GENESYS AEROSYSTEMS
a Moog Company

IDU-680 EFIS Software Version 9.0B (Rotorcraft)

Pilot Operating Guide and Reference

(Rotorcraft)

IDU-680 EFIS Software Version 9.0B

Document 64-000098-090B

This pilot guide must be carried in the aircraft and made available to the pilot at all times. It can only be used in conjunction with the Federal Aviation Administration (FAA) approved Rotorcraft Flight Manual (RFM). Refer to the applicable RFM or Rotorcraft Flight Manual Supplement (RFMS) for aircraft specific information, such as unique ground tests, limitations, and emergency procedures.

Cover Image: Turnagain Arm, Anchorage, Alaska

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Revision Record

Rev	Notes/Pages changed, added, or deleted by current revision	Date	Author

Retain this record in front of pilot guide. Upon receipt of a revision, insert changes and complete table below.

Revision or Edition	Revision Date	Insertion Date/Initials

Section 1 Introduction

1.1. Introduction

The Genesys Aerosystems Electronic Flight Instrument System (EFIS) is a "pilot-centered" system. While still highly automated, it presents the pilot with information necessary to make decisions and take appropriate actions. For example, the Highway-in-the-Sky (HITS) allows for highly automated approaches, but its predictive nature provides the pilot awareness of upcoming maneuvers. Instead of overloading the pilot with information and options, the Genesys Aerosystems EFIS presents only necessary information to reduce workload, decrease task complexity, and minimize confusion, which results in safer flying with less stress and fatigue.

1.2. EFIS/FMS Description

Figure 1-1: IDU-680 Input Identification

The integrated display unit (IDU) has 16 buttons along the vertical sides referenced as L1 through L8 starting at the top left corner of the display, moving down, and R1 through R8 from the top right corner, moving down the display from a pilot's perspective.

Four knobs at the bottom of the bezel are designated, from left to right, ❹,❸,❷, and ❶. References throughout this guide refer to which knob to push and rotate for desired outcomes but ❹ only controls the backlighting intensity.

A sensor on the face of the IDU bezel measures ambient light levels. Use ❹ to control the brightness of the panel or display lighting. To adjust panel lighting (illumination of legends, knobs, inclinometer, and buttons), push and rotate ❹ clockwise to increase or counterclockwise to decrease. Adjust display lighting (illumination of the LCD) without pushing rotate ❹ as described with panel lighting. Lighting may be controlled locally or remotely, with a default state being with the local control.

On the bezel between the two center knobs, a slip indicator or blank housing acts as the USB memory door. Lift it before power-up to initiate the ground maintenance mode after power-up. If a limits change, software, or database update is planned, the USB drive must be inserted before power-up.

NOTE:

If entering ground maintenance mode with bright light shining or reflecting directly into the display, shield the light sensor to avoid the IDU from going directly into the flight mode.

1.3. About This Guide

Operation of the Genesys Aerosystems EFIS is described in detail and divided into sections as follows:

TABLE OF CONTENTS: Locate areas by topic

INTRODUCTION (Section 1): Basic explanation of the pilot guide.

SYSTEM OVERVIEW (Section 2): Description of system and hardware; IDU behavior during initialization; warning alerts, time-critical warning alerts, master visual and aural alerts caution alerts, and advisory alerts with conditions; coloring conventions; abbreviations and acronyms; and database update procedures. Demonstrator mode; and EFIS Training Tool description.

DISPLAY SYMBOLOGY (Section 3): Identification of each screen element of the primary flight display (PFD) and multi-function display (MFD), and explanation of symbology.

REVERSIONARY MODES (Section 4): Views of displays with various sensor failed conditions and resulting symbology, as well as, examples of various configurations and display formats used with specific tables showing affected functions. Explanation of what to expect when a particular sensor fails and what changes on the display immediately or after a specified amount of time.

MENU FUNCTIONS AND STEP-BY-STEP PROCEDURES (Section 5): Menu structure of each feature and step-by-step procedures for operation of each task. Basic description of all knob and button functions with menu tile definitions.

QUICK START TUTORIAL (Section 6): Basics necessary for flying a flight with this system. Includes simple steps to manage displays for existing flight conditions to quickly gain familiarity with location of controls to manipulate the system for each operation.

IFR PROCEDURES (Section 7): Detailed information and instruction about selecting and flying instrument procedures with examples of the most popular published procedures with views of referenced published procedures. Includes descriptions of selection of departure, published instrument approach, standard terminal arrival procedures, as well as, how the active flight plan quickly reflects changes to ATC clearances.

TERRAIN AWARENESS WARNING SYSTEM (Section 8): Description of Enhanced HTAWS and HTAWS functionality for this aircraft with all configurations. Defines the various parameters, which automatically apply to each mode of flight.

APPENDIX (Section 9): Contains support material and other useful information about system operation, guidance from Jeppesen, flight planning, data logging retrieval, supplementary information, and regulatory references.

APPENDICES: Traffic, Remote Bugs Panel, WX-500 Lightning Strikes, Datalink, Weather Radar, Round Dials, Search and Rescue Patterns, Electronic Circuit Breaker Unit (ECBU), and Video. Sections on equipment and features not installed in every aircraft may be removed at the discretion of the end-user.

INDEX: Alphabetical listing of terms or keywords with corresponding page numbers.

GLOSSARY: Alphabetical listing of definitions for terms.

Section 2 System Overview

2.1. Abbreviations and Acronyms

µm Hg	Micrometer of Mercury
0R	No Radius
3D	Three-Dimensional
AC	Advisory Circular
ACTV	Active
ADAHRS	Air Data Attitude Heading Reference System
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADS-B	Automatic Dependent Surveillance-Broadcast
AFCS	Automatic Flight Control System
AGL	Above Ground Level
AHRS	Attitude Heading Reference System
AIRAC	Aeronautical Information Regulation and Control
AIRMET	Airmen's Meteorological Information
ALT	Pressure Altitude
ALT SEL	Altitude Selection
AMLCD	Active Matrix Liquid Crystal Display
ANP	Actual Navigation Performance
ANT	Antenna
AOA	Angle of Attack
AP	Autopilot
APP	Waypoint is part of an Instrument Approach Procedure
APPR	Approach
APT	Airport
APV	Approach with Vertical Guidance
ARINC	Aeronautical Radio, Inc.
ARL	Auto Range Limiting (RDR-2100)
ARTCC	Air Route Traffic Control Center
AS	SAE Aerospace Standard
ASEL	Aircraft Selected Altitude
ATC	Air Traffic Control

ATT	Attitude
Baro	Barometric setting
Baro-VNAV	Barometric Vertical Navigation
BC	Backcourse navigation
BFO	Beat Frequency Oscillator
B-RNAV	European Basic RNAV
BRT	Brightness
BTM	Bottom
C	Celsius
CA	Course to Altitude (ARINC-424 Leg)
CALC	Calculate RAIM Prediction
CAS	Crew Alerting System
CD	Course to DME Distance (ARINC-424 Leg)
CCW	Counter Clockwise
CDA	Continuous Descent Approach
CDI	Course Deviation Indicator
CF	Course to Fix (ARINC-424 Leg)
CI	Course to Intercept (ARINC-424 Leg)
CLR	Clear
CNX	Cancel
COM	Communication
CONT	Continue
CPLT	Co-Pilot
CPM	Computer Processor Module
CPU	Central Processing Unit
CR	Course to Radial Termination (ARINC-424 Leg)
CRC	Cyclic Redundancy Check
CRS	Course
CSA	Conflict Situation Awareness (ADS-B)
CTRST	Contrast
CW	Clockwise
DA	Decision Altitude
dB	Decibel
dBZ	Decibel relative to radar reflectivity (Z)

DCLTR	Declutter
DCND	Descend
DEC HT	Decision Height Bug
DEL	Delete
DESIG	Designate
DF	Direct to Fix (ARINC-424 Leg)
DFLT	Default
DG	Directional Gyro
DH	Decision Height
DLNK	Datalink
DME	Distance Measuring Equipment
DO	RTCA Document
DOD	Department of Defense
DP	Departure Procedure
DTG	Distance to Go
DR	Dead Reckoning
ECBU	Electronic Circuit Breaker Unit
EFIS	Electronic Flight Instrument System
EGM	Earth Gravity Model
EGNOS	European Geostationary Navigation Overlay Service
EGPWS	Enhanced Ground Proximity Warning System
EQPMNT	Equipment
ESSNTL	Essential
ETA	Estimated Time of Arrival
ETE	Estimated Time En route
ETT	EFIS Training Tool
EXCD	Exceedance
EXPND	Expand (also EXP)
F	Fahrenheit
FA	Course from a Fix to Altitude (ARINC-424 Leg)
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAR	Federal Aviation Regulation

FAS	Final Approach Segment (DO-229D and AC20-129 reference)
FAWP	Final Approach Waypoint (same as FAF)
FC	Course Fix to Along-Track Distance (ARINC-424 Leg)
FD	Course from a Fix to DME Distance (ARINC-424 Leg); Flight Director
FDE	Fault Detection and Exclusion
FG	Fixed Gear
FIS	Flight Information Service
FIS-B	Flight Information Service-Broadcast
FL	Flight Level
FLTA	Forward Looking Terrain Awareness
FM	Course from Fix to Manual termination (ARINC-424 Leg)
FMS	Flight Management System
FOV	Field of View
FPAP	Flight Path Alignment Point
FPL	Flight Plan
fpm	Feet per minute
FPM	Flight Path Marker
FPNM	Feet Per Nautical Mile
FRT	Fixed-Radius Transition
FSD	Full Scale Deflection
FT	Feet
FTE	Flight Technical Error
FTP	Fictitious Threshold Point
FNCT	Function
GAGAN	India’s GPS and GEO-Augmented Navigation System
GARP	GNSS Azimuth Reference Point
GBAS	Australia’s Ground Based Augmentation System
GLS	GNSS Landing System
GMAP	Ground Map mode (RDR-2100)
GMETAR	Graphical METAR (also GMTR)
GMF	Ground Maintenance Function
GN	Gain
GND	Ground

GNSS	Global Navigation Satellite System
GPI	Glide Path Intercept
GPIP	Glide Path Intercept Point
GPS	Global Positioning System
GPSV	Global Positioning System Vertical Navigation
GPWS	Ground Proximity Warning System
GS	Glide Slope; Ground Speed
H	Hold
HA	Terminates at an altitude (ARINC-424 Leg)
HF	Holding, Pattern to Fix (ARINC-424 Leg)
HM	Altitude or Manual Termination (ARINC-424 Leg)
HAL	Horizontal Alert Limit
HAT	Height Above Threshold
HDG	Heading
HFOM	Horizontal Figure of Merit
hh:mm:ss	Hours: Minutes: Seconds
HITS	Highway in the Sky
HLTH	Health
HORIZ	Horizontal
HOTAS	Hands on Throttle and Stick
hPa	Hectopascal
HPL	Horizontal Protection Level
HSI	Horizontal Situation Indicator
HUD	Head Up Display
IAP	Instrument Approach Procedure; Initial Approach Point
IAS	Indicated Airspeed
IAWP	Initial Approach Waypoint (same as IAP)
ICAO	International Civil Aviation Organization
ID	Identity or Identification
IDU	Integrated Display Unit
IF	Initial Fix leg
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IM	Inner Marker

INFO	Information
INHBT	Inhibit
inHg	Inches of Mercury
INIT	Initialize
IO	Input/Output
IP	Initial Point
IPV	Instrument Procedure with Vertical Guidance
ISA	International Standard Atmosphere
IVSI	Instantaneous Vertical Speed Indicator
IWP	Intermediate Approach Waypoint
K	Kilo = 1000
KB	Kilobyte
kHz	Kilohertz
KIAS	Knots Indicated Airspeed
KM	Kilometers
Km/h	Kilometers per Hour
KT	Knot - Nautical Mile per Hour
KTAS	Knots True Airspeed
LAT	Latitude
lbs	Pounds
LCD	Liquid Crystal Display
LCL	Local
LDA	Localizer-type Directional Aid
LED	Light Emitting Diode
LGND	Legend
LIFR	Low IFR conditions (Ceiling < 100’ or visibility < 1 mile)
LIN	Linear
LNAV	Lateral Navigation
LOC	Localizer
LOI	Loss of Integrity
LON	Loss of Navigation; Longitude
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
LTP	Landing Threshold Point

LVL	Level
MA	Waypoint is part of the missed approach segment of an Instrument Approach Procedure
MAGVAR	Magnetic Declination (Variation)
MAHP	Missed Approach Holding Point
MAHWP	Missed Approach Holding Waypoint (same as MAHP)
MAN	Manual
MAP	Missed Approach Point; Missed Approach Procedure
MASPS	Minimum Aviation System Performance Standard
MAWP	Missed Approach Waypoint (also MAWPT)
mbar	Millibars
MDA	Minimum Descent Altitude
MESO	Mesocyclonic
METAR	Routine hourly weather report
MFD	Multifunction Display
MIN	Minimum
MM	Middle Marker
MOA	Military Operations Area
MOT	Mark On Target
M/S	Meters per second
MSAS	Japan’s MTSAT-based Satellite Augmentation System
MSG	Message
MSL	Mean Sea Level
MVFR	Marginal Visual Flight Rules
NAS	U.S. National Airspace System
NAV	Navigation
NAVAID	Device or system providing navigational assistance
ND	Navigation Display
NDB	Nondirectional Beacon
NEXRAD	(Next-Generation Radar) network of weather radars operated by the National Weather Service (NWS) (also NXRD)
NIMA	National Imagery and Mapping Agency
NM	Nautical Mile
NRST	Nearest

nT	Nanoteslas (ref. World magnetic Model)
NWS	National Weather Service
OASIS	Open Architecture Systems Integration Symbology
OAT	Outside Air Temperature
OBS	Omnibearing Selector
ODP	Obstacle Departure Procedure
OF	Over-fly
OM	Outer Marker
OT	Other Traffic (Traffic Function)
PA	Proximate Advisory (Traffic Function)
PDA	Premature Descent Alert
PFD	Primary Flight Display (also refers to the primary IDU with software that only shows primary flight instrumentation)
PFI	Primary Flight Information
PI	Procedure Turn (ARINC-424 Leg)
PLT	Pilot
PM	Personality Module
PN	Part Number; Pan
PPOS	Present Position
PROC	Procedure
PRN	Pseudo-Random-Noise (Satellite communications)
PRS	Press
PRV	Previous
PSH	Push
PTK	Parallel offset (Parallel Track)
PTRS	Pointers
PWR	Power
QFE	Altimeter setting provides height above reference point
QNE	Altimeter setting provides pressure altitude readout
QNH	Altimeter setting provides MSL altitude at a reporting point
RA	Resolution Advisory (Traffic Function)
RADALT	Radar Altimeter (also RALT)
RAD-DST	Radial and Distance
RAIM	Receiver Autonomous Integrity Monitoring

RCP	Radar Control Panel
RDR	Radar
REC	ADF in Receive mode or DF in receiver or test mode
RF	Precision Arc to Fix (ARINC-424 Leg)
RG	Retractable Gear
RFM	Rotorcraft Flight Manual
RFMS	Rotorcraft Flight Manual Supplement
RHT	Radar Height
RMI	Radio Magnetic Indicator
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP APCH	Required Navigation Performance Approach
RNP AR-APCH	RNP approach procedure that requires special aircraft and aircrew authorization.
RTC	Required terrain clearance
RTCA	Radio Technical Commission for Aeronautics
RTD	Resistive Thermal Detector
RW	Runway
RX	Radio Receive indication
SAE	Society of Automotive Engineers
SAR	Search and Rescue
SAT	Saturation
SATLT	Satellite
SBAS	Satellite-Based Augmentation System
SCC	System Configuration Card (personality module)
SECAM	Analog color television system used in France
SI	International System of Units
SIC	Side-in-Command
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Advisory
SSM	Sign Status Matrix
STAB	Stability
STAR	Standard Terminal Arrival Routes
STBY	Stand-by

STD	Standard
STRKS	Strikes (Lightning detection)
SVN	Synthetic Vision (Tapes configuration in PFI area)
SVS	Synthetic Vision System
SYMB	Symbol
SYNC	Synchronize
SYRD	System Requirements Document
TA	Traffic Advisory (Traffic Function)
TACAN	Ultra-High Frequency Tactical Air Navigational Aid
TAFs	Terminal Aerodrome Forecasts
TAS	Traffic Advisory System; True Airspeed
TAWS	Terrain Awareness and Warning System
TCA	Terminal Control Areas
TCAD	Traffic Collision Alert Device
TCAS	Traffic Collision Alert System
TD	Terrain Data
T/D	Top of Descent
TERPS	Terminal Instrument Procedures
TF	Track to a Fix; Track from Fix to New Fix (ARINC-424 Leg)
TFR	Temporary Flight Restriction
TGT	Target
THLD	Radio microphone threshold
TIS	Traffic Information Service
TIS-B	Traffic information Service-Broadcast
TOAC	Time Of Arrival Control
TLT	Tilt (WX-RDR)
TRANS	Transition
TRK	Track
TRNDO	Tornadic
TSO	Technical Standard Order
TTA	Time to Alert
TTG	Time to Go
TURB	Turbulence
TX	Radio Transmit

USB	Universal Serial Bus, data storage device
USR	User Waypoint
UTC	Universal Time Coordinated
VA	Heading to Altitude (ARINC-424 Leg)
VAL	Vertical Alert Limit
VD	Heading to DME Distance (ARINC-424 Leg)
VDI	Vertical Deviation Indicator
VERT	Vertical
VFOM	Vertical Figure of Merit
VFR	Visual Flight Rules
VHF	Very High Frequency
V_{HOLD}	Aircraft's normal speed (in airspeed units configured in EFIS limits) for flying holding patterns. Value is used for calculating the turn radius of holding patterns.
VI	Heading to Intercept (ARINC-424 Leg)
VLOC	VOR/Localizer
VLON	Vertical Loss of Navigation
VM	Heading to Manual Termination (ARINC-424 Leg)
VNAV	Vertical Navigation (also VNV)
V_{NE}	Never exceed speed
V_{NO}	Maximum structural cruising speed or maximum speed for normal operations
VOR	VHF Omnidirectional Radio
VORTAC	Collocated VOR and TACAN
VP	VFR waypoints (five digits beginning with "VP")
VPL	Vertical Protection Level
V_{PROC}	Procedure Speed
VR	Heading to Radial Termination (ARINC-424 Leg)
VS	Vertical Speed
VSI	Vertical Speed Indicator
VTF	Vectors to Final
V_{TOS}	Minimum speed for a positive rate of climb with one engine inoperative
WAAS	Wide Area Augmentation System
WGS84	World Geodetic System 1984

WOG	Weight on Ground
WOW	Weight on Wheels
WPT	Waypoint
WX	Weather
WXA	Weather-alert (RDR-2100)
XFILL	Crossfill

2.2. System Overview

The IDU-680 is a complete flight and navigation instrumentation system providing information via computer-generated displays. The displays include 3D, enhanced situational awareness primary flight display (PFD) and multi-function display (MFD), which may be configured to show a Moving Map, HSI, Navigation Log (NAV LOG), WX-500 (Lightning) Traffic, WX-RDR, Video, or Datalink page.

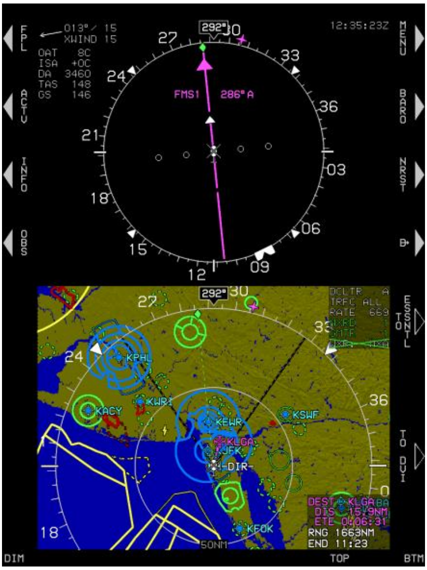
At any given time, each EFIS side, only has one IDU transmit enabled to send RS-232 and RS-422 system transmissions. By default, the PFD is transmit enabled and, if it subsequently fails, the respective MFD becomes transmit enabled.

The EFIS limits in Table 2-1 settings are possible when speed units are set accordingly.

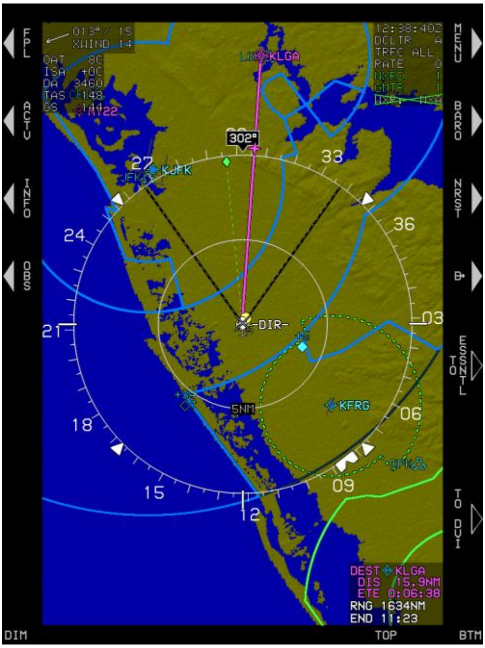
Table 2-1: EFIS Limits Options for Speed Units

	Airspeed Units Set To	
Parameters	Knots, MPH, or Km/h	SI
Airspeed	Knots, MPH, Km/h	Km/h
Altitude	Feet	Meters
Distance	NM	KM
Ground speed	Knots	Km/h
Temperature	°C or °F	°C
True Airspeed	Knots	Km/h
VSI	Fpm	M/S
Wind	Knots	M/S

In an IFR installation, the primary IDU-680 is configured so only the primary flight information (PFI) in the top area and a multi-function display (MFD) page in the bottom area are displayed.



PFD and Map Page MFD



MFD with Full Map Page

Figure 2-1: Display Options

NOTE:

Where distances are stated in NM or KM and altitudes are stated in Feet or Meters, the following statement applies: "depending upon the setting of the "Speed Units" system limit."

Table 2-2 describes the EFIS limits set for all screen captured views for this pilot guide development except where different settings are noted.

Table 2-2: Pertinent EFIS Limits Settings

Category	Setting
Screen Position Settings: Screen Number Aircraft Type	 #1 or #2 as specified Generic
Speed Settings: Airspeed Scale Type Airspeed Units Pilot-side analog configuration Digital configuration	 FAR 29.1545 Knots or "SI" units where depicted, Tapes Rolling (or Pure Digital where depicted)
Optional Sensor Settings: Datalink Receiver TAWS Type Traffic Sensor WX-500 (STRIKES) SAR Patterns NAV Preview ADF Navigation	 ADS-B HTAWS TCAD/TAS (RS-232) Installed Enabled Disabled Disabled
Airframe Settings: Landing Gear Configuration Same *** CAS Caution Enabled Temperature Units Map Encoder Rotation Landing Gear Maximum AGL Display Minimum Obstacle Height Roll Indicator Type Slip-Skid Display Minimum Runway length Positive G-Limit Negative G-Limit Show Full MFD Status Show MFD Density Alt	 Fixed (or Retractable where depicted) Disabled (If enabled "CAUTIONS") °C CW increase. CCW decrease Range (MAP/WX RDR) Fixed (or Retractable where shown) 2500' 0' Sky Pointer Enabled 0' N/A N/A Enabled Enabled

Table 2-2: Pertinent EFIS Limits Settings	
Category	**Setting**
Show MFD ISA Temp Deviation Show MFD True Airspeed	Enabled Enabled
Autopilot Settings: Autopilot Type Flight Director Flight Director on Side-in-Command	 Analog Enabled Disabled
Basic Sensor Settings: Remote Tuning ADF System ADC System Baro Autosetting on Startup Synch pilot/Copilot Baro AHRS System Analog interface unit DME System EFIS System Cockpit Arrangement Pilot Position GPS System Radar Altimeter Dual DH Baro Agl VOR System	 Cobham CD/Honeywell … Dual Dual Enabled Enabled Dual Installed Dual RC DME4000 Dual (Pilot-Side defaults to #2 Sensors) Side-by-Side Right Dual Dual Disabled Enabled Dual
Video Input Settings: VIDEO-1 Zoom = Enabled VIDEO-2 Zoom = Enabled VIDEO-3 Zoom = Disabled VIDEO-4 Zoom = Enabled VIDEO-5 Zoom = Enabled DVI Enabled	 Force NTSC Label = FLIR Force NTSC Label = TAC MAP Force NTSC Label = D-MAP Force NTSC Label = MISSION Force NTSC Label = <default> Pilot Screen 2
Weather Radar Settings: WX RDR Enable Screen #1 WX RDR Enable Screen#2 WX RDR Enable Screen#3 WX RDR Enable Screen #4 WX RDR Type External Radar Control Panel Radar Scan Width	 Enabled Enabled Disabled Disabled Honeywell RDR-2100 Not Installed 100° (± 50°)
Discrete Input Settings: GPI# 1 GPI# 2	 Warning/Caution Acknowledge Outer Marker

Table 2-2: Pertinent EFIS Limits Settings	
Category	**Setting**
GPI# 3	Middle Marker
GPI# 4	Inner Marker
GPI# 5	GPS Offside Select
GPI# 6	Fan Status
GPI# 7	AHRS Offside Select
GPI# 8	ADC Offside Select
GPI# 9	TAWS Inhibit
GPI# 10	HTAWS Low Altitude
GPI# 11	Crossfill Inhibit
GPI# 12	Weight On Ground/Wheels
AIU# 3	
Aircraft Fuel Settings:	
Fuel Totalizer	Enabled
Fuel Tank Count	2
Fuel Flow Count	2
Unmonitored Fuel	TRUE
Volume Units	Lbs. (Jet Fuel)
Aircraft Total Fuel QTY	2000
Aircraft Main Fuel Quantity	1000
Totalizer Fuel Increments	50
Aircraft low Fuel Caution	200
Aircraft Low Fuel Alarm	50
Wing Tank Split Caution	Disabled
Totalizer Mismatch Caution	Disabled
Fuel Tank #1 Settings:	
Tank Type	Aux Tank
Fuel Tank QTY	1000 LBS
Fuel Tank Caution	200 LBS
Fuel Tank Alarm	100

2.3. Functional Integration and Display Redundancy

IDUs incorporate a high-brightness liquid crystal display screen; bezel pushbuttons; four rotary knobs and enter switches. Because the receive ports of the IDUs are connected to the digital sensor modules in parallel, each IDU is independent from all other IDUs.

The IDUs depend upon intra-system (between IDUs on a side – “Sync”) and inter-system (between IDUs on opposite sides – “Crosslink”) to achieve synchronization of the integrated functions. The IDUs also depend upon intra-system communications to determine which IDU on a side takes over transmit-enabled responsibilities. The transmit-enabled IDU is the IDU providing data to external sensors and generating visual and audible alerts. Figure 2-2 is a typical system diagram.

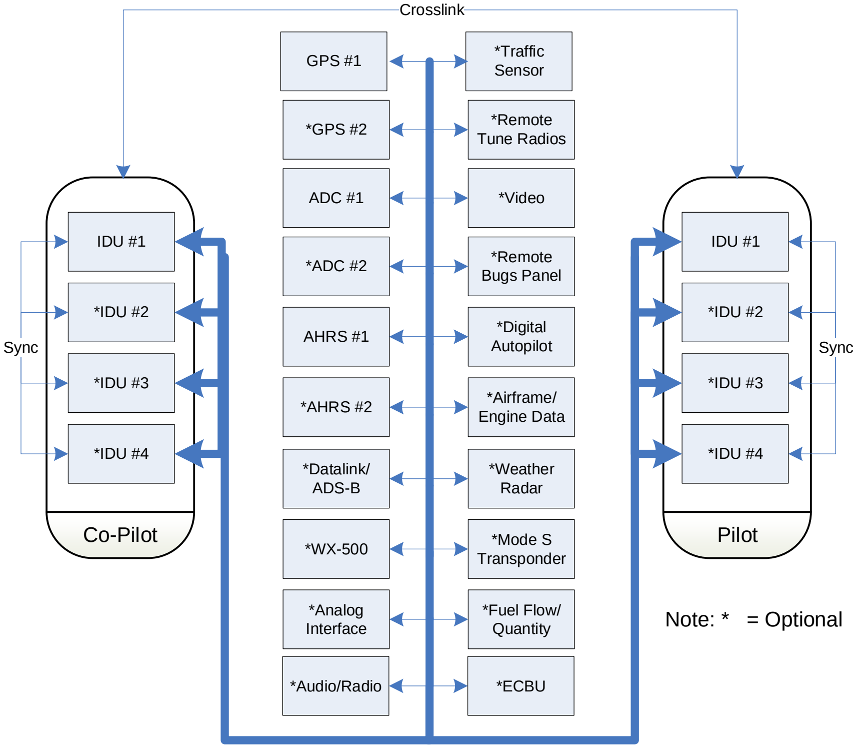


Figure 2-2: System Diagram

2.4. Application Software Air Mode and Ground Mode

Numerous symbology elements change behavior depending upon whether the aircraft is on the ground (ground mode) or in flight (air mode). Mode is determined separately from the system initialization modes. This parameter is continuously calculated as follows:

1) If airspeed is valid and AGL altitude is valid, ground mode is set when indicated airspeed is less than 30 knots, and AGL altitude is less than 75 feet.

2) If airspeed is invalid but AGL altitude is valid, ground mode is set when AGL altitude is less than 75 feet.

3) Under any other circumstance, air mode is set by default.

NOTE:

The application software for air mode or ground mode uses the following parameters:

Ground speed and airspeed - Knots
Altitude - Feet

2.5. IDU Initialization

Figure 2-3: IDU-680 Initialization Screen

On power up, the hardware, including file system, IO, and graphics, is initialized. Immediately after graphics initialization, a screen with “INITIALIZING” is displayed with the Genesys Aerosystems logo, software version number, and part number. The software version number defines: major revision number (i.e., “9.0”) and minor revision letter (i.e., “B”).

Table 2-3: IDU Software Version and Part Number

Version Number	Part Number
Rev 9.0B	25-680EFIS90B-SW-xxxx (IDU-680 CPM4)
	25-680EFIS90B-SW-xxxx (IDU-680 CPM5L)
	25-680EFIS90B-SW-xxxx (IDU-680 CPM5C)

NOTE:

Software part numbers can change after initial certification and are amended with installation manual changes or service bulletin issuance.

Table 2-4: CPU/IDU Number Designation	
CPU Number/IDU#	**Definition**
0	Single IDU installation
1	IDU only shows PFD
2	First MFD in multi-screen installation
3	Second MFD in a multi-screen installation
4	Third MFD in a multi-screen installation

Pilot IDU #1 reads aircraft configuration from its personality module. In a multi-screen installation, IDU #1 transmits this configuration to the other IDUs. The other IDUs save the transmitted configurations to flash drive storage.

Aircraft configurations are initially read from flash drive storage to provide IDUs with a default configuration setup in the event of personality module failure. Aircraft parameters (latitude, longitude, altitude), as they existed prior to the last system shutdown, are read for a good system initialization, even if system sensors are failed or not yet initialized. For future updates (i.e., updating software version 9.0B to 9.0C), all aircraft settings re-initialize to default values. Otherwise, aircraft settings, as they existed prior to the last system shutdown, are used to initialize the system except for the following default values:

1) Selected sensors are initialized to default values.
2) Active flight plan structure and associated values are cleared.
3) ADAHRS are set to slaved mode and the slewing value is initialized to zero.
4) Timers are turned off.
5) Datalink and map panning modes are set to off.
6) Fuel caution and alarm thresholds are set to default values.
7) Heading bug is set to 360° (HeliSAS-E enabled) or turned off.
8) Heading mode is turned off.
9) HSI navigation source is set to FMS.
10) HSI Preview navigation source is turned off (If NAV PRV enabled)
11) Horizon synchronization status is set to disabled.
12) Minimum altitude setting is turned off.

13) FMS OBS setting is set to automatic.

14) VOR/LOC 1 OBS setting is set to 360°.

15) VOR/LOC 2 OBS setting is set to 360°.

16) ADF1 OBS setting is set to 360°.

17) ADF2 OBS setting is set to 360°.

18) Parallel offset is set to 0 NM or KM.

19) PFD zoom mode is set to off.

20) Manual RNP is set to off.

21) If in round dial mode, analog AGL is set to off.

22) PFD skyway is set to on.

23) Vertical speed bug is turned off.

24) Target and preselected altitude bugs are turned off.

25) True North mode is turned off.

26) Airspeed speed bug is turned off.

27) If using weather radar menu, weather radar mode is set to off, vertical profile is set to off and stabilization is set to on.

28) Weather radar scale is initialized to 80NM. When using kilometers for radar scale, initialized to 160KM.

29) Crosslink is initialized to on.

30) Map modes are set to allowed values.

31) With DVI option, DVI is set to off.

32) Essential mode is set to off.

33) Traffic page flight level set to off.

34) All data link products selected for display.

Based upon the air/ground mode parameter value from the last system shutdown, the EFIS decides whether it is booting on the ground or in flight.

If booting on the ground, the following actions happen:

1) A logo screen with “TESTING” is displayed for a number of seconds while the various hardware subsystems are initialized.

Figure 2-4: Logo Screen (CPM5L)

2) CRC-32 values for application executable, limitations files, NavData® files, obstruction files, sounds database, and terrain header files are checked.

   During this action, “PRESS ANY BUTTON TO QUICK START” is displayed below “TESTING.” Press any button to stop the ground booting and execute the flight booting.

3) If the built-in-test (BIT) check fails, the program exits with an error message and creates a BIT result file indicating failure.

4) If the BIT check passes, the program continues to initialize and creates a BIT result file indicating passage.

5) If “Baro Auto-Setting on Startup” is enabled in EFIS limits, the system auto-sets the altimeter based on the terrain elevation at the startup point (only applicable at surveyed airports.) In QFE mode operation, the system auto-sets the altimeter to read zero altitude.

6) A logo screen displaying:

   a) Software CRC-32;

   b) Aircraft type;

   c) ECBU configuration name and CRC-32, if configured;

   d) Sounds database name and CRC-32;

   e) Magnetic variation coefficients version and CRC-32; and

   f) Database versions and validity dates are displayed along with “PRESS ANY BUTTON TO CONTINUE.”

With Charts

Without Charts

Figure 2-5: CRC Screen

7) After a button is pressed, if all critical sensors (GPS, ADC, and AHRS) are in normal condition, the display screens are shown immediately. IDU #1 initializes to the PFD screen.

8) If any critical sensor is not in normal condition, a logo screen with a two-minute countdown timer is displayed along with “PRESS ANY BUTTON TO SKIP.”

Figure 2-6: Two-Minute Countdown Screen

9) The display screens initialize at the earliest of:

   a) When 2 minutes have elapsed;

   b) When the pilot presses any button to escape the startup countdown; or

   c) When all critical sensors are in normal condition.

10) Display screens initialize as follows:

   a) IDU #1: PFD Normal mode - PFI on top and an MFD page.

b) IDU #2: MFD pages on top and bottom.

c) All other IDUs on each side (when configured for pilot and co-pilot): MFD pages on top and bottom.

11) On all IDUs with fuel totalizer functions enabled, the fuel set menu is activated to remind the pilot to set the fuel totalizer quantity.

12) All active alerts are automatically acknowledged for 5 seconds to reduce nuisance alerting.

If booting in the air, the following actions happen:

1) A logo screen with “QUICK START” is displayed.

Figure 2-7: QUICK START Screen

2) BIT result file created during the last ground boot is checked.

a) Failure = indicates a failure, program exits with an error message.

b) Passage = program continues.

3) Display screens initialize immediately as follows:

a) IDU #1: PFD Normal mode (PFI on top and MFD page on bottom.)

b) IDU #2: MFD pages on top and bottom.

c) All other IDUs: MFD pages on top and MFD on bottom.

NOTE:

If any menu is active after IDU initialization, press **EXIT (R1)** on each display and wait at least 20 seconds to allow PFDs to synchronize with MFDs and pilot and co-pilot sides to synchronize. If any IDU menu is active, intra-system and inter-system synchronization messages are paused.

2.6. General Arrangement

The IDU-680 is 7.500”W x 10.250”H x 4.750”D and weighs less than 9.5 lbs. It has the capacity to accommodate integrated peripherals mechanically attached to the IDU but have electrical isolation and redundancy. These modules may include:

1) Integrated ADAHRS sensor module
2) Integrated GPS/SBAS sensor module
3) Serial protocol converters
4) Video format converters

IDU #1 is configured so only the primary flight information (PFI) in top area and MFD page in bottom area are displayed.

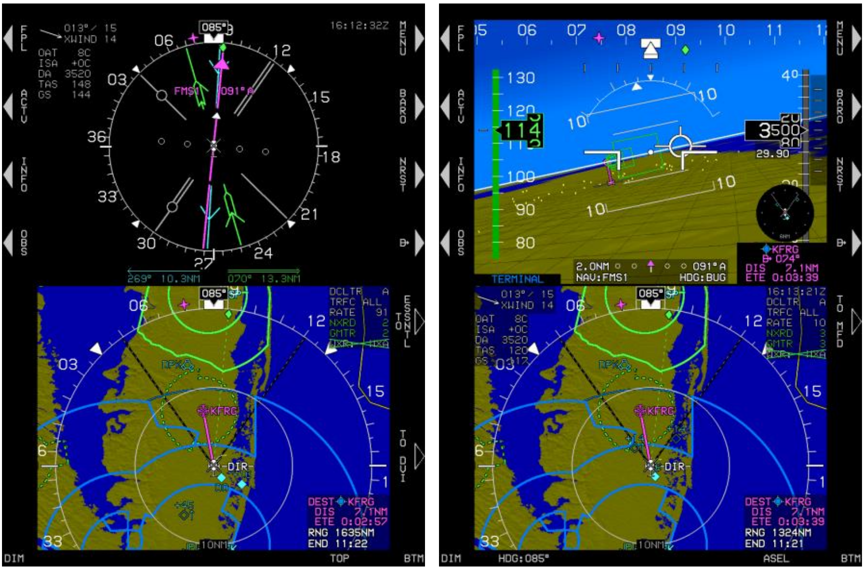
Data storage is sufficiently sized to hold world terrain, navigation, and obstruction databases. Because the receive ports are connected to the digital sensor modules in parallel, each IDU is independent from all others.

2.6.1. Normal and Essential Modes

IDU software has normal mode and essential modes. The PFD described in this pilot guide has only a normal mode and the MFD has normal and essential modes. See Section 3 Display Symbology for additional information. IDUs configured as #1 have a PFI page in the top area and a pilot-selectable multi-function page in the bottom area.

Press **(R5)** to toggle Normal and Essential modes. On PFD button is labeled **TO NORMAL** or **TO ESSNTL**. On MFD, button is labeled **TO ESSNTL** or **TO MFD**. Mode change is instantaneous.

If IDUs configured as #2, #3 or #4 are installed, their normal mode is pilot-selectable multi-function pages in both top and bottom areas.



MFD Normal Mode MFD Essential Mode

Figure 2-8: MFD Normal and Essential Modes

TAWS popups: When an FLTA alert is generated, a popup function enables PFI SVS and activates terrain at an appropriate scale and format on the moving map page (one of the multi-function pages). This is a required function of TSO-C194 for HTAWS (See Section 8 TAWS for more information.)

Traffic popups: When a traffic alert is generated, a popup function displays traffic on the PFI, moving map page, and mini traffic on the PFI (see Traffic appendix for more information).

2.6.2. Data Source Monitors

In installations with redundant sensors, IDUs continuously monitor the following sensors to detect disagreements:

1) Airspeed
2) Altitude
3) Attitude
4) Barometric setting (pilot vs. co-pilot sides)
5) GPS position, track, and ground speed
6) Heading
7) Localizer and glide slope deviations
8) Radar altitude

2.6.3. IDU Intra-System Communications

Communication between IDUs installed on the same system is referred to as intra-system communications. In a dual-sided (pilot and co-pilot) configuration, the crosslink system to system communications is referred to as inter-system communications. IDUs on a system side (pilot side and co-pilot side individually) monitor each other using intra-system communications and perform the following checks:

1) Intra-system communications freshness
2) Screen counter incrementing (i.e., screen not frozen)
3) Airspeed agreement
4) Altitude agreement
5) Attitude agreement
6) Barometric setting agreement
7) GPS position, track, and ground speed agreement
8) Heading agreement
9) Localizer and glide slope deviation agreement
10) Radar altitude agreement

2.6.4. GPS Aiding Limitation

To prevent gyro drift in the roll attitude solution, continuous corrections to roll attitude are made based upon speed, accelerations, and rates. The preferred correction speed source is airspeed from the air data computer (ADC). However, airspeed data becomes noisy and inaccurate as the aircraft slows, and the system automatically transitions to GPS ground speed (at approximately 55 KIAS) under these conditions.

When flying in a GPS-denied environment, be aware that flight below 55 KIAS could result in a degraded roll attitude solution. Therefore, avoid IMC conditions and crosscheck other attitude instruments when flying below 55 KIAS and transition to flight above 55 KIAS as soon as practicable.

2.7. Color Conventions

The EFIS uses a consistent set of colors to display information. Any color representation may not be identical as it appears on the IDU.

Table 2-5: Color Conventions

Color	Use(s)	Examples
WHITE	Items set by pilot and held by the EFIS or items where device feedback is not expected; marker beacon receiver high/low sensitivity	Scales markings (airspeed, altitude, heading, VSI, pitch, map ranges, etc.)

Table 2-5: Color Conventions

Color	Use(s)	Examples
	modes; scales, associated labels and figures; pilot action; or data entry. When used for an analog bar indication, light gray (low-intensity white) is used instead, as a large white area on the screen may be overwhelming.	Pilot-selected values (airspeed, heading, altitude) Secondary flight data (TAS, wind, OAT, timers, etc.)
CYAN	VOR #1, and IFR navigation dataset items. Information received from the device that is not related to a pilot setting.	Airports with instrument approach procedures, VORs, and intersections.
MAGENTA	Indicates calculated or derived data and certain navigation database items. Light magenta for visibility	Active waypoint related symbols. Course data (desired track, CDI). VFR airports, NDBs, VNAV altitudes, ACTV freq/codes, operating modes, and transmit-enabled indications.
GRAY	Background for airspeed and altitude readout and for conformal runway depiction Light gray for usable portion of active runway, dark gray for other runway surfaces	
GREEN	VOR #2, and to indicate normal or valid operation (airspeed, altitude tape coloring, status indication, etc.) Light green for visibility.	Aircraft ground track, skyway symbology, and airspeeds in green arc.
DARK GREEN	Terrain indication on moving map (slope between adjacent terrain determines the shade used).	
AMBER (YELLOW)	Identifies conditions requiring immediate pilot awareness and possible subsequent action. Currently used for DME hold indications. Loss of GPS navigation condition in all navigation symbology, including FMS active waypoint coloring.	

Table 2-5: Color Conventions

Color	Use(s)	Examples
OLIVE	In various shades shows terrain within 2000’ and below aircraft altitude.	
BROWN	In a variety of shades indicates earth/terrain portion of PFD or when above 100 feet less than aircraft altitude on MFD.	
BLUE	In a variety of shades indicates sky portion of PFD, bodies of water on moving map.	
RED	Indicates aircraft limitations or conditions, which require immediate pilot action, or a device failure (red “X”).	
BLACK	Field of view angle lines on moving map, figures on a gray background, and outlining borders and certain figures/elements on backgrounds with minimal contrast, e.g., airspeed, altitude, and menu tiles on the PFD/MFD.	

2.8. AHRS Fast Slave and Erect

If it becomes necessary to restore the heading and attitude references, the AHRS includes heading fast slave and attitude fast erect features, which can be performed when in approximately straight and level flight to ensure the best chance of providing valid observation for heading and attitude. See RFMS for nomenclature and location of switch or button.

2.9. Warning/Caution/Advisory System

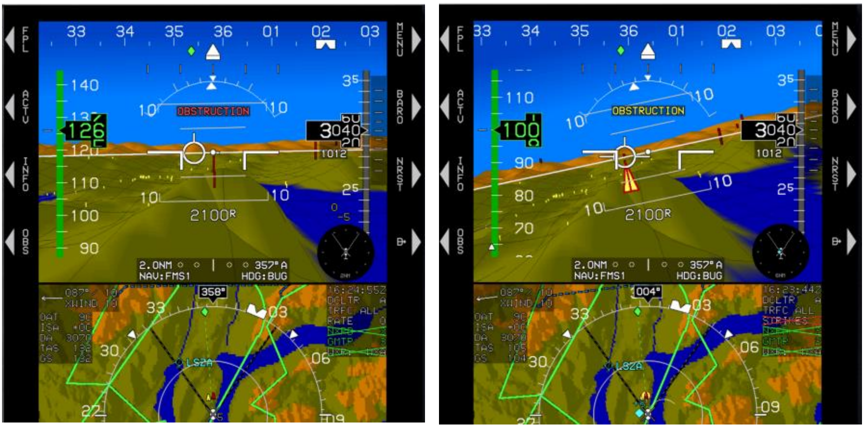
The IDU has an integrated audio/visual warning system, which monitors a wide variety of parameters and provides alerts for conditions that demand pilot action or awareness.

The following alerts are provided and described below:

1) Warning Alerts
2) Time-Critical Warning Alerts
3) Time-Critical Caution Alerts
4) Master Visual and Audible/Voice Alerts
5) Caution Alerts
6) Advisory Alerts

All warnings, including time-critical warnings, activate the warning (red) light and master caution light. All cautions, including time-critical cautions, activate the caution (yellow) light and master caution light. Once acknowledged, the flashing behavior stops, the audio alert is interrupted, and the discrete outputs are deactivated (as set in EFIS limits).

2.9.1. Time-Critical Warning and Caution Alerts



Time-Critical Warning Time-Critical Caution

Figure 2-9: Time-Critical Warning and Caution Alerts

Time-critical warning and caution alerts trigger the following elements (Table 2-6) and display in the pilot's primary field of view with a shaded background (Figure 2-9). EFIS limits may have enabled the option for time-critical alerts to illuminate a master warning/master caution push button annunciator when equipped.

> **NOTE:**
>
> The following examples show shaded backgrounds on sky and terrain backgrounds for readability.

Table 2-6: Time-Critical Warning and Caution Alerts in Primary Field of View

Alert Type	Text Color	Flash Rate	Audio Alert at Full Volume
WARNING WARNING	Red	2 Hz	Repeated until acknowledged

Table 2-6: Time-Critical Warning and Caution Alerts in Primary Field of View			
Alert Type	**Text Color**	**Flash Rate**	**Audio Alert at Full Volume**
CAUTION CAUTION	Amber (Yellow)	1 Hz	Plays only once

Table 2-7: Time-Critical Warning and Caution Alerts		
Visual Alert	**Voice Alert** **"--" No Voice Alert**	**Condition** **** No time delay**
OBSTRUCTION OBSTRUCTION	"Warning Obstruction, Warning Obstruction"	Obstruction within TAWS FLTA warning envelope. Half-second time delay.
TERRAIN TERRAIN	"Warning, Terrain, Warning Terrain"	Terrain cell within HTAWS FLTA warning envelope. Half-second time delay.
PULL UP PULL UP	"Terrain, Terrain, Pull Up, Pull Up"	Terrain cell within TAWS FLTA warning envelope. Half-second time delay.
		Within GPWS Mode 2 warning envelope. Half-second time delay.
	"Pull Up, Pull Up"	Within GPWS Mode 1 warning envelope. Half second time delay.
GLIDESLOPE GLIDESLOPE	"Glide Slope, Glide Slope"	Within GPWS Mode 5 warning envelope. Half-second time delay.
TRAFFIC TRAFFIC	"Traffic, Traffic"	Resolution advisory. Not given if own aircraft at or below 400' AGL nor if target is at or below 200' AGL (ground target). Audio not generated with TCAS-II. **
CHECK GEAR CHECK GEAR	"Check Gear, Check Gear"	If enabled in EFIS limits, activates if aircraft is below or 150' AGL, is descending, and any landing gear is not down. 2-second time delay.
TERRAIN TERRAIN	"Caution Terrain, Caution Terrain"	Terrain cell within TAWS FLTA caution envelope. Half-second time delay.
		Within GPWS Mode 2 caution envelope. Half-second time delay.
SINK RATE SINK RATE	"Sink Rate, Sink Rate"	Within GPWS Mode 1 caution envelope. Half-second time delay.

Table 2-7: Time-Critical Warning and Caution Alerts

Visual Alert	Voice Alert “--" No Voice Alert	Condition ** No time delay
TOO LOW TOO LOW	“Too Low Terrain, Too Low Terrain”	Within GPWS Mode 3 envelope. Half-second time delay.
		Within GPWS Mode 4-1 “Too Low Terrain” envelope. Half-second time delay.
	“Too Low Gear, Too Low Gear”	Within GPWS Mode 4-2 “Too Low Gear” envelope. Half-second time delay.
OBSTRUCTION OBSTRUCTION	“Caution Obstruction, Caution Obstruction”	Obstruction within TAWS FLTA caution envelope. Half-second time delay.
GLIDESLOPE GLIDESLOPE	“Glide slope, Glide slope”	Within GPWS Mode 5 caution envelope. Half-second time delay.
TRAFFIC TRAFFIC	“Traffic, Traffic”	Not given if own aircraft below 400’ AGL nor if target is below 200’AGL (ground target). Audio not generated with TCAS-II system. **
HRZ SYNC HRZ SYNC	-	Annunciates the Horizon Synchronization function is engaged. Annunciation does not flash or illuminate a master visual alert because it is not really a caution but instead a pilot selection annunciation. It is yellow because Horizon Synchronization symbology is yellow.

Time-critical warning and caution alerts are prioritized so only one alert at a time is active.

1) GPWS Mode 1 Warning
2) GPWS Mode 2 Warning
3) TAWS FLTA Warning
4) Obstruction Warning
5) TAWS FLTA Caution
6) Obstruction Caution
7) GPWS Mode 4-1
8) GPWS Mode 4-2
9) GPWS Mode 1 Caution
10) GPWS Mode 2 Caution
11) GPWS Mode 3
12) GPWS Mode 5 Warning

13) GPWS Mode 5 Caution
14) Check Gear
15) Traffic Warning (Resolution Advisory)
16) Traffic Caution (Traffic Advisory)
17) Horizon Synchronization Caution

2.9.2. Warning Alerts

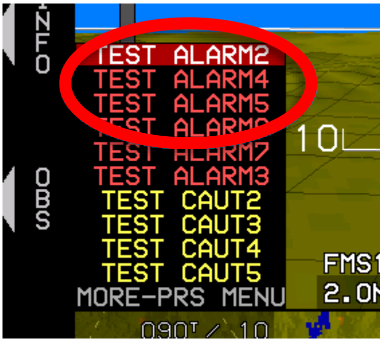


Figure 2-10: Warning Alerts

<table>
<tr><th colspan="4">Table 2-8: Warning Alert Elements</th></tr>
<tr><th>Visual Alert</th><th>Location</th><th>Flash Rate</th><th>Audio Alert</th></tr>
<tr><td>WARNING
WARNING</td><td>PFD lower left corner*</td><td>2 Hz</td><td rowspan="2">Repeated at full volume until acknowledged</td></tr>
<tr><td>Master Visual Alert</td><td>Amber (Yellow) warning light</td><td>1 Hz</td></tr>
<tr><td colspan="4">* In the lower-left corner of a transmit-enabled IDU PFI (PFI showing) or left corner of transmit-enabled IDU bottom area (PFI not showing.)</td></tr>
</table>

<table>
<tr><th colspan="3">Table 2-9: Warning Alerts</th></tr>
<tr><th>Visual Alert</th><th>Voice Alert/
Alert Tone</th><th>Condition
** No time delay</th></tr>
<tr><td>CHECK BREAKER</td><td>“Check Electric, Check Electric”</td><td>When configured. Only active when ECBU is configured and the alert condition exists for more than 1 second.**</td></tr>
</table>

Table 2-9: Warning Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition ** No time delay
LOW FUEL	"Fuel Low, Fuel Low"	One of the following conditions is true: 1) One of the Low Fuel Warning discrete inputs is active 2) One of the sensed fuel tank quantities is below its low fuel warning threshold 3) Total aircraft fuel is below the pilot-set emergency fuel threshold 1-minute time delay.
Duplicate Time-Critical Warning Alerts Covers the case where IDU#0 is not displaying the PFI		
OBSTRUCTION	"Warning Obstruction, Warning Obstruction"	Obstruction within TAWS FLTA warning envelope. Half-second time delay.
TERRAIN	"Warning, Terrain, Warning Terrain"	Terrain cell within HTAWS FLTA warning envelope. Half-second time delay.
PULL UP	"Pull Up, Pull Up"	Within GPWS Mode 1 warning envelope. Half-second time delay.
	"Terrain, Terrain" Pull Up, Pull Up"	Within GPWS Mode 2 warning envelope. Half-second time delay.
GLIDESLOPE	"Glide Slope, Glide Slope"	Within GPWS Mode 5 warning envelope. Half-second time delay.
TRAFFIC	"Traffic, Traffic"	Resolution Advisory. Not given if own aircraft at or below 400' AGL. Not given if target is at or below 200' AGL (ground target). Audio not generated with TCAS-II system.**

2.9.3. Caution Alerts

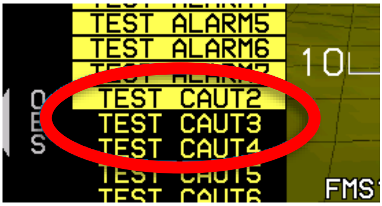


Figure 2-11: Caution Alerts

Table 2-10: Caution Alert Elements

Type Alert	Location	Flash Rate	Audio Alert
CAUTION CAUTION	PFD lower left corner of transmit-enabled IDU	1 Hz	Plays only once at full volume

Table 2-11: Caution Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
TERRAIN	"Caution, Terrain, Caution Terrain"	Terrain cell within TAWS FLTA caution envelope. Half-second time delay.
SINK RATE	"Sink Rate, Sink Rate"	Within GPWS Mode 1 caution envelope. Half-second time delay.
TOO LOW	"Too Low Terrain, Too Low Terrain"	Within GPWS Mode 3 envelope. Half-second time delay.
		Within GPWS Mode 4-1 "Too Low Terrain" envelope. Half-second time delay.
	"Too Low Gear, Too Low Gear"	Within GPWS Mode 4-2 "Too Low Gear" envelope. Half-second time delay.
TAWS AUTOROT	Alert Tone	TAWS autorotation mode activated through external switch. **

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
GLIDESLOPE	"Glide Slope, Glide Slope"	Within GPWS Mode 5 caution envelope. Half second time delay.
ADC1 FAIL ADC2 FAIL ADC1/2 FAIL	Alert Tone	Indicates no valid IAS, pressure altitude, nor VSI received from numbered ADC(s) for more than 1 second. ** [1]
ADS-B FAIL	Alert Tone	Mode-S transponder indicates bad ADS-B out status. 2-second time delay. Also, set by audio/radio interface with NGT-9000R transponder. 2-second time delay.
ADS-B DGRD	Alert Tone	ADS-B Out Degraded is active when audio-radio is configured. Indicates the ADS-B Out functionality of the interfaced transponder is degraded. Active when interfaced transponder supports ADS-B, transponder communication is not failed and the transponder status indicates ADS-B Out is degraded. 5-minute time delay. When interfaced with a dual transponder, the feedback received from the currently selected transponder is used for indicating the failure. ADS-B Datalink Degraded is active when the installed ADS-B Datalink System indicates invalid position data or receiver maintenance required. 5-second time delay. Invalid position data is ignored during and for 10 seconds after unusual attitude mode (position failure is expected during unusual attitudes due to antenna blocking). The "ADS-B FAIL" or "XPDR FAIL" caution has priority over this message.

Table 2-11: Caution Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
AHRS1 FAIL AHRS2 FAIL AHRS1/2 FAIL	Alert Tone	Indicates no valid bank, pitch, nor heading received from enumerated AHRS(s) for more than 1 second. Inhibited during and for 10 seconds after unusual attitude mode. ** [1]
AIU FAIL	Alert Tone	Only active when Aux Sensor Caution Split is not asserted in EFIS limits. No valid message received from installed Analog Interface System for more than 2 seconds. Sensor status also displayed in FAULTS menu. 5-second time delay.
AUX SENSOR	"Auxiliary Sensor Failure, Auxiliary Sensor Failure"	Only active when Aux Sensor Caution Split is not asserted in EFIS limits. AUX SENSOR is a collector message for the following: 1) AIU Failure; 2) Data Link Failure (non-ADS-B); 3) Strikefinder Failure; 4) TCAD/TAS System Failure; and 5) Weather Radar Failure. "Collector message" means that when the conditions for any of the above messages are met, this message will appear instead. Status of the above auxiliary sensors can be viewed in the FAULTS menu. 5-second time delay.
BEEP FAIL	Alert Tone	Only when HeliSAS is configured. Indicates HeliSAS beep trim failed. **
CHECK BREAKER	Alert Tone	Only active when ECBU is configured and the alert condition exists for more than 1 second.

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
PLT1 OVRTMP PLT2 OVRTMP PLT3 OVRTMP PLT4 OVRTMP CPLT1 OVRTMP CPLT2 OVRTMP CPLT3 OVRTMP CPLT4 OVRTMP	Alert Tone	IDU core temperature greater than 95°C. 2-second time delay.
PLT MISCOMP CPLT MISCOMP	Alert Tone	Only when fresh intra-system monitor messages are received. Indicates critical parameters used by displays on the indicated side exceed miscompare thresholds. Compares the following critical parameters: 1) Attitude (pitch and roll) 2) Heading 3) Pressure altitude 4) Indicated airspeed 5) Localizer (both inputs) 6) Glide slope (both inputs) 7) Radar altitude 8) Latitude 9) Longitude 10) Track 11) Ground speed 3-second time delay. Inhibited during and for 10 seconds after unusual attitude mode. [2]

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
PLT RANGE CPLT RANGE	"Check Range, Check Range"	Based on flight plan in use on indicated side, less than 30 minutes buffer (at current ground speed) between calculated range and distance to: 1) last waypoint if it is active; or 2) airport if on a missed approach; or 3) along-route distance to destination. Not activated in climbing flight nor if below 60 knots ground speed. 5-minute time delay.
GPS1 FAIL GPS2 FAIL GPS1/2 FAIL	Alert Tone	Indicates no valid message received from numbered GPS/SBAS for more than 5 seconds. ** Inhibited during and for 10 seconds after unusual attitude mode.
ALT MISCOMP	Alert Tone	Indicates pressure altitude difference between ADCs is beyond limits. 10-second time delay. Inhibit for 5 minutes after startup. [1]
ATT MISCOMP	Alert Tone	Indicates pitch or roll difference between AHRS is beyond limits (6°). 10-second time delay. Inhibit for 5 minutes after startup. [1]
PLT1 SCC PLT2 SCC PLT3 SCC PLT4 SCC CPLT1 SCC CPLT2 SCC CPLT3 SCC CPLT4 SCC	Alert Tone	Indicates personality module for designated IDU (side and IDU #) could not be read upon power-up. Internal limits are in use by the system. Only active on the ground.

Table 2-11: Caution Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
PLT1 TAWS PLT2 TAWS PLT3 TAWS PLT4 TAWS CPLT1 TAWS CPLT2 TAWS CPLT3 TAWS CPLT4 TAWS	Alert Tone	Indicates on the designated IDU (side and IDU #), aircraft is currently beyond extent of terrain database or a failure condition is preventing TAWS FLTA function from operating. Half-second time delay. Inhibited during and for 10 seconds after unusual attitude mode.
COOLING FAN	Alert Tone	Triggered when external cooling fan is commanded on by discrete output, but the cooling fan status discrete input indicates the cooling fan is not rotating. 1-minute time delay.
FUEL SPLIT	Alert Tone	Compares volume of fuel designated left wing tank fuel vs. right wing tank fuel to fuel split caution threshold. Issued if the difference exceeds fuel split caution threshold. Only performed if the fuel split caution threshold is non-zero and both left and right wing tank fuel is monitored and valid. 1-minute time delay.
LOW FUEL	"Fuel Low, Fuel Low"	Low fuel warning is not active and one of the following conditions is true: 1) A low fuel caution discrete inputs is active. 2) A sensed fuel tank quantity is below its low fuel caution threshold. 3) Total aircraft fuel is below the pilot-set minimum fuel threshold. 1-minute time delay.
GPS MISCOMP	Alert Tone	Indicates position, track, or ground speed difference between GPS/SBAS units is beyond the following limits: Position:

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
		En route Mode 4NM Terminal Mode 2NM Departure Mode .6NM IFR Approach Mode .6NM VFR Approach Mode .6NM Track: If ground speed is greater than 30 kts, miscompare if difference is more than 4°. Ground speed: If difference between GPS#1 and GPS#2 miscompare is more than 10 kts. 10-second time delay. Inhibited during and for 10 seconds after unusual attitude mode. [1]
GS MISCOMP	Alert Tone	Indicates at least one glide slope is receiving a signal within 1 dot of center and difference between glide slope signals is beyond limits (0.25 dots). 10-second time delay. [1]
HDG FAIL HDG1 FAIL HDG2 FAIL HDG1/2 FAIL	Alert Tone	"HDG FAIL" applicable to single AHRS installation. "HDG# FAIL" applicable to dual AHRS installation. Indicates that Heading is invalid but other AHRS data parameters are normal (i.e., attitude is not Red-X'd). Half-second time delay. [1]
HDG MISCOMP	Alert Tone	With neither AHRS failed nor in DG mode. Indicates heading difference between AHRS is beyond the heading miscompare threshold limit. 10-second delay. Inhibited during and for 10 seconds after unusual attitude mode. Inhibit for 5 minutes after startup. [1]

Table 2-11: Caution Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
IAS MISCOMP	Alert Tone	Indicates IAS difference between ADCs is beyond limits. 10-second time delay. Inhibit for 5 minutes after startup. [1]
LOC MISCOMP	Alert Tone	Indicates at least one localizer is receiving a signal within 1 dot of center and difference between localizer signals is beyond limits (0.25 dots). 10-second time delay. [1]
RALT MISCOMP	Alert Tone	Only in dual-radar altimeter installation with neither failed. Indicates radar altitude difference between radar altimeters is beyond the following limits: ≥ 500’ AGL Δ14% 100 – 500’ AGL Δ10% < 100’ AGL Δ10’ 10-second time delay. [1]
OAT FAIL OAT1 FAIL OAT2 FAIL OAT1/2 FAIL	Alert Tone	OAT FAIL applicable to single ADC installation. OAT# FAIL applicable to dual ADC installation. Indicates OAT indication is invalid but other air data parameters are normal (i.e., air data is not red-X’d). Half-second time delay. [1]
RALT FAIL RALT1 FAIL RALT2 FAIL RALT1/2 FAIL	Alert Tone	RALT FAIL applicable to single-radar altimeter installation. RALT# FAIL applicable to dual-radar altimeter installation. For analog radar altimeter, indicates aircraft is below 2000’ AGL in air mode without a valid radar altimeter reading. 2-second time delay. [1]
SAME ADC	Alert Tone	Indicates both sides are operating from same ADC source. ** [1][4]
SAME AHRS	Alert Tone	Indicates both sides are operating from same AHRS source. ** [1][4]
SAME DME	Alert Tone	Indicates both sides are operating from same DME source ** [1][3][4]

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
SAME GPS	Alert Tone	Indicates both sides are operating from same GPS/SBAS source. **[1][2][3][4]
SAME NAV	Alert Tone	Indicates both sides are operating from same navigation source. **[1][2][3][4]
SAME RALT	Alert Tone	Indicates both sides are operating from same radar altimeter source. **[1][2][3][4]
SSEC FAIL SSEC1 FAIL SSEC2 FAIL SSEC1/2 FAIL	Alert Tone	SSEC FAIL applicable to single ADC installation. SSEC# FAIL applicable to dual ADC installation. Indicates that either: 1) Genesys Aerosystems ADC is not transmitting SSEC-corrected data on an airframe that requires SSEC; or 2) There is a mismatch greater than or equal to 50umHg between the SSEC being calculated by the IDU and the SSEC being used by the ADC. Inhibited if the related ADC is in a failed condition. 1-minute time delay.
STRK FAIL	Alert Tone	Only active when Aux Sensor Caution Split is asserted. No valid message received from installed Strikefinder system for more than 4 seconds. Sensor status also displayed in FAULTS menu. 5-second time delay.
TAWS INHBT	Alert Tone	TAWS inhibited through use of discrete input. **
TCAS FAIL	Alert Tone	Only with ARINC 735A-1 TCAS-II, TCAS-I, or TAS. Indicates lack of communications with system or failure indication from system. **
TRFC FAIL	Alert Tone	Only active when Aux Sensor Caution Split is asserted. No valid message received from installed RS-232

Table 2-11: Caution Alerts		
Visual Alert	**Voice Alert/ Alert Tone**	**Condition**
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
		TCAD/TAS System or ADS-B TIS-B System for more than 2 seconds. Sensor status also displayed in FAULTS menu. 5-second time delay.
WXR FAIL	Alert Tone	Only active when Aux Sensor Caution Split is asserted. Weather Radar faults received from installed Weather Radar. Weather Radar status not received from installed Weather Radar for more than 2 seconds. Radar Control Panel faults received from installed Weather Radar for more than 2 seconds. Sensor status also displayed in FAULTS menu. 5-second time delay.
TOTALZR QTY	Alert Tone	Compares volume of sensed fuel to fuel totalizer calculation. Issued if difference exceeds totalizer mismatch caution threshold. Only performed if: 1) Totalizer mismatch caution threshold is non-zero; 2) Fuel totalizer is enabled; 3) Unmonitored fuel flag is false; 4) Fuel totalizer has a valid value; and 5) Fuel levels are valid. 1-minute time delay.
XFILL FAIL	Alert Tone	Only active in dual-System (Pilot and Co-pilot) when Single-Pilot Mode discrete input not asserted. Indicates lack of inter-System communications. 32-second time delay. [2][3]
XPDR FAIL	Alert Tone	Indicates the interfaced transponder reports internal failure.
CHECK GEAR	“Check Gear, Check Gear”	If configured in EFIS limits as Retractable Gear, when the aircraft is below 150’ AGL, the aircraft is

Table 2-11: Caution Alerts

Visual Alert	Voice Alert/ Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode configuration not asserted [4] Only active when CAUTION mode is enabled		
		descending, and any landing gear is not down. 2-second time delay.
Used on IDU #0 only. Duplicate time-critical caution alerts cover the case when IDU #0 is not displaying the PFI.		
OBSTRUCTION	"Caution, Obstruction, Caution Obstruction"	Obstruction within TAWS FLTA caution envelope. Half second time delay.
TRAFFIC	"Traffic, Traffic"	Traffic Advisory. Not given if own aircraft at or below 400' AGL. Not given if target is at or below 200'AGL (ground target). Audio not generated with TCAS-II system.**
TOO LOW	"Too Low Terrain, Too Low Terrain"	Within GPWS Mode 3 envelope. Half-second time delay.
	"Too Low Gear, Too Low Gear	Within GPWS Mode 4-1 "Too Low Terrain" envelope. Half-second time delay.
		Within GPWS Mode 4-2 "Too Low Gear" envelope. Half-second time delay.
GLIDESLOPE	"Glide Slope, Glide Slope"	Within GPWS Mode 5 caution envelope. Half-second time delay.
OBSTRUCTION	"Caution Obstruction, Caution Obstruction"	Obstruction within TAWS FLTA caution envelope. Half-second time delay.
TRAFFIC	"Traffic, Traffic"	Not given if own aircraft below 400' AGL nor if target is below 200'AGL (ground target). **
TERRAIN	"Caution, Terrain, Caution Terrain"	Terrain cell within TAWS FLTA caution envelope. Half-second time delay. Within GPWS Mode 2 caution envelope. Half-second time delay.
SINK RATE	"Sink Rate, Sink Rate"	Within GPWS Mode 1 caution envelope. Half-second time delay.

2.9.4. Side-Specific Caution Alerts

Side-specific caution alerts are displayed on all IDUs where the condition is detected. These types of alerts are used for critical monitoring functions that cannot take credit for the presence of other IDUs.

Table 2-12: Side-Specific Caution Alerts

Visual Alert	Alert Tone	Condition ** No time delay
CHECK IDU 1 CHECK IDU 2 CHECK IDU 3 CHECK IDU 4	Alert Tone	IDU status has not been received from another same-side IDU in the last second ± 0.1 seconds. # indicates which IDU is failing the check. **

2.9.5. Advisory Alerts

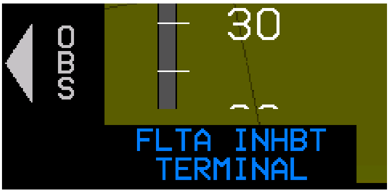


Figure 2-12: Advisory Alerts

Table 2-13: Advisory Alert Elements

Type Alert	Location	Appearance	Audio Alert
ADVISORY	PFD lower left corner of transmit-enabled IDU	While condition persists	Single advisory chime played at 80% volume

Table 2-14: Advisory Alerts

Visual Alert	Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode discrete not asserted [4] Only active when CAUTION mode is not enabled		
ADC INIT ADC1 INIT ADC2 INIT ADC1/2 INIT	Chime	"ADC INIT" applicable to single ADC installation. "ADC# INIT" applicable to dual ADC installation. Indicates ADC not at full accuracy during warm-up. ** [1]

Table 2-14: Advisory Alerts

Visual Alert	Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode discrete not asserted [4] Only active when CAUTION mode is not enabled		
AHRS1 DG AHRS2 DG AHRS1/2 DG	Chime	Indicates numbered AHRS in DG mode. ** [1]
CHECK BREAKER	Chime	Only active when ECBU is configured and the alert condition exists for more than 1 second.
PLT1 PWR PLT2 PWR PLT3 PWR PLT4 PWR CPLT1 PWR CPLT2 PWR CPLT3 PWR CPLT4 PWR	Chime	Indicates a dual redundant power supply within the designated IDU (side and IDU #) is not functioning correctly. Only active on the ground. 1-minute time delay. [2]
FPM INHBT	Chime	Flight path marker inhibit function activated through momentary external switch input. **
BARO MISCOMP	Chime	Only in Two-sided installation. Indicates mismatch of altimeter settings or altimeter modes between sides. 10-second time delay. [2][3]
TAWS LOW ALT	Chime	TAWS low altitude mode activated through use of external switch input. **
SAME ADC	Chime	Indicates both sides are operating from same ADC source. ** [1][4]
SAME AHRS	Chime	Indicates both sides are operating from same AHRS source. **[1][4]
SAME DME	Chime	Indicates both systems are operating from same DME source ** [1][3][4]
SAME GPS	Chime	Indicates both sides are operating from same GPS/SBAS source. ** [1][2][3][4]
SAME NAV	Chime	Indicates both sides are operating from same navigation source. **[1][2][3][4]
SAME RALT	Chime	Indicates both sides are operating from same radar altimeter source. **[1][2][3][4]
TAS INHBT	Chime	TAS audible inhibited through activation of TCAS/TAS audio inhibit discrete input.**

Table 2-14: Advisory Alerts

Visual Alert	Alert Tone	Condition
** No time delay [1] Only active in dual-sensor installation with neither sensor in failure condition [2] Only active in two-sided system (pilot and co-pilot) [3] Only active when single-pilot mode discrete not asserted [4] Only active when CAUTION mode is not enabled		
TAWS GS CNX	Chime	Class A TAWS and Enhanced HTAWS only. TAWS glide slope cancel (GPWS Mode 5) activated through external switch input. **
TCAS STBY	Chime	Only with TCAS-II. Indicates system is in standby or executing functional test in flight. **
TA ONLY	Chime	Only with TCAS-II. Indicates TCAS-II is unable to display resolution advisories. **
TCAS TEST	Chime	Only with TCAS-II. Indicates system is in functional test on ground. **
XFILL ARM	Chime	Only in dual-sided system with good inter-system communications and crossfill not inhibited. Indicates sides are not synchronized and synchronization function is available. ** [2][3]
XFILL INHBT	Chime	Only in dual-sided system with good inter-system communications. Indicates crossfill is manually inhibited through external switch input. ** [2][3]

2.9.6. Side-Specific Advisory Alerts

Side-specific advisory alerts have the same characteristics as advisory alerts except they always appear in the lower-left corner of the transmit-enabled IDU PFI (PFI showing) or lower-left corner of the transmit-enabled IDU bottom area (PFI not showing).

These types of alerts are used where the pilot and co-pilot systems can generate different alerts, such as when the pilot and co-pilot systems are not crossfilled and are operating on different FMS flight plans.

Table 2-15: Side-Specific Advisory Alerts		
Visual Alert	**Alert Tone**	**Condition ** No time delay**
CHK BARO	Chime	Ascending through transition level: Altimeter not set to 29.92 inHg or 1013 mbar. Descending through transition level: Altimeter set to 29.92 inHg or 1013 mbar. Descent warning times out in 10 seconds. Disabled during QFE operation. 2-second time delay.
ANP: 0.01 ANP: 15.0	Chime	GPS/SBAS actual navigation performance in nautical miles based upon current GPS/SBAS HPL. Value ranges from 0.01 to 15.0 NM.
RNP: 0.10A RNP: 15.0A	Chime	GPS/SBAS automatic required navigation performance in nautical miles as acquired from navigation database. Value ranges from 0.10 to 15.0 NM.
RNP: 0.10M RNP: 15.0M	Chime	GPS/SBAS manual required navigation performance in nautical miles. Value ranges from 0.10 to 15.0 NM.
DR 00:00 DR 01:23	Chime	GPS/SBAS in dead reckoning mode with valid ADC and AHRS data. Timer shows time since loss of position (mm:ss) to indicate quality of DR solution. Valid range is from 00:00 to 59:59. Inhibited during and for 10 seconds after unusual attitude mode.**
LNAV APPR	Chime	GPS/SBAS in LNAV approach mode.**
LNV/VNV APPR	Chime	GPS/SBAS in LNAV/VNAV approach mode. **
LP APPR	Chime	GPS/SBAS in LP approach mode. **
LPV APPR	Chime	GPS/SBAS in LPV approach mode.**
SUSPEND	Chime	Automatic waypoint sequencing is suspended under any of the following conditions: 1) Pilot has selected a manual GPS/SBAS OBS. 2) Active waypoint is the missed approach waypoint, and missed

Table 2-15: Side-Specific Advisory Alerts

Visual Alert	Alert Tone	Condition ** No time delay
		approach procedure has not been armed (ARM) nor initiated (MISS). 3) Aircraft is in a published or manually created holding pattern, and pilot has not chosen to continue (CONT) out of the holding pattern. 4) Leg following active waypoint is a manual termination leg, and the pilot has not chosen to resume (RESUME) to the waypoint following the manual termination. 5) Aircraft is in a repeating SAR pattern (see SAR appendix), and the pilot has not chosen to continue out of the SAR pattern.**
TERMINAL	Chime	GPS/SBAS in terminal mode. **
VFR APPR	Chime	GPS/SBAS in VFR approach mode. **
VECTORS	Chime	GPS/SBAS in vectors to final approach mode prior to sequencing FAWP. **
PTK = L 1NM PTK = L 20NM PTK = R 1NM PTK = R 20NM PTK ENDING	Chime	GPS/SBAS parallel offset path advisory. ## is nautical miles left (L) or right (R) of main path. PTK ENDING if within the parallel offset distance from a parallel offset exit waypoint. **
FLTA INHBT	Chime	Appears when FLTA function is automatically inhibited during normal operation. TAWS INHBT, caution has priority. **
TRUE NORTH	Chime	System operating in true north mode.**

2.9.7. Audio-Only Caution and Advisory Alerts

Audio-only caution alerts trigger a single audio-only message played at the full volume and audio-only advisory alerts trigger a single audio-only message played at 80% of the full volume selected in EFIS limits.

Table 2-16: Audio-Only Caution and Advisory Alerts

Caution or Advisory Alert	Voice Alert/ Alert Tone	Condition ** No time delay
Minimum Altitude Caution Alert	"Minimums, Minimums"	Deviation from above to below minimum altitude bug. Minimum altitude readout turns amber (yellow) and flashes. **
Selected Altitude Deviation Caution Alert	"Altitude, Altitude"	Deviation greater than 150' from selected altitude after capture (within 100' of altitude). 2-second time delay.
VNAV Altitude Deviation Caution Alert		If not on a descending VNAV profile, deviation greater than 150' from altitude of the current or prior VNAV waypoint after capture (within 100' of altitude). 2-second time delay.
Decision Height Caution Alert	"Decision Height"	Deviation from above to below decision height bug. Decision height readout turns amber (yellow) and flashes. **
GBS/SBAS Failure Caution Alert	Alert Tone	No valid position data available from selected GPS/SBAS for more than 5 seconds and dead reckoning not available. Inhibited during and for 10 seconds after unusual attitude mode. Loss of position data is obvious from symbology changes associated with reversionary modes.**
GPS/SBAS Loss of Integrity Caution Alert	Alert Tone	GPS/SBAS loss of integrity caution. Inhibited during and for 10 seconds after unusual attitude mode. LOI indication is integrated with lateral deviation indicator. ** 
GPS/SBAS Loss of Navigation Caution Alert	Alert Tone	GPS/SBAS loss of navigation caution. Inhibited during and for 10 seconds after unusual attitude mode. LON indication is integrated with lateral deviation indicator. ** 
Loss of Vertical Navigation Caution Alert	Alert Tone	Loss of vertical navigation caution. Inhibited during and for 10 seconds after unusual attitude mode. VLON indication is integrated with vertical deviation indicator. ** 

Table 2-16: Audio-Only Caution and Advisory Alerts		
Caution or Advisory Alert	**Voice Alert/ Alert Tone**	**Condition** **** No time delay**
Countdown Timer Chime	Chime	Sounds when countdown timer reaches 00:00:00. **
Level-off Advisory Alert	Altitude Alert Tone	Within the greater of 500’ or 50% of VSI from uncaptured selected or VNAV waypoint altitude. Inhibited in approach procedures. **

2.9.8. Voice Alerts and Muting

Only the highest priority (in criticality and recency), unacknowledged voice alert is played at any given time. Any playing audio message is immediately muted by activating the warning/caution acknowledge switch.

2.9.9. Visual Alert Prioritization and Declutter

Visual alerts are visually prioritized, so warnings are displayed above cautions, which are displayed above advisories. Within categories, visual alerts are stacked in chronological order, so the most recent alert appears on top.

Only the highest priority (in criticality and recency), unacknowledged audible annunciation is played at a time. In addition, to further minimize cockpit confusion, annunciations are grouped and prioritized so only one annunciation is active.

The maximum number of visual alerts that can be simultaneously displayed in the standard location is 11. In the event there are more than 11 visual alerts, **MORE-PRS MENU** appears for guidance in accessing the EXPAND CAS menu.

In addition, flags are decluttered from all IDUs, which are not transmit-enabled. Flags only appear on these IDUs if they are IDU-specific (i.e., CHECK IDU #).

2.10. Database and Software Updates

2.10.1. Navigation and Obstruction Databases

The EFIS uses Jeppesen Sanderson NavData® for the navigation database and Jeppesen Sanderson obstacle data for the obstruction database.

Visit www.jeppesen.com to place the order for the correct database.

NOTE:

When ordering, review the EFIS Equipment-Database Compatibility Matrix (document 01-000062) on the Genesys Aerosystems website. This document specifies the compatibility of Genesys Aerosystems EFIS equipment and software versions to navigation database versions.

Three available coverage areas of navigation databases may be used on this EFIS:

Americas - Major airports and navigation for Alaska, Canada, Continental U.S., Hawaii, Puerto Rico, Bahamas, Bermuda, Mexico, Central, and South America.

International - All available coverage except North and South America.

World - Major airports and navigation with the Americas.

