



G500(H)/G600/G700 TXi

Pilot's Guide



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WARNING

DO NOT USE TERRAIN AVOIDANCE DISPLAYS AS THE SOLE SOURCE OF INFORMATION FOR MAINTAINING SEPARATION FROM TERRAIN AND OBSTACLES. GARMIN OBTAINS TERRAIN AND OBSTACLE DATA FROM THIRD PARTY SOURCES AND CANNOT INDEPENDENTLY VERIFY THE ACCURACY OF THE INFORMATION.



WARNING

ALWAYS REFER TO CURRENT AERONAUTICAL CHARTS AND NOTAMS FOR VERIFICATION OF DISPLAYED AERONAUTICAL INFORMATION. DISPLAYED AERONAUTICAL DATA MAY NOT INCORPORATE THE LATEST NOTAM INFORMATION.



WARNING

DO NOT USE GEOMETRIC ALTITUDE FOR COMPLIANCE WITH AIR TRAFFIC CONTROL ALTITUDE REQUIREMENTS. THE PRIMARY BAROMETRIC ALTIMETER MUST BE USED FOR COMPLIANCE WITH ALL AIR TRAFFIC CONTROL ALTITUDE REGULATIONS, REQUIREMENTS, INSTRUCTIONS, AND CLEARANCES.



WARNING

DO NOT USE BASEMAP INFORMATION (LAND AND WATER DATA) AS THE SOLE MEANS OF NAVIGATION. BASEMAP DATA IS INTENDED ONLY TO SUPPLEMENT OTHER APPROVED NAVIGATION DATA SOURCES AND SHOULD BE CONSIDERED ONLY AN AID TO ENHANCE SITUATIONAL AWARENESS.



WARNING

DO NOT RELY SOLELY UPON THE DISPLAY OF TRAFFIC INFORMATION TO ACCURATELY DEPICT ALL OF THE TRAFFIC WITHIN RANGE OF THE AIRCRAFT. DUE TO LACK OF EQUIPMENT, POOR SIGNAL RECEPTION, AND/OR INACCURATE INFORMATION FROM AIRCRAFT OR GROUND STATIONS, TRAFFIC MAY BE PRESENT THAT IS NOT REPRESENTED ON THE DISPLAY.



WARNING

DO NOT USE DATalink WEATHER INFORMATION FOR MANEUVERING IN, NEAR, OR AROUND AREAS OF HAZARDOUS WEATHER. INFORMATION CONTAINED WITHIN DATalink WEATHER PRODUCTS MAY NOT ACCURATELY DEPICT CURRENT WEATHER CONDITIONS.



WARNING

DO NOT USE THE INDICATED DATalink WEATHER PRODUCT AGE TO DETERMINE THE AGE OF THE WEATHER INFORMATION SHOWN BY THE DATalink WEATHER PRODUCT. DUE TO TIME DELAYS INHERENT IN GATHERING AND PROCESSING WEATHER DATA FOR DATalink TRANSMISSION, THE WEATHER INFORMATION SHOWN BY THE DATalink WEATHER PRODUCT MAY BE OLDER THAN THE INDICATED WEATHER PRODUCT AGE.



WARNING

ALWAYS REFER TO CURRENT AERONAUTICAL CHARTS FOR APPROPRIATE MINIMUM CLEARANCE ALTITUDES. THE DISPLAYED MSAs ARE ONLY ADVISORY IN NATURE AND SHOULD NOT BE RELIED UPON AS THE SOLE SOURCE OF OBSTACLE AND TERRAIN AVOIDANCE INFORMATION.



WARNING

DO NOT USE GPS TO NAVIGATE TO ANY ACTIVE WAYPOINT IDENTIFIED AS A "NON WGS84 WPT" BY A SYSTEM MESSAGE. "NON WGS84 WPT" WAYPOINTS ARE DERIVED FROM AN UNKNOWN MAP REFERENCE DATUM THAT MAY BE INCOMPATIBLE WITH THE MAP REFERENCE DATUM USED BY GPS (KNOWN AS WGS84) AND MAY BE POSITIONED IN ERROR AS DISPLAYED.



WARNING

DO NOT RELY SOLELY UPON THE DISPLAY OF TRAFFIC INFORMATION FOR COLLISION AVOIDANCE MANEUVERING. THE TRAFFIC DISPLAY DOES NOT PROVIDE COLLISION AVOIDANCE RESOLUTION ADVISORIES AND DOES NOT UNDER ANY CIRCUMSTANCES OR CONDITIONS RELIEVE THE PILOT'S RESPONSIBILITY TO SEE AND AVOID OTHER AIRCRAFT.



WARNING

DO NOT RELY ON THE ACCURACY OF ATTITUDE AND HEADING INDICATIONS IN GEOGRAPHIC AREAS WHERE VARIATION IN THE EARTH'S MAGNETIC FIELD EXISTS. THIS INCLUDES: NORTH OF 72° NORTH LATITUDE AT ALL LONGITUDES; SOUTH OF 70° SOUTH LATITUDE AT ALL LONGITUDES; NORTH OF 65° NORTH LATITUDE BETWEEN LONGITUDE 75° W. AND 120° W. (NORTHERN CANADA); NORTH OF 70° NORTH LATITUDE BETWEEN LONGITUDE 70° W. AND 128° W. (NORTHERN CANADA); NORTH OF 70° NORTH LATITUDE BETWEEN LONGITUDE 85° E. AND 114° E. (NORTHERN RUSSIA); SOUTH OF 55° SOUTH LATITUDE BETWEEN LONGITUDE 120° E. AND 165° E. (REGION SOUTH OF AUSTRALIA AND NEW ZEALAND).



WARNING

DO NOT RELY SOLELY UPON DATALINK SERVICES TO PROVIDE TFR INFORMATION. ALWAYS CONFIRM TFR INFORMATION THROUGH OFFICIAL SOURCES SUCH AS FLIGHT SERVICE STATIONS OR AIR TRAFFIC CONTROL.



WARNING

DO NOT RELY ON INFORMATION FROM A LIGHTNING DETECTION SYSTEM DISPLAY AS THE SOLE BASIS FOR HAZARDOUS WEATHER AVOIDANCE. RANGE LIMITATIONS AND INTERFERENCE MAY CAUSE THE SYSTEM TO DISPLAY INACCURATE OR INCOMPLETE INFORMATION. REFER TO DOCUMENTATION FROM THE LIGHTNING DETECTION SYSTEM MANUFACTURER FOR DETAILED INFORMATION ABOUT THE SYSTEM.



WARNING

USE APPROPRIATE PRIMARY SYSTEMS FOR NAVIGATION, AND FOR TERRAIN, OBSTACLE, AND TRAFFIC AVOIDANCE. GARMIN SVT IS INTENDED AS AN AID TO SITUATIONAL AWARENESS ONLY AND MAY NOT PROVIDE EITHER THE ACCURACY OR RELIABILITY UPON WHICH TO SOLELY BASE DECISIONS AND/OR PLAN MANEUVERS TO AVOID TERRAIN, OBSTACLES, OR TRAFFIC.



WARNING

DO NOT USE THE GARMIN SVT RUNWAY DEPICTION AS THE SOLE MEANS FOR DETERMINING THE PROXIMITY OF THE AIRCRAFT TO THE RUNWAY OR FOR MAINTAINING THE PROPER APPROACH PATH ANGLE DURING LANDING.



WARNING

DO NOT USE TAWS INFORMATION FOR PRIMARY TERRAIN OR OBSTACLE AVOIDANCE. TAWS IS INTENDED ONLY TO ENHANCE SITUATIONAL AWARENESS.



CAUTION

DO NOT CLEAN DISPLAY SURFACES WITH ABRASIVE CLOTHS OR CLEANERS CONTAINING AMMONIA. THEY WILL HARM THE ANTI-REFLECTIVE COATING.



CAUTION

ENSURE THAT ANY UNIT REPAIRS ARE MADE BY AN AUTHORIZED GARMIN SERVICE CENTER. UNAUTHORIZED REPAIRS OR MODIFICATIONS COULD VOID BOTH THE WARRANTY AND AFFECT THE AIRWORTHINESS OF THE AIRCRAFT.



NOTE

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



NOTE

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



NOTE

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



NOTE

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



NOTE

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



NOTE

Use of polarized eye wear 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 website at www.garmin.com/prop65.



NOTE

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



NOTE

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



NOTE

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

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



NOTE

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



NOTE

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



NOTE

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



NOTE

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



NOTE

When using autopilot to fly an approach with vertical guidance, the autopilot will not level the aircraft at the MDA/DH even if the MDA/DH is set in the altitude preselect.



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

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

Record of Revision

REVISION	REVISION DATE	CHANGE DESCRIPTION
A	05/19/17	Initial Release.
B	01/16/18	Production Release.
C	01/18/18	Minor edits.
D	01/24/18	Minor edits.
E	08/17/18	Updates for software v2.20.

Current Revision Description

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
All	All	Added G500(H) to product family name.
SECTION 1: SYSTEM DESCRIPTION		
1.2.1	1-8	Added table notes to HSI Map (PFD) and Traffic (MFD) regarding function availability.
1.4	1-10	Updated slot designation information in table 1-2, "SD Card Slot Designations." Includes additions to reflect Flight Stream 510 functionality.
1.5.5	1-15	Added "Keypads" subsection.
1.7	1-18	Added VNAV magenta color designation.
1.8	1-19	Added information pertaining to Flight Stream 510.
1.10	1-20	Added note regarding SD card format and capacity.
		Added note 3 to table 1-6, "Supported Databases."
1.10.1	1-21	Added functional requirements for Flight Stream 510 and Garmin Pilot.
		Added Flight Stream 510 information to table 1-7, "Database Effective Status."
		Revised conditions for database yellow text convention.
1.10.3	1-22	Added functional limitation regarding Database Update page availability.
		Added controls and indications information (includes Connex icon database source icon).

Record of Revision

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
1.10.4	1-24	Added information regarding automatic database updates.
1.10.5	1-25	Added “Database Concierge” section.
1	1-27	Added “Flight Stream 510 Setup” section.
1.19	1-33	Updated unit settings for PFD and EIS.
1.20	1-34	Updated PFD Setup crew profile settings.
1.21.4	1-40	Added “Battery Pop-up Alerts” segment.
1.22.5	1-47	Added Garmin contact info for SVT enablement.
1.22.8	1-50	Added advisories pertaining to altitude preselector and air data input failure.
1.22.9	1-51	Added Flight Stream 510 condition description for advisory pertaining to datacard read error.
		Added advisory pertaining to Electronic Stability Protection.
1.24.8	1-62	Added table 1-30, “GFC 500/600.”
1.24.14	1-68	Added GRA 55 to LRU list in table 1-36, “Radar Altimeter.”
SECTION 2: ADVANCED FEATURES		
2	2-3	Added LOC CDI Prompting and CDI/VDI Preview to PFD Setup menu options.
		Added figure notes 3 through 7 to “PFD Roadmap.”
	2-4	Updated functions list for PFD Setup in table 2-1, “PFD System Selections, GDU 700().”
	2-5	Added TEMP/DALT, CDI/VDI Preview, LOC CDI Prompting, and SYNC Control to table 2-2, “PFD Setup Selections, GDU 1060.”
2.1	2-6	Added “Synchronization Options” section.
2.2	2-8	Added “Setting a Reference Bug” segment.
2	2-10	Added Air Temp & DALT Display to figure 2-3, “PFD Portrait Layout.”
2.4	2-16	Added “AHRS(1/2) Key” segment.
2.5	2-17	Added “VNAV Guidance Indications” section.
2.6.1	2-20	Added variable Vne information to “Rotorcraft” reference markings segment.

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
2.7	2-23	<p>Added color indications for BARO/RAD ALT and TEMP COMP minimums altitude.</p> <p>Added "Target Altitude Reference Field" segment.</p>
2.7.2	2-25	<p>Revised minimums source requirement to include temperature compensated barometric altimeter.</p> <p>Added information about visual and aural indications when approaching selected altitude.</p> <p>Added "Disable Altitude Bug" segment.</p>
2.7.3	2-26	Added "Temperature Compensation Minimums" section.
2.8	2-28	<p>Revised VSI description for split and full screen layouts.</p> <p>Added "Numeric Speed Indication" and "Required Vertical Speed Indication" segments.</p>
2.9.1	2-32	Added "Off Scale Indication" segment.
2.9.2	2-35	Updated table 2-11 to include flight phase information for LNAV and LP annunciations.
2.10.6	2-40	Added "Automatic Source Selection" section.
2.12.1	2-44	Added "VNAV Deviation Indications" section.
2.13	2-45	Added "CDI/VDI Preview" section.
2.14	2-48	Added information regarding bearing information fields on GDU 700L.
2.15	2-50	Added information pertaining to GDU 700L.
2.17	2-52	Added "Temp/DALT Display" section.
2.19	2-54	Added table 2-13, "Marker Beacon Symbols."
SECTION 3: ADVANCED FEATURES		
3	3-2	Added VNAV data requirement for ATK waypoints.
		Added terrain alerts to list of data depicted when HSI is active.
	3-3	Updated list of LDI indications.
		Added power lines to list of SVT obstacle depictions.
		Revised information regarding SVT alert depiction requirements.

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
3.4.4	3-16	Revised conditions required for SVT terrain and obstacle alert depictions.
3.6	3-22	Added information regarding Flight Director dual command cues.
3.8	3-24	Added table 3-7, "AP Basic Mode Annunciations."
	3-25	Added table 3-8, "AP Lateral & Vertical Mode Annunciations."
3.8.1	3-26	Added "Autopilot Alerts" section.
SECTION 4: MULTI-FUNCTION DISPLAY		
4.1	4-3	Added Flight Stream selection to table 4-1, "MFD Setup Selections."
4.3	4-10	Added Stormscope and SXM lightning to list of mutually exclusive overlays.
	4-12	Updated Radar overlay image.
4.5.1	4-15	Added Altitude Constraints to map selections.
4.6	4-17	Added table note 2 and Altitude Constraints to table 4-6, "Map Tab Selections."
4.5.2	4-20	Added User Airport, User Waypoint, and ATK to table 4-7, "Aviation Data Symbols."
4	4-26	Updated screen image in figure 4-2, "Charts Page."
4.8	4-30	Added list of conditions to Position Unavailable Indication segment.
		Added "Off Scale Areas" segment.
4	4-31	Updated feature requirements to reflect VNAV functionality.
		Updated screen image in figure 4-3, "Active Flight Plan Page."
		Added "Airport Info" segment.
4.11	4-32	Added "Active VNAV Constraint Window" segment.
	4-35	Added "ATK Identifier Labels" segment.
		Added "Altitude Constraint Labels" segment.
	4-36	Added "User Airport Icon" segment.

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
4.12	4-38	Updated screen image in figure 4-5, "Intersection Page."
	4-39	Updated information page features for Intersection, VOR, VRP, and NDB waypoints in table 4-15.
SECTION 5: WEATHER AWARENESS		
5.4.1	5-10	Updated hyperlink to National Weather Service Doppler Radar website.
	5-12	Revised "SiriusXM NEXRAD PRECIP Source Selection" segment.
5.5	5-13	Revised "Echo Tops" segment.
5.6	5-14	Revised "Cloud Tops (SXM)" segment.
5.10	5-18	Added table 5-6, "AIRMET Types."
5.22	5-25	Updated feature requirements for SiriusXM Weather.
		Added feature limitations.
		Revised note regarding Class 1 UAT transceiver requirement for displaying subscription-free FIS broadcast information.
5.22.1	5-26	Updated SiriusXM Weather Menu options for NEXRAD function.
5.22.2	5-27	Revised activation instructions for SiriusXM Weather.
		Updated hyperlink for SiriusXM website.
5.23.2	5-30	Updated information pertaining to TSO-C157B, paragraph 5.a(1)(c).
5.23.3	5-31	Updated information pertaining to FIS-B weather product age.
5.24.1	5-33	Revised Connex Weather activation instructions.
		Revised Connex Satellite Service account information to include hyperlink to flyGarmin.com.
5.27	5-43	Added "Warm-up Countdown Timer" segment.
SECTION 7: TERRAIN AWARENESS		
7.8	7-22	Added functional requirements for TAWS-B.
7.9	7-26	Revised section to include HTAWS.
SECTION 8: FUEL & ENGINE INDICATING SYSTEM		

Record of Revision

SECTION	PAGE NUMBER	CHANGE DESCRIPTION
8.2	8-6	Added CHT cylinder selectability to bar graph description in table 8-3, "EIS Functions."
8.3	8-9	Added table note 2 and revised descriptions for CHT, EGT, and Fuel/Main Fuel in table 8-4, "Gauge Types."
8.4.2	8-11	Added "Fuel Gauge Label" section.
8.4.3	8-12	Updated cylinder symbol definitions in table 8-6, "Engine Graph Color Indications."
8.5	8-13	Revised interactions for temperature gauges.
		Added table note 4 and Outside Air TEMP user fields to table 8-9, "Available User Fields."
8.6	8-15	Revised fuel computer functional description.
SECTION 9: ABNORMAL OPERATIONS		
9.1.1	9-3	Added "Standby PFD Display Options" section.
9.1.2	9-5	Updated screen image in figure 9-1, "GDU 700P Composite Display in Backup Mode."
	9-6	Updated screen image in figure 9-2, "Display Backup Modes."
9.2	9-9	Updated screen images in figure 9-4, "GBB 54 Backup Battery."
9.2.1	9-11	Added "Automatic Unit Shutdown" segment.
9.2.2	9-12	Added "Battery Alerts" section.
9.3	9-13	Added Standby PFD (pilot side) information to pilot awareness note.
	9-14	Added table 9-4, "AHRS/ADC Sensor Selection Annunciations."
		Added "Selecting Sensors on Pilot/Co-pilot PFD" segment.
		Added "Selecting Sensors on a Standby TXi PFD" segment
9.3.5	9-19	Revised AHRS/ADC sensor comparison information.
		Updated condition and threshold values in table 9-7, "Miscompare Thresholds."

Manual Layout

The layout and design of this manual is to provide clear, concise sections written in the logical order of a pilot's flight instrument and systems scan.

MANUAL SECTION LAYOUT	
Section 1	System Description
Section 2	Primary Flight Display
Section 3	Advanced Features
Section 4	Multi-function Display
Section 5	Weather Awareness
Section 6	Traffic Awareness
Section 7	Terrain Awareness
Section 8	Fuel & Engine Indicating System
Section 9	Abnormal Operations
Appendix A	Glove Qualification Procedure

Electronic Document Features

Versions of this guide are saved in Adobe Acrobat and are available for download at:
garmin.com/manuals

Acronyms and Initialisms

A

ACT	Altitude Compensated Tilt
ADAHRS	Air Data/Attitude & Heading Reference System
ADC	Air Data Computer
ADF	Automatic Direction Finding Equipment
ADI	Attitude and Direction Indicator
ADIZ	Air Defense Identification Zone
ADS-B	Automatic Dependent Surveillance Broadcast
AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
AGL	Above Ground Level
AHRS	Attitude Heading Reference System
AIM	Airman's Information Manual
AIRB	Basic Airborne Application
ALT	Altitude Hold
AP	Autopilot
ATC	Air Traffic Control
ATK	Along Track

C

CAT	Carburetor Air Temperature
CDI	Course Deviation Indicator
CDU	Control and Display Unit
CHT	Cylinder Head Temperature
CRS	Course
CTAF	Common Traffic Advisory Frequency

D

DG	Directional Gyro
DH	Decision Height

DME Distance Measuring Equipment

E

EDR Excessive Descent Rate
EGT Exhaust Gas Temperature
EIS Engine Information System
ENR En Route
ESP Electronic Stability and Protection

F

FAF Final Approach Fix
FDC Flight Data Center
FIS-B Flight Information Services Broadcast
FLTA Forward Looking Terrain Avoidance
FMS Flight Management System
FPM Feet Per Minute
FS Flight Stream

G

GCS Ground Clutter Suppression
GDC Garmin Air Data Computer
GDL Garmin Data Link
GDU Garmin Display Unit
GEA Garmin Engine and Airframe
GFC Garmin Flight Controller
GP Glidepath
GPS Global Positioning System
GPSS Global Positioning System Steering
GRS Garmin Reference System
GS Glideslope
GSL Geometric Sea Level
GSU Garmin Sensing Unit

Acronyms and Initialisms

GTP Garmin Temperature Probe

GWX Garmin Weather Radar

H

HDG Heading

HOT Hazardous Obstacle Transmission

HSI Horizontal Situation Indicator

HTAWS Helicopter Terrain Awareness and Warning System

I

IAF Initial Approach Fix

IAS Indicated Airspeed

IAT Induction Air Temperature

IFR Instrument Flight Rules

IGRF International Geomagnetic Reference Field

ILI Imminent Line Impact

ILS Instrument Landing System

IOI Imminent Obstacle Impact

ISA International Standard Atmosphere

ITI Imminent Terrain Impact

K

KIAS Knots Indicated Airspeed

L

LDI Lateral Deviation Indicator

LOA Letter of Authorization

LOC Localizer

LRU Line Replaceable Unit

M

MAP Missed Approach Point

MAHP Missed Approach Holding Point

MDA	Minimum Descent Altitude
METAR	Meteorological Terminal Aviation Routine Weather Report
MFD	Multi-Function Display
MOA	Military Operations Area
MSL	Mean Sea Level

N

NAVAID	Navigation Aid
NCR	Negative Climb Rate
NDB	Non-Directional Beacon
NEXRAD	Next-Generation Radar
NRST	Nearest

O

OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OCN	Oceanic

P

PCL	Pilot Controlled Lighting
PDA	Premature Descent Alert
PF	Primary Flight Display
PVT	Position, Velocity, and Time

R

RLC	Reduced Line Clearance
ROC	Reduced Required Obstacle Clearance
RTC	Reduced Required Terrain Clearance

S

SAT	Static Air Temperature
SBAS	Satellite-Based Augmentation System
SD	Secure Datacard
SSID	Service Set Identifier

Acronyms and Initialisms

SURF	Surface Situation Awareness
SVT	Synthetic Vision Technology
SXM	SiriusXM Weather

T

TA	Traffic Advisory
TAF	Terminal Aerodrome Forecast
TAS	Traffic Advisory System
TAT	Total Air Temperature
TAWS	Terrain Awareness and Warning System
TCAD	Traffic Alert and Collision Avoidance Devices
TCAS	Traffic Alert and Collision Avoidance System
TERM	Terminal
TFR	Temporary Flight Restriction
TIS	Traffic Information Service
TIT	Turbine Inlet Temperature
TSO	Technical Standard Order

U

UTC	Universal Time Coordinated
-----	----------------------------

V

VDI	Vertical Deviation Indicator
VFR	Visual Flight Rules
VLOC	VOR/Localizer
VNAV	Vertical Navigation
VOR	Very High Frequency Omni-directional Range
VRP	Visual Reporting Point
VS	Vertical Speed
VSI	Vertical Speed Indicator

W

WAAS	Wide Area Augmentation System
WATCH	Weather Attenuated Color Highlight
WP	Waypoint

Reference Documentation

DOCUMENT	P/N
<i>GDL 69/69A SiriusXM Satellite Radio Activation Instructions</i>	190-00355-04

Reference Websites

WEBSITE	ADDRESS
Aviation Limited Warranty	https://www.garmin.com/en-US/legal/aviation-limited-warranty
Database Concierge	Go to http://www.flygarmin.com/support and select Database Management.
ADS-B Academy	https://www.garmin.com/us/intheair/ads-b
Connex	http://www.garmin.com/connex

1 System Description

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FLIGHT STREAM 510 SETUP

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System Overview

The G500(H)/G600/G700 TXi is a display and sensor system available in three display options.

- GDU 1060 – 10" display
- GDU 700P – 7" portrait display
- GDU 700L – 7" landscape display

Depending on system specifics one or more of the following functions may apply:

- Primary Flight Display (PFD) – provides attitude, heading, air data, and navigation information to the pilot
- Multi-Function Display (MFD) – provides pilot awareness of factors that may affect the overall conduct of a flight
- Engine Indicating System (EIS) – provides engine and airframe operating parameters to the pilot

GDU 1060 PFD/MFD, EIS OPTION

The GDU 1060 is a PFD/MFD display, with an optional EIS function. Each function is designated to a portion of the display. The MFD can be selectively hidden or shown. When hidden, the PFD expands into the MFD space. If installed, the EIS function always shows and occupies either the left or right edge of the display.

GDU 700P PFD, MFD, EIS, MFD/EIS

The GDU 700P provides a single PFD, MFD, EIS, or combined MFD/EIS function. In some installations, it provides backup PFD or EIS information in the event that the primary PFD or EIS display fails or malfunctions.

GDU 700L PFD, EIS, OR MFD/EIS

The GDU 700L provides a single PFD, EIS, or MFD/EIS combined display. When configured as an MFD/EIS display, engine instruments are dedicated to 40% of the screen. The remaining screen portion displays all configured MFD options using a pilot-selectable menu.

1.1 Display Layout



Figure 1-1 Garmin Display Units

Table 1-1 Display Hardware Descriptions

DISPLAY	HARDWARE DESCRIPTIONS
Bezel	<ul style="list-style-type: none"> Ledges provide hand stability for data entry and when making selections. Includes the power key, mechanical knobs, photocell, and SD card slots.
Touchscreen	<ul style="list-style-type: none"> Multi-touch display provides controls for operating the unit.
Power Key	<ul style="list-style-type: none"> Powers unit on or off. Allows manual transition into display backup mode.
Photocell	<ul style="list-style-type: none"> Measures cockpit ambient light level to automatically adjust display brightness for day and night.
SD Card Slots	<ul style="list-style-type: none"> Each unit has two SD card slots. The purpose of each slot depends on display type.
Inner & Outer Knobs	<ul style="list-style-type: none"> Units have a dual concentric knob near the bottom of bezel. The GDU 1060 has two, one on each side. Inner and outer knob functionality differs according to display features.

1.2 Display Configurations



Figure 1-2 GDU 1060 Display Configurations

System Description



EIS Only



PFD Only



MFD Only



EIS/MFD

Figure 1-3 GDU 700P Display Configurations



EIS Only



PFD Only



EIS/MFD

Figure 1-4 GDU 700L Display Configuration

1.2.1 System Functions

PFD	MFD	EIS [2]
GDU 700()/1060	GDU 700P/1060 [3]	GDU 700()/1060 [3]
<ul style="list-style-type: none"> • Attitude • Airspeed • Altitude • Vertical Speed • Turn Coordinator • HSI • HSI Map [4] • Clock • Lateral and Vertical Deviation Indicators • Datalink Weather Display [1] • Radar Altimeter [1] • Autopilot Annunciations [1] • Flight Director [1] • Synthetic Vision [1] • Flight Path Marker [1] • System Advisories • Safety Monitors [1] • GPS NAV Status • Display Backup [1] [4] • Terrain Avoidance [1] 	<ul style="list-style-type: none"> • Navigation Map • Traffic [1] • Terrain • Charts • Flight Plan • Weather [1] • Waypoint Information • Music Services [1] • Terrain Avoidance [1] • Engine Data [1] • System Advisories • Video [1] 	<ul style="list-style-type: none"> • Fuel Qty (Main, Aux) • RPM/Tach • Propeller Sync Display • Manifold Pressure • Oil Pressure • Oil Temperature • Fuel Flow • Fuel Pressure • Fuel Calculations • Cylinder Operating Temperatures (CHT, EGT) • TIT • Lean Assist Mode • Carburetor Air Temperature • Intercooler Temperatures (IAT, CDT, Difference) • Amps/Volts • User Selectable Fields • User Adjustable Advisories

[1] Function availability dependent upon aircraft interfaces or enablement.

[2] Displayed engine operating parameters dependent upon configuration.

[3] GDU 700() MFD/EIS provides the same MFD and EIS functionality listed with the exception of weather radar and multi-engine.

[4] Not available for GDU 700L.

Pilot Interface

1.3 Unit Power

The GDU receives power directly from the aircraft's electrical system. To ensure safe operation, continuous built-in test features exercise the unit's processor, memory, external inputs, and outputs.

System failure annunciations typically disappear within the first 30 seconds after power-up. Upon power-up, the bezel key backlight momentarily illuminates.

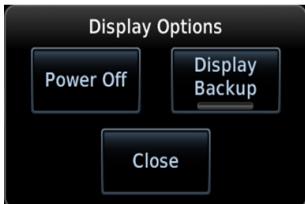
On MFD: The start-up screen presents the unit software version, the name and status of all installed databases, and controls for selecting a crew profile.

1.3.1 Power Off Options



WARNING

NEVER ATTEMPT TO POWER OFF THE UNIT WHILE AIRBORNE UNLESS OPERATIONAL PROCEDURES DICTATE.



Pushing the **Power** key once opens a pop-up menu. Selectable display options allow you to:

- Power off unit
- Close the menu (cancels shutdown)
- Change operating mode to display backup (if available)



Pushing and holding the **Power** key for 4 seconds powers off the unit without safeguards. Shutdown occurs once the timer reaches zero.

1.4 SD Card Slot



NOTE

Do not remove or insert an SD card while in flight. Always verify the system is powered off before inserting or removing an SD card.

Determine which card slot is appropriate for the task.

Table 1-2 SD Card Slot Designations

TASK	SD CARD SLOT		
	GDU 1060	GDU 700P	GDU 700L
Exporting data logs	Top	Top	Left
Saving system configurations	Top	Top	Left
Transferring crew profiles	Top	Top	Left
Capturing screen images [1]	Top	Top	Left
Upgrading software	Top	Top	Left
Enabling Flight Stream 510 connectivity [2]	Bottom	Bottom	Right
Updating databases [3]	Top or bottom	Top or bottom	Left or right

- [1] Screen images save to the bottom/right card when the top/left card is unavailable.
- [2] Install Flight Stream 510 in a GTN, if available.
- [3] While either slot may be used, the bottom/left slot has a faster transfer rate and is recommended for all database-related tasks.

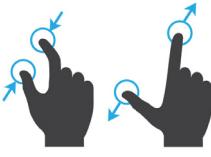
INSERT AN SD CARD

1. Verify slot is empty.
2. Hold card in the proper orientation.
 - **GDU 1060/700P:** label side of card faces left edge of display screen
 - **GDU 700L:** label faces top edge of display screen
3. Ensure back edge of card is flush with display bezel after insertion.

EJECT AN SD CARD

Release the spring latch by pressing lightly on the back edge of card.

1.5 Touchscreen

GESTURES	
TAP 	<ul style="list-style-type: none"> • Tap is touching the screen briefly with a single finger. • A tap can open a page or menu, activate a command key or data entry field, display map feature information, or select an option within application.
TAP AND HOLD 	<ul style="list-style-type: none"> • Certain momentary controls (e.g., directional arrow keys) provide a secondary tap and hold function. • Tap key and hold finger in place. Lift up once the desired action occurs. • Use this gesture for scrolling, enabling Caps Lock, and increasing/decreasing values continuously.
SWIPE 	<ul style="list-style-type: none"> • Touch object with finger, slide finger across screen, then lift up. • A swipe is a smooth motion used for viewing and scrolling lists, panning across a map or chart display, and zooming HSI map or Rotorcraft PFD VFR map display (upward and downward swipes only).
FLICK 	<ul style="list-style-type: none"> • This is similar to a swipe, except the finger leaves screen after a quick upward or downward motion. • Screen information moves at a fast speed, then slows down as it stops. • Scrolls through an item list faster than by pressing the arrow keys.
PINCH & STRETCH 	<ul style="list-style-type: none"> • Touch any map or chart with two fingers at the same time. Then, bring fingers close together (pinch) or spread apart (stretch). • Stretch to zoom in and pinch to zoom out. • Use these gestures to magnify map features, identify multiple objects in close proximity, read details on a chart, or magnify a video image.

1.5.1 Keys



Displays Advisories page.
Blinking icon indicates unread system advisories.



Inputs specified value.



Displays context menus.



Scrolls up.



Returns to previous page.



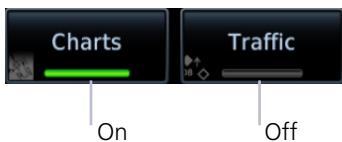
Scrolls down.



Cancels current function without inputting data.



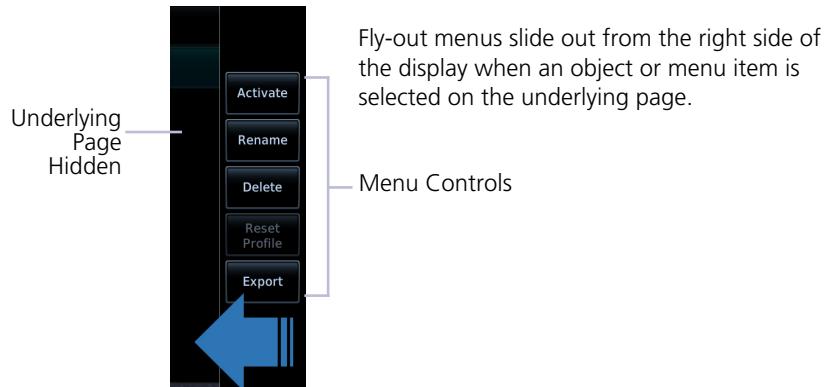
Indicates corresponding item is selected (e.g., database update).



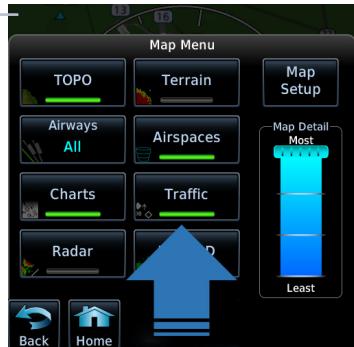
Toggle keys turn a specific function on or off. The current state of the function is indicated below the key label.

1.5.2 Menus

Fly-out menus and slide over windows group related controls into an expandable pane, allowing access to multiple functions on a single page.

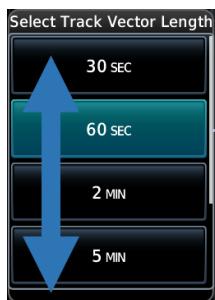


Underlying
Page
Hidden



Slide over windows slide up from the bottom of display.

1.5.3 Lists



Scrollable lists group control keys related to a single function (e.g., selectable range options). When scrolling, all keys in the list are inactive.

Scroll Bar



Popup lists open to the default or previously selected value.

Default or Current Setting

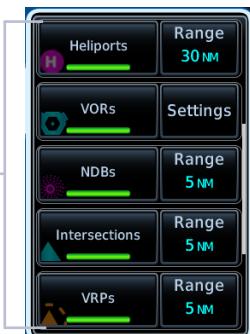
1.5.4 Tabs



Tabs group information into individual panes. Content includes scrolling lists, data fields, function keys, or a combination of controls.

Tabs are located along the left side or bottom edge of a pane.

Inactive Tabs



Lists containing a combination of controls typically appear within a tab and open to the first list item.

Toggle keys either enable or disable list items. In some cases, **Settings** or **Range** keys provide access to selectable setting options.

Toggle Keys

1.5.5 Keypads



The GDU employs multiple keypad types to serve specific settings and functions.

Tapping **Layout** changes the format between ABCDE and QWERTY.

1.6 Control Knobs



Inner and outer knobs offer an alternative method for selecting and modifying data without the use of touch keys.

GDU 1060: Each dual-concentric knob serves its own PFD or MFD display. When the PFD is in full-screen mode, both sets of dual-concentric knobs serve the PFD.

Table 1-3 PFD Knob Functions

PFD KNOB FUNCTION	
Outer Knob	<ul style="list-style-type: none"> • Selecting reference controls • Cursor placement and initial field/page selections • Moving cursor forward or backward within data field
Inner Knob (Turn)	<ul style="list-style-type: none"> • Selecting reference values • Inputting data • Modifying individual characters in data entry field
Inner Knob (Push)	<ul style="list-style-type: none"> • Entering current or specified numerical value • Synchronizing PFD reference to its current value • Alternating between standard and pilot set barometric pressure

Table 1-4 MFD Knob Functions

MFD KNOB FUNCTION	
Outer Knob	<ul style="list-style-type: none"> • Selecting a page shortcut • Cursor placement and initial field/page selections • Moving cursor forward or backward within data field
Inner Knob (Turn)	<ul style="list-style-type: none"> • Inputting data • Modifying individual characters in data entry field • Zooming • Controlling weather radar range
Inner Knob (Push)	<ul style="list-style-type: none"> • Entering a specified numerical value

Table 1-5 EIS Knob Functions

EIS KNOB FUNCTION	
Outer Knob	<ul style="list-style-type: none"> • Cursor placement and initial field/page selections • Moving cursor forward or backward within data field
Inner Knob (Turn)	<ul style="list-style-type: none"> • Inputting data • Modifying individual characters in data entry field
Inner Knob (Push)	<ul style="list-style-type: none"> • Entering a specified numerical value

1.6.1 Knob Function Indicators

A locator bar works in conjunction with the outer knob providing quick access to the indicated MFD page and/or PFD bug. Turning the outer knob clockwise or counter-clockwise moves the locator through displayed menu options. Changes in the current screen configuration may result in a change of menu options. Additional icons located to the left or right of the bar indicate available knob functions for the associated display.

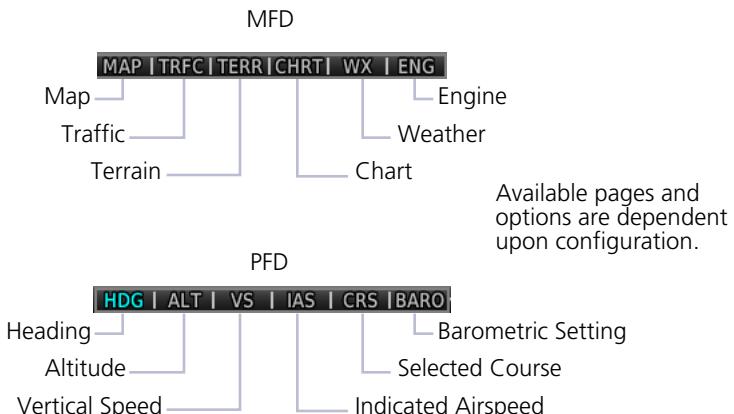


Figure 1-5 Knob Indications

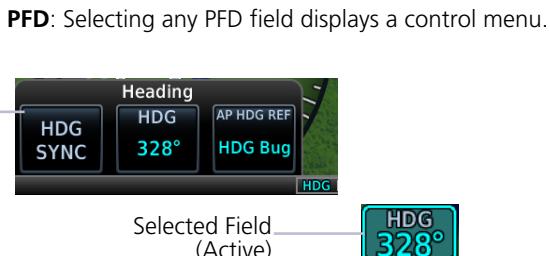


Figure 1-6 Active Bar Selections

1.7 Color Conventions

COLOR	FUNCTIONS
RED 	<ul style="list-style-type: none"> • Warning conditions • Operating limits
YELLOW 	<ul style="list-style-type: none"> • Cautionary conditions • Conditional operating ranges
GREEN 	<ul style="list-style-type: none"> • Safe operating conditions • Normal operating ranges • VOR/localizer data • Engaged modes
WHITE 	<ul style="list-style-type: none"> • Scales and markings • Current data and values • Armed modes
MAGENTA 	<ul style="list-style-type: none"> • GPS data • Active flight plan legs • VNAV data
CYAN 	<ul style="list-style-type: none"> • Pilot-selectable references
GRAY 	<ul style="list-style-type: none"> • Missing or expired data, product unavailable
BLUE 	<ul style="list-style-type: none"> • Sky • Water
BROWN 	<ul style="list-style-type: none"> • Ground

SD Cards & Databases

1.8 Logging Flight Data

FEATURE REQUIREMENTS

- SD card for external data logging
- Flight Stream 510 wireless datacard for data streaming

DATA LOGGING FUNCTION

- Capable of storing approximately 100 hours of flight data in the unit's internal memory
- Overwrites oldest files when the internal data log reaches capacity
- External data logging stops when the SD card is full
- Records various parameters related to aircraft flight instruments, engine indications, and configuration
- Streams logged flight and engine data to Garmin Pilot when Flight Stream 510 is present
- Information is available for export to SD card for later analysis
- Log files automatically generate upon unit power-up
- Files are stored in the "data_log" folder
- All files are saved in .csv format

1.9 Screen Captures

Images can be saved to the SD card at any time using a screen capture. The camera icon momentarily shows in the annunciator bar indicating a successful screen capture. Images automatically save to the "print" folder in the SD card root directory. To view image, remove SD card and open the "print" folder on a computer.



1. Insert SD card into the top or left card slot.
2. Push and hold right inner knob.
3. With inner knob depressed, push and release the power key.

1.10 Databases



NOTE

The GDU supports SD cards in the FAT32 format only, with capacities ranging between 8 GB and 32 GB.

Databases are stored in the internal memory of each display. To view update cycles, or to purchase individual databases or database packages, go to flyGarmin.com.

The TXi system offers three methods for loading and updating databases:

1. Load databases via SD card. The card can be removed after loading.
2. Transfer databases from a GTN or another GDU using Database SYNC.
3. Transfer databases from a mobile device using Database Concierge and a Flight Stream 510 wireless datacard.

Table 1-6 Supported Databases

DATABASE	FUNCTION
Airport Directory	Airport facility and FBO information
Basemap	Bodies of water, geopolitical boundary, and road information
ChartView [1]	Jeppesen terminal procedures
FliteCharts	AeroNav terminal procedures
IGRF [2] [3]	Internal ADAHRS and external AHRS correct for variations in the earth's magnetic field by applying calculations derived from the IGRF database
Navigation	Airport, NAVAID, waypoint, and airspace information (Garmin or Jeppesen)
Obstacles	Obstacle and wire data
SafeTaxi	Airport surface diagrams
Terrain	Terrain elevation data

- [1] Optional third party database. For subscription and update information, go to jeppesen.com.
- [2] When updated, the database is packaged with the Navigation database. Not available for individual download.
- [3] For magnetic field model version and part number information, refer to the AHRS section of the External LRUs page.

1.10.1 Database Effective Cycles

FUNCTIONAL REQUIREMENTS

- External GPS navigator for system to determine database effectiveness

OR

- Flight Stream 510 wireless datacard
- Garmin Pilot app on a mobile device

FUNCTIONAL LIMITATIONS

- EIS units do not support database functionality

Most databases expire at regular intervals. Exceptions include Basemap and Terrain, which neither expire nor update on a regular schedule. IGRF updates occur approximately every five years. Failure to update a database can lead to errors in heading information.

Table 1-7 Database Effective Status

DATABASE	FUNCTION
Databases with no effective date	<ul style="list-style-type: none"> Effective upon release Transfer occurs prior to database verification at system start-up No automatic transfer if Flight Stream 510 is present Includes Basemap and Terrain No pilot confirmation or restart required
Databases with specified effective dates	<ul style="list-style-type: none"> Effective during a specific period GDU determines database status using the current date and time from GPS Automatic activation occurs on the effective date

	Navigation	1613, Expires 05-JAN-17
	Basemap	16M1
	Obstacle/HOT	16B6, Expires 05-JAN-17
	Terrain	15T1
	SafeTaxi	16S6, Expires 05-JAN-17
	FliteCharts	1613, Expires 05-JAN-17
	Airport Directory	16D6, Expires 05-JAN-17

On MFD: The start-up page lists all currently installed databases. Review this list for current database types, cycle numbers, and expiration dates.

Yellow text denotes when a database is:

- Not available
- Installed before its effective date
- Missing date information
- Past its expiration date

	Terrain	Database Not Found
--	---------	--------------------

Pilot PFD Navigation database expires on 15-SEP-16

Expired database notifications indicate as system advisories.

1.10.2 Active and Standby

The GDU uses two types of databases: active and standby. Active databases are in use by the system. Standby databases have not reached the effective date. During normal operation, information about all active and standby databases are viewable on the associated tab.

On MFD, tabs are located on System Status page. They are located on Databases page of the PFD (GDU 700() only).

TAB	DISPLAYS
ACTIVE	<ul style="list-style-type: none"> Information about databases currently in use
STANDBY	<ul style="list-style-type: none"> Information databases that are not yet effective If a standby database is not available, the "No standby databases found" message displays in the Standby tab

1.10.3 Database Update Page

FUNCTIONAL LIMITATIONS

- Page not available while airborne

The Database Update page presents a list of all available databases. This page is accessible at any time for review purposes or manual database transfers.



To access the page, tap **Update**.

On MFD, this key resides in the System Status menu.

GDU 700() only: On PFD, it resides on the Databases page.



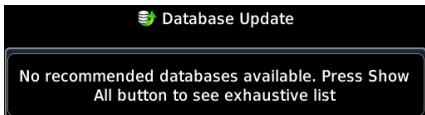
Select applicable database(s) for transfer. If all listed databases require updating, choose **Select All**.

Tapping **Select None** deselects all databases.



Tapping **Start** initiates the update process. GDU automatically restarts once all updates are complete.

By default, this page displays only the databases recommended for update.

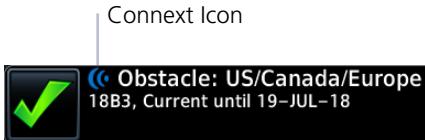


A message informs when no recommended databases are available.

	ChartView 1617, Expired 25-AUG-16	Error Info
	FliteCharts 1606, Expired 23-JUN-16	Error Info
	Obstacle: US/Canada/Europe Fix... 17B1, Expired 02-MAR-17	Error Info
	SafeTaxi: Americas 17S1, Expired 02-MAR-17	Error Info

Tapping **Show All** displays a complete list of all databases, including ones that are not yet effective or that may be older than the currently active database(s). For more details about a specific database, tap **Error Info**.

DATABASE SOURCE INDICATION



A Connexx icon indicates when a database is from Garmin Pilot via wireless transfer.

No indication means the database is either from an SD card or the unit's internal standby queue.

1.10.4 Automatic Updates

AUTOMATIC UPDATES OCCUR WHEN...

- Newer database is detected on the SD card or in the internal standby queue
- Newer database is within its effective dates
- Aircraft is on ground

When a newer database is available, follow the on-screen prompts to complete the update process. PFD issues a pop-up notification only on the GDU 700(). MFD automatically redirects to the Database Update page.

A status page displays a progress bar and the name of each database as it uploads to the GDU. Terrain and chart databases may require up to 5 minutes each for transfer. Total transfer time depends on the SD card type.

The unit automatically restarts once the update is complete. The update is indicated in the list of currently installed databases.

INSTALL OR UPDATE A DATABASE USING AN SD CARD

1. Download database onto SD card.
2. Insert SD card with the most recent database(s) into top/right card slot.
3. Power on GDU.



Selecting **Update** opens the Database Update page. A list displays the newest databases recommended for update.

All newer databases (effective and expired) transfer from the SD card to the internal standby queue.

BASEMAP, CHARTVIEW, AND TERRAIN UPDATES

These databases automatically transfer from an SD card without any prompting or progress indications. They do not require pilot confirmation or a unit restart.

1.10.5 Database Concierge

FEATURE REQUIREMENTS

- Flight Stream 510 wireless datacard
- Garmin Pilot app on a mobile device

Database Concierge allows wireless transfer of databases from a mobile device. A pilot selects and downloads databases inside the Garmin Pilot app. Transfers occur once Flight Stream 510 establishes a wireless connection inside the aircraft.

DATABASE CONCIERGE TRANSFER FUNCTIONS

- Automatic updates for databases with effective dates
- Preloads databases that are not yet effective by placing them in the internal standby queue
- Supports Database SYNC with capable Garmin avionics
- Displays database type, cycle, effective date, and transfer progress
- Start** key for manual operation
- Pilot confirmation required

TRANSFER A DATABASE USING DATABASE CONCIERGE

- Purchase database(s) from flyGarmin.com.
- Open Garmin Pilot and follow the download instructions.
- Install Flight Stream 510 into the GDU. If the system contains a GTN, install the datacard into that unit instead.
- Connect to Wi-Fi.
- Follow the on-screen prompts.



Database Concierge transfers databases from the app to Flight Stream 510. A progress bar shows when this process is complete.

GDU either updates or preloads databases based on their effective date. A second progress bar indicates upload status. The unit automatically restarts upon database activation.

Tapping **Skip** cancels any unfinished wireless transfers and initiates the update process. GDU activates any databases that completed transfer before the interruption. Previously selected databases on an SD card or in the internal standby update as well. If no databases are available, "Transfers interrupted" displays.

1.10.6 Database SYNC

Database SYNC minimizes database maintenance by synchronizing active and standby databases across all configured LRUs. Once a standby database becomes effective, each LRU automatically generates an update prompt. For information regarding database packages, and individual database purchases, go to flyGarmin.com.

TOGGLE DATABASE SYNC ON OR OFF

From the MFD home screen:

Tap **System > System Status > Menu > Database SYNC**

From the PFD: Tap **System > PFD Setup > Database SYNC**

DATABASE SYNC TRANSFER FUNCTIONS

- Enables automatic database synchronization across all capable Garmin avionics (e.g., GTN or G500/G600 legacy flight displays) and includes active and standby databases
- Not applicable to Terrain database
- Functionality not available for EIS-only configurations
- Toggling function off disables Chart Streaming (if enabled)
- Message informs that enabling Database SYNC may overwrite any databases currently in standby
- Message prompts unit restart if a new database is effective and the aircraft is on ground

1.10.7 Chart Streaming

Chart Streaming allows streaming of individual charts on an as-needed basis until database sync is complete. A typical chart database may take up to one hour to synchronize across multiple LRUs.

CHART STREAMING TRANSFER FUNCTIONS

- Enables automatic streaming of individual charts from the newest chart database. LRUs with chart streaming enabled display the most current chart information
- Current charts display on MFD Charts page; chart overlays are available for display on Map page
- Available for both ChartView and FliteCharts
- Chart database effective date displays on Charts page when chart expires
- Available only when Database SYNC is active and a current chart database is available
- Toggling off has no affect on Database SYNC

Flight Stream 510 Setup



Data logs transfer over Bluetooth. Databases transfer over Wi-Fi.

FEATURE REQUIREMENTS

- Flight Stream 510 wireless datacard (installed in GTN, if available)

FEATURE LIMITATIONS

- GDU allows pairing of up to 13 Bluetooth devices, with two simultaneous device connections
- Auto reconnect function is not available for Android devices
- GDU does not support Flight Stream 510 Phone/SMS and flight plan transfer functionality

PILOT AWARENESS: FLIGHT STREAM 510 SETUP

Setup page features allow the pilot to:

- View Flight Stream 510 product information
- Enable database updates
- Pair and manage Bluetooth devices
- View and edit Bluetooth name and Wi-Fi information



Refer to the Information window when contacting customer service regarding Flight Stream 510.

Product information includes:

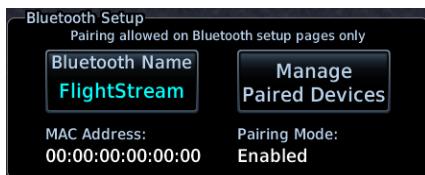
- Software version
- Part number

DATABASES

This feature allows automatic import of available database updates via Database Concierge.

1.11 Bluetooth Setup

Depending on display type, Bluetooth management options may reside on the Flight Stream page or on a dedicated setup page. Pairing occurs only when the Bluetooth Setup menu is opened.



Bluetooth information includes:

- Current Bluetooth device name
- MAC address
- Pairing mode status

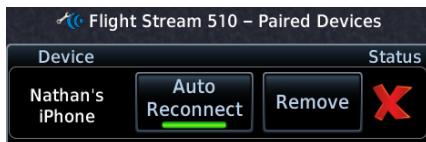
BLUETOOTH NAME

Allows entry of the Bluetooth device name.

PFD only displays: Use control knobs to enter the Bluetooth name. Keypad entry is not available.

EIS only displays: Bluetooth name is set up using Garmin Pilot. Manual data entry is not required.

1.11.1 Managing Paired Devices



To view a list of all paired devices and their connection status, tap **Manage Paired Devices**.

AUTO RECONNECT

Enables automatic connection between the GDU and the paired device when the two are within range.

REMOVE

Removing a device from the list means it is no longer paired with the GDU. This action requires pilot confirmation.

Be sure to remove pairing on both devices before attempting to pair them again.

1.12 Wi-Fi Setup



Wi-Fi setup information includes:

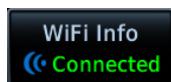
- Wi-Fi SSID
- Wi-Fi password
- MAC address of both Wi-Fi module and connected device (available only after launching Garmin Pilot)

1.12.1 Connecting to Wi-Fi

Enter the required SSID and password using the provided setup keys.

PFD only displays: Use control knobs for SSID and password entry. Keypad entry is not available.

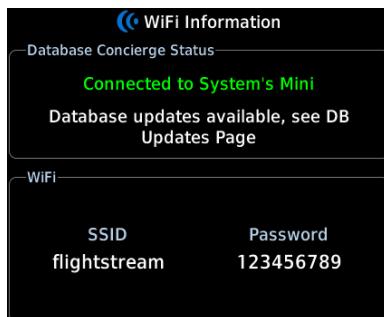
1.13 Wi-Fi Information



Tapping **WiFi Info** opens an information page. Wi-Fi connection status annunciations on the key label when this page is not active.

Table 1-8 Wi-Fi Info Key Annunciations

ANNUNCIATION	DESCRIPTION
Offline	Flight Stream 510 requires power up.
Ready	Wi-Fi is active, but the GDU is waiting to connect with a paired device.
Connected	System detects a connection between the GDU and a paired device.
Open App	Flight Stream 510 requires Garmin Pilot to be opened in order for database transfer to commence.



