFDS Data Link Page without requesting weather data.

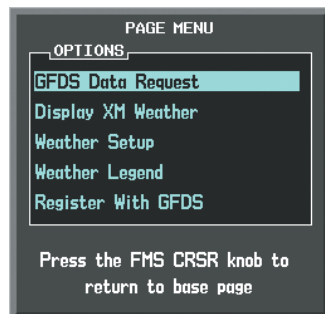


Figure 6-56 GFDS Weather Data Link Page Menu

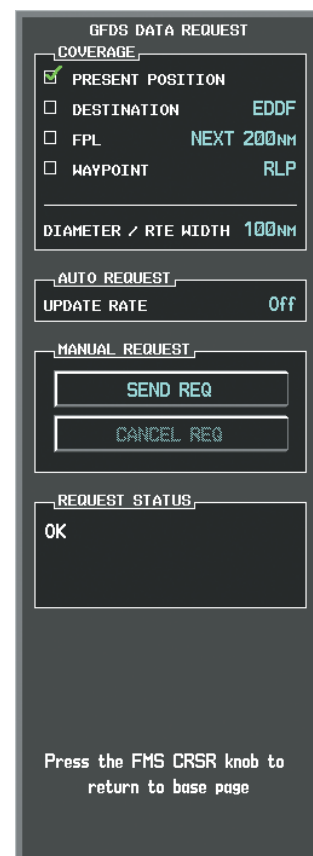


Figure 6-57 GFDS Data Request Window

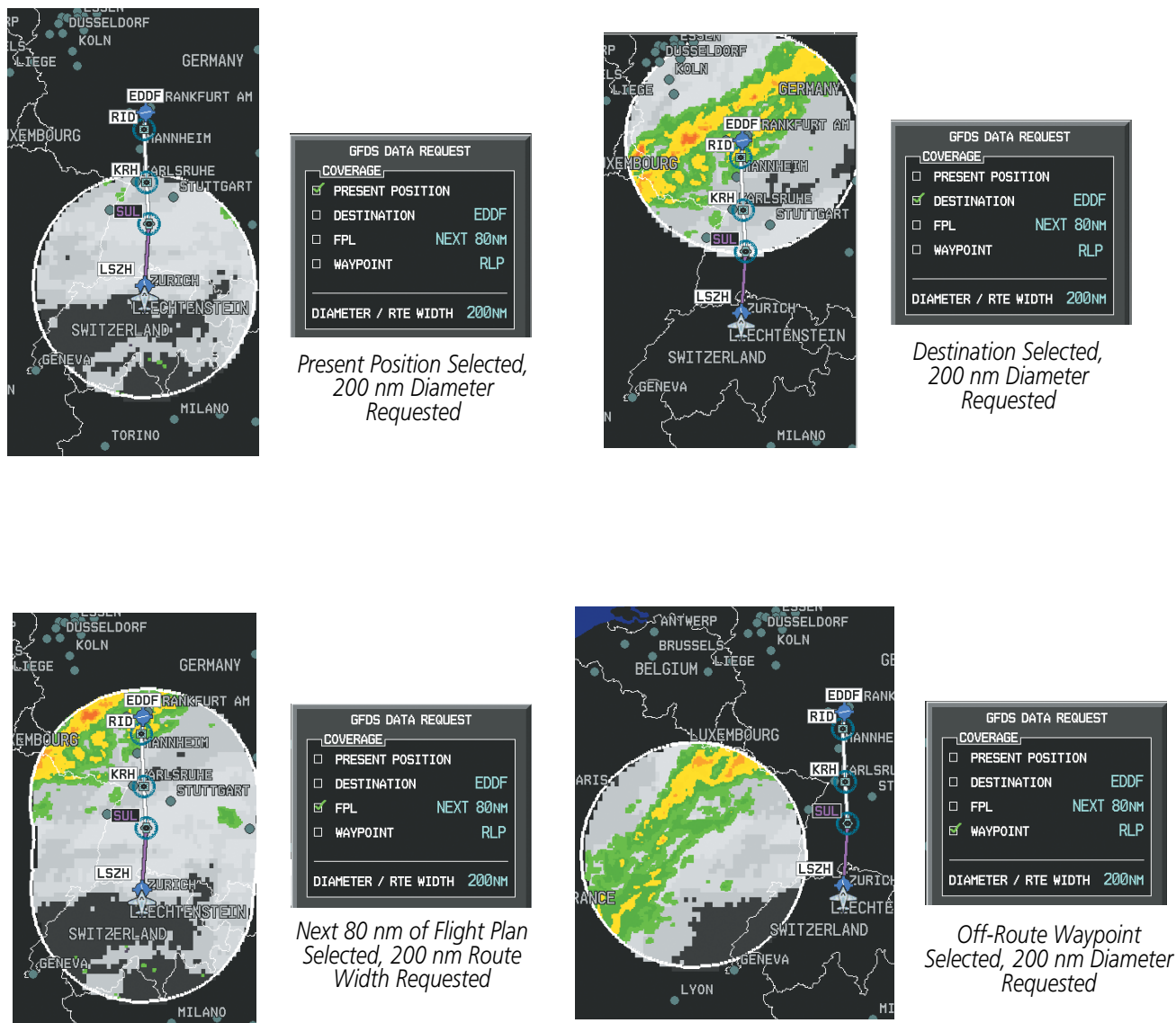


Figure 6-58 GFDSDATA Request Results with Precipitation and Infrared Satellite Displayed

During a GFDSDATA Request, the Request Status box displays “Processing...” and the ‘CANCEL REQ’ button is highlighted. If desired, the GFDSDATA Request window may be closed while the data request is processing by pressing the **FMS** Knob; the data request will continue to process in the background. GFDSDATA Requests typically take between 1 to 3 minutes to complete depending on the size of the selected weather coverage area and Iridium signal connection quality.

The G1000 retrieves all available Worldwide Weather products within the selected coverage area during an initial GFDSDATA Request, regardless of which products (if any) are currently enabled for display. On subsequent requests, previously retrieved textual data (such as METARs and TAFS) is retained if it has not expired, while new textual weather data matching the current coverage area and all graphical weather data is downloaded during every data request.

At the completion of a successful weather data request, the request status window (if still open) will indicate ‘OK’.

Cancelling a GFDS Weather Data Request in Progress:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Data Request' highlighted, press the **ENT** Key.
- 4) Turn the large **FMS** Knob to select 'CANCEL REQ' and press the **ENT** Key. The request status box indicates 'Request Cancelled'.
- 5) Press the **FMS** Knob to return to the GFDS Weather Datalink Page.

The pilot can schedule GFDS data requests to recur automatically. Auto requests remain enabled until the pilot disables them, or the G1000 power is cycled. The Request Status window will indicate a countdown timer until the next automatic data request occurs.



NOTE: *If automatic GFDS data requests were enabled prior to the system entering Reversionary Mode, the automatic weather data requests will continue in Reversionary Mode, however the GFDS Data Request window and its associated options will not be available.*

Enabling/disabling automatic GFDS Data Requests:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MENU** Key.
- 3) With 'GFDS Weather Request' highlighted, press the **ENT** Key.
- 4) Choose the desired weather coverage options.
- 5) Turn the large **FMS** Knob to select the 'UPDATE RATE' setting. Then turn the small **FMS** Knob to highlight the desired automatic update frequency (OFF, 5 Min, 10 Min, 15 Min, 20 Min, 25 Min, 30 Min, 45 Min, or 60 Min), then press the **ENT** Key.
- 6) The 'SEND REQ' button is highlighted and a countdown timer is displayed in the 'REQUEST STATUS' based on the currently selected update rate. Press the **ENT** Key to immediately send an immediate GFDS Data Request.

Or:

Press the **FMS** Knob to return to the GFDS Weather Data Link Page.

WORLDWIDE WEATHER PRODUCTS

PRECIPITATION



NOTE: Precipitation data cannot be displayed at the same time as terrain or Stormscope.

Precipitation (PRECIP) data is not real-time. The lapsed time between collection, processing, and dissemination of radar images can be significant and may not reflect the current radar synopsis. Due to the inherent delays and the relative age of the data, it should be used for long-range planning purposes only.

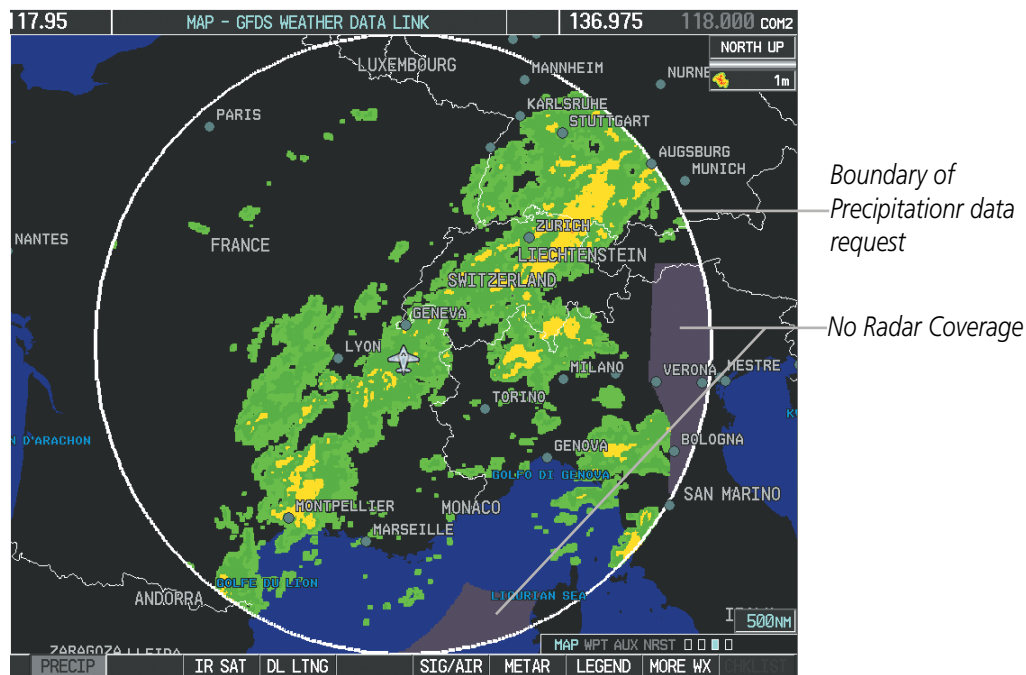


Figure 6-59 Precipitation Data on the GFDS Weather Data Link Page

Precipitation data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying Precipitation weather information:

- 1) Select the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the GFDS Weather Data Link Page.
- 2) Press the **PRECIP** Softkey.

Radar data shown represents lowest level, base reflectivity, of radar returns. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the GFDS Weather Data Link Page. For the Precipitation legend (Figure 6-60), select the **LEGEND** Softkey when Precipitation is selected for display.

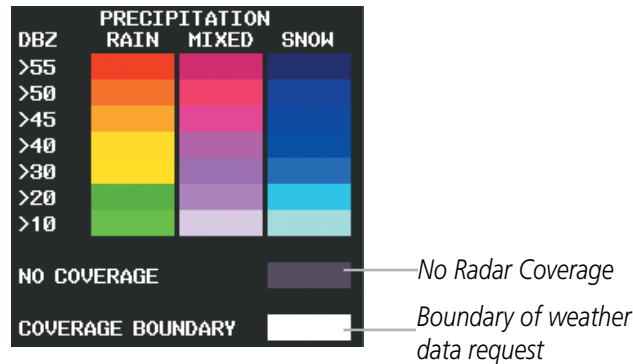


Figure 6-60 Precipitation Data Legend

The display of radar coverage is enabled active when Precipitation is selected for display. Areas where precipitation radar coverage is not currently available or is not being collected are indicated in gray shade of purple. A white boundary line depicting the selected coverage area of the GFDS weather data request encloses the precipitation data when this weather product is displayed.

REFLECTIVITY

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the Precipitation display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different radar echo intensities are measured in decibels (dB) relative to reflectivity (Z). Weather radars measure the reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

PRECIPITATION LIMITATIONS

Radar images may have certain limitations:

- Radar 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.
- Radar base reflectivity is sampled at the minimum antenna elevation angle. An individual radar site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.

- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers.

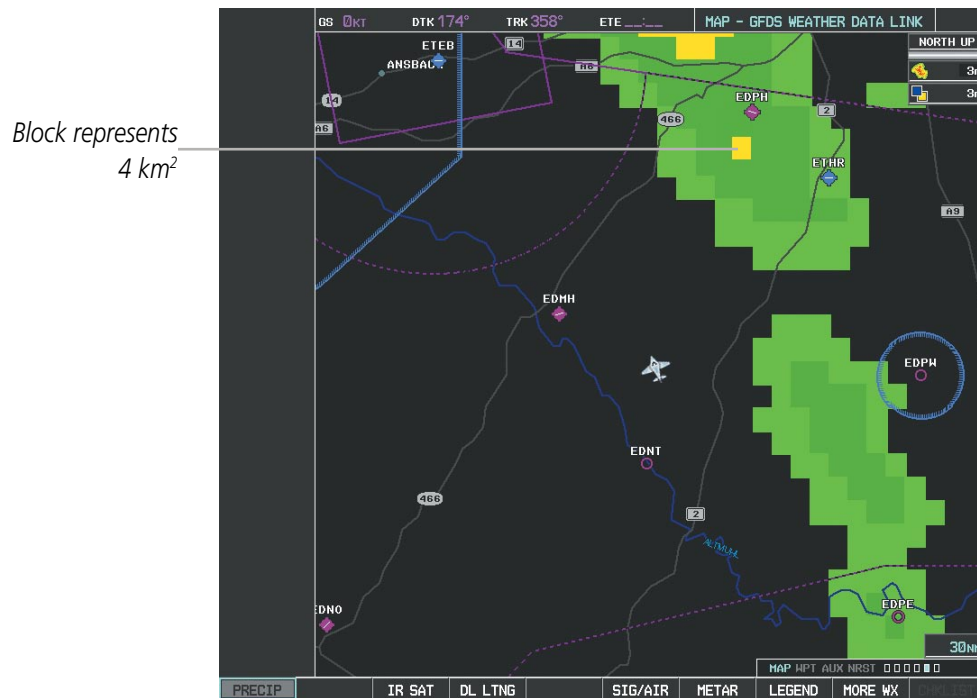


Figure 6-61 Precipitation Data - Zoomed

The following may cause abnormalities in displayed radar images:

- Ground clutter
- Strokes and spurious radar data
- Sun strokes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust from military aircraft, which can cause alterations in radar scans

INFRARED SATELLITE

Infrared Satellite (IR SAT) data (Figure 6-62) depicts cloud top temperatures from satellite imagery. Brighter cloud top colors indicate cooler temperatures occurring at higher altitudes.

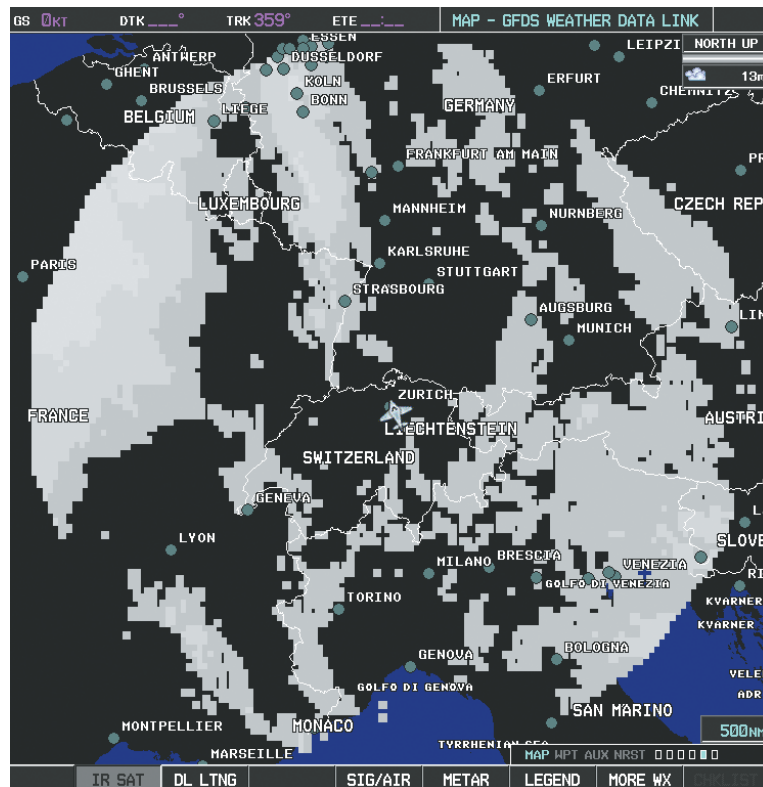


Figure 6-62 METAR Flags on the Weather Data Link Page

Displaying Cloud Tops information:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **IR SAT** Softkey.

To display the Infrared Satellite legend (Figure 6-63), select the **LEGEND** Softkey when Infrared Satellite data is selected for display.



Figure 6-63 Infrared Satellite Legend

DATALINK LIGHTNING

Datalink Lightning (DL LTNG) data (Figure 6-64) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. Neither cloud-to-cloud nor the exact location of the lightning strike is displayed.

If the aircraft is also equipped with the L-3 WX-500 Stormscope®, only one lightning product may be enabled for display at a time.

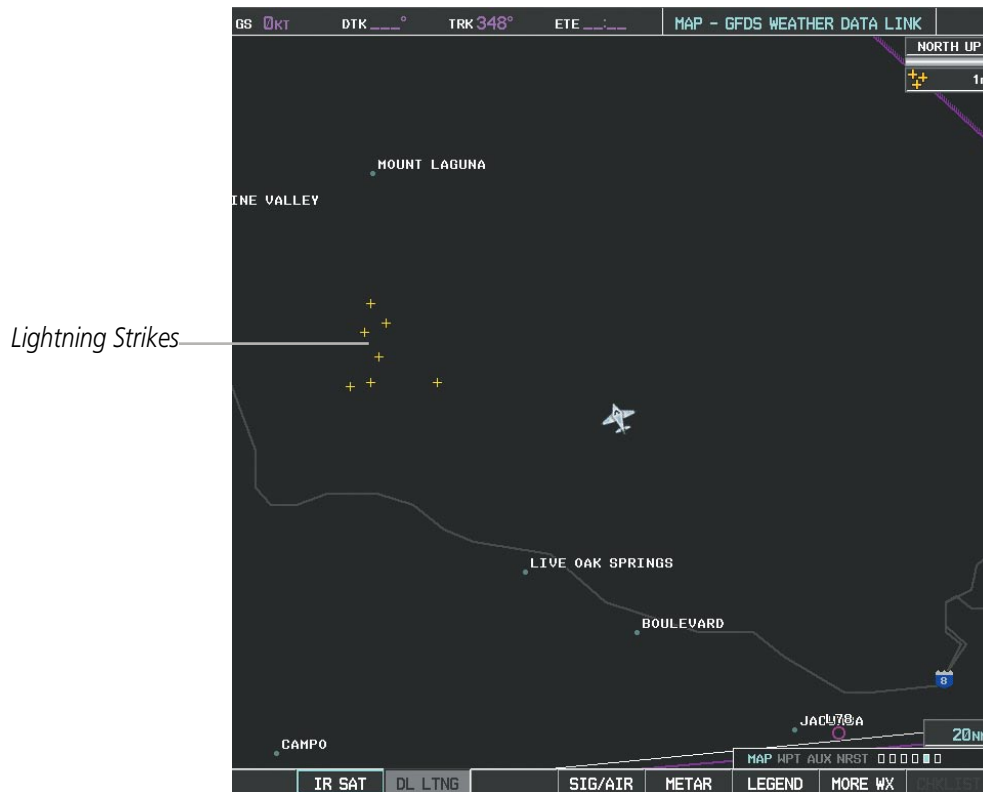


Figure 6-64 Datalink Lightning

Datalink Lightning data displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying Datalink Lightning information:

- 1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey). This step is not necessary on the GFDS Weather Data Link Page.
- 2) Press the **DL LTNG** Softkey.

To display the Datalink Lightning legend on the GFDS Weather Data Link Page (Figure 6-65), select the **LEGEND** Softkey when Datalink Lightning is selected for display.

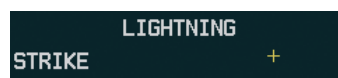


Figure 6-65 Datalink Lightning Legend

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is displayed as long as any portion of it is issued within the coverage area of the GFDS data request.

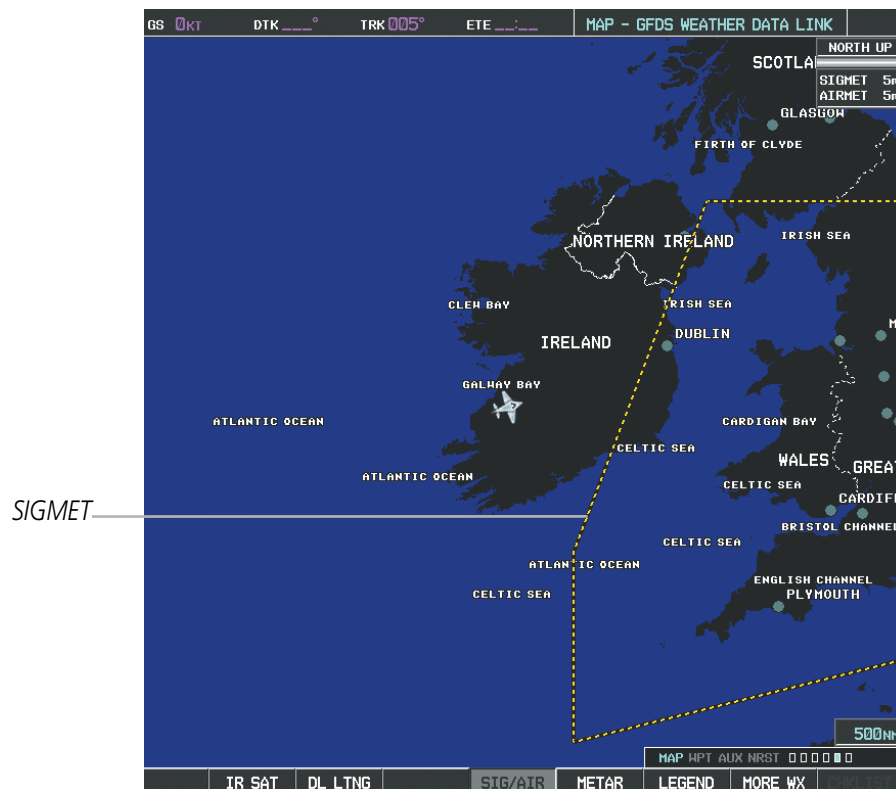


Figure 6-66 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **SIG/AIR** Softkey.
- 3) To view the text of the SIGMET or AIRMET, press the **RANGE** Knob and move the Map Pointer over the icon.
- 4) Press the **ENT** key. Figure 67 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-68), select the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.

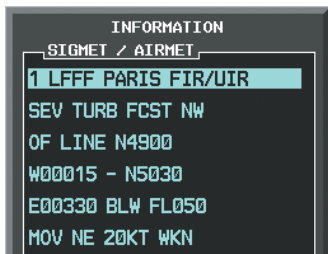


Figure 6-67 Sample SIGMET Text



Figure 6-68 SIGMET/AIRMET Legend

METARS AND TAFS



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

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code “SPECI” in the report. METARs are shown as colored flags at airports that provide them.

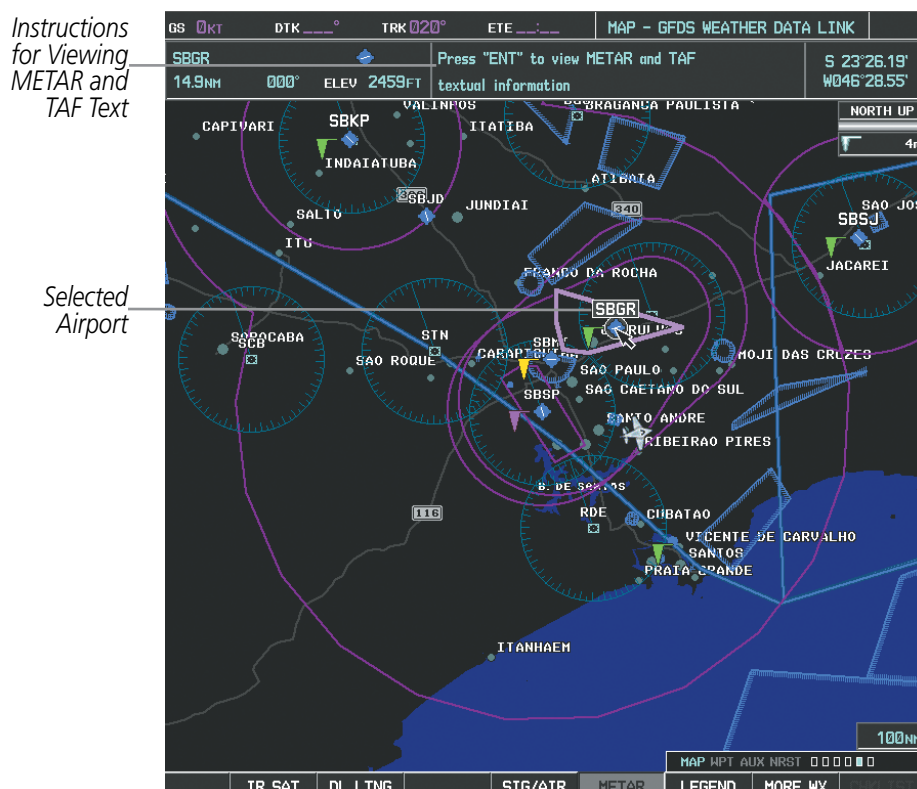


Figure 6-69 METAR Flags on the GFDS Weather Data Link Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. TAF information is displayed in its raw form when it is available.

Displaying METAR and TAF text:

- 1) On the GFDS Weather Data Link Page, select the **METAR** Softkey.
- 2) Press the **RANGE** Knob and pan to the desired airport.
- 3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
- 5) Press the **FMS** Knob or the **CLR** Key to return to the GFDS Weather Data Link Page.

Or:

- 1) Select the Weather Information Page.
 - a) Turn the large **FMS** Knob to select the Waypoint Page Group.
 - b) Select the **WX** Softkey to select the Weather Information Page.
- 2) Press the **FMS** Knob to display the cursor.
- 3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
- 4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

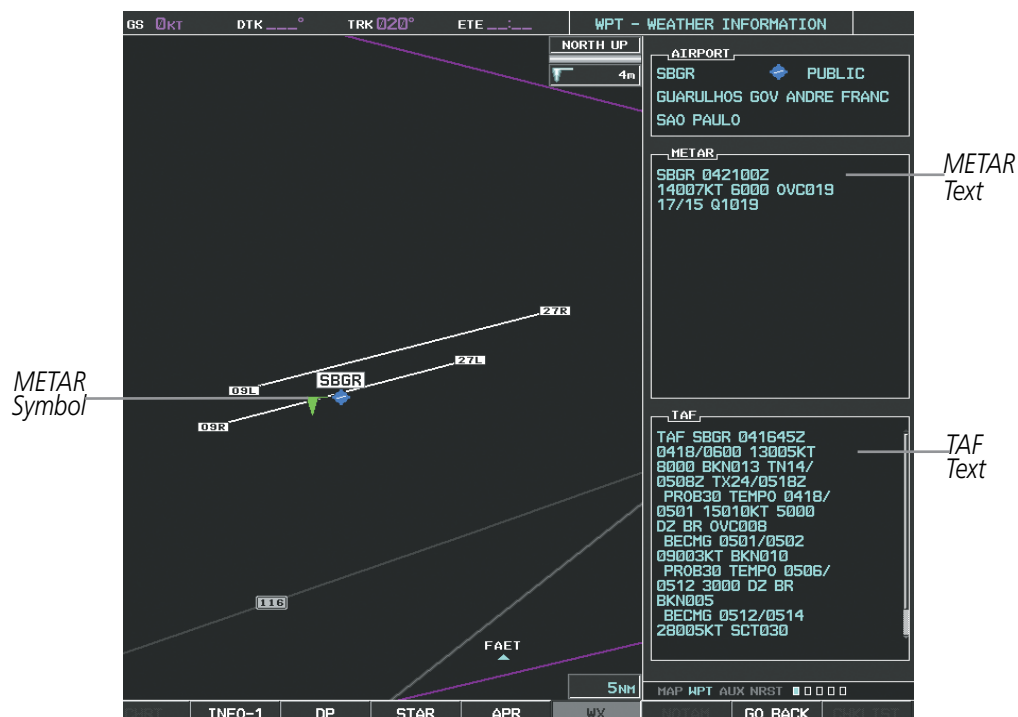


Figure 6-70 METAR and TAF Text

To display the METAR legend on the GFDS Weather Data Link Page (Figure 6-71), select the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.



Figure 6-71 METAR Legend

WINDS ALOFT

Winds Aloft data (Figure 6-72) shows the forecasted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments up to 42,000 feet MSL.

Displaying Winds Aloft data:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **WIND** Softkey.
- 4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Select the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

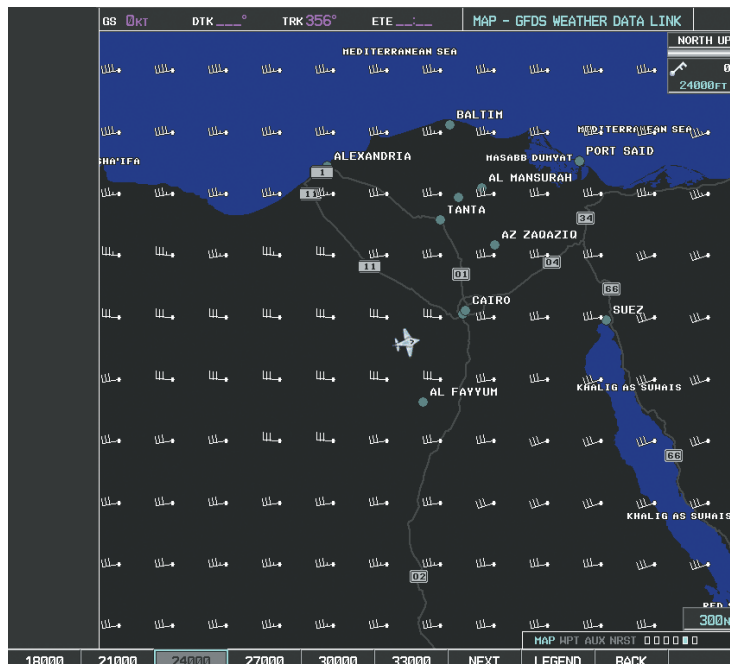


Figure 6-72 Winds Aloft at 24,000 Feet

To display the Winds Aloft legend (Figure 6-73), select the **LEGEND** Softkey when Winds Aloft is selected for display.

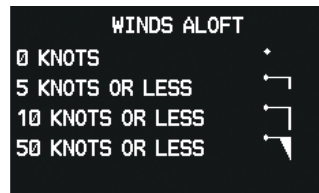


Figure 6-73 Winds Aloft Data with Legend



NOTE: Profile View is only available if TAWS-B is installed.

Winds Aloft data can also be shown inside the Profile View (Figure 6-74) on the Navigation Map Page. Wind direction arrows indicate headwind or tailwind components of at least five knots along the altitude scale using symbols comparable to those shown in the Winds Aloft legend (Figure 6-73). Refer to section 6.7 for additional information about Profile View.

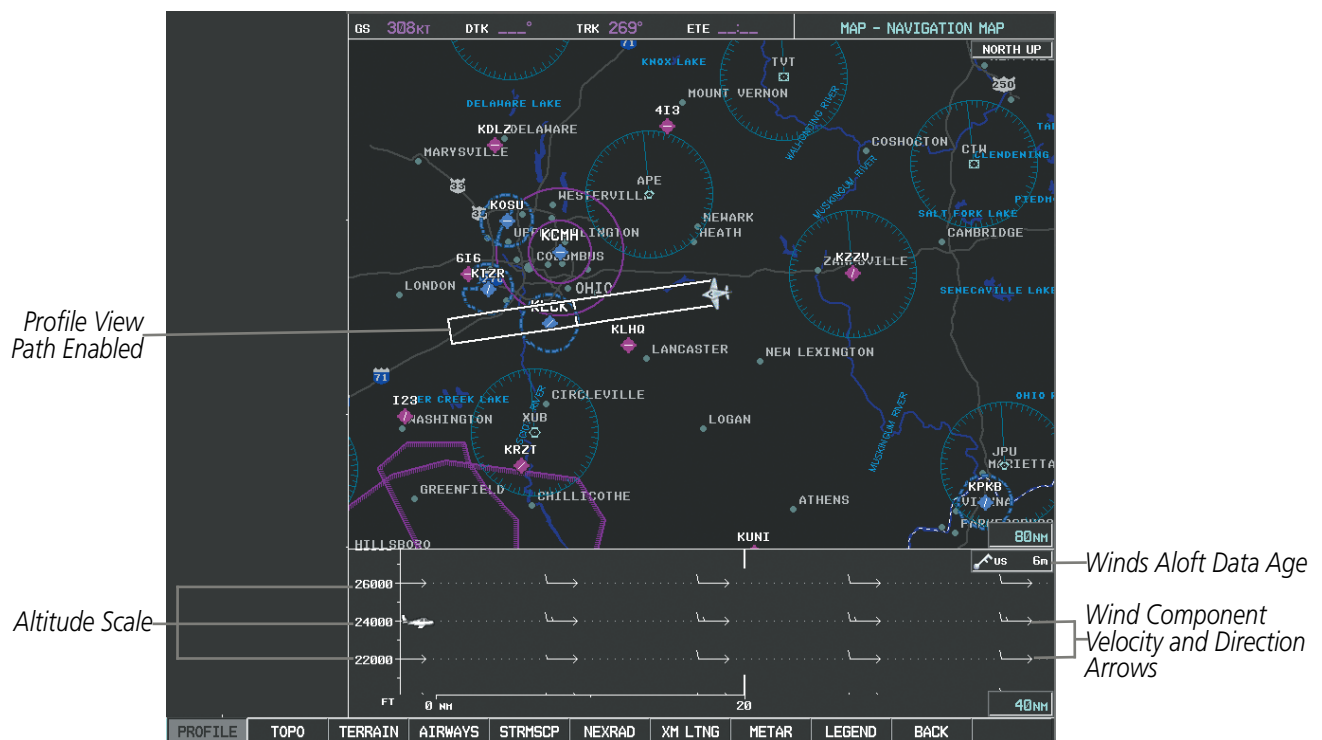


Figure 6-74 Navigation Map Page with Winds Aloft Data on Profile View

Showing/Hiding Profile View (containing winds aloft data)

- 1) Select the Navigation Map Page.
- 2) Select the **PROFILE** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the Navigation Map Page. This behavior can be changed on the Navigation Map Page.

Enabling/disabling winds aloft data display in Profile View:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-75).
- 4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key (Figure 6-76).
- 5) Turn the large **FMS** Knob to select 'Profile Winds' (Figure 6-77).
- 6) Turn the small **FMS** Knob to select 'On' or 'Off'.
- 7) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

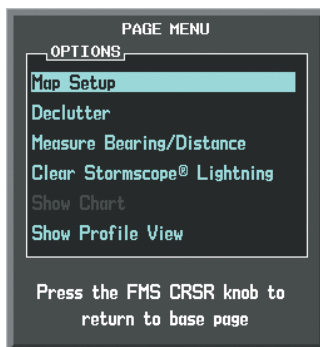


Figure 6-75 Navigation Map Page Menu



Figure 6-76 Navigation Map Page Setup Menu



Figure 6-77 Navigation Map Page Setup Menu, Weather Group

PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather encountered by pilots. A PIREP may contain unforecast adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

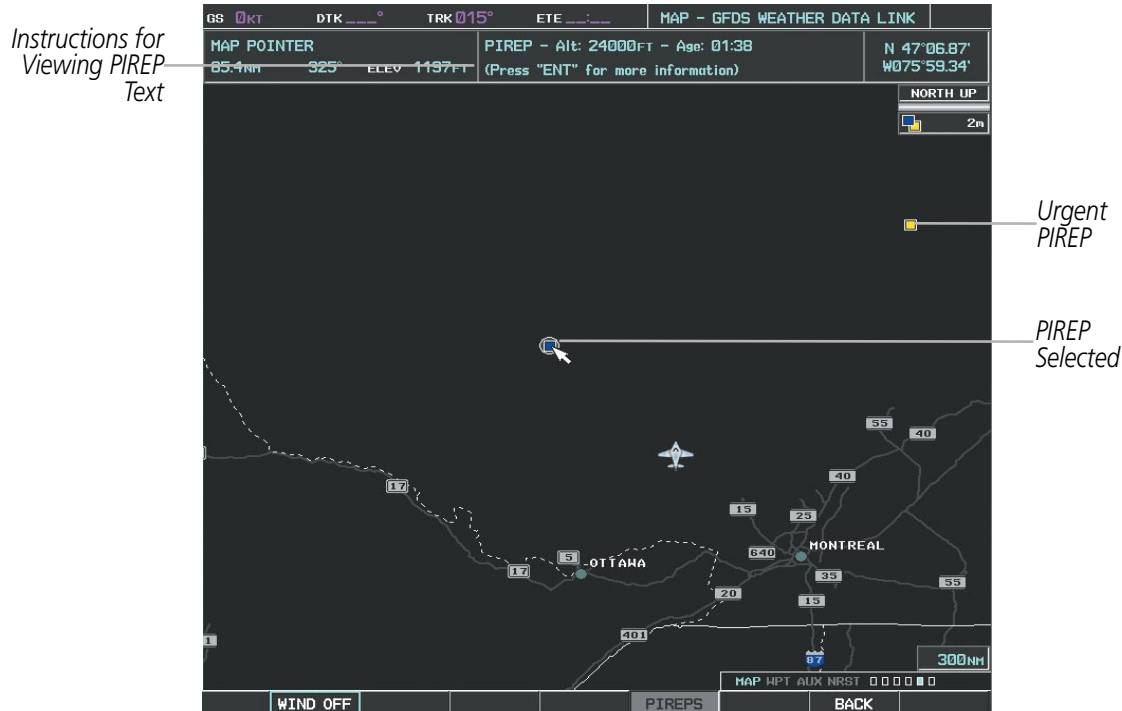


Figure 6-78 PIREPs on the GFDS Weather Data Link Page

Displaying PIREP text:

- 1) Select the GFDS Weather Data Link Page.
- 2) Press the **MORE WX** Softkey.
- 3) Press the **PIREPS** Softkey.
- 4) Press the **RANGE** Knob and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
- 5) Press the **ENT** Key. The PIREP text is first displayed in a decoded fashion, then as raw text.
- 6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP text.
- 7) Press the **FMS** Knob or the **CLR** Key to close the PIREP text window and return to the GFDS Weather Data Link Page.

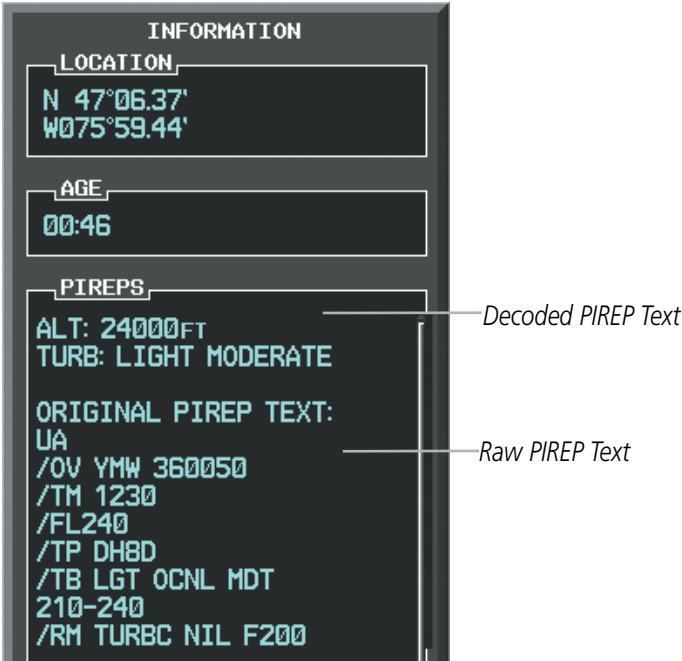


Figure 6-79 PIREP Text on the GFDS Weather Data Link Page

To display the PIREP or AIREP legend (Figure 6-80), select the **LEGEND** Softkey when PIREPs or AIREPs are selected for display.

The PIREP color is determined by the type (routine or urgent).



Figure 6-80 AIREPs & PIREPs Legend

ABNORMAL OPERATIONS

If the G1000 cannot complete a GFDS weather data request, one or more messages will appear in the request status window.

Weather Request Status Message	Description
Auto requests inhibited Send manual request to reset.	The system has disabled automatic weather data requests due to excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
GFDS Comm Error [2]	A communications error has occurred with the GDL59 or GIA. The G1000 should be serviced.
GFDS Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or the GDL 59 or a GIA is off-line.
GFDS Comm Error [5]	This can occur if the GDL 59 is off-line or not configured, or the Iridium or GFDS networks are not accessible. Check Iridium signal strength. If this error persists, the G1000 should be serviced.
GFDS Comm Error [6]	A communications error has occurred. If this error persists, the G1000 should be serviced.
GFDS Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the data request.
GFDS Comm Error [8]	A server error has occurred or invalid data received.
GFDS Login Invalid	There is a problem with the GFDS registration. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 for assistance.
GFDS Server Temporarily Inop	The GFDS weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
GFDS Server Inop	The GFDS weather data server will be out of service for at least 30 minutes.
Invalid Coverage Area	The weather data request coverage area does not contain at least one of the following: a waypoint, a flight plan, or a flight plan destination. Verify at least one of the coverage options is enabled (checked) and contains required criteria, then re-send the data request.
NO GFDS Subscription	The system is not currently subscribed to GFDS, or the access code is incorrect. Verify the access code. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 for assistance.
Reduce Request Area	The GFDS weather data request area exceeds size limits. Reduce weather coverage area and re-send data request.
Request Cancelled	The user has cancelled a GFDS weather data request.
Requested area too large. Reduce coverage area.	The size of the GFDS weather data request has exceeded limits. Reduce the size of the coverage area and try the weather data request again.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.
Transfer Preempted	The GDL 59 is busy. Retry request later.

Table 6-6 Abnormal GFDS Request Status Messages

The G1000 also displays message advisories on the PFD which may indicate a problem with the GDL 59; refer to Appendix A for more information.

WORLDWIDE WEATHER IN REVERSIONARY MODE

When the G1000 is operating in Reversionary Mode, only those weather products which can be displayed on the PFD Inset map will be available for display (see Table 6-4 for a list of weather products and their associated map availability).

If manual weather data requests were enabled prior to entering Reversionary Mode, no new GFDS weather data can be retrieved while operating in Reversionary Mode. If automatic weather data requests were enabled prior to Reversionary Mode operation, the system will continue the automatic data requests in Reversionary Mode (provided automatic requests have not been inhibited due to a system error).

6.3 AIRBORNE COLOR WEATHER RADAR

SYSTEM DESCRIPTION

The Garmin GWX 68 Airborne Color Weather Radar is a four-color digital pulsed radar with 6.5 kilowatts of output power. It combines excellent range and adjustable scanning profiles with a high-definition target display. The pulse width is four microseconds (μs) on all ranges except the 2.5 nm range. The GWX 68 uses a one μs pulse width at this range to reduce the targets smearing together on the display for better target definition at close range.

The KingAir 200/B200 Series 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 90°. 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.
- 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 reflect the weather behind a storm.
- Weather Alert that looks ahead for intense cell activity in the 80-320 nm range, even if these ranges are not being monitored.

PRINCIPLES OF PULSED 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. The returned signal is then processed and displayed on the G1000 MFD.

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.

Airborne weather radar should be used to avoid severe weather, not for penetrating severe weather. The decision to fly into an area of radar targets depends on target intensity, spacing between the targets, aircraft capabilities, and pilot experience. Pulse type weather radar detects only precipitation, not clouds or turbulence. The display may indicate clear areas between intense returns, but this does not necessarily mean it is safe to fly between them. Only Doppler radar can detect 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 used by Garmin Airborne Color Weather Radar should 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.

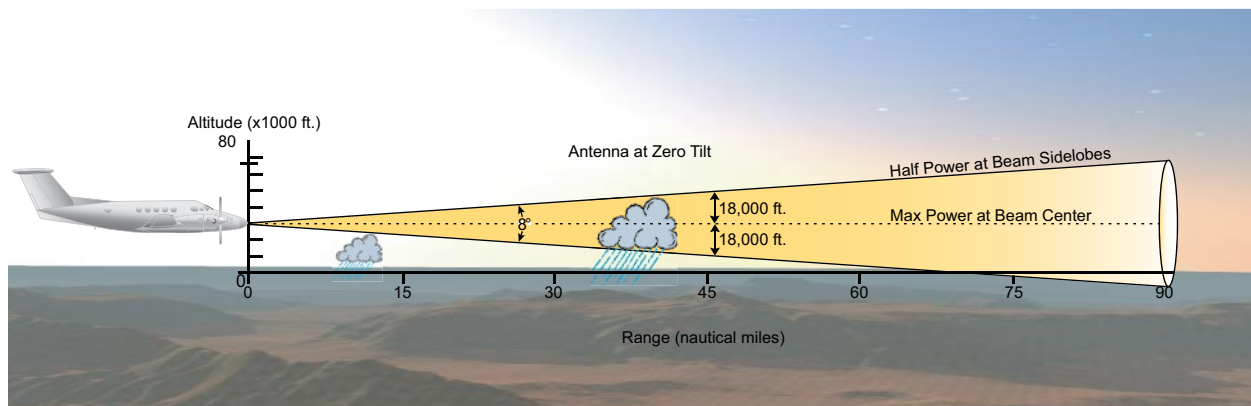


Figure 6-81 Radar Beam from a 12 inch Antenna

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.

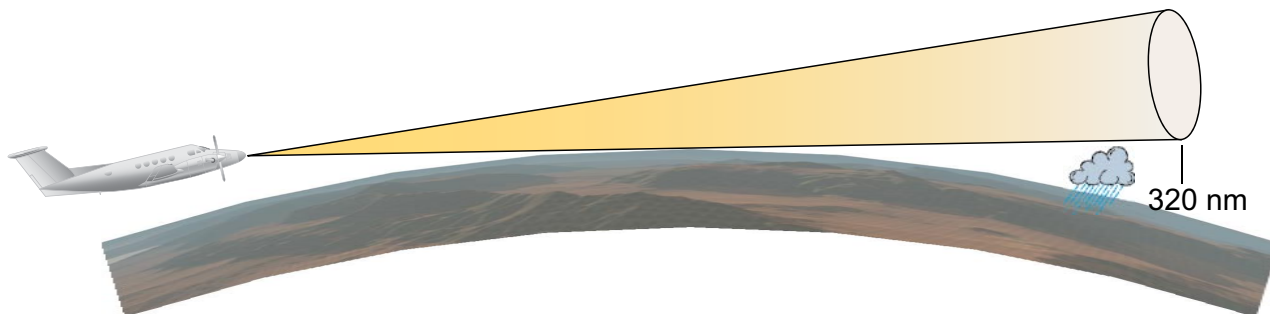


Figure 6-82 Radar Beam in Relation to the Curvature of the Earth

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 68 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 68 Weather Radar system can help in identifying 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.

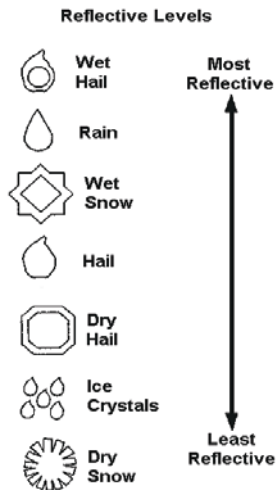


Figure 6-83 Precipitation Type and Reflectivity

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.

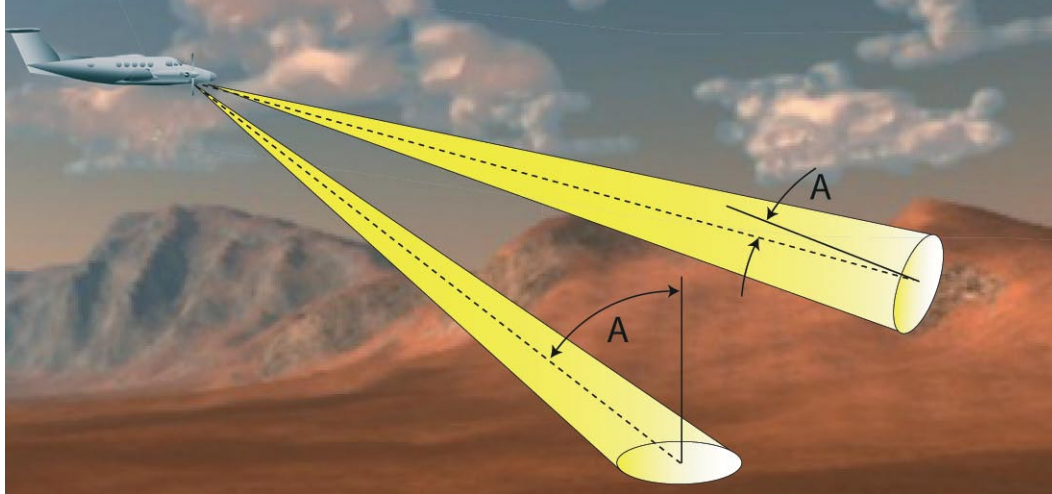


Figure 6-84 Angle of Incidence

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.

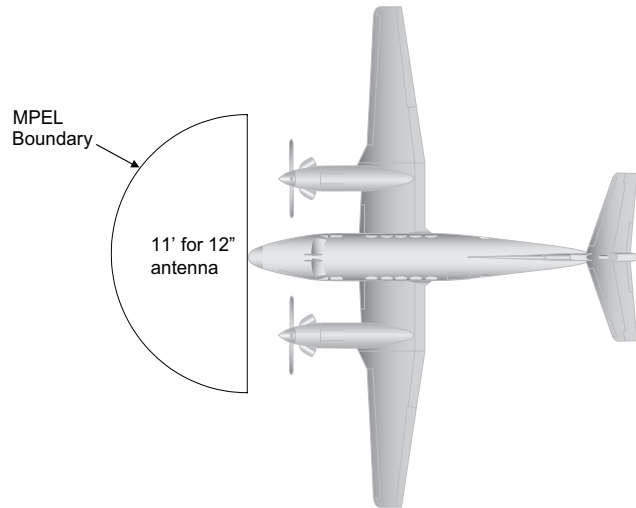


Figure 6-85 MPEL Boundary

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.

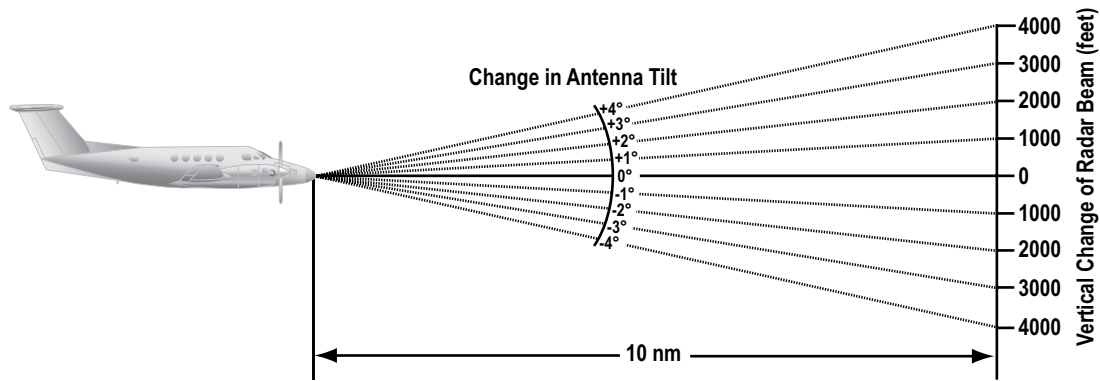


Figure 6-86 Vertical Change in Radar Beam per Nautical Mile

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. When the ground target return moves to 5 nm, maximum distance below the aircraft is 2,000 feet.

This setup provides a good starting point for practical use of the GWX 68. There are many other factors to consider in order to become proficient at using weather radar in all situations.

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	Approximate Precipitation Rate (in/hr.)
Black	< 23 dBZ	< .01.
Green	23 dBZ to < 32 dBZ	.01 - 0.1.
Yellow	32 dBZ to < 41 dBZ	0.1 - 0.5
Red	41 dBZ to < 50 dBZ	0.5 - 2
Magenta	50 dBZ and greater	> 2

Table 6-7 Precipitation Intensity Levels

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.

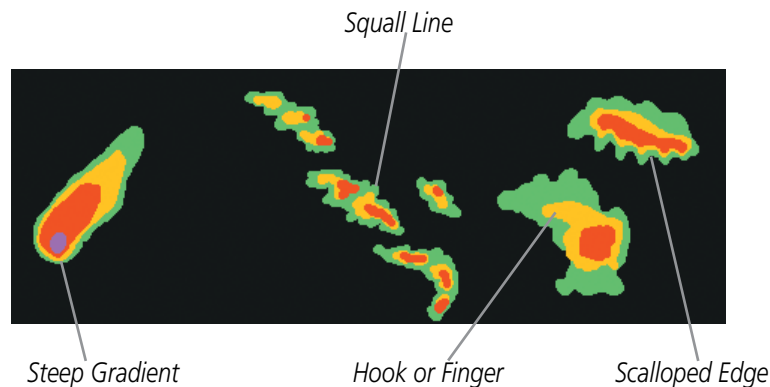


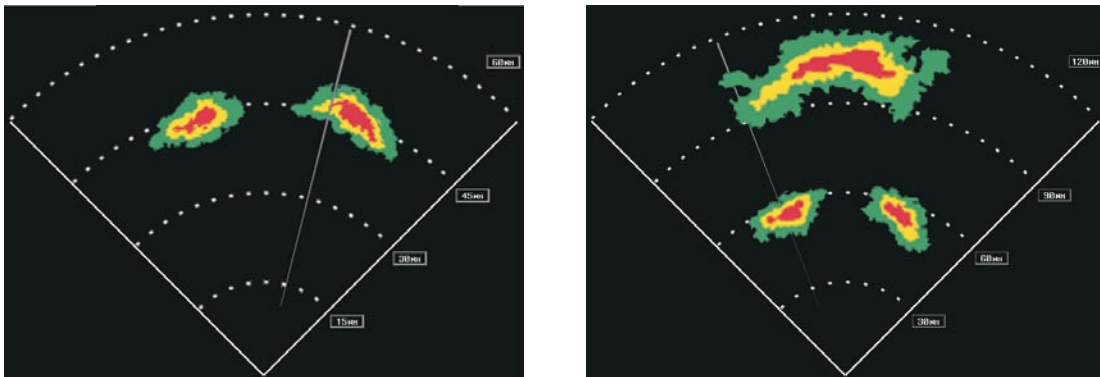
Figure 6-87 Cell Irregularities

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 6-88 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 6-89 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 (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.

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 mode, the weather radar system automatically switches to Standby mode. The system remains in Standby mode until both displays are restored. In Reversionary mode, the weather radar system cannot be controlled.

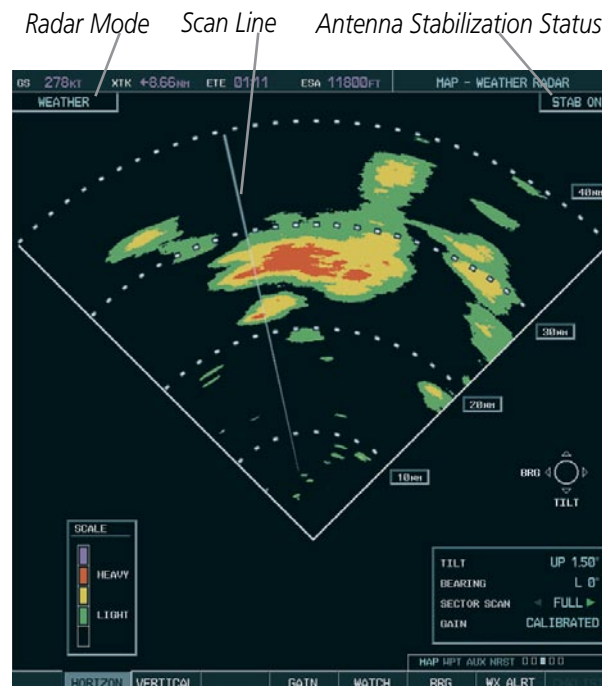


Figure 6-90 Horizontal Scan Display

Displaying weather on the Weather Radar Page:

- 1) Select the Weather Radar Page in the Map Page Group with the **FMS** Knob.
- 2) Select the **MODE** Softkey.
- 3) While on the ground, select the **STANDBY** Softkey. A one-minute warm-up period is initiated (countdown is displayed on the screen). After the warm-up is complete, the radar enters the Standby Mode.
 - a) Select the **WEATHER** Softkey. A confirmation window is displayed.

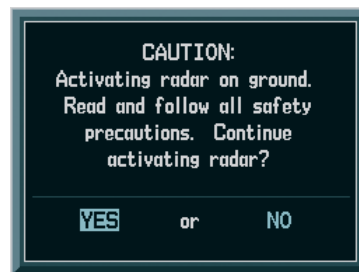


Figure 6-91 Confirming Activating Radar

- b) Turn the small **FMS** Knob to highlight **YES** and press the **ENT** Key to continue radar activation.

OR:

If the aircraft is airborne, select the **WEATHER** Softkey. A one-minute warm-up period is initiated (countdown is displayed on the screen). After the warm-up is complete, the radar begins transmitting.

- 4) Turn the **RANGE** Knob to select the desired map range.
- 5) The horizontal scan is initially displayed (Figure 6-90). If desired, select the **VERTICAL** Softkey to change to vertical scanning.

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) While in the Horizontal Scan view, select the **BRG** Softkey. This places the cursor in the BEARING field and displays the Bearing Line.
If the Bearing Line is not displayed, press the **MENU** Key and turn the large **FMS** Knob to select Show Bearing Line. Press the **ENT** Key.
- 2) Press the **ENT** Key.
- 3) Turn the small **FMS** Knob to place the Bearing Line on the desired storm cell or other area to be vertically scanned.

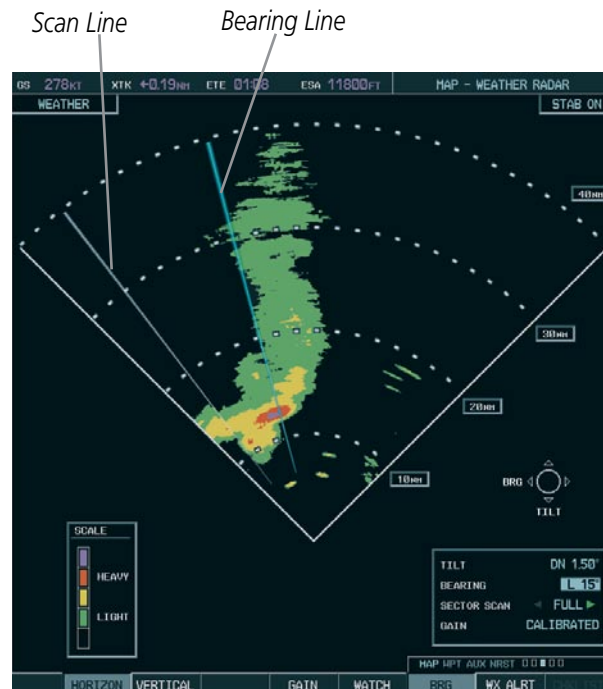


Figure 6-92 Bearing Line on Horizontal Scan

- 4) Select the **VERTICAL** Softkey. A vertical scan of the selected area is now displayed (Figure 6-93).
- 5) The small **FMS** Knob may be used to move the scanned bearing line a few degrees right or left.
- 6) Turn the **RANGE** Knob to adjust the range.
- 7) Press the **FMS** Knob to remove the cursor.
- 8) To select a new area to be vertically scanned, select the **HORIZON** Softkey to return to the Horizontal Scan view and repeat the previous steps.

The **RANGE** Knob can also be used to adjust bearing from left to right.

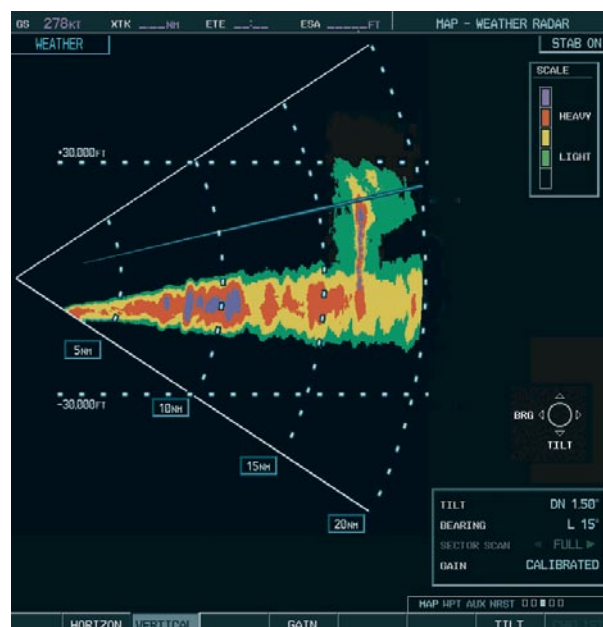


Figure 6-93 Vertical Scan Display

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 Horizontal Scan display:

- 1) Press the **FMS** Knob to activate the cursor in the TILT field.
- 2) Turn the small **FMS** Knob to select the desired antenna tilt angle.
- 3) Press the **ENT** Key.
- 4) Press the **FMS** Knob to remove the cursor.

The **RANGE** Knob can also be used to adjust tilt up and down.

Adjusting antenna tilt on the Vertical Scan display:

- 1) Select the **TILT** Softkey to activate the cursor in the TILT field and display the Tilt Line.
If the Tilt Line is not displayed, press the **MENU** Key and turn the large **FMS** Knob to select Show Tilt Line. Press the **ENT** Key.
- 2) Turn the small **FMS** Knob to adjust the antenna tilt angle. The selected tilt angle is implemented when Horizontal Scan is again selected.

The **RANGE** Knob can also be used to adjust tilt.

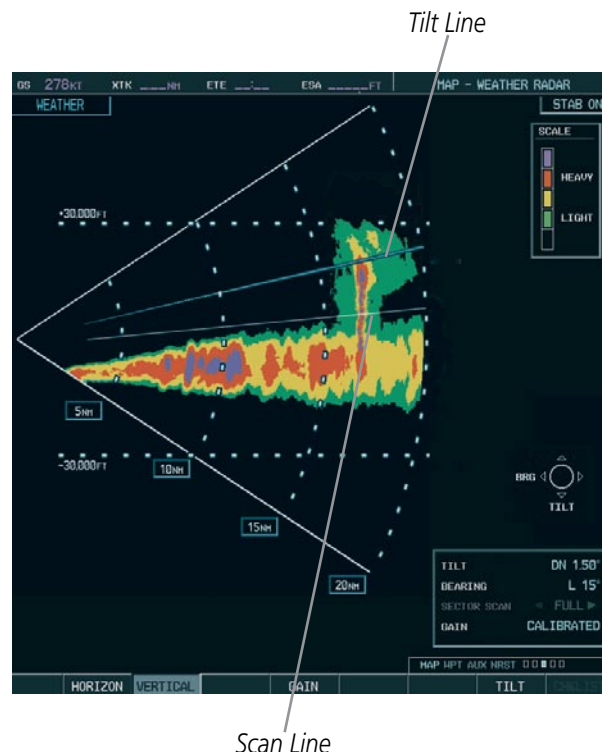


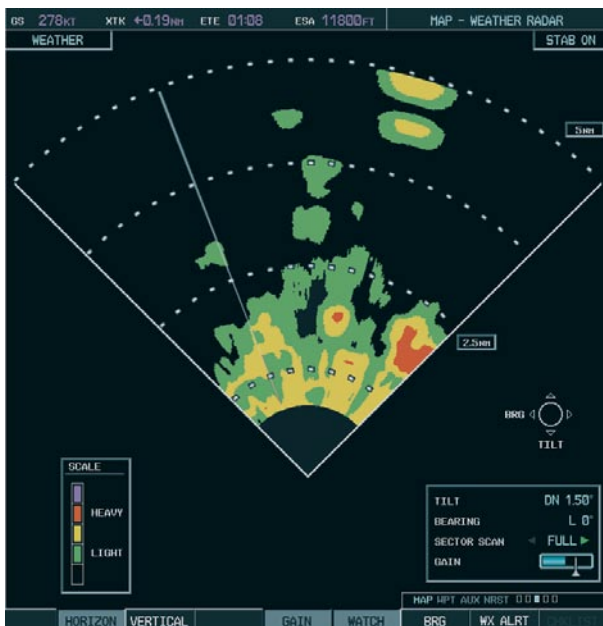
Figure 6-94 Adjusting Tilt on Vertical Scan Display

ADJUSTING GAIN

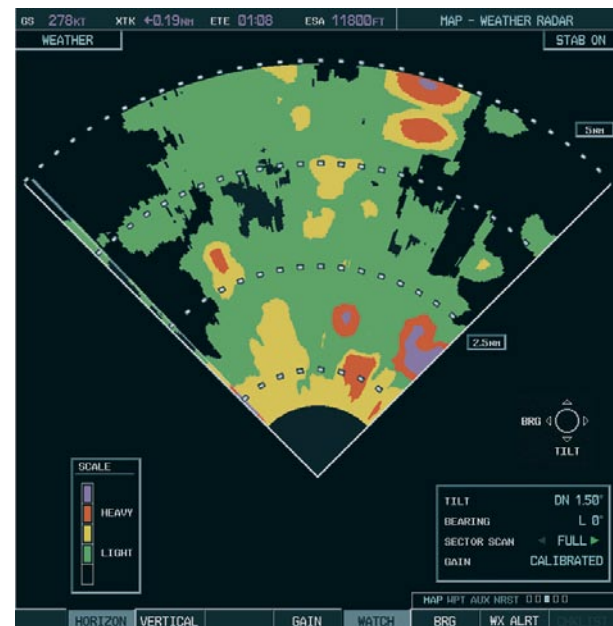


WARNING: Changing the gain in weather mode causes precipitation intensity to be displayed as a color not representative of the true intensity. Remember to return the gain setting to Calibrated for viewing the actual intensity of precipitation.

- 1) Select the **GAIN** Softkey to activate the cursor in the GAIN field.
- 2) Turn the small **FMS** Knob to adjust the gain for the desirable level. The gain setting is visible in the GAIN field as a movable horizontal bar in a flashing box. The line pointer is a reference depicting the calibrated position.
- 3) Press the **FMS** Knob to remove the cursor.
- 4) Select the **GAIN** Softkey again to recalibrate the gain. CALIBRATED is displayed in the GAIN field.



Manual Gain Set Below Calibrated



Calibrated Gain

Figure 6-95 Gain Calibration

SECTOR SCAN

- 1) While in horizontal scan mode, select the **BRG** Softkey to display the Bearing Line and place the cursor in the BEARING field. If the Bearing Line is not displayed, press the **MENU** Key and turn the large **FMS** Knob to select Show Bearing Line.
- 2) Press the **ENT** Key.



Figure 6-96 Selecting Sector Scan Position

- 3) Turn the small **FMS** Knob to place the Bearing Line in the desired position. The location of the Bearing Line becomes the center point of the Sector Scan.
- 4) Turn the large **FMS** Knob to place the cursor in the SECTOR SCAN field.
- 5) Turn the small **FMS** Knob to select FULL, 60°, 40°, or 20° scan.
- 6) If desired, readjust the Bearing Line as discussed previously to change the center of the Sector Scan.
- 7) Select the **BRG** Softkey again to remove the Bearing Line and cursor. The bearing reference is reset to 0°.

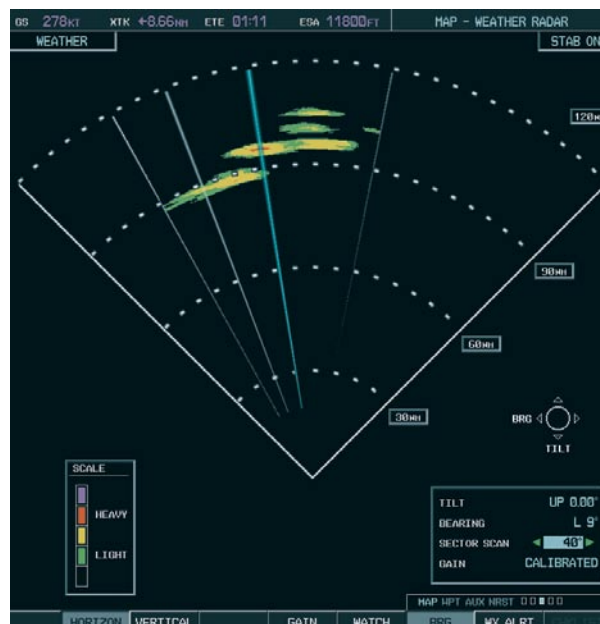


Figure 6-97 40° Sector Scan

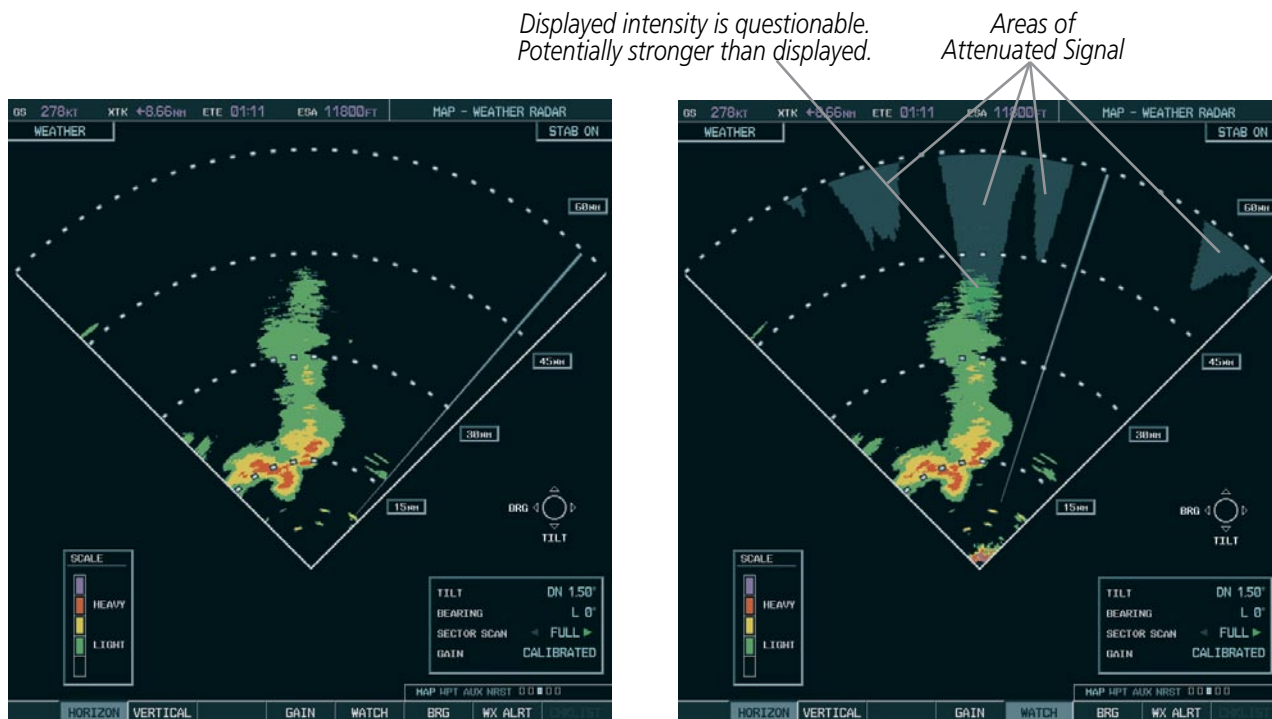
ANTENNA STABILIZATION

- 1) To activate or deactivate the antenna stabilization, select the **MODE** Softkey.
- 2) Select the **STAB ON** Softkey to activate antenna stabilization or select the **STAB OFF** Softkey to deactivate. The current stabilization condition is shown in the upper right of the weather radar display.

WEATHER ATTENUATED COLOR HIGHLIGHT (WATCH™)

While in horizontal scan mode, this feature can be used as a tool to determine 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. Issues with the radome also attenuates 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.

To activate or deactivate the WATCH™ feature, select the **WATCH** Softkey.



Horizontal Scan Without WATCH™

Horizontal Scan With WATCH™

Figure 6-98 Horizontal Scan Without and With WATCH™

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.

If a Weather Alert is detected within $\pm 10^\circ$ of the aircraft heading, an alert is displayed on the PFD in the Messages Window.

If the antenna tilt is adjusted too low, a weather alert can be generated by ground returns. To avoid unwanted weather alerts, deselect the **WX ALRT** Softkey.

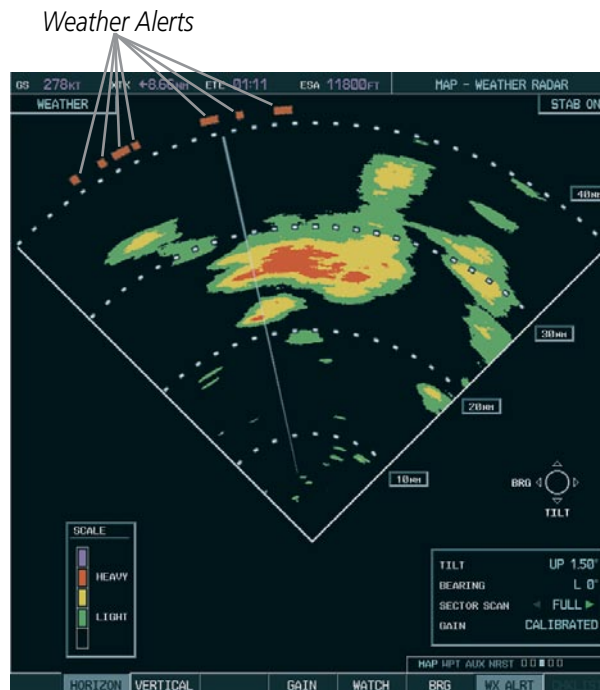


Figure 6-99 Weather Alert Indications

To activate or deactivate Weather Alerts, select the **WX ALRT** Softkey. Activating and deactivating also enables or inhibits the alert on the PFD.

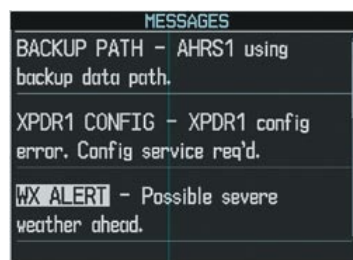


Figure 6-100 Weather Alert on PFD

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 on the MFD.

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 < 9 dB
Yellow	9 dB to < 18 dB
Magenta	18 dB to < 27 dB
Blue	27 dB and greater

Table 6-8 Ground Target Return Intensity Levels

Operation in Ground Map Mode

- 1) Select the **MODE** Softkey.
- 2) Select the **GROUND** Softkey to place the radar in Ground Map mode.
- 3) Select the **BACK** Softkey.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to place the cursor in the **TILT** field.
- 6) Adjust the antenna tilt angle by turning the small **FMS** Knob to display ground returns at the desired distance.
- 7) Press the **FMS** Knob to remove the cursor.