2.10.2. Update Requirements

Scheduled updates for databases are as follows:

1) Navigation Database - Every 28 days
2) Obstruction Database - Every 28 days
3) MAGVAR Database - Every 5 years (updated as described in a Genesys Aerosystems Service Bulletin)

CAUTION:

Failure to update the EFIS with the correct NavData® causes the IDU to remain in continual reboot mode and does not allow any display page to appear.

The EFIS is updated through the ground maintenance function (GMF). To gain access to the GMF, prior to applying power, slide the USB door (slip indicator or non-slip blank cover) at the bottom-center of the IDU bezel upward to the first detent position to expose the USB port.

When an update is performed, the following procedures must be performed separately on every IDU installed in the aircraft.

To update the databases:

1) Load the navigation database (navdata.exe) and obstruction database (obst.exe) on USB flash drive.

2) With the power off, insert the USB flash drive into USB port.

> **CAUTION:**
>
> **Always install a valid USB flash drive in the IDU prior to activating any ground maintenance function. Operation of the GMF without a valid USB flash drive installed may cause erroneous failure indications or corruption of the IDU.**

3) Power on the system. If after entering Update Databases or any other option, rotate ❶ to **Run Simulators**, push to enter and then rotate ❶ to **Run Demonstrator/Training Program** and push to enter.

4) Rotate ❶ to **Update Databases** and push to enter.

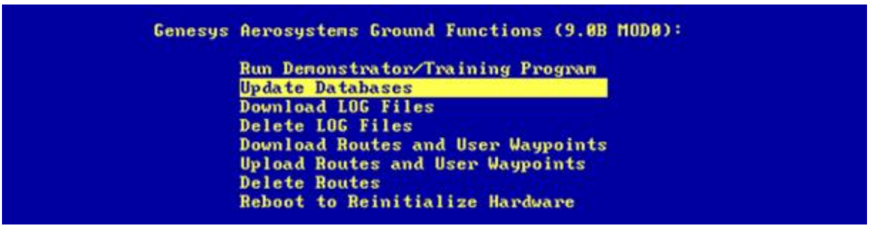


Figure 2-13: Ground Maintenance Page

5) Once each database is loaded, press any button to continue to complete the process.

6) Once both databases have been uploaded, power down the IDU, remove the USB flash drive, and lower the USB door.

7) Once each IDU has been updated, power up the entire EFIS in normal flight mode and verify each IDU successfully updated with the latest database by noting the new navigation database and obstruction database cycle expiration dates before acknowledging the CRC screen (Figure 2-5). Because the obstruction database is advisory in nature, there technically is no expiration date. The listed date is the effective date of the next available obstruction database.

8) A CRC self-test verifies the data at every step of the process, thereby ensuring the data installed into the system has not been corrupted at any point during the process.

2.10.3. Software and Terrain Database Update

Software updates and terrain databases are provided on an as-needed basis and performed as per a service bulletin.

2.11. Run Demonstrator/Training Program

The EFIS has a built-in demonstration application to fly anywhere in the world while performing any procedure (except takeoff and landing) based on the current Jeppesen navigation database. Use this feature on the ground in ground-mode as follows:

1) With power off, lift the USB door and insert a USB flash drive.

2) Power on the system. If after entering Update Databases or any other option, rotate ❶ to **Run Demonstrator/Training Program** and push to enter.

Use the demonstrator to gain familiarity with the EFIS menu structure and location of button tiles for each operation. Load an instrument procedure before take-off to view the expected sequence of events.

The demonstrator begins flying over Reno, Nevada, USA at an altitude of approximately 8000’ MSL. Altitude may be changed with altitude bug, VNAV profiles or navigation database procedures. Airspeed remains relatively constant but may be controlled with the IAS bug in the BUGS menu. The simulated aircraft may be positioned anywhere in the world, by activating a flight plan stored in the memory.

All appropriate navigation signals are simulated, allowing for precision and non-precision instrument approaches found within the current navigation database. All obstructions in the latest obstruction database and all warning, caution, and advisory audible and flag annunciations are presented as appropriate during simulated flights.

> **NOTE:**
>
> When the IDU is operating in the Demonstrator mode, the IDU is isolated from all sensors and other IDUs. The creation of a flight plan results in that flight plan being stored on that IDU alone. To have that new flight plan available on all other displays, the following action must be taken. While in flight mode, activate the flight plan created in the Demonstrator mode. With crossfill enabled (in dual-sided systems) view active flight plan on any other IDU and press **SAVE (L1)** to save this flight plan on all displays.

2.12. EFIS Training Tool

In addition to the demonstrator program, the EFIS Training Tool (ETT) is available to load on a personal computer. The ETT is compatible with 32- or 64-bit versions of Microsoft Windows®. It serves as a Ground-Based Utility tool for training pilots and provides features to play back log files from actual aircraft flight, record and capture images, create locked, unlocked flight plans, and user waypoints. See the installation and user guide distributed with the ETT installer for further details. Table 2-17 defines flight planning options for installed IDU-680 and Ground-based Utility.

Table 2-17: Flight Planning Options

Option	Flight Mode IDU-680*	Ground-Based Utility**
Create	Yes	Yes
Lock 🔒	No	Yes
Activate	Yes	Yes
Activate 🔒	Yes	Yes
Edit	Yes	Yes
Edit 🔒	No	No
Reverse	Yes	Yes
Reverse 🔒	No	No
Delete	Yes	Yes
Delete 🔒	No	Yes
Rename	Yes	Yes
Rename 🔒	No	Yes

* PFD or MFD unless otherwise restricted.
**ETT or IDU operating in Ground Demonstration Mode.

Section 3 Display Symbology

3.1. Introduction

This section details the symbology used on the PFD and MFD in normal and essential modes. Not all combinations of possible views are represented.

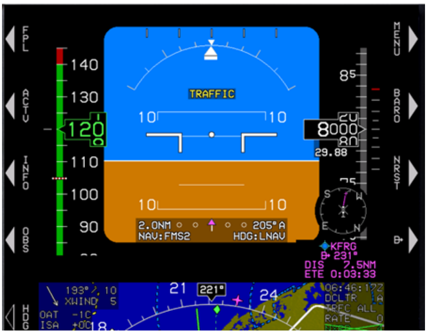
Figure 3-1: PFD in Normal Mode

3.1.1. IDU-680 PFD Display Basic Mode

When selected, basic mode is a traditional attitude display with airspeed, altitude, and heading scales appearing in blacked-out areas in a “Basic-T” arrangement but is disabled in unusual attitude mode. The following are no longer present in basic mode:

1) Atmospheric perspective
2) Airspeed trend
3) Terrain rendering
4) Obstruction rendering

5) Flight path marker
6) Airport runways/helipads
7) Highway in the sky
8) Bank scale declutter

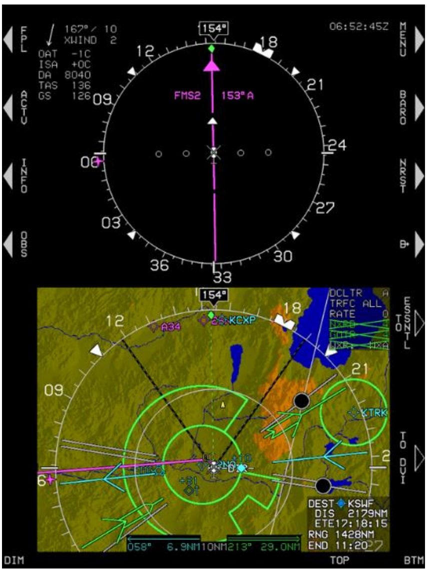


With Compass Rose Detected in Bottom Area

Without Compass Rose Detected in Bottom Area

Figure 3-2: PFD in Basic Mode

3.1.2. IDU-680 MFD Display



Normal Mode

Essential Mode

Figure 3-3: MFD in Normal and Essential Modes

3.2. Menu Functions

See Section 5 Menu Functions and Step-By-Step Procedures for menu philosophy description.

Figure 3-4: Knob Functions

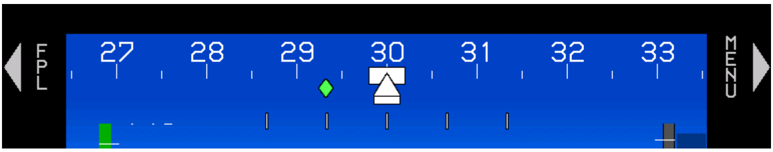
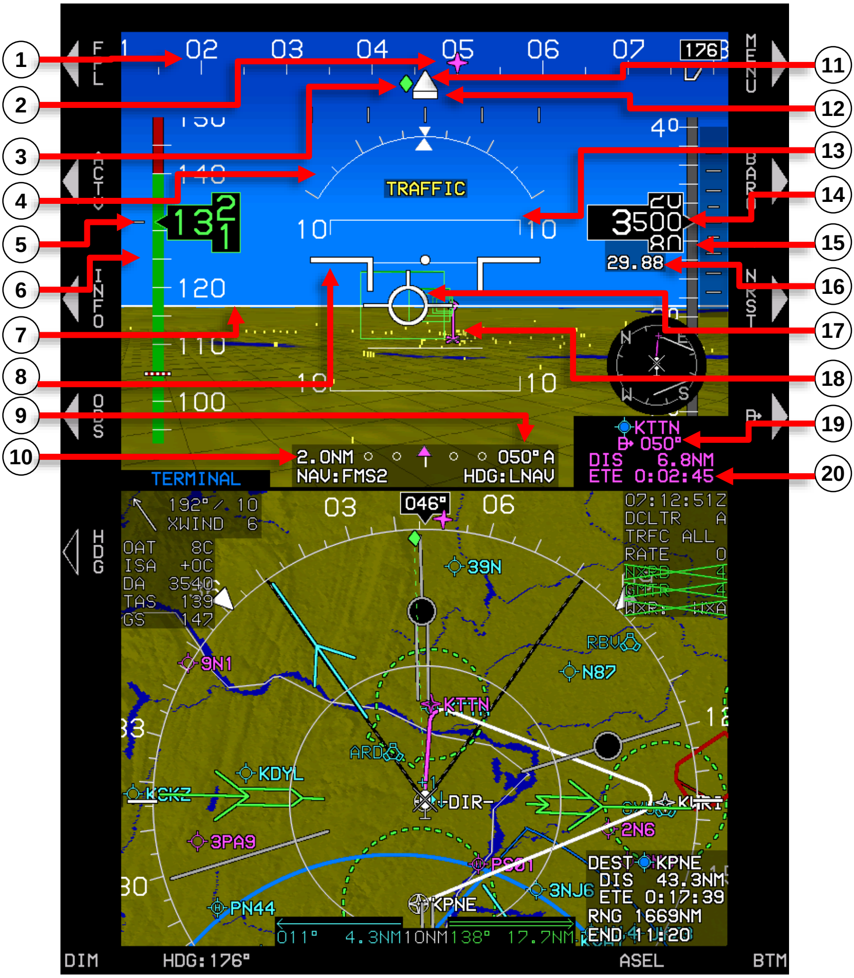


Figure 3-5: Menu Management

When the menu system is beyond the top-level, **EXIT (R1)** escapes to the top-level. When a menu level is deeper than the first level, **BACK (L1)** returns back one level through the menu system.

3.3. PFD Symbology

The PFD combines pitot-static information, heading, attitude, 3D navigation data, and more overlaid on a virtual background of the outside world. Other objects in the background, including terrain, obstructions, traffic (if enabled), and runways, are presented as if seen directly in front of the aircraft while looking outside.

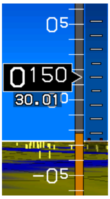


1) Directional Scale
2) Bearing to Waypoint
3) Track Pointer
4) Bank Angle Scale
5) Indicated Airspeed Readout
6) Indicated Airspeed Tape
7) Horizon Line
8) Waterline
9) Instantaneous bearing desired track to active waypoint
10) Course Deviation Indicator
11) Heading Pointer
12) Slip Indicator
13) Pitch Scale
14) Altitude Readout
15) Altitude Tape
16) Altimeter Setting
17) Flight Path Marker
18) Active Waypoint Symbol
19) Path to Active Waypoint Information Along-Track and Distance
20) ETE or ETA based on Along-Track Distance

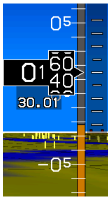
Figure 3-6: PFD Symbology

3.3.1. Altitude Display

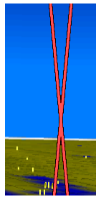
The PFD has an altitude box with altitude scale on the right side of the display. The altitude box digitally displays barometric altitude as adjusted by an altimeter setting. The digital display of altitude is either purely digital (to nearest 10 feet) or rolling digits (to nearest 20 feet) as defined in aircraft limits. The altitude box has a pointer that interacts with the altitude scale, which has graduations every 100 feet and labels every 500 feet. The altitude scale background has a gray region and a brown region where the junction between the gray and brown regions indicates ground level. When the ADC sensor fails, a red “X” is displayed in place of the altitude scale.



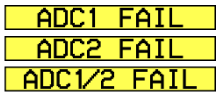
Pure Digital

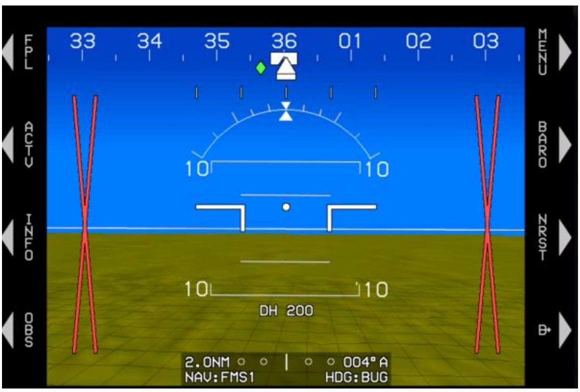


Rolling Digital



ADC Failure





Single System ADC Failure (Red X's Only)

Figure 3-7: Altitude Display

When EFIS limits are not set to SI units, altitude values (altitude display and user-selectable target [ASEL] and VNAV altitudes) may also be displayed in metric units with a resolution of 1 meter.

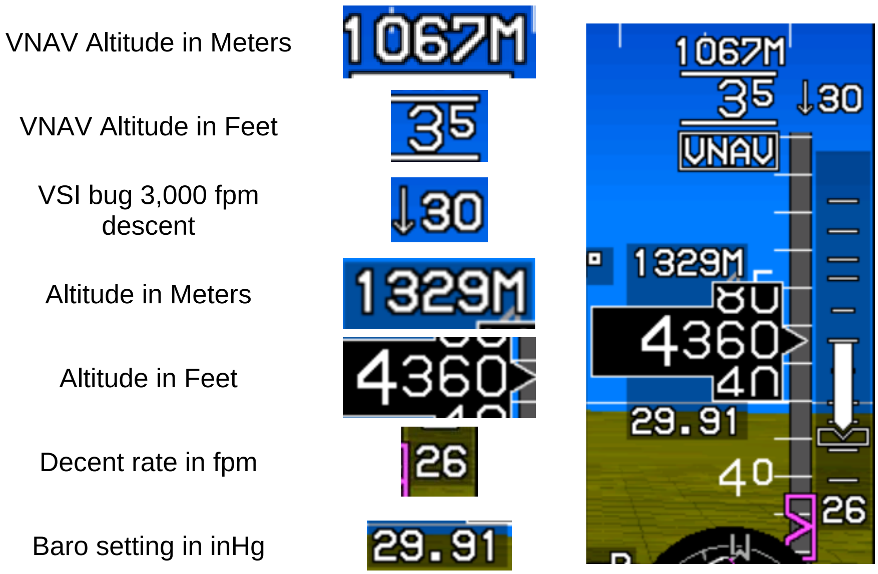


Figure 3-8: Altitude Display (Feet)

When using meters for altitude display, altitude values (altitude display and user-selectable target [ASEL] and VNAV altitudes) may be displayed in imperial unit feet units with a resolution of 1 foot.

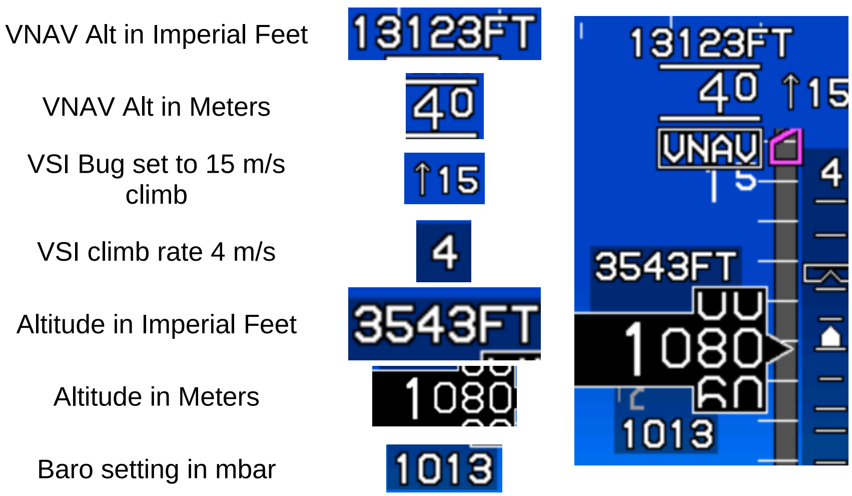


Figure 3-9: Altitude Display (Meters)

3.3.2. Altimeter Setting

The altimeter setting is displayed digitally below the altitude readout box in inches of mercury (inHg) or millibars (mbar) according to the user-selected units. Press **BARO (R2)** to enter altimeter setting mode and view the altimeter setting in inHg or mbar value in the lower right corner. Rotate ❶ CW to increase or CCW to decrease QNH. Push ❶ to enter the new value.

Figure 3-10: Altimeter Setting

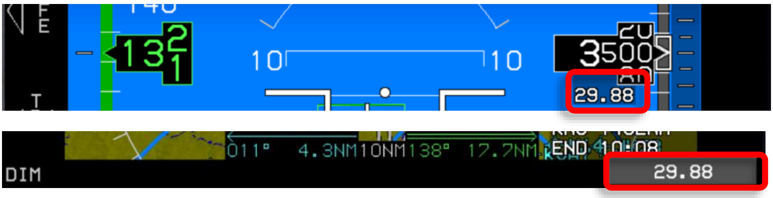


Figure 3-11: Selecting Altimeter Setting

QFE: Barometric setting resulting in the altimeter displaying height above a reference elevation (e.g., airport or runway threshold). When in QFE mode on the ground, system automatically sets to read zero altitude.

QNE: Standard barometric setting (29.92 inHg or 1013 mbar) used to display pressure altitude for flight above the transition altitude.

QNH: Barometric setting resulting in the altimeter displaying altitude above mean sea level at the reporting station.

Digital display of altitude is either purely digital (nearest 10 feet) or incorporates rolling digits (nearest 20 feet) as determined by EFIS limits.

Table 3-1: Altimeter Setting

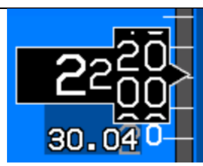
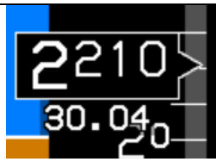
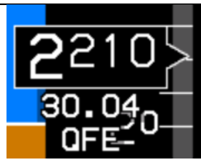
 Pure Digital - QNH	 Rolling Digital - QNH

Table 3-1: Altimeter Setting	
 Normal SVS Mode - QNH	 Basic Mode - QNH
 Normal SVS Mode - QFE	 Basic Mode - QFE

3.3.3. Selected Altitude Sub-Mode (Target Altitude)

Table 3-2: Selected Altitude Sub-Mode Values

Altitude	Range	Resolution	Indication
Feet	-1,000’ to 20,000’	100’	
Meters	-305m to 6,096m	30m	

When in selected altitude sub-mode, the altitude scale has a user-settable target altitude bug geometrically interacting with the altitude box pointer.

The target altitude bug setting annunciation includes "ASEL" indicating selected altitude sub-mode, and may be used either as a visual reference or, when vertically or partially integrated with an autopilot as a control parameter for climbs and descents.

When an autopilot is not installed, the selected altitude is a reference only. The target altitude bug setting is white, and the target altitude bug is filled-white at all times.

NOTE:

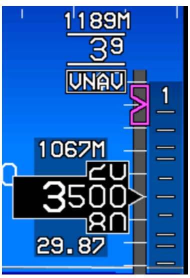
Altimeter setting limits are 745-1100 (mbar) or 22.00-32.00 (inHg).

3.3.4. Altitude Display (VNAV)

When enabled for performing VNAV with a manually selected altitude entered, **VNAV (L6)** appears. Pressing cancels ASEL (target altitude) and enters the VNAV altitude in the active flight plan.

Figure 3-12: Altitude Display (VNAV)

Altitude Display in Feet



Altitude values can also be presented in metric units (meter) (resolution 1 meter)

Altitude Display in Meters

Altitude values can also be presented in imperial unit (feet). Imperial display of barometric altitude (resolution 1 foot)

Figure 3-13: VNAV Sub-Mode

3.3.5. VNAV Sub-Mode

When in VNAV sub-mode, the altitude scale shows the active waypoint VNAV altitude (if it exists) with a bug symbol geometrically interacting with the altitude box pointer. The VNAV altitude bug setting is annunciated above the altitude scale with a resolution of 100 measurement units.

When not vertically integrated with a fully integrated digital autopilot, the VNAV altitude bug setting annunciation includes “VNAV” indicating VNAV altitude sub-mode and is colored white with the VNAV altitude bug filled-magenta at all times.

Figure 3-14: VNAV Sub-Mode (Not Vertically Integrated) (Feet for Altitude and NM for Distance)

Figure 3-15: VNAV Sub-Mode (Not Vertically Integrated) (Meters for Altitude and KM for Distance)

3.3.6. Minimum Altitude

The minimum altitude bug value is displayed with a resolution of 10 measurement units. The minimum altitude bug can be used in conjunction with a selected altitude or VNAV bug with no interference with each other. When a minimum altitude is set, descending from above to below causes a voice alert of "Minimums, Minimums" and the minimum altitude to turn amber (yellow) and flash.

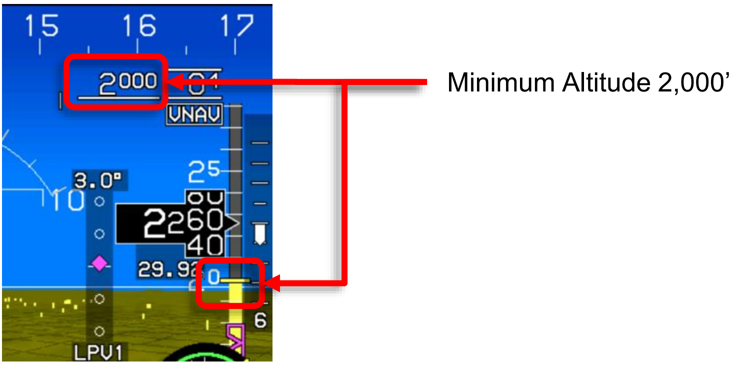


Figure 3-16: Minimum Altitude (Feet)

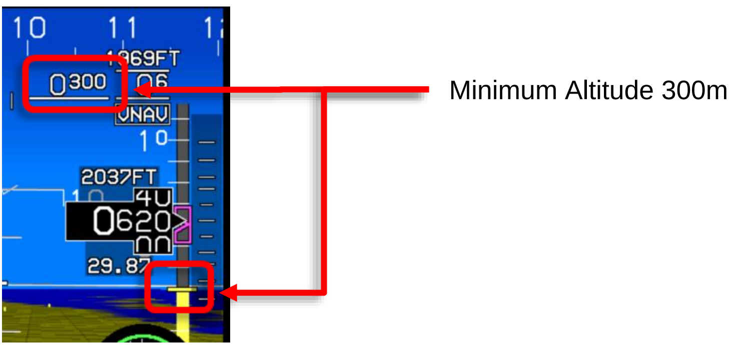


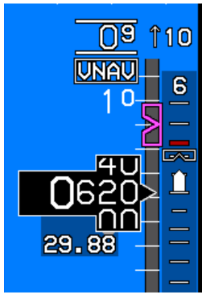
Figure 3-17: Minimum Altitude (Meters)

3.3.7. Vertical Speed Indicator

The vertical speed indicator (VSI) is depicted in a "worm" format providing analog and digital representation of VSI in feet per minute (fpm) or meters per second (m/s) depending upon the setting of the "Speed Units” system limit. A red line is optionally included at the rotorcraft’s published VSI limit.

The user-settable VSI bug setting can be set in increments of 100 fpm (or 1 m/s resolution). The vertical speed bug is used either as a visual reference, or as a control parameter for climbs or descents. It is mutually exclusive with the airspeed bug. When applicable, the VSI scale can include a red line at the rotorcraft's VSI limit.

Altitude in Feet: 600 fpm descent



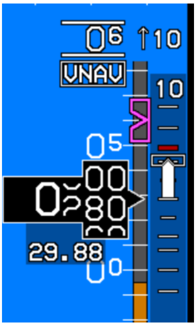
Altitude in Meters: 6 m/s Climb

Figure 3-18: VSI

Table 3-3: Scale Graduations and Display

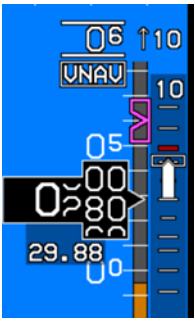
Traffic Installed	Scale Limit	Scale Graduations and Display
Rounded to 100 fpm with Resolution of 100 fpm		
With TCAS-II	±2,000 fpm	±500, ±1,000, ±2,000, ±3,000 fpm Background of the VSI functions as an RA display with green and red regions to provide RA maneuver guidance.
Without TCAS-II	±3,000 fpm	±500, ±1,000, ±2,000, and ±3,000 fpm
Rounded to 1 m/s with Resolution of 1 m/s		
With TCAS-II	±10 m/s	±3, ±5, ±10 m/s Background of the VSI functions as an RA display with green and red regions to provide RA maneuver guidance.
Without TCAS-II	±80 m/s	±5, ±10, ±20, and ±80 m/s

3.3.8. Vertical Speed Bug



The VSI indication has a user-settable vertical speed bug with a 100 fpm resolution and a range of ±2,000 fpm. It is mutually exclusive with the airspeed bug.

Figure 3-19: VSI Bug (fpm)



When using meters per second, the scale of the VSI is ±80 meters per second. The scale includes an integral scale with graduations at ±5, ±10, ±20, ±50, and ±80 meters per second. Analog readouts of VSI rounded to the nearest 1 meter per second appear above the VSI (climbs) or below the VSI scale (for descents).

Figure 3-20: VSI Bug (m/s)

When TCAS-II is enabled, the background of the VSI functions as an RA display with green and red colored regions to provide RA maneuver guidance. When using feet for altitude, the vertical speed bug has a range of ±2,000 fpm with resolution of 100 fpm.

When using meters per second for the VSI scale, the VSI bug is limited to the corresponding values in meters per second with a resolution of 1 m/s.

3.3.9. Normal AGL Indication

Above ground level (AGL) altitude is displayed in two formats, above the course deviation indicator (normal) and as the (analog) AGL indicator. These are mutually exclusive of each other and driven by the AGL altitude source used for TAWS, but not displayed when source is invalid or greater than the radar altimeter maximum valid as set in EFIS limits.

Source indication designates the source for either format as follows.

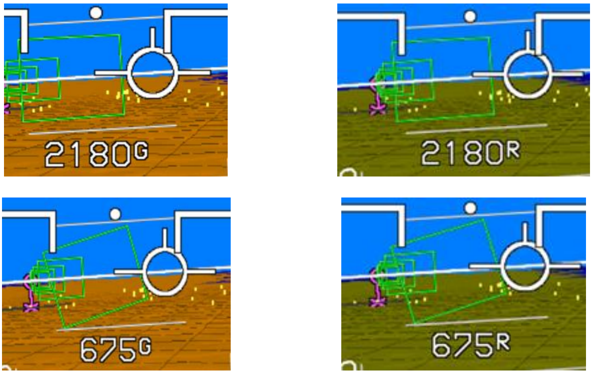
R = Radar Altitude

G = GPS/SBAS geodetic height less database ground elevation

B = Barometric altitude less database ground elevation

Feet

Meters



(SVS Basic) AGL Based on GPS Altitude

(SVS TAWS) AGL Based on Radar Altitude

Figure 3-21: Normal AGL Indication

AGL is not displayed when:

1) AGL altitude is greater than the radar altitude maximum valid altitude as set in EFIS limits.
2) AGL source is invalid.
3) Source is barometric and indicated airspeed is in the noise range (less than 20KIAS) due to rotor wash effects.
4) In unusual attitude mode.

When AGL altitude source is radar altitude, AGL indication is smoothed to avoid jumpiness as defined in Table 3-4.

Table 3-4: AGL Indication

Altitude	≥100 Meters	<100 Meters	≥300 Feet	≥100 Feet < 300 Feet	<100 Feet
AGL Indication resolution	5 Meters	1 Meter	10 Feet	5 Feet	1 Foot

3.3.10. Analog AGL Indication

The analog AGL indication is based on whatever AGL altitude source is being used for the TAWS. The analog AGL indicator is mutually exclusive with the mini map and mini traffic. Analog AGL altitude is not displayed when the user deselects analog AGL.

Analog AGL without DH | Analog AGL with DH

Feet

Meters

GPS/SBAS Source | Radar Altimeter Source | Above DH | Below DH with "Decision Height" voice alert

All images captured from PFI area with SVS TAWS configured.

Figure 3-22: Analog AGL Indication

If traffic is enabled and while above 500' AGL, the mini traffic overrides the analog AGL indication.

Table 3-5: Analog AGL Indicator (Feet)			
Markings 0-1000 Feet		**AGL**	**Scaling (clock position)**
0 to 100 Feet	100 to 1,000 Feet	0' AGL	6:00
Linear	Logarithmic	50' AGL	9:00
		100' AGL	12:00
Red radial line disappears at 1,000'		200' AGL	1:30
		500' AGL	3:00

Table 3-6: Analog AGL Indicator (Meters)			
Markings 0-50 Meters		**AGL**	**Scaling (clock position)**
0 to 50 Meters	50 to 500 Meters	0m	6:00
		25m	9:00
Linear	Logarithmic	50m	12:00
Red radial line disappears at 500 meters		100m	1:30
		250m	3:00

Feet	Tick Marks		Meters	Tick Marks	
	Major	Minor		Major	Minor
0’	✓		0m	✓	
10’		✓	5m		✓
20’		✓	10m		✓
30’		✓	15m		✓
40’		✓	20m		✓
50’	✓		25m	✓	
60’		✓	30m		✓
70’		✓	35m		✓
80’		✓	40m		✓
90’		✓	45m		✓
100’	✓		50m	✓	
200’		✓	100m		✓
300’		✓	150m		✓
400’		✓	200m		✓
500’	✓		250m	✓	
1000’	✓		500m	✓	

Table 3-7: Analog AGL Indicator Markings

3.3.11. Decision Height

A user-settable decision height is displayed above the CDI in Feet or Meters with the abbreviation DH and by a yellow radial on the analog indicator. When the aircraft descends below decision height, DH ### turns amber (yellow) and flashes and the circular tape turns amber (yellow). This is accompanied by “Decision Height” voice alert.

Figure 3-23: Decision Height (Feet)

Figure 3-24: Decision Height (Meters)

3.3.12. Airspeed Display

Airspeed is digitally displayed in same color as airspeed scale in knots, miles or kilometers per hour with interactive pointer. The airspeed scale is commensurate with the certification category of the aircraft. All examples if Figure 3-25 are in knots.

Pure Digital Normal ADC | Rolling Digital Normal ADC | ADC Failure

ADC1 FAIL

ADC2 FAIL

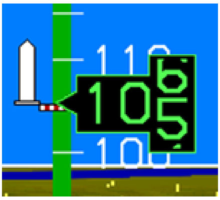
ADC1/2 FAIL

Figure 3-25: Airspeed Display

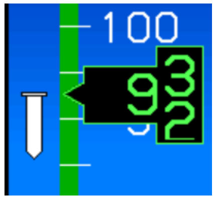
Figure 3-26: Airspeed Display Single Sensor System ADC Failure (Red X's Only)

The airspeed box pointer interacts with the airspeed scale and has graduations every five measurement units with labels every ten measurement units with high numbers at the top. The airspeed scale range has at least 40-75 measurement units.

The airspeed trend vector calculated along the rotorcraft longitudinal axis is displayed in a “worm” format to provide analog representation of IAS achieved in 5 seconds assuming the instantaneous longitudinal acceleration is maintained.



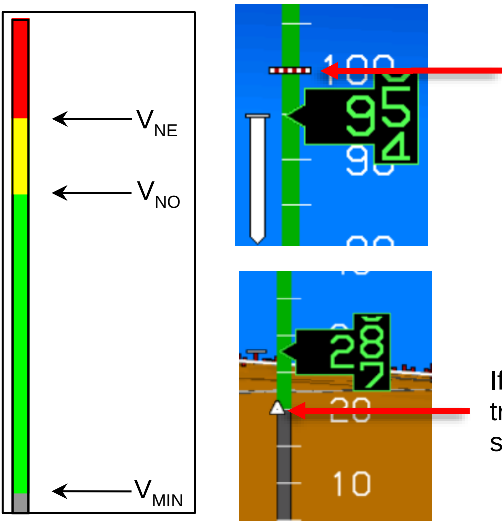
Airspeed trend vector indicating speed of 112 KIAS within 5 seconds



Airspeed trend vector indicating speed of 86 Km/h within 5 seconds

Figure 3-27: Airspeed Trend

The airspeed scale for Part 27 or 29 rotorcraft has additional specific airspeed markings as defined in Figure 3-28.



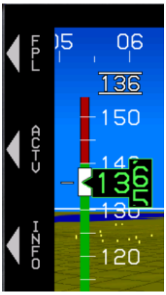
A red cross-hatched line at V_{NE} (power-off)

If enabled, a white triangle translational lift reference speed marker appears.

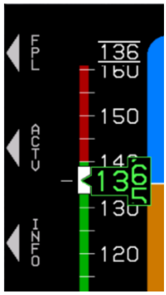
Figure 3-28: Airspeed Scale FAR Part 27/29

3.3.12.1. Airspeed Bug

The user-settable airspeed bug geometrically interacts with the airspeed box pointer. The airspeed bug setting annunciation is colored white and the airspeed bug is filled-white at all times, as in Figure 3-29, which shows examples without a vertically integrated autopilot installed.



SVS Mode



Basic Mode

Figure 3-29: Airspeed Scale Bug Indication

> **NOTE:**
>
> See applicable autopilot guide for airspeed bug colors when vertically integrated with autopilot.

When the airspeed bug setting differs from aircraft speed to the extent the bug is off scale, the bug appears to be parked in the direction of the difference.

Figure 3-30: Airspeed Scale Bug

The user-settable airspeed bug has a 1 knot resolution and a range from the minimum airspeed bug value (set in the system limits) at the low end and red-line airspeed at the high end. The bug can be used as a visual reference.

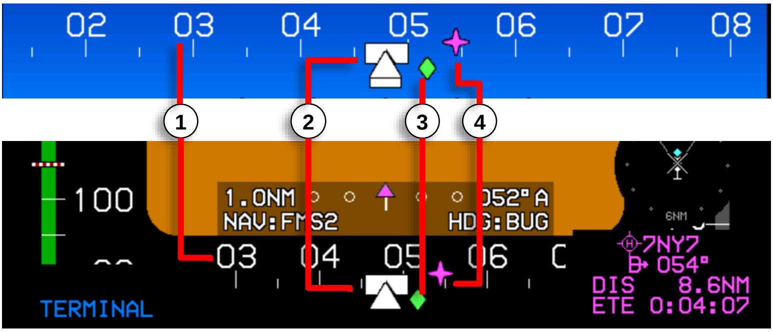
Table 3-8: Airspeed Bug Limits

Low End	High End
V_{MIN}	Red-line (V_{NE})

3.3.13. Heading Display

The PFI heading scale is across the top of the display and can be aligned with Magnetic North or True North depending upon the True North configuration set in EFIS limits.

Normal SVS Mode



Basic Mode

1) Heading Scale
2) Heading Pointer
3) Track Pointer
4) Active Waypoint Pointer

Figure 3-31: Heading Display

The integral slip indicator is responsive to lateral (Y-axis) G-force (slip indicator is the white rectangular part of the heading pointer) and is damped so it approximately matches a conventional glass vial indicator.

NOTE:

The track pointer is not displayed when ground speed is less than 30 knots.

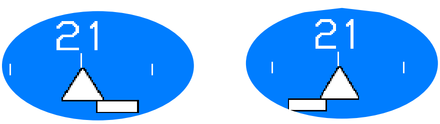


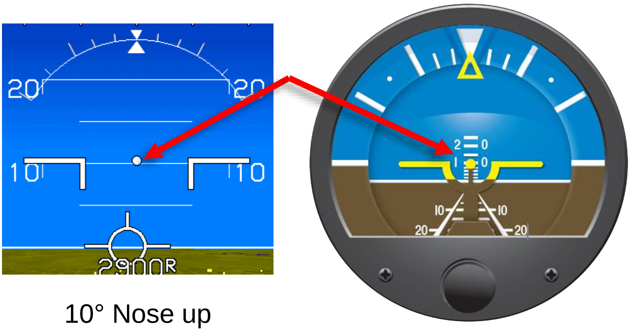
Figure 3-32: Dampened Integral Slip Indicator

When AHRS is in DG mode, DG appears as shown.

Figure 3-33: DG Indicated when AHRS in DG Mode

Table 3-9: Heading Display	
	Track pointer off scale when aircraft track is displaced from boundaries. (Extreme cross-wind condition)
	When an active waypoint exists, a star-shaped bearing pointer corresponds with the active waypoint.
	Waypoint pointer is displaced from heading tape.
	When changed, the heading bug value is displayed for 5 seconds.
	When the heading bug is displaced beyond the boundaries of the heading scale, a partial heading bug is shown at the limit of the heading scale with the heading bug value above it.
	When the heading bug is hollow, feedback from the autopilot indicates the HDG BUG sub-mode is in LNAV mode.
	When the heading bug is white-filled, feedback from the autopilot indicates the HDG BUG sub-mode is in HDG mode.
	Waypoint pointer and shortest direction of turn indications turn amber (yellow) if GPS loss of integrity (LOI) or loss of navigation (LON) caution.

3.3.14. Pitch Scale



10° Nose up
maintaining level flight

10° Nose up

Figure 3-34: Pitch Scale

The PFD has large aircraft symbol reference marks fixed in the center of the display. Rotation of the background, pitch scale, and background-oriented display elements occur relative to the location of the waterline symbol or large aircraft symbol reference marks.

Pitch scale has increments every 5° with major increments and pitch scale labels every 10°. Increments are equally spaced to approximately conform to the 3D PFD background. Pointer bars at the ends of each major increment indicate direction to the horizon and automatically declutter to present the fewest possible increments needed to clearly display pitch attitude.

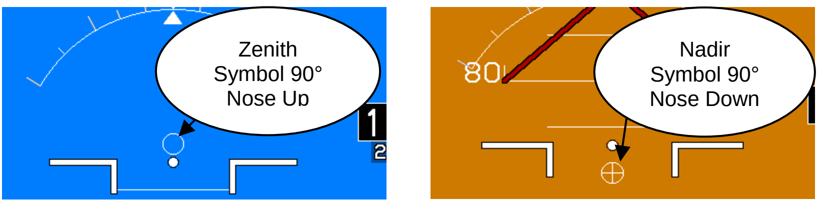


Figure 3-35: Pitch Scale Zenith and Nadir Symbol

3.3.15. Turn Rate Indicator

Rate of turn is available as an option in the PFD declutter menu to show a worm in the direction of turn with full-scale deflection indicating a standard rate of turn (and slightly beyond) and half-standard rate indicated at the mid-scale marking.

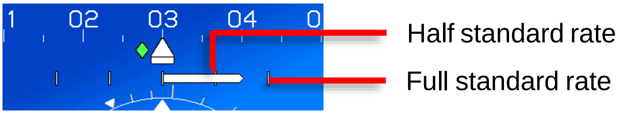


Figure 3-36: Turn Rate Indicator (Selected from Declutter Menu)

3.3.16. Unusual Attitude Mode

Less than 30° pitch up and not in Unusual Attitude Mode

More than 30° pitch up and in Unusual Attitude Mode

Figure 3-37: Unusual Attitude Mode

Unusual attitude mode is enabled when pitch attitude exceeds +30° or -30° or bank angle exceeds 65° and remains engaged until pitch attitude, and bank attitude returns to within 10° of the horizon. Recovery chevrons appear prior to reaching ±20° of pitch to aid in unusual attitude recovery and are a normal part of the pitch scale and are not necessarily tied to unusual attitude mode. The chevrons disappear when within ± 15° of the horizon. The following are disabled in the unusual attitude mode:

1) Terrain and obstruction rendering
2) CDI
3) VDI
4) FPM
5) Highway in the sky boxes
6) Atmospheric perspective
7) Analog and digital AGL indication
8) Active waypoint symbology
9) Mini Map
10) Mini Traffic
11) If in basic mode, PFD reverts to normal SVS mode
12) If in zoom mode FOV, PFD reverts to normal FOV
13) Runways
14) Menus

3.3.17. PFD Background

Time-Critical Terrain Caution Alert   Time-Critical Obstruction Caution Alert

Figure 3-38: PFD Terrain and Obstructions

The PFI has a 3D background generated from terrain elevation and obstruction elevation data stored in electronic memory. The actual horizon displayed on the PFI is based upon the higher of terrain within 90NM or a horizon calculated using a visible horizon equation. Thus, the relative elevation of terrain and obstructions with respect to aircraft altitude and performance is observed by reference to the primary flight information, pitch ladder, and flight path marker (FPM).

The background has two user-selectable field-of-view (FOV) modes, wide FOV mode (approximately 70°) and narrow FOV mode (approximately 35°). In unusual attitude mode, wide FOV mode is automatically selected.

A blended-tone sky is displayed in conjunction with terrain. The sky fades from light blue at the horizon to dark blue at the top of the display to simulate atmospheric perspective and enhance the 3D presentation.

WARNING:

DO NOT USE THIS EFIS FOR TERRAIN-FOLLOWING FLIGHT. DO NOT ATTEMPT TO NAVIGATE USING TERRAIN DEPICTION. ALWAYS ADHERE TO PUBLISHED NAVIGATIONAL INSTRUMENT PROCEDURES AND NAVIGATIONAL CHARTS IN ALL FLIGHT CONDITIONS.

Terrain ahead of the aircraft is shown with the artificial horizon in the correct scale and perspective for the aircraft's current position and altitude. Worldwide terrain coverage is provided in each IDU and shown with a resolution as in Table 3-10. Terrain is displayed ahead of the aircraft using a grid and simulates atmospheric perspective (terrain lines fade into the background ground color as they recede into the distance).

At latitudes greater than 75°, no grid lines are shown. To keep the grid spacing relatively consistent, at latitudes between 45° and 75°, the longitude spacing is increased according as in Table 3-10.

Table 3-10: LAT-LON Resolution Boundaries

Latitude Range	Longitude Grid Spacing	Heading Boundary	
		Pole	Equator
0° to 46°	24 arc-seconds		
46° to 62°	48 arc-seconds	46°	45°
62° to 70°	72 arc-seconds	62°	61°
70° to 74°	96 arc-seconds	70°	69°
74° to 75°	120 arc-seconds	74°	73°

WARNING:

DO NOT USE THIS EFIS FOR TERRAIN-FOLLOWING FLIGHT. DO NOT ATTEMPT TO NAVIGATE USING TERRAIN DEPICTION. ALWAYS ADHERE TO PUBLISHED NAVIGATIONAL INSTRUMENT PROCEDURES AND NAVIGATIONAL CHARTS IN ALL FLIGHT CONDITIONS.

NOTE:

There is a one-degree dead band to prevent grid flicker while flying along one of the boundary latitudes. The grid space switching changes at one degree less latitude when flying towards the Equator than it does when flying toward the Poles.

Obstructions such as towers, antennas, buildings, and other manmade structures are shown on the PFD as vertical amber (yellow) lines. Obstructions are conformal in both location and size and are only shown in conjunction with terrain regardless of altitude. Obstructions representing a collision hazard are annunciated with a time-critical warning or caution alert. See Section 2 System Overview for description of alerts.

WARNING:

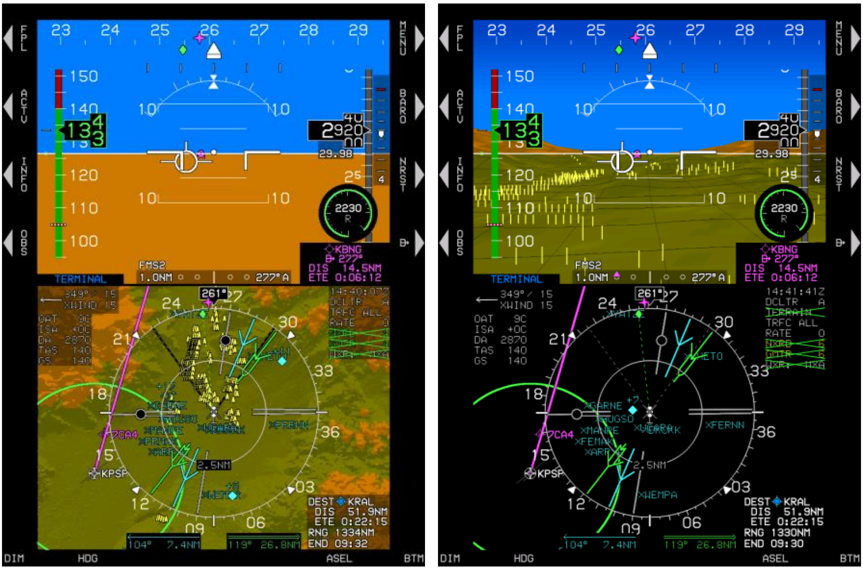
MANY TOWERS, ANTENNAS, STRUCTURES, AND OBSTRUCTIONS ARE NOT IN THE DATABASE.

Obstructions without hazardous condition

Obstructions creating an OBSTRUCTION caution

Figure 3-39: PFD with Obstructions

When terrain and obstruction rendering is deselected or disabled, the PFD screen background is a conventional blue over brown attitude display presentation without atmospheric perspective. Additionally, terrain may be deselected on the PFD and retained on the Map page (Figure 3-40).



PFI Area Terrain Deselected

MAP Area Terrain Deselected

Figure 3-40: PFD with Terrain Deselect Options

<table>
<tr><th colspan="4">Table 3-11: Terrain and Obstruction Rendering Levels</th></tr>
<tr><th>Feature</th><th>Terrain Coloring</th><th>Obstructions</th><th>Notes</th></tr>
<tr><td>SVS BASIC</td><td>Shades of brown for non-water terrain</td><td rowspan="2">Within the following ranges, depicted on PFI in SVS Basic or SVS TAWS mode:
Narrow FOV: 17NM
Wide FOV: 12NM
Tops at or below aircraft altitude: Amber
Tops are above aircraft altitude: Deep red
Obstructions causing TAWS alarms are depicted in separate symbology (See Section 8 TAWS)</td><td>Amber and red colors are not used for normal display of terrain. Obstructions are shown as yellow lines.
Deep blue for areas of water has precedence over shades of brown.</td></tr>
<tr><td>SVS TAWS</td><td>Shades of olive when at or below 100 ft. aircraft altitude
Shades of brown when above 100 ft. aircraft altitude
TAWS coloring of FLTA alert or warning cells</td><td>Amber and red colors are used for normal display of terrain and terrain areas causing FLTA alerts.
Deep blue for areas of water has precedence over other colors.</td></tr>
<tr><td>NONE</td><td colspan="3">No terrain nor obstructions are shown.
1) Neither SVS BASIC or SVS TAWS is selected; OR
2) The GPS/SBAS sensor is failed; OR
3) The ADC is failed; OR
4) In unusual attitude mode; OR
5) When the horizontal figure of merit exceeds the greater of 0.3NM or the horizontal alarm limit for the mode of flight.</td></tr>
</table>

NOTE:

Independent declutter of obstructions is not possible.

The obstruction data is provided by Jeppesen® and must be updated every 28 days to maintain current database information.

3.3.18. Flight Path Marker (Velocity Vector)

The flight path marker (FPM) appears on the background to coincide with the aircraft's actual flight path as projected on the outside world. The FPM is laterally displaced parallel to the horizon with respect to the center of the display to account for the difference between aircraft track and heading, and is vertically displaced perpendicular to the horizon to account for aircraft climb or descent angle.

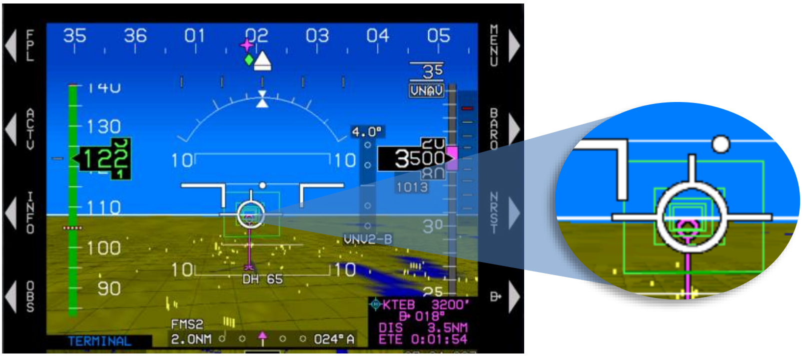
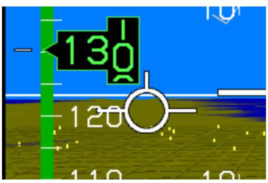
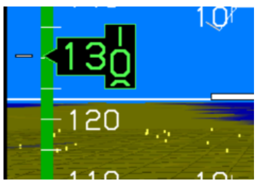


Figure 3-41: Flight Path Marker

Because the FPM is used in conjunction with a 3D background, the FPM utility normally associated with a HUD is achieved. When the FPM is displaced to the extent it interferes with heading, altitude, or airspeed indications, it is removed from the display.



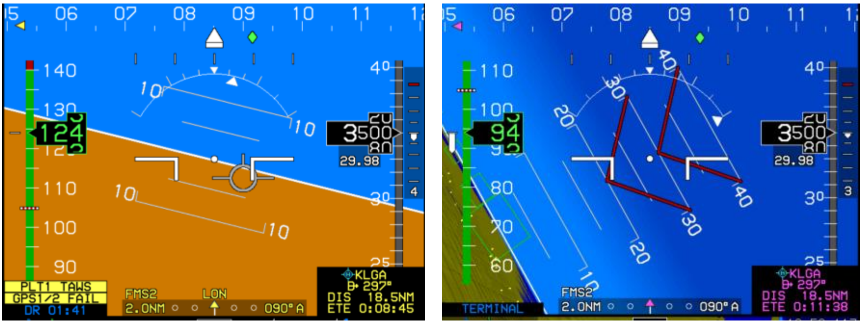
FPM nearing airspeed tape due to strong crosswind from the right



FPM removed due to excessive crosswinds from the right

Figure 3-42: Flight Path Marker Views

FPM movement is dampened by reference to aircraft pitch and heading so not to deviate from pitch or heading at a rate greater than 1°/sec.

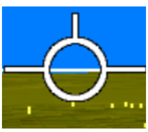


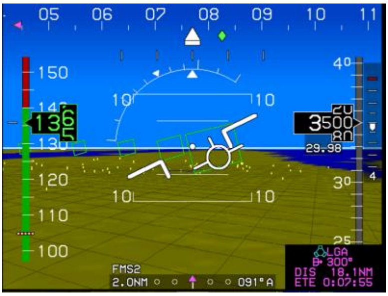
FPM grayed to indicate degraded condition with GPS failure

FPM absent (Unusual Attitude Mode)

Figure 3-43: Flight Path Marker Behavior

Table 3-12: FPM and Hover Vector Relationship

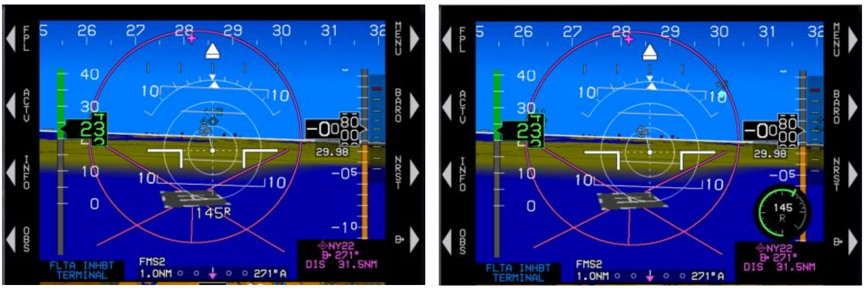
Symbology	Not Shown	Shown
	1) Basic Mode 2) EFIS configured for round dials 3) During Unusual Attitude Mode 4) When the location of the FPM is displaced to the extent that it would interfere with heading, altitude or airspeed indications 5) During FPM INHBT switch if configured 6) FPM at low speed (airspeed ≤ 45 KIAS or 83 Km/h) 7) When configured for WOG, the aircraft is in ground mode	1) SVS Mode 2) Airspeed >45 KIAS or 83 Km/h 3) When configured for WOG, airspeed is >45KIAS or 83 Km/h 4) During reversionary mode (GPS failure) changes to light gray color
	1) Ground speed >30 knots or 55 Km/h 2) During AHRS failure 3) When configured for WOG, aircraft is in ground mode	1) ≤30 knots or 55 Km/h ground speed 2) Aircraft is in air mode



When the Eastern (Russian) ADI format is configured in the EFIS limits, the FPM rotates to indicate roll.

Figure 3-44: Flight Path Marker Eastern (Russian) Format

3.3.19. Hover Vector



AGL Indicator (Normal) AGL Indicator (Analog)

Figure 3-45: PFD Hover Vector Symbology

The hover vector indicates direction and ground speed of drift at low ground speeds (≤30 knots with 2 knot deadband) with large aircraft symbol reference marks consisting of the following:

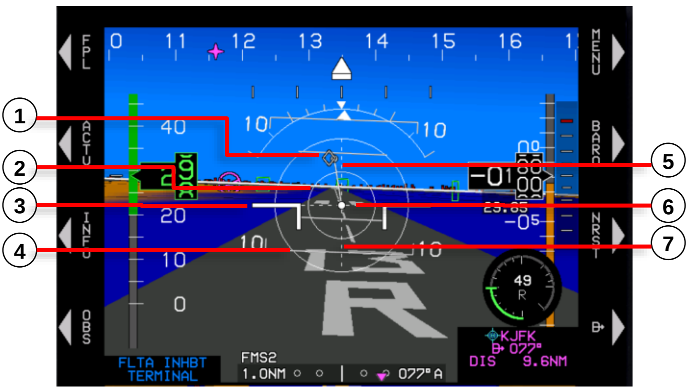


Figure 3-46: Hover Vector

1) Gray dot, equal in size to the white dot (list item 7 below) and connected to the white dot by a white line, floats over the concentric ring area to indicate direction and magnitude of drift in a gods-eye view.

   Deviation of the gray dot in a straight up direction (12 o'clock position) indicates forward flight, while straight down (6 o'clock position) indicates rearward flight. Deviation of the dot laterally indicates lateral drift in that direction. The movement of the dot is constrained to less than 5 knots per second to prevent jumpiness or 2.5 m/s when configured for "SI" units;

2) Inner concentric ring indicating 10 knots ground speed or 5 m/s ground speed;

3) Large aircraft symbol reference marks;

4) Outer concentric ring indicating 20 knots or 10 m/s ground speed;

5) Diamond-shaped acceleration cue is centered on the gray dot to indicate direction and magnitude of horizontal acceleration.

6) White dot of the large aircraft symbol reference marks indicates 0 knots ground speed and is the center for the concentric rings.

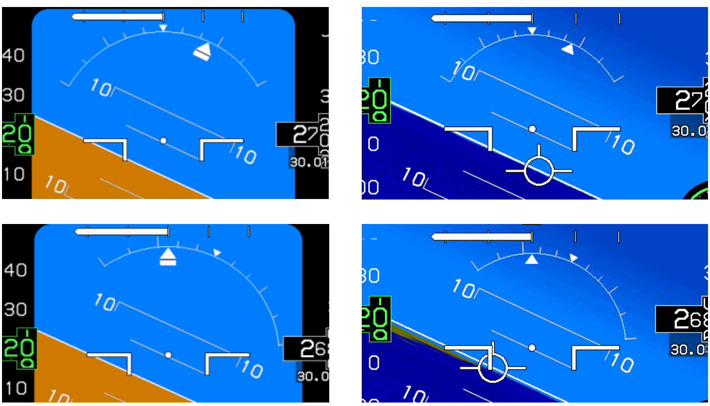
7) Vertical and horizontal dashed lines passing through the center extending to the outer ring.

See § 3.7 for full hover vector symbology with Hover page on MFD.

3.3.20. Bank Angle Scale

Sky Pointer

Roll Pointer



Basic Mode

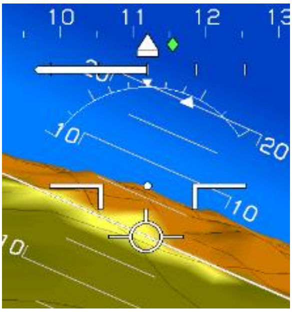
SVS Mode

Figure 3-47: PFD Bank Scale Configuration

The bank scale and roll pointer are centered upon the large aircraft symbol reference marks in basic or unusual attitude mode. When bank angle scale decluttering is selected (not in basic mode), the bank angle scale and sky pointer are displayed when the magnitude of bank angle exceeds 2.8°.

When not manually decluttered, the bank angle scale appears full time. Both, sky pointer and roll pointer configurations are shown Figure 3-47 demonstrating a left turn.

> **NOTE:**
>
> If the bank scale was decluttered, it becomes uncluttered while at low speed ≤30 knots ground speed. Bank scale decluttering can only be configured on the SVS mode.



When the bank angle scale and sky pointer are not decluttered, the bank scale appears full time with level, 10°, 20°, 30°, 45°, and 60° marks on left and right sides. The bank angle scale and roll pointer are centered upon the large aircraft symbol reference marks (basic or unusual attitude mode).

Figure 3-48: PFD Bank Scale

3.3.21. Timer Indication and Flight Time

When selected, a countdown or count-up timer is displayed above the FPM or large aircraft symbol reference marks. The flight timer begins as soon as the first time the aircraft transitions from ground mode to air mode. This flight time continues until the EFIS is powered down.

Figure 3-49: Timer Indication

When the flight time display option is selected, the current elapsed time since the aircraft transitioned from ground to air mode is displayed for 10 seconds or until any key is pressed. If the aircraft has not yet transitioned from ground to air mode, upon selecting the flight time display, it appears as FLT TM: 00:00:00.

Figure 3-50: Flight Time

3.3.22. Marker Beacon Symbology

Marker beacons data acquired from the navigation receiver are displayed on the PFD and disabled when the selected NAV source is FMS. Valid marker beacon signals cause circular indicators with appropriate coloring and markings to display in the lower central portion of the PFI.

Normal SVS Mode

Basic Mode

Built-in Test

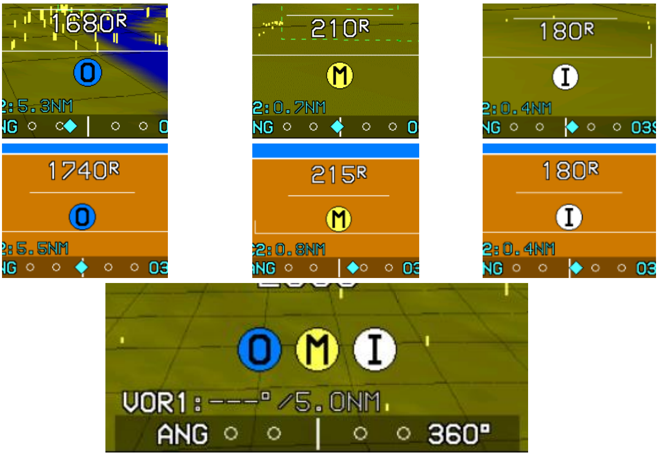
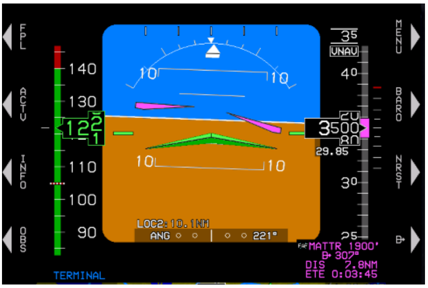


Figure 3-51: Marker Beacons

3.3.23. Flight Director Symbology

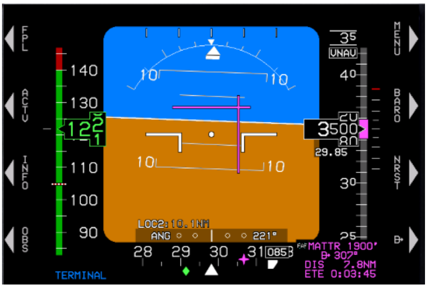
Flight director (FD) symbology is controlled on the IDU or integrated autopilot/flight director. When selected, FD symbology and valid steering commands are received from the FD with one of the following symbols shown in Normal mode. The PFD has a waterline symbol fixed in the center of the display. Rotation of the background, pitch scale, and background-oriented display elements occur relative to the location of the waterline symbol or large aircraft symbol reference marks.

Flight Director FD1 Single Cue



Flight Director FD1 Single Cue

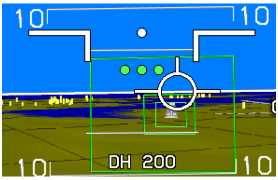
Flight Director FD2 Dual Cue



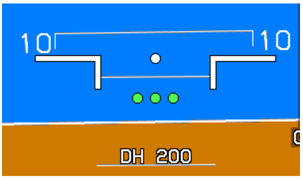
Flight Director FD2 Dual Cue

Figure 3-52: Flight Director

3.3.24. Landing Gear Indication



Normal SVS Mode



Basic Mode

Figure 3-53: Landing Gear Indication

When enabled in EFIS limits, the landing gear position is indicated as small, green “tires” below the flight path marker or large aircraft reference marks.

3.3.25. Course Deviation Indicator (CDI)

Table 3-13: CDI Behavior and Color

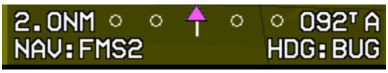
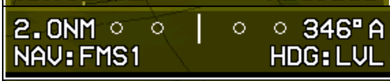
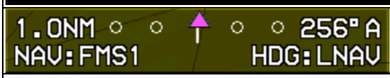
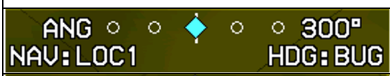
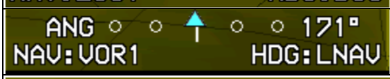
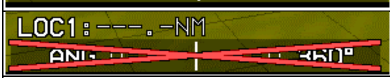
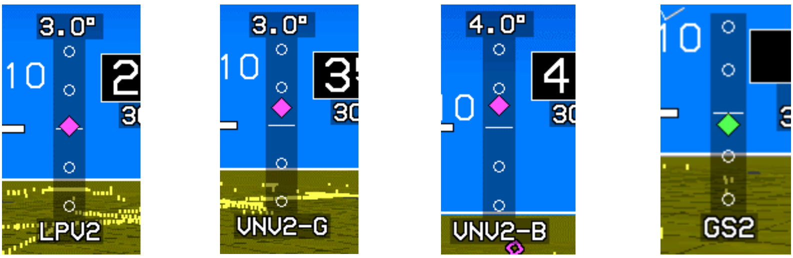
CDI Pointer and Condition	Color or Behavior
Full-Scale Deflection	Flash
Slaved to GPS/SBAS (with GPS LON)	Amber (Yellow)
Normal conditions	Magenta
In sources other than FMS	ANG (angular) scale annunciation
With Analog Autopilot Configured	
	RNP level of service
	The True North symbol (^{T}) (used if the navigation source is FMS and in True North mode)
	Reverse sensing (Course error exceeds 105°)
	Red "X" displayed over CDI
	Holding the wings level
	Selected nav source FMS1
	Selected nav source FMS2 (Only available if a second GPS/SBAS receiver is installed)
	Selected nav source VLOC1
	Selected nav source VOR1 with TO indication and LNAV captured
	Selected nav source VOR2 with the FROM indication
With Integrated Autopilot or Without Autopilot Configured When VOR, LOC, or BC is the NAV source, DME, when available, is displayed next to the NAV source	
	Reverse sensing (Course error exceeds 105°)
	Red "X" displayed over CDI
	Selected nav source FMS1 (during GPS approach)

Table 3-13: CDI Behavior and Color

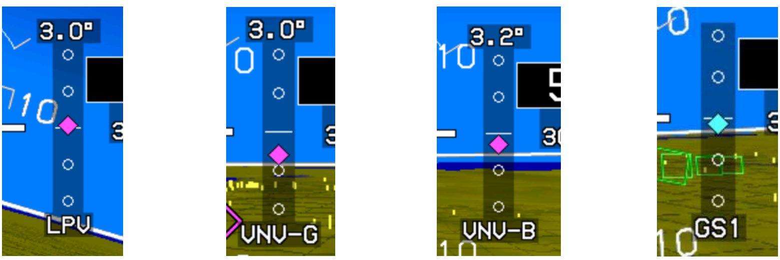
CDI Pointer and Condition	Color or Behavior
	Selected nav source VLOC1
	Selected nav source VOR1 with TO indication
	Selected nav source VOR2 with FROM indication

3.3.26. Vertical Deviation Indicator (VDI)

The vertical deviation indicator (VDI) displays vertical deviation for the selected valid vertical navigation source. The VDI displays the proper descent profile and automatically disappears in unusual attitude mode.



Dual Sensors Indication



Single Sensor Indication

Figure 3-54: Vertical Deviation Indicator

1) LPV Mode plus LPV Label: LPV is annunciated when descending on the final approach segment in LPV mode. GPS Altitude is utilized to generate VDI; pilot may follow guidance to LPV minima regardless of temperature. LPV1 or LPV2 is shown if configured with dual GPS/SBAS receivers.

2) LNAV/VNAV Mode plus VNV-G Label: VNV-G is annunciated when descending on the final approach segment in LP, LNAV/VNAV, and LNAV or RNP modes when using GPS VNAV. GPS altitude utilized to generate VDI; pilot may follow guidance to LNAV minima regardless of temperature. VNV1-G or VNV2-G is shown if configured with dual GPS/SBAS receivers.

3) LNAV/VNAV Mode plus VNV-B Label: VNV-B is annunciated as the default FMS barometric VNAV mode. Using barometric altitude to generate the VDI, pilot may follow guidance to LNAV minima as long as the specified temperature is within limits. VNV1-B or VNV2-B is shown if configured with dual air data computers.

4) LNAV Mode plus VNV-G Label: VNV-G is annunciated to indicate GPS altitude is used to generate the VDI, the pilot can follow guidance to LNAV minimums regardless of temperature.

5) LNAV Mode plus VNV-B Label VNV-B is annunciated to indicate barometric altitude is the VDI source and the pilot can follow guidance to LNAV minimums regardless of temperature.

6) Glide Slope: GS1 is annunciated and the pilot may follow guidance to published barometric DH. GS2 is shown if configured with dual NAV receivers.

Table 3-14: Vertical Deviation Indicator Behavior

Source (Below VDI)	Behavior/Condition	Pointer Color
FMS	Conforms to the VDI display	Magenta
Glide Slope	Source must be valid when a valid glide slope is received.	Cyan
LPV or VNAV mode	Source is valid if: On VNAV descent segments when approaching the Top of Descent point to provide descent anticipation as long as the following are true: 1) On VNAV descent segments; or 2) If the vertical deviations on VNAV level segments option are enabled, on VNAV level segments; or 3) If the vertical deviations on the VNAV level segments option are disabled when approaching the top of the descent point to provide descent anticipation;	Magenta

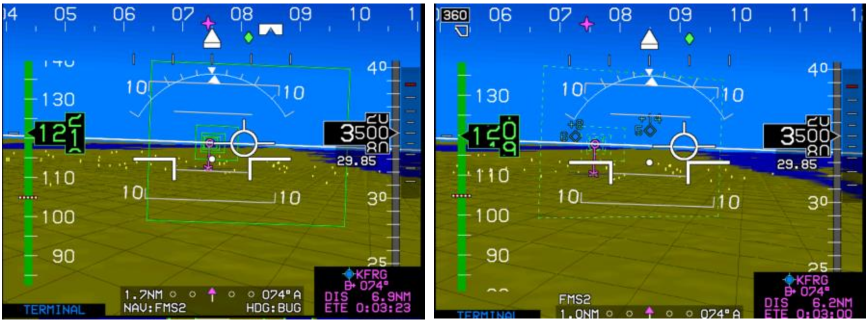
Table 3-14: Vertical Deviation Indicator Behavior

Source (Below VDI)	Behavior/Condition	Pointer Color
	Providing: 1) Aircraft is within 2NM or twice the full-scale deflection for the mode of flight (whichever is greater) of the lateral navigation route; and 2) Aircraft is in TO operation relative to the active VNAV waypoint (i.e., considering VNAV offsets); and 3) If on the final approach segment, the aircraft is within a 35° lateral wedge of the azimuth reference point (GARP or MAWPT + 10,000 ft.).	
LPV, VNV-G	During GPS LON or GPS VLON	Pointer and Text Color Amber (Yellow)

Figure 3-55: VDI Color during GPS/SBAS LON or VLON

3.3.27. Highway in the Sky/Skyway

When not decluttered, the PFD displays the active navigation route or manual OBS course in 3D with a series of skyway boxes, which overly the flight plan route at a desired altitude and provide lateral and vertical guidance. See Section 7 IFR Procedures for details.



Coupled skyway with autopilot or without autopilot

Uncoupled from skyway with autopilot

Figure 3-56: Highway in the Sky

3.3.28. Active Waypoint and Waypoint Identifier

The PFD displays the active waypoint symbol as a magenta "tethered balloon" consisting of:

1) an "X" depicted at the ground location of the active waypoint;

2) a hoop or "tethered balloon" (for fly-over waypoints) or "tethered diamond" (for fly-by waypoints) depicted at the VNAV altitude or at aircraft altitude (if there is no VNAV altitude), and

3) a line connecting "X" and hoop.

Figure 3-57: Active Waypoint Symbol

The "X" and connecting line are not shown if no ground elevation information is encoded with NavData® waypoint information (e.g., terminal and en route fixes). The active waypoint symbol is drawn using hidden-surface removal techniques of the terrain and obstruction rendering so an active waypoint behind terrain appears to be so. The active waypoint symbol disappears in unusual attitude mode and turns amber (yellow) if a GPS LON caution.

The identifier of the waypoint along with the path and along-track distance to the waypoint is displayed in the lower right corner of the PFI in magenta. If a target altitude is not set and the active waypoint has a VNAV altitude associated as in Figure 3-58 the identifier includes a display of the VNAV altitude.

1) Instantaneous bearing to desired track

2) Path to waypoint

3) Along-track distance to active waypoint

4) ETE or ETA based on along-track distance

Figure 3-58: Active Waypoint

> **NOTE:**
>
> Only the active waypoint is shown on the PFD display. Subsequent waypoints in a route are displayed sequentially as the current active waypoint is passed. With terrain turned off, the active waypoint is always visible regardless of distance.
>
> If the active waypoint is beyond the lateral limits of the screen, the magenta waypoint direction pointer (i.e., magenta triangle) on the directional scale indicates shortest direction of turn to the waypoint.
>
> If the waypoint is only a hoop hanging in space, it is a fix and not directly associated with a NAVAID on the ground (such as a VOR, NDB, user waypoint, or airport).
>
> If the waypoint X disappears behind terrain on the PFI, there is terrain between the aircraft present position and the waypoint.

3.3.29. Mini Map

The mini map is mutually exclusive with the analog AGL and mini traffic. These features disappear in unusual attitude mode.

Distance in NM

Distance in KM

Figure 3-59: Mini Map

Table 3-15: Mini Map Behavior (When Not Decluttered)

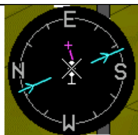
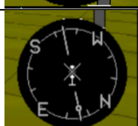
VOR Pointer, Active Leg, Ownship Symbol	Color		Condition
VOR 1		Cyan	When valid
VOR 2		Green	
ADF 1		Gray	
ADF2		Gray	
Active Leg		Magenta	GPS/SBAS normal

Table 3-15: Mini Map Behavior (When Not Decluttered)

VOR Pointer, Active Leg, Ownship Symbol	Color	Condition
	 Amber (Yellow)	GPS/SBAS LON condition
Ownship Symbol	 White	Always
Active Leg	 Magenta	GPS/SBAS normal
	 Amber (Yellow)	GPS/SBAS LON

3.3.30. Mini Traffic

See Traffic Appendix for further details.

Distance in NM

Distance in KM

Figure 3-60: Mini Traffic

When selected from the decluttering options, mini traffic is displayed in the lower right corner of the PFI area of the PFD above the active waypoint identifier. It has clock face markings fixed at the 6 NM/10KM scale.

During traffic warning (TA or RA), and the aircraft is above 500' AGL, the mini traffic scale automatically adjusts in multiples of the following units depending on EFIS limits settings.

Table 3-16: Mini Traffic (When Not Decluttered)

Distance in NM			Distance in KM		
2	4	6	3	6	10

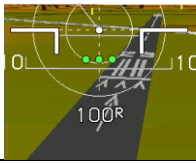
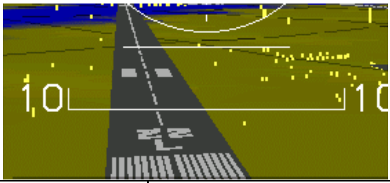
3.3.31. Runways

The PFD displays airport runways in a 3D manner. Upon activation of a DP, VFR approach, IFR approach, or STAR procedure, runways for the airport associated with the procedure, as well as, runways associated with the three nearest airports (computed by TAWS algorithms) are displayed. Runways are displayed with hidden-surface removal techniques of the terrain and obstruction rendering, so runways behind terrain appear to be so. Runways are based on characteristics in the navigation database, including elevation, position, orientation, length, and width, and displayed as defined in Table 3-17.

Figure 3-61: Runways

The shades of gray used to render the runways, selected runway and their respective markings are distinguishable from each other and from the color white, as shown in Table 3-17.

Table 3-17: Runway Drawing Criteria

Feature	Color	Notes
Runway surface	Dark gray 	According to characteristics from navigation database, e.g., including position, orientation, length, and width
Runway markings	Medium gray 	
Landing portion of selected runway	Light gray 	According to displaced threshold data
Runway markings for selected runway		Contrasting lighter gray

3.3.32. Heliports

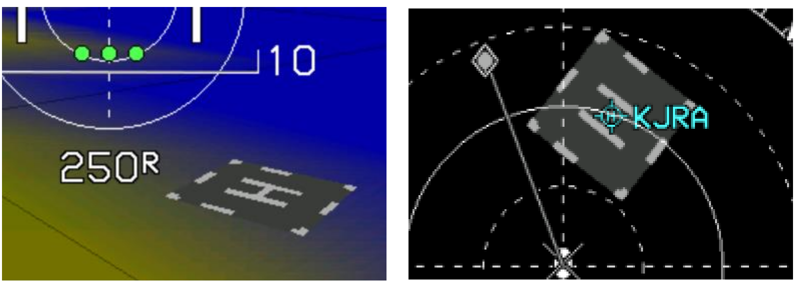


Figure 3-62: Heliports

Heliports appear as distinguishable 150’ x 150’ helipads with applicable markings. Heliports disappear do not appear in basic mode/when in round dial PFD, and disappear in the unusual attitude mode.

3.3.33. Horizon Synchronization

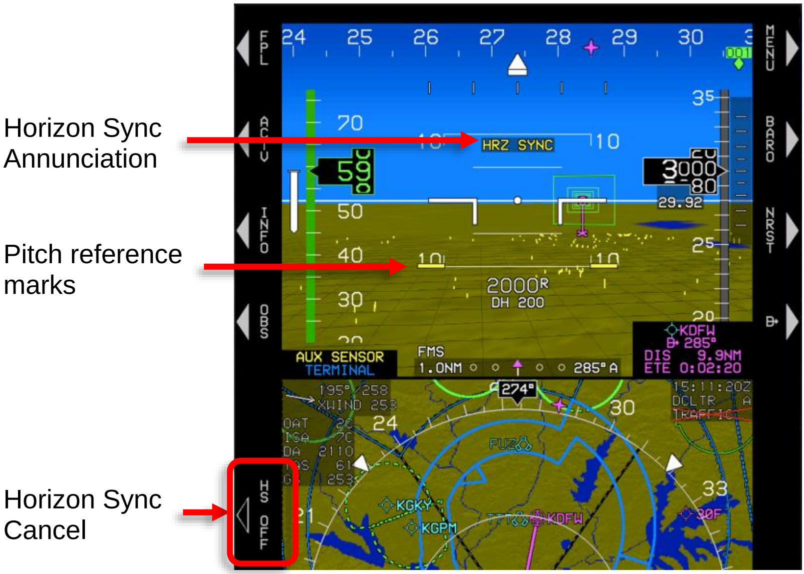


Figure 3-63: Horizon Synchronization

Horizon Synchronization introduces an offset to pitch angle and re-centering of the horizon during Category A departures with two yellow reference marks appearing at the actual horizon position.

Table 3-18: Horizon Synchronization Parameters

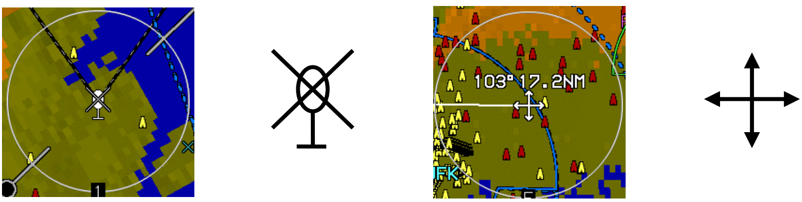
Required for Activation	Automatically Deactivates
1) Category A is enabled (airspeed < 60KIAS); 2) Pitch attitude information is valid; 3) No pitch or roll miscompare alert exist; 4) Pitch is in the range of ± 11°; and 5) EFIS is not in unusual attitude mode.	1) Category A is disabled (airspeed > 60KIAS); 2) Pitch attitude is invalid; 3) Pitch or roll miscompare alert exists; 4) Pitch magnitude is ≥ 30°; and 5) EFIS is in unusual attitude mode.

3.4. MFD Symbology

The EFIS displays a variety of MFD pages:

1) Moving Map
2) HSI
3) Navigation Log
4) Strikes (see WX-500 Lightning Strikes appendix)
5) Traffic (see Traffic appendix)
6) Datalink (see Datalink appendix)
7) Search and Rescue Patterns (see SAR appendix)
8) Weather Radar (see WX-RDR appendix)

3.4.1. Ownship Symbology



Rotorcraft

Pan Mode

Figure 3-64: Ownship Symbology

> **NOTE:**
>
> When not panning with the AHRS in the DG mode, "DG" appears to the right of the ownship symbol.

3.4.2. Clock Options

Zulu Time

Local Time

Displayed in upper right corner

Sunrise and sunset displayed with Info menu in lower right corner

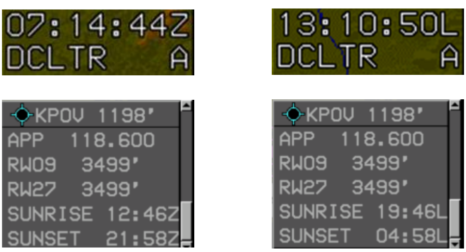


Figure 3-65: Clock Options

Table 3-19: Clock Options		
Feature	**Options**	**Notes**
Zulu or Local Time	hh:mm:ssZ hh:mm:ssL	Synchronized with the GPS/SBAS constellation
Declutter Mode	DCLTR A DCLTR M	= Automatic declutter mode = Manual declutter mode
Terrain Status	Enabled or Disabled	Indicated by absence or presence of terrain
		 Manually turned off
		 Failed
Traffic Status	See Traffic Appendix	
Strikes Status	See Strikes Appendix	
Datalink Weather Status	See Datalink Appendix	
WX-RDR Status	See WX-RDR Appendix	

3.4.3. Air Data and Ground Speed

The following are displayed in the upper left corner:

1) Wind: Information consists of the following readouts:

    a) The direction in degrees;

    b) Speed in Knots or m/s

    c) Crosswind in Knots or m/s; and

    d) Graphical wind vector arrow corresponding to MFD page orientation.