This page is accessible from the Database Update and start-up pages. Information includes:

- Database Concierge connection status
- Connected device name
- Database update availability and instructions
- Wi-Fi SSID and password

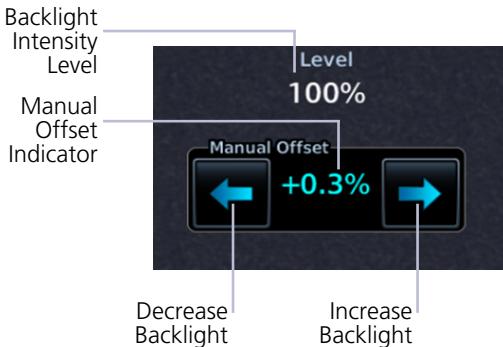
Pilot Settings

1.14 Display Brightness Control

Depending on configuration, display brightness is controlled using inputs from the built in photocell, aircraft dimmer bus, or both. Installer configured curves determine the amount of change in brightness that occurs in response to a control adjustment. If brightness control is not satisfactory, contact a Garmin dealer to adjust the lighting curves.

1.14.1 Automatic Brightness Control

Dimming is limited to prevent on screen indications from becoming unreadable. The built in photocell automatically controls display brightness based on ambient light levels.



During automatic control, the pilot may still adjust brightness using the manual offset controls in the System Backlight page.

The GDU retains manual offset settings over power cycles.

1.14.2 Manual Brightness Control

Optionally, the TXi system is configurable to use an aircraft dimming bus for display brightness control. Upon reaching minimum input level, display brightness reverts to the photocell. This prevents the display from going black in the even of a dimmer input failure.

1.15 System Status Page

The System Status page displays information specific to the GDU and its databases. Refer to this page when contacting customer service. Information includes:

- Serial number
- Main software version
- System ID
- Database information

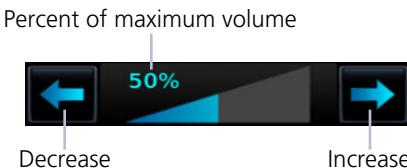
VIEW COPYRIGHTS



Tapping this key displays copyright information for all installed databases.

1.16 Click Volume

If the GDU is wired for audio output, set the click volume to the preferred level.



Volume displays as a percentage of the maximum volume, with 0% being muted and 100% being maximum volume.

1.17 Clock

Specify the time format and local offset. If a 12 hour or 24 hour clock is selected, tap **Local Offset**, and specify the appropriate offset value from UTC. Options include 12 hour, 24 hour, and UTC.

1.18 Weather Display Shortcut

A knob shortcut option is available when there are two or more active weather sources. Select a weather service and verify shortcut operation. Depending on configuration, available shortcut options may include:

- Connxxt Weather
- SiriusXM Weather
- FIS-B Weather
- Stormscope
- Radar



Selecting **Radar** changes the weather shortcut indicator to reflect the weather radar option is active.

1.19 Unit Selections



NOTE

Engine gauge, airspeed, and altimeter units are not pilot selectable.
Interfaced equipment may contain unit settings independent of the TXi system.

The System Units page displays a list of TXi system wide unit settings. Selections are synchronized across all configured GDUs.

SPECIFY UNIT TYPE

1. Review the current unit selections.
2. Tap the applicable parameter key.
3. Select a unit type.

Table 1-9 Units Page Setting

DISPLAY	SETTINGS
PFD	<ul style="list-style-type: none"> • BARO Pressure • Distance • NAV Angle • Temperature • Wind Speed
MFD	<ul style="list-style-type: none"> • Altitude • Distance • NAV Angle • Temperature
EIS [1]	<ul style="list-style-type: none"> • Distance • Fuel Computer [2] • Temperature

- [1] Engine gauge units are not adjustable.
[2] These units are not synchronized with other displays.

Crew Profiles

FEATURE REQUIREMENTS

- Requires MFD for creating crew profiles, modifications, and deletions

PILOT AWARENESS: MANAGE CREW PROFILES OPTION

The Manage Crew Profile option allows the pilot to:

- Save TXi system wide and display specific settings
- Create individual profiles for aircraft operated by multiple pilots
- Transfer profiles between aircraft

1.20 Crew Profile Settings

Crew profile settings include both system wide and display specific settings. Specific display profile settings include the pilot adjustable parameters for each configured display.

Table 1-10 System & Display Profile Settings

DISPLAY	FUNCTION	SETTING
SYSTEM		<ul style="list-style-type: none"> • Units • Nearest Airport Criteria • Click volume • Chart Streaming • Recently used waypoint lists • Weather knob shortcut • Backlight manual offset • Database SYNC
PFD	Synthetic Vision	<ul style="list-style-type: none"> • All
	HSI	<ul style="list-style-type: none"> • HSI Map • Map overlays • Bearing pointers
	Setup	<ul style="list-style-type: none"> • Wind Field • Clock/Timer • Menu Timeout • CDI/VDI Preview • BARO SYNC • Airspeed reference bug status

DISPLAY	FUNCTION	SETTING
MFD	Map	<ul style="list-style-type: none"> • All
	Traffic	<ul style="list-style-type: none"> • Motion vector • Altitude filter (ABV/BLW/NRM/UNR)
	Terrain	<ul style="list-style-type: none"> • View • Layers
	Flight Plan	<ul style="list-style-type: none"> • Column data fields
	Datalink weather products (SXM, FIS-B, Connex)	<ul style="list-style-type: none"> • Map orientation • Layers • Legend on/off • FIS-B on/off
	Stormscope	<ul style="list-style-type: none"> • View • Mode
	Music	<ul style="list-style-type: none"> • Preset group selection • Music category selection
	Engine	<ul style="list-style-type: none"> • EIS Lean Mode (ROP/LOP/TIT) • Engine advisories (on/off states, thresholds)
	System	<ul style="list-style-type: none"> • Time format (UTC/local) • Weather knob shortcut • Outside Air Temperature units
	Engine	<ul style="list-style-type: none"> • EIS Lean Mode (ROP/LOP/TIT) • Engine advisories (on/off states, thresholds)

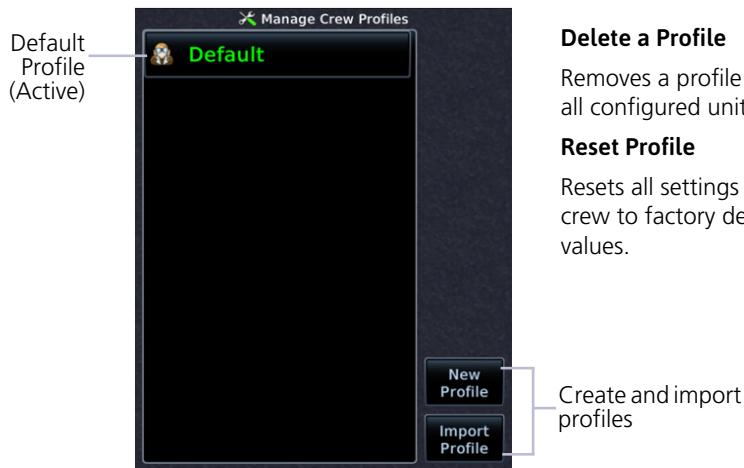
1.20.1 Crew Profile Management

FEATURE LIMITATIONS

The system stores a maximum of ten profiles. This includes nine user generated profiles and one default profile. Both New Profile and Import Profile functions are unavailable when this limit is reached. It is recommended to have all GDUs online when managing crew profiles. Profile synchronization is delayed for any LRU not online at the time a profile change occurs.

Profile management functions are provided in a fly-out menu on the Manage Crew Profiles page. Available options are based on current profile selection.

Setting modifications are automatically stored within the active crew profile. If no user generated profile is active, all adjustments are saved to the Default profile. The Default option is automatically selected when no user-generated crew profile is imported or defined. New and existing profiles are listed in the Manage Crew Profile page.



CREATE NEW PROFILE

A profile name is required to complete operation.

1. Tap **New Profile**, enter desired profile name.
2. Tapping **Create and Activate** activates new profile and adds it to list.



ADD CREW PROFILE TO A FULL PROFILE LIST

1. Delete an existing entry from the profile list.
2. Create or import the new profile.

IMPORT A PROFILE



1. Insert an SD card containing a new profile.
2. Tap **Import Profile**.
3. Select profile to import.



If an imported profile has the same name as the existing entry, it is possible to overwrite the existing entry or cancel request.



If imported profile has the same name as the active profile, overwrite option is not given. Acknowledge message, then activate a different profile and try again.



If SD card does not contain importable profiles, acknowledge message and replace SD card.

EXPORT A PROFILE

Export function writes a selected profile onto an SD card. This function overwrites any profile on the SD card with the same name. Available options are based on current profile selection.

ACTIVATE A PROFILE

Select a profile from list and tap **Activate**. When a profile is active:

- Name of profile turns green (active)
- All inactive profiles display in white text
- Name of active profile appears in Crew Profiles window on Setup page

System Messages

1.21 Alerts Types

The unit generates messages in response to various conditions that may occur.

Alert types are grouped according to the level of urgency and required response. They display in order of priority, from highest to lowest.

1. Warnings
2. Cautions
3. System and function advisories

1.21.1 Warnings & Cautions

Warnings require immediate attention. A cautions indicate the presence of an abnormal condition that may require pilot action. A warning may follow a caution if no attempt is made to correct the condition (e.g., altering the aircraft's path toward the alerted terrain or obstacle).

1.21.2 System & Function Advisories



Advisories provide status and operating information.

System advisories display on a dedicated page or slide over window. Depending on the number of advisories, this list may be scrollable.

Function or mode specific advisories appear as unobstructed annunciations on the associated display.

System Advisory Window

Mode Advisory Annunciation

1.21.3 Alert Annunciations

Alert annunciations are abbreviated messages that indicate an alerted function or mode. The color of the annunciation depends on the alert type.

ALERT COLORS
WARNING
CAUTION
ADVISORY

- Warnings display in white text on red background
- Cautions display in black text on amber background
- Function or mode specific advisories display in black text on white background

When an alert is triggered, the annunciation flashes by alternating text and background colors. It turns solid after five seconds. All annunciations remain active (solid) until the condition is resolved or no longer a threat.

GDU 700(): Engine annunciations flash indefinitely unless acknowledged by the pilot.

ANNUNCIATION LOCATION

The location of the annunciation varies according to display and function. On the PFD, alerts annunciate to the right of the HSI. On the MFD, they annunciate in the lower right corner of the page. PFD alerts show on all configured PFD units in the TXi system.

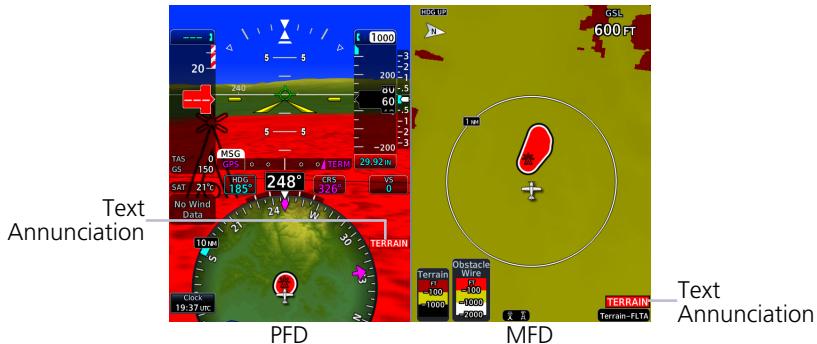
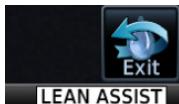


Figure 1-7 Warning Annunciations



Informational advisories pertaining to EIS modes and functions appear in the annunciator bar along the bottom of the screen.

1.21.4 Pop-up Alerts

If a warning or caution relating to terrain, traffic, or the backup battery occurs, a pop-up window may display over the MFD. These pop-ups only appear if the alerted function's associated MFD page is not active.



Figure 1-8 Pop-up Alert, GDU 1060

GDU 1060: If the PFD is in full screen mode during an alert, a flashing page access key (**Terrain** or **Traffic**) replaces the **MFD** key.



Figure 1-9 Warning Indications Full Screen Mode

POP-UP ALERT PRIORITY

In the event of simultaneous alerts, pop-up windows display in the following order:

1. Terrain alerts
2. Traffic alerts
3. Battery alerts

Each pop-up alert contains:

- Enlarged view of the alerted threat location
- Alert annunciation
- Alert inhibit information, if applicable
- Control key for closing the pop-up window
- Direct access key to associated MFD page

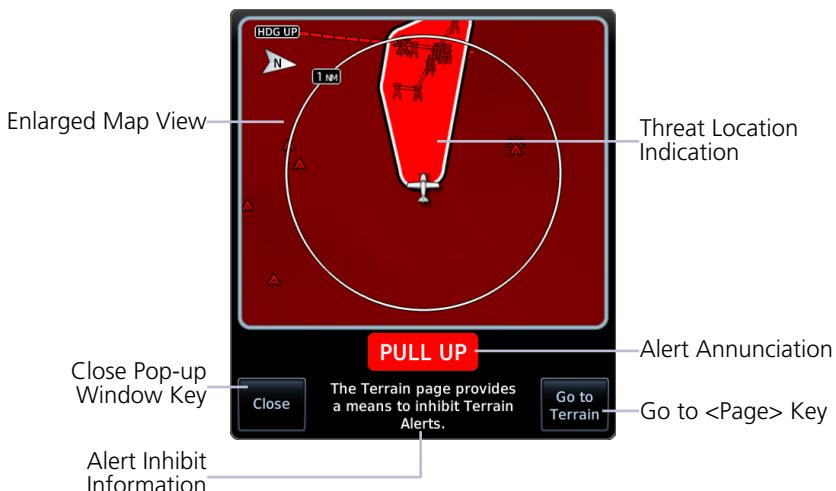
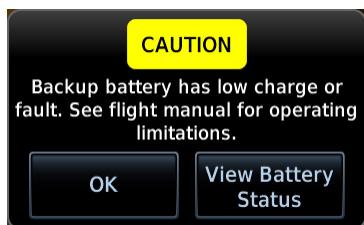


Figure 1-10 Pop-up Alert Layout

To open the indicated MFD page, tap **Go to <Page>**.

To acknowledge the alert and return to previous page view, tap **Close**.

BATTERY POP-UP ALERTS



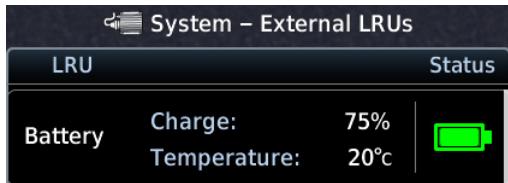
GDU 700P/1060

These pop-ups alert to backup battery status. Available options are dependent on unit and alert type.

Tapping **OK** acknowledges the alert and closes the pop-up.

System Description

GDU 700P/1060: The View Battery Status key provides direct access to the External LRU page.



Battery charge and temperature status display at the top of the LRU list.

GDU 700L: On PFD, battery pop-up alerts display in one of two locations depending on the state of the battery and the aircraft.



Vertical Pop-up Alert



Horizontal Pop-up Alert

Cautions display vertically along the left side of the screen.

These alerts may occur in flight. They do not display when the PFD menu is open.

Loss of aircraft power alerts display horizontally in front of the HSI.

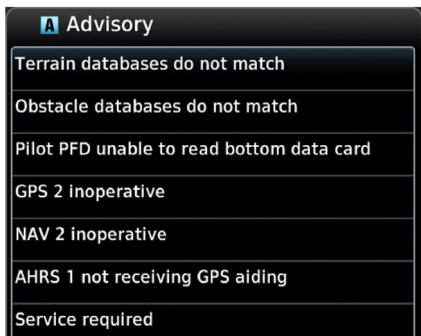
This alert occurs only on ground. It displays whether or not the menu is open.

1.21.5 Aural Alerts

Some alerts are accompanied by an aural voice message. Voice gender is configured during installation. To determine which alerts provide aural indications, refer to the applicable alerts table.

1.22 Advisories

Advisories are system-related messages that display across all connected GDUs in the TXi system. The alert includes the ID relative to the display.



- Most recent advisories are at the top of list
- View-once advisories remain in queue until viewed by the pilot
- Persistent (or conditional) advisories remain active until the indicated condition is resolved
- Acknowledging an advisory on one GDU automatically acknowledges the message across all TXi units

All advisories are logged in the unit's internal storage. This log may be viewed in configuration mode and exported to an SD card.

ADVISORY KEY



Tapping the **Advisory** key once displays the advisory list. Tapping it again acknowledges all active advisories and closes the list.

- Flashes in navigation bar when a new advisory is present
- Turns solid once all active advisories are acknowledged
- No longer displays after all active advisories are cleared

1.22.1 Audio Advisories

Contact the dealer for all audio related issues.

Table 1-11 Audio Advisories

ADVISORY	CONDITION
Audio inoperative.	A failure occurred with audio device.
	An audio clip does not play.
	Communication with audio device is lost.

1.22.2 Battery Advisories

Table 1-12 Battery Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
<GDU> battery unavailable: capacity test required.	Battery capacity test failure.	Service required. Acknowledge pop-up alert. Contact dealer for support.
	Annual capacity test overdue.	Testing required. Acknowledge pop-up alert. Contact dealer for support.
<GDU> battery unavailable: communication lost.	Battery communication is lost.	Service required. Acknowledge pop-up alert. Contact dealer for support.
<GDU> battery unavailable: fault detected.	A battery fault is present.	Service required. Acknowledge pop-up alert. Contact dealer for support.
<GDU> battery unavailable: power output failed.	Battery power output failure.	Service required. Acknowledge pop-up alert. Contact dealer for support.
<GDU> on battery power for <MM:SS>.	The indicated GDU is operating in battery mode.	Ensure that the aircraft is in a safe state. Correct the issue to restore electrical power to the GDU.

1.22.3 Database Advisories

Table 1-13 Database Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
AHRS 1/2 magnetic model database needs update.	AHRS 1/2 magnetic field model database is out of date. Occurs only when the aircraft is on ground.	Update IGRF database according to instructions in section 1.10.
<GDU> <Navigation/SafeTaxi/Obstacle> database expires on <date>.	The indicated database is approaching expiration (PFD-only displays).	If available, load the next cycle of database into standby.
	The indicated database is expired (PFD-only displays).	Update indicated database, if necessary.
<GDU> <Navigation/Terrain/Obstacle> database unavailable.	The indicated database is unavailable or corrupt.	Re-download and install the indicated database on the GDU. Contact a Garmin dealer for support.
<Navigation/Terrain /Obstacle> databases do not match.	Two or more TXi GDUs have a different version of the indicated database.	Update the indicated database. For information about all installed databases, go to the System Status page.
<GDU> <SafeTaxi/Basemap> database unavailable.	The indicated database is corrupt (PFD-only displays).	Re-download and install the indicated database, Contact a Garmin dealer for support.
	The indicated database is unavailable (PFD-only displays).	
Chart database expires on <date>.	The charts database is approaching expiration.	If available, load the next cycle of the charts database into standby.
	The charts database is expired Appears only on units with an MFD.	Update the database if necessary for operation.
<GDU> Chart database incomplete. Some charts unavailable.	Charts database verification failure.	Re-download and install the indicated database. Contact a Garmin dealer for support.

ADVISORY	CONDITION	CORRECTIVE ACTION
Chart database unavailable.	The configured charts database is unavailable (MFD displays).	Re-download and install the indicated database, Contact a Garmin dealer for support.
Chart streaming unavailable. Using installed chart database.	Chart streaming is not available. The GDU reverted to the currently installed charts.	Open the System Status page and check database synchronization status. If the problem persists, contact a Garmin dealer for support.
Database SYNC in progress. View System Status page for more info.	Database synchronization is in progress.	Wait for database synchronization to complete. Restart the GDU before attempting to use new databases.

1.22.4 Engine Advisories

Table 1-14 Engine System Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
<High/Low> <gauge name> advisory (e.g., High Oil Temperature, Low Battery Voltage).	The indicated engine parameter exceeds pilot-specified value.	
EGT Difference advisory.	Pilot-specified EGT Diff is exceeded by one or more engines.	
CHT Cooling advisory.	A cylinder's cooling rate is faster than pilot-specified CHT cooling rate.	Verify that parameter is within the operating limitations defined in the POH.
Low EST Fuel Remaining advisory.	Estimated fuel on board is below pilot-specified limit.	
Low Endurance advisory.	Remaining flight endurance is below pilot-specified limit.	

1.22.5 Terrain Advisories

Table 1-15 Terrain Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
Service TAWS. Invalid config.	Terrain/TAWS alerting configuration is invalid.	Contact a Garmin dealer for support.
	Fixed-Wing/Rotorcraft mismatch. The GDU's aircraft setting conflicts with the current external TAWS configuration.	
SVT could not be enabled.	The SVT feature cannot be unlocked with the current SD card.	Verify that the SVT feature unlock card is inserted in the GDU. If necessary, contact a Garmin dealer for support.
SVT has been successfully enabled. Restart all GDUs to complete enablement.	The SVT feature is enabled during the current power cycle.	To complete feature enablement, restart all configured GDUs.
<GDU> terrain database resolution insufficient.	Terrain database resolution does not support the current terrain alerting configuration (rotorcraft only).	Download and install the 2.9 arc-second Terrain database.
SVT Disabled	Outside terrain database coverage area.	Contact a Garmin dealer for database options.
Terrain/SVT Free TrialFlight time remaining: XX HRS	Terrain Settings Menu displays the flight hours remaining in the SVT free trial period.	<p>If SVT is desired, do one of the following:</p> <ul style="list-style-type: none"> • Contact a Garmin dealer to complete feature enablement within the 11 hour free trial period • Visit flyGarmin.com and purchase the feature enablement

1.22.6 Traffic Advisories

The following advisories pertain to various traffic system failures.

Table 1-16 Traffic System Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
1090ES traffic receiver fault.	ADS-B LRU reports that it is unable to receive 1090 Extended Squitter traffic.	Service required. Contact dealer for support.
ADS traffic alerting function inoperative.	The ADS-B LRU reports a traffic alerting failure.	Service required. Contact dealer for support.
ADS traffic function inoperative.	The ADS-B LRU reports a failure with the ADS-B Traffic input.	Service required. Contact dealer for support.
TAS/TCAS function inoperative.	TAS/TCAS device reports a traffic failure.	Reset the TCAS device. Contact dealer for support.
	Communication with the TAS/TCAS device is lost.	
TAS/TCAS system in standby.	The TAS/TCAS device is in standby mode for longer than 60 seconds while airborne.	If traffic alerts are desired, enable the operating mode of the traffic device.
Traffic/FIS-B functions inoperative.	The ADS-B LRU reports a critical fault and is inoperative.	Service required. Contact dealer for support.
	Communication with the ADS-B LRU is lost.	Service required. Contact dealer for support.
UAT fault.	The UAT LRU reports a low battery or fan fault.	Service required. Contact dealer for support.
UAT traffic/data receiver fault.	The ADS-B LRU reports that it is unable to receive UAT traffic and FIS-B data.	Service required. Contact dealer for service.

1.22.7 Satellite Service Advisories

The following advisories pertain to various satellite service conditions and failures. For support regarding all satellite service advisories, contact a Garmin dealer.

Table 1-17 Satellite Service Advisories

ADVISORY	CONDITION
Connxet weather receiver inoperative.	Communication with the GSR 56 is lost. The satellite weather service is in operative.
Connxet weather service not registered.	GSR 56 weather service requires registration for operation.
SiriusXM receiver inoperative.	SiriusXM receiver failure. Communication with the GDL 69/69A is lost.

1.22.8 PFD Advisories

The following advisories pertain to various conditions and devices associated with the PFD.

Table 1-18 PFD Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
ADC 1/2 error correction inoperative.	The indicated ADC reports that airspeed error correction is unavailable.	Contact dealer for service.
	The indicated ADC reports that altitude error correction (i.e., SSEC) is unavailable.	
<GDU> ADS-B in traffic does not match configuration.	The primary ADS-B traffic source is not available. GDU is relying on data from backup source.	Contact a Garmin dealer for support.
AHRS 1/2 not receiving GPS aiding.	The indicated AHRS is not receiving GPS data from any source.	Ensure that the navigator(s) is on and receiving a GPS signal. Check the AFMS for limitations. Contact dealer for service.

ADVISORY	CONDITION	CORRECTIVE ACTION
<GDU> air data input failure. V_{NE} is uncorrected.	The indicated GDU is not receiving temperature or pressure altitude data. Applicable to rotorcraft only.	Refer to airspeed limitations placard for applicable V_{NE} .
<GDU> demo mode, do not use in flight.	The unit is in demonstration mode.	To exit demo mode: Cycle power to the GDU. If the problem persists, contact dealer for service. Operating the GDU in demo mode during flight is prohibited.
GPS 1/2 inoperative.	The indicated GPS source failed.	Ensure that the navigator(s) is on and receiving a GPS signal.
	Communication with the indicated GPS is lost.	Switch to an alternate navigation source. Contact dealer for service.
NAV 1/2 inoperative.	The indicated NAV source is failed, or input data is not received.	Switch to an alternate navigation source.
<LRU> reports service required.	The indicated LRU reports an internal fault and requires service. Appears only when the aircraft is on ground.	Contact dealer for service.
Reset altitude preselector to enable VPATH descent.	TOD ahead. Vertical deviation is available and the selected altitude is < 75 ft below current altitude. Appears only for aircraft equipped with GFC 600.	Lower the selected altitude to at least 75 ft below the current aircraft altitude.
<GDU> backlight calibration lost.	The GDU cannot read LED calibration data, or the data is corrupt. Sunlight readability may be degraded. Appears only when the aircraft is on ground.	Contact dealer for service.

ADVISORY	CONDITION	CORRECTIVE ACTION
<GDU> controller unavailable.	Communication with GCU 485 is lost. Appears only when the aircraft is on ground.	Operate the indicated GDU using the touchscreen controls.
Service required.	The system or unit requires service. Appears only when the aircraft is on ground.	Contact dealer for service.
Service soon.	The system or unit detects an internal fault but continues to function. Appears only when the aircraft is on ground.	Contact dealer for service.

1.22.9 System Hardware Advisories

Table 1-19 System Hardware Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
<GDU> controller <ALT ARM/GPSS/CDI/VS ENG> key stuck.	The indicated key is stuck on GCU 485.	Push the indicated key again. If the key remains stuck, use the corresponding touchscreen controls. Contact dealer for service.
<GDU> controller <HDG/BARO/VS> knob-push stuck.	The indicated knob is stuck on GCU 485.	Push the indicated knob again. If the knob remains stuck, use the corresponding touchscreen controls. Contact dealer for service.
<GDU> controller has multiple stuck controls.	The unit detects multiple stuck controls on the GCU 485.	Use the touchscreen controls for all manual operations. Contact dealer for service.
<GDU> cooling fan failed.	The indicated GDU detects a cooling fan fault. PFD/MFD coloration may be incorrect. The backlight may dim to reduce power and heat.	Extended operation at high temperatures is not recommended as damage to the unit may occur. Contact dealer for service.

ADVISORY	CONDITION	CORRECTIVE ACTION
<GDU> display hot, display dimmed.	Unit temperature exceeds the over temperature threshold.	Decrease cabin temperature and increase cabin airflow near the GDU. If the problem persists, contact the dealer for service.
<GDU> <left/right/both> knob-push stuck.	The indicated GDU knob(s) is stuck.	Use the touchscreen controls for all manual operations.
Electronic Stability Protection failed.	Garmin Mode Controller signals an ESP system fault.	Consult the pilot's guide for the Garmin Mode Controller.
<GDU> unable to read <top/bottom/left/right> datacard.	The SD card in the indicated slot is unreadable or corrupt (i.e., data is unavailable).	Reformat the SD card using an external computer. Re-insert the SD card in the slot. If the problem persists, contact the dealer for service.
	The SD card is missing from the indicated slot.	Re-insert the SD card in the slot.
	User ejects Flight Stream 510 wireless datacard. Network connection lost.	Restart GDU to reconnect.

1.22.10 Weather Advisories

Table 1-20 Weather Service Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
Possible severe weather ahead. Check Weather Radar.	Weather alert detected within +/- 10 degrees of the aircraft heading. This advisory does not appear when the Weather Radar page is active on any TXi unit.	To view information about severe weather in the current flight path, open the Weather Radar page.
Stormscope inoperative.	The GDU is not receiving data from the Stormscope unit.	Consult the appropriate third-party documentation.
	Stormscope reports a failure status.	

ADVISORY	CONDITION	CORRECTIVE ACTION
Weather radar needs service.	<p>Weather radar reports a degraded or inoperative condition exists. Appears only when the aircraft is on ground.</p>	Contact dealer for service.
Weather radar inoperative.	The unit is not receiving weather radar data.	Contact dealer for service.

1.23 LRU Failure Annunciations

LRU fail annunciations are designed to be immediately recognizable. If an LRU failure occurs, a red or amber "X" appears over the associated flight instrument(s) or data field(s). For additional information regarding pilot responses to LRU failures, consult the AFMS.

The annunciation color is determined by instrument type.

- Red "X" displays over primary flight instruments and data fields
- Amber "X" displays over non-primary flight instruments

1.23.1 PFD Failure Annunciations

During power-up, certain flight instruments are invalid until the associated equipment completes initialization. Data fields (e.g., TAS, GS, SAT) display only dashes when the input source is not available.

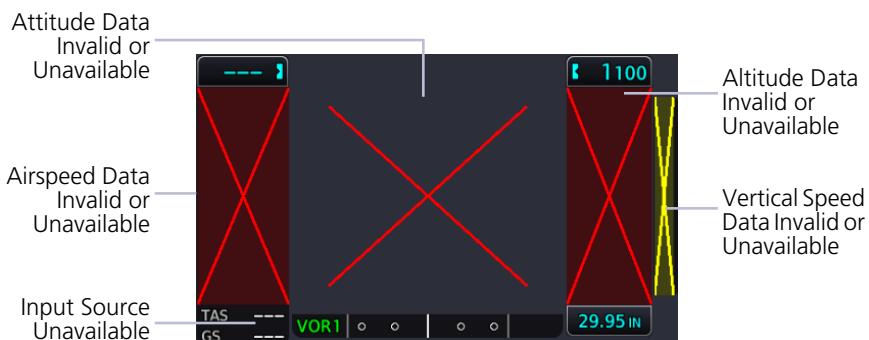


Figure 1-11 LRU Failure Annunciations PFD

If an instrument remains flagged after one minute, check the status of the associated LRU, then contact a Garmin dealer for additional support. For Garmin LRUs, go to the External LRUs page and note any failed LRUs.

Table 1-21 PFD LRU Failure Annunciations

INDICATOR	ANNUNCIATION AND CONDITION
Airspeed	Annunciation: Red "X" Condition: Display is not receiving airspeed data from the ADC.
Altitude	Annunciation: Red "X" Condition: Display is not receiving altitude data from the ADC.
Attitude	Annunciation: Red "X" Condition: Display is not receiving attitude and heading information from the AHRS.
Vertical Speed	Annunciation: Amber "X" Condition: Display is not receiving vertical speed data from the ADC.

1.23.2 EIS Failure Annunciations

An LRU failure annunciates on the EIS when instrument sensory data become invalid or unavailable.

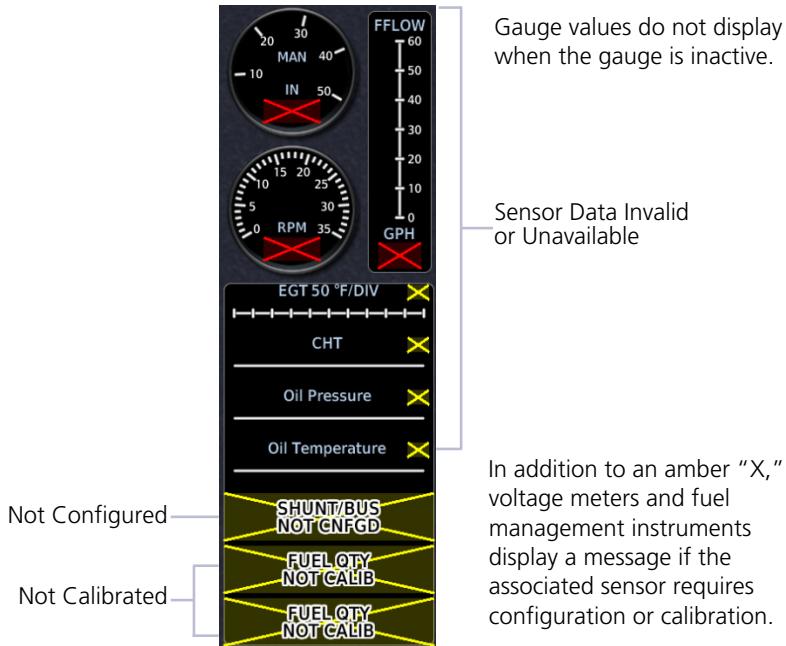


Figure 1-12 LRU Failure Annunciations EIS Gauge Strip

Table 1-22 EIS LRU Failure Annunciations

INDICATOR	ANNUNCIATION AND CONDITION
Voltmeter	Annunciations: Amber "X" SHUNT/BUS NOT CNFGD Condition: The shunt load meter is not configured for operation.
Fuel Quantity	Annunciations: Amber "X" FUEL QTY NOT CALIB Condition: A fuel quantity calibration is required.

Compatible Equipment

1.24 Line Replaceable Units

SYSTEM REQUIRED LRUs (PFD)

ADAHRS or ADC with AHRS

GMU 44

GTP 59

Garmin GPS navigator

The TXi system consists of multiple LRUs, which are installed behind the instrument panel or in a separate avionics bay. Their modular design aids system maintenance and unit replacement.

SYSTEM OPTIONAL LRUs

Backup GPS antenna

GAD 43/43e adapter

GBB 54 battery

GCU 485 PFD controller

GEA 110 engine airframe interface

Optional LRUs may include compatible equipment from either Garmin or a third party manufacturer.

OPTIONAL INTERFACES

Autopilot/flight director

GDL 69/69A SiriusXM data link

GDL 88/GTX 345 ADS-B transceiver

GSR 56 satellite data link

Radar altimeter

Stormscope

GTX 330 or
335 mode S transponder (TIS-A)

TAS/TCAS

Airborne weather radar

VHF NAV and glideslope receiver

DME

ADF

Some LRUs provide features that require registration and/or enablement prior to activation.

1.24.1 LRU Status

Devices that interface to the system via Ethernet display product information on the System Status page. Some interfaced equipment provide controls for product registration, enablement or viewing detailed status information. For additional information, touch **More Info**.



The device is configured and communicating properly



The device is not available and is not configured or it is not communicating properly

1.24.2 Standby Instruments

Except for installations limited to VFR, PFD installations require standby attitude, altitude, and airspeed instruments. Several types of standby instruments are acceptable, including individual analog instruments and certain electronic standby indicators.

1.24.3 Integrated Standby Instrument

An integrated standby instrument configuration consists of two GDU 700Ps, each with separate AHRS/ADC sensors. One display serves as the PFD, the other as EIS, MFD, or MFD/EIS. When activated, the display backup switch forces both displays into their display backup mode of operation.

The GBB 54 backup battery provides power to the PFD and sensors in the event of primary aircraft power failure. Both displays monitor and compare independent attitude, altitude, and airspeed data. The EIS, MFD, or MFD/EIS automatically displays its backup primary flight information when:

1. Either display detects a miscompare between attitude, altitude, or airspeed parameters.
2. Communication between displays is lost.
3. The display backup toggle switch is active.

This configuration provides the following functionality, which satisfies the backup instrumentation requirements.

The MFD, EIS, or MFD/EIS behaves as follows:

- An MFD will transition to a full-screen PFD display
- An EIS will transition to a split-screen PFD/EIS display
- An MFD/EIS will transition to a split-screen PFD/EIS display

1.24.4 PFD Controller

FUNCTIONAL LIMITATIONS

- Applicable to PFD only
- Selecting a data field does not automatically open control menu

An optional GCU 485 PFD controller provides dedicated PFD controls. Although control of PFD functions is available using the GDU knobs and touchscreen, the PFD controller provides dedicated knobs for heading, altitude, vertical speed, airspeed, and BARO setting. Dedicated keys are provided for CDI source selection, GPSS emulation mode, altitude capture arming, and vertical speed mode engagement. If configured, the PFD controller is used to control a Standby PFD.



Table 1-23 Control Unit Features

GCU 485 FEATURES

- Control knobs offer alternative ways to adjust reference bugs and barometric settings
- Push button configuration depends on the interfacing autopilot: CDI, GPSS, ARM, and ENG
- Photocell automatically adjusts lighting for day and night

Table 1-24 Control Unit Options

CONTROL	FUNCTION
ALT	Sets the selected altitude bug.
HDG	Sets the selected heading bug.
BARO	Sets the selected barometric pressure value. Pushing the knob reverts the setting to standard.
IAS	Sets the selected indicated airspeed.
VS	Sets the selected vertical speed.
ARM	Arms the autopilot altitude capture function.
CDI	Changes the NAV source for the CDI.
ENG	Engages the autopilot vertical speed mode.
GPSS	Engages or disengages GPSS mode.

1.24.5 Backup Battery

An optional GBB 54 backup battery provides emergency power to a GDU display, integrated ADAHRS, and a single GEA 110. The backup battery is mounted remotely and provides power when aircraft power is unavailable. This allows for continued PFD, MFD, and EIS functionality when aircraft electrical power is lost.

Table 1-25 Backup Power

LRU	DISPLAY	FUNCTION
GBB 54 Alternate emergency power source for GDU 700().	PFD	Battery availability and charge/discharge status
	MFD	
	EIS	

1.24.6 ADC & AHRS

The ADC and AHRS sense air data and aircraft attitude for display and use by other systems. AHRS units have a magnetometer interface for determining magnetic heading. ADC units have an OAT probe interface for measuring outside air temperature.

Table 1-26 ADC/AHRS/ADAHRS

LRU	DISPLAY	FUNCTION
GDC 72 GDC 74 ADC	PFD	<ul style="list-style-type: none"> • Air temperature • Airspeed • Altitude • Vertical speed
GSU 75/75B Integrated ADAHRS	PFD	ADC <ul style="list-style-type: none"> • Air temperature • Airspeed • Altitude • Vertical speed AHRS <ul style="list-style-type: none"> • Attitude • Heading • Rate of turn • Slip/skid/yaw
GRS 77 GRS 79 AHRS	PFD	<ul style="list-style-type: none"> • Attitude • Heading • Rate of turn • Slip/skid

1.24.7 PFD Adapter

Table 1-27 Autopilot Interface

LRU	DISPLAY	FUNCTION
GAD 43 Adapter	PFD	Analog attitude, heading, and yaw data for certain autopilots [1]
GAD 43e Enhanced Adapter	PFD	<ul style="list-style-type: none"> • Altitude preselect • VS control • Yaw damper • DME • NAV • ADF • RAD ALT

[1] Requires GRS 77/GRS 79/GSU 75 or internal ADAHRS.

1.24.8 Autopilot

Table 1-28 Autopilot Altitude Preselect/Vertical Speed

LRU	DISPLAY	FUNCTION
Collins: APS-65()		Selected altitude sync
Honeywell (Bendix King): KAP 100/150 KFC 150 KFC 200/250 KFC 275/325	PFD	<ul style="list-style-type: none"> • Altitude capture armed annunciation • Altitude capture engaged annunciation • Selected altitude sync • Selected VS sync [1] • VS engaged annunciation [1]
S-TEC: 55X 60-2 65 60 PSS		<ul style="list-style-type: none"> • Selected altitude sync • Selected VS sync

[1] KAP 150 and KFC 150/275/325 only.

Table 1-29 Autopilot External Flight Director

LRU	DISPLAY	FUNCTION
Bendix: M-4D		
Century: IV 41 2000		
Cessna: 300B IFCS/400B IFCS/800B IFCS 1000 IFCS		
Collins: APS-65 AP-106/107	PFD	External flight director
Honeywell (Bendix King): KFC 150/200/250 KFC 225/275/325 KFC 300		
S-TEC: 55 55X 60-2/65 1500/2100		
Sperry: SPZ-200/500		

Table 1-30 GFC 500/600

LRU	DISPLAY	FUNCTION
GFC 500 GFC 600 Flight Control System	PFD	<ul style="list-style-type: none"> • Electronic Stability and Protection annunciations [1] [2] • Overspeed/underspeed protection annunciations [3] • Mode annunciations [4] • Bug sync [5] • Flight Director

- [1] ESP roll engagement limits display differently between autopilots.
- [2] Available only when ESP is enabled and AP is disengaged.
- [3] Available only when AP is engaged and aircraft exceeds minimum or maximum engagement speed.
- [4] Track mode annunciation available only on GFC 500.
- [5] Includes value display and control for ALT, HDG, IAS, and VS. BARO sync, CDI source selection, and Selected Course sync output to primary attitude indicator when interfaced with G5 Electronic Flight Instrument.

1.24.9 Weather & Music

Table 1-31 Weather & Music

LRU	DISPLAY	FUNCTION
GDL 69/69A SXM Garmin SiriusXM receiver for weather. Overlays weather products on MFD and HSI Map.	PFD	Weather Products <ul style="list-style-type: none"> • NEXRAD • SXM Lightning • TFRs
	MFD	Weather Products [1] <p>Map Page:</p> <ul style="list-style-type: none"> • NEXRAD • Cloud Tops • Echo Tops • SXM Lightning • METARs • Storm Cells • TFRs <p>Weather Page:</p> <ul style="list-style-type: none"> • AIREP • NEXRAD • City Forecast • Cloud Tops • County Warnings • Cyclone • Echo Tops • Winds Aloft • Surface Pressure • SXM Lightning • Storm Cells • METARs • AIRMETs • SIGMETs • TFRs • PIREPs • Freezing Levels • Turbulence Forecast • Icing Forecast

System Description

LRU	DISPLAY	FUNCTION
GDL 69A SXM Garmin SiriusXM receiver for entertainment.	MFD	Entertainment Services SiriusXM Radio
GDL 88 GTx 345 Datalink traffic and weather.	PFD	Traffic Services <ul style="list-style-type: none">• ADS-B• TIS-B
	MFD	Weather Services <ul style="list-style-type: none">• FIS-B
GSR 56 Garmin (Iridium) Satellite Receiver for Connnext weather. Overlays weather products on MFD and HSI Map.	PFD	Weather Products <ul style="list-style-type: none">• Precip• TFRs
	MFD	Weather Products Map Page: <ul style="list-style-type: none">• Precip• IR Satellite• Lightning• METARs Weather Page: <ul style="list-style-type: none">• Precip• IR Satellite• Winds Aloft• Lightning• METARs/TAFs• AIRMETs• SIGMETs• TFRs• PIREPs
WX-500 Depicts Stormscope data on MFD and HSI Map.	PFD	Lightning strikes
	MFD	

LRU	DISPLAY	FUNCTION
Garmin: GWX 68 GWX 70 GWX 75 Provides airborne weather radar information.	MFD	<ul style="list-style-type: none"> • Ground, standby, test, and weather modes • Horizontal and vertical profiles • Roll/trim • Stabilization • Sector scan • Altitude compensated tilt [2] [3] • High resolution color scale [3] • Tilt limit (vertical sector scan) • WATCH shading • Target alert • Range • Tilt angle • Bearing angle • Gain <p>GWX 70/75 Features [4]</p> <ul style="list-style-type: none"> • Turbulence Detection • Ground Clutter Suppression
Honeywell (Bendix King) [4]: RDS 81 (RS 811A) RDS 82 (RS 181A) RDR 2000 (ART 2000) RDR 2100 (ART 2100) Third-party weather radar.		<ul style="list-style-type: none"> • Ground, standby, test, and weather modes • Horizontal profile • Vertical profile [5] • Roll/trim • Stabilization • Range • Tilt angle • Bearing angle [5] • Gain (ground mode)

[1] Product availability dependent upon subscription.

[2] GWX 70 only.

[3] GWX 75 only.

[4] Requires purchase of an enablement card.

[5] Feature dependent on radar.

[6] Not available on EIS/MFD configurations.

1.24.10 Engine Monitoring

Table 1-32 Engine Monitoring

LRU	DISPLAY	FUNCTION
GEA 110 Garmin Engine Adapter. Monitors engine, fuel, and electrical systems.	EIS	<ul style="list-style-type: none"> • Manifold Pressure • RPM • Fuel Flow • Oil Pressure • Oil Temperature • EGT • CHT • TIT • IAT • Fuel Quantity • Volts • Amps • Engine Data

1.24.11 Magnetometer

Table 1-33 Magnetometer

LRU	DISPLAY	FUNCTION
GMU 44 Provides magnetic information to the AHRS.	PFD	<ul style="list-style-type: none"> • Heading • Compass

1.24.12 Navigation/FMS

Table 1-34 Navigation/FMS

LRU	DISPLAY	FUNCTION
GPS 400W		• ILS/VOR [1]
GPS 500W	PFD	• LOC [1]
GNC 420W		• GS [1]
GNS 430W		
GNS 480		
GNS 530W		
GTN 625	MFD	• GPS Position
GTN 635		
GTN 650		
GTN 725		
GTN 750		

[1] Feature requires a NAV radio source.

1.24.13 Temperature Probe

Table 1-35 Temperature Probe

LRU	DISPLAY	FUNCTION
GTP 59	PFD	Outside air temperature
	EIS	

1.24.14 Radar Altimeter

Table 1-36 Radar Altimeter

LRU	DISPLAY	FUNCTION
Garmin: GRA 55/5500		
Collins: RAC-870 ALT-50A ALT-55B		
FreeFlight: RA-4500	PFD	Radar altitude (next to altitude tape)
Honeywell (Bendix King): KRA 10/10A KRA 405/405B		
Sperry: AA-100 AA-100A AA-200		

1.24.15 Traffic

Table 1-37 Traffic

LRU	DISPLAY	FUNCTION
GTX 33	PFD	
GTX 330		TIS-A
GTX 335	MFD	
GTX 345		
Garmin: GTS 800 GTS 820 GTS 825 GTS 850 GTS 855	PFD	
Avidyne (Ryan): TAS 6XX (9900BX)		
Honeywell (Bendix King): KTA 810 KMH 820 KTA 910 KMH 920	MFD	TAS/TCAS I
L3 Communications (Goodrich): SKY497 SKY899		
GDL 88	PFD	
GTX 345	MFD	ADS-B

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2 Primary Flight Display

PFD ROADMAP

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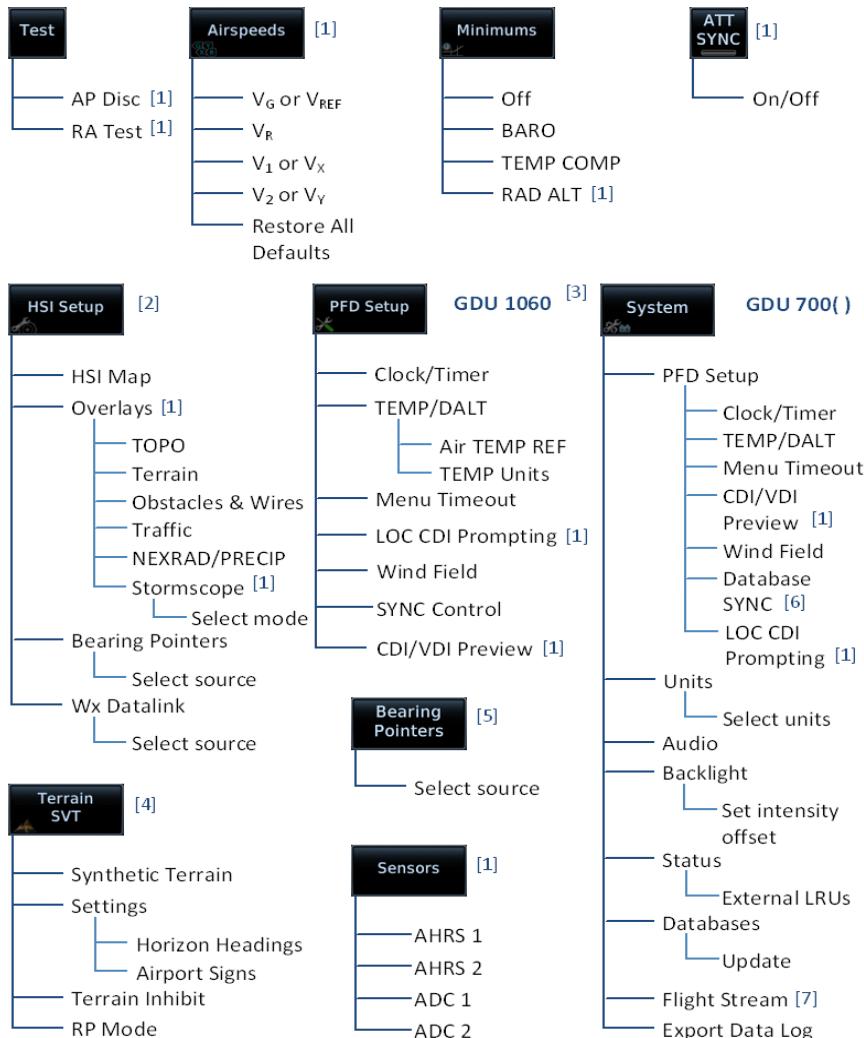
Primary Flight Display

2.21 Clock/Timer	2-55
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PFD Roadmap



The PFD menu provides access to various controls, sub-menus, and setup options.



[1] Dependent upon unit configuration.

[2] Not available on GDU 700L PFD.

[3] Units, audio, backlight, status, and database options are located in the System page of the MFD.

[4] Menu functions pertain to the specified terrain function.

[5] GDU 700L only.

[6] In multi-PFD systems, a SYNC Control page access key replaces Database SYNC. Options are dependent upon display type.

[7] Requires Flight Stream 510 wireless datocard.

PFD Setup

Table 2-1 PFD System Selections, GDU 700()

SELECTION	FUNCTION						
For GDU 700(), setup selections are accessible from the System Menu key.							
PFD Setup	<ul style="list-style-type: none"> Access CDI/VDI Preview, LOC CDI Prompting and Wind Field functions Access synchronization options (BARO, CDI, and DB) Control clock/timer Control Outside Air Temp/Density Altitude display Set menu display timeout 						
Units	<p>Except where noted, unit selections synchronize across all configured GDUs. Certain LRUs may contain unit settings independent of the TXi system.</p> <table> <tr> <td>• NAV Angle</td> <td>• BARO Pressure</td> </tr> <tr> <td>• Temperature</td> <td>• Distance</td> </tr> <tr> <td>• Wind Speed</td> <td></td> </tr> </table> <p>Altitude unit settings do not affect the altitude tape.</p>	• NAV Angle	• BARO Pressure	• Temperature	• Distance	• Wind Speed	
• NAV Angle	• BARO Pressure						
• Temperature	• Distance						
• Wind Speed							
Audio	<ul style="list-style-type: none"> Set click volume 						
Backlight	<ul style="list-style-type: none"> Adjust display brightness 						
Status	<ul style="list-style-type: none"> View unit and software information Check status of all configured LRUs 						
Databases	<ul style="list-style-type: none"> View information about active and standby databases Perform a manual database update 						
Flight Stream	<ul style="list-style-type: none"> Access Bluetooth and Wi-Fi setup functions 						
Export Data Log	<ul style="list-style-type: none"> Save logged data to SD card 						

Table 2-2 PFD Setup Selections, GDU 1060

SELECTION	FUNCTION
For GDU 1060, setup selections are available on the System page of the MFD.	
Clock/Timer	<ul style="list-style-type: none"> Control clock/timer
TEMP/DALT	<ul style="list-style-type: none"> Control Outside Air Temp/Density Altitude display Specify air temperature units and reference type
Wind Field	<ul style="list-style-type: none"> Control wind field function
Menu Timeout	<ul style="list-style-type: none"> Set menu display timeout
CDI/VDI Preview	<ul style="list-style-type: none"> Enable preview indicators for VDI Glidepath/Glideslope deviation, and VOR/LOC course and deviation [1]
LOC CDI Prompting	<ul style="list-style-type: none"> Allow prompts for switching the CDI source from GPS to LOC [2] [3]
SYNC Control	<ul style="list-style-type: none"> Access synchronization options (BARO, CDI)
Database SYNC	<ul style="list-style-type: none"> View information about active and standby databases Perform a manual database update

- [1] Available only when a configured GTN is present.
- [2] Available only when a configured GPS/NAV navigator (GTN 650/750 or GNS 430/530) is present.
- [3] For installations with a GFC 600, LOC CDI prompting is suppressed when the autopilot is armed to capture the localizer. The TXi CDI source automatically switches from GPS to LOC once the autopilot couples to the localizer.

2.1 Synchronization Options

FEATURE LIMITATIONS

- Available in multi-PFD systems only



Selecting **SYNC Control** opens a pop-up menu. Selected functions synchronize across all TXi PFDs.

Figure 2-1 SYNC Control Pop-up Options

SELECTION	FUNCTION
BARO	<ul style="list-style-type: none">Synchronizes the current barometric pressure value
CDI	<ul style="list-style-type: none">Synchronizes the selected CDI source
DB	<ul style="list-style-type: none">Initiates the database synchronization functionGDU 700() only

GDU 1060: The database synchronization option resides on the MFD System Status page.

2.2 Reference Bugs and Controls

PFD CONTROLS

- Airspeed
- Altitude
- Barometric Correction
- Heading
- Vertical Speed
- Selected Course

The PFD relies on touchscreen and control knob interactions for instrument and course adjustments.

Only one control is active at a time.
Control automatically reverts to heading
10 seconds after the last entry is made.

Additional information shown is determined in menu and setup, including synthetic vision depictions and HSI Map overlays.