6.4 STORMSCOPE



NOTE: The Stormscope system is not intended for hazardous thunderstorm penetration. Weather information on the G1000 MFD is approved for weather avoidance only. Refer to the WX-500 User's Guide for a detailed description of Stormscope operation.



NOTE: L-3 STORMSCOPE® WX-500 Lightning and XM or GFDS datalink lightning cannot be displayed at the same time.

The following pages can display Stormscope data:

- PFD Inset Map
- Stormscope Page
- Navigation Map
- AUX - Trip Planning Page
- Nearest Pages

To display Stormscope data on any map besides the Stormscope Page, select the **MAP** Softkey (or the **INSET** Softkey for the PFD Inset Map), then select the **STRMSCP** Softkey. These pages can also display cell or strike data using the yellow lightning strike symbology shown in Table 6-9.





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

Table 6-9 Lightning Age and Symbols

SETTING UP STORMSCOPE ON THE NAVIGATION MAP

Setting up Stormscope options on the Navigation Map:

- 1) On the Navigation Map Page, press the **MENU** Key.
- 2) With 'Map Setup' selected (Figure 6-101), press the **ENT** Key.
- 3) Turn the small **FMS** Knob to display the group selection window. Turn the small **FMS** Knob to select 'Weather' (Figure 6-102), and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to highlight and move between the product selections.
- 5) When an item is highlighted, turn the small **FMS** Knob to select the option.
- 6) Press the **ENT** Key.
- 7) Press the **FMS** Knob to return to the Navigation Map Page (Figure 6-103).

The following options are available (Figure 6-102):

- **STRMSCP LTNG** – Turns the display of Stormscope data on or off.
- **STRMSCP MODE** – Selects the CELL or STRIKE mode of lightning activity. Cell mode identifies clusters or cells of electrical activity. Strike mode indicates the approximate location of lightning strikes.
- **STRMSCP SMBL** – Selects the range at which Stormscope data displays. Stormscope data is removed when a map range greater than the STRMSCP SMBL value is selected.

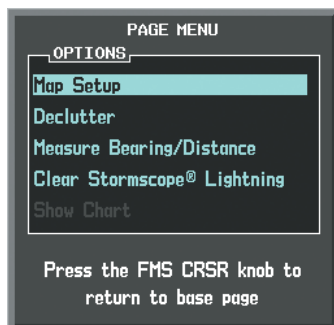


Figure 6-101 Page Menu

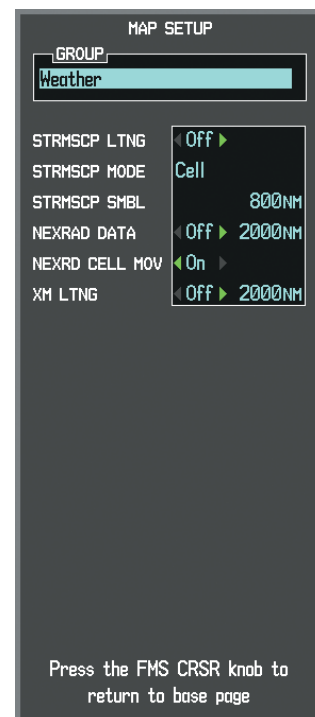


Figure 6-102 Map Setup Menu

CELL AND STRIKE MODE ON THE NAVIGATION MAP

On the Navigation Map, cell mode identifies cells of lightning activity (Figure 6-103). Stormscope identifies clusters of electrical activity that indicate cells. Strike mode indicates the approximate location of lightning strikes.

Selecting the 'cell' or 'strike' mode on the Navigation Map:

- 1) Press the **MENU** Key.
- 2) With 'Map Setup' selected, press the **ENT** Key (Figure 6-101).
- 3) Select the 'Weather' group (Figure 6-102).
- 4) Press the **ENT** Key. The cursor flashes on 'STRMSCP LTNG'.
- 5) Turn the **large FMS** Knob to select 'STRMSCP MODE'.
- 6) Turn the small **FMS** Knob to change between 'CELL' and 'STRIKE' options. When an item is selected, press the **ENT** Key.
- 7) Press the **FMS** knob to return to the Navigation Map Page.

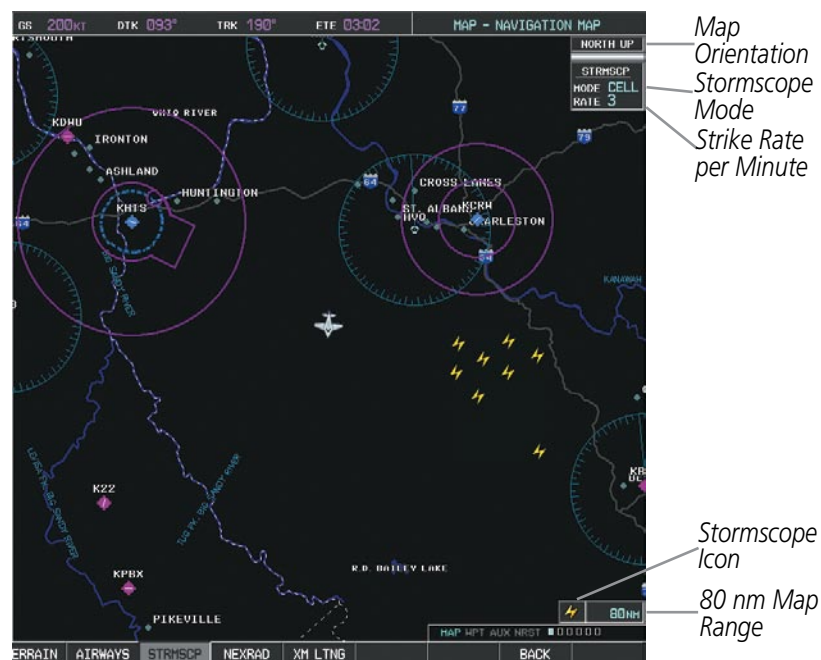


Figure 6-103 Navigation Map Page with Stormscope Lightning Data

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn. This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

Manually clearing Stormscope data on the Navigation Map:

- 1) Press the **MENU** Key.
- 2) Select 'Clear Stormscope Lightning' (Figure 6-104).
- 3) Press the **ENT** Key.

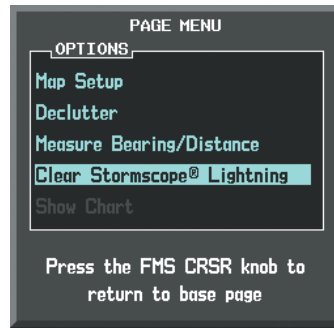


Figure 6-104 Navigation Map Page Options Menu

ZOOM RANGE ON THE NAVIGATION MAP

Stormscope lightning data can be displayed up to 800 nm zoom range (in North Up orientation) on the Navigation Map Page. However, in Track Up orientation at the 500 nm range, a portion of Stormscope lightning data can be behind the aircraft and therefore not visible on the Navigation Map. Since the range for Stormscope data is 400 nm diameter total (200 nm in front and 200 nm behind), the 500 nm range in North Up orientation shows all the data.

At a map range of less than 25 nm, Stormscope lightning data is not displayed, but can still be present. The presence of Stormscope lightning data is indicated by the annunciation 'LTNG < 25 nm' in the upper right corner (Figure 6-105).

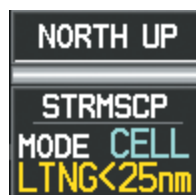


Figure 6-105 Lightning Display Range Annunciation

Selecting a Stormscope range on the Navigation Map:

- 1) Press the **MENU** Key.
- 2) Select 'MAP SETUP'.
- 3) Select the 'Weather' group.
- 4) Press the **ENT** Key.
- 5) Turn the large **FMS** Knob to select 'STRMSCP SMBL'.
- 6) Turn the small **FMS** Knob to select the maximum display range.

- 7) Press the **ENT** Key.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

To change the display range on the Navigation Map Page, turn the **RANGE** Knob clockwise to zoom out or counter-clockwise to zoom in.

SELECTING THE STORMSCOPE PAGE

Stormscope lightning data can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm.

Adjusting the Stormscope Map Range:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Stormscope Page.
- 3) To change the map range, turn the **RANGE** Knob clockwise to zoom out or counter-clockwise to zoom in.



Figure 6-106 Stormscope Page

Changing between 'cell' and 'strike' mode:

- 1) Select the Stormscope Page.
- 2) Press the **MODE** Softkey. The **CELL** and **STRIKE** softkeys are displayed.
- 3) Press the **CELL** Softkey to display 'CELL' data or select the **STRIKE** Softkey to display 'STRIKE' data. 'CELL' or 'STRIKE' is displayed in the mode box in the upper left corner of the Stormscope Page.
- 4) Press the **BACK** Softkey to return to the Stormscope Page.

Or:

- 1) Select the Stormscope Page.
- 2) Press the **MENU** Key.
- 3) Turn the small **FMS** Knob to choose between 'CELL' and 'STRIKE' options.
- 4) When an item is selected, press the **ENT** Key.

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn (Figure 6-107). This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

Manually clearing Stormscope data:

- 1) Select the Stormscope Page.
- 2) Press the **MENU** Key.
- 3) Select 'Clear Stormscope Lightning' (Figure 6-107).
- 4) Press the **ENT** Key.

Or:

- 1) Select the Stormscope Page.
- 2) Press the **CLEAR** Softkey.

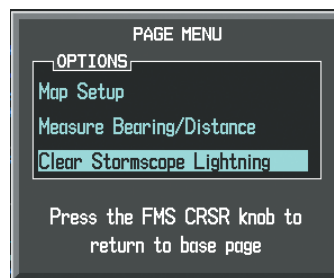


Figure 6-107 Navigation Map Page Options Menu

Changing the viewing mode between 360° and 120°:

- 1) Select the Stormscope Page.
- 2) Press the **VIEW** Softkey. The **360** and **ARC** softkeys are displayed.
- 3) Press the **360** Softkey to display a 360° viewing area or select the **ARC** Softkey to display a 120° viewing area.
- 4) Press the **BACK** Softkey to return to the Stormscope Page.

Or:

- 1) Select the Stormscope Page.
- 2) Press the **MENU** Key.
- 3) Turn the small **FMS** Knob to choose between 'View Arc' and 'View 360°' options.
- 4) When an item is selected, press the ENT Key.

6.5 TAWS-B



WARNING: Do not use TAWS-B information for primary terrain avoidance. TAWS-B is intended only to enhance situational awareness.



NOTE: Terrain data is not displayed when the aircraft latitude is greater than 75° North or 60° South.



NOTE: The data contained in the TAWS-B databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.

TAWS-B (Terrain Awareness and Warning System - Class B) is an optional feature to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS-B provides visual and aural annunciations when terrain and obstacles are within the given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only.

TAWS-B satisfies TSO-C151b Class B requirements for certification.

TAWS-B requires the following to operate properly:

- A valid terrain/obstacle/airport terrain database
- A valid 3-D GPS position solution

TAWS-B uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. 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-B uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used to determine TAWS-B alerts. GPS-MSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GPS altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS-B are referenced to mean sea level (MSL). Using the GPS position and GPS-MSL altitude, TAWS-B displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the GPS position and GPS-MSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-B can provide advanced alerts of predicted dangerous terrain conditions.

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

DISPLAYING TAWS-B DATA

TAWS-B uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-108 and Table 6-10 are used to represent terrain, obstacles, and potential impact points.

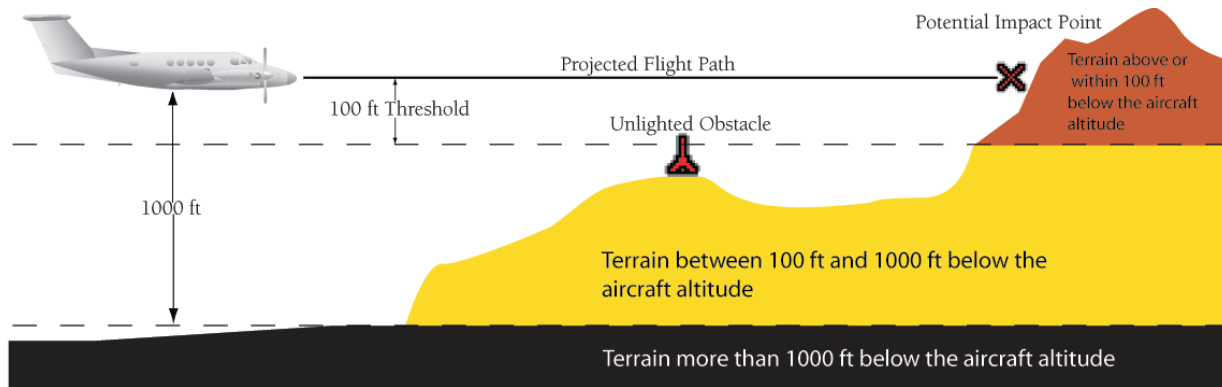


Figure 6-108 Terrain Altitude/Color Correlation for TAWS-B

Unlighted Obstacle		Lighted Obstacle		Potential Impact Points	Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL		
					WARNING: Red obstacle is above or within 100' below current aircraft altitude
					CAUTION: Yellow obstacle is between 100' and 1000' below current aircraft altitude

Table 6-10 TAWS-B Obstacle Colors and Symbology

TAWS-B information can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- TAWS-B Page
- Trip Planning Page
- Flight Plan Page

Displaying terrain and obstacle information (maps other than the TAWS-B Page):

- 1) Press the **MAP** Softkey (for the PFD Inset Map, select the **INSET** Softkey).
- 2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When TAWS-B is selected on maps other than the TAWS-B Page, an icon to indicate the feature is enabled for display and a legend for TAWS-B terrain colors are shown (Figure 6-115).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and

obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the TAWS-B Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-109).
- 4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-110).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-111).
 - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
 - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

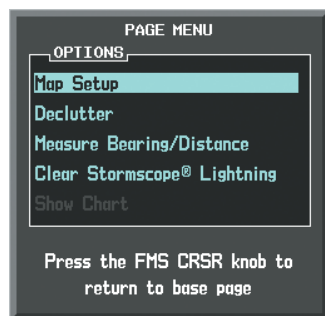


Figure 6-109 Navigation Map Page Menu

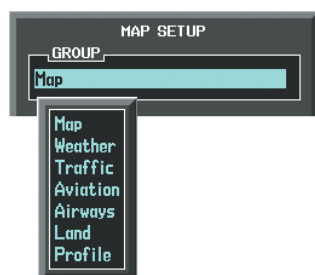


Figure 6-110 Navigation Map Page Setup Menu

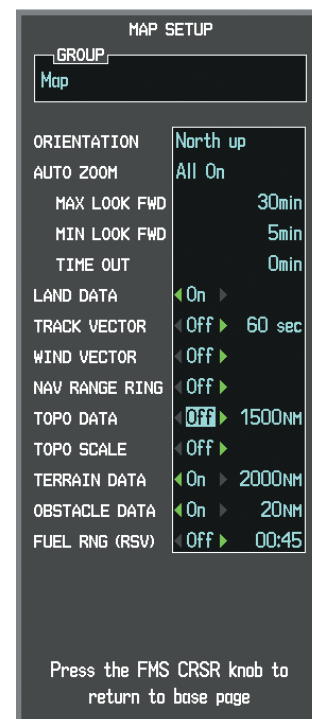


Figure 6-111 Navigation Map Page Setup Menu, Map Group

TAWS-B PAGE

The TAWS-B Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TAWS-B Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the TAWS-B Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the TAWS-B Page.

Changing the TAWS-B Page view:

- 1) Press the **VIEW** Softkey.
- 2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

- 1) Press the **MENU** Key.
- 2) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view

Showing/hiding aviation information on the TAWS-B Page:

- 1) Press the **MENU** Key.
- 2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

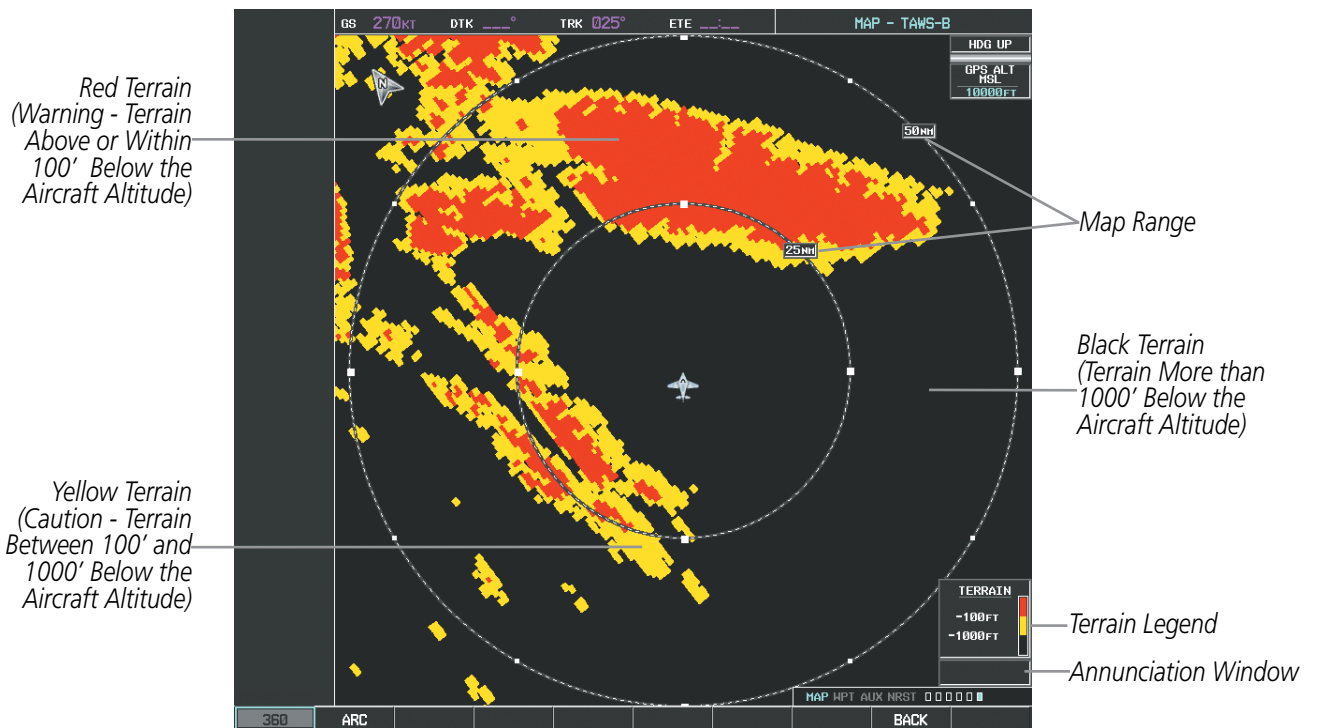


Figure 6-112 TAWS-B Page, 360° View

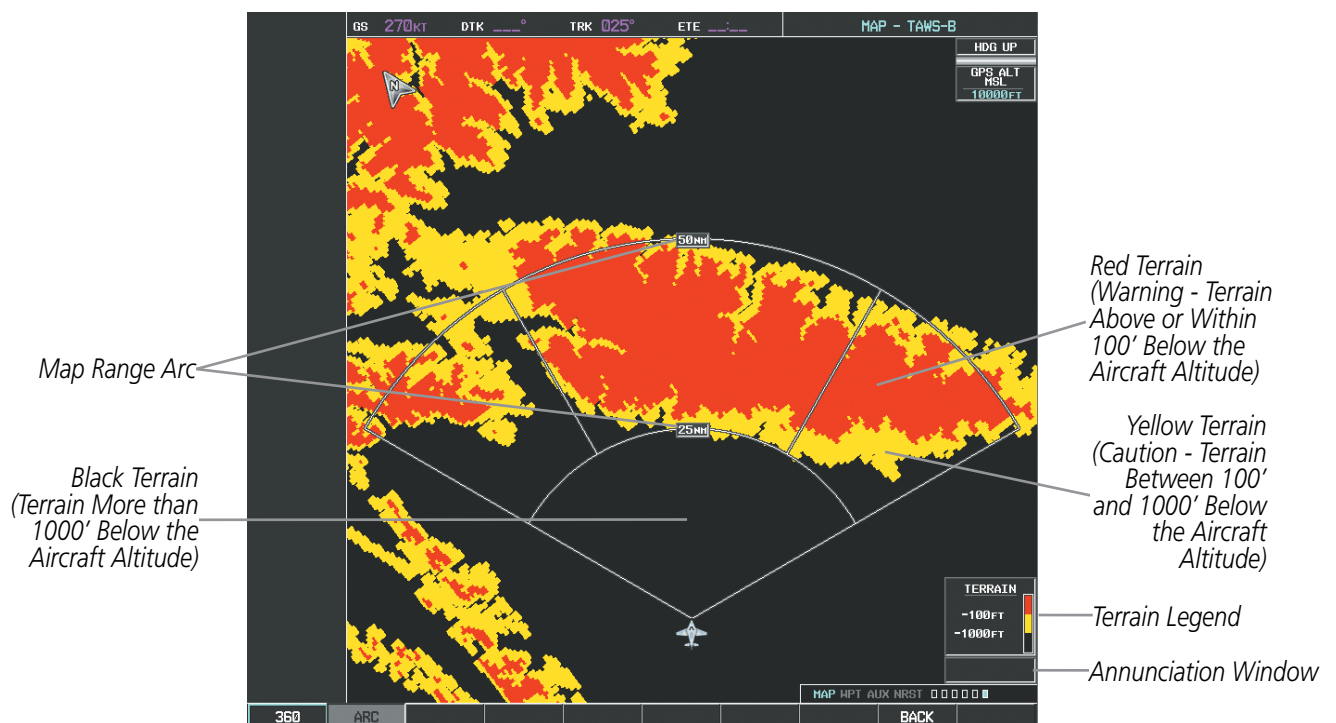


Figure 6-113 TAWS-B Page (ARC View)

TAWS-B ALERTS

Alerts are issued when flight conditions meet parameters that are set within TAWS-B software algorithms. TAWS-B alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued. Table 6-11 shows TAWS-B alert types with corresponding annunciations and aural messages.

When an alert is issued, annunciations appear on the PFD and MFD. The TAWS-B Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the TAWS-B Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the TAWS-B Page)

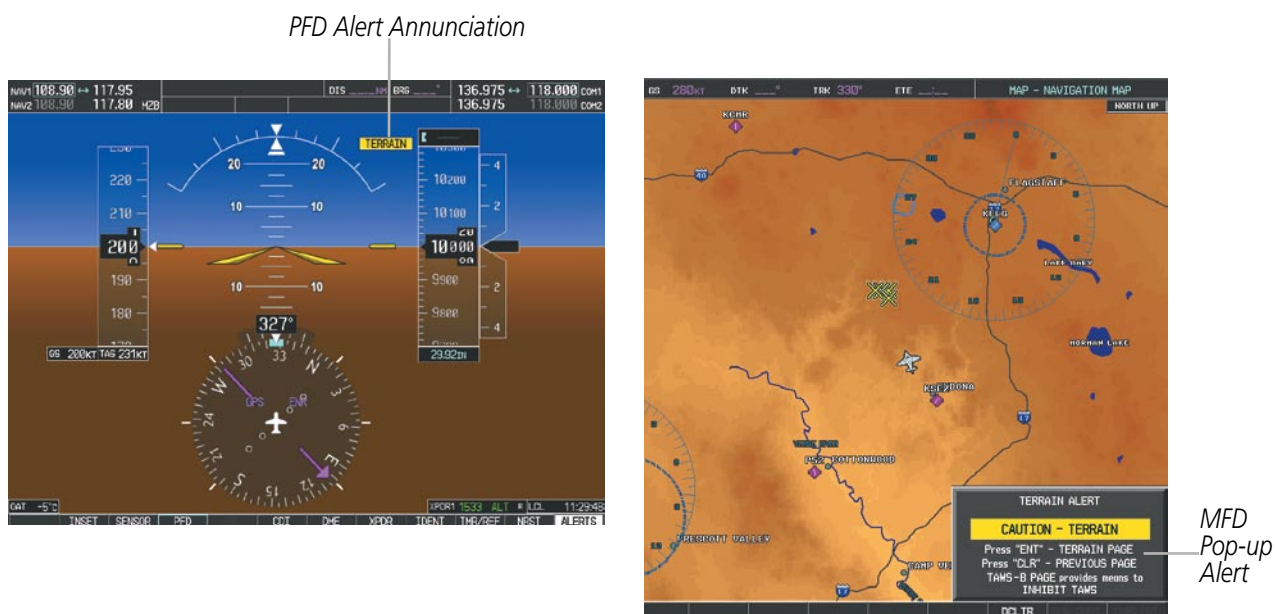


Figure 6-114 TAWS-B Alert Annunciations

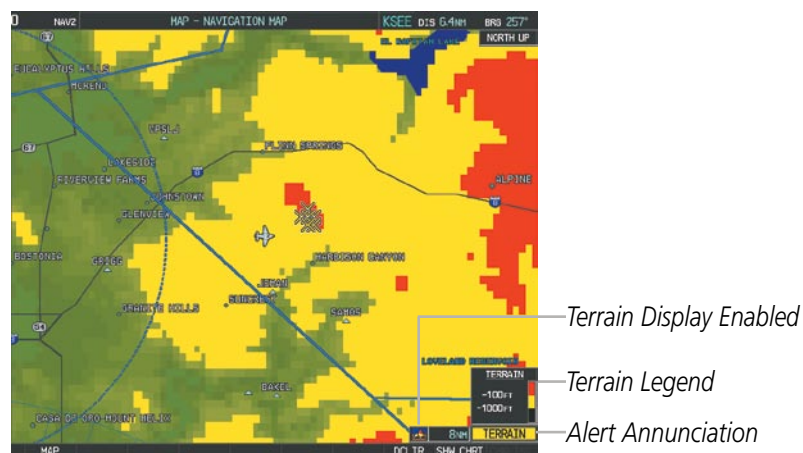


Figure 6-115 Navigation Map Page with Terrain data
(After TAWS-B Pop-up Alert Acknowledgment)

Alert Type	PFD/MFD Alert Annunciation	MFD Pop-Up Alert (Except TAWS-B Page)	Aural Message
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or Terrain Ahead, Pull Up; Terrain Ahead, Pull Up'
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK * or TOO LOW - TERRAIN	"Don't Sink" * or "Too Low, Terrain"

* Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration are indicated with asterisks.

Table 6-11 TAWS-B Alerts Summary

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide suitable notification when the aircraft is determined to be closing (descending) upon terrain at an excessive speed. Figure 6-116 shows the parameters for the alert as defined by TSO-C151b.

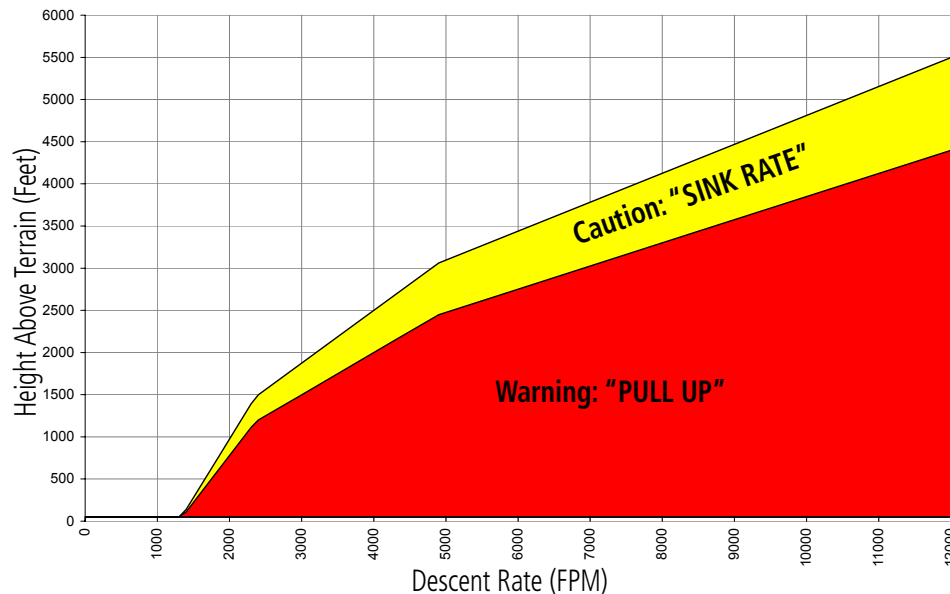


Figure 6-116 Excessive Descent Rate Alert Criteria

FORWARD LOOKING TERRAIN AVOIDANCE

Reduced Required Terrain Clearance (RTC) and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-117. When an RTC alert is issued, a potential impact point is displayed on the TAWS-B Page.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS-B Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-117.

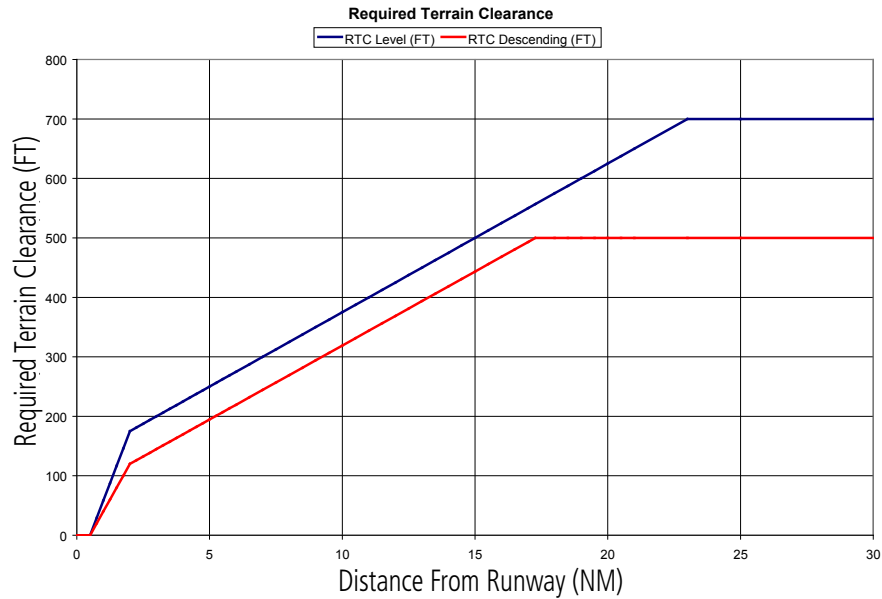


Figure 6-117 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically inhibited when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

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 6-118).

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.

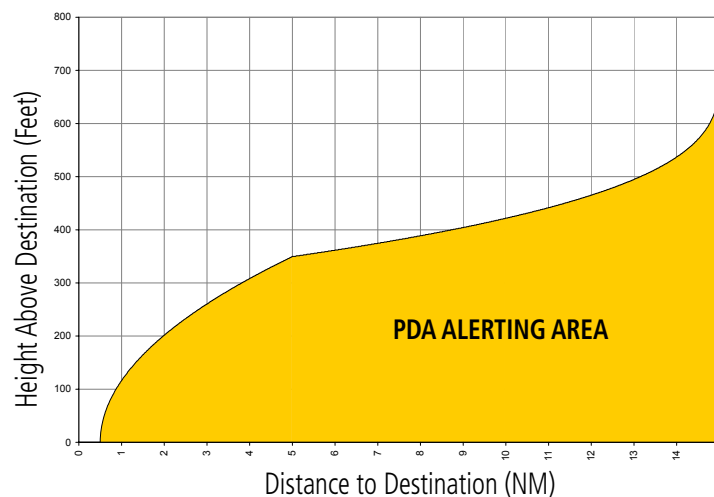


Figure 6-118 PDA Alerting Threshold

PDA and FLTA aural and visual alerts can be manually inhibited. Discretion should be used when inhibiting TAWS-B and the system should be enabled when appropriate. When TAWS-B is inhibited, the alert annunciation 'TAWS INH' is shown on the PFD and MFD (Figure 6-119).

TAWS INH

Figure 6-119 TAWS-B Alerting Disabled
(TAWS Inhibited) Annunciation

Inhibiting/enabling TAWS-B alerting:

- 1) Select the TAWS-B Page.
- 2) Press the **INHIBIT** Softkey to inhibit or enable TAWS-B (choice dependent on current state).

Or:

- a) Press the **MENU** Key.
- b) Select 'Inhibit TAWS' or 'Enable TAWS' (choice dependent on current state) and press the **ENT** Key.

If TAWS-B alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, a 'LOW ALT' annunciation may appear on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

FIVE-HUNDRED AURAL ALERT

The purpose of the aural alert message **"Five-hundred"** is to provide an advisory alert of when the aircraft descends to within 500 feet above the terrain or runway threshold. When the aircraft is within 5 nm of an airport, the **"Five Hundred"** aural alert is based on the nearest runway threshold elevation. When the aircraft is more than 5 nm of the nearest airport, the **"Five Hundred"** aural alert is based on the height above terrain.

There are no display annunciations or pop-up alerts that accompany the "Five Hundred" aural alert.

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT (NCR)

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 aural message "Don't Sink" is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the display. NCR alerting is only active when departing from an airport and when the following conditions are met:

- 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

NCR alerts can be triggered by either altitude loss (Figure 6-120) or sink rate (6-121).

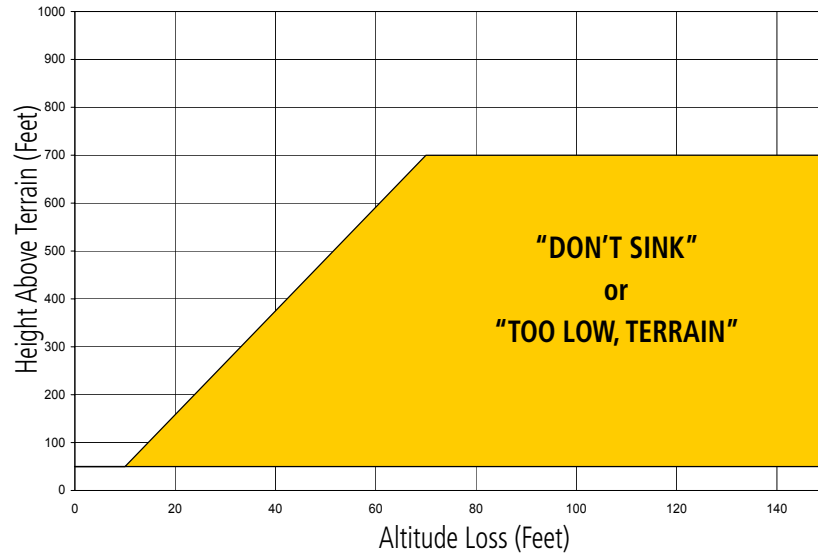


Figure 6-120 Negative Climb Rate (NCR) Altitude Loss

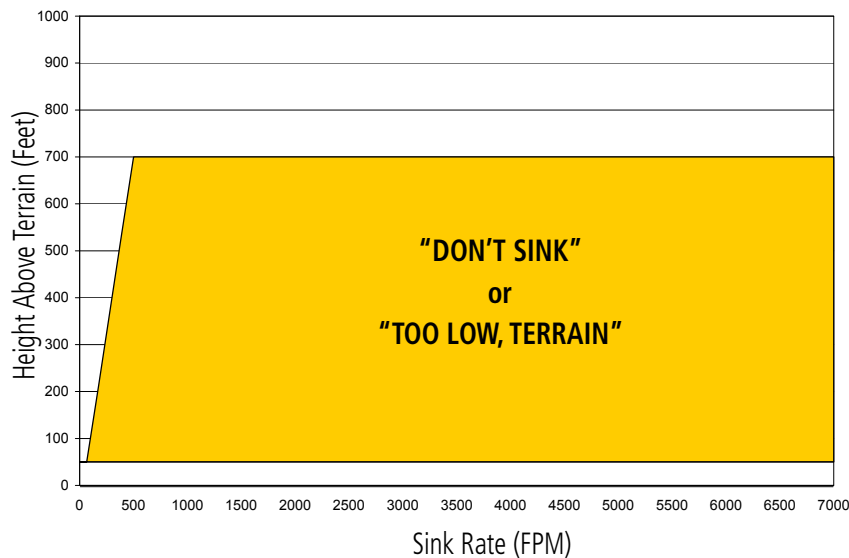


Figure 6-121 Negative Climb Rate (NCR) Sink Rate

SYSTEM STATUS

During power-up, TAWS-B conducts a self-test of its aural and visual annunciations. The system test can also be manually initiated. A single chime is issued at test completion. TAWS-B System Testing is disabled when ground speed exceeds 30 knots.

Manually testing the TAWS-B System:

- 1) Select the TAWS-B Page.
- 2) Press the **MENU** Key.
- 3) Select 'Test TAWS System' and press the **ENT** Key to confirm the selection. (Figure 6-123)

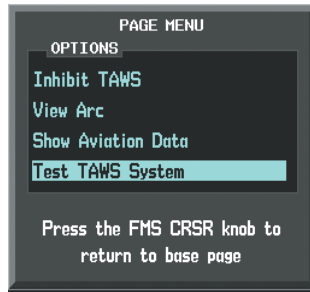


Figure 6-123 TAWS-B Page Menu

TAWS-B continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the aural message **“TAWS System Failure”** is generated along with the ‘TAWS FAIL’ alert annunciation.

TAWS-B requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation ‘TAWS N/A’ is generated in the annunciation window and on the TAWS-B Page. If in-flight, the aural message **“TAWS Not Available”** is also generated. When the GPS signal is restored and the aircraft is within the database coverage area, the aural message “TAWS Available” is generated.

Alert Type	PFD/MFD TAWS-B Page Annunciation	TAWS-B Page Center Banner Annunciation	Aural Message	TAWS Alert Types Not Available
System Test in progress	TAWS TEST	TAWS TEST	None	None Available
System Test pass	None	None	“TAWS System Test OK”	
TAWS System Test Fail; Terrain, Airport Terrain or Obstacle database unavailable or invalid on all GDUs; software mismatch among GDUs; TAWS audio fault	TAWS FAIL	TAWS FAIL	“TAWS System Failure”	FLTA, PDA
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None	
No GPS position	TAWS N/A	NO GPS POSITION	“TAWS Not Available”	FLTA, PDA, VCO
Excessively degraded GPS signal, or out of database coverage area	TAWS N/A	None	“TAWS Not Available”	FLTA, PDA
Sufficient GPS signal reception restored	None	None	“TAWS Available” (aural message only in flight)	
TAWS Alerting is disabled	TAWS INH	None	None	FLTA, PDA

Table 6-12 TAWS-B System Status Annunciations

6.6 PROFILE VIEW TERRAIN



NOTE: Profile View is only available if TAWS-B is installed..

The G1000 offers a Profile View of terrain and obstacles relative to the aircraft's current flight path and altitude on the Navigation Map Page of the MFD. Profile View does not provide TAWS-B terrain or obstacle caution or warning annunciations or voice alerts systems, nor does it display potential impact points inside the Profile View. The colors and symbols in Figure 6-124 and Table 6-13 are used to represent terrain and obstacles.

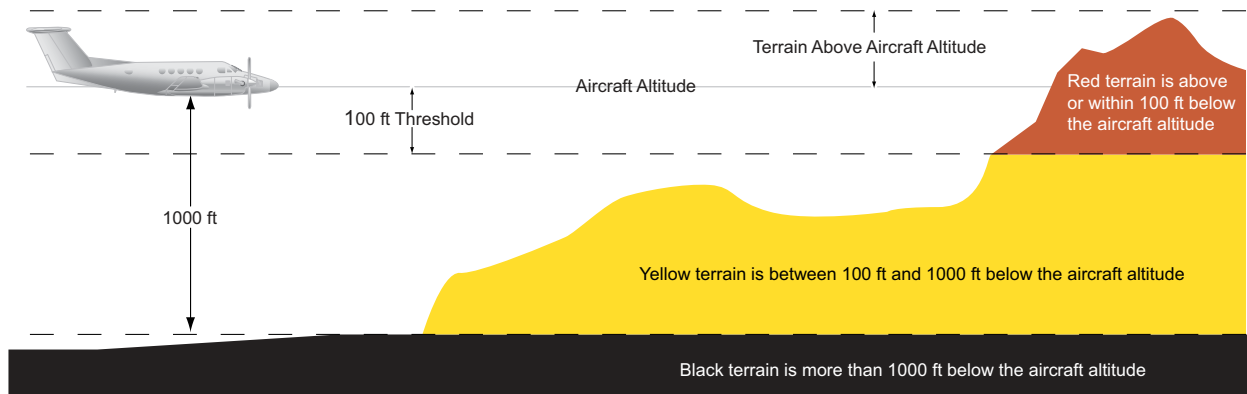


Figure 6-124 Terrain Altitude/Color Correlation for Profile View Terrain

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 6-13 Profile View Terrain/Obstacle Colors and Symbolology

Accessing Profile View:

- 1) Select the Navigation Map Page.
- 2) Press the **MAP** Softkey.
- 3) Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

- a) Press the **MENU** Key.
- b) Select 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Enabling/Disabling Profile View Terrain on the Navigation Map (when Profile View is enabled):

- 1) Select the Navigation Map Page.
- 2) Press the **MAP** Softkey.
- 3) Press the **TERRAIN** Softkey.

PROFILE VIEW DISPLAY

When the Profile View is enabled, it is displayed in a window below the Navigation Map. Altitude is shown along a vertical scale, with an aircraft icon positioned at the current altitude. Distance is represented horizontally along the bottom of the Profile View, and increases from left (present position) to right.

When the Navigation Map range is adjusted with the **RANGE** Knob, the horizontal distance of the Profile View is adjusted proportionately to be 1/2 of the Navigation Map range distance down to 1 nm, at which point Profile View is no longer available ('PROFILE NOT AVAILABLE' is displayed). When Navigation Map range is adjusted to remove altitude-correlated colored terrain data (as shown in the Terrain Legend) or obstacles from the Navigation Map, these items are also removed from the Profile View; only an outline of the terrain will be displayed in black in the Profile View window. Refer to the Terrain Proximity, Terrain-SVS, or TAWS-B discussions for more information about displaying terrain or obstacles on the Navigation Map Page.

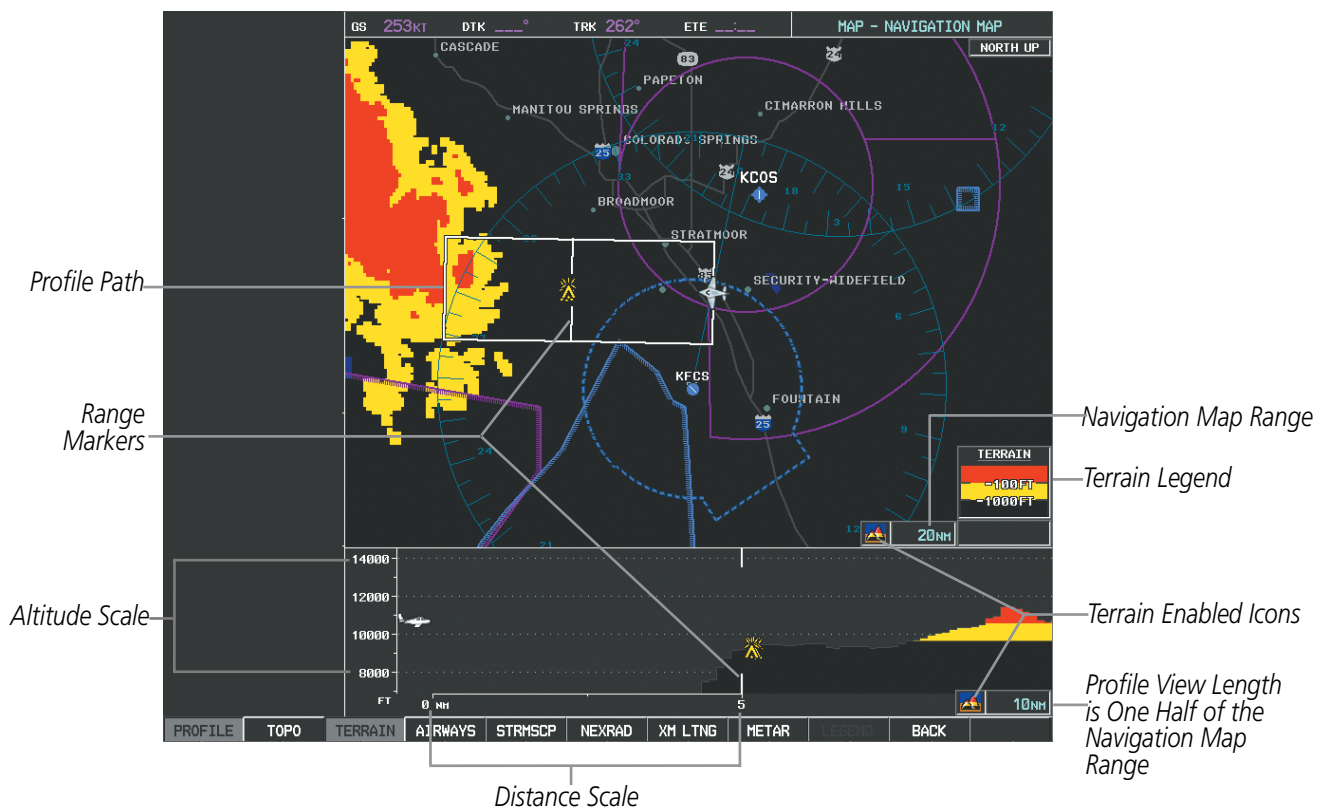


Figure 6-125 Profile View on Navigation Map with Terrain Display Enabled

The Profile View is based on the current aircraft track (or heading if track is unavailable) and shows the *highest* known terrain or obstacles within a predetermined width from the present aircraft position to the end of the profile range. The width of the Profile View is determined by the phase of flight, and is widest during enroute or oceanic phases (Table 6-14).

Flight Phase	Total Profile View Width
Approach	0.6 nm
Departure	0.6 nm
Terminal	2.0 nm
Enroute	4.0 nm
Oceanic	4.0 nm

Table 6-14 Profile View Width Scale

PROFILE PATH

The Profile Path displays the horizontal and lateral boundaries of the Profile View. The path is shown as a white rectangle on the Navigation Map Page and is only available when Profile View is enabled. White range markers both edges of the Profile Path rectangle match the range markers along the distance scale inside the Profile View display window whenever the profile range is at least 4 nm (or 7.5 km if configured for metric units).

The Profile Path rectangle may be configured on or off, and the Navigation Map range at which the Profile Path is removed from map display can be changed.

Customizing the Profile Path display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-126).
- 4) Turn the small **FMS** Knob to select the 'Profile' Group and press the **ENT** Key (Figure 6-127).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-128).
 - **PROFILE PATH** – Turns the display of the Profile Path on or off and sets maximum range at which Profile Path is shown
- 6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

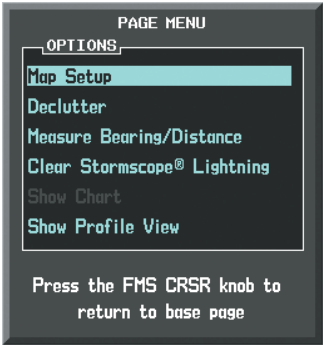


Figure 6-126 Navigation Map Page Menu



Figure 6-127 Navigation Map Page Setup Menu



Figure 6-128 Navigation Map Page Setup Menu, Profile Group

6.7 TAWS-A



WARNING: Do not use TAWS information for primary terrain avoidance. TAWS-A is intended only to enhance situational awareness.



NOTE: Terrain data is not displayed when the aircraft latitude is greater than 75° North or 60° South.



NOTE: The data contained in the TAWS databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.

TAWS-A (Terrain Awareness and Warning System - Class A) is an optional feature to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS-A provides visual and aural annunciations 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.

Class A TAWS requires the following components:

- A valid terrain/obstacle/airport terrain 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 supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. The data undergoes verification by Garmin to confirm accuracy of the content, 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 converted to a mean sea level (MSL)-based altitude (GPS-MSL altitude) and is used in part to determine TAWS-A alerts. GPS-MSL altitude accuracy is affected by factors such as satellite geometry, but it is not subject to variations in pressure and temperature that normally affect pressure altitude devices. GPS-MSL altitude does not require local altimeter settings to determine MSL altitude. Therefore, GPS altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS-A are referenced to mean sea level (MSL). Using the GPS position and GPS-MSL 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 GPS-MSL altitude are used to calculate and “predict” the aircraft’s flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-A can provide advanced alerts of predicted dangerous terrain conditions.

Class A TAWS incorporates radar altimeter input with the GPS-MSL 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 an airport, 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-MSL 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 DATA

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 6-129 and Table 6-15 are used to represent terrain, obstacles, and potential impact points.

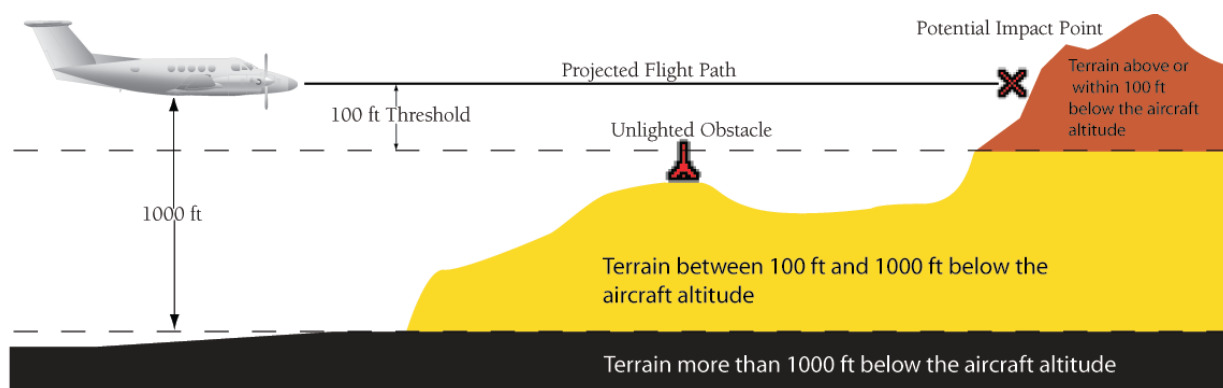


Figure 6-129 Terrain Altitude/Color Correlation for TAWS-B











Unlighted Obstacle		Lighted Obstacle		Potential Impact Points	Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL		
					WARNING: Red obstacle is above or within 100' below current aircraft altitude
					CAUTION: Yellow obstacle is between 100' and 1000' below current aircraft altitude

Table 6-15 TAWS-A Obstacle Colors and Symbology

TAWS-A PAGE

The TAWS-A Page shows terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TAWS-A Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the TAWS-A Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the TAWS-A Page.

Changing the TAWS-A Page view:

- 1) Select the **VIEW** Softkey.
- 2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

- 1) Press the **MENU** Key.
- 2) Select 'View Arc°' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view

Showing/hiding aviation information on the TAWS-A Page:

- 1) Press the **MENU** Key.
- 2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

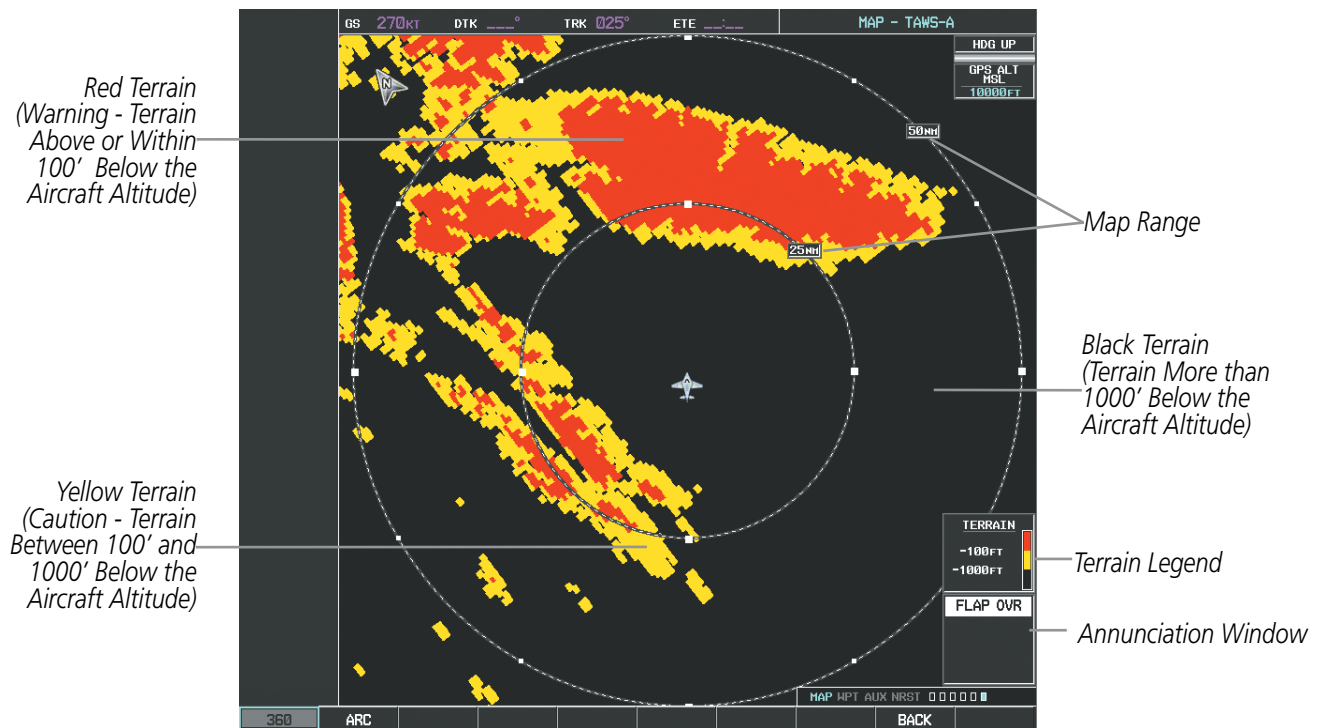


Figure 6-130 TAWS-A Page, 360° View

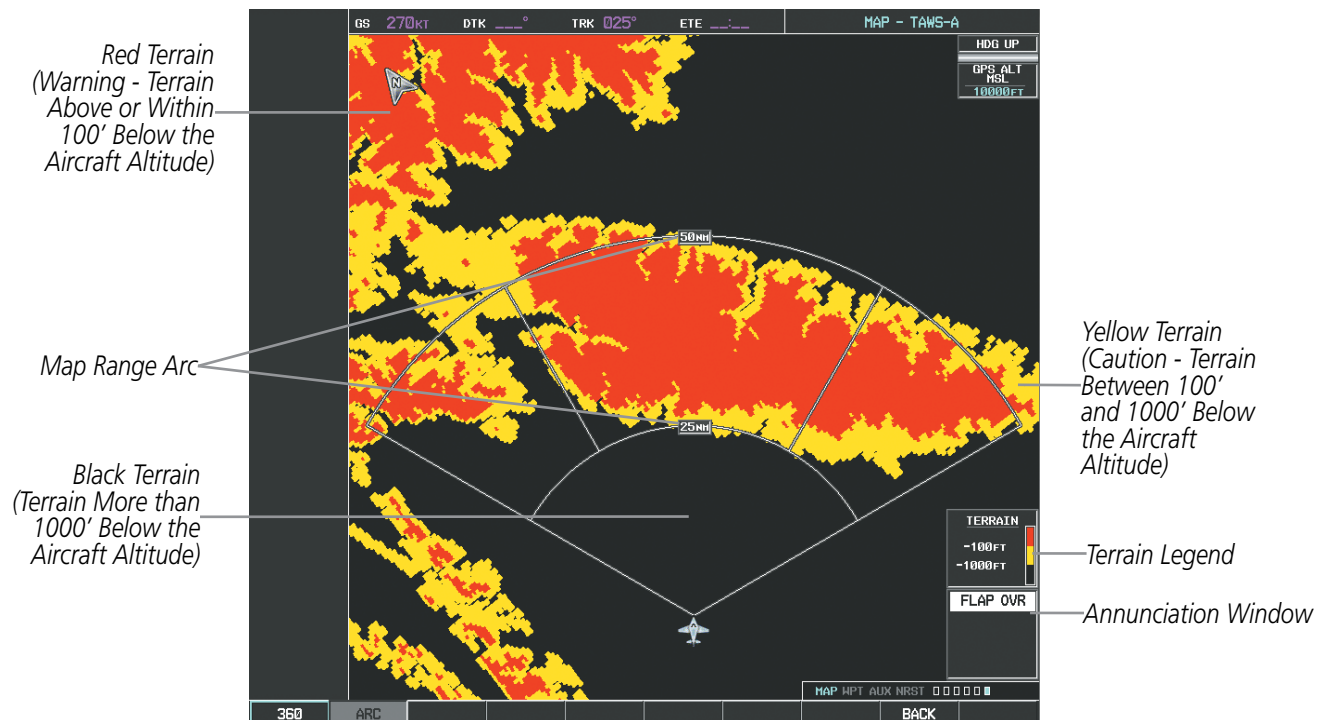


Figure 6-131 TAWS-A Page (ARC View)

TAWS-A ALERTS

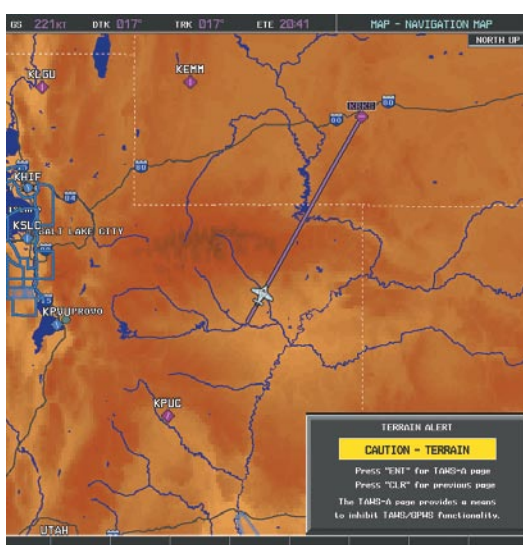
Alerts are issued when flight conditions meet parameters that are set within TAWS-A software algorithms. TAWS-A alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued. Table 6-16 shows TAWS-A alert types with corresponding annunciations and aural messages.

When an alert is issued, annunciations appear on the PFD and MFD. The TAWS-A Alert Annunciation is shown to the upper left of the Altimeter or upper right of the Airspeed indicator on the PFD and below the Terrain Legend on the MFD. If the TAWS-A Page is not already displayed on the MFD, a pop-up alert appears on the MFD while an alert is active. To acknowledge the pop-up alert:

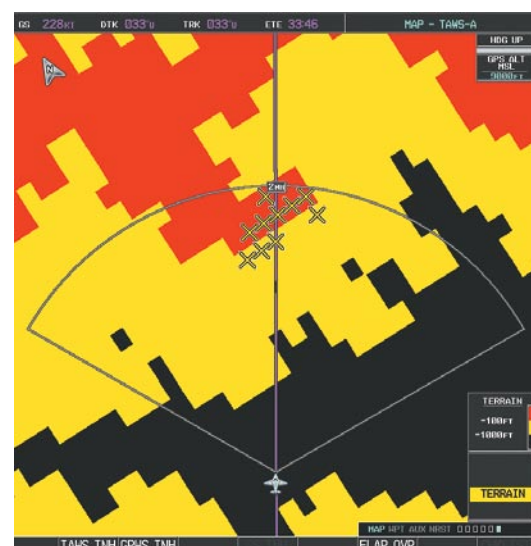
- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the TAWS-A Page)



PFD with TAWS-A Annunciations



MFD Pop-Up Alert (on non-TAWS-A pages)



MFD TAWS-A Page with Alert Annunciation

Figure 6-132 Example TAWS-A Annunciations

Alert Type	PFD/MFD TAWS-A Page Annunciation	MFD Map Page Pop-Up Alert (Except TAWS-A Page)	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" * or Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" * or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
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 * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" * or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" * or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Obstacle Ahead; Obstacle Ahead" * or "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 * or TOO LOW - TERRAIN	"Don't Sink" * or "Too Low, Terrain"
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" *

* Alerts with multiple messages are configurable. Alerts for the default configuration are indicated with asterisks.

Table 6-16 TAWS-A Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

Reduced Required Terrain Clearance (RTC) and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-133. When an RTC alert is issued, a potential impact point is displayed on the TAWS-A Page.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle cell in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS-A Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-133.

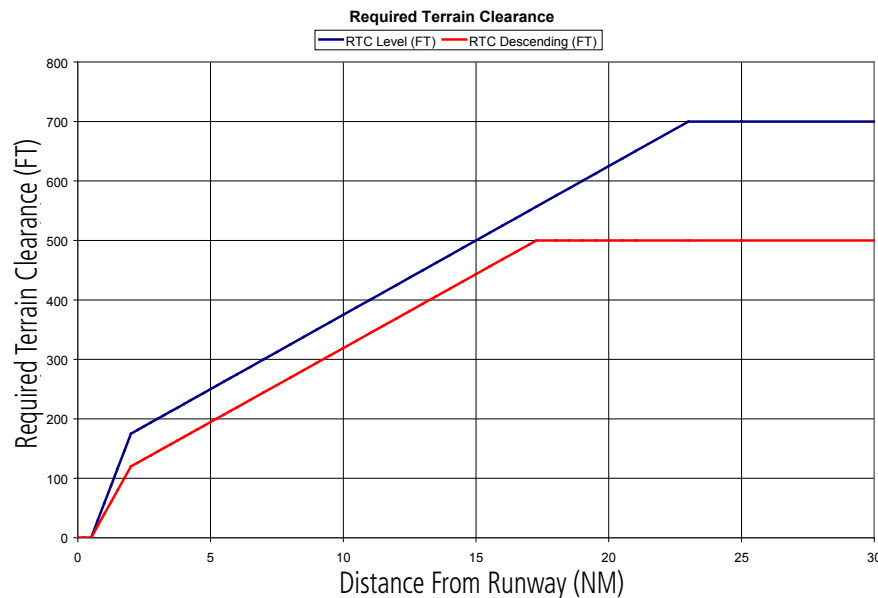


Figure 6-133 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically inhibited when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

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 6-134).

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.

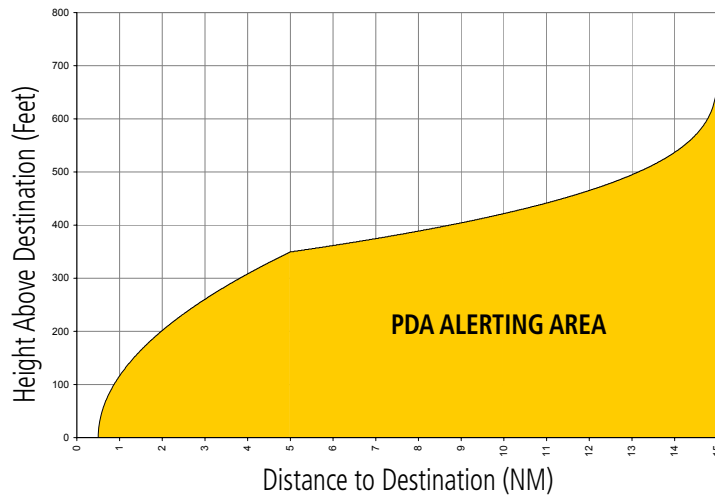


Figure 6-134 PDA Alerting Threshold

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.

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 aural and visual alerts can be manually inhibited. Discretion should be used when inhibiting alerts and the system should be enabled when appropriate. When PDA and FLTA alerts are inhibited, the alert annunciation 'TAWS INH' is shown on the PFD and on the TAWS-A Page annunciation window of the MFD (Figure 6-135).



Figure 6-135 TAWS-A Page Menu and Inhibit Annunciation

Inhibiting/enabling FLTA and PDA alerting:

- 1) Select the TAWS-A Page.
- 2) Select the **TAWS INH** Softkey to inhibit or enable TAWS-A (choice dependent on current state).

Or:

- 1) Press the **MENU** Key. (Figure 6-135)
- 2) Select 'Inhibit TAWS' or 'Enable TAWS' (choice dependent on current state) and press the **ENT** Key.

If PDA and FLTA alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, a 'LOW ALT' annunciation may appear on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

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 6-136 shows the parameters for the alert as defined by TSO-C151b.

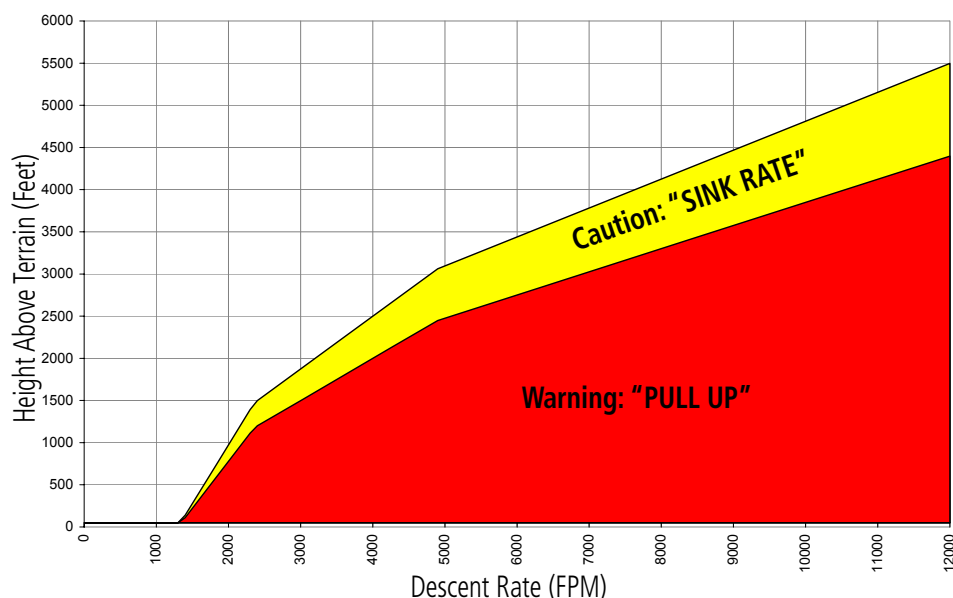


Figure 6-136 Excessive Descent Rate Alert Criteria

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 6-137 and 6-138 show the ECR alerting criteria for flaps in the landing configuration and for all other flight phases respectively.

ECR alerts are automatically inhibited 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.

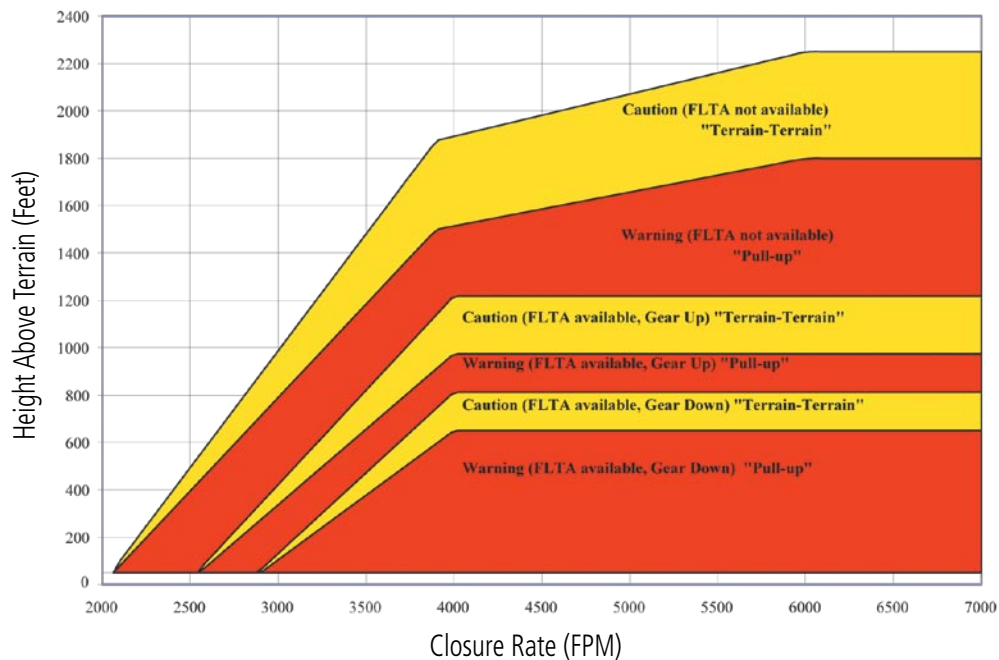


Figure 6-137 Excessive Closure Rate Alert Criteria (Flaps Up or Takeoff Configuration)

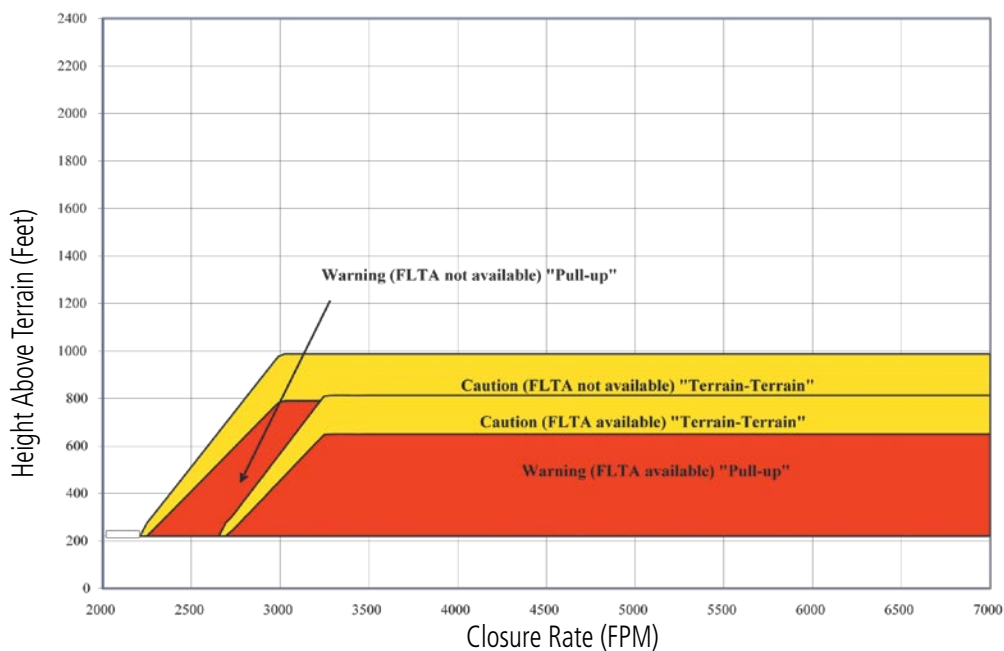
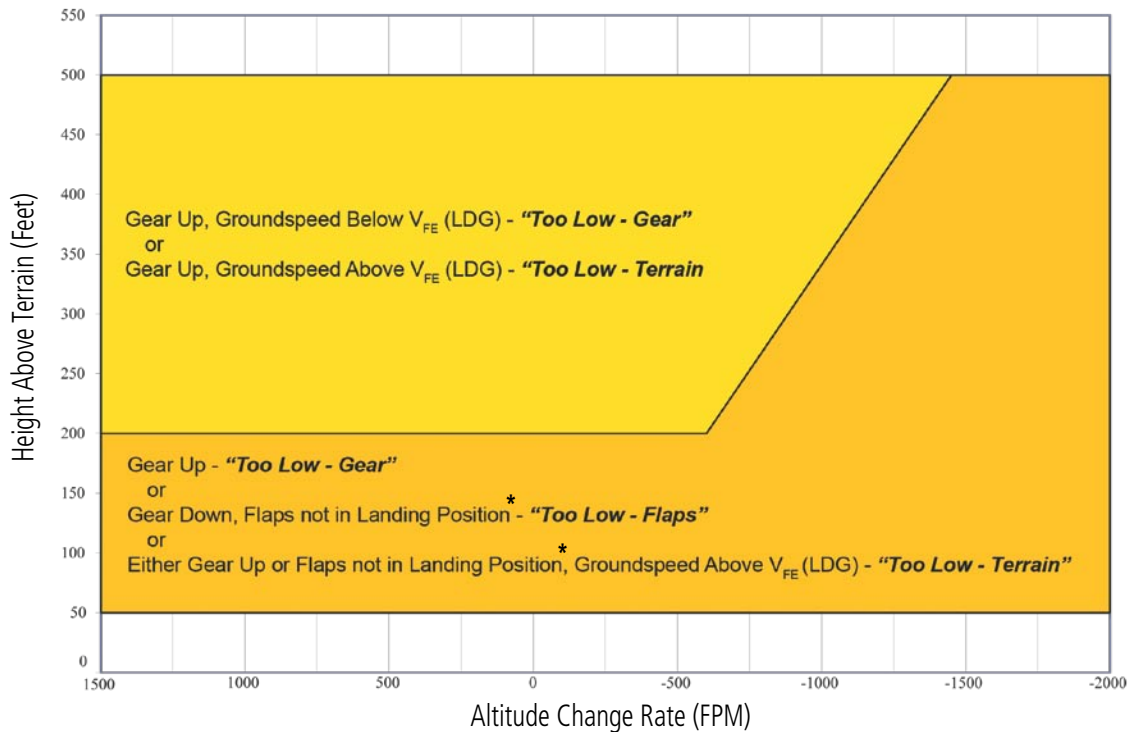


Figure 6-138 Excessive Closure Rate Alert Criteria (Flaps in Landing Configuration)

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 6-139.



* Flap position will not trigger alert if Flap Override option is enabled; see discussion below.

Figure 6-139 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.

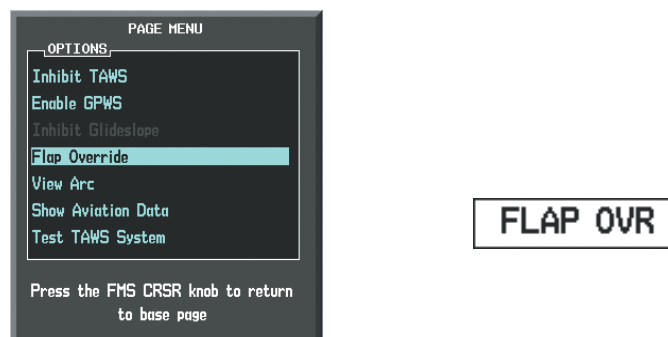


Figure 6-140 TAWS-A Page Menu and FIT Flap Override Annunciation

Overriding Flaps-based FIT alerting:

- 1) Select the TAWS-A Page
- 2) Select the **FLAP OVR** Softkey

Or:

- 1) Press the **MENU** Key. (Figure 6-140)
- 2) Select 'Flap Override' or 'Disable Flap Override' (choice dependent on current state) and press the **ENT** Key.

When the Flaps Override option is enabled, the annunciation 'FLAP OVR' is annunciated on the PFD and on the TAWS-A Page of the MFD (Figure 6-140). 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. TAWS-A will issue the aural message **"Too Low - Terrain"** and visual annunciations when conditions enter the caution alert area (Figure 6-141).