NOTE:

Wind information is not shown when the EFIS is in ground mode or the AHRS is in DG mode.

If referenced to magnetic north, direction readout uses the degree (°) symbol. Otherwise, a stylized true north (^{T}) symbol is used.

2) Outside Air Temperature (OAT): Digitally in °C or °F (as configured).

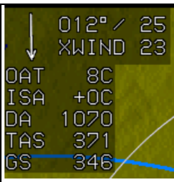
3) International Standard Atmosphere (ISA): Difference between ISA temperature and current outside air temperature is displayed digitally in °C or °F (negative value = less than standard OAT). Decluttered if not enabled in EFIS limits.

4) Density Altitude (DA): Digitally in feet or meters. Decluttered if the “Density altitude” is disabled in EFIS limits.

5) True Airspeed (TAS): Digitally in knots. Decluttered if “TAS” is disabled in EFIS limits.

6) Ground speed: Digitally in knots or Km/h.

Table 3-20: Air Data and Ground Speed

	Normal Mode		True North Mode	
				
Wind:	Knots	m/s	Knots	m/s
Alt:	Feet	Meters	Feet	Meters
Speed:	Knots	Km/h	Knots	Km/h

3.4.4. Moving Map

Basic Moving Map

Moving Map with IAP

Figure 3-66: Basic Moving Map

Table 3-21: Moving Map Orientation	
North-Up Arc Mode	
North-Up Centered Mode	
Heading Up Centered Mode	

3.4.5. Compass Rose/Boundary Circle Symbol

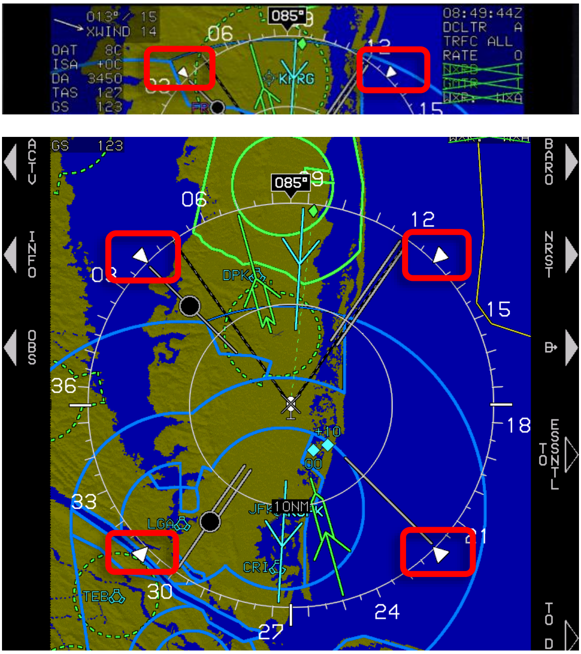
When selected, a digital heading readout and pointer aligned with the longitudinal axis of the ownship symbol appears on the compass rose boundary circle.

Normal Mode True North Mode

Figure 3-67: Compass Rose

If referenced to magnetic north, the heading readout uses the degree (°) symbol. Otherwise, a stylized true north (^{T}) symbol is used. A green diamond-shaped track pointer aligned with the aircraft's track across the earth appears on the compass rose but is not displayed when ground speed is less than 30 knots.

In heading up mode, the magnetic digital heading readout and pointer are aligned with the longitudinal axis of the ownship symbol.



MFD Full Map

Figure 3-68: Boundary Circle Symbols

NOTE:

See Section 7 IFR Procedures for description of the following heading modes with the AHRS and EFIS:

1) ADAHRS Slaved—EFIS Magnetic North
2) ADAHRS Slaved—EFIS True North
3) ADAHRS Free/"DG"—EFIS Magnetic North
4) ADAHRS Free/"DG"—EFIS True North

3.4.6. Waypoint Distance ETE/ETA Functions

Active navigation route and fuel totalizer information is presented in the lower right corner of the Map page.

GPS in normal state and current active waypoint

GPS in LON condition

GPS in normal state and not the current active waypoint

Figure 3-69: Waypoint Distance ETE/ETA Functions

Table 3-22: Waypoint Distance ETE/ETA Functions

Function	Conditions	Text
DEST Waypoint	If there is an active flight plan, waypoint type, identifier, along-track distance, and ETE/ETA for the last waypoint (“DEST” waypoint) are shown. If the active waypoint is not the last waypoint, time to destination waypoint is based on the flight plan route. Otherwise, time is based on a direct geodetic path. Waypoint information is white but turns amber (yellow) with GPS LON caution.	ETA or ETE Degree (°) or True North (^{T}) symbol
Range	Based on instantaneous fuel flow, fuel remaining and ground speed are shown immediately below “DEST” waypoint information for easy comparison.	
Endurance	Based on instantaneous fuel flow and fuel remaining as shown.	

3.4.7. Borders

National and United States state borders are drawn if selected at all map scales. They are white if the background includes terrain.

State Borders Drawn

Without State Borders Drawn

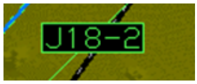
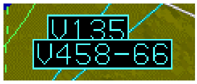
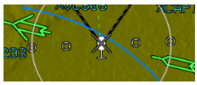
With State Borders on MFD Full Map

Figure 3-70: Borders

3.4.8. Navigation Data

Navigation data (ND) is displayed in correct relationship to the ownship symbol with navigation data symbols in Table 3-23.

Table 3-23: Navigation Symbology

	IFR Airport LRG APT ✓ IFR APT ✓		NDB NDBS ✓
	VFR Airport VFR APT ✓		Fix ENR FIXES ✓ TRM FIXES ✓
	VORTAC VORS ✓		High Altitude Airway H AIRWAY ✓
	DME only or TACAN VORS ✓		Low Altitude Airway L AIRWAY ✓
	VOR VORS ✓		User Waypoint USER WPTS ✓
	User Waypoint in Pan Mode USER WPTS ✓		HSI overlay CDI scale HSI ✓
	VFR Fix VFR FIXES ✓		

The Map has manual and automatic decluttering of navigation data. The six levels of automatic declutter are based upon the number of navigation data symbols drawn in the current map format and range as follows:

1) Airports: Manually or automatically decluttered. In automatic declutter mode, large airports (IFR procedure and longest runway and automatically adjusted threshold needed to achieve desired symbol count) are always shown; IFR airports that are not large airports are shown in levels 1, 2, 3, and 4; and VFR airports are shown in levels 1, 2, and 3.

2) VORs: Manually or automatically decluttered. In automatic declutter mode, VORs are shown in levels 1, 2, 3, 4, and 5.

3) NDBs: Manually or automatically decluttered. In automatic declutter mode, NDBs are shown in levels 1 and 2. Both en route and terminal NDBs are shown.

4) Fixes (including user waypoints): Manually or automatically decluttered. In automatic declutter mode, en route IFR fixes are shown in level 1. Terminal IFR fixes and VFR fixes are manually selected and not shown in automatic declutter mode. En route IFR fixes, terminal

IFR fixes, VFR fixes and user waypoints can be manually decluttered separately from each other.

5) High Altitude Airways: Manually selected/Automatically decluttered.

6) Low Altitude Airway: Manually selected/Automatically decluttered.

NOTE:

Airspace is manually selected and does not automatically declutter. Airspace selection status is maintained in the menu during power down and appears on the MAP during the next initialization.

Table 3-24: Airspace Depiction

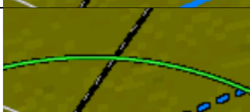
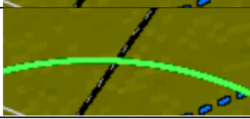
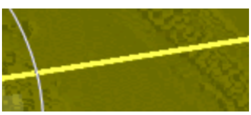
Type of ARINC 424 Airspace		Vertical Limits
	Dashed lines	More than ±500'
	Solid lines ARSPC CTRL ✓	Within ±500'
	Thick solid lines ARSPC CTRL ✓	Within airspace, vertical limits
		Airspace Color
	Class C, Control area, TRSAs, Class D ARSPC CTRL ✓	Green
	Class B, TCAs (where applicable) ARSPC CTRL ✓	Blue
	Caution, Danger, MOAs, Training, Warning, or Unknown areas ARSPC SUA Y ✓	Amber (Yellow)
	Prohibited, Restricted, or TFR areas (when equipped with Datalink) ARSPC SUA R ✓	Red

Figure 3-71: Navigation Data and Airspace Depiction (PFD or MFD Map Page)

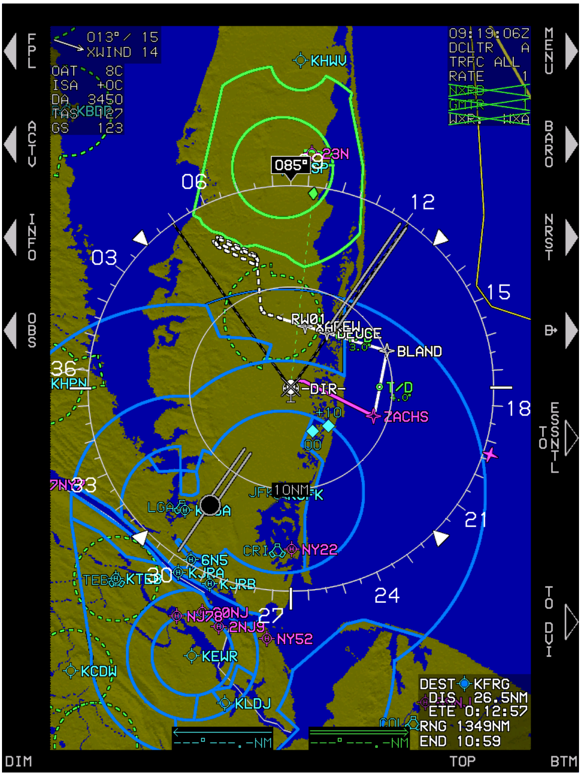
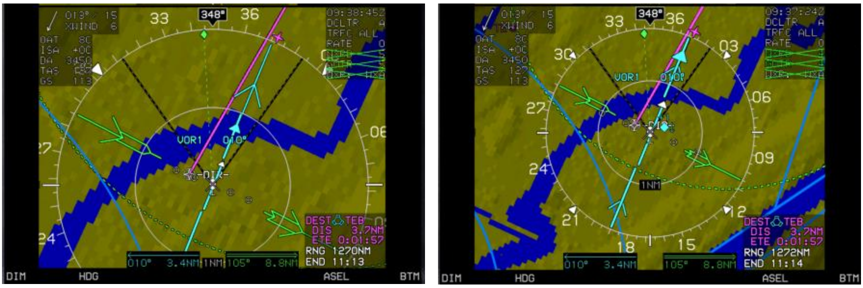


Figure 3-72: Navigation Data and Airspace Depiction (MFD Full Map)

3.4.9. Analog Navigation Symbology

When valid and selected, analog (VOR1, VOR2, ADF1, and ADF2) navigation symbology is displayed.



MAP in Arc Mode MAP in Centered Mode

Figure 3-73: Analog Navigation Symbology, HSI Overlay

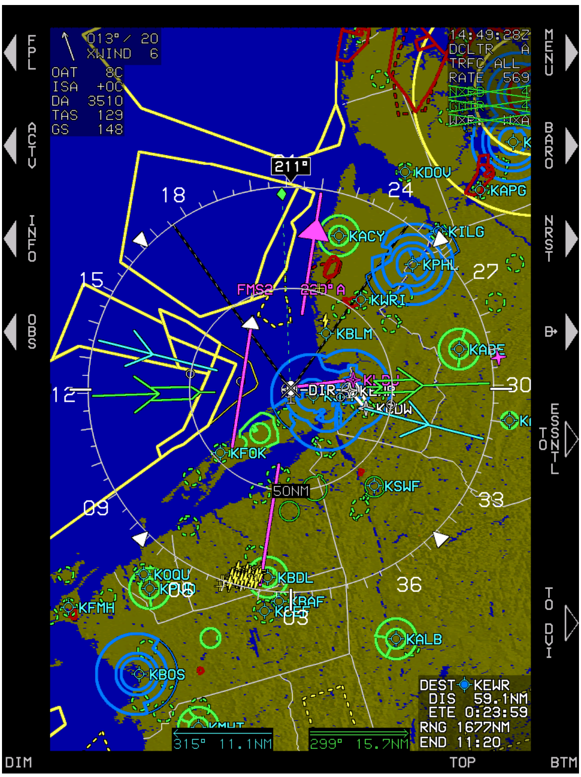


Figure 3-74: Analog Navigation Symbology, HSI Overlay (MFD Full Map)

When selected, VOR1, VOR2, ADF1, and ADF2 navigation are displayed with a magenta single line FMS1 or FMS2. VOR1 pointer is a cyan single-line pointer. VOR2 pointer is a green double-line pointer. If the DME channel is in hold mode, “H” is shown in the yellow distance readout. If a bearing or distance are not valid, the respective field is filled with dashes.

ADF1 (gray single-line pointer) and ADF2 (gray double-line pointer). If the radio signal is invalid, the associated navigation pointer is not shown.

When selected, the HSI displays analog (VOR1 [cyan] and VOR2 [green]) navigation symbology with an RMI pointer format overlaid upon the HSI. When the signal is invalid, the associated pointer is not shown. When the signal is valid for VOR1 and VOR2, a bearing and distance display for the selected VOR pointers appears at the bottom of the display in the same color of the respective pointer.

NOTE:

The full map page only has a centered mode.

If the aircraft limits indicate no DME channel1 or channel2 installed, no dashes are shown on the respective VOR pointer to indicate invalid DME data.

3.4.10. Terrain/Obstructions

Terrain and obstructions are displayed in correct relationship to the ownship symbol using color to show relationship to aircraft altitude.

Terrain and obstruction rendering is user-selectable to declutter the display by deselecting terrain. Furthermore, terrain and obstruction rendering is disabled when:

1) The GPS/SBAS sensor is failed; OR

2) When the ADC is failed; OR

3) When the horizontal figure of merit exceeds the greater of 0.3NM or the horizontal alarm limit for the mode of flight.

NOTE:

See Section 8 Terrain Awareness Warning System for obstructions causing TAWS alarms and depiction of separate symbology.

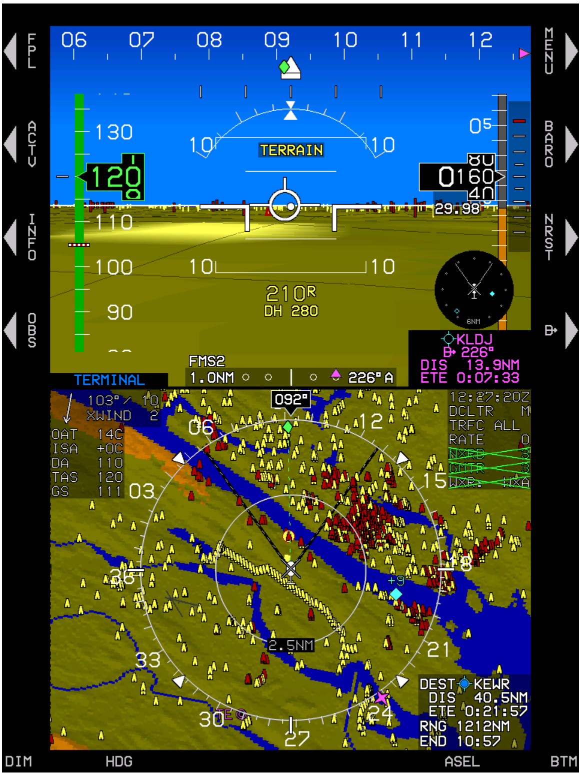


Figure 3-75: Terrain/Obstructions

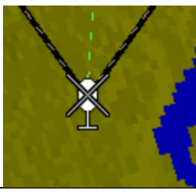
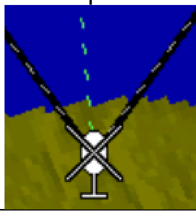
Table 3-25: Terrain Color		
Based on Aircraft Altitude	**Color**	**Notes**
Terrain at or below 100 feet below aircraft altitude	Olive shades 	Terrain slope determines shade
Terrain above 100 feet less than aircraft altitude	Brown shades 	
FLTA alerts	Amber and Red	See Section 8 TAWS

Table 3-25: Terrain Color

Based on Aircraft Altitude	Color	Notes
Water at all altitudes	Deep Blue 	Takes precedence over other colors

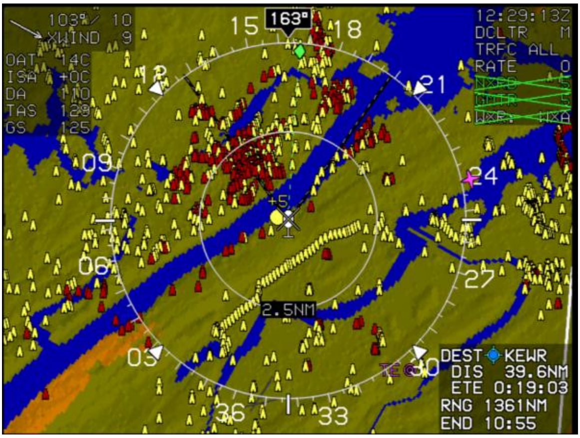


Figure 3-76: Obstructions

Table 3-26: Obstructions

Lateral Distance Away	17 NM or less	PFD in narrow FOV
	12 NM or less	PFD in wide FOV
	8.5 NM or greater or the current TAWS FLTA range in any cardinal direction	Not depicted
	8.5 NM or less	As described below
Vertical Criteria	More than 2000’ below aircraft	Not depicted
	Within 2000’ but at or below aircraft altitude	Depicted in amber (yellow)
	Above aircraft altitude	Depicted in deep red

3.4.11. Pan Mode

Pan mode is used for changing the location of the center of the page away from current location and viewing map details along the route of flight and at the intended or alternate destination while in flight or on the ground. When pan mode is active, use labeled buttons to pan location north, south, east, and west in a North-up, centered orientation. Upon entering the pan mode, the heading pointer, track pointer, lubber line, waypoint pointer, analog navigation symbology, and field of view lines are removed.

Figure 3-77 shows the line with bearing and distance from the map center to the aircraft's current position in white when the aircraft is more than 0.5 NM away. When panning, the nearest displayed airport, VOR, NDB, or fix within the inner range ring are highlighted with a flashing white circle. Waypoint information may be selected using **INFO/HIDE (R6)**. When exiting the pan mode, all previous settings are restored as before pan mode was enabled.

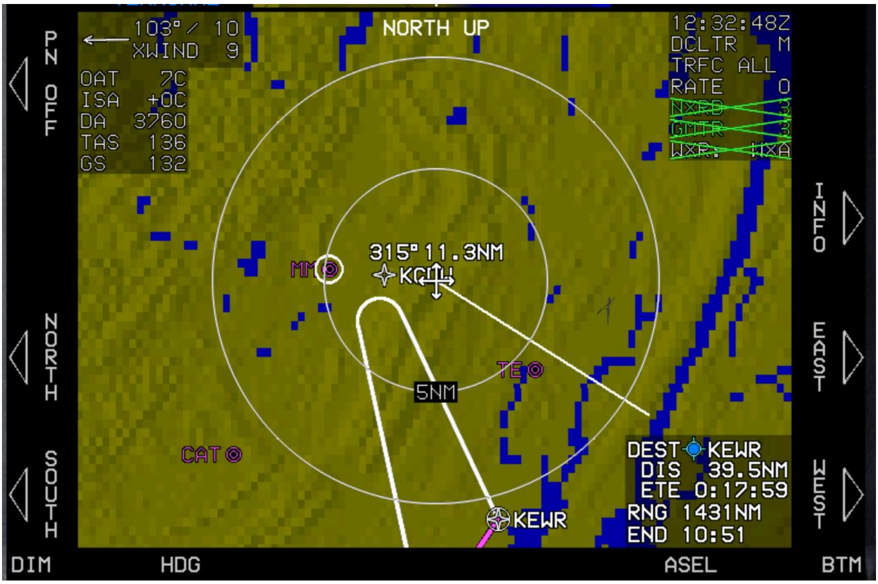
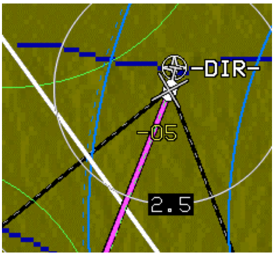


Figure 3-77: Pan Mode

3.4.12. Direct Point

Unnamed waypoints appear depending upon the procedure loaded when a direct-to command is entered. See Section 7 IFR Procedures for more information.



-ALT- altitude terminations

-DIR- waypoints that begin a Direct-To leg

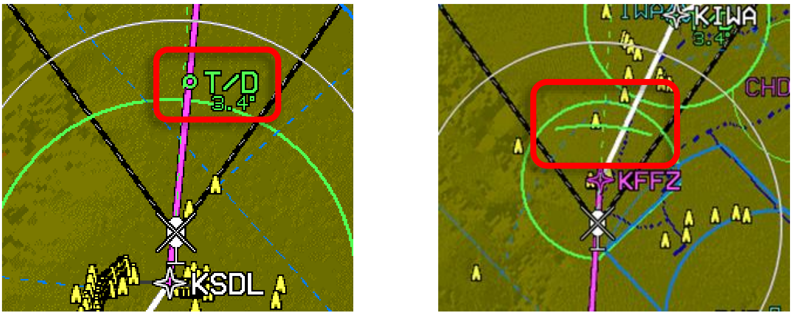
-DME- distance or DME terminations

-INT- intercept terminations

-RAD- radial terminations

Figure 3-78: Direct Point

3.4.13. Altitude Capture Predictor/Top-of-Descent



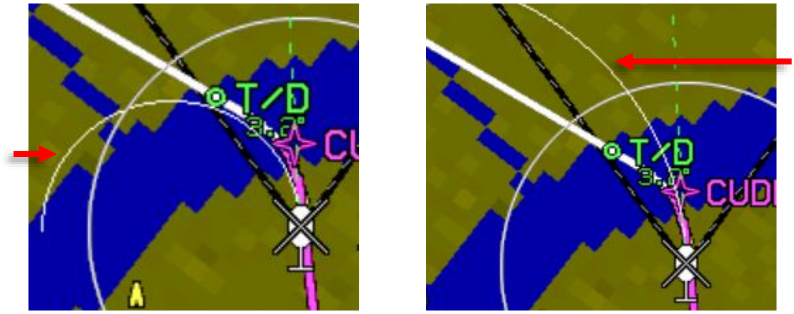
Top-of-Descent   Top-of-Climb or Bottom-of-Descent

Figure 3-79: Top-of-Descent or Top-of-Climb

When a selected altitude or VNAV is specified on the PFD, “T/D” marks correct point on the flight plan path at which descent must be commenced and contains location on the flight plan path with indication of the glide path angle used to calculate position. After passing top of descent along the lubber line, altitude is captured and shown as a green arc located ahead of the aircraft. The arc marks the bottom-of-descent or top-of-climb point.

3.4.14. Projected Path

When the aircraft is in a bank angle with ground speed > 60 Knots (72 Km/h), a projected path emanates from the ownship symbol. This curving path is based on aircraft bank angle and ground speed as projected one minute into the future up to a maximum of 180° of turn. The projected path or “noodle” assists in course interception and making small adjustments to bank angle for proper roll out.



Undershooting Overshooting

Figure 3-80: Projected Path

3.4.15. Parallel Track/Active Flight Plan Path/Manual Course

3.4.15.1. Parallel Track

When there is an active flight plan and GPS/SBAS OBS setting is automatic, the flight plan path is shown on the Map page in correct relationship to the ownship symbol. See Section 5 Menu Functions and Procedures for details on creating a parallel track.

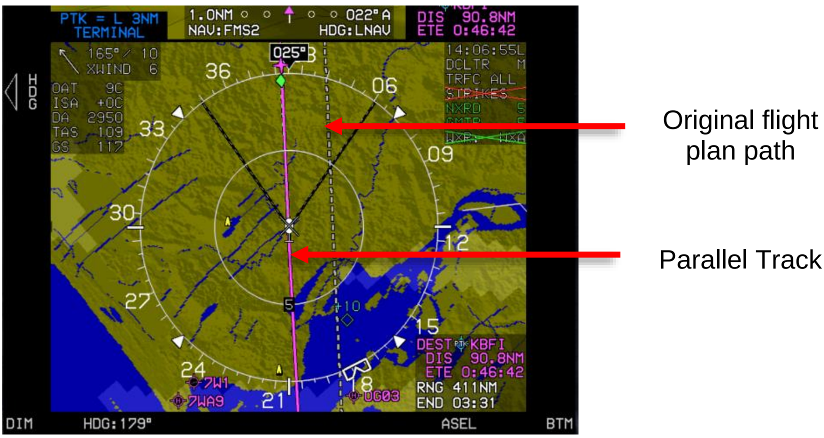


Figure 3-81: Parallel Track

3.4.15.2. Active Flight Plan Path

The active flight plan path's active leg/manual course and active waypoint are magenta but turn amber (yellow) if a GPS LON caution.

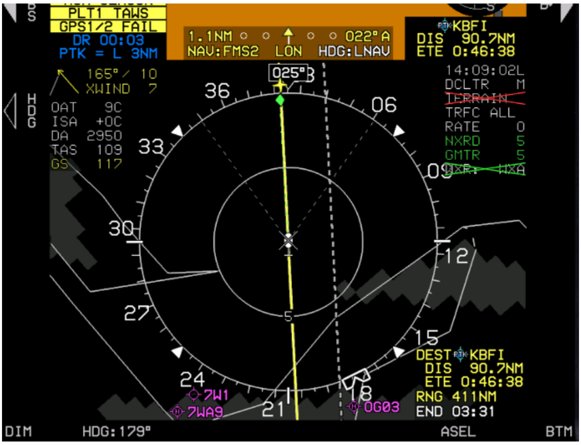


Figure 3-82: Loss of Navigation

3.4.15.3. Manual Course

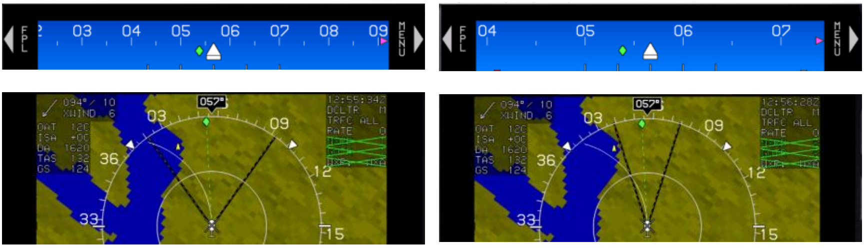
When there is an active waypoint and the GPS/SBAS OBS setting is manual SUSPEND appears (waypoint auto-sequencing is suspended when in manual OBS mode). The manual course through the waypoint is shown as a pointer centered on the waypoint. The pointer matches the lateral navigation guidance given on the PFD (GPS/SBAS CDI in manual OBS mode, skyway boxes, and mini map). See Section 7 IFR Procedures for further details.

The active flight plan path's active leg/manual course and active waypoint are magenta but turn amber (yellow) in case of a GPS LON caution.

Figure 3-83: Manual Course

3.4.16. Field of View (FOV) Indication

The Map page background indicates the FOV with a set of segmented gray lines leading out from the ownship symbol in either 35° or 70° angles depending on the zoom mode setting on the PFD.



Normal FOV (Zoom Off) Narrow FOV (Zoom On)

Figure 3-84: Field of View

3.4.17. Map Range

The white range ring is centered on the aircraft's position to estimate distances quickly. Distance (in NM or KM) from the aircraft to the ring is a white number overlaying the 6 o'clock position of the ring. The range ring is half the distance to the directional scale.

Figure 3-85: Map Range

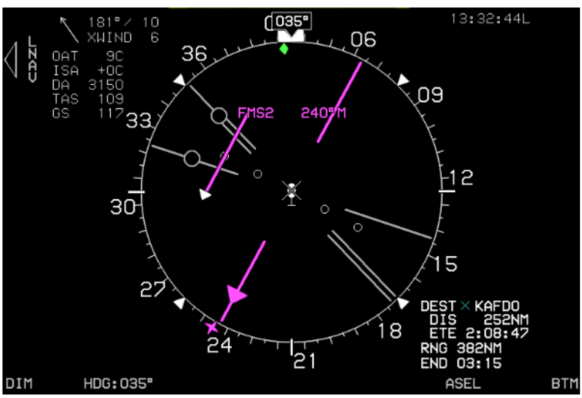
Table 3-27: Range Scale			
Distance in NM		**Distance in KM**	
Inner Ring	**Compass Rose**	**Inner Ring**	**Compass Rose**
0.5NM	1NM	1KM	2KM
1.0NM	2NM	2.5KM	5KM
2.5NM	5NM	5KM	10KM
5.0NM	10NM	10KM	20KM
10.0NM	20NM	25KM	50KM
25.0NM	50NM	50KM	100KM
50.0NM	100NM	100KM	200KM
100.0NM	200NM	250KM	500KM

Table 3-27: Range Scale			
Distance in NM		Distance in KM	
Inner Ring	Compass Rose	Inner Ring	Compass Rose
250.0NM	500NM	500KM	1,000KM
500.0NM	1,000NM	1,000KM	2,00KM

3.5. HSI Page

3.5.1. Analog Navigation Symbology

When selected, VOR1, VOR2, ADF1, and ADF2 navigation are displayed as defined in § 3.4.9.

<table>
<tr><th colspan="2">Table 3-28: HSI</th></tr>
<tr><td>VOR1/VOR2</td><td>
</td></tr>
<tr><td>ADF1/ADF2</td><td>
</td></tr>
</table>

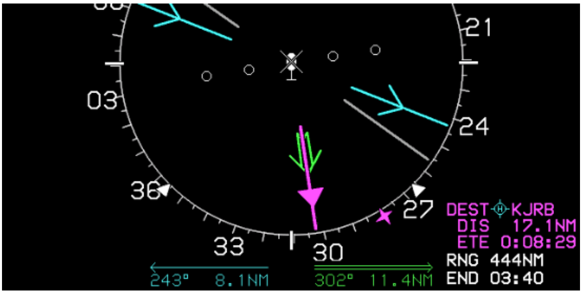


Figure 3-86: HSI Page Bearing Distance Readout

If a DME channel is in hold mode, the associated distance readout is displayed in amber (yellow) and "H" is above of the distance readout.

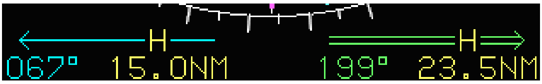
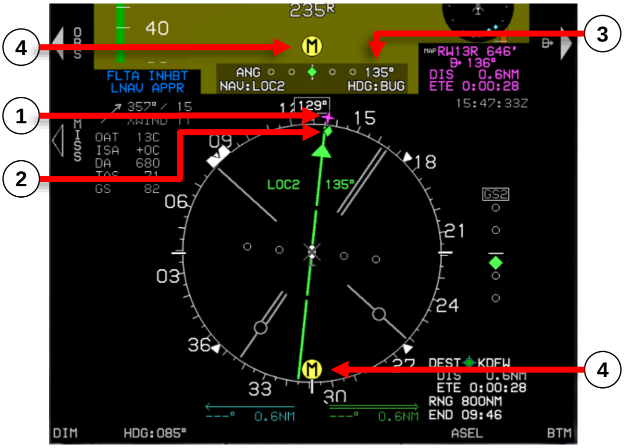


Figure 3-87: HSI Bearing Distance Readout with DME in HOLD

Valid marker beacon symbols are displayed on the PFI and HSI page with appropriate coloring markings. Only during a built-in-test, more than one marker beacon may be active. Marker beacons are disabled when NAV source is other than VLOC1 and or VLOC2.



1) Magenta bearing pointer to active waypoint

2) Green track pointer

3) Final approach course inside CDI area

4) Valid marker beacon

Figure 3-88: HSI with Marker Beacon Displayed

3.5.2. Conventional HSI/PTR Format

When selected, the MFD displays conventional HSI symbology, including a selected course pointer, a lateral deviation indicator, and a “TO-FROM” indicator. Navigation source indication and OBS setting are displayed in the top center of the HSI in the same color as the course pointer. The HSI pointer color is:

1) Magenta (if FMS is the selected navigation source)

2) Cyan (if VLOC1, or ADF1 (NAV PRV enabled), is the selected navigation source)

3) Green (if VLOC2, or ADF2 (NAV PRV enabled), is the selected navigation source)

4) Amber (Yellow) when the HSI is slaved to GPS/SBAS and there is a GPS LON condition.

Normal Magenta Pointer

GPS Loss of Navigation Amber (Yellow) Pointer and Waypoint Information

Figure 3-89: Conventional HSI/PTR Format

The ownship symbol (Figure 3-64) is centered and pointing straight up on the HSI. The HSI has a compass rose aligned with either magnetic north or true north depending upon the status of the true north configuration set in EFIS limits. When the HSI NAV source (FMS, VOR1, or VOR2) fails, a red “X” is displayed in place of the HSI deviations. When the AHRS is in DG mode, “DG” appears to the right of the ownship symbol.

3.5.3. HSI CDI and VDI Scale

The VDI appears when the VDI source is valid to display vertical deviation information for the currently selected navigation source. When the selected source is FMS, the VDI displayed on the HSI has the same behavior as the

VDI displayed on the PFD, with the exception of the VDI source displayed on the top of the VDI to avoid clutter with waypoint information below.

Figure 3-90: HSI CDI and VDI

3.5.4. Air Data and Ground Speed

Air data is displayed as specified in § 3.4.2.

Figure 3-91: HSI Display Air Data and Ground Speed

3.5.5. Clock/Options

Zulu Time

Local Time

Figure 3-92: HSI Clock

The following are displayed in the upper right corner of the HSI page:

1) Zulu or Local Time: As specified in § 3.4.2

2) Traffic: See Traffic Appendix

3) Datalink: See Datalink Appendix

3.5.6. Fuel Totalizer/Waypoint Distance ETE/ETA Functions

Fuel totalizer and waypoint distance is displayed in lower right corner of the HSI as specified in § 3.4.6.

Figure 3-93: HSI Totalizer/Waypoint Distance ETE/ETA

3.6. Navigation Log (NAV Log)

3.6.1. NAV Log Display Format

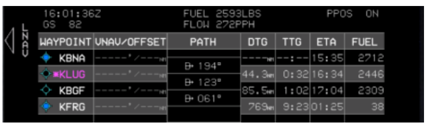
The NAV Log may be set to Waypoint to Waypoint (Wpt to Wpt) or Present Position to Waypoint (PPOS to WPT) display format as defined in Table 3-29.

Table 3-29: NAV Log Format

Wpt to Wpt	PPOS to Wpt
Waypoint Identifier	Waypoint Identifier
VNAV and VNAV Offset	VNAV and VNAV Offset
Path	Path
Distance	Distance to Go (DTG)
ETE	Time to Go (TTG)
ETA	ETA
Fuel Remaining	Fuel Remaining

PPOS status is annunciated in the upper right corner of the Nav Log.

In PPOS to WPT display format, PPOS status is annunciated as **PPOS ON**.



In Wpt to Wpt display format, PPOS status is annunciated as **PPOS OFF**.

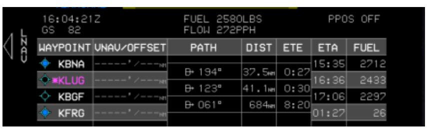


Figure 3-94: PPOS Status on Navigation Log

3.6.2. Clock and Ground Speed

The following are displayed in the upper left corner of the NAV Log:

1) Zulu Time or Local Time: As specified in § 3.4.2.

2) Ground speed: Displayed digitally in knots or Km/h

3.6.3. Fuel Remaining and Fuel Flow Data

The following are displayed in the upper right corner of the NAV Log:

1) Fuel Remaining: If fuel level or fuel flow is available, current fuel remaining is displayed digitally in fuel units.

2) Fuel Flow: If fuel flow is available, the current total fuel flow is displayed digitally in fuel units.

3.6.4. Waypoint Identifier Column

The identifier for each waypoint of the active flight plan is displayed in the left column of the NAV Log. The active waypoint, indicated with an asterisk, is magenta. The current active waypoint color turns amber (yellow) during a GPS LON caution. Brackets indicate suppressed waypoints. Navigation data symbols are shown with the waypoint identifier to distinguish the waypoint type easily.

For airports with an available datalinked (if equipped) METAR, a graphical METAR is displayed as a colored fill within the circular part of the airport symbol, the convention as defined in Table 3-30.

Table 3-30: Datalinked METAR Color Convention

Color	Meaning	
Sky Blue	Visual Flight Rules (VFR)	
Green	Marginal Visual Flight Rules	
Yellow	Instrument Flight Rules (IFR)	
Red	Low Instrument Flight Rules (LIFR)	
Magenta	Less than Category 1 Approach minimums	
Black	No Data	

Legends are drawn on top of the navigation data symbol when a waypoint has special attributes. The following legends are drawn on top of the navigation data symbol:

1) SAR = Waypoint is part of a SAR pattern

2) HOLD = Waypoint is part of an en route Holding pattern

3) Airway Designation = Waypoint is part of the designated airway

4) FAF = Waypoint is a final approach fix.

5) MAP = Waypoint is a missed approach point.

6) MA = Waypoint is part of the missed approach segment of an instrument approach procedure.

7) APP = Waypoint is part of an instrument approach procedure, but is not a final approach fix, missed approach point, nor part of the missed approach segment.

8) VFR = Waypoint is part of a VFR approach.

9) STAR = Waypoint is part of a standard terminal arrival procedure.

10) DP = Waypoint is part of a departure procedure.

11) PTK = Parallel offset. If a STAR or DP waypoint subject to a parallel offset, both STAR/DP and PTK are shown.

3.6.5. VNAV and VNAV Offset Column

The VNAV altitude and associated VNAV Offset are displayed immediately to the right of the Waypoint Identifier column. The VNAV altitude readout is in feet or meters, and the associated VNAV offset readouts are in nautical miles or kilometers.

If an approach with a final approach segment data block, the VNAV offset readout associated with the missed approach point is "GPI" to designate the distance to the glide path intercept point. VNAV altitudes and offsets from the navigation database or manually entered are shown in white. VNAV altitudes and offsets are computed automatically (shown in gray (note that auto-computed climb altitudes are dashed).

NOTE:
No VNAV data (dashes) is associated with a suppressed waypoint as a suppressed waypoint is not part of the active flight plan.

3.6.6. Path Column

LNAV path between waypoints is displayed immediately to the right of the VNAV and VNAV offset column. The following are displayed:

1) Suppressed waypoints (not part of the active flight plan) are shown as dashes.

2) Discontinuities (i.e., a leg where FMS cannot compute a valid path) are shown with the legend "-DISCONT-."

3) Skipped waypoints are shown with the legend "-SKIPPED-."

4) Altitude terminations are shown with the leg course followed by the altitude at which the leg terminates.

5) Manual termination legs are shown with leg course followed by "-MAN-."

6) Procedure turn legs are shown with a pictorial representation of a procedure turn (either left or right turns) and the entry and exit course for the procedure turn.

7) Holding pattern legs are shown with a pictorial representation of a holding pattern (either left or right turns) and the inbound course for the holding pattern.

8) Arc legs are shown with a pictorial representation of an arc (either left or right turns) and the arc's entry and exit radials.

9) Radius to a fix legs is shown with a pictorial representation of an arc (either left or right turns) followed by "RF."

10) SAR pattern legs are shown with a pictorial representation of the SAR pattern (Expanding Square, Rising Ladder, Orbit, Race Track, or Sector, each with either left or right turns) followed by "SAR." (See SAR appendix.)

11) Other leg types (Direct, DME termination, radial termination, intercept, or course to a fix) are shown using the Direct-To Symbol, followed by the leg course.

The vertical position of the path column elements are offset from the waypoint column elements to indicate that the path information applies to the leg between waypoints.

3.6.7. Distance Column

Distance between waypoints is displayed immediately to the right of the path column. The distance readouts in NM or KM are calculated considering the associated path and parallel offsets.

3.6.8. Estimated Time En Route Column

ETE between waypoints is displayed immediately to the right of the distance column and calculated considering the distance between waypoints and current ground speed.

3.6.9. Estimated Time of Arrival Column

ETA at the active waypoint and all subsequent waypoints are displayed immediately to the right of the ETE column. The time of waypoint sequencing is stored and displayed as the ETA at waypoints before the active waypoint.

The ETA at the active waypoint is calculated considering the associated time remaining on the active leg and the current time. The ETA at subsequent waypoints is calculated considering the cumulative ETEs and current time.

3.6.10. Fuel Remaining

The fuel remaining at each waypoint is displayed immediately to the right of the Estimated Time of Arrival column. The fuel remaining at waypoint sequencing is stored and displayed as the fuel remaining at the waypoint before the active waypoint.

The fuel remaining at the active waypoint is calculated considering the associated time remaining on the active leg, current fuel flow, and current fuel quantity. The fuel remaining at subsequent waypoints is calculated considering the cumulative ETEs, current fuel flow, and current fuel quantity.

3.6.11. Distance To Go Column (DTG)

The distance between waypoint and present position is displayed immediately to the right of the Path column. The distance readout is in nautical miles or kilometers. The distance between waypoint and present position is calculated considering the associated path as well as parallel offsets.

3.6.12. Time To Go Column (TTG)

The TTG between the waypoint and present position is displayed immediately to the right of the DTG column. The TTG between the waypoint and present position is calculated considering the associated DTG and current ground speed.

NOTE:

Since a suppressed waypoint is not part of the active flight plan, dashes appear in the absence of the following VNAV data associated with a suppressed waypoint.

Where column vertical position is aligned with preceding column, elements indicate the information applies to the associated waypoint.

Where column vertical position is offset from waypoint column elements, indicates that information applies to the leg between waypoints.

The following data columns are shown as dashes if suppressed, skipped, or manual terminations:

1) Path
2) Distance
3) ETE
4) ETA
5) Fuel remaining
6) TTG
7) DTG

3.7. Hover Page

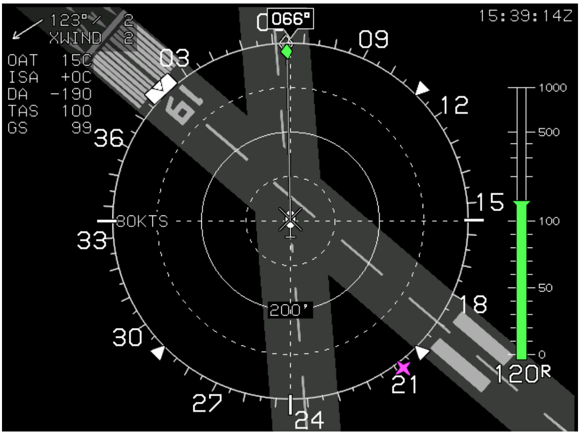


Figure 3-95: Hover Page Orientation

The hover page has the following elements.

1) Ownship symbology is as in Figure 3-64 pointing straight up.

2) Always displayed in a heading up orientation.

3) Compass rose aligned with either magnetic north or true north.

4) Hover vector elements as described in § 3.3.19.

3.7.1. Hover Vector

The hover vector indicates direction, speed and acceleration of drift, re-using the compass rose and range ring as speed scales. In addition, two intermediate speed scales (the first between the ownship symbol and the range ring, the second between the range ring and the compass rose) are drawn using dashed lines.

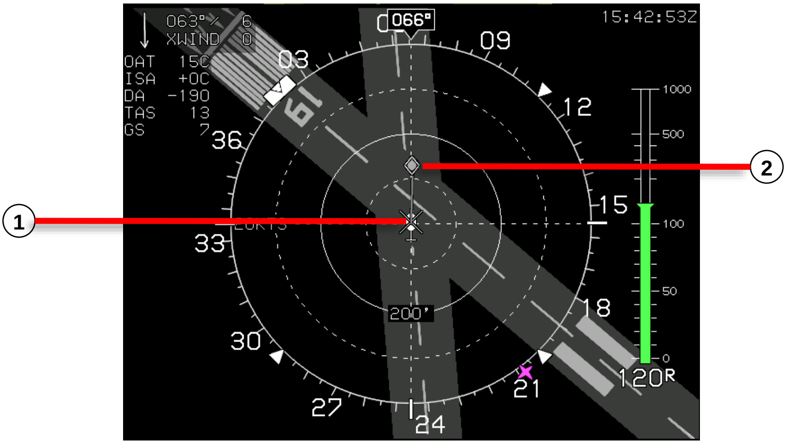


Figure 3-96: Hover Vector Symbology

1) The ownship symbol indicates 0 knots ground speed and a gray dot connected to the ownship symbol by a gray line floats over the hover page to indicate flight direction and ground speed.

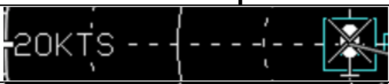
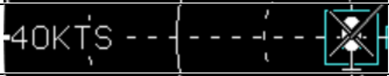
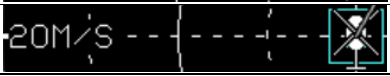
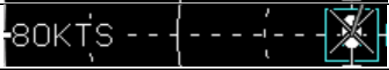
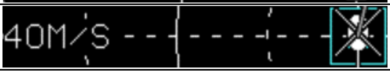
2) A diamond-shaped acceleration cue is centered on the gray dot to indicate direction and magnitude of horizontal acceleration. Deviation of the dot in a straight up direction (12 o'clock position) indicates forward flight while straight down (6 o'clock position) indicates rearward flight. Deviation of the dot laterally indicates lateral drift. Movement of the dot is constrained to less than five knots per second to prevent jumpiness.

When using meters/second for speed range, the movement of the dot is constrained to less than 2.5 meters per second.

The hover vector line and dot are limited and cropped at the outer circle of the hover page. When the AHRS is in DG mode, "DG" appears to the right of the ownship symbol.

The speed range for the hover vector indication automatically changes based upon current ground speed. Changes in speed range utilize a deadband to prevent flicker at speed range boundaries.

Table 3-31: Hover Speed Ranges

Knots for Speed	Km/h for Speed
	
	
	

3.7.2. Hover Page Range

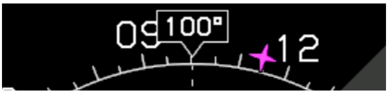
The user-selectable range can be displayed in either nautical mile or kilometers (based on "Speed Units" setting). Two range rings (one at half the radius of the compass rose) centered upon the ownship symbol aid in judging range to displayed symbols.

Table 3-32: Hover Page Range Values

Distance	Nautical Miles	Kilometers
From ownship symbol to the compass rose	400', 800', 1,600' 0.5NM, 1NM, 2NM, and 5NM	100m, 200m, 500m, 1KM, 2KM, 5KM, and 10KM
Half the radius from ownship to compass rose	200', 400', 800', 0.5NM, 0.5NM, 1NM, and 2.5NM	50m, 100m, 250NM, 500M, 1KM, 2.5KM, and 5KM

3.7.3. Compass Rose Symbols

As specified in § 3.4.5.

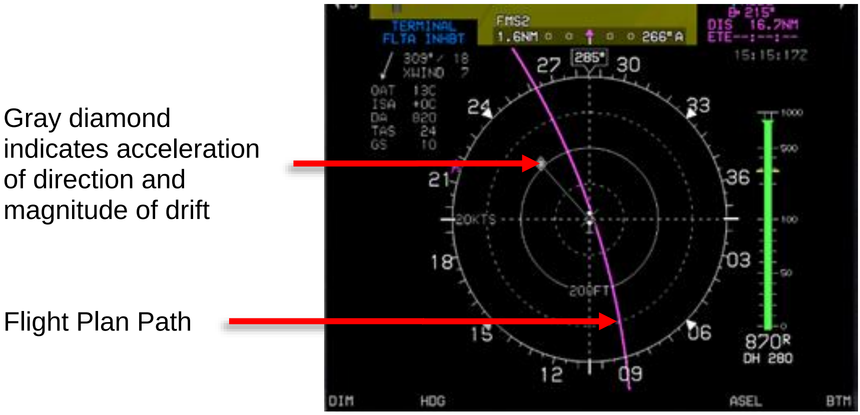


Normal Magnetic North Mode

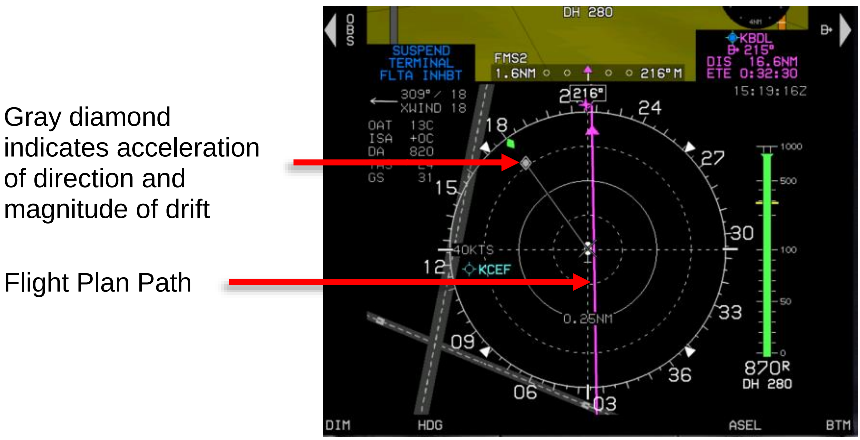
True North Mode

Figure 3-97: Hover Compass Rose

3.7.4. Active Flight Plan Path/Manual Course



Automatic OBS mode (Automatic Waypoint Sequencing)



Manual Course (Waypoint Sequencing Suspended)

Figure 3-98: Hover Vector Active Flight Plan Path/Manual Course

The active flight path, waypoints, and manual course appear as specified in § 3.4.15, § 3.4.15.2, and § 3.4.15.3. When there is a parallel offset, the active flight plan path depicts the parallel offset path, and the original flight plan path is shown with haloed gray dashed lines (Figure 3-99).

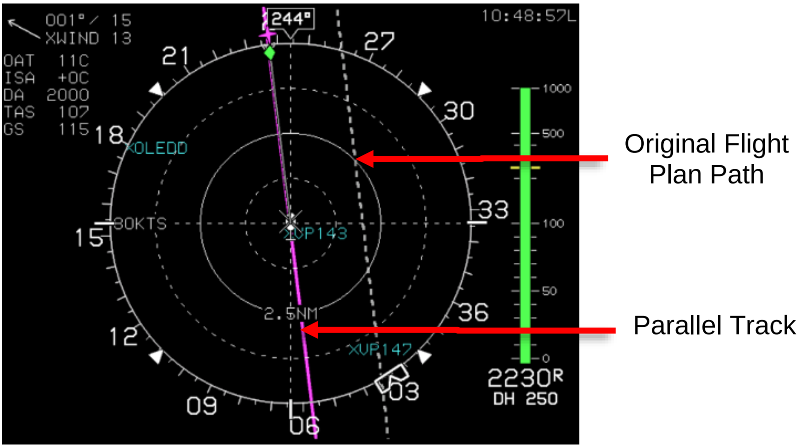


Figure 3-99: Hover Vector Active Flight Plan Path/Parallel Course

3.7.5. Navigation Data

Navigation data symbols are displayed as specified in § 3.4.8. The user waypoint symbol includes an outlining box sized so it is not obscured by the ownship symbol so the pilot may hover by reference to a user waypoint. These symbols cannot be decluttered from the Hover page since there is no **FORMAT..** menu option. Airport runways and some heliports are displayed in correct relationship and scale to the ownship symbol as defined in § 3.3.31 and § 3.3.32.

3.7.6. Projected Path

As specified in § 3.4.14.

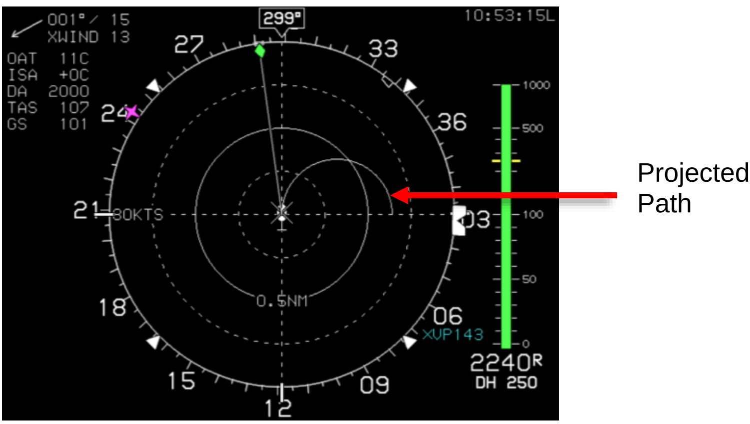


Figure 3-100: Hover Vector Projected Path

3.7.7. AGL Indication

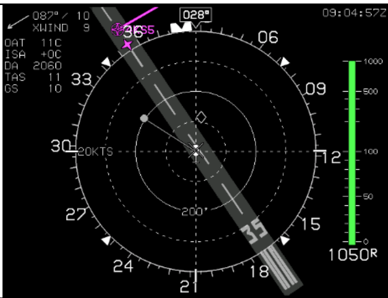
AGL altitude is displayed as an analog indication and digital readout on the right side of the hover page, in feet or meters (based on “Speed Units” setting) as defined in § 3.3.10. When AGL source is radar altitude, the digital readout of AGL is smoothed to avoid jumpiness.

Table 3-33: AGL Indication Parameters

Indication	Parameters
Digital Readout	Not displayed when its source is barometric and indicated airspeed is in the noise range <20KIAS due to rotor wash effects.
Resolution Feet for Altitude	At or above 300’ AGL/10’ resolution At or above 100’ AGL and below 300’/5 feet resolution Below 100’ AGL/1’ resolution
Resolution Meters for altitude	At or above 100 meters AGL/5 meters resolution Below 100 meters AGL/1 meter resolution

Table 3-34: Analog AGL Indication Parameters

Altitude	Minor Tick Marks	Range	Scale	Color/Characteristic
Feet	10’, 20’, 30’, 40’, 60’, 70’, 80’, 90’, 200’, 300’, and 400’	Max range of 1,000’	Linear 0 to 100’	Green-filled column thermometer with widened area on top
		Greater than 1,000’	Logarithmic 100’ to 1,000’	Green-filled column thermometer without widened area on top
Meters	5, 10, 15, 20, 30, 35, 40, 45, 100, 150, and 200 Meters	Max range of 500 Meters	Linear 0 to 50 Meters	Green-filled column thermometer with widened area on top
		Greater than 500 Meters	Logarithmic 50 to 500 Meters	Green-filled column thermometer without widened area on top

Table 3-35: Hover Vector AGL Indication	
	Above 1000’ AGL
	500’ AGL
	160’ AGL with DH set at 200’ AGL Accompanied with “Decision Height” voice alert.

3.7.8. Clock

As specified in § 3.4.2.

3.7.9. Air Data

As specified in § 3.4.2.

Section 4 Reversionary Modes

4.1. Reversionary Modes

The equipment has eight reversionary modes as follows:

Mode 0: GPS/SBAS, ADC, and AHRS normal.

Mode 1: GPS/SBAS failed; ADC and AHRS normal.

Mode 2: ADC failed; GPS/SBAS and AHRS normal.

Mode 3: AHRS failed; GPS/SBAS and ADC normal.

Mode 4: GPS/SBAS and ADC failed; and AHRS normal.

Mode 5: GPS/SBAS and AHRS failed; and ADC normal.

Mode 6: ADC and AHRS failed; and GPS/SBAS normal.

Mode 7: GPS, ADC, and AHRS failed.

To use this section, review the following tables and notes to determine what feature or function is affected by one or more of the three sensors failed conditions. Examples follow with the IDU-680 displays in various configurations with a table breaking down the affected functions.

Not all possible IDU-680 display configurations and format combinations are represented here. All eight modes of system operation are represented for description purposes.

Table 4-1: Reversionary Mode Status (PFD)

PFD Functions	Mode							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Airspeed	OK	OK	19	OK	19	OK	19	19
Altimeter	OK	OK	19	OK	19	OK	19	19
Altimeter Set Display	OK	OK	-	OK	-	OK	-	-
Bank Scale	OK	OK	OK	-	OK	-	-	-
CDI	OK	1 + 20	OK	OK	20	20	OK	20
Runway	OK	1	25	-	-	-	-	-
Waypoint Pointer	7	1	7	7	-	-	7	-
Heading Scale	7	7	7	7	7	-	7	-
AGL Ind.	OK	2	4	OK	11	11	4	-
Flight Path Marker	OK	1 + 14	-	-	-	-	-	-
Hover Vector	OK	-	-	-	-	-	-	-
Ground Track	7	1	7	7	-	-	7	-
Heading Indicator	7	7	7	-	7	-	-	-
Horizon	OK	OK	OK	-	OK	-	-	-
Mini Map	7	1	7	7	-	-	7	-
Pitch Scale	OK	OK	OK	-	OK	-	-	-
Highway in the Sky	OK	1 + 15	-	-	-	-	-	-
Terrain/Obstructions	OK	-	25	-	-	-	-	-
Clock Functions	OK	OK	OK	OK	OK	OK	OK	OK
VSI	OK	OK	-	OK	-	OK	-	-
Waterline Symbol	22	22	5	13	5	13	13	13
Waypoint Symbol	OK	1	-	-	-	-	-	-
Waypoint Brg./Dist.	OK	1	OK	OK	-	-	OK	-
Traffic Perspective	OK	OK	OK	-	-	-	-	-
Mini Traffic	OK	OK	OK	OK	OK	OK	OK	OK
Speed Trend	OK	OK	-	-	-	-	-	-

Table 4-2: MFD Functions

MAP Functions	Mode							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Aircraft Position	OK	1	OK	OK	-	-	OK	-
Special Use Airspace	9	1	6	9	-	-	6 + 9	-
Waypoint Pointer	9	1	9	9	-	-	9	-
Active Flight Plan Path	9	1	9	9	-	-	9	-
Ground Speed	OK	1	OK	OK	-	-	OK	-
Ground Track	9	1	9	9	-	-	9	-
Heading Indicator	9	9	9	-	9	-	-	-
Navigation Symbols	9	1	9	9	-	-	9	-
Outside Air Temp.	OK	OK	-	OK	-	OK	-	-
Projected Path	OK	1	OK	-	-	-	-	-
Traffic Perspective	OK	OK	OK	OK	OK	OK	OK	OK
Terrain/Obstructions	OK	-	25	OK	-	-	25+9	-
Clock Functions	OK	OK	OK	OK	OK	OK	OK	OK
Waypoint Brg./Dist.	OK	1	OK	OK	-	-	OK	-
Wind	21	3	-	-	-	-	-	-
WX-500 Data	OK	OK	OK	OK	OK	OK	OK	OK
Compass Rose	9	9	9	9	9	-	9	-
Fuel Totalizer Functions	23	24	23	23	12	12	12	12
True Airspeed	OK	OK	-	OK	-	OK	-	-
Density Altitude	OK	OK	-	OK	-	OK	-	-
OAT/ISA Display	OK	OK	-	OK	-	OK	-	-

Note 1: Presented using inertial dead-reckoning based on last known wind information. If unable to dead-reckon (e.g., heading is failed or true airspeed cannot be calculated) then function is disabled.

Note 2: Only radar altitude presented when available.

Note 3: Last known wind is saved during GPS/SBAS failure.

Note 4: Either radar altitude or geodetic altitude less database elevation.

Note 5: Waterline symbol expanded to large attitude bars. Rotorcraft versions (Part 27 or Part 29 airspeed scale), use full-time large attitude bars and do not show the waterline symbol.

Note 6: Special use airspace boundaries are drawn with bold lines due to lack of aircraft altitude data.

Note 7: In heading-only failure mode or AHRS failure mode, heading scale aligned with aircraft track and heading indication is removed. In heading-only failure mode or AHRS failure mode combined with GPS failure, heading scale is replaced with a red-X.

Note 8: N/A

Note 9: In heading-only failure mode or AHRS failure mode, compass rose aligned with aircraft track and heading indication is removed when in heading up mode. In heading-only failure mode or AHRS failure mode combined with GPS failure, compass rose is removed.

Note 10: Presenting using last-known wind information and aligned with aircraft track in heading up mode.

Note 11: Only radar altitude presented when available.

Note 12: Assuming valid fuel flow information, endurance is presented.

Note 13: Large attitude bars presented and X'd out.

Note 14: Flight Path Marker grayed after one minute to indicate degraded operation.

Note 15: Highway in the Sky removed after one minute.

Note 16: N/A

Note 17: Defaults to AIR unless Weight on Wheel/Weight on Ground configuration in EFIS limits is active.

Note 18: Only DH function (with valid AGL altitude) in this mode.

Note 19: Red-X in place of scale.

Note 20: VLOC CDI always available if optional VOR symbology enabled.

Note 21: Function removed during heading-only failure mode.

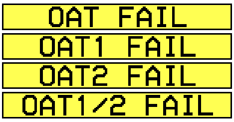
Note 22: Full-time large attitude bars and do not show the waterline symbol.

Note 23: N/A

Note 24: Assuming valid fuel flow information, both range and endurance are presented using inertial dead-reckoning based on last known wind information. If the pilot is unable to dead-reckon due to loss of heading or true airspeed cannot be calculated, then endurance only information is presented.

Note 25: Inhibited in accordance with the conditions specified in TAWS automatic inhibit function (abnormal operation).

4.1.1. OAT Sensor Failure Mode



With the OAT sensor failed, display of wind, OAT, and density altitude on MFD pages is disabled.

Figure 4-1: OAT Sensor Fail

4.1.2. Heading Failure Mode

With heading failed, the PFD heading scale and MFD compass rose align with track (if available) or are removed and replaced with a red-X.

In this failure mode, the PFD heading scale includes “GPS TRK” around the track marker to clearly delineate the failure mode.

Figure 4-2: GPS TRK

4.1.3. PFD Screen Auto Reversion

For IFR approval in aircraft, flight instrument information essential to safety of flight remains available to the pilot without additional action after a failure. To accommodate this, MFDs must have the ability to sense when the PFD has failed and take over the PFD function automatically. The manner in which this occurs is as follows:

When an MFD (IDU #2, #3, or #4) becomes the transmit-enabled IDU, the MFD automatically switches to Essential mode showing a PFI in the top area. In addition, if an OASIS EICAS is defined, Essential mode shows the OASIS EICAS in the bottom area. If an OASIS EICAS page is not defined, the bottom area is free to show any MFD page as defined. To change the MFD back to Normal mode after the automatic switch, press **TO MFD/TO ESSNTL (R5)**.

4.1.4. GPS Failure

GPS degrades or fails resulting from loss of satellite information or GPS equipment failure. When SBAS provides the integrity, the EFIS provides a loss of integrity (LOI) caution within two seconds if the current horizontal protection level (HPL) exceeds the horizontal alert level (HAL). The LOI caution appears when there is no integrity monitoring and disappears when it is restored.

Figure 4-3: LOI Caution

Further GPS degradation causes the EFIS to lose GPS updating of aircraft position, ground speed, and ground track, and the ability to calculate the wind information.

1) 

(Loss of Integrity) displayed with no time delay.

2) HPL > HAL for the phase of flight. Position is still presented based upon a GPS navigation solution.

3) 

(Loss of Navigation) displayed with no time delay of the onset of the following:

   a) The absence of power;

   b) Equipment malfunction or failure;

   c) The presence of a condition lasting five seconds or more where there are an inadequate number of satellites to compute position solution;

   d) Fault detects a position failure that cannot be excluded within time-to-alert when integrity is provided by FDE;

   e) HPL > HAL on the final approach segment: EFIS does not transition to DR navigation at this stage. A GPS navigation solution is still presented; and

   f) Where HPL > HAL on the final approach segment, this position may still be satisfactory for GPS navigation. For example, an HPL of 0.31NM exists, which means as soon as a transition to terminal mode occurs, all alerts would disappear. This is significantly important during a wind change if the system had been in a DR mode.

NOTE:

At any time, view HFOM on the FAULTS page to see the system-reported accuracy.

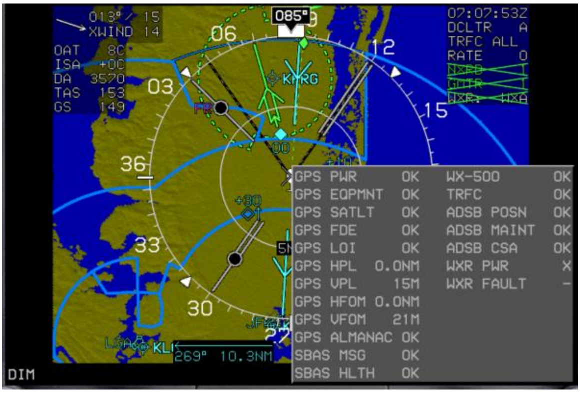


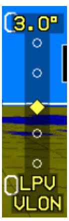
Figure 4-4: FAULTS Page on PFD or MFD

4) Dead Reckoning (DR)

If a GPS position cannot be calculated, a dead reckoning solution is provided with a timer. This solution is calculated from heading and TAS derived from the AHRS and ADC.

Figure 4-5: Dead Reckoning

5) Loss of Vertical Navigation (VLON)



In the event the navigation equipment is no longer adequate to conduct or continue the LNAV/VNAV approach, “VLON” appears within one second (as shown) of the onset of any of the following conditions:

Figure 4-6: Loss of Vertical Navigation

a) The absence of power;

b) Equipment malfunction or failure;

c) The presence of a condition where fault detection detects a position failure that cannot be excluded;

d) There are an insufficient number of SBAS HEALTY satellites;

e) The horizontal protection level exceeds the alert limit as follows for LNAV/VNAV approaches:

i) Prior to sequencing, the FAWP - HAL should be 0.3 NM with no limit on VAL.

ii) After sequencing the FAWP - HAL 556m (0.3NM) and VAL 50m.

When in LNAV mode, the fault detection function detects positioning failures within ten seconds after the onset of the positioning failure.

4.2. PFD and MFD Failure Mode Examples

All PFD examples are in Normal mode and there is no Essential mode.

GPS failure results in the EFIS operating in dead reckoning mode. The EFIS continues to provide navigational position, ground speed, and ground track information, based upon the last known wind, current air data, and heading. The PFD and MFD are affected as shown in the following images.

4.3. PFD Failure Mode 0 (Normal Mode)

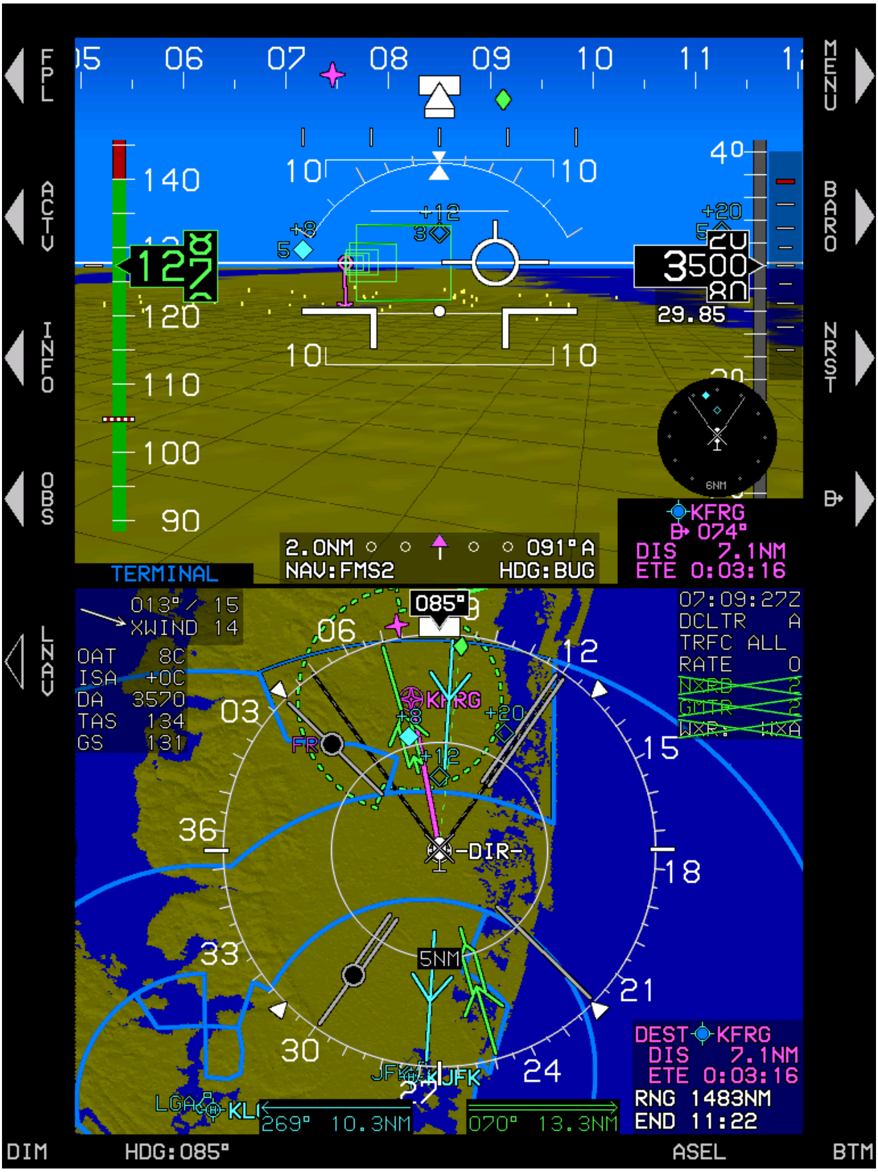
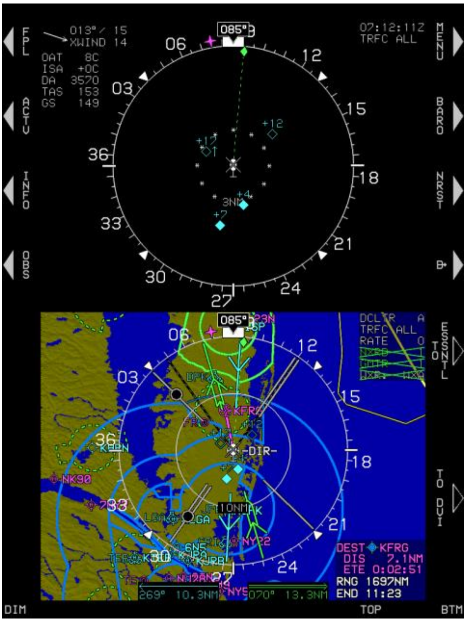


Figure 4-7: PFD Failure Mode 0 (Normal Mode)
GPS, ADC and AHRS Normal

4.3.1. MFD Failure Mode 0



Normal Mode

Essential Mode

Figure 4-8: MFD Failure Mode 0 GPS, ADC and AHRS Normal

4.4. PFD Failure Mode 1 (Normal Mode)

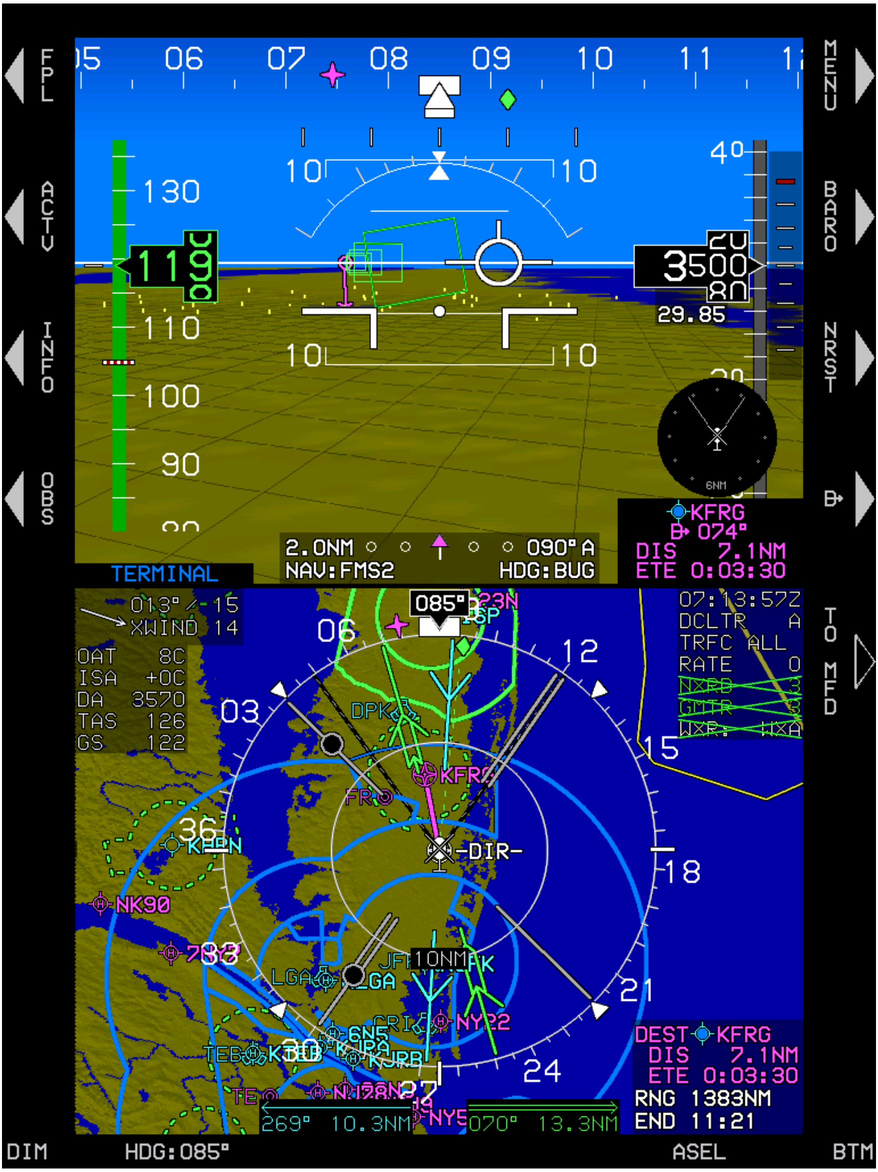
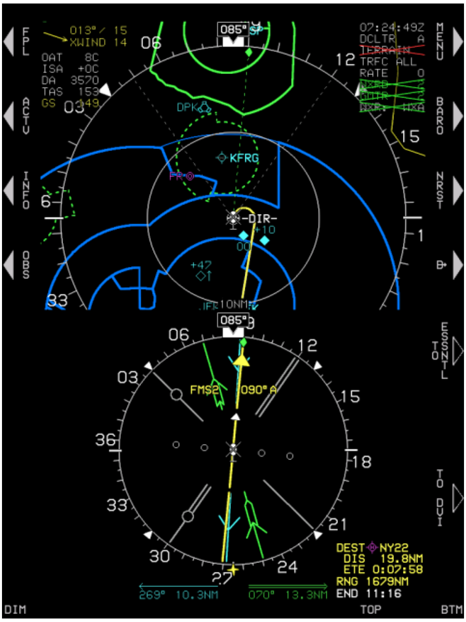
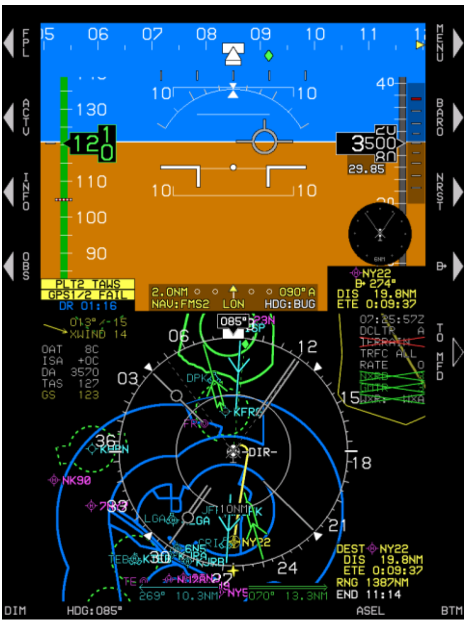


Figure 4-9: PFD Failure Mode 1 (Normal Mode)
GPS/SBAS Failed, ADC and AHRS Normal

4.4.1. MFD Failure Mode 1



Normal Mode



Essential Mode

Figure 4-10: MFD Failure Mode 1 GPS/SBAS Failed, ADC and AHRS Normal

4.5. PFD Failure Mode 2 (Normal Mode)

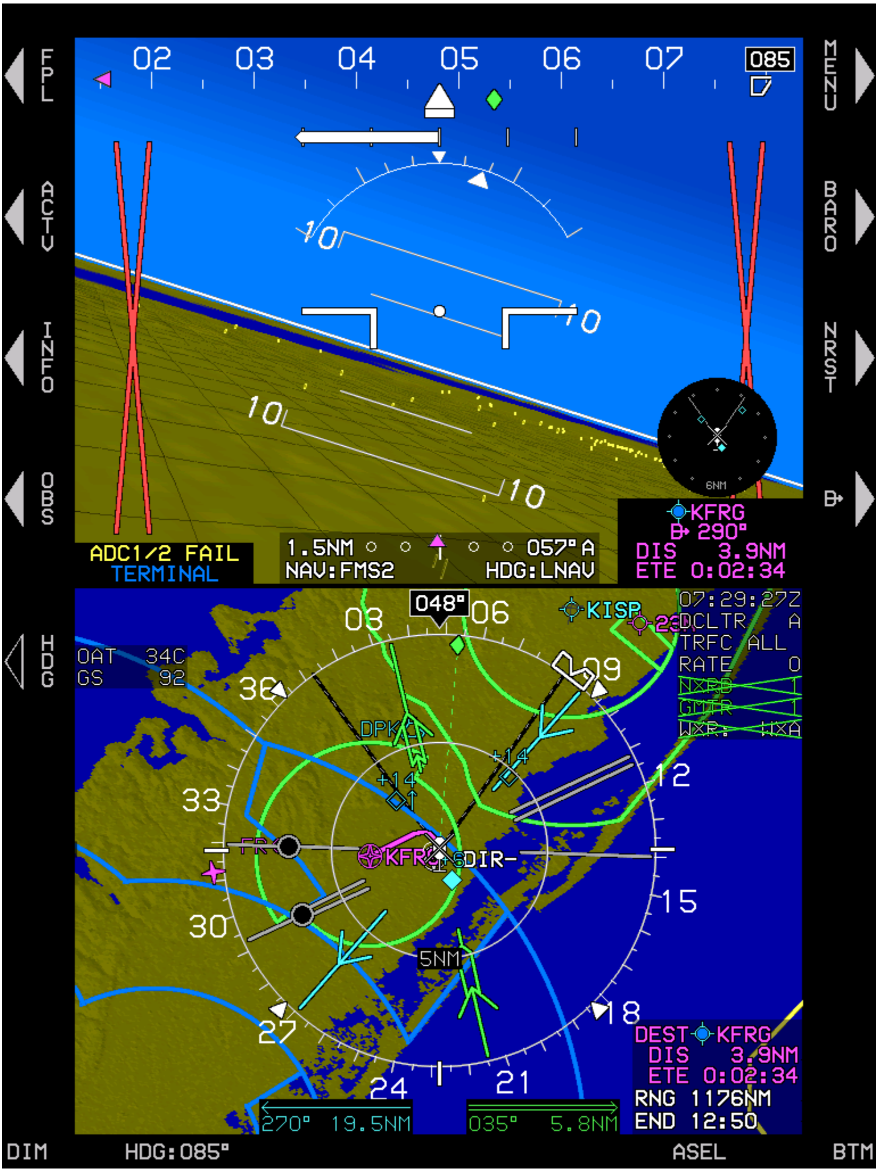


Figure 4-11: PFD Mode 2 (Normal Mode)
ADC Failed, GPS/SBAS and AHRS Normal

4.5.1. MFD Failure Mode 2

Normal Mode

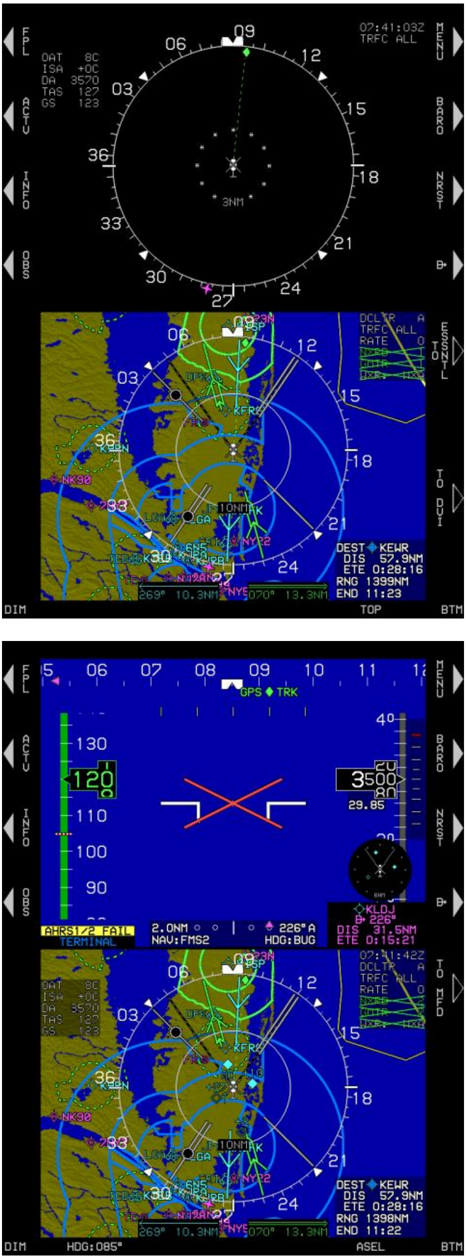
Essential Mode

Figure 4-12: MFD Failure Mode 2 ADC Failed, GPS/SBAS and AHRS Normal

4.6. PFD Failure Mode 3 (Normal Mode)

Figure 4-13: PFD Failure Mode 3 (Normal Mode)
AHRS Failed, GPS/SBAS and ADC Normal