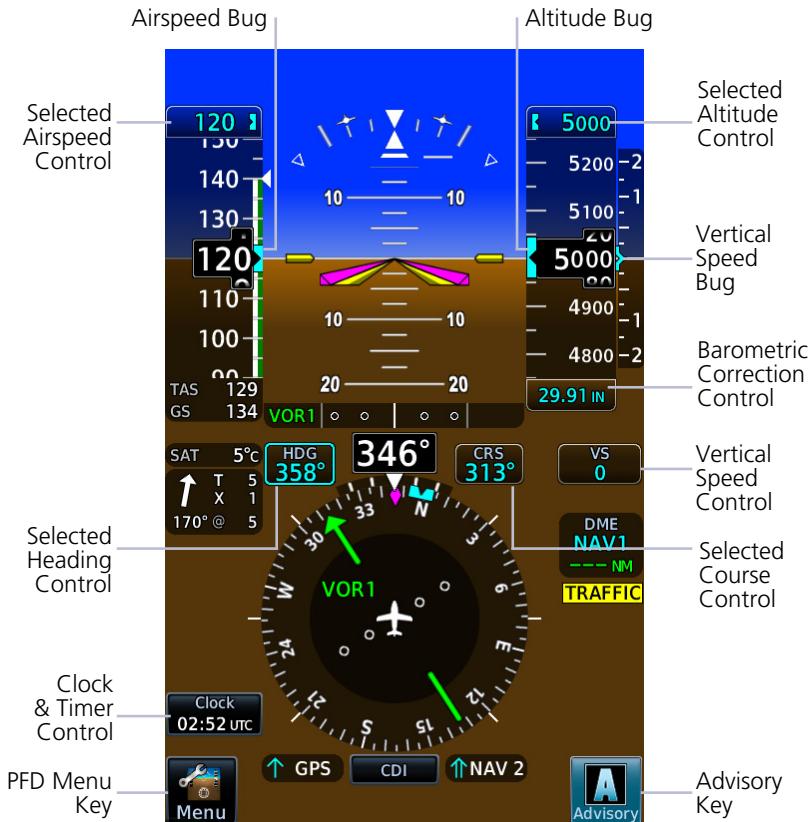


Figure 2-2 Reference Bugs and Controls

SETTING A REFERENCE BUG

Selecting any control opens a dedicated menu. Available options are dependent upon system configuration.



GDU 700L

On GDU 700L: Menu slides out from the left side of the screen.

On GDU 700P/1060: Menu slides up from the bottom of the screen.



GDU 700P/1060

There are three methods for operating the PFD controls:

1. Touch and Turn

Touch desired control to move knob focus to that control. Then:

- Turn inner knob to change selected value. **Or**
- Center press knob to synchronize with current value.

2. Turn and Turn

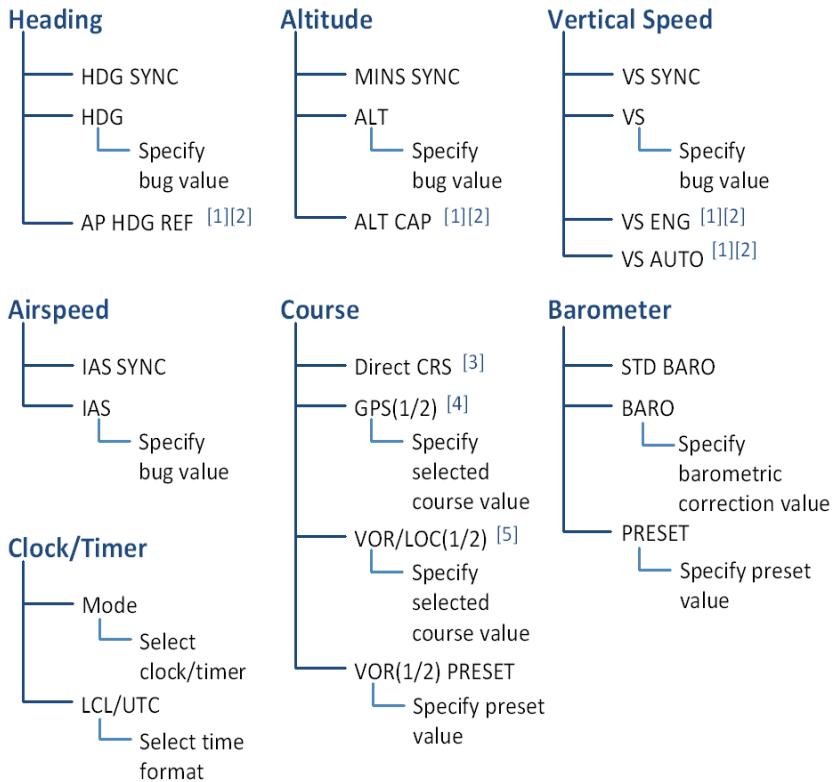
Turn outer knob to move knob focus to desired control. Then:

- Turn inner knob to change selected value. **Or**
- Center press knob to synchronize with current value.

3. Touch and Touch (GDU 700P/1060)

Touch desired control to display associated context menu and use the keys provided.

- Center key pulls up a keypad for numeric entries
- Additional controls are located on the left and right



[1] Requires an autopilot.

[2] Not applicable to all autopilots.

[3] Requires an active GPS source.

[4] Available during OBS mode only.

[5] Available only when VOR/LOC is the active CDI source.

Flight Instruments

SUPPLEMENTAL FLIGHT DATA

- GPS Navigation Status
- DME
- Radar Altitude
- Wind
- Clock/Timer

The top portion of the display provides attitude and air data.

The lower portion provides a horizontal situation indicator and supplemental flight data fields.



Figure 2-3 PFD Portrait Layout

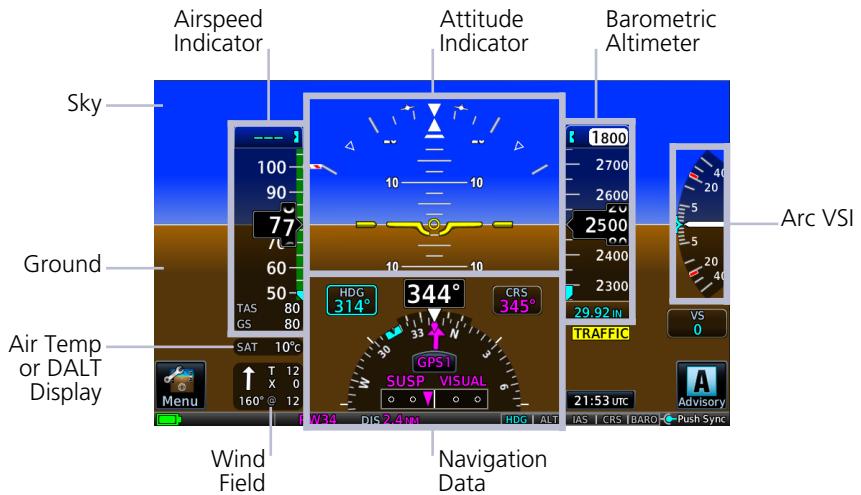
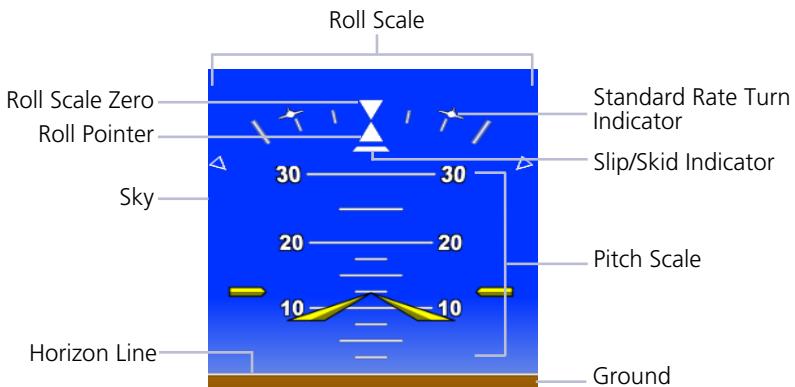


Figure 2-4 PFD Landscape Layout, Rotorcraft

2.3 Attitude Indicator

The attitude indicator provides a virtual representation of the ground and sky.



ROLL POINTER



The roll pointer indicates angle of bank at varying degrees on the roll scale.

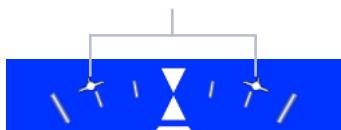


Pointer type is configured at installation as either fixed or sky.

- Major tick marks: 30° and 60°
- Minor tick marks: 10°, 20°, and 45°

STANDARD TURN RATE INDICATORS

Standard Turn Rate Indicators



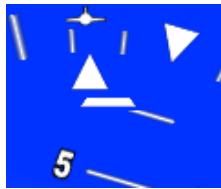
Indicators show the required bank angle needed to maintain a standard rate turn.

They dynamically change position based on True Airspeed.

Standard rate turn indicators are removed when:

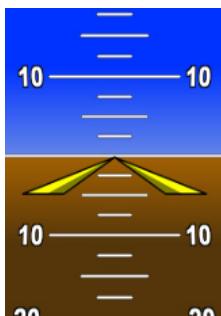
- TAS is invalid
- TAS is less than 60 kts
- Standard rate bank angle exceeds 30°
- Aircraft is on the ground

SLIP SKID INDICATOR



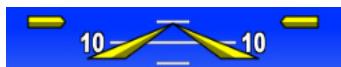
- Moves laterally away from roll pointer center (max 7° side-slip indication)
- Alignment with roll pointer denotes coordinated flight
- If attitude data becomes invalid, slip/skid indicator is removed

PITCH SCALE



- Markings range between -90° and 90° angles
- Major pitch graduations occur every 5° with SVT and 10° without SVT
- Each minor pitch mark is 5° from 25° nose down to 45° nose up
- Precision pitch marks are at each 2.5° from 20° nose up to nose down attitude

AIRCRAFT SYMBOL



Fixed Wing



Rotorcraft

Depending on aircraft type, aircraft symbol is either fixed wing or rotorcraft.

Symbol type is dependent upon configuration. For requirements, consult the POH.

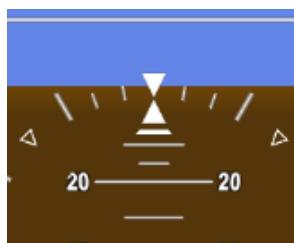
AWARENESS BANDS

Ground Awareness Band



Appears when current pitch attitude causes the sky presentation to completely fill the display.

Sky Awareness Band



Appears when current pitch attitude causes the ground presentation to completely fill the display.

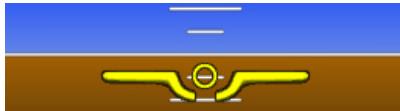
2.3.1 Attitude Sync, Rotorcraft Only

FEATURE LIMITATIONS

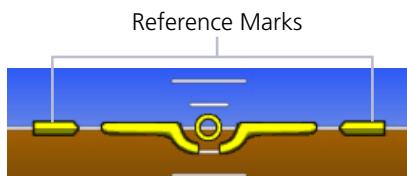
- Rotorcraft only
- Not available when current pitch and horizon line differ by more than +/-8°



- Synchronizes aircraft symbol to the horizon line
- Reference marks provide an absolute pitch reference
- Useful during pitch up or pitch down maneuvers



Attitude Sync Off



Attitude Sync On

2.4 Extreme Attitude Indications

To aid in recovery from extreme pitch attitude, red chevrons are shown between major pitch marks from 80° nose down to 30° nose down, and from 80° nose up to 50° nose up. The red chevrons always point towards 0° pitch.



Extreme Pitch



Extreme Roll

The PFD incorporates an extreme attitude declutter mode to improve instrument scan and facilitate aircraft recovery from extreme attitudes. The PFD declutters if pitch exceeds 20° nose down or 30° nose up, or bank angle exceeds 65°.

When selected, the extreme attitude declutter mode changes the enhanced HSI back to the standard HSI. If previously selected, once extreme attitude declutter mode is exited, the HSI returns to the enhanced HSI.

Table 2-3 Data Removed During Extreme Attitudes

DATA REMOVED DURING EXTREME ATTITUDES	
• Open menus and keyboards	• GPS navigation status
• GS	• Fast/Slow indicator
• TAS	• CDI source selection key
• Air temperature	• PFD Menu key
• Flight director command bars	• PFD Full screen key (GDU 1060 only)
• Marker beacon annunciation	• Standard rate turn indicators
• Vertical deviation indicator	• Wind field
• Clock/timer	• Selected heading
• Selected altitude key	• Selected course
• Selected vertical speed key	• Barometric pressure setting
• Selected IAS	• DME
• Bearing pointer information field(s)	• Advisory key

AHRS(1/2) KEY

- Allows pilot to change the current AHRS source while extreme attitude decluttering is in effect
- Replaces **PFD Menu** key during extreme attitudes

2.5 VNAV Guidance Indications

FEATURE REQUIREMENTS

- Configured GTN (v6.50 or later)
- Valid VNAV data
- GFC 500/600 for autopilot VNAV mode status annunciation

VNAV GUIDANCE FUNCTION

- Provides vertical profile guidance during the descent phase of flight
- Guidance based on altitude constraints associated with lateral waypoints in the active flight plan
- Presents vertical path guidance to the descending path as a linear deviation from the desired path (i.e., the vertical angle from the specified waypoint or altitude)
- Integrates vertical waypoints into the active flight plan
- Supports both manual and autopilot coupling

VNAV data received from the navigator display as magenta indications on the PFD.

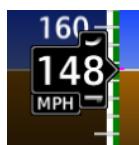


Table 2-4 VNAV PFD Indications

INDICATOR	VNAV DATA
Barometric Altimeter	<ul style="list-style-type: none"> Target altitude reference field Modified selected altitude knob increments
VSI	<ul style="list-style-type: none"> Required vertical speed indication
VDI	<ul style="list-style-type: none"> VNAV source and vertical deviation indications
AP Mode Banner [1]	<ul style="list-style-type: none"> VNAV mode annunciation

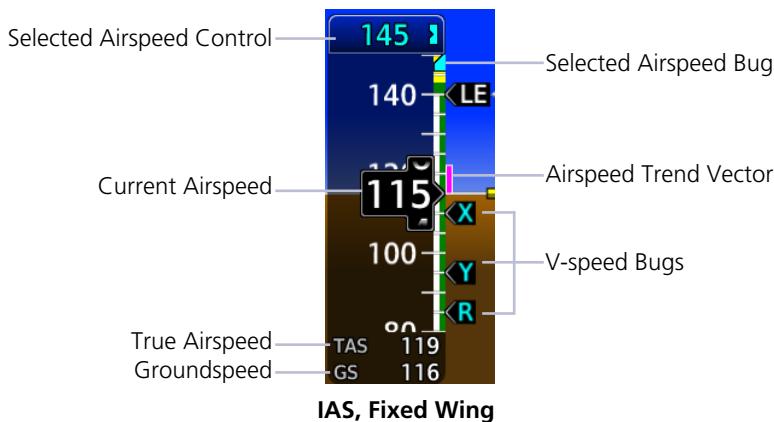
[1] Requires Garmin autopilot.

2.6 Airspeed Indicator



Airspeed indicator is configured at installation to meet the requirements of the AFM/POH. Available units: knots (default), kilometers per hour, and statute miles per hour.

For required airspeed limitations and markings, refer to the aircraft AFM/POH.



AIRSPED INDICATOR FEATURES

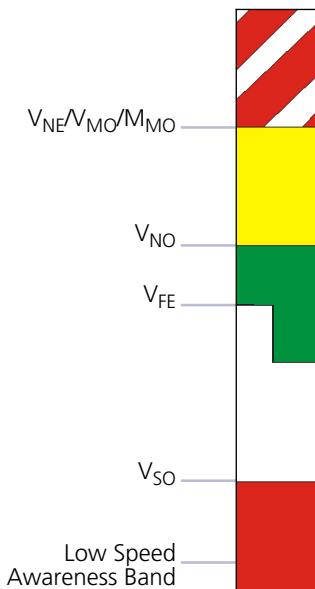
- Provides indicated airspeed, true airspeed, and groundspeed
- A fixed pointer, with rolling number gauge, indicates current airspeed on a moving tape
- Actual airspeed tape colors and markings vary by installation
- Data fields display true airspeed and groundspeed values
- As airspeed increases, tape scrolls down

Table 2-5 Airspeed Markings and Indications

FUNCTION & CONTROLS	
Selected Airspeed	<ul style="list-style-type: none"> Sets airspeed bug on tape if configured Both the bug and its digital value display in cyan Automatically synchronizes across all connected TXi PFDs
Airspeed Trend Vector	<ul style="list-style-type: none"> Magenta trend vector at the right of the airspeed tape 6 second prediction of airspeed based on current acceleration Removed if airspeed remains constant or if any data necessary to calculate airspeed is not available due to a system failure
Speed Range Strip	<ul style="list-style-type: none"> Multi-colored strip at the right of the moving tape Actual colors and patterns vary according to aircraft type
Selected Airspeed Bug	<ul style="list-style-type: none"> Set using the selected airspeed control Present on the right, inboard side of the tape if configured Parks at the top or bottom of the tape when selected airspeed is outside the visible range

2.6.1 Reference Markings

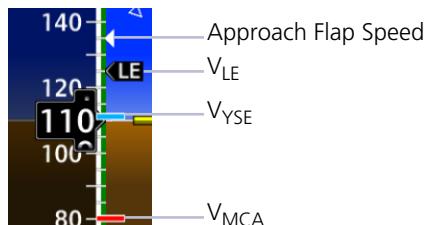
FIXED WING



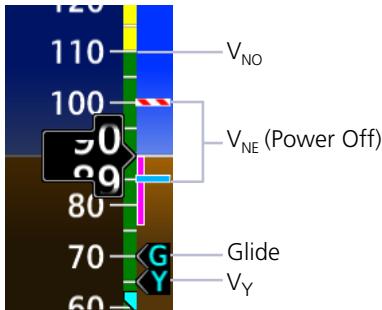
The V_{NE} , V_{MO} , or M_{MO} barber pole is configurable as a fixed V_{NE} value, or a variable $V_{NE}/V_{MO}/M_{MO}$ value that changes with altitude.

For configurations with multiple variable $V_{NE}/V_{MO}/M_{MO}$ values, the barber pole and alerting parameters extend to the lowest airspeed based on $V_{NE}/V_{MO}/M_{MO}$ calculations.

A white triangle reference marking is configured for airframes that are placarded with approach flap speed limitations.



ROTORCRAFT



Two types of markings are available for denoting maximum auto rotation speed (V_{NE} power off). This option is configured during installation.

Variable V_{NE} is based on values in the airspeed limitations placard.

OVERSPEED INDICATIONS



If the trend vector enters the overspeed range, the pointer turns yellow.



If current airspeed exceeds $V_{ne}/V_{mo}/M_{mo}$, the pointer turns red.

2.6.2 Reference Speeds

Selectable airspeed reference bugs are available for both fixed wing aircraft and rotorcraft. On/off controls reside in the Airspeeds page of the PFD menu.

Fixed wing Reference Speeds:

Glide or V_{REF} V_Y or $V2$ V_X or $V1$ V_R

Rotorcraft Reference Speeds:

Glide V_Y

V_X , V_Y , V_R and Glide default values are set during the installation process. V-speeds can be set for an individual flight, but will default back to install presets after a power cycle. When active (on), the V-speeds are displayed at their appropriate locations on the right of the airspeed tape.



A positive or negative value indicates the difference between the currently selected V-speed and its default value.

Restore All Defaults resets all V-speeds to their default values.

2.6.3 Fast/Slow Indicator



PC-12 Aircraft Only:

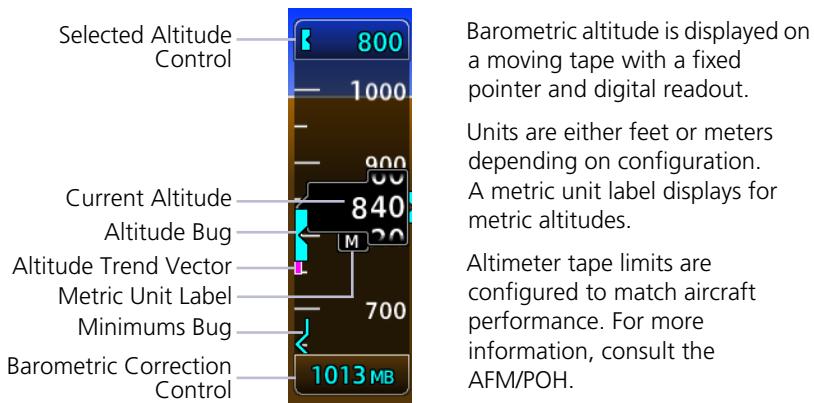
The Fast/Slow indication displays on left edge of PFD.

The indicator shows when indicated airspeeds are less than 150 KIAS, and the aircraft is configured for initial climb, or approach and landing conditions. For details on operation, consult the POH/AFM.

2.7 Barometric Altimeter

FEATURE LIMITATIONS

- 20 ft digital resolution
- Range: -1,000 to 99,000 ft



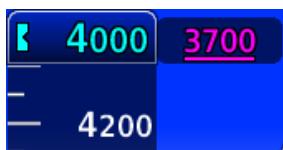
ALTIMETER FEATURES

Selected Altitude	<ul style="list-style-type: none"> • Sets altitude bug on altimeter when configured • Bug automatically synchronizes across PFDs • If Barometric minimums is set, selected altitude may be set to same value as barometric minimums • Determines visual and aural alerts for approaching and deviating from selected altitude • Provides source data for the range to altitude arc display on MFD map (GDU 1060 only) • Controls altitude preselect mode for various autopilots • Bug is removed by rotating control knob to a value <-1000 ft
Altitude Trend Vector	<ul style="list-style-type: none"> • Magenta trend vector at the left of the altitude tape • 6 second prediction of altitude based on current vertical speed • Absent if aircraft altitude remains constant or if data needed for rate calculation is not available due to a system failure

ALTIMETER FEATURES	
Barometric Correction Control	<ul style="list-style-type: none"> Displays in cyan digits at the bottom of altimeter tape Pilot can select units to display in inches of mercury (in Hg), Hectopascals (hPa), or Millibars (Mb) Digits display in yellow when pilot and co-pilot TXi PFD settings differ by more than 0.03 in Hg Barometric Pressure Setting to 29.92 in. / 1013 Mb setting when STD BARO is selected
Minimums Bug	<ul style="list-style-type: none"> Displays as a colored bracket for selected MDA/DH minimums set on the altimeter tape Bug is parked to the top or bottom of altimeter tape when value is outside current visible range Cyan bracket denotes BARO or RAD ALT minimums altitude Magenta bracket denotes TEMP COMP minimums altitude White bracket denotes close proximity above minimums altitude Yellow bracket denotes below minimums Triggers "Minimums, Minimums" aural alert at MDA/DHs
Altitude Bug	<ul style="list-style-type: none"> Set using the Selected Altitude A portion of the bug displays at the top or bottom of the altitude tape if selected Altitude Bug is out of visible range Bug width is 100 units wide, depicting (+/-) 50 unit increments

TARGET ALTITUDE REFERENCE FIELD

The location of this field varies depending on PFD layout.



**GDU 1060/700L
(Full Screen View)**



**GDU 700P
GDU 700L (Menu Open)
GDU 1060 (MFD/PFD/EIS)**

A magenta bar indicates target altitude in relation to the current altitude.



At or above target altitude

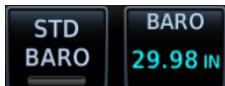


At target altitude



At or below target altitude

2.7.1 Adjusting Barometric Pressure



Controls for adjusting barometric pressure are located in Barometric Correction control menu.

Setting the Barometric Pressure:

There are two ways to adjust the barometric pressure setting.

1. Tap Barometric Setting field or rotate PFD control knob to BARO.
2. Tap **STD BARO** or enter desired barometric pressure using the **BARO** key or PFD inner knob.
 - If "STD BARO" is set, altimeter PRESET displays on popup menu. Set preset local altimeter setting.
 - Pressing PFD control knob toggles between Standard Barometric pressure and the pilot set value.

Figure 2-5 Barometric Correction Control Options

SELECTION	FUNCTION
STD BARO	<ul style="list-style-type: none"> • Toggles between standard barometric pressure and the pilot specified value
BARO	<ul style="list-style-type: none"> • Allows entry of selected barometric pressure value
PRESET	<ul style="list-style-type: none"> • Allows entry of destination barometric pressure while the aircraft is above transition level (FL 180) • Preselections do not affect altimeter readout • Transitioning from standard to selected sets the altimeter to the preset value • Available only when STD BARO is active



When **STD BARO** is active:

- **PRESET** entry key is available
- Control field annunciates standard baro label

2.7.2 Adjusting Selected Altitude

FEATURE REQUIREMENTS

The MINS SYNC function is available only when the following conditions are met.

- Minimums source is configured as barometric altimeter or temperature compensated barometric altimeter
- **BARO** source key is active
- A valid minimums altitude setting



Adjustments to the selected altitude value cause the alert function to reset.

Figure 2-6 Selected Altitude Control Options

SELECTION	FUNCTION
MINS SYNC	<ul style="list-style-type: none"> • Synchronizes altimeter bug to the MDA/DH setting
ALT	<ul style="list-style-type: none"> • Allows entry of a selected altitude value • Inner knob adjustments are in 100 ft increments

Visual and aural indications alert when the aircraft is approaching the selected altitude.

Table 2-6 Selected Altitude Alerting

DISTANCE FROM SELECTED ALTITUDE	INDICATION [1]
1,000 ft	<ul style="list-style-type: none"> • Flashing black text on white background • Optional aural tone [2]
200 ft	<ul style="list-style-type: none"> • Flashing cyan text on black background • Optional aural tone [2]
0 ft Altitude deviates more than ± 200 ft of selected altitude	<ul style="list-style-type: none"> • Flashing yellow text on blue background • Aural tone

[1] Alert duration: five seconds

[2] Aural tone dependent upon configuration.

DISABLE ALTITUDE BUG



Turn inner knob counterclockwise until the selected altitude value is < -1,000 ft. Values less than -1,000 display as a series of dashes.

2.7.3 Temperature Compensation Minimums

FEATURE REQUIREMENTS

- The TEMP COMP minimums function is available only when a destination airport is present on the external navigator
- Cycling power to the GDU clears all minimums data

GTNs and TXi displays use only one destination airport temperature for calculating compensated altitudes. Changing the temperature on one of these units automatically recalculates the value across all connected GTNs and GDUs.

TEMP COMP KEY



- Calculates compensated altitude for the destination airport
- Indicates temperature compensated minimums on altitude tape
- Synchronizes destination temperature between the GDU and GTN

Selecting this key when a destination airport temperature is not available automatically opens the TEMP at DEST keypad. Specify a temperature value to enable the function.

MINIMUMS BUG INDICATION



Compensating the approach minimums bug determines the location of the minimums reference on the altimeter. It does not adjust barometric altitude.

When temperature compensation is active, the minimums bug and numeric value turn magenta.

Setting Temperature Compensated Minimums:



- Tap **Altitude**. Specify the minimums altitude value.
- Tap **TEMP at DEST**. Specify the destination airport's current temperature.



GDU automatically calculates the compensated value. By default, this field displays the compensated minimums altitude.

Loading a different destination airport into the flight plan causes GDU to recalculate the compensated altitude based on the elevation of the new destination airport.

If the destination airport is lost (e.g., the pilot clears the flight plan on the navigator):

- Temperature compensation is unavailable
- Minimums altitude source type switches from TEMP COMP to BARO

To resume temperature compensation, reselect **TEMP COMP** after loading a new destination airport into the navigator.

**Altitude
306 FT**

Both TEMP COMP and BARO share the minimums altitude function. Switching between these two source types does not alter the specified altitude value.

2.7.4 MDA/DH Alerting

MDA and DH alerts are based on barometric altitude or optional radar altitude. Alerting is inhibited while the aircraft is on the ground. The radar altimeter option is only available in aircraft with a compatible radar altimeter interfaced to the TXi system.

Both radar altitude and barometric minimums settings are lost following a unit power cycle. Controls for setting MDA and DH alerting behavior reside in the Minimums menu.

Table 2-7 MDA/DH Alerts

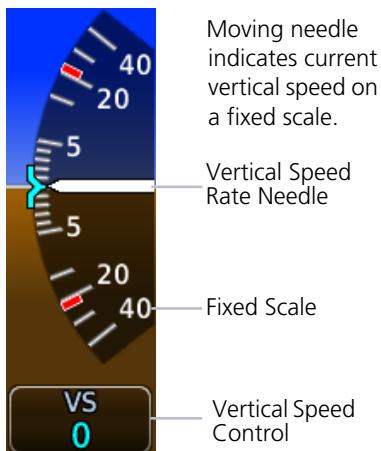
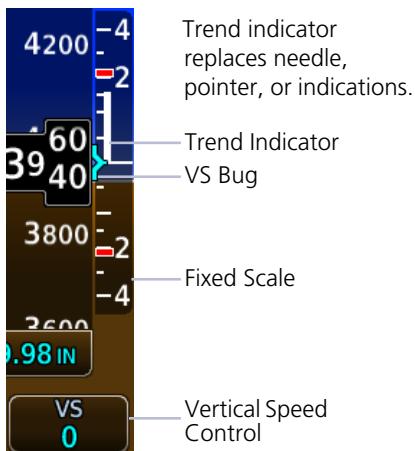
CONDITION	INDICATION
Initial MDA/DH	<p>When the MDA/DH is initially set:</p> <ul style="list-style-type: none"> • Cyan altitude value with bracket pointer displays at the bottom of the altimeter tape • BARO or RAD ALT minimums remain boxed until the MDA/DH altitude is visible on the altimeter tape • Minimums display "RA" when using RAD ALT settings <p>Once MDA/DH altitude is within altitude tape display range, the boxed value is removed and the cyan minimums bug begins tracking with the altimeter tape.</p>
Within 100 ft of MDA/DH	<ul style="list-style-type: none"> • Bug turns white
Reaching MDA/DH	<ul style="list-style-type: none"> • Bug turns yellow • Aural alert: "Minimums, minimums"

As the aircraft descends, the bug changes color to reflect the current altitude above minimums. Alerting is armed once the aircraft is >150 ft above min altitude.

- White at 50 ft above min
- Cyan at 150 ft above min

2.8 VSI

Vertical speed data displays on either a standard or arc style indicator. Format is dependent on unit type (portrait or landscape) and installer configuration.

Arc VSI**Standard VSI**

The arc format changes to standard when alternating between full and split views (arc during full PFD, standard during split). This occurs in the following display configurations.

GDU 1060 MFD/PFD/EIS or MFD/PFD (40%/60%)

GDU 700L PFD/menu open

NUMERIC SPEED INDICATION

GDU 1060/700L: A numeric field displaying current vertical speed is available on both standard and arc VSIs. The type of field depends on indicator format.



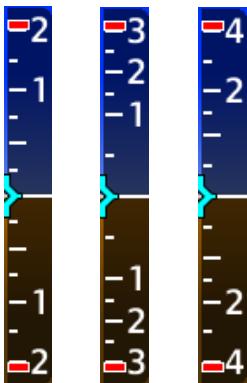
Standard VSI: This field replaces the trend indicator and moves up or down as the vertical speed changes. It displays only in expanded layouts.

GDU 1060: full screen PFD, split MFD/PFD, and split PFD/EIS

GDU 700L: full screen PFD



Arc VSI: A stationary field appears when vertical speed exceeds 300 fpm (1.5 mps).



Vertical speed range is dependent upon aircraft performance. Both range and units are configured at installation.

Available range types include:

+/- 2,000 FPM (+/- 9 MPS)

+/- 3,000 FPM (+/- 15 MPS)

+/- 4,000 FPM (+/- 21 MPS)

REQUIRED VERTICAL SPEED INDICATION



When receiving VNAV data from the navigator, a magenta chevron indicates the rate of descent needed to reach target altitude.

2.8.1 Selected Vertical Speed



Controls for setting the vertical speed bug reside in the VS control menu. Selected VS bug limits are determined by the visible tape range.

Figure 2-7 Selected VS Control Options

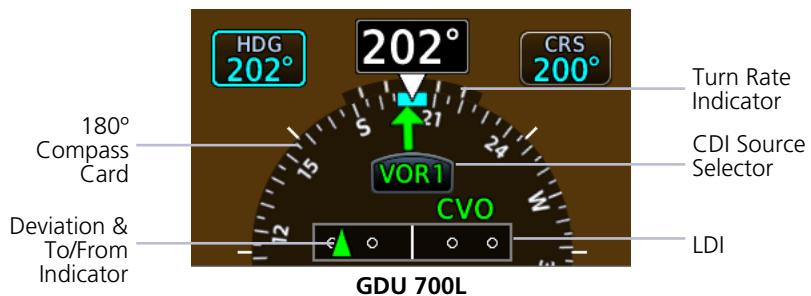
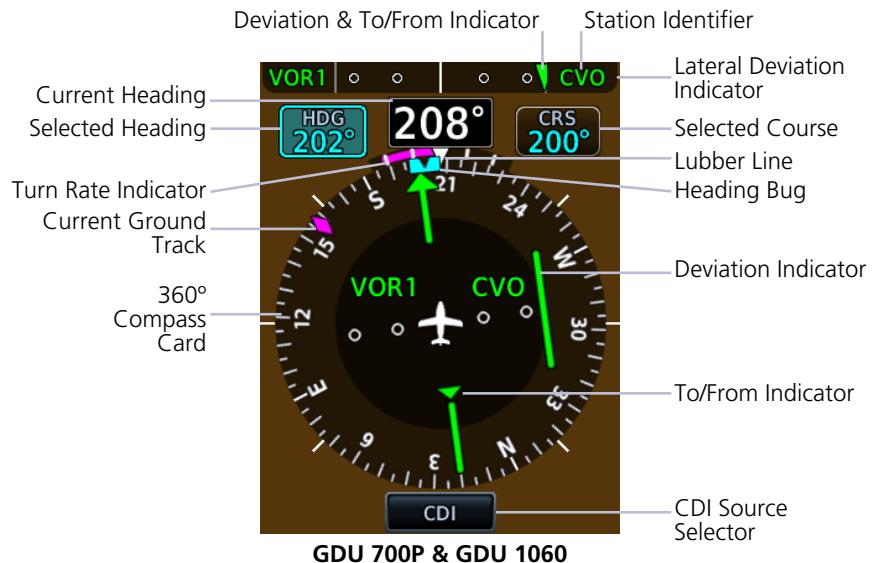
SELECTION	FUNCTION
VS SYNC	<ul style="list-style-type: none"> Synchronizes selected VS bug to current vertical speed
VS	<ul style="list-style-type: none"> Allows entry of a numeric vertical speed

2.9 Horizontal Situation Indicator

The HSI displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points with numeric labels every 30°. Major tick marks are placed at 10° intervals and minor tick marks are at 5° intervals. The HSI displays:

- Digital reading of the current heading
- A magenta diamond representing current track
- Turn rate, course deviation, bearing, and navigation source information

HSI layout varies according to display type.



HSI FEATURES	
Turn Rate Indicator	<ul style="list-style-type: none"> Lubber line serves as apex for the turn rate indicator, displaying aircraft centerline and direction straight ahead Tick marks closest to the lubber line depict half-standard rate turns and tick marks furthest away denote a standard rate turn 6 second prediction of heading based on present turn rate If aircraft turn rates are greater than 4° per second, an arrowhead appears at the end of the vector and a heading prediction is no longer valid
Lateral Deviation Indicator	<ul style="list-style-type: none"> Lateral movement of symbols indicate course deviation GPS flight phase, navigation source, OBS status, and message annunciator display on deviation indicator borders
Current Ground Track	<ul style="list-style-type: none"> Magenta diamond moves on compass card indicating aircraft current track over ground
Current Heading	<ul style="list-style-type: none"> Heading displays true north or magnetic values by selecting NAV Angle units from the System Units menu
To/From Indicator	<ul style="list-style-type: none"> Rotates with the course pointer on the standard HSI depicted as an upright or inverted triangle Displays only when an active navigation source is received (GPS or VOR) Color scheme is uniform with GPS and VOR/LOC source selections Upward pointing symbol indicates to, downward pointing symbol indicates from
Station Identifier	<ul style="list-style-type: none"> For VOR/LOC sources, the HSI displays the decoded Morse code station identifier on the right side of the CDI lateral deviation indicator Station Identifiers display at the center of the HSI when HSI map overlays are selected off
Heading Bug	<ul style="list-style-type: none"> Cyan bug on the compass card corresponds to the selected heading Selected heading is adjustable using the PFD knobs or touchscreen controls

2.9.1 Setting the Heading Bug



Controls for setting the heading bug are located in the Selected Heading control menu.

GDU 700L: Set the heading bug using the inner control knob.

Figure 2-8 Selected Heading Control Options

SELECTION	FUNCTION
HDG SYNC	<ul style="list-style-type: none"> Synchronizes heading bug to current heading
HDG [1]	<ul style="list-style-type: none"> Allows entry of a numeric heading

[1] Touch key not available on GDU 700L.

OFF SCALE INDICATION



Heading Bug
Off Scale

GDU 700L: It is possible for the heading bug position to be out of view on the 180° compass card. When this occurs:

- Heading bug parks on the side nearest to its actual position (a partial bug is visible at the bottom of the screen)
- Down arrow indicates direction

2.9.2 HSI Annunciations

HSI annunciations display on the HSI compass card and around the lateral deviation indicator. They include:

- GPS flight phase
- CDI source
- VOR/LOC station Morse Code identifier (when VOR is active)
- Navigator modes and messages
- Cross track error (if CDI deflects beyond full scale)

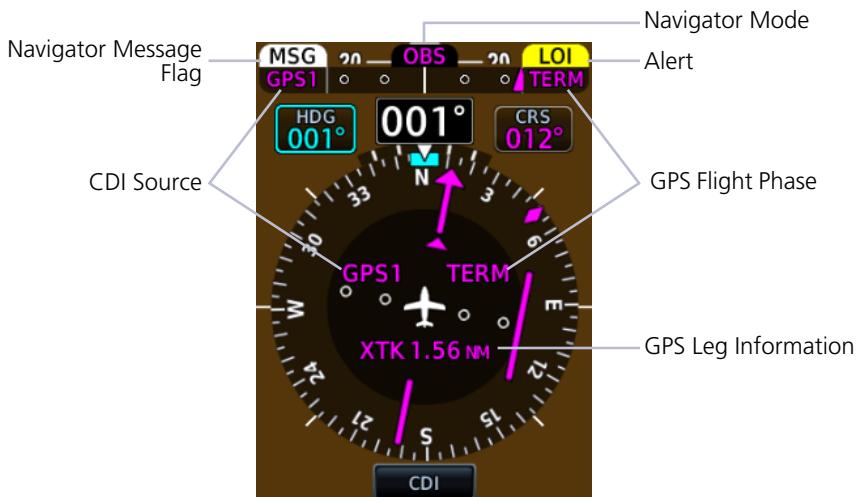


Table 2-8 Navigator Annunciations

ANNUNCIATION	LOCATION	DESCRIPTION
 WPT	Within Lateral Deviation Indicator	Waypoint Alert blinking text depicts arrival at a waypoint.
 SUSP	Above Lateral Deviation Indicator	GPS waypoint sequencing suspended.
 LOI	Above CDI Lateral Deviation Indicator	Loss of GPS Integrity Alert. GPS integrity is insufficient for the current phase of flight. GPS information is not present or is invalid for navigation use.
 MSG	Above CDI Lateral Deviation Indicator	Message Flag blinking text signaling a message is queued in the navigator.
 OBS	Above CDI Lateral Deviation Indicator	Omnibearing Selector Active.
 GPS1  VOR1  LOC1	Within CDI Lateral Deviation Indicator/Center of HSI	CDI Source displays current CDI source information.

GPS FLIGHT PHASE AND ANNUNCIATIONS

GPS FLIGHT PHASE ANNUNCIATION LOCATIONS

- CDI lateral deviation indicator
- Center of the HSI

Phase of flight annunciations are a direct indication of the current CDI behavior for the selected navigation source. Not all annunciations are available for every navigator.

Flight phase annunciations are typically shown in magenta. The color changes to yellow when cautionary conditions exist.

Table 2-9 GPS Flight Phase and Annunciations

ANNUNCIATION	FLIGHT PHASE
0.3NM	0.3 nm CDI scale
1NM	1.0 nm CDI scale
DPRT	Terminal level with departure procedure as the active navigation
DR	Dead reckoning (CDI not available)
ENR	En route
HDG LEG	Navigator provides heading information only (CDI not available)
LNAV	Lateral Navigation Approach
LNAV+V	Lateral Navigation Approach with advisory vertical guidance provided. LNAV+V uses published LNAV minimums.
L/VNAV	Lateral and Vertical Navigation Approach
LP	Localizer Performance Approach
LP +V	Localizer Performance Approach with advisory vertical guidance provided. LP +V uses published LP minimums.
LPV	Localizer Performance with Vertical guidance approach.
MAPR	Missed Approach
OCN	Oceanic
TERM	Terminal
VISUAL	Visual Approach

2.10 CDI

FEATURE LIMITATIONS

- CDI angular limits are $\pm 10^\circ$ when the navigation source is VOR or LOC

The CDI is located in the center of the standard HSI compass card, and is duplicated using a sliding lateral deviation indicator above the HSI. Control knob selection of CRS can set the course pointer, while the CDI source is VOR/LOC or GPS course when OBS mode is active.



Standard HSI



CDI Above HSI Map

The CDI is capable of displaying up to four sources of navigation depending on external navigator and navigation radio configuration. The CDI does not display if course deviation data are invalid.

2.10.1 Course Pointer Types

Course pointer type varies between single or double line arrows depending on the active CDI source. Arrow tips point in the direction of the selected course or GPS desired track.

Table 2-10 Course Pointer Types

ICON	SOURCE	ICON	SOURCE
	LOC1, VOR1		LOC2, VOR2
	GPS1		GPS2

2.10.2 Cross Track Error Indication



The GPS navigator determines CDI scaling. A cross track error displays if the CDI exceeds the full scale deviation value during GPS navigation.

Cross Track Error Annunciation

2.10.3 CDI Source Selection



Tapping the **CDI** key changes the current source in a sequential manner: GPS 1, VLOC 1, GPS 2, VLOC 2



On GDU 700L: Source selections display on the CDI key.



GPS Navigator 1



VLOC Navigator 1



VLOC Navigator 2



GPS Navigator 2

SOURCE SELECTION ALERT

The **CDI** key flashes to alert the pilot when a change in source selection is necessary. Conditions include:

- Localizer or ILS approach is active on the GPS navigator
- Active waypoint is the final approach fix
- Localizer deviation is less than full scale deflection
- Localizer approach course is within 20° of GPS track

2.10.4 Selected Course with VOR/LOC



Selecting a VOR/LOC source activates the Selected Course course control. All course indications and annunciations turn green.

Selecting **Direct CRS** centers the VOR CDI needle and sets a direct-to-fix course.

2.10.5 Selected Course with GPS

When a GPS source is selected, the Selected Course field displays course values in magenta. This function provides the preset course for VLOC guidance upon switching from GPS to VOR or LOC.



Selecting **VOR(1/2) PRESET** allows the pilot to preset VOR course selected course entries. Access this function by tapping the preset key and entering the value on the numeric keypad or by turning the inner control knob on the PFD.

GPS AUTO displays the automatic course computed by the navigator. There is no touch key available. Selected GPS course cannot be changed during non-OBS GPS operation.

2.10.6 Automatic Source Selection

FEATURE REQUIREMENTS

- Integrated GPS and NAV radio source (GTN 650/750 or GNS 430/530) for VOR/LOC to GPS auto-switch functionality during missed approaches
- GFC 600 with GTN 650/750 for GPS to LOC auto-switch functionality during localizer approach

The system automatically changes the navigation source during the following conditions.

CONDITION	CDI RESPONSE
Missed approach procedure activates	Navigation source automatically switches from VOR/LOC to GPS.
Autopilot captures the localizer	Navigation source automatically switches from GPS to LOC (GFC 600 only).

2.10.7 Auto-Slewing

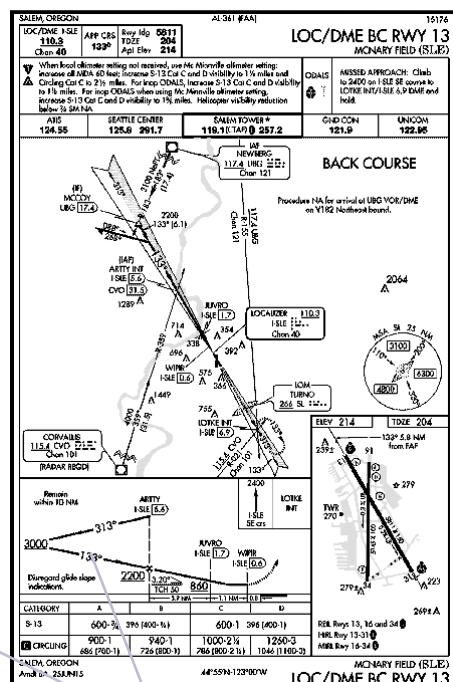
When changing the CDI source from GPS to LOC, the system auto-slews the selected course to the localizer course if:

- A localizer-based approach exists in current flight plan of GPS navigator
- A localizer frequency is active in navigator (LOC, BC, SDF, ILS, LDA)

When a LOC BC approach is activated, the course pointer slews 180° from the final inbound approach course to remove reversed needle sensing.



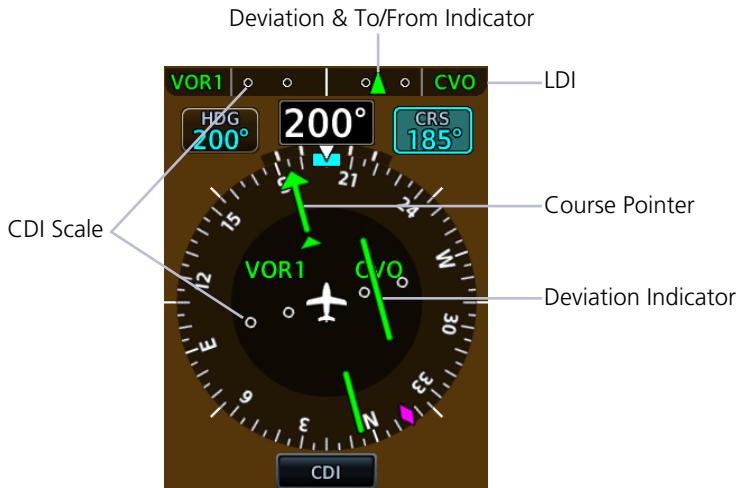
Course Selection and
Pointer Auto-Slewed
to 313°



Final Inbound Approach
Course 133°

2.11 LDI

Deviation indicators move left or right along the CDI scale to portray aircraft position relative to the selected course.



2.11.1 Reverse Sensing Correction

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



2.12 VDI

The VDI displays to the left of the altitude tape when:

- The aircraft is in an ILS or GPS approach with vertical guidance
- The GDU is receiving VNAV vertical guidance from the GTN

Status annunciations replace VDI indications when data is invalid or not available.



ILS Glideslope

For ILS glideslope indications, the VDI is a green diamond. An ILS glideslope indication appears if the current heading is within 107° of the selected course. This prevents the glideslope from displaying during localizer backcourse approaches.



No GS

Annunciates if a localizer frequency is tuned and there is no glideslope signal.



GPS Glidepath

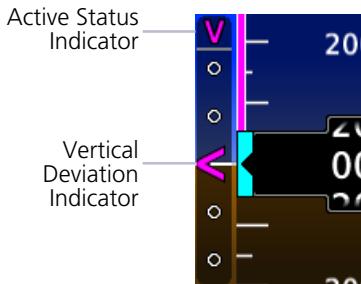
GPS glidepath vertical guidance is similar to glideslope indications. A magenta diamond glidepath indication displays for GPS approaches supporting vertical guidance (LNAV+V, L/VNAV, LPV, LP +V, VISUAL).



No GP

Annunciates if GPS glidepath data becomes invalid while the VDI is displayed.

2.12.1 VNAV Deviation Indications

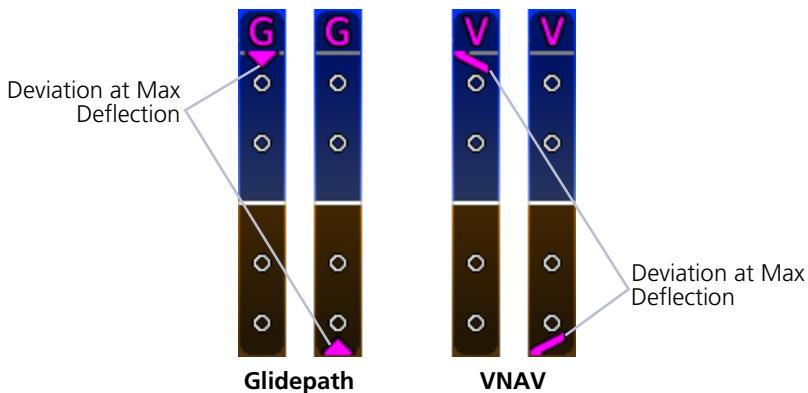


VNAV deviation guidance displays when:

- CDI source is GPS and the navigator is providing valid VNAV deviation data
- CDI source is VOR/LOC, the navigator is providing valid VNAV deviation data, and a VNAV mode is armed or active on the autopilot

These indications are absent when deviation data is invalid.

MAXIMUM DEFLECTION INDICATIONS



2.13 CDI/VDI Preview

FEATURE REQUIREMENTS

- Configured GTN

FEATURE LIMITATIONS

- Preview data display only when the selected CDI source is GPS



A preview option provides advance indications of approach lateral and/or vertical deviations, allowing the pilot to anticipate changes and make smooth transitions during approach. By default, this function is active.

All preview indications and annunciations are gray.

APPROACH PREVIEW DATA

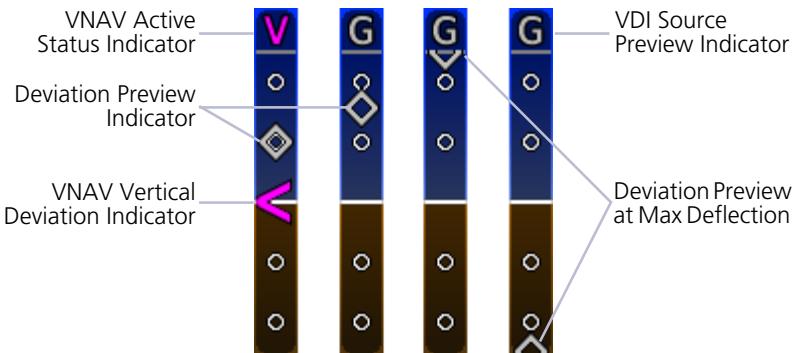
- | | |
|---|---|
| <ul style="list-style-type: none">CDI Source [1]CDI VOR/LOC Deviation [2]HSI Map VOR/LOC Course | <ul style="list-style-type: none">VDI Glidepath/GlideslopeVOR/LOC CourseVOR/LOC Morse Code ID |
|---|---|

[1] Only if Morse code is not available.

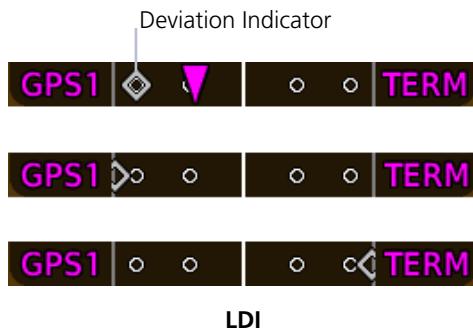
[2] Includes LOC backcourse deviation.

VDI PREVIEW

For ILS and GPS approaches, the VDI provides a preview of glideslope or glidepath deviation.



CDI PREVIEW

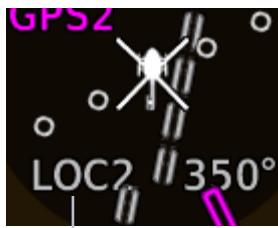


For VOR or ILS approaches, the CDI provides a preview of VOR or localizer deviation.

GDU 1060 & GDU 700P:



HSI



CDI Source Preview

If a VLC station ID is not available, the CDI source announces in its place (e.g., VOR, LOC).

To change the course preview:

1. Open the Course control menu.
2. Select **VOR/LOC PRESET**.
3. Specify a new preset value.

GDU 700L:

Preview data include a course pointer and lateral deviation indicator.



Supplemental Flight Data

2.14 Bearing Pointers

FEATURE LIMITATIONS

- Bearing pointers are mutually exclusive with the HSI Map. They do not display when HSI Map is active.

Selecting a bearing pointer does not necessarily make it visible. Bearing pointers are absent when:

- GDU does not receive valid data from the selected source
- NAV radio is not receiving tuned VOR station
- NAV radio is tuned to a Localizer frequency
- GPS is bearing source and active waypoint is not selected
- ADF is selected and signal is not received
- HSI Map function is on

ICON	BEARING
	1
	2

Two selectable bearing pointers are available for the display of VOR, GPS, or ADF data.

Arrow tips point to signal source in relation to the current aircraft heading.

Pointers do not override CDI features.

Bearing Information Fields



Bearing information fields indicate bearing type and navigation source. They display to the left and right of the compass card.

SET BEARING POINTERS

1. Turn off HSI Map if necessary.
2. Navigate to the Bearing Pointers page.
3. Select a bearing navigation source for the active pointer(s).

The GDU retains all pointer selections during a unit power cycle.



2.15 GPS NAV Status Field

FEATURE LIMITATIONS

- From and next waypoints may be removed when the number of characters in a full route exceeds the allowable space

A GPS NAV status field displays at the bottom of the PFD when the GPS navigator associated with the selected CDI source has an active valid leg. Information is based on calculations by the GPS navigator. Annunciations and window width vary according to GDU type.