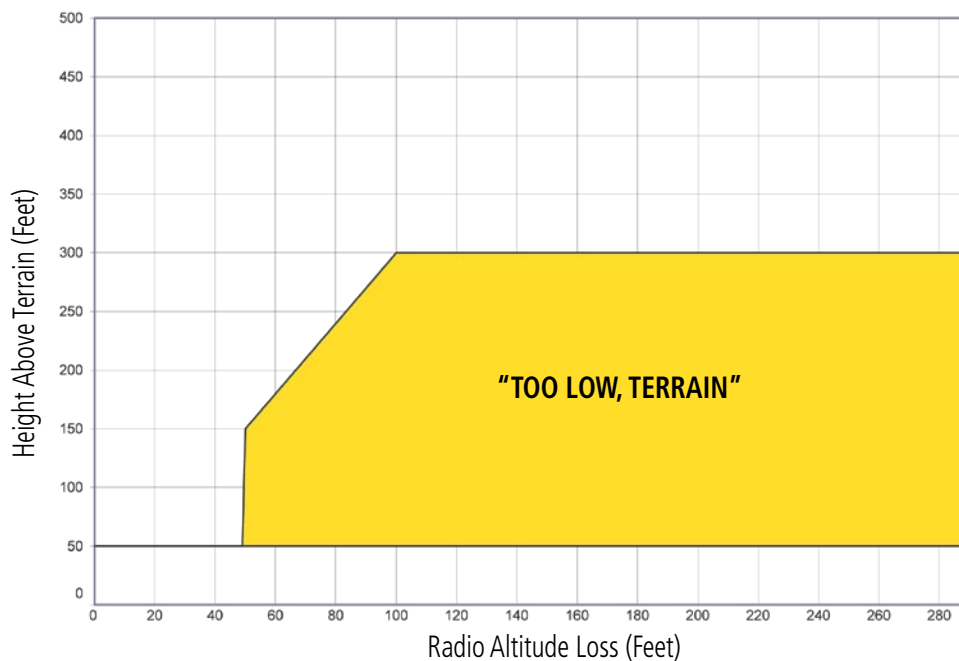


Figure 6-141 FIT Alerting After Takeoff

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 aural message “Don’t Sink” is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the MFD if the TAWS-A Page is not already displayed. 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 6-142) or sink rate (6-143).

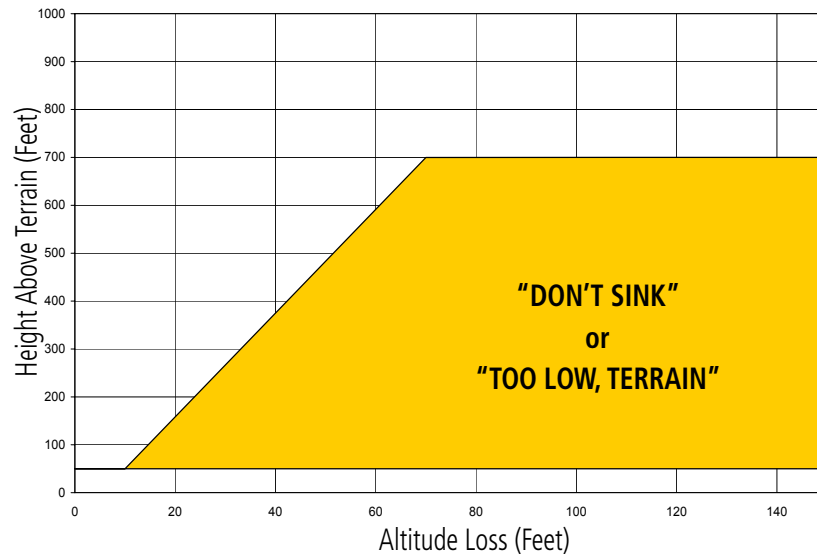


Figure 6-142 Negative Climb Rate (NCR) Altitude Loss

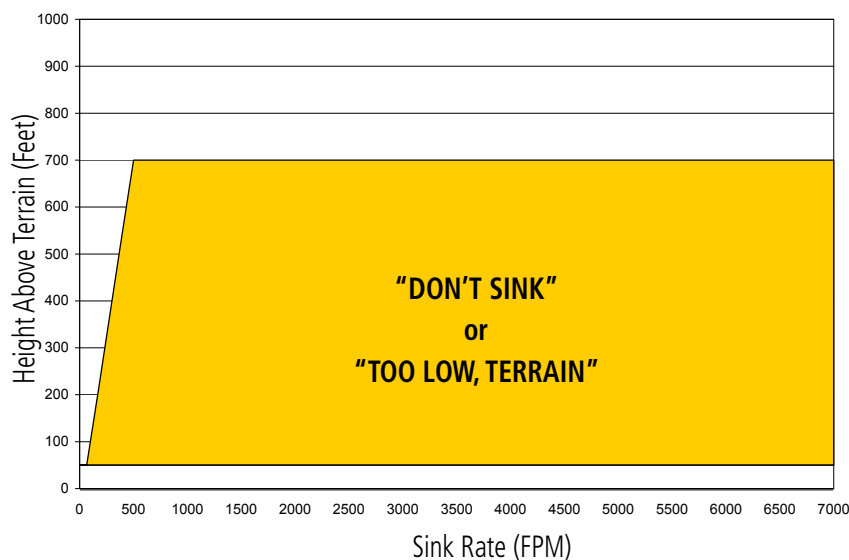


Figure 6-143 Negative Climb Rate (NCR) Sink Rate

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 aural and visual 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 alert annunciation 'GPWS INH' is shown on the PFD and on the TAWS-A Page annunciation window of the MFD (Figure 6-144).



Figure 6-144 TAWS-A Page Menu and GPWS Inhibit Annunciation

Inhibiting/enabling GPWS alerting:

- 1) Select the TAWS-A Page.
- 2) Select the **GPWS INH** Softkey to inhibit or enable GPWS alerts (choice dependent on current state).

Or:

- a) Press the **MENU** Key. (Figure 6-144)
- b) Select 'Inhibit GPWS' or 'Enable GPWS' (choice dependent on current state) and press the **ENT** Key.

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 6-145).

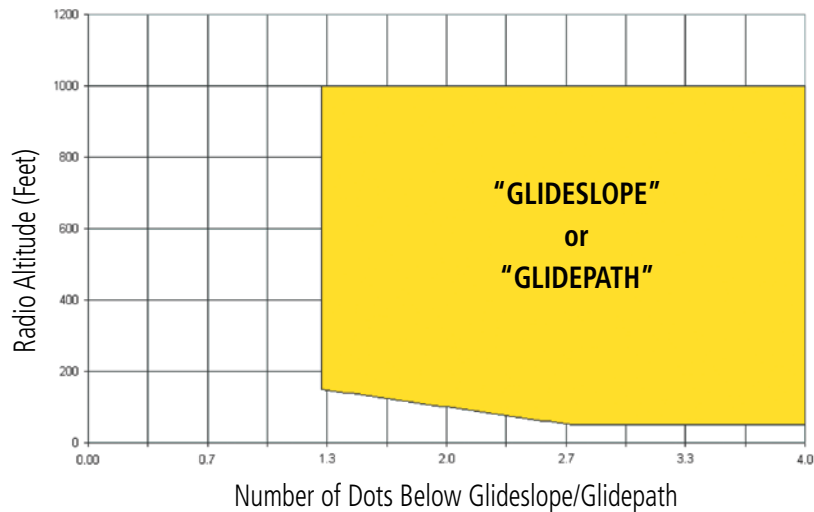


Figure 6-145 Excessive Below Glideslope/Glidepath Deviation Alert Criteria

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 configured for landing.

When a GSD caution alert occurs on an ILS approach, the aural and visual annunciation 'GLIDESLOPE' is issued. If a GSD caution alert occurs on an LPV, LNAV/VNAV, or LNAV+V approach, the aural and visual annunciation 'GLIDEPATH' is issued (Figure 6-146).

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.

During a GSD alert, the PFD Softkeys are reconfigured as shown in figure 6-146 to provide an option to inhibit the alert. A 'GLIDESLOPE' alert will display a **GS INH** Softkey to inhibit the alert. A 'GLIDEPATH' alert will display a **GP INH** Softkey to inhibit the alert. When an inhibit Softkey is pressed, the PFD Softkeys return to the top-level display. Press the **BACK** Softkey to return to the top level of the PFD Softkeys without inhibiting the GSD alert.



Figure 6-146 GSD Glideslope Alert and PFD Softkeys

ALTITUDE VOICE CALLOUT (VCO)

TAWS-A provides aural advisory alerts as the aircraft descends, beginning at 500 feet above the terrain (if greater than 5 nm from the nearest airport) or 500 feet above the nearest runway threshold (if less than 5 nm from the nearest airport). Upon descent to this altitude, the aural alert message **“Five-hundred”** is issued.

Maintenance personnel may enable additional VCO 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 aural and visual annunciations. The system test can also be manually initiated. A single chime is issued at test completion. 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/MFD TAWS-A Page Annunciation	TAWS-A Page Center Banner Annunciation	Aural Message
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 6-17 TAWS-A System Test Status Annunciations

Manually testing the TAWS-A System:

- 1) Select the TAWS-A Page.
- 2) Press the **MENU** Key.
- 3) Select 'Test TAWS System' and press the **ENT** Key to confirm the selection. (Figure 6-147)

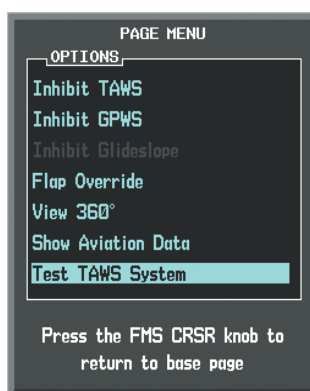


Figure 6-147 TAWS-A Page Menu

TAWS-A ABNORMAL OPERATIONS

TAWS-A continually monitors several system-critical items such as database validity, flap and landing gear position, radar altimeter input, and GPS status.

If no GDU contains Terrain, Airport Terrain, and Obstacle databases (or the databases are invalid), the aural message **"TAWS System Failure"** is generated along with the 'TAWS FAIL' alert annunciation.

TAWS-A requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation

'TAWS N/A' is generated in the annunciation window and on the TAWS-A Page. The aural message **"TAWS Not Available"** is also generated if airborne, and some TAWS-A terrain alerts will not be issued (Table 6-18), while GPWS alerting (which are not dependent on GPS position) will continue to operate. When the GPS signal is re-established and the aircraft is within the database coverage area, the aural message "TAWS Available" is generated.

TAWS-A also requires radar altimeter input. Should the radar altimeter input fail or become degraded, the annunciation 'GPWS FAIL' is generated in the annunciation window and on the TAWS-A Page. The aural message **"GPWS System Failure"** is also generated. The 'GPWS FAIL' annunciation will also occur if both GPS altitude and barometric altitude are unavailable. If only the GPWS system has failed, GPWS-based alerts will not be available (Table 6-18), while other TAWS-A alerting remains unaffected.

Alert Type	PFD/MFD TAWS-A Page Annunciation	TAWS-A Page Center Banner Annunciation	Aural Message	TAWS Alert Types Not Available
TAWS System Test Fail; Terrain, Airport Terrain or Obstacle database unavailable or invalid on all GDUs; software mismatch among GDUs; TAWS audio fault	TAWS FAIL *	TAWS FAIL	"TAWS System Failure"	FLTA, PDA
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None	
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"	FLTA, PDA, GSD†, VCO*
Excessively degraded GPS signal, or out of database coverage area	TAWS N/A	None	"TAWS Not Available"	FLTA, PDA
Sufficient GPS signal reception restored	None	None	"TAWS Available" (aural message only in flight)	
Radar Altimeter invalid, Vertical Speed Invalid, GPS and Baro Altitude invalid, Software mismatch among GDUs, TAWS configuration mismatch among GDUs, TAWS audio fault	GPWS FAIL *	None	"GPWS System Failure"	EDR, ECR, NCR, FIT, GSD

* VCO alerts are not issued if both TAWS and GPWS systems have failed or are not available

† GSD alert will be available if a valid ILS is being used for navigation, even if no valid GPS signal is being received.

Table 6-18 TAWS-A Abnormal Status Alerts

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.

6.8 TRAFFIC INFORMATION SERVICE (TIS)



WARNING: The Traffic Information Service (TIS) is intended for advisory use only. TIS is intended to help the pilot locate traffic visually. It is the responsibility of the pilot to see and maneuver to avoid traffic.



NOTE: TIS is available only when the aircraft is within the service volume of a TIS-capable terminal radar site. Aircraft without an operating transponder are invisible to both Traffic Advisory Systems (TAS) and TIS. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication.



NOTE: TIS is disabled if a TAS is installed.

Traffic Information Service (TIS) is designed to help in detection and avoidance of other aircraft. TIS uses the Mode S transponder for the traffic data link. TIS receives traffic information from ground stations, and is updated every 5 seconds. The system displays up to eight traffic targets within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. Traffic is displayed according to TCAS symbology.




TIS Symbol	Description
	Non-Threat Traffic
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-20 TIS Traffic Symbols

Traffic Advisories (TA) alert the crew to intruding aircraft. When traffic meets the advisory criteria for the TA, a solid yellow circle symbol is generated. A TA which is detected but is outside the range of the map on which traffic is displayed are indicated with a message in the lower left corner of the map.

TIS also provides a vector line showing the direction in which the traffic is moving, to the nearest 45°. Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the Traffic Map Page (Figure 6-157) or in a banner at the lower left corner of maps other than the Traffic Map Page on which traffic can be displayed.

The altitude difference between the requesting aircraft and other intruder aircraft is displayed above/below the traffic symbol in hundreds of feet. If the other aircraft is above the requesting aircraft, the altitude separation appears above the traffic symbol; if below, the altitude separation appears below. Altitude trend is displayed as an up/down arrow (for speeds greater than 500 fpm in either direction) to the right of the target symbol. Traffic symbols for aircraft without altitude reporting capability appear without altitude separation or climb/descent information.

DISPLAYING TRAFFIC DATA

Traffic information can be displayed on the following maps (when TIS is operating):

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

Traffic information is also displayed on the PFD when the Synthetic Vision System (SVS) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (maps other than the Traffic Map Page):

- 1) Press the **MAP** Softkey.
- 2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, an icon is shown to indicate the feature is enabled for display.

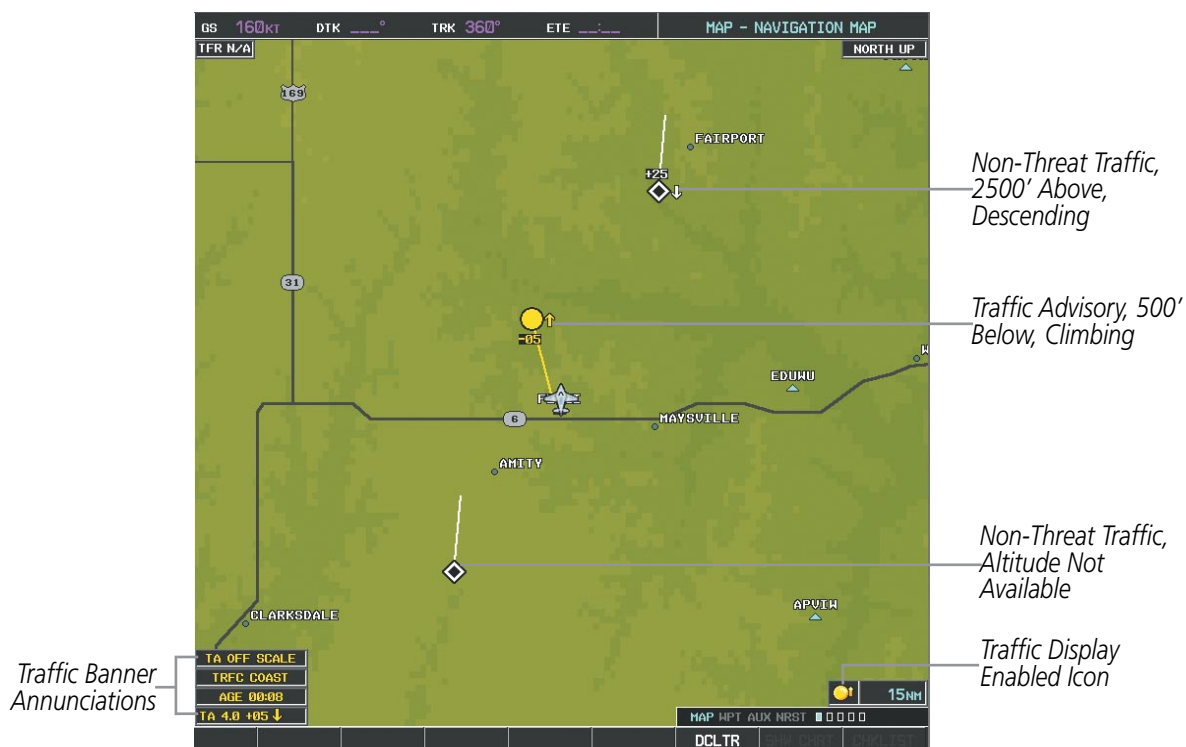


Figure 6-148 TIS Traffic on the Navigation Map Page

Displaying traffic information (PFD Inset Map):

- 1) Select the **INSET** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Select the softkey again to display the traffic-only inset (TRFC-2).
- 4) Select the softkey again to remove traffic data.

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Customizing traffic display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-149).
- 4) Turn the small **FMS** Knob to select the 'Traffic' Group and press the **ENT** Key (Figure 6-150).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-151).
 - TRAFFIC – Turns the display of traffic data on or off
 - TRAFFIC MODE – Selects the traffic mode for display; select from:
 - All Traffic - Displays all traffic
 - TA ONLY - Displays Traffic Alerts only
 - TRAFFIC SML – Selects the maximum range at which traffic symbols are shown
 - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown (with the option to turn off)
- 6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.



Figure 6-149 Navigation Map Page Menu



Figure 6-150 Navigation Map Page Setup Menu

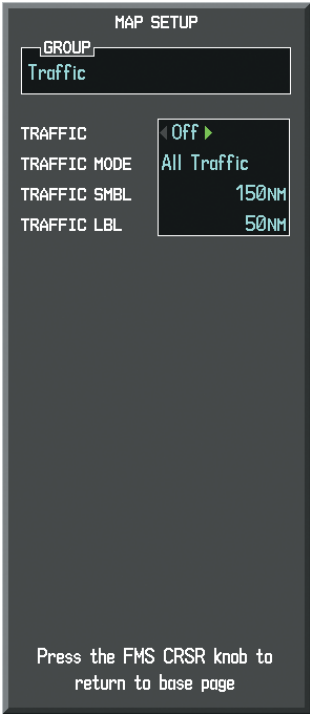


Figure 6-151 Navigation Map Page Setup Menu, Traffic Group

TRAFFIC MAP PAGE

The Traffic Map Page is specialized to show surrounding TIS traffic data in relation to the aircraft's current position and altitude, without clutter from the basemap. Aircraft orientation on this map is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob from 2 to 12 nm, as indicated by the map range rings.

The traffic mode is annunciated in the upper left corner of the Traffic Map Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. Once the aircraft is airborne, TIS switches from Standby to Operating Mode and the G1000 begins to display traffic information. Refer to the System Status discussion for more information.

Displaying traffic on the Traffic Map Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Confirm TIS is in Operating Mode:

Press the **OPERATE** Softkey to begin displaying traffic.

Or:

- a) Press the **MENU** Key.
- b) Select 'Operate Mode' (shown if TIS is in Standby Mode) and press the **ENT** Key.

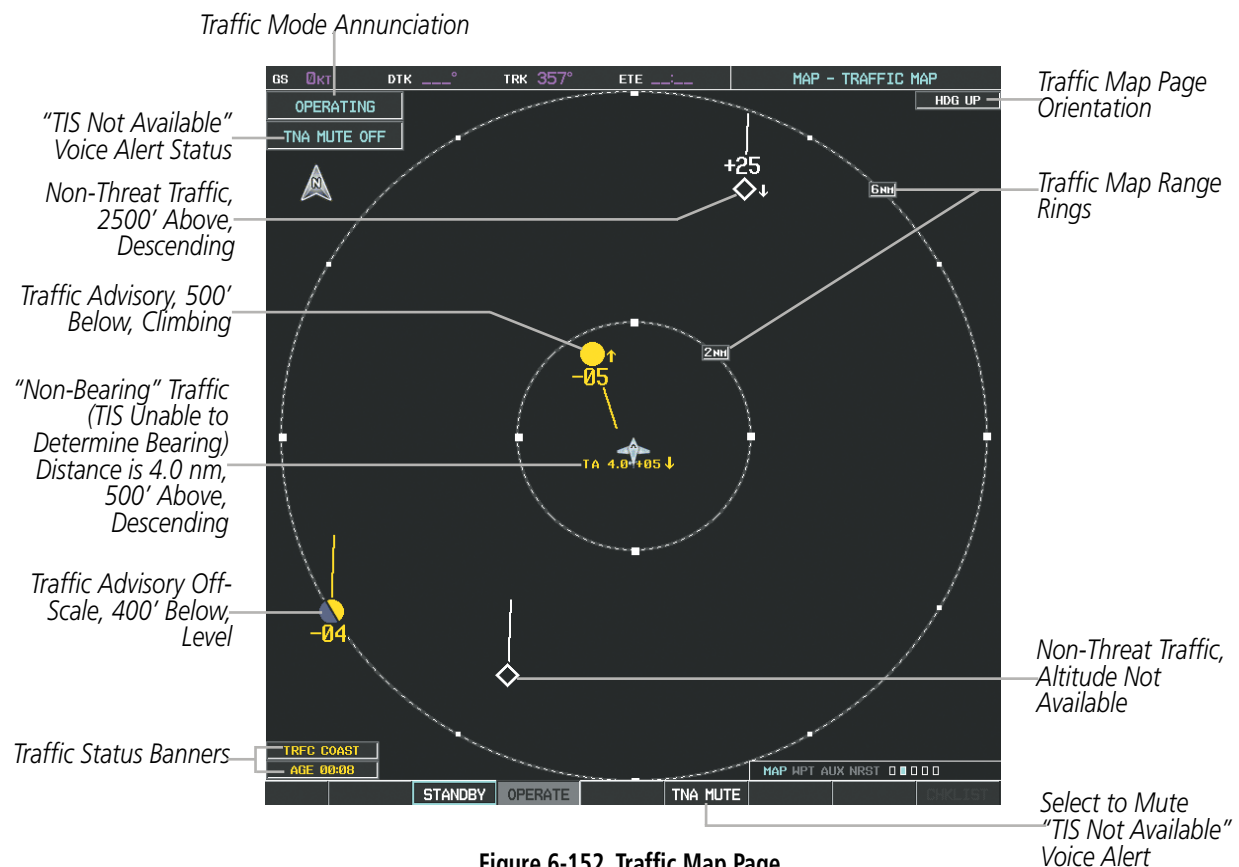


Figure 6-152 Traffic Map Page

TIS ALERTS

When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:

- A single **“Traffic”** voice alert is generated.
- A ‘TRAFFIC’ Annunciation appears to the top left of the Attitude Indicator on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with traffic.

To reduce the number of nuisance alerts due to proximate aircraft, the **“Traffic”** voice alert is generated only when the number of TAs increases. For example, when the first TA is displayed, a voice and visual annunciation are generated. As long as a single TA remains on the display, no additional voice alerts are generated. If a second TA appears on the display or if the number of TAs initially decreases and then subsequently increases, another voice alert is generated.

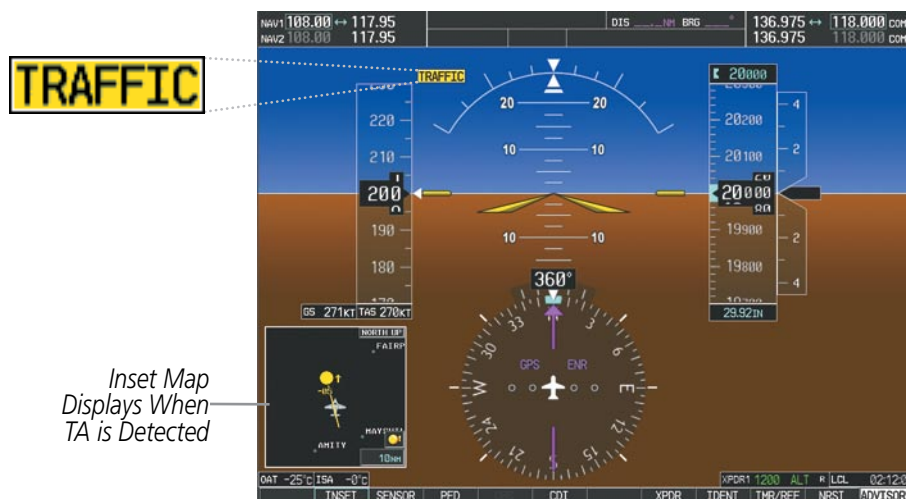


Figure 6-153 Traffic Annunciation (PFD)

A **“TIS Not Available”** (TNA) voice alert is generated when the TIS service becomes unavailable or is out of range. TIS may be unavailable in the radar coverage area due to the following:

- Radar site TIS Mode S sensor is not operational or is out of service
- Traffic or requesting aircraft is beyond the maximum range of the TIS-capable Mode S radar site.
- Traffic or requesting aircraft is above the radar site in the cone of silence and out of range of an adjacent site.
- Traffic or requesting aircraft is below radar coverage. In flat terrain, the coverage extends from about 3000 feet upward at 55 miles. Terrain and obstacles around the radar site can further decrease radar coverage in all directions.
- Traffic does not have an operating transponder.

The **“TIS Not Available”** (TNA) voice alert can be manually muted to reduce nuisance alerting. TNA muting status is shown in the upper left corner of the Traffic Map Page.

Muting the "TIS Not Available" voice alert:

- 1) Select the Traffic Map Page.
- 2) Press the **TNA MUTE** Softkey. The status is displayed in the upper left corner of the Traffic Map Page.

Or:

- a) Press the **MENU** Key.
- b) Select "'Not Available" Mute On' (shown if TNA muting is currently off) and press the **ENT** Key.

SYSTEM STATUS

The G1000 performs an automatic test of TIS during power-up. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). If TIS fails the power up test, an annunciation is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the transponder*
DATA FAILED	Data is being received from the transponder, but a failure is detected in the data stream*
FAILED	The transponder has failed*
UNAVAILABLE	TIS is unavailable or out of range




* Contact a service center or Garmin dealer for corrective action

Table 6-21 TIS Failure Annunciations



Figure 6-154 TIS Power-up Test Failure

The traffic mode is annunciated in the upper left corner of the Traffic Map Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. If traffic is selected for display on another map while Standby Mode is selected, the traffic display enabled icon is crossed out (also the case whenever TIS has failed). Once the aircraft is airborne, TIS switches to Operating Mode and traffic information is displayed. The mode can be changed manually using softkeys or the page menu.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TIS Operating	OPERATING	
TIS Standby	STANDBY (also shown in white in center of page)	
TIS Failed*	FAIL	

* See Table 6-23 for additional failure annunciations

Table 6-22 TIS Modes

Switching between TIS modes:

- 1) Select the Traffic Map Page.
- 2) Press the **STANDBY** or **OPERATE** Softkey to switch between modes. The mode is displayed in the upper left corner of the Traffic Map Page.

Or:

- a) Press the **MENU** Key.
- b) Select 'Operate Mode' or 'Standby Mode' (choice dependent on current state) and press the **ENT** Key. The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed (Table 6-23).

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↓	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
AGE MM:SS	Appears if traffic data is not refreshed within 6 seconds If after another 6 seconds data is not received, traffic is removed from the display The quality of displayed traffic information is reduced as the age increases
TRFC COAST	The displayed data is not current (6 to 12 seconds since last message) The quality of displayed traffic information is reduced when this message is displayed
TRFC RMVD	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message) Traffic may exist within the selected display range, but it is not displayed
TRFC FAIL	Traffic data has failed
NO TRFC DATA	Traffic has not been detected
TRFC UNAVAIL	The traffic service is unavailable or out of range

*Shown as symbol on Traffic Map Page

**Shown in center of Traffic Map Page

Table 6-23 TIS Traffic Status Annunciations

6.9 GARMIN GTS TRAFFIC



WARNING: The GTS 820 Traffic Advisory System (TAS) and GTS 850 Traffic Collision Avoidance System I (TCAS I) are intended for advisory use only to aid the pilot in visually acquiring traffic. No avoidance maneuvers should be based solely upon TAS or TCAS traffic information. It is the responsibility of the pilot in command to see and maneuver to avoid traffic.



NOTE: Pilots should be aware of TAS/TCAS system limitations. TAS/TCAS systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication. Pilots should remain vigilant for traffic at all times.



NOTE: TIS is disabled when TAS or TCAS is installed.

This section covers both the optional Garmin GTS 820 Traffic Advisory System (TAS) and Garmin GTS 850 Traffic Collision Avoidance I System (TCAS I). Operational differences between the GTS 820 and GTS 850 are noted throughout this section.

The Garmin GTS traffic system enhances flight crew situational awareness by displaying traffic information for transponder-equipped aircraft. The system also provides visual and aural traffic alerts including voice announcements to assist in visually acquiring traffic.

The system is capable of tracking up to 45 intruding aircraft equipped with Mode A or C transponders, and up to 30 intruders equipped with Mode S transponders. A maximum of 30 aircraft with the highest threat potential can be displayed simultaneously. No traffic surveillance is provided for aircraft without operating transponders.

THEORY OF OPERATION

When the traffic system is in Operating Mode, the unit interrogates the transponders of intruding aircraft while monitoring transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range. The traffic system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), visual and aural alerting is provided.

TAS SURVEILLANCE VOLUME

The GTS 820/850 surveillance system monitors the airspace within $\pm 10,000$ feet of own altitude, and up to 40 nm in the forward direction. Range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. In areas of greater transponder traffic density or when Traffic Collision and Alerting Systems II (TCAS II) systems are detected, the system automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

When paired with the optional GTX 33 ES (extended squitter) transponder, the traffic system uses Automatic Dependent Surveillance - Broadcast (ADS-B) position reports from participating aircraft to enhance the positional accuracy of traffic displayed within the TAS surveillance range.

TAS SYMBOLOGY

The traffic system uses symbology to depict intruding traffic on the displays using the symbols shown in Table 6-24.





TAS Symbol	Description
	Traffic Advisory (TA)
	Traffic Advisory Off Scale
	Proximity Advisory (PA)
	Non-Threat Traffic

Table 6-24 TAS Intruder Symbol Description

A Traffic Advisory (TA), displayed as a yellow circle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.

A Proximity Advisory (PA), displayed as a solid white diamond, indicates the intruding aircraft is within ± 1200 feet and is within a 6 nm range, but is still not considered a TA threat.

A Non-threat Advisory, shown as an open white diamond, is displayed for all other traffic beyond 6 nm that is neither a TA or PA.

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet. When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol indicates climbing or descending traffic with an upward or downward-pointing arrow respectively.

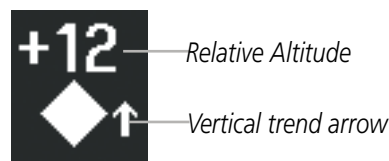


Figure 6-155 Intruder Altitude and Vertical Trend Arrow

The traffic system automatically suppresses the display of altitude-reporting aircraft on the ground under either of the following conditions:

- On-ground aircraft is equipped with a Mode S transponder.
- On-ground aircraft is equipped with a Mode C transponder, and own aircraft's radar altimeter (if installed) is displaying 1700' AGL or less.

TA ALERTING CONDITIONS

The traffic system automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting during flight phases likely to be near airports. Level A (less) TA sensitivity is used when the aircraft's landing gear is extended, or when the radar altimeter (if equipped) indicates own aircraft is below 2000' AGL. In all other conditions, Level B (greater) TA sensitivity is used to assess TA threats.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	Intruder closing rate provides less than 20 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 20 seconds of horizontal separation and vertical separation is within 600 feet. Or: Intruder range is within 0.2 nm and vertical separation is within 600 feet.
A	No	Intruder closing rate provides less than 15 seconds of separation.
B	Yes	Intruder closing rate provides less than 30 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 30 seconds of horizontal separation and vertical separation is within 800 feet. Or: Intruder range is within 0.55 nm and vertical separation is within 800 feet.
B	No	Intruder range is less than 20 seconds.

Table 6-25 TA Sensitivity Level and TA Alerting Criteria

TRAFFIC ALERTS

When the traffic system detects a new TA, the following occur:

- A single **“Traffic!”** voice alert is generated, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA (Table 6-26). The announcement **“Traffic! 12 o’clock, high, four miles,”** would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashing for five seconds and remains displayed until no TAs are detected in the area (Figure 6-156).
- The PFD Inset Map is automatically displayed with TA traffic.

If the bearing of TA traffic cannot be determined (Figures 6-158 and 6-161), a yellow text banner will be displayed in the center of the Traffic Map Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate “TA” followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer present.

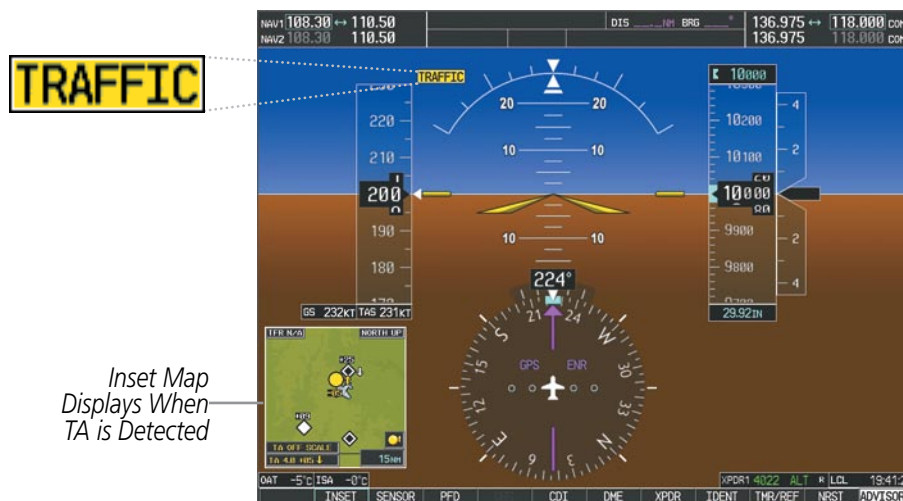


Figure 6-156 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Distance (nm)
“One o’clock” through “Twelve o’clock” or “No Bearing”	“High”, “Low”, “Same Altitude” (if within 200 feet of own altitude), or “Altitude not available”	“Less than one mile”, “One Mile” through “Ten Miles”, or “More than ten miles”

Table 6-26 TA Descriptive Voice Announcements

SYSTEM TEST



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

The traffic system provides a system test mode to verify the system is operating normally. The test takes ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the Traffic Map Page (Figure 6-157). An aural announcement is heard when the system test is complete.

Traffic System	Aural Announcement
GTS 820	"TAS System Test Passed." or: "TAS System Test Failed."
GTS 850	"TCAS System Test Passed." or: "TCAS System Test Failed"

Table 6-27 System Test Aural Announcements

When the system test is complete, the traffic system enters Standby Mode.

Testing the traffic system:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Turn the **Range** knob to set the range to 2/6 nm to allow for full traffic test pattern display.
- 4) Select the **TEST** Softkey.

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Test Mode'.
- 2) Press the **ENT** Key.

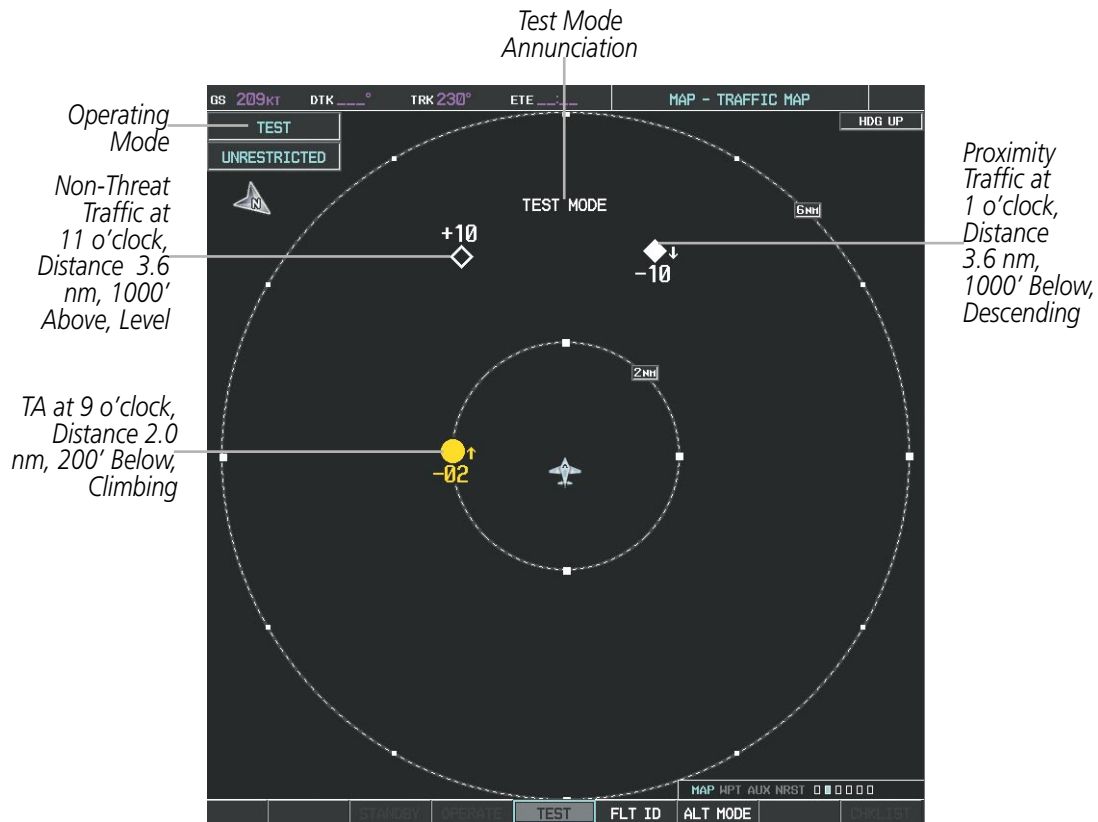


Figure 6-157 System Test in Progress with Test Pattern

OPERATION



NOTE: The traffic system automatically transitions from **STANDBY** to **OPERATE** mode eight seconds after takeoff. The unit also automatically transitions from **OPERATE** to **STANDBY** mode 24 seconds after landing.

After power-up, the traffic system is in Standby Mode. The system must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Selecting the **OPERATE** Softkey allows the system to switch from Standby Mode to Operating Mode as necessary. Selecting the **STANDBY** Softkey forces the unit into Standby Mode.

Switching from operating mode to standby mode:

On the Traffic Page, select the **STANDBY** Softkey

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Standby Mode'.
- 2) Press the **ENT** Key.

Switching from standby mode to operating mode:

On the Traffic Page, select the **OPERATE** Softkey

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select 'Operate Mode'.
- 2) Press the **ENT** Key. The GTS 820 switches from Standby Mode to Operating Mode as necessary.

TRAFFIC MAP PAGE

The Traffic Map Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob from 2 to 40 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

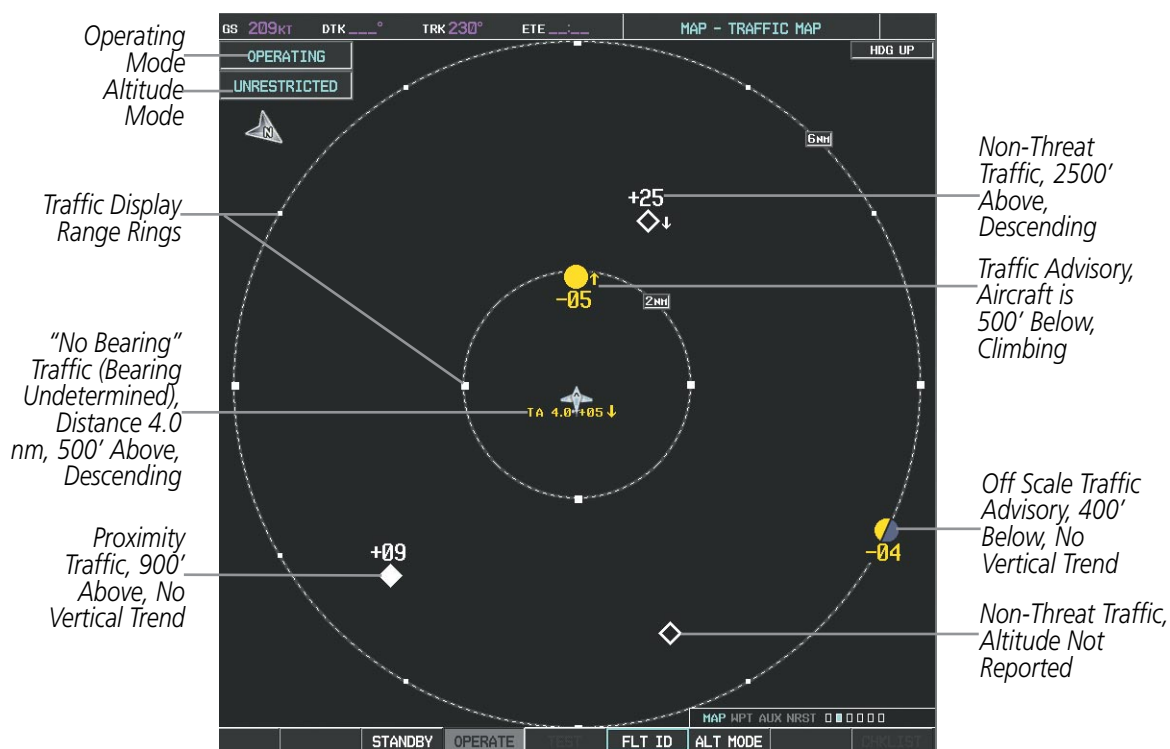


Figure 6-158 Traffic Map Page

Displaying traffic on the Traffic Map Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Select the **OPERATE** Softkey to begin displaying traffic. OPERATING is displayed in the Traffic mode field.
- 4) Select the **STANDBY** Softkey to place the system in the Standby mode. STANDBY is displayed in the Traffic mode field.
- 5) Turn the **RANGE** Knob clockwise to display a larger area or counter-clockwise to display a smaller area.

ALTITUDE DISPLAY

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. TAs occurring outside of these limits will always be shown.

Changing the altitude range:

- 1) On the Traffic Map Page, select the **ALT MODE** Softkey.
 - 2) Select one of the following Softkeys:
 - **ABOVE:** Displays non-threat and proximity traffic from 9000 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
 - **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
 - **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9000 feet below the aircraft. Typically used during descent phase of flight.
 - **UNREST** (unrestricted): All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
 - 3) To return to the Traffic Page, select the **BACK** Softkey.
- Or:
- 1) Press the **MENU** Key.
 - 2) Turn the small **FMS** Knob to select one of the following (see softkey description in step 2 above):
 - ABOVE
 - NORMAL
 - BELOW
 - UNRESTRICTED
 - 3) Select the **ENT** Softkey.

FLIGHT ID DISPLAY

The Flight IDs of other aircraft (when available) can be enabled for display on the Traffic Map Page (Figure 6-159). When a flight ID is received, it will appear above or below the corresponding traffic symbol on the Traffic Map Page when this option is enabled.

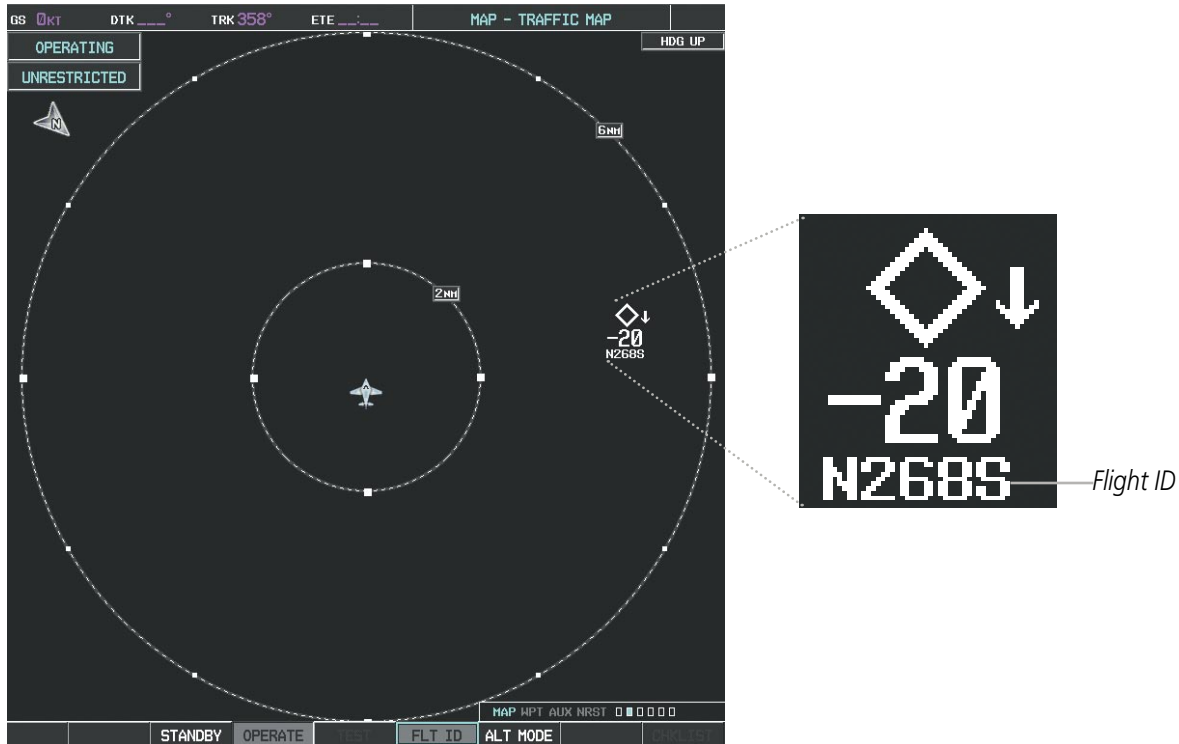


Figure 6-159 Traffic Map Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the Traffic Map Page, select the **FLT ID** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the small **FMS** Knob to select 'Show Flight IDs' or 'Hide Flight IDs' (choice dependent on current state) (Figure 6-160).
- 3) Press the **ENT** Key.

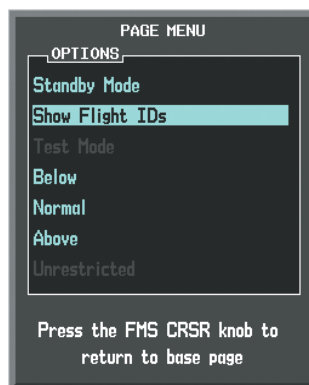


Figure 6-160 Traffic Map Page Menu

TRAFFIC MAP PAGE DISPLAY RANGE

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **RANGE** Knob from 2 to 40 nm, as indicated by the map range rings.

Changing the display range on the Traffic Map Page:

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
 - 2 nm
 - 2 and 6 nm
 - 6 and 12 nm
 - 12 and 24 nm
 - 24 and 40 nm

ADDITIONAL TRAFFIC DISPLAYS

Traffic information can be displayed on the following maps on the MFD when the unit is operating:

- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page
- System Pages

Traffic information can also be displayed on the PFD when the Synthetic Vision System (SVS) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the Traffic Map Page):

- 1) Select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate traffic is enabled for display (Figure 6-161).

Displaying traffic on the Navigation Map

- 1) Ensure the traffic system is operating. With the Navigation Map displayed, select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in the figure.

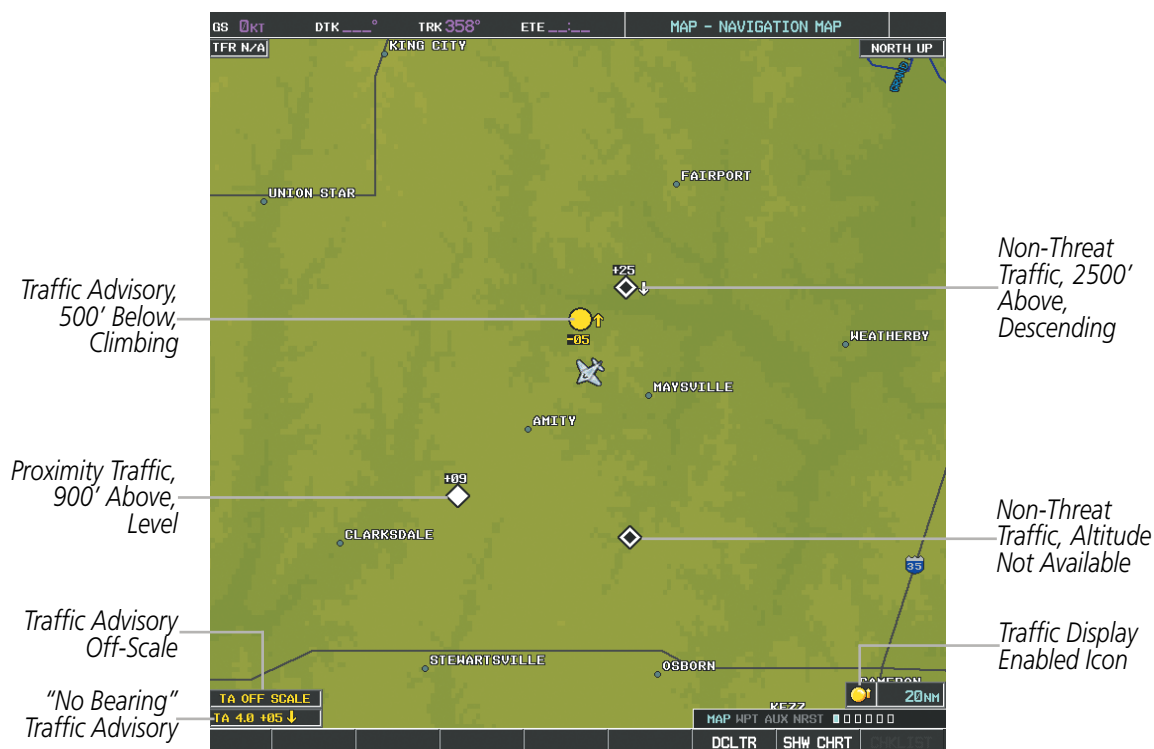


Figure 6-161 Traffic on the Navigation Map Page

Customizing the traffic display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-162).
- 4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-163).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-164).
 - TRAFFIC – Turns the display of traffic data on or off
 - TRAFFIC MODE – Selects the traffic mode for display; select from:
 - All Traffic - Displays all traffic
 - TA/PA - Displays Traffic Advisories and Proximity Advisories
 - TA ONLY - Displays Traffic Advisories only
 - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
 - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
- 6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

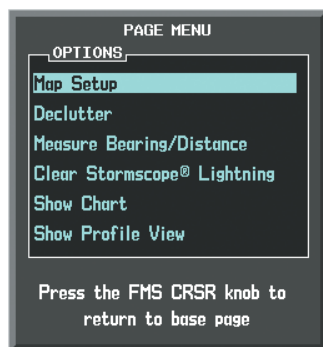


Figure 6-162 Navigation Map Page Menu



Figure 6-163 Navigation Map Page Setup Menu

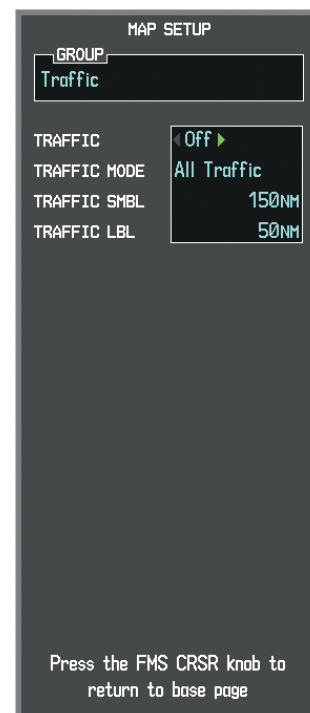


Figure 6-164 Navigation Map Page Setup Menu, Traffic Group

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.





Traffic information can also be displayed on the PFD Inset Map by pressing the **INSET** Softkey. A traffic map will appear in heading up orientation. Traffic information can also be overlaid with navigation, topographic and optional XM Weather data.

Displaying traffic information (PFD Inset Map):

- 1) Select the **INSET** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Select the softkey again to display the traffic-only inset (TRFC-2).
- 4) Select the softkey again to remove traffic data.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
Traffic System Test Initiated	TEST (also shown in white in center of page)	
Operating	OPERATING	
Standby	STANDBY (also shown in white in center of page)	
Traffic System Failed*	FAIL	

* See Table 6-29 for additional failure annunciations

Table 6-28 Traffic Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the traffic unit

Table 6-29 Traffic Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.


Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/ descending).
TRFC FAIL	Traffic unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the traffic unit

*Shown as symbol on Traffic Map Page


**Shown in center of Traffic Map Page

Table 6-30 Traffic Status Annunciations

6.10 L-3 SKYWATCH TRAFFIC

 **WARNING:** The Traffic Advisory System (TAS) is intended for advisory use only. TAS is intended to help the pilot locate traffic visually. It is the responsibility of the pilot to see and maneuver to avoid traffic.

 **NOTE:** TIS is disabled when a TAS or Traffic Collision Avoidance System (TCAS) is installed.

 **NOTE:** Refer to the SKYWATCH® (SKY497/SKY899) Pilot’s Guide for a detailed discussion of the TAS.

TAS SYMBOLOGY

The optional Traffic Advisory System (TAS) is designed to help in detection and avoidance of other aircraft. TAS uses an on-board interrogator-processor and an altitude reporting transponder for the air-to-air traffic data link. Traffic is displayed using four different symbols.





TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-31 TAS Symbol Description

A Non-threat Advisory, 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 5 nm range, but is still not considered a threat.

A Traffic Advisory (TA) alerts the crew to a potentially hazardous intruding aircraft. Closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is 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.

OPERATION

The unit must be in operating mode for traffic to be displayed. The ability to switch from standby to operating mode on the ground is especially useful for scanning the airspace around the airport before takeoff.

Switching from standby mode to operating mode:

- 1) On the Traffic Page, press the **OPERATE** Softkey or press the **MENU** Key and turn the small **FMS** knob to select Operating Mode.
- 2) If using the FMS menu, press the **ENT** Key to place the TAS in the operating mode.
- 3) To switch to Standby Mode from the Traffic Page, press the **STANDBY** Softkey.

System Test:

- 1) Set the range to 2/6 nm to allow for full test pattern display.
- 2) Select the **STANDBY** Softkey.
- 3) Select the **TEST** Softkey. 'TEST MODE' is annunciated on the MFD.
- 4) Self test takes approximately eight seconds to complete. When completed successfully, traffic symbols display and a voice alert is heard to indicate the system test passed.

DISPLAYING TRAFFIC DATA

Traffic information can be displayed on the following maps when the unit is operating:

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Active Flight Plan Page
- Nearest Pages

Traffic information can also be displayed on the PFD when the Synthetic Vision System (SVS) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic on the Traffic Map Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Select the **OPERATE** Softkey to begin displaying traffic. OPERATING is displayed in the Traffic mode field.
- 4) Select the **ALT MODE** Softkey to change the altitude volume.
- 5) Select the **STANDBY** Softkey to place the system in the Standby mode. STANDBY is displayed in the Traffic mode field.
- 6) Turn the **RANGE** Knob clockwise to display a larger area or counter-clockwise to display a smaller area.

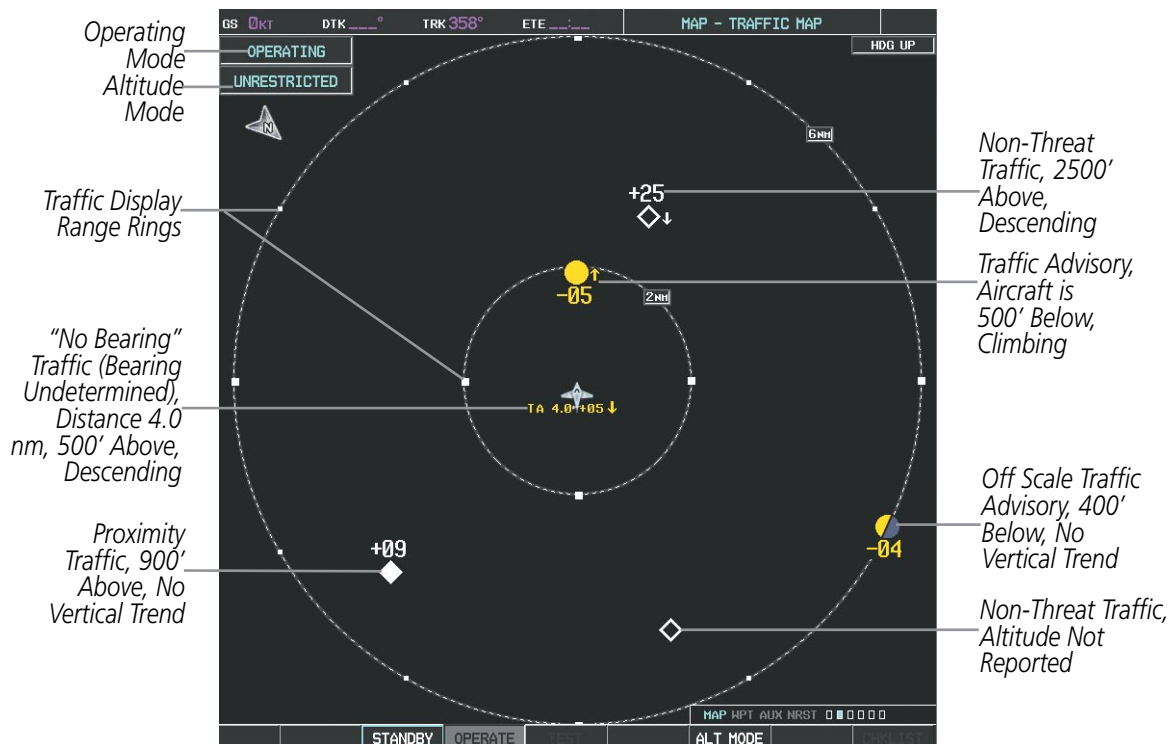


Figure 6-165 Traffic Map Page

The Traffic Map Page shows surrounding TAS traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner.

Displaying traffic information (maps other than the Traffic Map Page):

- 1) Press the **MAP** Softkey.
- 2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate TAS is enabled for display.

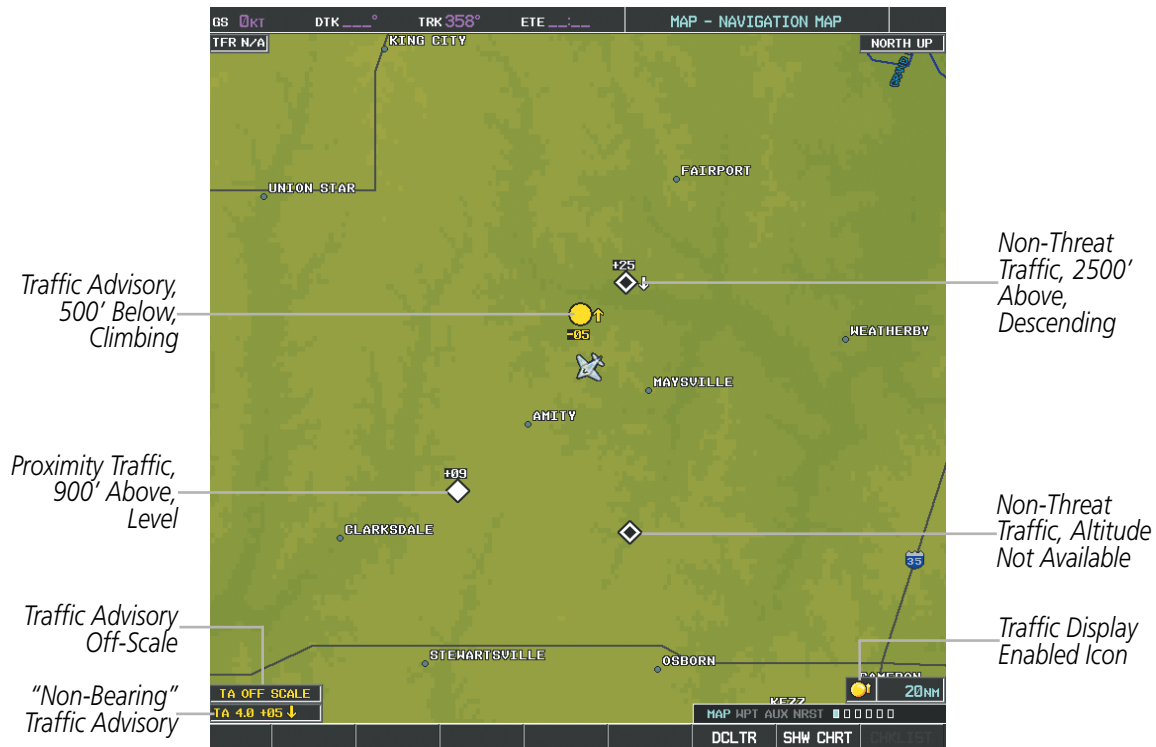


Figure 6-166 TAS Traffic on the Navigation Map Page

Displaying traffic information (PFD Inset Map):

- 1) Press the **INSET** Softkey.
- 2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Press the softkey again to display the traffic-only inset (TRFC-2).
- 4) Press the softkey again to remove traffic data.

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

ALTITUDE DISPLAY

Changing the altitude display mode:

- 1) On the Traffic Page, press the **ALT MODE** Softkey.
- 2) Press one of the following Softkeys:
 - **BELOW**
 - **NORMAL**
 - **ABOVE**
 - **UNREST** (unrestricted)
- 3) To return to the Traffic Page, press the **BACK** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the small **FMS** Knob to select one of the following:
 - **BELOW**
 - **NORMAL**
 - **ABOVE**
 - **UNREST** (unrestricted)
- 3) Press the **ENT** Softkey.

TRAFFIC MAP PAGE DISPLAY RANGE

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **RANGE** Knob from 2 to 40 nm, as indicated by the map range rings.

Changing the display range on the Traffic Page:

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
 - 2 nm
 - 2 and 6 nm
 - 6 and 12 nm
 - 12 and 24 nm*
 - 24 and 40 nm*

* Range available only on the SKY899 TAS.

Customizing the traffic display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-167).
- 4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-168).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-169).
 - TRAFFIC – Turns the display of traffic data on or off
 - TRAFFIC MODE – Selects the traffic mode for display; select from:
 - All Traffic - Displays all traffic
 - TA/PA - Displays Traffic Alerts and Proximity Advisories
 - TA ONLY - Displays Traffic Alerts only
 - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
 - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
- 6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

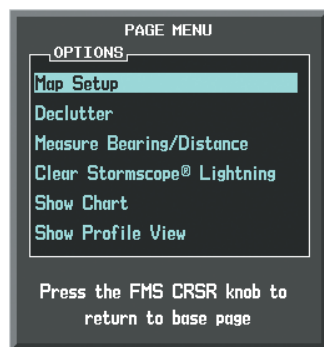


Figure 6-167 Navigation Map Page Menu



Figure 6-168 Navigation Map Page Setup Menu

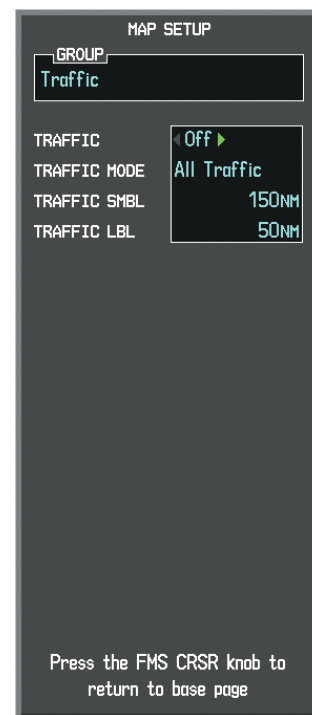



Figure 6-169 Navigation Map Page Setup Menu, Traffic Group

TAS ALERTS

 **NOTE:** Refer to the TAS documentation for information on alerts generated by the TAS equipment.

- When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:
- A **“Traffic, Traffic”** voice alert is generated.
 - A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
 - The PFD Inset Map is automatically displayed with TA traffic

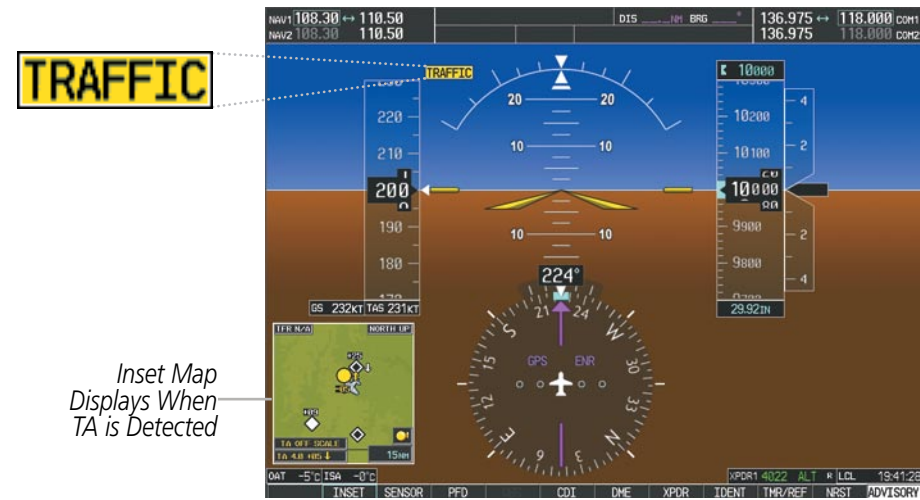


Figure 6-170 Traffic Annunciation (PFD)

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TAS Self-test Initiated	TEST (‘TEST MODE’ also shown in white on top center of page)	
TAS Operating	OPERATING	
TAS Standby	STANDBY (also shown in white in center of page)	
TAS Failed*	FAIL	

* See Table 6-33 for additional failure annunciations

Table 6-32 TAS Modes

If the unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TAS unit
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TAS unit

Table 6-33 TAS Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↓	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

*Shown as symbol on Traffic Map Page

**Shown in center of Traffic Map Page

Table 6-34 TAS Traffic Status Annunciations

6.11 HONEYWELL KTA 870 TRAFFIC



WARNING: The Traffic Information System (TAS) is intended for advisory use only. TAS is intended to help the pilot locate traffic visually. It is the responsibility of the pilot to see and maneuver to avoid traffic.



NOTE: TIS is disabled when a TAS is installed.



NOTE: Refer to the Honeywell® KTA 870 Pilot's Guide for a detailed discussion of the KTA 870 TAS.

TAS SYMBOLOGY

The optional Honeywell KTA 870 Traffic Advisory System (TAS) is designed to help in detection and avoidance of other aircraft. TAS uses an on-board interrogator-processor and the Mode S transponder for the air-to-air traffic data link. Traffic is displayed using four different symbols.





TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-35 TAS Symbol Description

A Non-threat Advisory, 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 5 nm range, but is still not considered a threat.

A Traffic Advisory (TA) alerts the crew to a potentially hazardous intruding aircraft. Closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is 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.

OPERATION

The KTA 870 must be in Operating Mode for traffic to be displayed. The unit starts in Operating Mode upon power-up.

Selecting the **STANDBY** Softkey forces the unit into Standby Mode. Selecting the **NORMAL** Softkey allows the KTA 870 to switch from Standby Mode to Operating Mode as necessary.

Switching from operating mode to standby mode:

On the Traffic Page, select the **STANDBY** Softkey

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select Standby Mode.
- 2) Press the **ENT** Key.

Switching from standby mode to operating mode:

On the Traffic Page, select the **NORMAL** Softkey

Or:

- 1) Press the **MENU** Key and turn the small **FMS** knob to select Normal Mode.
- 2) Press the **ENT** Key. The KTA 870 switches from Standby Mode to Operating Mode as necessary.

System Self Test

- 1) Set the range to 2/6 nm to allow for full test pattern display.
- 2) Select the **TEST** Softkey.
- 3) Self test takes approximately eight seconds to complete. When completed successfully, traffic symbols are displayed and a voice alert "TAS System Test Passed" is heard. In the event that the system test fails, the system reverts to Standby Mode and a voice alert "TAS System Test Failed" is heard.

Displaying traffic on the Traffic Map Page:

- 1) Turn the large **FMS** Knob to select the Map Page Group.
- 2) Turn the small **FMS** Knob to select the Traffic Map Page.
- 3) Select the **NORMAL** Softkey to begin displaying traffic. OPERATING is displayed in the Traffic mode field.
- 4) Select the **ALT MODE** Softkey to change the altitude volume.
- 5) Select the **STANDBY** Softkey to place the system in the Standby mode. STANDBY is displayed in the Traffic mode field.
- 6) Turn the **RANGE** Knob clockwise to display a larger area or counter-clockwise to display a smaller area.



Figure 6-171 Traffic Map Page

The Traffic Map Page shows surrounding TAS traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob from 2 to 40 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner.

DISPLAYING TRAFFIC DATA

Traffic information can be displayed on the following maps when the KTA 870 unit is operating:

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

Displaying traffic information (maps other than the Traffic Map Page):

- 1) Select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate TAS is enabled for display.

Displaying traffic on the Navigation Map

- 1) Ensure that the TAS system is operating. With the Navigation Map displayed, select the **MAP** Softkey.
- 2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in the figure.

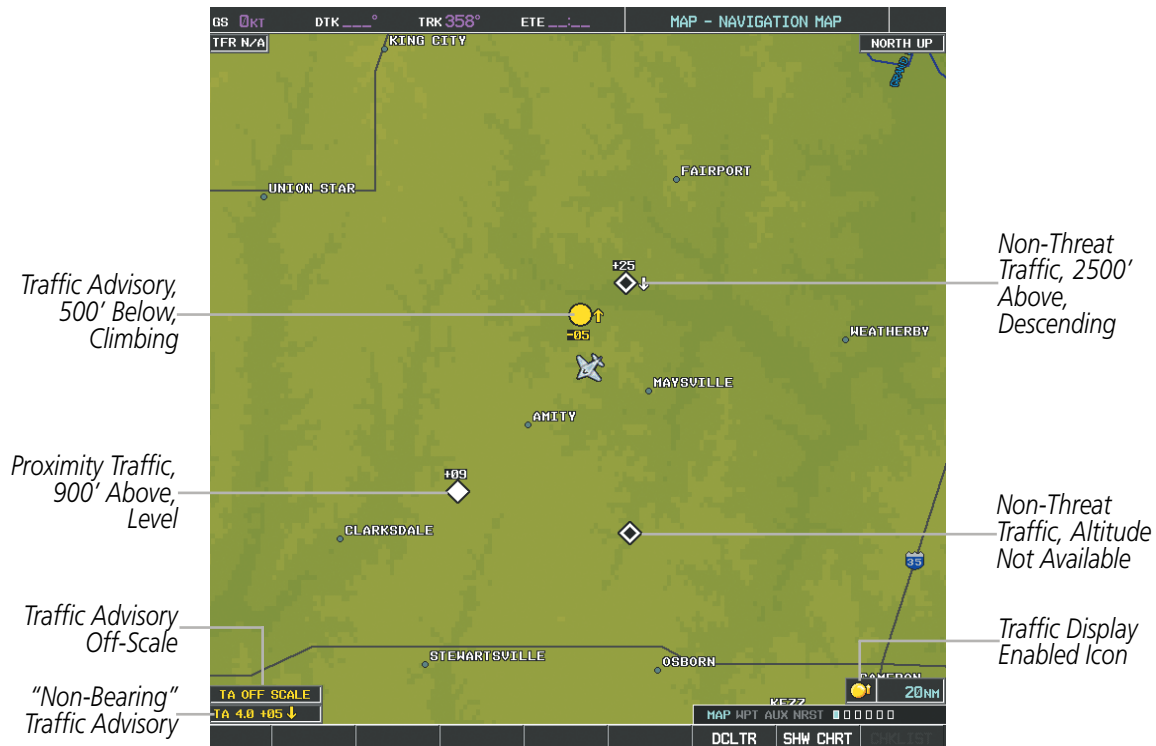


Figure 6-172 TAS Traffic on the Navigation Map Page

Displaying traffic information (PFD Inset Map):

- 1) Select the **INSET** Softkey.
- 2) Select the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
- 3) Select the softkey again to display the traffic-only inset (TRFC-2).
- 4) Select the softkey again to remove traffic data.

ALTITUDE DISPLAY

The Pilot can select the volume of airspace in which traffic is displayed. Traffic Advisories (TAs) outside of these limits will still be shown. Refer to the KTA 870 Pilot's Guide for specific display thresholds.

Changing the altitude display mode:

- 1) On the Traffic Page, select the **ALT MODE** Softkey.
- 2) Select one of the following Softkeys:
 - **BELOW**
 - **NORMAL**
 - **ABOVE**
 - **UNREST** (unrestricted)
- 3) To return to the Traffic Page, select the **BACK** Softkey.

Or:

- 1) Press the **MENU** Key.
- 2) Turn the small **FMS** Knob to select one of the following:
 - **BELOW**
 - **NORMAL**
 - **ABOVE**
 - **UNREST** (unrestricted)
- 3) Select the **ENT** Softkey.

TRAFFIC MAP PAGE DISPLAY RANGE

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **RANGE** Knob from 2 to 40 nm, as indicated by the map range rings.

Changing the display range on the Traffic Page:

- 1) Turn the **RANGE** Knob.
- 2) The following range options are available:
 - 2 nm
 - 2 and 6 nm
 - 6 and 12 nm
 - 12 and 24 nm
 - 24 and 40 nm

Customizing the traffic display on the Navigation Map Page:

- 1) Select the Navigation Map Page.
- 2) Press the **MENU** Key.
- 3) With Map Setup highlighted, press the **ENT** Key (Figure 6-173).
- 4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-174).
- 5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-175).
 - TRAFFIC – Turns the display of traffic data on or off
 - TRAFFIC MODE – Selects the traffic mode for display; select from:
 - All Traffic - Displays all traffic
 - TA/PA - Displays Traffic Alerts and Proximity Advisories
 - TA ONLY - Displays Traffic Alerts only
 - TRAFFIC SML – Selects the maximum range at which traffic symbols are shown
 - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
- 6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
- 7) Press the **ENT** Key to select an option.
- 8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.



Figure 6-173 Navigation Map Page Menu

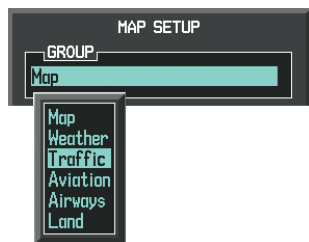


Figure 6-174 Navigation Map Page Setup Menu

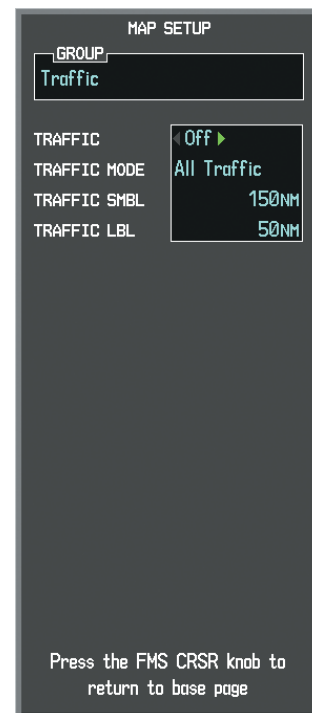


Figure 6-175 Navigation Map Page Setup Menu, Traffic Group

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

TAS ALERTS



NOTE: Refer to the KTA 870 documentation for information on alerts generated by the TAS equipment.

When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:

- A **“Traffic, Traffic”** voice alert is generated when the first TA is displayed.
- A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with TA traffic.
- A single **“Traffic”** voice alert is generated when the number of TAs increases.