4.6.1. MFD Failure Mode 3



Normal Mode

Essential Mode

Figure 4-14: MFD Failure Mode 3 AHRS Failed, GPS/SBAS and ADC Normal

4.7. PFD Failure Mode 4 (Normal Mode)

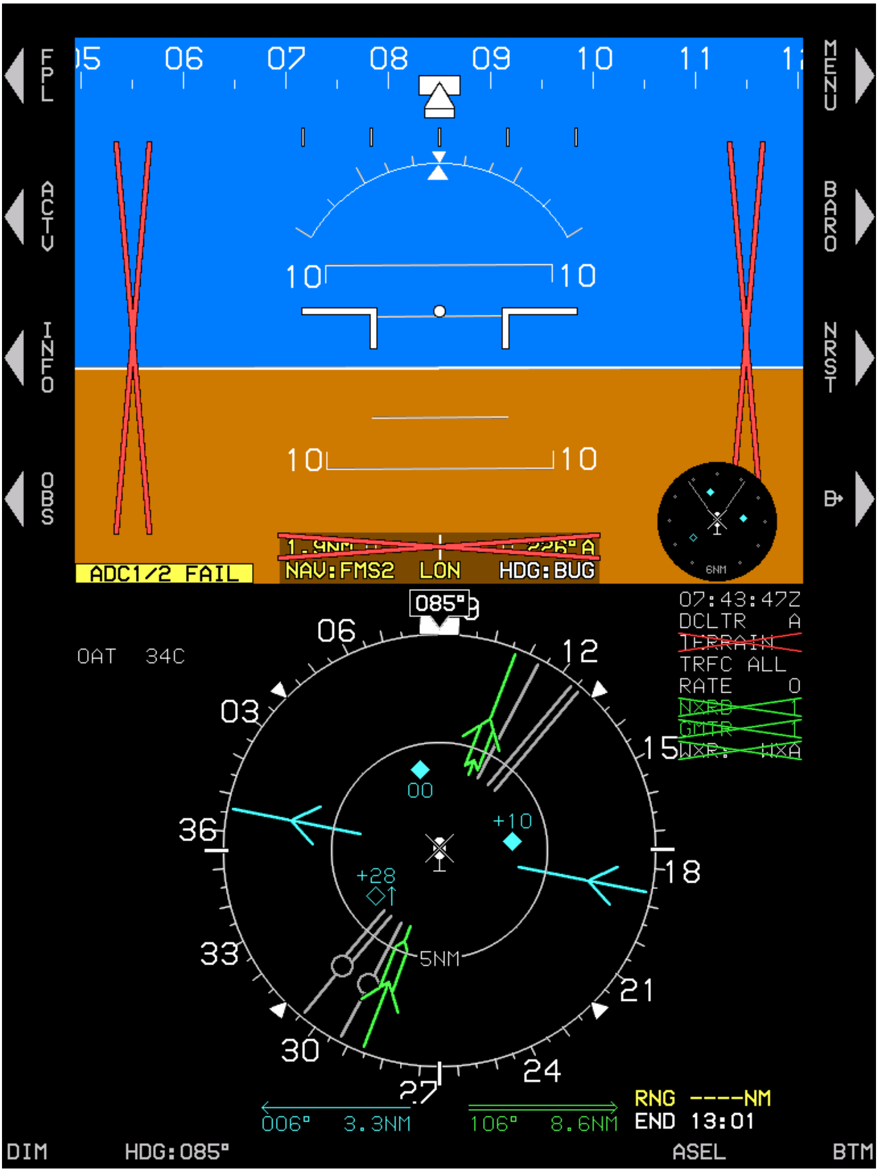
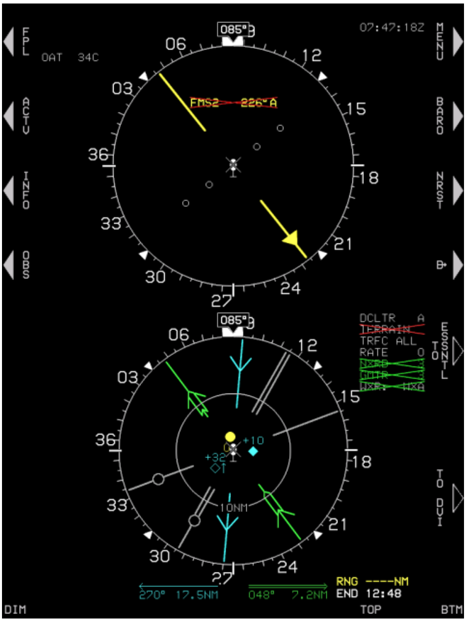
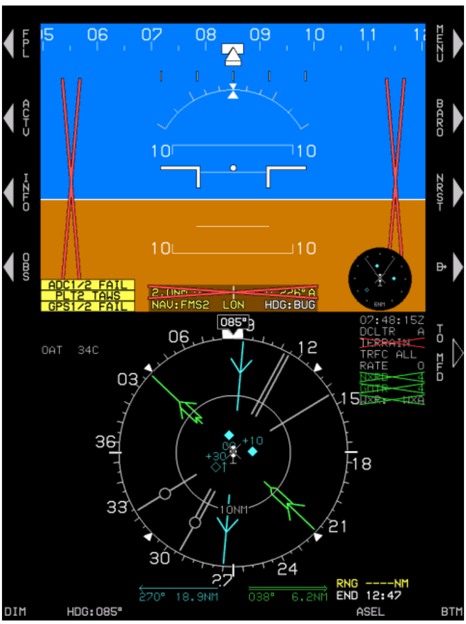


Figure 4-15: PFD Failure Mode 4 (Normal Mode)
GPS/SBAS and ADC Failed, AHRS Normal

4.7.1. MFD Failure Mode 4



Normal Mode



Essential Mode

Figure 4-16: MFD Failure Mode 4 GPS/SBAS and ADC Failed, AHRS Normal

4.8. PFD Failure Mode 5 (Normal Mode)

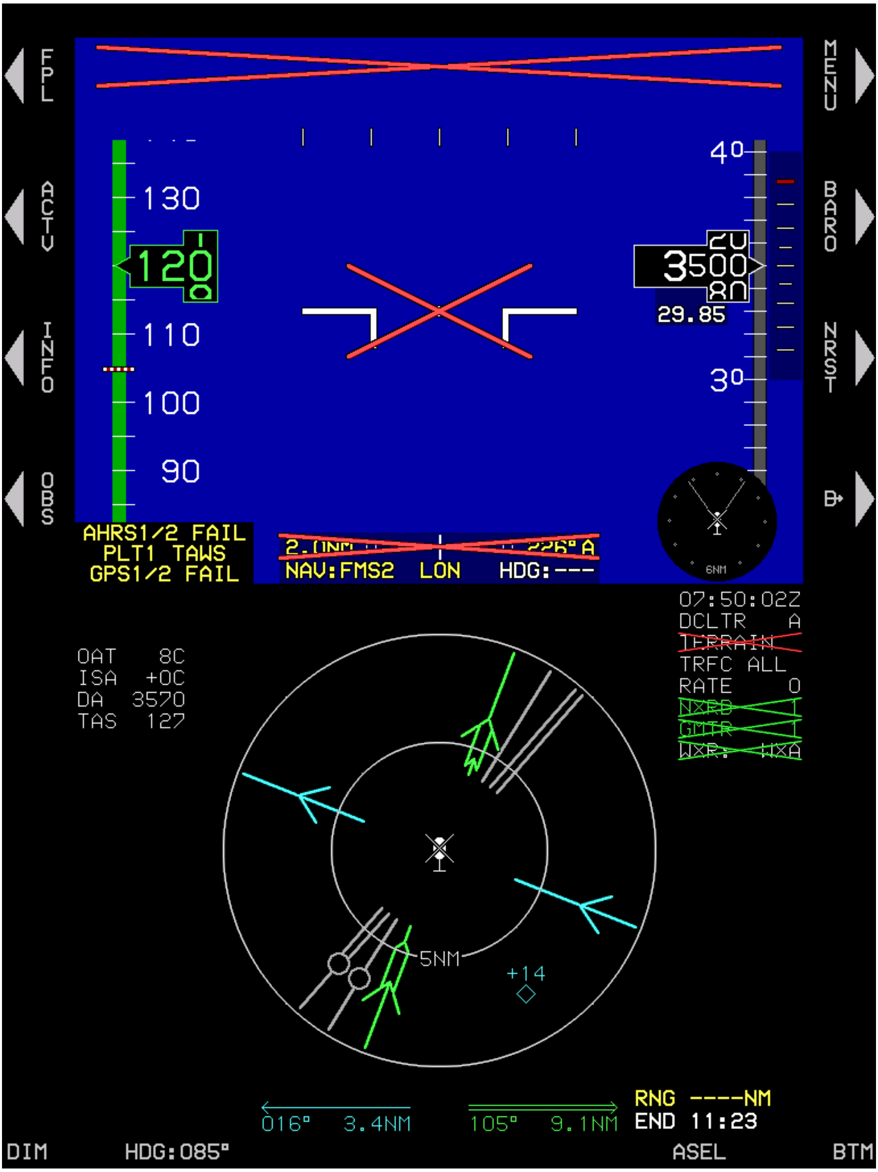
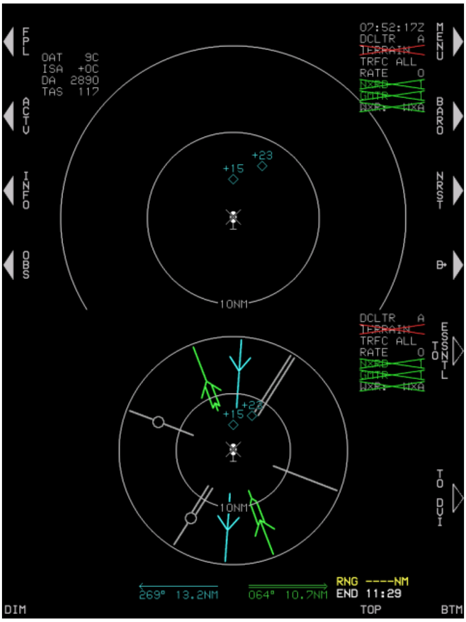


Figure 4-17: PFD Failure Mode 5 (Normal Mode)
GPS/SBAS and AHRS Failed, ADC Normal

4.8.1. MFD Failure Mode 5



Normal Mode

Essential Mode

Figure 4-18: MFD Failure Mode 5 GPS/SBAS and AHRS Failed, ADC Normal

4.9. PFD Failure Mode 6 (Normal Mode)

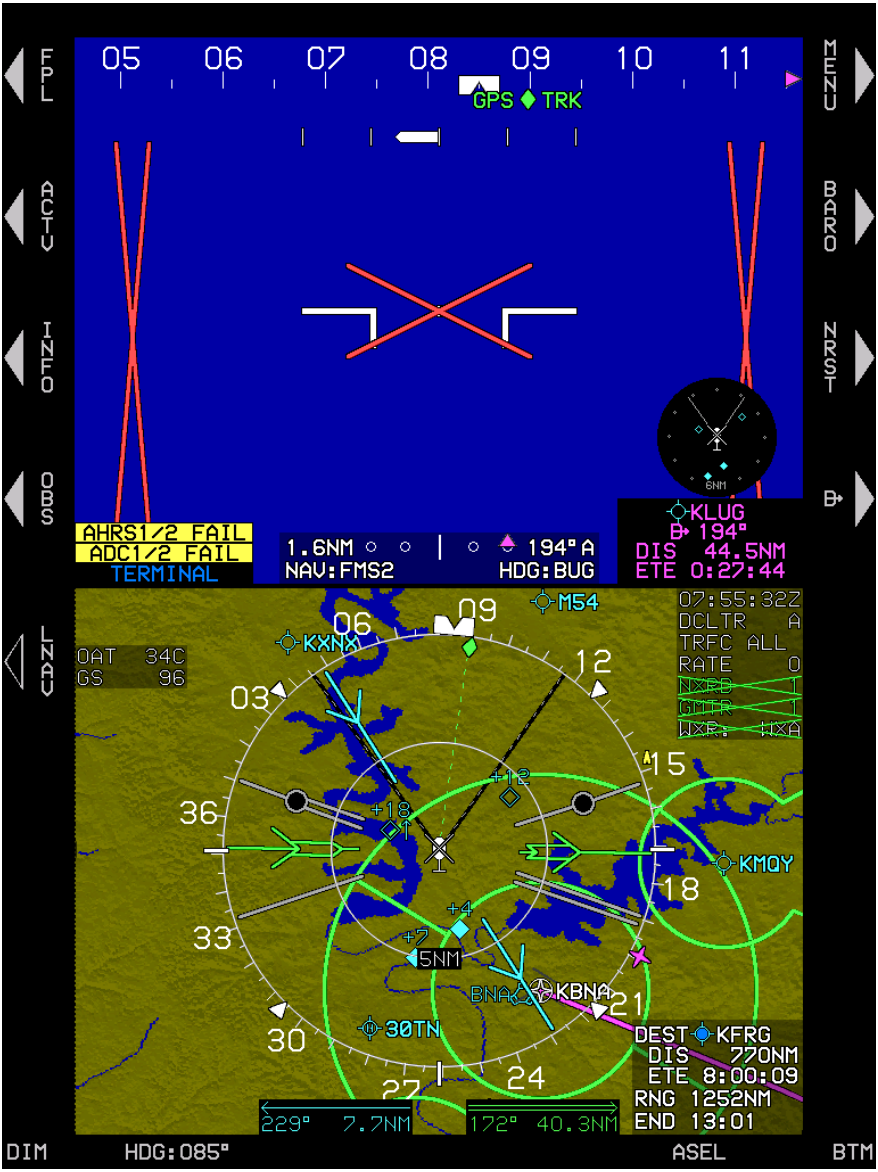
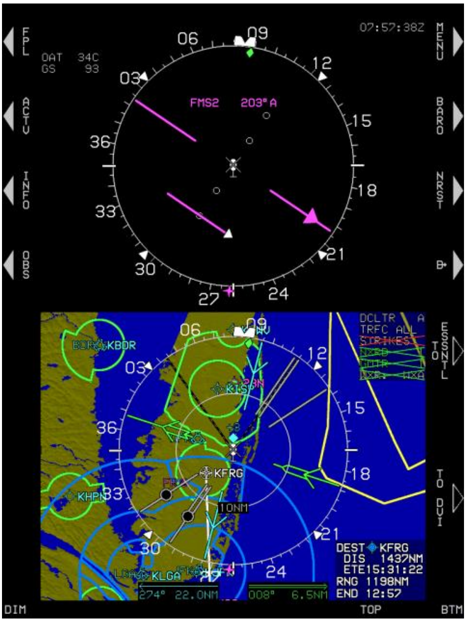


Figure 4-19: PFD Failure Mode 6 (Normal Mode)
ADC and AHRS Failed, GPS/SBAS Normal

4.9.1. MFD Failure Mode 6



Normal Mode

Essential Mode

Figure 4 21: MFD Failure Mode 6 ADC and AHRS Failed, GPS/SBAS Normal

4.10. PFD Failure Mode 7 (Normal Mode)

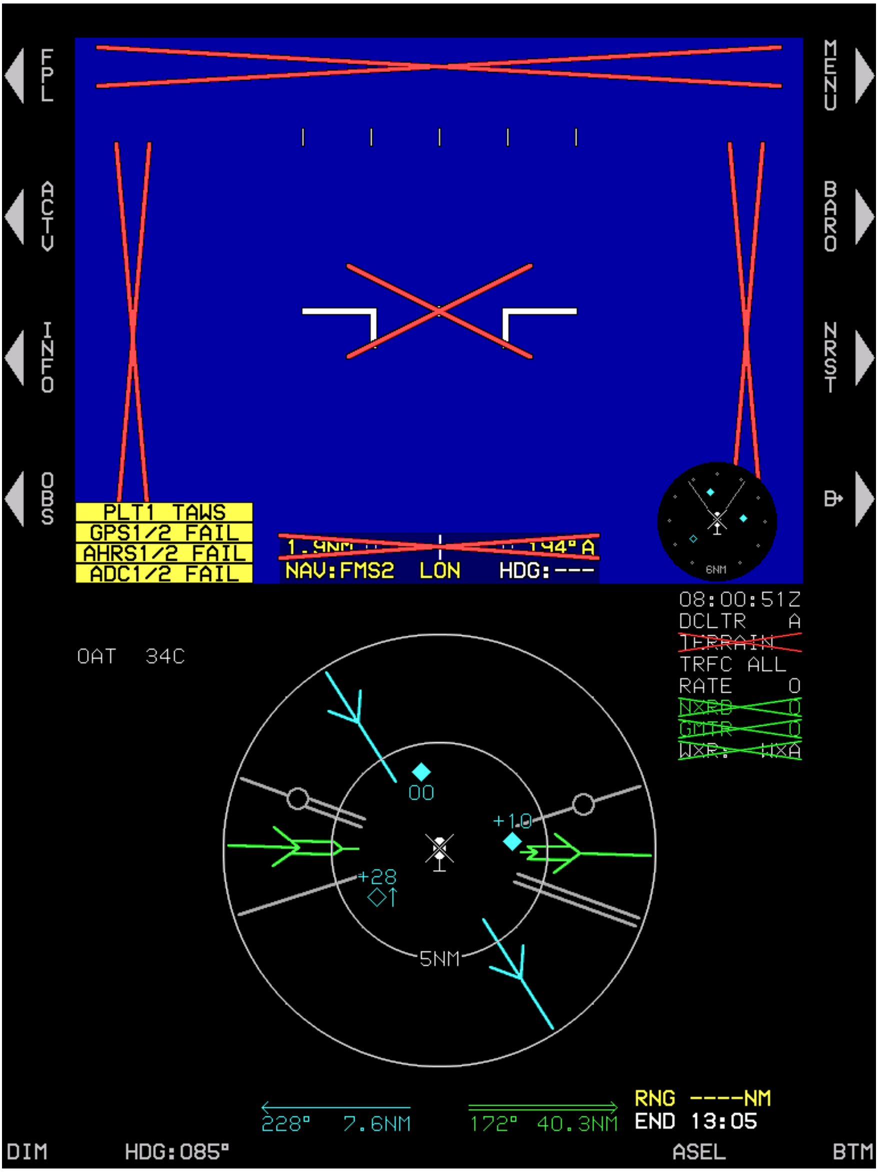
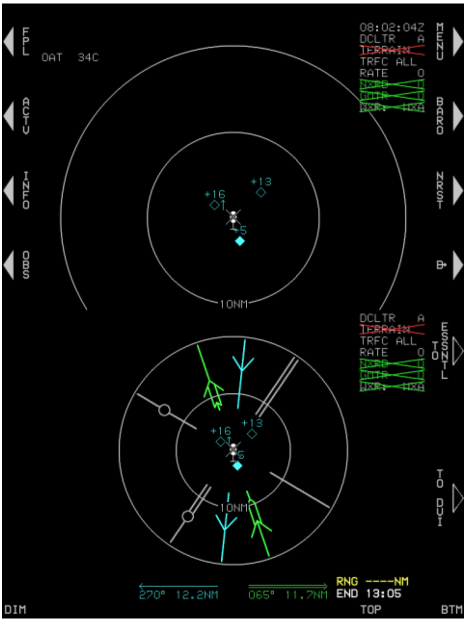
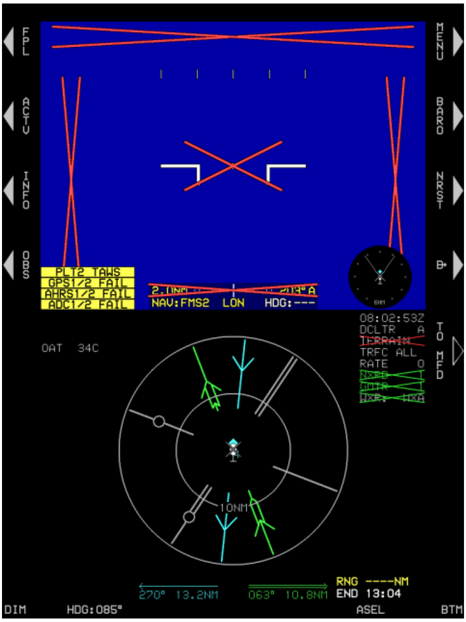


Figure 4-20: PFD Failure Mode 7 (Normal Mode)
GPS/SBAS, ADC and AHRS Failed

4.10.1. MFD Failure Mode 7



Normal Mode



Essential Mode

Figure 4-21: MFD Failure Mode 7 GPS/SBAS, ADC and AHRS Failed

Section 5 Menu Functions and Step-By-Step Procedures

5.1. Menu Functions

Navigate menu functions with the 16 peripheral buttons and three knobs (❸,❷, and ❶). ❹ is only used for adjusting screen and button brightness and cannot be used for menu functions. It is always labeled **DIM**.

Figure 5-1: IDU-680 Input Controls

5.1.1. Menu Philosophy

The menu system and buttons with an action are clearly labeled with tiles. The following rules are in the design of the menu system:

EXIT (R1): Whenever menu system is beyond the top-level, provides a one-touch escape to the top-level.

BACK (L1): Whenever soft menu level is deeper than the first-level, regresses through the menu system by one level.

Soft menu tiles: Used (even at the top-level) and are annunciated in a dedicated, blacked-out area in the screen margins adjacent to the appropriate IDU button or knob when appropriate.

Selection list: Menus adjacent to knobs are frequently a selection list. Within lists, a two-dot trailer 

indicates further menu levels. Lists too long to be presented in the space available provide an indication of location within the list.

Menu messages are displayed adjacent to the knobs when appropriate. Menu messages are cleared if any IDU button is pressed or knobs ❶, ❷, or ❸ are pushed or rotated.

A hollow triangle next to a menu legend means the button press is a final action. A filled triangle next to a menu legend means the button press leads to a further menu level.

Further menu levels

Without further menu levels

Figure 5-2: Indication of Further Menu Levels

5.1.2. Avoidance of Autonomous Behavior

The displays are designed to be under the control of the user to ensure critical functions are placed at the top level (i.e., **TO ESSNTL**). Autonomous changes in function are avoided to the most extent possible. The following autonomous behaviors incorporated into the IDUs, all of which are required by regulation or guidance.

Automatic popup of flight instruments: For IFR approval in rotorcraft, flight instrument information essential to flight safety must remain available to the user without additional crewmember action after a failure. This guidance is specific to flight instruments, but it does not address powerplant or navigation instruments. This requirement is met by assigning an order of precedence of the IDUs based upon the IDU number. IDU #1 always shows the essential flight instruments, because the PFI page is always shown in the top area. Lower priority MFD monitor the higher priority IDU via intra-system communications and automatically switch to Essential mode upon determining the higher priority IDU has failed.

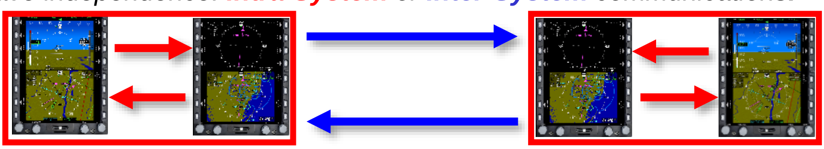
TAWS/HTAWS popups: When an FLTA alert is generated, a popup function enables PFI SVS and activates terrain at an appropriate scale and format on the moving map page (one of the multi-function pages). This is a required function of TSO-C194 for Enhanced HTAWS and is enabled in the other TAWS/HTAWS options integrated in the EFIS software (See Section 8 Terrain Awareness Warning System for details).

Traffic popups: When a traffic alert is generated, a popup function displays traffic on the PFI, mini traffic on the PFI, and moving map page (See Traffic appendix for details).

5.2. Menu Synchronization

System settings changed by the menu system are synchronized between multiple IDUs and between top and bottom areas in MFD-MFD mode as in Table 5-1. All parameters for rotorcraft are included. Each appendix for Datalink, Strikes, Video, Weather Radar, and Traffic contains specific limitations for menu synchronization for that feature.

Table 5-1: Menu Synchronization

Menu Parameter	Notes
The following menu parameters are synchronized across all displays at all times. These are bugs and fundamental aircraft values that should never have independence. ***Intra-System*** *or* ***Inter-System*** *communications.* 	
AHRS 1 and 2 mode and slewing values	
Fuel Totalizer Quantity	
VNAV Climb Angle	
Countdown Timer Start Time	
Countdown Timer Default Value	
Remote Tune Frequencies	When equipped and enabled
VNAV Descent Angle	
Decision Height Setting	Dependent upon EFIS Limits "Dual DH enabled"
Emergency and Minimum Fuel Settings	When enabled
Heading Bug and Heading Sub-Mode	

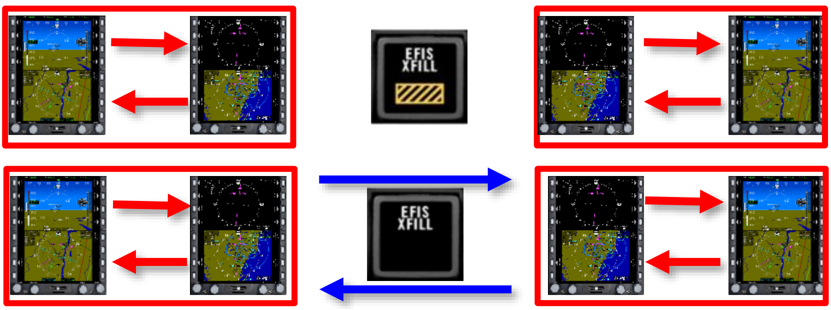
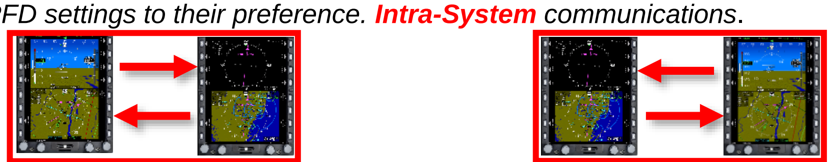
<table>
<tr><th colspan="2">Table 5-1: Menu Synchronization</th></tr>
<tr><th>Menu Parameter</th><th>Notes</th></tr>
<tr><td>Minimum Altitude Bug Value</td><td></td></tr>
<tr><td>VLOC OBS Settings</td><td>When equipped and enabled</td></tr>
<tr><td>Roll Trim parameter</td><td>When equipped and enabled</td></tr>
<tr><td>Airspeed Bug Setting</td><td></td></tr>
<tr><td>Target Altitude Bug Setting</td><td></td></tr>
<tr><td>Timer Starting Signal</td><td>When configured and enabled</td></tr>
<tr><td>True North Mode</td><td></td></tr>
<tr><td>VSI Bug Setting</td><td></td></tr>
<tr><td>Crosslink Synchronization Status</td><td rowspan="5">When equipped and enabled</td></tr>
<tr><td>TCAS-II control parameters</td></tr>
<tr><td>Traffic Filter Setting</td></tr>
<tr><td>WX RDR Control Menu mode parameter</td></tr>
<tr><td>Transponder Selection</td></tr>
<tr><td colspan="2">The following menu parameters are synchronized across all displays when crosslink is enabled. Otherwise, they are only synchronized onside. These parameters are FMS parameters and allow the pilot and co-pilot FMSs to be operated independently when crosslink is inhibited. Intra-System or Inter-System communications.

</td></tr>
<tr><td>Active Flight Plan Parameters</td><td></td></tr>
<tr><td>Runway Display Parameters</td><td></td></tr>
<tr><td colspan="2">The following menu parameters are only synchronized onside. These parameters are usually sensor selections or PFD options used to keep the appearance of any pilot's PFD consistent in the case of PFD reversion. The onside characteristic means that individual pilots can still adjust their PFD settings to their preference. Intra-System communications.
</td></tr>
<tr><td>Sensor Selections</td><td></td></tr>
</table>

Table 5-1: Menu Synchronization

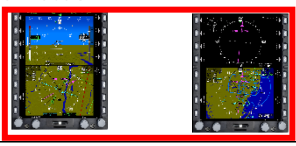
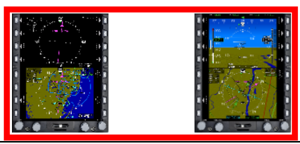
Menu Parameter	Notes
Barometric Setting Parameters (Baro, Transition alt, Set QFE Baro)	
Intra-System Setting Parameters	When configured and enabled
Decision Height Setting	Dependent upon EFIS Limits “Dual DH not enabled”
Active Navigation Source	
Horizon Synchronization Parameters	
PFD Basic Mode	
PFD Zoom Mode	
Navigation Preview Source	When enabled
PFD Analog AGL	
PFD Full-time Bank Scale	
PFD Flight Director	
PFD MINI MAP	
PFD Altitude (meters)	
PFD Skyway	
PFD Terrain	
Rate of turn indication	
PFD Traffic Perspective	
PFD MINI TRFC	
UTC Offset (Time Zone)	
WX RDR Control Menu parameters	Synchronized onside when Honeywell RDR-2XXX is installed.
Weather Radar Scale	Onside because range is controlled by the weather radar.
The following menu parameters are independent between displays. These are used to support non-PFI area display options to give the user maximum MFD operating flexibility. Note that some of these parameters are also independent between top and bottom MFD areas as specified in the notes.  	
CPU Type	To support mixed CPU type installations
MFD Show ETA	
Essential Mode Status	Support for reversion
MFD Map and HSI Page (DCLTR) Pointer Settings	Independent between top and bottom MFD areas

Table 5-1: Menu Synchronization

Menu Parameter	Notes
MFD Map Function Declutter Settings	
MFD Map NavData® Symbol Declutter Settings	
MFD OASIS Overlay	
MFD Strike (WX-500) Page Settings	
MFD Selected Page	
Forced OASIS Minimize	
MFD WX-500 Strikes Lightning	
MFD Strike (WX-500) Page Settings	
MFD Traffic Page Settings (Show FL)	
MFD Map Page Settings	
MFD Datalink Page Settings	
MFD Show ETA	
DVI Mode Status	Support for DVI option
MFD Video Page Settings	Independent between top and bottom MFD areas with the exception of the following video hardware settings: 1) Selected Input 2) Brightness 3) Contrast 4) Saturation 5) Hue

5.3. Top-Level Menu

On the top-level menu consists of soft menu options along with option labels for the knobs.

5.3.1. PFD Normal Mode Top-Level Menu

Under certain conditions, soft menu tiles automatically appear at the top-level to provide the user with single-touch access to needed functions. These menu tiles may be shown for a significant period of time, or until acknowledged.

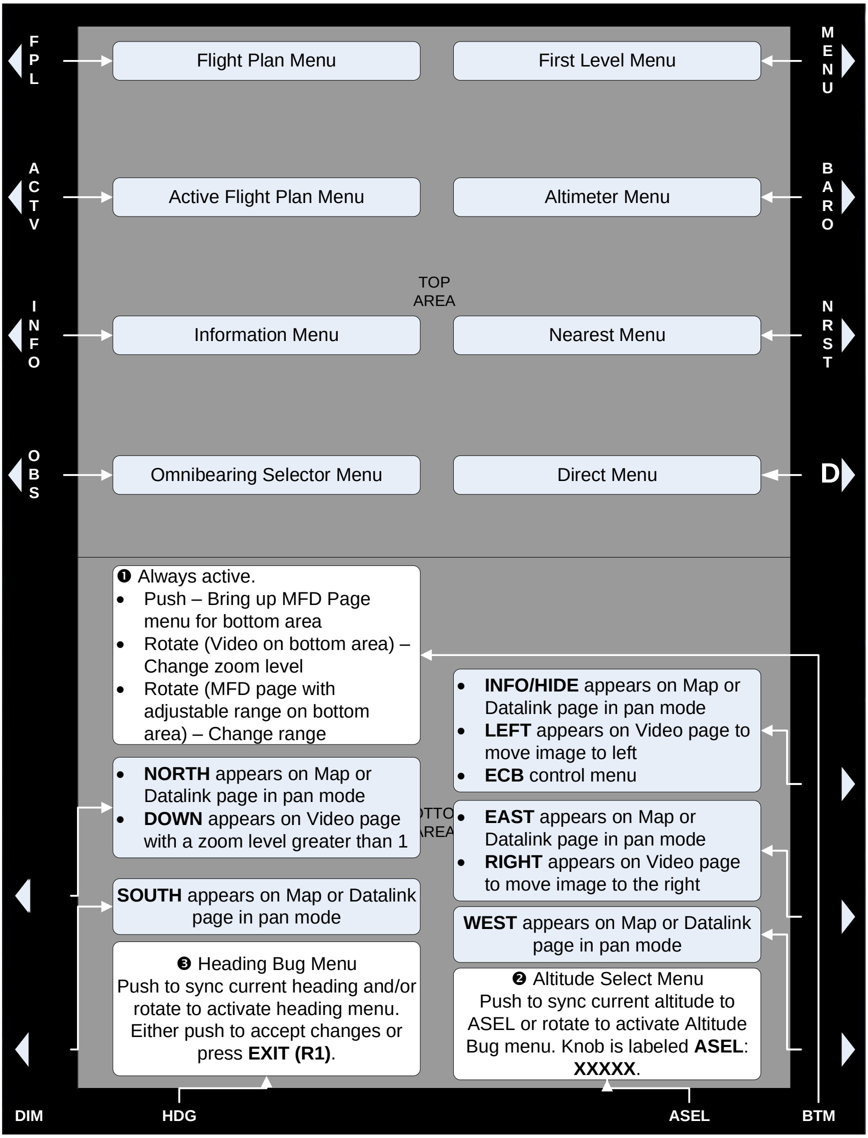


Figure 5-3: PFD Normal Mode Top-Level Menu (Normal Mode)

5.3.2. MFD Normal Mode Top-Level Menu

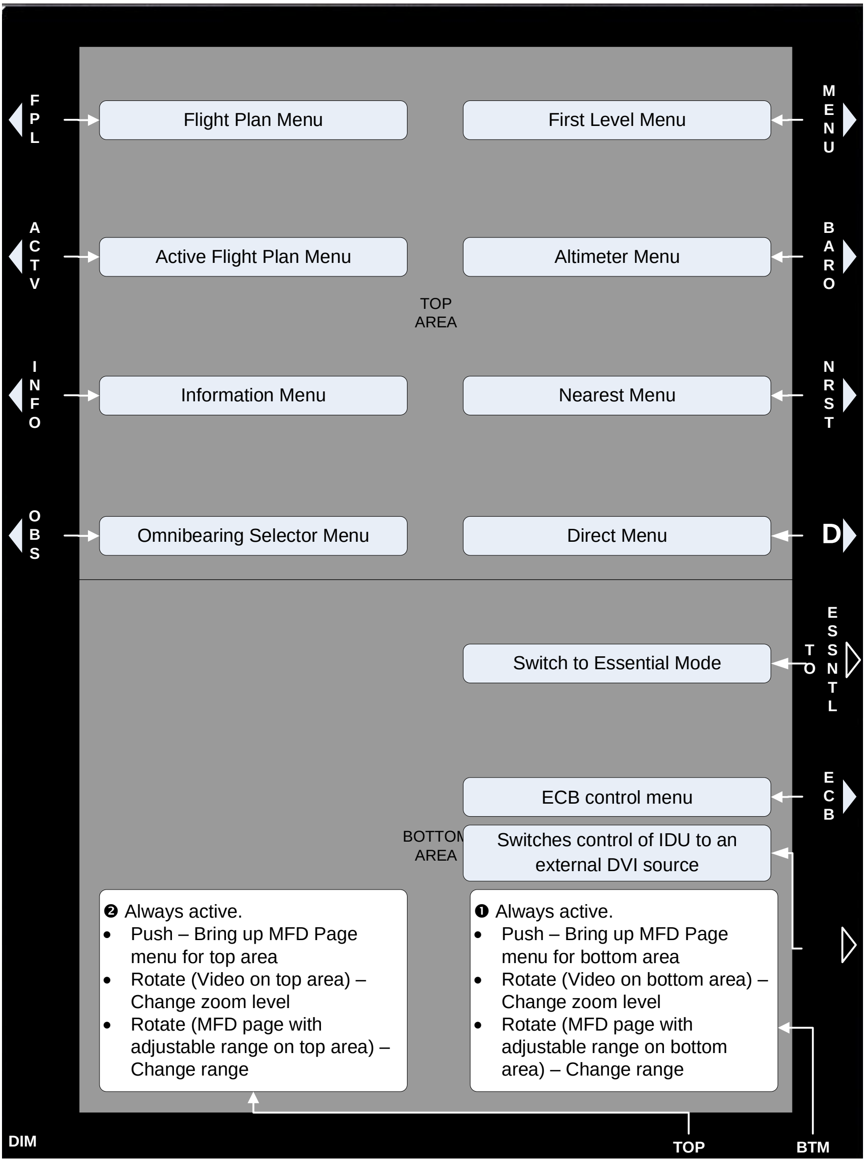


Figure 5-4: MFD Top-Level Menu (Normal Mode)

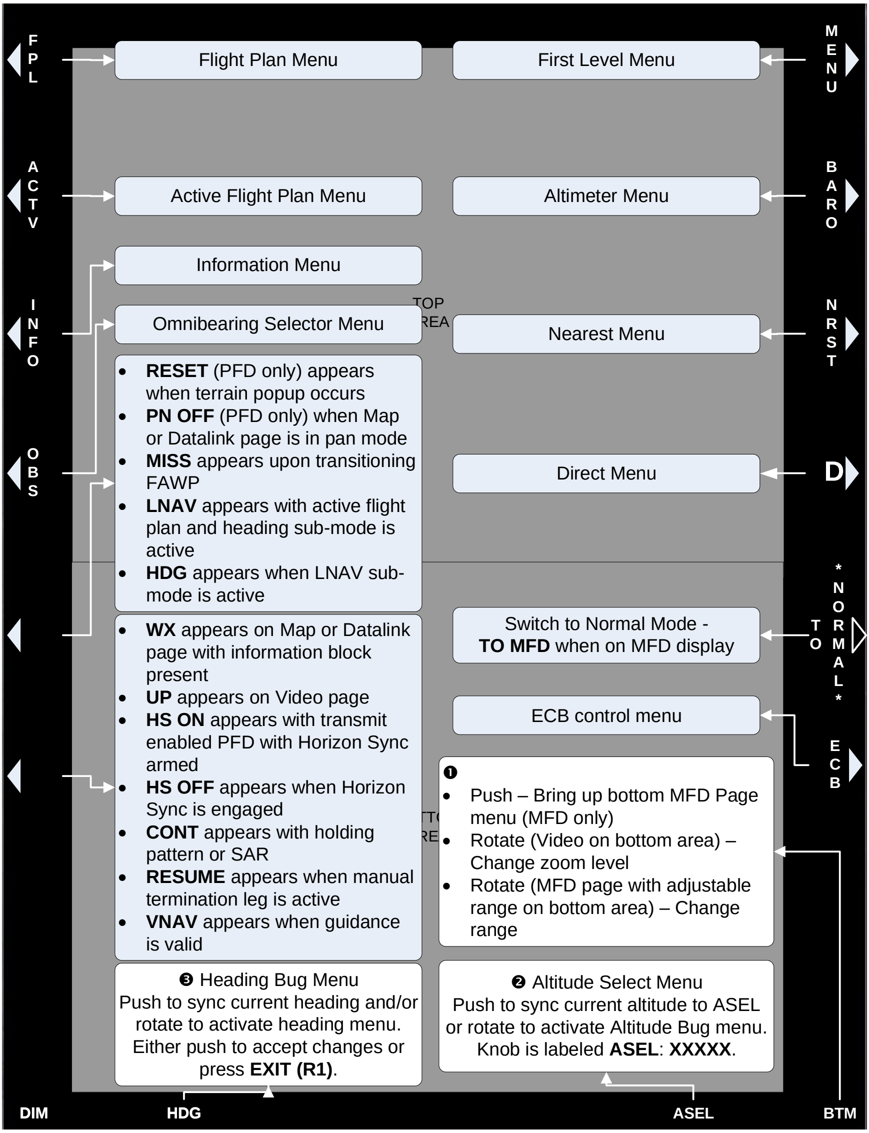


Figure 5-5: PFD or MFD Top-Level Menu (Essential Mode)

5.4. PFD Page First-Level

Top area of IDU #1 is fixed to the PFD page. Select essential mode on other IDUs to show PFD page in the top area. PFD page first-level options are shown adjacent to the top eight buttons. Options may also appear on the bottom eight buttons as appropriate to the page shown in the bottom area. When an identical option is shown adjacent to both the top area and bottom area, the option is only shown adjacent to the top area.

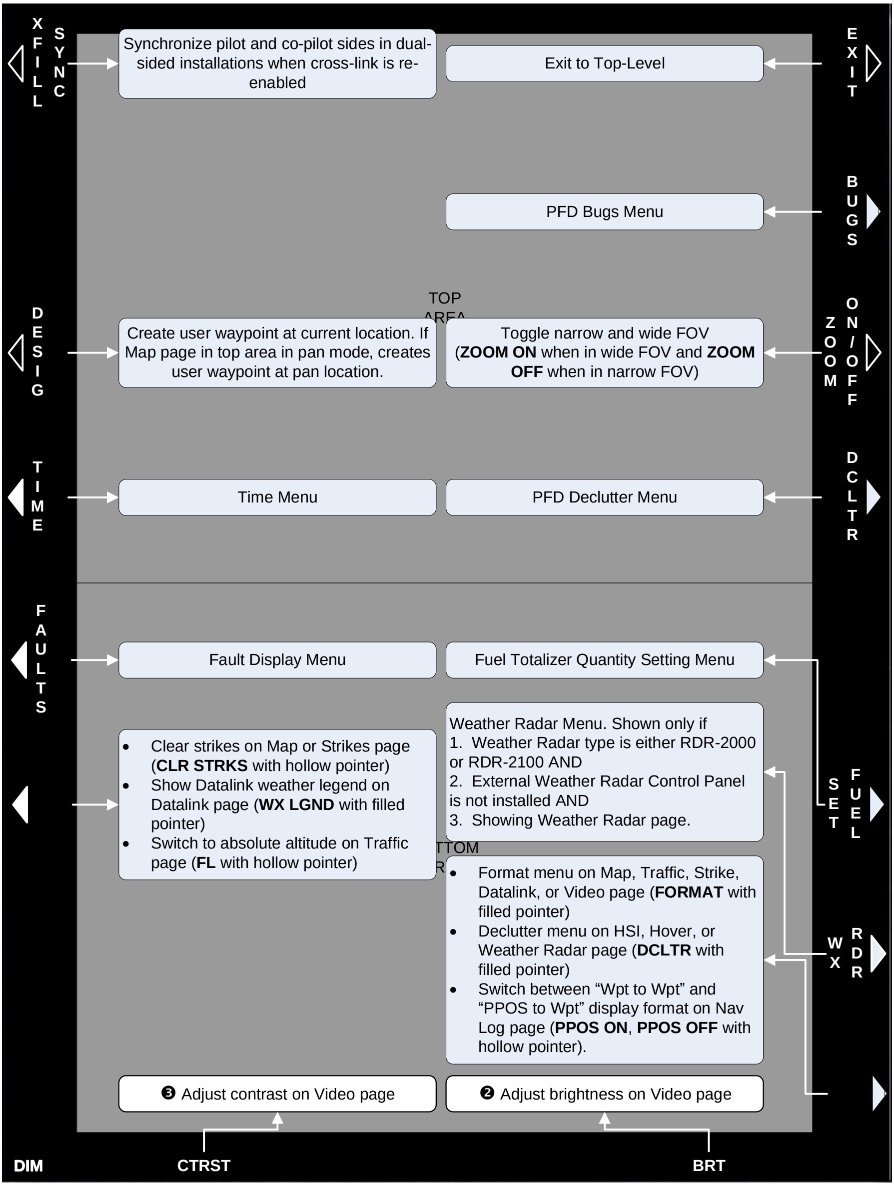


Figure 5-6: PFD Page First-Level

Table 5-2: Crossfill Inhibit/Arm/Sync Function

Crossfill [1]	Flight Plan	Indication (Pilot and Co-pilot)	Action to Synchronize Flight Plans: Pilot	Action to Synchronize Flight Plans: Co-pilot	Result
Enabled (Cond.1)	Synchronized	None	None	None	No action required. Pilot and co-pilot sides already synchronized
Enabled (Cond.2)	Not Synchronized [2]	XFILL ARM	**MENU (R1)** **XFILL SYNC (L1)**	None	Pilot's flight plan is sent to co-pilot side and both sides are synchronized. XFILL ARM is removed from both sides.
			None	**MENU (R1)** **XFILL SYNC(L1)**	Co-pilot's flight plan is sent to pilot side and both sides are synchronized. XFILL ARM is removed from both sides.
Inhibited (Cond.3)	Not Synchronized	XFILL INHBT	Enable crossfill [1] (proceed to Cond. 2)		XFILL INHBT removed. XFILL ARM displayed on both sides.

(1) Crossfill is inhibited with the use of a latching (ON) crossfill inhibit switch. Crossfill is enabled by releasing (OFF) this switch.

(2) Pilot and co-pilot flight plans can become unsynchronized under the following conditions:

1) Crossfill is inhibited, and pilot and co-pilot flight plans are separately changed before crossfill is re-enabled.

2) Either the pilot or co-pilot side is restarted with an active flight plan on the other side and crossfill enabled.

3) If XFILL FAIL condition exists and any changes are made to either side flight plans.

5.5. MFD Page First-Level

MFD page first-level options are shown adjacent to the area in which the MFD page resides. When an identical option is shown adjacent to both the top area and bottom areas, the option is only shown adjacent to the top area. (Options spelled the same but affect different areas of the display are not identical.)

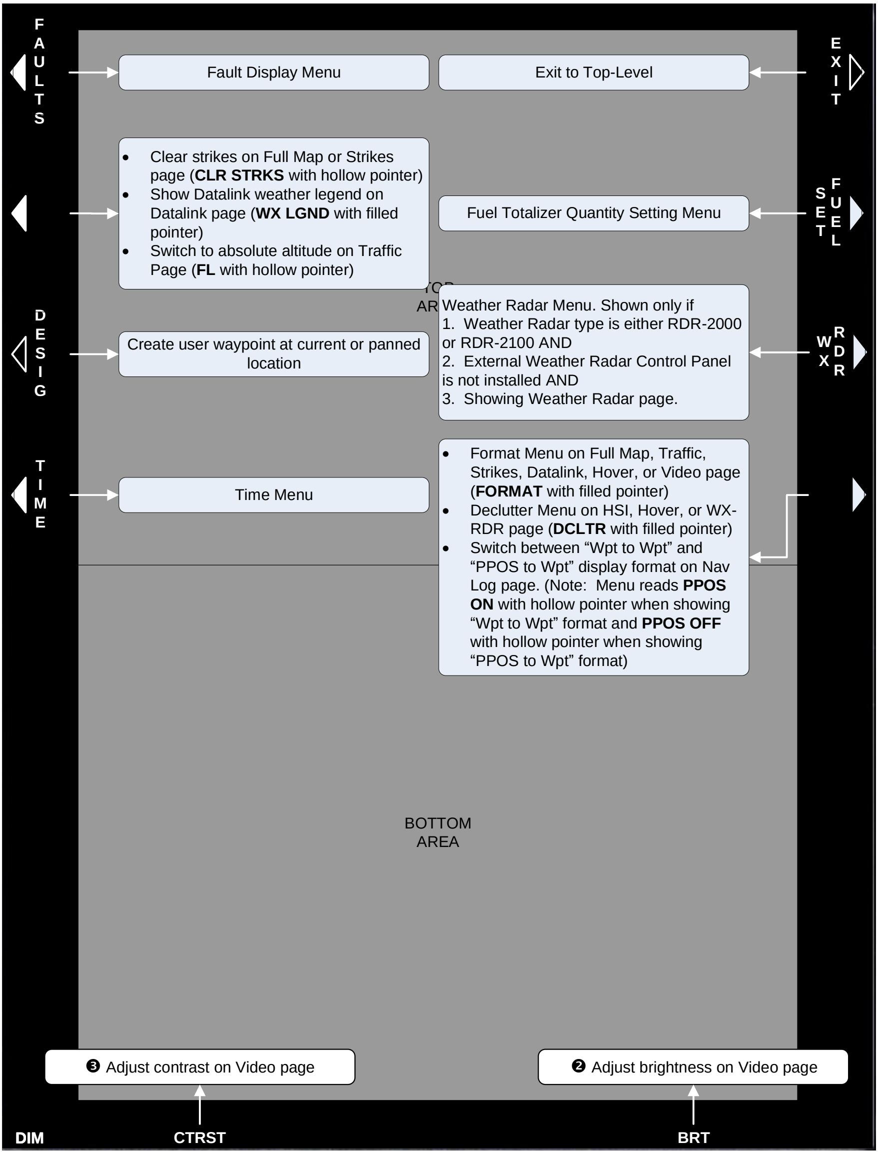


Figure 5-7: First-Level (MFD IDU #2) with an MFD Page in Both Areas (Normal Mode)

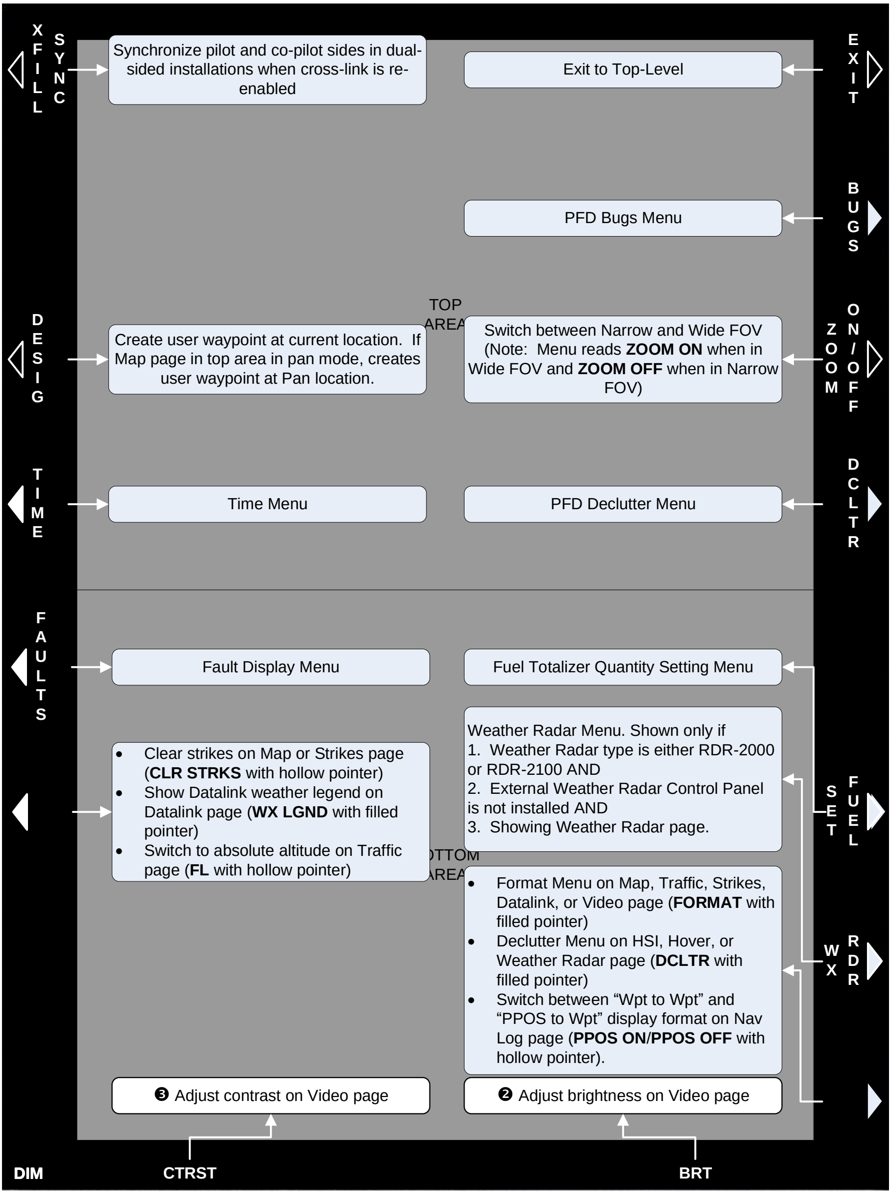


Figure 5-8: First-Level (PFD IDU #1) (PFI in Top Area and MFD in Bottom Area) (Normal Mode)

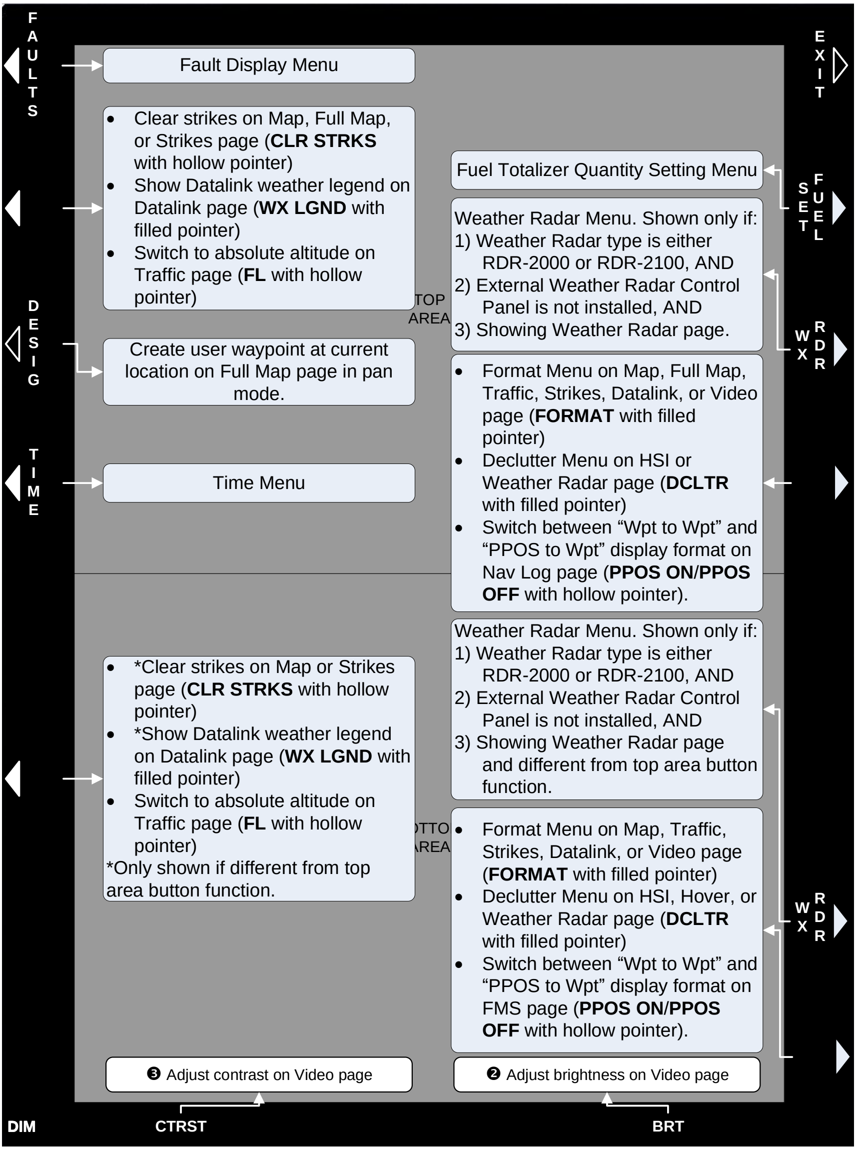


Figure 5-9: First-Level (MFD IDU #2) with an MFD Page in Both Areas (Normal Mode)

5.6. Flight Plan (FPL) Menu

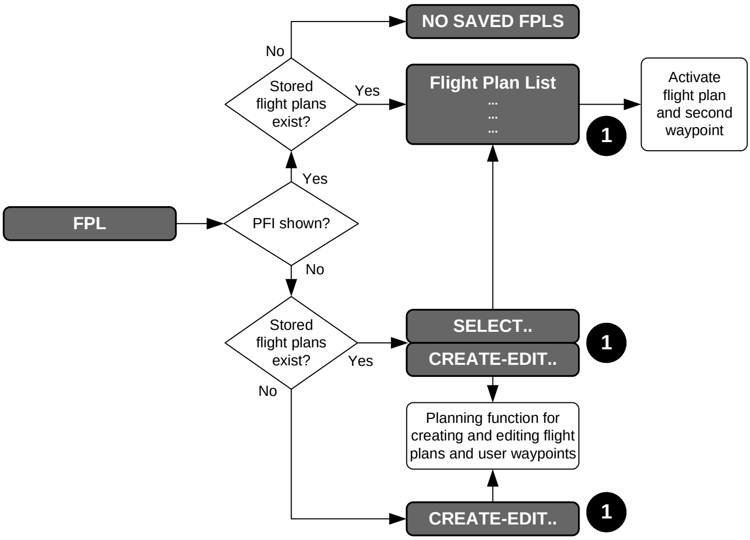


Figure 5-10: Flight Plan Menu

Upon activation of the flight plan menu, the system checks for saved flight plans. If there are no saved flight plans, only **CREATE-EDIT..** knob message appears. Otherwise, a list of saved flight plans is presented. Upon selection of a saved flight plan, the second waypoint in the flight plan is activated. On any IDU, when **FPL (L1)** is pressed, a list for selection appears or if no flight plans are saved, **NO SAVED FPLS** appears.

Figure 5-11: Select from Option List

Flight Plan Limits: Flight plans are stored routes (100 maximum) for repeated use without having to re-enter the waypoints each time. A flight plan consists of at least two waypoints (a start and an end) and may have up to 100 waypoints. Flights requiring more than 100 waypoints are divided into two or more flight plans.

> **NOTE:**
>
> Locked flight plans (preceded by 🔒) are shown first. When selected, the locked flight plan is activated. Locked flight plans are only created, edited, deleted, or reversed with a ground-based utility and are loaded into the system using a ground maintenance function.

5.6.1. Flight Planner Page

The flight planner page is used for detailed operations on user-modifiable elements in the IDU database. Perform the following types of functions through the flight planner page in the bottom area:

1) PFDs and MFDs are used for managing stored flight plans (activating, editing, deleting, renaming and reversing);

2) Managing user waypoints (creating, editing, and deleting); and

3) Performing RAIM predictions.

These operations demand user attention and are not a normal operating condition for the IDU. When the flight planner page is in use, it only appears on the bottom page taking over the IDU's controls and disabling the menu operations described in this document. Normal menu operation and IDU control function are restored upon:

1) Exiting the flight planner page; or

2) Automatic reversion of the IDU to the PFD or Essential mode exits the flight planner page and wipes out any changes being performed.

NOTE:

Unless otherwise noted, the following step-by-step procedures are for the PFD or MFD.

Because the flight planner page takes over the IDUs controls, limitations are placed upon access and display of the flight planner page. Upon activation of the flight plan menu, the EFIS checks for the existence of stored flight plans. If flight plans do exist, an option list is presented for selection of a flight plan or entering the flight planning page.

Selecting the stored flight plan option leads to a list of stored flight plans. Upon selection of a stored flight plan, the second waypoint in the flight plan is activated.

5.6.2. To Create an Overfly User Waypoint on PFD (Step-By-Step)

1) When flying over intended waypoint, press **MENU (R1)**, within 10 seconds press **DESIG (L3)** on PFD or MFD.

2) A user waypoint is created at the present position and automatically named "OF###," where ### is the next available sequence overfly user waypoint number.

3) Press **MENU (R1)**, then press **FORMAT (R8)**, then press **SYMB DCLTR..** rotate ❶ to **MANUAL..** and push to enter and rotate ❶ and push to select **USER WPTS.**

4) Edit waypoint (see § 5.6.12) to change the waypoint name or characteristics.

> **NOTE:**
>
> A maximum of 999 user waypoints may be created and stored.
>
> If configured in EFIS limits, “Remote User Waypoint Designate switch” may be used to easily create a user waypoint.

5.6.3. Flight Plan (FPL) Menu Selecting and Activate on PFD (Step-By-Step)

1) Press **FPL (L1)**.

2) Rotate ❶ to **SELECT..** and then push to enter.

3) Rotate ❶ to desired flight plan and push to enter.

5.6.4. Flight Plan (FPL) Menu Create-Edit (Step-By-Step)

1) Press **FPL (L1)**.

2) Rotate ❶ to **CREATE-EDIT..** and push to enter.

3) **CREATE FLIGHT PLAN** Push ❶ to enter.

4) Press **ADD (R6)** to create first waypoint.

5) Rotate ❶ to create first waypoint or press **NRST APT (L6)**, **NRST VOR (L7)**, **NRST NDB (L8)**, **NRST FIX (R6)**, or **NRST USR (R7)**, to view applicable list.

6) If **NRST VOR (L7)** was pressed. Rotate ❶ and push to enter desired VOR as the first VOR in the flight plan.

7) A VOR was added and the highlighted line is now advanced to the next position below. Press **ADD (R6)** to create the next waypoint.

8) Continue adding waypoints as described in steps above and progress up to as many as 100 waypoints.

9) Airway routing occurs between pre-determined pathways. If an airway is desired repeat step 7, then select the VOR containing the airway

routing. When a VOR is added to the flight plan and highlighted, the associated airway is made available for selection, **INSRT (R6)** then **AIRWAY (R8)**.

10) Press **SAVE (R8)** to save changes to one of the 100 maximum saved flight plans.

5.6.5. Flight Plan (FPL) Menu Selection Edit Flight Plan on PFD or MFD (Step-By-Step)

1) Press **FPL (L1)**.
2) Rotate ❶ to **CREATE-EDIT..** and push to enter.
3) Rotate ❶ to **EDIT FLIGHT PLAN** and push to enter.
4) Rotate ❶ to desired flight plan requiring editing and push to enter.
5) Rotate ❶ to highlight waypoint where another waypoint is to be inserted above and press **INSERT (R6).**
6) Press **NRST APT (L6)**, **NRST VOR (L7)**, **NRST NDB (L8)**, **NRST FIX (R6)**, or **NRST USR (R7)**, to view applicable list, rotate ❶ to desired selection and push to enter.
7) With any VOR associated with an eligible airway entered into the flight plan highlighted, press **INSRT (R6)** then **AIRWAY (R8)** to view possible options. Rotate ❶ to select desired airway, then push to accept.
8) Rotate ❶ to desired end point on airway and push to enter.
9) To delete any waypoint, rotate ❶ to desired waypoint and **DEL (R7)** appears as an option for deleting the highlighted waypoint. Press **DEL (R7)** to delete waypoint. Push ❶ to **CONFIRM DELETE WPT.**
10) If flight plan is satisfactory, accept and save by pressing **SAVE (R8)**, and then **EXIT (R1)** to exit the flight plan menu.

5.6.6. Activate Flight Plan on PFD or MFD (Step-By-Step)

1) Press **FPL (L1)**.
2) Push ❶ **SELECT..** to select from list of stored flight plans and push to enter.
3) Rotate ❶ to desired flight plan and push to enter; OR
4) Rotate ❶ to **CREATE-EDIT..** and push to enter.
5) Rotate ❶ to **ACTIVATE FLIGHT PLAN** and push to enter.

6) Rotate ❶ to desired saved flight plan and push to enter. The selection for activating is accepted. Push to enter.

7) Press **EXIT (R1)** if no other action is necessary. This returns to the **CREATE-EDIT..** menu option. Press **EXIT (R1)** to exit menu and restore to last MFD page on the bottom.

5.6.7. Reverse Flight Plan on PFD or MFD (Step-By-Step)

1) Press **FPL (L1)**.

2) Rotate ❶ to **CREATE-EDIT.** and push to enter.

3) Rotate ❶ to **REVERSE FLIGHT PLAN** and push to enter.

4) Rotate ❶ to desired flight plan and push to enter.

5) If no other flight plan to reverse, press **EXIT (R1)**.

5.6.8. Delete Flight Plan on PFD or MFD (Step-By-Step)

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **DELETE FLIGHT PLAN** and push to enter.

3) Rotate ❶ to desired flight plan to delete. Push to enter.

4) Push ❶ to **CONFIRM DELETE FPL**.

5) The next flight plan is highlighted. If no further deletions, press **EXIT (R1)**.

5.6.9. Rename Flight Plan on PFD or MFD (Step-By-Step)

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **RENAME FLIGHT PLAN** and push to enter.

3) Rotate ❶ to flight plan intended to rename. Push to enter.

4) Rotate and push ❶ create a new 12-character name for this flight plan.

5) Press **SAVE (R8)** to save changes.

6) If no further renaming is required, press **EXIT (R1)**.

5.6.10. Create User Waypoint (LAT-LON) on PFD or MFD (Step-By-Step)

User waypoints can be created with three methods:

1) Latitude and longitude

2) Radial and distance

3) Overfly (Designate)

Follow this step-by-step procedure to create a user waypoint using latitude and longitude.

1) Repeat steps 1 and 2 in 1 and 2 in § 5.6.7.

2) Rotate ❶ to **CREATE USER WPT (LAT-LON)** and push to enter.

3) To name a new user waypoint, rotate ❶ and push to enter up to five-characters and or spaces.

NOTE:
Duplicate user waypoint names are not accepted.

4) With new user waypoint name created, push and or rotate ❶ to proceed through all fields as necessary.

5) Approach bearing preloading depends on mode of flight as follows:

   a) On Ground: Preloaded with current heading

   b) In Flight: Preloaded with "OFF" value.

   c) If desired, specify the approach bearing to user waypoint in degrees 1°-360°. "OFF" disables VFR approaches to the user waypoint.

6) Once all fields are entered, press **SAVE (R7)** to save user waypoint or press **D→** **(R8)** to activate/save waypoint as the active waypoint and begin navigation guidance.

7) Changes are saved and user waypoint is saved as one of the 999 user waypoints. EFIS returns to **CREATE FLIGHT PLAN**. Press **EXIT (R1)** to exit menu.

5.6.11. Create User Waypoint (RAD-DST) on PFD or MFD (Step-By-Step)

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **CREATE USER WPT (RAD-DST)** and push to enter.

3) Identifier is automatically named “RD###” where ### is the next available radial distance waypoint number.

4) Rotate ❶ to enter identifier for reference waypoint and push to enter.

5) If multiple search results appear, a list appears. **INFO (R6)** appears to verify each waypoint information.

6) Rotate ❶ to desired waypoint and push to enter.

> **NOTE:**
>
> If a single search results, menu advances to radial entry box.

7) Rotate ❶ to enter the radial entry and distance from desired waypoint.

> **NOTE:**
>
> RADIAL/DIST values, (1-360° and .1NM/KM-200NM/KM)

8) Press **SAVE (R7)** to save user waypoint or press **D→ (R8)** to activate/save as the active waypoint and begin navigation guidance.

5.6.12. Edit User Waypoint on PFD or MFD (Step-By-Step)

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **EDIT USER WPT** and push to enter.

3) **EDIT WHICH USER WAYPOINT:** Rotate ❶ to desired waypoint to be edited and then push to enter.

4) Rotate and push ❶ to edit all fields and then push to enter.

5) Either press **SAVE (R7)** to save edited user waypoint or **D→ (R8)** to begin navigational guidance.

6) If no more waypoints to be edited, press **EXIT (R1)**.

5.6.13. Delete User Waypoint on PFD or MFD (Step-By-Step)

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **DELETE USER WPT** and push to enter.

3) Rotate ❶ to desired waypoint to be deleted. Push to enter action.

4) Push ❶ to **CONFIRM DEL USER WPT**.

5) If no more waypoints to delete, press **EXIT (R1)**.

NOTE:

Changes to user waypoint parameters while in flight are not automatically updated to an active flight plan containing that user waypoint.

When changes are made to a user waypoint, and those changes are desired in existing flight plans which use the waypoint, it must be deleted and replaced in the flight plans with the following steps:

1) Edit the user waypoint as described.

2) Open a flight plan, which uses the user waypoint.

3) Delete the existing waypoint from the flight plan.

4) Save and exit.

5) Reload the flight plan if it was in use.

5.6.14. RAIM Prediction on PFD or MFD (Step-By-Step)

When selected, the RAIM prediction screen is only shown if the GPS/SBAS receiver is capable of performing a RAIM Prediction (not suitable for enroute predictions). This requires there be no faults along with a current almanac in memory. The faults menu may be monitored to determine if the GPS/SBAS receiver is capable of performing a RAIM prediction.

1) Repeat steps 1 and 2 in § 5.6.7.

2) Rotate ❶ to **RAIM PREDICTION** and push to enter.

3) Rotate and push ❶ enter to the desired waypoint and select **INFO (R6)** to verify the waypoint.

4) Rotate and push ❶ to enter **UTC TIME:** and **UTC DATE:**.

5) Press **CALC (R6)** to check RAIM predictive status.

6) If another RAIM prediction is necessary, press **START OVER (R6)** or press **EXIT (R1)**.

NOTE:

The user may perform RAIM prediction at a designated waypoint via the following data entry boxes:

1) Designated Waypoint: Prompted to enter an identifier for the designated waypoint. If there is a single result, advanced to UTC time entry box. If there is no result, re-prompted to enter an identifier. If there are multiple results, a selection list with matching identifiers is presented and, upon selection, is advanced to UTC time entry box. **INFO (R6)** aids in selection and gives access to information for the highlighted results.

2) **UTC Time Entry:** Allows entry of the 24-Hour UTC estimated time of arrival at the designated waypoint.

3) **UTC Date Entry:** Allows entry of the UTC estimated date of arrival at the designated waypoint. The minimum speed used for calculation waypoint ETA calculation is V_{PROC}.

4) **PRN Mask Entry:** Allows specification the PRN number of satellites expected to be unavailable at the destination.

5) **EXIT:** Exit of the RAIM prediction screen at any time.

6) Once a designated waypoint and UTC estimated time of arrival are entered, **CALC (R6)** appears to initiate the RAIM Prediction. Press **CALC (R6)** to check the UTC estimated time of arrival and ensure it is within the current almanac (i.e., <3.5 days from current date and time). If it is, a Predictive FDE Request message requesting “Detection Availability” with a required HAL of 0.3NM is sent to the GPS/SBAS receiver. In response, the GPS/SBAS receiver replies with a sequence of Predictive FDE Response messages. These messages are parsed and used to fill in the RAIM Prediction result area at the bottom of the screen. The RAIM Prediction result area shows the RAIM Prediction results as “OK” or “XX” for ETA ± in 5-minute increments. Once a prediction is complete, press **START OVER (R6)** to perform another prediction without exiting the RAIM Prediction screen.

5.7. Active Flight Plan (ACTV) Menu

See Section 7 IFR Procedures for active flight plan description.

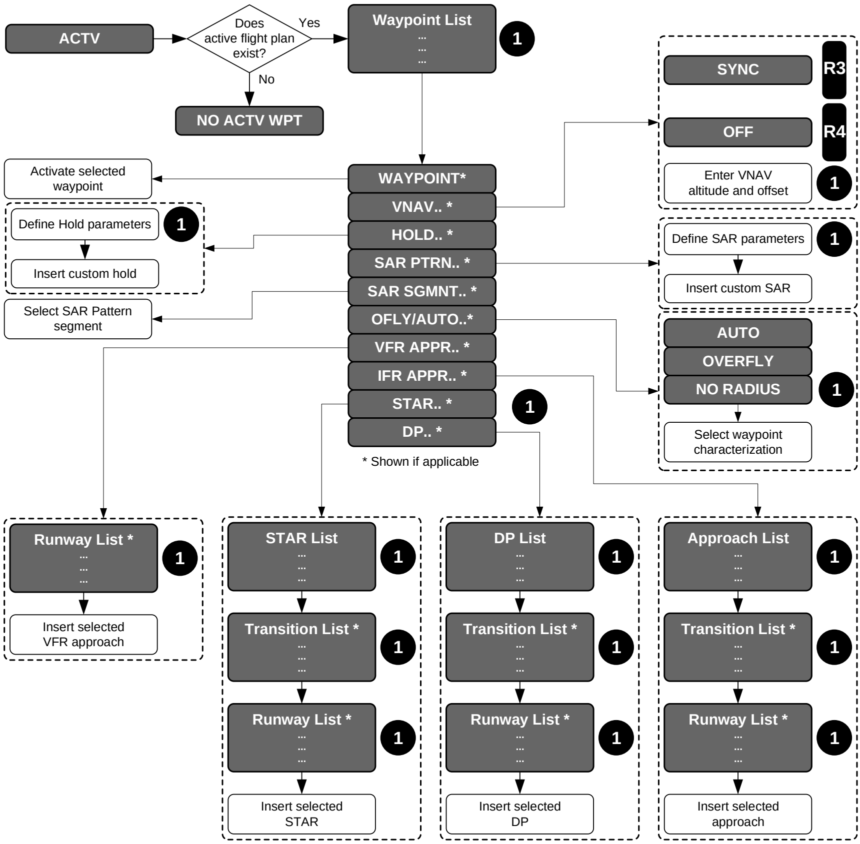


Figure 5-12: Active Flight Plan Main Menu

The following options allow various modifications for the active flight plan. Upon pressing **ACTV (L2)**, the EFIS checks for the existence of an active waypoint. If there is no active waypoint, **NO ACTIVE WPT** menu message is displayed. Otherwise, a selection list of waypoints in the active flight plan is presented. The waypoint list shows the following:

1) Each waypoint identifier and characterization (default is auto otherwise overfly ("OF") or no radius ("0R") is shown as selected);

2) A symbol designating waypoint type along with any special attributes;

3) VNAV altitudes and offsets associated with each waypoint; and

4) Information related to the flight plan path between each waypoint.

VNAV altitudes are presented in feet or meters and VNAV offsets are presented in NM or KM depending upon the setting of the “Speed Units” system limit. In case of an approach with a final approach segment data block, the VNAV offset associated with the missed approach point is the “GPI” to designate distance to the glide path intercept point.

When courses are presented as part of the path information, they are displayed referenced to either magnetic or True North depending upon the status of the Truth North mode selection. When distances are presented as part of the path information, they are displayed in NM or KM.

When VNAV altitudes and offsets that come from the navigation database or that have been manually entered are shown in white. VNAV and offset altitudes that are computed automatically are shown in gray. The current active waypoint is designated by an asterisk and shown in magenta. The active waypoint color turns amber (yellow) in the event of a GPS Loss of Navigation caution. Any suppressed waypoints are designated by brackets.

5.7.1. Active Flight Plan (ACTV) Menu Options

The active flight plan menu options for **APT (L2)**, **NRST FIX (R2)**, **NRST NDB (L4)**, **NRST USR (R3)**, **NRST VOR (L3)**, and **NRST AIRWAY (R4)** are defined in Table 5-3. Searches are conducted for 20 items within 240 NM nearest to the waypoint prior to the insertion point or added at the end. If list is empty, (no items within 240NM), **NO RESULTS** message is displayed.

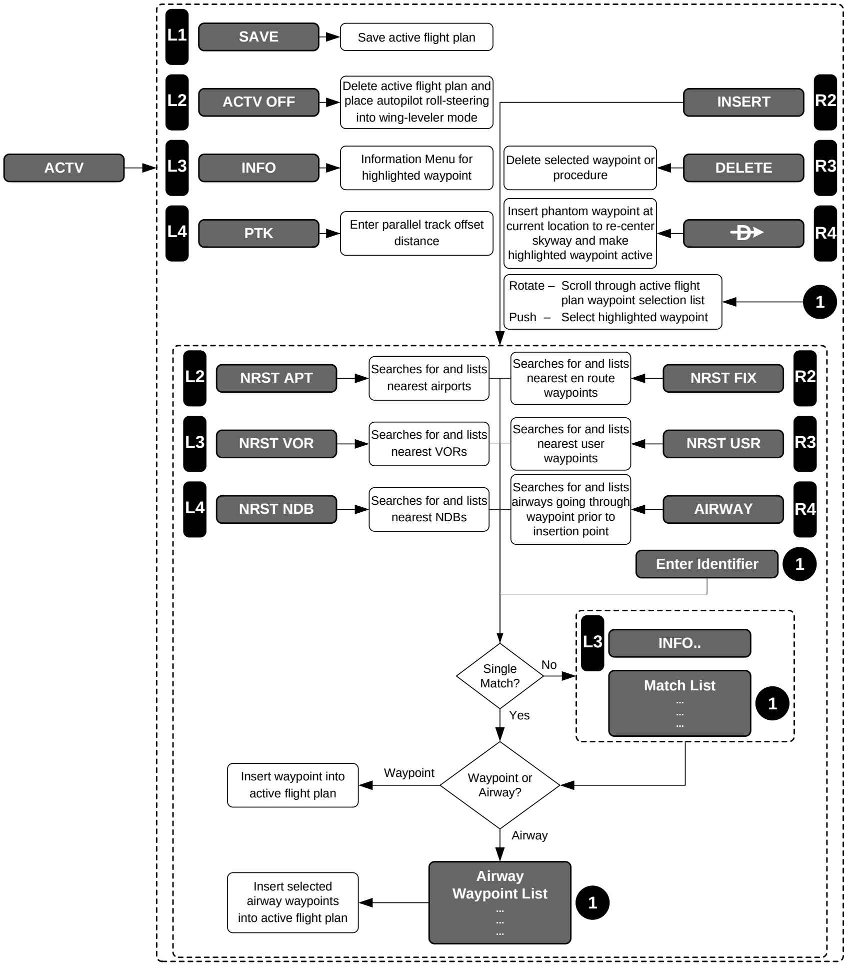


Figure 5-13: Active Flight Plan Menu Options

Table 5-3: Active Flight Plan Menu Options		
Menu Options	**Action for Active Flight Plan**	**Limitations**
SAVE (L1)	Saves and is part of 100 stored flight plans	Saves without procedures or phantom waypoints. Named by first and last waypoints. New flight plans with same start and end waypoints but with different routing, a number (1-9) is appended to the name to uniquely identify up to 10 routings with same start and end points.