GDU 700P/1060:

- From, to, and next waypoints
- Leg and waypoint types
- Identifier, distance, and ETE of active waypoint



GDU 700L:

- Active waypoint identifier and distance
- GPS message status



GPS/NAV STATUS SYMBOLS

Table 2-11 Active Leg GPS Navigation Status Field Symbols

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	IAF		Arc Left
	FAF		Holding Pattern (Right Turns)
	MAP		Holding Pattern (Left Turns)
	MAHP		Right Arrow
	Parallel Track		Direct To
	Arc Right		

2.16 Relative Wind Data

WIND DATA
<ul style="list-style-type: none"> • Wind direction and speed • Headwind (H) • Tailwind (T) • Crosswind (X)

The system computes current wind conditions during flight and displays the data in a dedicated field.

Status annunciations replace wind data when conditions are calm or the configured data source is invalid or not available. Wind data displays when groundspeed is 30 knots and higher.

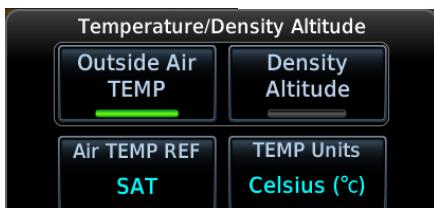
A white arrow indicates wind direction relative to the aircraft's heading. The numeric display of the wind direction is dependent on the NAV Angle system unit setting.



Table 2-12 Wind Status Annunciations

ANNUNCIATION	DESCRIPTION
Wind Calm	Calculated winds are less than or equal to 2.5 kts.
No Wind Data	GPS track or TAS data are invalid or unavailable.

2.17 Temp/DALT Display



A dedicated field displays outside air temperature or density altitude based on pilot selection. These reference values are mutually exclusive. Selecting one automatically turns off the other.

Outside Air TEMP

ISA +0°F

Displays the pilot selected air temperature reference.

Units are available in °C or °F.

Options include:

- Static Air Temperature
- Total Air Temperature
- Temperature difference from ISA

Density Altitude

DALT 10000

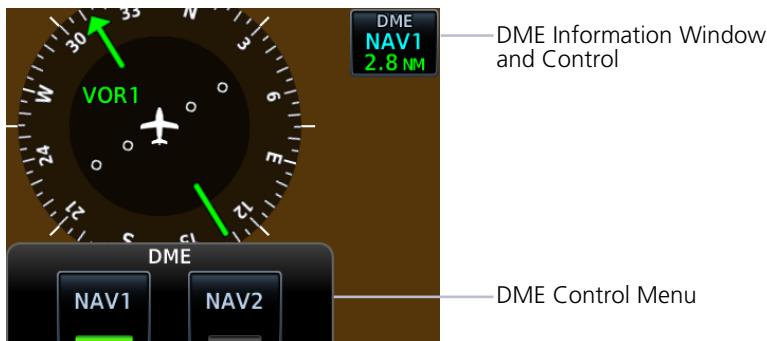
Displays pressure altitude corrected for nonstandard temperature.

Units display in increments of ten, and are in feet or meters depending on altitude tape configuration.

2.18 DME Display

When the GDU is configured with a GAD 43e and interfaced with a DME receiver, a selectable DME information window is available for display. Information includes the DME source (NAV1, NAV2, EXT, or HOLD) and distance.

When a DME signal is invalid, “--- NM” replaces the distance.



DME HOLD activates/deactivates the DME tuning hold function and can be selected for either DME NAV 1 or DME NAV 2.

Switching between NAV1 and NAV2 automatically cancels the function.
Not all installations have the DME HOLD function.

2.19 Marker Beacon Symbols



Inner Marker
Symbol

Marker beacon symbols display left of the altitude tape when interfaced to a marker beacon receiver. All marker beacon light and audio tests are performed through controls on the associated audio panel.

Table 2-13 Marker Beacon Symbols

SYMBOL	MARKER TYPE
I	Inner
M	Middle
O	Outer

2.20 Radar Altitude

The GDU displays radar height when a radar altimeter is interfaced to the system. Radar altitude displays to the left of the altitude tape. The RA altitude field automatically displays when the aircraft is within operating range of the installed radar altimeter unit (generally 2,500 ft AGL).

Brown and white hash marks depict a ground awareness band on the altimeter tape. When the radar altimeter readout is 0 ft, the ground band will level with the altitude pointer.

ROTORCRAFT ONLY: Depending on configuration, an audio alert is active when the radar altimeter indicates the aircraft is descending below 100 ft.



As the aircraft climbs, the ground band moves down the tape in equal amounts to the indicated RAD ALT value.

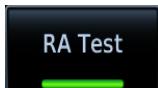


If the radar altimeter fails, the message "RA FAIL" annunciates in place of the current radar value.

2.20.1 RA Test

FEATURE LIMITATIONS

- Self-test functionality is not available on all radar altimeters
- Sequence duration is approximately 12-20 seconds
- For test values and unit limitations, consult the appropriate third party radar altimeter documentation



A test function verifies communication between the GDU and the radar altimeter.

During the test sequence:

- Ground awareness band displays on the altimeter tape
- RA readout field displays a test altitude value (e.g., 50 ft AGL)
- To suspend the test, deselect **RA Test** or exit the Test menu.

2.21 Clock/Timer

A generic timer counts up in an H:MM:SS format. There are no aural alerts or pilot advisories associated with this feature. Turning the clock/timer function off removes the control key from the instrument display.



Mode: Toggles between Clock & Timer.

Start/Stop: Pauses timer.

Reset Profile: Resets timer to zero. Count resumes when the timer is reset during operation.

INTENTIONALLY LEFT BLANK

3 Advanced Features

HSI MAP

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MAP DISPLAY, GDU 700L

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SVT

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HSI Map

FEATURE REQUIREMENTS

- Valid GPS position and magnetic heading
- FIS-B, Iridium transceiver, or SiriusXM receiver (weather overlays only)
- Active weather subscription (Connex and SiriusXM only)
- WX-500 receiver (Stormscope only)
- Valid VNAV data (ATK waypoints)

FEATURE LIMITATIONS

- GDU 700P/1060 only



Tapping **HSI Map** places a map within the HSI. This key resides in the PFD menu.

HSI MAP INTERACTIONS

- Map interactions are zoom only. Pan functionality is not available.
- Overlays declutter at a predefined map range for specified data depictions

WHEN HSI MAP IS ACTIVE

- Standard HSI view expands to incorporate a basemap and selected overlay
- Map overlays replace standard HSI indications
- HSI display enlarges to a 270° compass card view to accommodate the map
- CDI and annunciations are removed
- CDI indications appear only on the LDI
- Status icons indicate active map overlays
- Bearing pointers do not display
- HSI reverts to a standard depiction in the absence of a valid magnetic heading or GPS source

DATA DEPICTED WHEN HSI MAP IS ACTIVE

- | | |
|--|--|
| <ul style="list-style-type: none">• GPS flight plan• TFRs• Range to altitude arc | <ul style="list-style-type: none">• Airspace boundaries and altitudes• Runway and SafeTaxi detail• Terrain alerts, if configured |
|--|--|



Standard HSI



HSI Map

HSI ARC

When a heading bug, track indicator, course preview pointer, or course pointer moves to a position on the HSI circle behind or below other PFD controls, indicators depict on a miniature arc, representative of the hidden portion of the HSI circle.



CDI

LDI



GPS NAV Status Field

LDI indications include:

- CDI source
- Course deviation
- GPS phase of flight
- Course deviation preview
- Navigator message annunciations
- To/from
- VLOC station identifier
- Waypoint arrival annunciation

3.1 HSI Overlays

TOPO



- Topographic map depicting terrain elevation using a color scale similar to Sectional Charts

TERRAIN



- Terrain map depicting terrain elevation relative to aircraft altitude
- Uses the same color scale as the dedicated Terrain page
- NEXRAD weather overlay is disabled to prevent confusion of depicting radar and terrain data with similar colors

OBSTACLES AND WIRES



- Depicts obstacle and wire elevations relative to aircraft altitude
- Uses the same color scale as the dedicated Terrain page
- Data removed when viewing range is >5 nm

TRAFFIC



- Displays traffic using a NORMAL altitude filter
- Data removed when viewing range is >20 nm

NEXRAD/PRECIP & TFRS



- Overlays NEXRAD/PRECIP datalink weather from ADS-B, SiriusXM, or Garmin Connex [1] [2] as selected in the HSI Setup menu
- Precipitation intensity displays in accordance with NEXRAD/PRECIP legend viewable on the dedicated weather page
- Weather and TFR product age display on HSI Setup Menu

STORMSCOPE



- Overlays Stormscope strike or cell data on map [3]
- Data is removed after 4 minutes

LIGHTNING



- Depicts SiriusXM or Connex lightning strike information on the basemap [1] [4]

- [1] Requires aircraft to be equipped with appropriate datalink receiver and an active datalink weather subscription service, if applicable. FIS-B is not a subscription based service.
- [2] NEXRAD/PRECIP and terrain overlay functions are mutually exclusive. Enabling one automatically disables the other.
- [3] Requires aircraft to be equipped with appropriate WX-series Stormscope system.
- [4] Stormscope and SXM lightning overlay functions are mutually exclusive. When one is installed and selected in the PFD menu, the other is not available.

3.1.1 Overlay Status Icons

Icons represent the presence of overlay data. For real time products (e.g., TFRs, NEXRAD/PRECIP), these icons indicate the recency of data.

The absence of an overlay icon means one of two possible conditions:

1. Overlay is not present at the current zoom level.
2. Overlay control is off.

Table 3-1 HSI Overlay Status Icons

ACTIVE ICON	DESCRIPTION
	Obstacles overlay data is active on the display.
	Power line overlay data is active on the display.
	TFR overlay is active.
	Terrain overlay is active on the display.
	Traffic system is active and displaying information.
	NEXRAD or PRECIP overlay is active and displaying received information.
	Lightning overlay is active and displaying SiriusXM or Connex lightning information.
	Stormscope overlay is active and displaying lightning strikes.

FAULT INDICATION



A fault icon means overlay data is not available, not received, or has failed (where relevant).

OLD DATA



An old data icon means overlay data is not current, but remains displayed.

Map Display, GDU 700L

FEATURE LIMITATIONS

- GDU 700L only
- Rotorcraft
- Map display feature must be configured as available



Tapping **Map** overlays a full screen map on the PFD.

MAP INTERACTIONS

- Map interactions are single-finger zoom controlled
- Pan functionality is not available
- Overlays declutter at a predefined map range

WHEN MAP IS ACTIVE

- VFR style moving map with 360° compass card replaces standard PFD layout
- Road and city information display in support of VFR operations
- Airspeed, altitude, BARO correction, and groundspeed values display within a selectable attitude indicator key
- Display automatically returns to full screen PFD in the event of extreme attitudes
- PFD Menu key changes to accommodate only the map display

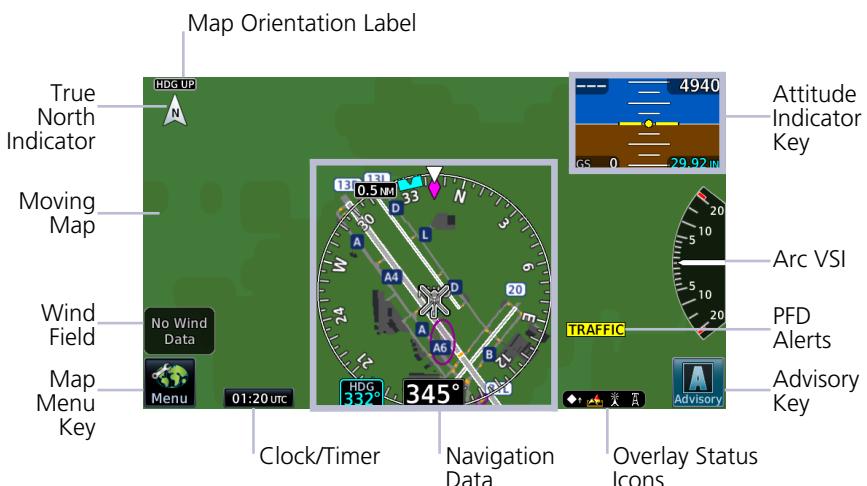


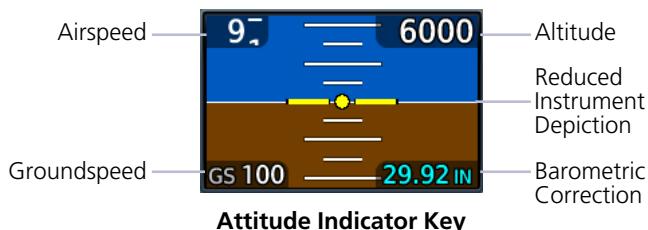
Figure 3-1 GDU 700L PFD Map Features

DATA DEPICTED WHEN PFD MAP IS ACTIVE

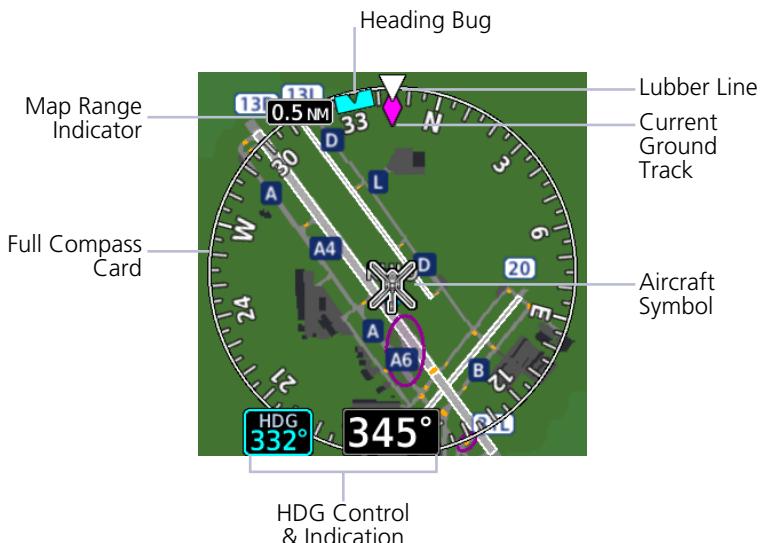
- Full compass card view
- Lubber line and heading bug
- Current ground track
- Selected Heading control and current heading field
- Selected BARO control
- Reduced attitude display
- Arc VSI (if configured)
- Wind field
- Clock/timer
- Autopilot annunciations
- Active fix and distance to active fix (if available from the navigator)

ATTITUDE INDICATOR KEY

To return to full screen PFD, tap the attitude indicator key. This key displays a reduced attitude depiction and instrument data fields. It resides in the upper right corner of the display when full screen map is active. Data fields are display only.



360° COMPASS CARD



3.2 GDU 700L Map Overlays

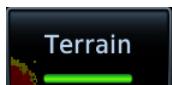


Tapping **Menu** while the map is active opens an overlay menu. Overlay selections display in a dedicated menu.

Overlay Selections

- TOPO
- Terrain
- Obstacles
- Wires
- Traffic
- Weather Datalink
 - SiriusXM
 - FIS-B
 - Connex
 - NEXRAD/PRECIP
 - Datalink Lightning
- Stormscope
- Off
- Strike Mode
- Cell Mode

3.2.1 Overlay Controls



Control keys enable the specified overlay function only and do not activate interfaced equipment. Overlay keys remain active even in the absence of required data.

Table 3-2 GDU 700L Map Overlays

OVERLAY	DESCRIPTION
TOPO	<ul style="list-style-type: none"> Overlays topographical data and ground elevation scale Depictions are similar to a VFR sectional
Terrain	<ul style="list-style-type: none"> Overlays terrain map data Color shading depicts terrain elevation relative to the aircraft's altitude
Obstacles & Wires	<ul style="list-style-type: none"> Depicts obstacle and wire elevations relative to aircraft altitude Uses the same color scale as the dedicated Terrain page Data removed when viewing range is >5 nm
Traffic	<ul style="list-style-type: none"> Overlays traffic information Filter selection on Traffic page determines altitude range Optional
NEXRAD/PRECIP & TFRs	<ul style="list-style-type: none"> Overlays NEXRAD/PRECIP datalink weather from ADS-B, SiriusXM, or Garmin Connex as selected in the Overlay menu Precipitation intensity displays in accordance with NEXRAD/PRECIP legend viewable on the dedicated weather page Weather and TFR product age display
Stormscope	<ul style="list-style-type: none"> Overlays Stormscope strike or cell data Data is removed after 4 minutes

3.2.2 Overlay Status Icons

Icons indicate which overlays are present at the current map range. A crossed out icon means the overlay is active, but data is unavailable due to a failure, test, or standby condition (where relevant).

The absence of an overlay icon means one of two possible conditions:

1. Overlay not present at the current detail level or zoom setting.
2. Overlay control is off.

Table 3-3 GDU 700L Overlay Status Icons

ICON	DESCRIPTION	ICON	DESCRIPTION
	Obstacles		Terrain
	Power Lines		Traffic
	Stormscope		Data not available

SVT



NOTE

Synthetic terrain aids pilot awareness of terrain and obstacles in front of the aircraft. It does not replace primary flight instruments.

FEATURE REQUIREMENTS

- Valid attitude and magnetic heading
- Valid 3-D GPS position
- Valid terrain and obstacle databases
- Feature enablement to continue service beyond the free trial period

FEATURE LIMITATIONS

- Loss of any required data, including temporary loss of GPS, causes SVT to be removed until data is restored
- Depicts only terrain contours and obstacles from the associated databases. Optional depictions (e.g., airport signs, aircraft heading) are dependent upon pilot selections. Power line depictions are not available
- SVT terrain alerting functionality is not compliant with TSO-C151c
- Aural and visual alerting functions are in accordance with appendix H.2 of AC 20-167A

3.3 SVT Setup



SVT setup selections are accessible from the **Terrain/SVT** key.

Figure 3-2 SVT Setup Selections

SELECTION	FUNCTION
Synthetic Terrain	Activate SVT function.
Settings	Activate horizon heading markings and airport signs.
Terrain Inhibit	Deactivate Terrain aural and visual alerts.

3.4 SVT Features



NOTE

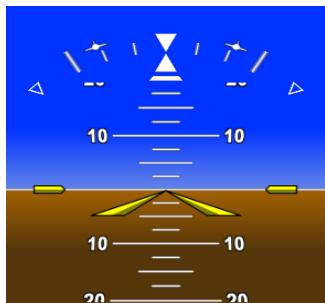
GDUs with PFD functionality have a 10-hour free trial of SVT. A timer in the Terrain/SVT menu indicates current trial status.

SVT presents a forward looking view of the terrain, obstacles, and traffic surrounding the aircraft. This optional feature offers a visual enhancement to the PFD.

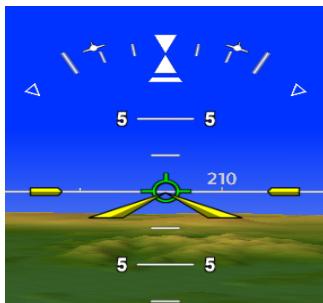
SVT FEATURES	
PFD	MFD
<ul style="list-style-type: none"> • Terrain Alerting • Obstacle Alerting • SVT Alert Inhibit • Flight Path Marker • Zero Pitch Line • Arc-second Grid Lines • Horizon Heading Marks • Traffic Display • Airport Signs • Runway Display • 3-D Alert Symbols 	<ul style="list-style-type: none"> • Terrain Alerting • Obstacle Alerting • SVT Field of View • SVT Alert Inhibit Controls

3.4.1 Pitch Scale Expansion

When SVT is active, the pitch scale expands to display fewer degrees of pitch. This change in scale is necessary to maintain an accurate representation of terrain.



Default Pitch Scale

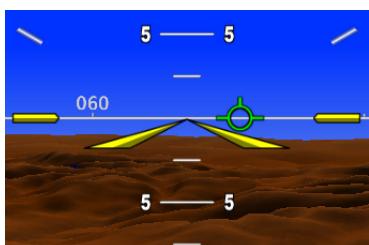


Pitch Scale with SVT

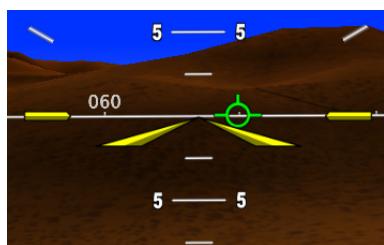
3.4.2 Zero-Pitch Line

PILOT AWARENESS: ZERO PITCH LINE

This horizontal reference line spans the width of the PFD. It is useful when quickly determining whether the aircraft's current altitude is above or below the approaching terrain.



Zero-Pitch Line Above Mountains



Zero-Pitch Line Below Mountains

3.4.3 Flight Path Marker



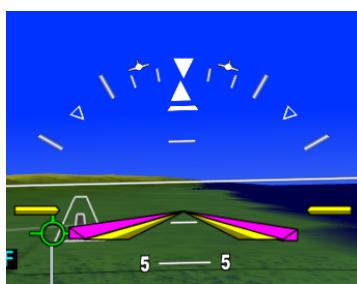
WARNING

DO NOT USE THE FLIGHT PATH MARKER AS A FLIGHT DIRECTOR.

PILOT AWARENESS: FLIGHT PATH MARKER

The flight path marker displays when SVT is enabled and active, and groundspeed is greater than 30 knots. This is useful when assessing potential conflicts with terrain, obstacles, and traffic.

Displayed terrain or obstacles in the aircraft's flight path depicted extending above the FPM indicate a possible conflict.



Flight Path Marker

The flight path marker displays the aircraft's projected path relative to runways, traffic, terrain, and obstacles.

It indicates the aircraft's current lateral and vertical path, accounting for wind speed and direction relative to the 3-dimensional terrain depiction.

3.4.4 SVT Terrain and Obstacles

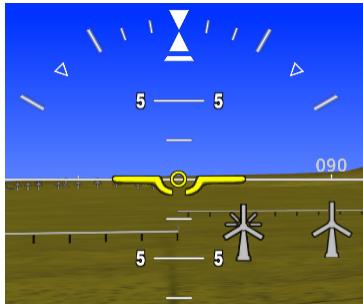


Figure 3-3 SVT Features



Depicts terrain in front of the aircraft. Color palette indicates terrain and obstacles at varying elevations.

This imagery derives from the aircraft's attitude, heading, GPS 3-D position, and terrain and obstacle databases.

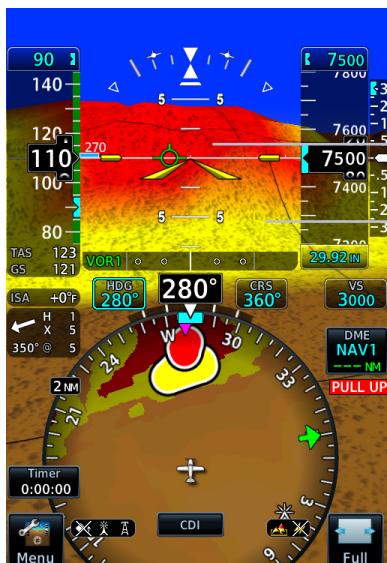


Two-dimensional symbols represent an obstacle's relative height above terrain and distance from the aircraft.

- Includes towers, power lines, and wind turbines
- Obstacles never obstruct instrumentation
- Size varies according to aircraft proximity

TERRAIN AND OBSTACLE ALERTS

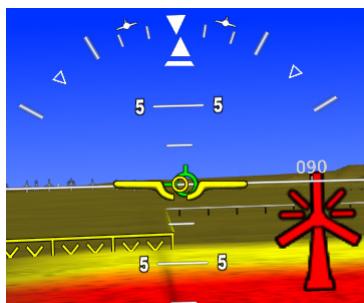
When interfaced to a GTN with TAWS-B or HTAWS enabled, or when TXi Terrain FLTA or TAWS-B is enabled, terrain and obstacle alerts include alert depictions in SVT.



In the event of a terrain or obstacle alert, SVT shading changes to red or yellow, reflecting alert status.

SVT Warning Shade

SVT Caution Shade

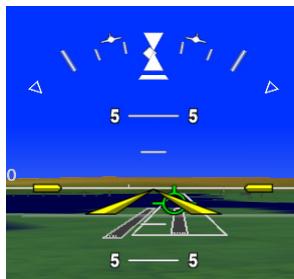


3.4.5 SVT Runways



Runway depictions provide improved awareness of runway location with respect to surrounding terrain. Runway thresholds correspond to their correct elevation with respect to terrain.

Runways oriented within 45° of aircraft heading are represented in white, others in gray.



The runway is brighter with a white box outline when a runway approach is active. This improves recognition of the intended runway.

Detail is added as the aircraft becomes closer to the runway. This includes runway numbers and centerlines. Taxiways are not shown in SVT.

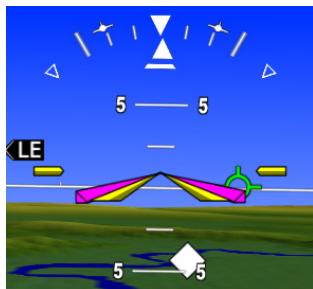
3.4.6 SVT Traffic

Detected intruders display in their relative location as determined by the aircraft traffic systems. Traffic in 3-D appears larger when closer, and smaller when further away. Intruders above the zero pitch line are above the aircraft's altitude and intruders below are lower.

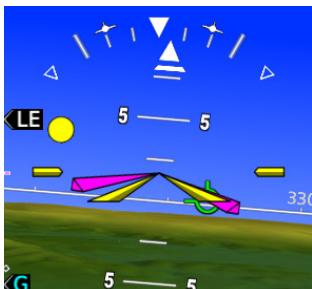


Figure 3-4 SVT Traffic Display

A white diamond indicates proximate traffic. A yellow circle indicates alerted traffic.



Proximity Advisory

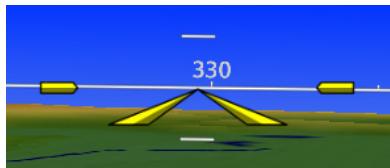


Traffic Advisory

3.4.7 Selectable Display Features

Pilot selectable display features provide additional indications in synthetic vision.

HORIZON HEADINGS



Horizon heading marks synchronize with the HSI. Tick marks and compass heading display in 30° increments on the zero-pitch line. These markings are not visible behind the altimeter and airspeed indicator.

AIRPORT SIGNS



Signs denote airport location and ID. These indications are useful when flying into an unfamiliar airport.

The type of indication is dependent on the aircraft's approach distance.

To reduce clutter, signs for private airports display only if the airport is in the active flight plan.

Table 3-4 SVT Airport Indications

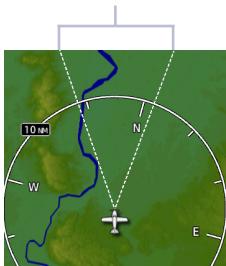
RANGE FROM AIRPORT	INDICATION
15 nm	Signpost and frame only.
8 nm	Identifier annunciates within frame.
4.5 nm	No indication (runway visible).

SVT FIELD OF VIEW (MFD)

FEATURE LIMITATIONS

- Available only on GDU 1060
- Displays only when the Synthetic Terrain function is active

SVT Field of View



On MFD:

The Map page offers a depiction of the PFD's lateral view.

Terrain and traffic within this V-shaped indicator are visible in synthetic vision.

Autopilot

AUTOPILOT INTERFACE FUNCTIONS

- | | |
|---|---|
| <ul style="list-style-type: none">• GPSS• Flight Director• Mode annunciations | <ul style="list-style-type: none">• Altitude capture• Lateral/vertical deviations• VS preselect |
|---|---|

3.5 GPSS

GPSS provides roll command signals from the navigator to the autopilot in order to:

- Make smooth transitions when passing waypoints
- Fly curved leg types (e.g., procedure turns and holding patterns)

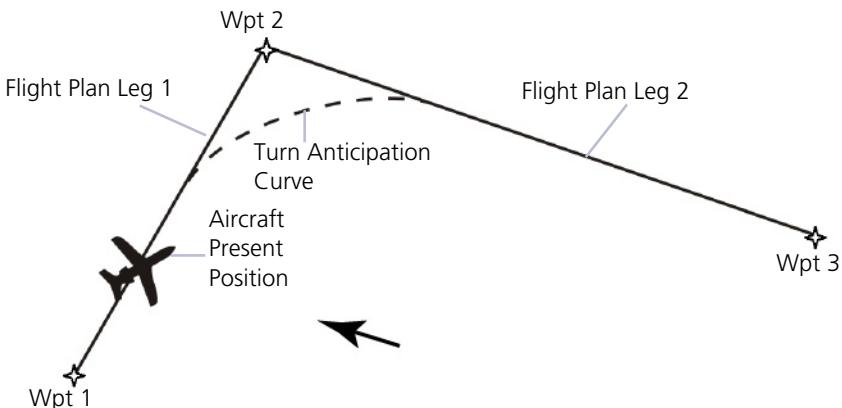


Figure 3-5 GPSS Turn Anticipation

If the autopilot is capable of receiving GPSS Roll Steering information and when navigating using GPS guidance, data is transmitted through a digital communications bus from the GDU to the autopilot. In dual GPS installations, the PFD sends Roll Steering information for the currently-selected GPS source. For these autopilots there is no pilot action required to use GPSS.

For autopilots that are not GPSS Roll Steering capable, the GDU converts GPSS turn commands into a heading error signal for the autopilot. When autopilot is operated in HDG mode and GPSS is selected on the PFD, the autopilot flies the turn commands from the GPS navigator selected on PFD 1. An additional touchscreen button is provided on the selected heading popup window for toggling the autopilot heading reference between GPSS and selected heading. After setting the heading bug, "GPSS" displays in selected heading field.



The **AP HDG REF** key is present if an autopilot is interfaced with the GDU and is configured to use GPSS emulation. This key changes the autopilot's heading reference between HDG bug and GPSS.

When GPSS is selected:

- Heading bug changes from solid to a cyan outline
- Selection key announces a GPSS label

The heading bug may still be adjusted by the pilot as a visual reference without affecting GPSS to the autopilot.

Table 3-5 GPSS Mode Icons

ICON	CONDITION
	Roll steering function is active, but no commands are sent.
	GDU is sending roll steering commands to autopilot (pilot side only).
	GDU is sending roll steering commands to autopilot (copilot side or second PFD only).
	GDU is sending selected HDG commands without GPSS. Heading bug on HSI is solid.

3.6 Flight Director

FEATURE REQUIREMENTS

- Autopilot flight director commands interfaced to the TXi system

FUNCTIONAL LIMITATIONS

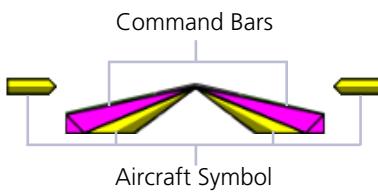
Pilot controls for flight director functions are not available on the GDU. They are available only on the autopilot/flight director controller.

The TXi system limits the distance the flight director commands may deviate from the aircraft attitude icon. If the pitch command provided by the flight director is greater than that allowed by the display, then the command bars will display at the maximum distance allowed by the PFD. As the aircraft pitch changes to satisfy the command bars, the bars will continue display at the maximum distance from the aircraft attitude symbol until the aircraft pitch deviation is within the command display limit.

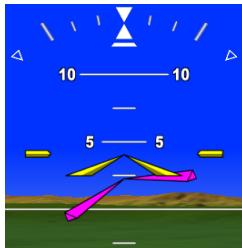
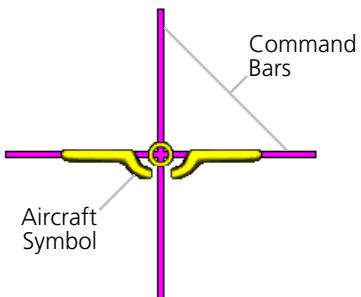
COMMAND CUES

The Flight Director displays commands from the external flight director on the PFD. Depending on aircraft type, these commands display as either single cue (fixed wing) or dual cue (rotorcraft).

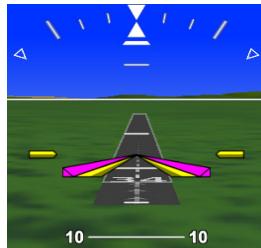
Single Cue



Dual Cue



Descend Left Command



Aircraft at Commanded Attitude

Command bars represent pitch and roll guidance.

Table 3-6 Flight Director Command Indications

CONDITION	INDICATION
Commanded pitch is greater than GDU maximum allowable limit.	Command bars display at maximum allowable limit.
Aircraft pitch exceeds -20°+30°.	Command bars and annunciations declutter.
Aircraft roll exceeds ±65°.	
Attitude information becomes invalid or unavailable.	Command bars do not display.

3.7 Altitude Preselect Functions

FEATURE LIMITATIONS

- Mode availability is dependent upon autopilot type

3.7.1 Arming Altitude Capture

Depending on the autopilot and flight director interface, the GDU provides altitude preselect capabilities. This allows autopilot to capture a preselected altitude.

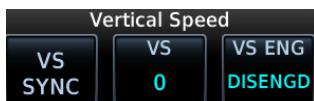
If arming is required, the **ALT CAP** arms the altitude capture function and sets the altitude bug.



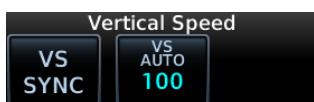
- Specify altitude value.
 - Set **ALT CAP** to "ARMED."
- An optional **ARM** key is available on the GCU 485 control panel.

3.7.2 Enabling Vertical Speed Control

Depending on the autopilot and flight director interface, the GDU provides vertical speed commands to autopilots.



- Specify vertical speed value.
- Set **VS ENG** to ENGAGED.



VS key label changes to reflect mode status.
"AUTO" indicates the autopilot is actively scheduling vertical speed.

3.8 Mode Annunciations

FEATURE LIMITATIONS

- Applicable only to GFC 500/600 and KFC 225/275/325

Autopilot mode status annunciations along the top edge of the PFD.

- Green indicates active status
- White indicates armed mode

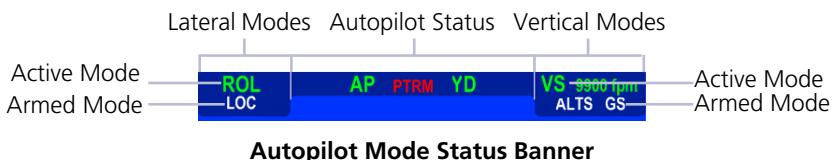


Table 3-7 AP Basic Mode Annunciations

ROTORCRAFT ONLY		FIXED WING & ROTORCRAFT	
ATT	Attitude Retention	AP	Autopilot
CPLD	Flight Director Coupled	YD	Yaw Damper
FTR	Force Trim Release	CWS	Control Wheel Steering
PRY	Pitch, Roll, and Yaw		

Table 3-8 AP Lateral & Vertical Mode Annunciations

VERTICAL MODE ANNUNCIATIONS		LATERAL MODE ANNUNCIATIONS	
ALT	Altitude Hold	BC	Backcourse Navigation
ALTS	Selected Altitude Capture	GPS	GPS Approach
APR	Approach		GPS Navigation
GA	Go Around	HDG	Heading
GP	Glidepath	LVL	Level Hold
GS	Glideslope	LOC	Localizer Approach
IAS	Indicated Airspeed		Localizer Navigation
LVL	Level Hold	NAV	Navigation
PIT	Pitch Hold	ROL	Roll Hold
VNAV	Vertical Navigation	VAPP	VOR Approach [1]
VPTH	Vertical Path	VOR	VOR Navigation
VS	Vertical Speed		

[1] GFC 600 only.

3.8.1 Autopilot Alerts

Table 3-9 GFC 500/600 Alerts, Fixed Wing

ANNUNCIATION	DESCRIPTION
PFT	Preflight test in progress.
PFT	Preflight test failure.
AFCS	Autopilot failure.
AP	Autopilot is automatically disengaged.
AP	Autopilot is manually disengaged. [1]
PTRM	Pitch trim failure. Autopilot may remain engaged. If autopilot disengages, re-engagement cannot occur until after the problem is resolved. May be red or yellow.
↑ELE	Mistrim condition requiring nose up elevator trim.
↓ELE	Mistrim condition requiring nose down elevator trim.
←AIL	Mistrim condition requiring roll trim to the left.
AIL→	Mistrim condition requiring roll trim to the right.
←RUD	Mistrim condition requiring rudder trim to the left.
RUD→	Mistrim condition requiring rudder trim to the right.
MAXSPD	Overspeed protection is active.
MINSPD	Underspeed protection is active.
YAW	Yaw damper failure. May be red or yellow.

[1] Annunciation flashes for 5 seconds, then turns off.

Table 3-10 GFC 600 Alerts, Rotorcraft

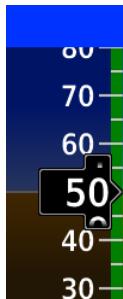
ANNUNCIATION	DESCRIPTION
PFT	Preflight test failure.
FCS	HFCS failure. May be flashing or solid.
P R Y	Servo failure.
P R Y	Out of detent.
P R Y	Out of detent > 30 seconds. [1]
P R Y	Servo is disengaging. [1]
CPLD	HFCS Flight Director is disengaging. [1]
MAXSPD	Overspeed protection is active.
LOWSPD	Underspeed protection is active.
YAW	Yaw damper failure. May be yellow or red.

[1] Annunciation flashes for 10 seconds, then turns off.

FOR ROTORCRAFT: The selected airspeed bug and control field are not present during overspeed and underspeed protection modes.



Normal IAS operating mode.



Underspeed protection active.



Autopilot maintains airspeed at the current bug value.
This value annunciates with the active vertical mode.

3.9 Autopilot Preflight Test



WARNING

DO NOT USE AUTOPILOT IF IT DOES NOT DISENGAGE NORMALLY DURING THE PREFLIGHT TEST.

FEATURE LIMITATIONS

- AP DISC availability is dependent upon unit configuration

If the system detects a malfunction in the AHRS, "ATTITUDE" annunciates on the PFD and the autopilot disconnects. For more information, refer to the autopilot operating instructions.

The GAD 43e uses AHRS attitude output to generate analog signal information for an installed ADI-gyro based autopilot system. Should an error occur within the GAD 43e or AHRS output, the autopilot will disengage. Test the autopilot disconnect before each flight.

TEST THE AUTOPILOT DISCONNECT

1. Power up all avionics. Allow time for self-test completion.
2. Engage autopilot.
3. Select **Test** from the PFD Menu.
4. Tap **AP DISC**.
5. Verify autopilot disconnects.

4 Multi-Function Display

MFD ROADMAP

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SIRIUSXM AUDIO ENTERTAINMENT

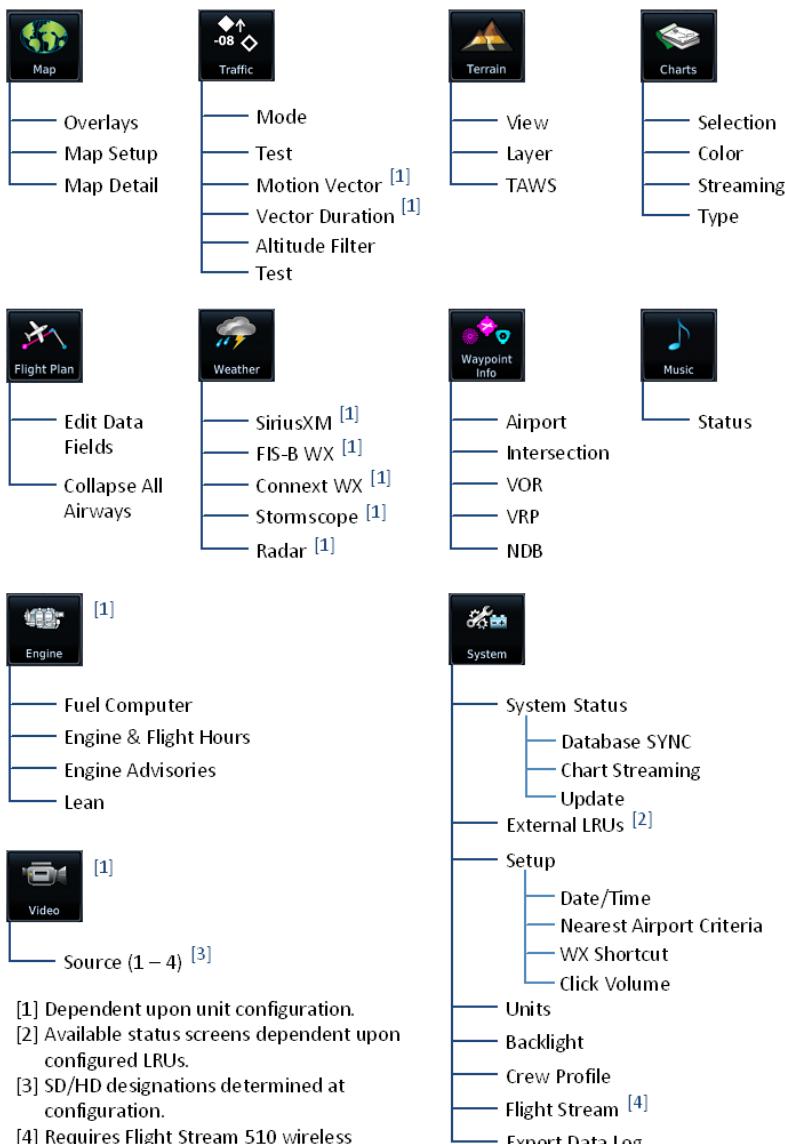
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MFD Roadmap

Menu selections vary based on features and optional equipment installed with Garmin avionics.



4.1 MFD Setup

Table 4-1 MFD Setup Selections

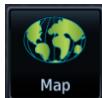
SELECTION	FUNCTION				
System Status	<ul style="list-style-type: none"> View unit, software, and database information Check standby database availability Access Database SYNC, Chart Streaming, and manual database update functions 				
External LRUs	<ul style="list-style-type: none"> Check status of all configured LRUs 				
Setup	<ul style="list-style-type: none"> Set the clock and click volume Create weather page shortcut 				
Units	<p>Specify units of measure for displayed data. Selections synchronize across all configured GDUs. Certain LRUs may contain unit settings independent of the TXi system.</p> <table> <tr> <td>Distance</td> <td>Temperature</td> </tr> <tr> <td>Altitude</td> <td>NAV Angle</td> </tr> </table>	Distance	Temperature	Altitude	NAV Angle
Distance	Temperature				
Altitude	NAV Angle				
Backlight	<ul style="list-style-type: none"> Adjust display brightness 				
Crew Profile	<ul style="list-style-type: none"> Access crew profile management function 				
Flight Stream	<ul style="list-style-type: none"> Access Bluetooth and Wi-Fi setup functions 				
Export Data Log	<ul style="list-style-type: none"> Save logged data to SD card 				

4.1.1 Nearest Airport Criteria

Filtering criteria includes settings for minimum runway length and hard or soft runway surface options. Selections determine which airports are available when using the nearest airport search feature.

RUNWAY SURFACE	MINIMUM RUNWAY LENGTH
Aircraft runway surface selection: <ul style="list-style-type: none"> Any Hard/Soft Hard Only Water 	Specify the shortest distance required for takeoff and landing. In the AFM/POH, this is typically the distance given for sea level and the coldest air temperature.

Map



To increase situational awareness, the Map page depicts the aircraft's current position relative to land, aeronautical, weather, and traffic information.

FEATURE REQUIREMENTS

- Active GPS source (aircraft position symbol)
- FIS-B, Iridium transceiver, or SiriusXM receiver (weather data)
- GDL 69, GDL 88, GTX 345, or GSR 56, with appropriate weather service subscription (NEXRAD overlay)
- Active weather subscription (Connex and SiriusXM only)
- Valid charts database (ChartView, FliteCharts) with effective database cycle, and aircraft to be airborne
- GWX 68, GWX 70, or GWX 75 (airborne weather radar overlay)
- WX-series Stormscope receiver (lightning data)

FEATURE LIMITATIONS

- Onboard weather radar not available for GDU 700() EIS/MFD configuration



Figure 4-1 Default Map Elements

Table 4-2 Map Functions

MAP OBJECT	FUNCTION
Aircraft Symbol	Depicts current aircraft position and orientation. <ul style="list-style-type: none">• Tip represents actual aircraft location• Symbol type is dependent upon configuration• Absent if GPS source is not available
Basemap	Presents a graphical depiction of land and water data. Basemap is always depicted.
Page Orientation Label	Three orientations: <ol style="list-style-type: none">1. North Up orients map to north.2. Heading Up orients map to current aircraft heading.3. Track Up orients map to current aircraft GPS track.
North Indicator	Indicates True north. Tap to orient map North Up.
Map Range Indicator	Displays current map range in upper left quadrant of range ring (i.e., distance from the aircraft to range ring).
NAV Range Ring	Displays current direction of travel on a rotating compass. Orientation: Magnetic north
Map Overlay Icons	Indicates status of overlays at the current map range. Includes: lightning, obstacles, power lines, precipitation, Stormscope, terrain, and traffic
Menu Key	Accesses map overlay controls and pilot selectable settings.

FEATURE LABELS

To maintain readability, map feature labels remain uniform at all zoom levels.

TRAFFIC UNITS

System Units page selections do not affect the display of traffic on the Map page.



If altitude system units are set to meters, the traffic overlay icon will change, serving as a reminder that traffic altitude values remain in feet.

LAND AND WATER DEPICTIONS

Land and water data are for general reference only. Data accuracy is not suitable for use as a primary navigation source. The information is intended to supplement and not replace official government charts and notices.

DATA DRAWING ORDER

The electronic map draws data in order of priority, from highest (1) to lowest (39), with higher priority features drawn atop those of lower priority.

Table 4-3 Map Data Drawing Order

LEVEL	FEATURE	LEVEL	FEATURE
1	Traffic	21	PIREP
2	Ownship	22	AIREP
3	Flight Plan	23	City Forecast
4	TAWS FLTA	24	Surface Conditions
5	Fuel Range Ring	25	Airspace
6	Weather RADAR	26	Waypoints
7	Charts	27	Airways
8	Stormscope	28	Reference Grid
9	Point Obstacles	29	Turbulence
10	Line Obstacles	30	Icing
11	TFR	31	Radar Coverage
12	Freezing Level	32	Echo Tops
13	Cell Movement	33	NEXRAD
14	Lightning	34	Cloud Tops
15	METAR	35	SafeTaxi
16	Winds Aloft	36	Runways
17	SIGMET	37	Terrain
18	AIRMET	38	Basemap
19	Cyclone	39	Topo
20	County Warning		

4.2 Map Interactions

Typical map interactions include zoom, pan, and object selection.

PAN & ZOOM

Panning allows movement of the map in any direction without change to the current zoom setting. Zooming adjusts the current magnification level between pilot specified range parameters.

OBJECT SELECTION

Tapping any object or location on the map displays a map pointer and an information banner.

MAP POINTER



This symbol indicates point of contact on the map. A gray circle highlights any selected waypoint or obstacle.

INFO BANNER

Available information and controls are dependent upon object or location type and proximity to other objects.

INFO BANNER FEATURES

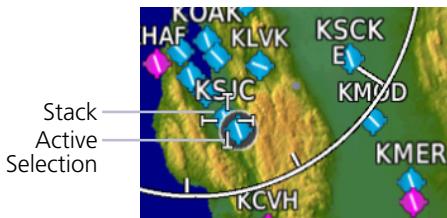
- Pan mode annunciation
- Bearing, distance, and estimated time en route from current aircraft position to map pointer
- Location elevation
- **Next** key for stacked objects
- Maximum altitude AGL and MSL for obstacles
- Information page access key for the selected waypoint, airspace, airport, airport surface hot spot, or TFR



STACKED OBJECTS

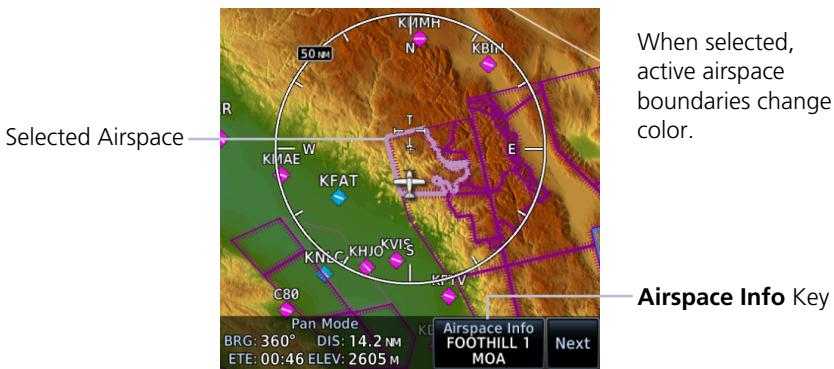
Next

To move the selector through each object in proximity of the map pointer, select an object and tap **Next**.



Overlapping objects may be difficult to identify at a given zoom level.

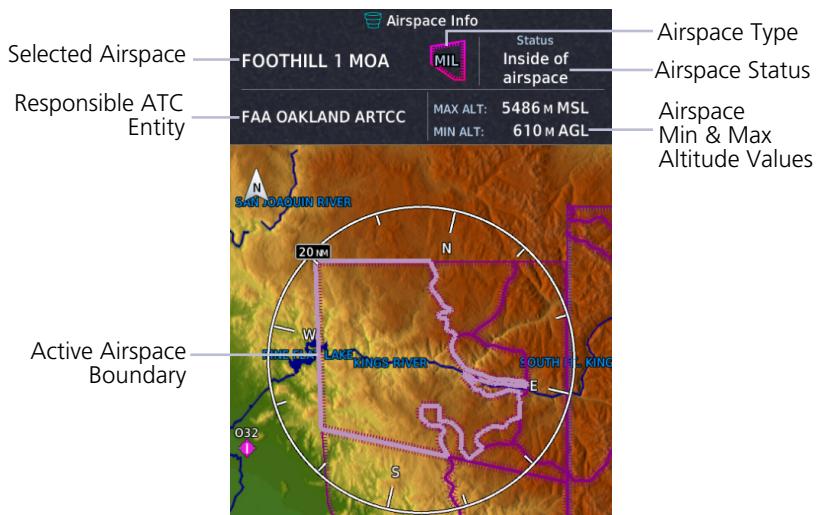
AIRSPACE INFO



AIRSPACE INFO PAGE FEATURES

Airspace info pages have the same basic layout as waypoint info pages. The upper portion contains specific data of the selected airspace. The remainder of the page displays the active airspace boundary and a map of the surrounding area. Data includes:

- Airspace status and type
- ATC entity responsible for the airspace, if applicable
- Floor and ceiling altitudes



4.3 Map Overlays

Overlay Selections

- TOPO
- Terrain
- Airways
 - Off
 - Low
 - High
 - All
- Airslices
- Charts
- Traffic
- Radar
- NEXRAD

Various map overlay selections may be configured. The following overlay functions are mutually exclusive. Enabling one automatically disables the other.

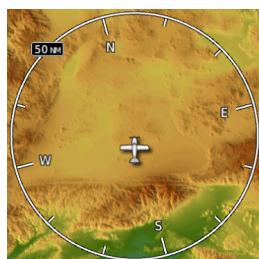
- NEXRAD, terrain, and weather radar overlays
- Stormscope and SXM lightning
- Cloud tops and echo tops
- Charts and SafeTaxi

4.3.1 Overlay Controls



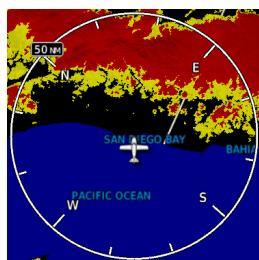
Control keys enable the specified overlay function only and do not activate interfaced equipment. Overlay keys remain active even in the absence of required data.

TOPO



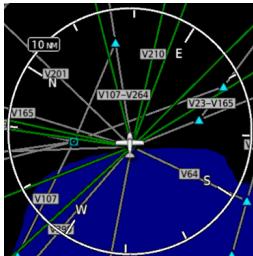
- Overlays topographical data and ground elevation scale
- Depictions are similar to a VFR sectional

TERRAIN



- Overlays terrain map data
- Color shading depicts terrain elevation relative to the aircraft's altitude

AIRWAYS



- Overlays the selected airway type(s) with identifier labels
- Options include: low, high, all, or off (none)
- High altitude airways are green, low altitude airways are gray

AIRSPACES



- Overlays airspace boundaries with altitude labels

CHARTS



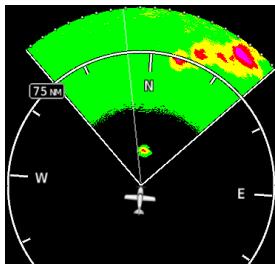
- Overlays geo-referenced chart information
- Approach chart for the active flight plan in the navigator
- Airport surface chart if nearest airport is within 200 NM and no approach is active
- Arrival and departure chart overlays are not available
- Depicts planview area only; excludes inset information (e.g., missed approach procedure view)
- Optional

TRAFFIC



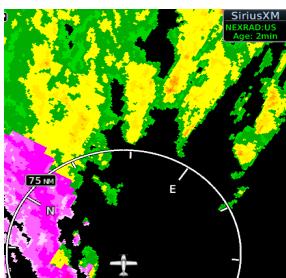
- Overlays traffic information
- Filter selection on Traffic page determines altitude range
- Optional

RADAR



- Overlays airborne weather radar information
- Depictions are identical to those on Weather Radar page
- Excludes WATCH shading
- Optional

NEXRAD



- Overlays datalink precipitation weather information, including product age
- Optional

4.3.2 Overlay Status Icons

Icons indicate which overlays are present at the current map range. A crossed out icon means the overlay is active, but data is unavailable due to a failure, test, or standby condition (where relevant).