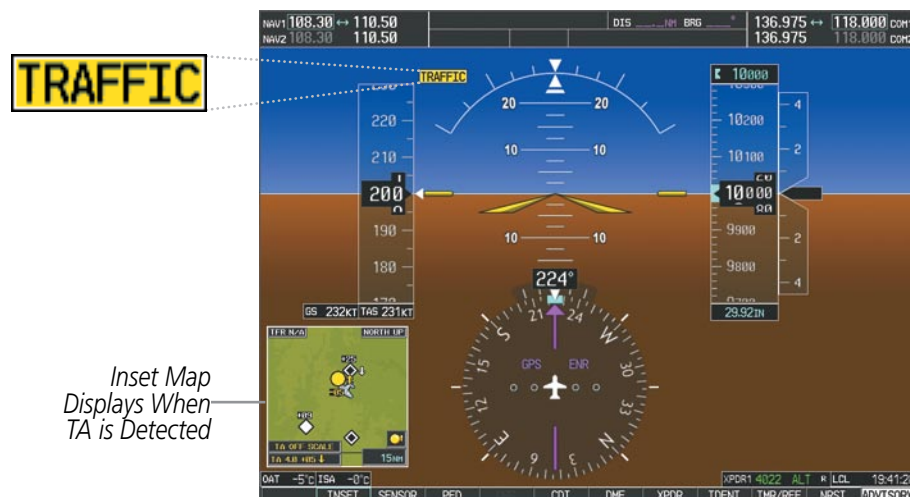






Figure 6-176 Traffic Annunciation (PFD)

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TAS Self-test Initiated	TEST (‘TEST MODE’ also shown in white on top center of page)	
TAS Operating	OPERATING	
TAS Standby	STANDBY (also shown in white in center of page)	
TAS Failed*	FAIL	

* See Table 6-37 for additional failure annunciations

Table 6-36 TAS Modes

If the unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TAS unit
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TAS unit

Table 6-37 TAS Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↓	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

*Shown as symbol on Traffic Map Page

**Shown in center of Traffic Map Page

Table 6-38 TAS Traffic Status Annunciations

SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

7.1 AFCS OVERVIEW



NOTE: *The approved Pilot's Operating Handbook (POH) and FAA Approved Airplane Flight Manual (AFM) always supersedes this Pilot's Guide.*

The GFC 700 is a digital Automatic Flight Control System (AFCS), fully integrated within the G1000 System avionics architecture. The System Overview section provides a block diagram to support this system description. GFC 700 AFCS functionality is distributed across the following Line Replaceable Units (LRUs):

- GDU 1040A Primary Flight Displays (PFDs) (2)
- GSA 80 AFCS Servos (4)
- GMC 710 AFCS Control Unit
- GSM 85A / GSM 86 Servo Gearboxes (4)
- GIA 63W Integrated Avionics Units (IAUs) (2)

The GFC 700 AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — The Beechcraft 200/B200 has two flight directors, each operating within an IAU and referred to as pilot-side and copilot-side. Commands for the selected flight director are displayed on both PFDs.

The flight director provides:

- Command Bars showing pitch/roll guidance
- Vertical/lateral mode selection and processing
- Autopilot communication
- **Autopilot (AP)** — Autopilot operation occurs within the pitch, roll, and pitch trim servos. It also provides servo monitoring and 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 is self-monitoring and 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 servo provides manual electric pitch trim capability when the autopilot is not engaged.

AFCS CONTROL UNIT

The AFCS Control Unit is positioned above the MFD, and has the following controls:

- ① **HDG Key** Selects/deselects Heading Select Mode
- ② **APR Key** Selects/deselects Approach Mode
- ③ **NAV Key** Selects/deselects Navigation Mode
- ④ **FD Key** Activates/deactivates the flight director only
Pressing once turns on the selected flight director in the default vertical and lateral modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.
- ⑤ **XFR Key** Transfers between the pilot and copilot flight directors and controls which flight director the autopilot is tracking
- ⑥ **ALT Key** Selects/deselects Altitude Hold Mode
- ⑦ **VS Key** Selects/deselects Vertical Speed Mode
- ⑧ **FLC Key** Selects/deselects Flight Level Change Mode
- ⑨ ⑪ **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
- ⑩ **SPD Key** Toggles Airspeed Reference between IAS and Mach for Flight Level Change Mode
- ⑪ **NOSE UP/DN Wheel** Adjusts the reference in Pitch Hold, Vertical Speed, and Flight Level Change modes (see Table 7-2 for change increments in each mode)
- ⑫ **VNV Key** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- ⑬ **ALT SEL Knob** Controls the Selected Altitude in 100-ft increments (a finer resolution of 10 feet is available under approach conditions)
- ⑭ **YD Key** Engages/disengages the yaw damper
- ⑮ **AP Key** Engages/disengages the autopilot
- ⑯ **BANK Key** Manually selects/deselects Low Bank Mode
- ⑰ **BC Key** Selects/deselects Backcourse Mode
- ⑱ **HDG 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

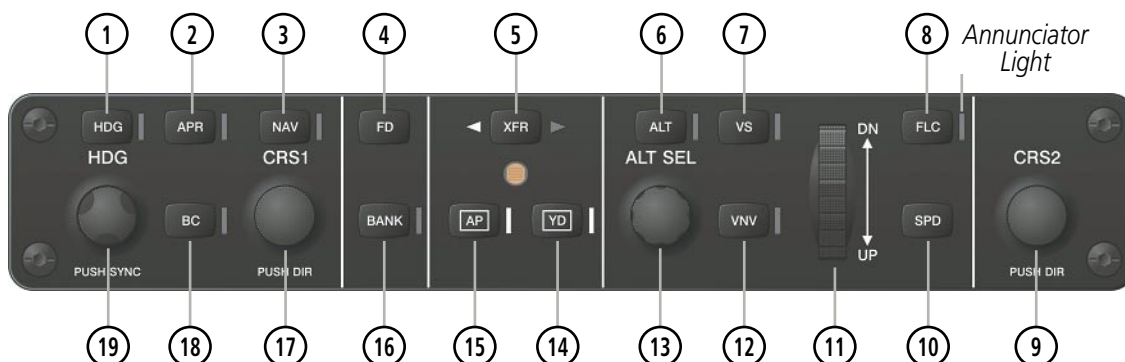


Figure 7-1 GMC 710 AFCS Control Unit

ADDITIONAL AFCS CONTROLS

The following AFCS controls are located separately from the AFCS Control Unit:

AP/YD DISC TRIM INTRPT Switch (Autopilot Disconnect/Trim Interrupt)	<p>Disengages the autopilot, yaw damper, and flight director and interrupts pitch trim operation</p> <p>An AP/YD DISC Switch is located on each control wheel.</p> <p>This switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural tone.</p>
CWS Button (Control Wheel Steering)	<p>While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in a Vertical Navigation, Glideslope, or Glidepath Mode) and roll (if in Roll Hold Mode)</p> <p>A CWS Button is located on each control wheel.</p> <p>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.</p>
GA Button (Go Around)	<p>Selects flight director Takeoff (on ground) or Go Around (in air) Mode</p> <p>If an approach procedure is loaded this button 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.</p> <p>The GA Button is located on the left throttle.</p>
MEPT Switch (Manual Electric Pitch Trim)	<p>Used to command manual electric pitch trim</p> <p>An MEPT Switch is located on each control wheel.</p> <p>The pilot side MEPT Switch has priority over the copilot side MEPT Switch.</p> <p>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. Pushing the MEPT ARM Switch disengages the autopilot, if currently engaged, but does not affect yaw damper operation. The MEPT ARM Switch may be used to acknowledge an autopilot disconnect alert and mute the associated aural tone.</p> <p>Manual trim commands are generated only when both sides of the switch are operated simultaneously. If either side of the switch is active separately for more than three seconds, MEPT function is disabled and 'PTRM' is displayed as the AFCS Status Annunciation on the PFDs. The function remains disabled until both sides of the switch are inactivated.</p>

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 (-15° , $+20^{\circ}$) 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 (when the flight director is not active) activates the pilot-side flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the displays by pressing the **FD** Key again. The **FD** Key is disabled when the autopilot is engaged.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key	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 Button	Takeoff (on ground)	TO	Takeoff (on ground)	TO
	Go Around (in air)	GA	Go Around (in air)	GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
FLC Key	Roll Hold (default)	ROL	Flight Level Change	FLC
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking*	VPTH
NAV Key	Navigation**	GPS	Pitch Hold (default)	PIT
		VOR		
		LOC		
BC Key	Backcourse***	BC	Pitch Hold (default)	PIT
APR Key	Approach**	GPS	Pitch Hold (default)	PIT
		VOR		
		LOC		
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT

*Valid VNV 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 GPS course before **NAV or **APR** Key press activates flight director.

***The selected navigation receiver must have a valid LOC signal before **BC** Key press activates flight director.

Table 7-1 Flight Director Activation

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 on the right. Armed modes are displayed in white and active in green.

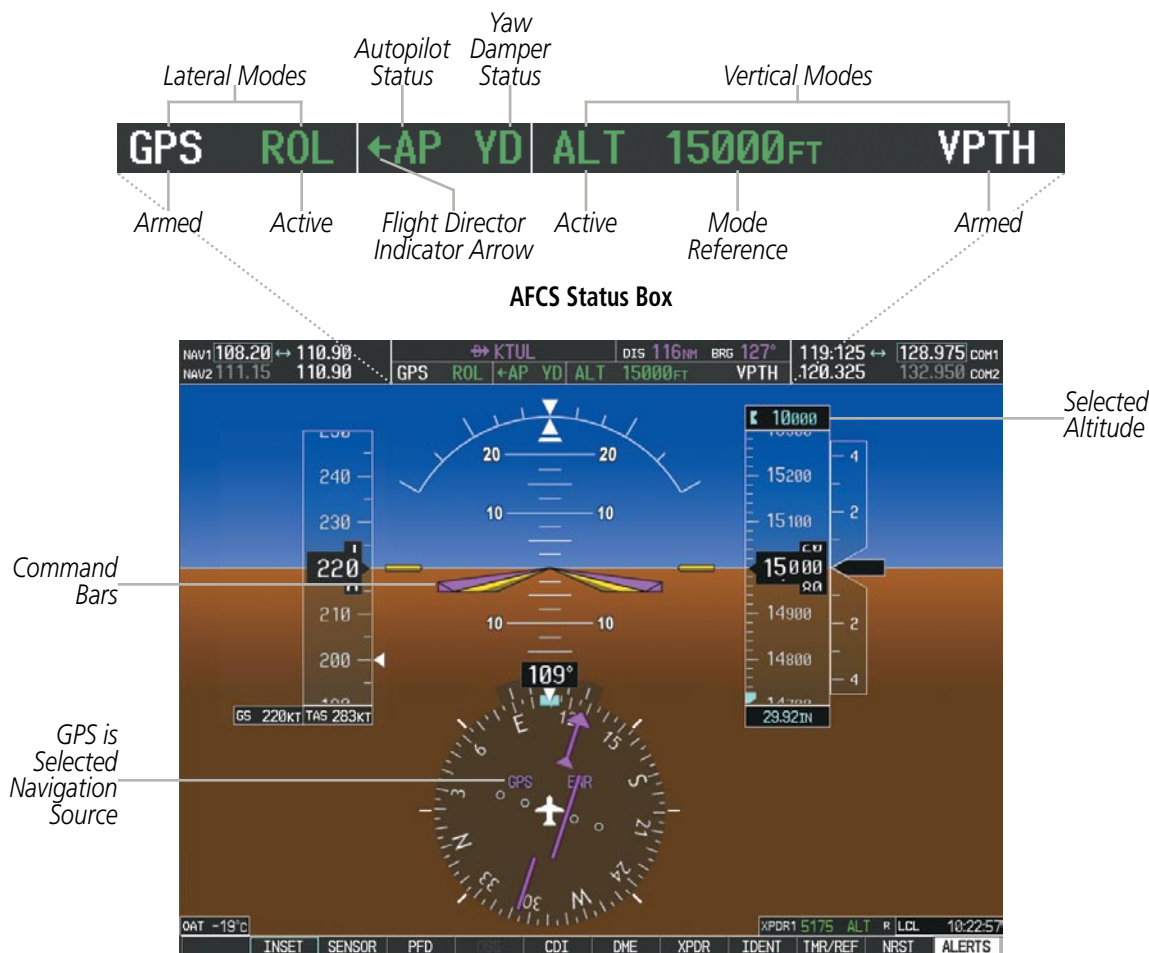


Figure 7-2 PFD AFCS Display

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. Mode keys on the AFCS controller are accompanied by annunciator lights (Figure 7-1) which are illuminated when their respective modes are armed or active.

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the **FD** Key is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, GPS, VNV, SBAS) required to compute commands. When such a loss occurs, the system automatically begins to roll the wings level (enters Roll Hold Mode) or maintain the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.



Figure 7-3 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.

SWITCHING FLIGHT DIRECTORS

The GFC 700 in the Beechcraft 200/B200 has two flight directors, each operating within an IAU. 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. Flight directors may be switched by pressing the **XFR** Key. The annunciator light arrow for the selected flight director is also illuminated beside the **XFR** Key. When the flight directors are switched, the vertical and lateral modes revert to default.

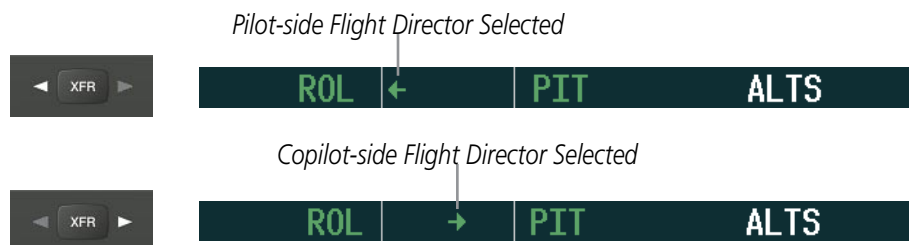


Figure 7-4 Flight Director Selection Indications

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed in magenta on the PFDs as a single cue or cross pointers. 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 7-5) move together vertically to indicate pitch commands and bank left or right to indicate roll commands. Command Bars displayed as a cross pointer (Figure 7-6) move independently to indicate pitch (horizontal bar) and roll (vertical bar) commands. Both PFDs show the same Command Bar format.

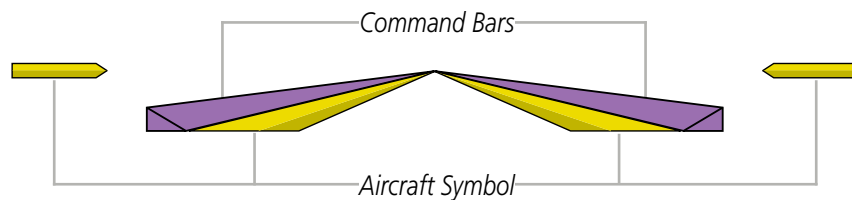


Figure 7-5 Single-cue Command Bars

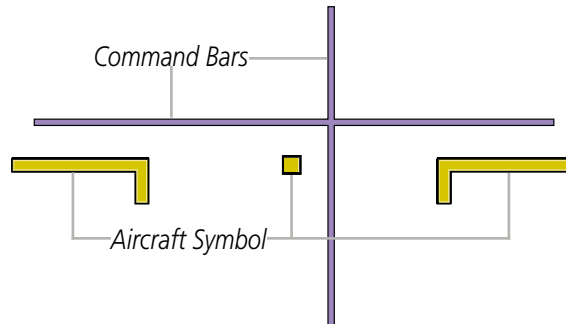


Figure 7-6 Cross-pointer Command Bars

Changing Command Bar format:

- 1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight 'Format Active' in the 'Flight Director' box.
- 4) Turn the small **FMS** Knob to highlight the desired format.

'SNGL CUE' to display Command Bars as a single cue (Aircraft Symbol in figure 7-5).

Or:

'X-POINTER' to display Command Bars as a cross pointer (Aircraft Symbol in Figure 7-6).

If the attitude information being sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if the pitch exceeds +30°/-20° or bank exceeds 65°.

UNDERSPEED PROTECTION

Underspeed Protection is available when the optional Electronic Stability and Protection (ESP) system is installed and the autopilot is on. It is designed to discourage aircraft operation below minimum established airspeeds.

When aircraft airspeed reaches 100 knots IAS, a yellow MINSPD annunciation (Figure 7-7) will appear above the airspeed indicator. When the airspeed trend vector (specific to each flap setting) reaches a predetermined airspeed, a single aural “AIRSPEED” will sound, alerting the pilot to the impending underspeed condition. When aircraft angle of attack is within four degrees of stall warning, the Pitch Limit Indicator (Figure 7-7) will be displayed approximately four degrees above the aircraft symbol on the pitch attitude indicator. If deceleration continues, the Pitch Limit Indicator will move downward on the pitch attitude indicator until coincident with the aircraft symbol at stall warning angle of attack.



Figure 7-7 MINSPD Annunciation and Pitch Limit Indicator

If the aircraft continues to decelerate, Underspeed Protection functionality depends on which vertical flight director mode is selected. For the purpose of this discussion, the vertical flight director modes can be divided into two categories: Those in which it is important to maintain altitude for as long as possible (altitude-critical modes), and those in which maintaining altitude is less crucial (non-altitude critical modes).

ALTITUDE-CRITICAL MODES (ALT, GS, GP, TO, GA, FLC)

If the aircraft decelerates to stall warning, the lateral and vertical flight director modes will change from active to armed (Figure 7-8), and the autopilot will provide input causing the aircraft to pitch down and the wings to level.



Figure 7-8 Lateral and Vertical Flight Director Modes Armed

An aural “AIRSPEED” alert will sound every five seconds and a red “UNDERSPEED PROTECT ACTIVE” annunciation (Figure 7-9) will appear to the right of the vertical speed indicator. The pitch down force will continue until the aircraft reaches a pitch attitude at which IAS equals the IAS at which stall warning turns off, plus two knots.

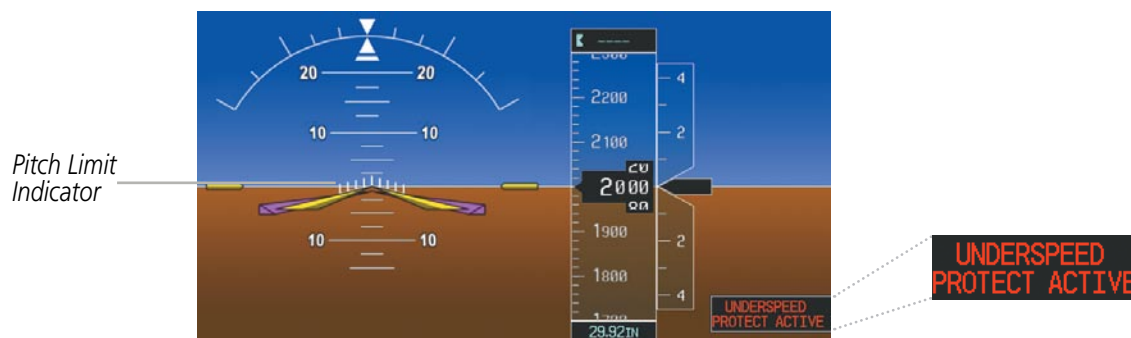


Figure 7-9 Underspeed Protect Active Annunciation

When airspeed increases (as a result of adding power/thrust) to above the IAS at which stall warning turns off, plus two knots, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference. The vertical and lateral flight director modes will change from armed to active, and when aircraft angle of attack reaches approximately five degrees below stall warning angle of attack, the Pitch Limit Indicator will be removed.

NON-ALTITUDE CRITICAL MODES (VS, VNAV, IAS,)

If the aircraft decelerates to an IAS below the minimum commandable autopilot airspeed, a red “UNDERSPEED PROTECT ACTIVE” annunciation (Figure 7-9) will appear to the right of the vertical speed indicator. The vertical flight director mode will change from active to armed (Figure 7-10), and the autopilot will cause the aircraft to pitch down until reaching a pitch attitude at which IAS equals the minimum commandable autopilot airspeed.



Figure 7-10 Vertical Flight Director Mode Armed

When airspeed increases (as a result of adding power/thrust) to an IAS above the minimum commandable autopilot airspeed, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference. The vertical flight director mode will change from armed to active, and when aircraft angle of attack reaches approximately five degrees below stall warning angle of attack, the Pitch Limit Indicator will be removed.

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 **NOSE 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 reference value ranges for each parameter are also listed in the table.

Vertical Mode	Description	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	Holds the current 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 the current Altitude Reference	ALT Key	ALT nnnnn FT		
Vertical Speed	Maintains the current aircraft vertical speed; may be used to climb/descend to the Selected Altitude	VS Key	VS nnnn FPM	-4000 to +4000 fpm	100 fpm
Flight Level Change, IAS Hold	Maintains the current aircraft airspeed (in IAS or Mach) while the aircraft is climbing/descending to the Selected Altitude	FLC Key	FLC nnn KT	100 to 259 kt	1 kt
Flight Level Change, Mach Hold			FLC M .nnn	M 0.15 to 0.52	M 0.01
Vertical Path Tracking	Captures and tracks descent legs of an active vertical profile	VNV Key	VPTH		
VNV Target Altitude Capture	Captures the Vertical Navigation (VNV) Target Altitude	**	ALTV		
Glidepath	Captures and tracks the SBAS 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 Button	TO	8.6°	
Go Around	Commands a constant pitch angle and wings level in the air		GA	8°	
Level	Autopilot engages and commands pitch angle necessary to establish zero vertical fpm	***	LVL	N/A	

* *ALTS armed automatically when PIT, VS, FLC, TO, or GA active, and under VPTH when Selected Altitude is to be captured instead of VNV Target Altitude*

** *ALTV armed automatically under VPTH when VNV Target Altitude is to be captured instead of Selected Altitude*

*** *Level mode can only become activated as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.*

Table 7-2 Flight Director Vertical Modes

PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed) or switched (the **XFR** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active vertical mode by the 'PIT' annunciation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

CHANGING THE PITCH REFERENCE

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **NOSE UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

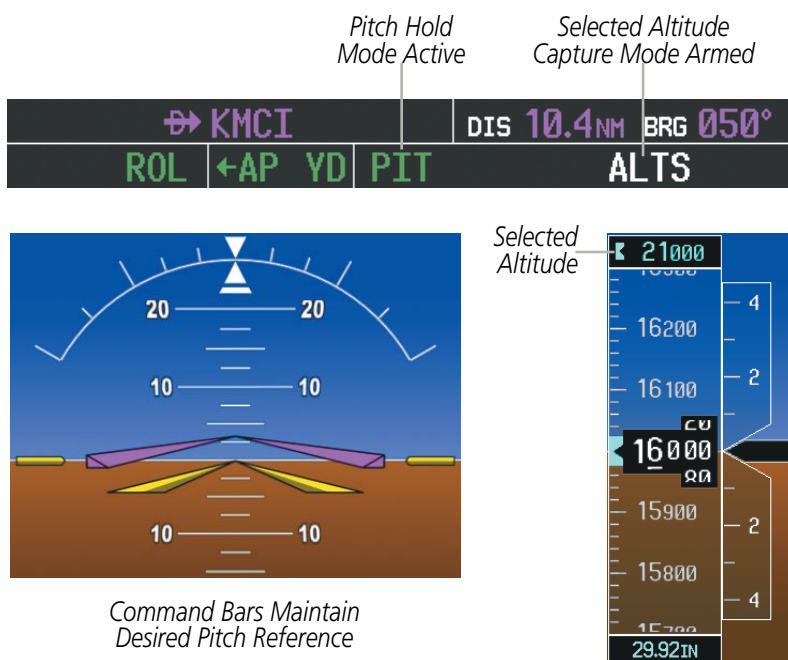


Figure 7-11 Pitch Hold Mode

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 VNV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-11 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 7-12). This automatic transition is indicated by the green 'ALTS' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT' annunciation. The Selected Altitude is shown as the Altitude Reference beside the 'ALTS' annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude (shown as the Altitude Reference). As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition.

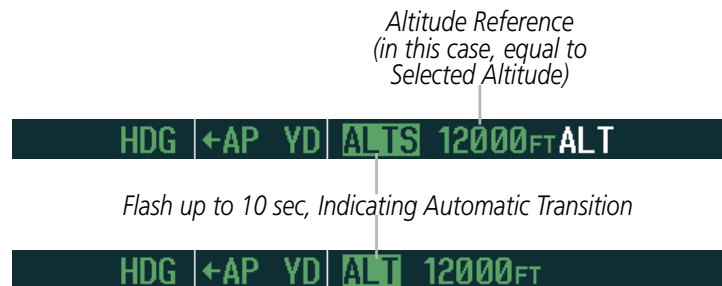


Figure 7-12 Automatic Mode Transitions During Altitude Capture

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)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-12). Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director's Altitude Reference.

CHANGING THE ALTITUDE REFERENCE



NOTE: Turning the **ALT 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 depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

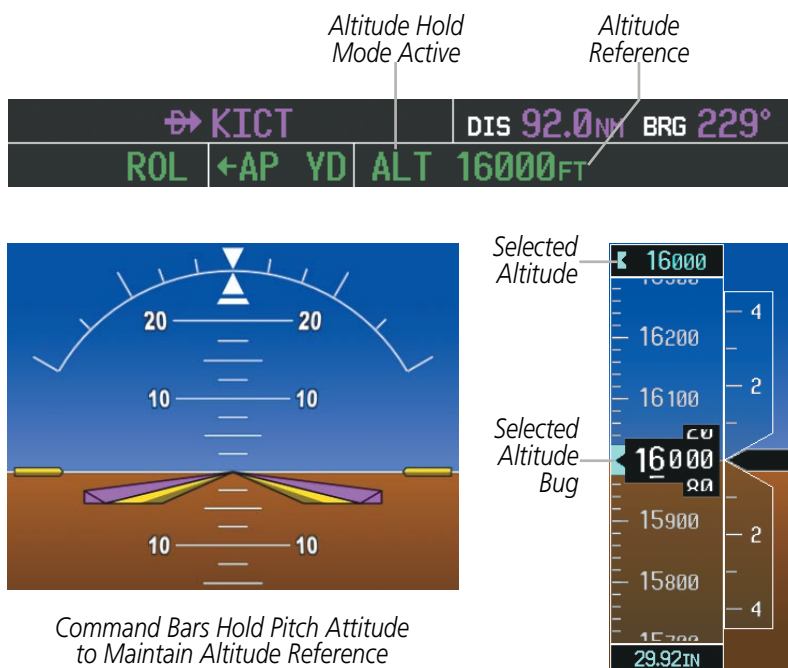


Figure 7-13 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

CHANGING THE VERTICAL SPEED REFERENCE

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by:

- Using the **NOSE UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the **CWS** Button



NOTE: If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.

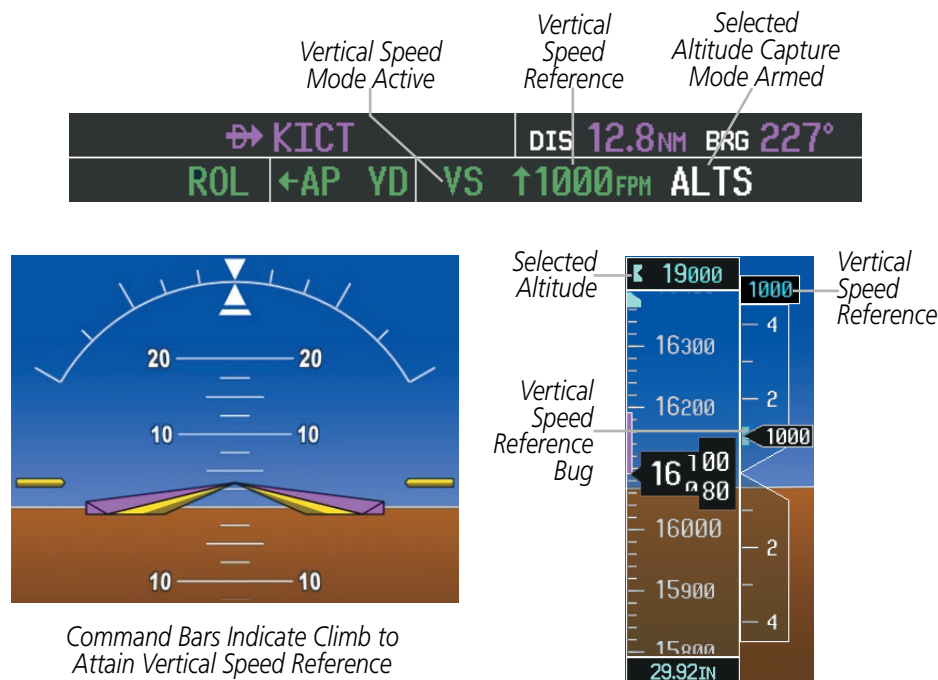


Figure 7-14 Vertical Speed Hold Mode

FLIGHT LEVEL CHANGE MODE (FLC)



NOTE: *The Selected Altitude should be set before selecting Flight Level Change Mode.*

Flight Level Change Mode is selected by pressing the **FLC** Key. This mode acquires and maintains the Airspeed Reference (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 beside the Airspeed Reference in the AFCS Status Box. The Airspeed Reference is also displayed directly above the Airspeed Indicator, along with a bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

CHANGING THE AIRSPEED REFERENCE

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **NOSE UP/DN** Wheel
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Airspeed Reference, then releasing the **CWS** Button



NOTE: *If the Selected Altitude is reached during CWS maneuvering, the Altitude Reference is not changed. To adjust the Altitude Reference in this case, the **CWS** Button must be pressed again after the Selected Altitude is reached.*

During climb, the pilot must select the Airspeed Reference (IAS or Mach), automatic switching does not occur. For descent, if Mach airspeed reference is selected (above 16,000 ft) the aircraft descends in Mach until the Mach airspeed reference reaches 250 KIAS, at which point the airspeed reference automatically switches to IAS. The system determines aircraft climb or descent by the relationship between the current and Selected altitudes.

Airspeed Reference units can be manually toggled between IAS and Mach units using the **SPD** Key. 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 only in the AFCS Status Box.

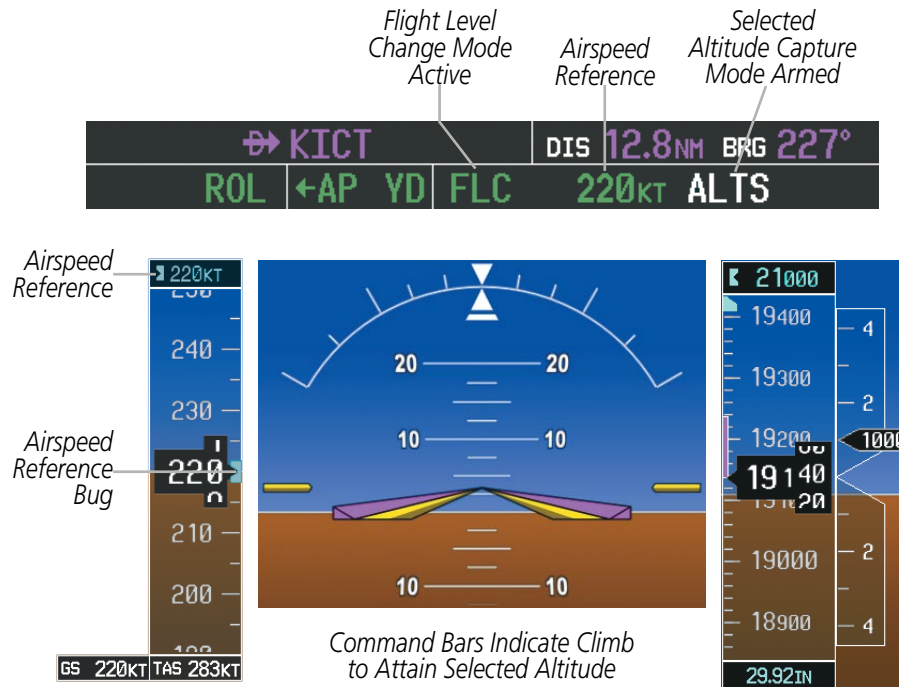


Figure 7-15 Flight Level Change Mode (IAS)

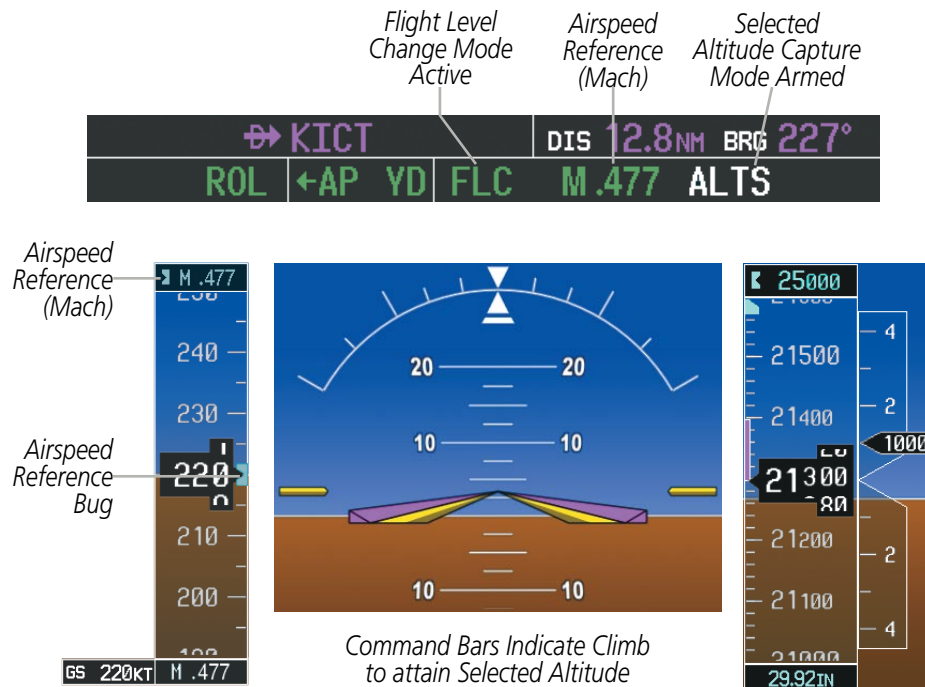


Figure 7-16 Flight Level Change Mode (Mach)

VERTICAL NAVIGATION MODES (VPTH, ALTV)



NOTE: VNV is disabled when parallel track or Dead Reckoning Mode is active.



NOTE: The Selected Altitude takes precedence over any other vertical constraints.

Vertical Navigation (VNV) flight control is available for enroute/terminal cruise and descent operations any time that VNV flight planning is available. Refer to the GPS Navigation Section for more information on VNV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (**VNV ENBL** Softkey pressed on the MFD).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNV modes.

VERTICAL PATH TRACKING MODE (VPTH)



NOTE: If another vertical mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.



NOTE: Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.

When a vertical profile (VNV flight plan) is active and the **VNV** Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. 'VPTH' (or 'V' when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.

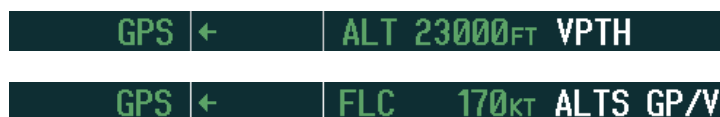


Figure 7-17 Vertical Path Tracking Armed Annunciations

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 five minutes of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received within one 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 PFD Navigation Status Box and the "Vertical track" voice message, VNV indications (VNV Target Altitude, vertical deviation, and vertical speed required) appear on the PFDs in magenta (Figure 7-18).

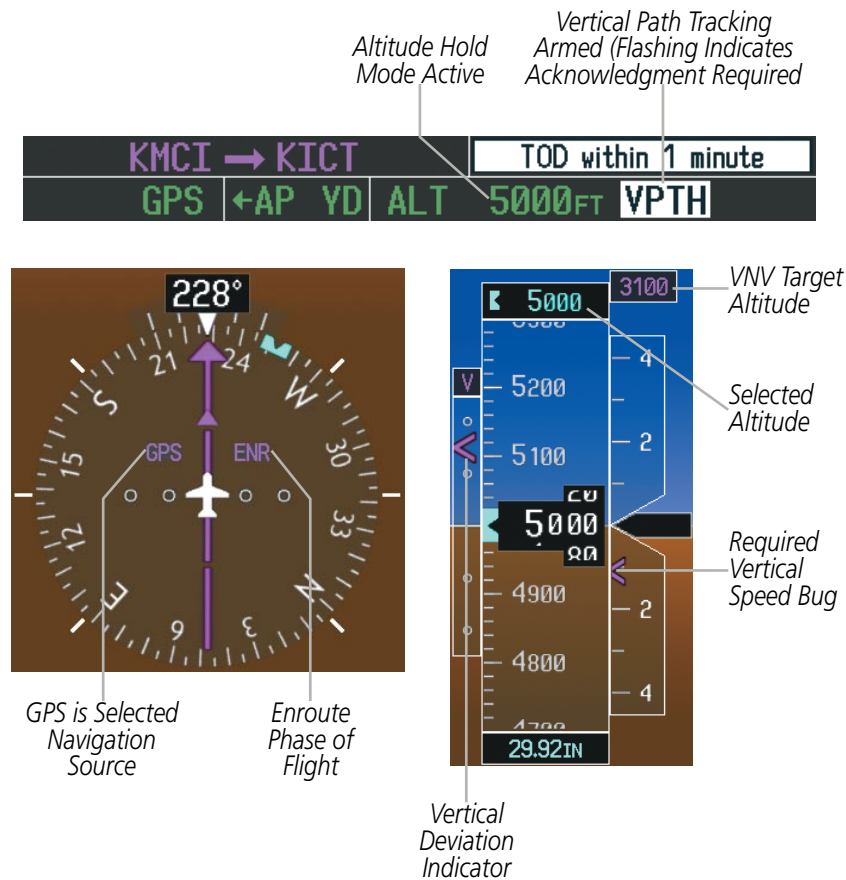


Figure 7-18 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile (Figure 7-19). An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

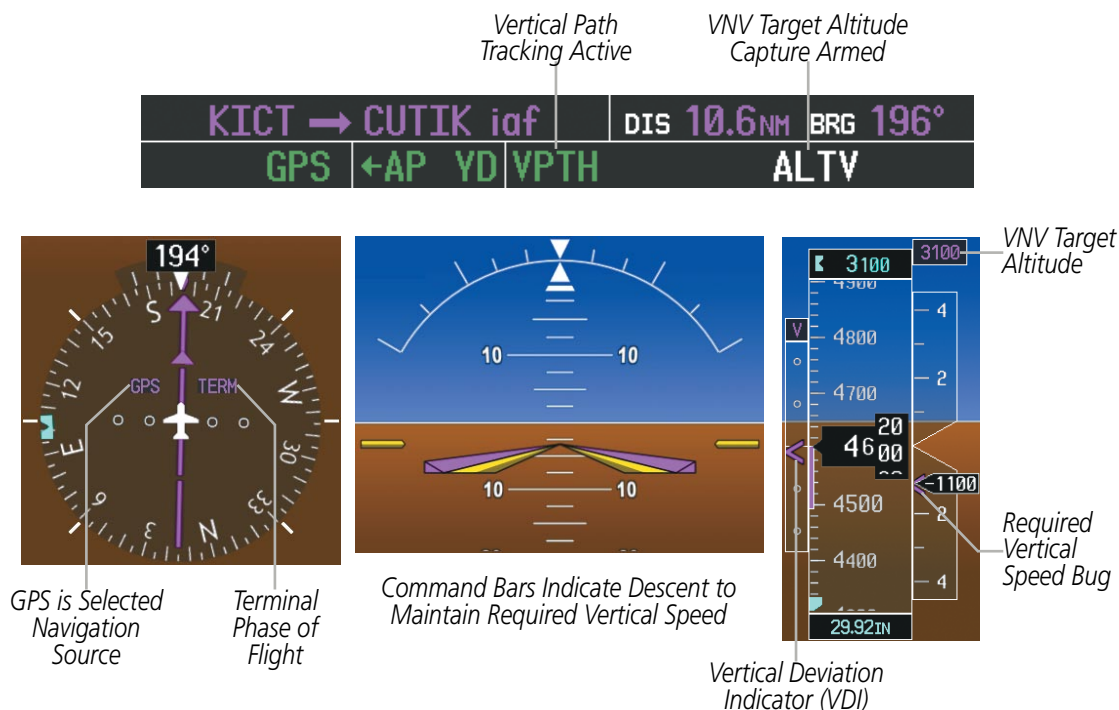


Figure 7-19 Vertical Path Tracking Mode

If the altimeter barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

AUTOMATIC REVERSION TO PITCH HOLD MODE

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

NON-PATH DESCENTS

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNV flight control is selected. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.



Figure 7-20 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

VNV TARGET ALTITUDE CAPTURE MODE (ALTV)



NOTE: Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation ‘ALTV’ indicates that the VNV Target Altitude is to be captured. VNV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the GPS Navigation Section for details). At the same time as “TOD within 1 minute” is annunciated in the Navigation Status Box, the active VNV Target Altitude is displayed above the Vertical Speed Indicator.

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green ‘ALTV’ annunciation flashing for up to 10 seconds and the appearance of the white ‘ALT’ annunciation. The VNV Target Altitude is shown as the Altitude Reference beside the ‘ALTV’ annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RSVI) is removed once VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white ‘ALT’ annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.

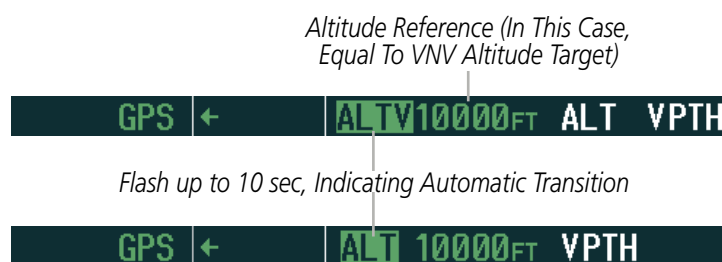


Figure 7-21 Automatic Mode Transitions During Altitude Capture

CHANGING THE VNV TARGET ALTITUDE



NOTE: Pressing the **CWS** Button while in VNV Target Altitude Capture Mode does not cancel the mode.

Changing the current VNV Target Altitude while VNV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNV target altitudes can be changed while editing the active flight plan (see the GPS Navigation Section for details).

GLIDEPATH MODE (GP)

Glidepath Mode is used to track the SBAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting Glidepath Mode:

- 1) Ensure a GPS approach with vertical guidance (LPV, LNAV/VNAV, LNAV +V) is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.



NOTE: Some RNAV (GPS) 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 7-22 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- The active waypoint is at or after the final approach fix (FAF).
- Vertical deviation is valid.
- The CDI is at less than full-scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)



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.

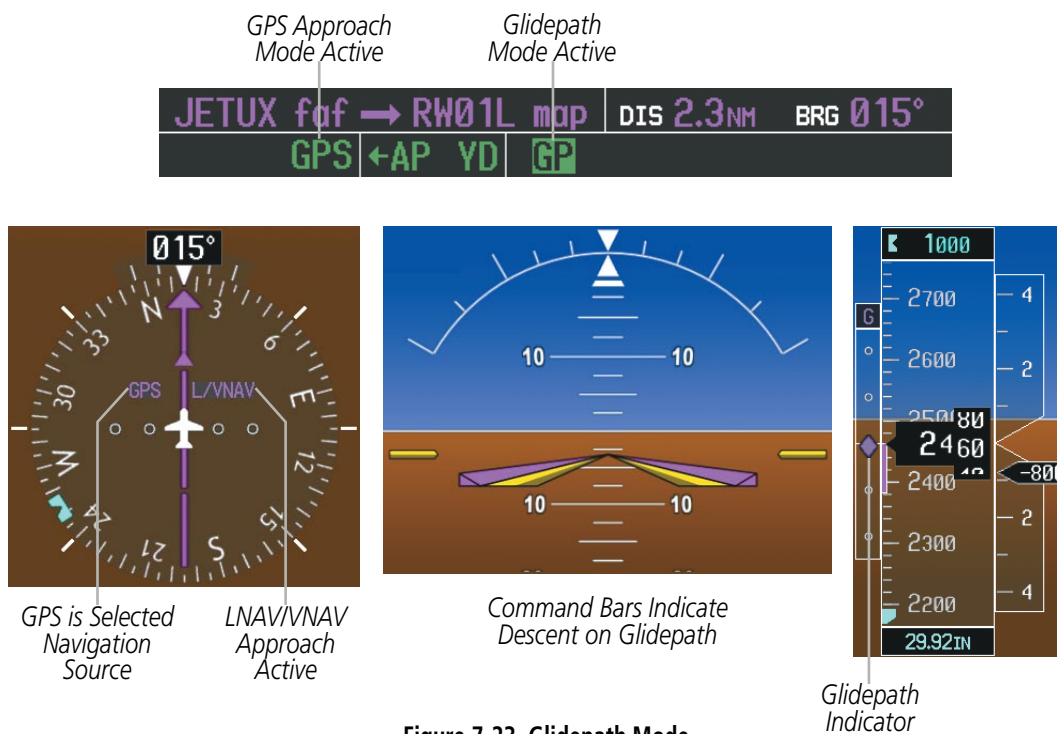


Figure 7-23 Glidepath Mode

GLIDESLOPE MODE (GS)

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as 'GS' in white), LOC Approach Mode is armed as the lateral flight director mode.

Selecting Glideslope Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

Or:

- 1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

LOC HDG ←AP YD ALT 9000FT GS

Figure 7-24 Glideslope Mode Armed

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to capture and track the glideslope.



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.

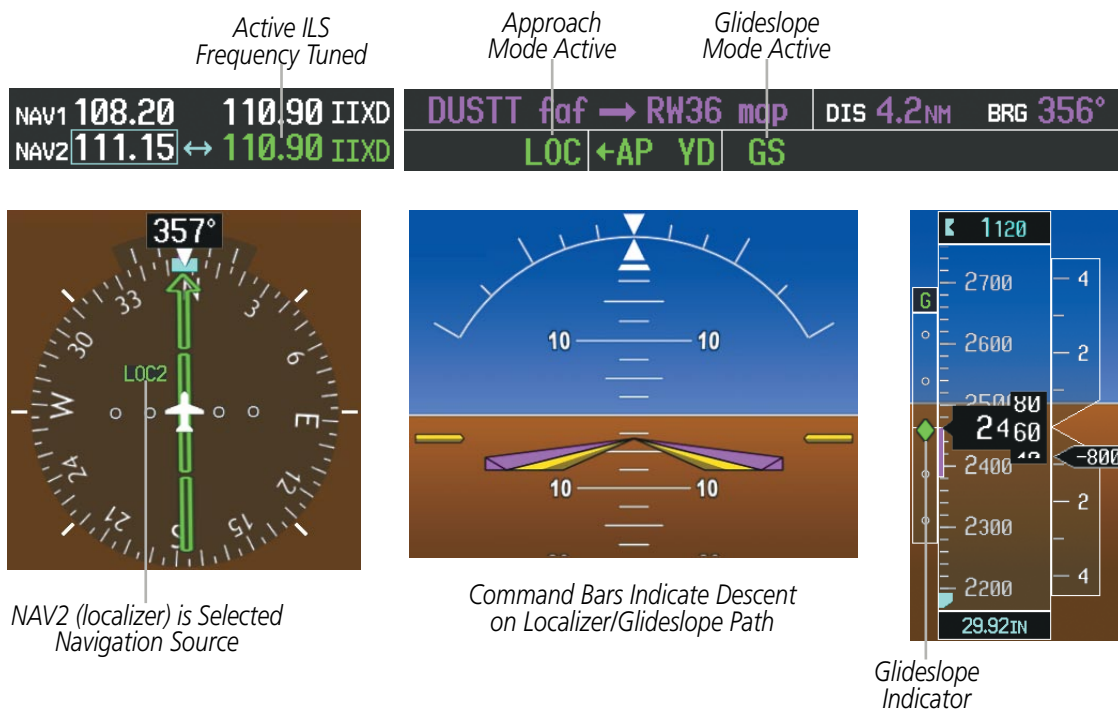


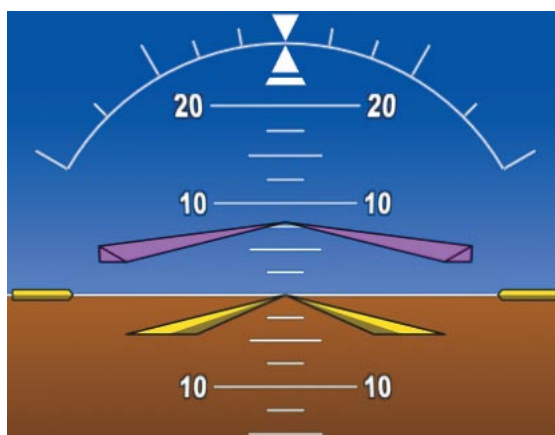
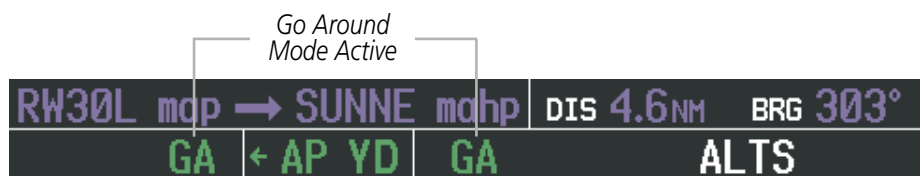
Figure 7-25 Glideslope Mode

TAKEOFF (TO) AND GO AROUND (GA) MODES

Go Around and Takeoff modes are coupled pitch and roll modes and are annunciated as both the vertical and lateral modes when active. In these modes, the flight director commands a constant set pitch attitude and wings level. The **GA** Button is used to select both modes. The mode entered by the flight director depends on whether the aircraft is on the ground.

Takeoff Mode provides an attitude reference during rotation and takeoff. This mode can be selected only while on the ground by pushing the **GA** Button. The flight director Command Bars assume a wings-level, pitch-up attitude.

Pressing the **GA** Button while in the air activates the flight director in wings level, pitch-up attitudes, allowing the execution of a missed approach or a go around.



Command Bars Indicate Climb



Figure 7-26 Takeoff and Go Around Modes

LEVEL MODE (LVL)

Level (LVL) mode becomes active only as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

When the normal flight envelope thresholds have been exceeded for more than 50% of the last 20 seconds, Level mode is activated. The autopilot will engage and provide input to bring the aircraft back into straight and level flight based on zero degrees roll angle and zero feet per minute vertical speed. An aural “ENGAGING AUTOPILOT” alert sounds and the lateral and vertical flight director annunciations will display “LVL”. The AFCS will remain in Level mode until the pilot selects another mode.



Figure 7-27 Level Mode

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 Go Around and Takeoff modes.

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	25°
Low Bank	Limits the maximum commanded roll angle	BANK Key	*	15°
Heading Select	Captures and tracks the Selected Heading	HDG Key	HDG	25°
Navigation, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	NAV Key	GPS	25°
Navigation, VOR Enroute Arm/Capture/Track			VOR	25°
Navigation, LOC Arm/Capture/Track (No Glideslope)			LOC	25°
Backcourse Arm/Capture/Track	Captures and tracks a localizer signal for backcourse approaches	BC Key	BC	25°
Approach, GPS Arm/Capture/Track	Captures and tracks the selected navigation source (GPS, VOR, LOC)	APR Key	GPS	25°
Approach, VOR Arm/Capture/Track			VAPP	25°
Approach, ILS Arm/Capture/Track (Glideslope Mode automatically armed)			LOC	25°
Takeoff	Disengages the autopilot and commands a constant pitch angle and wings level on the ground in preparation for takeoff	GA Button	TO	Wings Level
Go Around	Commands a constant pitch angle and wings level in the air		GA	Wings Level
Level	Autopilot engages and commands wings level	**	LVL	Wings Level

* 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.

** Level mode can only become activated as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

Table 7-3 Flight Director Lateral Modes

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach Mode. 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 or switched, 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 condition.



Figure 7-28 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 25°	Maintains current aircraft roll attitude
> 25°	Limits bank to 25°

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 (GPS and VOR). Low Bank Mode is activated automatically above 20,500 feet. The flight director deactivates Low Bank Mode when descending through 20,500 feet. The annunciator light next to the **BANK** Key illuminates while Low Bank Mode is selected.

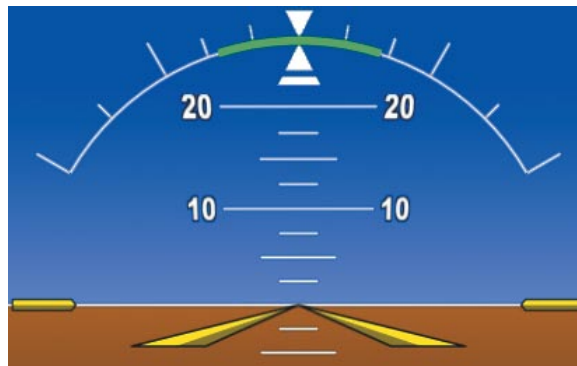


Figure 7-29 Low Bank Mode Limits

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 on either PFD. 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 330° at a time result in turn reversals.

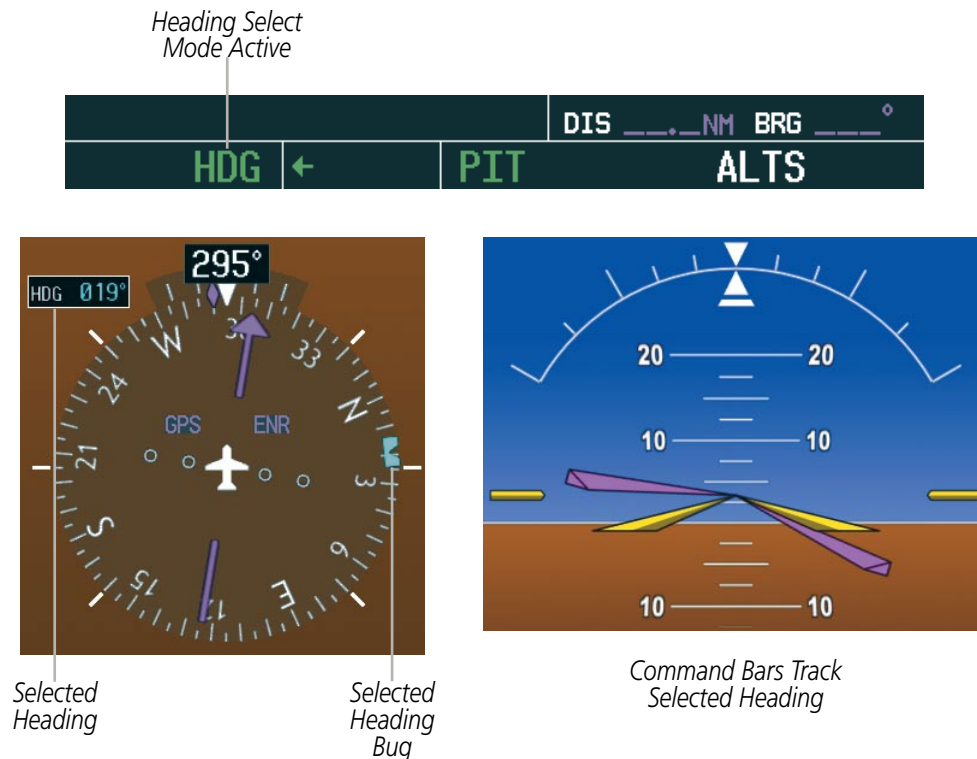


Figure 7-30 Heading Select Mode

NAVIGATION MODES (GPS, VOR, LOC)



NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Navigation Mode.

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (GPS, VOR, LOC). The flight director follows GPS roll steering commands when GPS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision GPS and LOC approaches where vertical guidance is not required.

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. If the CDI shows 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 lateral mode.



Figure 7-31 GPS Navigation Mode Armed

When the CDI has automatically switched from GPS to LOC during a LOC/ILS approach, GPS Navigation Mode remains active, providing GPS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed automatically when the navigation source switch takes place if the **APR** Key is not pressed prior to the automatic source switch.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the **CDI** Softkey)
- During a LOC/ILS approach, the FAF is crossed while in GPS Navigation Mode after the automatic navigation source switch from GPS to LOC

CHANGING THE SELECTED COURSE

If the navigation source is VOR or localizer or OBS Mode has been enabled when using GPS, 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 GPS flight plan) when the **CWS** Button is released.

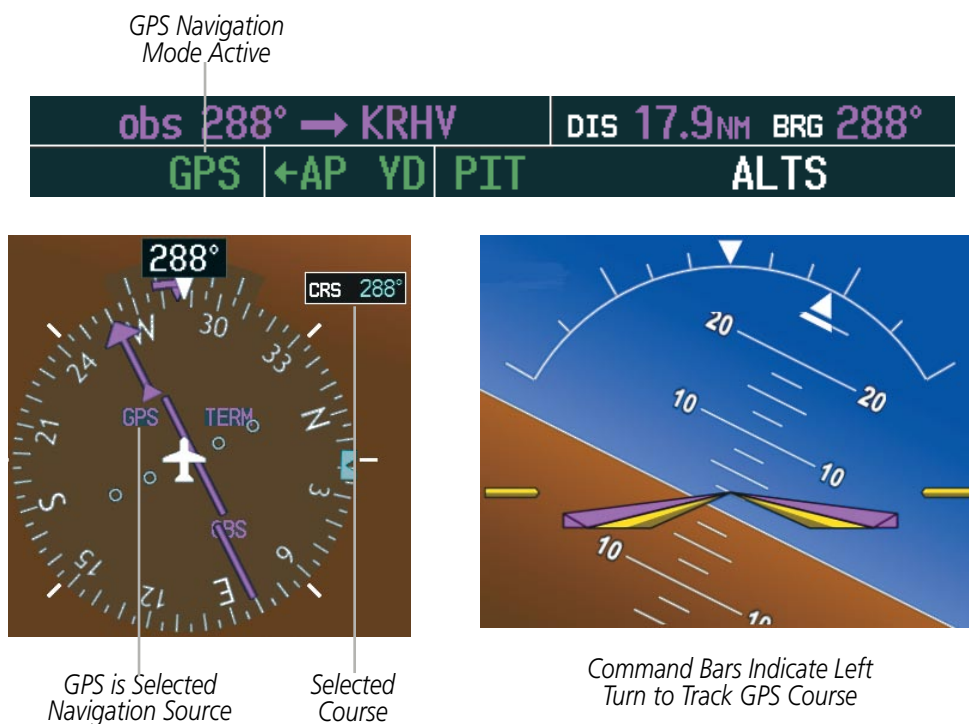


Figure 7-32 Navigation Mode

APPROACH MODES (GPS, VAPP, LOC)



NOTE: The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Approach Mode.

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (GPS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less the 1 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 **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

When GPS Approach Mode is armed, Glidepath Mode is also armed.

Selecting GPS Approach Mode:

- 1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
- 2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.



Figure 7-33 GPS Approach Mode Armed

LOC Approach Mode allows the autopilot to fly a LOC/ILS approach with a glideslope. When LOC Approach Mode is armed, Glideslope Mode is also armed automatically. LOC captures are inhibited if the difference between aircraft heading and localizer course exceeds 105°.

Selecting LOC Approach Mode:

- 1) Ensure a valid localizer frequency is tuned.
- 2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 3) Press the **APR** Key.

Or:

- 1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
- 2) Ensure a LOC/ILS approach is loaded into the active flight plan.
- 3) Ensure the corresponding LOC frequency is tuned.
- 4) Press the **APR** Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

- Approach Mode is active and a Vectors-To-Final is activated
- Approach Mode is active and Navigation source is manually switched
- During a LOC/ILS approach, GPS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from GPS to LOC

CHANGING THE SELECTED COURSE

If the navigation source is VOR or localizer or OBS Mode has been enabled when using GPS, 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 GPS flight plan) when the **CWS** Button is released.

BACKCOURSE MODE (BC)



NOTE: When making a backcourse approach, set the Selected Course to the localizer front course.

Backcourse Mode captures and tracks a localizer signal in the backcourse direction. The mode may be selected by pressing the **BC** Key. Backcourse Mode is armed if the CDI is greater than one dot when the mode is selected. If the CDI is less than one dot, Backcourse Mode is automatically captured when the **BC** Key is pressed. The flight director creates roll steering commands from the Selected Course and deviation when in Backcourse Mode.

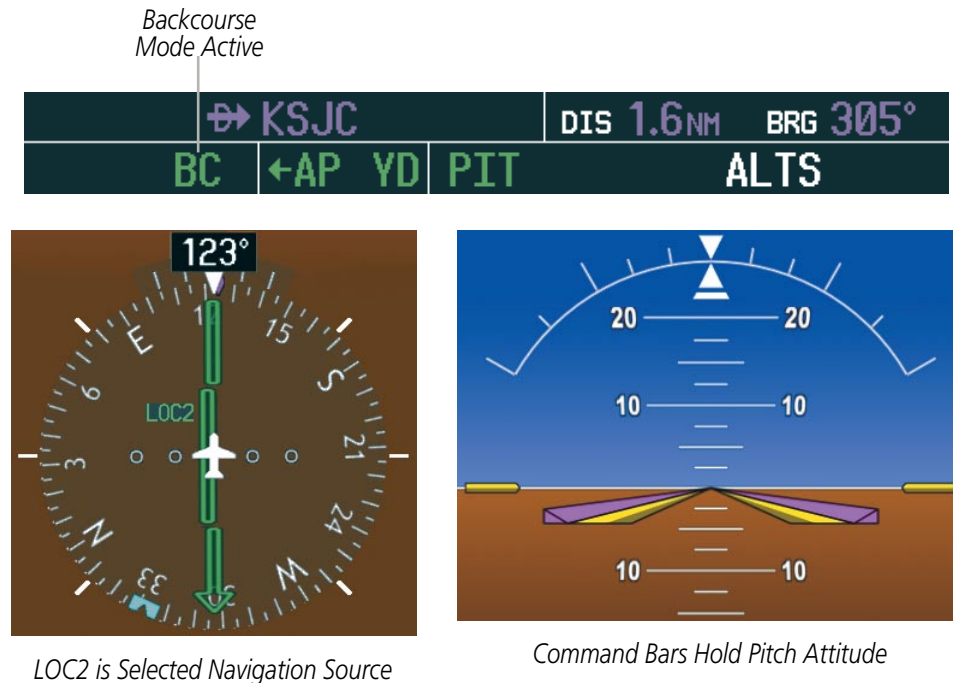


Figure 7-34 Backcourse Mode

CHANGING THE SELECTED COURSE

If the navigation source is VOR or localizer or OBS Mode has been enabled when using GPS, 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 reset any reference data while in Backcourse Mode. The autopilot guides the aircraft back to the Selected Course 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 GPS Navigation Mode is engaged, GPS 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 GPS. 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 GPS 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 GPS Navigation Mode, the AFCS will no longer track the arc.

LEVEL MODE (LVL)

Level (LVL) mode becomes active only as a function of Electronic Stability and Protection (ESP). Refer to the Additional Features section for a detailed discussion of the optional ESP feature.

When the normal flight envelope thresholds have been exceeded for more than 50% of the last 20 seconds, Level mode is activated. The autopilot will engage and provide input to bring the aircraft back into straight and level flight based on zero degrees roll angle and zero feet per minute vertical speed. An aural “ENGAGING AUTOPILOT” alert sounds and the lateral and vertical flight director annunciations will display “LVL”. The AFCS will remain in Level mode until the pilot selects another mode.



Figure 7-35 Level Mode

7.5 AUTOPILOT AND YAW DAMPER OPERATION



NOTE: Refer to the POH/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 servo to relieve any sustained effort required by the pitch servo. Autopilot operation is independent of the yaw damper.

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 to 6 deg/sec 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 set to certain values. This allows 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 flight director maneuvers. Flight director pitch commands are rate- and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric pitch trim (MEPT). This allows the aircraft to be trimmed using a control wheel switch rather than the trim wheel. Manual trim commands are generated only when both halves of the **MEPT** Switch are operated simultaneously. 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 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.

ENGAGEMENT



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 and the annunciator lights on the AFCS controller for the autopilot and yaw damper are illuminated. The flight director engages in Pitch and Roll Hold Modes when initially activated.



Figure 7-36 Autopilot and Yaw Damper Engaged

When the **YD** Key is pressed, the system engages the yaw damper independently of the autopilot and the yaw damper annunciator light is illuminated.

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.

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. CWS activity has no effect on yaw damper engagement.

The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.



Figure 7-37 CWS Annunciation

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to flight director mode descriptions for specific CWS behavior in each mode.

DISENGAGEMENT

The autopilot is manually disengaged by pushing the **AP** Key on the AFCS Control Unit or the **MEPT ARM** Switch. Manual autopilot disengagement is indicated by a five-second flashing yellow 'AP' annunciation and a three-second autopilot disconnect aural alert.



Figure 7-38 Manual Autopilot Disengagement

Pushing the **AP/YD DISC** Switch disengages both the yaw damper and the autopilot. When the yaw damper and autopilot are manually disengaged, both the 'AP' and 'YD' annunciation turn yellow and flash for 5 seconds and a three-second autopilot disconnect aural alert is generated.



Figure 7-39 Yaw Damper Disengagement

After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the **MEPT ARM** or **AP/YD DISC** Switch (**AP/YD DISC** Switch also cancels the flashing 'AP' annunciation).

Automatic autopilot disengagement is indicated by a flashing red and white 'AP' annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP/YD DISC** or **MEPT ARM** Switch. Automatic autopilot disengagement occurs due to:

- System failure
- Invalid sensor data
- Inability to compute default flight director modes (FD also disengages automatically)

Yaw damper disengagement is indicated by a five-second flashing yellow 'YD' annunciation. Automatic yaw damper disengagement occurs 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 7-40 Automatic Autopilot and Yaw Damper Disengagement

7.6 EXAMPLE FLIGHT PLAN



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 scenario-based set of procedures (based on the example flight plan found in the Flight Management Section) shows 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 GPS Navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

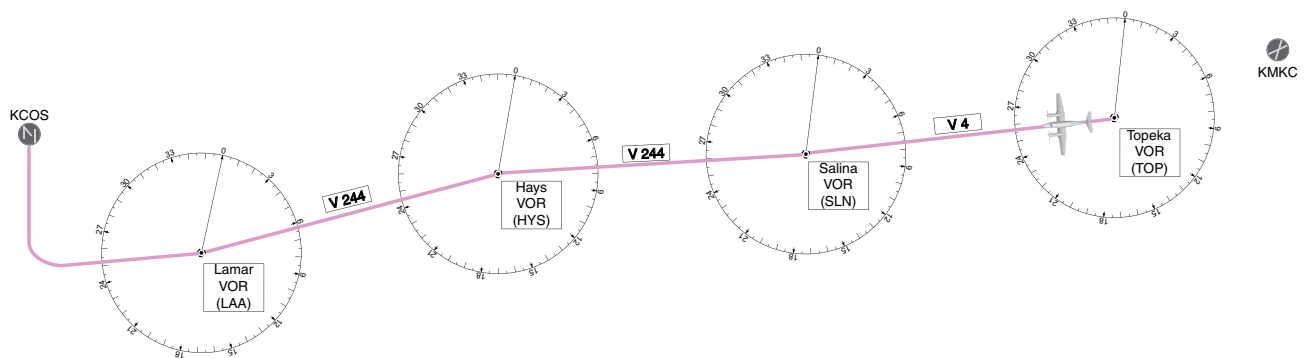


Figure 7-41 Flight Plan Overview

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** Button to activate Takeoff Mode. The flight director Command Bars establish a pitch up attitude to follow.

T0	←	T0	ALTS
----	---	----	------

- c) Press the **AP** Key to engage the autopilot in a climb, holding the pitch angle commanded in Takeoff Mode and wings level.

T0	←AP YD	T0	ALTS
----	--------	----	------

- 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).

Press the **VS** Key to activate Vertical Speed Mode.

The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **NOSE UP/DN** Wheel or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.

ROL	←AP YD	VS	↑1000FPM	ALTS
-----	--------	----	----------	------

- 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.

HDG	←AP YD	VS	↑1000FPM	ALTS
-----	--------	----	----------	------

- 4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

HDG	←AP YD	ALTS	12000FT	ALT
-----	--------	------	---------	-----

At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

HDG	←AP YD	ALT	12000FT
-----	--------	-----	---------

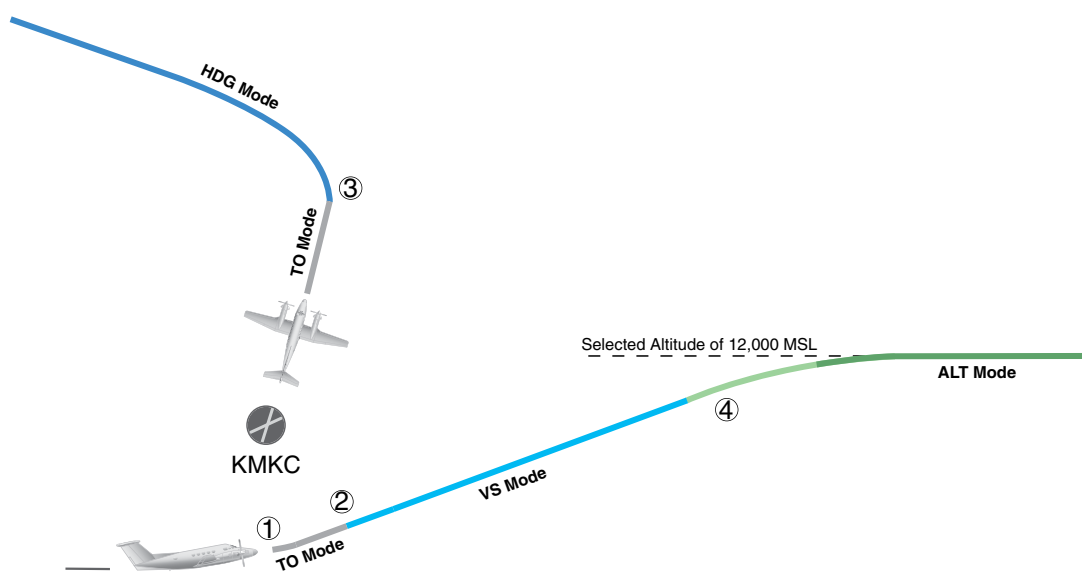


Figure 7-42 Departure

INTERCEPTING A VOR RADIAL

During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or GPS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

- 1) Arm VOR Navigation Mode:
 - a) Tune the VOR frequency.
 - b) Press the **CDI** Softkey to set the navigation source to VOR.
 - c) Use the **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 to the left of the active lateral mode.

VOR HDG ← AP YD ALT 12000FT

- 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.

VOR ← AP YD ALT 12000FT

- 3) The autopilot continues the turn until the aircraft is established on the Selected Course.

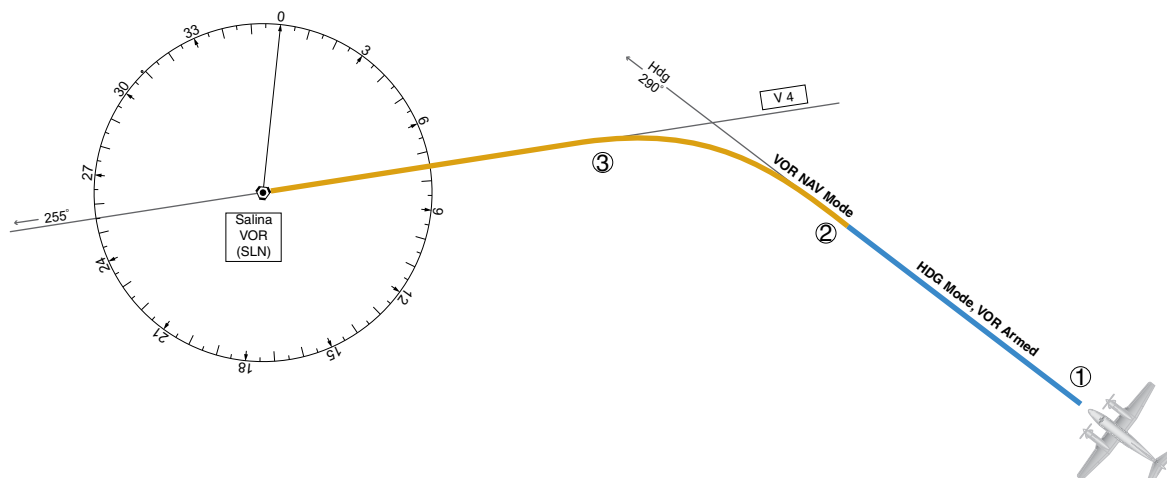


Figure 7-43 Intercepting a VOR Radial

FLYING A FLIGHT PLAN/GPS COURSE



NOTE: Changing the navigation source cancels Navigation Mode and causes the flight director to revert back to Roll Hold Mode (wings rolled level).

As the aircraft closes on Salina VOR, GPS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying a GPS flight plan:

- 1) Transition from VOR to GPS Navigation Mode:
 - a) Press the **CDI** Softkey until GPS is the selected navigation source.
 - b) Press the **NAV** Key to activate GPS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.

GPS ←AP YD ALT 12000FT

- 2) Following the flight plan, the autopilot continues to steer the aircraft under GPS guidance. Note that in GPS Navigation Mode, course changes defined by the flight plan are automatically made without pilot action required.

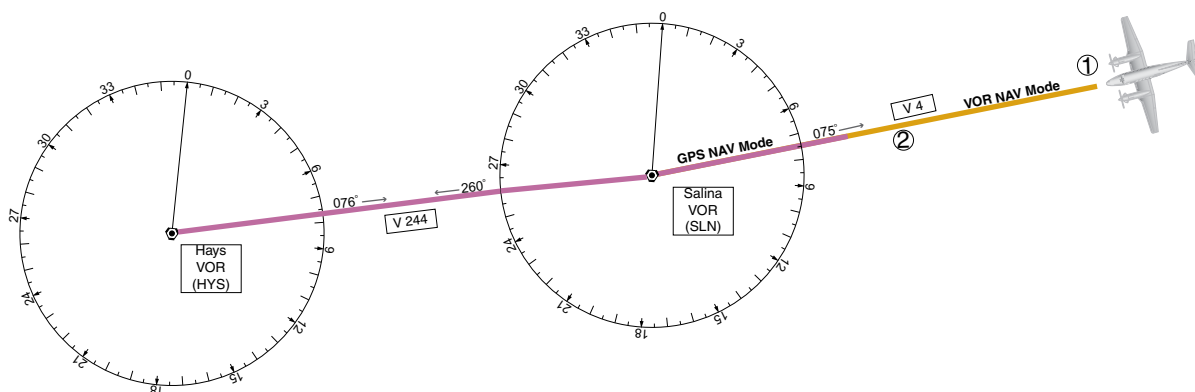


Figure 7-44 Transition to GPS Flight Plan

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 GPS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNV flight control can provide vertical profile guidance, a VNV flight plan must be entered and enabled.
- Non-path descent in a VNV scenario – A VNV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Flight Level Change descent:

1) Select Flight Level Change Mode:

- Using the **ALT SEL** Knob, set the Selected Altitude to 10,000 feet.
- 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.

GPS | ←AP YD | FLC 200KT | ALTS

- If desired press the **SPD** Key to display the Airspeed Reference in Mach.