Table 5-3: Active Flight Plan Menu Options

Menu Options	Action for Active Flight Plan	Limitations
ACTV OFF (L2)	Deletes flight plan	Prompted to confirm deletion.
INFO (L3)	Activates information menu for highlighted waypoint	With no active flight plan, activates information for nearest airport.
PTK (L4)	If active leg is eligible for offset, allows user to specify parallel offset distance in nautical miles or kilometers that applies to the active and contiguous legs	Range of parallel offsets are from 20 units left or right of track in 1-unit increments. (NM or KM depending on "Speed Units" system limit). **PTK (L4)** is absent if current leg is ineligible for offsetting.
INSERT/ ADD (R2)	Insert or add a waypoint or airway (See Note below)	**ADD**: At end of active flight plan. **INSERT**: Above highlighted waypoint. **SEARCH**: Requires minimum of two characters. **INFO**: After adding waypoint, appears to aid in selection. **AIRWAY**: Search for all airways going through highlighted waypoint. Offers option to select exit waypoint. After selection, all airway waypoints from the waypoint prior to the insertion point to the desired exit point are added to the flight plan.
NRST APT (L2)	Search for airports of runway length criteria set in EFIS limits	**INFO**: After adding waypoint, and aids in selection.
NRST FIX (R2)	Search for fixes	**INFO**: Provides information and aids in selection and includes datalinked weather information when available and enabled.
NRST NDB (L4)	Search for NDBs	**INFO**: Provides information and aids in selection.

Table 5-3: Active Flight Plan Menu Options

Menu Options	Action for Active Flight Plan	Limitations
NRST USR (R3)	Search for nearest user waypoints	**INFO**: Provides information and aids in selection.
NRST VOR (L3)	Search for nearest VORs	**INFO**: Provides information and aids in selection.
Identifier Entry Box	Area to enter identifier where knob message would normally appear	Entry of at least two characters and then **SEARCH (R4)** appears to begin immediate search. Selection list may appear for addition to add to the active flight plan. Highlighted result information may include datalinked weather when enabled and available. **INFO**: Provides information and aids in selection.
DELETE (R3)	If highlighted waypoint is a non-procedure waypoint, deletes the waypoint after confirmation	If highlighted waypoint a parallel offset entry or exit waypoint or is part of a procedure, deletes entire procedure after confirmation. Does not appear if highlighted waypoint is a non-procedure and there are fewer than three non-procedure waypoints in active flight plan. Otherwise, deletes the waypoint. Does not appear if highlighted waypoint is suppressed or one position beyond the end of the active flight plan.
 **(R4)**	Inserts phantom waypoint at the current aircraft position and makes the highlighted waypoint active	Phantom waypoint is a fly-over defined entry waypoint, and leg prior to phantom waypoint is designated a discontinuity. Assures skyway is re-centered for guidance. Does not appear when highlighted waypoint is suppressed, is one position past the end of the active flight plan, an undrawn waypoint, phantom waypoint, SAR pattern waypoint, dynamic termination waypoint, or parallel offset entry, or entry waypoint. Otherwise inserts a phantom waypoint at the current aircraft location. Phantom waypoint is designated a fly-over defined

Table 5-3: Active Flight Plan Menu Options

Menu Options	Action for Active Flight Plan	Limitations
		entry waypoint and the leg prior to the phantom waypoint is designated a discontinuity.

NOTE:

To avoid corruption of IFR approaches, STARs, DPs holding patterns, and SAR patterns, **INSERT/ADD** does not appear when the highlighted waypoint is:

1) the second or subsequent waypoint of a procedure,

2) suppressed airport and the prior waypoint is part of an approach procedure,

3) a holding point, or

4) a SAR pattern exit waypoint.

When activated, a sub-menu is presented as follows:

For waypoints, if there is a single result, it is inserted or added to the active flight plan. If there is no result, user is re-prompted to enter an identifier. If there are multiple results, a list with matching identifiers is presented and, upon selection, the selected waypoint is inserted or added to the active flight plan. **INFO (L3)** aids in selection and gives access to information for the highlighted result.

For airways, This option only appears when an airway transits through the waypoint prior to the insertion point. When activated, a search is performed for all airways going through the highlighted waypoint and matching the entered identifier (i.e., for a list of all Victor airways, Q-routes and T-routes, enter an identifier string of “V”, “Q,” “T”, etc.). If there is a single result, a list of airway waypoints is shown to select the desired user selected exit point. If there is no result, user is re-prompted to enter an identifier. If there are multiple results, a list with matching airway identifiers is presented and, upon selection, a list of airway waypoints is shown to select the desired exit point. Upon selecting the desired exit point, all airway waypoints from the previous waypoint to the desired exit point are inserted or added to the active flight plan. Each active flight plan has a limit of a maximum of 100 waypoints.

5.7.2. Active Flight Plan (ACTV) Menu Options (Step-By-Step)

1) Press **ACTV (L2)** to view active flight plan. Rotate ❶ to desired waypoint. Push to enter.
2) Rotate ❶ to desired option (for example, **VNAV..**) and push to enter.
3) As one option, a VNAV setting is entered (arrive at XXXX' XNM prior to crossing waypoint.)
4) As another option, press **DELETE (R3)** to delete the next waypoint (XXXXX).
5) Push ❶ to **CONFIRM DELETE WPT**.

5.7.3. Active Flight Plan (ACTV) Hold Menu Option (Step-By-Step)

1) With desired flight plan selected and activated, press **ACTV (L2)** to view active flight plan.
2) Rotate ❶ to desired waypoint. Push to enter.
3) Rotate ❶ to desired option (for example **HOLD..**) and push to enter.
4) Rotate ❶ to set **COURSE:**, **TURN DIR:**, **LEG DIST:**, or **LEG TIME:**, and push to enter between each entry. (**LEG DIST:** and **LEG TIME:** are mutually exclusive.)
5) The active flight plan automatically appears to show changes. Press **SAVE (L1)** to save as another stored flight plan or press **EXIT (R1)** to save changes and close menu.

5.7.4. Active Flight Plan (ACTV) Options NRST Menu Option (Step-By-Step)

1) With active flight plan displayed, rotate ❶ to desired waypoint where a new waypoint is to be inserted above and press **NRST (R3)** to see NRST options. Then push ❶ to enter.
2) Press **NRST APT (L2)**, **NRST VOR (L3)**, **NRST NDB (L4)**, **NRST FIX (R2)**, or **NRST USR (R3)** to view applicable list. Rotate ❶ to desired selection and push to insert into active flight plan.

5.8. Information (INFO) Menu

If **INFO** is activated from within the **ACTV**, **NRST**, or Direct menus, information on the highlighted waypoint is shown. The amount and type of information presented depends upon the type of waypoint as defined in Table 5-4. Otherwise, the function checks for an active waypoint. If there is an active waypoint, it becomes the default entry. If there is no active waypoint, then the nearest airport becomes the default entry. If the default entry is accepted, then information for the default entry is shown. If the user rejects the default entry by entering identifier characters, a search for matching characters is performed. Since only two identifier characters are needed, **SEARCH (R4)** appears to begin searching if desired. If there is a single result from the search, information for that result is shown. If there is no result from the search, the user is re-prompted to enter an identifier. If there are multiple results from the search, a selection list with matching identifiers is presented to allow the user to select the desired identifier.

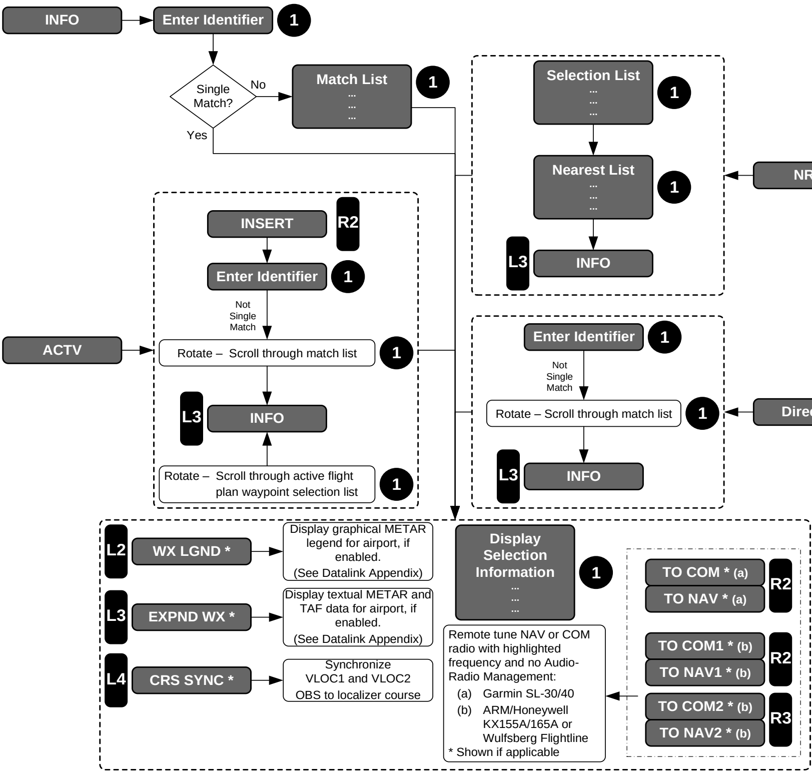
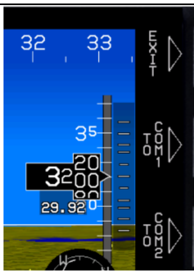


Figure 5-14: Information Menu

NOTE:

Frequencies are only sent to either com or nav radios in the standby position. It is up to the user to swap frequencies to the active position in the applicable radio.

Table 5-4: Information Menu		
Type	**NAVAID**	**Airports**
Waypoint Identifier Waypoint Type Waypoint elevation Long Name Bearing and distance (presented in NM or KM) Latitude and longitude Sunrise/Sunset time	NAVAID Type Frequency	Communication frequencies Airport runway data (Note 1) Airport elevations are in feet or meters depending on EFIS limits setting.
Note 1: With Datalink available and enabled, airport graphical METAR, current altimeter setting and current wind conditions are presented. Current wind conditions are presented in knots or meters per second. If textual METAR data for a specified airport is not available, the date field is presented as "----".		

Table 5-5: Remote Tuning COM or NAV Radios	
	For remote tuning, **TO COM1 (R2)** and/or **TO COM2 (R3)** is shown to allow transmission of the frequency to remote radios when frequencies greater than or equal to 118 MHz are highlighted in the INFO block.
	**TO NAV1 (R2)** or **TO NAV2 (R3)** is shown to allow transmission of the frequency to remote radios when frequencies less than 118 MHz are highlighted in the INFO block.

When the information presented is for an ILS or localizer waypoint and the current VLOC1 or VLOC2 omnibearing selectors are not synchronized with the localizer course, press **CRS SYNC** (**L4**) to synchronize the VLOC1 and VLOC2 omnibearing selectors to the localizer course.

5.8.1. Information (INFO) Menu (Step-By-Step)

1) Press **INFO (L3)** to view active waypoint.
2) Push ❶ to view information.
3) Press **WX LGND (L2)** to view examples of weather symbology or **EXPND WX (L3)** to view METARS and or TAF reports.

5.9. Omnibearing Selector (OBS) Menu (without NAV Preview)

OBS menu allows for control of the Omnibearing selector for showing course deviations. When navigation/HSI source is FMS, **OBS AUTO/OBS MAN (R4)** toggles between automatic and manual OBS settings (see Table 5-6).

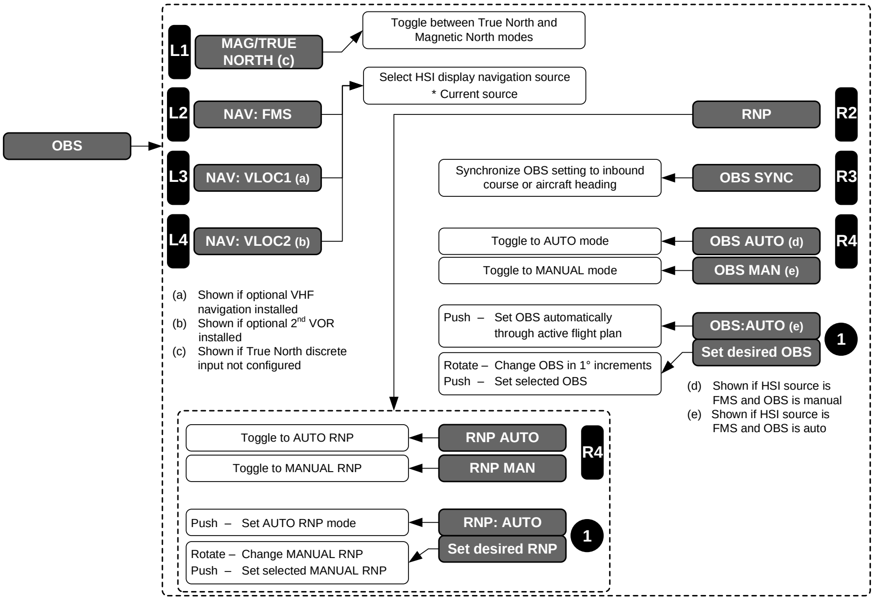
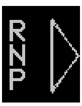


Figure 5-15: Omnibearing Selector (OBS) Menu (without NAV Preview)

Table 5-6: Omnibearing Selector (OBS) Menu Options			
OBS (L4)	**OBS SYNC (R3)**	**OBS MANUAL (R4)**	**Nav Source and CDI Indication**
FMS (L2) 	Only available with active waypoint. Synchronizes **FMS** to inbound course	Only available with active waypoint. Settable in increments of 1° with ❶	GPS navigation source  or 
VLOC1 (L3) 	Synchronizes **VLOC1** or **VOR1** to the inbound course or if the inbound course cannot be determined, to aircraft heading.	Settable in increments of 1° with ❶	  
VLOC2 (L4) 	Synchronizes **VLOC2** or **VOR2** to the inbound course or if the inbound course cannot be determined, to aircraft heading.		  
RNP (R2) 	When selected, allows for **RNP (R4)**  or 	Rotate ❶ to set desired manual RNP value.	Manual RNP is selectable between 0.10NM and 15NM: 0.01 increments RNP 0.10 and RNP 0.3 0.1NM increments RNP 0.3 and RNP2.0 1NM increments RNP 2.0 and RNP 15
TRUE NORTH (L1) 	OBS Menu allows the user to toggle between **TRUE NORTH (L1)** and **MAG NORTH (L1)**		

NOTE:

If true north mode is not configured in EFIS limits for external switching, the OBS menu allows the user to toggle between **TRUE NORTH** and **MAG NORTH** modes.

5.9.1. Omnibearing Selector (OBS) Menu (Step-By-Step)

1) Before pressing **OBS (L4)** to make any OBS changes, view the current setting to see **FMS** is selected.

2) Press **OBS (L4)** and then make HSI source selection or change to **OBS MANUAL (R4)**. (There must be an active waypoint selected to use manual OBS.)

3) To select manual RNP press **OBS (L4)**.

4) Press **RNP (R2)**.

5) Press **RNP MANUAL (R4)**.

6) Rotate ❶ to desired FSD and push to enter to view estimate of position uncertainty required in RNP airspace.

5.9.2. True North and Magnetic North Menu (Step-by-Step)

1) Press **OBS (L4)** to open menu for true north option selection.

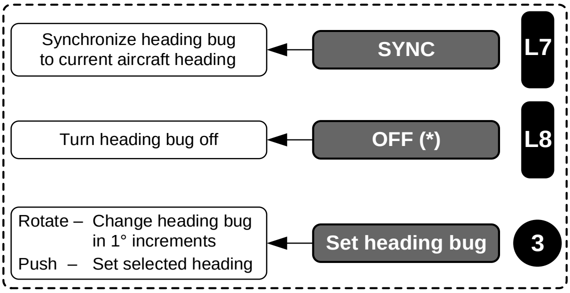
2) Press **TRUE NORTH (L1)** to change heading reference to true instead of magnetic, or activate switch if True North is configured in EFIS limits.

3) Reference is now true north as seen in heading indications and TRUE NORTH advisory flag.

4) Repeat step 1 and then press **MAG NORTH (L1)** to restore heading reference to magnetic north.

5.10. Heading Bug (HDG) Menu

Use the heading bug menu to set the heading bug in increments of 1°, synchronize to current heading, or turn off heading bug. If an integrated autopilot (HeliSAS-E) is installed, it is not be possible to turn off the heading bug.



PFD (Normal and Essential Modes)
MFD (Essential Mode Only)
(*) Not available if integrated autopilot installed

Figure 5-16: Heading Bug (HDG) Menu

5.10.1. HDG Bug (HDG) with Analog Autopilot (Step-By-Step)

1) Rotate ❸ to enter heading mode.

2) Rotate ❸ to change heading bug in 1° increments.

3) Push ❸ to select set heading from previous step or press **SYNC (L7)** to synchronize current heading while in a turn or holding current heading.

4) With an autopilot enabled, to change the HDG sub-mode to HDG, press **HDG (L5)** and the autopilot begins receiving left-right steering commands from the filled HDG bug.

5) HDG bug sub-mode is now HDG bug and **LNAV (L5)** appears for one touch changing back to LNAV sub-mode.

5.10.2. HDG Bug (HDG) without Analog Autopilot (Step-By-Step)

1) Rotate ❸ to enter heading mode.

2) Rotate ❸ to change heading bug in 1° increments.

3) Push ❸ to select new heading or press **SYNC (L7)** to synchronize current heading.

4) Press **OFF (L8)** to turn off HDG BUG menu.

5) Push ❸ to enter HDG value and exit HDG menu or press **EXIT (R1)**.

5.11. Altitude Bug Menu

Select the altitude bug to synchronize the target altitude to current altitude, turn off the target altitude, or set a new value in increments of 100 feet.

NOTE:

"Target altitude" refers to pre-selected altitude in Genesys HeliSAS-E installations.

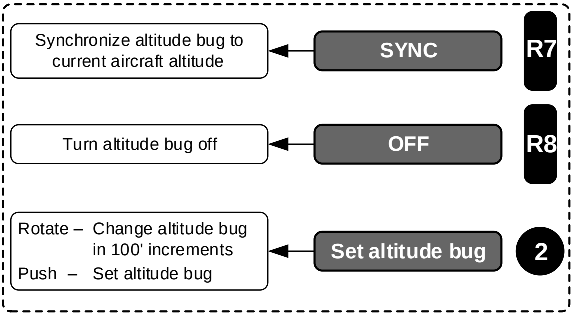


Figure 5-17: Altitude Bug (ASEL) Menu

5.11.1. Altitude Bug (ASEL) Menu (Step-By-Step)

1) Rotate ❷ to enter altitude mode or push to synchronize current altitude to **ASEL**. Pushing ❷ only sets target altitude to the current altitude without opening the ASEL menu.
2) Press **SYNC (R7)** to synchronize current altitude or press **OFF (R8)** to turn off ASEL selection.
3) Rotate ❷ to enter new target altitude.

5.12. Nearest (NRST) Menu

Upon selecting a category from the option list, a list of up to 20 items within 240NM matching the category appears. If the list is empty (i.e., no items within 240NM), **NO RESULTS** is displayed. The selection list includes identifier, bearing, and distance to the item. The list of airports contains an indication of the longest runway length at the airport or greater than or equal to the minimum runway length setting as configured during installation.

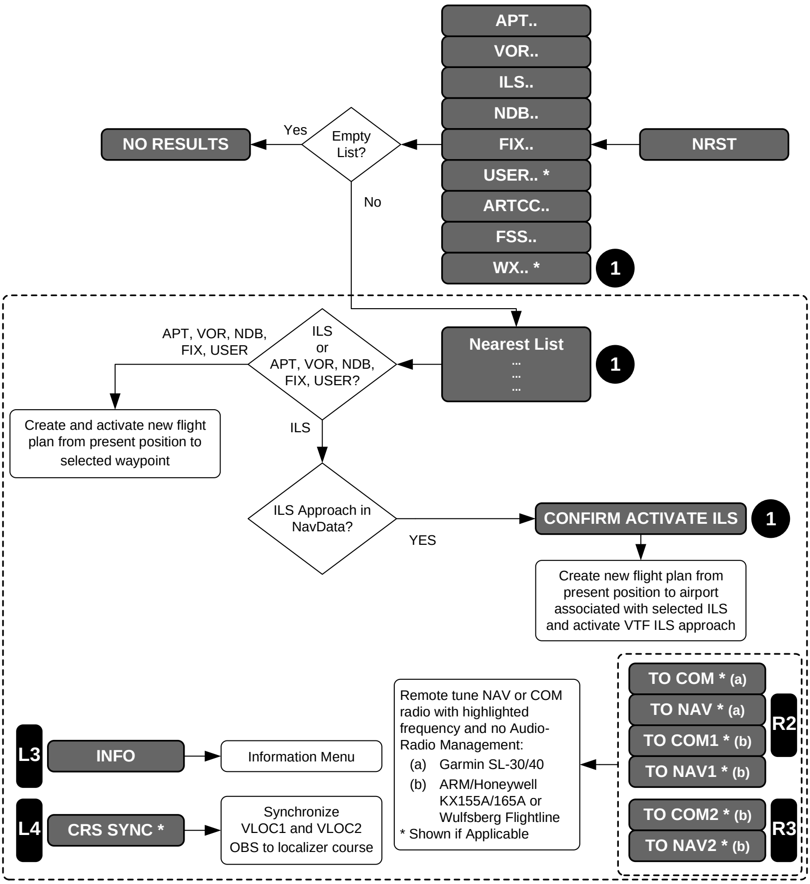


Figure 5-18: Nearest (NRST) Menu

Table 5-7: Nearest (NRST) Menu Options

Menu Options	Limitations
APT..	**INFO (L3)** available for further information. Identifier, geodetic bearing and distance*** to APT, indication of longest runway length in feet*, Sunrise/Sunset time in Zulu or local time, and CTAF frequency. List only includes airports with runway length greater than or equal to minimum runway length in EFIS limits.

Table 5-7: Nearest (NRST) Menu Options	
Menu Options	**Limitations**
VOR..	**INFO (L3)** available for further information. Symbol, type facility, identifier, geodetic bearing and distance to VOR***, (current radial), Sunrise/Sunset time in Zulu or local time, and frequency.
ILS..	**ILS** APT identifier, geodetic bearing to active runway threshold and distance ***, and localizer frequency. Where the current VLOC1 or VLOC2 OBS does not match the localizer course, **CRS SYNC (L4)** appears for one touch synchronizing VLOC1 and VLOC2 to the localizer course. **INFO (L3)** available for further information, Sunrise/Sunset time in Zulu or local time for that airport.
NDB..	**INFO (L3)** available for further information. **INFO**: Symbol, identifier, geodetic bearing and distance to NDB***, Sunrise/Sunset time in Zulu or local time, and frequency.
IFR FIX..	Symbol, fix 5-digit Identifier, airport associated, and geodetic bearing and distance*** to fix. **INFO (L3)** available for further information, Sunrise/Sunset time in Zulu or local time.
VFR FIX..	Symbol, fix long name, geodetic bearing to*** **INFO (L3)** available for further information, Sunrise/Sunset time in Zulu or local time.
USER..	If existing. Symbol, assigned name, geodetic bearing and distance*** to user waypoint. **INFO (L3)** available for further information, Sunrise/Sunset time in Zulu or local time.
ARTCC..	**RX**, **TX**, or **RXTX** symbol, facility name, geodetic bearing and distance*** to antenna distance***, and frequency.
FSS..	**RX**, **TX**, or **RXTX** symbol, facility name, geodetic bearing and distance*** to antenna, and frequency.
WX..	Type of airport symbol, facility name, geodetic bearing and distance*** to airport. **INFO (L3)** available for further information, Sunrise/Sunset time in Zulu or local time.
* Always in feet ** Always in NM *** In either NM or KM depending upon EFIS setting limits.	

5.12.1. Nearest (NRST) Menu ILS (Step-By-Step)

See Section 7 IFR Procedures for step-by-step details.

5.13. Direct Menu

Upon activating the direct menu from the top-level menu, the function checks for an active waypoint and, if found, it becomes the default entry. If there is no active waypoint, the nearest airport becomes the default entry.

If the default entry is the active waypoint and is accepted by the user, a phantom waypoint is inserted at the current aircraft location. The phantom waypoint is a fly-over defined entry waypoint, and the leg prior to the phantom waypoint is designated a discontinuity. This assures the skyway is "re-centered" to provide guidance to the new active waypoint. The rest of the active flight plan remains unchanged.

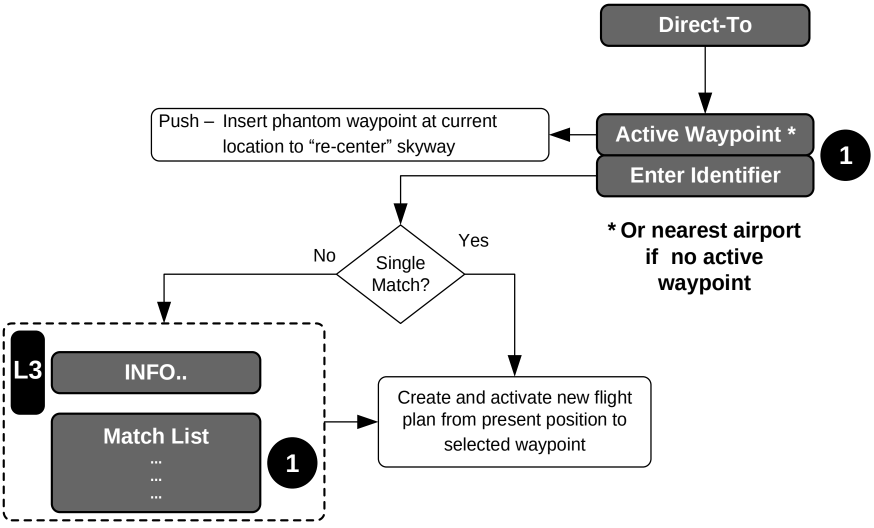


Figure 5-19: Direct Menu

Table 5-8: Direct Menu Options (Default Entry)

	Active Waypoint Yes	Active Waypoint No	Mode	Comments
Accepted		✓	Air	New active flight plan created from present position to selected waypoint *
		✓	Ground	A search is conducted for database airport within 6NM/11KM. If found, a new active flight plan is created from found airport to selected waypoint **
	✓		Air or Ground	Prompted to confirm active waypoint. HITS are re-centered with direct routing to active waypoint.
Rejected	Enters waypoint characters		Air	EFIS searches for matching characters. If there is a single result, resulting action depends on Air or Ground mode.*
			Ground	**
No Results	Re-prompted to enter identifier		Air	If multiple results are presented, a selection list with matching identifiers is presented. *
			Ground	**

* Results when in Air Mode for accepted entry.
** Results when in the Ground Mode for accepted entry.

5.13.1. Direct Menu (Step-By-Step)

1) Press D→ **(R4)** to enter direct menu.

2) Active or nearest airport waypoint appears above ❶ as the active waypoint in the new active flight plan.

3) If in step 1, ❶ was rotated, a field appears beginning with “A” for further action to create new waypoint.

4) After creating new identifier, rotate ❶ to the end and push to enter and create a new active flight plan from the present aircraft position.

5.14. Time Menu

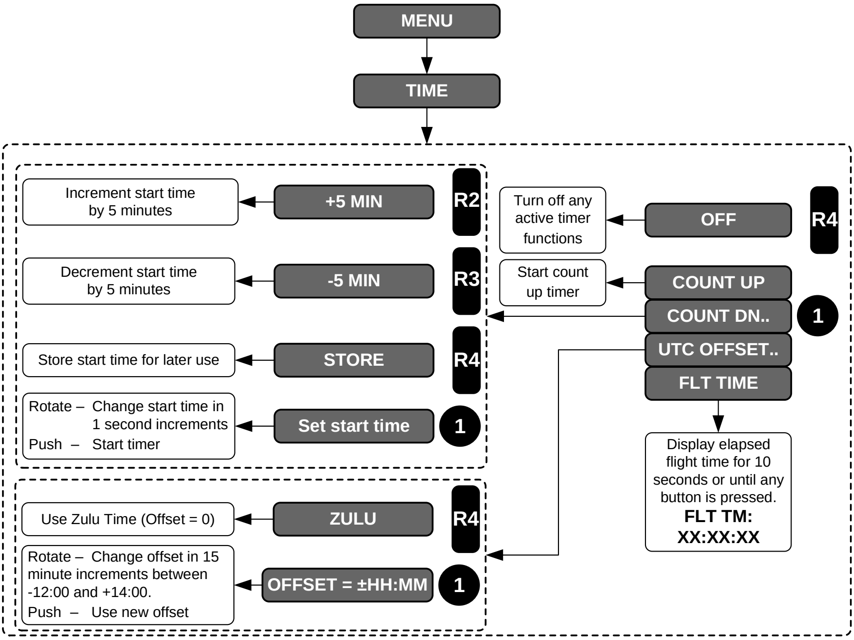


Figure 5-20: Time Menu

5.14.1. Time Menu (Step-By-Step)

1) Press **MENU (R1), then TIME (L4)** to enter Time Menu.

2) Push ❶ to select **COUNT UP**, or rotate to and push to select and enter **COUNT DN..**, **UTC OFFSET..** (Time Zone), or **FLT TIME**.

3) If **COUNT UP** is selected, a timer appears on the PFI area below bank scale.

4) If **COUNT DN..** is selected, push ❶ to enter.

5) **+5 MIN (R2)** and **STORE (R4)** appear as shortcuts to quickly increase or decrease by 5 minute increments. Push ❶ to enter the default 05:00 countdown timer or press **+5 MIN (R2)** as many times as necessary to set the countdown timer. (Maximum time is 59 minutes and 59 seconds.)

6) To turn off timer, press **MENU (R1)**, within 10 seconds. Press **TIME (L4)**, and then **OFF (R4)**.

7) To set offset for local time, rotate ❶ to **UTC OFFSET..** (Time Zone). Push to enter.

8) Rotate ❶ to desired offset value (time zone). Push to enter. (This is the only place both Zulu and Local time are shown.) Local time now appears where Zulu time was previously. The local time appears after a power cycle and initialization.

9) If **FLT TIME** is selected, push ❶ and the current elapsed time since the aircraft transitioned from the ground to air mode is displayed for 10 seconds or until any button is pressed or ❶, ❷, or ❸ are rotated or pushed.

10) If the aircraft has not yet transitioned from ground to air mode, the flight time display option indicates **FLT TM: XX:XX:XX**.

NOTE:

When local time is created and local time is present, all ETA references in active flight plan information and Nav Log no longer refers to UTC. Use caution with ATC clearances since they are always based upon UTC.

5.14.2. **AHRS Slave, DG, and Slew**

Upon activating the PFD source menu, an option list of sensor sources is shown. If a Genesys ADAHRS is the selected AHRS and a DG/Slave input is not configured for that AHRS, **AHRS SLAVE**/**AHRS DG (R2)** toggles between the two AHRS modes. If in DG mode without slew inputs configured for the selected AHRS, then **AHRS SLEW (R3)** enters a submenu to adjust the DG mode slewing value.

5.15. PFD Source Menu

When dual sensors are installed with an ADC, AHRS, and GPS off-side select is not configured in EFIS limits. Other systems installed on both sides, are also included in the option list below if off-side select is not configured in EFIS limits.

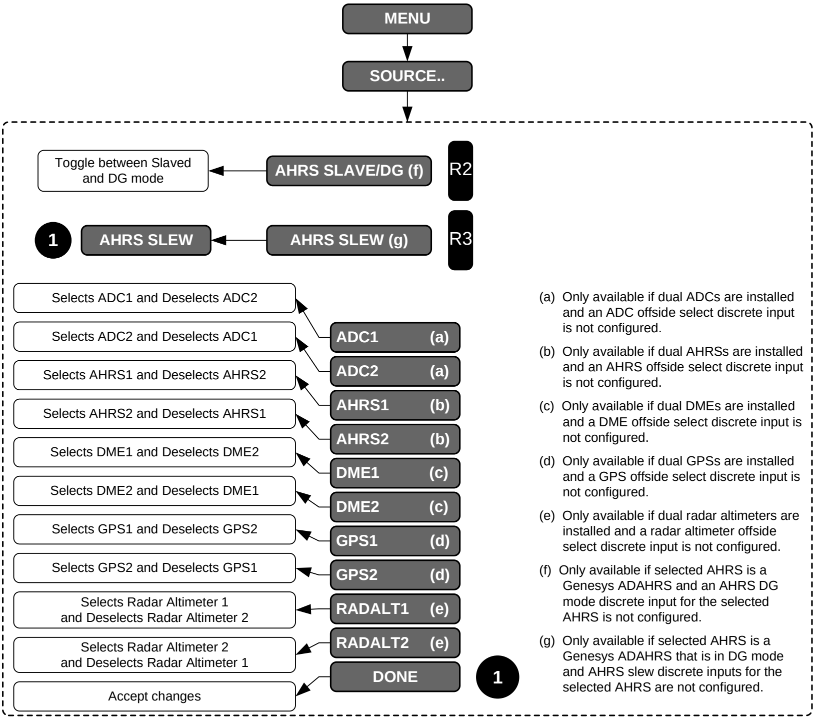


Figure 5-21: PFD Source Menu

5.15.1. PFD Page First-Level Source Selection (Step-By-Step)

1) Press **MENU (R1)**, and then press **SOURCE (L2)**.

2) Rotate ❶ to check desired source, push to select, rotate to **DONE** and push to enter or press **EXIT (R1)**.

5.16. PFD Bugs Menu

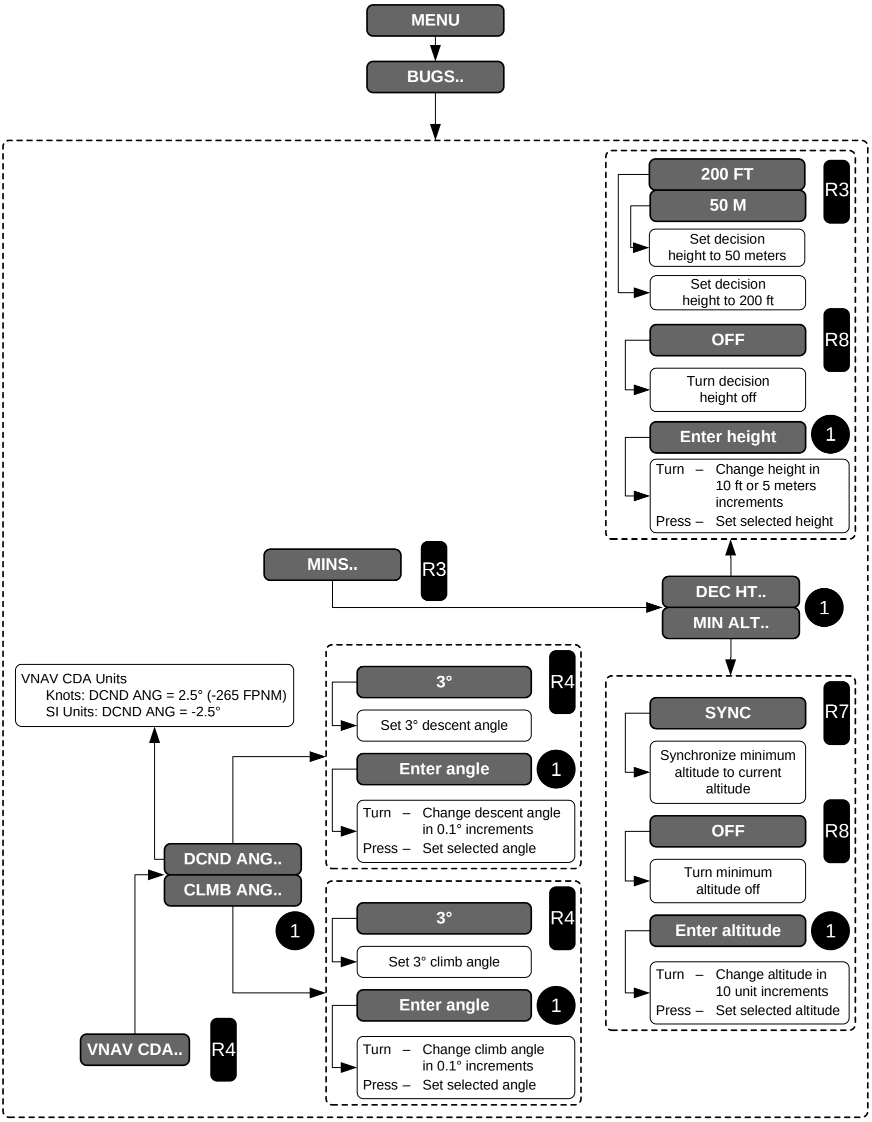


Figure 5-22: PFD Bugs Menu

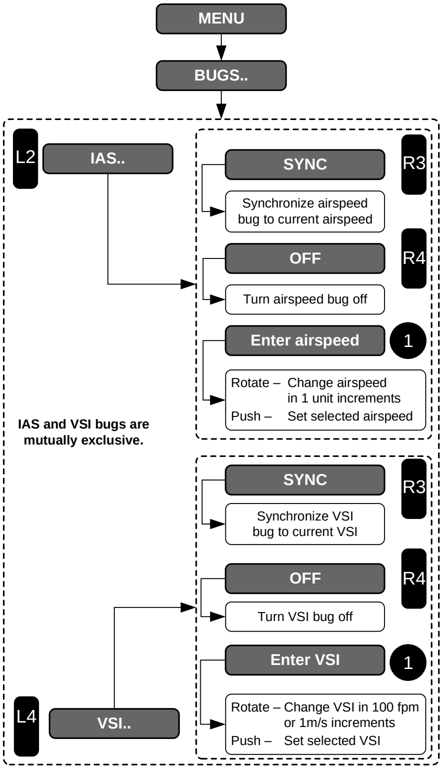


Figure 5-23: PFD Bugs Menu (Continued)

5.16.1. PFD Bugs Menu (Step-By-Step)

5.16.1.1. MINS

1) Press **MENU (R1)**, within 10 seconds, press **BUGS (R2)** to enter the Bugs menu.

2) Press either **MINS (R3)**, or **VNAV CDA (R4)**.

3) If **MINS (R3)** is pressed, push ❶ to select **DEC HT..** or rotate ❶ to **MIN ALT..** and push to enter.

4) If **DEC HT..** is pushed, rotate ❶ to create new decision height in feet or meters in increments of 10 units (as set in EFIS limits) and push to enter.

5) Press **OFF (R4)** to turn off DH display.

6) If **MINS (R3)** is pressed, rotate ❶ to select **MIN ALT..** and push to enter.

7) Rotate ❶ to select desired barometric minimum altitude in feet or Meters in increments of 10 units and push to enter.

8) Press **SYNC (R3)** to synchronize current altitude or **OFF (R4)** to turn off MIN ALT display.

5.16.1.2. VNAV CDA

Selection brings up further action to select either climb angle or descent angle. Selecting either option allows the user to set the descent or climb angle in increments of 0.1°.

1) If **VNAV CDA (R4)** is pressed, push ❶ to select **DCND ANG...** Rotate ❶ to create the descent angle (from -0.1° to -20.0°).

2) Rotate ❶ to enter new descent angle (-4.0º) and push to enter. Press **3° (R4)** to select default or press **EXIT (R1)** to save changes and return to the top menu level.

3) If **CLMB ANG..** is pushed, rotate ❶ to create the climb angle (from +0.1° to +20.0°), or press **3° (R4)** to set the default value.

> **NOTE:**
>
> IAS and VSI bugs are mutually exclusive. Selecting one turns off the other.

5.16.1.3. VSI

1) If **VSI (L4)** was pressed, press **SYNC (R3)** to synchronize current rate of climb or descent to set VSI bug. Press **OFF (R4)** to turn off existing VSI bug, or rotate ❶ to desired VSI climb or descent rate in fpm in increments of 100 fpm. Then push to enter.

2) Press **OFF (R4)** to turn off VSI bug.

5.16.1.4. IAS

If **IAS (L2)** was pressed, press **SYNC (R3)** to synchronize current IAS to set bug. Press **OFF (R4)** to turn off existing IAS bug, or rotate ❶ to desired IAS Then push to enter.

5.17. PFD Declutter (DCLTR) Menu

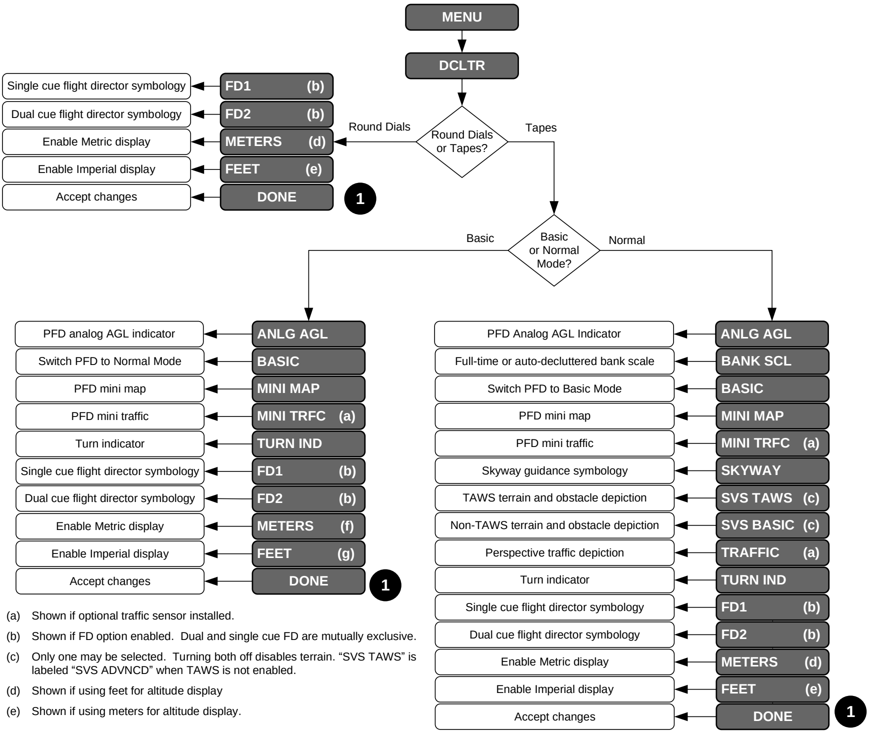


Figure 5-24: PFD DCLTR Menu

Table 5-9: PFD Declutter Options

Option	Configuration		Notes
	Normal SVS	Basic	
ANLG AGL	✓	✓	Mutually exclusive
MINI MAP	✓	✓	
MINI TRFC	✓	✓	
BANK SCL	✓		Always in view while in basic mode
BASIC	✓	✓	Switches PFD to basic mode
SKYWAY	✓		Skyway guidance symbology
SVS TAWS	✓		Non-TAWS perspective terrain and obstacle depiction (mutually exclusive with TAWS perspective terrain and obstacle depiction) SVS TAWS is labeled “SVS ADVNCD” when TAWS is not enabled

Table 5-9: PFD Declutter Options

Option	Configuration		Notes
	Normal SVS	Basic	
SVS BASIC	✓		TAWS perspective terrain and obstacle depiction (mutually exclusive with Non-TAWS perspective terrain and obstacle depiction)
TRAFFIC	✓		Perspective Traffic indications
TURN IND	✓	✓	Turn rate indication
FD1	✓	✓	Mutually exclusive
FD2	✓	✓	
METERS	✓	✓	When using Feet for altitude Additional metric display of altitude, target altitude, and bug setting
FEET	✓	✓	When using Meters for altitude Imperial display (feet) of barometric altitude and target altitude bug setting

5.17.1. PFD DCLTR Menu (Step-By-Step)

1) Press **MENU (R1)**, then press **DCLTR (R4)** to enter Declutter menu.

2) Rotate ❶ to **ANLG AGL**, **BANK SCL**, **BASIC**, **MINI MAP**, **MINI TRFC**, **SKYWAY**, **SVS TAWS**, **SVS BASIC**, **TRAFFIC**, **TURN IND**, **FD1**, **FD2**, or **METERS**. Push to enter.

3) When using feet for altitude. Rotate ❶ to **ANLG AGL**, **BANK SCL**, **BASIC**, **MINI MAP**, **MINI TRFC**, **SKYWAY**, **SVS TAWS**, **SVS BASIC**, **TRAFFIC**, **TURN IND**, **FD1**, **FD2**, or **METERS**. Push to enter.

4) When using meters for altitude. Rotate ❶ to **ANLG AGL**, **BANK SCL**, **BASIC**, **MINI MAP**, **MINI TRFC**, **SKYWAY**, **SVS TAWS**, **SVS BASIC**, **TRAFFIC**, **TURN IND**, **FD1**, **FD2**, or **FEET**. Push to enter.

5) If **BANK SCL** is deselected press **EXIT (R1)** or rotate ❶ to **DONE** and push to enter.

NOTE:

Bank scale is removed while in level flight. Bank scale is automatically restored when exceeding 2.8° left or right bank angles or when entering hover vector mode.

6) Repeat step 1 and then rotate ❶ to **SVS TAWS** and push to deselect.

7) With both **SVS TAWS** and **SVS BASIC** deselected, the non-TAWS perspective terrain and obstacle depiction is displayed in the PFI area.

8) With **SVS BASIC** selected the PFI area terrain is colored in shades of brown. Slope between adjacent terrain pixels in an increasing longitude direction determines shade used.

9) With **SVS TAWS** selected, the PFI area TAWS perspective terrain and obstacle depiction is shown using color to show relationship to aircraft altitude with terrain colored in shades of olive when at or below 100' below the aircraft. The slope between adjacent terrain pixels in an increasing longitude direction determines shade used.

10) To save changes and exit menu, rotate ❶ to **DONE** and then push to enter or press **EXIT (R1)**.

11) When using feet for altitude, repeat step 1. Rotate ❶ to **METERS** and push to select.

12) When using meters for altitude, Repeat step 1. Rotate ❶ to **FEET** and push to select.

5.18. Altimeter (BARO) Menu

Press **BARO (R2)** to activate the altimeter menu. Rotate ❶ to increase (CW) or decrease (CCW) the barometric setting and push to accept the new barometric setting.

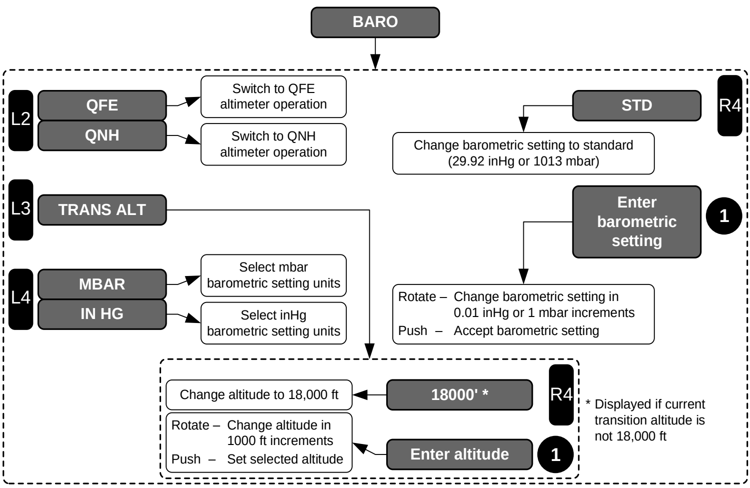


Figure 5-25: Altimeter (Baro) Menu

5.18.1. Altimeter (BARO) Menu (Step-By-Step)

1) Press **BARO (R2)** to enter Altimeter menu.

2) Rotate ❶ to set proper QNH and push to enter. In this example, 30.01 inHg is set. Press **EXIT (R1)** to save changes and return to the top menu level.

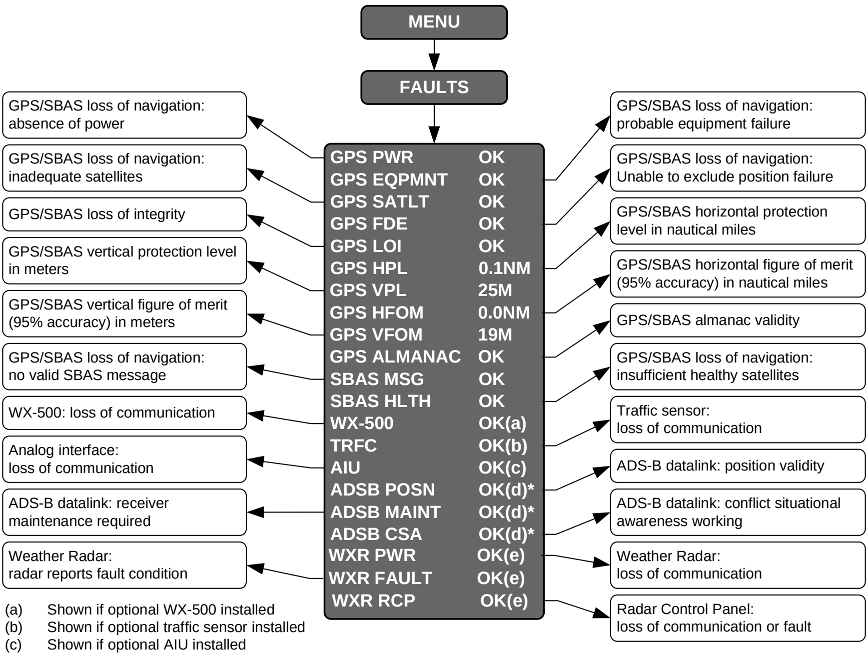
3) Repeat step 1. Press **TRANS ALT (L3)** to change transition altitude.

4) Rotate ❶ to set desired transition altitude in 500' increments and push to enter or press **EXIT (R1)** to enter and exit **BARO** menu. Transition altitude of 6500' is saved during subsequent shutdown and next initialization.

5) If current transition altitude is not 18,000', **18000 (R4)** appears for quick resetting.

6) With the **BARO** menu open, **STD (R4)** appears to quickly set QNH to standard 29.92 inHg or 1013 mbar.

5.19. Faults Display Menu



(a) Shown if optional WX-500 installed
(b) Shown if optional traffic sensor installed
(c) Shown if optional AIU installed
(d) Shown if optional ADS-B datalink installed
(e) Shown if optional weather radar installed, weather radar type is RDR-2000, RDR-2100 or RDR-1600 and external weather radar control panel installed.

Figure 5-26: Faults Menu

Upon selecting the faults menu, status of the following system parameters are displayed.

1) GPS/SBAS loss of navigation due to absence of power (GPS PWR).

2) GPS/SBAS loss of navigation due to probable equipment failure (GPS EQPMNT).

3) GPS/SBAS loss of navigation due to inadequate satellites to compute a position solution (GPS SATLT).

4) GPS/SBAS loss of navigation due to a position failure that cannot be excluded within the time to alert (GPS FDE).

5) GPS/SBAS loss of integrity and loss of navigation due to loss of integrity (GPS LOI). 

6) Readout of the current GPS/SBAS horizontal protection level (GPS HPL) in nautical miles. This value may be used as the estimate of position uncertainty required in RNP airspace.

7) Readout of the current GPS/SBAS vertical protection level (GPS VPL) in meters.

8) Readout of the current GPS/SBAS horizontal figure of merit (GPS HFOM) in nautical miles. This value is an indication of the 95% confidence horizontal position accuracy.

9) Readout of the current GPS/SBAS vertical figure of merit (GPS VFOM) in meters. This value is an indication of the 95% confidence vertical position accuracy. (For example, the MSL altitude used in the TAWS algorithms use geodetic height converted to MSL with the current Earth Gravity Model (EGM) database. For this to be considered valid for use as MSL altitude, the VFOM must be less than or equal to 106 feet). Additionally, the tertiary source for vertical speed is GPS/SBAS vertical speed providing the VFOM is less than or equal to 106 feet. When AGL altitude is based on BARO, it is because the RADALT is in a failed state and the VFOM exceeded 106 feet rendering the vertical component of GPS altitude invalid in the MSL altitude calculation.

10) An indication of whether the GPS/SBAS receiver has a valid almanac in memory (GPS ALMANAC).

11) GPS/SBAS loss of navigation due to no valid SBAS message received for four seconds or more (SBAS MSG). 

12) GPS/SBAS loss of navigation due to insufficient number of SBAS HEALTHY satellites (SBAS HLTH).

13) Loss of communications with the analog interface (AIU).

14) Loss of communications with the traffic sensor.

15) An indication of ADS-B position validity (ADSB POSN), an indication of whether maintenance of the ADS-B receiver is required (ADSB MAINT) and an indication of whether the Conflict Situational Awareness algorithm is working (ADSB CSA).

5.19.1. Fault Display (FAULTS) Menu (Step-By-Step)

1) Press **MENU (R1)**, within 10 seconds press **FAULTS (L5)** (PFD) **FAULTS (L1)** (MFD) to view the faults menu.

2) Faults menu appears. View status of GPS and equipment parameters.

5.20. Fuel Totalizer Quantity Setting (SET FUEL) Menu

PFD (MAP) MFD (FULL MAP)

Figure 5-27: PFD/MFD SET FUEL

When fuel totalizer is configured in the aircraft limits, the Set Fuel menu is available.

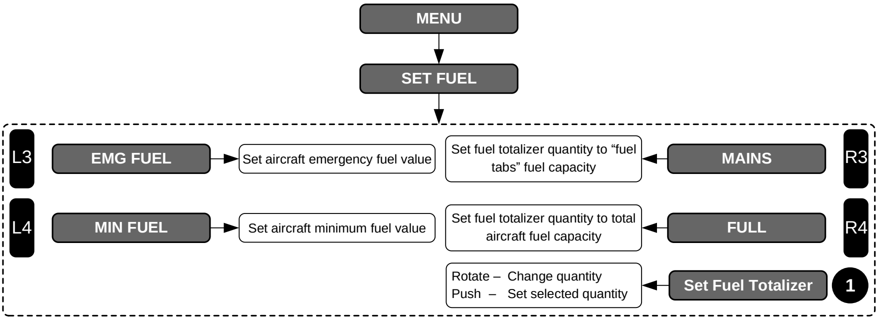
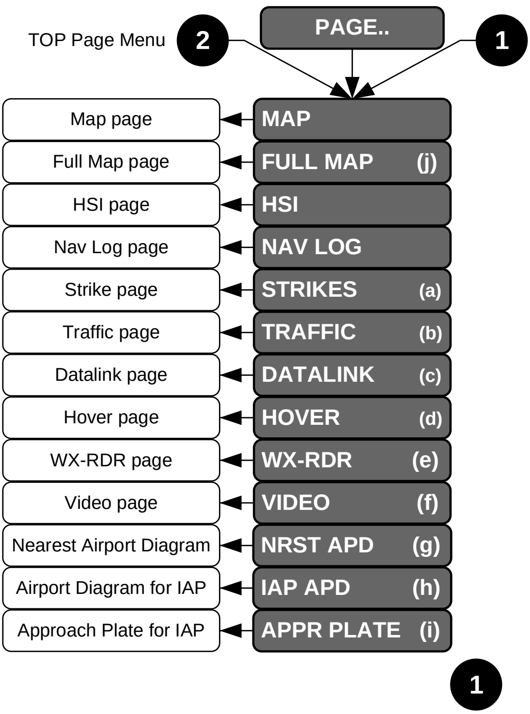


Figure 5-28: SET FUEL (Totalizer Quantity Setting) Menu

5.21. Page Menu

The Page menu allows the user to select which MFD page to display. The currently displayed MFD page is the default selection upon entering the menu.



(a) Shown if optional WX-500 installed.

(b) Shown if optional traffic sensor installed.

(c) Shown if optional ADS-B or normal datalink installed.

(d) Not available if in MFD-only operation.

(e) Shown if optional weather radar installed.

(f) Shown if one or more optional video inputs are enabled.

(g) CPM5 or above IDU-680 with chart database only. Shown if an airport diagram exists for one of the nearest 3 airports. Shown as full page portrait images. *Not shown on PFD or when MFD is in Essential mode or while flight planning.

(h) CPM5 or above with chart database only. Shown if an airport diagram exists for the instrument approach procedure loaded in the active flight plan.

(i) CPM5 or above with chart database only. Shown if an approach plate exists for the instrument approach procedure loaded in the active flight plan. * as shown in (g)

(j) Shown other than IDU #1.

Figure 5-29: MFD PAGE Menu

5.21.1. MFD Menu Page (Step-By-Step)

1) Push **TOP** ❷ or **BTM** ❶ to change MFD pages.
2) Push ❶ and then rotate to **MAP**, **HSI**, **NAV LOG**, **STRIKES**, **TRAFFIC**, **DATALINK**, **HOVER**, **WX-RDR**, **VIDEO**, **NRST APD**, or **FULL MAP** and push to enter.
3) Push ❷ and then rotate to **MAP**, **HSI**, **NAV LOG**, **STRIKES**, **TRAFFIC**, **DATALINK**, **HOVER**, **WX-RDR**, **VIDEO**, **NRST APD**, or **FULL MAP** and push to enter.

5.21.1.1. Changing MFD Page Orientation (PFD or MFD)

1) Press **MENU (R1)**. Then press **FORMAT (R8)**.
2) If in **ARC** mode, push ❶ to enter **CENTER** to center display.
3) If in **CENTER** mode, push ❶ to enter **ARC** to change back to ARC mode.
4) If in **HDG UP** mode, rotate ❶ to **N UP** and push to change display to North Up orientation.
5) To enter pan mode, Rotate ❶ to **PAN ON** and push to enter.
6) **NORTH (L7)**, **SOUTH (L8)**, **EAST (R7)**, and **WEST (R8)** are used to move the cursor. Bearing and distance appears when more than 0.5 NM/1.0KM away.
7) **INFO/HIDE (R6)** appears for viewing or hiding waypoint information.
8) To turn off pan mode, either press **PN OFF (L5)** or **MENU (R1)**, and then **FORMAT (R8)** then push ❶ to select **PAN OFF**.

5.22. MFD NAV LOG Page (PFD or MFD)

Push ❶ and rotate to **NAV LOG** and push to enter (see Section 3 Display Symbology for more information).

5.22.1. NAV LOG (Step-By-Step) (PFD or MFD)

1) With **NAV LOG** displayed, press **MENU (R1)**, within 10 seconds press **PPOS OFF (R8)** to turn present position **OFF**.
2) Repeat step 1, press **PPOS OFF (R8)** to turn **ON**.
3) When the **NAV LOG** is on the **TOP** area of an MFD, press **PPOS OFF/PPOS ON (R4)** to toggle.

5.23. MFD Map Page Format Menu

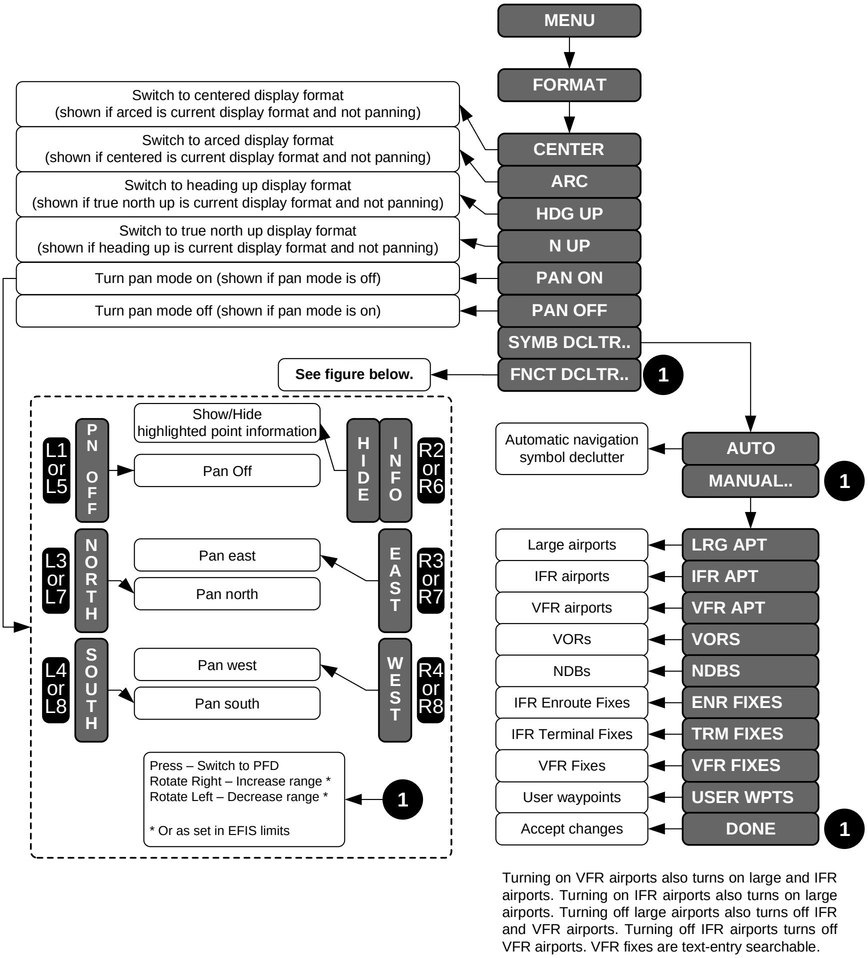


Figure 5-30: Map Page Format Menu

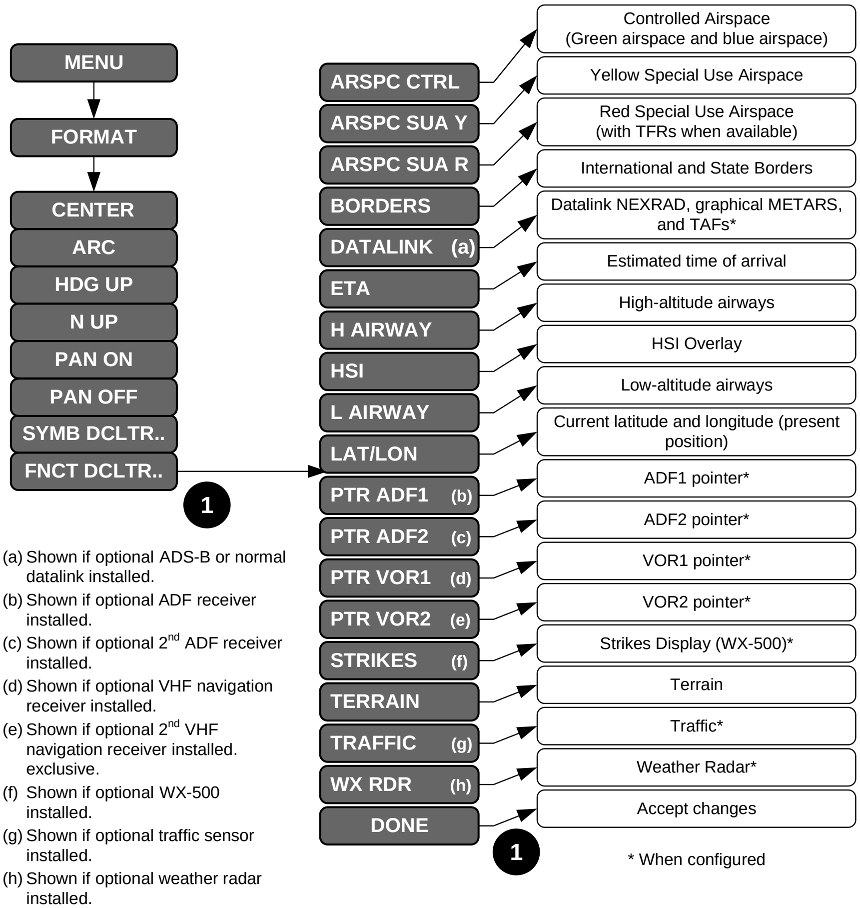


Figure 5-31: Map Page Format Menu (Continued)

5.23.1. Map Page Format (Step-By-Step)

5.23.1.1. Changing MFD Page Orientation (PFD or MFD)

1) Press **MENU (R1)**. Then press **FORMAT (R8)**.

2) If in **ARC** mode, push ➊ to enter **CENTER** to center display.

3) If in **CENTER** mode, push ➊ to enter **ARC** to change back to ARC mode.

4) If in **HDG UP** mode, rotate ➊ to **N UP** and push to change display to North Up orientation.

5) To enter pan mode, Rotate ❶ to **PAN ON** and push to enter.

6) **NORTH (L7)**, **SOUTH (L8)**, **EAST (R7)**, and **WEST (R8)** are used to move the cursor. Bearing and distance appears when more than 0.5 NM/1.0KM away.

7) **INFO/HIDE (R6)** appears for viewing or hiding waypoint information.

8) To turn off pan mode, either press **PN OFF (L5)** or **MENU (R1)**, then **FORMAT (R8)** then push ❶ to select **PAN OFF**.

5.23.1.2. Adding LAT/LON to MFD Map Page

1) Press **MENU (R1)**, press **FORMAT (R8)**.

2) Rotate ❶ to **FNCT DCLTR..** and push to enter.

3) Rotate ❶ to **LAT/LON** and push to select. Either press **EXIT (R1)** or rotate ❶ to **DONE** and push to enter.

4) To turn off terrain, repeat steps 1 and 2. Rotate ❶ to **TERRAIN** and push to deselect.

5) To exit menu, press **EXIT (R1)** or rotate ❶ to **DONE** and push to enter. When the IDU is powered down and reinitialized, terrain remains in the OFF condition until restored.

5.23.2. MFD Full Map Page (Step-By-Step) (MFD Only)

1) Push **TOP** ❷ or **BTM** ❶ and rotate to **FULL MAP** and push to enter.

2) To format the full map, press **MENU (R1)**, within 10 seconds press **FORMAT (R4)**.

> **NOTE:**
>
> While in the **FULL MAP** page, the selection of any of the following pages return the MFD to that page on either **TOP** ❷ or **BTM** ❶ depending upon selection.

5.24. MFD HSI Declutter (DCLTR) Menu

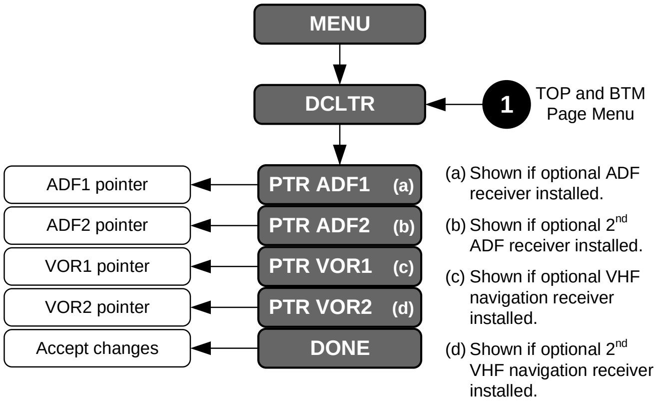


Figure 5-32: HSI Declutter Menu (PFD or MFD)

5.24.1. MFD HSI Declutter (DCLTR) Menu (Step-By-Step)

1) Press **MENU (R1)**, within 10 seconds and then **DCLTR (R4)** or **(R8)** to enter Declutter menu.

2) Rotate ❶ to **PTR ADF1**, **PTR ADF2**, **PTR VOR1**, or **PTR VOR2**, and push to select. Rotate ❶ to **DONE** and then push to enter or press **EXIT (R1)** to save changes and exit menu.

5.25. NAV LOG Page (PFD or MFD)

Push ❶ and rotate to **NAV LOG** and push to enter (see Section 3 Display Symbology for more information).

5.25.1. NAV LOG (Step-By-Step) (PFD or MFD)

1) With **NAV LOG** displayed, press **MENU (R1)**, within 10 seconds press **PPOS OFF (R8)** to turn present position **OFF**.

2) Repeat step 1, press **PPOS OFF (R8)** to turn **ON**.

3) When the **NAV LOG** is on the **TOP** area of an MFD, press **PPOS OFF/PPOS ON (R4)** to toggle.

5.26. Hover Page

See Section 3 Display Symbology for hover vector details.

5.26.1. Hover Page (Step-By-Step) (PFD or MFD)

1) On the PFD push **BTM ❶**. Rotate to **HOVER** and push to enter.

2) On the MFD, to view hover vector page on top, push **TOP ❷** and rotate to **HOVER** and push to enter.

3) On the MFD, to view hover vector page on the bottom, push **BTM ❶** and rotate to **HOVER** and push to enter.

5.27. Electronic Charts Page (MFD Only)

When the optional charts database is loaded on a CPM-5 IDU or above, airport diagrams and instrument approach plates are available upon selection. When the chart includes geo-referencing information, a geo-referenced ownship with shaded background is displayed in correct location and orientation.

5.27.1. Electronic Charts Page (Step-By-Step) (MFD Only)

This option available with charts database loaded with a CPM-5 or above used in the USA only.

With an instrument approach procedure loaded in the active flight plan, push **TOP ❷** or **BTM ❶** and then rotate ❶ to **NRST APD**, **IAP APD**, **APPR PLATE** and then push to enter.

Section 6 Quick Start Tutorial

Begin by reading the EFIS Rotorcraft Flight Manual Supplement (RFMS). Also see Quick Reference Guide (doc 64-000096-090B).

Knobs at the bottom of the IDU bezel are numbered 1-4 from the right side as noted. ❹ only controls panel or display lighting brightness. To adjust panel lighting (legends, encoders, inclinometer, and buttons), push and rotate ❹. To adjust display lighting (illumination of LCD display), rotate ❹ without pushing. Rotate ❸ to adjust the heading bug setting.

Power up the EFIS. The system performs a built-in test. If all tests pass, the system displays a screen identifying the database coverage. Press any button or push ❸, ❷, or ❶ to acknowledge. The system begins a two-minute countdown while awaiting sensor initialization. For the purpose of flight planning, etc., press any button or rotate or push ❸, ❷, or ❶ to override this countdown.

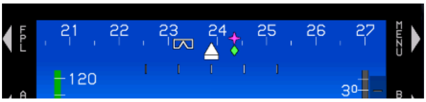
PFD Normal Mode

Press **BARO (R2)**.

Rotate ❶ to proper setting and push to enter value or press **EXIT (R1)**.

Press -D→ **(R4)** to enter a destination active waypoint. Without an active waypoint, the nearest airport is automatically selected.

Rotate ❶ to the desired alpha or numerical character, push to confirm, and advance to the next position. Push to enter each space, until all five spaces have been entered or viewed.



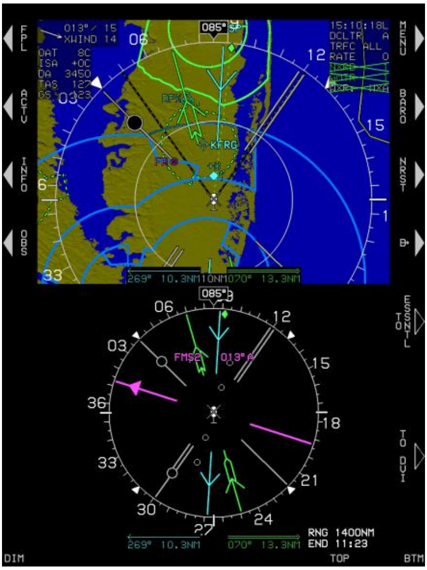
A magenta star bearing waypoint and a green diamond track symbol are displayed on the directional scale.

A direct route to the active waypoint is activated and appears as magenta tethered balloon on the PFI area. (Tether is not drawn if fix is not a ground location.)

Active waypoint information, including waypoint type and identifier; elevation or crossing altitude; and along-track distance are displayed below the **ANLG AGL**, **MINI MAP**, or **MINI TRFC** indicator, as configured.

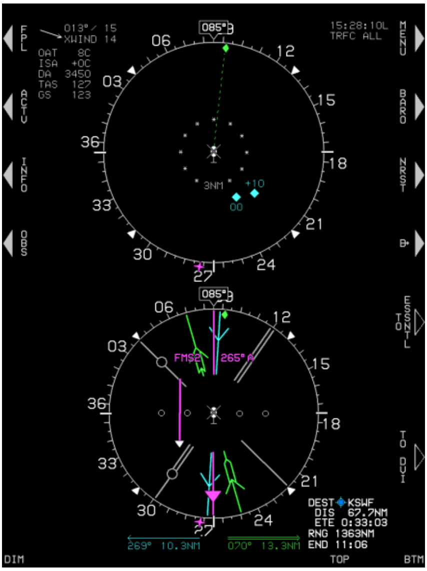
Indicated airspeed is on the left, altitude is on the right, and heading is across the top. FMS/VLOC CDI is located on the bottom. VSI appears on the right side of the altitude tape. Time-critical caution is displayed in the primary field of view.

MFD Normal Mode



Heading up map with airspace and active waypoint information on the upper area.

The bottom area is showing the HSI page selection with FMS2 pointer in automatic waypoint sequencing along with VOR1 and VOR2 pointers showing relative bearings to associated navigation receivers and radial distance DME information on the bottom.



On MFD, press **TO ESSNTL (R5)** to display PFI on top and the last selected MFD mode on bottom.

When in Essential mode, press **TO MFD (R5)** to display MFD page on top and bottom.

Manual Leg

A manual leg has been created within a procedure and waypoint sequencing is suspended. Press **RESUME (L6)** to resume normal waypoint sequencing.

Waypoint sequencing has resumed and the next waypoint is now the active waypoint.

Flight Plans (Stored Routes)

Activate Flight Plan on PFD or MFD

1) Press **FPL (L1)**.
2) Push ❶ to **SELECT..** from list of stored flight plans.
3) Rotate ❶ to select desired flight plan and push to activate.

Create Flight Plan on PFD or MFD

1) Press **FPL (L1)**.
2) Rotate ❶ to **CREATE-EDIT..** and push to enter.
3) Select **CREATE FLIGHT PLAN** and push to enter.
4) Press **ADD (R6)** to create first waypoint using ❶ to enter waypoints from beginning to end; or press **NRST APT (L6)**, **NRST VOR (L7)**, **NRST NDB (L8)**, **NRST FIX (R6)**, **NRST USR (R7)**, or **AIRWAY (R8)** (when applicable) select next waypoint, and push to enter.

5) Press **SAVE (R8)** to save flight plan.

6) Press **EXIT (R1)** to exit **CREATE FLIGHT PLAN** flight plan menu.

Waypoints

Create a User Waypoint on PFD or MFD

1) Press **MENU (R1)**.

2) Press **DESIG (L3)**. Results are never seen in the PFI area or ND if **USER WPTS** in the symbol declutter menu remains deselected.

Edit a User Waypoint PFD or MFD

1) Press **FPL (L1)**.

2) Rotate ❶ to **CREATE-EDIT..** and push to enter.

3) Rotate ❶ to **EDIT USER WPT** and push to enter.

4) Rotate ❶ to highlight waypoint to edit and push to enter.

5) Edit waypoint. Press **SAVE (R7)** or **(R8)** to create new waypoint as the active waypoint and begin navigation guidance.

    a) If **SAVE (R7)** is pressed, **EDIT WHICH USER WAYPOINT** appears for further action. If none is desired, press **EXIT (R1)** to exit menu.

    b) If **(R8)** is pressed, a new active waypoint is created and navigation guidance has begun. Press **EXIT (R1)** to exit flight planner.

Insert Waypoint into an Active Route on PFD or MFD

1) Press **ACTV (L2)**.

2) Rotate ❶ to location on waypoint list where added waypoint is to be inserted above.

3) Press **INSERT (R2)**.

4) Press **NRST APT (L2)**, **NRST VOR (L3)**, **NRST NDB (L4)**, **NRST FIX (R2)**, or **NRST USR (R3)**, or **AIRWAY (R4)** (when applicable) and then:

    a) Rotate ❶ to make selection and push to enter, or

    b) Use ❶ to enter waypoint identifier and push to enter.

5) Press **SAVE (L1)** to save new active flight plan as another stored flight plan or press **EXIT (R1)** to save changes to active flight plan.

Add Waypoint to an Active Route on PFD or MFD

1) Press **ACTV (L2)**.
2) Rotate ❶ to end of active flight plan and one empty row below.
3) Press **ADD (R2)** then steps 4 and 5 as shown above.

Delete Waypoint from an Active Route on PFD or MFD

1) Press **ACTV (L2)**.
2) Rotate ❶ to highlight the waypoint to delete and then press **DELETE (R3)** to prompt **CONFIRM DEL WPT**. If part of a published procedure, press **DELETE (R3)** to prompt **CONFIRM DEL PROC**.
3) Rotate ❶ to **CONFIRM DEL WPT** or **CONFIRM DELETE PROC** and push to enter.
4) Press **SAVE (L1)** to save new active flight plan as another stored flight plan.

Omnibearing Selector Function

Automatic OBS if in Manual OBS (FMS OBS Only) PFD or MFD

1) With an active waypoint and FMS as the active nav source, press **OBS (L4)**.
2) Push ❶ **OBS:AUTO** to enter. (This is the default mode)

Manual OBS PFD or MFD

1) With an active waypoint and FMS as the active nav source, press **OBS (L4)**. Ensure the active navigation source is FMS.
2) Press **OBS MANUAL (R4)** and then rotate ❶ to desired OBS value, or press **OBS SYNC (R3)** and push ❶ to enter. (This action suspends automatic waypoint sequencing.)

OBS Active Navigation Source Selection Pilot or Co-Pilot PFD or MFD

1) Press **OBS (L4)**.
2) Press **NAV FMS (L2) or NAV VLOC1 (L3), or NAV VLOC2 (L4)** to change the active navigation source.
3) If **VLOC1** or **VLOC2** are selected, rotate ❶ to select **OBS:XXX° (XXX°)** course and then push to enter. The active navigation source is indicated with an asterisk.

Approaches/Track

Select a VFR Approach on PFD or MFD

The active flight plan must contain an eligible airport for runway selection and VFR approach creation.

1) Press **ACTV (L2)**.
2) Rotate ❶ to desired airport or user waypoint and push to enter.
3) Rotate ❶ to **VFR APPR..** and push to enter.
4) Rotate ❶ to desired runway and push to enter. (For VFR approach to eligible user waypoint, this step is omitted.)

Change Runway during VFR Approach on PFD or MFD

This deletes the previous VFR approach and creates a new VFR approach to the selected runway.

1) Press **ACTV (L2)**.
2) Rotate ❶ to destination airport and push to enter.
3) Rotate ❶ to **VFR APPR..** and push to enter.
4) **PICK RW:** Rotate ❶ to select desired runway and push to enter.
5) Push ❶ to **CONFIRM REPLACE APPROACH**.

Select an IFR Approach on PFD or MFD

1) Press **ACTV (L2)**.
2) Rotate ❶ to desired eligible airport and push to enter.
3) Rotate ❶ to **IFR APPR..** and push to enter.
4) **PICK APPR** Rotate ❶ to desired approach and push to enter.
5) **PICK TRANS:** Rotate ❶ to desired transition and push to enter.
6) **PICK RW:** Rotate ❶ to desired runway and push to enter.

Change Runway during IFR Approach on PFD or MFD

This deletes the previous IFR approach and creates a new IFR approach to the selected runway.

1) Press **ACTV (L2)**.
2) Rotate ❶ to suppressed airport and push to enter.

3) Rotate ➊ to **IFR APPR..** and push to enter.

4) **PICK APPR:** Rotate ➊ to desired approach. Push to enter.

5) **PICK TRANS:** Rotate ➊ to desired transition (when applicable). Push to enter.

6) **PICK RW:** Rotate ➊ to desired runway. Push to enter.

7) Push ➊ to **CONFIRM REPLACE APPROACH**.

Create NRST ILS Approach on PFD or MFD

1) Press **NRST (R3)**.

2) Rotate ➊ to **ILS..** and push to enter.

3) Rotate ➊ to desired airport (beginning with “ILS”) and push to enter.