The absence of an overlay icon means one of two possible conditions:

1. Overlay not present at the current detail level or zoom setting.
2. Overlay control is off.

Table 4-4 MFD Overlay Status Icons

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Obstacles		Terrain
	Power Lines		Traffic
	Stormscope		Data not available

4.4 Map Detail



4 (Most)

3

2

1 (Least)

An adjustable slider controls the level of detail on the map.
Changes to the map detail level take effect immediately.

Table 4-5 Map Detail Levels

FEATURE	4	3	2	1
Small Cities	✓	✗	✗	✗
Medium Cities	✓	✗	✗	✗
Large Cities	✓	✗	✗	✗
Freeways	✓	✗	✗	✗
Highways	✓	✗	✗	✗
Roads	✓	✗	✗	✗
Railroads	✓	✗	✗	✗
Basemap Labels	✓	✗	✗	✗
VORs	✓	✓	✗	✗
NDBs	✓	✓	✗	✗
Line Obstacles	✓	✓	✗	✗
Point Obstacles	✓	✓	✗	✗
Airspaces that are not prohibited or restricted	✓	✓	✗	✗
Waypoints	✓	✓	✓	✗
SafeTaxi	✓	✓	✓	✗
Prohibited Airspaces	✓	✓	✓	✗
Present	✓	Removed		✗

4.5 Map Setup

Map Setup

- Map
- Aviation
- Land
- Traffic
- Weather

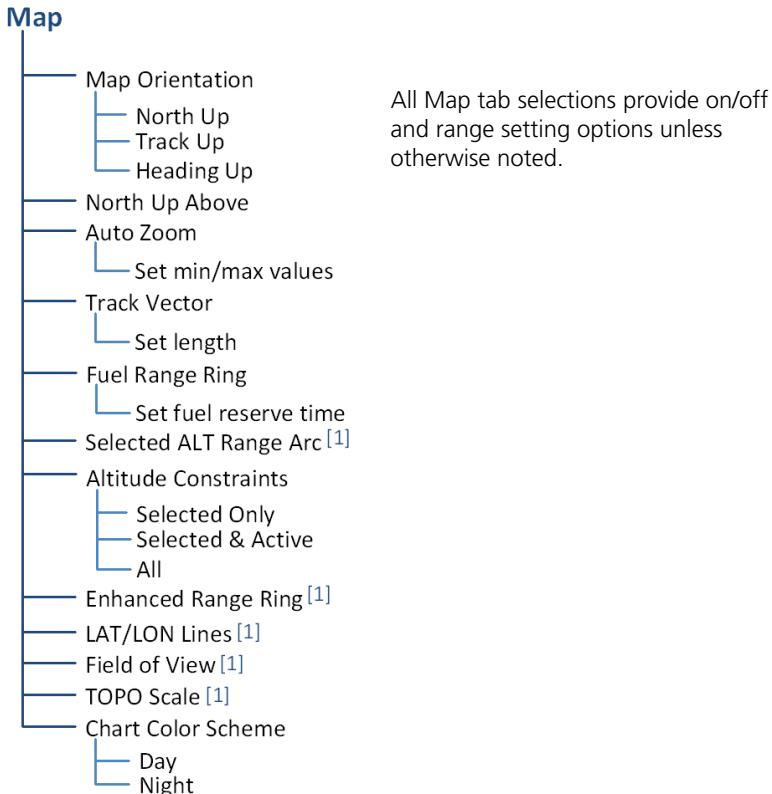
Overlay data controls are located in the Map Setup menu. Changes to an overlay setting take effect immediately. Selections are organized into five groups.

RESTORE DEFAULTS

Restore Defaults

Located in the bottom of each list. This key restores all original factory settings for the active group tab.

4.5.1 Map Selections



[1] On/off functionality only.

PILOT AWARENESS: CHOOSING MAP SCALES

- Consider which map scales or zoom levels to use to achieve the desired level of detail and map information.
- Generally, use smaller map scales or zoom levels in and around terminal areas and whenever precise navigation is required (e.g., airway or radial intercepts).
- During cruise flight, map scale settings often increase to balance navigation, situational awareness, and decision making.

PILOT AWARENESS: MAP ORIENTATION

- Orientation sets the map page to either North Up, Track Up, or Heading Up.
- North Up is useful when zoomed out to view the entire route or a frontal system on a NEXRAD display.
- Using the North Up Above feature causes the screen to switch at certain zoom levels. This is useful as a shortcut to quickly increase situational awareness.

PILOT AWARENESS: VFR & IFR FLIGHTS

- Track vector length options display as a dashed line and arrow extending from the aircraft icon, showing current track and distance the aircraft will travel in the selected time.
- If the track vector is placed over a point on the map, and no data is entered into the system, the GDU indicates a wind-corrected GPS track to that point. This is useful for intercepting airways and radials, making small but positive lateral corrections during approaches, and in setting up for arrivals in the terminal area.

Table 4-6 Map Tab Selections

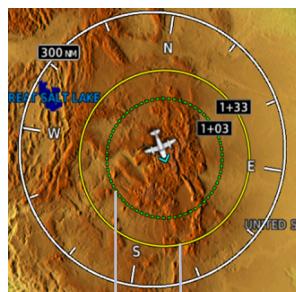
SELECTION	DESCRIPTION
Map Orientation	<ul style="list-style-type: none"> • Specifies map display orientation • Label above North indicator shows current orientation
North Up Above	<ul style="list-style-type: none"> • Specifies range at which the map orientation changes to North Up
Auto Zoom	<ul style="list-style-type: none"> • Automatically adjusts page to display the next waypoint in flight plan at the closest possible map range • Presents SafeTaxi data while aircraft is on ground • Automatic functionality is overridden during manual zoom interactions. It resumes when: <ul style="list-style-type: none"> • Another waypoint is in sequence • Aircraft transitions from on ground to airborne • Auto zoom range matches manual override range • Set minimum and maximum values to best meet operational needs
Track Vector	<ul style="list-style-type: none"> • Indicates current ground track • End of arrow represents aircraft position at the specified time interval

SELECTION	DESCRIPTION
Fuel Range Ring	<ul style="list-style-type: none"> Estimates the remaining range at the current fuel consumption rate and ground speed [1] Calculations are based on the pilot specified fuel quantity in the fuel computer Dashed green circle indicates selected range to reserve fuel Solid yellow circle indicates total endurance range
Selected ALT Range Arc	<ul style="list-style-type: none"> Represents location at which the aircraft is expected to reach selected altitude [2]
Altitude Constraints	<ul style="list-style-type: none"> Displays altitude constraint labels within the flight plan
Enhanced Range Ring	<ul style="list-style-type: none"> Provides a more precise indication of distance between the aircraft and map objects Fixed range value at half the distance of NAV range ring
LAT/LON Lines	<ul style="list-style-type: none"> Displays latitude and longitude lines
Field of View	<ul style="list-style-type: none"> Depicts lateral terrain view presented in SVT [2] Synthetic Terrain function on PFD must be active for indication to display
TOPO Scale	<ul style="list-style-type: none"> Displays a topographical elevation scale
Chart Color Scheme	<ul style="list-style-type: none"> Changes chart overlay color for day or night view

[1] Requires EIS.

[2] GDU 1060 only.

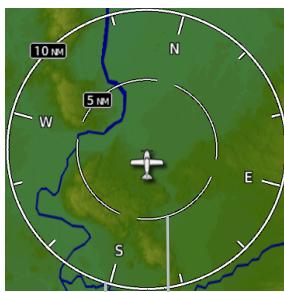
Fuel Range Ring



Range to
Reserve Fuel

Range to
Empty

Enhanced Range Ring



NAV
Range Ring

Enhanced
Range Ring

Field of View
(GDU 1060 Only)



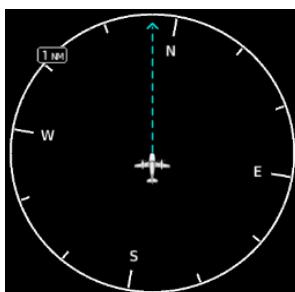
Selected ALT Range Arc
(GDU 1060 Only)



TOPO Scale

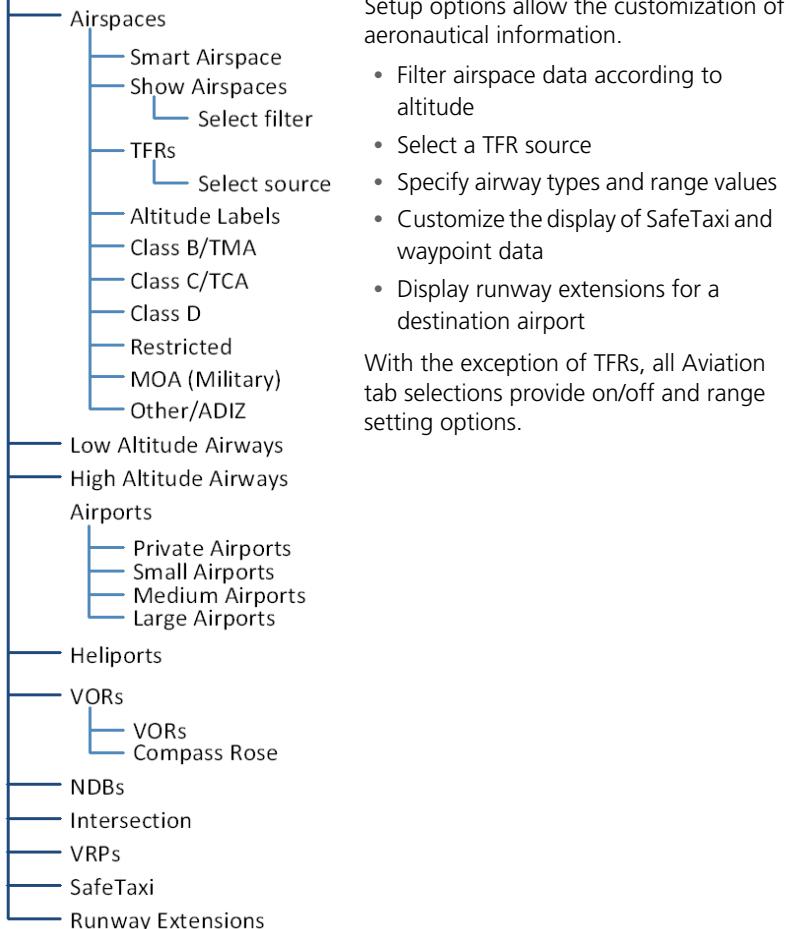


Track Vector



4.5.2 Aviation Selections

Aviation



PILOT AWARENESS: RUNWAY EXTENSIONS

The runway feature extends the runway's centerline out 5 NM from the runway threshold. This is useful when setting up for a visual approach, especially at airports with parallel runways or low visibility.

Table 4-7 Aviation Data Symbols

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Non-towered, non-serviced airport		Non-towered, serviced airport
	Towered, non-serviced airport		Towered, serviced airport
	Soft surface, non-serviced airport		Soft surface, serviced airport
	Restricted (private) airport		Unknown airport
	Heliport		ILS/DME or DME only
	Intersection		LOM
	NDB		TACAN
	VOR		VRP
	VOR/DME		User Airport
	VORTAC		User Waypoint
	Runway extension		ATK

4.5.3 Smart Airspace

Garmin's Smart Airspace feature automatically de-emphasizes non-pertinent airspace away from the aircraft's current altitude. An airspace boundary turns gray when its vertical proximity to the aircraft is >1,000 ft. This range increases linearly to 2,000 ft as the aircraft ascends to 10,000 ft.

Table 4-8 Smart Airspace Criteria

AIRCRAFT ALTITUDE	AIRSPACE PROXIMITY TO AIRCRAFT [1]
Sea level	>1,000 ft
>10,000 ft	2,000 ft

[1] Vertical distance above and below aircraft altitude.

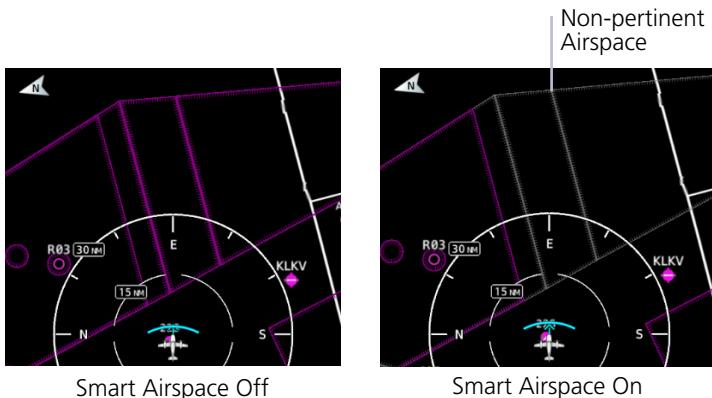


Table 4-9 Airspace Data Symbols

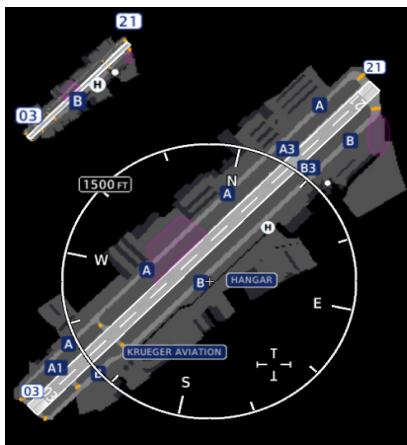
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Class B Altitude Label (ceiling/floor)		Class C/TCA
	Class C Altitude Label (ceiling/floor)		Class D
	Class D Altitude Label (ceiling only)		Restricted
	TFR		MOA
	Class B/TMA		Other/ADIZ

4.5.4 SafeTaxi

During flight, SafeTaxi database is mutually exclusive with chart databases. SafeTaxi and hot spot data display only when the Charts overlay is off.

SAFETAXI FEATURES

- Airport diagram overlay that includes hot spot information
- Aircraft position relative to taxiways, runways, and airport landmarks
- Automatically overrides Charts overlay function during ground operations
- Pilot selectable range options



SafeTaxi provides greater map detail and higher image resolution at lower zoom levels.

Feature labels denote:

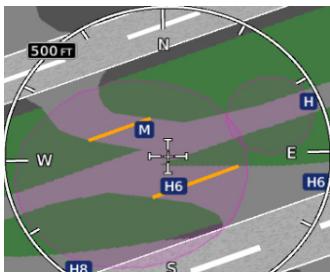
- Runways
- Taxiways
- Airport landmarks

Table 4-10 SafeTaxi Data Symbols

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Runway		Taxiway
	Helipad		Construction Area
	Airport Beacon		Unpaved Parking

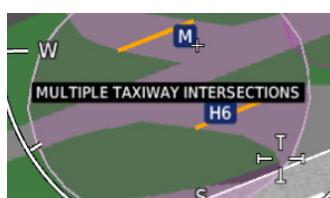
HOT SPOTS

SafeTaxi hot spots identify locations on an airport surface where positional confusion or runway incursions are likely to occur. These known problem areas require heightened attention by pilots.



The following airport features may be deemed hot spots by aviation authorities.

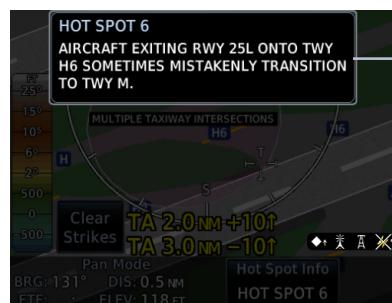
- Intersecting taxiways and runways
- Complex ramp areas
- Directional limitations
- Limited wing-tip clearance
- Overflight risk



Selecting the border of a hot spot displays a brief summary of the indicated hazard and an information key.



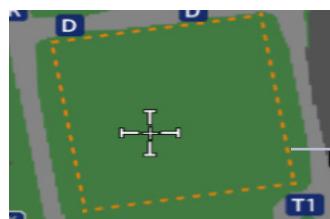
Accessing this key provides additional location information. Numbering corresponds to a list on the airport diagram.



Location Info

Overlay Icons
(not hidden)

CONSTRUCTION SPOTS



There are no expanded detail keys or notes associated with construction areas.

Construction Area Border

4.5.5 Land Selections

Land

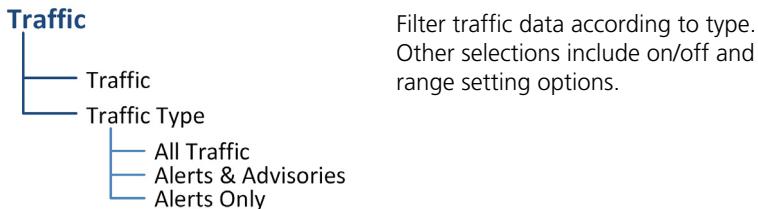
- Obstacles
- Wires
- Railroads
- Rivers/Lakes
- State/Province Borders
- Roads
 - Local Roads
 - Local Highways
 - National Highways
 - Freeways
- Cities
 - Small Cities
 - Medium Cities
 - Large Cities

Selections include on/off and range setting options for all land features.

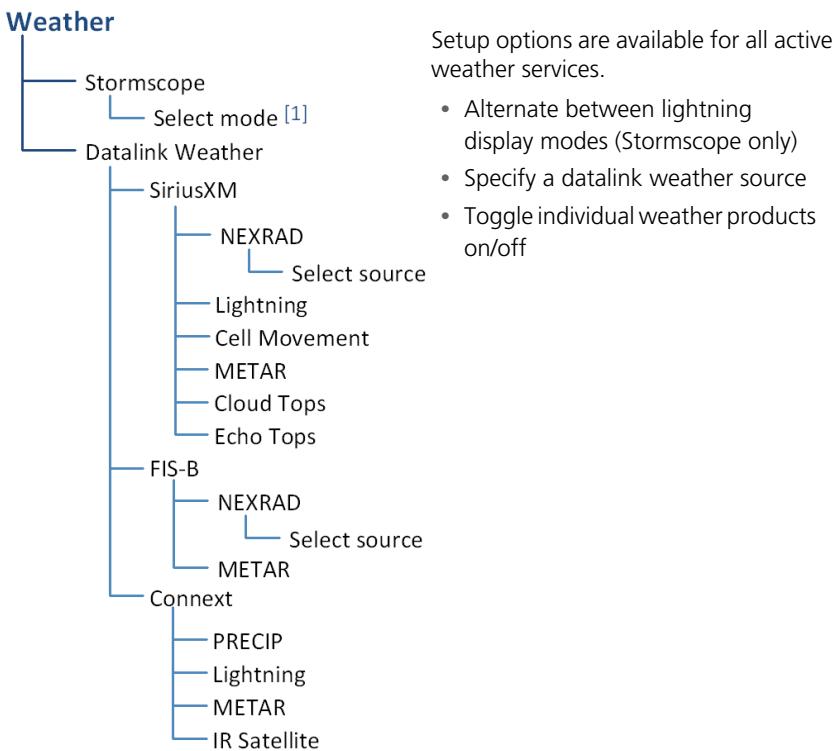
Table 4-11 Land Data Symbols

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Railroad		National Highway
	River/Lake		Freeway
	State/Province Border		Small City
	Local Road		Medium City
	Local Highway		Large City

4.5.6 Traffic Selections



4.5.7 Weather Selections



[1] Mode selection affects setting on dedicated weather page.

Charts



The Charts page provides terminal procedures and airport surface diagrams.

FEATURE REQUIREMENTS

- A current and valid chart database

FEATURE LIMITATIONS

- Geo-referencing is not available for arrival and departure charts
- Chart databases are optional and mutually exclusive

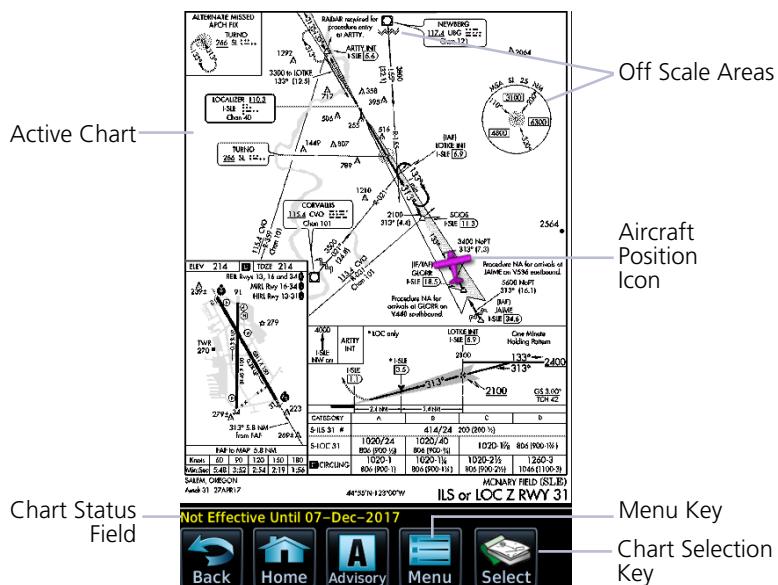


Figure 4-2 Charts Page

CHART STATUS

Active chart status displays in the lower left corner of the Charts page.

Getting Newer Charts

Charts are in the process up updating.

Charts Changed

Charts are up to date.

Expired 28-Apr-2016

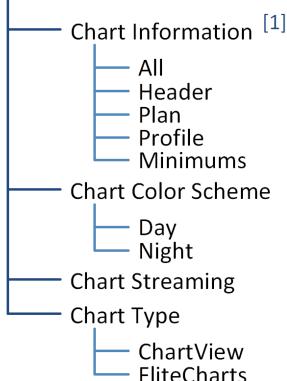
Database is out of date.

Not Effective Until 31-Mar-2016

Database is installed before it is current.

4.6 Chart Setup

Charts Menu

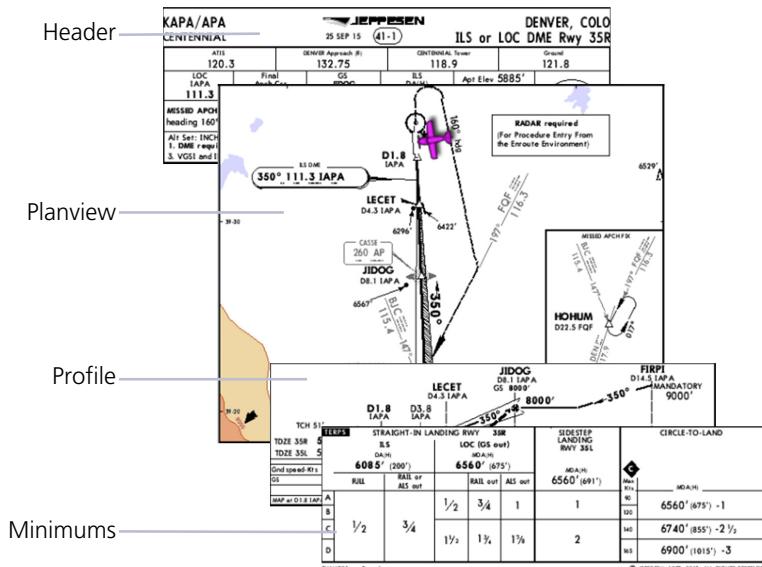


[1] ChartView only.

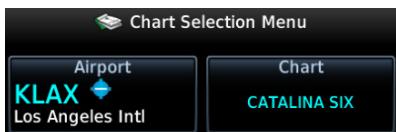
Table 4-12 Charts Menu Selections

SELECTION	DESCRIPTION
Chart Information	Displays individual sections of a chart in the ChartView database only. Options include: <ul style="list-style-type: none"> • All • Header • Planview • Profile • Minimums
Chart Color Scheme	Toggles chart color scheme between day and night modes. <ul style="list-style-type: none"> • Day mode displays black on white background • Night mode displays inverse white on black background
Chart Streaming	<ul style="list-style-type: none"> • Enables automatic streaming of individual charts to the GDU during database synchronization • Streams from the newest chart database • Charts from the previously loaded database remain available for display • Toggling this function off does not affect Database SYNC • No restart required
Chart Type	<ul style="list-style-type: none"> • Toggles chart database type between FliteCharts and ChartView • Selections must be made on the ground • Restart required for changes to take effect

CHART INFORMATION SECTIONS



4.7 Chart Selection



To open a menu, tap **Select**. Enter an airport identifier and choose from the available chart types.

Table 4-13 Chart Types

TAB	CONTENTS
Information	Airport surface charts, alternate minimums, rate of climb and descent tables, inoperative components or visual aids tables, hot spots, land and hold-short operations, and other destination specific flight data.
Departure	Departure route descriptions, including takeoff minimums and obstacle notes.
Arrival	Arrival procedure instructions. Arrival charts are listed in alphabetical order.
Approach	All approach charts associated with the selected airport. Charts are listed according to level of precision and approach type. Runways are listed in numerical order.

AUTOMATIC CHART SELECTION

Automatic chart selection occurs every time the Charts page is opened. The type of chart selected is determined by aircraft status and content from the active flight plan. This function does not override manual chart selections unless a change occurs during one of the following conditions.

Table 4-14 Chart Display Condition & Default

CONDITION	DISPLAY DEFAULT
No flight plan or destination airport is present.	Nearest airport diagram.
Aircraft is on the ground.	Nearest airport diagram (regardless of flight plan).
Flight plan is present, but approach is not loaded.	Airport surface chart for previous airport in flight plan.
Approach is loaded in the selected GPS navigator.	Applicable approach chart.
No charts are available for a selected airport.	"Chart not available for [airport ID]."

4.8 Aircraft Position Icon

FEATURE REQUIREMENTS

- Aircraft position is fully within chart boundaries
- FliteCharts or ChartView is active (airborne maneuvers only)
- SafeTaxi is active (ground maneuvers only)

FEATURE LIMITATIONS

- SIDs and STARs do not support the display of aircraft position
- Not available for arrival and departure charts
- Displays only within the planview area of geo-referenced approach charts

Aircraft position displays on airport diagrams and approach charts when the current position is known.

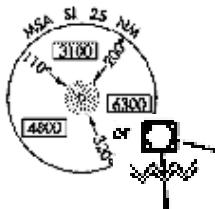
POSITION UNAVAILABLE INDICATION



A fault icon displays in the lower right-hand page corner when:

- Aircraft position data is not available
- Backup GPS is in use
- Selected chart does not contain geo-referenced data
- Selected chart layer is not All or Planview

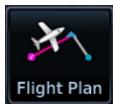
OFF SCALE AREAS



Some charts contain supplemental information within the planview. These areas are considered off scale as they are not geographically accurate.

Aircraft position depictions in off scale areas should be judged relative to the geo-referenced information within the planview only.

Active Flight Plan



Current flight plan information received from a Garmin navigator displays as a scrolling list on the Active Flight Plan page.

FEATURE REQUIREMENTS

- External GPS navigator
- Configured GTN, v6.50 or later (VNAV constraint data)
- Active flight plan

FEATURE LIMITATIONS

- Create, edit, and delete functionality not available on GDU. Any alterations to a flight plan must be performed using the external navigator
- Displays up to 100 waypoints for an active flight plan

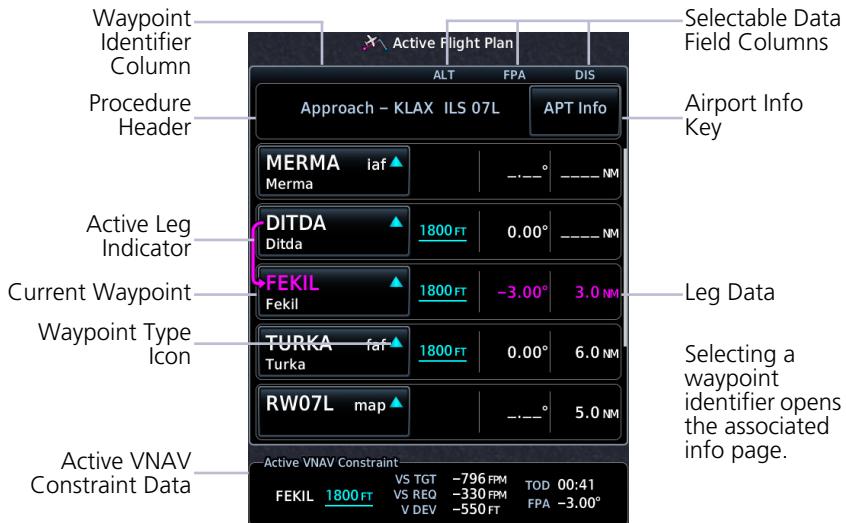


Figure 4-3 Active Flight Plan Page

AIRPORT INFO



For convenience, airport information is directly accessible from the procedure header. This includes airports specified in active approaches, arrivals, and departures.

ACTIVE VNAV CONSTRAINT WINDOW

VNAV CONSTRAINT DATA

- ALT - Altitude Constraints
- VS TGT - Vertical Speed Target
- VS REQ - Vertical Speed Required
- V DEV - Vertical Deviation
- TOD/BOD - Top/Bottom of Descent
- FPA - Flight Path Angle

VS TGT and FPA are pilot-specified values received from the GTN. All other constraint values are based on VNAV calculations.

The TOD field may change to display BOD once the top of descent value counts down to zero.

4.9 Edit Data Fields



To select a flight plan data column, tap **Edit Data Fields**. Columns are arranged in numerical order (1 - 3).

To restore columns to default display settings, tap **Restore Defaults**.

DATA FIELD SELECTIONS

- ALT - Altitude Constraint
- CUM - Cumulative Distance
- DIS - Distance
- DTK - Desired Track
- ETA - Est. Time of Arrival
- ETE - Est. Time En Route
- FPA - Flight Path Angle

Selections are identical for each column. By default, flight plan information fields display:

Column 1: DTK

Column 2: DIS

Column 3: CUM

4.10 Collapse All Airways

Airways automatically display as flight plan legs. A single airway may contain numerous legs. Airways without an active leg collapse for simplification. This does not affect airway legs shown on the external navigator(s).

Airway Indication

Airway – V83.SAF				
MASSA	▲	177°	6.0 NM	988 NM
LYSSA	▲	177°	8.0 NM	996 NM
ZOTOS	▲	177°	7.6 NM	1003 NM
TAS Taos	▢	177°	23.0 NM	1026 NM

All airways begin with an indicator field and end with an exit identifier.

Expanded Airway Detail

Airway – V83.SAF (collapsed)				
SAF Santa Fe	▢	—°	109 NM	1091 NM

To hide all waypoints along an airway, but not the airway's exit waypoint, tap **Collapse All Airways**.

Airway Collapsed Indication

Exit Waypoint

4.11 Flight Plan Map Indications

FLIGHT PLAN LEG STATUS

LEG STATUS	COLOR
Active	Magenta
Next & Future	White
Past or Inactive	Gray

Active, next, and previous flight plan legs overlay on the Map page and HSI Map and are display only.

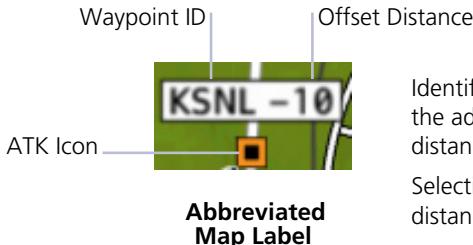


Figure 4-4 Active Flight Plan Map Indications

ATK IDENTIFIER LABELS



This icon represents a temporary lateral position (or checkpoint) relative to an existing waypoint in the flight plan.



Identifier labels on the Map page denote the adjacent waypoint's ID and offset distance from the specified ATK.

Selecting an ATK displays its bearing and distance in the info banner.



Unlike waypoints, ATKs indicate a temporary route fix in the flight plan. The GDU receives this data from the navigator, not a database.

Enabling the altitude constraint function in the Map Setup menu adds a VNAV altitude reference to the flight plan. The ATK serves as a lateral checkpoint when the feature is off.

ALTITUDE CONSTRAINT LABELS



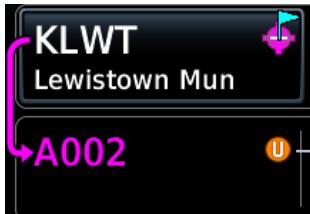
Altitude constraint data display as text labels on the Map page. Units are typically feet or meters depending on current altitude setting in the Units page. They display as flight level altitudes if specified as such on the navigator.

If excessive labels are cluttering the map, this feature may be turned off.

USER AIRPORT ICON



A dedicated icon indicates user created airport waypoints received from the external GPS navigator.



User airport indications display on both the Active Flight Plan and Map pages.

Selected User Airport



When selected, the user identifier annunciates in the info banner.

User Identifier

Waypoints



Dedicated information pages provide waypoint search functions and details not available on the Map page.

4.12 Waypoint Information

FEATURE REQUIREMENTS

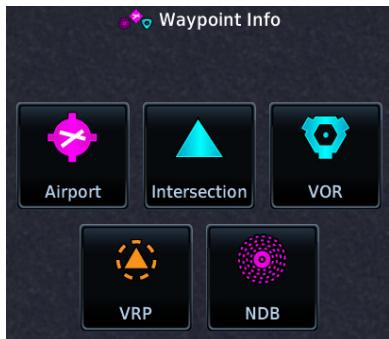
- Viewing NOTAMs requires ChartView or FIS-B

FEATURE LIMITATIONS

- 2-D maps provide zoom functionality only (panning is not available)
- FIS-B transmits distant and FDC NOTAMs within 100 nm of radio station position

PILOT AWARENESS: AIRPORT PAGE

The Airport page is a great place to start while performing an approach brief, checking weather, or considering a diversion.



Waypoints are organized into five groups:

1. Airports
2. Intersection
3. VOR
4. VRP
5. NDB

Multi-Function Display

Intersection, VOR, VRP, and NDB information pages have a uniform layout.

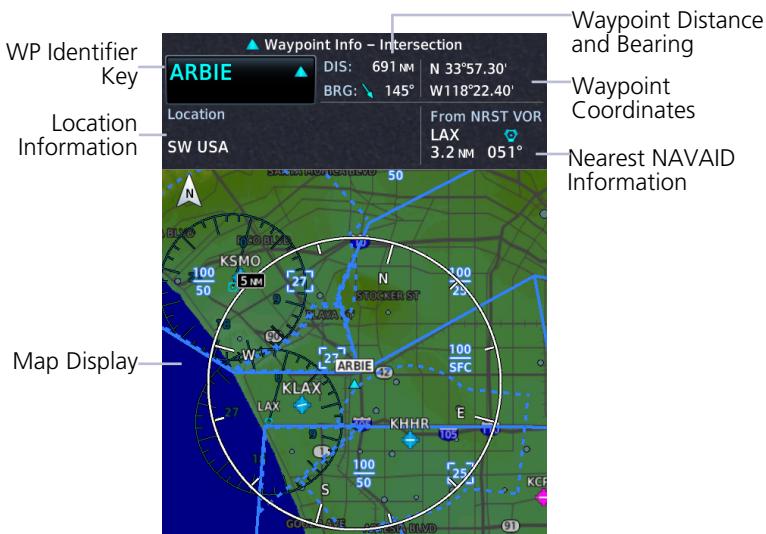


Figure 4-5 Intersection Page

Table 4-15 Information Page Features

WAYPOINT	FEATURES
All	<p>Data Fields:</p> <ul style="list-style-type: none">Distance and bearing from current aircraft positionLatitude and longitudeApplicable country and/or region (e.g., "SW USA")2-D map of the surrounding area (Map views display on Preview and Runways tabs of the Airports page)Identifier and type icon <p>Search Options:</p> <p>WP Identifier key with access to multiple search tabs.</p>

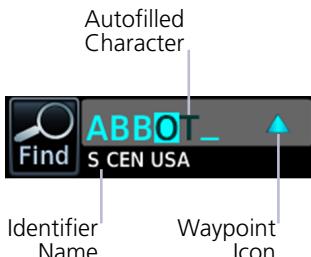
WAYPOINT	FEATURES
Airport  Airport	<p>Info: Airport location, elevation, time zone, airport charts, and fuel availability.</p> <p></p> <p>To open the specified airport chart, tap View Charts.</p> <p>Preview: SafeTaxi depiction of airport and surrounding area.</p> <p>Runway: Identifiers, size, surface type, traffic pattern direction, and PCL frequency.</p> <p></p> <p>To open a list of available runways, tap Runways.</p> <p>Frequencies: Available communication and localizer frequencies. The "c" symbol denotes frequencies that function as the CTAF. If available, for additional frequency information, tap "More Information."</p> <p>Weather Data: METARs, city forecast, and TAF weather information for an airport.</p> <p>NOTAMs: Applicable distant and FDC NOTAMs.</p> <p>Airport Directory: Airport arrival information including local information based on AC-U-KWIK or AOPA data.</p>
Intersection  Intersection	<p>Data Fields:</p> <p>From NRST VOR: identifier, type icon, bearing, and distance</p>
VOR  VOR	<p>Data Fields:</p> <ul style="list-style-type: none"> Frequency To NRST APT: identifier, type icon, bearing, and distance Station Declination VOR Class
VRP  VRP	<p>Data Fields:</p> <p>To NRST APT: identifier, type icon, bearing, and distance</p>
NDB  NDB	<p>Data Fields:</p> <ul style="list-style-type: none"> Frequency To NRST APT: identifier, type icon, bearing, and distance Marker Description

4.13 Waypoint Selection



The **WP Identifier** key provides access to different waypoint search options. Enter a specific identifier or select one from the available search tabs.

4.13.1 Waypoint Autocomplete



The autocomplete function assigns alphanumeric values into search entry fields.

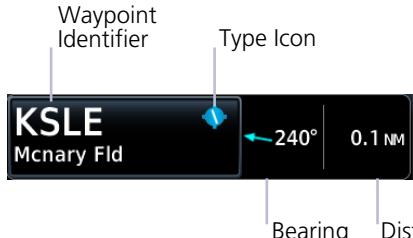
Autocomplete characters are cyan and display from cursor position to the right of the field.

Characters autocomplete based on the first alphabetical match in the navigation database. Matching entries typically change with the addition of each typed character. "No matches found" and "Duplicate found" annunciate when applicable.

4.13.2 Search Tabs



The **Find** key provides access to multiple search tabs. Each tab displays a list of identifiers based on specific criteria.



Each entry includes general information about the associated waypoint.

Table 4-16 Search Tab Contents

TAB	FUNCTION
Recent	Lists up to 20 of the most recently viewed waypoints.
Nearest  Filter	Lists up to 25 waypoints within a 200 nm radius. Tap Filter and select from the available filter options. Only waypoints belonging to the selected class appear in the list. To list all classes, select All .
Flight Plan	Lists all waypoints contained in active flight plan.
Search Name 	Lists all airports, NDBs, and VORs associated with specified facility name. Tap key and enter facility name.
Search City 	Lists all airports, NDBs, and VORs found in proximity of the city. Tap key and enter city name.

SiriusXM Audio Entertainment



The Music page provides controls for tuning and presetting satellite radio music channels.

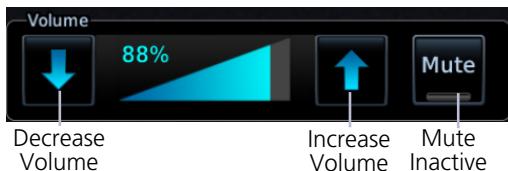
FEATURE REQUIREMENTS

- Active SiriusXM Satellite Radio subscription
- Audio Radio and/or Data Radio ID
- Configured GDL 69/69A interface



Figure 4-6 Music Page

RADIO VOLUME



Directional keys allow volume adjustments.

Mute toggles radio volume on or off.

4.14 SiriusXM Audio Activation



The GDL 69/69A Status page provides information necessary for activating SiriusXM Satellite Radio services. To access this page, navigate to the External LRUs list, or tap **Status**.

For information, refer to *GDL 69/69A SiriusXM Satellite Radio Activation Instructions*. For subscription activation instructions, visit siriusxm.com.



If the Audio Radio ID and/or Data Radio ID do not display during GDL 69 operation, contact a Garmin dealer.

4.15 Browse Music Channels

SIRIUSXM RADIO OPTIONS

- Channels 0 to 999
- Categories 0 to 63

Music provides both numeric entry and channel seek functionality.

4.15.1 Audio Category Selection



To filter the list of available channels according to a specific music type, tap **Category**.

Active Channel Indication

Browse Music Channels		All Categories
2	James Arthur Say You Won't Let Go	Hits 1
3	Selena Gomez Kill 'Em With Kindness	Venus
4	Zay Hilfigger/Zaylon McCall JuJu On The Beat	Pitbull
5	Tico & the Triumphs Motorcycle	50s on 5
6	Kai Winding More (63)	60s on 6
7	Bee Gees More Than A Woman (78)	70s on 7
8	Huey Lewis & The News The Power Of Love (85)	80s on 8

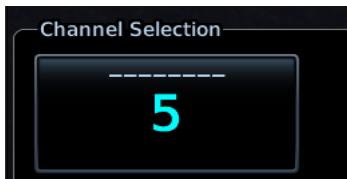
Current Category Selection

Current Channel Selection

Category Key



4.15.2 Direct Channel Tuning



To enter a specific radio channel by number, tap **Channel**.

ASSIGN CHANNEL PRESETS

QUICK TUNING OPTIONS

- Six preset groups
- Up to three preset channels per group

For quick tuning, use presets to store multiple channels in the unit's memory.



SETTING A CHANNEL

1. Select a channel.
2. Tap **Presets** until desired preset group displays.
3. Tap and hold any preset key for three seconds.

PRESET CHANNEL

1. Select a preset group.
2. Tap any preset channel key.

External Video



The Video page displays live video from up to four mounted cameras.

FEATURE REQUIREMENTS

- Composite or HD video camera input
- Enablement card



Figure 4-7 Video Page

INPUT SOURCES

FORMAT	LIMIT
SD	2
HD	2

Two inputs are available for each video format. If an input source is not available, "No Video Input Signal" annunciates in place of a live image.



Camera designations are configured during installation.

PAN & ZOOM



Zooming magnifies the live image up to 10x its range. Zoom settings apply only to the active camera display. Panning allows movement of the zoomed image in any direction.

4.16 SD Video Setup

SD DISPLAY SETTINGS

- Brightness
- Contrast
- Saturation

Selectable display settings are available for SD video only.
HD display settings are configured at installation.

4.16.1 Settings Key

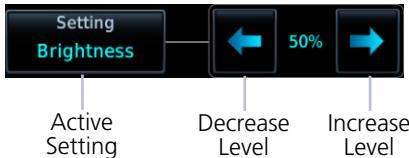


To open a control window, tap **Settings**.



To return to normal display mode, tap **Full**.

SETTINGS ADJUSTMENT



Directional keys allow adjustment of the active setting. Setting values are adjustable for each SD source.

RESTORE DEFAULTS



- Restores the active video display settings configured at installation
- Requires pilot confirmation

5 Weather Awareness

WEATHER DISPLAY

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-----	------------------------	-----

DATALINK WEATHER

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STORMSCOPE

Weather Awareness

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Weather Display



Weather data displays as overlays on the dedicated weather page, Map page, and HSI Map. Available functions depend on the active weather source(s).



Figure 5-1 Common Weather Elements

5.1 Weather Products

Table 5-1 Available Weather Products and Displays

WEATHER PRODUCT FUNCTION	MFD WX PAGE	MFD WX POP-UP TEXT	HSI MAP	MFD MAP PAGE	WAYPT INFO (ARPT)
AIRMET	F, X, C	F, X, C			
Cell Movement/SCIT	X, C			X	
City Forecast	X	X			X
Cloud Top/R Satellite	X, C			X, C	
County Warnings	X	X			
Cyclone Track	X				
Echo Tops	X			X	
Freezing Levels/Zero Degree Isotherm	X				
Icing Potential/SLD	X				
Lightning (Datalink)	X, C		X, C	X, C	
Lightning (Stormscope)	S		S	S	
METAR w/Decoding	F, X, C	F, X, C		F, X, C	F, X, C
NEXRAD/PRECIP	F, X, C		F, X, C	F, X, C	
NOTAMS	F	F			F
AIREP	X	X			
PIREP	F, X, C	F, X, C			
AIRMET	F, X, C	F, X, C			
SIGMET	F, X, C	F, X, C			
Surface Analysis	X				
TAF	F, X, C	F, X, C			F, X

WEATHER PRODUCT FUNCTION	MFD WX PAGE	MFD WX POP-UP TEXT	HSI MAP	MFD MAP PAGE	WAYPT INFO (ARPT)
Temps Aloft	F				
TFR	F, X, C	F, X, C	F, X, C		
Turbulence	X				
Weather Radar (on-board) [1]	W			W	
Winds Aloft	F, X, C				

[1] Not supported on split screen MFD/EIS.

LEGEND

Connxxt Product	C
FIS-B Graphic Product	F
On-board WX Radar Equipment	W
SiriusXM Product	X
Stormscope Product	S

Datalink Weather



WARNING

DO NOT RELY SOLELY ON DATALINK WEATHER FOR WEATHER INFORMATION. DATALINK WEATHER PROVIDES A SNAPSHOT IN TIME. IT MAY NOT ACCURATELY REFLECT THE CURRENT WEATHER SITUATION.



NOTE

Datalink weather is not intended to replace weather briefings or in-flight weather reports from AFSS or ATC.

FEATURE REQUIREMENTS

- FIS-B, GSR 56 transceiver, or GDL 69/69A SXM receiver

Datalink weather services are available through FIS-B Weather, SiriusXM Weather, and Connexx WX that transmit from a ground station or satellite.

5.2 Weather Page Interactions



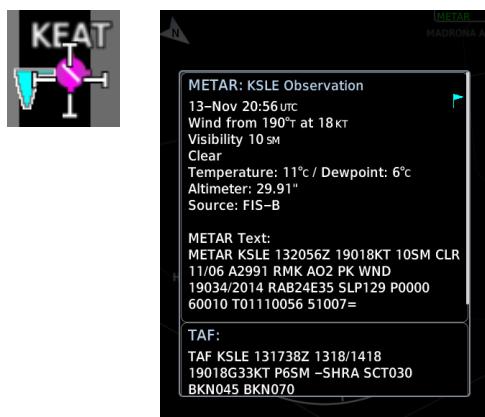
Selected Altitude

Plus and minus keys adjust altitude in 3,000 ft increments for altitude-based weather products.

Selectable altitude values vary by weather service and product. Includes: Icing, Turbulence, and Winds Aloft

Table 5-2 Weather Icons & Interactions

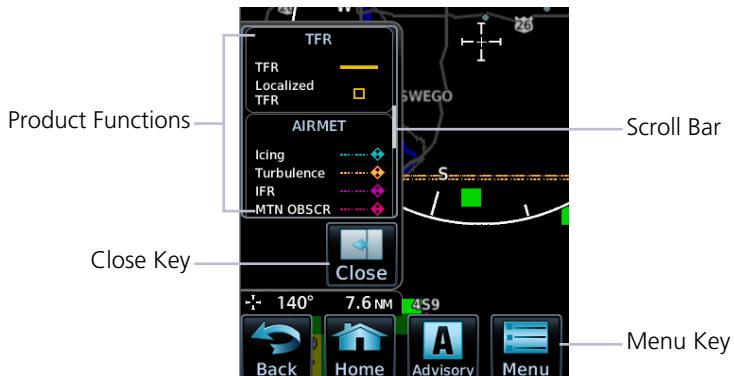
WEATHER ICONS	MAP INTERACTIONS
Tapping any weather icon displays an information banner. When applicable, a pop-up window displays additional data.	<ul style="list-style-type: none"> • Pan mode symbol • Bearing and distance to map pointer from aircraft's current position • Cloud Top altitudes • Pan location • Report data



Tapping an airport icon displays information about local weather conditions.

Table 5-3 Product Legends

LEGEND	LEGEND INTERACTIONS
A scrollable legend provides relevant product colors and symbols via the data link weather menu page. Definitions are organized by product function.	To view a product legend, tap the Menu key and select Legend . If a valid subscription is not available, "No weather products enabled" displays.



5.3 Weather Product Age



NOTE

Data contained within a composite weather product may be older than its weather product age and should never be considered current.

A timestamp identifies the approximate time of data collection for each weather product. For quick reference, the age of each active weather product is calculated and shown in a color-coded side bar on the Weather and Map pages.

TIMESTAMP COLOR DEFINITIONS



- **Green** – Weather product is considered current. Its age is newer than half its expiration time. Tapping the Timestamp window displays time for all green colored weather products.
- **Amber** – Weather product is considered stale. Its age is older than half its expiration time. A weather product may be amber when its issue date and time occurs in the future by more than the complete expiration time for the requested weather product. (e.g., some TFRs)
- **Gray** – Received weather product data is expired, has not been received, or is not supported at the selected altitude. No Data or ALT UNAVBL displays next to the weather product title.



On PFD:

Timestamps for NEXRAD/PRECIP and TFR products display in the HSI Setup menu.

5.4 Precipitation

FIS-B

SiriusXM®

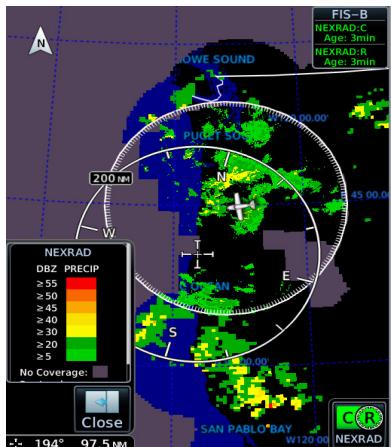
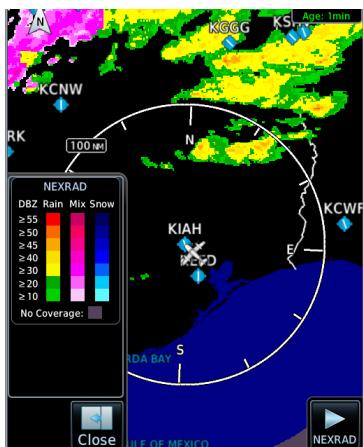
Connext

5.4.1 NEXRAD



WARNING

NEVER USE NEXRAD WEATHER FOR MANEUVERING IN, NEAR, OR AROUND AREAS OF HAZARDOUS WEATHER. NEXRAD IMAGES ARE SNAPSHOTS OF PAST WEATHER DATA. THEY ARE NOT SAFE FOR USE AS REAL TIME DEPICTIONS OF NEARBY WEATHER ACTIVITY.

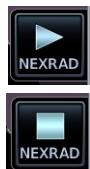


NEXRAD weather radar displays a mosaic of precipitation data, colored according to reflectivity. Composite reflectivity images depict the highest radar energy received from multiple antenna tilt angles at various altitudes. Base reflectivity images depict radar returns from the lowest antenna tilt angle.

The precipitation intensity level reflected by each pixel represents the highest level of composite radar reflectivity data sampled in that location.

A clear understanding of ground-based Doppler weather radar capabilities will allow you to interpret the NEXRAD weather imagery in the safest way possible. The National Oceanic and Atmospheric Administration hosts a description of the technology on its website: https://www.weather.gov/jetstream/doppler_intro

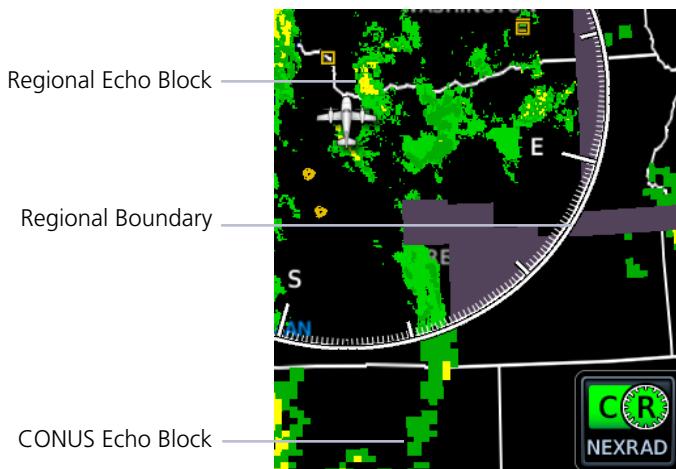
RADAR DATA ANIMATIONS



To depict trending weather movements over time, an animation function stitches the last three to six received radar images together in sequence, from oldest to newest, and replays them on a continuous loop. Play and stop controls are active when three or more NEXRAD images are available for playback.

FIS-B NEXRAD

FIS-B NEXRAD is uplinked to the aircraft as two separate weather products: CONUS and Regional NEXRAD. Both products display individually or simultaneously, separated by a white hash-marked boundary. CONUS and Regional NEXRAD are selectable separately via the NEXRAD button on the bottom right of the weather map. FIS-B NEXRAD does not differentiate between liquid and frozen precipitation types.



REGIONAL

FIS-B Regional NEXRAD is a high-resolution weather image with a limited range, centered around each broadcasting ground station. The (high resolution) Regional NEXRAD pixels are 1.5 minutes (1.5 nautical miles = 2.78 km) wide by 1 minute (1 nautical miles = 1.852 km) tall. Each weather pixel varies with latitude. Above 60° latitude, pixel block widths double to 3 minutes/nautical mile for regional maps.

Depending on the locations of received FIS-B ground stations, Regional NEXRAD coverage can extend as far as 250 nm around an aircraft's position. Aircraft flying at higher altitudes typically receive data from more ground stations than aircraft flying at low altitudes.

CONUS

FIS-B CONUS NEXRAD is a large, low-resolution weather image for the entire continental U.S. CONUS NEXRAD pixels are 7.5 minutes (7.5 nm = 13.89 km) wide by 5 minutes (5 nautical miles = 9.26 km) wide.

SIRIUSXM NEXRAD PRECIP SOURCE SELECTION

SiriusXM offers NEXRAD radar imagery from CONUS and non-CONUS sources. Weather menu options are Composite and Base.