GPS | ←AP YD | FLC M.400 | ALTS

- Use the **NOSE 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.
- As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

GPS | ←AP YD | **ALTS** 10000FT ALT

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

GPS | ←AP YD | **ALT** 10000FT

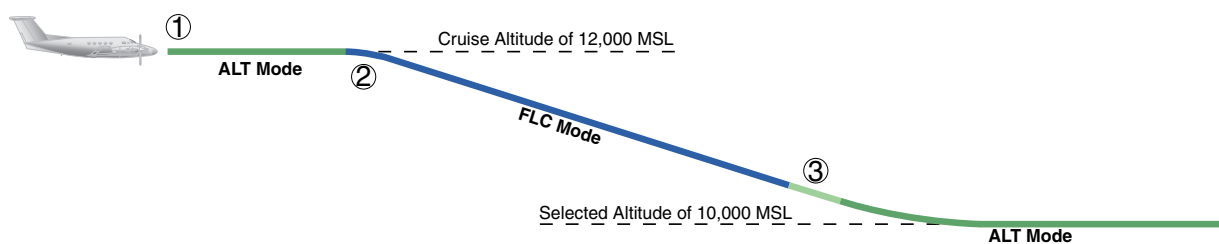


Figure 7-45 FLC Descent

Vertical Path Tracking descent to VNV Target Altitude:**1) Select VNV flight control:**

- a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'VPTH' appears.

GPS ←AP YD ALT 12000FT VPTH

b) Using the ALT SEL Knob, set the Selected Altitude below the flight plan's VNV Target Altitude of 10,000 feet.

If the Selected Altitude is not at least 75 ft below the VNV Target Altitude, the flight director captures the Selected Altitude rather than the VNV 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 VNV Target Altitude. Intention to capture the VNV Target Altitude is indicated by the white 'ALTV' annunciation.

GPS ←AP YD VPTH ALTV

3) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.

GPS ←AP YD ALTV10000FT ALT

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

GPS ←AP YD ALT 10000FT

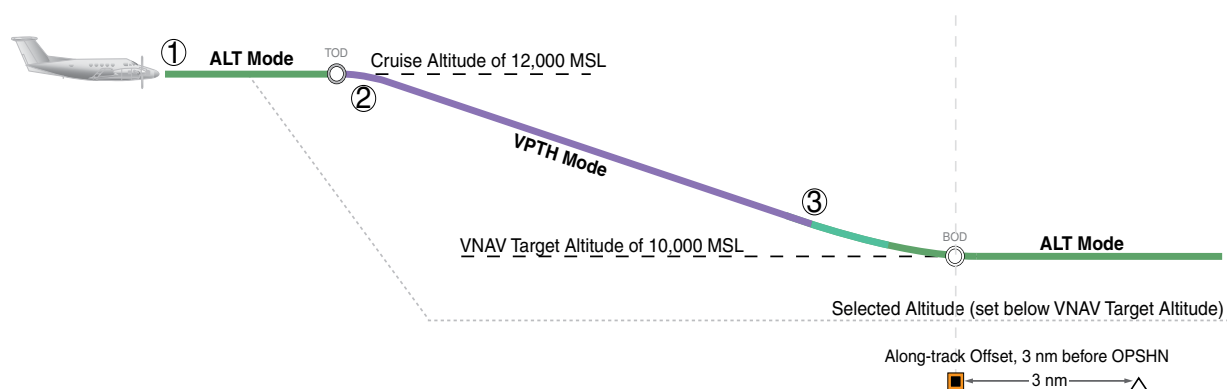


Figure 7-46 VPTH Descent

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 VNV 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 VNV 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.

GPS	←AP YD	FLC	184KT	ALTS	VPTH
-----	--------	-----	-------	------	------

- 2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.
- 3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

GPS	←AP YD	ALTS	9400FT	ALT	VPTH
-----	--------	------	--------	-----	------

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off reset Selected Altitude at or below 9,000 ft.

GPS	←AP YD	ALT	9400FT	VPTH
-----	--------	-----	--------	------

- 4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).

GPS	←AP YD	VPTH	ALTV
-----	--------	------	------

- 5) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.

GPS	←AP YD	ALTV	9000FT	ALT
-----	--------	------	--------	-----

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.

GPS	←AP YD	ALT	9000FT
-----	--------	-----	--------

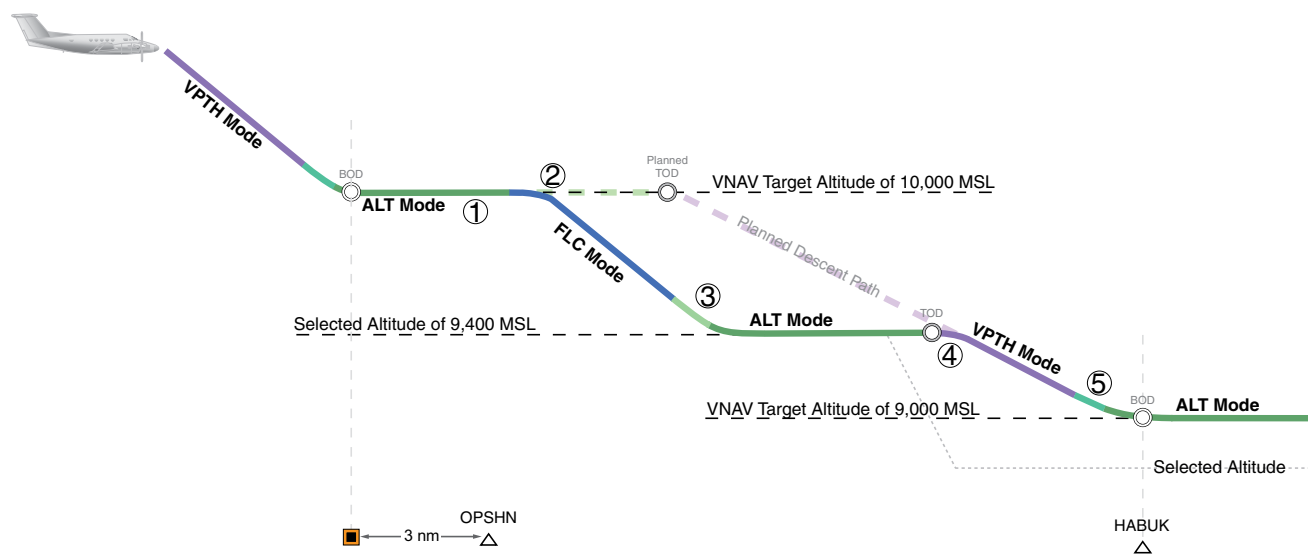


Figure 7-47 Non-path Descent

APPROACH



NOTE: If an approach contains a DME arc, the arc must be flown in Navigation Mode with the GFC 700. When receiving vectors from ATC, Navigation Mode must be selected prior to intercepting the ARC.

Flying an ILS approach:

- 1) Transition from GPS 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.

HDG	←AP YD	ALT	9000FT
-----	--------	-----	--------

- 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.

LOC	HDG	←AP YD	ALT	9000FT	GS
-----	-----	--------	-----	--------	----

- c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determines 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/YD DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Button to execute a missed approach.

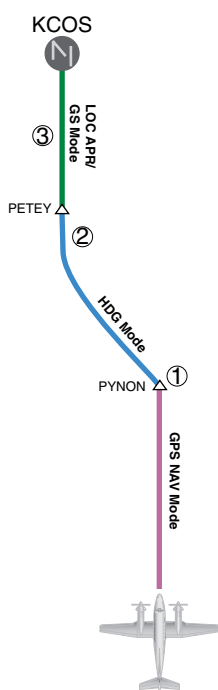


Figure 7-48 ILS Approach to KCOS

Flying a RNAV GPS approach with vertical guidance:



WARNING: When flying an RNAV approach (with vertical guidance) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.

- 1) Arm flight director modes for a RNAV GPS approach with vertical guidance:
 - a) Make sure the navigation source is set to GPS (use **CDI** 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. GPS Approach Mode is activated and Glidepath Mode is armed.

GPS | ←AP YD | VPTH | ALTS GP

- 3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.

GPS | ←AP YD | GP

- 4) There are two options available at this point, as the autopilot flies the approach:
 - Push the **AP/YD DISC** Switch at the decision height and land the aircraft.
 - Use the **GA** Button to execute a missed approach.

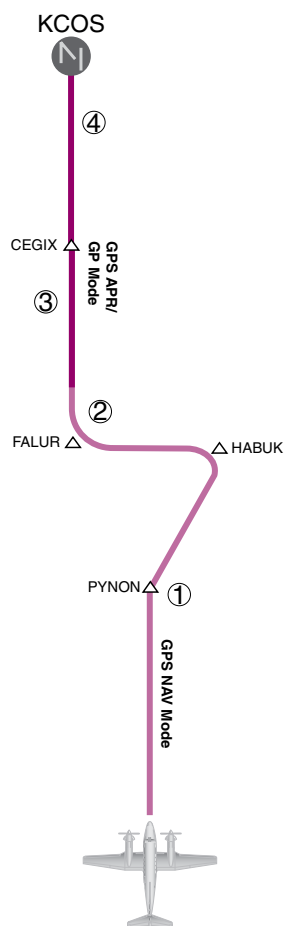


Figure 7-49 LPV Approach to KCOS

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** Button at the Decision height and apply go-around power to execute a missed approach. The autopilot will remain engaged and the flight director will indicate nose-up and wings level attitudes. If flying an ILS or LOC approach the CDI will switch to GPS as the navigation source.

GA	←AP YD	GA	ALTS
----	--------	----	------

- 2) Start the climb to the prescribed altitude in the published Missed Approach Procedure (in this case, 10,000 ft). Upon reaching the appropriate altitude, press the **NAV** Key climb to have the autopilot fly to the hold.

GPS	←AP YD	PIT	ALTS
-----	--------	-----	------

- 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.

GPS	←AP YD	FLC	100KT	ALTS
-----	--------	-----	-------	------

As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.

GPS	←AP YD	ALTS 10000FT	ALT
-----	--------	--------------	-----

The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.

GPS	←AP YD	ALT 10000FT
-----	--------	-------------

- 4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box, above the AFCS Status Box.

6.0NM	MOGAL	DIS 2.2NM	BRG 149°
GPS	←AP YD	ALT 10000FT	

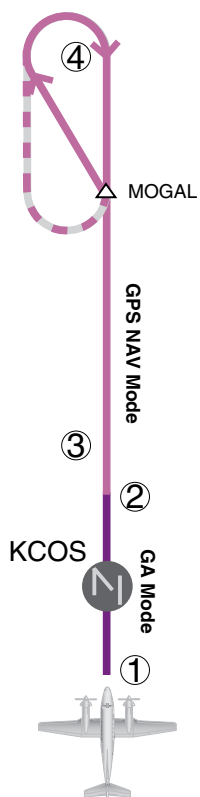


Figure 7-50 Go Around/Missed Approach

7.7 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

The annunciations in Table 7-5 (listed in order of increasing priority) can appear on the PFDs above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.



Figure 7-51 AFCS Status Annunciation

Alert Condition	Annunciation	Description
Rudder Mistrim Right	RUD→	Yaw servo providing sustained force in the indicated direction
Rudder Mistrim Left	←RUD	
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	
Pitch Trim Failure (or stuck MEPT Switch)	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MEPT switches separately to unstick
Yaw Damper Failure	YAW	YD control failure
Roll Failure	ROLL	Roll axis control failure; AP and YD inoperative
Pitch Failure	PTCH	Pitch axis control failure; AP and YD inoperative
System Failure	AFCS	AP and MEPT are unavailable; FD may still be available, but YD inoperative
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion Do not press the AP/YD DISC Switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
	PFT	Preflight system test failed; aural alert sounds at failure

Table 7-5 AFCS Status Alerts

OVERSPEED PROTECTION



NOTE: Overspeed protection is not active in ALT, GS or GP modes.

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. Overspeed protection is provided to limit the flight director's pitch command 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 Overspeed Protection is active, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow 'MAXSPD' annunciation. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.

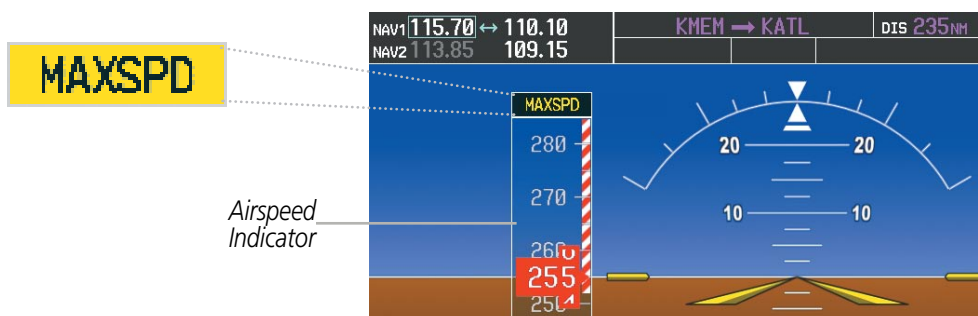


Figure 7-52 Overspeed Annunciation

BLANK PAGE

SECTION 8 ADDITIONAL FEATURES



NOTE: *With the availability of SafeTaxi®, ChartView, or FliteCharts®, it may be necessary to carry another source of charts on-board the aircraft.*

Additional features of the system include the following:

- Synthetic Vision System (SVS)
- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- AOPA's Airport Directory
- Data Link Services
- Iridium satellite telephone
- XM Radio entertainment
- Scheduler
- Flight Data Logging
- Electronic Stability and Protection (ESP™) System

The optional Synthetic Vision System (SVS) provides a three-dimensional forward view of terrain features on the PFD. SVS imagery shows the pilot's view of relevant features in relation to the aircraft attitude, as well as the flight path pertaining to the active flight plan.

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

The optional ChartView and FliteCharts provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information. Either ChartView or FliteCharts may be configured in the system, but not both.

AOPA's Airport Directory offers detailed information for a selected airport, such as available services, hours of operation, and lodging options.

Telephone 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 XM Radio entertainment audio feature of the GDL 69A Data Link Receiver handles more than 170 channels of music, news, and sports. XM Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as Switch fuel tanks, Change oil, or Altimeter-Transponder Check in the Messages Window on the PFD.

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.

The Electronic Stability and Protection (ESP™) system discourages aircraft operation outside an established flight envelope.

8.1 SYNTHETIC VISION SYSTEM (SVS)



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

The optional Synthetic Vision System (SVS) is a visual enhancement to the G1000 Integrated Flight Deck. SVS depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 30 degrees to the left and 35 degrees to the right. SVS information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode (Figure 8-137). The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a nine arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of nine arc-seconds, meaning that the terrain elevation contours are stored in squares measuring nine arc-seconds on each side, is required for the operation of SVS. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVS to be disabled until the required data is restored.

The SVS terrain display shows land contours (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) is integrated within SVS to provide visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Terrain alerts are displayed in red and yellow shading on the PFD.

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

The following SVS enhancements appear on the PFD:

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



Figure 8-1 Synthetic Vision Imagery

SVS OPERATION

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

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

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

- **PATHWAY** Softkey enables display of rectangular boxes that represent course guidance.
- **SYN TERR** Softkey enables synthetic terrain depiction.
- **HRZN HDG** Softkey enables horizon heading marks and digits.
- **APTSIGNS** Softkey enables airport signposts.

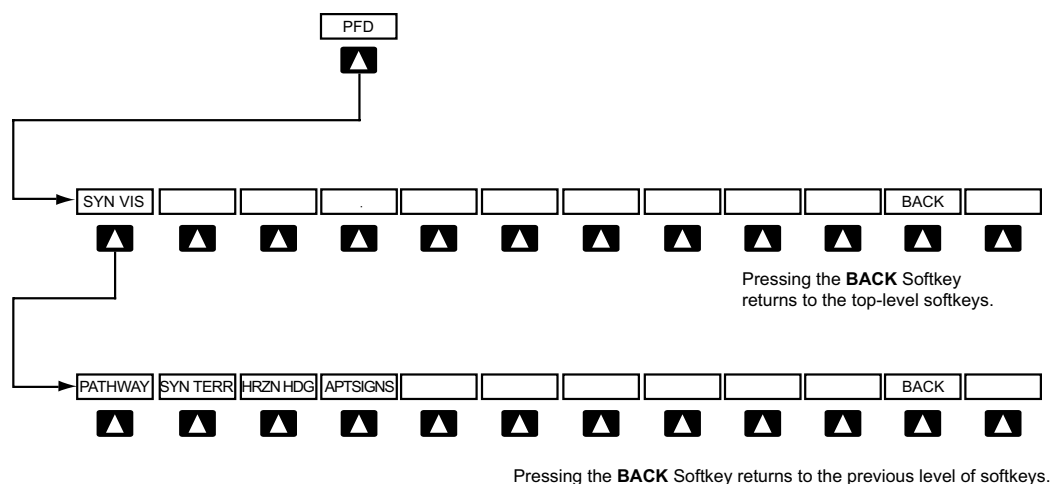


Figure 8-2 SVS Softkeys

Activating and deactivating SVS:

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

Activating and deactivating Pathways:

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **PATHWAY** Softkey. The Pathway feature will cycle on or off with the **PATHWAY** Softkey.

Activating and deactivating Horizon Headings:

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **HRZN HDG** Softkey. The horizon heading display will cycle on or off with the **HRZN HDG** Softkey.

Activating and deactivating Airport Signs:

- 1) Press the **PFD** Softkey.
- 2) Press the **SYN VIS** Softkey.
- 3) Press the **APTSIGNS** Softkey. Display of airport signs will cycle on or off with the **APTSIGNS** Softkey.

SVS FEATURES



Figure 8-3 SVS on the Primary Flight Display



NOTE: Pathways and terrain features are not a substitute for standard course and altitude deviation information provided by the CDI, VSI, 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 8-4).

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

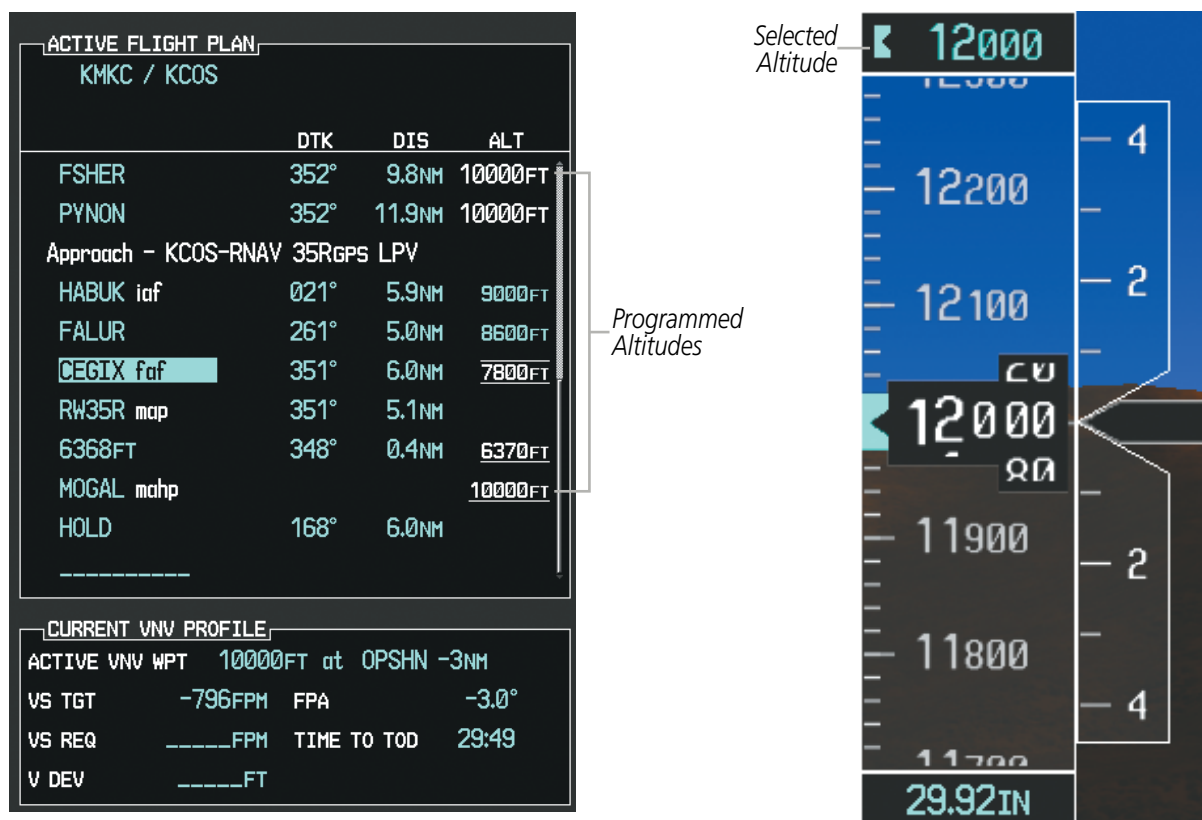


Figure 8-4 Programmed and Selected Altitude

Pathways provide supplemental glidepath/glide slope 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 SVS field of view, pathways will not be visible until the aircraft has turned toward this leg. While approaching the center of the active leg and prescribed altitude, the number of pathway boxes decreases to a minimum of four.

Climb profiles cannot be displayed due to the variables associated with aircraft performance. Flight plan legs requiring a climb are indicated by pathways displayed at a level above the aircraft at the altitude selected or programmed.

DESCENT AND APPROACH

Pathways are shown descending only for a programmed descent (Figures 8-5, 8-6). When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided that the selected altitude is lower than the programmed altitude.

When an approach providing vertical guidance is activated, Pathways are shown level at the selected altitude up to the point along the final approach course where the altitude intercepts the extended vertical descent path, glidepath, or glideslope. From the vertical path descent, glidepath, or glideslope intercept point, the pathways are shown inbound to the Missed Approach Point (MAP) along the published lateral and vertical descent path, or at the selected altitude, whichever is lower.

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

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

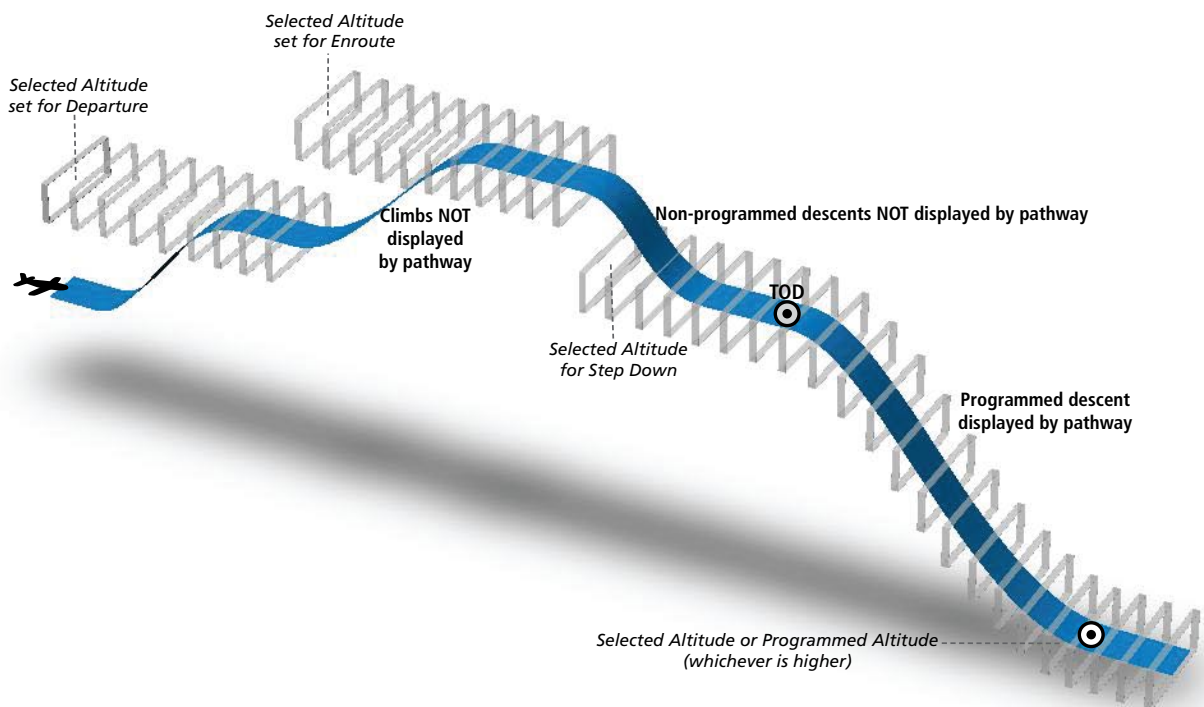


Figure 8-5 SVS Pathways, Enroute and Descent

MISSED APPROACH

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

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

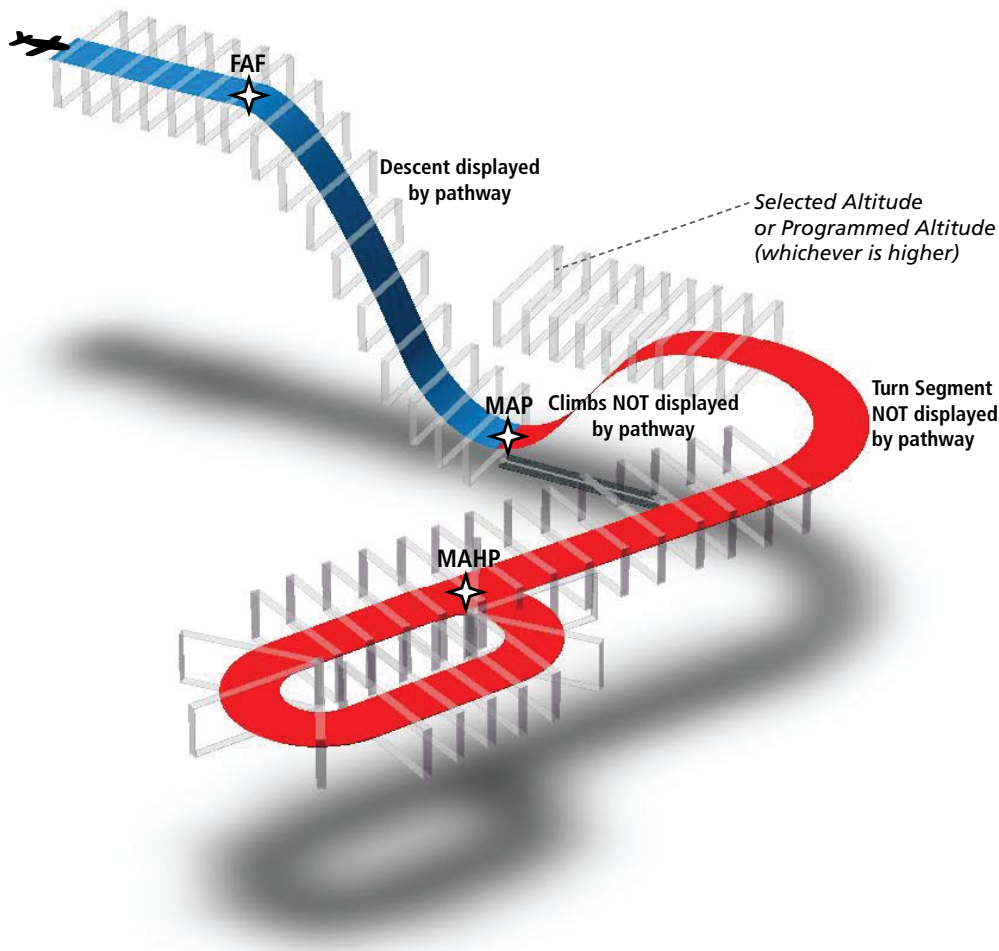


Figure 8-6 SVS Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

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

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

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the pathway boxes as shown (Figure 8-7).

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



Figure 8-7 Flight Path Marker and Pathways

ZERO PITCH LINE

The Zero Pitch Line is drawn completely across the display and represents the aircraft attitude with respect to the horizon. It may not align with the terrain horizon, particularly when the terrain is mountainous or when the aircraft is flown at high altitudes.

HORIZON HEADING

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

TRAFFIC



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

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

AIRPORT SIGNS

Airport Signs provide a visual representation of airport location and identification on the synthetic terrain display. When activated, the signs appear on the display when the aircraft is approximately 15 nm from an airport and disappear at approximately 4.5 nm. Airport signs are shown without the identifier until the aircraft is approximately 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 **APTSIGNS** Softkey.



Figure 8-8 Airport Signs

RUNWAYS



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



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

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



TAWS 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-B 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 8-10), MFD map displays, and TAWS-B Page on the MFD. Terrain shading will only occur on the synthetic terrain display on the PFD and TAWS-A Page on the MFD when using the optional TAWS-A system. No terrain shading nor potential impact points will be displayed on the PFD inset map or the MFD map display. For more detailed information regarding TAWS, refer to the Hazard Avoidance Section.

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



Figure 8-10 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols 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. When employing a TAWS-B system, unlike the Inset map and MFD moving map display, obstacles on the synthetic terrain display do not change colors to warn of potential conflict with the aircraft's flight path until the obstacle is associated with an actual FLTA alert. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.

As with terrain alerting on a TAWS-A system, obstacle alerting is limited to the synthetic terrain display on the PFD and the TAWS-A Page on the MFD.



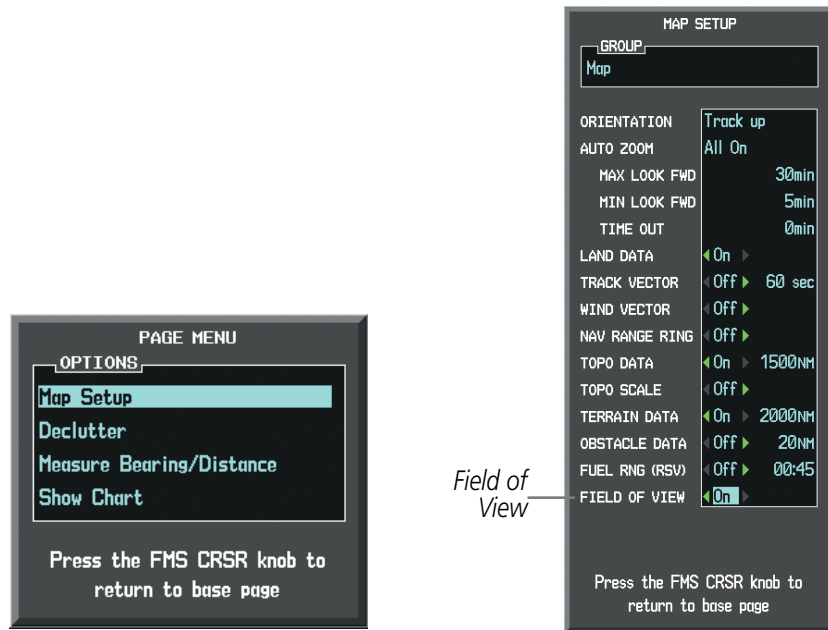
Figure 8-11 Obstacle

FIELD OF VIEW

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

Configuring field of view:

- 1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to highlight Map Setup and press the **ENT** Key.



Navigation Map Page OPTIONS Menu

Map Setup Menu, Map Group, Field of View Option

Figure 8-12 Option Menus

- 3) Turn the **FMS** Knob to select the Map Group and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to scroll through the Map Group options to FIELD OF VIEW.
- 5) Turn the small **FMS** Knob to select On or Off.
- 6) Press the **FMS** Knob to return to the Navigation Map Page.

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



Figure 8-13 PFD and MFD Field of View Comparison

8.2 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the MFD display is within the SafeTaxi ranges, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map page that displays the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of pages where the SafeTaxi feature can be seen:

- Navigation Map Page
- Inset Map (PFD)
- Weather Datalink Page
- Airport Information Page
- Intersection Information Page
- NDB Information Page
- VOR Information Page
- User Waypoint Information Page
- Trip Planning Page
- Nearest Pages
- Active and Stored Flight Plan Pages

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Bravo inside the High Alert Intersection boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



Figure 8-14 SafeTaxi Depiction on the Navigation Map Page

The **DCLTR** Softkey (declutter) label advances to DCLTR-1, DCLTR -2, and DCLTR-3 each time the softkey is selected for easy recognition of decluttering level. Selecting the **DCLTR** Softkey removes the taxiway markings and airport feature labels. Selecting the **DCLTR-1** Softkey removes VOR station ID, the VOR symbol, and intersection names if within the airport plan view. Selecting the **DCLTR-2** Softkey removes the airport runway layout, unless the airport in view is part of an active route structure. Selecting the **DCLTR-3** Softkey cycles back to the original map detail. Refer to Map Declutter Levels in the Flight Management Section.

Configuring SafeTaxi range:

- 1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to highlight the Map Setup Menu Option and press the **ENT** Key.

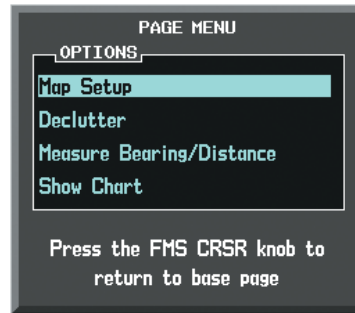


Figure 8-15 Navigation Map PAGE MENU, Map Setup Option

- 3) Turn the **FMS** Knob to select the Aviation Group and press the **ENT** Key.
- 4) Turn the large **FMS** Knob to scroll through the Aviation Group options to SAFETAXI.
- 5) Turn the small **FMS** Knob to display the range of distances.
- 6) Turn either **FMS** Knob to select the desired distance for maximum SafeTaxi display range.
- 7) Press the **ENT** Key to complete the selection.
- 8) Press the **FMS** Knob to return to the Navigation Map Page.

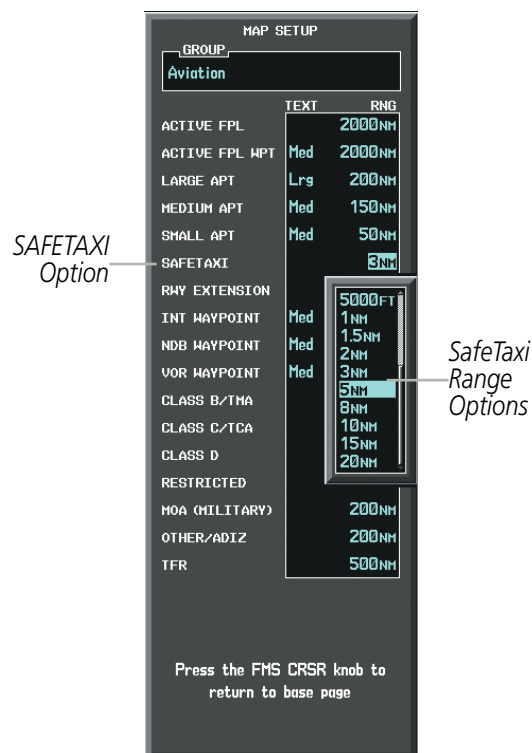


Figure 8-16 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options

SAFETAXI CYCLE NUMBER AND REVISION

SafeTaxi database is revised every 56 days. SafeTaxi is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.

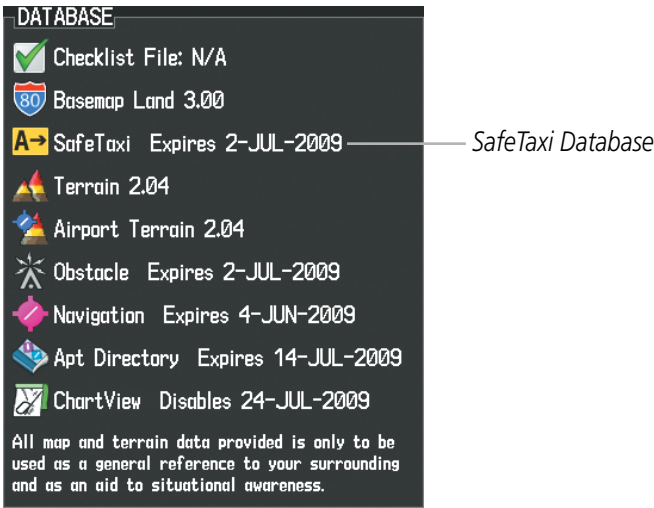


Figure 8-17 Power-up Page, SafeTaxi Database

Power-up Page Display	Definition
A→ SafeTaxi Expires 2-JUL-2009	Normal operation. SafeTaxi database is valid and within current cycle.
A→ SafeTaxi Expires 2-JUL-2009	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 also be found on the AUX - System Status page, as seen in Figure 8-18.

Select the **MGD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

The SafeTaxi database cycle number shown in Figure 8-18, 09S3, is deciphered as follows:

09 – Indicates the year 2009

S – Indicates the data is for SafeTaxi

3 – Indicates the third issue of the SafeTaxi database for the year

The SafeTaxi EFFECTIVE date 07–MAY–09 is the beginning date for the current database cycle. SafeTaxi EXPIRES date 02–JUL–09 is the revision date for the next database cycle.



Figure 8-18 AUX – System Status Page, SafeTaxi Current Information

SafeTaxi information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Figures 8-18 and 8-19). NOT AVAILABLE appears in blue in the REGION field if SafeTaxi data is not available on the database card (Figure 8-19). An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Select the **MFD1 DB** Softkey a second time. The softkey label will change to **PFD1 DB**. The DATABASE window will now be displaying database information for PFD1. As before, scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

Select the **PFD1 DB** Softkey. The softkey label will change to **PFD2 DB**. The DATABASE window will now display database information for PFD2. Again, scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

Refer to Updating Garmin Databases in Appendix B for instructions on revising the SafeTaxi database.

Figure 8-19 illustrates possible SafeTaxi database conditions that may appear on the AUX - System Status Page. The EFFECTIVE date is the beginning date for this database cycle. If the present date is before the effective date, the EFFECTIVE date appears in yellow and the EXPIRES date appears in blue. The EXPIRES date is the revision date for the next database cycle. NOT AVAILABLE indicates that SafeTaxi is not available on the database card or no database card is inserted.

<div>MFD1 DATABASE</div> <div>REGION WORLDWIDE</div> <div>VERSION 3.00</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>SAFETAXI - BOTTOM CARD</div> <div>REGION US</div> <div>VERSION 2.23</div> <div>CYCLE 0953</div> <div>EFFECTIVE 07-MAY-09</div> <div>EXPIRES 02-JUL-09</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>TERRAIN - BOTTOM CARD</div> <div>REGION WORLDWIDE-9</div> <div>VERSION 2.04</div>	<div>MFD1 DATABASE</div> <div>REGION WORLDWIDE</div> <div>VERSION 3.00</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>SAFETAXI - BOTTOM CARD</div> <div>REGION US</div> <div>VERSION 2.23</div> <div>CYCLE 0953</div> <div>EFFECTIVE 07-MAY-09</div> <div>EXPIRES 02-JUL-09</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>TERRAIN - BOTTOM CARD</div> <div>REGION WORLDWIDE-9</div> <div>VERSION 2.04</div>	<div>MFD1 DATABASE</div> <div>REGION WORLDWIDE</div> <div>VERSION 3.00</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>SAFETAXI - UNKNOWN</div> <div>REGION NOT AVAILABLE</div> <div>VERSION</div> <div>CYCLE</div> <div>EFFECTIVE -- -- --</div> <div>EXPIRES -- -- --</div> <div>GARMIN LTD. AND ITS SUBSIDIARIES 2008</div> <div>TERRAIN - BOTTOM CARD</div> <div>REGION WORLDWIDE-9</div> <div>VERSION 2.04</div>
--	--	---

Current Date is before Effective Date

SafeTaxi Database has Expired

SafeTaxi Database Not Installed

Figure 8-19 AUX – System Status Page, SafeTaxi Expired, SafeTaxi Not Available

8.3 CHARTVIEW

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the plan view of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

CHARTVIEW SOFTKEYS

ChartView functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys shown below appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting the **CHRT OPT** Softkey advances to the next level of softkeys: **ALL**, **HEADER**, **PLAN**, **PROFILE**, **MINIMUMS**, **FIT WDT**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

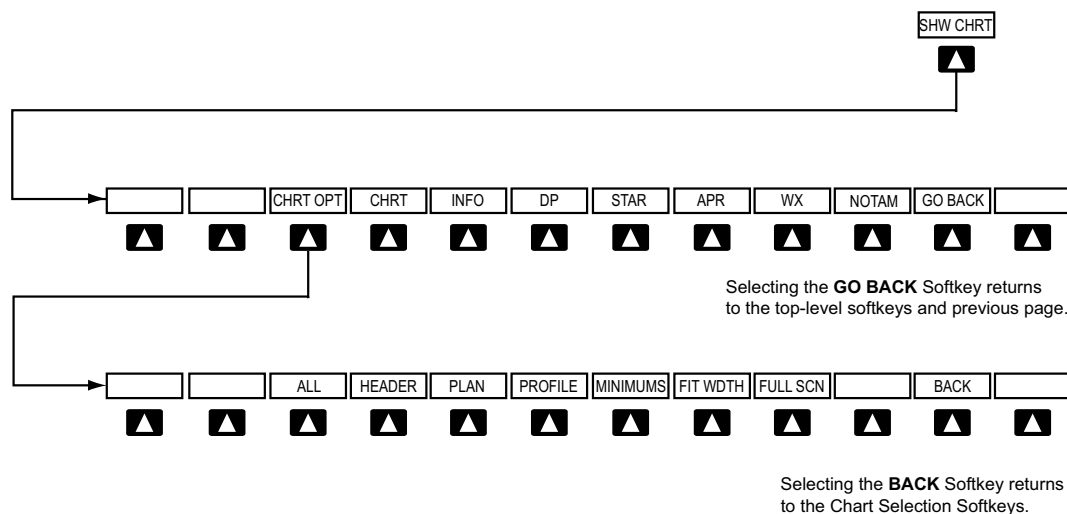


Figure 8-20 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

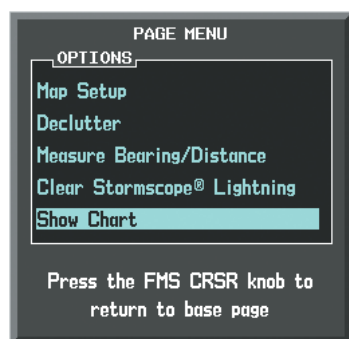
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select the **SHW CHRT** Softkey.

Or:

- 1) Press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
- 3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-21 Option Menus

On the Waypoint Airport Information Page OPTIONS Menu, select the desired chart and press the **ENT** Key to display the chart.

When no terminal procedure chart is available, the banner CHART NOT AVAILABLE appears on the screen. The CHART NOT AVAILABLE banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-22 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner UNABLE TO DISPLAY CHART is then displayed.



Figure 8-23 Unable To Display Chart Banner

When a chart is not available by selecting the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, selecting the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, select the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Select the **APR** Softkey if the Approach Box is not currently shown).
- 4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
- 5) Press the **ENT** Key to complete the airport selection.
- 6) Turn the large **FMS** Knob to select the Approach Box.
- 7) Turn the small **FMS** Knob to show the approach chart selection choices.
- 8) Turn either **FMS** Knob to scroll through the available charts.
- 9) Press the **ENT** Key to complete the chart selection.

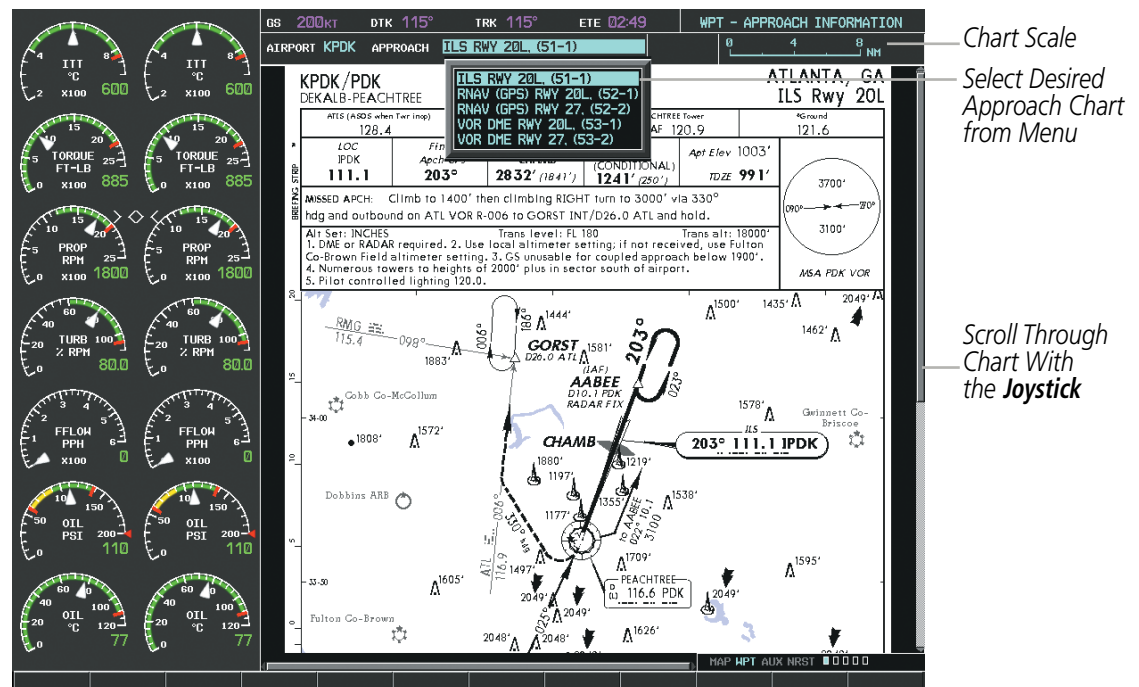


Figure 8-24 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000 softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears (Figure 8-28). If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

Selecting the **CHRT** Softkey switches between the ChartView diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the Gainesville, FL (KGNV) Airport Diagram and the navigation map on the WPT – Airport Information page.

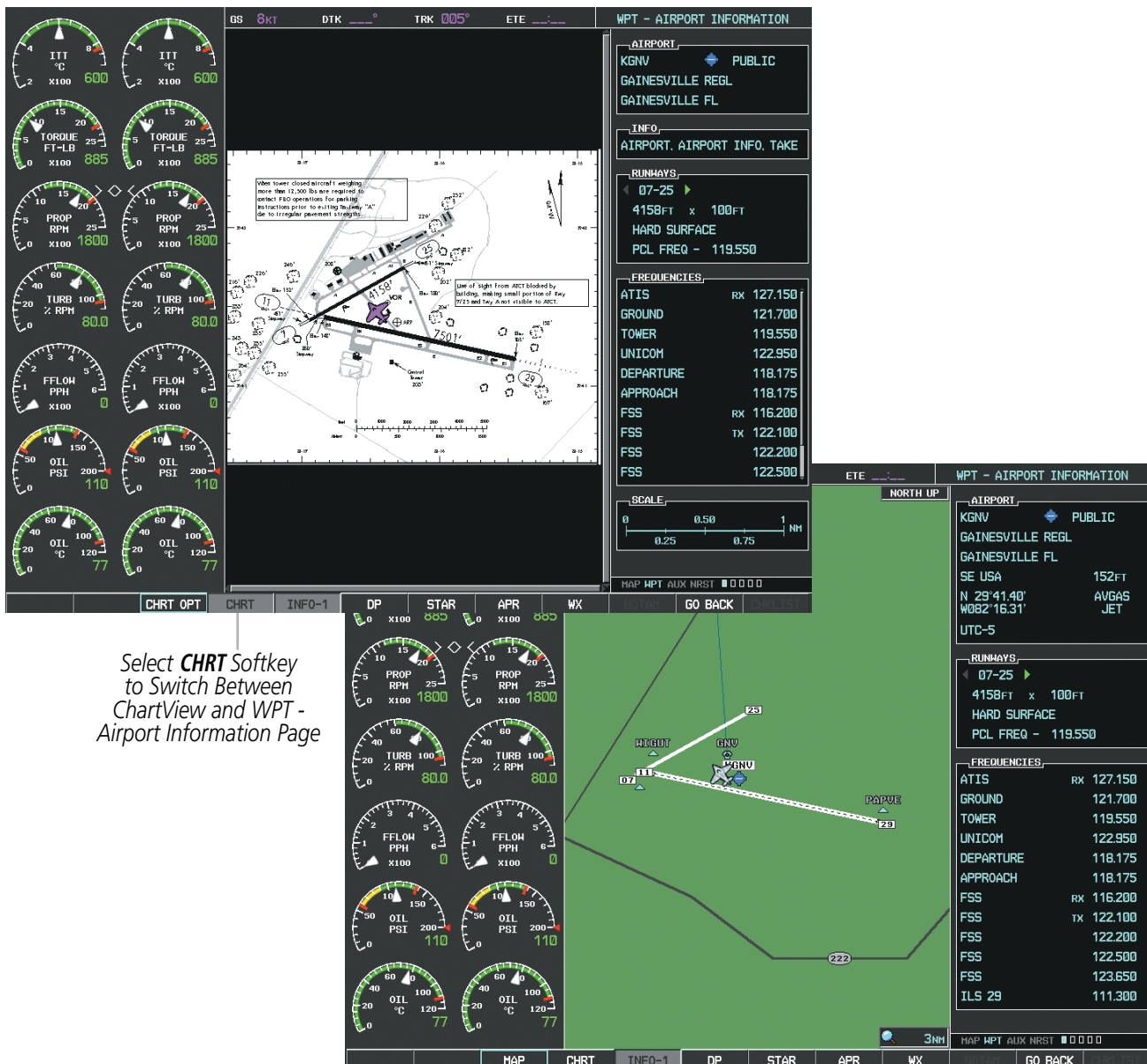


Figure 8-25 CHRT Softkey, Airport Information Page

Selecting the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey has no effect.

The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries. In the example shown, the aircraft is turning onto Taxiway Bravo on the Charlotte, NC (KCLT) airport.

Another source for additional airport information is from the INFO Box above the chart for certain airports. This information source is not related to the **INFO** Softkey. When the INFO Box is selected using the **FMS** Knob, the G1000 softkeys are blank. The Charlotte, NC airport has five additional charts offering information; the Airport Diagram, Take-off Minimums, Class B Airspace, Airline Parking Gate Coordinates, and Airline Parking Gate Location. (The numbers in parentheses after the chart name are Jeppesen designers.)



Figure 8-26 Airport Information Page, INFO View, Full Screen Width

In the example shown in Figure 8-26, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 8-27).

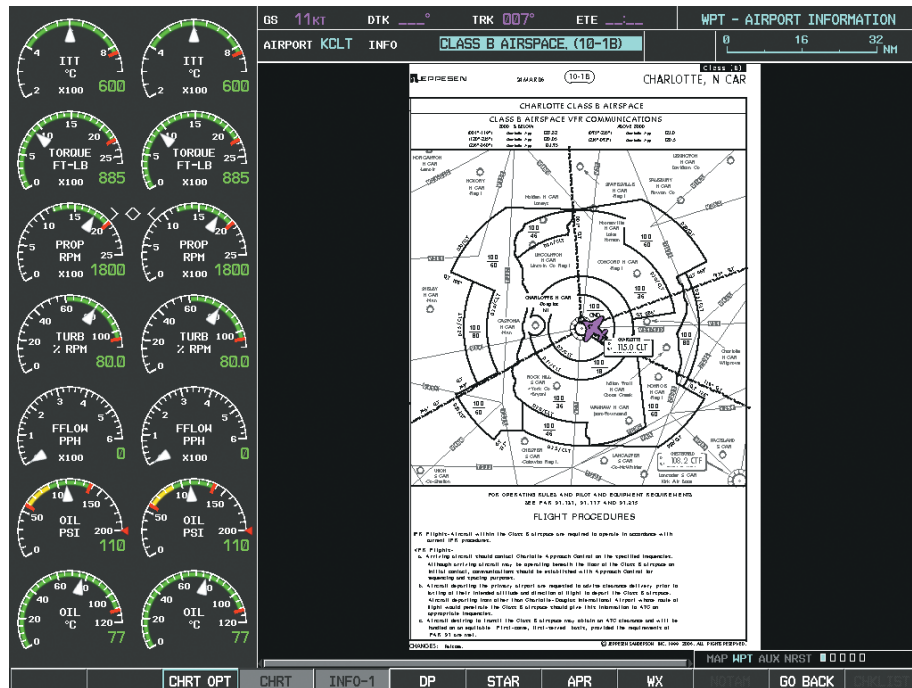


Figure 8-27 Airport Information Page, Class B Chart Selected from INFO View

Selecting the **DP** Softkey displays the Departure Procedure Chart if available.

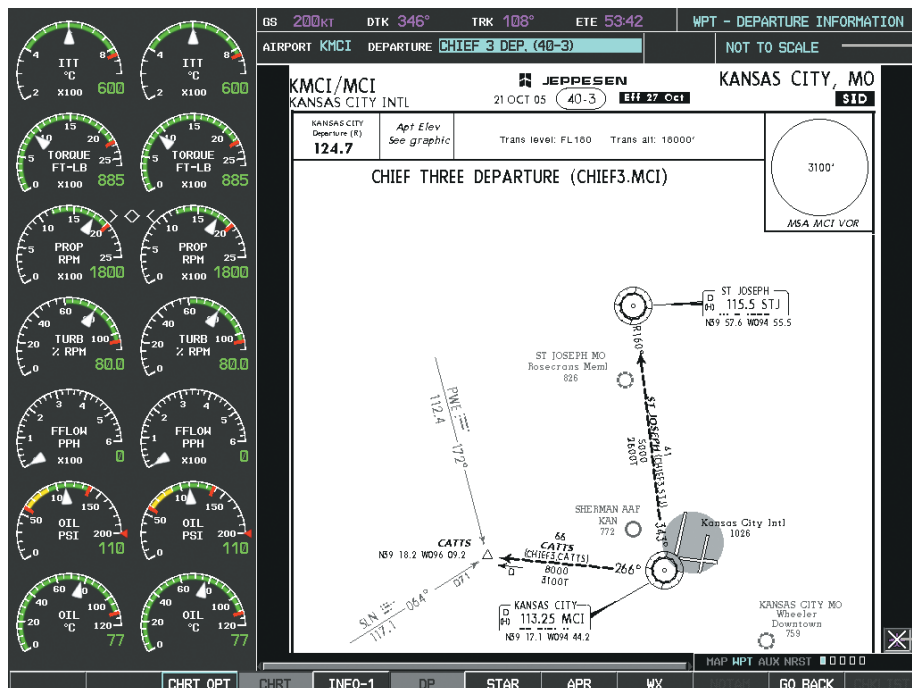


Figure 8-28 Departure Information Page

Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

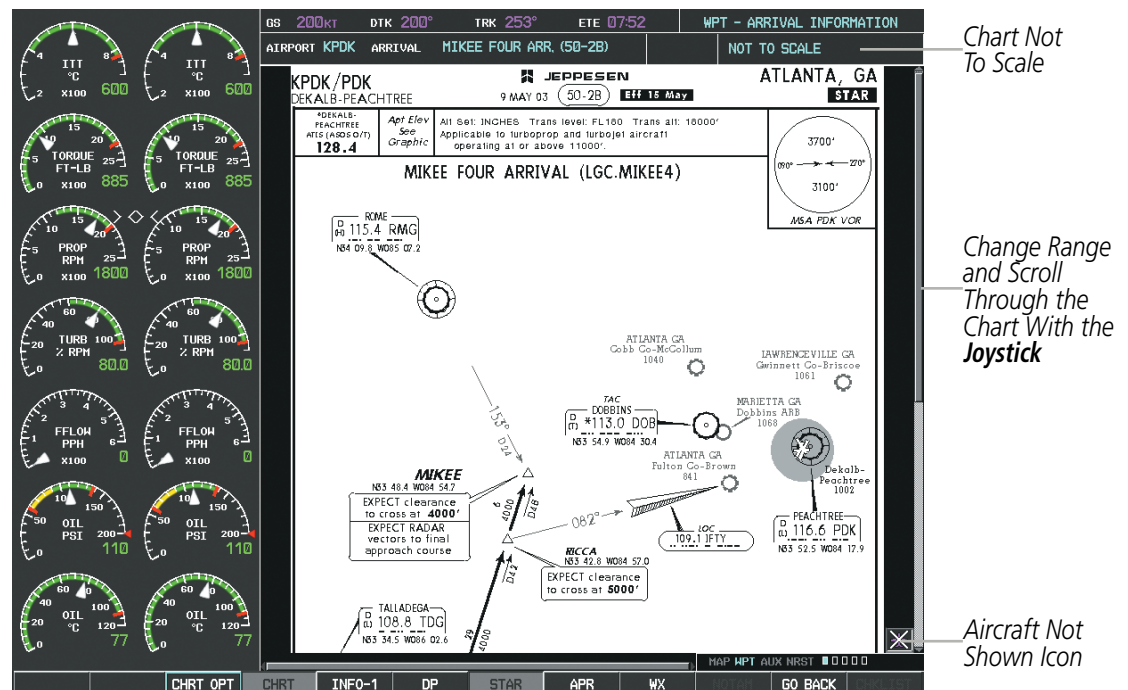


Figure 8-29 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.

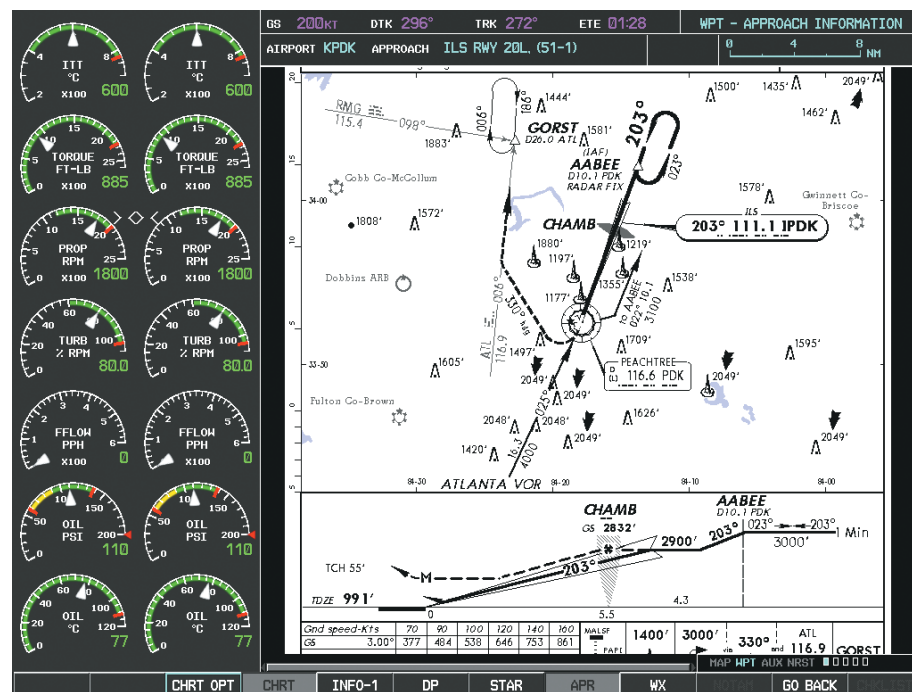


Figure 8-30 Approach Information Page

Selecting the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the XM Data Link Receiver, when available. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.

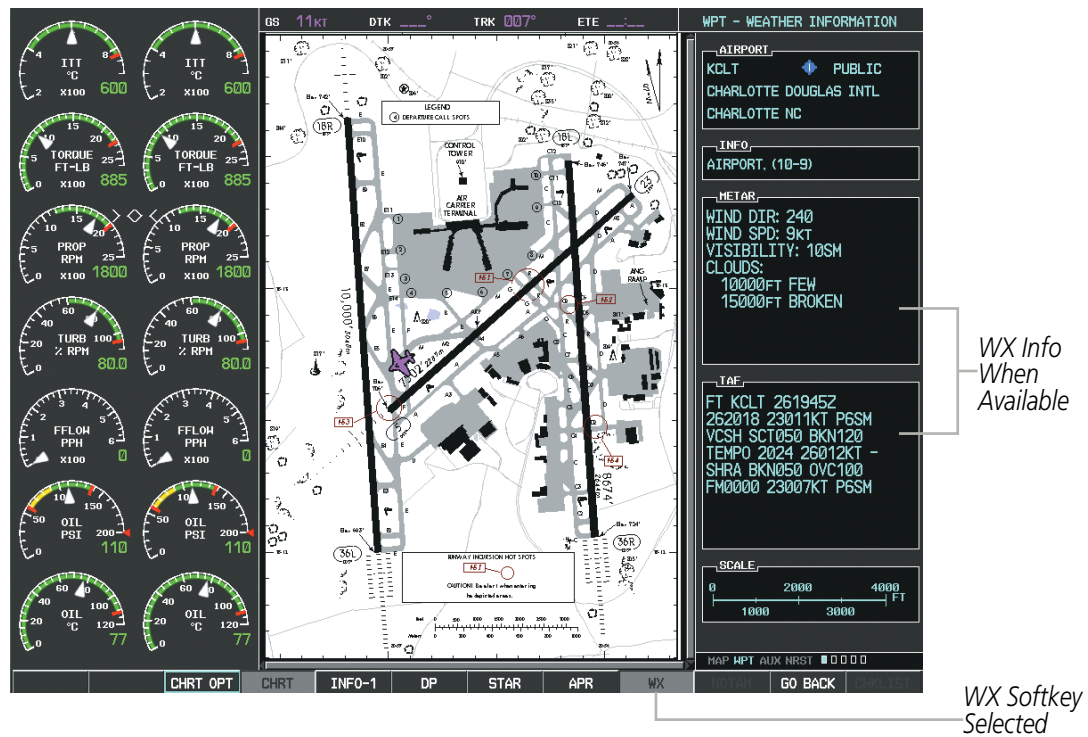


Figure 8-31 Weather Information Page



NOTE: A subdued softkey label indicates the function is disabled.

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Selecting the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled as shown in Figure 8-31. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections.

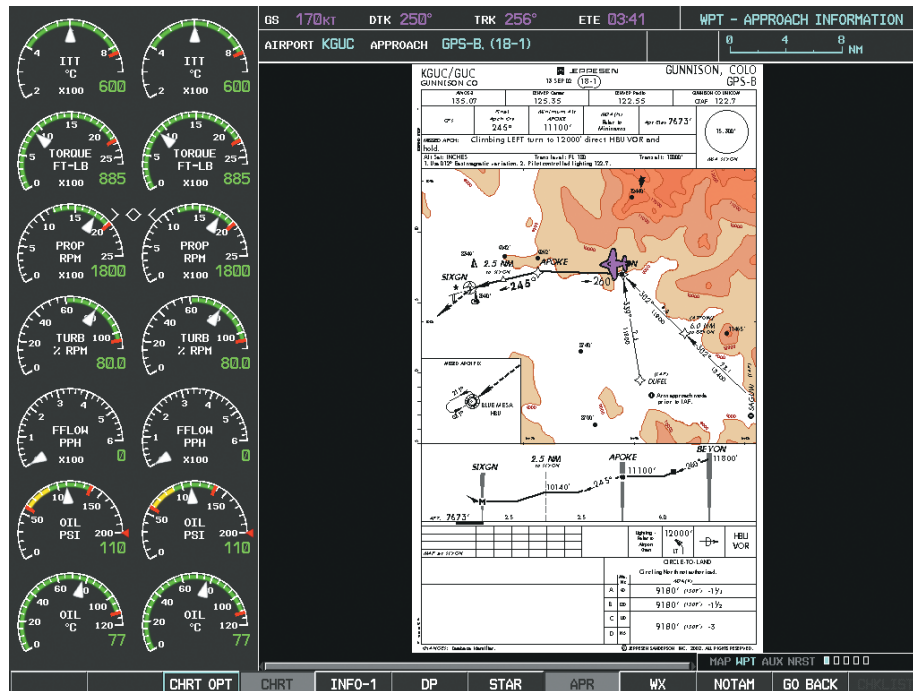


Figure 8-32 NOTAM Available

NOTAM Softkey
Appears for
Selected Airports



Figure 8-33 Airport Information Page, Local NOTAMs

Local
NOTAM on
This Airport

NOTAM Softkey
Selected

Selecting the **NOTAM** Softkey again removes the NOTAMS information.

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).

CHART OPTIONS

Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-20).

Selecting the **ALL** Softkey shows the complete approach chart on the screen.

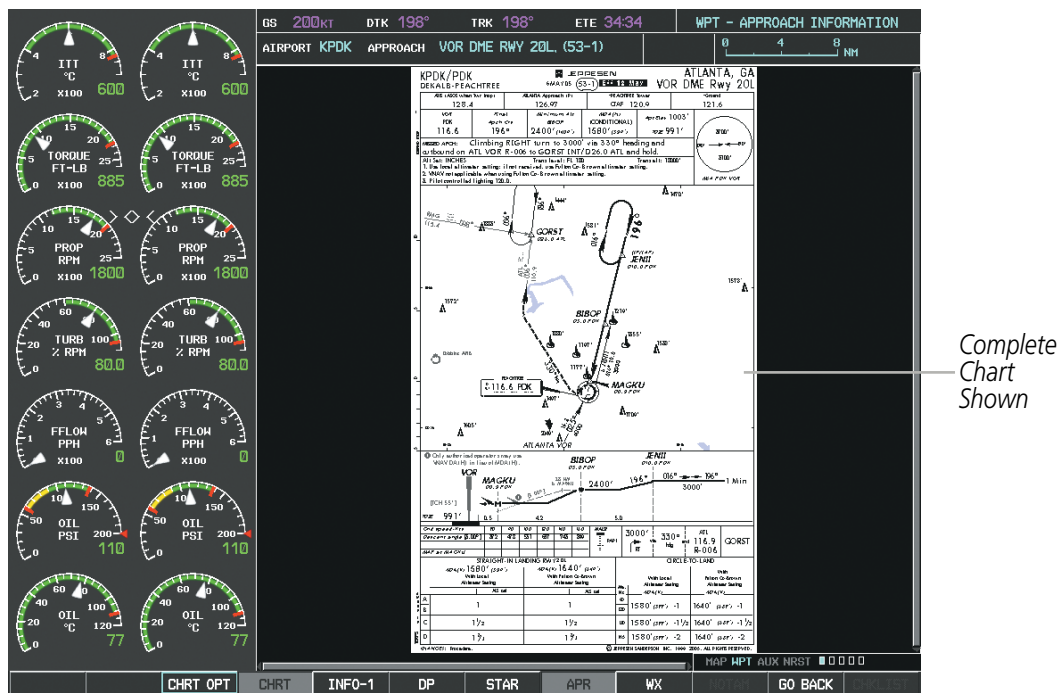


Figure 8-34 Approach Information Page, ALL View

Selecting the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.

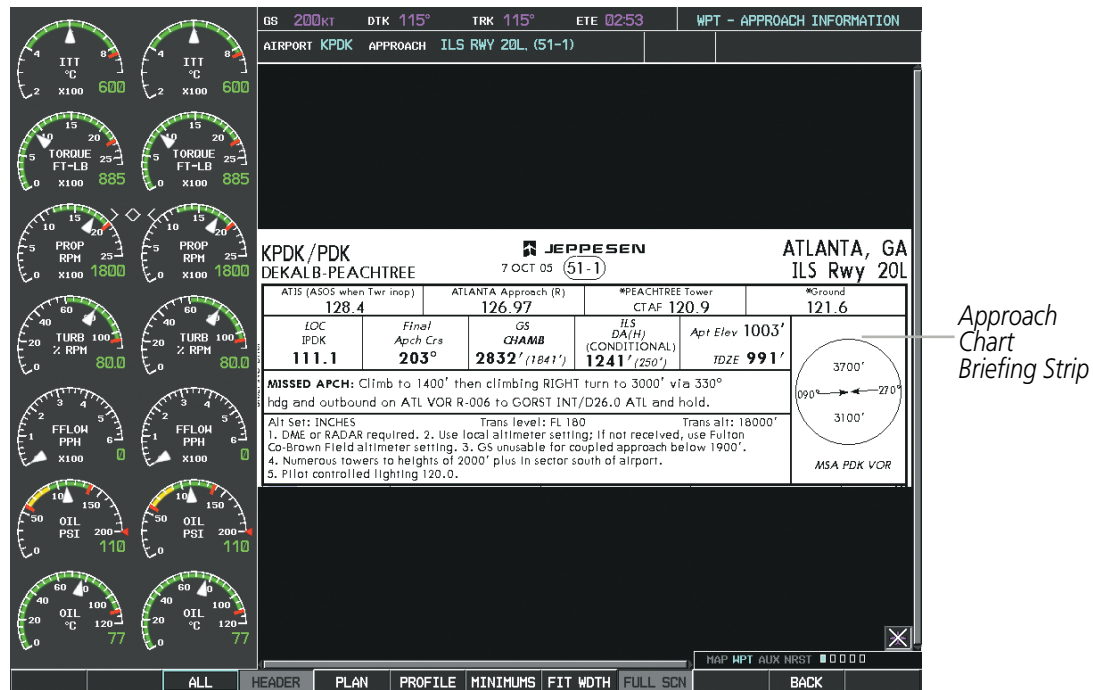


Figure 8-35 Approach Information Page, Header View

Selecting the **PLAN** Softkey shows the approach chart two dimensional plan view.

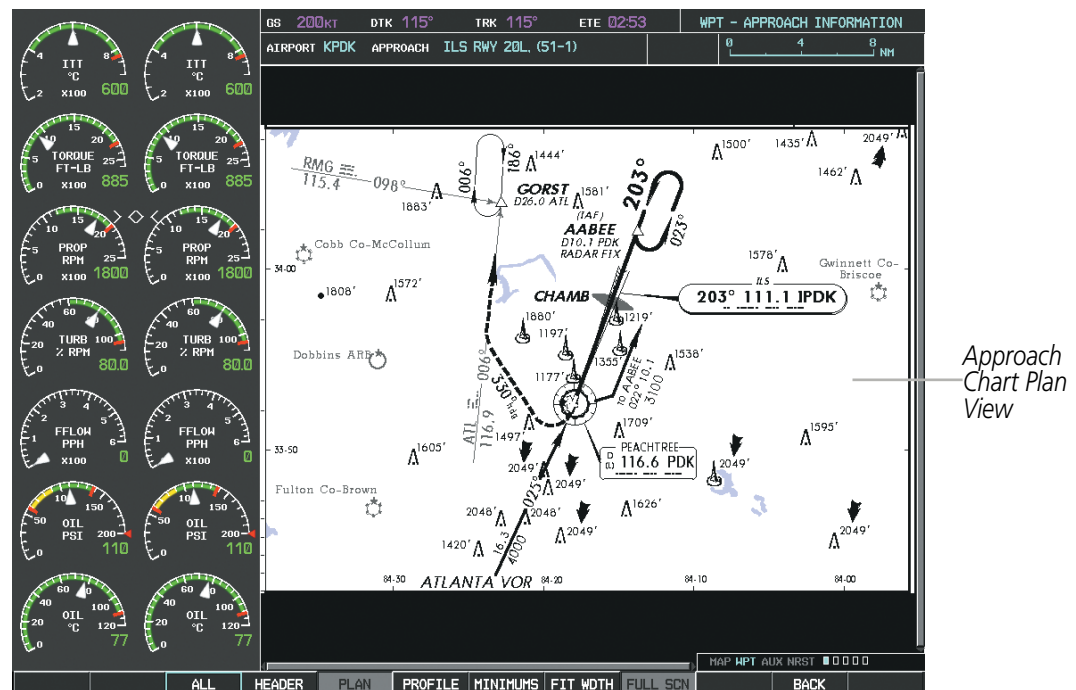


Figure 8-36 Approach Information Page, Plan View

Selecting the **PROFILE** Softkey displays the approach chart descent profile strip.

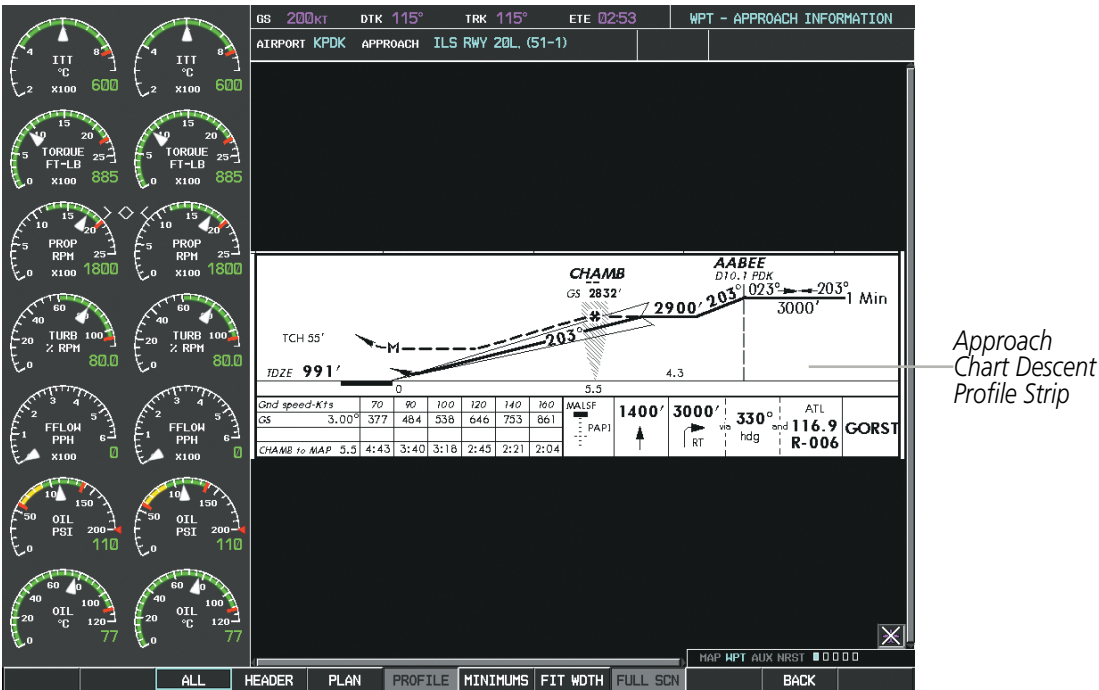


Figure 8-37 Approach Information Page, Profile View, Full Screen Width

Selecting the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.



Figure 8-38 Approach Information Page, Minimums View, Full Screen Width

If the chart scale has been adjusted to view a small area of the chart, selecting the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.



Select **FIT WIDTH** Softkey to Show Full Chart Width

Figure 8-39 Airport Information Page, FIT WIDTH Softkey Selected

Selecting the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

Selecting Additional Information:

- 1) While viewing the Airport Taxi Diagram, select the **FULL SCN** Softkey to display the information windows (AIRPORT, INFO).
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the AIRPORT, INFO, RUNWAYS, or FREQUENCIES Box (INFO Box shown).
- 4) Turn the small **FMS** Knob to select the INFO Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
- 5) Press the **FMS** Knob again to deactivate the cursor.