4) ILS frequency is sent to NAV1 and NAV2 standby positions. Further pilot action is necessary to swap frequencies to respective active positions.

> **NOTE:**
>
> The heading bug is automatically activated to the current bug setting to act as a starting point for receiving vectors (with or without autopilot enabled). It is recommended to align the heading bug with the aircraft heading or set the heading bug to the assigned vector heading before pressing the knob to confirm the selection.

5) Push ➊ to **CONFIRM ACTIVATE ILS**. (Previous active flight plan is deleted.)

6) A direct flight plan to the airport associated with the ILS is created.

7) If the heading bug is turned off, it is activated to current heading to act as a starting point for receiving vectors (with or without autopilot enabled.)

8) A vectors-to-final ILS approach to the ILS is activated.

9) Automatic HSI nav source switching to the VLOC2 pilot side and VLOC2 co-pilot side occurs.

10) With crossfill normal, both pilot side and co-pilot side VLOC1 and VLOC2 (regardless of active nav source selection), OBS settings are

set to the associated localizer course. (With crossfill inhibited, this action only occurs on side where NRST ILS menu was activated.)

> **NOTE:**
>
> Any previous waypoints from the deleted active flight plan need to be added to the new NRST ILS active flight plan if necessary. (If an active flight plan existed, it is canceled once an NRST ILS is confirmed, and previous waypoints from the canceled active flight plan would have to be added to the new NRST ILS active flight plan.)

XFILL SYNC Operation

XFILL SYNC Operation on PFD

Crossfill is the normal default mode of operation.

During crossfill inhibited operation, XFILL INHBT appears on the PFD in the lower left corner.

When the pilot and co-pilot sides are not synchronized, XFILL ARM appears in lower left corner of the PFD.

When the pilot and co-pilot sides are not synchronized, press **MENU (R1)** then **XFILL SYNC (L1)** to synchronize the pilot and co-pilot active flight plan parameters from the side where the button press occurred.

Section 7 IFR Procedures

7.1. EFIS Navigation Operational Capabilities

The installed Genesys Aerosystems EFIS, receives GPS/SBAS satellite data from the Genesys Aerosystems TSO-C145c GPS Beta 3 sensor, meets TSO-C146c Class 3, and complies with AC 20-138D for navigation using GPS and GPS/SBAS (within the coverage of a satellite-based augmentation system complying with ICAO Annex 10) for en route, terminal area, non-precision approach, and approach procedures with vertical guidance operations. Non-precision approach operations include those based on conventional navigation aids with "or GPS" in the title and those with "GPS" and "RNAV (GPS)" in the title to "LNAV" and "LP" minimums. Approach procedures with vertical guidance includes "RNAV (GPS) to "LNAV/VNAV" and "LPV" minimums.

Navigation information is referenced to the WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

7.2. Active Flight Plan

Before using the Genesys EFIS GPS navigation system to fly any part of an instrument procedure in VMC or IMC, always compare each leg of the applicable and current published charted procedure to the flight plan displayed on the map. This EFIS and FMS may not support some specific navigation leg types. All pilots must understand how each leg is depicted and navigated prior to conducting the procedure. Not all airport diagrams or instrument approach plates are supported by the Navigation/Charts database.

After updating the navigation database and planning to fly an instrument procedure, practice in the **RUN DEMONSTRATOR/TRAINING PROGRAM** to view how each leg is depicted.

If navigation planning includes manual sequencing of any leg in a procedure, verify what specific navigation guidance the EFIS provides. When any procedure includes ARINC-424 legs defined by headings, or that terminate at a specific altitude, the pilot must understand how the EFIS behaves and how system behavior can affect coupled autopilot operations.

Upon activation of the active flight plan menu, the application checks for an active waypoint. If there is no active waypoint, **NO ACTIVE WPT** appears. Otherwise, a list of waypoints in the active flight plan is presented with the following:

1) Waypoint identifier and characterization (default is auto, otherwise overfly (“OF”), or no radius (“0R”) is shown as selected.)

2) Symbol designating waypoint type and what type of procedure (if any) the waypoint is associated

3) VNAV altitudes and offsets associated with each waypoint

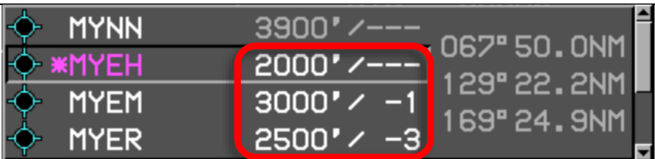
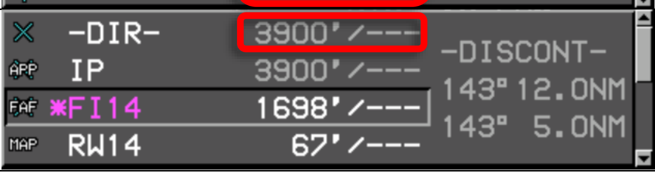
4) Information related to flight plan path between each waypoint

In the case of an approach with a final approach segment data block, the VNAV offset readout associated with the missed approach point is “GPI” to designate distance to the glide path intercept point. When courses are presented as part of the path information, they are displayed referenced to either magnetic or true north depending upon the status of the true north discrete input. If referenced to magnetic north, the course is indicated with the degree (°) symbol. Otherwise, a stylized true north (^{T}) symbol appears.

VNAV altitudes and offsets from the navigation database or have been manually entered are white, and those computed automatically are gray. The active waypoint is designated by an asterisk and is cyan or magenta (See Section 2 System Overview for color conventions) but turns amber (yellow) in the event of a GPS LON caution.

The active waypoint is designated by an asterisk and is magenta but turns amber (yellow) during a GPS LON caution.

Table 7-1: VNAV Altitudes and Offsets

Input Source	Color
Navigation database or manually entered	
Computed automatically	

A suppressed waypoint (designated by brackets) is an airport associated with an IFR or VFR approach procedure. After an approach procedure is activated, the associated airport is no longer part of the active flight plan for guidance purposes. However, the associated airport is still shown in the waypoint list for it to be highlighted for information or to activate other procedures to the airport.

NOTE:

Adding a STAR procedure with neither an instrument approach nor a SID does not suppress the airport waypoint. Adding a STAR to a different airport in the active flight plan does not change the original suppressed waypoint airport.

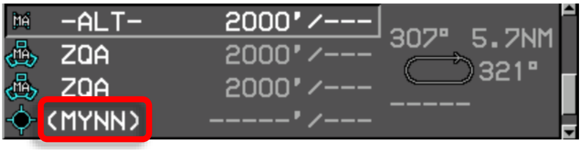


Figure 7-1: Suppressed Waypoint

It is possible to add a departure procedure to another airport within an active flight plan and have two suppressed waypoints within the same active flight plan.

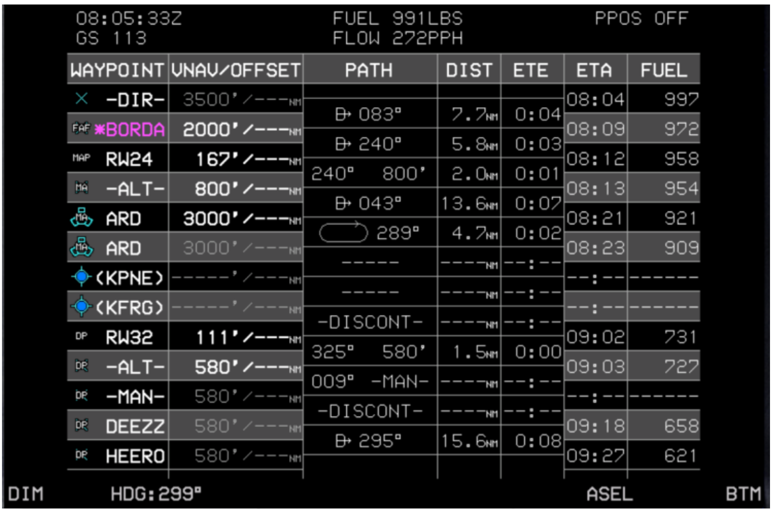


Figure 7-2: Active Flight Plan with Two Suppressed Waypoints

7.2.1. Skipped Waypoint

A skipped waypoint is a waypoint associated with a dynamic termination leg with a zero length. These are either:

1) An altitude termination leg when current aircraft altitude is above the termination altitude; or

2) System-created (i.e., not NavData® specified) intercept to a course to a fix leg where there is insufficient distance to calculate an intercept heading.

To add a waypoint to the end of the active flight plan, rotate through each waypoint of the flight plan to one position past the end.

7.2.2. Waypoint

Upon selection of a waypoint from the selection list, the EFIS checks whether the selected waypoint meets the criteria for waypoint activation, manual VNAV parameter entry, custom holding pattern entry, manual overfly characterization, VFR approach entry, IFR approach entry, STAR entry, or DP entry. If it does, a list is presented as follows:

1) **WAYPOINT** If valid, activates the flightplan leg to the selected waypoint. Option valid for any waypoint except:

    a) Suppressed waypoint;

    b) Skipped waypoint;

    c) A waypoint following a discontinuity; or

    d) The first waypoint.

2) **VNAV..** If valid, enter a manual VNAV altitude and offset for the selected waypoint. This menu level allows for synchronizing the VNAV altitude to current altitude and for removing the manual VNAV altitude and offset entries. These altitudes are settable in increments of 100 feet and distances of 1 NM. Option valid for any waypoint except:

    a) Suppressed waypoint

    b) Skipped waypoint;

    c) A manual termination waypoint;

    d) A waypoint that is part of an IFR or VFR approach;

    e) A SAR pattern exit waypoint:

    f) A parallel offset entry or exit waypoint; or

    g) One of the following types of termination legs:

        i) Dynamic;

        ii) Altitude;

        iii) DME;

        iv) Radial; or

        v) Intercept

3) **HOLD..** If valid, enter a manual holding pattern at the selected waypoint. Option valid for any waypoint except:

    a) Suppressed waypoint;

    b) Skipped waypoint;

c) A manual termination waypoint;

d) A waypoint that is part of a missed approach procedure, including the missed approach waypoint;

e) A waypoint that is part of a VFR approach;

f) A holding pattern waypoint;

g) A SAR pattern exit waypoint;

h) A waypoint that begins with a departure procedure;

i) A parallel offset entry or exit waypoint; or

j) One of the following dynamic termination waypoints:

   i) Altitude;

   ii) DME;

   iii) Radial; or

   iv) Intercept

4) **SAR PTRN..** If valid, create and enter a SAR pattern as defined in the SAR appendix. If SAR patterns are enabled in the EFIS limits this option is valid for any waypoint except:

a) Suppressed waypoint;

b) Skipped waypoint;

c) A manual termination waypoint;

d) A waypoint that is part of an IFR or VFR approach;

e) A holding waypoint;

f) A SAR pattern exit waypoint;

g) A waypoint that begins a departure procedure;

h) A parallel offset entry or exit waypoint; or

i) One of the following dynamic termination waypoints:

   i) Altitude;

   ii) DME;

   iii) Radial; or

   iv) Intercept

5) **SAR SGMNT..** Select which segment within the SAR pattern should be active for navigation guidance. If the selected waypoint is the active waypoint and is one of the following types of SAR patterns:

a) Expanding square;

b) Rising ladder; or

c) Sector search

6) **OFLY/AUTO..** If the selected waypoint is neither suppressed, skipped, nor a manual termination, change the waypoint's overfly characterization. The choices are:

a) **AUTO**: Reset automatic overfly characterization by FMS.

b) **OVERFLY**: Force the overfly characterization to be an overfly adjust-exit waypoint and force the inbound course to go directly to the waypoint regardless of the amount of course change required.

c) **NO RADIUS**: Force the turn radius at the waypoint to be zero. This forces the inbound course and outbound course to go directly to and from the waypoint regardless of the amount of course change required.

NOTE:

It is not possible to track a “NO RADIUS” path perfectly, but the FMS path guidance quickly recaptures the outbound course after resuming automatic waypoint sequencing. Designating a waypoint as a “NO RADIUS” waypoint affects the turn radius used to calculate procedure turn and holding pattern leg paths.

7) **VFR APPR..** If selected waypoint is a user waypoint with an approach bearing, a VFR approach to the user waypoint based on the approach bearing is created, then the user waypoint becomes suppressed.

If the selected waypoint is a VFR airport or an IFR airport with surveyed runways, the user is presented with a list of runways. After selecting a runway, a VFR approach to the runway is created, and then the airport waypoint becomes suppressed. Activating a VFR approach deletes (after pilot confirmation) any pre-existing IFR or VFR approaches. If a heading bug is not active; activating a VFR approach activates the heading bug on current aircraft heading and is used to define the course intercept angle.

This option is invalid if the selected waypoint is a holding pattern waypoint or SAR pattern exit waypoint. (Note: this forces the user to deactivate a manual holding pattern or SAR pattern prior to activating a VFR approach).

8) **IFR APPR..** If selected waypoint is an airport with an IFR approach, the pilot is presented with a list of available approaches including, if applicable, the five-digit channel number, followed by a list of available transitions (if there are more than one), and a list of runways (if there are surveyed runways at the airport). After selection, the appropriate IFR approach is created, and the airport waypoint is suppressed. Activating an IFR approach deletes any pre-existing IFR or VFR approaches. If there is a pre-existing STAR to the airport, the IFR

approach waypoints are inserted after the STAR waypoints. If a heading bug is not active and the activated transition is "Vectors to Final," activating an IFR approach activates the heading bug on current aircraft heading for purposes of defining the course intercept angle.

9) **STAR..** If selected waypoint is an airport with a STAR, the pilot is presented with a list of available STARs, followed by a list of available transitions (if there are more than one) and a list of runways (if there are surveyed runways at the airport). After selection, the appropriate STAR is created. Activating a STAR automatically deletes any pre-existing STAR. If there is a pre-existing approach (IFR or VFR) to the airport, STAR waypoints are inserted prior to the approach waypoints.

8) **DP..** If selected waypoint is an airport with a DP, the user is presented with a list of DPs, followed by a list of available transitions (if there are more than one) and a list of runways (if there are surveyed runways and more than one runway authorized for the DP). After selection, the appropriate DP is created, and upon activation, deletes any pre-existing DPs after user confirmation.

   This option is invalid if the selected waypoint is a holding pattern waypoint or SAR pattern exit waypoint. (This forces a user to deactivate a manual holding pattern or SAR pattern prior to activating an IFR approach).

7.3. Operations Outside a GPS/SBAS Coverage Area

When outside of a GPS/SBAS service provider's coverage area, the GPS receivers can revert to using FDE for integrity. The GPS receiver uses GPS/SBAS integrity or FDE; whichever provides the best protection level. GPS/SBAS equipment does not have any limitations in oceanic and remote areas provided the operator obtains an FDE prediction program.

7.4. IFR Procedures

Pilots operating in a radar environment are expected to associate departure headings or an RNAV departure advisory with vectors or the flight path to the planned route or flight. Use of both types of departure procedures; Obstacle Departure Procedures (ODP), which are printed either textually or graphically, and Standard Instrument Departure procedures (SIDs), which are always printed graphically. All DPs, either textual or graphic may be designed using either conventional or RNAV criteria. RNAV procedures have RNAV printed in the title.

ODPs are not found in the navigation database, and therefore the climb angle found in the PFD bugs menu should be set to comply with the steeper than normal climb gradient during the departure until established on the en route structure. ODPs are recommended for obstruction clearance and may be flown without ATC clearance, unless an alternate departure procedure (SID or radar vector) has been specifically assigned by ATC.

Approach minima are never coded in NavData®. On some approaches, the altitude coded at the MAP for a non-precision approach coincides with an MDA (normally where the final approach course does not align with the runway), but more often the coded altitude is some height above the threshold.

7.5. Overview of Procedures and Instrument Approaches

This Genesys Aerosystems EFIS provides 3D GPS precision and non-precision instrument approach guidance using a system integral TSO C146c BETA 3 GPS receiver with GPS and augmented GPS with SBAS (Satellite Based Augmentation System) commonly referred to as WAAS (Wide Area Augmentation System). In order to support full integration of RNAV procedures into the National Airspace System (NAS), a charting format for instrument approach procedures (IAPs) designed to avoid confusion and duplication of instrument approach charts was created.

Use of this GPS receiver provides a level of certified service supporting RNAV (GPS) approaches to LNAV, LP, LNAV/VNAV, and LPV lines of minima within system coverage. Some locations close to the edge of the coverage may have lower availability of vertical guidance.

The Genesys Aerosystems EFIS guides the pilot through every step of the approach procedure with HITS 3D symbology. The system defines a desired flight path based upon the active flight plan. The current position of the aircraft is determined relative to the desired path in order to determine deviation for display on the GPS/SBAS CDI and VDI. The EFIS auto-sequences from one waypoint to the next in accordance with the flight plan along the flight path with the following exceptions:

1) Pilot has selected a manual GPS/SBAS OBS (SUSPEND shown).

2) Active waypoint is the missed approach waypoint, and missed approach procedure has not been armed (**ARM**) nor initiated (**MISS**) (SUSPEND shown).

3) Aircraft is in a published or manually created holding pattern, and pilot has not chosen to continue (**CONT**) out of the holding pattern (SUSPEND shown).

4) Active waypoint is the last waypoint of the active flight plan (no flag shown).

5) Leg following active waypoint is a manual termination leg, and the pilot has not chosen to resume (**RESUME**) to the waypoint following the manual termination (SUSPEND shown).

6) The aircraft is in a repeating SAR pattern (Race Track, Sector Search, or Orbit) and the pilot has not chosen to continue out of the SAR pattern (SUSPEND shown). (See SAR appendix.)

Where automatic waypoint sequencing is suspended due to reasons 1, 2, or 4 above, the EFIS automatically switches from “To” operation to “From” operation when appropriate. If not suspended, automatic waypoint sequencing occurs upon the following conditions:

1) Bearing to the transition point (turn bisector for the fly-by waypoint, active waypoint for fly-over waypoint) is more than 90° from the current course (transition from “To” to “From” operation);

2) Aircraft location is within one turn diameter (based upon current true Airspeed and 15° angle of bank) of the transition point; and

3) Aircraft heading is within 90° of the current course (generally pointed in the correct direction).

7.5.1. Highway in the Sky (Skyway)

When not decluttered, the PFD displays the active navigation route or manual OBS course in a 3D manner with a series of skyway boxes, which overlay the flight plan route at a desired altitude and provide lateral and vertical guidance. Skyway boxes conform to the VNAV requirements of GPS/SBAS receiver requirements (TSO-C-146C). The top and bottom of the boxes are parallel to the horizon on straight leg segments and dynamically tilt with respect to the horizon on turning leg segments based on leg segment turn radius and ground speed.

Table 7-2: Highway in the Sky Configuration

Type HITS Lines	Fully Integrated Autopilot	Partially Integrated Analog Autopilot	Un-Integrated Autopilot or No Autopilot
Dashed	Not coupled to skyway		
Solid	Coupled to Skyway	Coupled to skyway. Autopilot is either in HDG mode with LNAV heading/roll-steering sub-mode engaged or in NAV/APR mode with FMS1 or FMS2 as the selected navigation source.	Always Solid

When the active route is in view, up to five boxes are shown with the dimensions being a constant 400 feet wide (±200 feet from the desired lateral path) by 320 feet tall (±160 feet from the desired vertical path) and spaced horizontally 2000 feet.

Skyway boxes are drawn using the hidden surface removal techniques of the terrain and obstruction rendering, so a skyway box behind terrain appears to be so. Skyway boxes disappear in basic mode and unusual attitude mode. In reversionary mode 1 (GPS failure), skyway boxes disappear after one minute to indicate degraded navigation performance.

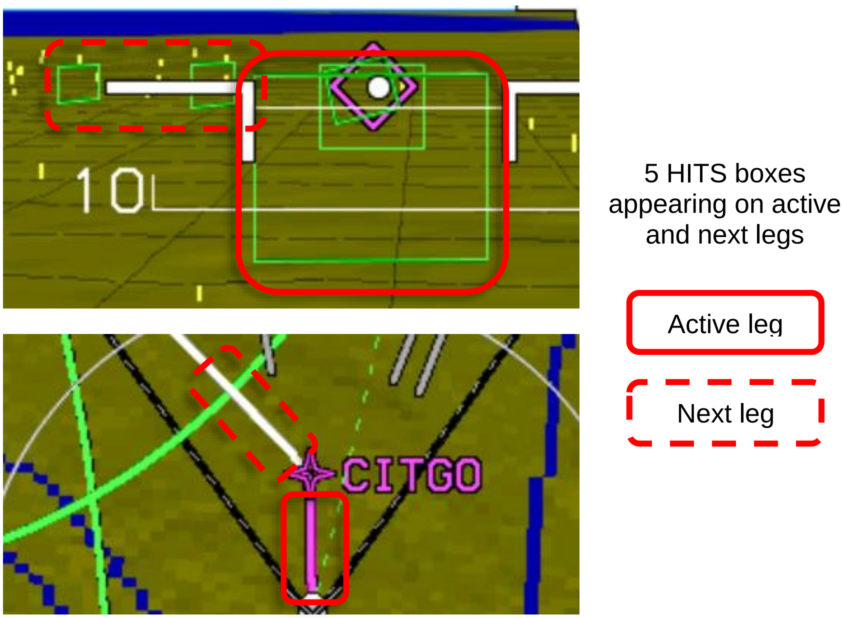


Figure 7-3: Highway in the Sky Five Boxes

Skyway box altitude is controlled by VNAV altitude, aircraft altitude, climb performance, and climb/descent angle setting (in PFD BUGs menu outside of the FAF when an instrument approach is loaded). If no VNAV altitude is set, the skyway boxes describe the desired lateral flight path at the aircraft's current altitude.

With a VNAV altitude set, the boxes provide both lateral and vertical guidance. Climb and descent angle settings are controlled individually with a resolution of 0.1°.

When no VNAV altitudes associated with a waypoint exist and a target altitude is set, HITS box altitudes emanate from the current aircraft altitude and indicate a climb or descent, as appropriate, until reaching the target altitude. When a climb is shown, the HITS boxes are drawn at the higher of actual climb angle or the dynamic climb angle setting. When a descent is shown, the HITS boxes are drawn at an angle corresponding to the descent angle setting in the PFD BUGs menu.

NOTE:

The purpose of this symbology is to emulate an altitude pre-selector and give guidance to climb or descend real-time as if being issued an assigned altitude from ATC.

When at least one VNAV altitude associated with a waypoint exists, HITS boxes are guided by VNAV waypoints determined by VNAV altitude and VNAV offsets from flight plan waypoints. The two sources for VNAV altitudes come from the navigation database or are manually input through the ACTV menu. VNAV altitudes are automatically computed by the system using “look-ahead” rules if not coming from the navigation database or manually input.

When “look-ahead” finds a further VNAV altitude constraint above the previous VNAV altitude constraint (climb commanded), then an automatic VNAV altitude is continuously calculated for the waypoint based upon an immediate climb to the altitude constraint at the dynamic climb angle.

When “look-ahead” finds a further VNAV altitude constraint below the previous VNAV altitude constraint (descent commanded), then an automatic VNAV altitude is calculated for the waypoint based upon a descent to reach the VNAV altitude constraint at the associated waypoint using the descent angle setting. If no further VNAV altitude constraints are found, then the automatic VNAV altitude is set to the last valid altitude constraint.

When a VNAV climb is desired, the HITS boxes are drawn at a vertical position that is higher of the following:

1) The dynamic climb angle emanating from the aircraft’s present position (aircraft-referenced);

2) The dynamic climb angle emanating from the next waypoint VNAV altitude (geo-referenced forward); OR

3) The climb angle setting emanating from the previous waypoint VNAV altitude (geo-referenced backward).

NOTE:

The geo-referenced backward calculation is only considered when the current leg is part of a procedure and is designed to provide pilot awareness if a specified climb angle gradient is not being met.

Once the HITS boxes intercept the VNAV altitude, further boxes are drawn with a zero angle to show a level-off followed by a level segment. Since five HITS boxes are shown, the level-off depiction becomes a compelling anticipatory cue for the pilot.

VNAV climb guidance is shown in Figure 7-4, Figure 7-5, and Figure 7-6.

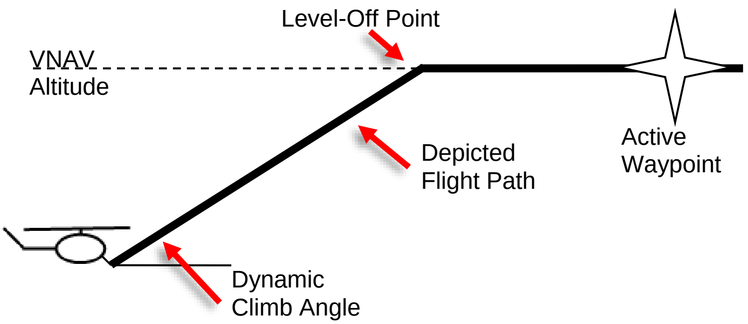


Figure 7-4: Highway in the Sky (Aircraft Referenced)

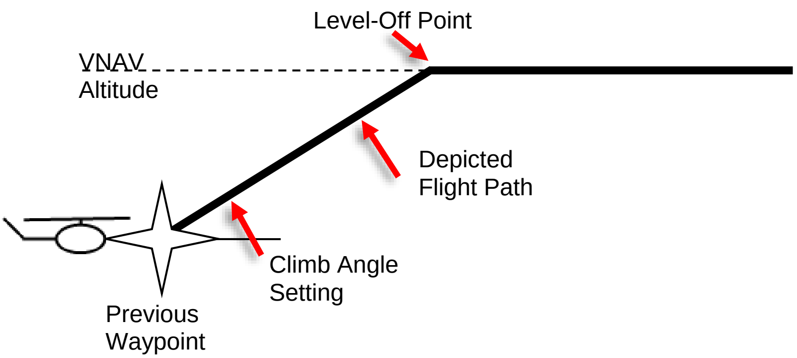


Figure 7-5: Highway in the Sky (Geo-Referenced Backward)

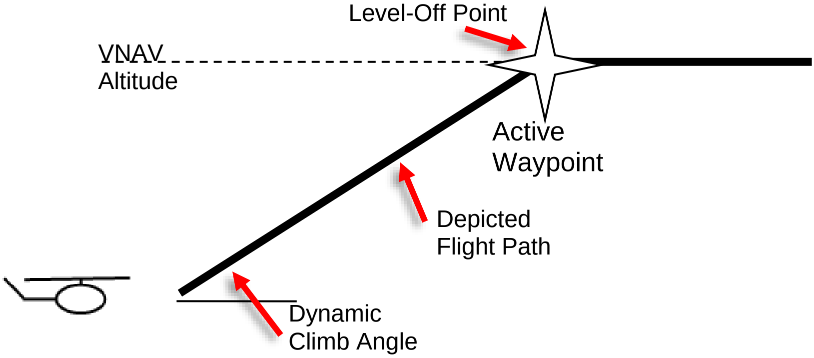


Figure 7-6: Highway in the Sky (Geo-Referenced Forward)

When a VNAV descent is desired, boxes are drawn with a zero angle until reaching a descent point. Further boxes are drawn downward at an angle corresponding to the descent angle setting. The descent point is defined by the intercept of a line emanating upward from the subsequent VNAV waypoint at the descent angle setting and a line representing level flight at the previous VNAV altitude. On the final approach segment of an IFR approach, descent angle and VNAV waypoint are defined in Table 7-3.

Table 7-3: Final Segment of IFR Approach, Descent Angle and VNAV Waypoint

Condition	VNAV Waypoint	Descent Angle
IFR approach with valid final approach segment data block containing a non-zero glide path angle	Glide Path Intercept Point (GPIP) as defined in final approach segment data block	Descent angle as defined in final approach segment data block
Absent or invalid final approach segment data block, or final approach segment data block glide path angle is set to 0° No intermediate waypoints exist between FAF and MAP	Missed approach point location	Straight line from FAF to MAP location and altitudes

Table 7-3: Final Segment of IFR Approach, Descent Angle and VNAV Waypoint

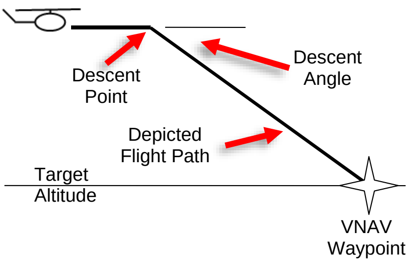
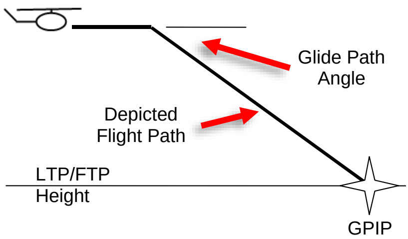
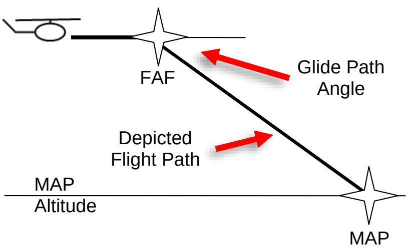
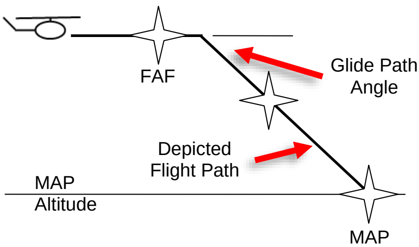
Condition	VNAV Waypoint	Descent Angle
Absent or invalid final approach segment data block, or final approach segment data block glide path angle is set to 0° Intermediate waypoints exist between FAF and MAP	Missed approach point location	Steepest descent angle based upon straight lines from FAF and subsequent intermediate waypoints to MAP location and altitudes

On the final approach segment of a VFR approach procedure, the higher of the descent angle setting or 3° is used.

Because five HITS boxes are shown, the descent point depiction is an anticipatory cue. Figure 7-7 depicts descent guidance and creates an easily understood, yet safe, VNAV paradigm to meet the VNAV requirements current guidance.

Figure 7-7: Highway in the Sky Final Approach Segments

Furthermore, the paradigm is biased towards keeping the aircraft at the highest altitude possible for the longest period of time. The climb paradigm compensates for an aircraft's ability to climb more steeply than specified and warns of being below a desired climb gradient when the aircraft is unable to meet the specified climb angle. The descent paradigm encourages flying stabilized approaches.

<table>
<tr><th colspan="2">Table 7-4: VNAV Paradigm</th></tr>
<tr>
<td>Normal Descent

</td>
<td>Final Approach Segment Descent w/FAS DB and Non-zero Glide Path Angle

</td>
</tr>
<tr>
<td>Final Approach Segment Descent w/o FAS Data Block Glide Path Angle or Intermediate Waypoints

</td>
<td>Final Approach Segment Descent w/o FAS Data Block Glide Path Angle and with Intermediate Waypoint

</td>
</tr>
</table>

The VNAV paradigm scheme was used to create an easily understood, yet safe, method to meet certification requirements. Simplicity is the primary objective and this paradigm is biased towards keeping the aircraft at the highest altitude possible for the longest time. The climb paradigm automatically compensates for an aircraft’s ability to climb more steeply than specified and also warns of being below a desired climb gradient when the aircraft is unable to meet the specified climb angle. Furthermore, this descent paradigm encourages flying stabilized, and continuous descent profiles.

7.5.2. Waypoint Sequencing

When automatic waypoint sequencing is suspended due to reasons 1, 2, or 4 in § 7.5, the EFIS switches from “To” to “From” operation when appropriate. If not suspended, automatic waypoint sequencing occurs in following conditions:

1) Bearing to the transition point (turn bisector for fly-by waypoint, active waypoint for fly-over waypoint) is more than 90° from the current course (i.e., transition from “To” to “From” operation);

2) Aircraft location is within two turn diameters (based upon current true airspeed and 15° angle of bank) of the active waypoint location; and

3) Aircraft heading is within 90° of the current course (i.e., generally pointed in the correct direction).

The desired flight path is created from a sequence of straight, left turning, and right turning leg segments designed to provide smooth skyway, GPS/SBAS CDI, and lateral autopilot guidance. Each leg between waypoints is composed of up to nine segments. Radii for turning segments (other than DME arc or radius to a fix segment) are calculated with the parameter speed determined as follows:

1) If the waypoint is part of a DP and within 30NM of the departure runway, speed is the pre-programmed procedure speed.

2) If the waypoint is part of a STAR and within 30NM of the arrival runway, speed is the pre-programmed procedure speed.

3) If the waypoint is part of an IFR or VFR approach procedure, speed is the preprogrammed procedure speed.

4) If the waypoint is part of a holding pattern, speed is the preprogrammed procedure speed.

5) Within a SAR pattern, speed is the lower of holding speed or procedure speed

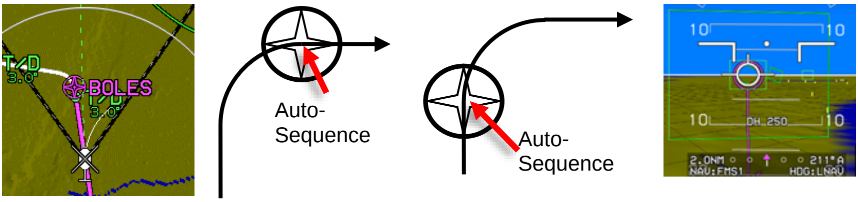
6) Where a fixed-radius transition (FRT) is defined by the navigation database for a waypoint, that turn radius is used for the turning segment. FRT is used in en route flight in order to save the number of waypoints and to provide a smoother transition. The RF leg can only be used in a SID or in a STAR. It is the flight plan leg stored in the navigation database, which is defined by constant radius turns around a given fix.

7) Otherwise, speed is the current true airspeed or procedure speed, whichever is higher.

In all cases, if NavData® derived speed limit is associated with the waypoint, speed is the lower of the NavData® derived speed limit or the speed determined above.

Radius for DME arc or radius to a fix segments comes from NavData®.

7.5.3. Fly-Over Waypoints



MFD | *Defined Exit* | *Defined Entry* | PFD

Figure 7-8: Fly-Over Waypoints

To create the desired flight path, each waypoint is designated as a fly-over or a fly-by waypoint. Waypoints are further subdivided into waypoints with a defined entry heading and waypoints with a defined exit heading. Waypoint auto-sequencing for fly-by waypoints occurs at the bisector of the turn. Waypoint auto-sequencing for fly-over waypoints occurs over the waypoint.

7.5.3.1. Fly-Over With Defined Entry Heading

These waypoints are type fly-over with defined entry heading:

1) Waypoint leading into discontinuity;

2) Waypoints which are marked as overfly in the navigation database or menu system;

3) Exit from holding pattern;

4) Exit from SAR pattern;

5) Exit from procedure turn;

6) Entry into holding pattern;

7) Missed approach point;

8) Phantom waypoint (created by inserting a waypoint into the active flight plan or performing Direct-To function within the active flight plan – avoids S-turns);

9) Last waypoint;

10) Reference (takeoff runway end) waypoint of a DP; and

11) Altitude, DME, or radial termination legs (ARINC-424 path types CA, FA, VA, CR, VR, CD, FD, and VD; see Table 7-5).

Table 7-5: RNAV Path Terminator Leg Type

Path	Designator		Terminator
Constant DME arc	A	A	Altitude
Course to	C	C	Distance
Direct Track	D	D	DME Distance
Course from a Fix to	F	F	Fix
Holding Pattern	H	I	Next Leg
Initial	I	M	Manual Termination
Constant Radius	R	R	Radial Termination
Track Between	T		
Heading To	V		
Examples: CF= Course to Fix, and FM= Course from a Fix to a Manual Termination, etc.			

7.5.3.2. Fly-Over With Defined Exit Heading

These waypoints are type fly-over with defined exit heading:

1) Entry into procedure turn; and

2) Waypoint exiting a discontinuity with the exception of phantom waypoints or DP reference waypoints;

3) First waypoint with the exception of phantom or DP reference waypoints

4) Course to a fix legs that are not to the FAF/FAWP are fly-by with defined entry heading. All other waypoints are fly-by with defined exit heading.

5) Entry into SAR pattern.

7.5.4. Fly-By Waypoints

Course to a fix legs that are not to the FAF/FAWP are Fly-By with defined entry heading. All other waypoints are Fly-By with defined exit heading. Leg segments for paths are constructed by the EFIS (see Figure 7-9).

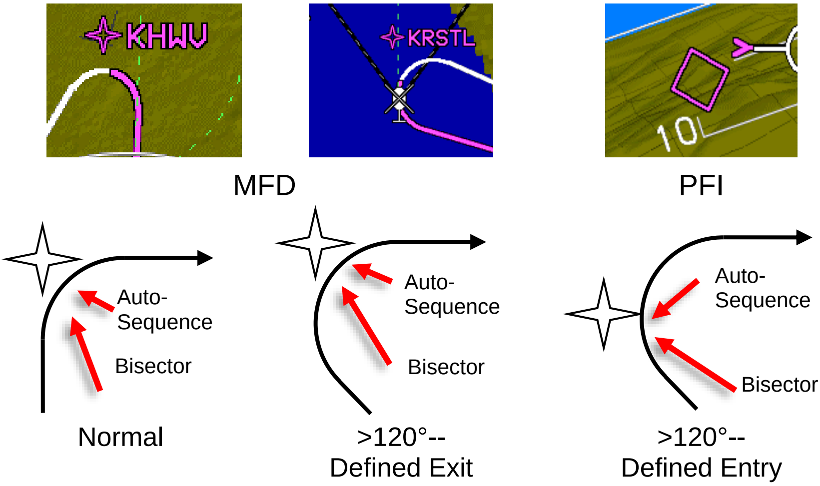


Figure 7-9: Fly-By Waypoints

> **NOTE:**
>
> Entry adjustments should be expected anytime a turn exceeds 120º. Turns greater than 120º should not be used in conjunction with RNP routes. (RNP standards specifically exclude such turns from RNP requirements.)

Table 7-6: Leg Segments for Paths Constructed by EFIS

Path Type	Waypoint		# of Segments and Description
	Entry	Exit	
Straight Leg, DME Arc or Radius to a Fix	Fly-By	Fly-By	2nd half of fly-by turn at entry waypoint. WGS-84 geodesic or arc path from entry to exit turns. 1st half of fly-by turn at exit waypoint.
	Fly-By	Fly-Over Defined Exit Heading	2nd half of fly-by turn at entry waypoint. WGS-84 geodesic or arc path from entry to exit turns. Turn to exit heading prior to exit waypoint.
	Fly-By	Fly-Over Defined Entry Heading	2nd half of fly-by turn at entry waypoint. WGS-84 geodesic or arc path from entry turn to exit waypoint.

Table 7-6: Leg Segments for Paths Constructed by EFIS

Path Type	Waypoint Entry	Waypoint Exit	# of Segments and Description
	Fly-Over Defined Exit Heading	Fly-By	WGS-84 geodesic or arc path from entry waypoint to exit turn. 1st half of fly-by turn at exit waypoint.
	Fly-Over Defined Exit Heading	Fly-Over Defined Exit Heading	WGS-84 geodesic or arc path from entry waypoint to exit turn. Turn to exit heading prior to exit waypoint.
	Fly-Over Defined Exit Heading	Fly-Over Defined Entry Heading	WGS-84 geodesic or arc path from entry waypoint to exit waypoint.
	Fly-Over Defined Entry Heading	Fly-By	Turn from entry heading after entry waypoint. WGS-84 geodesic or arc path from entry to exit turns. 1st half of fly-by turn at exit waypoint.
	Fly-Over Defined Entry Heading	Fly-Over Defined Exit Heading	Turn from entry heading after entry waypoint. WGS-84 geodesic or arc path from entry to exit turns. Turn to exit heading prior to exit waypoint.
	Fly-Over Defined Entry Heading	Fly-Over Defined Entry Heading	Turn from entry heading after entry waypoint. WGS-84 geodesic or arc path from entry turn to exit waypoint.
Procedure Turn	Fly-Over Defined Exit Heading	Fly-Over Defined Entry Heading	WGS-84 geodesic path from entry waypoint on outbound heading for 30 seconds. Turn to procedure turn heading (45°). Outbound on procedure turn heading for 72 seconds. Turn to inbound heading (135°). WGS-84 geodesic path to exit waypoint. Entry waypoint and exit waypoint are same point.

Table 7-6: Leg Segments for Paths Constructed by EFIS			
Path Type	**Waypoint**		**# of Segments and Description**
	Entry	**Exit**	
Holding Pattern	Fly-Over Defined Entry Heading	Fly-Over Defined Entry Heading	Turn to proper entry procedure heading. This heading varies. For a parallel entry, it is 180° from the holding course. For direct and teardrop entries, it is the heading required to get to entry of inbound turn. WGS-84 geodesic path to entry of inbound turn. Inbound turn. Degree of turn varies depending upon entry procedure and heading. WGS-84 geodesic path to holding fix for direct and teardrop entries. WGS-84 geodesic path to entry of turn to holding pattern heading for parallel entries. Turn to holding pattern heading for parallel entries. This leg is not used for direct and teardrop entries. Turn to holding pattern outbound leg (180°). Holding pattern outbound leg (length based upon either time or distance as specified by navigation database). Turn to holding pattern inbound leg (180°). Holding pattern inbound leg (length based upon either time or distance as specified by navigation database).

7.5.5. Direct-To

If the EFIS generates a WGS-84 geodesic path to a designated “To” fix, the aircraft captures this path without “S-turning” or undue delay. Where the selected “To” fix is in the active flight plan, the required transition is created as follows:

1) A phantom waypoint is created at the current aircraft location.

2) Waypoints prior to the Phantom waypoint are automatically decluttered from the flight plan.

3) Phantom waypoint is designated a Fly-Over defined entry heading waypoint where entry heading is current aircraft track.

7.5.5.1. Direct-To Unnamed Waypoints Inside Procedures

The following identifiers are for unnamed waypoints inside a published procedure and are found on the map or inside the active flight plan.

1) -ALT- altitude terminations
2) -DIR- waypoints that begin a Direct-To leg
3) -DME- distance or DME terminations
4) -INT- intercept terminations
5) -RAD- radial terminations
6) -MAN- manual terminations

7.6. Discontinuities

When the EFIS is unable to construct a smooth flight path as described above due to active flight plan waypoint spacing (i.e., spacing too close for turn radius), a discontinuity is placed between the waypoints. When a discontinuity exists, no path nor skyway is drawn between the waypoints. The pilot cannot activate the waypoint exiting the discontinuity, as it is not possible to provide path guidance to this waypoint. Attempts to activate the waypoint exiting the discontinuity activates the next waypoint or, if there is no next waypoint (i.e., end of active flight plan), activation of the waypoint leading into the discontinuity.

7.6.1. Manual Termination Legs

Manual termination legs (ARINC 424 path types FM and VM) are a special case and are handled as follows:

1) The manual termination leg is rendered as a path on the database course/heading for 10NM beyond either:

    a) the previous waypoint (manual leg not active); or

    b) the nearest on-path point (manual leg active);

2) Rendering of the manual termination leg does not terminate with a waypoint symbol;

3) The manual termination leg is followed by a discontinuity;

4) Waypoint sequencing is suspended on the manual termination leg;

5) Once on the manual termination leg, **RESUME (L6)** appears;

6) When ready to end manual navigation and resume a path to the waypoint following the manual termination leg, press **RESUME (L6)** to create and activate a Direct-To path to the waypoint.

NOTE:

If the manual termination leg is not followed by another waypoint (other than a suppressed waypoint), **RESUME (L6)** does not appear, because there would be no waypoint-to-waypoint sequencing to resume.

7.7. Magnetic Course

The source of magnetic variation used for paths defined using magnetic course is in accordance with the following:

1) If the leg is part of a database terminal area procedure and the magnetic variation is specified by the State for that procedure, the magnetic variation to be used is the value specified.

2) If the leg is not part of a procedure and the active fix is a VOR, the magnetic variation to be used is the published station declination for the VOR.

3) If the leg is not part of a procedure and the terminating fix is not a VOR, the magnetic variation to be used is defined by the system using an internal model.

The EFIS computes magnetic variation at any location within the region where flight operations may be conducted using magnetic north reference. The assigned magnetic variation is calculated with the NIMA GEOMAG algorithm and World Magnetic Model appropriate to the five-year cycle.

MAG VAR DATA: WMM-2020 (D1CDE26D)

Figure 7-10: MAG VAR Database

7.7.1. AHRS Modes for Heading Source

AHRS Slaved—EFIS Magnetic North: Standard mode of operation. Everything displayed relative to magnetic north drift free.

AHRS Slaved—EFIS True North: Everything displayed relative to true north with drift free heading. The preferred way to operate in areas where navigation is done relative to true north. (See Section 9 Appendix for limitations on Earth's magnetic flux horizontal field.)

AHRS Free/"DG"—EFIS Magnetic North: Use when operating around significant magnetic disturbances in areas where navigation is done relative to magnetic north. Ensure the compass rose is slewed to a magnetic north value.

AHRS Free/"DG"—EFIS True North: Method of operation in high-latitude areas where navigation is accomplished relative to true north. Heading is not drift free and requires periodic correction. This mode may also be used when operating around significant magnetic disturbances in areas where navigation is done relative to true north. Ensure the compass rose is slewed to a true north value.

7.7.2. EFIS True North Mode

True north mode is selectable either through **OBS (L4)**, **TRUE NORTH (L1)** or an external switch if configured in EFIS limits. This mode is intended to address aircraft requirements during high or low latitude operations and should be used when the AHRS has been set to free-gyro mode. See Section 3 Display Symbology for true north mode symbology examples.

7.7.3. GPS Altitude

WGS-84 ellipsoid altitude received from the GPS/SBAS is converted to geodetic (MSL) altitude using the EGM 2008 geoidal database.

7.7.4. Dead Reckoning

The EFIS has dead reckoning capability and is active whenever the GPS/SBAS sensor is not sending a valid position. The EFIS projects the last known GPS/SBAS position forward using TAS and heading, corrected for last known wind as it continues to navigate using this position and the active flight plan. The system provides the capability to determine bearing to an airport, based upon the dead reckoning position.

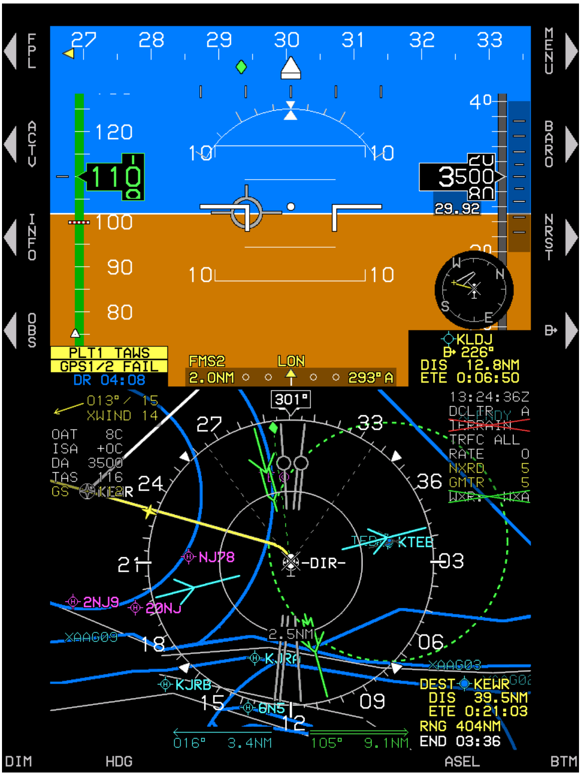


Figure 7-11: Dead Reckoning

7.7.5. Parallel Offsets

The parallel offset is a route parallel to, but offset from, the original active route. The basis of the offset path is the original flight plan leg(s) and one or more offset reference points as computed by the EFIS.

The computed offset reference points are located so they lie on the intersection of lines drawn parallel to the host route at the desired offset distance and the line that bisects the track change angle, except where the parallel offset ends. In this case, the offset reference point is located abeam of the original flight plan waypoint at the offset distance.

The parallel offset function is not available nor applies to:

1) Legs that are apart of approach procedures (IFR and VFR); or

2) Legs with complex geometries or that begin or end with dynamic terminations (ARINC 424 path types other than CF, DF, or TF or any leg where the starting waypoint is not a fixed position); or

3) Legs that begin at an aircraft starting position (reference waypoint in a DP or Phantom waypoints created by the Direct-To function).

Parallel offset functions do not propagate through the following:

1) Any waypoint at the beginning or end of a route discontinuity; or

2) Any waypoint at the beginning or end of a prohibited leg type; or

3) A waypoint with an unreasonable path geometry (defined as a turn greater than 120°.)

When the parallel offset function begins or ends within a flight plan due to the above constraints, parallel offset entry (PTK+) or exit (PTK-) waypoints are inserted into the flight plan. PTK ENDING appears in sufficient time to alert the pilot to return to the original path. Discontinuities precede parallel offset entry waypoints and follow parallel offset exit waypoints. This allows the pilot to navigate to and from the parallel offset as required.

Figure 7-12: Parallel Offset PTK-

The EFIS provides guidance to parallel tracks at a selected offset distance. When executing a parallel offset, the navigation mode and all performance requirements of the original route in the active flight plan are applicable to the offset route. The EFIS provides for entry of offset distance in NM or KM (depending upon setting of “speed Units” in EFIS limits) in increments of 1 unit left or right of course, and is capable of offsets of at least 20 units. Offset mode is indicated with an advisory flag, i.e., PTK = L 20NM/ PTK = L 20KM. When in offset mode, the EFIS provides reference parameters (e.g., cross-track deviation, distance-to-go, time-to-go) relative to the offset path and offset reference points.

Once a parallel offset is activated, the offset remains active for all flight plan route segments until removed automatically (transitioning through a parallel track exit waypoint), until the flight crew enters a “Direct-To” routing or activates a new flight plan route, or until (manual) cancellation.

> **NOTE:**
>
> If a parallel offset is entered in the active flight plan and then cancelled, that active flight plan is no longer eligible for configuring another parallel offset without deleting and reopening due to the creation of a discontinuity.

Table 7-7: Parallel Offsets Symbols and Description

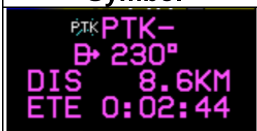
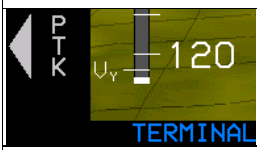
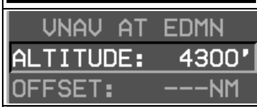
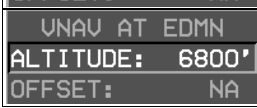
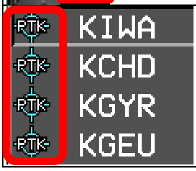
Symbol	Description
	Parallel offset has been created and has a designated ending waypoint.
	Designated ending waypoint of parallel offset
	Parallel track advisory indicating offset track 2 NM to the right of host route.
	**PTK (L4)** appears when active route is eligible for a parallel offset.
	Approaching end of parallel offset waypoint
	VNAV altitude is possible with offset of distance before or after waypoint.
	VNAV altitude input is possible but not an offset of a distance before or after waypoint.

Table 7-7: Parallel Offsets Symbols and Description	
Symbol	**Description**
	The absence of **PTK (L4)** indicates a parallel offset is not allowed for reasons stated above.
	Indicates each waypoint is a part of the parallel offset.

7.8. Navigation Database Requirements

The updateable navigation database contains at least the following location and path information, referenced to WGS-84, with a resolution of 0.01 minute (latitude/longitude) and 0.1° (for course information) or better at all of the following for the area(s) in which IFR operations are intended:

1) Airports.

2) VORs, DMEs (including DMEs collocated with localizers), collocated VOR/DMEs, VORTACs, and NDBs (including NDBs used as locator outer marker).

3) All named waypoints and intersections shown on en route and terminal area charts.

4) All airways shown on en route charts, including all waypoints, intersections, and associated RNP values (if applicable). Airways are retrievable as a group of waypoints. Select the airway by name to load the appropriate waypoints and legs between desired entry and exit points into the flight plan.

5) RNAV DPs and STARs, including all waypoints, intersections, and associated RNP values (if applicable). DPs and STARs are retrievable as a procedure. Select the procedure by name to load the appropriate waypoints and legs into the flight plan.

6) LNAV approach procedures in the area(s) in which IFR operation is intended consist of:

   a) Runway number and label (required for approach identification);

b) Initial approach waypoint (IAWP);

c) Intermediate approach waypoint(s) (IWP), when applicable;

d) Final approach waypoint (FAWP);

e) Missed approach waypoint (MAWP);

f) Additional missed approach waypoints, when applicable; and

g) Missed approach holding waypoint (MAHWP).

The complete sequence of waypoints and associated RNP values (if applicable), in the correct order for each approach, is retrievable as a procedure. Select the procedure by name to load the appropriate waypoints and legs into the flight plan.

CAUTION:

Failure to update IAP/APD data with current data results in expired NRST APD, IAP APD, or APPR plate images to appear on the MFD. (Limited to USA customers only.)

NOTE:

Waypoints used as a final approach waypoint (FAWP) and LTP/FTP/MAWP in an LNAV/VNAV procedure are uniquely identified as such to provide proper approach mode operation.

The LNAV/VNAV approach data consists of height of the runway threshold, threshold crossing height, and glidepath angle.

7) LPV, LP, and/or LNAV/VNAV published procedures are available in the area(s) where IFR operation is intended. Select a procedure by name to load the appropriate waypoints and legs into the active flight plan.

NOTE:

Manual entry and or update of the navigation database is not possible. Recalling data from storage does not prevent it from being retained for later use.

7.9. Default GPS/SBAS Navigation Modes

In the default GPS/SBAS mode, the EFIS has en route, terminal, LNAV approach, LNAV/VNAV approach, LP approach, LPV approach, VFR approach, and departure navigation modes. Mode annunciation, alert limits (horizontal and vertical), and CDI FSD (horizontal and vertical) are determined by navigation mode.

Table 7-8: Default GPS/SBAS Navigation Modes

Navigation Mode	Annunciation
En route	None
Terminal	TERMINAL
LNAV Approach	LNAV APPR
LNAV/VNAV Approach	LNV/VNV APPR
LP Approach	LP APPR
LPV Approach	LPV APPR
VFR Approach	VFR APPR
Departure	TERMINAL

The system switches to default navigation modes based upon region of operation as defined in Figure 7-10.

Table 7-9: Default Navigation Modes Based Upon Region of Operation

Default Nav Mode	Definition of Region
Departure	Selected when active waypoint is first waypoint of a departure or missed approach procedure <u>and</u> active leg heading is aligned (±3°) with active runway heading. Also, set when active waypoint is MAWP but a missed approach has been manually activated.
VTF Approach (LNAV, LNAV/VNAV, LP, or LPV)	VTF IFR approach has been selected; <u>and</u> within 30NM of the active runway; <u>and</u> FAWP is active waypoint*; <u>and</u> bearing to FAWP is within 45° of final approach segment track (treated as a mode entry criteria); <u>and</u> desired track to FAWP is within 90° of final approach segment track (treated as a mode entry criteria).

Table 7-9: Default Navigation Modes Based Upon Region of Operation	
Default Nav Mode	**Definition of Region**
Approach (LNAV, LNAV/VNAV, LP or LPV)	IFR approach has been selected; <u>and</u> within 30NM of the active runway; <u>and</u> MAWP or FAWP is active waypoint; <u>and</u> if FAWP is active waypoint: bearing to FAWP is within 45° of final approach segment track (treated as a mode entry criteria); <u>and</u> desired track to FAWP is within 90° of final approach segment track (treated as a mode entry criteria); <u>and</u> either segment leading into FAWP is not a holding pattern, or pilot has elected to continue out of holding.
VFR Approach	VFR approach has been selected; <u>and</u> within 30NM of the active runway; <u>and</u> active runway is the active waypoint; and the bearing to the active runway/user waypoint is within 45° of the final approach segment track (treated as a mode entry criteria); and the aircraft track is within 90° of the final approach segment track (treated as a mode entry criteria).
Terminal	Not in departure mode; <u>and</u> Not in approach mode; <u>and</u> active waypoint is part of a departure <u>or</u> active waypoint and previous waypoint are parts of an arrival or approach <u>or</u> within 30NM of the departure airport, arrival airport, or runway.
En route	Not in departure, approach, nor terminal modes.

> **NOTE:**
>
> During RNP 0.3 Approach (manually or coded) the scale remains in RNP 0.3.

7.10. GPS/SBAS CDI Scale

Table 7-10: Summary of Changes in Cross-Track FSD			
Distances are always in NM units			
	To En route	To Terminal	To Approach
From En route		Change from ±2 NM FSD to ±1 NM FSD over distance of 1 NM; start transition when entering terminal mode.	
From Terminal	Change from ±1 NM FSD to ±2 NM FSD over distance of 1 NM; start transition when entering en route mode.		If VTF, switch immediately. Otherwise, change from ±1 NM FSD to approach FSD over distance of 2 NM; start transition at 2 NM from FAWP.
From Approach		Change to ±1 NM.	
From Departure		If initial leg is aligned with runway, change from ±0.3 NM FSD to ±1 NM FSD at turn initiation point of first fix in departure procedure.	

NOTE:

For RNP 0.3 routes, the time to alert (TTA) is the same as for the approach. For RNP 0.3, the EFIS uses a 10-second TTA when using GPS-only and a 2-second TTA when using EGNOS.

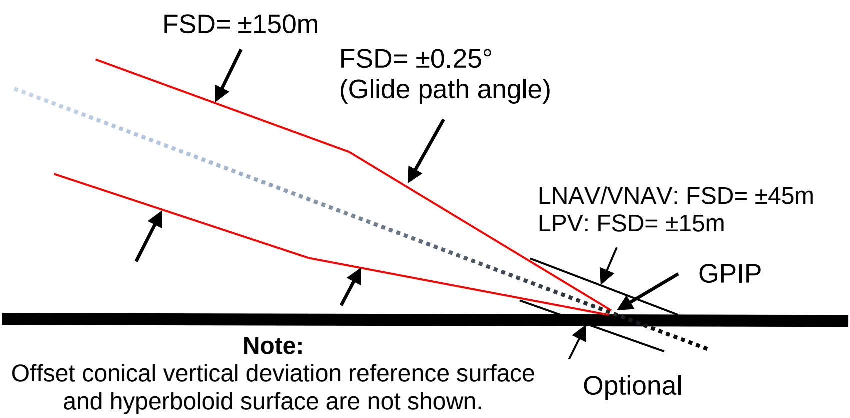
7.10.1. OBS Setting of CDI

In automatic mode, the system controls the scale and OBS setting. The selected navigation source is annunciated below the CDI as follows:

1) NAV: **FMS1**/**FMS2**
2) NAV: **VOR1**/**LOC1**
3) NAV: **BC1**/**BC2** (annunciated instead of LOC1/2 when course error exceeds 105°)
4) NAV: **VOR2**/**LOC2**

7.10.2. Alerting Scheme for LNAV/VNAV Procedures

During normal operation with FMS source of navigation guidance, when an LNAV/VNAV procedure has been entered into the active flight plan and the EFIS is in LNAV/VNAV, the vertical and lateral integrity flags are out of view, and guidance displays show the deviations from track in vertical and lateral dimensions. The linear vertical scale limits of the VDI for LNAV/VNAV and LPV approaches are shown in Figure 7-13.



Ref: DO-229D Figure 2-16

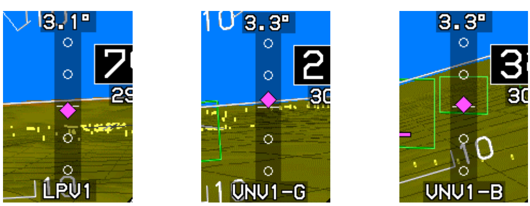


Figure 7-13: Vertical Deviation Indicator Linear Deviation

> **NOTE:**
>
> For RNP 0.3 routes, time to alert (TTA) is the same as for the approach. For RNP 0.3, the EFIS uses a 10-second TTA when using GPS-only, and a 2-second TTA when using EGNOS.

7.10.3. Alerting Scheme for LPV/LP Procedures

During normal operation in with FMS source of navigation guidance, when an LPV or LP procedure has been entered into the active flight plan and the EFIS is in LPV or LP, the vertical and lateral integrity flags are out of view (only lateral integrity flag for LP). Additionally, the guidance displays show the deviations from track in vertical and lateral dimensions (only lateral for LP.)

The linear lateral scale limits of the CDI for LNAV approach procedure.

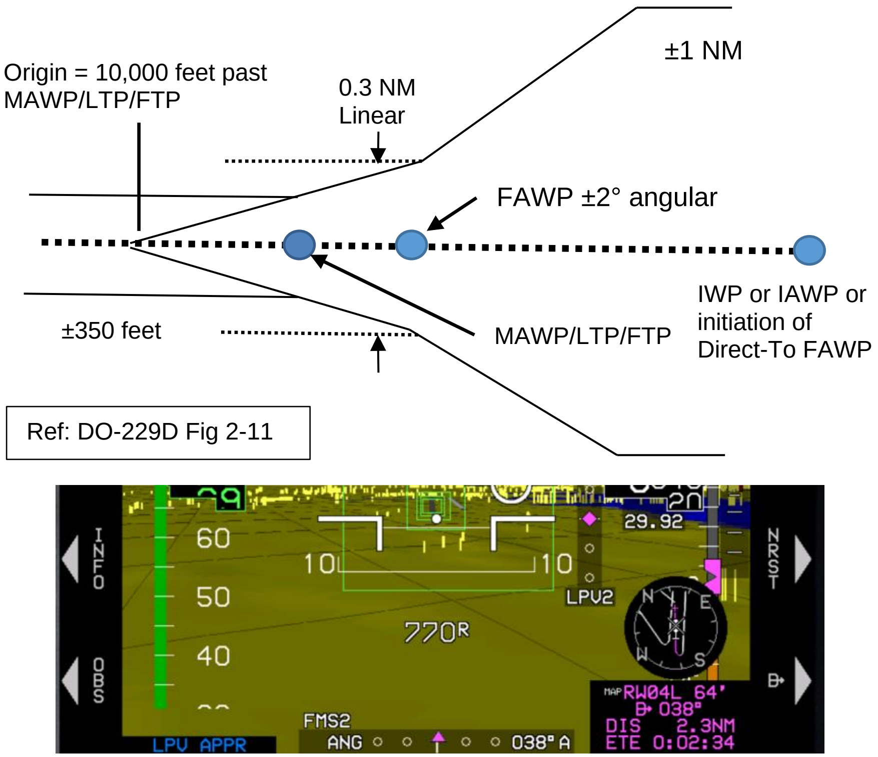
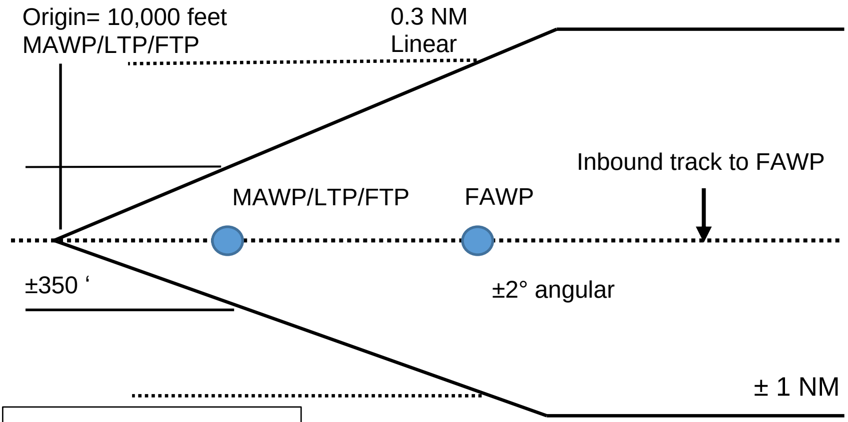


Figure 7-14: FSD Lateral Deviation Indicator Linear Deviation (not VTF Approach)

> **NOTE:**
>
> The sensitivity change from ±0.3NM to ±1NM can take as long as 30 seconds to provide a smooth transition for autopilots.



Ref: DO-229D Fig 2-12

Figure 7-15: FSD Lateral Deviation Indicator Linear Deviation VTF Approach

NOTE:

Non-Numeric Cross-Track Deviation

The full-scale deflection for LNAV is either identical to LNAV/VNAV or one of the following:

Angular deviations

1) If a VTF approach has not been selected:

   a) Prior to 2NM from the FAWP, the FSD is ±1NM;

   b) Between 2NM from the FAWP and the FAWP, the FSD is gradually changed to the FSD specified in c) at the FAWP;

   c) At and beyond the FAWP, but before initiating a missed approach, the FDS is the minimum of; constant FSD of ±0.3 NM; or angular FSD defined by a ±2.0° wedge with origin located 10,000 feet past the MAWP. The FSD continues to decrease or reach a minimum of ±350 feet.

2) If a VTF has been selected, the FSD is the minimum of; constant FSD of ± 1NM; or angular FSD defined by a ±2.0° wedge with origin located 10,000 feet past the MAWP. The FSD continues to decrease or reach a minimum of ±350 feet.

7.11. Approach Type Selection

The EFIS selects the approach type (LNAV, LNAV/VNAV, LP, or LPV) when entering approach mode with the following order of precedence and prerequisites:

1) LPV:

   a) LPV Enable is enabled;

   b) ARINC-424 “Level of Service” indicates LPV minimums are published;

   c) Valid long-term, fast and ionospheric SBAS corrections are available and being applied to at least 4 GPS satellites;

   d) Final approach segment data block exists and passes CRC check; and

   e) Horizontal and vertical alert limits from final approach segment data block are predicted to be supported.

Figure 7-16: GPS Mode (LPV APPR)

2) LP: (Same precedence and prerequisites as LPV)

3) LNAV/VNAV:

a) ARINC-424 “Level of Service” indicates LNAV/VNAV minimums are published;

b) If a final approach segment data block exists, LPV Enable is enabled;

c) If a final approach segment data block exists, it passes CRC check; and

d) Horizontal alert limit of 556m (.3NM) is predicted to be supported.

NOTE:

Because the EFIS inherently supports barometric VNAV, it is not a prerequisite that the vertical alert limit be supportable, nor is it a prerequisite that valid long-term, fast, and ionospheric SBAS corrections to be available and applied to at least four GPS satellites. Rather, the vertical alert limit (50m) and SBAS correction tests are used to determine whether to present guidance based upon GPS altitude or barometric altitude.

4) LNAV: Default approach type selected when none of the above selections are made, and there are no prerequisites for selecting LNAV.

The EFIS continuously displays the approach type (mode indication) after selection. The EFIS does not degrade the approach type after selection unless the approach procedure is reselected or changed.

> **NOTE:**
>
> These are GPS/SBAS modes and still appear during a ground-based approach such as an ILS.
>
> Some instrument procedures include notes stating, “RNP 0.3 required,” and are coded as an RNAV procedure. In these cases, select manual RNP to see the RNP and ANP values on the PFD.

7.11.1. Required Navigation Performance

The EFIS supports RNP by the following means:

1) Manually entered RNP values

2) RNP values automatically retrieved from the navigation database that are associated airways or procedures (DPs, STARS, or IAPs).

Table 7-11: RNP Order of Precedence

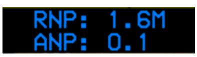
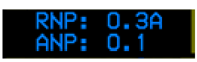
Navigation Mode	**Annunciations**	**Conditions**
Manual RNP (Manually set between 0.1NM and 15NM)		Navigation mode is RNP, and manually entered RNP is used to determine CDI FSD, LON and LOI alerting. Manual RNP overrides all other modes.
Manual RNP on the Final Approach Segment		The system conforms to the mode in the associated ARINC-424 "Level of Service" navigation database record. The level of service tracks the minima lines on the published approach plate.
Automatic RNP (Retrieved from Navigation Database)		When outside the approach region of operation, if a manually entered RNP value does not exist but an automatic RNP value
Automatic RNP on the Final Approach Segment		

Table 7-11: RNP Order of Precedence		
Navigation Mode	**Annunciations**	**Conditions**
		retrieved from the database does exist.
CDI shows RNP navigation mode, and automatically retrieves the RNP value to determine CDI FSD, LON alerting, and LOI alerting.		

> **NOTE:**
>
> When outside the approach region of operation and neither a manually entered nor automatic RNP value exists, the system operation defaults to GPS/SBS operations.

7.11.2. Automatic RNP Mode

In automatic RNP mode, after sequencing the FAWP, the EFIS indicates when the navigation system is no longer adequate to conduct or continue the approach by displaying the LON condition inside the CDI on the transmit enabled display. The flag is latched until no longer in an approach mode.

Figure 7-17: Automatic RNP Mode

7.11.3. Approach Path Definition (GPS Procedures)

Normal IAP path definitions are as specified in the procedure contained in the navigation database. Deviations are provided with respect to the active leg of the approach procedure.

7.11.4. VTF IFR Approach

In addition, the pilot may select a Vectors To Final (VTF) IFR approach, indicating the pilot does not intend to fly the entire procedure. When a VTF IFR approach is selected, the EFIS creates an initial point (IP) waypoint on the extended final approach course to provide deviations relative to the extended final approach course. The IP is a fly-over defined exit heading waypoint, and the leg prior to the IP is designated a discontinuity. Until the FAWP is sequenced, the EFIS indicates a VTF IFR approach has been selected VECTORS to indicate guidance is not relative to a published approach path, and TERPS clearances are not assured.

7.11.5. VTF VFR Approach

The pilot may select a VFR approach to a runway or user waypoint with a defined approach bearing. When a VFR approach is selected, the EFIS creates an IP waypoint approximately 12 NM on the extended final approach course to provide deviations relative to the extended final approach course. The IP is designated as a fly-over defined exit heading waypoint, and the leg prior to the IP is designated as a discontinuity.

Figure 7-18: VTF VFR Approach

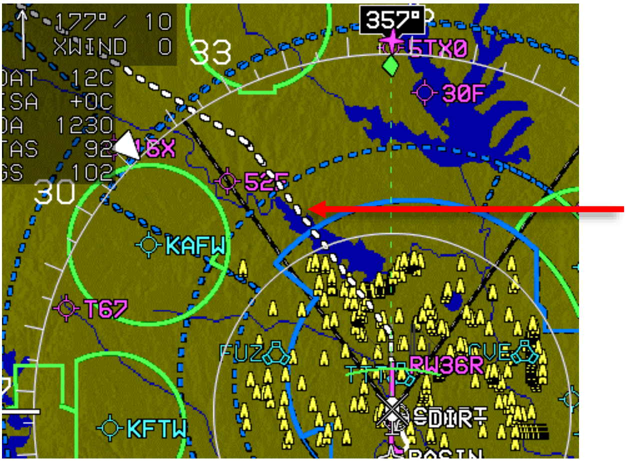
As depicted in Figure 7-18, during the VTF VFR approach, the aircraft proceeds towards the IP. Since the IP is designated as a discontinuity, proceeding direct is not possible. When attempting to proceed direct to the IP, only the active leg between the IP and RW12 is activated.

7.12. Missed Approach and Departure Path Definition

Once on the final approach segment, the pilot may initiate an immediate missed approach or arm the system to execute the missed approach at the MAWP. If armed before crossing the MAWP, the equipment arms the missed approach for automatic initiation at the MAWP. If a missed approach is not initiated prior to crossing the MAWP, the EFIS switches to FROM mode at the MAWP and continues on the same course.

If the pilot initiates the missed approach, the EFIS provides guidance relative to the procedure. If a missed approach is armed prior to crossing the MAWP, the desired path to and after the MAWP is defined by the procedure. If the first leg in the missed approach procedure is not a straight path aligned within 3° of the final approach course, the FSD changes to terminal mode FSD (±1 NM) when the missed approach is initiated.

Otherwise, the FSD changes to ±0.3 NM when the missed approach is initiated (departure mode) and changes to terminal mode FSD (±1 NM) at the turn initiation point of the first waypoint in the missed approach procedure.



Missed Approach

Figure 7-19: Missed Approach and Departure Path

The pilot may select DP guidance and, if the first leg in the DP is not a straight path aligned within 3° of the runway heading, terminal mode FSD (±1NM) is used. Otherwise, the FSD is ±0.3 NM (departure mode) and changes to terminal mode FSD (±1 NM) at the turn initiation point of the first waypoint in the DP.

7.13. Loss of Navigation Monitoring

The EFIS continuously monitors for loss of navigation capability. In manual or automatic RNP mode prior to sequencing the FAWP, the LON caution is displayed with a 10-second time to alert the RNP value is less than 2NM and a 30-second time to alert otherwise. RNP is also a statement of navigation performance necessary for operation within a defined airspace. Use the Faults menu to distinguish the cause of the LON caution. The caution returns to its normal state upon termination of the responsible condition.

Table 7-12: Loss of Integrity Caution Monitoring

Mode of Flight	HAL	Time to Alert
RNP: 0.10A RNP: 15.0A (See Note 1)	As manually set or automatically retrieved	10 Seconds (RNP< 2NM) 30 Seconds (otherwise)

Table 7-12: Loss of Integrity Caution Monitoring		
Mode of Flight	**HAL**	**Time to Alert**
En route	2 NM	30 Seconds
TERMINAL	1 NM	10 Seconds
LNAV APPR	0.3 NM	10 Seconds
LNV/VNV APPR	0.3 NM	10 Seconds
LP APPR LPV APPR	0.3 NM	10 Seconds
Departure	0.3 NM	10 Seconds
Note 1: Only applicable prior to sequencing FAWP. Meeting loss of integrity criteria after sequencing the FAWP is defined as LON.		

NOTE:

This aircraft is equipped for the following individual levels of RNP but may not be capable due to limited satellite coverage. Manual RNP is selectable between 0.10NM and 15NM as follows:

1) 0.01NM increments between RNP 0.10 and RNP 0.3

2) 0.1NM increments between RNP 0.3 and RNP 2

3) 1NM increments between RNP 2 and RNP 15

7.13.1. Faults Menu

Use the faults menu to distinguish the cause of the LON caution. Table 7-13 explains conditions and caution termination for each mode of flight.

Table 7-13: Summary of Faults Menu		
Mode of Flight	**Conditions**	**Caution Termination**
Manual RNP RNP: 0.10M RNP: 15.0M	LON displayed with a 10-second time to alert if RNP value is less than 2NM and a 30-second time to alert.	Returns to normal state immediately upon termination of responsible condition.
Automatic RNP RNP: 0.10A RNP: 15.0A	After sequencing the FAWP, LON displayed when navigation system is no longer is adequate to conduct or continue the approach.	Latched until equipment no longer in an approach mode.

Table 7-13: Summary of Faults Menu

Mode of Flight	Conditions	Caution Termination
En route and Terminal TERMINAL	LON displayed when navigation system is no longer is adequate to conduct or continue the navigation.	Returns to normal state immediately upon termination of responsible condition.
LNAV Approach mode LNAV APPR	Upon passing the FAWP, flag is latched until EFIS is no longer in an approach mode.	Returns to normal state immediately upon termination of responsible condition
LNAV/VNAV Approach mode LNV/VNV APPR	LON displayed when navigation system is no longer adequate to conduct or continue the approach.	After sequencing the FAWP, LON/VERT LON flags are latched until the equipment is no longer in an approach mode. As defined above with the exception that when the LNAV/VNAV approach mode is predicated upon Barometric VNAV. (See Note1)
LP or LPV Approach mode LP APPR LPV APPR	LON or VERT LON displayed when navigation system is no longer adequate to conduct or continue the approach.	Prior to sequencing the FAWP, flags return to normal state immediately upon termination of the responsible condition.
Note 1: A supplemental test is added for lateral and vertical flagging. A supplemental test is added for vertical flagging when barometric altitude information is in a failed state.		

7.13.2. Loss of Integrity Caution Monitoring

The EFIS provides a caution, independent of any operator action when the equipment has a loss of integrity monitoring. When HPL (Horizontal Protection Level) exceeds the applicable HAL (Horizontal Alert Limit) for the longer than applicable time to alert and HPL_{SBAS} exceeds the HAL for the current navigation mode for longer than 2 seconds.

The receiver transmits only one type of HPL, either HPLFD or HPL SBAS, as valid at any time.

Table 7-14: Loss of Integrity Caution Monitoring

All distances used are always based on NM unit.

Mode of Flight	HAL	Time to Alert
RNP: 0.10A RNP: 15.0A (See Note 1) *	As manually set or automatically retrieved	10 Seconds (RNP<2NM) 30 Seconds (otherwise)
En route	2 NM	30 Seconds
TERMINAL	1 NM	10 Seconds
LNAV APPR *	0.3 NM	10 Seconds
LNV/VNV APPR *	0.3 NM	10 Seconds
LP APPR * LPV APPR	0.3 NM	
Departure	0.3 NM	

*Requirements only apply to sequencing FAWP; meeting loss of integrity criteria after sequencing the FAWP is defined as a Loss of Navigation (LON)

Note 1: Only applicable before sequencing FAWP. Meeting loss of integrity criteria after sequencing the FAWP is defined as LON.

The caution returns to its normal state immediately upon termination of the responsible condition.

7.14. Manual Holding Patterns

Most waypoints within an active flight plan can have a manual holding pattern created with the following parameters:

1) Inbound course to the holding fix with 1° increment relative to magnetic or true north.

2) A left or right turn direction.

3) A leg distance, settable in either time (increments of 0.1 minutes from 0.5 minutes to 5.0 minutes) or distance (in NM or KM.) (Increments of 1 unit from 1 to 25 units).

4) When a time setting is used, the speed used to calculate distance is the holding speed set in EFIS limits.

7.15. Selection of an Instrument Procedure

When an instrument procedure is selected and active, the receiver notifies the pilot of the most accurate level of service supported by the combination of the GPS/SBAS signal, receiver, and selected approach using naming conventions on the minima lines of the selected approach procedure. Once the level of service has been given, the EFIS operates in this mode for the duration of the procedure, unless the level of service is unavailable. The EFIS cannot change back to a more accurate level of service until the next time an approach is activated.

The following includes examples of step-by-step procedures:

1) Standard Instrument Departure (DP)

2) VFR Approach to User Waypoint

3) Standard Terminal Arrival Route (STAR)

4) ILS Instrument Approach

5) ILS Instrument Approach with Manual Termination Leg

6) LOC Back Course Instrument Approach

7) RNAV (GPS) Instrument Approach to LP Minima

8) RNAV (GPS) Instrument Approach to LPV Minima

9) RNAV (RNP) Instrument Approach to RNP 0.30 DA

10) NRST ILS Instrument Approach

11) LNAV VOR Instrument Approach

12) Instrument Approach with Missed Approach Flown to Alternate Fix

7.15.1. Standard Instrument Departure (DP) (Step-By-Step)

When valid and the selected waypoint is an airport with a DP in the database, the pilot is presented a selection list of DPs, followed by selection list of transition(s) and runways as appropriate.

1) Press **ACTV (L2)** departure airport must be entered as a waypoint.

2) Rotate ❶ to desired airport and push to enter.

3) Rotate ❶ to **DP..** and push to enter.

4) Rotate ❶ to desired DP. Push to enter.

5) Rotate ❶ to desired runway. Push to enter.

6) ATC issues radar vectors to assigned route as published in the DP text notes.

7) Edit active flight plan accordingly. Press **EXIT (R1)** to exit active menu.

8) Push ❶. Rotate to **NAV LOG** and then push to enter. View first portion and then rotate ❶ to view remainder of NAV Log, if necessary.

7.15.2. VFR Approach to User Waypoint (Step-By-Step)

To create a VFR approach procedure for any of the possible 999 user waypoints stored in the system, it is assumed that user waypoints have been uncluttered on the Map page and user waypoints are visible. In this scenario, a new user waypoint is created at the present location. Not all menu steps are depicted in the EFIS views since they are described in Section 5 Menu Functions and Step-By-Step Procedures.

1) While maneuvering around a desired area, press **MENU (R1)**, within 10 seconds press **FORMAT (R8)**. Rotate ❶ to **PAN ON** and then push to enter.