Table 5-4 SXM NEXRAD Source Options

SOURCE	DESCRIPTION
Composite (CONUS)	Composite reflectivity image of radar for the conterminous U.S.
Base	Base reflectivity image. Coverage and availability are dependent upon subscription.



Depending on the SXM service and installed GDL hardware, radar base reflectivity imaging may have broader coverage within North America or be limited to only Canada.

Precipitation above 52° N may display as mixed precipitation regardless of actual precipitation type. Precipitation of an unknown type always displays as rain.

5.4.2 Connex

Precipitation products are available for areas around the world. For current coverage areas and product information, visit www.garmin.com/connex.

5.5 Echo Tops

FIS-B

SiriusXM®

Connext



Depicts the location, elevation, and direction of NEXRAD radar echoes. This information is useful for gauging storm intensity in a relative sense. A higher radar echo means a stronger storm updraft.

Due to similarities in color schemes, this product is mutually exclusive with Cloud Tops.

5.6 Clouds

FIS-B

SiriusXM®

Connext

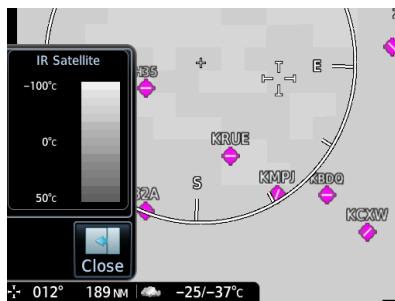
5.6.1 Cloud Tops (SXM)



Indicates the altitude of the highest visible portions of a cloud at the time of measurement. Cloud top altitude data are estimated from IR satellite imagery.

Due to similarities in color schemes, this product is mutually exclusive with Echo Tops.

5.6.2 IR Satellite (Connext)



Infrared Satellite weather information is available for North America and Europe.

- Lighter grays depict colder temperatures
- Darker grays depict warmer temperatures

5.7 Lightning

FIS-B

SiriusXM®

Connext



A yellow cross icon represents a strike event occurring within a two kilometer region. Strike location is an estimate of its center. Unlike Stormscope, the icon does not change shape or color as data ages.

Only cloud-to-ground strikes are reported through the Connext weather service.

5.8 METARs and TAFs

FIS-B

SiriusXM®

Connext

METAR and TAF reports provide information on current and forecast conditions. Colored METAR flags display for all TXi weather sources when a METAR reporting station is matched with a corresponding TXi navigation database identifier. When selected, the METAR is decoded and shows above the original METAR text. METARs are provided only in areas covered by the navigation database currently loaded.

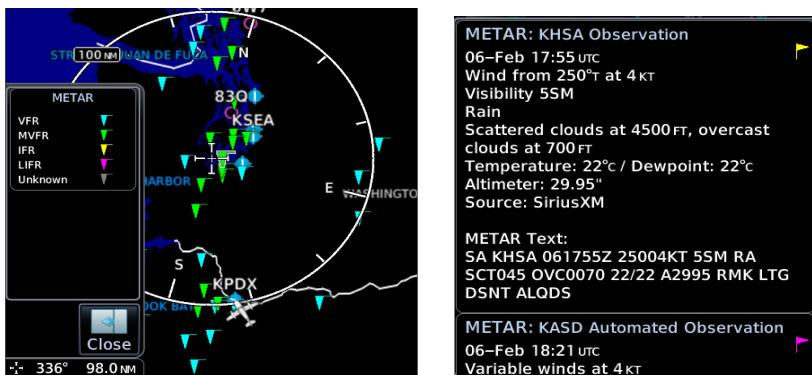


Table 5-5 METAR Symbols

METAR SYMBOL	DESCRIPTION
	VFR: Ceiling greater than 3000 ft. AGL and visibility greater than five miles.
	Marginal VFR: Ceiling 1000 to 3000 ft. AGL and/or visibility three to five miles.
	IFR: Ceiling 500 to 1000 ft. AGL and/or visibility one to three miles.
	Low IFR: Ceiling below 500 ft. AGL and/or visibility less than one mile.
	Unknown

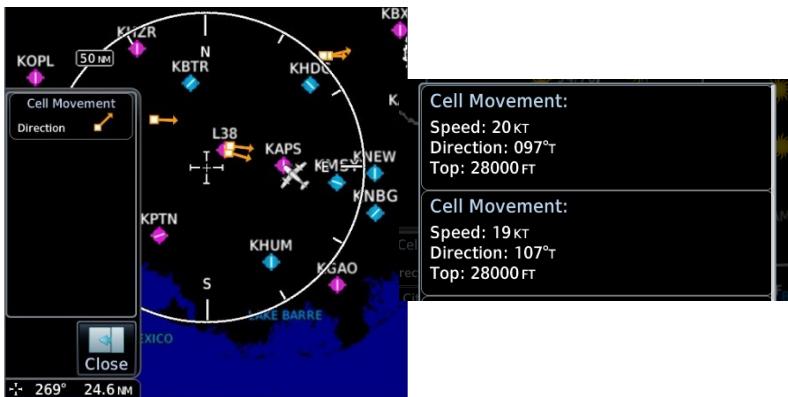
5.9 Cell Movement

FIS-B

SiriusXM®

Connext

Information derived from NEXRAD displays the location of storm cells within a strong storm. Cell direction, speed, and storm top altitude is provided with a corresponding visual storm cell vector (arrow) indication.



5.10 AIRMETS

FIS-B

SiriusXM®

Connex

The AIRMET overlay draws the geographical boundaries of received AIRMETS on the dedicated weather page. AIRMETS include advisories of weather that may be particularly hazardous to single engine, light aircraft and VFR pilots. Tap an AIRMET graphic area to view the detailed AIRMET report text.

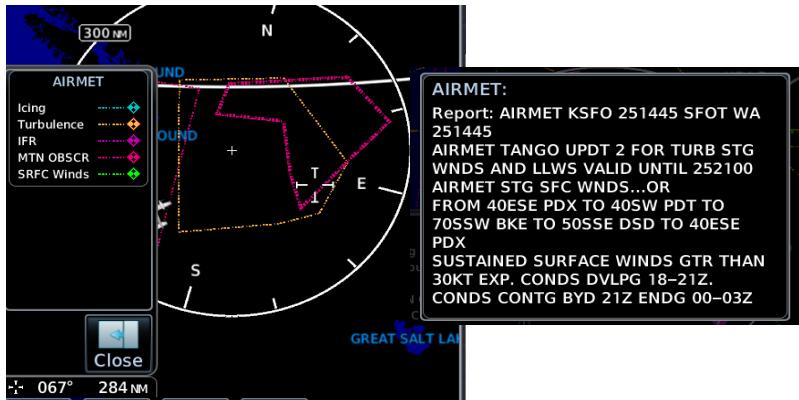


Table 5-6 AIRMET Types

SELECTION	DESCRIPTION
Icing	<ul style="list-style-type: none"> Areas of moderate airframe icing including areal extent
Turbulence	<ul style="list-style-type: none"> Areas of moderate turbulence including vertical extent
IFR	<ul style="list-style-type: none"> Weather conditions with ceilings <1,000 ft and/or visibility <3 mi
MTN OBSR	<ul style="list-style-type: none"> Widespread mountain obscuration due to clouds, precipitation, smoke, haze, mist, or fog
Surface Winds	<ul style="list-style-type: none"> Sustained surface winds >30 kt and/or potential non-convective wind sheer below 2,000 ft AGL

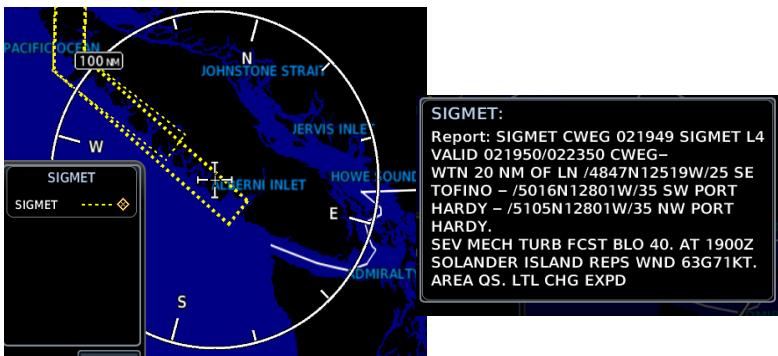
5.11 SIGMETS

FIS-B

SiriusXM®

Connext

The SIGMET overlay draws the geographical boundaries of received SIGMETs on the dedicated weather page. Convective and non-convective SIGnificant METerological Information combine in a textual report and display graphically for the observed or forecast region. The SIGMET text displays when the graphical SIGMET is selected. Touch the graphical depiction for additional information.

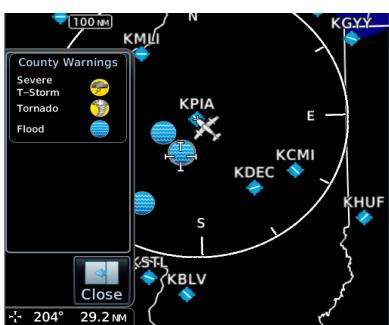


5.12 County Warnings

FIS-B

SiriusXM®

Connext



County warnings are provided for the counties within the continental United States. Specific public awareness and protection alerts such as fires and natural disasters are included with warnings for tornadoes, thunderstorms, floods and flash floods. Filter options:

- Severe T-Storm
- Tornado
- Flooding

5.13 Cyclone/Hurricane Track

FIS-B

SiriusXM®

Connext



Provides hurricane and tropical storm information, showing location, forecast track and track errors as issued by the National Hurricane Center.

Options include: current, 12, 24, 48, and 72 hour periods for 5 days

5.14 AIREP/PIREPs

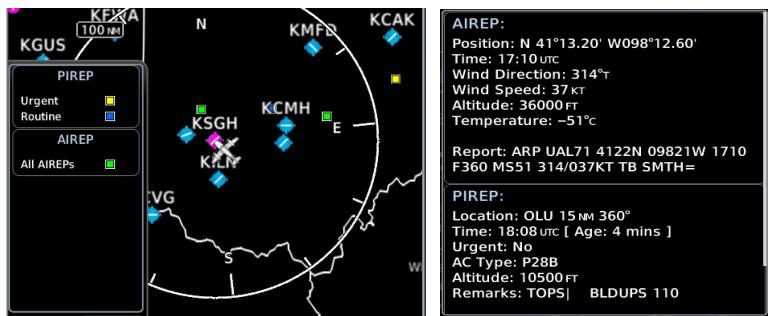
FIS-B

SiriusXM®

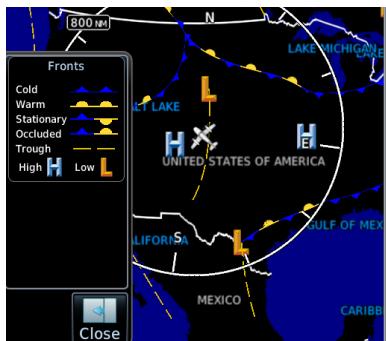
Connext

AIREPs are routine, automated reports of in-flight weather conditions such as wind and temperature. AIREPs display with a green map icon. Selecting the icon displays a report window.

PIREPs are pilot-generated weather reports that may contain non-forecast 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). Routine display with a blue map icon and urgent display with an amber icon. Selecting either icon displays a report window.



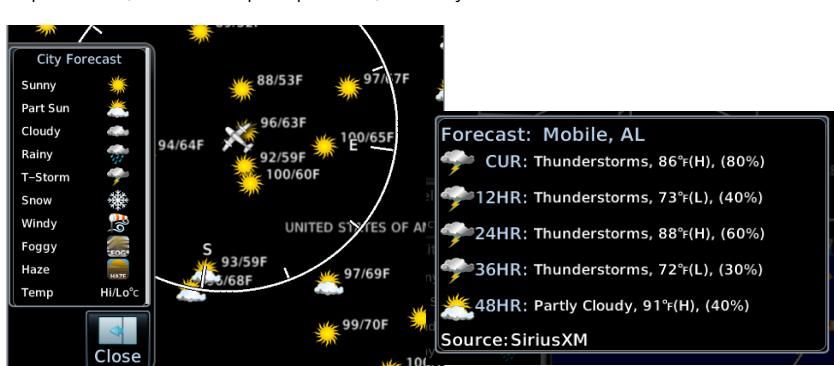
5.15 Surface Analysis



Displays high (H) and low (L) pressure areas at the earth's surface as well as frontal locations.

Options for forecast period include: current, 12, 24, 36, and 48 hours

5.16 City Forecast



5.17 Winds Aloft



SiriusXM®

Connext

Indicates wind speed and direction for the specified altitude.

Altitude range: surface to 45,000 ft

The wind barb extends outward from the reporting location dot in the direction of wind origination.

Reporting altitudes vary depending on the weather provider.

5.18 Icing



SiriusXM®

Connext

The Icing potential shows a graphic view of the current icing conditions in four categories:

1. Light
2. Moderate
3. Severe
4. Extreme
(not specific to aircraft type)

Altitude range: 1,000 to 30,000 ft

The Icing potential is not a forecast, but a presentation of icing potential at the time of analysis. A time stamp shows the time of data compilation.

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 black and red blocks over the icing colors.

5.19 Turbulence

FIS-B

SiriusXM®

Connext



Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 ft. Turbulence data is intended to supplement AIRMETs and SIGMETs.

5.20 Freezing Levels

FIS-B

SiriusXM®

Connext



Color-coded contour lines indicate the altitude of the freezing level.

5.21 TFRs

FIS-B

SiriusXM®

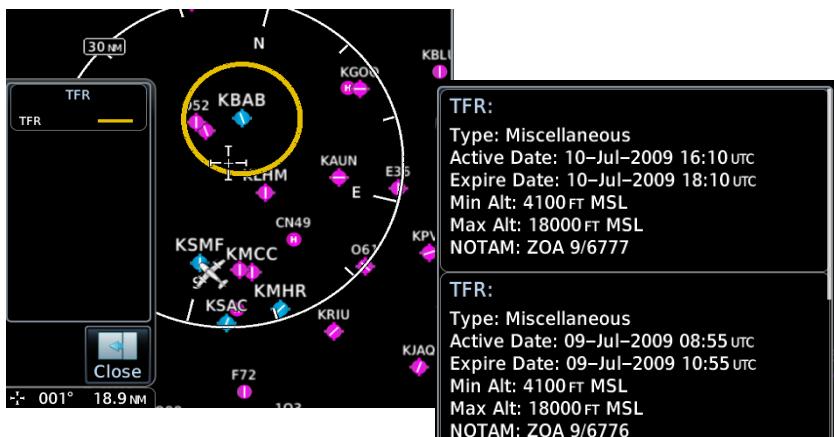
Connext



WARNING

DO NOT EXCLUSIVELY USE DATALINK SERVICES FOR TFR INFORMATION. ALWAYS CONFIRM TFR INFORMATION WITH OFFICIAL SOURCES SUCH AS FLIGHT SERVICE STATIONS OR AIR TRAFFIC CONTROL.

TFRs identify areas of airspace where aircraft are temporarily restricted from operating. TFRs are routinely issued for occurrences such as dignitary visits, military activities, and forest fires. Tapping the TFR graphic on the weather page brings up textual details for the selected TFR.



5.22 SiriusXM



SiriusXM satellites deliver high bandwidth (S-band) data to provide high-resolution images. Available data is received within a few minutes after the aircraft satellite receiver comes into view of the SiriusXM satellite network.

FEATURE REQUIREMENTS

- Active SiriusXM Aviation Weather subscription
- Data Radio ID
- Configured GDL 69/69A interface

FEATURE LIMITATIONS

- For Icing Potential, Winds Aloft (U.S.), and Turbulence, the valid time displays instead of product age
- For Freezing Level and Winds Aloft (Canada), the generation time displays instead of valid time



NOTE

Per FAA TSO-C157b, "This FIS-B Class 2 equipment is not interoperable with the FAA SBS provider." Information displayed from the GDL 69/69A receiver is provided as a commercial service of SiriusXM. To receive and display information from the subscription-free FIS broadcast managed by FAA SBS, a separate Class 1 UAT transceiver is required.

5.22.1 SiriusXM Weather Setup

SiriusXM Weather Menu

- Map Orientation
 - North Up
 - Track Up
 - Heading Up
- Datalink Status
 - GDL 69 Status
- Legend
- NEXRAD
 - Composite (CONUS)
 - Base (Canada)
 - Base
 - Off
- Lightning
- Echo Tops
- Cloud Tops
- METAR
- Cell Movement
- AIRMET
 - Icing
 - Turbulence
 - IFR
 - MTN OBSCR
 - Surface Winds
- SIGMET
- County Warnings
 - Severe T-storm
 - Tornado
 - Flooding
- Cyclone
- AIREP PIREP
- Forecast Period
 - Select period
- City Forecast
- Winds Aloft
- Icing
- Turbulence
- Freezing Levels
- TFR

5.22.2 Activating Services

Before SiriusXM Weather is accessed, service must be activated by the SiriusXM customer service. This is accomplished by providing either one or two coded IDs, SiriusXM Satellite Weather (data) and Sirius Satellite Radio (audio). The coded IDs are used to send an activation signal, which allows the use of weather and entertainment products received by the GDL 69/69A.

For subscription activation instructions, visit siriusxm.com.

To complete activation:

1. Contact SiriusXM using the customer service phone number listed on the website.
2. Provide the customer service agent with your Data ID and Audio ID.
3. Position aircraft within satellite reception area and power unit.
4. Tap **Weather > SiriusXM Weather > Menu > Datalink Status**.
5. Verify activation. Status page displays Data ID, Subscription Level, and weather product listings.
6. Tap **Menu > Lock activation > OK**.

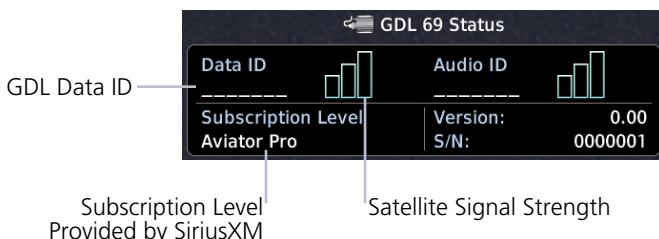


Figure 5-2 GDL 69 Status Page

5.22.3 SiriusXM Weather Products



When SiriusXM weather services are not activated, all the weather product boxes are cleared on the GDL 69 Status page. A yellow “Activation Required” message prompts in the center of status page.

The Service Class refers to the groupings of weather products available for subscription.

5.23 FIS-B Weather



No pilot action is required to receive FIS-B weather information. FIS-B weather products include METARS, TAFs, NEXRAD (Regional and CONUS (Combined)), AIRMETs, SIGMETs, PIREPs, and Winds and Temperatures Aloft. Other products include NOTAMs and TFRs.

FEATURE REQUIREMENTS

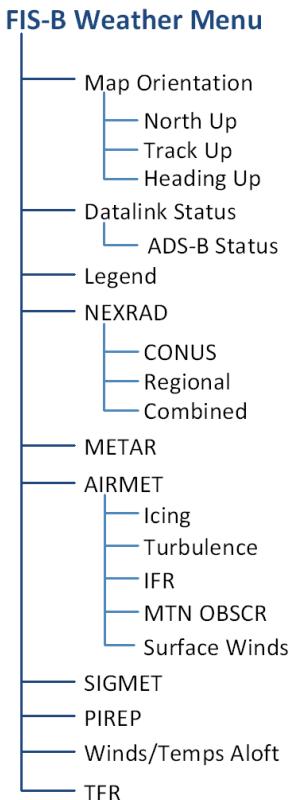
- UAT receiver (GDL 88, GTX 345)

The FAA provides FIS-B as a Surveillance and Broadcast Service operating on the UAT (978 MHz) frequency band. FIS-B uses a network of FAA-operated Ground-Based Transceivers (GBTs) to transmit weather datalink information to the aircraft's receiver on a scheduled continuous basis.

The Flight Information Service-Broadcast (FIS-B) Weather service is freely available for aircraft equipped with a capable datalink universal access transceiver (UAT). Ground stations provide uninterrupted services for the majority of the contiguous U.S., Hawaii, Guam, Puerto Rico, and parts of Alaska. No weather subscription service is required. For the latest FAA ground station coverage information, visit:

www.faa.gov/nextgen/programs/adsb/

5.23.1 FIS-B Weather Setup



5.23.2 FIS-B Data Transmission Limitations

FIS-B broadcasts provide weather data in a repeating cycle which may take several minutes to completely transmit all available weather data. Therefore, not all weather data may be immediately present upon initial FIS-B signal acquisition.

LINE OF SIGHT RECEPTION

To receive FIS-B weather information, the aircraft's datalink receiver must be within range and line-of-sight of an operating GBT. Reception may be affected by altitude, terrain, and other factors. Per the FAA, much of the United States has FIS-B In airborne coverage at and above 3,000 feet AGL. Terminal coverage is available at altitudes below 3,000 feet AGL and is available when flying near approximately 235 major U.S. airports. Surface coverage allows FIS-B ground reception at approximately 36 major U.S. airports.

PER FAA TSO-C157B

FIS-B information may be used for pilot planning decisions focused on updating the pilot's awareness of the dynamic flight environment; including avoiding areas of inclement weather that are beyond visual range and pilot near-term decisions where poor visibility precludes visual acquisition of inclement weather. FIS-B weather and NAS status information may be used as follows:

- a. To promote pilot awareness of ownship location with respect to reported weather, including hazardous meteorological conditions; NAS status indicators to enhance pilot planning decisions; and pilot near-term decision-making.
- b. To cue the pilot to communicate with Air Traffic Control, Flight Service Station specialist, operator dispatch, or airline operations control center for general and mission critical meteorological information, NAS status conditions, or both.

FIS-B information, including weather information, NOTAMs, and TFR areas, are intended for the sole purpose of assisting in long-/near-term planning and decision making. The system lacks sufficient resolution and updating capability necessary for aerial maneuvering associated with immediate decisions. In extreme scenarios, the oldest weather radar data on the display can be up to 15 to 20 minutes older than the display's age indication for that weather radar data. Therefore, do not attempt to use FIS-B weather information to maneuver the aircraft at minimum safe distances from hazardous weather.

FIS-B information must not be used in lieu of a standard preflight briefing.

- c. [Displaying FIS-B weather using GDL 88, or GTX 345 Class 1 transceivers] FIS-B uplink is a subscription-free FIS broadcast managed by FAA SBS. It provides an FAA approved source for METAR, TAF, WINDS, PIREPs, NEXRAD, AIRMET, SIGMET, and TFR information, and is subject to the broadcast range limits for these products.

FIS-B uplink is not an FAA approved source for NOTAMs.

5.23.3 FIS-B Product Age

Contact the appropriate weather product supplier for current broadcast rates and refresh intervals. Graphically dense weather products may take several minutes to receive completely.

The broadcast rate represents the periodic interval at which the ADS-B ground stations transmit the weather product for reception. Weather data with the same time stamp may be received multiple times in a row. Broadcast intervals are typically higher than the weather product update intervals.

FIS-B update intervals report the frequency at which weather products refresh with new data from reporting stations, ground sensors, and weather product compilations.

FIS-B transmission intervals report the frequency at which weather products are broadcast by the ADS-B ground stations network.

5.23.4 Raw Text Reports

Access FIS-B raw text data by tapping the **Raw Text Reports** key on the ADS-B Status page. Selecting a FIS-B data link textual product accesses the latest uploaded data.



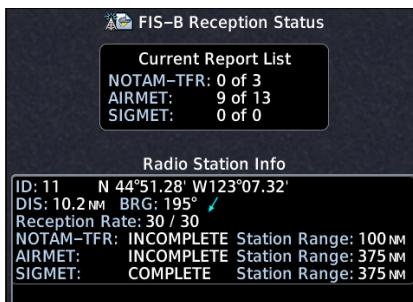
To display Raw Text Reports from the FIS-B Weather Menu, tap:

Datalink Status > Raw Text Reports

5.23.5 FIS-B Ground Reception Status

FIS-B ground station transmission status may be monitored when the UAT transceiver is powered and the FIS-B weather option is selected. A current report lists completeness of NOTAM-TFR, AIRMET, and SIGMET data for all received ground stations.

For the received ground station, the station range field indicates complete/incomplete status only for those products within the ground station's range.



To access the FIS-B Ground Station Status page from the FIS-B Weather Menu, tap:

Datalink Status > Ground Stations

5.24 Connex Weather



Garmin provides Connex datalink, on-demand weather products through the Iridium satellite system via a GSR 56 transceiver and L-band frequencies. An Iridium satellite data subscription service is required for worldwide Connex weather coverage.

FEATURE REQUIREMENTS

- GSR 56 transceiver
- Data plan

Connex Weather coverage is available throughout most of Europe, Canada, and the U.S. Additional radar coverage areas are added continuously. For the latest radar coverage information, visit:

<https://fly.garmin.com/fly-garmin/connex/worldwide-weather/>

Various world-wide weather subscription package options provide weather reporting for most of Europe, Canada, Australia, and the U.S.

5.24.1 Activating Connex Services

To access Connex Weather, visit flyGarmin.com and create a Connex Satellite Services account. Be ready to provide the GDU ID, airframe information (model, tail number), and Iridium serial number. Garmin will issue an access code for entry on the Connex Registration page. If access code and system ID are correct, the airframe registration details will display.

To complete activation:

1. Move aircraft within satellite range and power unit.
2. Go to MFD home page.
3. Tap **Weather > Connex Weather > Menu > Connex Settings > Datalink Status > Connex Registration > Access Code.**
4. Enter the required code, then tap **Register** to complete the process.

5.24.2 Deactivating Connex Unit Registration

Specific GDU Connex registration can be deactivated in order for the unit to no longer make requests to Connex. This does not cancel the subscription. While viewing the Connex Registration display page, tap **Access Code**.

Enter an invalid access code to deactivate the Connex registration. Weather requests will now fail and the system will no longer link to the Connex account.



Figure 5-3 Connex Registration Page

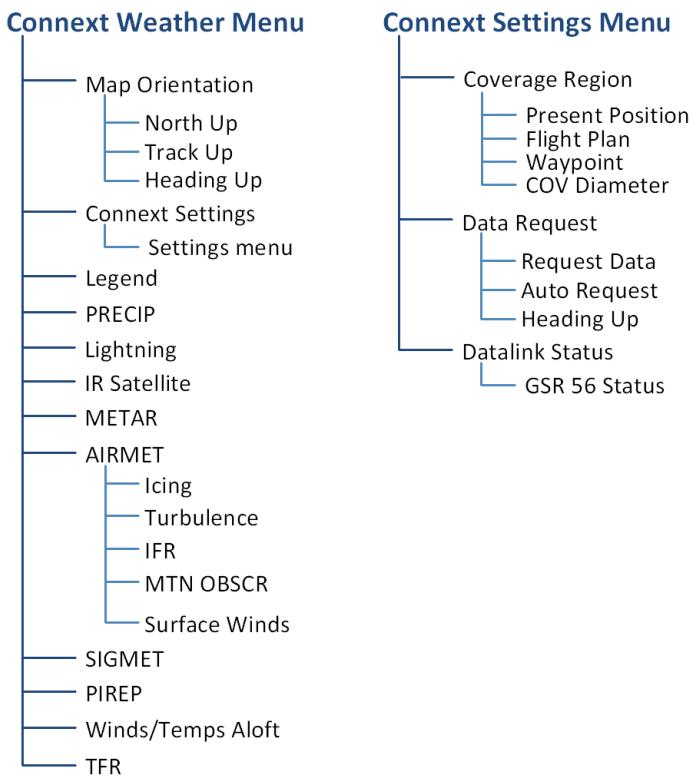
5.24.3 Connex Weather Product Age



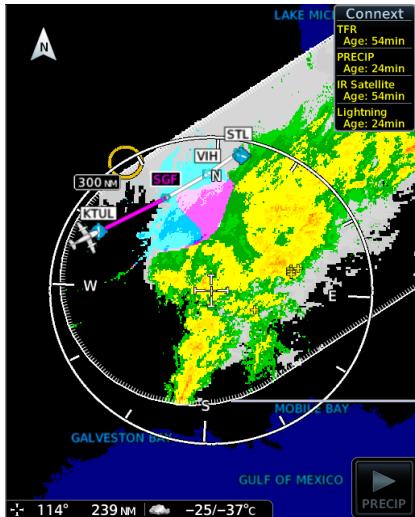
Connex weather product requests are pilot controlled. Weather products are refreshed at intervals that are defined and controlled by Connex and its data vendors.

Weather product age is based on the time difference between when the data was assembled by Connex and current GPS time. Weather products expire at intervals based on each product. When the data expires, it is removed from the display. This ensures that displayed data is consistent with what is currently provided by Connex Satellite Radio services.

5.24.4 Connex Weather Setup



5.24.5 Connex Data Requests



Connex weather data may be updated on an on-request basis. This feature allows the pilot to download selected weather products for a specific waypoint, flight plan, or destination, and the time frame.

Access is via the Connex Settings Menu.

Coverage Boundary



The pilot can update Connex weather data at any time regardless of predetermined automatic update frequency.

Table 5-7 Connect Weather Request Controls

CONTROL KEY	DESCRIPTION
Present Position	Request weather information around aircraft's present position. COV diameter determines extent of request.
Destination	Request weather information for the destination airport.
Flight Plan	Request weather information for the active flight plan route.
Distance	Enter requested weather information for a specified distance along the active flight plan. Range is 10 nm to 500 nm.
Waypoint	Request weather information for a specified waypoint.
COV Diameter	Define the diameter of coverage. Range is 10 nm to 500 nm.
Request Data	Request weather data at any time. Reset Auto Request timer (if active) for next request interval.
Auto Request	Select the automatic weather request period. Options: Off, 5 min, 10 min
Datalink Status	View Iridium satellite datalink status and signal strength.

Stormscope



Stormscope lightning data display on a dedicated weather page or as overlays on the Map page and HSI Map.

5.25 Stormscope Page



WARNING

DO NOT EXCLUSIVELY USE THE LIGHTNING DETECTION SYSTEM FOR WEATHER AVOIDANCE. THE SYSTEM MAY DISPLAY INACCURATE OR INCOMPLETE INFORMATION. REFER TO THE LIGHTNING DETECTION SYSTEM DOCUMENTATION FOR ADDITIONAL INFORMATION.

FEATURE REQUIREMENTS

- WX-500 Stormscope Weather Mapping Sensor

FEATURE LIMITATIONS

- Stormscope lightning information cannot display concurrently with the SiriusXM Lightning weather product
- Lighting data does not display at ranges less than 25 nm. Be aware that strikes may still be present

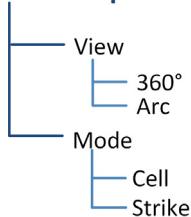
STORMSCOPE FEATURES

- Passive weather avoidance system
- Detects electrical discharges from thunderstorms within 200 nm of current position
- Plots strike count and relative bearing location every two seconds
- Heading and distance from aircraft
- Arc and 360° viewing options

For additional information, consult the WX-500 pilot's guide.

5.26 Stormscope Setup

Stormscope Menu



Setup options reside in the setup menu.

Changes in mode selection on the Stormscope page reflect across all lightning overlays (Map page, HSI Map).

5.26.1 Stormscope Modes

CELL

Cell mode identifies cluster of electrical activity, grouping individual strikes together. Use Cell mode during heavy storm activity to identify where storm cells are located.

STRIKE

Strike mode plots discharge points in relation to where the individual discharges are detected. Strike mode displays the initial strikes associated with a building thunderstorm in relation to where it's detected.

Table 5-8 Stormscope Symbols

SYMBOL	TIME SINCE STRIKE (SECONDS)
	Less than 6 Lightning bolt indicates initial strike.
	Less than 60
	Less than 120
	Less than 180

STRIKE RATE

Strike Rate reports the approximate number of strikes per minute for a given view range. It is useful when trying to determine if storm cells are building or decaying.

Mode: Strike | Rate: 47

Strikes occur at a higher rate as a storm matures. They are less frequent as the storm dissipates.

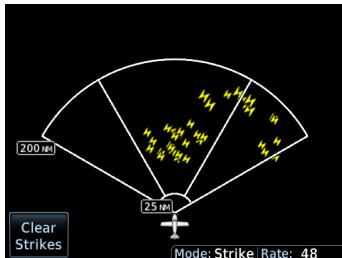
Clear Strikes

To reset the rate value, clear the page of all strikes.

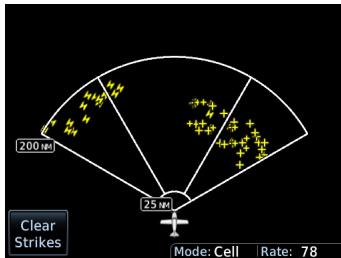
5.26.2 Views

Stormscope provides both arc and 360° views of lightning data.

ARC VIEW

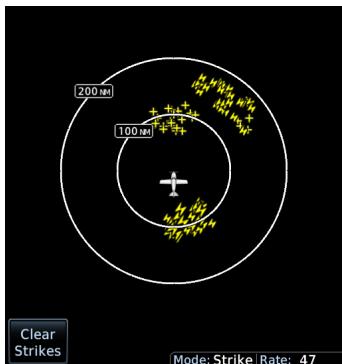


Strike Mode

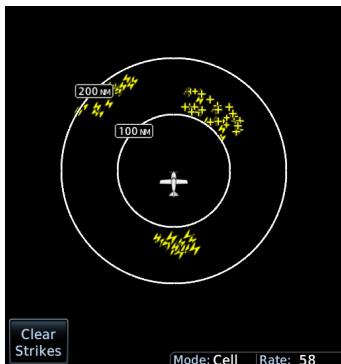


Cell Mode

360° VIEW



Strike Mode



Cell Mode

Airborne Weather Radar



Weather radar data display on a dedicated weather page or as overlays on the Map page.

5.27 Weather Radar Page



WARNING

USE WEATHER RADAR TO AVOID SEVERE WEATHER, NOT TO ENTER IT.

FEATURE REQUIREMENTS

- GDU 1060 or full screen MFD on GDU 700P

FEATURE LIMITATIONS

- Available modes and intensity levels depend on the installed radar type
- Not available on GDU 700() EIS/MFD

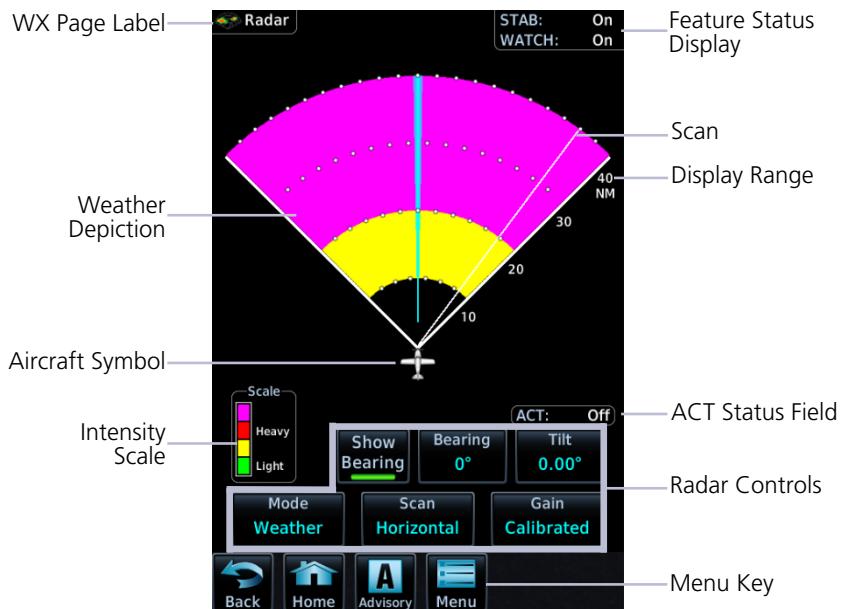


Figure 5-4 Weather Radar Page

RADAR UNITS

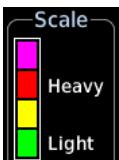
Distances on the Weather Radar page display in nautical miles.

DISPLAY ADJUSTMENTS

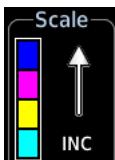
To change radar display range, adjust the inner control knob.

To adjust tilt and bearing angle, tap and drag the line indicator as necessary, or use the associated control keys.

INTENSITY SCALE



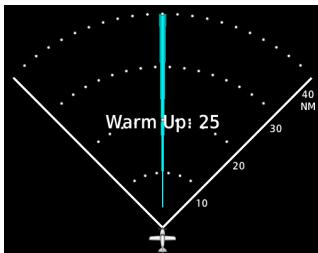
Weather



Ground

Each operating mode uses a unique color palette to depict increasing intensity levels.

WARM-UP COUNTDOWN TIMER



A warm-up period initiates upon power up (GWX 68 only). Duration varies depending on how long the radar is off. The radar begins transmitting once warm-up is complete.

5.28 Weather Radar Setup

Radar Menu

- Horizontal Sector Scan [1]
 - Select scan width
- Vertical Sector Scan [2]
 - Select scan width
- Stabilization
- WATCH Shading [1]
- Weather Advisories [1]
- Altitude Compensated Tilt [2]
- Turbulence Detection [2][3]
- Ground Clutter Suppression [2][3]

Available setup options are dependent upon configuration.

With the exception of Sector Scan, all selections are on/off only.

[1] Not available for third-party radars.

[2] GWX 70/75 only.

[3] Requires feature enablement.

5.28.1 Sector Scan

The sector scan option focuses the scan on a smaller segment of the radar sweep. This is useful when monitoring priority weather targets.

SCAN	INCREMENTS
Horizontal	20°, 40°, 60°, 90°, Full
Vertical	10°, 20°, 30°, Full
The 90° horizontal scan option is available only for radars with extended scan capabilities (120° sweep).	

Increments vary according to scan type.

Horizontal sector scans center on the bearing line, vertical sector scans center on the tilt line.

5.28.2 Stabilization

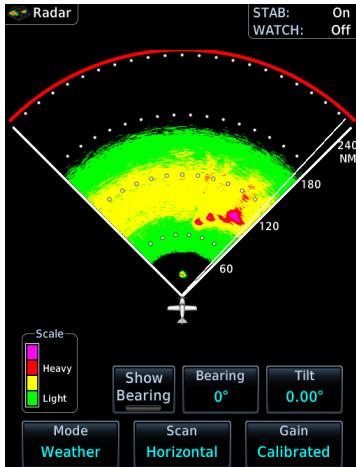
This feature helps stabilize the antenna so the scan is parallel to the ground when active. When off, the antenna scan is relative to the aircraft lateral axis. Status displays in the upper right corner of the radar page.

5.28.3 WATCH

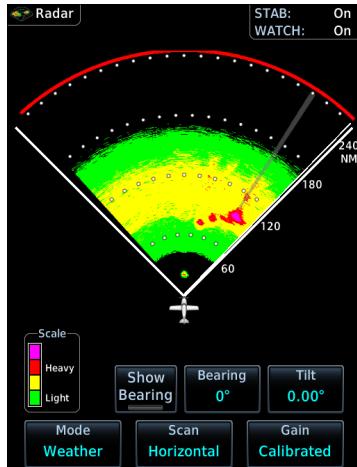
FEATURE LIMITATIONS

- Not available for third party radars

Use WATCH to determine areas of inaccuracies in displayed intensity from attenuation while in horizontal scan mode. Adjust tilt to determine the extent of attenuation in a shaded area. WATCH only displays in horizontal scans.



WATCH Off

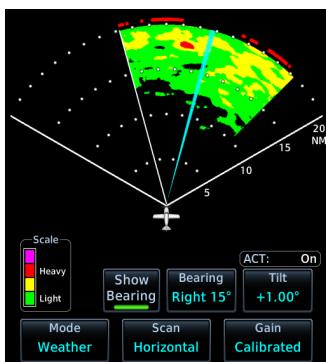


WATCH On

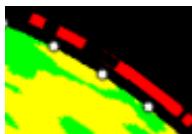
5.28.4 Weather Alert

FEATURE LIMITATIONS

- Not available for third party radars



These alerts indicate the presence of heavy precipitation beyond the current display range (80 nm to 320 nm from current position).



Red bands on the outer range ring display at the approximate azimuth of severe weather targets.

If the antenna tilt is adjusted too low, a weather alert is generated by ground returns. If a weather alert is detected within ± 10 degrees of the aircraft heading, an advisory displays on the MFD in the advisory window.

5.28.5 Altitude Compensated Tilt

FEATURE LIMITATIONS

- GWX 70/75 only



This feature adjusts the tilt to compensate for altitude changes as the aircraft climbs and descends. Status displays above the radar controls.

5.28.6 Turbulence Detection

FUNCTIONAL REQUIREMENTS

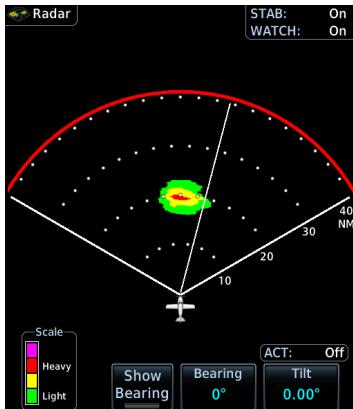
- Enablement card

FEATURE LIMITATIONS

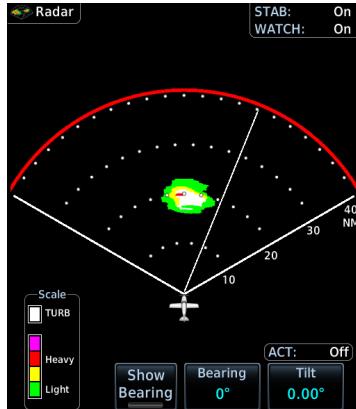
- GWX 70/75 only

This feature detects and displays severe turbulence. Status reports as inactive when:

- Current scan range is greater than 160 nm
- Radar is not in weather mode
- Vertical scan is active



Turbulence Off



Turbulence On

5.28.7 Ground Clutter Suppression

FEATURE REQUIREMENTS

- Enablement card

FEATURE LIMITATIONS

- GWX 70/75 only
- Not available for vertical scans

This feature reduces the amount of returns of highly reflective objects on the ground, while maintaining the intensity and size of weather returns.

5.29 Radar Modes



WARNING

DO NOT TRANSMIT WHEN PERSONNEL OR OBJECTS ARE WITHIN 11 FEET OF THE ANTENNA.



CAUTION

PLACE RADAR IN STANDBY MODE BEFORE TAXIING TO PREVENT DAMAGE TO THE RADAR ASSEMBLY.

5.29.1 Mode Key

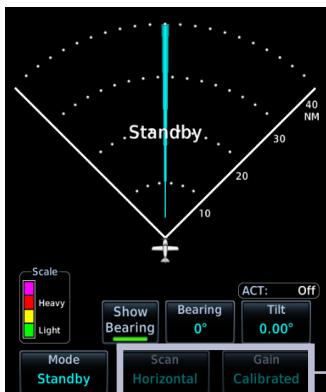


To open a list of available mode options, tap this key.

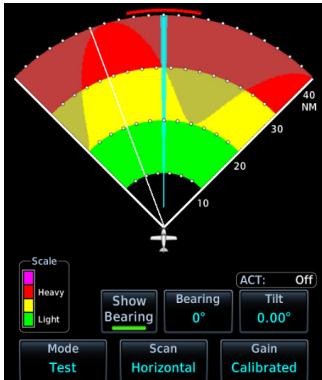


A confirmation pop-up alerts the pilot when attempting to scan while on the ground.

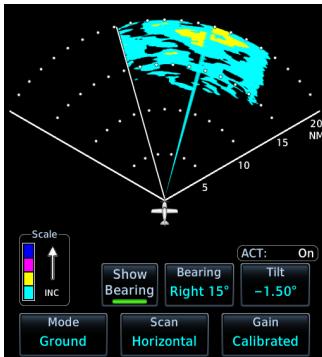
STANDBY



- Parks the antenna at the centerline
- **Scan** and **Gain** controls are inactive
- Automatic standby occurs during power up and landing

TEST

- Places transmitter in standby as the display simulates a radar sweep
- Test data verifies communication between the weather radar and display
- Radar pulses do not transmit from the antenna during this mode

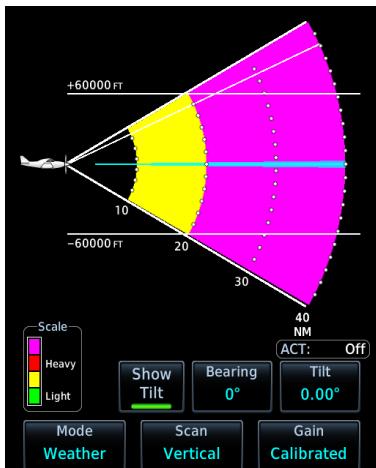
GROUND

- Presents a depiction of terrain similar to that of a topographical map
- Useful when trying to verify aircraft position

Table 5-9 Ground Target Intensity Levels

GROUND MAP MODE COLOR	GWX RADAR INTENSITY	THIRD-PARTY RADAR LEVEL
Black	0 dB	0
Light Blue	> 0 dBZ to < 9 dBZ	1
Yellow	9 dBZ to < 18 dBZ	2
Magenta	18 dBZ to < 27 dBZ	3 and above
Blue	27 dBZ and greater	Not used

WEATHER



- Presents an airborne depiction of precipitation
- Colors represent approximate rainfall intensity and rates for weather radar targets

Table 5-10 Precipitation Intensity Levels

WEATHER MODE COLOR	GWX 68 RADAR		GWX 70 RADAR	THIRD-PARTY RADAR
	APPROXIMATE INTENSITY	APPROXIMATE RAINFALL RATE (IN/HR)	APPROXIMATE INTENSITY	RADAR RETURN LEVEL [1]
Black	< 23 dBZ	< .01	< 23 dBZ	0
Green	23 dBZ to < 33 dBZ	.01 - 0.1	23 dBZ to < 33 dBZ	1
Yellow	33 dBZ to < 41 dBZ	0.1 - 0.5	33 dBZ to < 41 dBZ	2
Red	41 dBZ to < 50 dBZ	0.5 - 2	41 dBZ to < 50 dBZ	3
Magenta	50 dBZ and greater	2	50 dBZ and greater	4
White			Turbulence Detection	

[1] Refer to radar documentation.

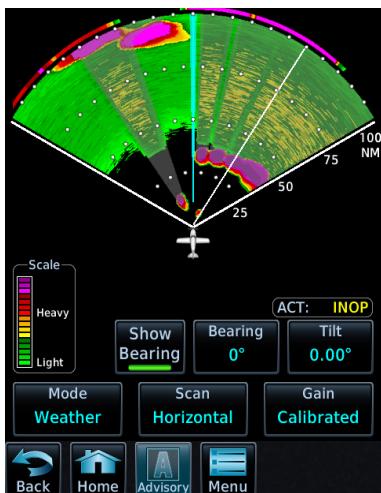
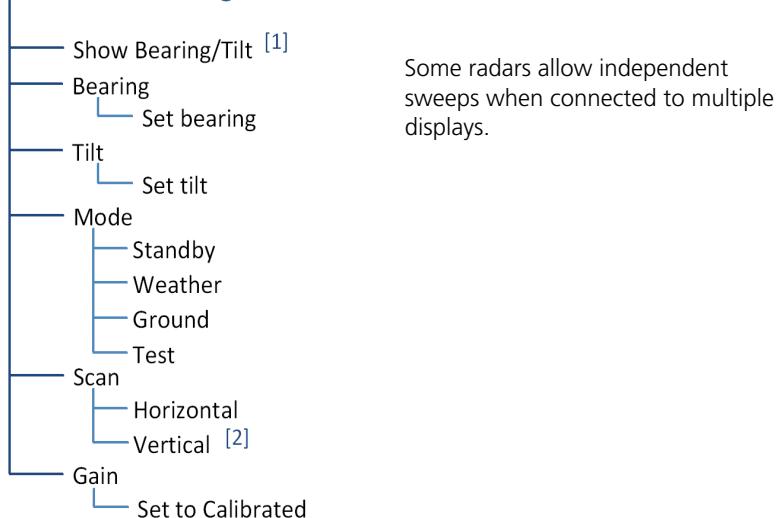


Table 5-11 GWX 75 Radar Levels

WEATHER MODE COLOR	GWX 75 RADAR APPROXIMATE INTENSITY
Black	< 22 dBZ
Green	23 dBZ to < 32 dBZ
Yellow	33 dBZ to < 40 dBZ
Red	41 dBZ to < 48 dBZ
Magenta	49 dBZ and greater
White	Turbulence Detection

5.30 Radar Controls

Weather Radar Page



Some radars allow independent sweeps when connected to multiple displays.

[1] Dependent on scan type selection.

[2] Not available for RS 181 and RS 811 radars.

5.30.1 Show Bearing/Tilt

Displays the tilt or bearing line depending on current scan selection. This feature is useful when making horizontal or vertical scan adjustments.

5.30.2 Bearing

FEATURE LIMITATIONS

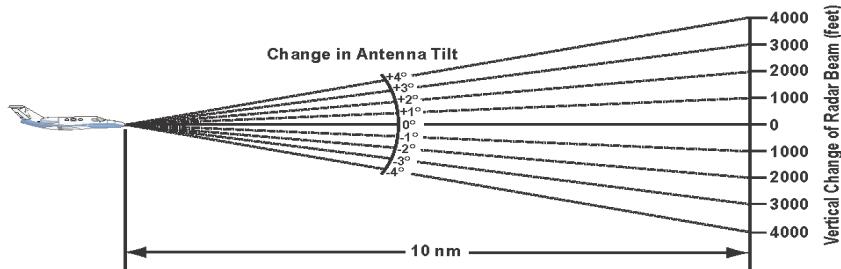
- Not available on RS 181 and RS 811 radars



Directional keys allow fine adjustment of the bearing line angle. This method is optional to tapping and dragging.

5.30.3 Tilt

Use antenna tilt to locate the top and bottom of storm cells and to increase intensity of ground target returns. One degree of tilt equals 100 feet of altitude per nautical mile. In areas of multiple heavy cells, use the vertical scan feature along with antenna tilt to examine the cells. Avoid shadowed areas behind targets.



A typical tilt setup adjusts the bottom of the radar beam to 4° below parallel with the ground. To adjust the antenna tilt for this typical setup:

1. Fly the aircraft level.
2. Adjust antenna tilt so ground returns display at a distance equal to the aircraft's current altitude (AGL) divided by 1,000.

When flying at altitudes between 2,000 and 30,000 ft AGL with the typical tilt setup, avoid target returns at 5 nm. These may be either weather or ground returns that are 2,000 ft or less below the aircraft. Raise the antenna tilt 4° to separate ground returns from weather returns in flat terrain. Return the antenna to the previous setting after a few sweeps of the radar. Set the display range to 60 nm for aircraft flying at 15,000 ft or lower. Monitor ground returns for possible threats.

If flying above 29,000 ft with the typical tilt setup, be cautious of targets 30 nm or closer. This may indicate a thunderstorm that the aircraft cannot fly over safely.

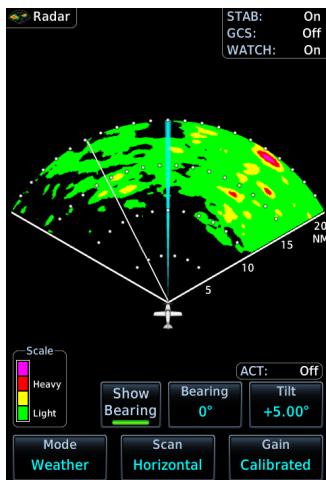
5.30.4 Scan

FEATURE LIMITATIONS

- RS 181 and RS 811 radars do not support vertical scan functionality

Horizontal scans provide a visual depiction of weather in front of the aircraft. Vertical scans focus the radar on a particular vertical target.

HORIZONTAL



For bearing line visibility, tap **Show Bearing**.

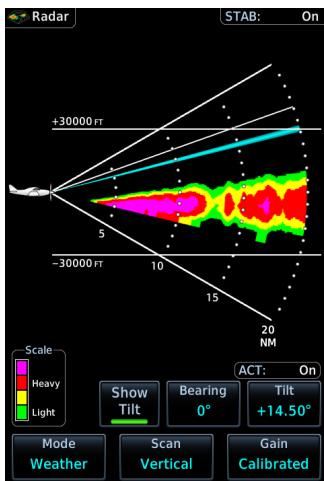
To adjust the horizontal scan bearing:

- Tap and drag the bearing line left or right
- Or
- Adjust the angle using the **Bearing** control

To adjust vertical angle for the horizontal scan, tap **Tilt** and then adjust the angle using directional keys.

VERTICAL

When vertically scanning with stabilization on, the physical area that the radar is sweeping may not match the displayed vertical scan. This occurs when the aircraft pitch is not at 0°. To compensate, the GDU does not draw the unscanned portion.



For tilt line visibility, tap **Show Tilt**.

To adjust the tilt of vertical scan:

- Tap and drag the tilt line up or down
- Or
- Adjust the angle using the **Tilt** control

To adjust horizontal angle for the vertical scan, tap **Bearing** and then adjust the angle using directional keys.

5.30.5 Gain



NOTE

Precipitation intensity may not be accurate if the gain is changed.

FEATURE LIMITATIONS

- For third party radars, this control is active only during ground mode

This feature controls the sensitivity of the radar receiver. Adjustments to receiver sensitivity automatically change the intensity of radar targets.



Directional keys allow sensitivity adjustments.

Tapping **Set to Calibrated** restores the calibrated gain setting and returns intensity depictions to their actual colors.

5.31 Radar Alerts

A caution message alerts the pilot of a weather radar failure. Scan depictions on Weather Radar and Map pages do not display.

Weather radar overlay detail is absent from the Map page if heading input is lost.