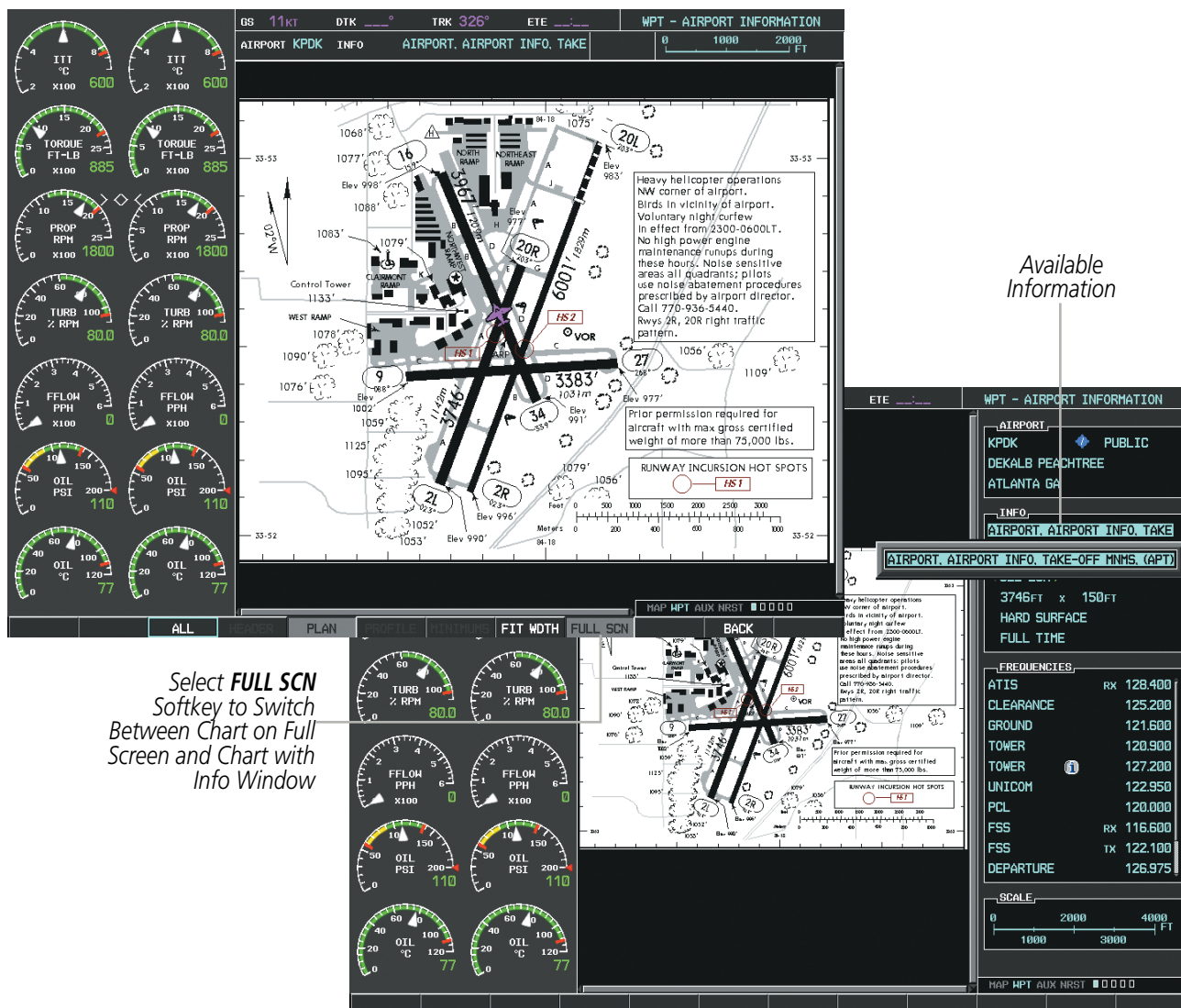


Figure 8-40 Airport Information Page, Full Screen and Info Window

Selecting the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
- 4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

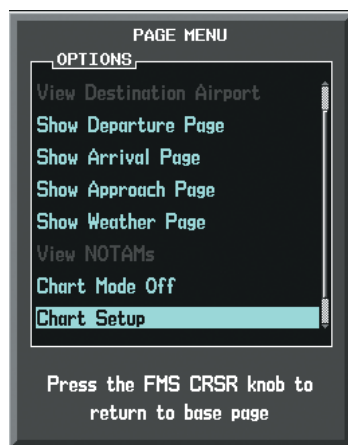
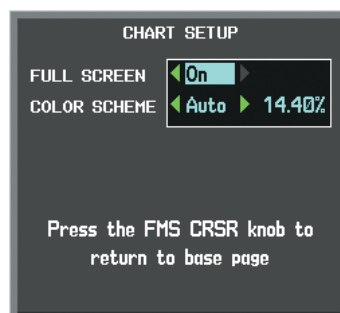


Chart Setup Option



Full Screen On/Off Selection

Figure 8-41 Page Menus

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the MFD softkeys are blank.

Selecting Day, Night, or Automatic View:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

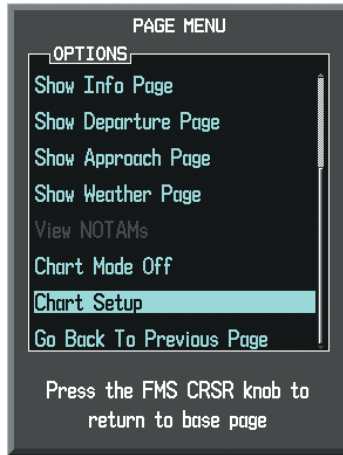


Figure 8-42 Waypoint Information Page, OPTIONS Menu

- 3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-43).
- 4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
- 5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

- 6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

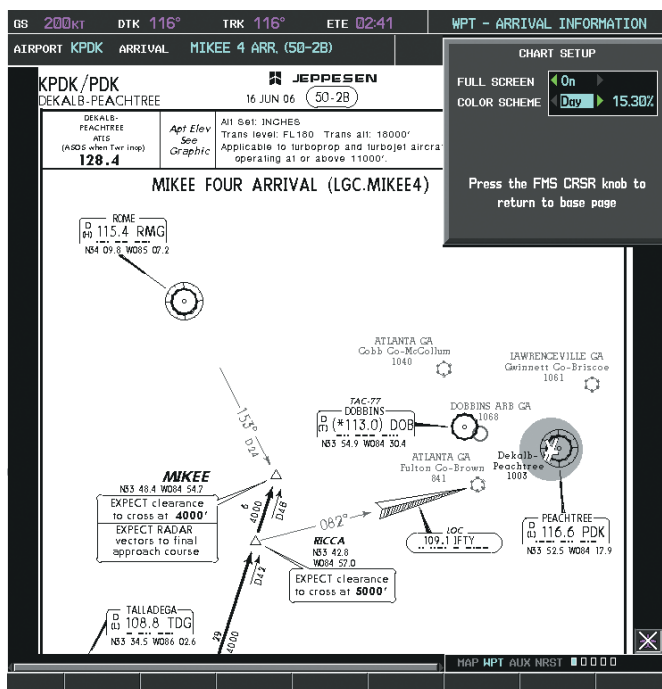


Figure 8-43 Arrival Information Page, Day View

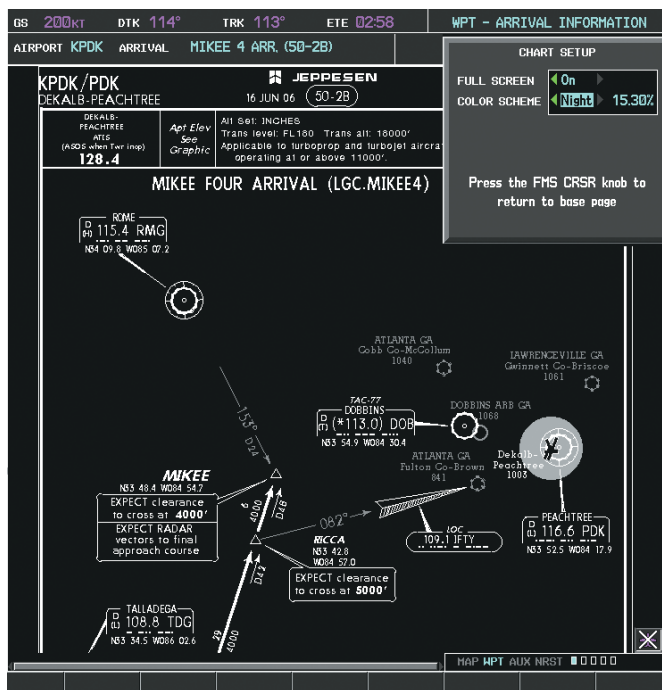


Figure 8-44 Arrival Information Page, Night View

CHARTVIEW CYCLE NUMBER AND EXPIRATION DATE

ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing. When turning on the system, the Power-up Page displays the current status of the ChartView database. See the table below for the various ChartView Power-up Page displays and the definition of each.

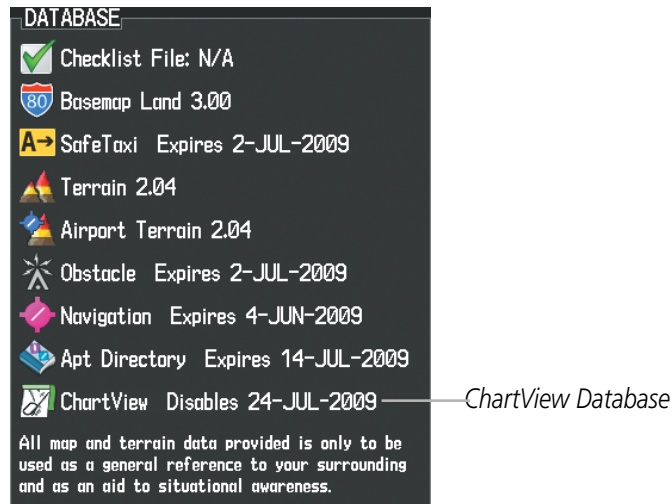


Figure 8-45 Power-up Page, ChartView Database

Power-up Page Display	Definition
Blank Line	System is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
ChartView Disables 24-JUL-2009	Normal operation. ChartView database is valid and within current cycle.
Chart data update available.	ChartView database is within 1 week after expiration date. A new cycle is available for update.
Chart data is out of date!	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
Chart data is disabled.	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
Verify chart database cycle.	System time is not available. GPS satellite data is unknown or the system has not yet locked onto satellites. Check database cycle number for effectivity.
Verifying Chart data	System is verifying chart database when new cycle is installed for the first time.
Chart Data is Corrupt!	After verifying, chart database is found to be corrupt. ChartView is not available.

Table 8-2 ChartView Power-up Page Annunciations and Definitions

The ChartView time critical information can also be found on the AUX - System Status page. The database CYCLE number, EXPIRES, and DISABLES dates of the ChartView subscription appear in either blue or yellow text. When the ChartView EXPIRES date is reached, ChartView becomes inoperative 70 days later. This is shown as the DISABLES date. When the DISABLES date is reached, charts are no longer available for viewing. The **SHW CHRT** Softkey label then appears subdued and is disabled until a revised issue of ChartView is installed.



NOTE: A subdued softkey label indicates the function is disabled.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the ChartView database information is shown.

The ChartView database cycle number shown in the figure, 0904, is deciphered as follows:

09 – Indicates the year 2009

04 – Indicates the fourth issue of the ChartView database for the year

The EXPIRES date 05-MAR-09 is the date that this database should be replaced with the next issue.

The DISABLES date 14-MAY-09 is the date that this database becomes inoperative.



Figure 8-46 AUX – System Status Page, ChartView Current and Available

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

Other possible AUX - System Status page conditions are shown in Figure 8-47. The EXPIRES date, 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. CYCLE NOT AVAILABLE in blue, indicates no ChartView data is available on the database card or no database card is inserted.

MFD1 DATABASE

APT DIRECTORY - BOTTOM CARD

REGION	US
VERSION	1.01
CYCLE	0902
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09

Copyright 2009 Aircraft Owners and Pilots Assn

CHART - BOTTOM CARD

CHART	Jeppesen ChartView
CYCLE	0904
EXPIRES	06-MAR-09
DISABLES	15-MAY-09

Copyright 2009. Jeppesen Sanderson, Inc.

MFD1 DATABASE

APT DIRECTORY - BOTTOM CARD

REGION	US
VERSION	1.01
CYCLE	0902
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09

Copyright 2009 Aircraft Owners and Pilots Assn

CHART - BOTTOM CARD

CHART	Jeppesen ChartView
CYCLE	0904
EXPIRES	06-MAR-09
DISABLES	15-MAY-09

Copyright 2009. Jeppesen Sanderson, Inc.

MFD1 DATABASE

APT DIRECTORY - BOTTOM CARD

REGION	US
VERSION	1.01
CYCLE	0902
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09

Copyright 2009 Aircraft Owners and Pilots Assn

CHART - UNKNOWN

CHART	Jeppesen ChartView
CYCLE	NOT AVAILABLE
EXPIRES	-- -- --
DISABLES	-- -- --

Copyright 2009. Jeppesen Sanderson, Inc.

ChartView has Expired, but is not Disabled

ChartView Database is Disabled

ChartView Database is Not Available

Figure 8-47 AUX – System Status Page, ChartView Expired, ChartView Disabled, ChartView Not Available

8.4 FLITECHARTS

FliteCharts resemble the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts. FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, and **GO BACK**. The chart selection softkeys appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting the **CHRT OPT** Softkey displays the available terminal chart and advances to the next level of softkeys: **ALL**, **FIT WDTN**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

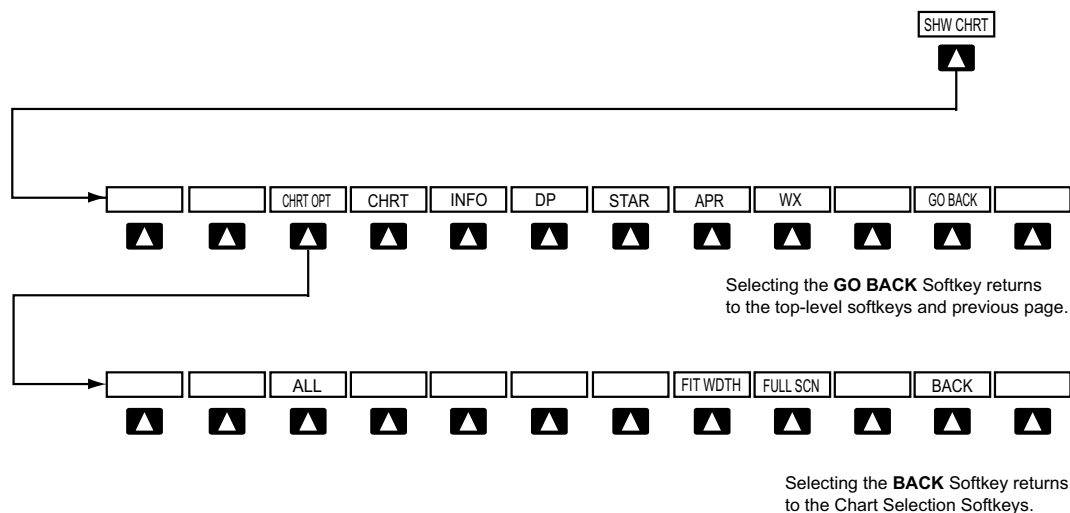


Figure 8-48 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys

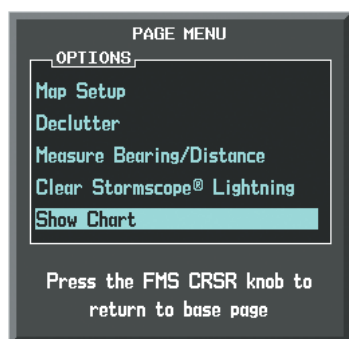
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select the **SHW CHRT** Softkey.

Or:

- 1) Press the **MENU** Key to display the PAGE MENU.
- 2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
- 3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-49 Option Menus

On the Waypoint Airport Information Page OPTIONS Menu, select the desired chart and press the **ENT** Key to display the chart.

When no terminal procedure chart is available, the banner CHART NOT AVAILABLE appears on the screen. The CHART NOT AVAILABLE banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-50 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner UNABLE TO DISPLAY CHART is then displayed.



Figure 8-51 Unable To Display Chart Banner

When a chart is not available by selecting the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, selecting the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

- 1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, select the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Select the **APR** Softkey if the Approach Box is not currently shown).
- 4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
- 5) Press the **ENT** Key to complete the airport selection.
- 6) Turn the large **FMS** Knob to select the Approach Box.
- 7) Turn the small **FMS** Knob to show the approach chart selection choices.
- 8) Turn either **FMS** Knob to scroll through the available charts.
- 9) Press the **ENT** Key to complete the chart selection.

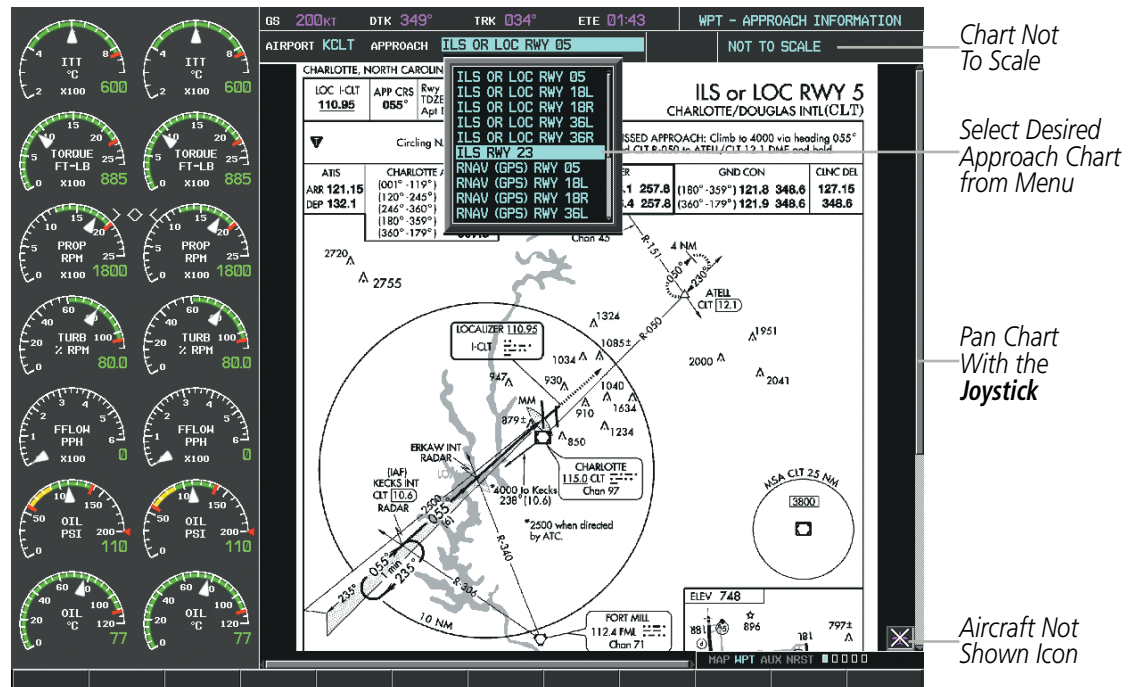


Figure 8-52 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000 softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.

Selecting the **CHRT** Softkey switches between the FliteCharts diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the Gainesville, FL (KGNV) Airport Diagram and the navigation map on the WPT – Airport Information page.

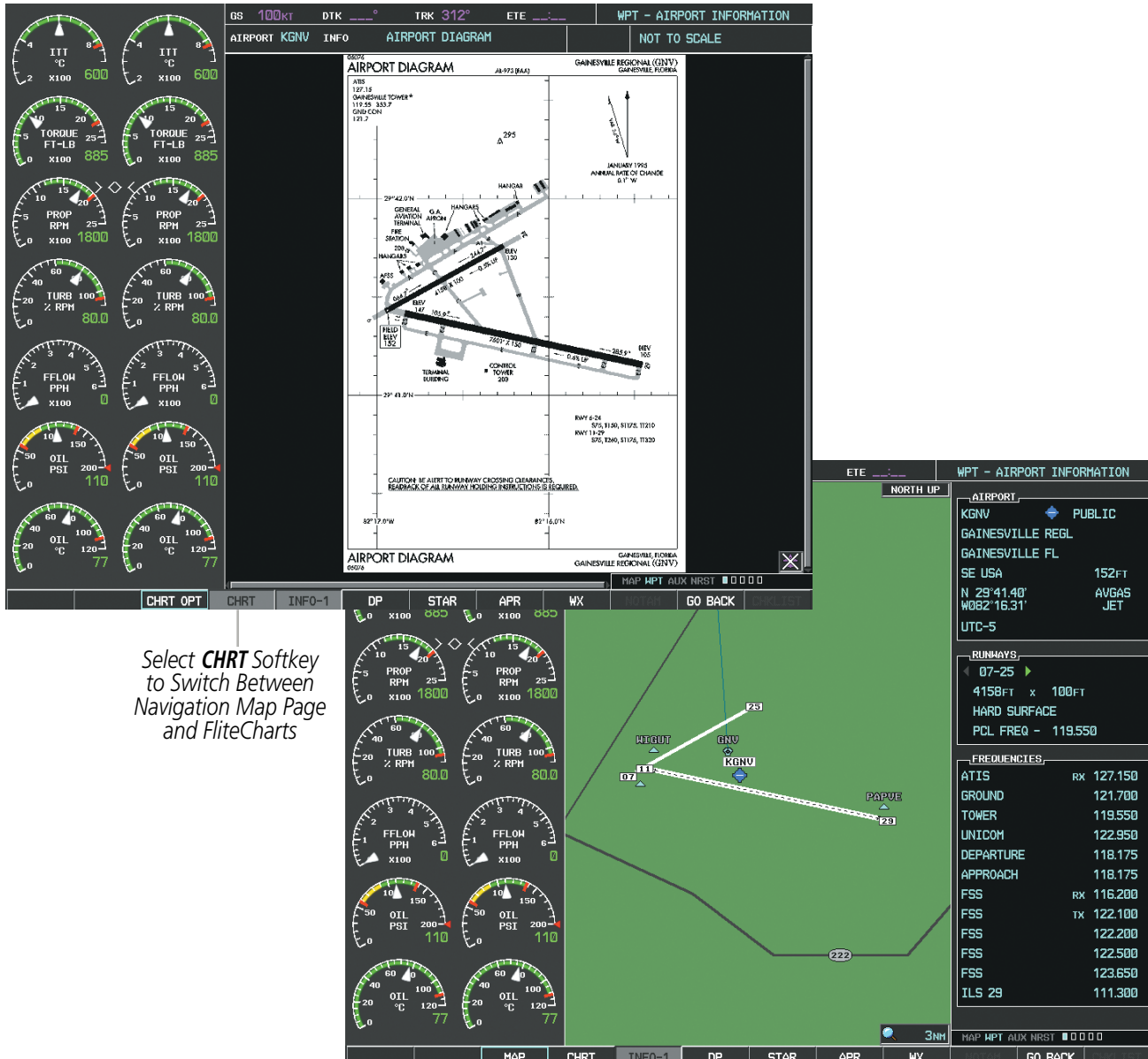


Figure 8-53 CHRT Softkey, Airport Information Page

Selecting the **INFO** Softkey returns to the airport diagram when the view is on a different chart. If the displayed chart is the airport diagram, the **INFO** Softkey has no effect.

Another source for additional airport information is from the INFO Box above the chart (Figure 8-60) or to the right of the chart (Figure 8-54) for certain airports. This information source is not related to the **INFO** Softkey. When the INFO Box is selected using the **FMS** Knob, the G1000 softkeys are blank. The DeKalb Peachtree Airport has three additional charts offering information; the Airport Diagram, Alternate Minimums, and Take-off Minimums.

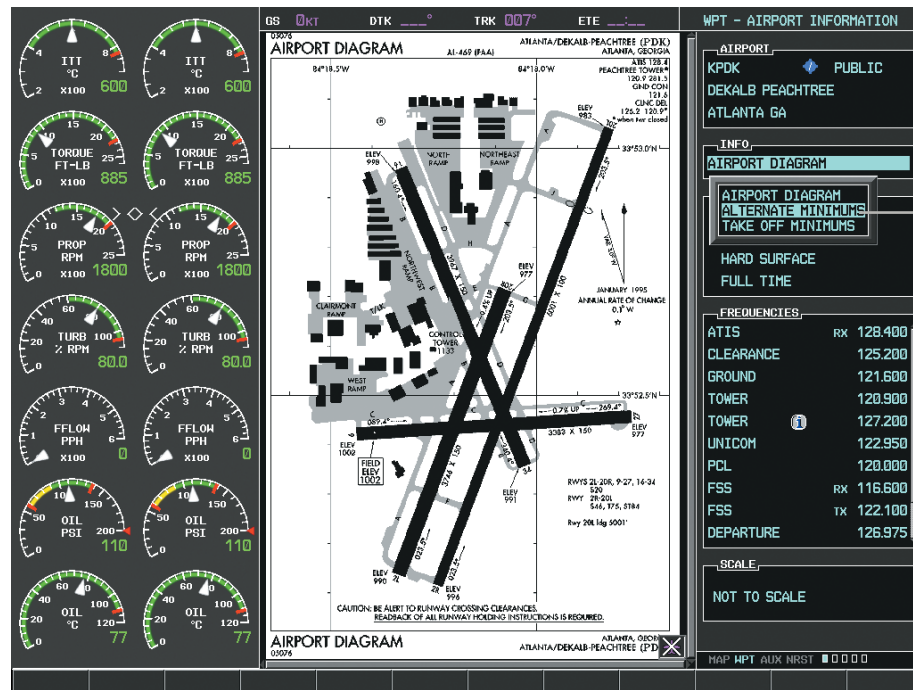


Figure 8-54 Airport Information Page, INFO View with Airport Information

In the example shown in Figure 8-54, ALTERNATE MINIMUMS is selected. Pressing the **ENT** Key displays the IFR Alternate Minimums Chart (Figure 8-55).

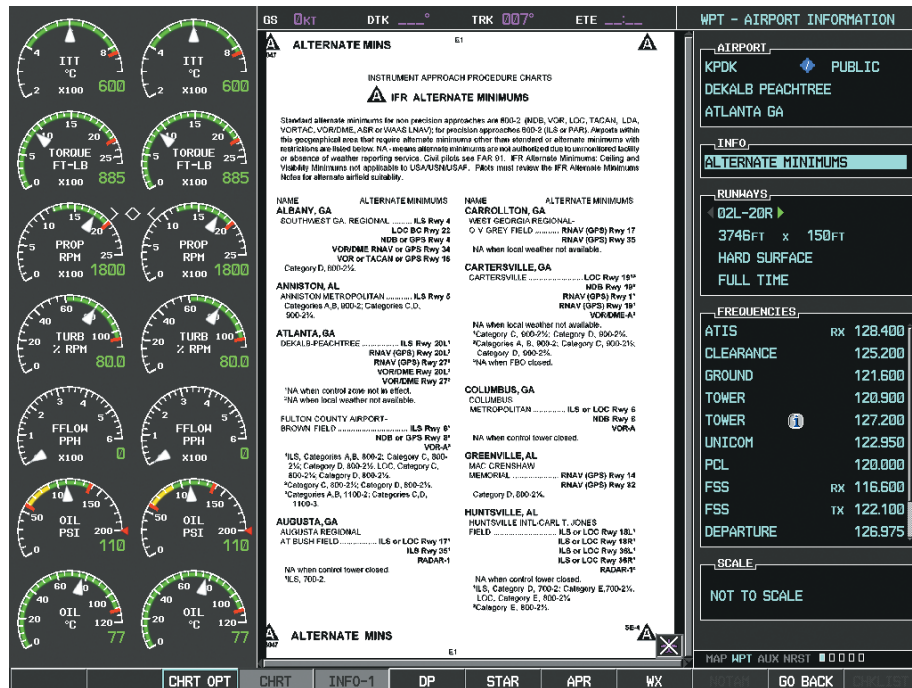


Figure 8-55 Airport Information Page, ALTERNATE MINIMUMS Selected from INFO View

Selecting the **DP** Softkey displays the Departure Procedure Chart if available.

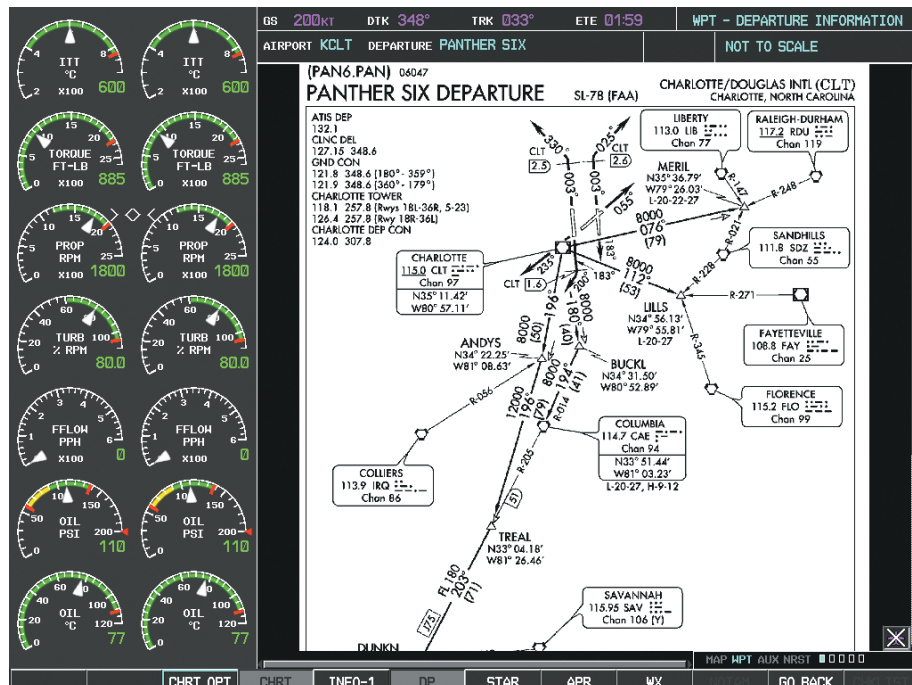


Figure 8-56 Departure Information Page

Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

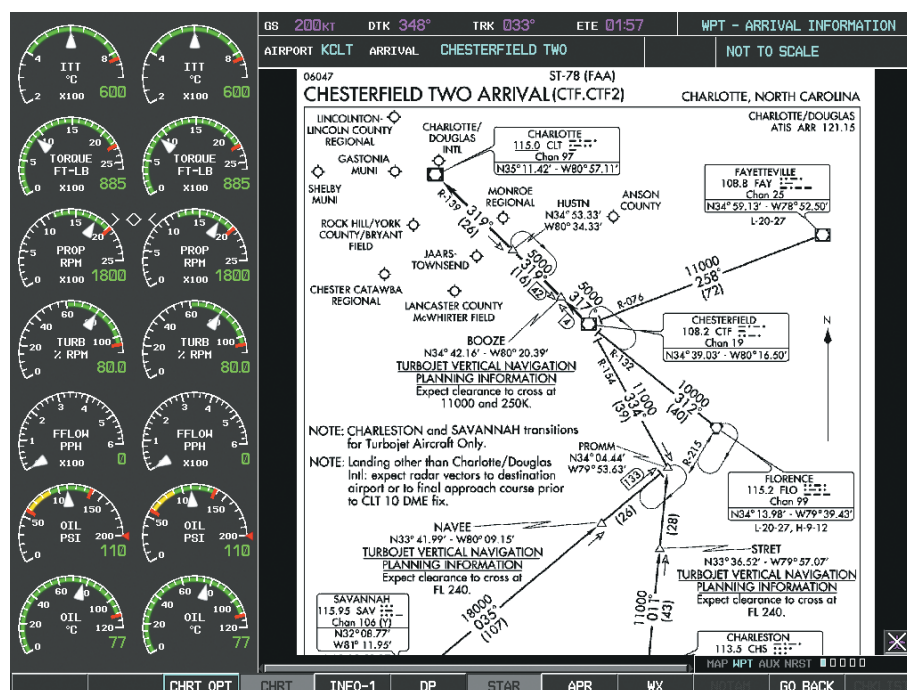


Figure 8-57 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.

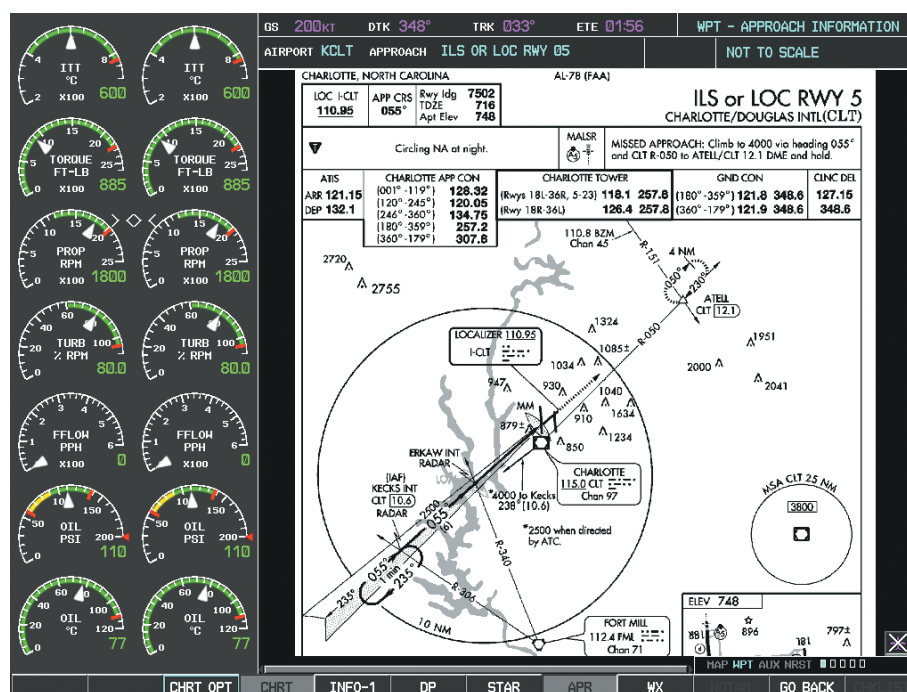


Figure 8-58 Approach Information Page

Selecting the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data such as METAR and TAF from the XM Data Link Receiver. Weather information is available only when an XM Data Link Receiver is installed and the XM Weather subscription is current.

Selecting Additional Information:

- 1) While viewing the Airport Taxi Diagram, select the **WX** Softkey to display the information windows (AIRPORT, INFO).
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn the large **FMS** Knob to highlight the INFO Box.
- 4) Turn the small **FMS** Knob to select the INFO Box choices. When the INFO Box is selected the G1000 softkeys are blank. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
- 5) Press the **FMS** Knob again to deactivate the cursor.

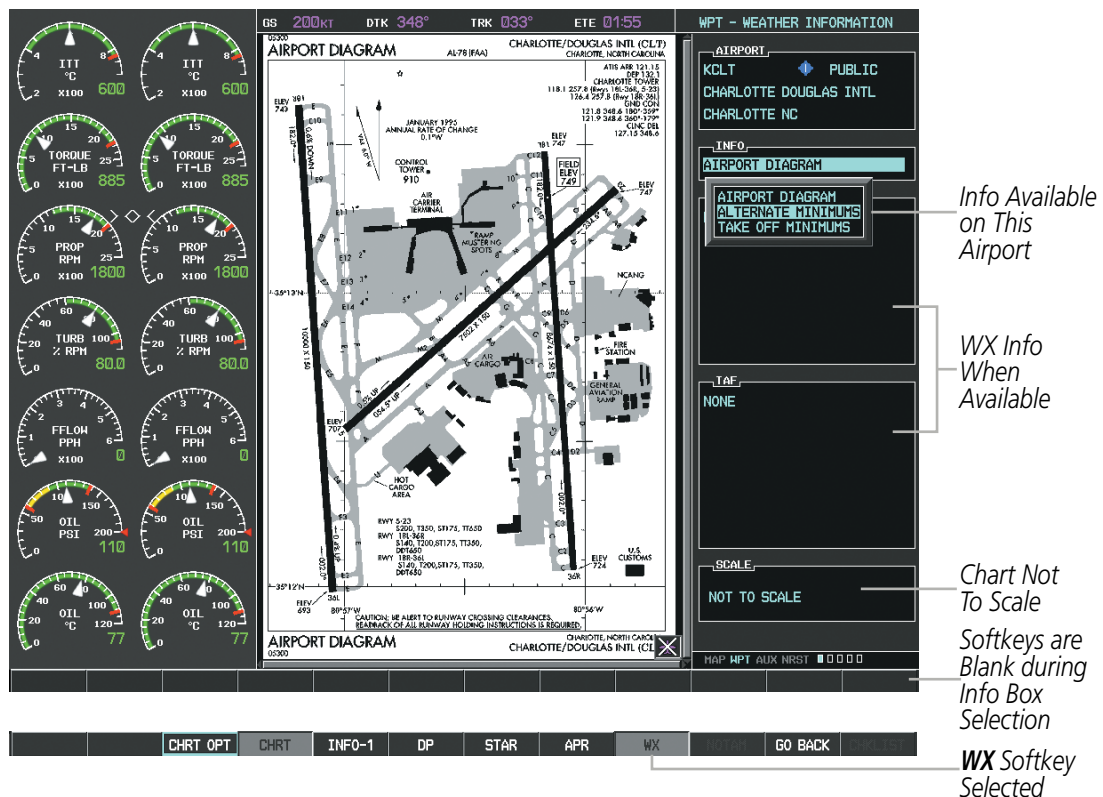


Figure 8-59 Weather Information Page, WX Softkey Selected

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).

CHART OPTIONS

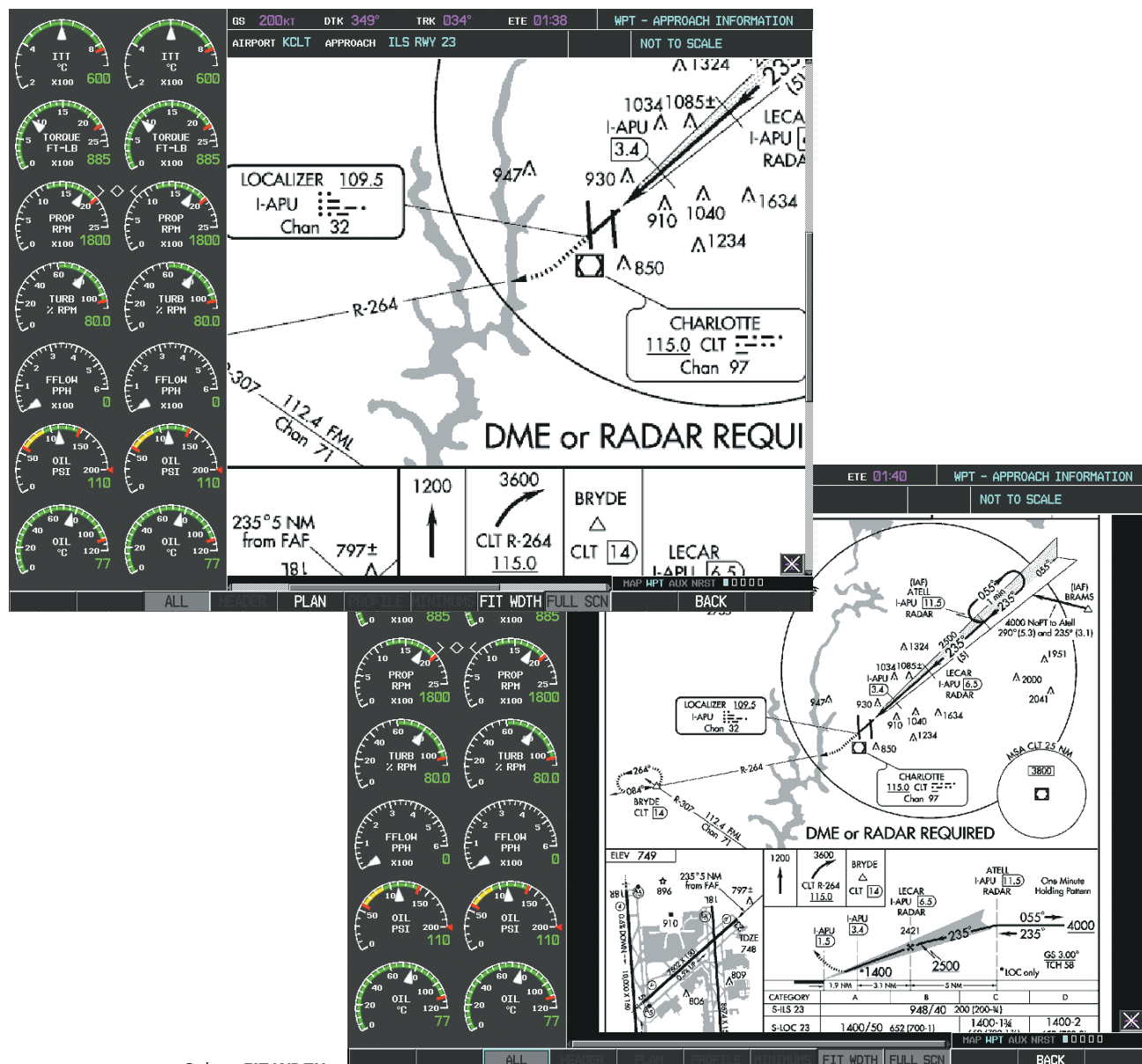
Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-48).

Selecting the **ALL** Softkey shows the complete chart on the screen.



Figure 8-60 Airport Information Page, ALL View Selected

Selecting the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.



Select **FIT WIDTH** Softkey to Show Full Chart Width

Figure 8-61 Approach Information Page, FIT WIDTH Softkey Selected

Selecting the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

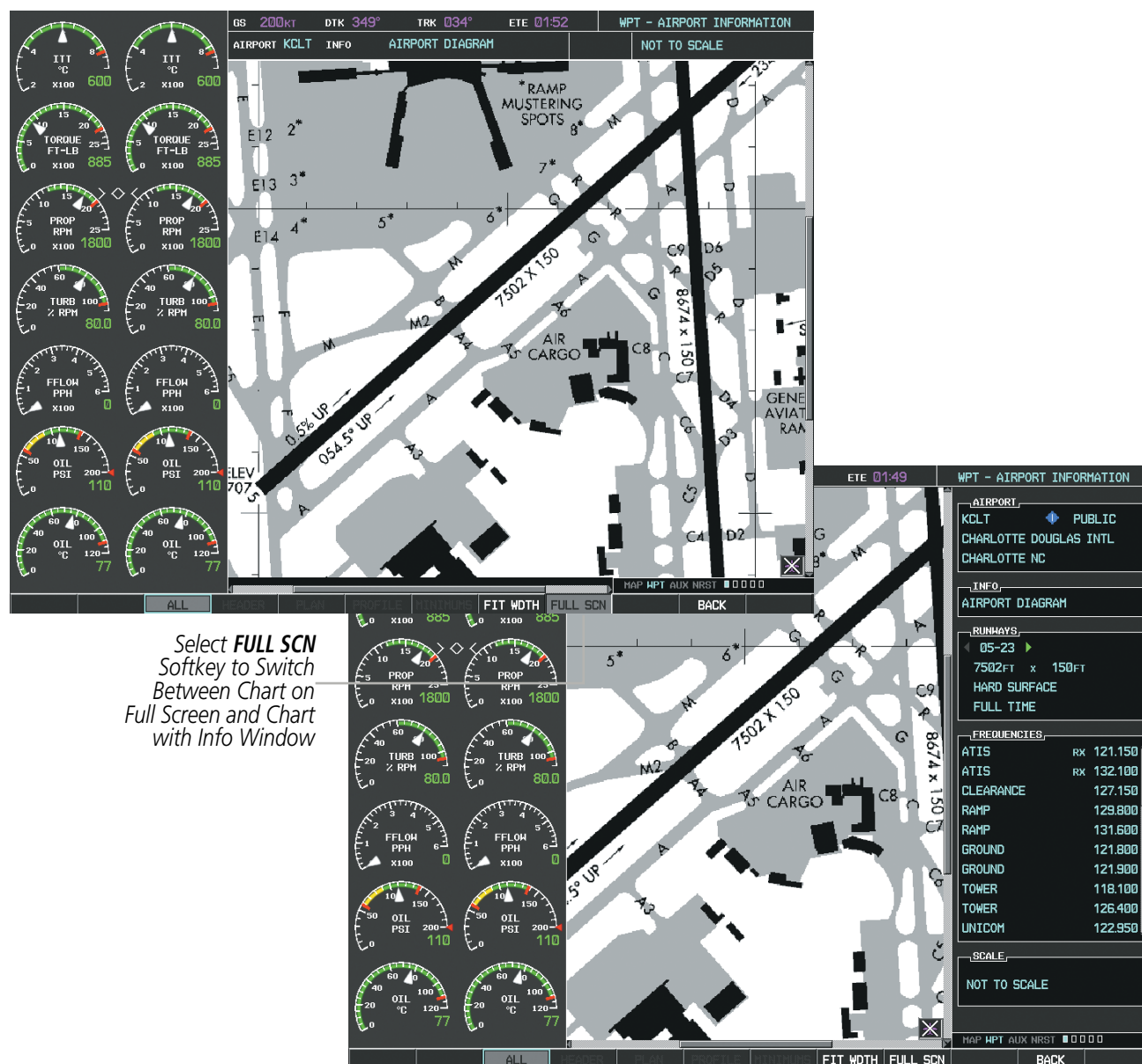


Figure 8-62 Airport Information Page, Full Screen and Info Window

Selecting the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
- 3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
- 4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

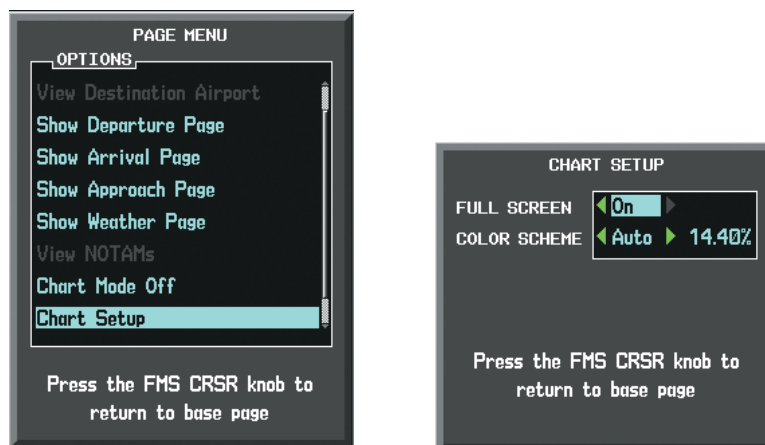


Chart Setup Option

Full Screen On/Off Selection

Figure 8-63 Page Menus

DAY/NIGHT VIEW

FliteCharts can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the MFD softkeys are blank.

Selecting Day, Night, or Automatic View:

- 1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
- 2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

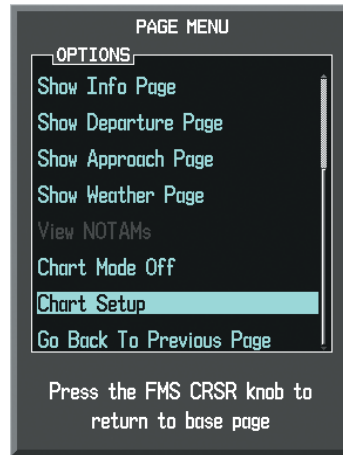


Figure 8-64 Waypoint Information Page, OPTIONS Menu

- 3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-65).
- 4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
- 5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.

- 6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

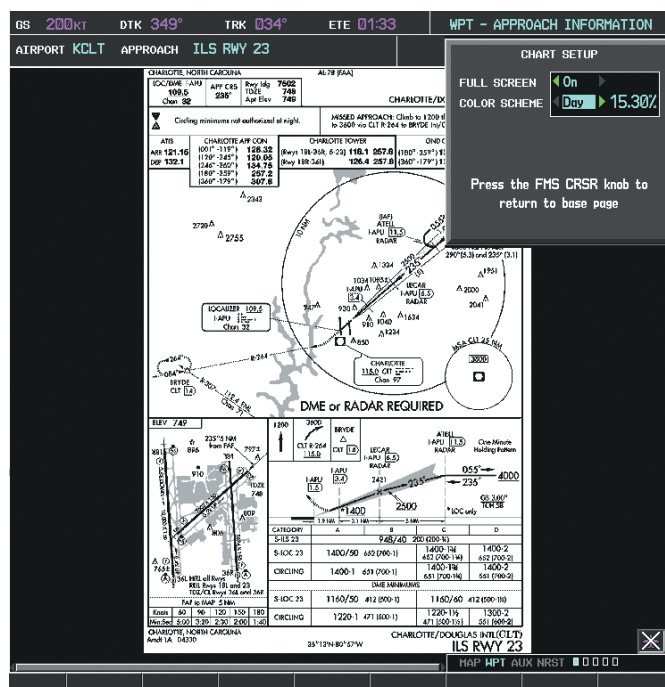


Figure 8-65 Approach Information Page, Day View

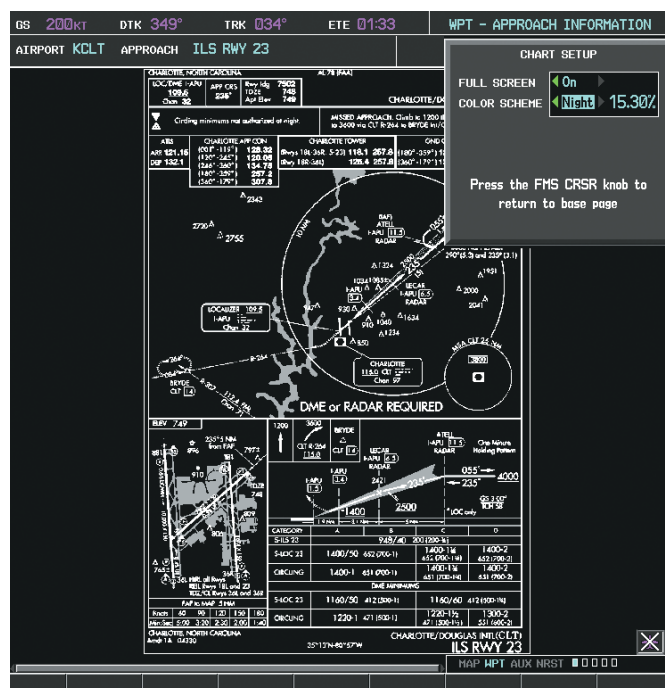


Figure 8-66 Approach Information Page, Night View

FLITECHARTS CYCLE NUMBER AND EXPIRATION DATE

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts 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 Power-up Page displays the current status of the FliteCharts database. See the table below for the various FliteCharts Power-up Page displays and the definition of each.



Figure 8-67 Power-up Page, FliteCharts Database

Power-up Page Display	Definition
Blank Line	Blank Line. System is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database
FliteCharts Expires 24-JUL-2009	Normal operation. FliteCharts database is valid and within current cycle.
Chart data is out of date!	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
Chart data is disabled.	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

Table 8-3 FliteCharts Power-up Page Annunciations and Definitions

Other possible AUX - System Status page conditions are shown in Figure 8-68. ‘FliteCharts Expires’ plus a date in white, indicates the chart database is current. ‘Chart data is out of date!’ in yellow, indicates charts are still viewable, but approaching the disable date.

When the 180 day grace period has expired, ‘Chart data is disabled.’ in yellow indicates that the FliteCharts database has expired and is no longer viewable. ‘Chart Data: N/A’ appears in white if no FliteCharts data is available on the database card or no database card is inserted.

FliteCharts time critical information can also be found on the AUX - System Status page. The FliteCharts database REGION, CYCLE number, EFFECTIVE, EXPIRES, and DISABLES dates of the subscription appear in either blue or yellow text. Dates shown in blue are current data. Dates shown in yellow indicate the data is not within the current subscription period.

FliteCharts becomes inoperative 180 days after the FliteCharts EXPIRES date is reached, and is no longer available for viewing. This date is shown as the DISABLES date. After the disable date the **SHW CHRT** Softkey label appears subdued and is unavailable until a revised issue of FliteCharts is installed.



NOTE: A subdued softkey label indicates the function is disabled.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the FliteCharts database information is shown.

The FliteCharts database cycle number shown in the figure, 0905, is deciphered as follows:

09 – Indicates the year 2009

05 – Indicates the fifth issue of the FliteCharts database for the year

The FliteCharts EFFECTIVE date 07-MAY-09 is the first date that this database is current.

The FliteCharts EXPIRES date 04-JUN-09 is the last date that this database is current.

The DISABLES date 01-DEC-09 is the date that this database becomes inoperative.



Figure 8-68 AUX – System Status Page, FliteCharts Current and Available

The FliteCharts database is provided from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

The other three possible AUX - System Status page conditions are shown here. The EXPIRES date, in yellow, is the revision date for the next database cycle. The DISABLES date, in yellow, is the date that this database cycle is no longer viewable. REGION and CYCLE NOT AVAILABLE in blue, indicate that FliteCharts database is not available on the database card or no database card is inserted.

MFD1 DATABASE	
VERSION	1.01
CYCLE	09D2
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09
Copyright 2009 Aircraft Owners and Pilots Assn	
CHART - BOTTOM CARD	
CHART	FliteCharts
REGION	US
CYCLE	0905
EFFECTIVE	07-MAY-09
EXPIRES	04-JUN-09
DISABLES	01-DEC-09
Copyright 2009, Garmin Ltd. on its subsidiaries	

MFD1 DATABASE	
VERSION	1.01
CYCLE	09D2
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09
Copyright 2009 Aircraft Owners and Pilots Assn	
CHART - BOTTOM CARD	
CHART	FliteCharts
REGION	US
CYCLE	0905
EFFECTIVE	07-MAY-09
EXPIRES	04-JUN-09
DISABLES	01-DEC-09
Copyright 2009, Garmin Ltd. on its subsidiaries	

MFD1 DATABASE	
VERSION	1.01
CYCLE	09D2
EFFECTIVE	15-APR-09
EXPIRES	14-JUL-09
Copyright 2009 Aircraft Owners and Pilots Assn	
CHART - UNKNOWN	
CHART	FliteCharts
REGION	NOT AVAILABLE
CYCLE	NOT AVAILABLE
EFFECTIVE	-- -- -- --
EXPIRES	-- -- -- --
DISABLES	-- -- -- --

FliteCharts Expired, but is not Disabled

FliteCharts Database is Disabled

FliteCharts Database is Not Available

Figure 8-69 AUX – System Status Page, FliteCharts Expired, FliteCharts Disabled, FliteCharts Not Available

8.5 AOPA AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) Airport Directory database offers detailed information regarding services, hours of operation, lodging options, and more. This information is viewed on the Airport Information Page by selecting the INFO Softkey until **INFO-2** is displayed as shown in Figure 8-70.



Figure 8-70 AOPA Information on the Airport Information Page

AOPA DATABASE CYCLE NUMBER AND REVISION

The AOPA Airport Directory database is revised four times per year. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.

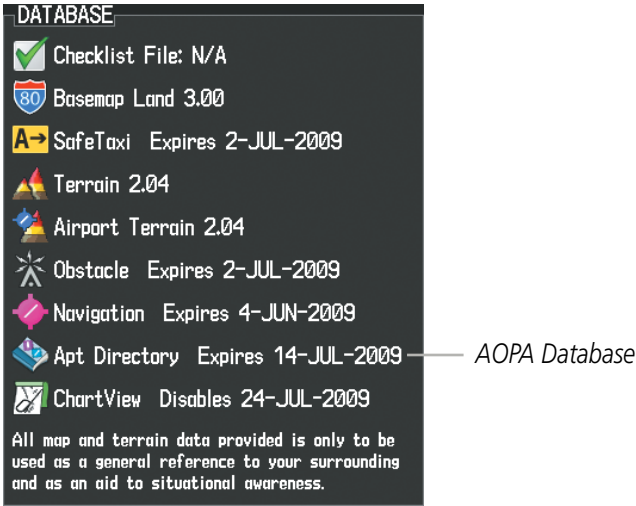


Figure 8-71 Power-up Page, Airport Directory Database

Power-up Page Display	Definition
Apt Directory Expires 14-JUL-2009	Normal operation. AOPA Airport Directory database is valid and within current cycle.
Apt Directory Expires 14-JUL-2009	AOPA Airport Directory database has expired.
Apt Directory N/A	Database card contains no AOPA Airport Directory data.

Table 8-4 Airport Directory Annunciation Definitions

The Airport Directory Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page, as seen in Figure 8-72.

Select the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the Airport Directory database information is shown.

The Airport Directory database cycle number shown in the figure, 09D2, is deciphered as follows:

09 – Indicates the year 2009

D – Indicates the data is for Airport Directory

2 – Indicates the second issue of the Airport Directory database for the year

The Airport Directory EFFECTIVE date 15-APR-09 is the beginning date for the current database cycle. The Airport Directory EXPIRES date 14-JUL-09 is the revision date for the next database cycle.



Figure 8-72 AUX – System Status Page, Airport Directory Current Information

Airport Directory information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Table 8-4). NOT AVAILABLE appears in blue in the REGION field if Airport Directory data is not available on the database card. An expired Airport Directory database is not disabled and will continue to function indefinitely.

8.6 SATELLITE TELEPHONE AND DATA LINK SERVICES



NOTE: *Separate accounts must be established to access the Iridium satellite network for voice/SMS and low speed data transmission, and high speed data transmission for the 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 Short Message Service (SMS). Iridium telephone is available to the flight crew through the audio panel and headsets. An optional handset may be installed in the aircraft cabin to be used for voice communication between the aircraft cabin and the cockpit and for Iridium telephone service in the aircraft cabin. A low speed (2400 baud) internet connection is also provided for limited personal computer use in the cabin.

Operation of these features in the cockpit is accomplished through the AUX-TELEPHONE, AUX-TEXT MESSAGING, AUX-REPORT STATUS, and AUX-WI-FI SETUP Pages. For operation using the cabin handset, consult the instructions provided with the handset.

REGISTERING WITH GARMIN FLIGHT DATA SERVICES

A subscriber account must be established prior to using the Iridium Satellite System for telephone, text messaging and low speed data services. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135. After an account has been established, the system must be registered.

Registering the system for telephone and low speed data services:

- 1) With the aircraft outside and having a clear view of the sky, turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX-SYSTEM STATUS. Note the System ID number in the AIRFRAME field as seen in Figure 8-72.
- 3) Turn the small **FMS** Knob to select the AUX-REPORTS STATUS or AUX-WI-FI SETUP Page.

- 4) If necessary, select the **REPORTS** Softkey. The AUX-REPORT STATUS Page is now displayed as shown in Figure 8-73.



Figure 8-73 Report Status Page Selected Prior to System Registration

- 5) Press the **MENU** Key. The Page Menu window is now displayed as seen in Figure 8-74.
- 6) If the system is connected to Wi-Fi proceed to step 10. If there is no Wi-Fi connection, turn the **FMS** Knob to select 'Iridium Internet' in the menu list.

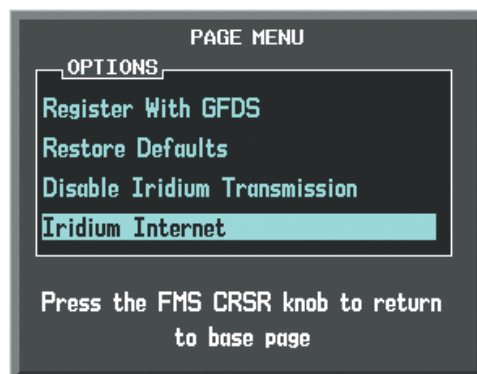


Figure 8-74 Select Iridium Internet

- 7) Press the **ENT** Key.
- 8) Select **CONNECT** Softkey. Momentarily, IRIDIUM 1 will display 'CONNECTED' in the Connection Status Window.
- 9) Press the **MENU** Key to again display the Page Menu window.

- 10) Select 'Register With GFDS' in the menu list.

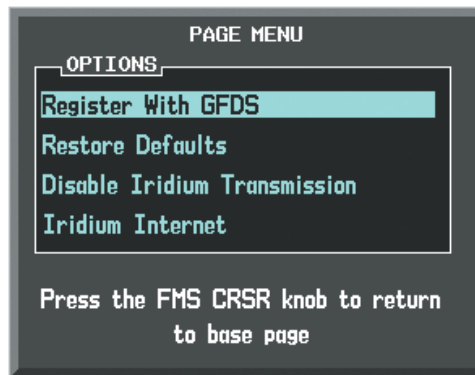


Figure 8-75 Select Register With GFDS

- 11) Press the **ENT** Key. The Garmin Flight Data Service Registration window is now displayed as shown in Figure 8-76.

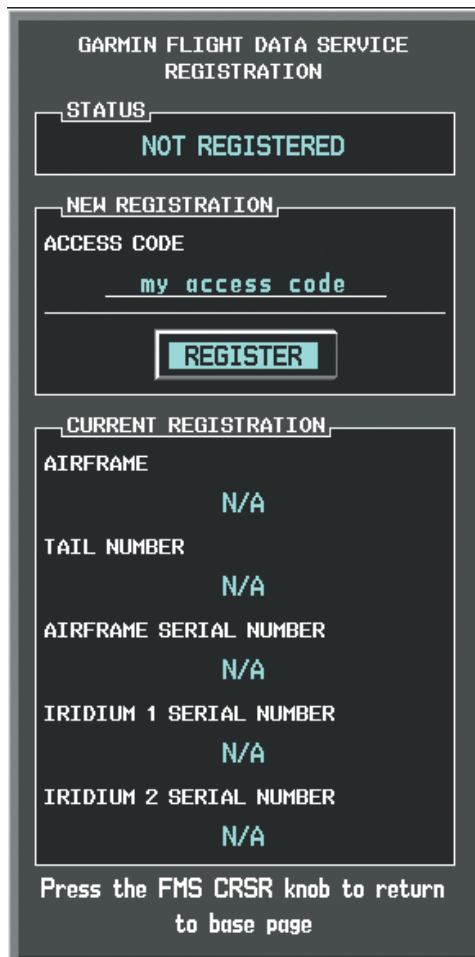


Figure 8-76 Enter Access Code

- 12) Enter the last four digits of the System ID number in the Access Code field.
- 13) Press the **ENT** Key. REGISTER will now be highlighted as in Figure 8-76.
- 14) Press the **ENT** Key. System registration is complete when 'REGISTERED' is displayed in the STATUS field.

DISABLE/ENABLE IRIDIUM TRANSCEIVER

Iridium telephone and data communications may be turn on of off by performing these simple steps.

Disabling/enabling telephone and low speed data services:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX-REPORTS STATUS or AUX-WI-FI SETUP Page.
- 3) If necessary, select the **REPORTS** Softkey. The AUX-REPORT STATUS Page is now displayed as shown in Figure 8-77.



Figure 8-77 Report Status Page

- 4) Press the **MENU** Key. The Page Menu window is now displayed as seen in Figure 8-78.
- 5) Turn the **FMS** Knob to select 'Disable Iridium Transmission' in the menu list.

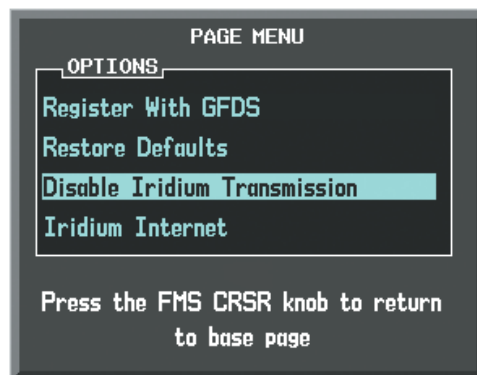


Figure 8-78 Select Disable Iridium Transmission

- 6) Press the **ENT** Key. The Iridium transceiver is now disabled.
- 7) To enable the Iridium transceiver, repeat steps 1 through 4, then select 'Enable Iridium Transceiver'.

TELEPHONE COMMUNICATION

The pilot or copilot can place and answer calls on the Iridium satellite network as well as to or from the telephone handset in the cabin. Calls can also be answered or made from the optional cabin phone, however, only actions initiated from the cockpit will be discussed here. See the cabin handset user guide for more information. Control and monitoring of telephone functions are accomplished through the AUX-TELEPHONE Page.

Viewing the Telephone Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX - TELEPHONE or AUX - TEXT MESSAGING Page.
- 3) If necessary, select the **TEL** Softkey to display the AUX-TELEPHONE Page.

The phone status display, as shown in Figure 8-79, gives a graphical representation of the current disposition of voice and/or data transmissions. Table 8-5 describes symbology used on Phone Status display.

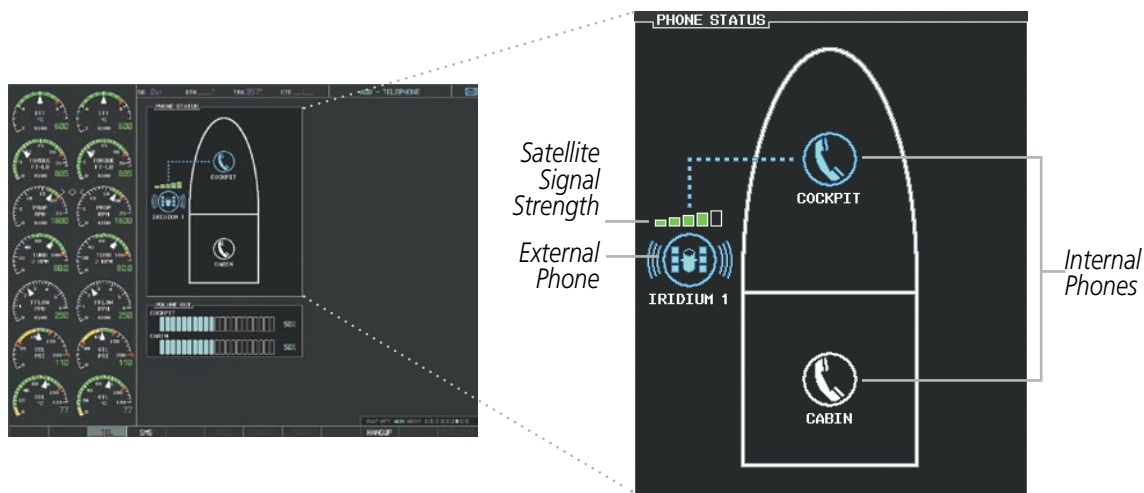


Figure 8-79 Phone Status Display
















Internal Phone	External Phone	Description
		Phone is Idle
		Phone is ringing
		Phone has a dial tone (off hook) or connected to another phone
		Phone dialed is busy
		Phone is dialing another phone
		Phone has failed
		Phone status not known
		Phone is disabled
		Phone is reserved for data transmission
		Calling other phone or incoming call from other phone
		Other phone is on hold
		Phones are connected

Table 8-5 Telephone Symbols

INCOMING CALLS

When viewing MFD pages other than the AUX-TELEPHONE Page, a pop-up alert similar to Figure 8-80 will be displayed and an aural alert “Incoming Call” will be heard. If the call is from the cabin, CABIN will be displayed as seen in Figure 8-80. If the incoming call is an Iridium network call, IRIDIUM will be displayed. The pop-up alert may be inhibited at times, such as during takeoff. In addition to the pop-up alert, a ringing phone symbol will be displayed to the right of the MFD page title as shown in Figure 8-80. Also, the voice alert “Incoming Call” will be heard on the selected cockpit audio.



Figure 8-80 Incoming Call

Answering an incoming call in the cockpit:

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Select the **ANSWER** Softkey on the MFD.

Or:

While viewing the AUX-TELEPHONE Page



NOTE: The Push-to-Talk switch is not utilized for telephone communication. The microphone is active after selecting the **ANSWER** Softkey, and stays active until the call is terminated.

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Press the **MENU** Key to display the Page Menu.
- 3) Turn either **FMS** Knob to place the cursor on ‘Answer Incoming Call’.
- 4) Press the **ENT** Key.

Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the call unanswered. Selecting the **TEL** Softkey will display the AUX-TELEPHONE Page allowing additional call information to be viewed before answering.

Muting incoming call alerts:

- 1) With the AUX-TELEPHONE Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on ‘Mute Incoming Call Alerts’.
- 3) Press the **ENT** Key. The voice and pop-up alert will not be displayed now when an incoming call is received.

OUTGOING CALLS

Voice calls can be made from the cockpit to the handset in the cabin, or to an external phone through the Iridium Satellite Network.

Making a call to the cabin:

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Select the **DIAL** Softkey on the MFD. A display similar to Figure 8-81 will be shown.

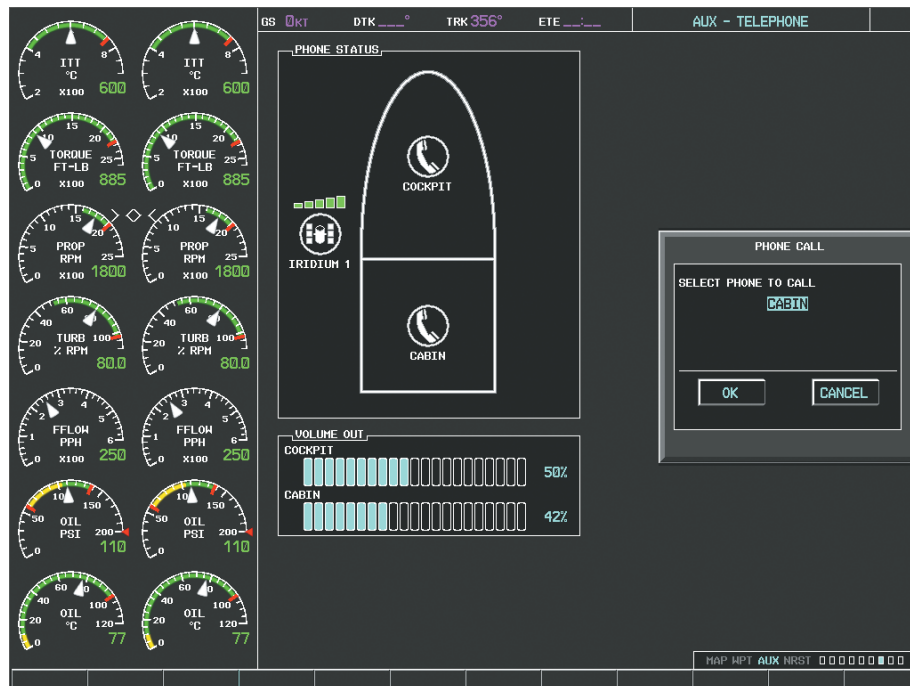


Figure 8-81 Initiating a Cabin Call

- 3) Press the **ENT** Key. The cursor will move from 'CABIN' to 'OK'.

- 4) Press the **ENT** Key again. The cabin phone will now ring as seen in Figure 8-82.

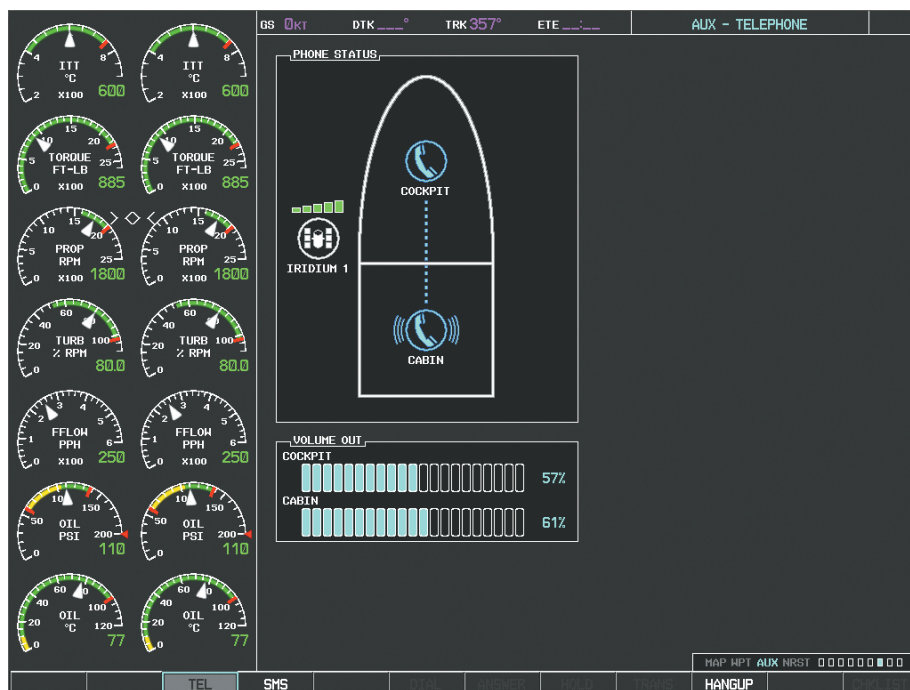


Figure 8-82 Cabin Phone Ringing

When the cabin phone is answered, the connection is established as shown in Figure 8-83. To exit the call, select the **HANGUP** Softkey.



Figure 8-83 Cabin Phone Answered

Making an external call from the cockpit using the Iridium satellite network:

- 1) Press the **TEL** Key on the appropriate audio panel.
- 2) Select the **DIAL** Softkey on the MFD. A display similar to Figure 8-84 will be shown.



Figure 8-84 Initiating an External Call

- 3) Turn the small **FMS** Knob to select 'IRIDIUM' as seen in Figure 8-85.

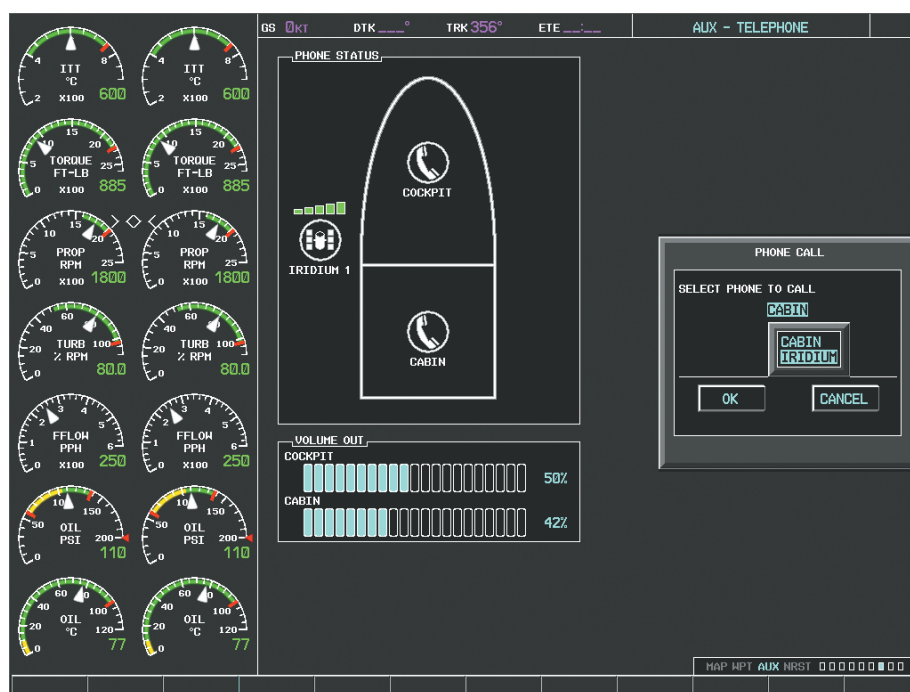


Figure 8-85 Selecting the Iridium Satellite System

- 4) Press the **ENT** Key. The cursor has now moved to the phone number entry field as shown in Figure 8-86.

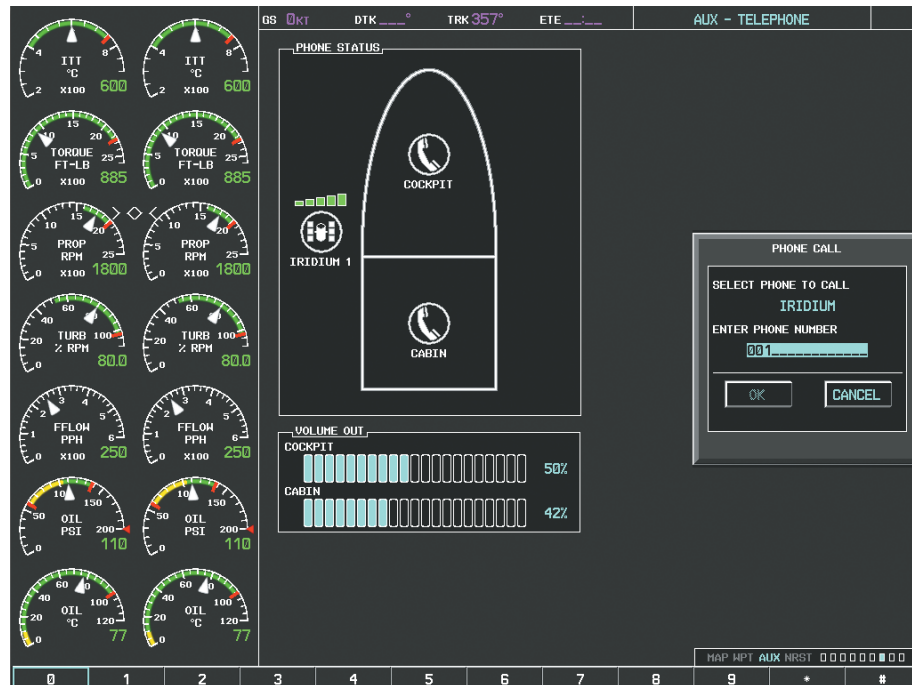


Figure 8-86 Enter Phone Number

- 5) Enter the desired telephone number (country code first) by selecting the number softkeys on the MFD or by pressing the numeric keys on the MFD Control Unit.
- 6) Press the **ENT** Key. 'OK' is highlighted as in Figure 8-87.