2) Press **NORTH (L7**) to position the panning ownship symbol near the desired landing user created heliport. Press **WEST (R8)** to position panning ownship symbol directly over the desired landing runway center.

3) Press **MENU (R1)**, within 10 seconds press **DESIG (L3)**, which drops a user waypoint automatically named.

4) Before a VFR approach can be created to this waypoint, it must be edited with an approach bearing and saved.

5) Assuming crossfill is normal, on either MFD or PFD, press **FPL (L1)**, rotate ❶ to **CREATE-EDIT..**, and then push to enter.

6) Rotate ❶ to **EDIT USER WPT** and then push to enter.

7) Rotate ❶ to desired waypoint and then push to enter.

8) Rotate ❶ and push to sequence all five spaces to create desired name for user waypoint and then push to enter through entire editing process, to include adding an approach bearing.

9) Either press **SAVE (R7)** to save the changes or press **D→ (R8)** to save changes and begin navigation guidance to user waypoint and automatically return to **EDIT WHICH USER WPT:** menu.

10) If **D→ (R8)** is pressed followed by **EXIT (R1)** to exit **EDIT WHICH USER WPT:** menu, press **ACTV (L2)** to open active flight plan.

11) Push ❶ to open list of available options for the user waypoint.

12) With the desired waypoint as the active waypoint, press **ACTV (L2)** on any PFD or MFD. Push ❶ to see options, rotate to **VFR APPR..**, and then push to enter.

13) Push ❶ to accept the use of the desired waypoint or press **EXIT (R1)**.

14) Rotate ❶ to change map scale as desired and then turn the aircraft for a downwind toward the IP. (Automatically created approximately 12NM out on the approach bearing approach bearing to the user waypoint.)

15) Press **MENU (R1)**, press **BUGS (R2)**, and then press **VNAV CDA (R4)**. Push ❶ to enter **DCND ANG..**, rotate ❶ to desired angle of descent, and then push to enter.

16) Upon approaching top of descent (TOD), the vertical guidance provides HITS down to 50’ above surface elevation.

7.15.2.1. For VFR Flight Planning

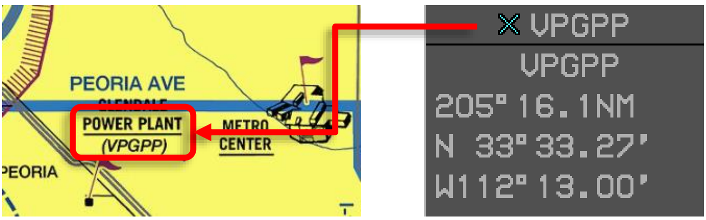


Figure 7-20: VFR Waypoint

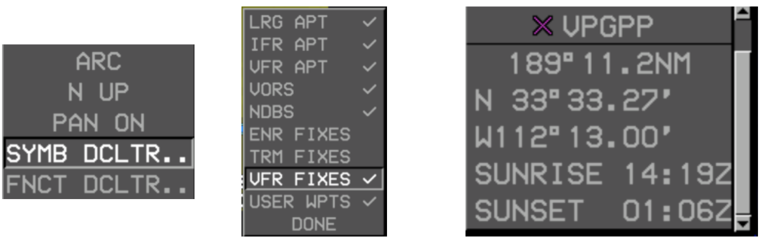


Figure 7-21: Map Format Options

7.15.3. Standard Terminal Arrival Route (STAR) (Step-By-Step)

If the selected waypoint is an airport with a published STAR, this option is available for selection from a list of available STARs, transitions, and runways. After selection, the appropriate STAR is created and displayed on the Map page. Activating a STAR deletes any pre-existing STAR, and it is inserted prior to any approach waypoints if previously entered.

STARs normally terminate at a fix near the airport, so a radar vector or feeder route is used for transition to the approach phase of the arrival. If an instrument approach is activated during the STAR, the approach waypoints are inserted after the STAR.

1) Arrival airport must be entered as a waypoint.
2) Rotate then push ❶ with desired airport highlighted.
3) Rotate ❶ to **STAR..** and push to enter.
4) **PICK STAR:** Rotate ❶ to desired STAR. Push to enter.
5) **PICK TRANS:** Rotate ❶ to desired transition. Push to enter. *= Most logical transition from avenue of arrival.
6) **PICK RW:** Rotate ❶ to desired runway and push to enter.
7) ATC clears direct XXX and ILS/DME RWY XXX. Press **ACTV (L2)**, rotate ❶ to **XXX**, press **D→** **(R4)**, and push ❶ to enter. (See § 7.15.12)
8) Push ❶ and rotate to **NAV LOG**. Push to enter to view first portion and then rotate ❶ to view remainder of NAV Log, if necessary.

7.15.4. ILS Instrument Approach (Step-By-Step)

1) Press **ACTV (L2)**. Rotate ❶ to desired airport and push to enter.
2) Rotate ❶ and select **IFR APPR...** Push to enter.
3) **PICK APPR:** Rotate ❶ to desired instrument approach with matching 5-digit channel number from instrument approach chart and then push to enter.
4) **PICK TRANS:** Rotate ❶ to transition (* indicates most logical from current position). Push to enter.
5) **PICK RW:** Rotate ❶ to assigned runway for landing and then push to enter. (Colors selected runway light gray.)
6) If instructed to hold at XXXXX, press **ACTV (L2)**, rotate ❶ to highlight **XXXXX**, and then push to enter. Rotate ❶ to **HOLD..** and push to enter.
7) Enter holding direction and leg distance or length of time. Push to enter.
8) Established in the hold as directed. When ATC issues clearance for the approach, press **CONT (L6)** to continue waypoint sequencing to the FAF.
9) Passing the FAF, press **ARM (L6)** to arm the missed approach procedure and continue waypoint sequencing.

7.15.5. ILS Approach with Manual Termination Leg in Map (Step-By-Step)

See § 7.6.1 for more information on manual termindation legs.

Activate ILS as described in § 7.15.12. The step-by-step procedure assumes the approach was armed and the aircraft flew past the MAWP.

1) Past the MAWP, auto nav source switches to FMS (as configured). The current -ALT- (altitude termination leg) climbing to XXXX'.
2) After meeting the altitude termination leg requirements, automatic waypoint sequencing suspended and ready for pilot action to press **RESUME (L6)**.
3) Press **RESUME (L6)** to resume normal waypoint sequencing. The course to next active waypoint appears as a magenta line, and active waypoint information is updated.

7.15.6. LOC Back Course Instrument Approach (Step-By-Step)

1) Press **ACTV (L2)**. Rotate ❶ to airport active waypoint. Push to enter.
2) Rotate ❶ to **IFR APPR..** and push to enter.
3) **PICK APPR:** Rotate ❶ to desired LOC back course procedure and push to enter.
4) **PICK TRANS:** Push ❶ to accept transition (* indicates most logical from current position). Push to enter.
5) **PICK RW:** Rotate ❶ to desired runway. Push to enter.
6) Assume ATC issued clearance to proceed direct to the FAF. Press **ACTV (L2)**. Rotate ❶ to the FAF, press D→ **(R4)**, and then push to enter.
7) Press **EXIT (R1)** to exit active menu; or
    a) Push ❶. **WAYPOINT** appears. Push ❶ to accept the as a waypoint with no further action or press **EXIT (R1)**.
8) Press **OBS (L4)**, and then press **NAV VLOC1 (L3)** or **NAV VLOC2 (L4)**, as applicable.
9) Rotate ❶ to set back course bearing of XXX° and push to enter. This results in proper sensing of back course CDI indications.
10) Past the FAF, **MISS (L5)** and **ARM (L6)** appear. Press **ARM (L6)** to arm the missed approach for automatic waypoint sequencing upon passing the MAWPT.
11) Passing the MAWP, nav source automatically switches to FMS (as configured), and CDI color changes from cyan to magenta.

12) If entering the published hold, **CONT (L6)** appears. Press to leave the hold and continue to the next waypoint in active flight plan, if applicable.

7.15.7. RNAV (GPS) Instrument Approach to LP Minima (Step-By-Step)

1) Select desired airport and desired instrument approach as described in § 7.15.4.

2) **PICK TRANS:** Rotate ❶ to **-VTF-** and then push to enter.

3) **PICK RW:** Rotate ❶ to assigned landing runway.

4) ATC issues radar vector to fly HDG 200° to #### and maintain ####'. Rotate ❸ to **200°** and then push to enter.

5) ATC now issues clearance direct XXXXX and cleared for RNAV XXXXX Approach.

6) Press **ACTV (L2)**, rotate ❶ to desired waypoint in active flight plan, press D→ **(R4)**, and then push ❶ to continue.

7) Press **EXIT (R1)** to exit active menu; or

    a) Push ❶. **WAYPOINT** appears. Push ❶ to accept the as a waypoint with no further action or press **EXIT (R1)**.

8) Past the FAF, press **ARM (L6)** to arm the missed approach leg.

9) This leg changes the VDI source to VNV2-G and LP APPR replaces TERMINAL indicating the approach mode.

10) Missed approach is executed. Nav source remains FMS, but FSD scaling automatically switched to 0.3NM.

11) Active waypoint information describes the altitude termination leg ahead.

7.15.8. RNAV (GPS) Instrument Approach to LPV Minima (Step-By-Step)

1) Select desired airport and desired instrument approach, transition, and runway as described in § 7.15.4.

2) ATC issues radar vector to fly HDG 300° to XXXXX**.** Rotate ❸ to **300°** and then push to enter.

3) ATC now issues clearance direct XXXX and cleared for RNAV XXXXX approach. Press **ACTV (L2)**, rotate ❶ to FAF, then press D→ **(R4),** push ❶ to continue.

4) **WAYPOINT** appears. Push ❶ to accept waypoint with no changes or press **EXIT (R1)**.

5) Inside of FAF, LPV APPR indicates the GPS mode of operation.

6) **MISS (L5)** and **ARM (L6)** appear. Press **MISS (L5)** for immediate missed approach or **ARM (L6)** to arm the missed approach leg.

7) Past the MAWP, NAV source remains FMS and scale automatically changes to 0.3NM FSD.

8) Depending on how this procedure was coded, RNP and ANP values may appear for a particular leg with mode of service depicted in CDI area.

9) If entering the published MAWPT, and additional waypoints follow in active flight plan, **CONT (L6)** appears. Press to cancel SUSPEND and navigate to next leg of active flight plan.

7.15.9. RNAV (RNP) Instrument Approach to RNP 0.30 DA (Step-By-Step)

1) Select desired airport and desired instrument approach, transition, and runway as described in § 7.15.4.

2) ATC issues radar vector to fly HDG 300° to XXXXX**.** Rotate ❸ to **300°** and then push to enter.

3) ATC now issues clearance direct XXXX and cleared for RNAV XXXXX approach. Press **ACTV (L2)**, rotate ❶ to FAF, press **(R4)**, and then push ❶ to continue.

4) Press **EXIT (R1)** to exit active menu; or

   a) Push ❶. **WAYPOINT** appears. Push ❶ to accept the as a waypoint with no further action or press **EXIT (R1)**.

5) Inside of FAF, LPV APPR indicates the GPS mode of operation.

6) **MISS (L5)** and **ARM (L6)** appear. Press **MISS (L5)** for immediate missed approach or **ARM (L6)** to arm the missed approach leg.

7) Past the MAWP, NAV source remains FMS and scale automatically changes to 0.3NM FSD.

NOTE:

Depending on how this procedure was coded, RNP and ANP values may appear for a particular leg with mode of service depicted in CDI area.

8) If entering the published MAWPT, and additional waypoints follow in active flight plan, **CONT (L6)** appears. Press to cancel SUSPEND and navigate to next leg of active flight plan.

NOTE:

When outside the approach region of operation, if a manually entered RNP value does not exist. An automatic RNP value retrieved from the navigation database does exist, then the automatically retrieved RNP value is annunciated along with actual navigation performance in the PFI area. The navigation mode is RNP and the automatically retrieved RNP value is used to determine CDI, FSD, LON and LOI alerting.

When outside the approach region of operation and neither a manually entered nor automatic RNP value exists, the system operation defaults to GPS/SBAS operation.

7.15.10. NRST ILS Instrument Approach (Step-By-Step)

This method does not require the airport to be in the active flight plan and uses the NRST MENU with the NRST ILS method of creation.

1) Press **NRST (R3)**. Rotate ❶ to **ILS..** and then push to enter. This action clears any prior active flight plan.

2) Rotate ❶ to highlight desired airport with “ILS” on the left. Push to enter.

3) Push ❶ to **CONFIRM ACTIVATE ILS**. (See Section 6 Quick Tutorial for description of NRST ILS on PFD or MFD.) Following actions occur:

    a) If present, previous active flight plan is deleted.

    b) A vectors-to-final ILS approach is created.

    c) If the heading bug was off (no autopilot installed), it is activated to the current heading.

    d) VLOC 1 and VLOC 2 OBS are set to the associated localizer course.

e) When configured in EFIS limits, ILS frequency is automatically transmitted to NAV1 and NAV2 in standby position. (Pilot must ensure correct frequency is swapped to active position and identified on both nav receivers)

f) EFIS changes to LOC2, and VDI indicates source of glide slope GS (as applicable) when it appears.

4) FAF is the active waypoint. Press **(R4)**. Push ❶ to enter a direct route with navigation guidance to FAF.

5) Published minimums can be set as described in Section 5 Menu Functions and Step-By-Step Procedures.

6) Passing the FAF, **MISS (L5)** and **ARM (L6)** appear. Press **ARM (L6)** to arm the missed approach procedure and continue automatic waypoint sequencing.

7) HITS indicates guidance to follow GPS overlay of the localizer and glide slope. However, the localizer source for CDI and glide slope receiver VDI are the primary navigation sources for guidance on this ILS approach.

8) On short final with indicating the GPS mode of LNAV APPR, GPS mode automatically switches to LNAV APPR and replaced TERMINAL.

9) Push ❶ and rotate to **HSI** and push to enter to display the HSI page. (This must be manually changed back to the Map page if desired during the missed approach procedure as shown in the next step.)

10) During the missed approach, the navigation source automatically switches to FMS with 0.3NM FSD, and terminal mode is active while within the terminal area.

NOTE:

If there is inadequate source data available for a NRST ILS search, the approach is not loaded.

7.15.11. VOR/DME Instrument Approach (Step-By-Step)

1) Select desired airport and desired instrument approach, transition, and runway as described in § 7.15.4.

2) Press **ACTV (L2)**. Rotate ❶ to view procedure and select fix for compliance with ATC clearance. Press (R4) and push ❶ to enter.

3) **WAYPOINT** appears. Push ❶ to accept waypoint with no changes or press **EXIT (R1)**.

4) Set EFIS to display VOR pointers and DME bearing and distance symbology. See Section 5 Menu Functions and Step-By-Step Procedures for more information.

5) Set EFIS minimums. See Section 5 Menu Functions and Step-By-Step Procedures for more information.

6) After passing the FAF, **MISS (L5)** and **ARM (L6)** appear. Press **MISS (L5)** to immediately execute the missed approach procedure or press **ARM (L6)** to arm the missed approach procedure upon crossing the MAWPT.

7) After passing the MAWPT and the missed approach procedure automatically sequenced, aircraft begins following the dashed magenta missed approach course lines on the MAP. NAV source automatically switched to FMS and 0.3 NM FSD.

7.15.12. ILS or LOC RWY XX Instrument Approach with Missed Approach Flown to Alternate Fix (Step-By-Step)

During the instrument approach clearance, ATC advised that in the event of a missed approach, plan to fly the alternate missed approach instructions to XXXXX intersection and hold as published. The ILS or LOC RWY ## instrument approach is loaded and the active flight plan is opened. ❶ is rotated to one position past the end of the active flight plan and **INSERT (R2)** is pressed; and XXXXX entered with ❶ and pushed to enter.

1) Insert XXXXX waypoint in active flight plan. Push ❶ to enter.

2) Press **ACTV (L2)** and rotate ❶ to **XXXXX** and push to enter.

3) Rotate ❶ to **HOLD...** Push to enter.

4) Create published holding pattern at XXXXX. Rotate/push ❶ through the process and push to enter. Observe XXXXX is in correct position in active flight plan after XXXXX.

5) En route to the (FAF) for the ILS RWY XX, observe where XXXXX is located on the map.

6) Upon executing the missed approach, press **ACTV (L2)**, rotate ❶ to **XXXXX**, press D→ **(R4)**, and then push ❶ to enter a direct routing to XXXXX.

7) Verify active flight plan has holding pattern entered as published and is depicted correctly.

8) Established in the holding pattern at XXXXX. When cleared to continue to next waypoint on active flight plan, press **CONT (L6)** to resume waypoint sequencing. If an approach is necessary at the destination, the approach can be loaded without losing the holding pattern at XXXXX, since it was not part of the initial approach procedure loaded into the active flight plan.

NOTE:

PFD Bugs menu VNAV descent angles are not applicable for inside the FAF during a published instrument procedure.

IFR en route, terminal, and instrument approach navigation predicted upon EFIS is prohibited unless the pilot verifies the currency of the navigation database or verifies each selected waypoint for accuracy by reference to current approved data.

Instrument approach navigation must be accomplished in accordance with the approved instrument procedures. These procedures are retrieved from the EFIS navigation database. Before conducting an instrument procedure, the procedure should be verified by reference to current approved data.

Navigation databases should be current for the duration of the flight. If the Aeronautical Information Regulation and Control (AIRAC) cycle is due to change during the flight, operators and pilots should establish procedures to ensure the accuracy of navigation data including suitability of navigation facilities used to define the routes and procedures for flight. Once acceptable means to compare aeronautical charts (new and old) to verify navigation fixes prior to departure, electronic data have traditionally been verified against paper products. If an amended chart is published for the procedure, do not use the database to conduct the operation.

There may be a slight difference between the navigation information portrayed on the chart and the primary navigation display heading. Differences of three degrees or less may result from equipment manufacturer’s application of magnetic variation and are operationally acceptable.

GPS receivers do not “fail down” to lower levels of service once the approach has been activated.

If only LPV VLON appears, use the LNAV minima if the rules under which the flight is operating allow changing the type of approach being flown after commencing the procedure. If the lateral integrity limit is exceeded on an LP approach, a missed approach is necessary, since the lateral alarm limit may not be reset while the approach is active.

Section 8 Terrain Awareness Warning System

8.1. TAWS (Terrain Awareness and Warning System) Functions

The IDU provides TSO-C194 HTAWS functionality. With the rotorcraft configuration and external sensors/switches, the system is configured to options found in Table 8-1:

1) Terrain Display: Terrain and obstacles on PFD and Map.

2) Forward Looking Terrain Awareness (FLTA): Alerts to hazardous terrain or obstructions in front of the aircraft.

3) Excessive Rate of Descent (GPWS Mode 1): Alerts when hazardously high rate of descent above terrain (i.e., descending into terrain).

4) Excessive Closure Rate to Terrain (GPWS Mode 2): Alerts when hazardously high rate of change above terrain (i.e., flying level over rising terrain).

5) Sink Rate after Takeoff or Missed Approach (GPWS Mode 3): Alerts when loss of altitude is detected immediately after takeoff or initiation of a missed approach.

6) Flight into Terrain when not in Landing Configuration (GPWS Mode 4): Alerts when descending into terrain without properly configuring the aircraft for landing.

7) Excessive Downward Deviation from an ILS Glide Slope (GPWS Mode 5): Alerts when deviating below glide slope on the final approach segment of an ILS approach.

Table 8-1: TAWS Functions Provided by the EFIS

Aircraft Type	TAWS Class	Terrain Display	FLTA	GPWS Mode				
				1	2	3	4	5
Rotorcraft RG	Enhanced	✓	✓	✓	✓	✓	✓	✓
Rotorcraft FG	Enhanced	✓	✓	✓	✓	✓		✓
Rotorcraft	Normal	✓	✓			✓		
Notes: RG = Retractable Gear, FG = Fixed Gear								

8.2. Terrain Display

The display of terrain on the PFD and Map are described in Sections 3 Display Symbology and 5 Menu Functions and Step-By-Step Procedures.

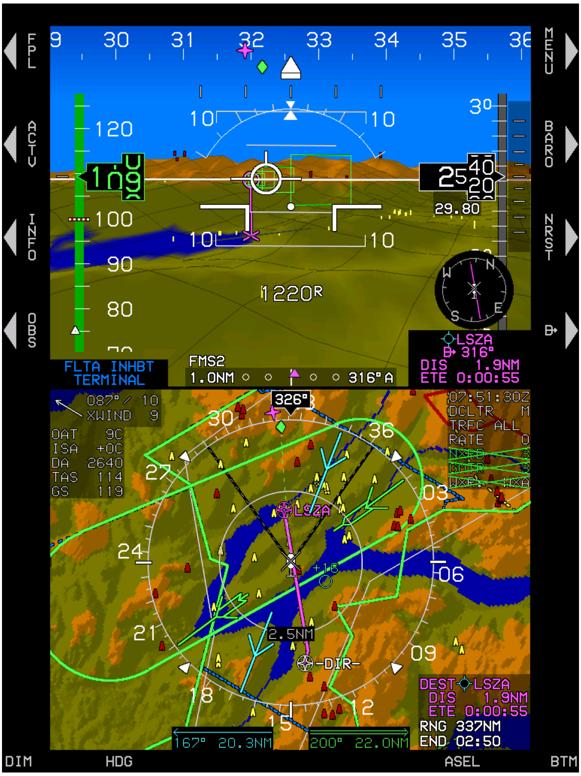


Figure 8-1: Terrain Display with FLTA INHBT

8.3. Forward Looking Terrain Alert Function

FLTA function uses the following to alert to hazardous terrain or obstructions within a search envelope in front of the aircraft:

1) Terrain database
2) Obstruction database
3) Airport and runway database
4) Aircraft position
5) Aircraft track
6) Aircraft ground speed
7) Aircraft bank angle
8) Aircraft altitude
9) Aircraft vertical speed

8.3.1. FLTA Modes

FLTA mode is either slaved to the GPS/SBAS navigation mode or set automatically based upon default mode logic.

8.3.2. GPS/SBAS Navigation Mode Slaving

When slaved, the GPS/SBAS active runway threshold or user waypoint is the reference point for automatic FLTA inhibiting. The advantage is the GPS/SBAS navigation modes are a direct indication to the FLTA function of pilot intent.

8.3.3. Default FLTA Mode

If the default FLTA navigation mode is higher in precedence than the GPS/SBAS navigation mode, FLTA mode is slaved to the default FLTA navigation mode. These modes and order of precedence are:

1) Departure Mode: Enabled when in ground mode. Reference point for automatic FLTA inhibiting and mode envelope definition is the last point at which the ground definition was satisfied (near the liftoff point). Departure Mode ends upon climbing through 1500 feet above or traveling more than 6NM from the reference point.

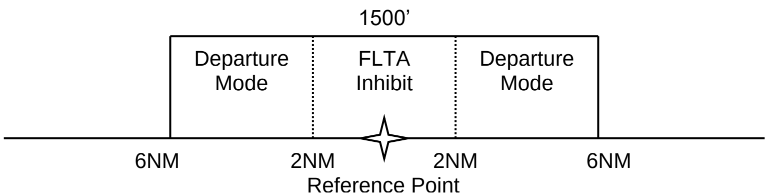


Figure 8-2: Default FLTA INHBT

2) Other Modes: For other default FLTA modes, reference point for automatic FLTA inhibiting and mode envelope is the nearest runway threshold or the nearest user waypoint with a defined approach bearing. TAWS continuously searches all runway thresholds at the nearest three airports (and nearest user waypoints with a defined approach bearing) every 3NM of distance traveled to determine the nearest runway threshold. Modes are as follows:

    a) Approach Mode: When within 1900 feet and 5NM of the reference point.

    b) Terminal Mode: From 5NM to 15NM from the reference point when below an altitude that varies from 1900 feet (at 5NM) to 3500 feet (at 15NM) above the reference point.

    c) En route Mode: When not in any other mode.

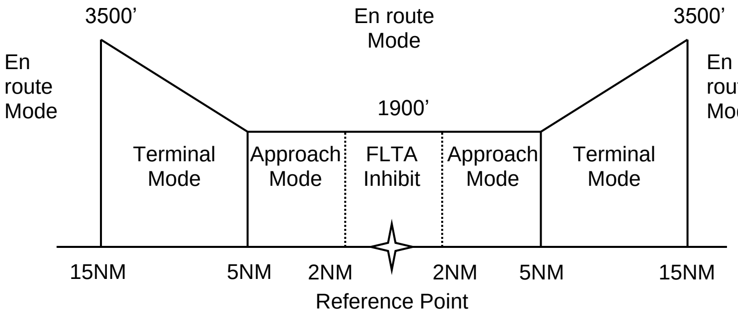


Figure 8-3: FLTA INHBT Mode Areas

8.3.4. FLTA Search Envelope

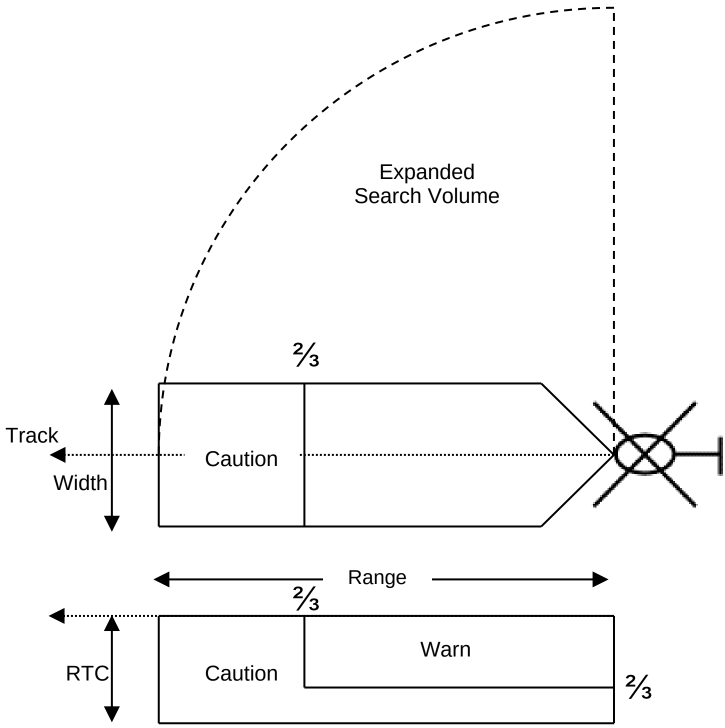


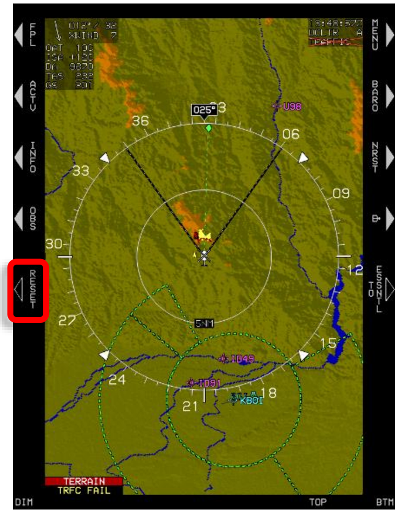
Figure 8-4: FLTA Search Volume

The FLTA search envelope is an area in front of and below the aircraft. If terrain or obstructions are found within the FLTA search envelope, a caution or warning is given. Dimensions of the search envelope depend upon TAWS type, FLTA mode, and aircraft track, ground speed, bank angle, and vertical speed. Basic envelope parameters are as follows:

1) TAWS Type: Determines value of several parameters used to calculate the search envelope.
2) Aircraft Track: Terrain search envelope is aligned with aircraft track.
3) Aircraft Ground Speed: Used in conjunction with range parameter to determine the look-ahead distance and used with FLTA mode to determine search volume width.
4) Aircraft Bank Angle: Used to expand the search volume in the direction of a turn and requires at least 10° of bank. In addition, search volume expansion is delayed, so at 10° of bank, the bank angle must be continuously held for 3.25 seconds.
5) Aircraft Vertical Speed: Used to determine which Required Terrain Clearance (RTC) values should be used. At vertical speeds > -500 fpm, level and climbing flight RTC values are used. At vertical ≤ -500 fpm, descending flight RTC values are used. In addition, vertical speed is used to increase the descending flight RTC value used by the system.

8.3.5. FLTA Alerts and Automatic Pop-Up

PFD IDU #1



MFD IDU #0 in Full Map page

Figure 8-5: PFD in Pop-Up Mode

When terrain or obstructions fall within the FLTA search envelope, an FLTA warning is generated. Terrain rendering is enabled when an FLTA warning is initiated or upgraded as follows:

1) On PFD, terrain rendering is enabled;

2) On map page, terrain rendering is only enabled if TAWS Inhibit is not enabled.

In addition, when an FLTA warning is initiated or upgraded, an automatic pop-up mode is engaged and bottom area display:

3) Switches to map page.

4) Switches to aircraft centered and heading up.

5) Panning disabled.

6) Scale set to:

    a) 10 NM (ground speed > 200 knots)

    b) 5 NM (ground speed ≤ 200 knots and > 100 knots)

    c) 2NM (ground speed ≤ 100 knots)

    After the pop-up mode is engaged, the pilot may change any setting automatically changed by the pop-up mode. In addition, **RESET (L5)** appears for 20 seconds to reset the previous screen configuration with one button press. Pop-ups only occur on IDU #1, and does not occur If TAWS Inhibit is enabled.

8.4. Excessive Rate of Descent (GPWS Mode 1)

GPWS Mode 1 function is present in Enhanced HTAWS and uses aircraft vertical speed information and AGL altitude to alert when the rate of descent is hazardously high as compared to height above terrain. GPWS Mode 1 has a caution and warning threshold. When below the thresholds, a GPWS Mode 1 warning is generated.

<table>
<tr><th colspan="5">Table 8-2: HTAWS GPWS Mode 1 Envelope</th></tr>
<tr><td rowspan="3">Sink Rate (fpm)</td><th colspan="4">AGL Altitude (ft.)</th></tr>
<tr><th colspan="2">Caution Threshold</th><th colspan="2">Warning Threshold</th></tr>
<tr><td>SINK RATE</td><td>SINK RATE</td><td>PULL UP</td><td>PULL UP</td></tr>
</table>

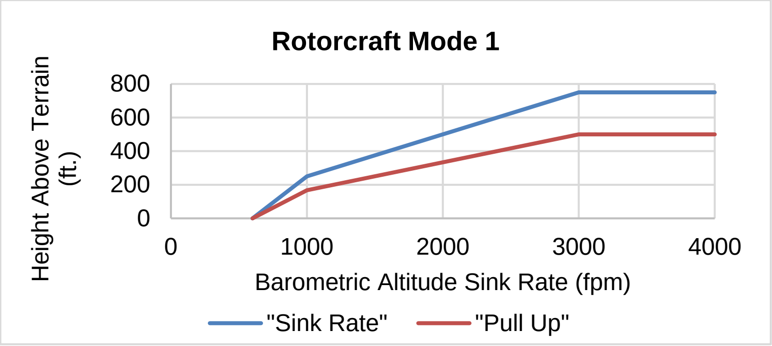


Figure 8-6: Rotorcraft GPWS Mode 1

8.5. Excessive Closure Rate to Terrain (GPWS Mode 2)

GPWS Mode 2 function is present in Enhanced HTAWS only and uses filtered AGL rate and AGL altitude to alert when the rate of change of height above terrain is hazardously high as compared to height above terrain (i.e., flying level over rising terrain). Envelope selection is determined as follows and is based upon a 10-second sampling time.

There are two Mode 2 envelopes: Mode 2A, which is active when not in landing configuration, and Mode 2B, which is active when in landing configuration. Envelope selection is determined as follows.

Table 8-3: HTAWS GPWS Mode 2 Envelopes

Landing Gear	**Mode 2A**	**Mode 2B**
Retractable	Landing Gear Up	Landing Gear Down
Fixed	AGL Altitude > 200 ft or Airspeed > 80 KIAS	AGL Altitude ≤ 200 ft and Airspeed ≤ 80 KIAS

When the GPWS Mode 2 envelope is pierced, a GPWS Mode 2 warning is generated.

Table 8-4: HTAWS GPWS Mode 2A Envelopes (NOT in Landing Configuration)

AGL Rate (fpm)	**AGL Altitude (ft.)**			
	Caution Threshold		**Warning Threshold**	
	TERRAIN	TERRAIN	PULL UP	PULL UP

Table 8-5: HTAWS GPWS Mode 2B Envelopes (Landing Configuration)			
AGL Altitude (ft.)			
Caution Threshold		Warning Threshold	
TERRAIN	TERRAIN	PULL UP	PULL UP

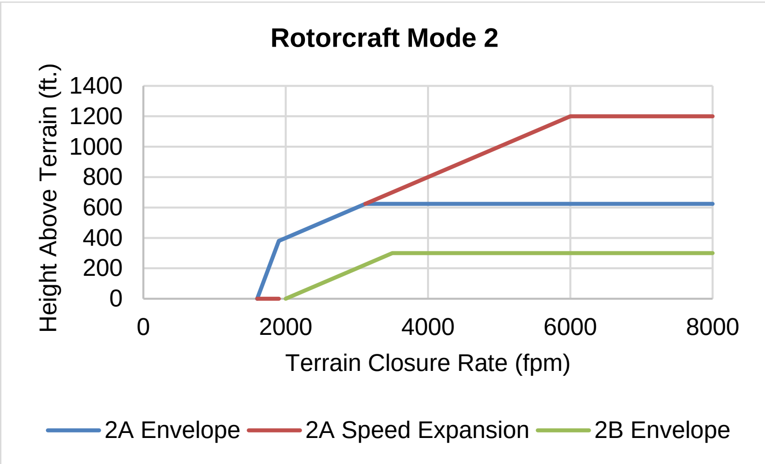


Figure 8-7: Rotorcraft GPWS Mode 2

8.6. Sink Rate after Takeoff or Missed Approach (GPWS Mode 3)

GPWS Mode 3 function uses aircraft vertical speed information and AGL altitude to alert when sink rate is detected immediately after takeoff or initiation of a missed approach. GPWS Mode 3 is armed by either being in ground mode or by being on the first leg of a missed approach procedure (as determined by the GPS/SBAS) with distance to the active runway threshold increasing. GPWS Mode 3 is disarmed upon climbing through 400 feet AGL**,** traveling more than 3NM from the last point at which the ground definition was satisfied (this is near the liftoff point), or transitioning to the second leg of a missed approach procedure. GPWS Mode 3 has a caution threshold based upon height above terrain and vertical speed. When below the caution threshold (AGL threshold = 1.4 x sink rate), a GPWS Mode 3 caution is generated.

Figure 8-8: GPWS Mode 3 Warning (Sink Rate after Takeoff or Missed Approach)

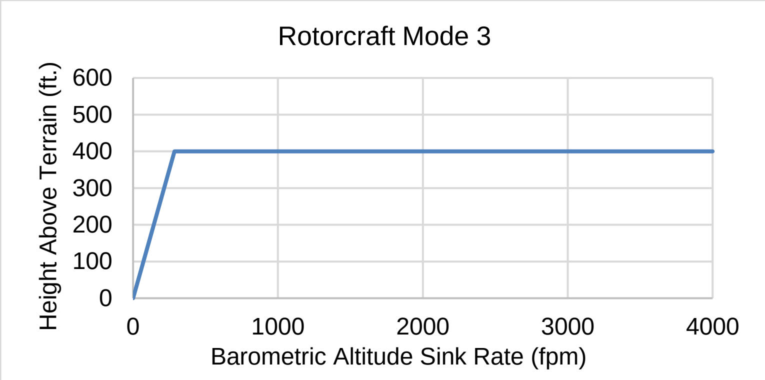


Figure 8-9: Rotorcraft GPWS Mode 3

8.7. Flight into Terrain when not in Landing Configuration (GPWS Mode 4)

GPWS Mode 4 function is present in Enhanced HTAWS and uses aircraft speed information and AGL altitude to alert when descending into terrain without properly configuring the aircraft for landing. There are two Mode 4 envelopes: Mode 4A, which gives cautions when landing gear is in other than landing configuration, and Mode 4B, which gives cautions when landing gear are in other than landing configuration. Applicability of Mode 4 envelopes to aircraft types are as defined in Table 8-6.

Table 8-6: HTAWS GPWS Mode 4 Envelopes

Landing Gear	Mode 4A	Mode 4B
Retractable	Landing Gear Up	Not Applicable
Fixed	Not Applicable	Not Applicable

Mode 4 envelope consists of low-speed and high-speed regions.

Table 8-7: HTAWS GPWS Mode 4 Alerting Criteria

Region	Caution Flag	Single Voice Alert
Low-Speed		"Too Low Gear"
High-Speed		"Too Low Terrain"
Autorotation expansion, when engaged, regardless of speed		"Too Low Gear"

Mode 4 alerting criteria require the Mode 4 envelope to be entered from above so changing aircraft configuration while within a Mode 4 envelope does not generate an alert.

Table 8-8: HTAWS GPWS Mode 4A Envelopes

Segment	Speed (KIAS)	AGL Altitude (ft.)
4A Low-Speed	< 100	150 (400 in autorotation)
4A High-Speed	≥ 100	

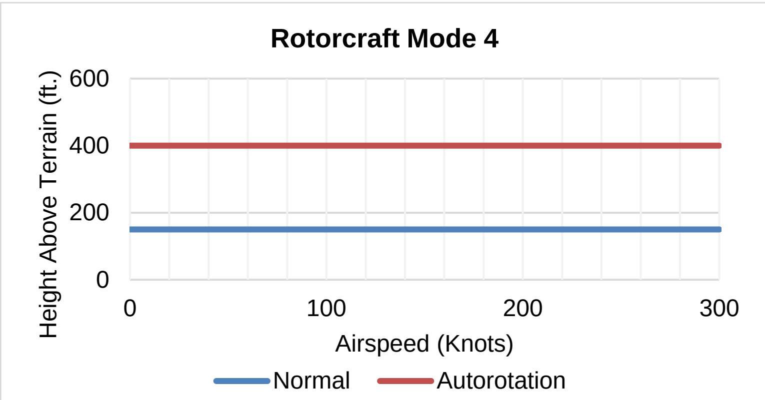


Figure 8-10: Rotorcraft GPWS Mode 4

8.8. Excessive Downward Deviation from an ILS Glide Slope (GPWS Mode 5)

GPWS Mode 5 function is present in Enhanced HTAWS only and uses ILS glide slope deviation information and AGL altitude to alert when an excessive downward glide slope deviation is detected on the final approach segment of an ILS approach. GPWS Mode 5 is armed when a valid glide slope signal is being received, and the aircraft is below 1000' AGL.

GPWS Mode 5 has a caution and warning threshold. When below a threshold, a GPWS Mode 5 warning is generated. The curve compares glide slope deviation to AGL altitude.

Table 8-9: HTAWS GPWS Mode 5 Envelopes

Caution Threshold	Warning Threshold
GLIDESLOPE GLIDESLOPE	GLIDESLOPE GLIDESLOPE

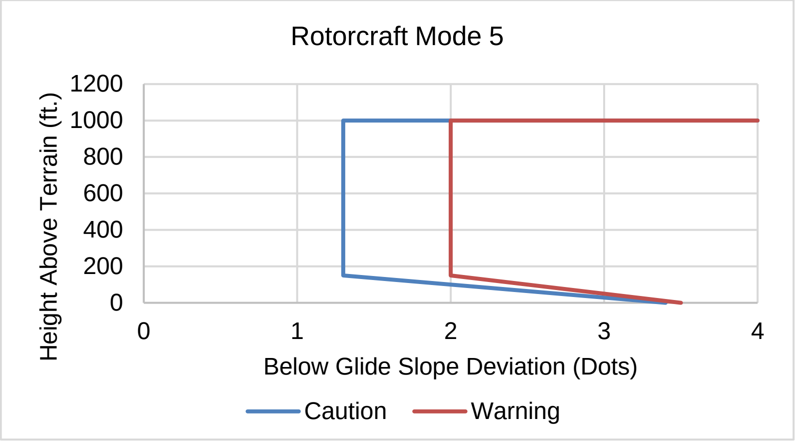


Figure 8-11: Rotorcraft GPWS Mode 5

8.9. External Sensors and Switches

TAWS requires a variety of inputs from external sensors and switches to perform its functions as follows:

1) GPS/SBAS Receiver. Source of aircraft position, geodetic height, horizontal figure of merit (HFOM), vertical figure of merit (VFOM), loss of integrity (LOI), and loss of navigation (LON). Connects directly to the IDU.

2) Air Data Computer (ADC). Source of barometric altitude, outside air temperature, and vertical speed. Connects directly to the IDU.

3) ILS Receiver. Glide slope receiver is the source of glide slope deviation.

4) Radar Altimeter (RA). Source for radar altitude.

5) Gear Position Sensors. As configured in the system limits, source of landing gear position.

6) TAWS Inhibit Switch. As configured in the system limits, used for manual inhibiting of TAWS alerting functions. Gives an indication of actuation (e.g., toggle/rocker or button with indicator light and TAWS INHBT).

7) Low Altitude Mode Switch. As configured in the system limits, used for inhibiting and modifying HTAWS alerting functions to allow normal operation at low altitudes. Low Altitude Mode Switch is of the latching type and gives an obvious indication of actuation (e.g., toggle/rocker or

button with indicator light and TAWS LOW ALT in the lower left corner of PFI area on PFD).

8) Audio Mute Switch. Momentarily activated to silence active audible alerts. It is connected directly to the IDU.

9) Glide Slope Deactivate Switch: As configured in the system limits, momentarily activated to inhibit GPWS Mode 5 function.

10) Low Torque Sensor: A low torque discrete, as configured in the system limits and used for inhibiting and modifying HTAWS alerting functions during an autorotation.

Table 8-10: External Sensors and Switches (Applicable HTAWS)

Aircraft Type	**Rotorcraft RG**	**Rotorcraft FG**	**Rotorcraft**
HTAWS Class	Enhanced	Enhanced	Normal
GPS/SBAS	✓	✓	✓
ADC	✓	✓	✓
Gear Position Sensor	✓		
TAWS Inhibit Switch	✓	✓	✓
Audio Cancel Switch	✓	✓	✓
Low Altitude Mode Switch	✓	✓	✓
Low Torque Sensor	✓	✓	
ILS	✓	✓	
Radar Altimeter	✓	✓	
Glide Slope Deactivate Switch	✓	✓	
Notes: RG = Retractable Gear; FG = Fixed Gear			

8.10. TAWS Basic Parameter Determination

Fundamental parameters used for HTAWS functions are as follows.

Table 8-11: HTAWS Basic Parameters Determination

Parameter	**Source**	**Notes**
Aircraft position, ground speed, and track	GPS/SBAS	HFOM must be less than or equal to the greater of 0.3 NM or the horizontal alert limit (HAL) for mode of flight
MSL Altitude Secondary source of MSL altitude is barometric altitude	GPS/SBAS	Geodetic height converted to MSL with current EGM database. To be considered valid to use as MSL altitude, VFOM must be less than or equal to 106 feet.

Table 8-11: HTAWS Basic Parameters Determination		
Parameter	**Source**	**Notes**
from an air data computer.		Barometric altitude is based upon a barometric setting in the following order of preference: 1) If either the pilot or co-pilot system is operating in QNH mode, the QNH barometric setting is used (i.e. on-side barometric setting preferred); or 2) If GPS/SBAS geodetic height has been valid within the last 30 minutes, a barometric setting derived from the GPS/SBAS geodetic height is used. If neither of the above conditions is met, MSL altitude is marked as invalid. When a reporting station elevation is determined and outside air temperature is valid, a temperature correction is applied. HTAWS uses the lower of the barometric altitude or the temperature-corrected altitude. In the case of QNH-mode barometric setting, reporting station elevation is derived from waypoint or active runway elevations in the active flight plan using the following logic: 1) If the aircraft is in TERMINAL, DEPARTURE, IFR APPROACH, or VFR APPROACH mode and an active runway exists, reporting station elevation is the elevation of the active runway threshold. 2) Otherwise, if the aircraft is in TERMINAL mode, reporting station elevation is the elevation of the airport causing TERMINAL mode. 3) In EN ROUTE mode, no reporting station elevation is determined.

Table 8-11: HTAWS Basic Parameters Determination		
Parameter	**Source**	**Notes**
		In the case of GPS/SBAS geodetic height-based barometric setting, reporting station elevation is the GPS MSL altitude reported at the time the barometric setting was determined (see Section 3 Display Symbology).
Terrain Data	Terrain Database	To be considered valid, the following must apply: 1) Aircraft position is valid; 2) Aircraft position is within the boundaries of the terrain database; and 3) Terrain database is not corrupt as determined by built-in test at system initialization and during runtime.
Obstacle Data	Obstacle Database	To be considered valid, the following must apply: 1) Aircraft position is valid; 2) Aircraft position is within the boundaries of the obstacle database; and 3) Obstacle database is not corrupt as determined by built-in test at system initialization.
AGL Altitude	Radar Altitude	Secondary source is MSL altitude less terrain altitude.
Vertical Speed	Instantaneous Vertical Speed	IVSI values come from barometric vertical speed from an ADC "quickened" with vertical acceleration from an AHRS. Secondary source for vertical speed is barometric vertical speed from an ADC. Tertiary source for vertical speed is GPS/SBAS vertical speed providing the VFOM is less than or equal to 106 feet.
Terrain Closure Rate	Smoothed first derivative of AGL altitude	Due to multiple sources for altitude, there are multiple sources for terrain closure rate.

Table 8-11: HTAWS Basic Parameters Determination		
Parameter	**Source**	**Notes**
Runway/ Reference point location	EFIS navigation database	To be considered valid, the following must apply: 1) Aircraft position is valid; 2) Aircraft position is within boundaries of the navigation database; and 3) Navigation database is not corrupt as determined by a built-in test at system initialization.

8.11. TAWS Automatic Inhibit Functions (Normal Operation)

The following automatic inhibit functions occur during normal TAWS operation to prevent nuisance warnings:

1) FLTA function is automatically inhibited when in terminal, departure, IFR approach, or VFR approach modes and within 2 NM and 1900' of the reference point.

2) GPWS Modes 1 through 4 are automatically inhibited when below 50 feet AGL (radar altimeter AGL altitude) or below 100 feet AGL (terrain database AGL altitude).

3) GPWS Mode 4 is inhibited while Mode 3 is armed.

4) GPWS Mode 5 is inhibited below 200' AGL. This form of automatic inhibit remains active until the aircraft climbs above 1000' AGL and prevents nuisance alarms on missed approach when glide slope receiver detects glide slope sidelobes.

5) FLTA function is automatically inhibited when indicated airspeed or ground speed is below the HTAWS FLTA inhibit speed.

8.11.1. TAWS Automatic Inhibit Functions (Abnormal Operation)

The following automatic inhibit functions occur during the specified abnormal operations:

1) Autorotation detection: When the low torque sensor is active, an Enhanced HTAWS enters autorotation mode. In this mode:

   a) FLTA is inhibited;

   b) GPWS Mode 1 is inhibited;

c) GPWS Mode 2 is inhibited; and

d) GPWS Mode 4 uses a modified envelope (see § 8.7).

8.11.2. TAWS Manual Inhibit Functions

The pilot may select the following manual inhibit functions:

1) Terrain Display may be inhibited using an EFIS soft menu declutter control. (See Section 3 Display Symbology for PFD background for details.)

2) All TAWS alerting functions (including pop-up functionality) are inhibited with the external TAWS inhibit switch, which does not affect the terrain display function, including FLTA warning (red) and caution (amber [yellow]) cells on MAP page and PFI.

3) Low Altitude Mode Switch may be actuated to inhibit or modify parameters for alerting functions. This switch desensitizes HTAWS when purposefully flying VFR at low altitudes with the following effects:

    a) GPWS Mode 1 is inhibited.

    b) GPWS Mode 2 is inhibited.

    c) GPWS Mode 3 is inhibited.

4) GPWS Mode 5 is inhibited with the glide slope cancel switch when below 1000’ AGL. GPWS Mode 5 manual inhibit automatically resets by ascending above 1000’ AGL.

8.12. TAWS Selections on PFD

Terrain and obstruction symbology for FLTA alerts meet the following requirements:

1) Terrain cells that pierce the FLTA warning volume are colored red.

2) Terrain cells that pierce the FLTA caution volume are colored yellow.

3) Obstructions whose tops pierce the FLTA warning volume are visually distinct from the non-alerting obstructions and flash.

4) Obstructions whose tops pierce the FLTA caution volume are visually distinct from non-alerting obstructions.

The following figures show all possible scenarios including “None” where the aircraft pierces the TAWS FLTA terrain envelope, and SVS TAWS is enabled for the safest possible warning alert condition.

PFD SVS Basic

PFD SVS TAWS with Terrain Warning

PFD SVS TAWS with Obstruction Caution

PFD SVS TAWS with Obstruction Warning

Figure 8-12: PFD TAWS Selections

If SVS TAWS and SVS BASIC were not selected and the aircraft pierced the TAWS FLTA Terrain envelope, the EFIS automatically enables SVS TAWS. TERRAIN takes precedence over OBSTRUCTION.

PFI area TAWS deselected

Aircraft pierces TAWS FLTA terrain envelope

Figure 8-13: Automatic PFD Terrain Caution

Section 9 Appendix

9.1. Operating Tips

This section contains a variety of useful information not found elsewhere in the document and includes operating tips, system specifications, and environmental requirements.

With the Genesys Aerosystems EFIS installed and certified in all categories of certified aircraft, numerous tips and suggestions are available for obtaining the maximum performance and benefit from this system.

9.2. Domestic or International Flight Planning

Due to the differences in every aircraft avionics suite installation for the pilot to determine what equipment code is applicable for domestic or international flight plans, the aircraft operator must determine which certifications pertain to them. Visit the FAA website, www.faa.gov, for flight plan guidance for both domestic and international filers, as well as, information and documentation regarding FAA, ICAO, and flight services agreements and procedures.

9.3. Altitude Miscompare Threshold

The altitude miscompare threshold is based upon allowable altitude error. There are two components to allowable altitude error, instrument error and installed system error. Table 9-1 defines the allowable instrument error is based upon the values of SAE AS8002A Table 1.

Table 9-1: Allowable Instrument Error

Altitude	Allowed Error
Sea Level	25’
1,000’	25’
2,000’	25’
3,000’	25’
4,000’	25’
5,000’	25’
8,000’	30’
11,000’	35’
14,000’	40’
17,000’	45’
20,000’	50’

Allowable installed system error is added on top of instrument error and these values are derived from the regulations as defined in Table 9-2.

Table 9-2: Regulatory Reference	
Regulation	**Allowed Error**
14 CFR § 27.1325	At sea level, the greater of 30’ or 30% of the calibrated airspeed in knots. This increases proportionally to SAE AS8002A Table 1 at higher altitudes.
14 CFR § 29.1325	

An allowable altitude error is computed for each compared value and added together to create the altitude miscompare threshold. This accommodates for the values deviating in different directions.

Worked example for a calibrated airspeed of 100 knots and comparing a first altitude of 3,490’ with a second altitude of 3,510’:

1) Calculate allowable instrument error based upon altitudes:
   Allowable Instrument Error #1 = 50’
   Allowable Instrument Error #2 = 50’

2) Calculate allowable installed system error based upon altitudes and calibrated airspeed:
   Allowable Installed System Error #1 = 30’
   Allowable Installed System Error #2 = 30’

3) Calculate altitude miscompare threshold based upon sum of above allowable errors:
   Altitude Miscompare Threshold = 160’

9.4. Airspeed Miscompare Threshold

Airspeed miscompare threshold is based upon allowable airspeed error. There are two components to allowable airspeed error, instrument error and installed system error. Table 9-3 defines the allowable instrument error is based upon the values of SAE AS8002A Table 3.

Table 9-3: Airspeed Error	
Calibrated Airspeed	**Allowed Error**
50 knots	5 knots
80 knots	3 knots
100 knots	2 knots
120 knots	2 knots
150 knots	2 knots
200 knots	2 knots

Allowable installed system error is added on top of instrument. Error and these values are derived from the regulations as defined in Table 9-4.

Table 9-4: Airspeed Regulatory Reference	
Regulation	**Allowed Error**
14 CFR § 27.1323	Starting from (0.8 x V_{CLIMB}): Greater of 5 knots or 3%. Do not perform a comparison if either value is below (0.8 x V_{CLIMB}).
14 CFR § 29.1323	For climbing flight (VSI > 250 feet per minute): Starting from (V_{TOS} – 10): 10 knots Do not perform a comparison if either value is below (V_{TOS} – 10) For other flight regimes: Starting from (0.8 x V_{TOS}): Greater of 5 knots or 3%. Do not perform a comparison if either value is below (0.8 x V_{TOS}). System uses V_{CLIMB} as a substitute for V_{TOS}.

An allowable airspeed error is computed for each compared value and added together to create the airspeed miscompare threshold and accommodates for the values deviating in different directions.

9.5. Jeppesen Sanderson NavData® Chart Compatibility

As GPS navigation, flight management systems, computer flight maps, and computer flight planning systems have gained acceptance, avionics companies and software developers have added more features. Even with the many systems available today, current external en route, departure, arrival, and approach charts are still required and necessary for flight. Avionics systems, flight planning, computer mapping systems, and associated databases might not provide all of the navigation information needed to conduct a legal and safe flight. They are not a substitute for current aeronautical charts.

See www.Jeppesen.com for the latest information on coding instrument procedures, naming conventions, altitudes within the database, and aeronautical information compatibility.

9.6. Data Logging and Retrieval

The EFIS logs all data associated with a flight, including all flight instrument and navigation data, which may be downloaded for review after flight. Data from the last 5 flights (power cycles) or 20 hours are logged at a one-second interval.

Data logging files contain recordings of flight and engine parameters of up to five hours each from the previous five system operations. During system operation, flight and engine parameters are recorded every one second. Each time the parameters are recorded, a Zulu time stamp followed by three lines of comma delimited ASCII text data are written where the first line contains flight parameters and, the second line contains engine parameters.

With IDU powered off, open USB door, and insert USB flash drive. Power up, and select **Download LOG Files** to create a “\log” directory on the USB flash drive and copy the data logging files into the directory.

CAUTION:

Always install a valid USB flash drive in the IDU prior to activating any GMF to avoid erroneous failure indications or corruption of the IDU.

9.6.1. Delete Log Files

1) If there are problems updating a navigation database or application software due to an excessively large log file, select “Delete Log Files” to delete all log files in the log directory.

2) Files named “LOG00.dat” thru “LOG04.DAT” and “MSGLOG.DAT” are deleted. This does not affect operations of the EFIS, as the EFIS generates new “LOG00.DAT” and “MSGLOG.DAT” files once a power cycle begins at power on. Press any button on the IDU or push ❶ to return to the Ground Maintenance menu.

9.6.2. Logged Flags and Custom CAS Messages

Flags and custom CAS messages are logged in memory to a file named “caslog00.csv” (*.csv files may be opened in Microsoft Excel or similar spreadsheet software). In addition, data from the previous four flights are saved in files “caslog01.csv” through “caslog04.csv.” Upon system start, the existing “caslog00.csv” through “caslog03.csv” files are renamed “caslog01.csv” through “caslog04.csv,” and “caslog00.csv” is opened for active logging.

The first line of the log files contains column headings related to the flag’s text (for standard warning functions) or the “CAS Log File Text” parameter (for custom CAS messages). All standard warning functions are logged. Only custom CAS messages with valid “CAS Log File Text” parameters (i.e., not an empty string) are logged. Within the data fields of the log file, values are written as defined in Table 9-5.

Table 9-5: Log File Values	
Category	**Value**
NORMAL	0
ADVISORY	1
CAUTION	2
WARNING	3

9.7. Routes and Waypoints

The navigation database includes VFR waypoints, which consist of five digits beginning with "VP." These may be found on VFR charts and should be loaded in the FMS prior to flight to ensure they are available in the database, and info checked for proper location.

9.7.1. Download Routes and User Waypoints

1) Select **Download Routes and User Waypoints** from the GMF to download all routes and user waypoints stored in the IDU to the USB flash drive. This option is useful for fleet operations where multiple aircraft fly the same routes.

2) Routes are stored on USB flash drive as NAME1-NAME2.RTE where NAME1 is the 1 to 5-character designation of the origin waypoint and NAME2 is the 1 to 5-character designation of the destination waypoint. User waypoints are stored on the USB flash drive as "USER.DAT."

9.7.2. Upload Routes and User Waypoints

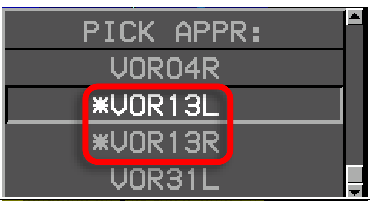
To copy all routes and user waypoints from a USB flash drive to the IDU, select **Upload Routes and User Waypoints** from GMF. Use this option in conjunction with the "Download Routes and User Waypoints" option to upload the same routes and user waypoints in multiple aircraft.

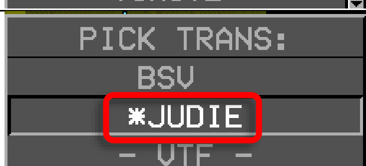
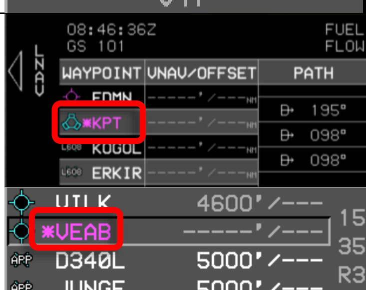
9.7.3. Delete Routes and User Waypoints

When corrupted routes cause the IDU to continually reboot, select **Delete Routes** on the Ground Maintenance page to remove all routes and the user waypoint file (USER.DAT) from the IDU.

9.8. Summary of Asterisk Symbology

<table>
<tr><th colspan="2">Table 9-6: Summary of Asterisk Symbology Use</th></tr>
<tr><th>Examples of Asterisk Locations</th><th>Meaning of Asterisk Use</th></tr>
<tr><td>

Examples include “VOR or GPS RWY…” or “RNAV (GPS) RWY…”

</td><td>Approved approaches are noted by an asterisk (*) before the approach procedure label. These approaches do not require any ground based navigational aids.

Instrument approach title includes “RNAV” or “(GPS).”</td></tr>
<tr><td>
</td><td>Transition most likely selected due to avenue of arrival. (Not all instrument procedures include a transition.)</td></tr>
<tr><td>
</td><td>In addition to the magenta color, asterisk designates the active leg.</td></tr>
<tr><td>
</td><td>Asterisk designates the nearest end point.</td></tr>
</table>

9.9. USB Flash Drive Limitations

When powering up the IDU with a USB flash drive inserted and “Error: No updater files found on USB drive” displays, the USB is likely not acceptable for loading or transferring data.

1) Ensure the USB flash drive with required files is properly connected.
2) Try again after reboot.
3) Press any button to continue.
4) Try a different USB flash drive.

NOTE:

USB flash drive must be formatted as FAT16 or FAT32.

If the flash drive is not recognized, try another source.

Traffic

T 1. Traffic Symbology

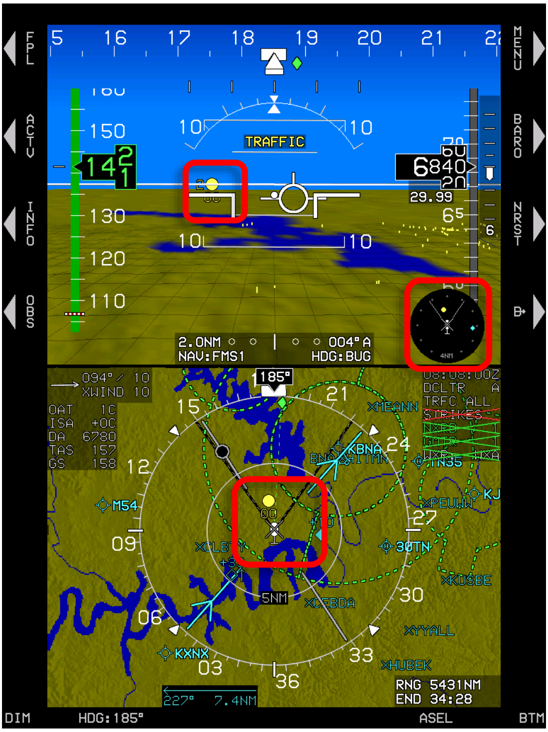


Figure T-1: Traffic Symbology

T 1.1. Traffic Display Definitions

1) Resolution Advisory (RA): Traffic with a dangerous closest point of approach and generates climb or descent commands as defined by internal TCAS-II sensor logic.

2) Traffic Advisory (TA): Traffic with a dangerous closest point of approach as defined by internal traffic sensor logic.

3) Proximate Advisory (PA): Traffic within 6NM/11KM and ±1200'/±366M from ownship that is not an RA or TA.

4) Other Traffic (OT): Traffic beyond 6NM/11KM or ±1200'/±366M from ownship that is not an RA or TA.

T 1.2. Traffic Rendering Rules

Table T-1: Traffic Rendering Rules

Type Traffic	Distance*	Results
TA Traffic (TCAS-I/II, TAS, and TIS-A	Off-scale	Half-symbols
TA Traffic (no bearing)	N/A	Displayed with text
OT and PA traffic (no bearing)		Not displayed
OT and PA Traffic	Beyond 6 NM/11KM	
TAS or TIS-A Sensor	Within 200'/61M of ground	
*Displayed in NM or KM, altitude displayed in feet or meters, and VSI in fpm or m/s depending on the setting of the "Speed Units" system limit.		

Table T-2: Traffic Symbology

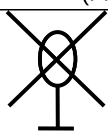
Type Traffic	Symbology			
TCAS-I, TCAS-II, TAS and TIS-A	 Other Traffic	Proximate Advisory	Traffic Advisory (Flashing)	Resolution Advisory (Flashing)
Ownship Symbol				

Table T-3: ADS-B Traffic Symbols

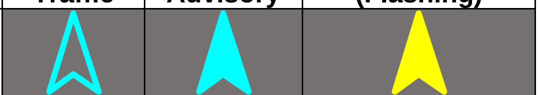
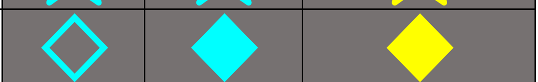
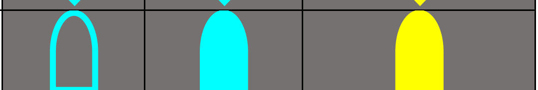
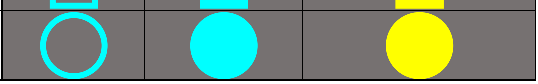
	Other Traffic	Proximate Advisory	Traffic Advisory (Flashing)
High-Integrity Traffic with Track Information			
High-Integrity Traffic without Track Information			
Degraded Position Traffic with Track Information			
Degraded Position Traffic without Track Information			

Table T-4: Pilot Selected OT and PA Traffic Altitude-Filter

Mode	Parameter
AUTO	If aircraft VSI is less than -500fpm, traffic within +2,700 and -9,900 feet of aircraft altitude displayed. If aircraft VSI is more than +500 fpm, traffic within -2,700 and +9,900 feet of aircraft altitude displayed. Otherwise, traffic within -2,700 and +2,700 feet of aircraft altitude displayed.
ABOVE	Traffic within -2,700 and +9,900 feet of aircraft altitude displayed.
BELOW	Traffic within +2,700 and -9,900 feet of aircraft altitude displayed.
NORMAL	Traffic within -2,700 and +2,700 feet of aircraft altitude displayed.
ALL	All received traffic displayed, no altitude filtering.
All values are altitudes in feet or meters depending upon “Speed Units” system limit and VSI rates in fpm.	

Traffic pop ups: When a traffic alert is generated, a pop-up function displays traffic on the PFI, moving map page, and mini traffic on the PFI.

Figure T-2: Traffic Pop-Ups

T 1.3. Mini Traffic

When selected from declutter options, mini traffic is displayed in the lower right corner of the PFI area of the PFD above the active waypoint identifier and has clock face markings fixed at the 6 NM scale.

Distance in NM

Distance in KM

Figure T-3: Mini Traffic

When using kilometers scale, selected from declutter options, **MINI TRFC**, is normally fixed at 10KM.

During traffic warning (TA or RA), and the aircraft is above 500' AGL, the mini traffic scale automatically adjusts in multiples of units depending on EFIS limits settings (see Table T-5).

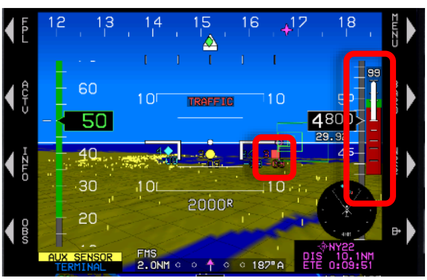
Table T-5: Mini Traffic Scale

Distance in NM			Distance in KM		
2	4	6	3	6	10

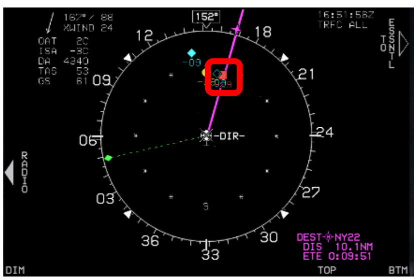
The mini map, mini traffic, and analog AGL indication are mutually exclusive with mini traffic taking precedence during a traffic warning (TA or RA) if above 500'AGL. This feature automatically disappears in the Unusual Attitude mode.

T 1.4. TCAS-II Traffic Resolution Advisory Indicator

When TCAS-II is enabled, the background of the VSI functions as an RA display with green and red colored regions for resolution advisory guidance.



RA PFD



RA MFD Traffic Page

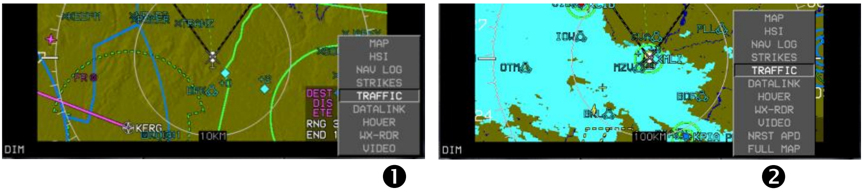
Figure T-4: TCAS-II RA Indication

T 2. Dedicated Traffic Page

When selected, a traffic page is available based roughly on the appearance of a TCAS display and has the following elements.

T 2.1. MFD Page Menu

TRAFFIC: Shows the Traffic page.



PFD or MFD Bottom Traffic Page

MFD Top Traffic Page

Figure T-5: Traffic Page Access

When MFD is a full Map page, selecting the Traffic page changes the configuration to Traffic page on the bottom area and the top area returns to its last configured page.

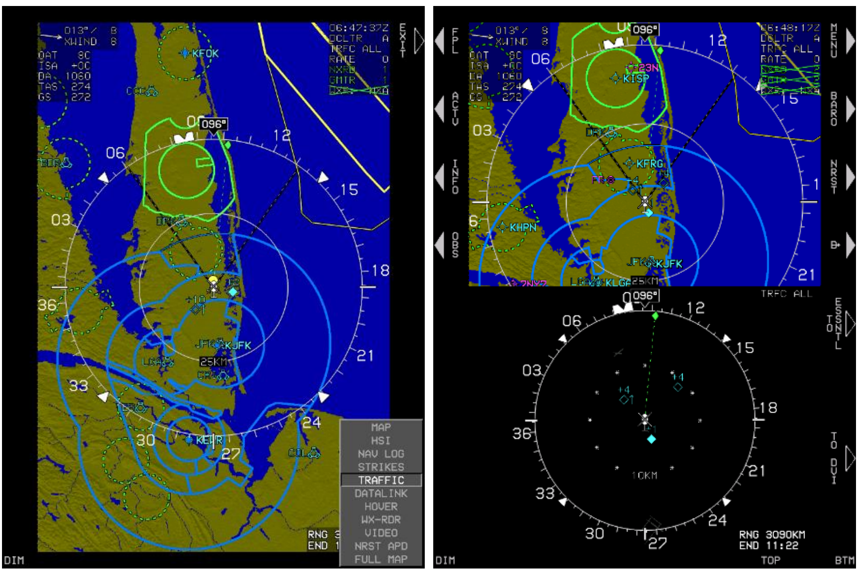


Figure T-6: Traffic Page Access (MFD Full Map Page)

T 2.2. PFD First-Level Menu in Normal Mode

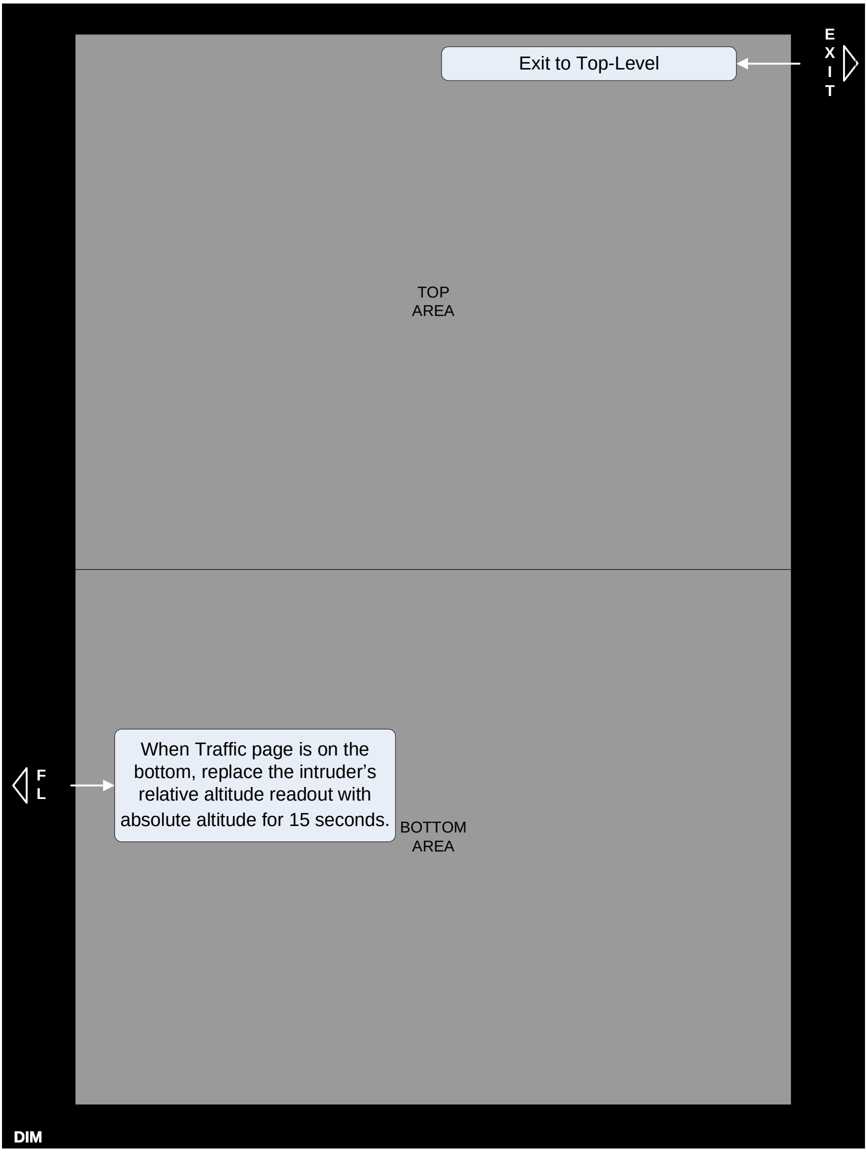


Figure T-7: PFD First-Level Menu in Normal Mode

T 2.3. MFD First-Level Menu in Normal Mode (MFD Page in Both Areas)

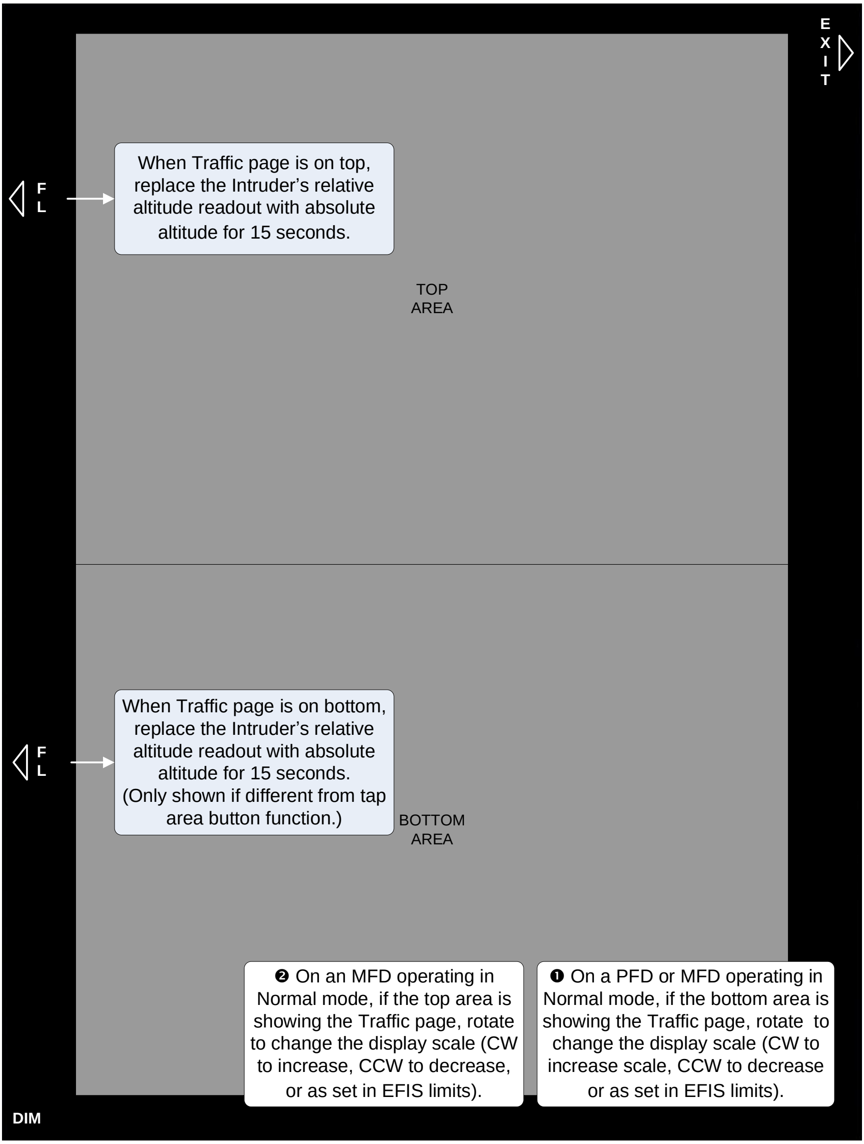


Figure T-8: MFD First-Level Menu in Normal Mode

T 2.4. Flight Level Option

When the Traffic page is displayed, and flight level (FL) is activated, the system replaces the intruder's relative altitude with absolute altitude for 15 seconds.

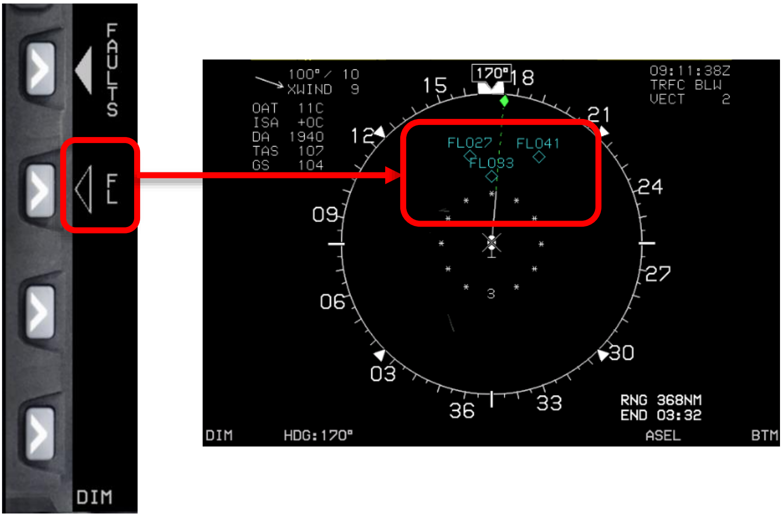


Figure T-9: Flight Level Option

T 2.5. Traffic Page Screen Range

The TCAS range ring is centered upon the ownship symbol to help the user judge range to displayed symbols.

Table T-6: Traffic Page Range

Range in NM					Range in KM				
5	10	20	50	100	10	20	50	100	200
All distances represent the distance from the ownship symbol to the compass rose.									

T 2.6. MFD Traffic Format Menu

Upon selecting the MFD format menu, **FORMAT (R8)**, a list appears with options.

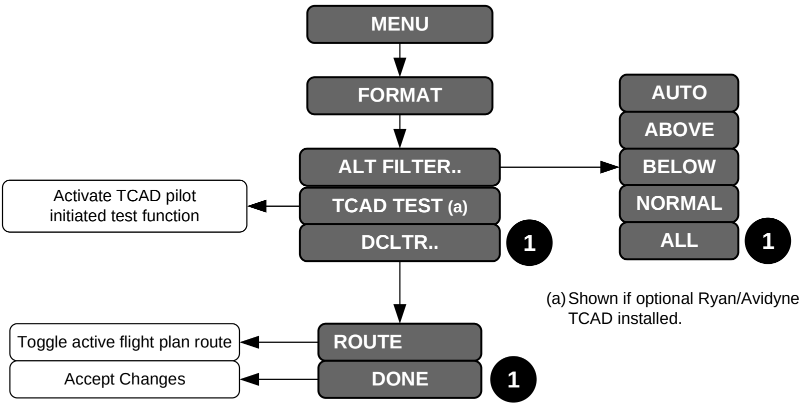


Figure T-10: MFD Traffic Format Menu

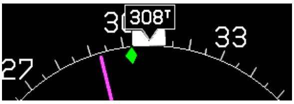
T 2.7. Traffic Page (Step-By-Step) (PFD or MFD)

1) On the PFD, push ❶ and rotate to **TRAFFIC** and push to enter.
2) To adjust Traffic page scale, rotate ❶ to select radius (see Table T-6).
3) On MFD, rotate ❷ (top) or ❶ (bottom) to **TRAFFIC** and push to enter.
4) On MFD, press **MENU (R1)**, within 10 seconds press **FORMAT (R4)** or **(R8)** to format the Traffic page on top or bottom.
5) On MFD, push ❶ to enter **ALT FILTER..** and then push to enter to set altitude filters.
6) Push ❶ to accept **AUTO** altitude filtering.
7) Rotate ❶ to **ABOVE** and push to accept altitude filtering.
8) Rotate ❶ to **BELOW** and push to accept altitude filtering.
9) Rotate ❶ to **NORMAL** and push to accept altitude filtering.
10) Rotate ❶ to **ALL** and push to accept altitude filtering.
11) Rotate ❶ to **TCAD TEST** and push to enter. (TCAD/TAS [RS-232] ground operations only.)
12) Repeat step 4 and rotate ❶ to **DCLTR..** and then push to enter.
13) Push ❶ to select or deselect to show route on Traffic page.
14) To save changes and exit menu, rotate ❶ to **DONE** and push to enter or press **EXIT (R1)**.

T 2.8. Compass Rose Symbols

The compass rose is aligned with either magnetic north or true north depending upon the status of the true north discrete input. A digital heading readout and pointer aligned with the longitudinal axis of the ownship symbol appears on the compass rose boundary circle. Compass rose symbols are as specified in Section 3 Display Symbology. A green dashed lubber line connects the center of the aircraft symbol and the track pointer.

Normal Mode



True North Mode

Figure T-11: Traffic Page Compass Rose Symbols

> **NOTE:**
>
> The track pointer, lubber line, and altitude capture predictor arc, are not displayed when ground speed is less than 30 knots.

A pilot-settable heading bug geometrically interacting with the heading pointer appears on the compass rose.