Table 5-12 Radar Alerts

ANNUNCIATION	ALERT TYPE & CONDITION
RADAR FAULT	<p>Alert Type: Caution</p> <p>Condition</p> <p>Data contains a fault unrelated to attitude.</p>
RADAR FAIL	<p>Alert Type: Caution (GWX only)</p> <p>Condition</p> <p>Weather radar product status is timed out.</p>
RADAR CONTROLS DISAGREE	<p>Alert Type: Caution (Third party radars only)</p> <p>Condition</p> <p>Radar's actual state does not match the commanded state.</p>
RADAR ACTIVE	<p>Alert Type: Caution (GWX 70/75 and third party radars)</p> <p>Condition</p> <p>Radar is in standby, but remains active due to another interfacing controller.</p>

6 Traffic Awareness

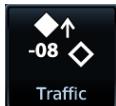
TRAFFIC DISPLAY

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Traffic Display



The Traffic page displays intruding traffic in relation to the current position and altitude of the aircraft without clutter from other data.

AVAILABLE TRAFFIC SOURCES

- TIS-A
- TAS/TCAS 1
- ADS-B with or without TCAS

Collision avoidance and traffic surveillance data display on the Traffic page or as overlays on the Map page and HSI Map. Synthetic vision traffic depictions display on PFD when SVT is enabled.

The availability of functions, alerting features, and options depend on the traffic system source. ADS-B controls are accessible from the Traffic menu. Controls for other traffic systems are located on the Traffic page.

FEATURE LIMITATIONS

- Symbols depicted depend on traffic source (e.g., TIS-A, TAS, ADS-B)
- Intruding aircraft without altitude reporting capabilities do not display altitude separation data or climb/descent indications
- Available display ranges and vector types depend on traffic source

TRAFFIC UNITS

PARAMETER	UNITS
Altitude	ft
Distance	nm

Traffic units are always uniform.

System Units page selections do not affect the traffic display.

ALT IN FT

If the system units for altitude are set to meters, an annunciation reminds the pilot that all displayed altitude values remain in feet.

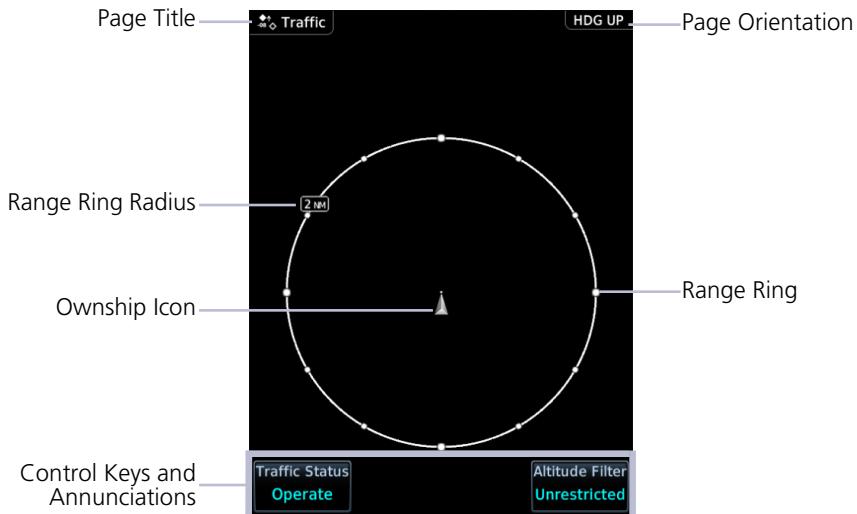


Figure 6-1 Traffic Page

Table 6-1 Traffic Display Functions

DISPLAY OBJECT	FUNCTION
Ownership Icon	<ul style="list-style-type: none"> Depicts current aircraft position Nose of the ownership is the actual ownership location Unlike the configured aircraft symbol on map displays, ownership icon is always a directional arrow
Page Orientation Label	Orientations: <ol style="list-style-type: none"> Heading up (HDG UP) during normal operation. Track up (TRK UP) if there is no valid heading.
Range Rings	<ul style="list-style-type: none"> Ranges vary according to traffic system type Outer ring represents selected range
Altitude Separation Value	<p>Indicates when an intruder is above or below the ownership. Value placement is based on intruder location.</p> <ul style="list-style-type: none"> Above traffic symbol if intruder is above Below symbol if intruder is below Plus or minus sign denotes higher or lower altitude
Vertical Trend Arrow	<ul style="list-style-type: none"> Active when an intruder is climbing or descending at a vertical speed greater than 500 fpm
Intruding Aircraft Symbol	<p>Color may be cyan or white depending on configuration. Actual intruder location varies according to symbol type.</p> <ul style="list-style-type: none"> Tip of directional symbols Center of non-directional symbols

INVALID ALTITUDE DEPICTIONS



If an intruder does not have a valid altitude, its symbol displays without the altitude tag.

OFF SCALE TRAFFIC ALERTS



Off scale (out of range) traffic alerts are depicted as half yellow symbols on the outermost range ring at the correct bearing.

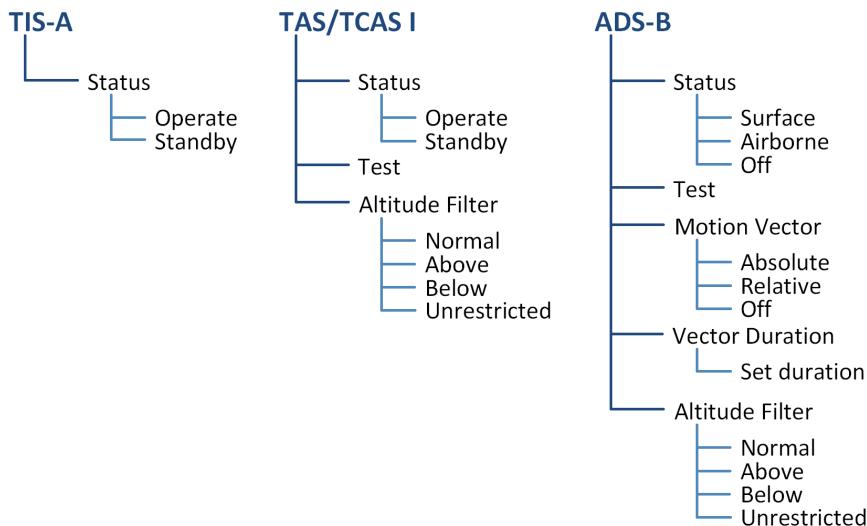
TRAFFIC OVERLAY STATUS ICONS

Overlay icons indicate the status of displayed traffic on HSI Map, Rotorcraft PFD VFR Map, and the MFD Map page.

Table 6-2 Traffic Overlay Status Icons

ICON	DESCRIPTION
	Map is displaying traffic.
	Map is not displaying traffic.

6.1 Traffic Setup

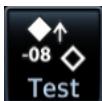


6.1.1 Traffic Test

FEATURE LIMITATIONS

- ADS-B, TAS, and TCAS applications only
- Available only when the aircraft is on ground (i.e., standby mode)
- Test pattern depiction is dependent upon the active traffic system

TEST KEY



The test function displays a test pattern on the Traffic page. For ADS-B, this option is accessible via the Traffic menu.

The system automatically returns to normal operating mode once the test is complete.

6.1.2 Altitude Filtering

FEATURE LIMITATIONS

- ADS-B, TAS, and TCAS applications only

Pilot selectable filters limit the display of traffic to a specific altitude range relative to the altitude of the ownship.

Filter selections apply to both the Traffic page and the traffic overlay on the Map page.

On a standalone PFD, HSI Map always presents traffic at the Normal filter setting. On GDU 1060, it uses the same filter selections on MFD.

Table 6-3 Altitude Filter Selections

SELECTION	ALTITUDE RANGE
Normal	-2,700 ft to 2,700 ft
Above	-2,700 ft to 9,900 ft
Below	-9,900 ft to 2,700 ft
Unrestricted	-9,900 ft to 9,900 ft

Traffic Types

6.2 TIS-A

FEATURE REQUIREMENTS

- Aircraft location is within the service volume of a Mode S terminal radar site
- TIS-capable Mode S transponder is interfaced to the GDU

FEATURE LIMITATIONS

For information about TIS-A functions and limitations, consult the AIM.

TIS-A FEATURES

- 2-D graphical depiction of proximate traffic based on data received from terminal radars
- Track vector depicts intruder trajectory over the ground
- Vertical coverage: +3,500/ -3,000 ft from ownship
- Eight intruder maximum within an 8 nm radius
- Five second update cycle
- Normal and standby mode options

Table 6-4 TIS-A Setup Selections

SELECTION	FUNCTION
Status	Select operating mode. Options are Operate and Standby.

6.2.1 TIS-A Traffic Symbols

Traffic information is for advisory use only. The pilot is responsible for identifying and avoiding traffic.

Table 6-5 TIS-A Traffic Symbols

TRAFFIC SYMBOL	TRAFFIC DESCRIPTION
	TIS-A
	Non-threat Traffic
	Traffic Advisory
	TA Off-scale

6.2.2 TIS-A Status Indications

Table 6-6 TIS-A Status Annunciations

ANNUNCIATION	DESCRIPTION
Data Failed	GDU receives data from the transponder, but a failure exists in the data stream.
Failed	Transponder failure.
No Data	GDU is not receiving valid data from the transponder.
TA X.X NM ±XX ↑	System cannot determine TA bearing. Intruder depiction not available. Annunciation includes: <ul style="list-style-type: none"> Distance in nautical miles Altitude separation in hundreds of feet Altitude trend arrow (climbing/descending)
TA OFF SCALE	TA is outside the selected display range.
Traffic Coast x SEC	Intruder depictions are more than six seconds old.
Traffic Removed	Intruder depictions are more than 12 seconds old. Traffic symbols no longer display.
Unavailable	Transponder not receiving TIS-A data from ground station.

6.3 TAS/TCAS I

TAS/TCAS I FEATURES

- Airborne traffic system independent of ground radar
- 2-D graphical depiction of traffic relative to aircraft position and altitude

Table 6-7 TAS/TCAS I Setup Selections

SELECTION	FUNCTION
Status	Select operating mode. Options are Operate and Standby.
Test	Initiate a test of the traffic system.
Altitude Filter	Select filter range. Options include: <ul style="list-style-type: none"> • Normal • Above • Below • Unrestricted

6.3.1 TAS/TCAS I Traffic Symbols

Traffic information is for advisory use only. The pilot is responsible for identifying and avoiding traffic conflict.

Table 6-8 TAS/TCAS I Traffic Symbols

TRAFFIC SYMBOL	TRAFFIC DESCRIPTION
	TAS/TCAS I
	Other Traffic
	Proximity Advisory
	Traffic Advisory
	TA Off-scale

6.3.2 TAS/TCAS I Status Indications

Table 6-9 TAS/TCAS I Status Annunciations

ANNUNCIATION	DESCRIPTION
Data Failed	GDU receives traffic data, but the TAS unit is reporting a failure.
Failed	Traffic data failure.
No Data	GDU is not receiving valid data from the TAS unit.
TA X.X NM ±XX ↑	System cannot determine TA bearing. Intruder depiction not available. Annunciation includes: <ul style="list-style-type: none">• Distance in nautical miles• Altitude separation in hundreds of feet• Altitude trend arrow (climbing/descending)

6.4 ADS-B

ADS-B FEATURES
<ul style="list-style-type: none"> • Runway and taxiway depiction during SURF mode (< 2 nm range scale) • Selectable traffic icons display intruder and vector information • Customizable motion vectors (type, duration) • Airborne and surface mode options • On-scene mode option (rotorcraft only)

Table 6-10 ADS-B Setup Selections

SELECTION	FUNCTION
ADS-B Status	Enable automatic mode selection. System selects between Surface and Airborne depending on the state of the aircraft. Selecting Off disables the function.
Test	Initiate a test of the traffic system.
Motion Vector	Select motion vector type. Selecting Off removes all motion vectors from the display. <ul style="list-style-type: none"> • Absolute • Relative • Off
Vector Duration	Select the amount of time represented by the endpoint. Options range from 0 seconds to 5 minutes. A longer duration results in a longer vector.
Altitude Filter	Select filter range. Options include: <ul style="list-style-type: none"> • Normal • Above • Below • Unrestricted

6.4.1 ADS-B Traffic Symbols

Traffic Information is for advisory use only. The pilot is responsible for identifying and avoiding traffic conflict.

Table 6-11 ADS-B Traffic Symbols

TRAFFIC SYMBOL	TRAFFIC DESCRIPTION
	ADS-B
	Basic Directional
	Basic Non-directional
	Basic Off-scale Selected
	Directional (On-Ground)
	Non-directional (On-Ground)
	Proximate Directional (On-Ground)
	Proximate Non-directional (On-Ground)
	Proximate Directional
	Proximate Non-directional
	Proximate Off-scale Selected
	Non-directional Alerted
	Off-scale Non-directional Alerted Traffic
	Directional Alerted Traffic
	Off-scale Directional Alerted Traffic
	Directional Surface Vehicle
	Non-directional Surface Vehicle

6.4.2 ADS-B Traffic Applications

FEATURE LIMITATIONS

- On-scene mode functionality is available only for rotorcraft

Table 6-12 ADS-B Traffic Applications

MODE	FEATURES
AIRB	<ul style="list-style-type: none">Airborne traffic applicationActive in the en route environment (>5 nm and >1,500 ft above the nearest airport)
SURF	<ul style="list-style-type: none">Airborne and ground traffic applicationActive on ground or within the terminal environment (<5 nm and <1,500 ft above field elevation)Runway and taxiway depictions when the zoom scale is <2 nm (Traffic page only)Ground vehicle depictions
On-scene	<ul style="list-style-type: none">Rotorcraft nuisance alert suppression optionReduces alerts caused by proximity rotorcraft operating in a scene environment (e.g., EMS landing zone, news gathering events)Mode activation and control by way of navigatorLook-ahead time: 3 secondsTraffic alarm vertical threshold: 200 ftIncremental protected traffic volume: 1,000 ft

6.4.3 Motion Vectors

FEATURE LIMITATIONS

- Motion vectors display on the Traffic page only

A motion vector is a line extending from the nose of an intruder icon. Its orientation represents the intruder's direction and movement. A yellow vector indicates when traffic meets intruding TA criteria (i.e., closing rate, distance, vertical separation).

Figure 6-2 Motion Vector Types

TYPE	DESCRIPTION
Absolute	<ul style="list-style-type: none"> Cyan or white vector depending on configuration Depicts intruder ground track Calculations based on intruder direction and ground speed Endpoint depicts intruder's position over the ground at the end of the selected duration Airborne and ground functionality
Relative	<ul style="list-style-type: none"> Green vector Depicts intruder movement relative to the ownship Calculations based on track and ground speed of both intruder and ownship Endpoint depicts intruder's location relative to the ownship at the end of the selected duration Airborne functionality only "Relative Motion - Unavailable" annunciates during ground operations

6.4.4 ADS-B Status Indications

Table 6-13 ADS-B Status Annunciations

ANNUNCIATION	DESCRIPTION
Absolute Motion - XX SEC/MIN	Active motion vector type is absolute.
Failed	ADS data failure.
No Data	GDU is not receiving valid traffic data.
No GPS Position	ADS-B LRU detects that GPS unit is initializing.
Relative Motion - XX SEC/MIN	Active motion vector type is relative.
Relative Motion - UNAVAILABLE	Aircraft is not airborne and the active motion vector type is relative.
Unavailable	Necessary traffic data not available.

6.4.5 ADS-B Traffic Interactions

ADS-B TRAFFIC SYMBOLS	PAGE INTERACTIONS
<p>Selecting a traffic symbol displays information about the aircraft in the upper right corner of the page.</p> <p>Selections remain active through altitude filtering, zoom scale, and page changes.</p> <p>Tapping Next repeatedly steps through multiple symbols spaced closely together.</p>	<ul style="list-style-type: none"> Registration/call sign Vehicle type Closure rate Track Ground speed AIRB/SURF eligibility Next key for multiple traffic symbols

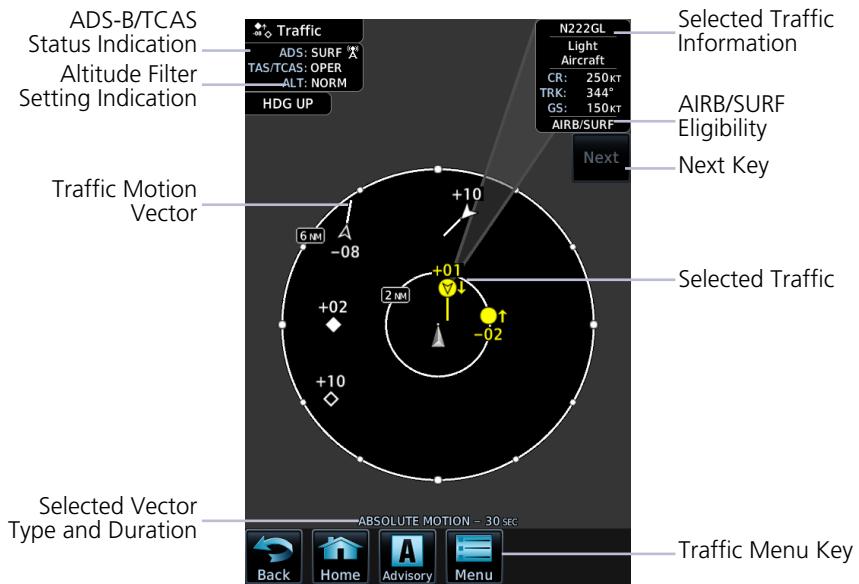


Figure 6-3 ADS-B Traffic Page

6.5 Traffic Alerts

Traffic alerts occur anytime there is an increase in the number of traffic advisories. They remain active until the area is clear of all TAs.



MFD Pop-up

Traffic alerts appear as textual annunciations on the PFD, and as a pop-up window on the MFD, when applicable. Aural traffic alerts are not a function of the GDU.



PFD Annunciation

Table 6-14 Traffic Alerts

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE	
TRAFFIC	Alert Type: Caution Pop-up Alert: Yes	
	Condition	Voice Message
	The traffic system reports a traffic advisory.	Message content depends on current traffic system configuration.

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7 Terrain Awareness

TERRAIN CONFIGURATIONS

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Terrain Configurations

AVAILABLE TERRAIN CONFIGURATIONS

- (H)Terrain Proximity
- (H)Terrain-FLTA
- TAWS-B
- External TAWS

Terrain, obstacle, and wire data display as overlays on the Terrain page, Map page, and HSI Map. Alerting functions are dependent upon the aircraft type and configured terrain alerting options.

Terrain controls are accessible from the Terrain menu. Map overlay keys are accessible from the associated map menu.

EXTERNAL TAWS

Depending on system configuration, the GDU may be capable of remotely indicating TAWS information from the navigator.

7.1 GPS Altitude for Terrain

FUNCTIONAL REQUIREMENTS

GPS altitude is derived from satellite measurements. To acquire an accurate 3-D fix (latitude, longitude, altitude), a minimum of four operating satellites must be in view of the GPS receiver antenna.

The terrain system uses GPS altitude and position data to:

- Create a 2-D image of surrounding terrain and obstacles relative to the aircraft's position and altitude
- Calculate the aircraft's flight path in relation to surrounding terrain and obstacles
- Predict hazardous terrain conditions and issue alerts

7.1.1 GSL Altitude & Indicated Altitude

The GDU converts GPS altitude data to GSL altitude (i.e., the geometric altitude relative to MSL) for use in terrain functions. All Terrain page depictions and elevation indications are in GSL.

Variations between GSL altitude and the aircraft's corrected barometric altitude (or indicated altitude) are common. As a result, Terrain page altitude data may differ from current altimeter readings. Both GSL altitude and indicated altitude represent height above MSL, but differ in accuracy and reliability.

Table 7-1 GSL and Indicated Altitude Features

ALTITUDE TYPE	FEATURES
GSL ALTITUDE	<ul style="list-style-type: none"> Highly accurate and reliable geometric altitude source Does not require local altimeter settings to determine height above MSL Not subject to pressure and temperature variations Affected primarily by satellite geometry
INDICATED ALTITUDE	<ul style="list-style-type: none"> Barometric altitude source corrected for pressure variations Requires frequent altimeter setting adjustment to determine height above MSL Subject to local atmospheric conditions Affected by variations in pressure, temperature, and lapse rate

7.2 Database Limitations



NOTE

Garmin cross-validates terrain and obstacle data in accordance with TSO-C151c. However, the information should never be considered all-inclusive. Database inaccuracies or omissions may exist.

Garmin obtains terrain and obstacle data from government sources and cannot independently verify the accuracy and completeness of the information. Pilots must familiarize themselves with the appropriate charts and other data for safe flight.

Terrain and obstacle data are not available when the aircraft is operating outside of the installed database coverage area.

Table 7-2 Database Coverage Limitations

DATABASE	LIMITATIONS
Terrain	<ul style="list-style-type: none">Not available north of 89° N latitude and south of 89° S latitude
Obstacle	<ul style="list-style-type: none">Coverage areas vary according to database typePower line indications for the contiguous United States and small parts of Canada and MexicoRegional definitions may change without noticeMay not contain uncharted obstaclesMay include power lines or only HOT lines depending on database type [1]

- [1] HOT lines are power lines that share location with other obstacles identified by the FAA.

Terrain Display



Unlike the Map page and HSI Map, the Terrain page does not provide controls for toggling overlays on or off.

7.3 Terrain Page



WARNING

DO NOT USE TERRAIN AND OBSTACLE DATA TO NAVIGATE OR MANEUVER AROUND TERRAIN. THEY ARE AN AID TO SITUATIONAL AWARENESS ONLY.

FEATURE REQUIREMENTS

All terrain functions require the following components to operate properly.

- Valid 3-D GPS position for terrain and obstacle data display
- Valid terrain/obstacle database

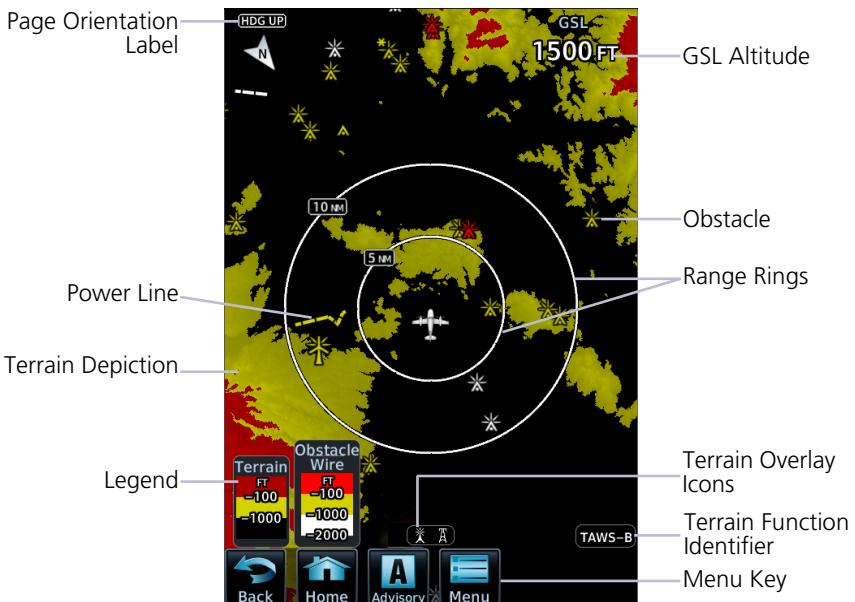
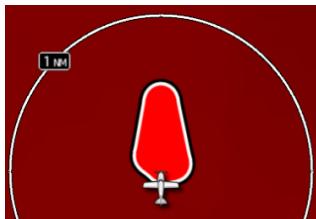


Figure 7-1 Terrain Page

Table 7-3 Terrain Display Functions

DISPLAY OBJECT	FUNCTION
Page Orientation Label	Normally, Heading Up orientation. Changes to Track Up in the event of a heading failure.
GSL Altitude	Displays current GPS height above mean sea level. Pilot selectable units are available on the System Units page.
Legend	Displays color designations for terrain and obstacle relative altitude ranges.
Terrain Function Identifier	Indicates the active terrain function. Includes: HTerrain-FLTA TAWS-B, (H)Terrain-FLTA, and Terrain Proximity
Terrain Overlay Icon	Indicates when power lines or obstacles are present at the current zoom scale. 
Menu Key	Provides access to pilot selectable settings, self-test, and alert inhibit functions.

AUTOMATIC ZOOM

In the event an alert occurs, the page automatically zooms to provide the best depiction of that alerted terrain, obstacle, or power line.

7.4 Terrain Setup

Terrain Page Menu

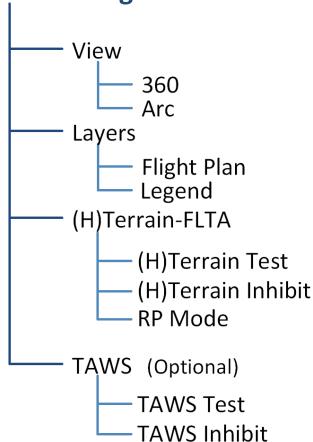


Table 7-4 Terrain Setup Selections

SELECTION		FUNCTION
View	360	<ul style="list-style-type: none"> Changes view format to a 360° ring encircling the aircraft (default view)
	Arc	<ul style="list-style-type: none"> Changes view format to a forward-looking 120° arc
Layers	Flight Plan	<ul style="list-style-type: none"> Toggles the active flight plan display over terrain map on or off
	Legend	<ul style="list-style-type: none"> Toggles the Terrain and Obstacle/Wire legend on or off
(H)Terrain FLTA	(H)Terrain Test	<ul style="list-style-type: none"> Performs terrain alerting system test Verifies the validity of required databases
	(H)Terrain Inhibit	<ul style="list-style-type: none"> Inhibits the FLTA aural and visual alerts
	RP Mode [1]	<ul style="list-style-type: none"> Reduces alerting thresholds for low-level operations
TAWS-B	TAWS Test	<ul style="list-style-type: none"> Performs TAWS alerting system test Verifies the validity of required databases
	TAWS Inhibit	<ul style="list-style-type: none"> Inhibits the PDA/FLTA audible and visual alerts

[1] Rotorcraft only.

7.5 Terrain Proximity

FEATURE LIMITATIONS

- Terrain and obstacle depictions are relative to aircraft altitude
- Obstacle depictions are dependent upon database
- Setup does not provide visual or aural alerts

TERRAIN PROXIMITY FEATURES

- Non-TSO C151c certified terrain display system
- 2-D graphical representation of surrounding terrain, obstacles, and power lines relative to aircraft position and altitude
- Declutter automatically removes obstacle and power line data at large ranges
- Continuous monitoring of database validity, GPS and hardware status
- Displays when higher level terrain functions are active

7.5.1 Terrain Elevation Depictions

Color shading depicts terrain elevations relative to the aircraft's position and altitude. Colors automatically adjust as the aircraft's altitude changes.

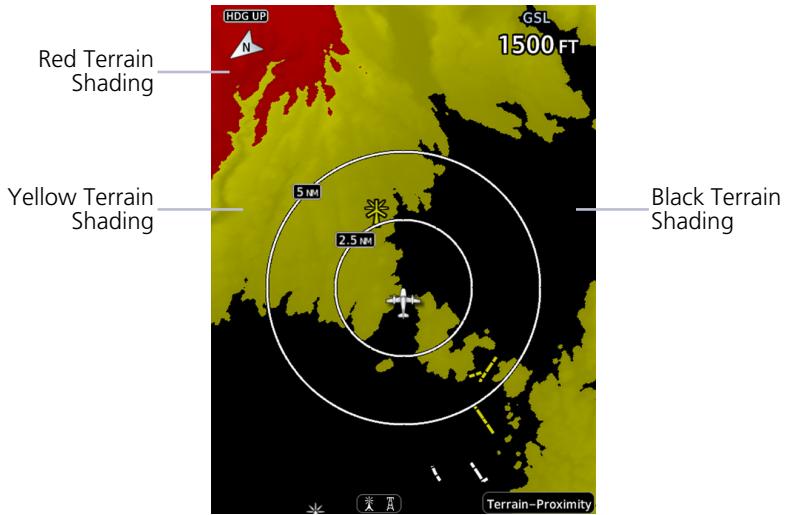
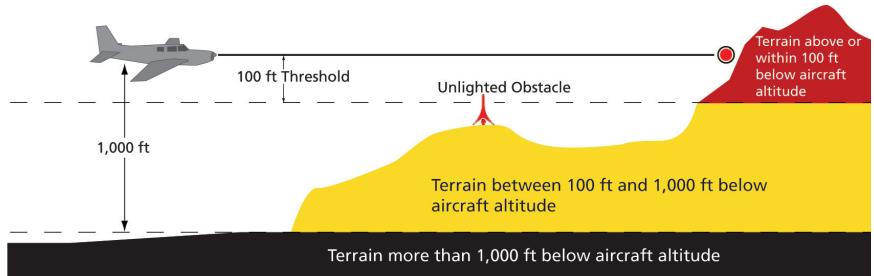


Figure 7-2 Terrain Depictions, Fixed Wing

Terrain Awareness

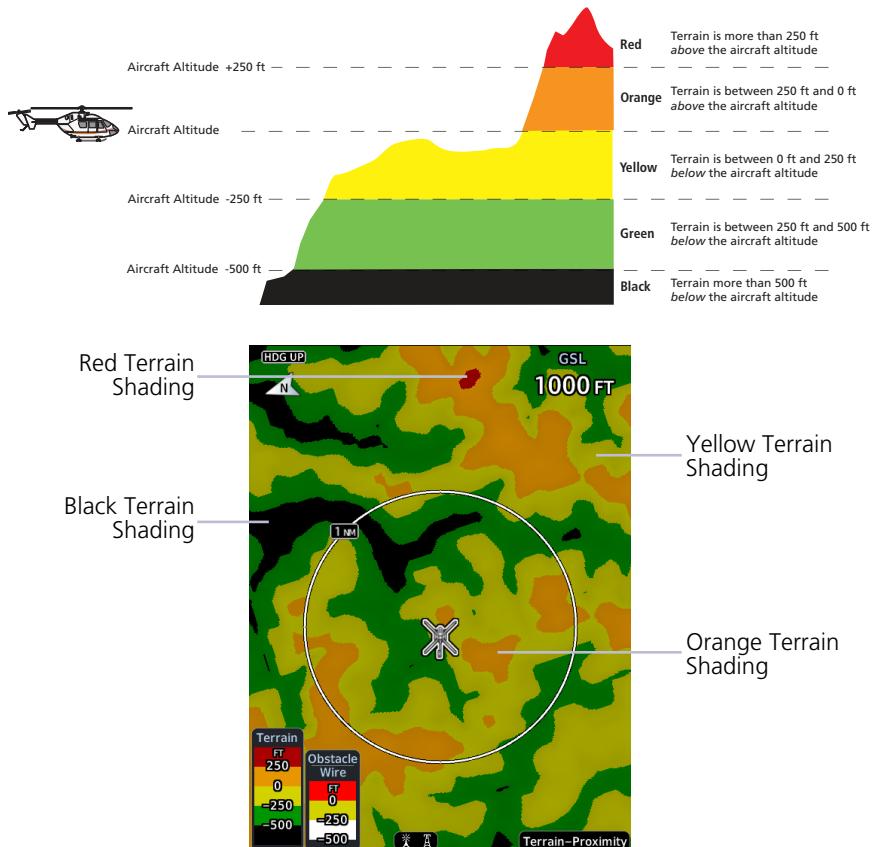


Figure 7-3 Terrain Depictions, Rotorcraft

7.5.2 Obstacle Elevation Depictions

FEATURE LIMITATIONS

- Fixed wing aircraft: obstacles more than 2,000 ft below current altitude do not display
- Rotorcraft: obstacles more than 500 ft below current altitude do not display
- Power line depictions in synthetic vision are currently not available

Table 7-5 Tower Obstacles

UNLIGHTED OBSTACLE		LIGHTED OBSTACLE		OBSTACLE LOCATION	
<1000' AGL	>1000' AGL	<1000' AGL	>1000' AGL	FIXED WING	ROTORCRAFT
				Red obstacle is above or within 100 ft below current altitude.	Red obstacle is at or above current altitude.
				Yellow obstacle is between 100 ft and 1000 ft below current altitude.	Yellow obstacle is within 250 ft below current altitude.
				White obstacle is between 1,000 ft and 2,000 ft below current altitude.	White obstacle more than 250 ft below current altitude.

Table 7-6 Wind Turbine Obstacles

UNLIGHTED WIND TURBINE OBSTACLE	LIGHTED WIND TURBINE OBSTACLE	WIND TURBINE OBSTACLE LOCATION	
		FIXED WING	ROTORCRAFT
		Red obstacle is above or within 100 ft below current altitude.	Red obstacle is at or above current altitude.
		Yellow obstacle is between 100 ft and 1,000 ft below current altitude.	Yellow obstacle is within 250 ft below current altitude.
		White obstacle is more than 1,000 ft below current altitude.	White obstacle more than 250 ft below current altitude.

Table 7-7 Power Line Obstacles

OBSTACLE	POWER LINE OBSTACLE LOCATION
	Red power line is above or within 100 ft below current altitude.
	Yellow power line is between 100 ft and 1,000 ft below current altitude.
	White power line is between 1,000 ft and 2,000 ft below current altitude.

OBSTACLE GROUPS

With the exception of power lines, obstacles within close proximity of each other may display as a group.



- Asterisk indicates that the obstacle belongs to a group
- Relative altitude of the highest obstacle determines color
- Depiction is of the most immediate threat

Terrain Alerting

PILOT AWARENESS: ALERT BEHAVIOR SETTINGS

The behavior of an alerting function is determined at installation.
Installer configurable settings allow:

- Alert suppression for specific runway types
- Gender selection for voice messages
- Volume level

7.6 Alert Types

Available alerting functions depend on the installed terrain system.

Table 7-8 Terrain Alert Types

TERRAIN	ALERT TYPES
FLTA	<ul style="list-style-type: none">• Imminent Impact• Reduced Clearance
TAWS-B	<ul style="list-style-type: none">• Imminent Impact• Reduced Clearance• Excessive Descent Rate• Negative Climb Rate• Premature Descent

Table 7-9 Terrain Alert Conditions

ALERT TYPE	CONDITION
Imminent Impact [1]	Aircraft reaches the minimum clearance altitude of any obstacle (IOI), terrain (ITI), or power line (ILI) in the projected flight path.
Reduced Clearance [1]	Aircraft's vertical flight path is projected to be within the minimum clearance altitude of an obstacle (ROC), terrain (RTC), or power line (RLC).
Excessive Descent Rate	Aircraft descends toward terrain at an excessive rate.
Negative Climb Rate	Aircraft loses altitude following takeoff. <ul style="list-style-type: none"> • Altitude is <700 ft above terrain • Distance from departure airport is 2 nm or less • Deviation from departure heading is <110°
Premature Descent [2]	Aircraft is significantly below the normal approach path for the nearest runway. <ul style="list-style-type: none"> • Altitude is <700 ft above terrain • Distance from destination airport is 15 nm or less

- [1] Alerting inhibited <200 ft AGL within 0.5 nm of approach runway or <125 ft AGL within 1.0 nm of runway threshold.
- [2] Alerting inhibited within 0.5 nm of approach runway or <125 ft AGL within 1.0 nm of runway threshold. Alerting thresholds for final descent are based on current position, speed, and flight path data.

7.6.1 Alerting Thresholds

Table 7-10 Minimum Clearance Altitudes

FLIGHT PHASE	MINIMUM CLEARANCE ALTITUDE	
	LEVEL FLIGHT	DESCENDING
En Route	700 ft	500 ft
Terminal	350 ft	300 ft
Approach	150 ft	100 ft
Departure	100 ft	100 ft

EDR THRESHOLDS

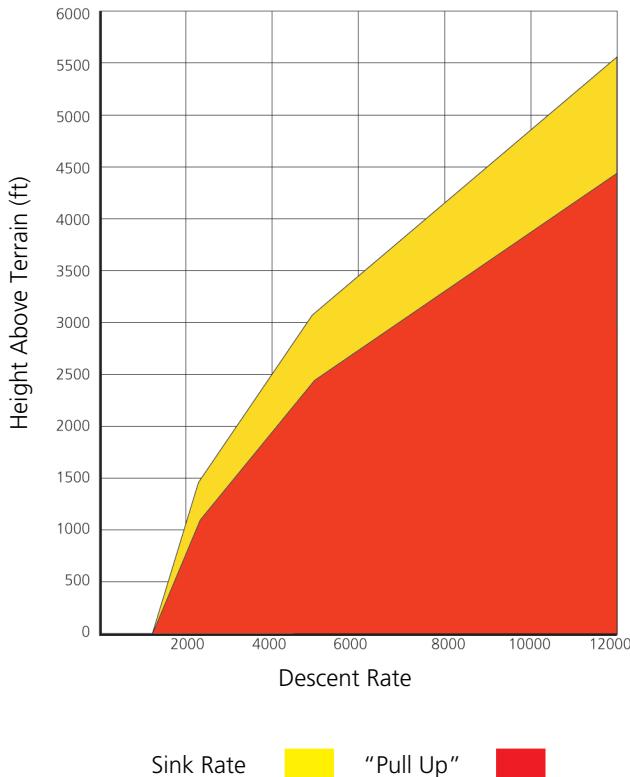


Figure 7-4 EDR Thresholds

PDA THRESHOLD

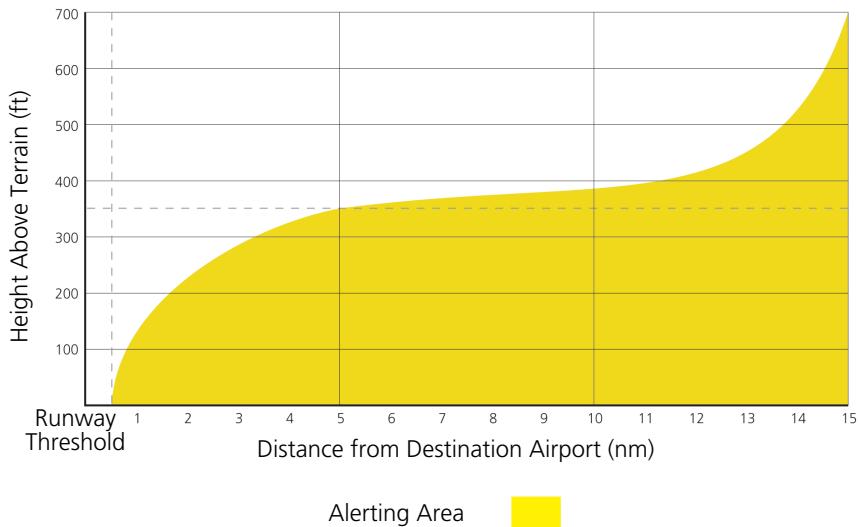


Figure 7-5 PDA Threshold

NCR THRESHOLDS

Alert triggers: altitude loss, sink rate

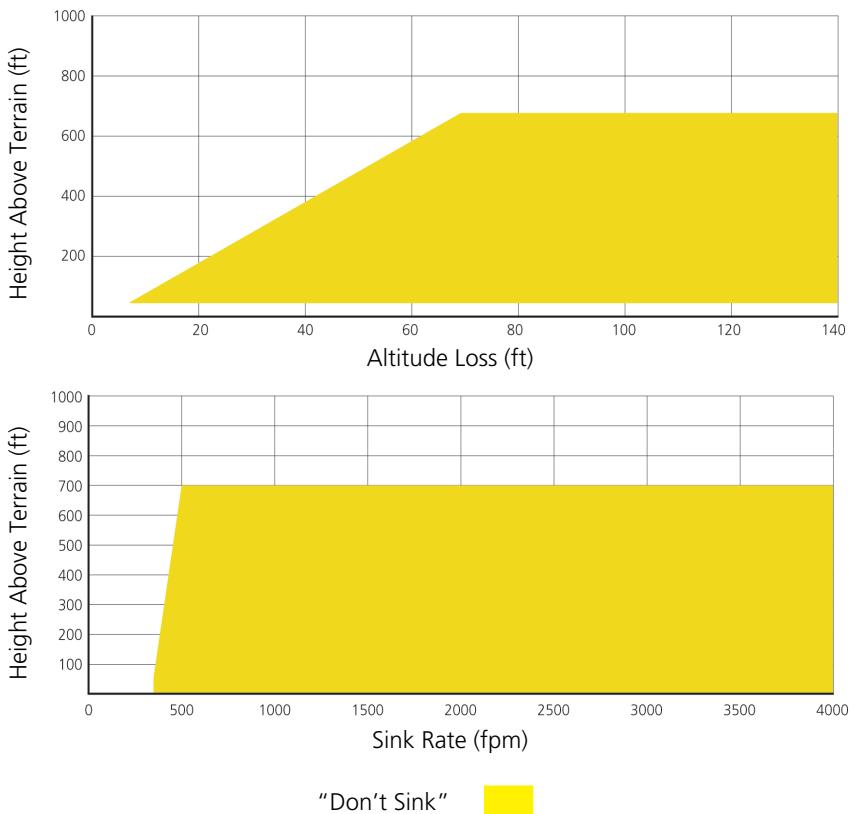


Figure 7-6 NCR Thresholds

7.6.2 Inhibiting TAWS and Terrain-FLTA Alerts



Access via the terrain pop-up alert or Terrain page menu.



NOTE

Always use discretion when inhibiting TAWS or Terrain-FLTA alerts.
Re-activate the alert function when appropriate.

Table 7-11 Inhibit & Automatic Inhibit Functions

INHIBITS	FUNCTION
INHIBIT	Manually inhibits TAWS or Terrain-FLTA aural and visual alerts for low altitude approaches or rotorcraft operation.
AUTOMATIC INHIBIT	Automatically inhibits TAWS and Terrain-FLTA alerts when the aircraft meets certain approach criteria.

Table 7-12 Automatic Terrain Inhibit Criteria

TERRAIN CONFIGURATION	APPROACH CRITERIA
TAWS	<ul style="list-style-type: none"> GPS/SBAS approach Position inside FAF
TAWS & TERRAIN-FLTA	<ul style="list-style-type: none"> Altitude <200 ft above runway elevation Position <0.5 nm of approach end or between each runway end

7.7 Terrain-FLTA

TERRAIN-FLTA FEATURES

- Non-TSO C151c certified terrain alerting system
- Aural and visual alerts for potential flight path conflicts involving terrain, obstacles, or power lines
- FLTA functions: RTC, RLC, ROC, ITI, ILI, and IOI
- Terrain depictions and display overlays
- Cautions and warnings indicate alert severity and threat type
- Textual annunciations on PFD and MFD
- Pop-up alerts on MFD
- Threat location indication on map displays (Map page, HSI Map, Terrain page) and SVT
- Self-test and alert inhibit functionality. FLTA is active whether synthetic vision is on or off
- Reduced protection mode (rotorcraft only)

7.7.1 Reduced Protection Mode, Rotorcraft Only

FEATURE LIMITATIONS

- Rotorcraft only
- Alerting times are significantly less than during normal operating mode

During reduced protection mode, alerting times are significantly less than during normal operating mode. Use this function only when terrain is within sight.



PFD Annunciation



MFD Annunciation

- Allows rotorcraft-configured systems to operate using reduced terrain alerting system thresholds
- Suppresses caution alerts during low level operations and off airport landings while providing warning alert protection from terrain and obstacles

7.7.2 Terrain-FLTA Alerts

Table 7-13 Terrain-FLTA Alerts

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE	
TER FAIL	Alert Type: Caution Pop-up Alert: N/A	
	Condition	Voice Message
	Terrain reports a system failure. The database is missing or corrupt.	"Terrain System Failure"
TER INHB	Alert Type: Advisory Pop-up Alert: N/A	
	Condition	Voice Message
TER N/A	Alert Type: Caution Pop-up Alert: N/A	
	Condition	Voice Message
	No certified GPS position. Degraded GPS signal. Aircraft is outside of the terrain database regional coverage.	"Terrain System Not Available"
Voice Message Only	Alert Type: Advisory Pop-up Alert: N/A	
	Condition	Voice Message
	Terrain system is transitioning from unavailable to available.	"Terrain System Available"

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE						
TERRAIN	Alert Type: Warning Pop-up Alert: Yes						
	<table border="1"> <tr> <td>Condition</td><td>Voice Message</td></tr> <tr> <td>Reduced Required Terrain Clearance</td><td>"Warning, Terrain, Terrain"</td></tr> <tr> <td>Imminent Terrain Impact</td><td></td></tr> </table>	Condition	Voice Message	Reduced Required Terrain Clearance	"Warning, Terrain, Terrain"	Imminent Terrain Impact	
Condition	Voice Message						
Reduced Required Terrain Clearance	"Warning, Terrain, Terrain"						
Imminent Terrain Impact							
TER TEST	Alert Type: Caution Pop-up Alert: Yes						
	<table border="1"> <tr> <td>Condition</td><td>Voice Message</td></tr> <tr> <td>Reduced Required Terrain Clearance</td><td rowspan="2">"Caution, Terrain, Terrain"</td></tr> <tr> <td>Imminent Terrain Impact</td></tr> </table>	Condition	Voice Message	Reduced Required Terrain Clearance	"Caution, Terrain, Terrain"	Imminent Terrain Impact	
Condition	Voice Message						
Reduced Required Terrain Clearance	"Caution, Terrain, Terrain"						
Imminent Terrain Impact							
Voice Message Only	Alert Type: Advisory Pop-up Alert: N/A Condition: Terrain system test is in progress.						
OBSTACLE	Alert Type: Advisory Pop-up Alert: N/A						
	<table border="1"> <tr> <td>Condition</td><td>Voice Message</td></tr> <tr> <td>Terrain system test is okay.</td><td>"Terrain System Test Okay"</td></tr> </table>	Condition	Voice Message	Terrain system test is okay.	"Terrain System Test Okay"		
Condition	Voice Message						
Terrain system test is okay.	"Terrain System Test Okay"						
OBSTACLE	Alert Type: Warning Pop-up Alert: Yes						
	<table border="1"> <tr> <td>Condition</td><td>Voice Message</td></tr> <tr> <td>Reduced Obstacle Clearance</td><td>"Warning, Obstacle, Obstacle"</td></tr> <tr> <td>Imminent Obstacle Impact</td><td></td></tr> </table>	Condition	Voice Message	Reduced Obstacle Clearance	"Warning, Obstacle, Obstacle"	Imminent Obstacle Impact	
Condition	Voice Message						
Reduced Obstacle Clearance	"Warning, Obstacle, Obstacle"						
Imminent Obstacle Impact							
OBSTACLE	Alert Type: Caution Pop-up Alert: Yes						
	<table border="1"> <tr> <td>Condition</td><td>Voice Message</td></tr> <tr> <td>Reduced Obstacle Clearance</td><td>"Caution, Obstacle, Obstacle"</td></tr> <tr> <td>Imminent Obstacle Impact</td><td></td></tr> </table>	Condition	Voice Message	Reduced Obstacle Clearance	"Caution, Obstacle, Obstacle"	Imminent Obstacle Impact	
Condition	Voice Message						
Reduced Obstacle Clearance	"Caution, Obstacle, Obstacle"						
Imminent Obstacle Impact							

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE	
WIRE	Alert Type: Warning Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Line Clearance	"Warning, Wire, Wire"
	Imminent Line Impact	
WIRE	Alert Type: Caution Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Line Clearance	"Caution, Wire, Wire"
	Imminent Line Impact	

7.8 TAWS-B

FUNCTIONAL REQUIREMENTS

- TAWS-B feature enablement
- External annunciator for displaying alert information (non-PFD GDUs only)

TAWS-B FEATURES
<ul style="list-style-type: none"> • Optional TSO C151c Class B terrain alerting system • All Terrain-FLTA functions plus: premature descent, excessive descent rate, negative climb rate, and altitude voice callout (500 ft) alerts

7.8.1 TAWS-B Alerts

Table 7-14 TAWS-B Alerts

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE	
OBSTACLE	Alert Type: Caution Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Obstacle Clearance	“Caution, Obstacle Caution, Obstacle”
PULL UP	Imminent Obstacle Impact	“Obstacle Ahead; Obstacle Ahead”
	Alert Type: Warning Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Required Terrain Clearance	“Terrain, Terrain; Pull Up, Pull Up”
	Imminent Terrain Impact	“Terrain Ahead, Pull Up; Terrain Ahead, Pull Up”
	Reduced Obstacle Clearance	“Obstacle, Obstacle; Pull Up, Pull Up”
	Imminent Obstacle Impact	“Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up”
	Reduced Line Clearance	“Wire Ahead, Pull Up; Wire Ahead, Pull Up”
	Imminent Line Impact	“Wire, Wire; Pull Up, Pull Up”
	Excessive Descent Rate	“Pull Up”

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE		
TAWS FAIL	Alert Type: Caution Pop-up Alert: N/A		
	Condition	Voice Message	
	An internal TAWS-B audio failure exists. The database is missing or corrupt.	"TAWS System Failure"	
	Internal terrain alerting configuration is invalid.		
TAWS INHB	Alert Type: Advisory Pop-up Alert: N/A Condition: TAWS-B reports inhibit mode active		
	Alert Type: Caution Pop-up Alert: N/A		
TAWS N/A	Condition	Voice Message	
	The GDU is using backup GPS. The navigation solution is degraded or the aircraft is beyond the database coverage area. TAWS-B reports that the system is not available.	"TAWS Not Available"	
Voice Message Only	Alert Type: Advisory Pop-up Alert: N/A		
	Condition	Voice Message	
	GPS signal integrity returns or the aircraft is back within the database coverage area. TAWS transitions from unavailable to available.	"TAWS Available"	

ANNUNCIATION	ALERT TYPE, POP-UP, CONDITIONS, & VOICE MESSAGE	
TAWS TEST	Alert Type: Advisory Pop-up Alert: N/A Condition: TAWS-B system test is in progress	
Voice Message Only	Alert Type: Advisory Pop-up Alert: N/A	
	Condition	Voice Message
	Internal TAWS-B system test is okay.	"TAWS System Test Okay"
Voice Message Only	Alert Type: Advisory Pop-up Alert: N/A	
	Condition	Voice Message
	Aircraft is descending through 500 ft AGL.	"Five Hundred"
TERRAIN	Alert Type: Caution Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Required Terrain Clearance	"Caution, Terrain; Caution, Terrain"
	Imminent Terrain Impact	"Terrain Ahead; Terrain Ahead"
	Excessive Descent Rate	"Sink Rate"
	Premature Descent Alert	"Too Low, Terrain"
	Negative Climb Rate	"Don't Sink" or "Too Low, Terrain"
WIRE	Alert Type: Caution Pop-up Alert: Yes	
	Condition	Voice Message
	Reduced Line Clearance	"Caution, Wire; Caution, Wire"
	Imminent Line Impact	"Wire Ahead; Wire Ahead"

7.9 External TAWS/HTAWS

FEATURE REQUIREMENTS

- TAWS/HTAWS function provided by a source external to the GDU

FEATURE LIMITATIONS

- TAWS/HTAWS controls are available only on the external TAWS/HTAWS device

Table 7-15 Garmin External TAWS/HTAWS Functions

EXTERNAL TAWS/HTAWS	FUNCTION
External Garmin GPS	<ul style="list-style-type: none">• Terrain function relies on an external Garmin GPS device for all TAWS/HTAWS data [1]• On PFD: Changes in CDI source selection have no effect on TAWS/HTAWS alerting functions

[1] For more information, refer to the applicable GNS 500W series or GTN series pilot's guide and/or addendum.

Table 7-16 External TAWS/HTAWS Features

TAWS/HTAWS SOURCE	TXI FEATURES
GTN	<ul style="list-style-type: none">• TAWS/HTAWS alert depictions on the Terrain page, Map page, and in synthetic vision• Terrain depictions and display overlays• Textual annunciations on PFD• Pop-up alerts on MFD
GNS	<ul style="list-style-type: none">• Terrain depictions and display overlays• Textual annunciations on PFD
Third Party TAWS	<ul style="list-style-type: none">• GDU display provides only Terrain Proximity functionality

8 Fuel & Engine Indicating System

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EIS Roadmap

Engine Menu

- Fuel Computer
 - Set full/tabs
 - Specify fuel quantity remaining
 - Connect
- Engine & Flight Hours [1]
 - View total hours
- Engine Advisories
 - Specify advisory limits
- Lean Mode [2]
 - Select mode

On GDU 700(), setup functions are accessible from the System menu. On GDU 1060, they reside on the MFD System page.

System

GDU 700()

- Units
 - Select units
- Status
 - External LRUs
- Backlight
 - Set intensity offset
- Lean Mode [2]
 - Select mode
- Export Data Log

System Page

GDU 1060

- External LRUs
 - View LRU status
- Units
 - Select units
- Backlight
 - Set intensity offset
- Export Data Log

[1] This page is informational only.

[2] Mode selections dependent upon aircraft configuration.

8.1 EIS Setup

Table 8-1 EIS Setup Selections

SELECTION	FUNCTION
Units	<p>Specify units of measure for fuel computer and pilot selectable gauges. Selections synchronize across all configured GDUs. [1]</p> <ul style="list-style-type: none"> • Distance • Fuel Computer • Temperature
Status	<ul style="list-style-type: none"> • View unit and software information • Check status of all configured LRUs
Backlight	<ul style="list-style-type: none"> • Adjust display brightness
Export Data Log	<ul style="list-style-type: none"> • Save logged data to SD card
Lean Mode [2]	<ul style="list-style-type: none"> • Select Lean Mode from popup menu • Options dependent upon configured engine type

[1] Engine gauge units are not adjustable.

[2] On GDU 1060, this function is accessible from the Engine menu.