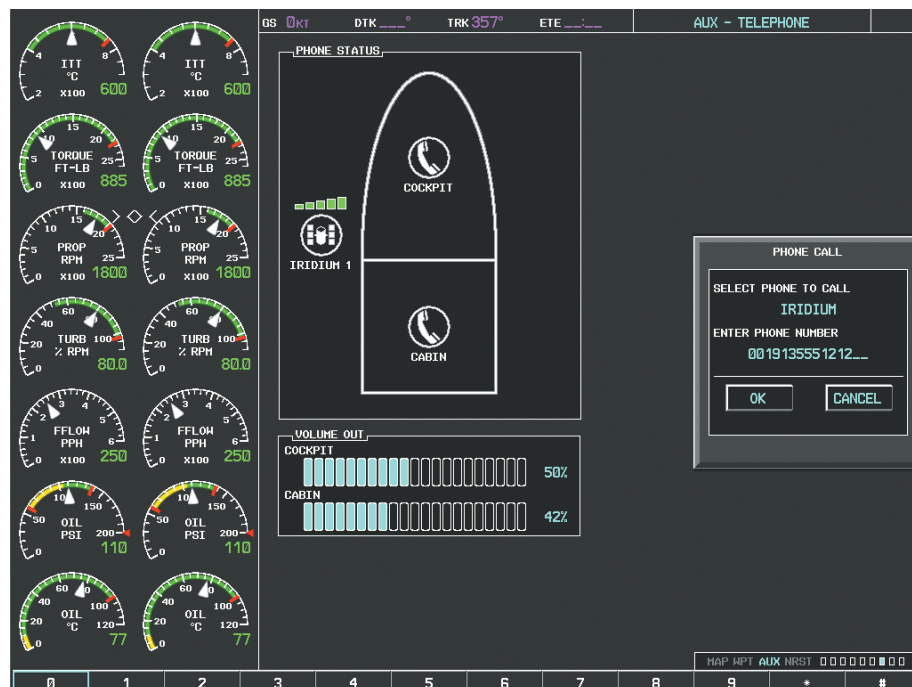


Figure 8-87 Make the Call

- 7) Press the **ENT** Key. The system will begin calling the number, as in Figure 8-88.

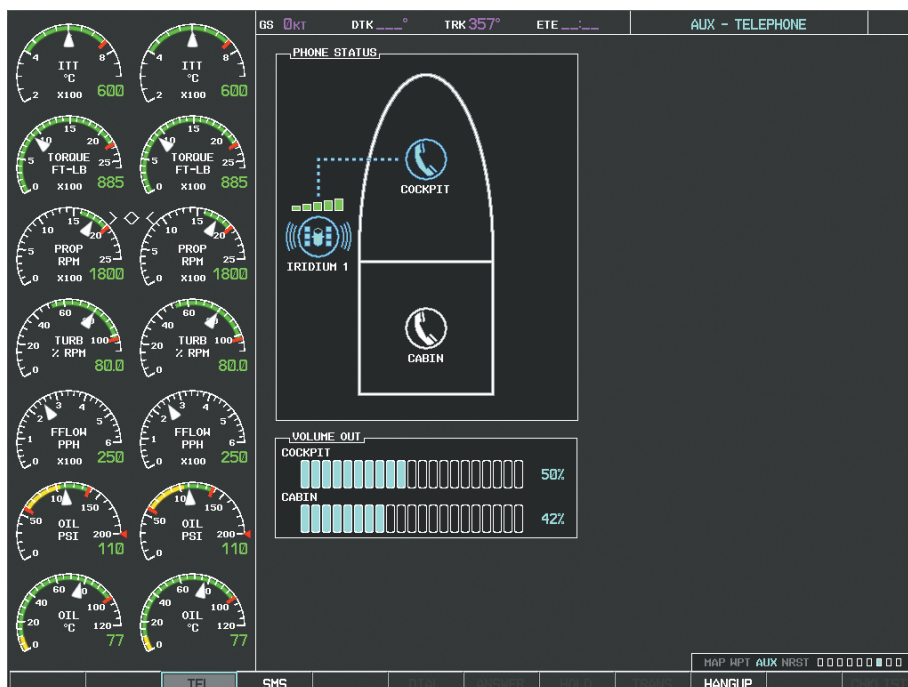


Figure 8-88 System is Making the Connection

When the phone is answered, the connection is established as shown in Figure 8-89. To exit the call, select the **HANGUP** Softkey.



Figure 8-89 Phone is Answered, Connection Complete

PLACING THE COCKPIT PHONE ON HOLD

Placing a call on hold:

Select the **HOLD** Softkey on the MFD.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Put Current Call On Hold'.
- 3) Press the **ENT** Key.

The cockpit phone is now isolated from the call as seen in Figure 8-90. This figure illustrates a conference call between the cockpit, cabin, and an external phone in which the cockpit phone has been put on hold. Select the **HOLD** Softkey again to resume the call.



Figure 8-90 Cockpit Phone on Hold

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, or (when two Iridium Transceivers are installed) an external call can be transferred to another external phone.

Transferring a call:

- 1) Select the **TRANS** Softkey on the MFD.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Transfer Current Call'.
- c) Press the **ENT** Key.

A window similar to that shown in Figure 8-91 will be displayed. In this example, an active call to the cabin is transferred to an external number. Therefore, the window shows the 'Iridium' option. If the active call is with an external phone, 'CABIN' would be the option.

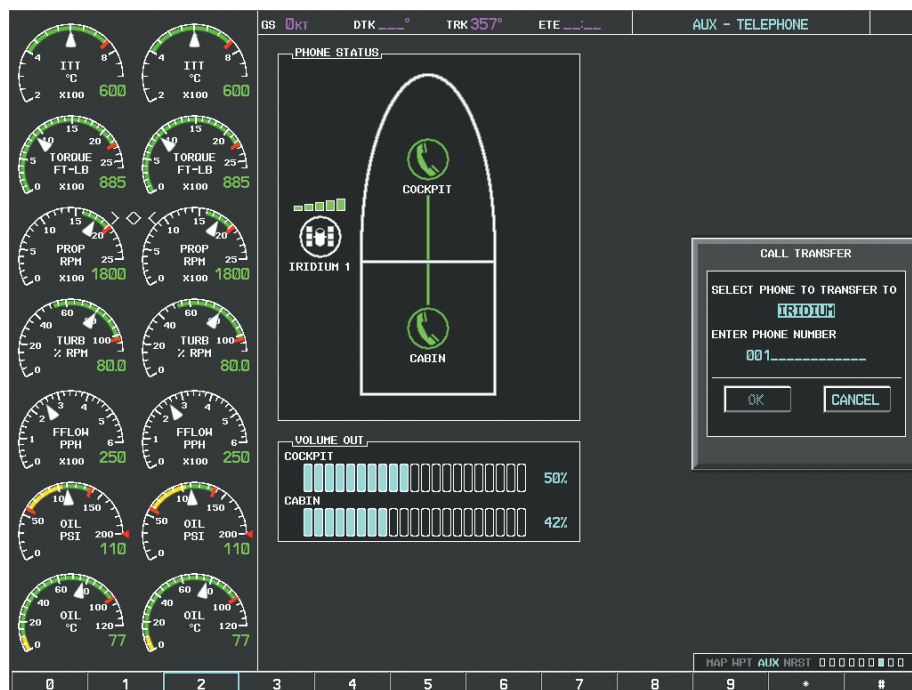


Figure 8-91 Enter Phone Number to Receive Transferred Call

- 2) Press the **ENT** Key. The cursor now highlights the phone number entry field.
- 3) Enter the phone number to which the call is being transferred, as discussed earlier for making an external call on the Iridium satellite network.
- 4) Press the **ENT** Key. 'OK' is now highlighted.

- 5) Press the **ENT** Key again to place the call as shown in Figure 8-92.

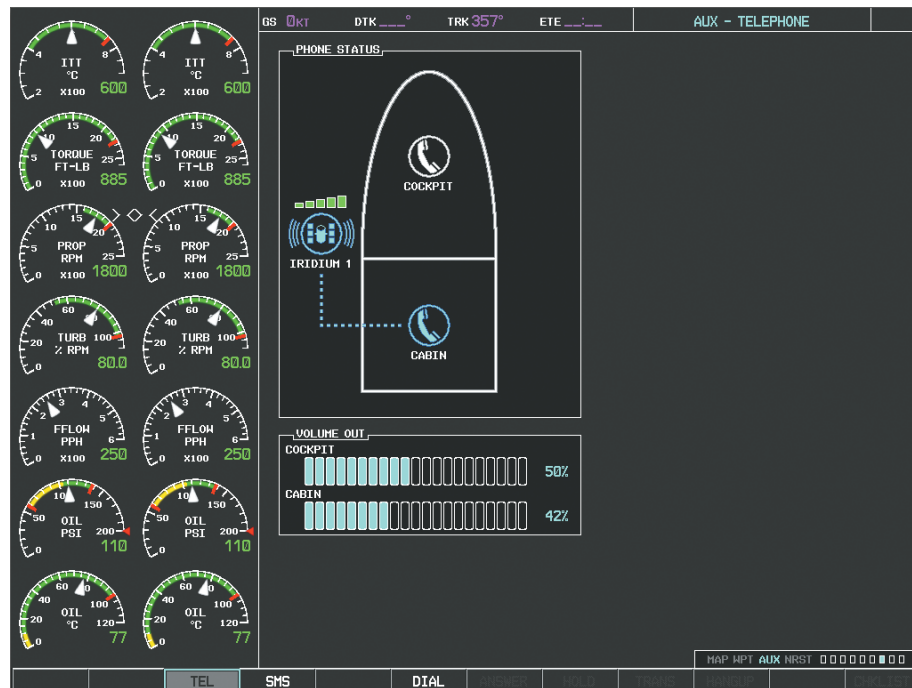


Figure 8-92 Call Transfer to an External Phone

When the external phone is answered, the call connection is indicated as in Figure 8-93.

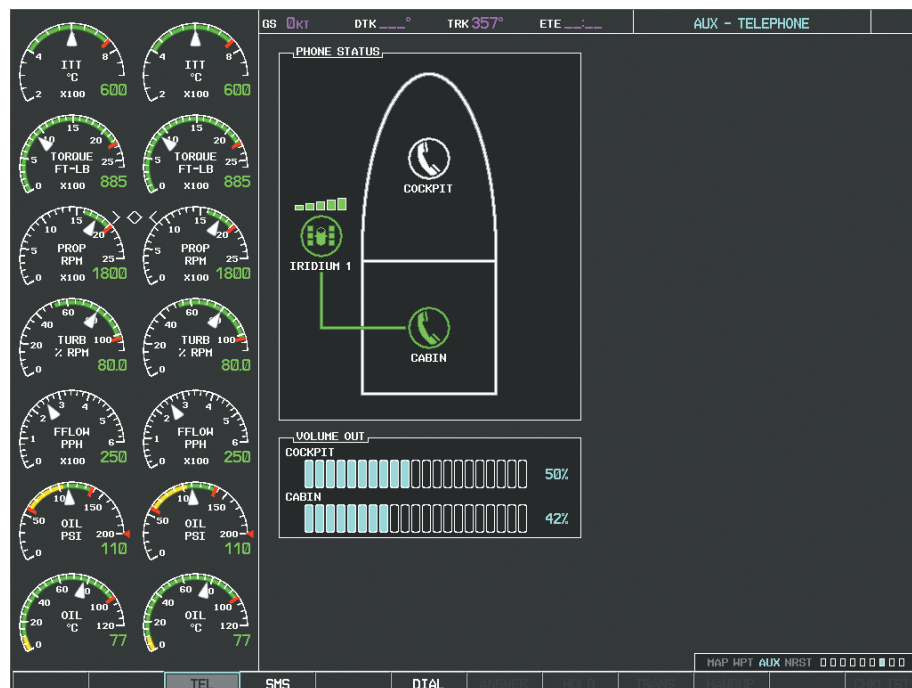


Figure 8-93 Call Transfer Complete

MAKING A CONFERENCE CALL FROM THE COCKPIT

The cabin or an external phone (two external phones if two Iridium Transceivers are installed) can be added to a call already in progress.

Adding another phone to an active call:

- 1) Select the **CONF** Softkey on the MFD.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Conference Current Call'.
- c) Press the **ENT** Key.

A window similar to that shown in Figure 8-94 will be displayed. In this example, an external phone will be added to an active call to the cabin. Therefore, the window shows the 'IRIDIUM' option. If the active call is with an external phone, 'CABIN' would be the option.



Figure 8-94 Initiate a Conference Call

- 2) Press the **ENT** Key. The cursor now highlights the phone number entry field.
- 3) Enter the phone number to be added to the call, as discussed earlier for making an external call on the Iridium satellite network.
- 4) Press the **ENT** Key. 'OK' is now highlighted.

- 5) Press the **ENT** Key again to place the call as shown in Figure 8-95.

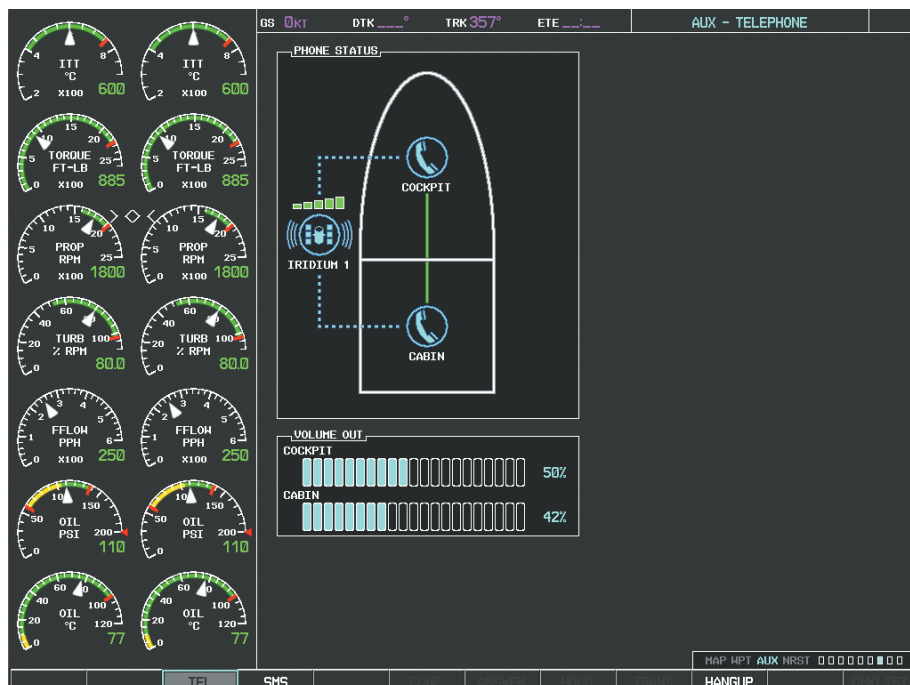


Figure 8-95 Conference in External Phone

When the external phone is answered, the call connection is indicated as in Figure 8-96.



Figure 8-96 External Phone Added

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.

The text messaging user interface is mainly through the AUX-TEXT MESSAGING Page.

Viewing the Text Messaging Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX - TELEPHONE or AUX - TEXT MESSAGING Page.
- 3) If necessary, select the **SMS** Softkey to display the AUX-TEXT MESSAGING Page as shown in Figure 8-97.



Figure 8-97 Text Messaging Page








Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message
	Predefined text message

Table 8-6 Text Message Symbols

VIEWING A TEXT MESSAGE WHEN RECEIVED

When viewing MFD pages other than the AUX-TEXT MESSAGING Page, a pop-up alert similar to Figure 8-98 will be displayed when a new text message is received.



New Text Message Pop-up



New Text Message Symbol on MFD Page

Figure 8-98 New Text Message Received

Select the **VIEW** Softkey to view the message (Figure 8-99). Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the text message unopened. Selecting the **IGNR ALL** Softkey will extinguish the pop-window and ignore all future incoming text messages. Selecting the **SMS** Softkey will display the AUX-TEXT MESSAGING Page.



Figure 8-99 Text Message Displayed from Pop-Up Alert

The pop-up alerts may be enabled or disabled through the Page Menu.

Enabling/disabling incoming text message pop-up alerts:

- 1) With the AUX-TEXT MESSAGING Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Disable New Message Popups' or 'Enable New Message Popups'.
- 3) Press the **ENT** Key. The pop-up alert will not be displayed when an incoming text message is received.



Figure 8-100 Disabling New Text Message Pop-Ups

REPLY TO A TEXT MESSAGE

After reading a text message, a reply may be sent.

Replying to a text message:

While viewing the text message, select the **REPLY** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Reply To Message'.
- 3) Press the **ENT** Key.

SENDING A TEXT MESSAGE

Text messages may be sent from the AUX-TEXT MESSAGING Page.

Sending a new text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, select the **NEW** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Draft New Message'.
- c) Press the **ENT** Key.



Figure 8-101 Composing a New Text Message

- 2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter the desired telephone number or email address. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-101.
- 3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.
- 4) Enter the desired message using any combination of entry methods as described in step 2.
- 5) Press the **ENT** Key.
- 6) Select the **SEND** Softkey to send the message immediately, or select the **SAVE** Softkey to save the message in Outbox for sending at a later time. Select the **CANCEL** Softkey to delete the message.

PREDEFINED TEXT MESSAGES

Time and effort can be saved in typing text messages that are used repeatedly by saving these messages as a predefined message.

Creating a predefined text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.

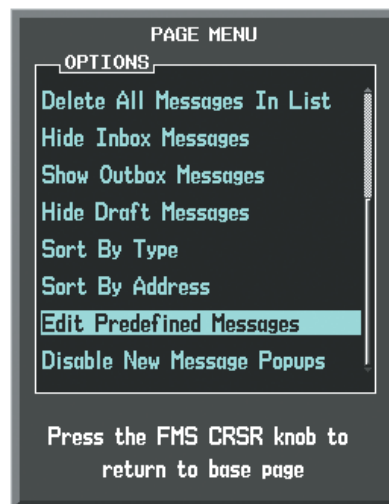


Figure 8-102 Creating/Editing Predefined Messages

- 2) Turn either **FMS** Knob to select 'Edit Predefined Messages' as shown in Figure 8-102.
- 3) Press the **ENT** Key. The PREDEFINED MESSAGES view is now displayed.
- 4) Select the **NEW** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Draft New Predefined Message'.
- c) Press the **ENT** Key. The PREDEFINED SMS TEXT MESSAGE Window is now displayed as shown in Figure 8-103.



Figure 8-103 Composing a Predefined Message

- 5) The cursor is displayed in the 'TITLE' field. Enter the desired message title. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey.
- 6) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.
- 7) Enter the desired message using any combination of entry methods as described in step 5.
- 8) Press the **ENT** Key.
- 9) Select the **SAVE** Softkey. The new predefined message is now shown in the displayed list. Selecting the **CANCEL** Softkey will delete the message without saving.
- 10) Press the **MENU** Key to display the Page Menu.
- 11) Turn either **FMS** Knob to place the cursor on 'Stop Editing Predefined Message'.
- 12) Press the **ENT** Key.

Sending a predefined text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, select the **NEW** Softkey.
- 2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter the desired telephone number or email address. Entry can be accomplished through the alphanumeric keys on the MFD

Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Select the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-104.

- 3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field (Figure 8-104).



Figure 8-104 Composing a New Text Message

- 4) Select the **PREDEFD** Softkey. The PREDEFINED MESSAGE MENU Window is displayed as seen in Figure 8-105.



Figure 8-105 Predefined Message List

- 5) Turn either **FMS** Knob to select the desired predefined message.
- 6) Press the **ENT** Key. The predefined message text is inserted into the message field. If desired, the message can be edited by using the FMS Knobs.
- 7) Press the **ENT** Key.
- 8) Select the **SEND** Softkey to transmit the message.

TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent' and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts. Each text message box may be viewed separately, or together in any combination.

Show Inbox messages:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **INBOX** Softkey (Figure 8-106).

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Inbox Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.



Figure 8-106 Text Message Inbox

Show Outbox messages:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **OUTBOX** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Outbox Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

Show Draft messages:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **DRAFTS** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Show Draft Messages'.
- 3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

MANAGING TEXT MESSAGES

The viewed messages may be listed according to the date/time the message was sent or received, the type of message (read, unread, sent, unsent, etc.), or by message address.

Viewing messages sorted by message date/time:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **TIME** Softkey (Figure 8-106).

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Date/Time'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window (Figure 8-106).

Viewing messages sorted by message type:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **TYPE** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Type'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing messages sorted by address:

While viewing the AUX-TEXT MESSAGING Page, select the **ARRANGE** Softkey, then select the **ADDRESS** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Sort By Address'.
- 3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing the content of a text message:

- 1) While viewing the AUX-TEXT MESSAGING Page, select the desired message box.
- 2) Press the **FMS** Knob to activate the cursor.
- 3) Turn either **FMS** Knob to select the desired message.
- 4) Select the **VIEW** Softkey.

Or:

Press the **ENT** Key.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'View Selected Message'.
- c) Press the **ENT** Key.

Message content is displayed as shown in Figure 8-107).



Figure 8-107 Viewing Message Content

- 5) To close the text message, select the **CLOSE** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Close Message'.
- c) Press the **ENT** Key.

Marking selected message as read:

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to select the desired message.
- 3) Select the **MRK READ** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Mark Selected Message As Read'.
- c) Press the **ENT** Key.

The message symbol now indicates the message has been opened.

Marking all messages as read:

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Mark All New Messages As Read'.
- 3) Press the **ENT** Key. A confirmation window is displayed.
- 4) With cursor highlighting 'YES', press the **ENT** Key. The message symbols now indicate all the message have been opened.

Delete a message:

- 1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to select the desired message.
- 3) Select the **DELETE** Softkey.

Or:

- a) Press the **MENU** Key to display the Page Menu.
- b) Turn either **FMS** Knob to place the cursor on 'Delete Selected Message'.
- c) Press the **ENT** Key.

WI-FI CONNECTIONS

The system can connect to a IEEE 802.11g compatible network provided the aircraft is on the ground and located within range of the network. The system is capable of WEP64, WEP128, WPA-PSK, and WPA2-PSK encryption formats. WPA-Enterprise and WPA2-Enterprise are not supported. Connections that require web proxies, captive portals, or other elements that require user credentials, including a username and password or a redemption or access code; or require action such as accepting a user agreement, are not supported.

Control and monitoring of Wi-Fi functions are accomplished through the AUX-WI-FI SETUP Page.

Viewing the Wi-Fi Setup Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select the AUX - WI-FI SETUP or AUX - REPORT STATUS Page.
- 3) If necessary, select the **WI-FI** Softkey to display the AUX-WI-FI SETUP Page as shown in Figure 8-108.

Setting up a new Wi-Fi connection:

- 1) Select the **AVAIL** Softkey on the MFD. A list of available networks will be displayed in the AVAILABLE NETWORKS window as shown in Figure 8-108. Signal strength is shown for each network, as well as security requirements and whether the network has been saved in the system's memory.



Figure 8-108 Available Wi-Fi Networks

- 2) If necessary, select the **RESCAN** Softkey to have the system scan again for available networks.
- Or:
- a) Press the **MENU** Key to display the Page Menu.
 - b) Turn either **FMS** Knob to place the cursor on 'Rescan Available Networks'.
 - c) Press the **ENT** Key.

- 3) Press the **FMS** Knob to place the cursor in the list of networks.
- 4) Turn either **FMS** Knob to select the desired network. See Figure 8-109.



Figure 8-109 Desired Network Selected

- 5) Select the **CONNECT** Softkey.
- Or:
 - a) Press the **MENU** Key to display the Page Menu.
 - b) Turn either **FMS** Knob to place the cursor on 'Connect To Selected Network'.
 - c) Press the **ENT** Key.
- 6) If the network is secured, a window similar to Figure 8-110 will be displayed in order to enter the necessary passcode. Use the **FMS** Knobs to enter the desired alpha numeric characters. Select the **CAP LOCK** Softkey to enter upper case letters. If there is no security associated with the network, proceed to step 9.



Figure 8-110 Enter Security Code

- 7) Press the **ENT** Key. 'OK' will be highlighted.
- 8) Press the **ENT** Key again.
- 9) The SAVE SETTINGS window is now displayed with the cursor highlighting 'SAVE CONNECTION'.

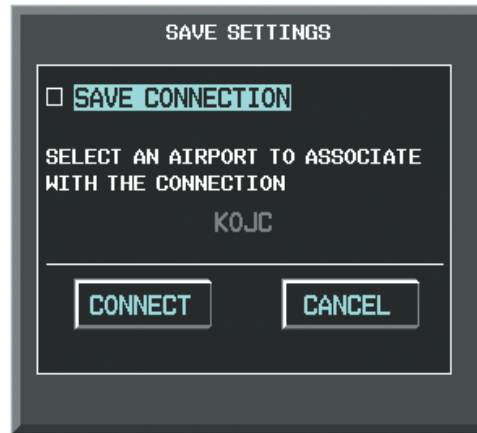


Figure 8-111 Save Option

- 10) The selected network can be saved to system memory to make re-connection easier at a later time.

Connecting the selected network without saving:

- a) Turn the large FMS Knob to move the cursor to highlight 'CONNECT'.
- b) Press the **ENT** Key.

Saving and connect the selected network:

- a) Press the **ENT** Key. A checkmark is placed in the checkbox and the cursor moves to the airport field as shown in Figure 8-112.
- b) Using the **FMS** Knobs, enter an airport identifier to be associated with the saved network. This aids in identifying the network later in the event of duplicate network names.
- c) Press the **ENT** Key. The cursor moves to 'CONNECT'.
- d) Press the **ENT** Key again to connect to the selected network.

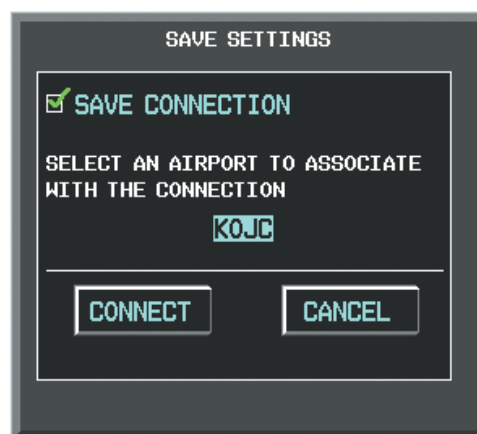


Figure 8-112 Save Connection

Editing a saved network:

- 1) While viewing list of saved networks, press the **FMS** Knob to activate the cursor as seen in Figure 8-113.
- 2) Turn either **FMS** Knob to highlight the network to be edited.
- 3) Pressing the **ENT** Key at this point will check or uncheck the AUTO CONNECT checkbox. When a checkmark is present, the system will automatically connect to the network when within range.



Figure 8-113 Select Network to be Edited

- 4) Select the **EDIT** Softkey. The cursor now appears in the CONNECTION SETTINGS window as shown in Figure 8-114.



Figure 8-114 Select Attributes to Edit

- 5) Turn the large **FMS** Knob to select the network attribute to be edited.
- 6) Turn the small **FMS** Knob to begin editing the field.
- 7) When the entry is complete, press the **ENT** Key.
- 8) Turn the large **FMS** Knob or press the **ENT** Key until 'SAVE' is highlighted.
- 9) Press the **ENT** Key.

Disconnecting a Wi-Fi network:

Select the **DISCNCT** Softkey.

Or:

- 1) Press the **MENU** Key to display the Page Menu.
- 2) Turn either **FMS** Knob to place the cursor on 'Disconnect From Network'.
- 3) Press the **ENT** Key.

Deleting a saved Wi-Fi network:

- 1) While viewing the list of saved networks, press the **FMS** Knob to activate the cursor.
- 2) Turn either **FMS** Knob to highlight the network to be deleted.
- 3) Select the **DELETE** Softkey. The selected network is removed from the list.

SYSTEM DATA LOGGING



NOTE: An account must be established with Garmin Flight Data Services to make full use of the System Data Logging feature.

The system provides recording of Central Maintenance Computer (CMC) data while the aircraft is on the ground or in flight, including engine trend and exceedance data.

The recorded data is then assembled into reports that can be transmitted to Garmin Flight Data Services using any of three data transmission methods (Wi-Fi, Iridium RUDICS, and Iridium Short Burst Data). The system selects the appropriate transmission method based on communication network availability. Data transmission is initiated manually when the airplane is on the ground.

If report transmission is interrupted for some reason (e.g. networks unavailable, hardware failure, loss of power), the system will attempt to resume sending the reports at the next opportunity. The system ensures the complete data set is transmitted.

Transmitted reports remain in the system's memory until they are overwritten by newer data.

Control and monitoring of report transmissions is accomplished through the AUX-REPORT STATUS Page as seen in Figure 8-115.

Viewing the Report Status Page:

- 1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
- 2) Turn the small **FMS** Knob to select AUX-WI-FI SETUP or AUX-REPORT STATUS Page.
- 3) If necessary, select the **REPORT** Softkey to display the AUX-REPORT STATUS Page.



Figure 8-115 Report Status Page

Changing transmission method:

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the 1st or 2nd transmit method for the desired data report.
- 3) Turn the small **FMS** Knob to select the desired option (SAT SHORT BURST, SAT RUDICS, WI-FI, or NONE) as shown in Figure 8-116. Sat Short Burst is generally used for transmission of data packets less than 300 bytes. Wi-Fi is used only when the aircraft on the ground.
- 4) Press the **ENT** Key.



Figure 8-116 Select Transmission Method

Sending all unsent data:

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the SEND button on the desired data report.
- 3) Press the **ENT** Key. The Send Report window is displayed as shown in Figure 8-117.
- 4) Turn the large **FMS** Knob to highlight the 'SELECT DATA TO SEND' field.
- 5) Turn the small **FMS** Knob to select 'ALL UNSENT DATA'.
- 6) Press the **ENT** Key.



Figure 8-117 Select Data to Send

Resending data or send data recorded in a specific time frame:

- 1) While viewing the Report Status Page, press the **FMS** Knob to activate the cursor.
- 2) Turn the large **FMS** Knob to move the cursor to the SEND button on the desired data report.
- 3) Press the **ENT** Key. The Send Report window is displayed as shown in Figure 8-118.
- 4) Turn the large **FMS** Knob to highlight the 'SELECT DATA TO SEND' field.
- 5) Turn the small **FMS** Knob to select 'DATA WITHIN TIME FRAME'.



Figure 8-118 Select Data Within a Specific Time Frame

- 6) Press the **ENT** Key. The time frame selection fields are now displayed as shown in Figure 8-119.
- 7) Turn the large **FMS** Knob to select the starting time or date field.

- 8) Turn the small **FMS** Knob to select the desired starting time or date.



Figure 8-119 Set Starting & Ending Time or Date for Time Frame

- 9) Press the **ENT** Key. The cursor will move to the next field.
- 10) When the last field is addressed, 'OK' will be highlighted as seen in Figure 8-120. Press the **ENT** Key to send the selected data.



Figure 8-120 Select OK to Send Data

Restoring Reports Page options to default settings:

- 1) While viewing the Report Status Page, press the **MENU** Key.
- 2) Turn the **FMS** Knob to select 'Restore Defaults' in the menu list as shown in Figure 8-121.
- 3) Press the **ENT** Key.

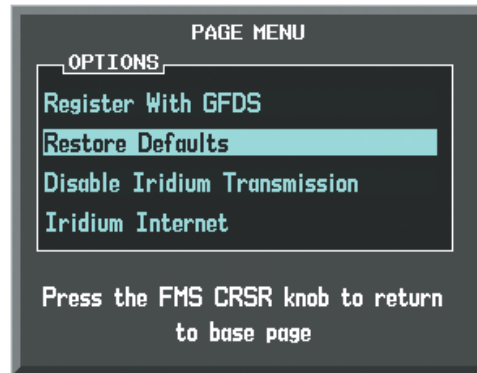


Figure 8-121 Restore Defaults

- 4) A confirmation window as shown in Figure 8-122 is now displayed.



Figure 8-122 Restore Defaults Confirmation

- 5) Turn the large **FMS** Knob to select 'YES' or 'NO'.
- 6) With 'YES' highlighted, press the **ENT** Key.

8.7 XM RADIO ENTERTAINMENT



NOTE: Refer to the Hazard Avoidance Section for information about XM Weather products.

The optional XM Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot's and passengers' enjoyment. The GDL 69A can receive XM Satellite Radio® entertainment services at any altitude throughout the Continental U.S. Entertainment audio is available only on the GDL 69A Data Link Receiver, not the GDL 69.

XM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. XM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.xmradio.com.

ACTIVATING XM SATELLITE RADIO SERVICES

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

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. Either or both services can be activated. XM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the XM Information Page on the MFD (Figure 8-123)
- On the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.



NOTE: The **LOCK** Softkey on the XM Information Page (Auxiliary Page Group) is used to save GDL 69A activation data when the XM services are initially set up. It is not used during normal XM Radio operation, but there should be no adverse effects if inadvertently selected during flight. Refer to the GDL 69/69A XM Satellite Radio Activation Instructions (190-00355-04, Rev H or later) for further information.

Activating the XM Satellite Radio services:

- 1) Contact XM WX Satellite Radio through the e-mail address listed on their website (www.xmradio.com) or by the customer service phone number listed on the website. Follow the instructions provided by XM Satellite Radio services.
- 2) Select the Auxiliary Page Group.
- 3) Select the next to last page in the AUX Page Group.
- 4) Select the **INFO** Softkey to display the XM Information Page.
- 5) Verify that the desired services are activated.
- 6) Select the **LOCK** Softkey.
- 7) Turn the large **FMS** Knob to highlight YES.
- 8) To complete activation, press the **ENT** Key.



Figure 8-123 XM Information Page

If XM weather services have not been activated, all the weather product boxes are blank on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.

USING XM RADIO

The XM Radio Page provides information and control of the audio entertainment features of the XM Satellite Radio.

Selecting the XM Radio Page:

- 1) Turn the large **FMS** Knob to select the Auxiliary Page Group.
- 2) Turn the small **FMS** Knob to select the displayed AUX - XM Information Page.
- 3) Select the **RADIO** Softkey to show the XM Radio Page where audio entertainment is controlled.



Figure 8-124 XM Radio Page

ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel that the XM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

Selecting a channel from the channel list:

- 1) While on the XM Radio Page, select the **CHNL** Softkey.
- 2) Select the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH -** Softkey.

Or:

- 1) Press the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
- 2) Press the **ENT** Key to activate the selected channel.

Selecting a channel directly:

- 1) While on the XM Radio Page, select the **CHNL** Softkey.
- 2) Select the **DIR CH** Softkey. The channel number in the Active Channel Box is highlighted.
- 3) Select the numbered softkeys located on the bottom of the display to directly select the desired channel number.
- 4) Press the **ENT** Key to activate the selected channel.

CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is PRESETS to view channels that have been programmed.

Selecting a category:

- 1) Select the **CATGRY** Softkey on the XM Radio Page.
- 2) Select the **CAT +** and **CAT -** Softkeys to cycle through the categories.

Or:

Turn the small **FMS** Knob to display the Categories list. Highlight the desired category with the small **FMS** Knob and press the **ENT** Key. Selecting All Categories places all channels in the list.



Figure 8-125 Categories List

PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by selecting the **PRESETS** and **MORE** Softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

Setting a preset channel number:

- 1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, select the **PRESETS** Softkey to access the first five preset channels (**PS1 - PS5**).
- 2) Select the **MORE** Softkey to access the next five channels (**PS6 – PS10**), and again to access the last five channels (**PS11 – PS15**). Selecting the **MORE** Softkey repeatedly cycles through the preset channels.
- 3) Select any one of the (**PS1 - PS15**) softkeys to assign a number to the active channel.
- 4) Select the **SET** Softkey on the desired channel number to save the channel as a preset.

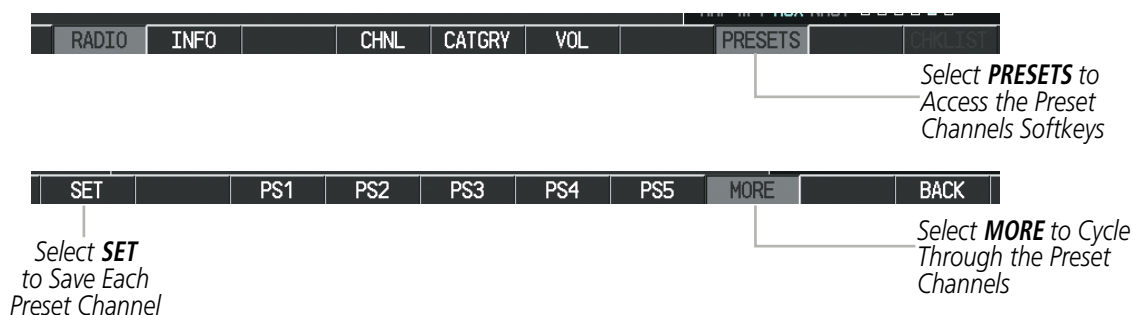


Figure 8-126 Accessing and Selecting XM Preset Channels

Selecting the **BACK** Softkey, or 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUME

Radio volume is shown as a percentage of full volume. Volume level is controlled by selecting the **VOL** Softkey, which brings up the **MUTE** Softkey and the volume increase and decrease softkeys.

Adjusting the volume:

- 1) With the XM Radio Page displayed, select the **VOL** Softkey.
- 2) Select the **VOL –** Softkey to reduce volume or select the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is selected, the volume can also be adjusted using the small **FMS** Knob.)
- 3) Select the **MUTE** Softkey to mute the audio. Select the **MUTE** Softkey again to unmute the audio.

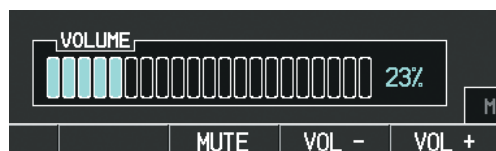


Figure 8-127 Volume Control

XM Radio volume may also be adjusted on each passenger headset.

8.8 SCHEDULER

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

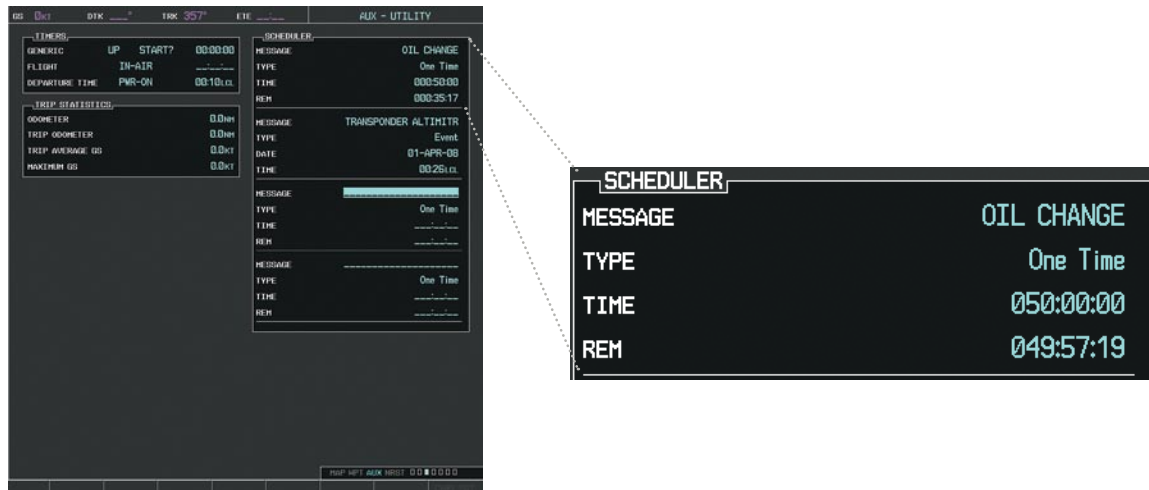


Figure 8-128 Scheduler (Utility Page)

Entering a scheduler message:

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the first empty scheduler message naming field.
- 4) Use the **FMS** Knob to enter the message text to be displayed in the Messages Window and press the **ENT** Key.
- 5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the field next to Type.
- 6) Turn the small **FMS** Knob to select the message type:
 - Event—Message issued at the specified date/time
 - One-time—Message issued when the message timer reaches zero (default setting)
 - Periodic—Message issued each time the message timer reaches zero
- 7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
- 8) For periodic and one-time messages, use the **FMS** Knob to enter the timer value (HH:MM:SS) from which to countdown and press the **ENT** Key.

- 9) For event-based messages:
 - a) Use the **FMS** Knob to enter the desired date (DD-MM-YY) and press the **ENT** Key.
 - b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
 - c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.
- 10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

Deleting a scheduler message:

- 1) Select the AUX - Utility Page.
- 2) Press the **FMS** Knob momentarily to activate the flashing cursor.
- 3) Turn the large **FMS** Knob to highlight the name field of the scheduler message to be deleted.
- 4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.
- 5) Press the **ENT** Key while the message line is cleared to clear the message time.

Scheduler messages appear in the Messages Window on the PFD. When a scheduler message is waiting, the **ALERTS** Softkey label changes to **ADVISORY**. Pressing the **ADVISORY** Softkey opens the Messages Window and acknowledges the scheduler message. The softkey label reverts to **ALERTS** when pressed. Pressing the **ALERTS** Softkey again removes the Messages Window from the display, and the scheduler message is deleted from the message queue.

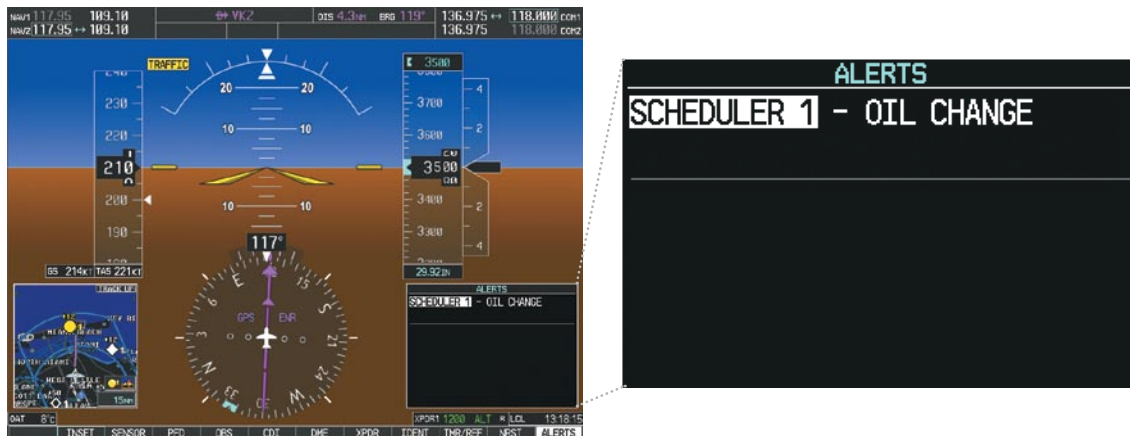


Figure 8-129 PFD Messages Window

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 that date (dataYYYY_MM_DD.csv). The file is created automatically each time the G1000 system is powered on, provided an SD card has been inserted.

The status of the Flight Data Logging feature can be viewed on the AUX-UTILITY Page. If no SD card has been inserted, “NO CARD” is displayed. When data is being written to the SD card, “LOGGING DATA” is displayed.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the G1000 system is capable of logging for the Beechcraft 200/B200 aircraft.

- | | | |
|------------------------------------|--|--|
| • Date | • Latitude (degrees; geodetic; +North) | • Autopilot On/Off |
| • Time | • Longitude (degrees; geodetic; +East) | • AFCS roll/pitch modes |
| • GPS altitude (MSL) | • Magnetic Heading (degrees) | • AFCS roll/pitch commands |
| • GPS altitude (WGS84 datum) | • HSI source | • GPS fix |
| • Baro-Corrected altitude (feet) | • Selected course | • GPS horizontal alert limit |
| • Baro Correction (in/Hg) | • Com1/Com2 frequency | • GPS vertical alert limit |
| • Indicated airspeed (kts) | • Nav1/Nav2 frequency | • SBAS GPS horizontal protection level |
| • Vertical speed (fpm) | • CDI deflection | • SBAS GPS vertical protection level |
| • GPS vertical speed (fpm) | • VDI/GP/GS deflection | • Fuel Qty (right & left)(gals) |
| • OAT (degrees C) | • Wind Direction (degrees) | • Fuel Flow (gph) |
| • True airspeed (knots) | • Wind Speed (knots) | • Turbine RPM |
| • Pitch Attitude Angle (degrees) | • Active Waypoint Identifier | • Oil Pressure (psi) |
| • Roll Attitude Angle (degrees) | • Distance to next waypoint (nm) | • Oil Temperature (deg. F) |
| • Lateral and Vertical G Force (g) | • Bearing to next waypoint (degrees) | • ITT (deg. F) |
| • Ground Speed (kts) | • Magnetic variation (degrees) | • Torque |
| • Ground Track (degrees magnetic) | | |

The file containing the recorded data will appear in the format shown in Figure 8-130. 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_090210_104506_KIXD.csv

Figure 8-130 Log File Format

Data logging status can be monitored on the AUX-UTILITY Page.

8.10 ELECTRONIC STABILITY & PROTECTION (ESP™)

Electronic Stability and Protection (ESP) is an optional feature that is intended to discourage the exceedance of attitude, established airspeed and angle of attack parameters. This feature will only function when the aircraft is above 200 feet AGL and the autopilot is not engaged.

ESP engages when the aircraft exceeds one or more conditions (pitch, roll, Vmo, Mmo, and/or angle of attack) beyond the normal flight parameters. Enhanced stability for each condition is provided by applying a force to the appropriate control surface to return the aircraft to the desired flight envelope. This is perceived by the pilot as resistance to control movement in the undesired direction when the aircraft approaches a steep attitude, high airspeed, or when a stall is imminent.

As the aircraft deviates further from the desired attitude, angle of attack, or airspeed continues to increase, the force increases (up to an established maximum) to encourage control movement in the direction necessary to return to the desired attitude and/or airspeed range. Except in the case of high airspeed, when maximum force is reached, force remains constant up to the maximum engagement limit. Above the maximum engagement limit, forces are no longer applied. There is no maximum engagement related to a high airspeed condition.

When ESP has been engaged for more than ten seconds (cumulative; not necessarily consecutive seconds) of a 20-second interval, the autopilot is automatically engaged with the flight director in Level Mode in the pitch and/or roll axis, bringing the aircraft into level flight. An aural “Engaging Autopilot” alert is played and the flight director mode annunciation will indicate ‘LVL’ for vertical and lateral modes.

The pilot can interrupt ESP by pressing and holding either the Control Wheel Steering (**CWS**) or Autopilot Disconnect (**AP/YD DISC TRIM INTRPT**) switch. Upon releasing the **CWS** or **AP/YD DISC TRIM INTRPT** switch, ESP force will again be applied, provided aircraft attitude, angle of attack and/or airspeed are within their respective engagement limits. ESP can also be overridden by overpowering the servo’s mechanical torque limit.

ESP can be enabled or disabled on the AUX-SYSTEM SETUP 2 Page on the MFD.

To enable or disable ESP:

- 1) Turn the large **FMS** Knob to select the AUX Page Group.
- 2) Turn the small **FMS** Knob to select the System Setup Page.
- 3) If necessary, select the **SETUP 2** Softkey to display the AUX-SYSTEM SETUP 2 Page. If the AUX-SYSTEM SETUP 2 is already displayed, proceed to step 4.
- 4) Press the **FMS** Knob to activate the cursor.
- 5) Turn the large **FMS** Knob to place the cursor in the STABILITY & PROTECTION field.
- 6) Turn the small **FMS** Knob to select ‘ENABLE’ or ‘DISABLE’.
- 7) Press the **FMS** Knob to remove the cursor.

ESP is automatically enabled on system power up.

ROLL ENGAGEMENT

Roll Limit Indicators are displayed on the roll scale at 45° right and left, indicating where ESP will engage (see Figure 8-131). As roll attitude exceeds 45°, ESP will engage and the on-side Roll Limit Indicator will move to 30°, as shown in Figure 8-132. The Roll Limit Indicator is now showing where ESP will disengage as roll attitude decreases to within the desirable roll attitude range.

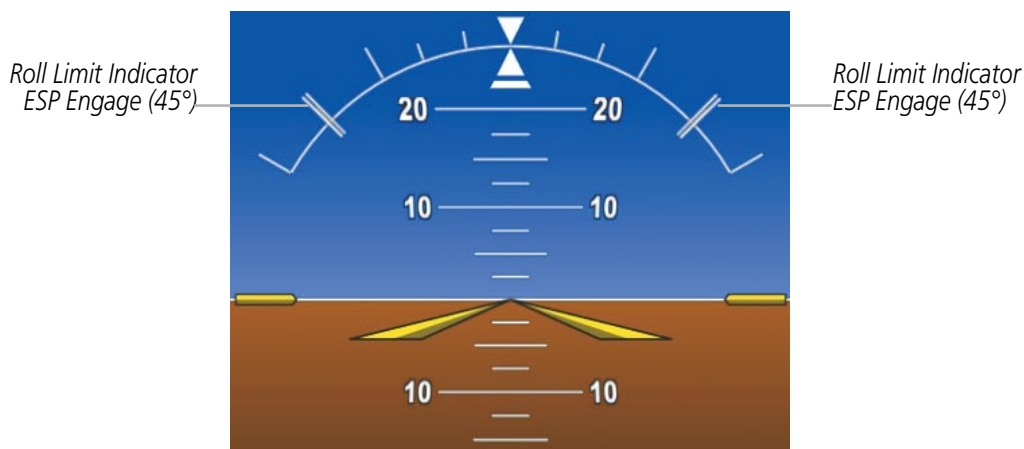


Figure 8-131 ESP Roll Engagement Indication (ESP NOT Engaged)

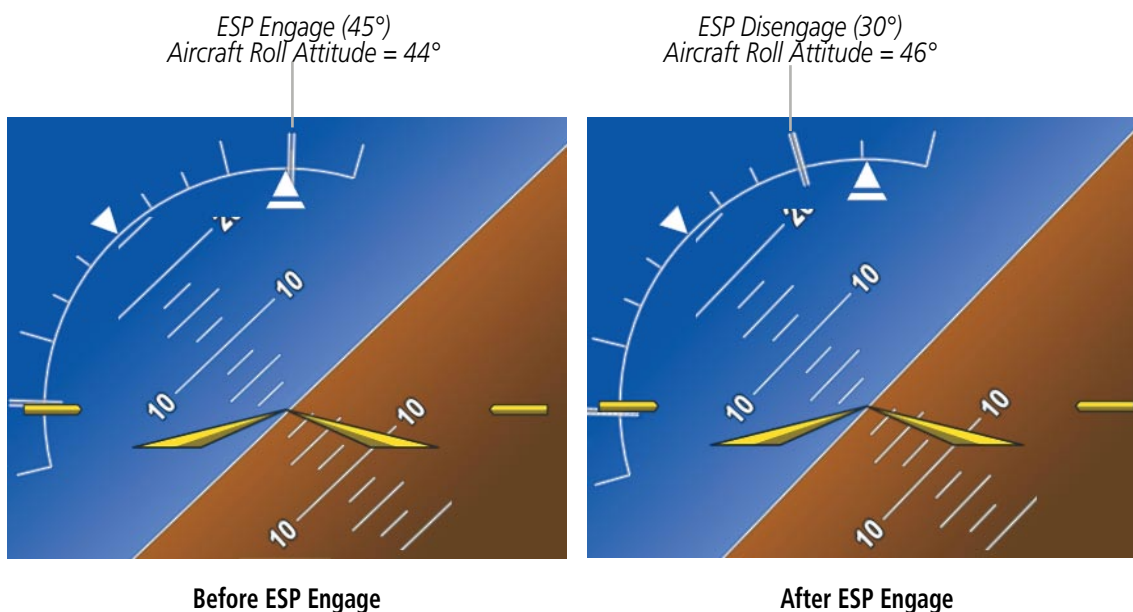


Figure 8-132 Roll Increasing to ESP Engagement

Once engaged, ESP force will be applied between 30° and 75°, as illustrated in Figure 8-133. The force increases as roll attitude increases and decreases as roll attitude decreases. The applied force is intended to encourage pilot input that returns the airplane to a more normal roll attitude. As roll attitude decreases, ESP will disengage at 30°.

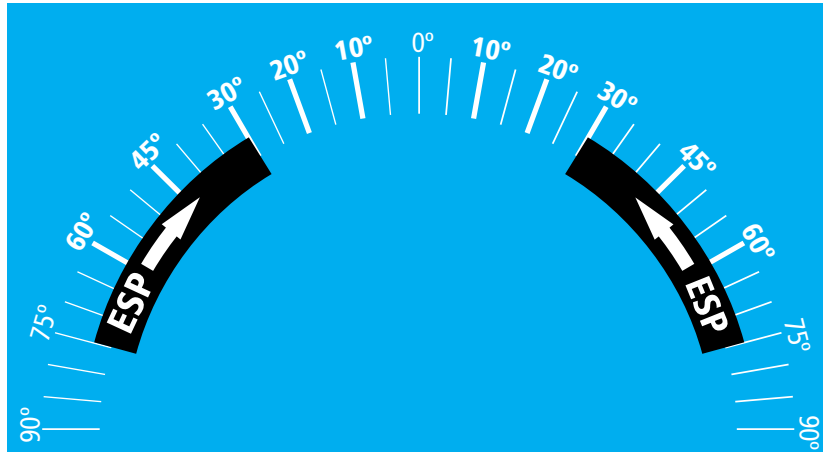


Figure 8-133 ESP Roll Operating Range When Engaged
(Force Increases as Roll Increases & Decreases as Roll Decreases)

ESP is automatically disengaged if the aircraft reaches the autopilot roll engagement attitude limit of 75° (Figure 8-134).

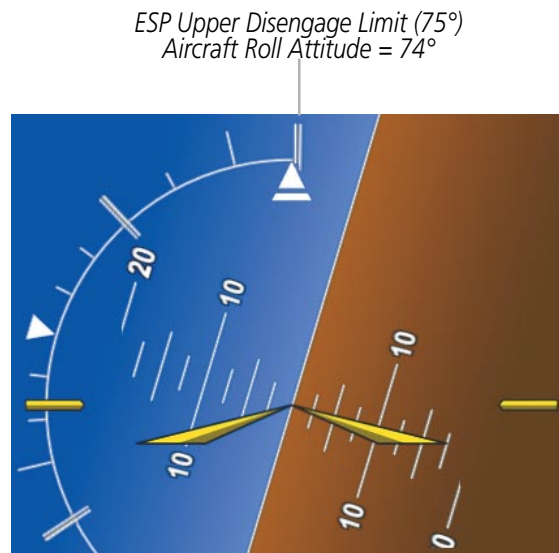


Figure 8-134 Roll Attitude Autopilot Engagement Limit (ESP Engaged)

PITCH ENGAGEMENT

ESP engages at 20° nose-up and 17° nose-down. Once ESP is engaged, it will apply opposing force between 15° and 50° nose-up and between 12° and 50° nose-down, as indicated in Figure 8-135. Maximum opposing force is applied between 25° and 50° nose-up and between 22° and 50° nose-down.

The opposing force increases or decreases depending on the pitch angle and the direction of pitch travel. This force is intended to encourage movement in the pitch axis in the direction of the normal pitch attitude range for the aircraft.

There are no indications marking the pitch ESP engage and disengage limits in these nose-up/nose-down conditions.

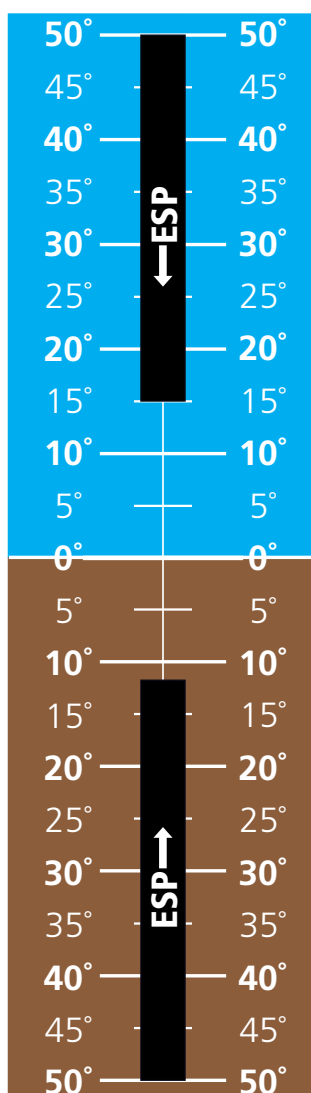


Figure 8-135 ESP Pitch Operating Range When Engaged
(Force Increases as Pitch Increases & Decreases as Pitch Decreases)

ANGLE OF ATTACK PROTECTION

ESP force may be applied if the Angle of Attack computer determines a stall warning condition is imminent. In this condition, the Pitch Limit Indicator will be initially displayed 4° below this computed pitch attitude (Figure 8-136). When pitch attitude equals that indicated by the Pitch Limit Indicator, ESP will engage, applying a force in the direction necessary to lower the nose of the aircraft.

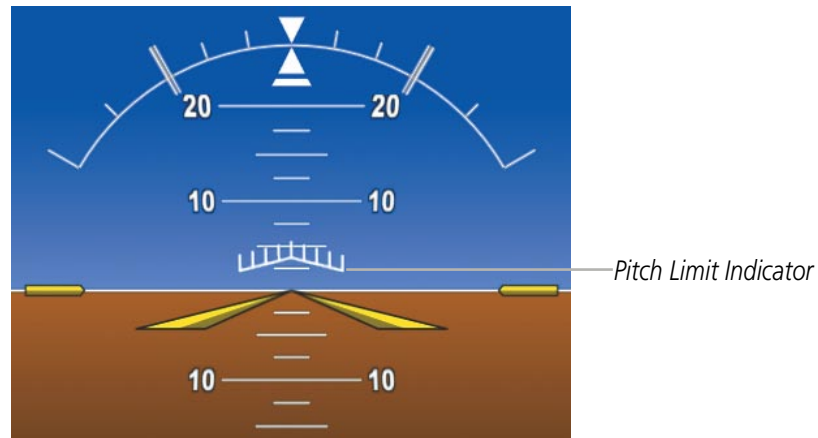


Figure 8-136 Pitch Limit Indicator

HIGH AIRSPEED PROTECTION

Exceeding V_{mo} or M_{mo} will result in ESP applying force to raise the nose of the aircraft. When the high airspeed condition is remedied, ESP force is no longer applied.

8.11 ABNORMAL OPERATION

SVS TROUBLESHOOTING

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

SVS becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data
- 9 Arc-second Terrain data
- Obstacle data
- TAWS function is not available, in test mode, or failed
- The position of the aircraft exceeds the range of the terrain database.

REVERSIONARY MODE

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



Figure 8-137 SVS Reversionary Mode

UNUSUAL ATTITUDES

Unusual attitudes are displayed with red chevrons overlaid on the display indicating the direction to fly to correct the unusual attitude condition. The display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.

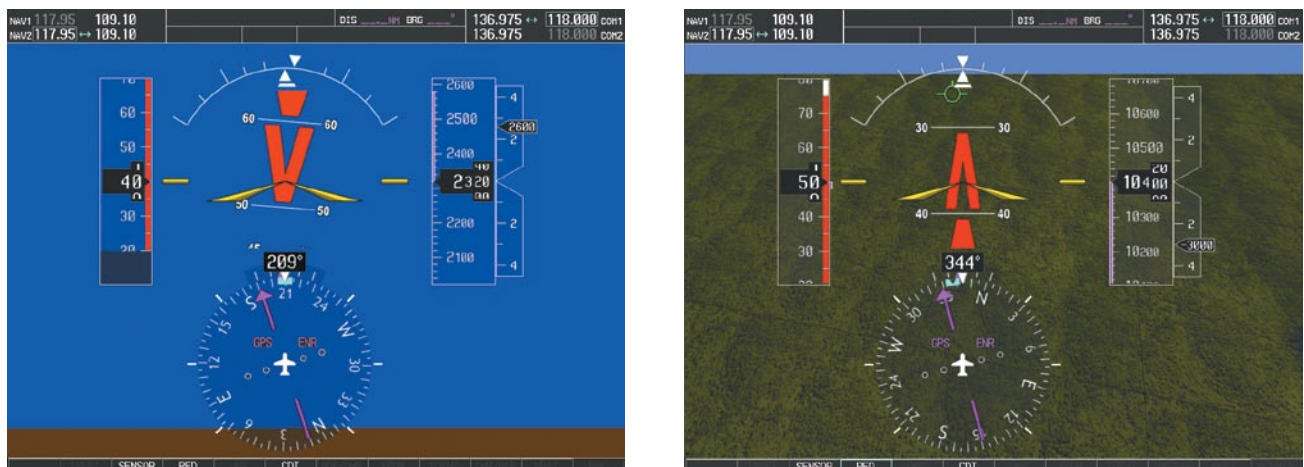


Figure 8-138 Unusual Attitude Display

The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display.



Figure 8-139 Blue Sky Bar with Full Display Terrain

GDL 69/69A 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 XM
- Ensure the XM subscription has been activated
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver
- Ensure that nothing is plugged into the MUSIC 1 or MUSIC 2 jacks because that would prevent XM radio from being heard

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69/69A) status, serial number, and software version number. If a failure has been detected in the GDL 69/69A the status is marked with a red X.

Selecting the AUX - System Status Page:

- 1) Turn the large **FMS** Knob to select the AUX Page Group.
- 2) Turn the small **FMS** Knob to select the AUX - System Status Page.

LRU INFO			
	STATUS	SERIAL NUMBER	VERSION
COM1	✓		7.00
COM2	✓		7.00
GCU	✓	27000006	2.02d
GDC1	✓	47801548	1.05
GDC2	✓	47801373	1.05
GDL69	✓	47750372	3.02.00
GEA1	✓	46701911	2.07
GEA2	✓	46701913	2.07
GEA3	✓	FFFFFFFF	1.02
GIA1	✓	68500319	1.02
GIA2	✓	48400000	3.01
GMA1	✓	48400001	3.01
GMA2	✓		2.02d
GMC	✓	47500593	2.01
GMU1	✓	47500607	2.01
GMU2	✓	AB0062149	2.3

Figure 8-140 LRU Information Window on System Status Page

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	XM Radio Page - active channel field	Data Link Receiver antenna error; service required
UPDATING	XM Radio Page - active channel field	Data Link Receiver updating encryption code
NO SIGNAL	XM Radio Page - active channel field Weather Datalink Page - center of page	Loss of signal; signal strength too low for receiver
LOADING	XM Radio Page - active channel field	Acquiring channel audio or information
OFF AIR	XM Radio Page - active channel field	Channel not in service
---	XM Radio Page - active channel field	Missing channel information
WEATHER DATA LINK FAILURE	Weather Datalink Page - center of page	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	Weather Datalink Page - center of page	XM subscription is not activated

Table 8-7 GDL 69/69A Data Link Receiver Error Messages

BLANK PAGE

ANNUNCIATIONS AND ALERTS



NOTE: *The Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (AFM/POH) supersedes information found in this document.*

The G1000 Alerting System conveys alerts using the following:

- **Annunciation Window:** The Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described later in the Alert Levels Definitions section. The Annunciation Window is located to the right of the Altitude and Vertical Speed boxes on the display. All annunciations can be displayed simultaneously in the Annunciation Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window. Lower priority annunciations are displayed towards the bottom of the window.
- **Alerts Window:** The Alerts Window displays text messages for up to 64 prioritized alert messages. Pressing the **ALERTS** Softkey displays the Alerts Window. Pressing the **ALERTS** Softkey a second time removes the Alerts Window from the display. When the Alerts Window is displayed, the **FMS** Knob can be used to scroll through the alert message list.
- **Softkey Annunciation:** During certain alerts, the **ALERTS** Softkey may appear as a flashing annunciation to accompany an alert. The **ALERTS** Softkey assumes a new label (ADVISORY). By selecting the softkey when flashing an annunciation, the alert is acknowledged. The softkey label then returns to **ALERTS**. If alerts are still present, the **ALERTS** label is displayed in white with black text. Selecting the **ALERTS** Softkey a second time views the alert text messages.
- **System Annunciations:** Typically, a large red 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the G1000 System Annunciations Section for more information.

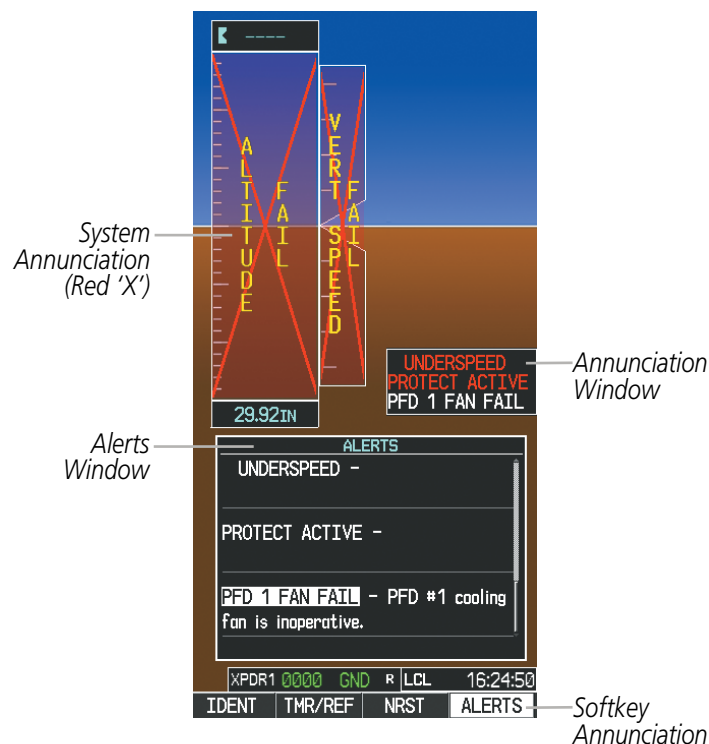
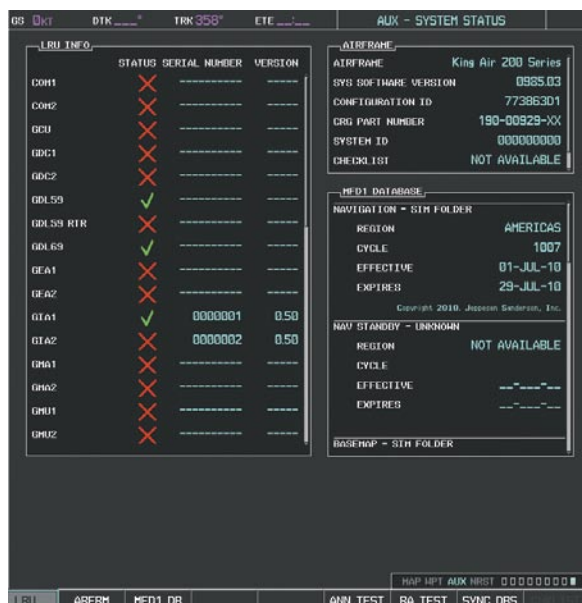


Figure A-1 G1000 Alerting System

- **Audio Alerting System:** The G1000 System issues audio alert tones when specific system conditions are met. See the Alert Level Definitions Section for more information. The annunciation tone may be tested from the AUX - System Status Page.

Testing the system annunciation tone and annunciator lights:

- 1) Use the **FMS** Knob to select the AUX - System Status Page.
 - 2) Select the **ANN TEST** Softkey.
- Or:
- a) Press the **MENU** Key.
 - b) Highlight 'Enable Annunciator Test Mode' and press the **ENT** Key.



Press to Test
Annunciation Tone and
Annunciation Lights

Figure A-2 System Status Page, System Annunciation Testing

ALERT LEVEL DEFINITIONS

The G1000 Alerting System, as installed in Beechcraft 200/B200 Series aircraft, uses one alert level.

- **ANNUNCIATION OR MESSAGE ADVISORY:** This level of alert provides general information.

An annunciation alert is accompanied by a flashing 'ADVISORY' Softkey annunciation (see Figure A-3). Pressing the **ADVISORY** Softkey acknowledges the presence of the annunciation alert.

Message advisory alerts issue a flashing 'ADVISORY' Softkey annunciation (see Figure A-3). Pressing the **ADVISORY** Softkey acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts Window.

ADVISORY

Figure A-3 Softkey Annunciation (ALERTS Softkey Labels)

AIRCRAFT ALERTS

The following alerts are configured specifically for the Beechcraft 200/B200 Series. Red annunciation window text signifies warnings. White annunciation window text signifies advisories. See the Aircraft Flight Manual (AFM) for recommended pilot actions.

WARNING ANNUNCIATIONS

Annunciation Window Text	Alerts Window Message	Audio Alert
UNDERSPEED PROTECT ACTIVE	None	None

ADVISORY ANNUNCIATIONS

Annunciation Window Text	Alerts Window Message	Audio Alert
AVN FAN 1 FAIL	Avionics cooling fan #1 is inoperative.	None
AVN FAN 2 FAIL	Avionics cooling fan #2 is inoperative.	None
MFD FAN FAIL	MFD cooling fan is inoperative.	None
PFD 1 FAN FAIL	PFD #1 cooling fan is inoperative.	None
PFD 2 FAN FAIL	PFD #2 cooling fan is inoperative.	None

MESSAGE ADVISORY ALERTS

Advisory alerts issue a flashing ‘ADVISORY’ Softkey annunciation. Pressing the **ADVISORY** Softkey acknowledges the presence of the advisory alert and displays the alert text message in the Alerts Window.

Alerts Window Message	Audio Alert/Voice Message
TAWS GEAR FAULT – Landing Gear detected in the DOWN position.	None
TAWS FLAP FAULT – Flaps detected in the LDG position.	None
WOW FAULT – Miscompare between weight on wheels inputs.	None
WOW INVALID – Weight on wheels inputs invalid.	None
ESP OFF – ESP selected off.	None
ESP FAIL – ESP is inoperative.	None
ESP DEGRADE – ESP AOA mode is inoperative.	None
ESP DEGRADE – ESP IAS mode is inoperative.	None
YD OFF – AP engaged without Yaw Damper	None

AURAL ALERTS

The following aural alerts are announced by the system using a voice of male or female gender (see the AUX - System Setup Page for the default configured voice gender; contact a Garmin-authorized service center to change the audio alert voice). Terrain Awareness and Warning System voice alerts are also generated (refer to the TAWS Alerts section).

Aural Alert	Description
"Minimums"	The aircraft has descended below the preset minimum descent altitude or decision altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Airspeed"	The aircraft is in an underspeed condition. See the AFCS section for more details.
"Engaging autopilot"	The ESP system is engaging the autopilot. See the AFCS section for more details.
"Traffic"	Played when a Traffic Advisory (TA) is issued with the TIS system, the optional GTS 820 TAS system, or the optional GTS 850 TCAS system. See the Hazard Avoidance section for additional details on GTS 820/850 voice alerts.
"TIS Not Available"	The aircraft is outside the Traffic Information Service (TIS) coverage area.
"Traffic, Traffic"	Played when a Traffic Advisory (TA) is issued with the optional SKY 497/SKY899 TAS system, or the optional KTA 870 TAS system. See the Skywatch PG or KTA 870 PG for additional details on voice alerts.
"Traffic"	Played for each subsequent TA (KTA 870 only).
"Traffic Advisory System Test Passed" "SKYWATCH System Test Passed" "TAS System Test OK" "TAS System Test Passed" "TCAS System Test Passed"	Played when the optional traffic system passes a pilot-initiated self test. - SKY 497 TAS - SKY 899 TAS - KTA 870 TAS - GTS 820 TAS - GTS 850 TCAS
"Traffic Advisory System Test Failed" "SKYWATCH System Test Failed" "TAS System Test Fail" "TAS System Test Fail" "TCAS System Test Fail"	Played when the optional traffic system fails a pilot-initiated self test. - SKY 497 TAS - SKY 899 TAS - KTA 870 TAS - GTS 820 TAS - GTS 850 TCAS
"One o'clock" through "Twelve o'clock" or "No Bearing"	Intruder bearing (GTS 820/850 only)
"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	Intruder relative altitude (GTS 820/850 only)
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Intruder distance (GTS 820/850 only)

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). If one or both of the sensed values are unavailable, it is annunciated as a 'NO COMP' (no compare) as seen in Figure A-4. The following is a list of the possible annunciations:



Figure A-4 Sensor Comparator Window

Comparator Window Text	Condition
ALT MISCOMP	Difference in altitude sensors is ≥ 200 ft.
IAS MISCOMP	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 MISCOMP	Difference in heading sensors is > 6 degrees.
PIT MISCOMP	Difference in pitch sensors is > 5 degrees.
ROL MISCOMP	Difference in roll sensors is > 6 degrees.
ALT NO COMP	No data from one or both altitude sensors.
IAS NO COMP	No data from one or both airspeed sensors.
HDG NO COMP	No data from one or both heading sensors.
PIT NO COMP	No data from one or both pitch sensors.
ROL NO COMP	No data from one or both roll sensors..

REVERSIONARY SENSOR ANNUNCIATIONS

Reversionary sensor 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. Pressing the **SENSOR** Softkey gives access to **ADC1**, **ADC2**, **AHRS1**, and **AHRS2** Softkeys. These softkeys allow manual switching of sensors. In the case of certain types of sensor failures, the G1000 may make some sensor selections automatically. The GPS sensor cannot be switched manually.

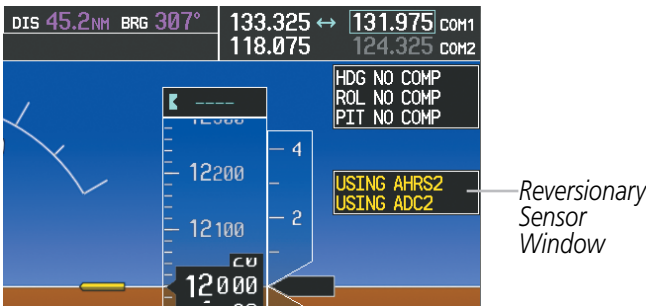


Figure A-5 Reversionary Sensor Windows

Reversionary Sensor Window Text	Condition
BOTH ON ADC1	Both PFDs are displaying data from the number one Air Data Computer.
BOTH ON ADC2	Both PFDs are displaying data from the number two Air Data Computer.
BOTH ON AHRS1	Both PFDs are displaying data from the number one Attitude & Heading Reference System.
BOTH ON AHRS2	Both PFDs are displaying data from the number two Attitude & Heading Reference System.
BOTH ON GPS1	Both PFDs are displaying data from the number one GPS receiver.
BOTH ON GPS2	Both PFDs are displaying data from the number two GPS receiver.
USING ADC1	PFD2 is displaying data from the #1 Air Data Computer.
USING ADC2	PFD1 is displaying data from the #2 Air Data Computer.
USING AHRS1	PFD2 is displaying data from the #1 AHRS.
USING AHRS2	PFD1 is displaying data from the #2 AHRS.
USING GPS1	PFD2 is displaying data from the #1 GPS.
USING GPS2	PFD1 is displaying data from the #2 GPS.

G1000 SYSTEM ANNUNCIATIONS

When a new message is issued, the **ALERTS** Softkey flashes to alert the flight crew of a new message. It continues to flash until acknowledged by pressing the softkey. Active messages are displayed in white text. Messages that have become inactive change to gray text. The **ALERTS** Softkey flashes if the state of a displayed message changes or a new message is displayed. The inactive messages can be removed from the Message Window by pressing the flashing **ALERTS** Softkey.

The G1000 System Messages convey messages to the flight crew regarding problems with the G1000 system. Typically, a large red 'X' appears in a window when a related LRU fails or detects invalid data.

When an LRU or an LRU function fails, a large red 'X' is typically displayed on windows associated with the failed data. The following section describes various system annunciations. Refer to the AFM/POH for additional information regarding pilot responses to these annunciations.



NOTE: Upon power-up of the G1000 system, certain windows remain invalid as G1000 equipment begins to initialize. All windows should be operational within one minute of power-up. Should any window continue to remain flagged, the G1000 system should be serviced by a Garmin-authorized repair facility.

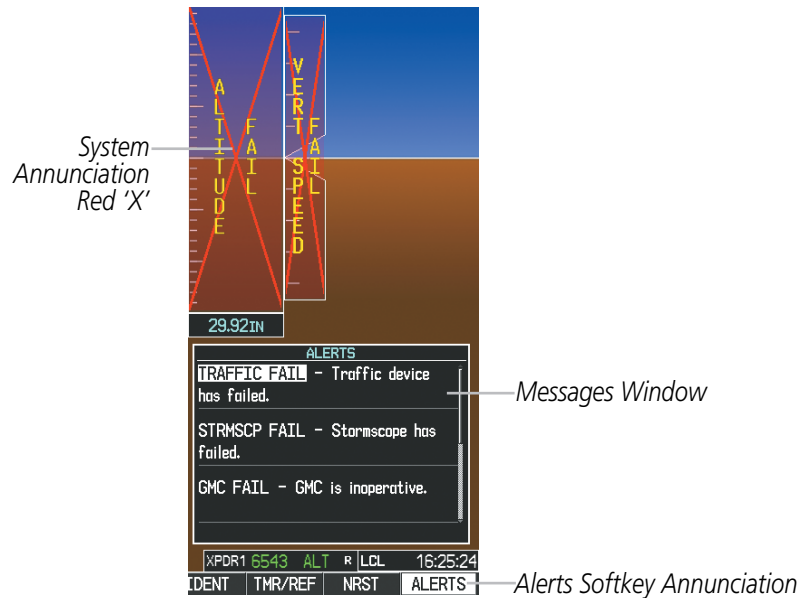


Figure A-6 G1000 System Messages

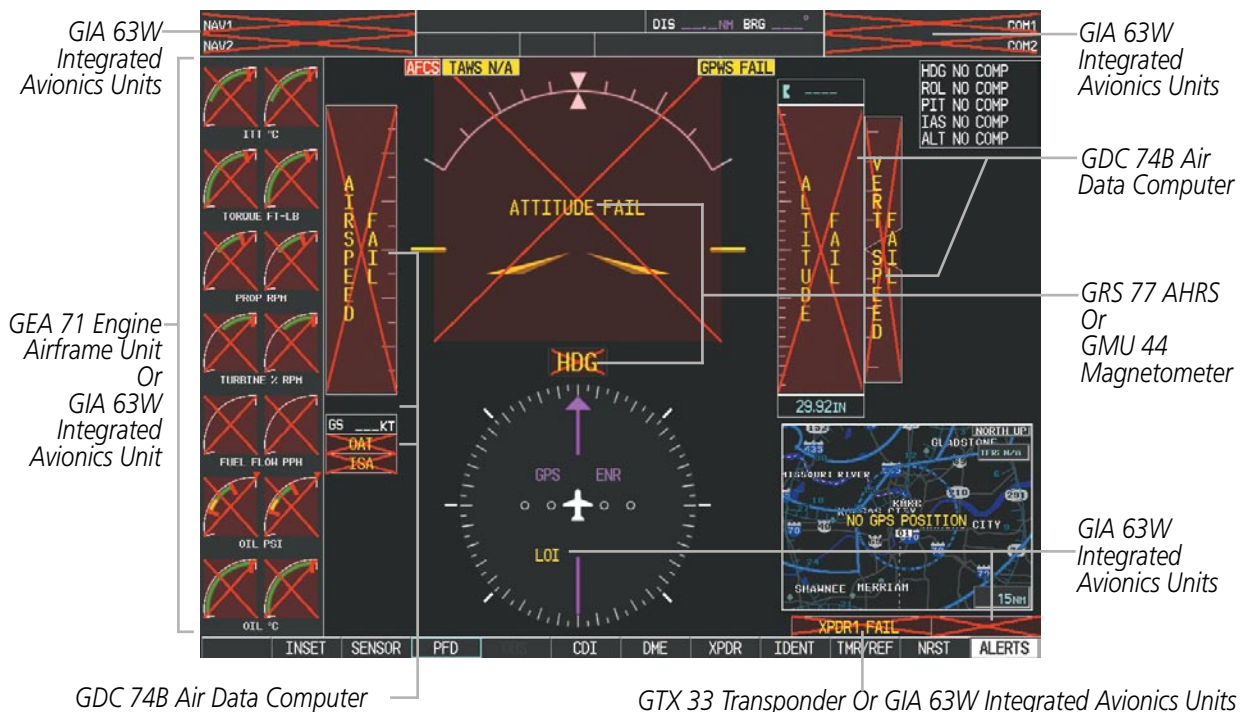









Figure A-7 G1000 System Failure Annunciations



NOTE: Upon power-up, certain windows remain invalid as G1000 equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the G1000 System should be serviced by a Garmin-authorized repair facility.

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	Display system is not receiving airspeed input from air data computer.
	Display system is not receiving valid heading input from AHRS.
	Display system is not receiving altitude input from the air data computer.
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving valid transponder information.
	GPS information is either not present or is invalid for navigation use. Note that AHRS utilizes GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see AFM/POH).
Other Various Red X Indications	A red 'X' through any other display field (such as engine instrumentation display) indicates that the field is not receiving valid data.

G1000 SYSTEM MESSAGE ADVISORIES

This section describes various G1000 system message advisories. Certain messages are issued due to an LRU or an LRU function failure. Such messages are normally accompanied by a corresponding red 'X' annunciation as shown previously in the G1000 System Annunciation section.



NOTE: This Section provides information regarding G1000 message advisories that may be displayed by the system. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message. Always use sound pilot judgment. The AFM/POH takes precedence over any conflicting guidance found in this section.

MFD & PFD MESSAGE ADVISORIES

Message	Comments
DATA LOST – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFD with preferred settings, if desired.
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD and PFD are not communicating with each other. The G1000 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 G1000 system should be serviced.
PFD2 SERVICE – PFD2 needs service. Return unit for repair.	
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	
MANIFEST – PFD1 software mismatch. Communication halted.	The PFD and/or MFD has incorrect software installed. The G1000 system should be serviced.
MANIFEST – PFD2 software mismatch. Communication halted.	
MANIFEST – MFD1 software mismatch. Communication halted.	
PFD1 CONFIG – PFD1 configuration error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.
PFD2 CONFIG – PFD2 configuration error. Config service req'd.	
MFD1 CONFIG – MFD1 configuration error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The G1000 system should be serviced.
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The MFD and PFD have different software versions installed. The G1000 system should be serviced.
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 G1000 system should be serviced.
PFD2 COOLING – PFD2 has poor cooling. Reducing power usage.	
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	

Message	Comments
PFD1 KEYSTK – PFD1 [key name] Key is stuck.	A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.
PFD2 KEYSTK – PFD2 [key name] Key is stuck	
MFD1 KEYSTK – MFD1 [key name] Key is stuck.	
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The G1000 system should be serviced.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage.	The PFD1 voltage is low. The G1000 system should be serviced.
PFD2 VOLTAGE – PFD2 has low voltage. Reducing power usage.	The PFD2 voltage is low. The G1000 system should be serviced.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage.	The MFD voltage is low. The G1000 system should be serviced.

DATABASE MESSAGE ADVISORIES

Message	Comments
MFD1 DB ERR – MFD1 navigation database error exists.	The MFD and/or PFD detected a failure in the navigation database. Attempt to reload the navigation database. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 navigation database error exists.	
PFD2 DB ERR – PFD2 navigation database error exists.	
MFD1 DB ERR – MFD1 basemap database error exists.	The MFD and/or PFD detected a failure in the basemap database. The G1000 system should be serviced.
PFD1 DB ERR – PFD1 basemap database error exists.	
PFD2 DB ERR – PFD2 basemap database error exists.	
MFD1 DB ERR – MFD1 terrain database error exists.	The MFD and/or PFD detected a failure in the terrain database. Ensure that the terrain card is properly inserted in display. Replace terrain card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 terrain database error exists.	
PFD2 DB ERR – PFD2 terrain database error exists.	
MFD1 DB ERR – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU. Ensure that the terrain card is properly inserted in the specified display. Replace terrain card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 terrain database missing.	
PFD2 DB ERR – PFD2 terrain database missing.	

Message	Comments
MFD1 DB ERR – MFD1 obstacle database error exists.	The MFD and/or PFD detected a failure in the obstacle database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 obstacle database error exists.	
PFD2 DB ERR – PFD2 obstacle database error exists.	
MFD1 DB ERR – MFD1 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU. Ensure that the terrain card is properly inserted in the specified display. Replace terrain card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 obstacle database missing.	
PFD2 DB ERR – PFD2 obstacle database missing.	
MFD1 DB ERR – MFD1 airport terrain database error exists.	The MFD and/or PFD detected a failure in the airport terrain database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 airport terrain database error exists.	
PFD2 DB ERR – PFD2 airport terrain database error exists.	
MFD1 DB ERR – MFD1 airport terrain database missing.	The airport terrain database is present on another LRU, but is missing on the specified LRU. Ensure that the terrain card is properly inserted in the specified display. Replace terrain card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 airport terrain database missing.	
PFD2 DB ERR – PFD2 airport terrain database missing.	
MFD1 DB ERR – MFD1 Safe Taxi database error exists.	The MFD and/or PFD detected a failure in the Safe Taxi database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
PFD1 DB ERR – PFD1 Safe Taxi database error exists.	
PFD2 DB ERR – PFD2 Safe Taxi database error exists.	
MFD1 DB ERR – MFD1 Chartview database error exists.	The MFD and/or PFD detected a failure in the Chartview database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
MFD1 DB ERR – MFD1 FliteCharts database error exists.	The MFD and/or PFD detected a failure in the FliteCharts database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the G1000 system should be serviced.
MFD1 DB ERR – MFD1 Airport Directory database error exists.	The MFD detected a failure in the Airport Directory database. Ensure the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
DB MISMATCH – Navigation database version mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions installed. Crossfill is off. Install correct navigation database version in both displays.

Message	Comments
DB MISMATCH – Navigation database type mismatch. Xtalk is off.	The PFDs and MFD have different navigation database types installed (Americas, European, etc.). Crossfill is off. Install correct navigation database type in both displays.
DB MISMATCH – Terrain database version mismatch.	The PFDs and MFD have different terrain database versions installed. Crossfill is off. Install correct terrain database version in both displays.
DB MISMATCH – Terrain database type mismatch.	The PFDs and MFD have different terrain database types installed. Crossfill is off. Install correct terrain database type in both displays.
DB MISMATCH – Obstacle database version mismatch.	The PFDs and MFD have different obstacle database versions installed. Crossfill is off. Install correct obstacle database version in both displays.
DB MISMATCH – Airport Terrain database mismatch.	The PFDs and MFD have different airport terrain databases installed. Crossfill is off. Install correct airport terrain database in both displays.

GMA 1347D MESSAGE ADVISORIES

Message	Comments
GMA1 FAIL – GMA1 is inoperative.	The audio panel self-test has detected a failure. The audio panel is unavailable. The G1000 system should be serviced.
GMA2 FAIL – GMA2 is inoperative.	
GMA XTALK – GMA crosstalk error has occurred.	An error has occurred in transferring data between the two GMAs. The G1000 system should be serviced.
GMA1 CONFIG – GMA1 configuration error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The G1000 system should be serviced.
GMA2 CONFIG – GMA2 configuration error. Config service req'd.	
MANIFEST – GMA1 software mismatch. Communication halted.	The audio panel has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GMA2 software mismatch. Communication halted.	
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio panel self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio panel may still be usable. The G1000 system should be serviced when possible.
GMA2 SERVICE – GMA2 needs service. Return unit for repair.	

GIA 63W MESSAGE ADVISORIES

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 G1000 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 G1000 system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	

Message	Comments
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 G1000 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 G1000 system should be serviced.
GIA2 SERVICE – GIA2 needs service. Return the unit for repair.	
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable. The G1000 system should be serviced.
HW MISMATCH – GIA hardware mismatch. GIA2 communication halted.	
MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GIA2 software mismatch, communication halted.	
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 G1000 system should be serviced.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	
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 G1000 system should be serviced when possible.
COM2 SERVICE – COM2 needs service. Return unit for repair.	
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 G1000 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 G1000 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.

Message	Comments
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
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 – Approach downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only 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'.
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 G1000 system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	
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 G1000 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 G1000 system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The G1000 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 G1000 system should be serviced when possible.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	

GEA 71 MESSAGE ADVISORIES

Message	Comments
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
GEA2 CONFIG – GEA2 config error. Config service req'd.	The GEA2 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GEA2 software mismatch, communication halted.	The #2 GEA 71 has incorrect software installed. The G1000 system should be serviced.

GTX 33 MESSAGE ADVISORIES

Message	Comments
XPDR1 CONFIG – XPDR1 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
XPDR2 CONFIG – XPDR2 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
MANIFEST – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GTX2 software mismatch, communication halted.	The transponder has incorrect software installed. The G1000 system should be serviced.
XPDR1 SRVC – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XPDR2 SRVC – XPDR2 needs service. Return unit for repair.	The #2 transponder should be serviced when possible.
XPDR1 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.
XPDR2 FAIL – XPDR2 is inoperative.	There is no communication with the #2 transponder.

GRS 77 MESSAGE ADVISORIES

Message	Comments
AHRS1 TAS – AHRS1 not receiving valid airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The G1000 system should be serviced.
AHRS2 TAS – AHRS2 not receiving valid 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 G1000 system should be serviced.
AHRS1 GPS – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The G1000 system should be serviced when possible.
AHRS2 GPS – AHRS2 using backup GPS source.	The #2 AHRS is using the backup GPS path. Primary GPS path has failed. The G1000 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 G1000 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 G1000 system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The G1000 system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The #2 AHRS is not receiving backup GPS information. The G1000 system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The G1000 system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The #2 AHRS is operating exclusively in no-GPS mode. The G1000 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.

Message	Comments
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.
GEO LIMITS – AHRS1 too far North/South, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is flagged as invalid.
GEO LIMITS – AHRS2 too far North/South, no magnetic compass.	
MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GRS2 software mismatch, communication halted.	The #2 AHRS has incorrect software installed. The G1000 system should be serviced.

GMU 44 MESSAGE ADVISORIES

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 G1000 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 G1000 system should be serviced.
MANIFEST – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GMU2 software mismatch, communication halted.	

GDL 69A MESSAGE ADVISORIES

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 G1000 system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69. The receiver is unavailable. The G1000 system should be serviced.
MANIFEST – GDL software mismatch, communication halted.	The GDL 69 has incorrect software installed. The G1000 system should be serviced.

GDC 74B MESSAGE ADVISORIES

Message	Comments
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	GDC1 or GDC2 is reporting that the altitude error correction is unavailable. The G1000 system should be serviced.
ADC2 ALT EC – ADC2 altitude error correction is unavailable.	
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC1 or GDC2 is reporting that the airspeed error correction is unavailable. The G1000 system should be serviced.
ADC2 AS EC – ADC2 airspeed error correction is unavailable.	

Message	Comments
MANIFEST – GDC1 software mismatch, communication halted.	The GDC 74B has incorrect software installed. The G1000 system should be serviced.
MANIFEST – GDC2 software mismatch, communication halted.	

GCU 477 MESSAGE ADVISORIES

Message	Comments
GCU CNFG – GCU Config error. Config service req'd.	GCU 477 configuration settings do not match those of backup configuration memory. The G1000 system should be serviced.
GCU FAIL – GCU is inoperative.	A failure has been detected in the GCU 477. The GCU 477 is unavailable.
MANIFEST – GCU software mismatch, communication halted.	The GCU 477 has incorrect software installed. The G1000 system should be serviced.
GCU KEYSTK – GCU [keyname] Key is stuck	A key is stuck on the GCU 477 bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.

GMC 710 MESSAGE ADVISORIES

Message	Comments
GMC CNFG – GMC Config error. Config service req'd.	Error in the configuration of the GMC 710.
GMC FAIL – GMC is inoperative.	A failure has been detected in the GMC 710. The GMC 710 is unavailable.
MANIFEST – GMC software mismatch, communication halted.	The GMC 710 has incorrect software installed. The G1000 system should be serviced.
GMC KEYSTK – GMC [keyname] Key is stuck	A key is stuck on the GMC 710 bezel. Attempt to free the stuck key by pressing it several times. The G1000 system should be serviced if the problem persists.

GWX 68 MESSAGE ADVISORIES

Message	Comments
GWX CONFIG – GWX config error. Config service req'd.	GWX 68 configuration settings do not match those of the GDU configuration. The G1000 system should be serviced.
GWX FAIL – GWX is inoperative.	The GDU is not receiving status packet from the GWX 68 or the GWX 68 is reporting a fault. The GWX 68 radar system should be serviced.
GWX SERVICE – Needs service. Return unit for repair.	A failure has been detected in the GWX 68. The GWX 68 may still be usable.
WX ALERT – Possible severe weather ahead.	The GWX 68 indicates severe weather within ± 10 degrees of the aircraft heading at a range of 80 to 320 nm.
MANIFEST – GWX software mismatch, communication halted.	The GWX 68 has incorrect software installed. The G1000 system should be serviced.

GTS 820/850 TRAFFIC ADVISORY SYSTEM

Message Advisory	Comments
GTS CONFIG – GTS Config error. Config service req'd.	The GTS and GDU have different copies of the GTS configuration, or the Mode S address is invalid. The G1000® system should be serviced.
MANIFEST – GTS software mismatch, communication halted.	The GTS has incorrect software installed. The G1000® system should be serviced.

GSR 56 MESSAGE ADVISORIES

Message	Comments
GSR1 FAIL – GSR1 has failed.	A failure has been detected in the #1 GSR 56. 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 GFDS – Data services are inoperative, register w/ GFDS.	The GDL 59 is not registered with Garmin Flight Data Services, or it's current registration data has failed authentication.
MANIFEST – GDL software mismatch, communication halted.	The GDL 59 has incorrect software installed. The system should be serviced.

MISCELLANEOUS MESSAGE ADVISORIES

Message	Comments
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-up, the G1000 system detects that a stored flight plan waypoint is locked. This occurs when an navigation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in a flight plan that is deleted. Remove the waypoint from the flight plan if it no longer exists in any database, Or - update the waypoint name/identifier to reflect the new information.
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 that the timer has expired.
DB CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains a procedure that is no longer consistent with the navigation database. This alert is issued only after an navigation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.

Message	Comments
DB CHANGE – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after an navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
ESP CONFIG – ESP config error. Config service req'd.	The ESP function is not installed correctly. ESP is not available. The system should be serviced.
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.
LOCKED FPL – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.
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.
INSIDE ARSPC – Inside airspace.	The aircraft is inside the special use airspace.
ARSPC AHEAD – Airspace ahead less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the special use 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.
APPR INACTV – Approach is not active.	The system notifies the pilot that 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.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
PTK FAIL – Parallel track unavailable: invalid leg type.	Invalid leg type for parallel offset.
PTK FAIL – Parallel track unavailable: past IAF.	IAF waypoint for parallel offset has been passed.
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 crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.

Message	Comments
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.
NO WGS84 WPT – Non WGS 84 waypoint for navigation -[xxxx]	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint.
TRAFFIC FAIL – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The G1000 system should be serviced.
FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA 63/W 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°.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
SVS – SVS DISABLED: Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVS – SVS DISABLED: Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.
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 – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 1 ERR – Card 1 is invalid.	The SD card in the top card slot of the specified PFD or MFD contains invalid data.
[PFD1, PFD2, or MFD1] CARD 2 ERR – Card 2 is invalid.	The SD card in the bottom card slot of the specified PFD or MFD contains invalid data.

AFCS ALERTS

System Status Field



Figure A-8 AFCS System Status Field

The following alert annunciations appear in the AFCS System Status field on the PFD.

Condition	Annunciation	Description
Pitch Failure	PTCH	Pitch axis control failure. AP is inoperative.
Roll Failure	ROLL	Roll axis control failure. AP is inoperative.
MET Switch Stuck, or Pitch Trim Axis Control Failure	PTRM	If annunciated when AP is engaged, take control of the aircraft and disengage the autopilot. If annunciated when AP is not engaged, move each half of the MET switch separately to check if a stuck switch is causing the annunciation.
Yaw Damper Failure	YAW	YD control failure; AP also inoperative
System Failure	AFCS	AP and MET are unavailable. FD may still be available.
Elevator Mistrim Up	↑ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose up control wheel force upon autopilot disconnect.
Elevator Mistrim Down	↓ELE	A condition has developed causing the pitch servo to provide a sustained force. Be prepared to apply nose down control wheel force upon autopilot disconnect.
Aileron Mistrim Left	←AIL	A condition has developed causing the roll servo to provide a sustained left force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Aileron Mistrim Right	AIL→	A condition has developed causing the roll servo to provide a sustained right force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Rudder Mistrim Left	←RUD	A condition has developed causing the yaw servo to provide a sustained force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Rudder Mistrim Right	RUD→	A condition has developed causing the yaw servo to provide a sustained force. Ensure the slip/skid indicator is centered and observe any maximum fuel imbalance limits.
Preflight Test	PFT	Performing preflight system test. Upon completion of the test, the aural alert will be heard.
	PFT	Preflight system test has failed.



NOTE: Do not press the **AP/YD DISC TRIM INTRPT** switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

TAWS ALERTS

Annunciations appear on both PFDs and the MFD. Pop-up alerts appear only on the MFD.

Alert Type	PFD/MFD TAWS Page Annunciation	Additional TAWS Page Annunciation	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP † or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up" † or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD - PULL-UP or TERRAIN - PULL-UP †	Terrain Ahead, Pull Up; Terrain Ahead, Pull Up" or "Terrain, Terrain; Pull Up, Pull Up" †
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP † or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up" † or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE AHEAD - PULL-UP or OBSTACLE - PULL-UP †	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up" or "Obstacle, Obstacle; Pull Up, Pull Up" †
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up" or " [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 † or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain" † or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD or CAUTION - TERRAIN †	"Terrain Ahead; Terrain Ahead" or "Caution, Terrain; Caution, Terrain" †
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE † or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle" † or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD or CAUTION - OBSTACLE †	"Obstacle Ahead; Obstacle Ahead" or "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 † or TOO LOW - TERRAIN	"Don't Sink" † or "Too Low, Terrain"
*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"

* TAWS-A Only

† Default Selection

Alert Type	PFD/MFD TAWS Page Annunciation	Additional TAWS Page Annunciation	Aural Message
*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	"Glide Slope" or "Glide Path"
Altitude Voice Callout (VCO) (all except "Five-Hundred" are configurable)	None	None	"Five-Hundred" or * "Four-Hundred" or * "Three-Hundred" or * "Two-Hundred" or * "One-Hundred"

* TAWS-A Only

† Default Selection

TAWS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD TAWS Page Annunciation	Additional TAWS Page Annunciation	Aural Message	TAWS Alert Types Not Available
System Test in progress	TAWS TEST	TAWS TEST	None	None Available
System Test pass	None	None	"TAWS System Test OK"	
TAWS System Test Fail; Terrain, Airport Terrain or Obstacle database unavailable or invalid on all GDUs; software mismatch among GDUs; TAWS audio fault	TAWS FAIL †	TAWS FAIL	"TAWS System Failure"	FLTA, PDA
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None	
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"	FLTA, PDA, GSD††, VCO
Excessively degraded GPS signal, or out of database coverage area	TAWS N/A	None	"TAWS Not Available"	FLTA, PDA
Sufficient GPS signal reception restored	None	None	"TAWS Available" (aural message only in flight)	
TAWS Alerting is disabled	TAWS INH	None	None	FLTA, PDA
*Radar Altimeter invalid, Vertical Speed Invalid, GPS and Baro Altitude invalid, Software mismatch among GDUs, TAWS configuration mismatch among GDUs, TAWS audio fault	GPWS FAIL †	None	"GPWS System Failure"	EDR, ECR, NCR, FIT, GSD

Alert Type	PFD/MFD TAWS Page Annunciation	Additional TAWS Page Annunciation	Aural Message	TAWS Alert Types Not Available
*GPWS Alerting is disabled	GPWS INH	None	None	EDR, ECR, NCR, FIT
*Flap Override is enabled	FLAP OVR	None	None	FIT alerts based on flap position
*Glideslope/Glidepath Alerting is disabled	GS INH or GP INH	None	None	GSD

* TAWS-A Only

† VCO alerts are not issued if both TAWS and GPWS systems have failed or are not available.

†† GSD alert will be available if a valid ILS is being used for navigation, even if no valid GPS signal is being received.

FLIGHT PLAN IMPORT/EXPORT MESSAGES

In some circumstances, some messages may appear in conjunction with others.

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. One or more of these waypoints did not import successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints that the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight 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.

SD CARD USE

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.



CAUTION: Do not load Jeppesen navigation data (except ChartView) onto Garmin Supplemental Data Cards.



NOTE: Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the AUX-System Status Page being displayed in yellow.

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.



NOTE: The Jeppesen aviation navigation database is now referred to as the 'navigation database'. Previously this database had been referred to as the 'aviation database'.

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 navigation database update into the top card slot of the display (PFD or MFD) to be updated (label of SD card facing left).
- 2) Turn the system ON. A prompt similar to the following is displayed in the upper left corner of the display:

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 0904 0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES: 07-MAY-2009 04-JUN-2009
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1: Standby Navigation Database Prompt

- 3) Press the **NO** Softkey to proceed to the active database update, or press the **YES** Softkey to start the standby database update to the SD card in the bottom card slot.

- 4) A prompt similar to the following is displayed, press the **YES** Softkey to update the active navigation database.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?  
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.  
  
FROM      TO  
REGION:   WORLDWIDE   WORLDWIDE  
CYCLE:    0904        0905  
EFFECTIVE: 09-APR-2009  07-MAY-2009  
EXPIRES:  07-MAY-2009  04-JUN-2009  
  
NO WILL BE ASSUMED IN 8 SECONDS.  
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.  
.  
UPDATED 1 FILES SUCCESSFULLY!  
PRESS ANY KEY TO CONTINUE.  
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

- 5) After the update completes, the display starts in normal mode.
- 6) Turn the system OFF and remove the SD card.
- 7) Repeat steps 1 through 4 for the other PFD and the MFD. The MFD and PFD databases are now updated. Remove the SD card when finished.
- 8) During MFD startup, verify that the correct update cycle is loaded.

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so that the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (upon on-ground power up) as to whether the database should be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-up. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Uploading the standby database to the active location takes approximately 45-55 seconds. The pilot is alerted that the update is complete by a system alert message, 'NAV DB UPDATED'.

Loading a standby navigation database:

- 1) With the system OFF, insert the SD card containing the navigation database update into the top card slot of the desired PFD or MFD.
- 2) Verify that an SD card is inserted in the bottom slot.

- 3) Turn the system ON. A prompt similar to the following is displayed.

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 0904 0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES: 07-MAY-2009 04-JUN-2009
NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-3 Standby Navigation Database Prompt

- 4) Press the **YES** Softkey, to start the update.
- 5) After the navigation database files are copied to the bottom SD card. A prompt similar to the following is displayed.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
FROM TO
REGION: WORLDWIDE WORLDWIDE
CYCLE: 0904 0905
EFFECTIVE: 09-APR-2009 07-MAY-2009
EXPIRES: 07-MAY-2009 04-JUN-2009
NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-4 Active Navigation Database Prompt

- 6) Press the **YES** Softkey to manually update the active navigation database, or press the **NO** Softkey to allow the system to automatically update the active navigation database as applicable per database effectivity.
- 7) After the update, the display starts in normal mode.
- 8) Repeat steps 1-7 for each PFD and the MFD, if updating manually.
- 9) Verify the effectivity of the active navigation database in each PFD and the MFD on the AUX-System Status Page.



NOTE: The system compares the active databases on each PFD and the MFD, and displays a system alert message 'DB Mismatch' if they are not identical. Similarly, if the standby databases on each PFD and the MFD are not identical, the system will display a 'DB Mismatch' alert for the standby navigation databases. Garmin recommends enabling the automatic database synchronization feature to protect against database mismatches.

GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Airport terrain
- SafeTaxi
- Airport Directory (AOPA)
- Terrain
- Obstacle
- FliteCharts

After subscribing to the desired database product, these database products will be downloaded to three Supplemental Data Cards (with the exception of FliteCharts, which is loaded on only one card). Insert each Supplemental Data Card into the correct location shown in Figure B-5. These cards must not be removed except to update the databases stored on each card.

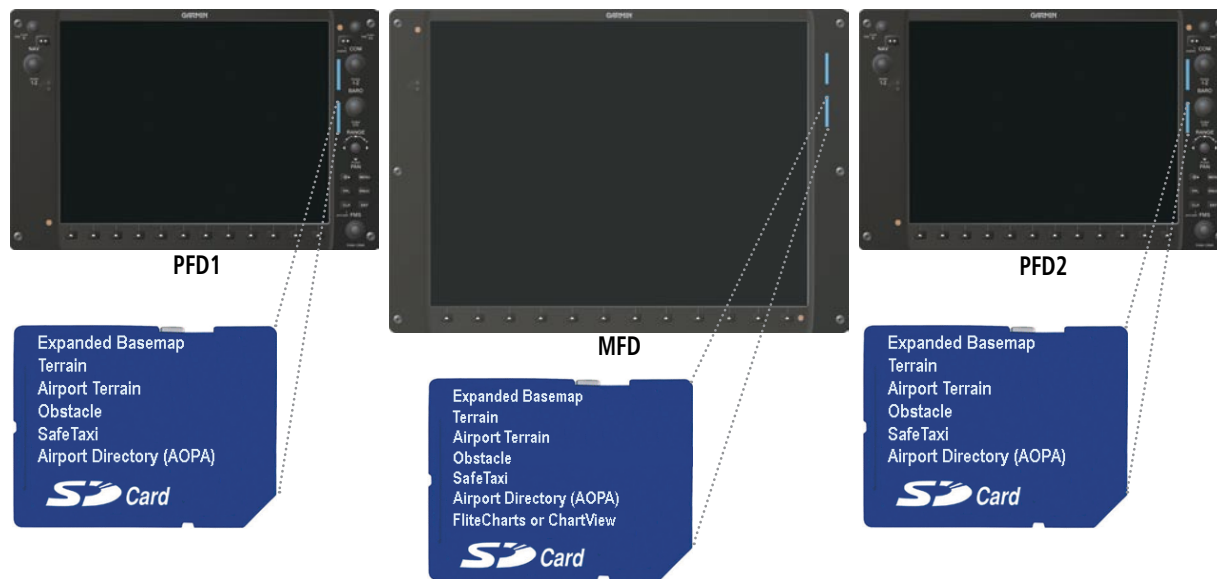


Figure B-3 Correct Database Locations

Since these databases are not stored internally in the displays, a Supplemental Data Card containing identical database versions must be kept in each display unit.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. The airport terrain database contains increased resolution terrain data around airports. These databases are updated periodically and have no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.



NOTE: The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.

The AOPA Airport Directory provides data on airports and heliports throughout the U.S., and offers detailed information for over 5,300 U. S. airports, along with the names and phone numbers of thousands of FBOs. This database is updated four times per year and has no expiration date.

The SafeTaxi database contains detailed airport diagrams for selected airports. These diagrams aid in following ground control instructions by accurately displaying the aircraft position on the map in relation to taxiways, ramps, runways, terminals, and services. This database is updated on a 56-day cycle.

The FliteCharts database contains procedure charts for the United States only. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

UPDATING GARMIN DATABASES

The Garmin database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website (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 the existing Supplemental Data Cards. Equipment required to perform the update is as follows:

- Windows-compatible PC computer (Windows 2000 or XP recommended)
- SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
- Updated database obtained from the Garmin website
- Existing Supplemental Database SD Cards (010-00330-41, -42, or -43) 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 cards, perform the following steps:

- 1) Insert one SD card in the bottom card slot of the MFD and one in the bottom card slot of each PFD. The SD card containing the ChartView or FliteCharts database must be inserted into the bottom slot on the MFD.
- 2) Apply power to the system. View the MFD power-up screen. Check that the databases are initialized and displayed on the power-up screen. When updating the terrain and FliteCharts databases, an 'in progress' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 3.

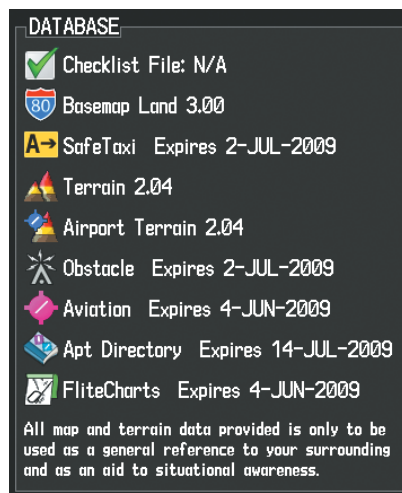


Figure B-6 Database Information on the Power-up Screen

- 3) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.
- 4) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 5) Turn the small **FMS** Knob to select the System Status Page.



Figure B-7 Display Database Softkey

- 6) Press the Display Database Softkey (Figure B-7) to place the cursor in the 'DATABASE' box.
- 7) Turn either **FMS** Knob to scroll through the database list and check that all databases are current and there are no errors.
- 8) Press the Display Database Softkey to view the Database info pertaining to the desired PFD or MFD.
- 9) Turn either **FMS** Knob to scroll through the database list and check that all databases are current and there are no errors.
- 10) Repeat steps 8 and 9 until all the databases in each applicable display have been verified.
- 11) Power down the system.

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

The automatic database synchronization feature automatically transfers the database from a single SD database card to the SD cards on each PFD and the MFD to ensure that all databases are synchronized throughout the system. After power-up, the system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Standby Navigation, Basemap, Safetaxi, Airport Terrain, Obstacle, Airport Directory (AOPA), and Terrain. This feature applies only to databases that are stored on the SD card that resides in the bottom slot of each display. This feature does not apply to the active navigation database which is stored internally in each display, or to the charts databases (FliteCharts and ChartView) which are only required to be present on the MFD. The typical procedure would be to download new databases to the MFD card, then synchronize the data to the PFD(s).



NOTE: The 9-arc second terrain database may take as long as 100 minutes to synchronize using this method. Therefore the user may want to transfer the data using a PC, or connect the system to a ground power source while performing the database synchronization.

If the automatic database synchronization feature is enabled, the standby navigation database can be loaded onto a single SD card (using the Dual Navigation Database Feature) and placed in the bottom card slot of the MFD. After power-up, the system will transfer the standby navigation database from that card to the bottom SD card in each PFD. After the sync completes, if the active navigation database is out-of-date and the standby database is effective, the standby database will be transferred and used as the internal active database upon the next power cycle.

The synchronization progress may be monitored on the AUX-System Status Page in the Sync Status section of the Database Window (Figure B-8). This section shows the synchronization status of each applicable database, including the percent complete, time remaining, and to which displays the databases are being copied. When the synchronization is complete, the status is listed as 'Complete', followed by the displays to which the databases were copied. This sub-section is only present when a sync is occurring or has occurred on the current power-up.

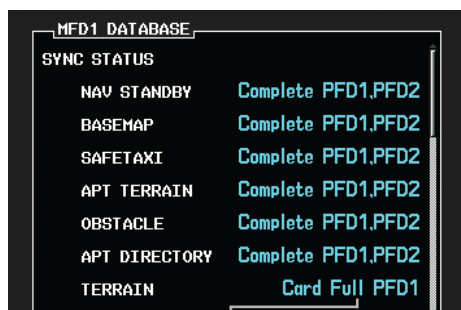
An indication of 'Complete' still requires a power cycle before the synchronized databases will be used by the system.



Figure B-8 AUX-System Status Page, Database Window

The Display Database Softkey (Figure B-7) is used to place the cursor in the Database Window. Upon first press of the Display Database Softkey, the softkey will change to a selected state (black text on gray background) and the cursor will appear in the Database Window. At this point the user can scroll through all databases in the Database Window to view status information. If the Display Database Softkey is pressed repeatedly, the softkey will cycle through PFD1, PFD2, and MFD. Database status information in the Database Window will reflect the database of the selected PFD or MFD. After a successful sync and restart, verify that the proper databases are now in use on the AUX-System Status Page (Figure B-8).

If an error occurs during the synchronization, an error message will be displayed, followed by the affected display in the Sync Status section of the Database Window (Figure B-9). If a synchronization completes on one display, but an error occurs on another, the error message will be displayed with the affected display listed after it. When an error message (Table B-1) is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization when 'Card Full' or 'Err' is shown.



Database Synchronization Error Message

Figure B-9 Synchronization Error Message

Error Message	Description
Canceled	An active synchronization has been canceled using the SYNC DBS Softkey
Card Full	SD card does not contain sufficient memory
Err	Displayed for all other errors that may cause the synchronization process to be halted
Timeout	System timed-out prior to the database transfer completing

Table B-1

The **SYNC DBS** Softkey (Figure B-10) on the AUX–System Status Page allows the flight crew control over the automatic database synchronization feature. When database synchronization is enabled, the **SYNC DBS** Softkey is displayed as black text on gray background. When database synchronization is disabled, the softkey is displayed as white text on black background. If the **SYNC DBS** Softkey is pressed while a database synchronization is in progress, the current synchronization process will be canceled.



Figure B-10 SYNC DBS Softkey

Performing a database synchronization:

- 1) 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. When updating the terrain and FliteCharts databases, an 'in progress' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.
- 5) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.
- 6) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 7) Turn the small **FMS** Knob to select the System Status Page.
- 8) Make sure the **SYNC DBS** Softkey is in the enabled state (Figure B-10).
- 9) Monitor the Sync Status in the Database Window, wait for all databases to complete synching.
- 10) Remove and reapply power to the system, select the AUX-System Status Page, and verify that all databases have been synchronized.

Canceling an automatic database synchronization:

- 1) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
- 2) Turn the small **FMS** Knob to select the System Status Page.
- 3) Press the **SYNC DBS** Softkey (if needed) to disable (Figure B-10) automatic database synchronization.
- 4) Acknowledge the cancellation by pressing the **ENT** Key.

BLANK PAGE

GLOSSARY

ACC	accuracy	AUX	auxiliary
ACT, ACTV	active, activate	AWOS	Automated Weather Observing System
ADC	air data computer		
ADF	Automatic Direction Finder	B ALT	barometric altitude
ADI	Attitude Direction Indicator	BARO	barometric setting
AF	Arc to fix	BATT	battery
AFCS	Automatic Flight Control System	BC	backcourse
AFM	Airplane Flight Manual	Bearing	The compass direction from the present position to a destination waypoint.
AFMS	Airplane Flight Manual Supplement		
AFRM	airframe	BFO	beat frequency oscillator
AGL	Above Ground Level	BKSP	backspace
AHRS	Attitude and Heading Reference System	BRG	bearing
AIM	Airman's Information Manual		
AIRMET	Airman's Meteorological Information	C	center runway
ALRT	alert	°C	degrees Celsius
ALT	altitude	CA	Course to Altitude
ALT, ALTN	alternator	CALC	calculator
AMPS	amperes	Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
ANNUNC	annunciation	CD	Course to DME distance
ANT	antenna	CDI	Course Deviation Indicator
AP	autopilot	CDU	Control Display Unit
AP DISC	autopilot disconnect	CF	Course to Fix
APR	approach	CHT	Cylinder Head Temperature
APT	airport, aerodrome	CHKLIST	checklist
ARINC	Aeronautical Radio Incorporated	CHNL	channel
ARSPC	airspace	CI	Course to Intercept
ARTCC	Air Route Traffic Control Center	CLD	cloud
ARV	arrival	CLR	clear
AS	airspeed	cm	centimeter
ASB	Aviation Support Branch	CNS	Communication, Navigation, & Surveillance
ASOS	Automated Surface Observing System		
ATC	Air Traffic Control	CO	carbon monoxide
ATCRBS	ATC Radar Beacon System	COM	communication radio
ATIS	Automatic Terminal Information Service	CONFIG	configuration
ATK	along-track	COOL	coolant
AUTOSEQ	automatic sequence	COPLT	co-pilot

Course	The line between two points to be followed by the aircraft.	DH	decision height
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.	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).
CR	Course to Radial	DIR	direction
CRG	Cockpit Reference Guide	DIS	distance
CRNT	current	Distance	The 'great circle' distance from the present position to a destination waypoint.
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.	DME	Distance Measuring Equipment
CRS	course	DOP	Dilution of Precision
CRS	Course to Steer	DP	Departure Procedure
CRSR	cursor	DPRT	departure
CTA	Control Area	DR	dead reckoning
CTRL	control	DSBL	disabled
Cumulative	The total of all legs in a flight plan.	DTK	Desired Track
CVR	Cockpit Voice Recorder	E	empty, east
CVRG	coverage	ECU	Engine Control Unit
CWS	control wheel steering	Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
CYL	cylinder	EGNOS	European Geostationary Navigation Overlay Service
D ALT	density altitude	EGT	Exhaust Gas Temperature
DB, DBASE	database	EIS	Engine Indication System
dBZ	decibels 'Z' (radar return)	ELEV	elevation
DCLTR, DECLTR	declutter	ELEV	elevator
DEC FUEL	decrease fuel	EMERGCY	emergency
deg	degree	EMI	Electromagnetic Interference
DEIC, DEICE	de-icing	ENDUR	endurance
DEP	departure	Endurance	Flight endurance, or total possible flight time based on available fuel on board.
Desired Track	The desired course between the active "from" and "to" waypoints.	ENG	engine
DEST	destination	ENGD	engaged
DF	Direct to Fix	ENR	enroute
DFLT	default		
DGRD	degrade		

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.	FL	flight level
ENT	enter	FLC	Flight Level Change
EPE	Estimated Position Error	FM	Course From Fix to Manual Termination
EPU	Estimated Position Uncertainty	FMS	Flight Management System
ERR	error	FOB	Fuel On Board
ESA	Enroute Safe Altitude	FPL	flight plan
ESP	Electronic Stability and Protection	fpm	feet per minute
Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.	FREQ	frequency
Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.	FRZ	freezing
Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed.	FSS	Flight Service Station
ETA	Estimated Time of Arrival	ft	foot/feet
ETE	Estimated Time Enroute	Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
EXPIRD	expired	Fuel On Board	The total amount of usable fuel on board the aircraft.
°F	degrees Fahrenheit	G/S, GS	glideslope
FA	Course From Fix to Altitude	GA	go-around
FAA	Federal Aviation Administration	gal, gl	gallon(s)
FADEC	Full Authority Digital Engine Control	GBOX	gearbox
FAF	Final Approach Fix	GDC	Garmin Air Data Computer
FAIL	failure	GDL	Garmin Satellite Data Link
FC	Course From Fix to Distance	GDU	Garmin Display Unit
FCC	Federal Communication Commission	GEA	Garmin Engine/Airframe Unit
FCST	forecast	GEO	geographic
FD	Course From Fix to DME Distance	GFC	Garmin Flight Control
FD	flight director	GFDS	Garmin Flight Data Services
FDE	Fault Detection and Exclusion	GIA	Garmin Integrated Avionics Unit
FFLOW	fuel flow	GLS	Global Navigation Satellite Landing System
FIS-B	Flight Information Services-Broadcast	GMA	Garmin Audio Panel System
FISDL	Flight Information Service Data Link	GMT	Greenwich Mean Time
		GMU	Garmin Magnetometer Unit
		GND	ground
		gph	gallons per hour
		GPS	Global Positioning System

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	ICAO	International Civil Aviation Organization
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.	ICS	Intercom System
Ground Track	see Track	ID	Identification/Morse Code Identifier
GRS	Garmin Reference System	IDENT, IDNT	identification
GS	Ground speed	IF	Initial Fix
GTX	Garmin Transponder	IFR	Instrument Flight Rules
		IG	Imperial gallon
		ILS	Instrument Landing System
		IMC	Instrument Meteorological Conditions
		in	inch
HA	Hold Terminating at Altitude	INACTV	inactive
HDG	heading	INC FUEL	increase fuel
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	IND	indicated
		Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
HF	Hold Terminating at Fix	INFO	information
HFOM	Horizontal Figure of Merit	in HG	inches of mercury
Hg	mercury	INT	intersection(s)
HI	high	INTEG	integrity (RAIM unavailable)
HI SENS	High Sensitivity	IrDA, IRDA	Infrared Data Association
HM	Hold with Manual Termination		
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.	KEYSTK	key stuck
hPa	hectopascal	kg	kilogram
HPL	Horizontal Protection Level	kHz	kilohertz
hr	hour	km	kilometer
HSDB	High-Speed Data Bus	kt	knot
HSI	Horizontal Situation Indicator		
HT	heat	L	left, left runway
HUL	Horizontal Uncertainty Level	LAT	latitude
Hz	Hertz	LBL	label
		lb	pound
I	Inner Marker	LCD	Liquid Crystal Display
IAF	Initial Approach Fix	LCL	local
IAT	Indicated Air Temperature	LED	Light Emitting Diode
IAU	Integrated Avionics Unit	Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to.

Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate.	MIN	minimum
Leg	The portion of a flight plan between two waypoints.	Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
LIFR	Low Instrument Flight Rules	MSAS	Multi-functional Satellite Augmentation System
LNAV	Lateral Navigation	MKR	marker beacon
LO	low	MOA	Military Operations Area
LOC	localizer	MOV	movement
LOI	loss of integrity (GPS)	mpm	meters per minute
LON	longitude	MSA	Minimum Safe Altitude
LPV	Localizer Performance with Vertical guidance	MSG	message
LRU	Line Replaceable Unit	MSL	Mean Sea Level
LT	left	MT	meter
LTNG	lightning	mV	millivolt(s)
LVL	level	MVFR	Marginal Visual Flight Rules
M	Middle Marker	N	north
m	meter	NAV	navigation
MAG	Magnetic	NAVAID	NAVigation AID
MAG VAR	Magnetic Variation	NDB	Non-directional Beacon
MAHP	Missed Approach Hold Point	NEXRAD	Next Generation Radar
MAN IN	manifold pressure (inches Hg)	nm	nautical mile(s)
MAN SQ	Manual Squelch	NoPT	No Procedure Turn Required (Procedure shall not be executed without ATC clearance)
MAP	Missed Approach Point	NRST	nearest
MASQ	Master Avionics Squelch	O	Outer Marker
MAX	maximum	OAT	Outside Air Temperature
MAXSPD	maximum speed (overspeed)	OBS	Omni Bearing Selector
MDA	barometric minimum descent altitude	OFST	offset
MET	manual electric trim	OXY	oxygen
METAR	Meteorological Aviation Routine	P ALT	pressure altitude
MEPT	manual electric pitch trim	PA	Passenger Address
MFD	Multi Function Display	PA	Proximity Advisory
MGRS	Military Grid Reference System	PASS	passenger(s)
MHz	megahertz	PC	personal computer
MIC	microphone		

PFD	Primary Flight Display	RVRSNRY	reversionary
PI	Procedure Turn to Course Intercept	RX	receive
PIT, PTCH	pitch		
POSN	position	S	south
PPM	parts per million	SA	Selective Availability
P. POS	Present Position	SAT	Static Air Temperature
PRES, PRESS	pressure	SBAS	Satellite-Based Augmentation System
PROC	procedure(s), procedure turn	SCIT	Storm Cell Identification and Tracking
psi	pounds per square inch	SD	Secure Digital
PT	Procedure Turn	sec	second(s)
PTK	parallel track	SEL, SLCT	select
PTT	Push-to-Talk	SFC	surface
PWR	power	SIAP	Standard Instrument Approach Procedures
		SID	Standard Instrument Departure
QTY	quantity	SIGMET	Significant Meteorological Information
		Sim	simulator
R	right, right runway	SLP/SKD	slip/skid
RAD	radial	SMBL	symbol
RAIM	Receiver Autonomous Integrity Monitoring	SPD	speed
RAM	random access memory	SPI	Special Position Identification
REF	reference	SPKR	speaker
REM	remaining (fuel remaining above Reserve)	SQ	squelch
		SRVC, SVC	service
REQ	required	STAL	stall
RES	reserve (fuel reserve entered by pilot)	STAR	Standard Terminal Arrival Route
REV	reverse, revision, revise	STATS	statistics
RF	Constant Radius Turn to Fix	STBY	standby
RMI	Radio Magnetic Indicator	STD	standard
RMT	remote	STRMSCP	Stormscope
RNG	range	SUA	Special Use Airspace
RNWX	runway	SUSP	suspend
ROL	roll	SVS	Synthetic Vision System
ROM	read only memory	SW	software
rpm	revolutions per minute	SYS	system
RST FUEL	reset fuel		
RSV	reserve (fuel reserve entered by pilot)	T	true
RT	right	TA	Traffic Advisory

TACAN	Tactical Air Navigation System		
TAF	Terminal Aerodrome Forecast	V, Vspeed	velocity (airspeed)
TAS	True Airspeed	VA	Heading Vector to Altitude
TAS	Traffic Advisory System, true airspeed	VAPP	VOR approach
TAT	Total Air Temperature	VAR	variation
TAWS	Terrain Awareness and Warning System	VD	Heading Vector to DME Distance
TCA	Terminal Control Area	Vdc	volts, direct current
TCAS	Traffic Collision Avoidance System	VERT	vertical
TEL	telephone	Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
TEMP	temperature	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.
TERM	terminal		
TF	Track Between Two Fixes		
TFR	Temporary Flight Restriction		
T HDG	True Heading	VFOM	Vertical Figure of Merit
TIS	Traffic Information System	VFR	Visual Flight Rules
TIT	Turbine Inlet Temperature	VHF	Very High Frequency
TKE	Track Angle Error	VI	Heading Vector to Intercept
TMA	Terminal Maneuvering Area	VLOC	VOR/Localizer Receiver
TMR/REF	Timer/Reference	VM	Heading Vector to Manual Termination
Topo	topographic	VMC	Visual Meteorological Conditions
Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'	VNAV, VNV	vertical navigation
Track Angle Error	The angle difference between the desired track and the current track.	VOL	volume
TRG	target	VOR	VHF Omni-directional Range
TRK	track	VORTAC	very high frequency omnidirectional range station and tactical air navigation
TRSA	Terminal Radar Service Area	VPL	Vertical Protection Level
TRUNC	truncated	VPROF	VNV profile, vertical profile
TTL	total	VPTH	VNV path, vertical path
TURN	procedure turn	VR	Heading Vector to Radial
TX	transmit	VS	vertical speed
		VSI	Vertical Speed Indicator
UNAVAIL	unavailable	VSR	Vertical Speed Required
USR	user	VTF	vector to final
UTC	Coordinated Universal Time		
UTM/UPS	Universal Transverse Mercator / Universal Polar Stereographic Grid	W	watt(s), west
		WAAS	Wide Area Augmentation System

FREQUENTLY ASKED QUESTIONS

If a particular aspect of G1000 operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

WHAT IS 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 G1000 System monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

WHY ARE THERE NOT ANY APPROACHES AVAILABLE FOR A FLIGHT PLAN?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind that some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the G1000 indicates “NONE” for the available procedures.

WHAT HAPPENS WHEN AN APPROACH IS SELECTED? CAN A FLIGHT PLAN WITH AN APPROACH, A DEPARTURE, OR AN ARRIVAL BE STORED?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original en route portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note that the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 System automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

CAN “SLANT GOLF” (“/G”) BE FILED USING THE G1000?

“/G” may be filed for a flight plan. The G1000 System meets the requirements of TSO-C145a Class 3 and ETSO-C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the approved AFM/POH as well as the Aeronautical Information Manual (AIM) for more information.

WHAT DOES THE OBS SOFTKEY DO?

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the G1000 automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)	OBS
• Automatic sequencing of waypoints	• Manual sequencing - ‘holds’ on selected waypoint
• Manual course change on HSI not possible	• Manually select course to waypoint from HSI
• Always navigates ‘TO’ the active waypoint	• Indicates ‘TO’ or ‘FROM’ waypoint
• Must be in this mode for final approach course	• Cannot be set for final approach course or published holding patterns

When OBS mode is active, the G1000 allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO** Knob and HSI (much like a VOR).

The most common application for using the **OBS** Softkey is the missed approach. The G1000 suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000 from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Pressing the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

WHY DOES THE G1000 NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?

The G1000 only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no "OBS" or 'SUSP' annunciation). For automatic sequencing to occur, the aircraft must also cross the "bisector" of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

HOW CAN A WAYPOINT BE SKIPPED IN AN APPROACH, A DEPARTURE, OR AN ARRIVAL?

The G1000 allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD from the Active Flight Plan Page by highlighting the desired waypoint and selecting the **ACT LEG** Softkey then the **ENT** Key to approve the selection. The GPS then provides navigation along the selected flight plan leg.

WHEN DOES TURN ANTICIPATION BEGIN?

The G1000 smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ###° in # seconds' or 'Next HDG ###° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ###° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ###° now' or 'Next [DTK/HDG] to ###° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate that the midpoint of the turn has been crossed.

WHEN DOES THE CDI SCALE CHANGE?

Once a departure is activated, the G1000 Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

WHY DOES THE HSI NOT RESPOND LIKE A VOR WHEN OBS MODE IS ACTIVE?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

WHAT IS THE CORRECT MISSED APPROACH PROCEDURE? HOW IS THE MISSED APPROACH HOLDING POINT SELECTED?

To comply with TSO specifications, the G1000 does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Softkey is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the Active Flight Plan Page and use the **ACT LEG** Softkey to activate the missed approach portion of the procedure.

AFTER A MISSED APPROACH, HOW CAN THE SAME APPROACH BE RE-SELECTED? HOW CAN A NEW APPROACH BE ACTIVATED?



NOTE: Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message “Are you sure you want to discontinue the current approach?” appears. The G1000 directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting ‘ACTIVATE APPROACH’ using the large **FMS** Knob and pressing the **ENT** Key. The G1000 provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by pressing the **PROC** Key. Choose ‘SELECT APPROACH’, select the desired approach from the list shown, and press the **ENT** Key. Select the desired transition, then activate the approach using the **ENT** Key.








To activate a new approach to a different airport, press the **Direct-to** Key and select the desired airport using the **FMS** Knobs. Press the **ENT** Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

MAP SYMBOLS











NOTE: Refer to the Flight Management Section for the topography legend and the Hazard Avoidance Section for XM Weather Product legends.




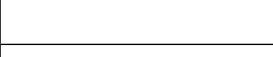



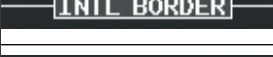


AIRPORT

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	














NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (non-directional radio beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	





LINE SYMBOLS

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area Prohibited Area Alert Area Restricted Area Caution Area Training Area Danger Area Unknown Area	
Class C Terminal Radar Service Area Mode C Area	
Military Operations Area (MOA)	
State or Province Border	
International Border	
Road	
Railroad	
Latitude/Longitude	





MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Default Map Pointer	
Elevation Pointer	
Wind Vector	
Measuring Pointer	
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	

STORMSCOPE LIGHTNING STRIKES

Item	Symbol
Lightning Strike (0-6 sec ago)	
Lightning Strike (6-20 sec ago)	
Lightning Strike (20-60 sec ago)	
Lightning Strike (60-120 sec ago)	

TRAFFIC

Item	Symbol
Non-threat Traffic (hollow diamond)	
Proximity Advisory	
Traffic Advisory, Out of Range	
Traffic Advisory	

TERRAIN AVOIDANCE COLORS AND SYMBOLS

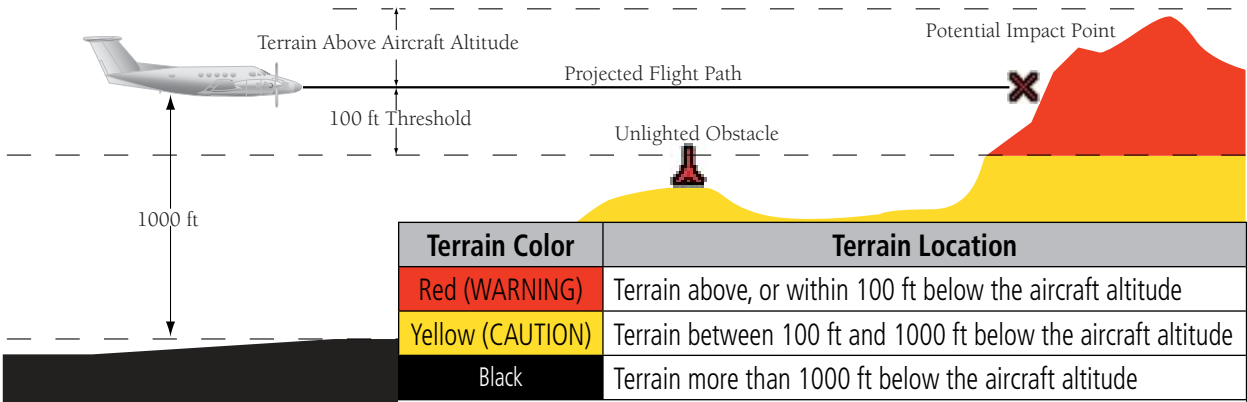


Figure E-1 TAWS Color Chart

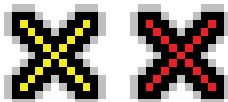











Figure E-2 TAWS Potential Impact Points












Height	Unlighted Obstacle		Lighted Obstacle		Obstacle Color	Obstacle Location
	< 1000 ft AGL	> 1000 ft AGL	< 1000 ft AGL	> 1000 ft AGL		
Obstacle Symbol					Red (WARNING)	Obstacle within 100 ft of or above aircraft altitude
					Yellow (CAUTION)	Obstacle within 1000 ft of aircraft altitude
					Gray	Obstacle more than 1000 ft below aircraft altitude

Obstacle Symbols and Colors

HAZARD AVOIDANCE FEATURES

This table identifies the symbols displayed in the lower right corner of PFD or MFD maps to indicate which hazard avoidance features are activated for display.

Feature	Symbol
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	

Feature	Symbol
City Forecast display enabled	
Surface Analysis display enabled	
Freezing Levels display enabled	
Winds Aloft display enabled	
County Warnings display enabled	
Cyclone Warnings display enabled	
Icing Potential (CIP and SLD) (ICNG)	
Pilot Weather Report (PIREPs)	
Air Report (AIREPs)	
Turbulence (TURB)	
Loss of hazard avoidance feature, (a white X is shown over the symbol to indicate not available; e.g., traffic)	

A

Access code	575
Activate a Flight Plan	226
Active database	655, 656, 660
Active frequency	108, 118
ADF audio	119
ADS-B	424
AFCS Status Box	54, 459
AHRS	20, 645, 646, 647
Aircraft Symbol	461
Air Data Computer	1, 636
Airport	
Information	182
Airspace Alerts	198, 199, 297
Airspeed Indicator	54, 56–57
Airspeed Reference	456, 469–470
Airways	
Collapsed	239
Expanded	239
Alerting System	631, 636
Audio	632
Alerts	631
AFCS	651
Aircraft	633
Arrival	44
Audio voice	44
Aural	634
Levels	632
TAWS	652
Alerts Window	81
Along Track Offset	231
ALT	293
Altimeter	54, 61–62
Altimeter barometric setting	54
Altitude	
Constraints	242, 280
Altitude alerting	84
Altitude Hold Mode	467
Altitude Reference	466, 467, 475
Annunciations	
Comparator	635
G1000 System	22, 636
Reversionary Sensor	636
Test tone	45, 632
Annunciations, softkey	81
Annunciation Window	81
Annunciator lights	136
AOPA Airport Directory	513, 570, 571, 572, 658
AP	651
Approach	674
Activating	255
ILS	504
Loading	223, 252, 254

Missed	508
Removing	255
WAAS	506
Approach Mode	486, 504, 506
APR softkey	254, 260
Arc HSI	66
Arrival procedure	207, 221, 249, 251, 277, 280, 289
Attitude	1
Attitude & Heading Reference System	636
Attitude Indicator	54, 59–60
Audio Panel Fail-Safe Operation	144
Automatic Dependent Surveillance - Broadcast	424
Automatic Flight Control System (AFCS)	455–512
Alerts and annunciations	510–511
Controls	456–457
Status Annunciations	510
Status Box	459
Automatic squelch	117
Autopilot	455, 490–492, 651
Autopilot Disconnect	457, 492
Auto-tuning	126
Auto-tuning, COM	112
Auto-tuning, NAV	122
Auto Zoom	150
Auxiliary Pages (AUX)	36
AUX - system status page	530, 532, 551, 552, 567, 568, 569, 572
Aviation Symbols	162, 207

B

Backcourse Mode	488
Backlighting	52
Barometric setting, Altimeter	54, 62–63
Basic Empty Weight	261
Basic Operating Weight	261
Bearing/distance, measuring	157
Bearing information	68–69
Bearing Information Windows	55
Bearing line	367, 368, 370, 371
Bearing source	69

C

Calibrated Airspeed	258
Cargo	262
CDI	251, 268, 280, 288, 295, 649
Chart Not Available	534, 554
Chart options	542, 561
CHART SETUP box	548, 565
ChartView	513, 533, 551
CLD TOP Softkey	345
Clearance Recorder	139
Closest Point	239
COM channel spacing	116

COM Frequency Box	108
Command Bars	461
Communication (COM) Frequency Box	54
Comparator Annunciations	635
Comparator Window	82
COM Tuning Failure	142
Controls (Softkeys)	22–25
Control Wheel Steering (CWS)	457, 491
Copy a Flight Plan	226
Course Deviation Indicator (CDI)	70–73
Course To Altitude	256
Cylinder Head Temperature (CHT °F)	92

D

Database(s)	17, 655
Database synchronization	45, 657, 660, 662, 663
Data link	1
Datalink receiver troubleshooting	628
Data logging	620
Data reports	606, 607, 608, 609
Date and time	39
Day/Night views	548, 565
Day view	549, 566
Dead Reckoning	88
Decision Height (DH)	55
Declutter, display	89
Delete Flight Plans	227
Deleting	
An entire airway	228, 229
An entire procedure	228, 229
An individual waypoint	228, 229
Flight Plan Items	228
Density Altitude	259
Departure	
Procedure	219, 233, 246, 248
Select	246, 249, 252, 255
Time	257
Timer	48
Digital audio entertainment	4
Dilution of Precision (DOP)	30
Direct-to	175, 200, 201, 202, 203, 204, 205, 240, 241, 278, 280, 295
Display backup	19, 105
DME audio	119
DME Information Window	69
DME tuning	128
Dual navigation database	656

E

Electronic Stability and Protection	59, 513, 621
Emergency frequency	142
Engine Indication System (EIS)	91–100
Entering Flight ID	129

ESP	59, 513, 621, 622, 623, 624, 625
Estimated Landing Fuel	263
Estimated Position Error (EPE)	30
Excess Fuel Weight	263
Excessive Descent Rate Alert	388, 405
Extended Squitter	424

F

Failure	
Input	21
FD	651
Field of View (SVS)	173
Flight director (FD)	455, 458–459
Modes, lateral	481–512
Modes, vertical	464–478
Switching	460
Flight Level Change Mode	469, 498, 502
Flight plan	
Closest point to reference	239
Storing	674
Flight plan Import/Export Messages	654
Flight timer	48
FliteCharts	513, 553
FliteCharts®	513
FliteCharts cycle	568
FliteCharts expiration	568
FliteCharts functions	553
FPA	242, 285
Frequency	
Nearest	195
Frequency spacing	116
Frequently asked questions	673
Fuel	
Efficiency	259
Endurance	259
Remaining	259
Required	259
Statistics	259
Fuel Flow (FFLOW GPH)	92
Fuel on Board	259, 262, 263
Fuel Quantity (FUEL QTY GAL)	92

G

Gain	370
Garmin Databases	658
Garmin Flight Data Services	513, 606
GDC 74A	1
GDL 69/69A	1, 299
GDU 1040	1
GEA 71	1
GFC 700	455
GIA 63	1
Glidepath	293

Glidepath Indicator	64
Glidepath Mode (GP)	476, 486, 506
Glideslope	293
Glideslope Indicator	64
Glideslope Mode	478, 504
Global Positioning System (GPS)	
Navigation	200–298
Receiver information	29–31
GMA 1347	1, 17
GMU 44	1
Go Around Mode	479, 508–509
GPS Window	662
Ground mapping	374
Groundspeed	49
GRS 77	1
GTS 800	648
GTX 33 ES	424
GTX 33 Mode S Transponders	1, 129

H

Hazard Avoidance features	680
Heading	54
Heading Select Mode	483
HI SENS	127
Horizontal scan	366, 367, 368, 369, 372, 373
Horizontal Situation Indicator (HSI)	65–77
HSI double green arrow	118
HSI magenta arrow	118
HSI single green arrow	118

I

IDENT function	131
ID indicator	121
ILS approach	504
Indicated Altitude	258
Initialization (system)	17
Inset Map, PFD	55
Intercom	137
Intersection	
Information	183–184
Inverting a flight plan	226
IOI	387, 402, 652
Iridium satellite network	573, 577, 582, 586, 588, 590
ISA	78

J

Jeppesen aviation database	655
----------------------------	-----

K

Key(s)	9, 11
--------	-------

L

Land Symbols	161
Lateral modes, flight director	481–512
Level Mode	621
LNAV	268
LO SENS	127
Low Altitude Annunciation	85
Low speed data	573, 576
LPV	268, 295, 493

M

Magnetometer	1, 21
Map	
Pages	35
Panning	152
Symbols	677
Marker beacon	127
Marker Beacon Annunciations	83
MASQ processing	101
Measurement units, changing displayed	43
Menus	34
Message Advisories	632
Database	640
G1000 System	639
GCU 477	647
GDC 74B	646
GDL 69A	646
GEA 71	644
GIA 63W	642
GMA 1347D	642
GMC 710	647
GMU 44	646
GRS 77	645
GTX 33	645
GWX 68	647
MFD & PFD	639
Miscellaneous	648
Message Advisory Alerts	633
Messages	
Reminder	50
MET	651
Minimum Descent Altitude (MDA)	55
Minimums	634
MISCOMP	635
Missed Approach	207, 256, 264, 268, 295, 508
Mistrim	651
MKR/MUTE	127
Mode S	25, 129, 131
Mode selection softkeys	129, 130, 131
Morse code identifier	121
Multi Function Display (MFD)	

Softkeys-----	28	Power ON settings-----	136
N		Predefined message-----	594, 595, 597
National Weather Service-----	325	Primary Flight Display (PFD)	
NAV1 audio-----	119	Softkeys-----	22–24
NAV2 audio-----	119	Procedures	
Navigation		GFC 700-----	493–509
Database-----	242, 243	Q	
Map-----	203	Quick tuning 121.500 MHz-----	111
Navigation Mode-----	484–485, 496–497	R	
Navigation mode selection-----	118	Radar altitude-----	86
Navigation (NAV) Frequency Box-----	54	Radar Signal Attenuation-----	359
Navigation source-----	70–72	Radar Signal Reflectivity-----	359
Navigation Status Box-----	54	Radar, Weather-----	357
Nav radio selection-----	118	RAIM-----	251, 264, 265, 266, 267
Nearest		Range-----	171
Airport-----	179, 180, 181, 182, 195–198, 254	Receiver Autonomous Integrity Monitoring (RAIM)31–32,	
Airport Minimum Runway Length-----	182	264, 673	
Airports Page-----	180, 181, 182	Register-----	573, 575
Airport Surface Matching-----	182	Reminder messages-----	50
VOR-----	195–196	Report transmissions-----	606
Nearest airports, frequency tuning-----	112	Required	
Nearest Pages (NRST)-----	37	Vertical Speed-----	286
NEXRAD Softkey-----	342	Vertical Speed Indicator-----	286
Night view-----	549, 566	Reversionary Mode-----	144
NO COMP-----	635	Reversionary Sensor Annunciations-----	636
Non-path descent-----	474, 502–503	Reversionary Sensor Window-----	82
Normal operating mode-----	18	ROC-----	387, 402, 652
O		Roll Hold Mode-----	482
OAT-----	78	RS-232-----	4
OBS Mode-----	76–77	RS-485-----	3
Obstacles-----	642, 643	RVSI-----	286, 287
Odometer-----	49	RX indicator-----	109
Oil Pressure (OIL PSI)-----	92	S	
Omni Bearing Selector (OBS)-----	674–675	SafeTaxi-----	513, 527, 530
Other Statistics-----	257, 259	SafeTaxi database-----	531
Outside Air Temperature-----	78	SBAS-----	264, 266, 267, 673
Outside Air Temperature (OAT)-----	54	Scheduler-----	50–51, 513–514, 617
Overview-----	1	SD card-----	16
P		Sector scan-----	370, 371
Page groups-----	35–38	Secure Digital (SD) card-----	655
Parallel Track-----	232, 233	Selected Altitude--	54, 61, 84, 465, 466, 468, 469, 471, 475
Passenger Address (PA) System-----	138	Selected Altitude Bug-----	54
Passenger(s)-----	262	Selected Altitude Capture Mode465, 466, 467, 468, 471	
PFD failure-----	143	Selected Altitude Intercept Arc-----	174
Pilot and Stores Weight-----	261	Selected Course-----	55, 66, 485, 487, 488
Pilot profiles-----	41–42	Selected Heading-----	66, 456, 483
PIREP-----	353	Selecting a COM radio-----	108
Pitch Hold Mode-----	465	Sensor-----	635, 636
Pitch indication-----	59		

Sequencing, automatic	675
Sequencing waypoints, suspend	77
Servos, AFCS	455
SIGMET	316, 347
Simultaneous COM Operation	138
Skywatch	438
Slip/Skid Indicator	54, 59
Softkey annunciations	81
Softkeys	22–25
Sort Flight Plans	226
Speaker	136
STAB	372
Standby database	655, 656, 660
Standby frequency	108, 112, 118
Standby frequency field	108
Stereo headsets	136
Stormscope WX-500 Series II	375
Stuck microphone	142
Sunrise	258
Sunset	258
Surface Analysis	319
SVS	650
SVS troubleshooting	626
Symbols, map	677
Synthetic vision (SVS)	513, 514
System annunciations	22, 631, 636
System ID	573, 575
System Setup Page	38
System Status Page	45
System time	54

T

TA	634
Tachometer (RPM)	92
TAF	317, 348
Takeoff Mode	479
TAS	366, 367, 368, 369, 370, 371, 645
TAWS	84, 392, 402, 413, 414, 652, 653
TAWS-B	381, 397
TAWS System Status Annunciations	653
TCAS System Test Fail	634
TCAS System Test Passed	634
Telephone	5, 513, 573, 577, 578
Terminal procedures charts	534, 554
Terrain	402, 642, 652, 653
Color indications	679
Terrain Awareness and Warning System	381, 397
Text message	590, 591, 594, 597
Text messaging	573, 590
Tilt	369
Tilt line	369
Timer	

Departure	48
Flight	48
Timer, PFD generic	46
TIS	415
TOD	285, 286, 292
TOPO DATA	158, 159, 168
Top of Descent	285, 286
TOPO SCALE	160
Track	65
Traffic Advisory System	648
Traffic Advisory (TA)	83, 366, 634
Traffic AdvisoryTraffic Advisory (TA)	634
Traffic Annunciation	55
Traffic Information Service (TIS)	
Voice alerts	83
Transponder code entry	133
Transponder data box	101
Transponder ground mode	131
Transponder mode field	101, 131, 132
Transponder standby mode	131
Transponder Status Box	54
Trend Vector	
Turn Rate	68
Trip Planning	257, 258, 259
Trip statistics	49, 258, 259
True Airspeed	54, 56, 259
Turn anticipation	675
Turn Rate Indicator	68
TX indicator	109

U

Unable to display chart	534, 554
Unmuted Inputs	136
Updating Garmin databases	531

V

Vertical deviation	62, 473
Vertical deviation guidance	243
Vertical Deviation Indicator (VDI)	64, 286, 287
Vertical navigation	242
Direct-to	241, 242
Vertical Navigation flight control	471–475
Vertical Path Tracking Mode	471–472, 500
Vertical scan	368, 369
Vertical speed guidance	243
Vertical Speed Indicator (VSI)	64
Vertical Speed Mode	468
Vertical Speed Reference	468
Vertical track	634
VFR code	135
VNAV	205, 649, 650
VNAV Target Altitude	471–474

VNAV Target Altitude Capture Mode	475
VNV	285, 671
VNV guidance	
Disabling	241
Enabling	240
VNV indications, PFD	80
VNV Target Altitude	64
Voice alerts, TIS Traffic	83, 420, 444, 452
Volume	616
VOR	
Nearest	195–196
VOR selection	118
VSI	287
Vspeed references	55
Vspeeds	57–58
VS TGT	242, 285

W

WAAS	268, 493, 643, 673
WAAS precision approach	506
Warranty	ii
WATCH	372, 373
Waypoint	
Automatic sequencing	674, 675
Skipping	675
Waypoint Selection Submenu	201, 210, 214, 265
Weather Attenuated Color Highlight	372
Weather (real-time)	4
Weather Softkeys	304
Wi-Fi	513, 573, 601, 605, 606, 607
Wind	148, 170
Wind data	55
Winds Aloft	350
WIND Softkey	350

X

XM radio	612, 614
XM radio active channel	614
XM radio channel list	614
XM radio presets	616
XM radio service class	613
XM radio troubleshooting	628
XM Satellite Radio	299
XM Satellite Weather	299
Activating	299
AIREPs	329
AIRMETs	316, 347
Cell Movement	315
Cloud Tops	313
County Warnings	325
Cyclones & Hurricanes	326
Echo Tops	312

Freezing Level	321
Icing	327
Lightning	314
NEXRAD	308
PIREPs	329
SIGMETs	316, 347
Surface Analysis	319
Turbulence	328
Winds Aloft	322
XM weather/radio	4

Z

Zoom	
Auto	150



GARMIN®



Garmin International, Inc.
1200 East 151st Street
Olathe, KS 66062, U.S.A.
p:913.397.8200
f:913.397.8282

www.garmin.com

Garmin AT, Inc.
2345 Turner Road SE
Salem, OR 97302, U.S.A.
p:503.391.3411
f:503.364.2138

Garmin (Europe) Ltd.
Liberty House, Bulls Copse Road
Houndsdown Business Park
Southampton, SO40 9RB, U.K.
p:44/0870.8501241
f:44/0870.8501251

Garmin Corporation
No. 68, Jangshu 2nd Road
Shijr, Taipei County, Taiwan
p:886/02.2642.9199
f:886/02.2642.9099