EIS Display



The EIS displays engine, electrical, and fuel information using parameter specific indicator types (e.g., analog indicators, digital data fields, bar graphs, horizontal and vertical bar indicators).

These instruments replace traditional analog gauges used for starting the engine and monitoring performance. For limitations, consult the AFM or POH.



Single Engine



Multi-engine

Instrument layout varies according to:

- Display type
- Number of engines in aircraft
- Number and type of installed sensors



GDU 700P

GDU 700L and GDU 700P present engine instrumentation on a full-screen dedicated display when configured for EIS.



GDU 700L

40%

60%

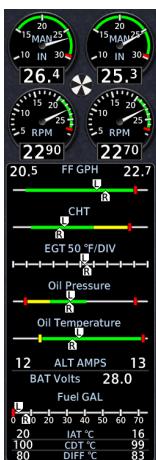


GDU 700L with EIS/MFD

GDU 700() with the EIS/MFD layout present a split view of required engine instrumentation with an MFD function. This configuration supports single-engine aircraft.



Engine Page



Gauge Strip

GDU 1060 presents two views of engine instrumentation. A pilot selectable engine page on the MFD and a vertical gauge strip which is always present.

Table 8-2 GDU 1060 EIS Views

VIEW	DESCRIPTION
Engine Page	<ul style="list-style-type: none"> Gauges depicting oil temperature, oil pressure, and fuel flow Pilot selectable user fields Graphical depiction of engine CHT/EGT/TIT values [1] Menu access key Lean Assist mode function key
Gauge Strip	<ul style="list-style-type: none"> Unobstructed compact view of engine information Resides at the left or right edge of the display [2] No selectable features

[1] Primary EGT and TIT dependent upon aircraft type.

[2] Location dependent upon configuration.

8.2 EIS Functions



Figure 8-1 Common EIS Display Elements

Table 8-3 EIS Functions

DISPLAY OBJECT	FUNCTION
Graphical Indicators	Display a graphical presentation and digital readout of the specified value. [1]
Digital Data Fields	Display a digital readout from the associated sensor. [1] Includes single or dual input values depending on system configuration. Placement corresponds to engine location.
Bar Graphs	Provide digital EGT/TIT and CHT cylinder readings. [2] <ul style="list-style-type: none"> • CHT and EGT digital values are selectable by cylinder • After 10 seconds, CHT values default to the hottest cylinder on each engine
Fuel Quantity Gauges	Display fuel amounts for the specified fuel tanks. [3]
Horizontal and Vertical Bar Indicators	Display instrument information on a single horizontal or vertical bar. Includes single or dual pointers depending on engine type. May include digital readout fields depending on display layout.

DISPLAY OBJECT	FUNCTION
Prop Sync Indicator	<p>Provides a visual reference for synchronizing multi-engine RPM. This indicator uses inputs received from the left and right engine tachometer to show a comparison of the matched RPM and the propeller phase angles between two engines.</p> <ul style="list-style-type: none"> • If RPM for both engines is the same, indicator remains stationary • If RPM varies between engines, the indicator rotates in direction of the faster engine <p>The speed at which the indicator rotates is determined by the RPM differential between the two engines.</p>
Selectable User Field	<p>Opens a menu of the selectable data fields available for display. The type of parameters available for selection is determined during installation.</p> <p>A white border differentiates selectable user fields from non-selectable digital data fields.</p>
Lean/Monitor Key	<p>Enables or disables Lean Assist mode.</p> <ul style="list-style-type: none"> • To enable mode and change the name on the key label, tap Lean • To exit mode and return the graph to its normal temperature monitoring mode, tap Monitor <p>Lean Assist mode is required for all engine leaning operations.</p>
Menu Key	<p>Provides access to the fuel computer, engine and flight hours, engine advisories, and lean modes. On GDU 700(), controls for customizing system settings also reside here.</p>

- [1] Limits are configured according to system design or the AFM/POH. They are not pilot selectable.
- [2] Primary EGT and TIT indications are dependent upon aircraft type.
- [3] Fuel gauges are configured and calibrated during installation.

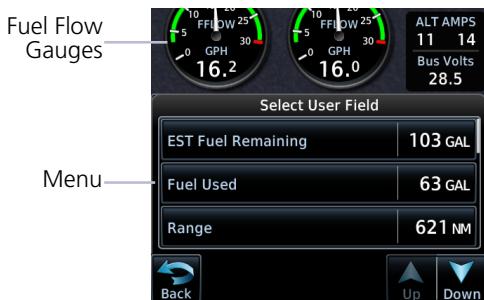
Gauges

PILOT AWARENESS: RPM INDICATION

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

8.3 Gauge Types

Gauge format varies depending on GDU type and configuration. Indicators appearing as round gauges on one display may appear as a vertical or horizontal bar on another. Exceptions include the tachometer and manifold pressure gauges which are always round.



Dedicated EIS Display

Table 8-4 Gauge Types

LABEL	UNITS	FUNCTION
RPM	RPM	<ul style="list-style-type: none"> • Engine tachometer
MAN	inHg, psi	<ul style="list-style-type: none"> • Engine manifold pressure
Fuel or Fuel Pressure	psi, bar	<ul style="list-style-type: none"> • Fuel pressure
FF	gph, lt/hr, PPH, kg/hr	<ul style="list-style-type: none"> • Fuel flow
CARB or CARB Temperature	°C, °F	<ul style="list-style-type: none"> • Carburetor air temperature • Blue arc indicates temperature range where carburetor icing is likely to occur (-15 to 5 °C)
Oil or Oil Pressure	psi, HPa, bar	<ul style="list-style-type: none"> • Oil pressure

The following items are not obstructed by pop-up alerts or menu functions.

- Primary engine indications
- Gauge strip

LABEL	UNITS	FUNCTION
Oil or Oil Temperature	°C, °F	<ul style="list-style-type: none"> • Oil temperature
CHT	°C, °F	<ul style="list-style-type: none"> • Cylinder head temperature for hottest cylinder (bar indicator) [1] • Graphical representation of CHT for each cylinder [2] • Hottest cylinder and cooling rate indications • Selectable temperature values on full EIS layouts [3]
EGT	°C, °F	<ul style="list-style-type: none"> • Graphical representation of exhaust gas temperature for each cylinder [2] • Peak EGT • Selectable temperature values [4] [5] • Average exhaust gas temperature for engine (Primary EGT) [6]
TIT	°C, °F	<ul style="list-style-type: none"> • Turbine inlet temperature
IAT	°C, °F	<ul style="list-style-type: none"> • Inlet air temperature
CDT	°C, °F	<ul style="list-style-type: none"> • Compressor discharge temperature
IAT CDT Diff	°C, °F	<ul style="list-style-type: none"> • IAT, CDT, and IAT/CDT temperature differential
Fuel or Main Fuel	lb, lt, gal, kg	<ul style="list-style-type: none"> • Current fuel quantity in main tanks
Tip Fuel	lb, lt, gal, kg	<ul style="list-style-type: none"> • Current fuel quantity in tip tanks
Aux Fuel	lb, lt, gal, kg	<ul style="list-style-type: none"> • Current fuel quantity in auxiliary tanks
Bus Volts	V	<ul style="list-style-type: none"> • Bus voltage
Bat Volts	V	<ul style="list-style-type: none"> • Battery voltage
ALT AMPS or ALT %	A, %	<ul style="list-style-type: none"> • Alternator load
BAT Amps	A	<ul style="list-style-type: none"> • Battery load

[1] EIS gauge strip only.

[2] Due to limited space, not all cylinders display on EIS/MFD layouts.

[3] GDU 700() or GDU 1060 Engine page.

[4] Graph labels are dependent upon aircraft configuration (e.g., "E" indicates Primary EGT; "T" indicates TIT).

[5] EIS gauge strip presents Primary EGT (if installed) or hottest of the individual EGTs.

[6] Range and units are dependent upon configuration.

8.4 Markings & Indications

Gauge range indications are color coded in accordance with their specified operating limits. Units of measure, limits, and gauge colors are configured during installation.

- Amber radial line or arc denotes a caution range
- Red minimum/maximum line or arc denotes a limitation

8.4.1 Non-safe Range Indications & Alerting

ALERT SUPPRESSION

The following gauges do not alert when the tachometer indicates less than 100 RPM and the aircraft is on ground.

- Fuel flow
- Fuel pressure
- Manifold pressure
- Oil pressure

To attract attention, engine gauges change appearance when a parameter is within a caution or warning alert band. These non-safe range indications remain active while the gauge is within the alerted range.

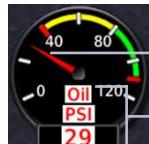
For alerting purposes, gauges are split into two groups: engine power and engine performance. Alerting functions differ for each group.

Pointer Color Change
Solid Highlight



Power Gauge

Pointer Color Change
Flashing Highlights



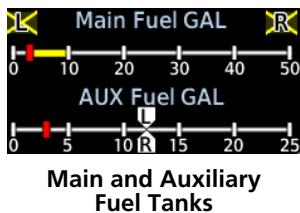
Performance Gauge

Table 8-5 Gauge Alerting Functions

GROUP	GAUGE	FUNCTION
Engine Power	Manifold Pressure Tachometer Fuel Flow	<ul style="list-style-type: none"> Pointer changes color to reflect non-safe operating status. Readout field turns solid amber or red depending on alert type.
Engine Performance	Oil Pressure [1] Oil Temperature Primary EGT CHT CDT Amps/Volts Fuel Pressure Fuel Quantity	<ul style="list-style-type: none"> Pointer changes color to reflect non-safe operating status. Gauge label, readout field, and units (if displayed) flash amber or red depending on alert type. ACK key flashes (GDU 700() only). All flashing indications turn solid once the pilot acknowledges the alert. [2]

- [1] To minimize the number of nuisance alerts, oil pressure gauges do not flash when within the caution band.
[2] Alerts automatically acknowledge after 10 seconds on GDU 1060.

8.4.2 Fuel Gauge Label



The fuel quantity gauge label reflects the aircraft's fuel tank configuration.

For aircraft with both main and auxiliary fuel tanks, this gauge is labeled "Main Fuel."

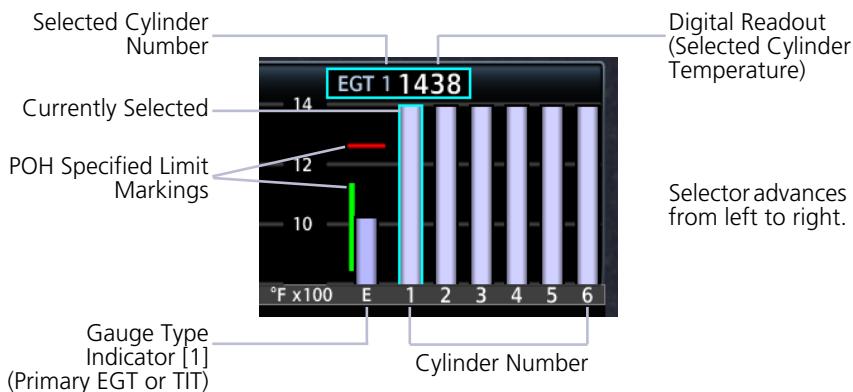


8.4.3 Bar Graph Indications

Each bar graph contains the following components.

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

The size of each graph varies according to aircraft type (i.e., single or twin engine aircraft and the number of cylinders per engine) and gauge configuration (i.e., TIT or primary EGT).



[1] Presence and type dependent upon configuration.

Table 8-6 Engine Graph Color Indications

SYMBOL	INDICATION	MEANING
	Cyan CHT/EGT Highlight	Currently selected cylinder
	Amber CHT Highlight	Hottest cylinder (automatically selected)
	Single Blue CHT Arrow	CHT is cooling at a rate faster than 30°F (16.7°C) per minute
	Double Blue CHT Arrow	CHT is cooling at a rate faster than 60°F (33.3°C) per minute

8.5 Gauge Interactions

Table 8-7 Temperature Values

TEMPERATURE VALUES	GAUGE INTERACTIONS
<p>The EIS graphically displays CHT and EGT data for each cylinder.</p> <p>Graduations are scaled and sized during installation.</p>	<p>Tapping the a graph manually advances the selector to the next temperature value (e.g., CHT, EGT, Primary EGT, or TIT).</p> <ul style="list-style-type: none"> • CHT selections revert to auto mode after 10 seconds of inactivity • EGT values are not selectable during lean assist operations

Table 8-8 Selectable User Fields

SELECTABLE USER FIELDS	GAUGE INTERACTIONS
<p>These fields allow you to select engine and fuel parameters for display on the EIS.</p> <p>Available user fields and selectable parameters are determined during installation.</p>	<p>Tapping any user field opens a list of available engine parameters and their current values.</p> <p>Selecting a parameter displays its value on the EIS and closes the menu.</p> <ul style="list-style-type: none"> • Fields may be modified to display alternate data at any time • Several parameter units are pilot adjustable

Table 8-9 Available User Fields

KEY	DISPLAYS
EST Fuel Remaining	<ul style="list-style-type: none"> Estimated amount of total fuel remaining [1] [3]
Fuel Used	<ul style="list-style-type: none"> Total fuel used since last update to estimated fuel remaining quantity [1] [3]
Range	<ul style="list-style-type: none"> Total range based on remaining fuel and current ground speed [1] [3]
Endurance (HH:MM)	<ul style="list-style-type: none"> Fuel endurance time in hours+minutes [1]
Fuel at Destination	<ul style="list-style-type: none"> Estimated fuel amount at current flight plan destination [1] [2] [3]
Endurance at DEST	<ul style="list-style-type: none"> Remaining fuel endurance time (hours+minutes) at destination [1] [2]
Flight/Engine Hours	<ul style="list-style-type: none"> Total flight and engine hours [5]
Efficiency	<ul style="list-style-type: none"> Fuel efficiency [3]
Outside Air TEMP (ISA)	<ul style="list-style-type: none"> Degrees deviation from the International Standard Atmosphere model [4]
Outside Air TEMP (SAT)	<ul style="list-style-type: none"> Outside static air temperature [4]
Outside Air TEMP (TAT)	<ul style="list-style-type: none"> Outside total air temperature [4]
CHT DIFF	<ul style="list-style-type: none"> Difference between hottest and coldest CHT for each engine [6]
EGT DIFF	<ul style="list-style-type: none"> Difference between hottest and coldest EGT for each engine [6]

[1] Values are based on fuel computer calculations.

[2] Requires an active flight plan from the navigator.

[3] Parameter units are pilot selectable.

[4] Units are independent of PFD units.

[5] Engine hours accumulate when an engine is running. Flight hours accumulate when the aircraft is in air.

[6] Units are dependent upon configuration.

Fuel



CAUTION

ENSURE THAT ESTIMATED FUEL QUANTITY VALUES IN THE FUEL COMPUTER ARE ACCURATE BEFORE FLIGHT. FUEL QUANTITY GAUGE INDICATIONS MAY NOT PROVIDE THE ACCURACY REQUIRED FOR DETERMINATION OF ON BOARD FUEL DURING FLIGHT.

8.6 Fuel Computer

The fuel computer calculates and displays fuel parameter values when a flight plan is active in a connected and compatible navigator. Calculations are based on GPS ground speed, the pilot specified destination airport, estimated fuel remaining, and inputs received from the engine fuel flow sensor. Fuel parameters are available for display on the EIS in a selectable user field include:

- Aircraft endurance
- Endurance at destination
- Fuel used
- Efficiency
- Fuel at destination
- Range

PILOT AWARENESS: ESTIMATED FUEL REMAINING DATA

- Based on estimated fuel remaining value entered by the pilot
- Initial value automatically reduced based on current fuel flow
- Not limited to the capacity of the aircraft fuel system
- Preset keys for “full” and “tabs” aid in fuel data entry

PILOT AWARENESS: FUEL RANGE RINGS

Fuel range rings are a pilot-selectable map overlay indicating an estimate of remaining flight distance based on fuel onboard, fuel consumption rates, and current ground speed.

The map depicts two separate rings: an outer yellow ring displaying total endurance range, and an inner dashed green ring displaying range to reserve fuel. These rings offer the pilot additional situational awareness regarding fuel remaining and endurance.

Table 8-10 Fuel Computer Selections

SELECTION	FUNCTION
EST Fuel Remaining	<p>Opens a keypad for specifying the estimated fuel remaining value. The fuel computer bases its calculations on the value entered here.</p> <p>To account for added fuel and maintain accurate fuel flow measurements over time, always update this value upon refueling.</p> <p>This keypad provides additional controls for specifying preset fuel values.</p>
Calibrate FFLOW	<p>Opens the Fuel Flow Calibration page. Controls for calibrating the fuel flow meter reside here.</p> <p>This key remains inactive until a new value is entered for EST Fuel Remaining.</p>

8.6.1 Preset Fuel Quantities

The fuel computer stores preset fuel amounts for estimated full and tab amounts. For the operating limitations of a specific aircraft, consult the POH.

Table 8-11 Fuel Remaining Selections

SELECTION	FUNCTION
Full	Sets the fuel remaining value to the specified full amount.
Tab	Sets the fuel remaining value to the specified tab amount.
Set Full/Tabs	<p>Opens the Set Fuel Tabs menu. Select the appropriate data entry key and enter the estimated fuel amounts. These values vary according to aircraft type.</p> <p>Fuel Full Capacity: Specify the tank full amount.</p> <p>Fuel Tab Capacity: Specify a tank tab amount.</p>

8.6.2 Fuel Flow Calibration

A calibration function compares the estimated fuel used amount (calculated by the system) with the actual fuel used amount (determined by the pilot upon refueling). The system calculates a fuel flow correction factor based on these inputs. This adjustment value is applied to future fuel flow calculations.

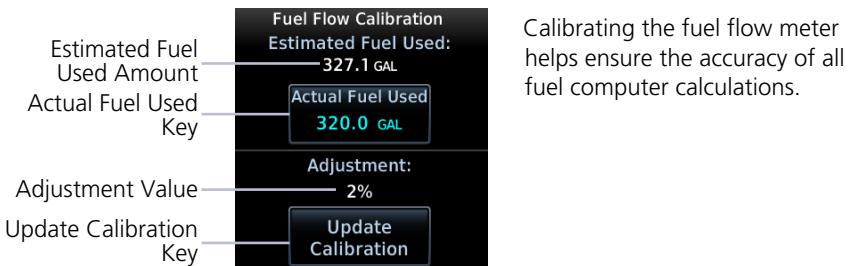


Table 8-12 Fuel Flow Calibration Selections

SELECTION	FUNCTION
Actual Fuel Used	Allows you to specify the actual amount of fuel used since the last adjustment to the EST Fuel Remaining quantity.
Update Calibration	Updates the current calibration value. Confirming the request re-calibrates the fuel flow meter and saves the new calibration value.

8.7 Engine Advisories

Specify values at which the system will advise of certain engine parameters. The system issues an advisory message when an engine gauge exceeds its specified value. These messages are acknowledged in the same manner as system advisories.

Available selections are based on aircraft configuration.

- CHT Cooling Rate
- EGT Differential
- High CHT
- High TIT
- High/Low Battery Voltage
- High/Low Bus Voltage
- High/Low Oil Temperature
- Low Endurance [1]
- Low Estimate Fuel Remaining [1]

[1] Actual amounts are based on fuel computer calculations and an active flight plan.

Lean Assist Mode

FEATURE REQUIREMENTS

- For specific engine leaning procedures and temperature targets, consult the AFM

FEATURE LIMITATIONS

- Lean mode availability is dependent upon aircraft configuration and engine instrumentation

Selectable lean modes allow you to identify peak EGT/TIT temperatures and temperature differential values associated with the leaning process.

Available mode selections are listed in the Lean Mode menu.

8.8 Lean Mode Key



Tapping the **Lean** key once places the EIS in Lean Assist mode.



To return to normal operating mode, tap **Monitor**.

When Lean Assist mode is active:

- EGT graph features are not selectable
- Engine menu is not available
- **Monitor** key displays in the navigation bar
- Mode type annunciates at the bottom of the display

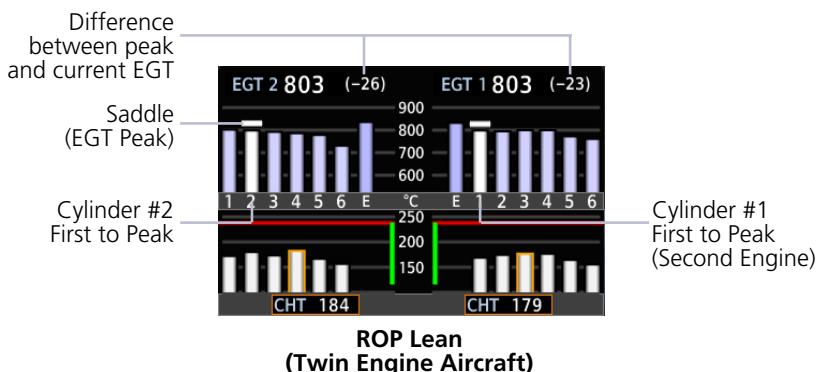
8.9 Peak Temperature Indications

During Lean Assist mode, the system waits for the EGT or TIT to peak, and then decrease by a minimum of 6 °F. When this occurs:

- The corresponding temperature bar on the graph turns white.
- A white saddle indicates the maximum temperature value recorded for the sensor. In cases where the system waits for the last engine cylinder to peak, violet saddles indicate the maximum temperature of all other peaked cylinders.
- The "PEAK" annunciation and temperature value display in white at the top of the graph. After three seconds, this field reverts to the current operating temperature.
- A numeric field displays the difference between the peak and current operating temperatures. This value changes to reflect all subsequent temperature fluctuations. A negative value denotes an operating temperature lower than the maximum recorded value. A positive value denotes a temperature increase greater than the previously detected peak.
- Saddle position and deviation values automatically adjust to reflect any increases in peak temperature.

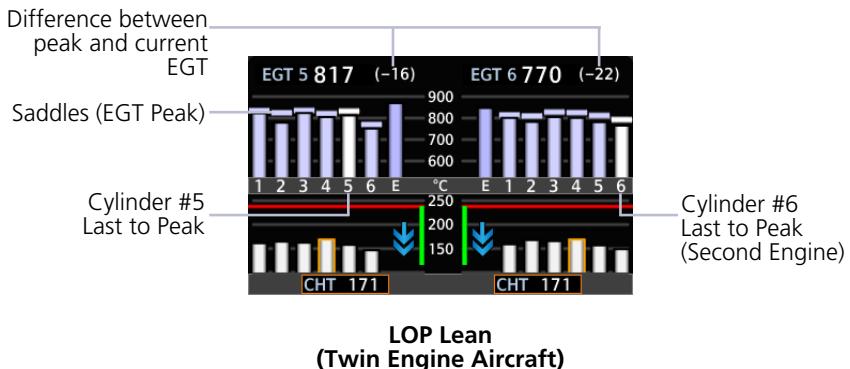
8.10 ROP Lean

ANNUNCIATION	MODE	FUNCTION
ROP LEAN	Rich of Peak Lean	<ul style="list-style-type: none"> Indicates the first engine cylinder to reach peak EGT during the leaning process



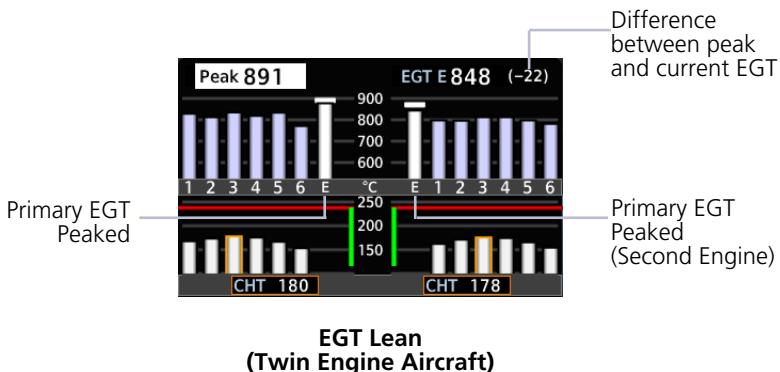
8.11 LOP Lean

ANNUNCIATION	MODE	FUNCTION
LOP LEAN	Lean of Peak Lean	<ul style="list-style-type: none"> Indicates the last engine cylinder to reach peak EGT during the leaning process



8.12 EGT Lean

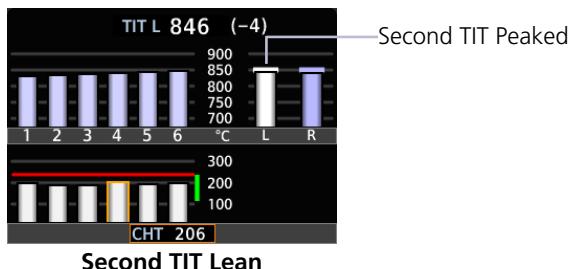
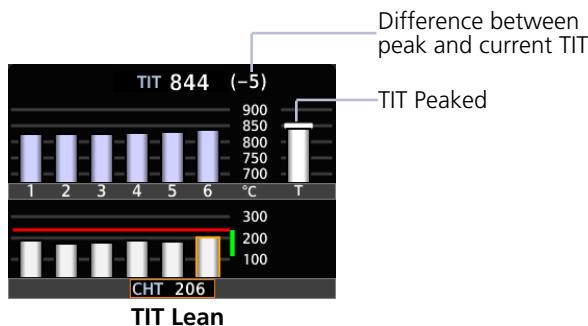
ANNUNCIATION	MODE	FUNCTION
EGT LEAN	Primary EGT Lean	<ul style="list-style-type: none"> Indicates the peak temperature of the primary EGT during the leaning process Available only when Primary EGT is the configured gauge type



8.13 TIT Lean

TIT leaning is available for turbocharged aircraft configured for single or dual TIT measurements.

ANNUNCIATION	MODE	FUNCTION
TIT LEAN	Turbine Inlet Temperature Lean	<ul style="list-style-type: none"> Indicates the peak TIT during the leaning process Available only on single turbocharger aircraft
TIT 1 LEAN	Turbine Inlet Temperature Lean First Peak	<ul style="list-style-type: none"> Indicates the first temperature sensor to reach peak TIT Available only on single engine aircraft equipped with dual turbochargers Function resembles ROP Lean
TIT 2 LEAN	Turbine Inlet Temperature Lean Second Peak	<ul style="list-style-type: none"> Indicates the second temperature sensor to reach peak TIT Available only on single engine aircraft equipped with dual turbochargers Function resembles LOP Lean



EIS Operations

PHASE OF FLIGHT	OPERATION
Initial Setup	Customize system settings
	Set fuel full and tab capacity levels
	Set engine advisories
	Calibrate fuel flow
Preflight	Add fuel
En Route	Lean the engine
	Monitor gauges
Post Flight	Record engine and flight hours

8.14 Initial Setup

Initial setup operations include:

- Customizing system settings
- Setting fuel tabs
- Setting engine advisories
- Calibrating fuel flow



For convenience, flight and engine hours display at startup.

CUSTOMIZE SYSTEM SETTINGS

Specify all necessary EIS settings. Customization options reside in either the System page (GDU 1060) or the System menu (GDU 700()).

SET FUEL FULL AND TAB CAPACITY

Specify estimated fuel full and tab values using the controls in the fuel computer.

SET ENGINE ADVISORIES

Specify engine advisory parameters and limit values.

8.14.1 Calibrate Fuel Flow



NOTE

If the calculated adjustment factor exceeds the 10 percent fuel flow calibration limit, contact your dealer for support.

Calibrate fuel flow using the controls provided in the fuel computer. Re-calibration is recommended following the first flight or any time there is a significant difference between the estimated remaining fuel quantity and the actual amount of fuel in the tanks.

1. Fuel aircraft to a known level (i.e., the bottom of the tabs inside each fuel filler port).
2. Tap **EST Fuel Remaining** and enter the amount of fuel on board.
NOTE: This value must be at least 5 liters (2 gallons) greater than the previous estimated fuel on board amount.
3. Burn no less than 10 percent of usable fuel. Burning more than 10 percent will yield a more accurate calibration.
4. Refuel to the previously entered level.
5. Tap **EST Fuel Remaining** and enter the amount of fuel on board.
6. Tap **Calibrate FFlow**.
7. Enter the amount of actual fuel used. Note the adjustment value.
8. Tap **Update Calibration**.
9. Confirm the request.
10. Acknowledge the pop-up message.

8.15 Preflight

ADD FUEL

Update the remaining fuel quantity whenever fuel is added to the aircraft.

1. Fuel the aircraft.
2. Enter the appropriate fuel amount using the fuel computer.

8.16 En Route

LEAN THE ENGINE

1. Select the preferred leaning function from the Lean Mode menu.
2. Tap **Lean**.
3. Monitor the temperatures graph for reference peak events and lean the mixture accordingly.

8.17 Post Flight

RECORD ENGINE AND FLIGHT HOURS

Document total engine and flight time. This information is necessary for logging and maintenance purposes. Engine and flight hours are viewable on the associated page.

Engine Alerts

8.18 Engine Alerts



NOTE

Engine warnings require immediate action.

ACKNOWLEDGE ALERT KEY (GDU 700() ONLY)



- Flashes yellow and black when an engine caution is present
- Flashes red and white when an engine warning is present
- Engine alerts display as textual annunciations on the PFD
- Disappears once alert is acknowledged
- **GDU 1060:** All engine cautions and warnings automatically acknowledge after 10 seconds

Tapping the **ACK** key acknowledges the condition and suppresses all flashing alert indications (i.e., annunciation, gauge). It does not remove the annunciation from the display. Alert annunciations and non-safe range indications remain active (solid) for as long as the gauge is within the alerted range.

Table 8-13 Engine Alerts

ANNUNCIATION	ALERT TYPE, CONDITIONS, AND NOTES	
ENGINE	Alert Type: Warning	
	Condition An engine parameter indicates a red alerting range (low or high).	Note Requires immediate action.
	Alert Type: Caution	
	Condition An engine parameter indicates a yellow alerting range (low or high).	

REMOTE ENGINE ANNUNCIATIONS

GDU 700()/1060: Engine alerts annunciate on the PFD when the unit is connected to a GDU 700() configured for EIS.



Engine Annunciator on PFD

EXTERNAL ENGINE ALERT LAMPS

An external lamp is required if the only EIS display is installed outside the pilot's primary field of view. This lamp illuminates any time an engine alert is active. It turns off once the alert is acknowledged.

9 Abnormal Operations

BACKUP INSTRUMENTS

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Backup Instruments

9.1 Display Backup

FUNCTIONAL LIMITATIONS

- Applicable to pilot side units only
- Only pilot or center units trigger backup mode when offline
- Not available in single TXi display installations
- Display backup mode supports a limited set of EIS gauges

DISPLAY BACKUP MODE OCCURS UNDER THREE CONDITIONS

1. Loss of communication with a GDU that displays EIS or PFD data.
2. Pilot activation through on-screen selection or toggle switch.
3. AHRS or ADC fault caused by miscompare or missing data. This only triggers backup mode if the unit is configured as a standby PFD.

When transitioning, priority is given to primary gauges first. All menu items and lean controls are disabled in this mode. An optional external toggle switch allows manual activation of backup mode.

9.1.1 Standby PFD Display Options

FEATURE REQUIREMENTS

Additional standby PFD functionality is available in installations that include:

- Dual external ADAHRS sensors: one external ADAHRS; one internal AHRS connected to an ADC
- Two pilot side GDU 700P units: one configured as a dedicated PFD, the other configured as either MFD, EIS, or MFD/EIS
- Non-PFD GDU configured as standby PFD

During display backup, the standby PFD allows you the option of continuing backup PFD mode or returning to the unit's previous display mode (MFD, EIS, or MFD/EIS). This option is available only if display backup is triggered by an AHRS or ADC data miscompare or by pilot activation.

DISPLAY BACKUP KEY

This key remains available during display backup for as long as the GDUs are in communication with each other. It is not available during display backup if only the standby PFD is operational.



To return the standby PFD to its previous display mode:

1. Push the **Power** key.
2. Deselect **Display Backup**.

9.1.2 Composite Display Backup Mode

When a GDU 700P enters a PFD/EIS composite display backup mode, certain aspects of the normal PFD layout change to accommodate the display of EIS data.

PFD when in composite display backup mode:

- A limited, 90° field of view HSI replaces the Standard HSI or HSI Map
- CDI source selection key replaces air temperature and wind data fields
- Attitude background defaults to a blue over brown artificial horizon display (non-SVT)

Removed from display in composite mode:

- Air temperature field
- Clock/timer field
- Wind data fields
- PFD Menu key
- Advisory key

Unchanged from display in composite mode:

- Airspeed
- Barometric altitude
- Attitude

Unavailable PFD functions operating in composite mode:

- Changing airspeed references
- Setting BARO or RA Minimums
- Selection of AHRS or ADC sources
- Manual adjustment of backlight levels
- Viewing external LRU status



Figure 9-1 GDU 700P Composite Display in Backup Mode

Abnormal Operations



Normal Mode EIS



PFD/MFD



Display Failure



Backup Display Mode

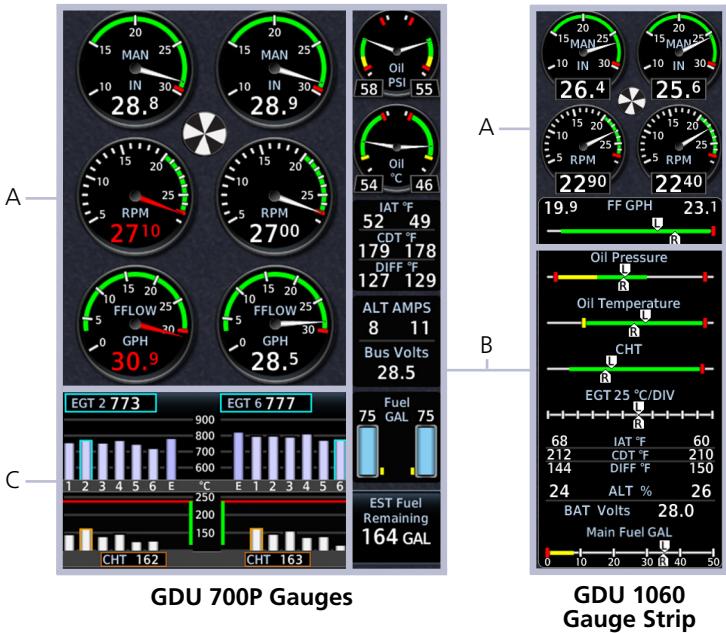


Backup Display Mode



Display Failure

Figure 9-2 Display Backup Modes



A	Gauges display with little or no change.
B	Gauges transfer depending on priority and open gauge slots.
C	Gauges simplify and transfer, depending on available display area.

Figure 9-3 EIS Gauge Reversion

9.2 Backup Battery

FUNCTIONAL LIMITATIONS

- Applicable to GDU 700() only
- During backup battery mode, display brightness is set for minimum sunlight readability

BATTERY SUPPORTED LRUS

- Backup GPS
- GDU 700()
- GEA 110
- GMU 44
- GTP 59
- Integrated ADAHRS

GBB 54 FEATURES

- Lithium-ion battery unit
- Integrated heater ensures performance in low temperatures
- Charged by GDU during normal operations
- Status indications denote battery state and availability
- Pop-up alerts with estimated time remaining
- System advisories with timer display



Figure 9-4 GBB 54 Backup Battery

9.2.1 Battery Status Indications

Status indications include a battery icon and timers.

BATTERY ICON

- Displays when the GBB 54 is powering the GDU, battery charge state is insufficient, or a battery fault exists
- Displays in the annunciator bar and on External LRUs page
- Removed when the battery is at full charge

Table 9-1 Battery Icon Status Conditions

ICON	STATE	CONDITION
Absent [1]	Charged	<ul style="list-style-type: none"> • Backup battery at full charge (>30 minutes) and available for use.
	Charging/Warming Up	<ul style="list-style-type: none"> • Battery has less than 30 minutes remaining charge. [2] • Battery temperature is below -20°C. [2] [3]
	Discharging	<ul style="list-style-type: none"> • GDU on backup battery power. 15 to 30 minutes remaining.
	Discharging/Caution	<ul style="list-style-type: none"> • GDU on backup battery power. 0 to 15 minutes remaining.
	Discharging/Warning	<ul style="list-style-type: none"> • GDU on backup battery power for longer than 30 minutes. Loss of power may be imminent. [4] • Charge state uncertain (i.e., GDU switches to backup battery power before battery reaches full charge).
	Unavailable/Error	<ul style="list-style-type: none"> • Battery error. Backup battery power is unavailable. • Capacity test is overdue.

[1] A green check on the External LRUs page denotes LRU availability.

[2] Aircraft power is required.

[3] The warm up process can take up to 30 minutes.

[4] A total power loss occurs when aircraft power fails and the backup battery is unavailable or depleted.

BATTERY TIMERS

Battery timers alert the pilot of:

- Transitions from aircraft power to backup battery power
- Total time on battery power

Table 9-2 Battery Timers

TIMER	ALERT TYPE	CONDITION
Elapsed time on battery power (count-up)	Advisory	Aircraft is in flight.
60 second countdown	Pop-up	Aircraft is on ground or in an unknown state.

Automatic Unit Shutdown

To prevent battery depletion, the unit automatically powers off once the 60 second countdown timer expires.



Tapping **Stay On** cancels the automatic shutdown sequence, allowing the unit to continue operation on backup battery power.

9.2.2 Battery Alerts

Caution messages alerting to backup battery status may display while in flight. On GDU 700L, these alerts are shortened to accommodate space limitations.

Table 9-3 Backup Battery Alerts

ANNUNCIATION	ALERT TYPE & CONDITION
Backup battery in use. Estimated time remaining: 15 minutes.	<p>Alert Type: Caution Pop-up Alert: Yes</p> <p>Condition</p> <p>GDU on backup battery power, discharging for 15 minutes.</p>
Backup battery has low charge or fault. See flight manual for operating limitations.	<p>Alert Type: Caution Pop-up Alert: Yes</p> <p>Condition</p> <p>Battery is charging. Estimated charge is below 30 minutes.</p> <p>GDU detects a battery fault or warning state.</p> <p>Loss of communication.</p> <p>Battery power output failure.</p> <p>Capacity test failure or testing overdue.</p>

9.3 AHRS & ADC Failures

PILOT AWARENESS: AHRS/ADC NORMAL OPERATIONS

In dual AHRS/ADC installations, use the onside AHRS/ADC during normal operations and the offside AHRS/ADC only when necessary. Under normal conditions, sensor assignment should be as follows.

Pilot PFD: AHRS 1, ADC 1

Co-pilot PFD: AHRS 2, ADC 2

Standby PFD (pilot side): AHRS 2, ADC 2

The AHRS uses aiding data from the GPS navigator, air data computer, and magnetometer to provide accurate attitude data. Failure of these inputs may cause attitude data to become unavailable. Additional annunciations indicate current alignment and calibration status.



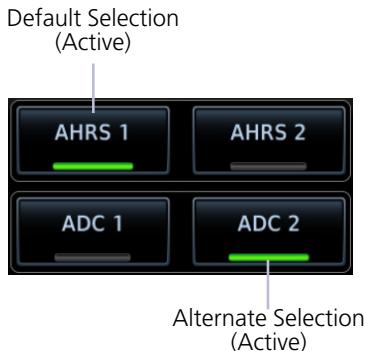
9.3.1 AHRS and ADC Sensor Selection

The pilot is provided AHRS/ADC source selection controls when dual ADC or AHRS sensors are configured.

Table 9-4 AHRS/ADC Sensor Selection Annunciations

ANNUNCIATION	DISPLAY	DESCRIPTION
SINGLE TXI PFD		
"ON ADC 2" or "ON AHRS 2" (black text on white)	Pilot's PFD	Pilot selected ADC 2 or AHRS 2 as the sensor source.
TWO TXI PFDS		
"ON ADC 2" or "ON AHRS 2" (black text on yellow)	Pilot's PFD	Pilot changed sensor source from the default setting.
"ON ADC 1" or "ON AHRS 1" (black text on yellow)	Co-pilot's PFD Standby PFD (pilot side)	GDU is in display backup mode.

SELECT SENSORS ON PILOT/CO-PILOT PFD

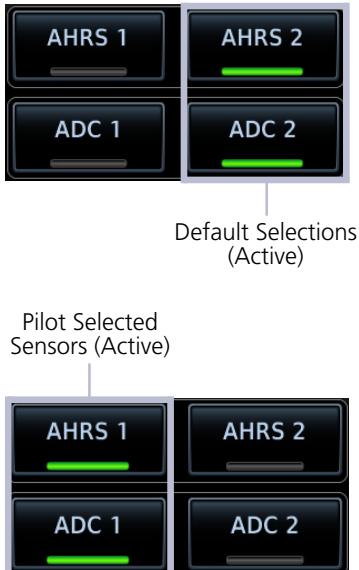


AHRS and ADC selection keys reside on the Sensors page of the PFD menu.

Alternate attitude or air data sources annunciate on the PFD. Default selections do not annunciate.

ON ADC2

SELECT SENSORS ON A STANDBY TXI PFD



By default, the pilot side standby PFD uses ADC 2 and AHRS 2 data when the unit transitions to backup PFD mode. This occurs during any one of the following conditions.

- Primary PFD failure
- Miscompare state
- No compare state

Standby PFD allows you to specify alternate data sources if the default selections are not preferred.



PFD



MFD (Standby PFD)



Display Failure



Sensor Options Available

During backup PFD mode, sensor select options remain available.

Figure 9-5 Standby PFD Sensor Options

9.3.2 AHRS Operating In Reversionary Mode

A failure of the air data input has no effect on AHRS output, while AHRS is operating in normal mode. If the air data input fails, while the AHRS is operating in backup No-GPS mode, PFD attitude and heading data are invalid.

9.3.3 GPS Failure

Two GPS inputs may be provided to the AHRS. If GPS information from one of the inputs fails, the AHRS uses the remaining GPS input, and an advisory message informs the pilot. If both GPS inputs fail, the AHRS continues to provide attitude and heading information to the PFD as long as true airspeed data is available and valid.

9.3.4 AHRS Alerts

Table 9-5 AHRS Alerts

ANNUNCIATION	ALERT TYPE & CONDITION
HDG FAIL	<p>Alert Type: Warning</p> <p>Condition</p> <p>Invalid heading.</p>
AHRS ALIGN: Keep Wings Level	<p>Alert Type: Caution</p> <p>Condition</p> <p>AHRS is aligning. Appears during AHRS initialization.</p>
CALIBRATE AHRS/MAG	<p>Alert Type: Caution</p> <p>Condition</p> <p>AHRS calibration is incomplete.</p> <p>Service required. Contact a Garmin dealer for support.</p>
ON ADC <#>	<p>Alert Type: Caution (Dual TXi PFD only)</p> <p>Condition</p> <p>PFD is using opposite-side ADC data.</p> <p>Alert Type: Advisory (Single TXi PFD only)</p> <p>Condition</p> <p>PFD is using ADC data from ADC 2.</p>

ANNUNCIATION	ALERT TYPE & CONDITION
ON AHRS <#>	Alert Type: Caution (Dual TXi PFD only) Condition PFD is using opposite-side AHRS data.
	Alert Type: Advisory (Single TXi PFD only) Condition PFD is using AHRS data from AHRS 2.
ATTITUDE	Alert Type: Caution Condition Flight dynamics monitor detects a possible discrepancy in AHRS outputs.

Table 9-6 LRU Failures Effect On AHRS Operation

LRU	CONDITION	AHRS OUTPUT
ADC	ADC input fails during normal mode.	Valid attitude and heading information (no interruption).
	ADC input fails while AHRS is in NO-GPS mode.	Attitude and heading fails.
GPS Navigator	GPS inputs fail. AHRS continues to operate in No-GPS mode (ADC and magnetometer required).	Valid attitude and heading information (no interruption).
Magnetometer	Magnetometer input fails while aircraft is on the ground. AHRS transitions to back-up mode without magnetometer.	Valid attitude information (no interruption). Heading displays using GPS track data.
	Magnetometer input fails while aircraft is in the air. AHRS transitions to no magnetometer mode.	Valid attitude information (no interruption). Invalid heading information. Display enters reversionary track mode.
GPS and Magnetometer	Magnetometer and GPS inputs fail.	Attitude and heading fails.

9.3.5 Miscompare & No Compare

AHRS/ADC SENSOR COMPARISON

The GDU continuously monitors and compares sensor data when more than one AHRS or ADC is present. A miscompare state occurs when the difference between two or more sensor outputs is above the predefined threshold.

Table 9-7 Miscompare Thresholds

PARAMETER	CONDITION	THRESHOLD
Indicated Airspeed	All	200 feet
	Both <35 kts	Inhibited
	Either or both \geq 35 kts, and both <80 kts	10 kts
	Either \geq 80 kts	7 kts
Lateral Acceleration	All	0.2G
Normal Acceleration	All	0.2G
Pitch Attitude	All	5°
Pitch Attitude Rate	All	1°
Roll	All	6°
Roll Rate	All	3°

MISCOMPARE ANNUNCIATIONS

Miscompares generate a caution annunciation over the affected PFD instrument(s).



Indicated airspeed, "IAS" annunciates below the airspeed pointer.



Altitude, "ALT" annunciates below the barometric altitude pointer.



Pitch and/or roll, "ATTITUDE" displays on the pitch scale.

In addition to miscompare monitors, the GDU provides an independent flight dynamics monitor that compares computed cross heading, vertical accelerations, and roll angles against reported values generated by the AHRS. If there is a disagreement between the flight dynamics monitor and the AHRS parameters, the "ATTITUDE" caution annunciates.

NO COMPARE ANNUNCIATIONS

A no compare monitor determines when data to the second ADC or AHRS source is unable to be used for comparison.



No compares generate an advisory annunciation over the affected instrument(s) driven by ADC and AHRS units.



9.4 HSI Failure Modes

The HSI continues to display limited navigation information during magnetometer and GPS failures. If the magnetometer input fails, the AHRS transitions to backup No-Magnetometer mode and continues to output valid attitude information.

If the aircraft is airborne, the PFD heading output reverts to GPS track. Magnetic heading is replaced by GPS track information and HSI compass card orients to GPS track. The following TXi system conditions exist:

- SVT turns off and automatically re-enables when heading is restored
- Map orientations change from HDG UP to TRACK UP
- When heading is restored orientations change back to HDG up
- When heading fails heading bug remains
- GDU continues driving autopilot heading error output using track in place of heading



**HSI with
Magnetometer Failure**

"HDG FAIL" annunciates when there is an AHRS heading data failure.

If the magnetometer fails, the HSI compass card indicates GPS track. The numeric heading value turns magenta to indicate GPS track is displayed.



**HSI with GPS and
Magnetometer Failures**

If both the magnetometer and GPS units fail:

- HSI reverts to a non-directional CDI
- Numeric heading display is removed
- Use the selected course control to manually control OBS

9.4.1 GPS Failure



WARNING

DO NOT USE PROJECTED POSITION DATA AS THE ONLY MEANS OF NAVIGATION.

When dead reckoning mode is active on the GPS navigator:

- System flags all external outputs dependent on GPS position data
- Map page reports “No GPS Position”; overlays are not available
- DR Mode annunciates on HSI, replacing ENR or OCN
- Traffic and Stormscope data continue to display on their respective pages
- Charts are available for display on the dedicated MFD page, but the ownship is no longer geo-referenced on the chart
- CDI and terrain functionality not available



Figure 9-6 Dead Reckoning

9.4.2 Backup GPS

Each GDU is equipped with a backup GPS receiver. When the optional Garmin backup GPS antenna is connected, and if all the certified GPS sources are lost, the system provides 2-D GPS position information from the backup GPS. No pilot action is required to enable the use of backup GPS data.

Only one GDU in a multi-GDU installation requires a connected backup GPS antenna. The system automatically cross-fills backup GPS data between GDUs.

Backup GPS data is used only to provide non-safety critical functions and only after the failure of all certified GPS position sources. Backup GPS data is only provided when a valid GPS position is received from an airborne certified GPS source that is subsequently lost. The system always utilizes time from the backup GPS when no other source is available, even prior to receipt of GPS time from a certified GPS source.

Backup GPS data provides:

- Ownship position on the moving map
- GPS track display
- Waypoint bearing/distance information
- Ground speed
- Wind calculations

When backup GPS is in use:

- Yellow "BACKUP GPS" annunciation displays on all geo-referenced maps
- Navigation using backup GPS is not provided
- Map overlays for Stormscope, traffic, terrain, and obstacles are disabled
- Traffic page continues to display data from TIS-A and TCAS sources

Functions inhibited with backup GPS:

- Bearing pointer on Waypoint Info page
- Chart geo-referencing
- SVT
- GPS altitude displays
- GPS navigation status field
- Terrain page display

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A Glove Qualification Procedure



NOTE

This procedure is not authorized for completion during flight. Perform all tasks while the aircraft is on the ground.

The touchscreen uses capacitive touch technology to sense the proximity of skin to the display. A glove creates a barrier between the skin and the display glass, potentially reducing the ability of the display to detect touches.

This procedure qualifies a specific glove for use with the touchscreen. Due to differences in finger size, glove size, and touchscreen between the GDU 700() and GDU 1060 units, the qualification procedure is specific to the pilot/glove and GDU combination. Multiple units must be evaluated individually.

GLOVE SELECTION CONSIDERATIONS

- Thinner gloves perform better than thicker gloves.
- Leather gloves, and gloves designed specifically for use with capacitive touchscreen devices, are often found to be acceptable.
- To improve touchscreen sensitivity while wearing gloves, use the pad of your finger instead of the tip during touch interactions.

GLOVE QUALIFICATION GUIDANCE

- Table A-1 contains the tasks required to qualify a glove.
- Table A-2 contains tasks that are not required to qualify a glove, but may limit how some functions are accessed while wearing a glove.

GLOVE QUALIFICATION STEPS

Complete only the tasks for the capabilities relevant to the installed GDU(s).

1. Sit in the pilot's seat.
2. Start the GDU in normal mode.
3. Perform the tasks listed in table A-1 and table A-2, tapping each key with a non-gloved finger. It is not necessary to record any results for this step.
4. Repeat step 3 using a gloved hand.
5. For each task, determine whether the touchscreen response is the same or worse than without the glove.
6. Record the results in the applicable table. Items that may cause the operation to be worse include, but are not limited to:
 - Multiple attempts to select a key
 - Unintentional selection of adjacent key(s)
 - Excessive force on the touchscreen to select a key
7. If all applicable tasks produce the same response with and without a glove, the pilot may use the glove in flight.

GLOVE QUALIFICATION PROCEDURE

Pilot: _____

Glove Description: _____

Circle the applicable TXi GDU and system function(s).

1060 700L 700P / PFD MFD EIS

Table A-1 Tasks Required for Glove Qualification

TASK	OPERATION WITH GLOVE (CIRCLE ONE)	
PFD		
Change the current CDI source.	Same	Worse
Tap HDG	Same	Worse
Change AP HDG REF setting.	Same	Worse
Close control menu.	Same	Worse
Tap Barometric Setting Control	Same	Worse
Toggle STD BARO key on and off.	Same	Worse
Close	Same	Worse
Menu	Same	Worse
Minimums	Same	Worse
BARO	Same	Worse
Type a minimums altitude value.	Same	Worse
Enter	Same	Worse
Back	Same	Worse
HSI Setup	Same	Worse
Bearing Pointers	Same	Worse
Toggle Bearing Pointer 1 on and off.	Same	Worse
Back	Same	Worse
PFD Setup	Same	Worse
Clock/Timer	Same	Worse

TASK	OPERATION WITH GLOVE (CIRCLE ONE)	
Enable clock/timer.	Same	Worse
Exit PFD Setup.	Same	Worse
Close menu.	Same	Worse
Clock/Timer Control	Same	Worse
Enable timer mode (if necessary).	Same	Worse
Start and stop timer.	Same	Worse
Close control menu.	Same	Worse
Advisory	Same	Worse
Close advisory panel.	Same	Worse
MFD		
Home	Same	Worse
Waypoint Info	Same	Worse
Airport	Same	Worse
Tap WP Identifier key.	Same	Worse
Type a new airport identifier.	Same	Worse
Enter	Same	Worse
Add each of the following waypoints in the same manner.		
KPRC	Same	Worse
LOTKE	Same	Worse
EIS		
For GDUs with integrated EIS only.		
Home	Same	Worse
Engine	Same	Worse
Advance selector through each EGT/TIT cylinder.	Same	Worse
Toggle Lean Mode key on and off.	Same	Worse
Menu	Same	Worse

Glove Qualification Procedure

TASK	OPERATION WITH GLOVE (CIRCLE ONE)	
Engine Advisories	Same	Worse
Type a temperature value for the High Oil TEMP advisory.	Same	Worse
Enter	Same	Worse
Return temperature value to its previous setting.	Same	Worse
Back	Same	Worse
Engine & Flight Hours	Same	Worse
Back	Same	Worse
Exit menu.	Same	Worse

Table A-2 Tasks Not Required for Glove Qualification

TASK	OPERATION WITH GLOVE (CIRCLE ONE)	
PFD		
Menu	Same	Worse
HSI Setup	Same	Worse
Enable HSI Map.	Same	Worse
Exit menu.	Same	Worse
With one finger on the map, swipe up to zoom in, swipe down to zoom out.	Same	Worse
MFD		
Open the Map page.	Same	Worse
With two fingers on the map, stretch to zoom in, pinch to zoom out.	Same	Worse
With one finger on the map, swipe in any direction to pan.	Same	Worse
Menu	Same	Worse
Map Setup	Same	Worse
Drag to the bottom of the Map tab list.	Same	Worse
LAT/LON Lines	Same	Worse
Exit menu.	Same	Worse
EIS		
None.		

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