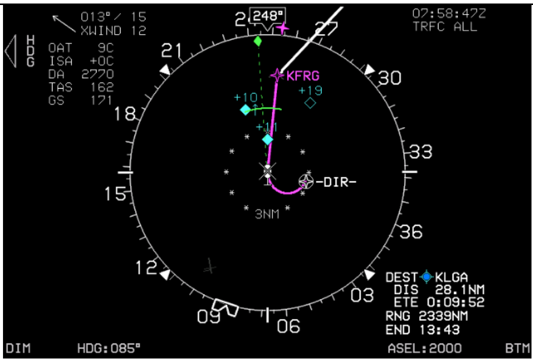
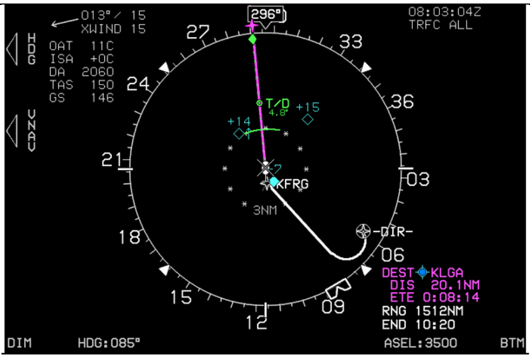
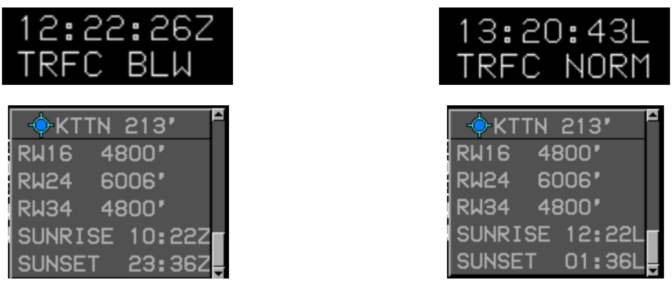
Table T-7: Traffic Page Examples	
	If a target altitude is set and not captured, an altitude capture predictor arc is displayed on the lubber line at a point corresponding with predicted climb or descent distance (based upon current VSI).

Table T-7: Traffic Page Examples

	A top of descent symbol is shown at the point where a VNAV descent is predicted to commence.
	A magenta, star-shaped waypoint pointer is displayed on the heading scale at a point corresponding with the active waypoint and turns amber (yellow) in the event of GPS LON caution.

T 2.9. Clock and Options

The following are displayed in the upper right corner of traffic page.



Zulu Time Local Time

Figure T-12: Clock and Options

Table T-8: Clock and Options

Feature	Options	Notes
Zulu or Local Time	hh:mm:ssZ hh:mm:ssL	Synchronized with the GPS/SBAS constellation.
Traffic Status	Enabled or Disabled	If traffic is disabled, overlying red “X”. When enabled, traffic altitude filtering is as follows (see Table T-3). AUTO = **TRFC AUTO** ABOVE = **TRFC ABV** BELOW = **TRFC BLW** NORMAL = **TRFC NORM** ALL = **TRFC ALL**

T 2.10. Air Data and Ground Speed

As defined in Section 3 Display Symbology.

Speed in Knots Altitude in Feet   Speed in Km/h Altitude in Meters

Figure T-13: Air Data and Ground Speed

> **NOTE:**
>
> Wind information is not shown when indicated airspeed is in the noise range of less than 30 knots, when the aircraft is in the ground mode, or when the AHRS is in DG mode.

T 2.11. Fuel Totalizer/Waypoint Distance Functions

As defined in Section 3 Display Symbology.

Distance in NM   Distance in KM

Figure T-14: Fuel Totalizer/Waypoint Distance Functions

T 2.12. Traffic Display Format

The traffic display uses a centered display format with the ownship symbol (Table T-2) centered on the traffic page with data displayed out to an equal distance in all directions. When the AHRS is in DG mode, "DG" appears to the right of the ownship symbol.

Figure T-15: Traffic Display Format

T 3. PFD Declutter (DCLTR) Menu

Upon activating the PFD declutter menu, a list of declutter items is shown.

Table T-9: PFD Declutter Options and Features

Declutter Options	Configuration	
	SVN	Basic
PFD Mini Traffic	✓	✓
Perspective Traffic Depiction	✓	N/A

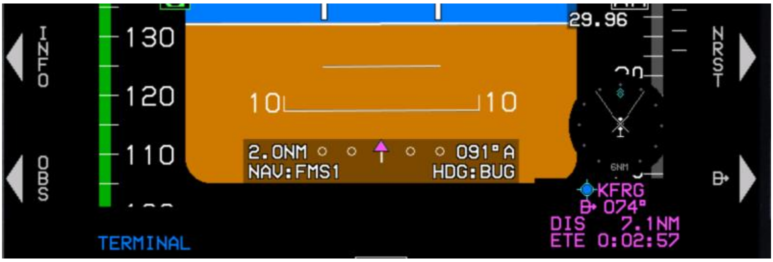


Figure T-16: Basic Mode Mini Traffic

T 4. MFD Fault Display Menu

Loss of communications with traffic sensor (TRFC) is indicated by an "X" in place of the "OK."

Figure T-17: Menu Faults Status

T 5. Menu Synchronization

Section 5 Menu Functions and Step-by-Step Procedures for additional information.

Table T-10: Menu Synchronization

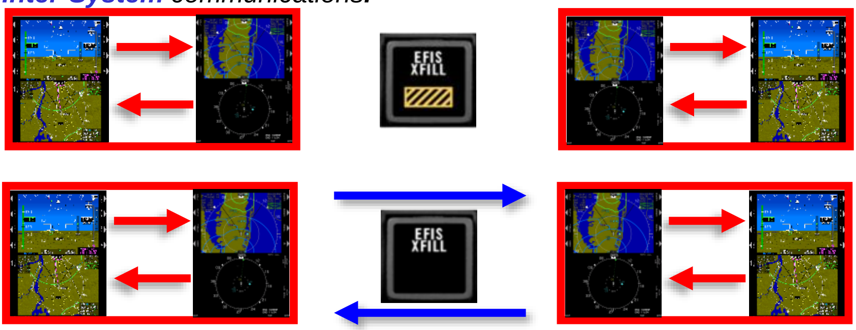
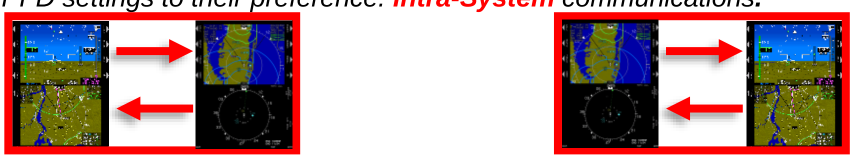
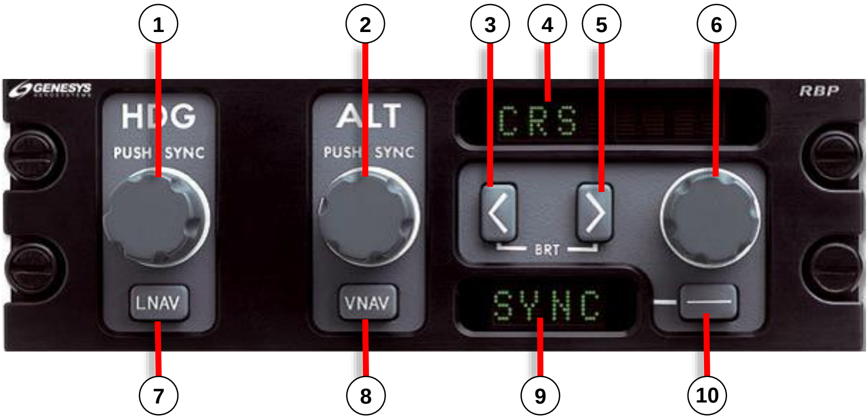
Menu Parameter	Notes
The following menu parameters are synchronized across all displays when crosslink is enabled. Otherwise, they are only synchronized onside. These parameters are FMS parameters and allow the pilot and co-pilot FMSs to be operated independently when crosslink is inhibited. ***Intra-System*** *or* ***Inter-System*** *communications.* 	
Traffic Filter Setting	
The following menu parameters are only synchronized onside. These parameters are usually sensor selections or PFD options used to keep the appearance of any pilot's PFD consistent in the case of PFD reversion. The onside characteristic means that individual pilots can still adjust their PFD settings to their preference. ***Intra-System*** *communications.* 	
PFD Mini Traffic	
PFD Traffic	
The following menu parameters are independent between displays. These are used to support non-PFD display options to give the pilot maximum MFD operating flexibility. Note that some of these parameters are also independent between top and bottom MFD areas as specified in the notes. 	

Table T-10: Menu Synchronization	
Menu Parameter	**Notes**
MFD Traffic Page Settings (show FL)	Independent between top and bottom MFD areas

Remote Bugs Panel (RBP)

RBP 1. Remote Bugs Panel



1) Increase/decrease HDG bug – Push to synchronize to current heading	2) Increase/decrease target altitude – Push to synchronize to current altitude
3) Moves through "Set" options – press both arrows simultaneously to place into brightness dimming mode	4) Main display – Indicates course, bug, angle, height, and minimums to be set with multifunction knob
5) Moves through "Set" options – Press both arrows simultaneously to place into brightness dimming mode	6) Multifunction Knob – Increase/decrease value indicated in main display, and adjust lighting when in dimming mode
7) LNAV – Switches autopilot roll steering between LNAV and HDG sub-modes (N/A with HeliSAS Ver 56+ installed)	8) VNAV – Switches autopilot pitch steering between VNAV and target altitude sub-modes
9) Option display – Toggles function value in main display	10) Set Option button – Toggles function displayed in option display (also exits brightness dimming mode)

Figure RBP-1: Remote Bugs Panel

The Remote Bugs Panel (RBP) promotes ease of operation while minimizing pilot workload complexity by providing dedicated controls for frequently used bugs and controls for setting IDU parameters as defined in Table RBP-1.

The heading (HDG) and altitude (ALT) knobs behave similarly as the knobs on the IDU (see Section 5 Menu Functions and Step-By-Step Procedures for HDG and ALT knob description).

During initialization, the RBP begins with "GENESYS RBP" on the main and option display screens. To access the internal light sensor control for brightness, press the two arrow buttons simultaneously and rotate the multifunction knob to make adjustments. Press the Option button to exit the brightness control program and return the RBP to normal operation.

Table RBP-1: Remote Bugs Panel (RBP)

Button/Knob	Function	Rotate	Push Knob or Press Button
HDG Knob	Heading Bug	Increase or decrease	Synchronize to current heading
LNAV Button (With autopilot enabled)	LNAV	N/A	Toggle HDG sub-mode and LNAV sub-mode. (Only active when **HDG** or **LNAV** soft tile appears on EFIS.) Not applicable to installations without an autopilot or installations with a fully-integrated digital autopilot (i.e., HeliSAS-E and Genesys/S-TEC DFCS) because there are no HDG or LNAV sub-modes in those integrations.
ALT Knob	Altitude Bug	Increase or decrease target altitude	Synchronize to current altitude
VNAV Button (With autopilot enabled)	VNAV	N/A	HeliSAS-E/S-TEC DFCS: Turn off any preselected target altitude bug EFIS with VNAV Sub-Mode: Turn off target altitude bug to allow for entering VNAV sub-mode. (Only active when **VNAV** tile appears on EFIS.) Not applicable to

Table RBP-1: Remote Bugs Panel (RBP)			
Button/Knob	**Function**	**Rotate**	**Push Knob or Press Button**
			installations without an autopilot or installations with a fully-integrated digital autopilot (i.e., HeliSAS-E and Genesys/S-TEC DFCS) because there are no VNAV sub-modes with those integrations.
Function Active Nav Course			
Multifunction Knob	GPS Course	Increase or decrease	If a manual GPS exists: (not in automatic OBS) Synchronize to current bearing to active waypoint.
Multifunction Knob	VLOC1 VLOC2	Increase or decrease	Synchronize nav source course to the current bearing to the station if NAV1 or NAV2 receiver is coupled to VOR; or synchronize the VLOC1 or 2 course to current aircraft heading if NAV receiver is coupled to LOC.
Multifunction Knob	ADF1 ADF2	Increase or decrease	Synchronize ADF1 or ADF2 course to the current bearing to the station
Preview NAV Course			
Multifunction Knob	VLOC1 VLOC2	Increase or decrease	Synchronize nav source course to the current bearing to the station if NAV1 or NAV2 receiver is coupled to VOR; or synchronize the VLOC1 or VLOC2 course to current aircraft heading if NAV receiver is coupled to LOC.
Multifunction Knob	ADF1 ADF2	NA	Synchronize ADF1 or ADF2 course to the current bearing to the station

Table RBP-1: Remote Bugs Panel (RBP)

Button/Knob	Function	Rotate	Push Knob or Press Button
Multifunction Knob	VLOC1 VLOC2	NA	Synchronize the VLOC1 or VLOC2 course to the current bearing to the station if Nav receiver is coupled to VOR; or Synchronize the VLOC1 or VLOC2 course to the current aircraft heading if NAV receiver is coupled to LOC.
Multifunction Knob	Airspeed Bug	Increase or decrease	Synchronize to current airspeed
Multifunction Knob	Vertical Speed Bug		Synchronize to current VSI
Multifunction Knob	Climb Angle Set		Set to 3°
	Descent Angle Set		
Multifunction Knob	Decision Height Bug		Set to 200’ AGL
Multifunction Knob	Minimum Altitude Bug		Synchronize to current altitude
Set Option “---“ Button	GPS Course	N/A	When selected NAV source is GPS, changes OBS mode (Manual or Automatic)
Set Option “---“ Button	Active NAV Course		No function
Set Option “---“ Button	Preview Nav Course		
Set Option “---“ Button	VOR 1 Course		
Set Option “---“ Button	VOR 2 Course		
Set Option “---“ Button	Airspeed Bug		Toggle on or off
Set Option “---“ Button	Vertical Speed Bug		
Set Option “---“ Button	Climb Angle Setting		No function
Set Option “---“ Button	Descent Angle Setting		

Table RBP-1: Remote Bugs Panel (RBP)			
Button/Knob	**Function**	**Rotate**	**Push Knob or Press Button**
Set Option "---" Button	Decision Height Bug		Toggle on or off
Set Option "---" Button	Minimum Altitude Bug		
Arrow Buttons	Function Scroll	N/A	Move through "Set" options. Press both arrow buttons simultaneously to place into dimming mode.

Main Message

Option Message

Figure RBP-2: Main and Option Messages

Table RBP-2: Main and Option Messages - Active NAV Course Function		
Selected Active Nav Source	**Main Message**	**Option Message**
GPS	**NAV FMS**	**AUTO** (If EFIS in manual OBS mode) **MAN** (If EFIS in automatic OBS mode)
VLOC1	**NAV VOR1** (If Nav receiver coupled to VOR) **NAV LOC1** (If NAV receiver coupled to LOC) **NAV BC1**	Current VLOC1 Course setting (degrees)

Table RBP-2: Main and Option Messages - Active NAV Course Function		
Selected Active Nav Source	**Main Message**	**Option Message**
	(If NAV receiver coupled to LOC BC)	
VLOC2	**NAV VOR2** (If Nav receiver coupled to VOR) **NAV LOC2** (If NAV receiver coupled to LOC) **NAV BC2** (If NAV receiver coupled to LOC BC)	Current VLOC2 Course setting (degrees)
ADF1	**NAV ADF1**	Current ADF1 Course setting (degrees)
ADF2	**NAV ADF2**	Current ADF2 Course setting (degrees)

Table RBP-3: Main and Option Messages - Preview NAV Course Function		
Selected Preview Nav Source	**Main Message**	**Option Message**
VLOC1	**PRV VOR1** (If Nav receiver coupled to VOR) **PRV LOC1** (If NAV receiver coupled to LOC) **PRV BC1** (If NAV receiver coupled to LOC BC)	Current VLOC1 Course setting (degrees)
VLOC2	**PRV VOR2** (If Nav receiver coupled to VOR) **PRV LOC2** (If NAV receiver coupled to LOC) **PRV BC2** (If NAV receiver coupled to LOC BC)	Current VLOC2 Course setting (degrees)

Table RBP-3: Main and Option Messages - Preview NAV Course Function		
Selected Preview Nav Source	**Main Message**	**Option Message**
ADF1	**PRV ADF1**	Current ADF1 Course setting (degrees)
ADF2	**PRV ADF2**	Current ADF2 Course setting (degrees)

Table RBP-4: Main and Option Messages - Other Functions		
Function	**Main Message**	**Option Message**
GPS Course (EFIS in manual OBS mode)	**CRS FMS**	**AUTO** (If EFIS in manual OBS mode)
VLOC1 Course	**CRS VOR1** (If Nav receiver coupled to VOR) **CRS LOC1** (If NAV receiver coupled to LOC) **CRS BC1** (If NAV receiver coupled to LOC BC)	Current VLOC1 Course setting (degrees)
VLOC2 Course	**CRS VOR2** (If Nav receiver coupled to VOR) **CRS LOC2** (If NAV receiver coupled to LOC) **CRS BC2** (If NAV receiver coupled to LOC BC)	Current VLOC2 Course setting (degrees)
Airspeed Bug	**SPD BUG**	**ON** (If airspeed bug is OFF) **OFF** (If airspeed bug is ON)
Vertical Speed Bug	**VSI BUG**	**ON** (If vertical speed bug is OFF)

Table RBP-4: Main and Option Messages - Other Functions

Function	Main Message	Option Message
		OFF (If vertical speed bug is ON)
Climb Angle Setting	**CLIMB ANG**	Current climb angle setting (tenths of a degree)
Descent Angle Setting	**DCND ANG**	Current descent angle setting (tenths of a degree)
Decision Height Bug	**DEC HT**	**ON** (If decision height bug is OFF) **OFF** (If decision height bug is ON)
Minimum Altitude Bug	**MIN ALT**	**ON** (If minimum altitude bug is OFF) **OFF** (If minimum altitude bug is ON)

NOTE:

If NAV PREVIEW is enabled in EFIS limits, the following RBP functions are available:

1) Active Nav Course

2) Preview NAV Course (If preview source is not set to OFF)

If NAV PREVIEW is not enabled in EFIS limits, the following RBP functions are available:

1) GPS Course

2) VLOC1 Course

3) VLOC2 Course

The above two groups of RBP functions are mutually exclusive as determined by the EFIS limits settings.

WX-500 Lightning Strikes

S 1. WX-500 Data

Figure S-1: PFD with Strikes Page on Bottom

When selected, the EFIS displays cell mode or strike mode lightning strikes in correct relationship to the ownship symbol with the limits defined in Table S-1.

Table S-1: Lightning Strikes

Time or Distance Limit	View
Display scale less than 25 NM or 50KM*	Strikes not shown
More than 3 minutes old	
Strikes less than 20 seconds old	Lightning symbol
Strikes between 20 seconds and 2 minutes old	Large cross symbol
Strikes between 2 and 3 minutes old	Small cross symbol
* If using KM for ND display scale as set in EFIS limits.	

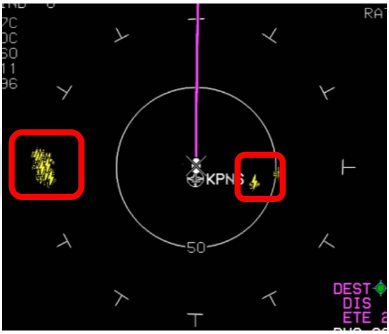
The pilot may select either an arced or centered display format.

Arced: Ownship displaced toward the bottom of the screen. Strike data are displayed in a larger scale while displaying all data within range ahead of the aircraft.

Centered: Ownship symbol is in the center of the screen with navigation data is displayed out to an equal distance in all directions.

Strikefinder markings are aligned with either magnetic north or true north depending upon the status of the true north discrete input. When the AHRS is in DG mode, "DG" appears to the right of the ownship symbol.

Map Page Strikes Display Overlay



Strikes Page Display

Figure S-2: Lightning Symbols

S 2. Dedicated Strikes Page

STRIKES: Shows the Strikes page.

S 2.1.1. MFD Strikes Page (Step-By-Step)

1) On the PFD, push ❶, on the MFD push ❶ or ❷, and then rotate to STRIKES and push to enter.

2) When the MFD is full map, push ❷ and select **STRIKES** to display Strikes page on top and Map page on the bottom

3) If ❶ is pushed, and **STRIKES** is selected, the Strikes page appears on the bottom and Map on the top.

S 2.2. Strikes Page Screen Range

Table S-2: Lightning Page Screen Range

	Range in NM from				Range in KM			
Ownship to range ring (shown on range ring)	12.5	25	50	100	25	50	100	250
Ownship to Strikefinder markers	25	50	100	200	50	100	200	500

S 2.3. Air Data and Ground Speed

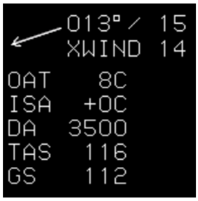


Figure S-3: Air Data and Ground Speed in Upper Left Corner

S 2.4. Clock and Options

Zulu Time

Local Time

Figure S-4: Clock and Options

The following are displayed in the upper right corner:

1) Zulu or Local Time: As specified in Section 3 Display Symbology.

2) WX-500 Status: When selected, displays cell mode lightning strikes in correct relationship to the ownship symbol with the limits found in Table S-3.

Table S-3: WX-500 Status

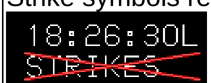
Condition	Annunciation
System Normal, Cell Mode	**CELL MODE** annunciates mode **RATE ###** depicts strike rate
System Normal, Strike Mode	**STRK MODE** annunciates mode **RATE ###** depicts strike rate
System Failed with “Show Full Sensor Status Flag” enabled in EFIS Limits	**STRIKES** overlaid with red “X” Strike symbols removed 
System in Test Mode	**STRK TST** shown Strike symbols removed
Traffic Page	
System Normal, Strikes Selected	**RATE ###** depicts strike rate Strike symbols shown

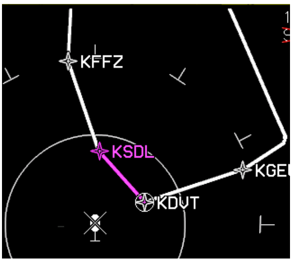
Table S-3: WX-500 Status	
Condition	**Annunciation**
System Normal, Strikes Deselected with "Show Full Sensor Status Flag" enabled in EFIS Limits	**STRIKES** overlaid with green "X" Strike symbols removed
System Failed with "Show Full Sensor Status Flag" enabled in EFIS Limits	**STRIKES** overlaid with red "X" Strike symbols removed
System in Test Mode	**STRK TST** shown Strike symbols removed

A new strike rate value is calculated every five seconds during normal operation, based upon strikes within the selected display range. The number of fresh strikes (less than 20 seconds old) is used to generate a strike rate representing strikes per minute. Strike rate increases are displayed immediately upon calculation, while decreases in strike rate are damped. Activating the strike clear function resets the strike rate to zero.

S 2.5. Active Flight Plan Path/Manual Course/Runways

When there is an active flight plan and the GPS/SBAS OBS setting is automatic, the flight plan path is shown on the Strikes page in correct relationship to the ownship symbol.

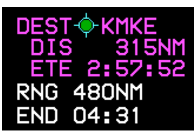
When there is an active waypoint and the GPS/SBAS OBS setting is manual, the course through the waypoint is shown as a pointer centered on the waypoint. The pointer matches the lateral navigation guidance on the PFD (GPS/SBAS CDI in manual OBS mode, skyway boxes, and mini-map).



The active flight plan path's active leg/manual course and active waypoint are magenta but turn amber (yellow) in the event of a GPS LON caution. Airport runways appear in correct relationship and scale to the ownship symbol.

Figure S-5: Active Flight Plan Path/Manual Course/Runways

S 2.6. Fuel Totalizer/Waypoint Distance Functions



As defined in Section 3 Display Symbology.

Figure S-6: Fuel Totalizer/Waypoint Distance Functions

S 2.7. PFD First-Level Menu in Normal Mode

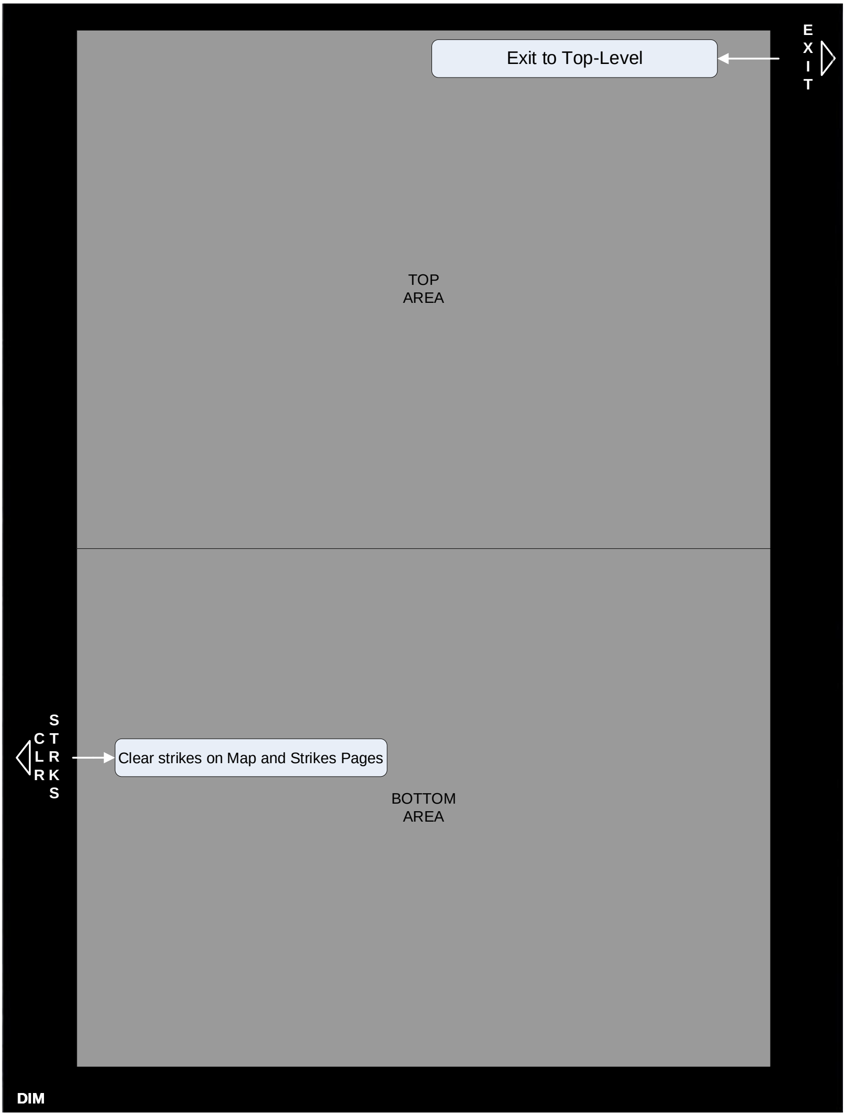


Figure S-7: PFD First-Level Menu in Normal Mode

S 2.8. MFD First-Level Menu in Normal Mode

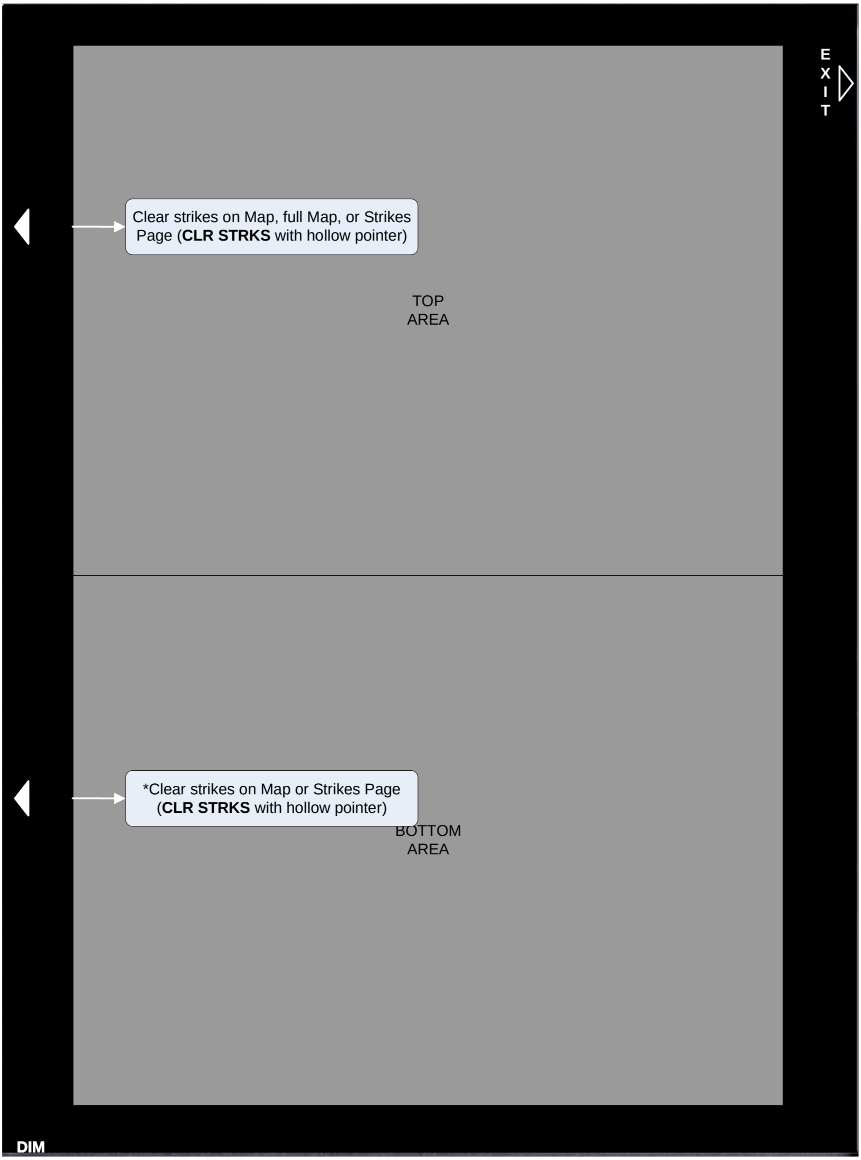


Figure S-8: MFD First-Level Menu in Normal Mode

CLR STRKS (L2) or **WX LGND (L2)**: On Strikes page with WX-500 enabled, **CLR STRKS** clear strikes.

❷: On an MFD operating in Normal mode, if the top area is showing the Strikes page, rotate ❷ to change the display scale (CW to increase, CCW to decrease).

❶: On a PFD or MFD operating in Normal mode, if the bottom area is showing the Strikes page, rotate ❶ to change the display scale (CW to increase scale, CCW to decrease scale).

S 2.9. Strikes Format Menu

Upon selecting the MFD format menu, **FORMAT (R8)** when in the Strikes page, the following option list appears:

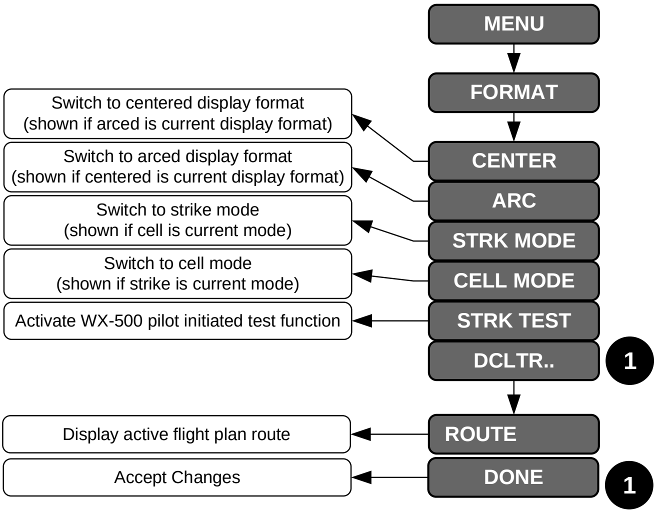


Figure S-9: Strikes Format Menu

S 3. MFD Fault Display Menu

Loss of communications with the WX-500 is indicated by an “X” replacing the “OK”.

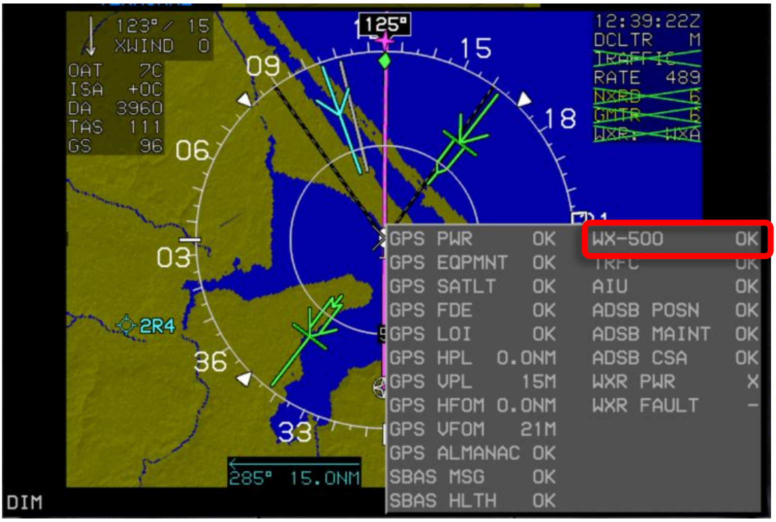


Figure S-10: MFD Fault Display Menu

S 4. Menu Synchronization

Section 5 Menu Functions and Step-by-Step Procedures for additional information.

Table S-4: Menu Synchronization	
Menu Parameter	**Notes**
The following menu parameters are independent between displays. These are used to support non-PFD display options to give the pilot maximum MFD operating flexibility. Note that some of these parameters are also independent between top and bottom MFD areas as specified in the notes.	
	
Sensor Selections	
Strike (WX-500) Page Settings	Independent between top and bottom MFD areas

Datalink

D 1. Datalink Page

When interfaced with an optional datalink or ADS-B receiver, a Datalink page is available.

D 1.1. Datalink Page Locations

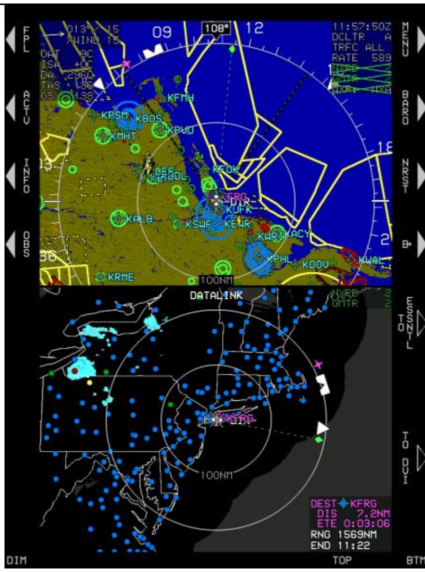
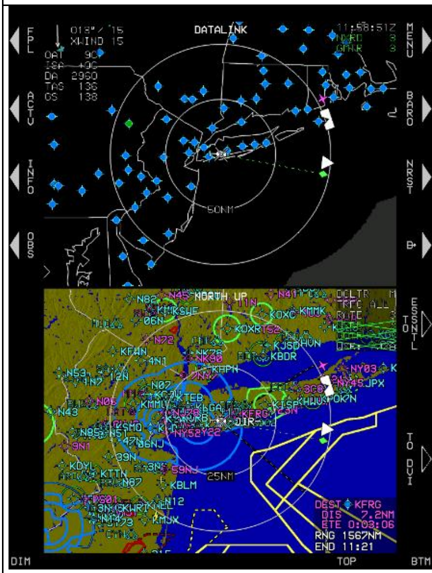
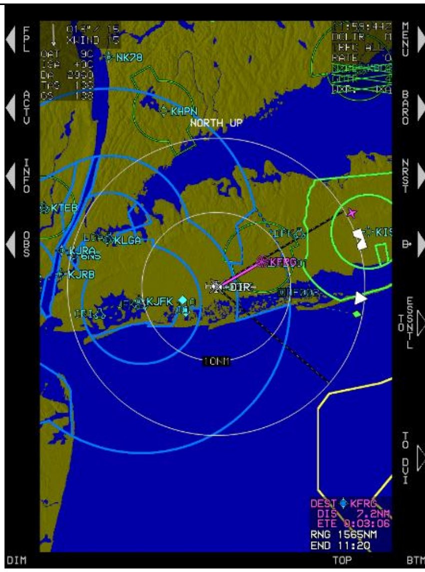
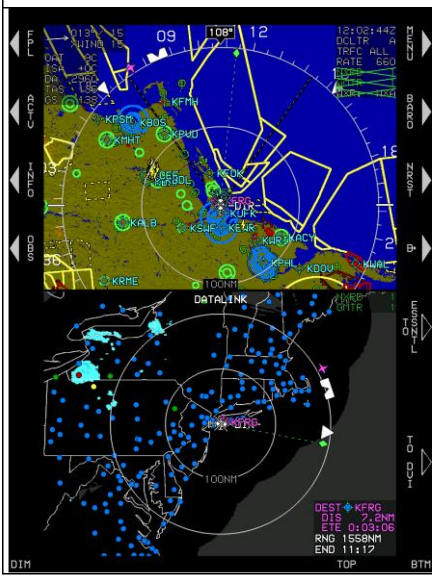
<table>
<tr><th colspan="2">Table D-1: Datalink Page Locations</th></tr>
<tr><td></td><td></td></tr>
<tr><td>PFD bottom area only</td><td>MFD bottom area</td></tr>
</table>

Table D-1: Datalink Page Locations	
	
MFD Top area	MFD with full Map page and selecting Datalink page
	When selecting Datalink page when the MFD shows the full Map page, the top area returns to the last MFD top area page and Datalink becomes the bottom area page.

D 2. Datalink Symbology

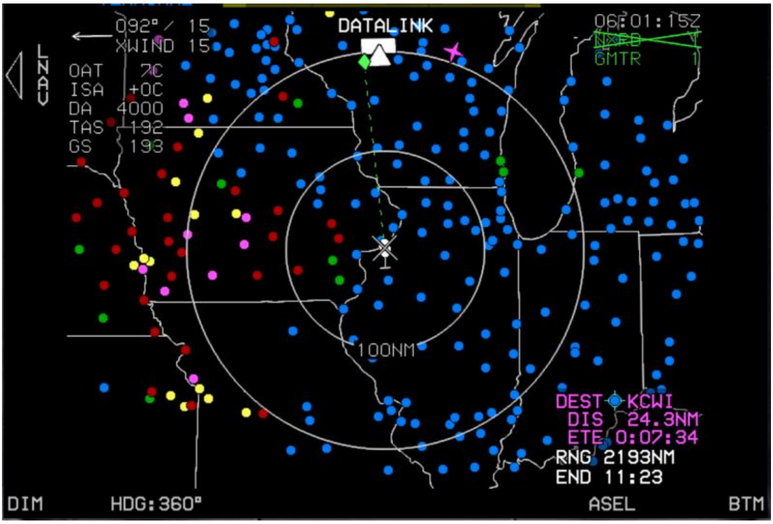


Figure D-1: Datalink Symbology with G METAR On

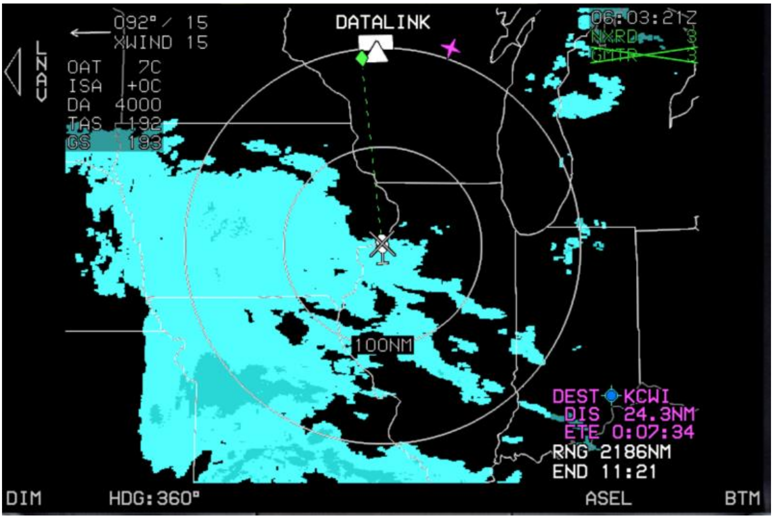
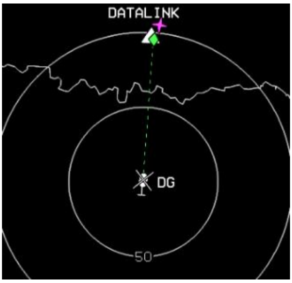


Figure D-2: Datalink Symbology with NEXRAD On

D 2.1. Ownship Symbol with DG



When not panning with AHRS in the DG mode, "DG" appears right of the ownship symbol. The datalink page is always displayed in a North-up orientation with a boundary circle in place of the compass rose. If not in pan mode, the ownship symbol is aligned with the aircraft heading.

Figure D-3: Datalink Symbology Rotorcraft Ownship Symbol

D 2.2. Borders

National and United States state borders are drawn in white in their correct relationship to the ownship symbol. The lowest scale available is 25NM or 50KM and selectable on the Map page.

D 2.3. NEXRAD Radar Data

NEXRAD data is displayed in correct relationship as colored regions of precipitation using the following coloring convention.

Table D-2: ADS-B Data

NEXRAD Data	Available if included in user subscription.
Graphical METAR Data	Available if textual METAR data is included in user subscription. Derived from textual METAR data using EFIS algorithm.

NEXRAD data is displayed on the MFD in correct relationship as colored regions of precipitation using the convention in Table D-3.

Table D-3: Datalink NEXRAD Data

Color	Meaning
Gray Shading	Areas beyond the limits of radar coverage or areas with missing data
Magenta	Rain >= 50dBZ
Red	Rain >= 45dBZ and < 50dBZ
Light Red	Rain >= 40dBZ and < 45dBZ
Amber (Yellow)	Rain >= 30dBZ and < 40dBZ
Green	Rain >= 20dBZ and < 30dBZ
Cyan	Snow >= 20dBZ
Light Cyan	Snow >= 5dBZ and < 20dBZ

Table D-3: Datalink NEXRAD Data	
Color	**Meaning**
Magenta	Mixed Precipitation >= 20dBZ (Area is distinguishable from rain >= 50dBZ by graphical context)
Light Magenta	Mixed Precipitation >= 5dBZ and < 20dBZ

When the EFIS is interfaced with an optional Weather Radar, NEXRAD Radar automatically declutters when weather radar returns are selected for display on the MFD. Display of NEXRAD Radar Data is inhibited during active FLTA alerts.

> **NOTE:**
>
> NEXRAD radar data automatically declutters when weather radar returns are selected for display on the MFD.

Table D-4: NEXRAD Decluttered by WX-RDR	
	PFD with Map on MFD with Datalink selected for overlay
	PFD with Map on MFD with Datalink and WX-RDR selected for overlay

<table>
<tr><th colspan="2">Table D-4: NEXRAD Decluttered by WX-RDR</th></tr>
<tr><td>
</td><td>MFD full Map page with Datalink selected for overlay</td></tr>
<tr><td>
</td><td>MFD full Map page with and WX- RDR selected for overlay</td></tr>
</table>

D 2.4. Graphical METARS

Graphical METARs are displayed on the MFD in correct relationship to the ownship symbol.

Table D-5: Graphical METARS (G METARS) Range

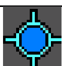
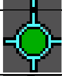
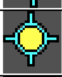
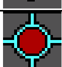
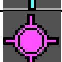
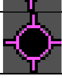
Screen Range		Display
NM	**KM**	
50	100	All Graphical METARs with Airport symbol and ID
100	200	All Graphical METARs with Airport symbol
200	500	All Graphical METARS
500	1,000	VFR Graphical METARS are decluttered
1,000	2,000	VFR and MFVR Graphical METARS are decluttered.
2,000	4,000	

Graphical METARs are also displayed in the menu system “nearest airport,” “nearest weather,” and “info” functions.

Figure D-4: NRST Airport INFO

If the airport has an available datalinked METAR, the circular part of the airport symbol is colored-fill with the coloring convention in Table D-6.

Table D-6: Graphical METAR Symbols

Color		Meaning
Sky Blue		Visual Flight Rules (VFR)
Green		Marginal Visual Flight Rules (MVFR)
Amber (Yellow)		Instrument Flight Rules (IFR)
Red		Low Instrument Flight Rules (LIFR)
Magenta		Less than Category 1 Approach Minimums
Black		No Data

Graphical weather conditions data are displayed in the menu system “info” function as large colored squares per the convention in Table D-7.

Table D-7: Datalink Graphical METAR Precipitation

Color	Meaning
Sky blue	No significant precipitation
Green	Rain
White	Snow
Red	Hazardous weather
Right half gray	Obscuration to visibility
Small black square centered in large square	High wind
Black	No data

The following may be displayed on the datalink page:

1) Convective SIGMET: Magenta line segments showing the area boundary in correct relationship to the ownship symbol. User may view the text of individual convective SIGMETs. When viewing text, the associated symbol flashes.

2) Icing AIRMET and SIGMET: Cyan line segments showing the area boundary in correct relationship to the ownship symbol. User may view the text of individual icing AIRMETs and SIGMETs. When viewing text, the associated symbol flashes.

3) IFR AIRMET and SIGMET: Red line segments showing the area boundary in correct relationship to the ownship symbol. User may view the text of individual IFR AIRMETs and SIGMETs. When viewing text, the associated symbol flashes.

4) Turbulence AIRMET and SIGMET: Amber (yellow) line segments showing the area boundary in correct relationship to the ownship symbol. User may view the text of individual turbulence AIRMETs and SIGMETs. When viewing text, the associated turbulence AIRMET or SIGMET symbol flashes.

Textual METAR and TAF data are displayed when appropriate in the menu system info function. Time of observation and forecast are contained within the text.

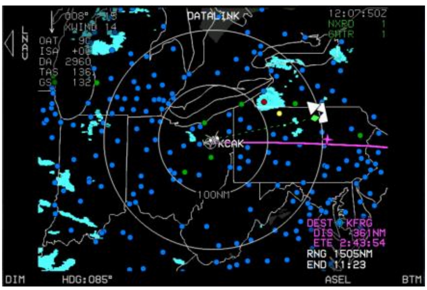
Figure D-5: METAR and TAF Report for KMIA

D 3. MFD Page (PAGE) Menu

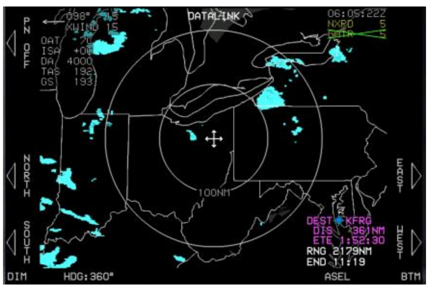
DATALINK: Shows the Datalink page.

D 3.1. Datalink Page Orientation

The Datalink page is always displayed in a North-Up orientation. The page has a boundary circle instead of a compass rose and “DATALINK” above the boundary circle. If not in pan mode, the ownship symbol is aligned with the aircraft heading.



Datalink orientation with active flight plan



Pan Mode

Figure D-6: Datalink Page Orientation

D 3.2. Datalink Page Screen Range

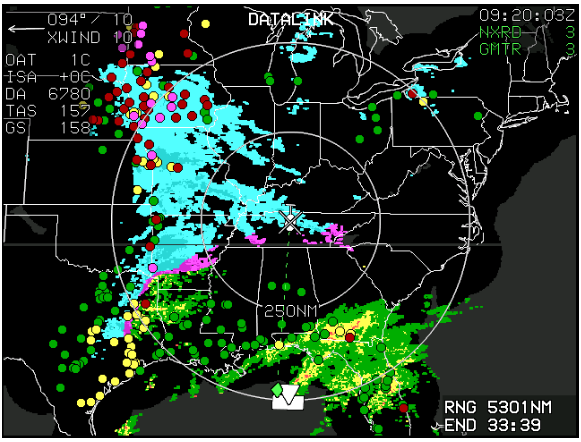


Figure D-7: Datalink Screen Range

When selected, screen ranges (all distances represent distance from the ownship symbol to the boundary circle) are available. Radius of the range ring is presented on the range ring.

Table D-8: Datalink Page Screen Ranges

Ownship to Range Ring		Ownship to Boundary Circle	
NM	KM	NM	KM
25	50	50	100
50	100	100	200
100	250	200	500
250	500	500	1,000
500	1,000	1,000	2,000
1,000	2,000	2,000	4,000

D 3.3. Datalink Page Legend

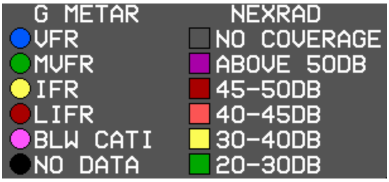
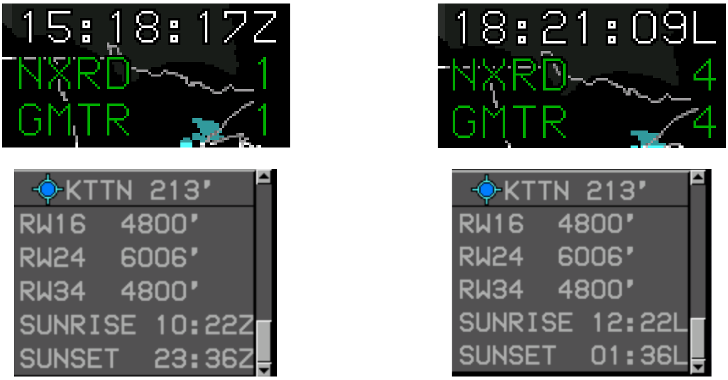


Figure D-8: ADS-B Datalink Page Legend

D 3.4. Air Data and Ground Speed

Air data and ground speed are displayed in the upper left corner of the datalink page as specified in Section 3 Display Symbology.

D 3.5. Clock/Options



Zulu Time　　　　Local Time

Figure D-9: Clock/Options

The following are displayed in the upper right corner:

1) Zulu or Local Time: As in Section 3 Display Symbology.

2) Datalink Weather Status: When status of NEXRAD, and graphical METARs, are displayed as defined in Table D-9.

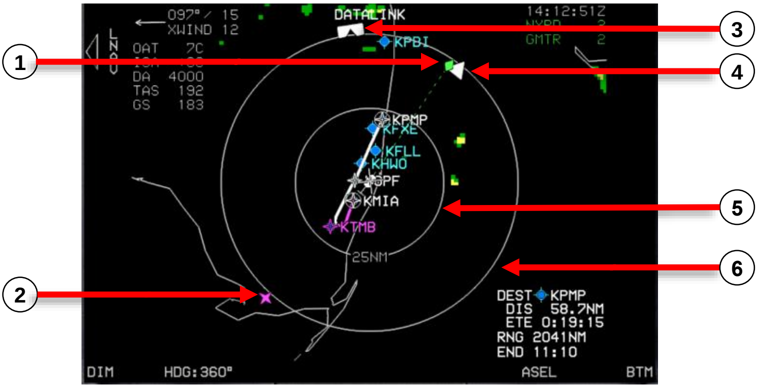
Table D-9: Datalink NEXRAD Status

Condition	Status Annunciation	
	*NEXRAD	Graphical METAR
Never completely downlinked	No Annunciation	
Downlinked within last 5 minutes and selected for display (*if installed, weather radar deselected from display). “Show Full MFD Status in EFIS limits.”	“NXRD ##” in green. ## is age in minutes. NEXRAD shown.	“GMTR ##” in green. ## is age in minutes. G METARS shown.
Downlinked within last 5 minutes and deselected from display (*if installed, weather radar selected for display).	“NXRD ##” in green. ## is age in minutes.	“GMTR ##” in green. ## is age in minutes. “GMTR ##” overlaid with green “X”

Table D-9: Datalink NEXRAD Status		
Condition	Status Annunciation	
	*NEXRAD	Graphical METAR
“Show Full MFD Status in EFIS limits.”	“NXRD ##” overlaid with green “X” NEXRAD not shown.	G METARS not shown.
Not downlinked within last 5 minutes but downlinked within last 10 minutes and selected for display (*if installed, weather radar deselected from display). “Show Full MFD Status in EFIS limits.”	“NXRD ##” in amber (yellow). ## is age in minutes. NEXRAD shown.	“GMTR ##” in amber (yellow). ## is age in minutes. G METARS shown.
Not downlinked within last 5 minutes but downlinked within last 10 minutes and deselected from display (*if installed, weather radar selected for display). “Show Full MFD Status in EFIS limits.”	“NXRD ##” in amber (yellow). ## is age in minutes. “NXRD ##” overlaid with green “X” NEXRAD not shown.	“GMTR ##” in amber (yellow). ## is age in minutes. “GMTR ##” overlaid with green “X” G METARS not shown.
Not downlinked within last 10 minutes but downlinked within last 75 minutes and selected for display (*if installed, weather radar deselected from display).	“NXRD ##” in red. ## is age in minutes. NEXRAD shown.	“GMTR ##” in red. ## is age in minutes. G METARS shown.
Not downlinked within last 10 minutes but downlinked within last 75 minutes and deselected from display (*if installed, weather radar selected for display). “Show Full MFD Status in EFIS limits.”	“NXRD ##” in red. ## is age in minutes. “NXRD ##” overlaid with green “X” NEXRAD not shown.	“GMTR ##” in red. ## is age in minutes. “GMTR ##” overlaid with green “X” G METARS not shown.
Not downlinked within last 75 minutes (timed-out). “Show Full MFD Status in EFIS limits.”	“NXRD XX” in red “NXRD XX” overlaid with red “X” NEXRAD not shown.	“GMTR XX” in red “GMTR XX” overlaid with red “X” G METARS not shown.

D 3.6. Boundary Circle Symbols

A white triangular heading pointer aligned with the longitudinal axis of the ownship symbol appears on the boundary circle with a green diamond-shaped track pointer aligned with the aircraft's track across the earth. A green dashed lubber line connects the center of the aircraft symbol and the track pointer.



1) Ground Track Pointer and Lubber Line
2) Waypoint Bearing Pointer
3) Heading Bug
4) Heading Pointer
5) Range Ring
6) Boundary Circle

Figure D-10: Boundary Circle Symbol

D 3.7. Pan Mode

Use the pan mode to change the location of the center of the page away from current location and view weather conditions along the route of flight and at the intended destination or alternate destination. When pan mode is active, a line is drawn from the map center to the aircraft's current position, and bearing and distance to the map center is always displayed above the ownship symbol when the aircraft is more than 0.5 NM away. If referenced to magnetic north, (as specified in Section 3 Display Symbology) when panning, the nearest displayed graphical METAR symbol within the inner range ring is highlighted with a flashing circle. When such a point is highlighted, dedicated buttons are present to allow the pilot to view and hide the waypoint information (including datalink weather information) associated with that point.

D 3.8. Top-Level Menu Option Descriptions

❶ Knob: On a PFD or MFD operating in Normal mode, if the bottom area is showing the Datalink page, rotate (CW to increase, CCW to decrease) to change the display scale (or as set in EFIS limits.)

❷ Knob: On an MFD (IDU #2, #3, or #4) operating in Normal mode, if the top area is showing Datalink page, rotate ❷ (CW or CCW to increase/decrease) to change the display scale (or as set in EFIS limits.)

D 3.9. Top-Level Menu Automatic Pop-Up Function Descriptions

See Section 5 Menu Functions and Step-by-Step Procedures for top-level menu option descriptions. Soft menu tiles appear adjacent to buttons under the specified conditions.

Table D-10: Top-Level Auto Pop-Up Function Descriptions

Note 1	Note 2	Tile Legend and Action in Order of Precedence
L1	**L5**	When Datalink page with pan mode enabled, **PN OFF** appears. Press to disable pan mode.
L2	**L6**	When Map or Datalink page with: (a) pan mode enabled; (b) information for the nearest highlighted waypoint is shown; and (c) airport weather information is present in the information block; **WX** appears. Press to display textual METAR and TAF data for the airport.
L3	**L7**	When Datalink page with pan mode enabled, **NORTH** appears. Press to shift center of page in the specified direction.
L4	**L8**	When Datalink page with pan mode enabled. **SOUTH** appears. Press to shift the center of the page in the specified direction.
R2	**R6**	When MFD or Datalink page with pan mode enabled, **INFO** or **HIDE** appears. Press to toggle information for nearest highlighted waypoint.
R3	**R7**	When Datalink page with pan mode enabled, **EAST** appears. Press to shift the center of the page in the specified direction.
R4	**R8**	When Datalink page with pan mode enabled, **WEST** appears. Press to shift the center of the page in the specified direction.
Note 1: Function tied to page in top area. Note 2: Function tied to page in bottom area or transmit enabled.		

D 3.10. MFD Page First-Level Option Descriptions

WX LGND (ACTV) (L2): Activates datalink weather legend.

D 3.11. MFD Datalink Format Menu

Upon selecting the MFD format menu **FORMAT (R8)** on Datalink page, a list appears.

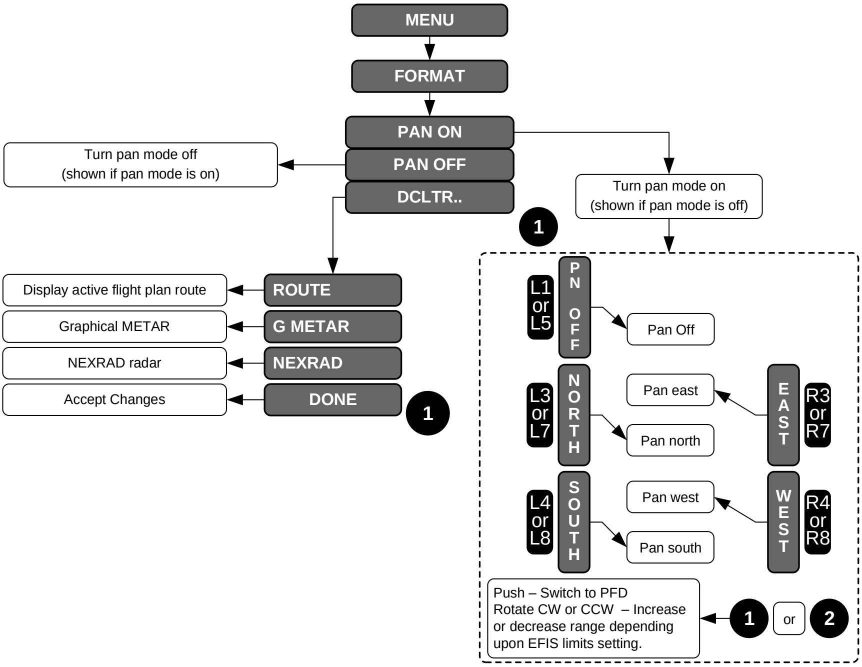
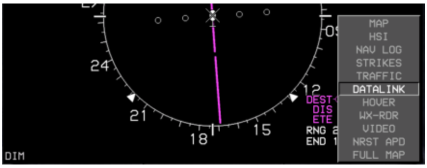
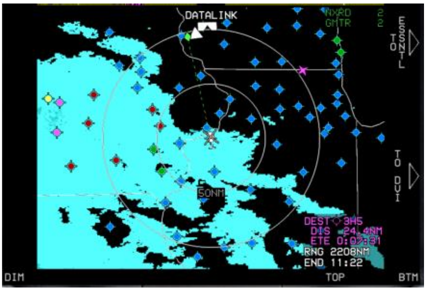


Figure D-11: MFD Datalink Format Menu

D 3.11.1. MFD Datalink Page (Step-By-Step)

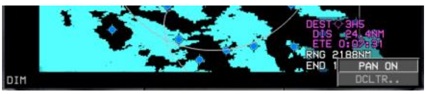


1) Push ❶ **BTM** or ❷ **TOP** and rotate to **DATALINK** and push to enter.

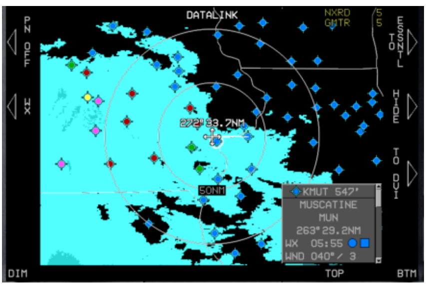


2) Example shows MFD with Datalink page on bottom area.

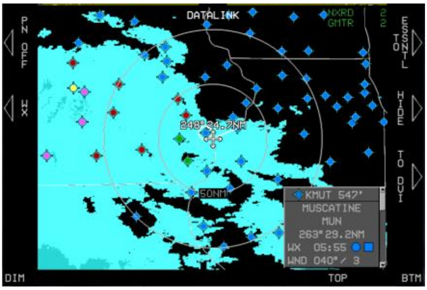
3) Press **MENU (R1)**, within 10 seconds press **FORMAT (R8)** to format Datalink page.



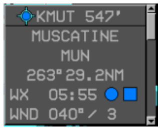
4) Either push ❶ to **PAN ON** or rotate to **DCLTR...** Push to enter.

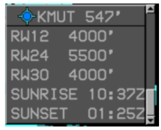


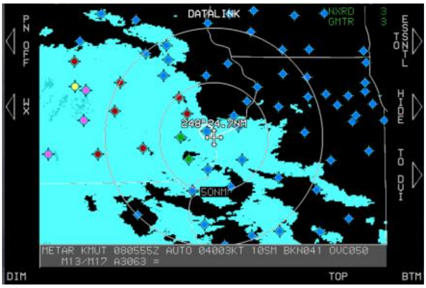
5) If **PAN ON** is selected, press **NORTH (L7)**, **SOUTH (L8)**, **EAST (R7)**, or **WEST (R8)** to pan to flashing circle.



6) Press **INFO (R6)** to view airport information. Press **HIDE (R6)** to hide information.

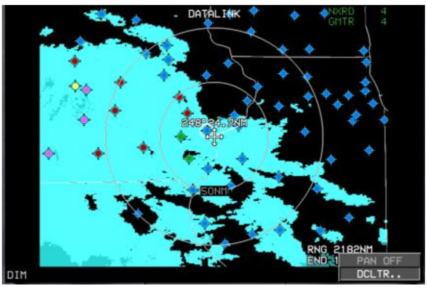




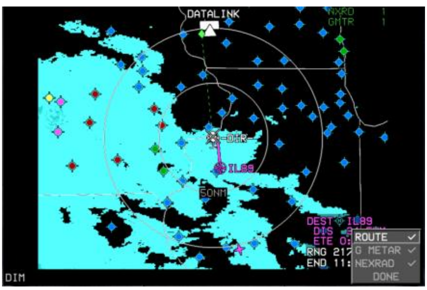


7) Press **WX (L6)** to view METAR information for the selected airport.

8) When finished, press **PN OFF (L5)** or press **MENU (R1)**, within 10 seconds press **FORMAT (R8)** and push ❶ to turn off the panning and exit menu.

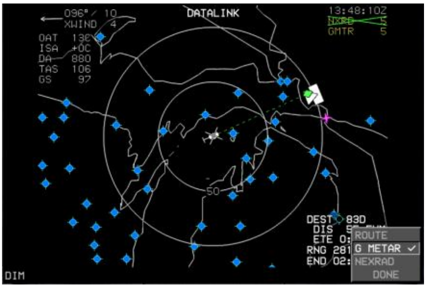


9) Repeat step 4 and select **DCLTR...**



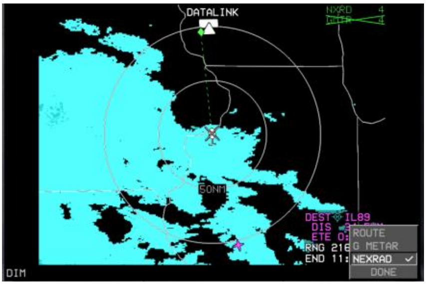
10) Push ❶ to select **ROUTE**.

11) Push ❶ again to deselect.



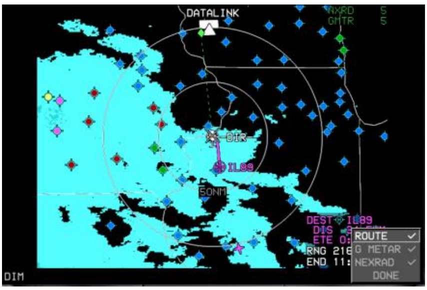
12) Rotate ❶ to **G METAR** and push to select.

13) Push ❶ again to deselect.



14) Rotate ❶ to **NEXRAD** and push to select.

15) Push ❶ again to deselect.



16) Rotate ❶ and push to select each option to display all three.

17) To overlay and display datalink information on the map, return to the pap page and press **MENU (R1)**, then press **FORMAT (R8)**.

18) Rotate ❶ to **FNCT DCLTR..** and push to enter.

19) Rotate ➊ to **DATALINK** and push to enter.

20) Datalink information is now overlaid on the map page. Rotate ➊ to **DONE** and push to enter or press **EXIT (R1)** to save changes and exit menu.

D 4. Fault Display Menu

Press **MENU (R1)**, then within 10 seconds, **FAULTS (L1)**. Upon selecting the faults menu on either PFD or MFD with ADS-B datalink enabled, an indication of ADS-B position validity (ADSB POSN), indication of whether ADS-B receiver maintenance is required (ADSB MAINT), and indication the conflict situational awareness algorithm is working (ADSB CSA) appear.

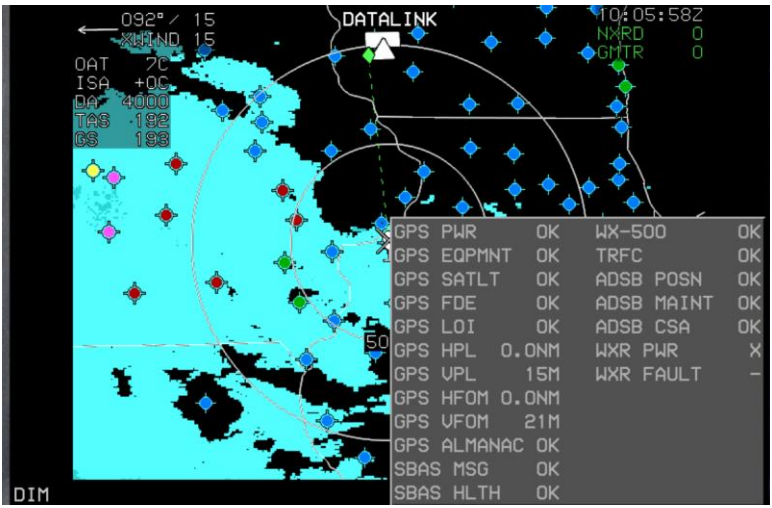
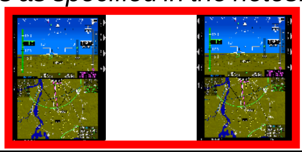


Figure D-12: FAULTS Menu with ADS-B Status

D 5. Menu Synchronization

Section 5 Menu Functions and Step-by-Step Procedures for additional information.

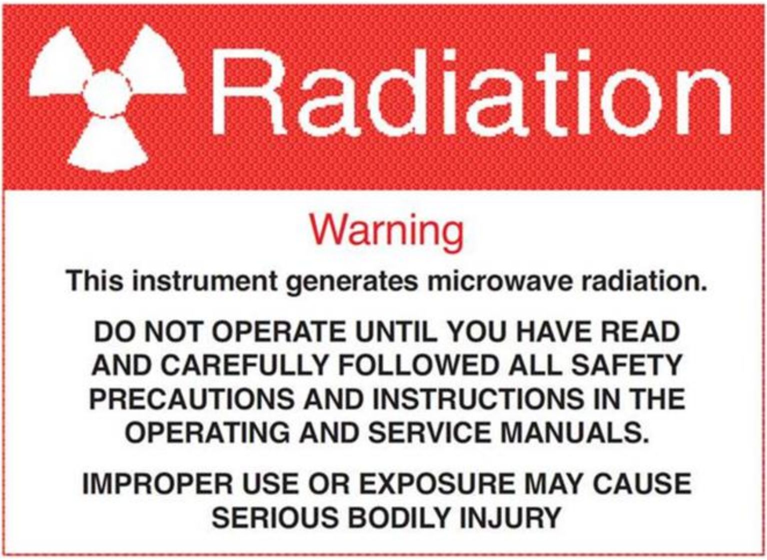
Table D-9: Menu Synchronization	
Menu Parameter	**Notes**
The following menu parameters are independent between displays. These are used to support non-PFD display options to give the pilot maximum MFD operating flexibility. Note that some of these parameters are also independent between top and bottom MFD areas as specified in the notes.  	
MFD Datalink Page Settings	Independent between top and bottom MFD areas

Weather Radar

WX 1. Weather Radar

This Weather Radar appendix is primarily for the Honeywell RDR-2100 installed with no external control panel. The EFIS controls the WX RDR from the EFIS PFD bottom display or MFD with WX RDR displayed in the top or bottom area. Since there is only one RDR-2100 installed in the aircraft, only one display area at a time can show the WX RDR menu. A horizontal and profile depiction is available through user-selection.

WARNING:



CAUTION:

Maintain prescribed safe distance when standing in front of operating antenna. (Reference FAA Advisory Circular #20-68)

Never expose eyes or any part of the body to an unterminated wave guide.

Figure WX-1: Weather Radar Image on Map

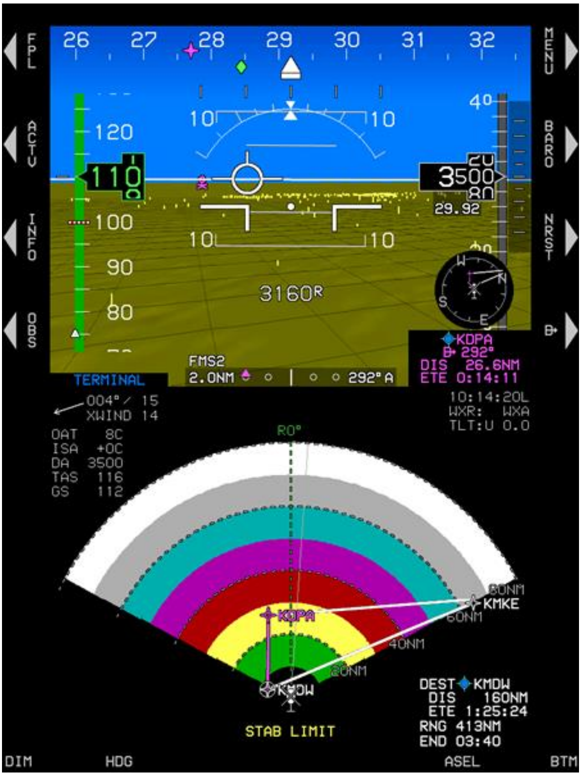


Figure WX-2: PFD Weather Radar Image on Bottom

WX 1.1. Ownship Symbol

Weather radar automatically declutters when weather radar returns are selected for display on the map page in correct relationship to the ownship symbol unless inhibited during active FLTA alerts. When weather radar is selected, Datalink NEXRAD is automatically deselected. Table WX-2 defines all inhibited factors with display. See Section 3 Display Symbology for ownship symbology details.

Table WX-1: Weather Radar Page Vertical Profile Altitude References

Distance in NM	Vertical Profile Altitude	Distance in KM	Vertical Profile Altitude
5NM	±7.5 X 1,000’	10KM	±2.5 X 1,000M
10NM	±15 X 1,000’	20KM	±5 X 1,000M
20NM	±30 X 1,000’	40KM	±10 X 1,000M
40NM	±60 X 1,000’	80KM	±20 X 1,000M
80NM	±120 X 1,000’	160KM	±40 X 1,000M
160NM	±240 X 1,000’	320KM	±80 X 1,000M
240NM	±360 X 1,000’	480KM	±120 X 1,000M
320NM	±480 X 1,000’	640KM	±160 X 1,000M

Table WX-2: Weather Radar Inhibited Conditions

During Active FLTA alerts
ND Moving Map Pan Mode
When North Up orientation is selected
When RDR-2100 is in vertical profile mode
When screen range is too small to effectively show the weather returns (defined as when the length of the weather radar scan line is longer than 512 pixels given current weather radar scale setting, screen range, and screen mode)

WX 2. Weather Radar Page

WX 2.1. MFD Page Menu

WX-RDR: Shows the Weather Radar page.

WX 2.2. First-Level Menu Option Descriptions

WX RDR (R7): If a Weather Radar page is displayed on the PFD, activates the Weather Radar menu for controlling Honeywell RDR-2000/2100.

WX RDR (R3): If a Weather Radar page is displayed on top area of the MFD, activates the Weather Radar menu for controlling Honeywell RDR 2000/2100.

DCLTR (R8): On the Weather Radar page with declutterable OASIS overlays or in horizontal profile mode, **DCLTR (R8) a**ctivates Weather Radar Declutter menu option. **ROUTE** toggles active flight plan route.

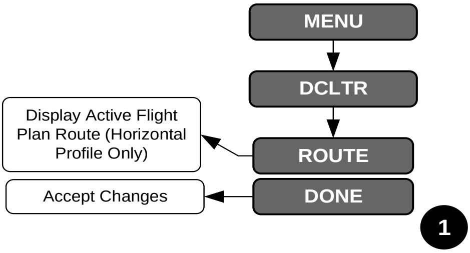


Figure WX-3: WX RDR Declutter (DCLTR) Menu

WX 2.3. Weather Radar Page Menu

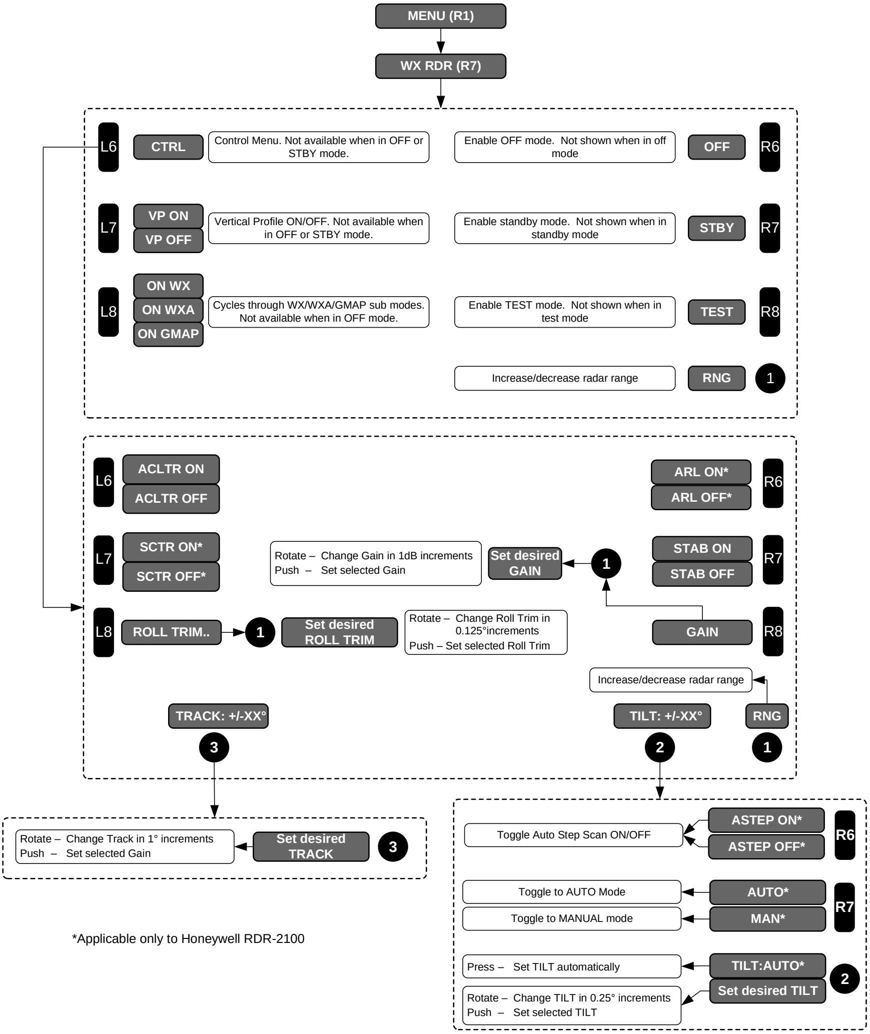


Figure WX-4: WX RDR Menu

Upon selecting WX RDR menu in the WX RDR page when weather radar type is RDR-2100 without external RCP installed, the following list appears.

1) **OFF (R6)**: Turns Weather Radar off.

2) **CTRL (L6)**: Activates a list to control live parameters as follows:

a) **ACLTR ON/OFF (L6)**: Toggles anti-clutter option between on and off.

b) **ASTEP ON (R6)**: Toggles auto step scan on or off. Begin by adjusting tilt to +15° or -15°.

c) **ARL ON/OFF (R6)**: Toggles automatic range limit option between on and off.

d) **SCTR ON/OFF (L7)**: Toggles sector scan option between on and off.

e) **STAB ON/OFF (R7)**: Toggles stabilization mode on or off.

f) **ROLL TRIM (L8)**: Changes roll trim in increments of 0.125° between +3.875° and -4.000°.

g) **GAIN (R8)**: Change radar gain in increments of 0.5 dB between 0-31.5 dB.

h) **TRACK ❸**: Rotate CW to increase and CCW to decrease changes in track in increments of 1° in the following limits settings.

   i) Scan width 80° (+/- 40°)

   ii) Scan width 90° (+/- 45°)

   iii) Scan width 100° (+/- 50°)

   iv) Scan width 120° (+/- 60°)

i) **TILT ❷**: Toggles tilt mode between auto tilt (RDR-2100 only) and manual tilt. Also toggles auto-step-scan option between on and off. When in manual tilt mode, changes tilt angle in increments of 0.25°.

j) **RNG ❶**: See § WX 2.5.

3) **STBY (R7)**: Toggles WX RDR to standby mode, press **ON WXA (L8)** to turn on WX RDR.

4) **TEST (R8)**: Toggles radar into test mode, press **ON WX (L8)** to return to normal operation.

5) **ON WX/WXA/GMAP (L8)**: Toggles WX ON, WXA, or GMAP.

6) **VP ON/OFF (L7)**: Toggles vertical profile ON/OFF. (When VP is OFF, horizontal profile is ON. See § WX 2.4.

7) **RNG ❶**:

   a) On an MFD (IDU #2, #3, or #4) operating in Normal mode, if the top area is showing the Weather Radar page, rotate ❶ to change the display range (direction of rotation is dependent upon EFIS limits settings).

b) ❶: On a PFD or MFD operating in Normal mode, if the bottom area is showing the Weather Radar page, rotate ❶ to change the display range (direction of rotation is dependent upon EFIS limits settings).

> **NOTE:**
>
> The weather radar modes are mutually exclusive and therefore selecting one turns off the other modes with the exception of vertical profile, which appears in the selection box only when the selected weather radar mode is not OFF or STBY.

WX 2.3.1. Managing RDR-2100 Weather Radar Menus (PFD) (Step-By-Step)

1) On PFD, push ❶ and rotate to **WX-RDR** and push to enter.
2) Press **MENU (R1)**, within 10 seconds press **WX RDR (R7)**.
3) Press **OFF (R6)** to enable OFF mode. (This option is not shown when in OFF mode.)

> **NOTE:**
>
> Turn off weather radar menu if no longer showing WX-RDR page.

4) Press **STBY (R7)** to enable standby mode. (This option not shown when in standby mode.)
5) Press **TEST (R8)** to enable test mode. (This option not shown when in test mode.)
6) While in STBY mode, press **ON WX (L8)** to return radar to ON mode.
7) Current mode status is displayed in upper right corner of radar page. Press **VP ON (L7)** to toggle between horizontal and vertical modes.

> **NOTE:**
>
> VP mode is automatically turned off if not showing any WX-RDR page on the onside IDUs.

8) Press **ON WXA (L8)** to enable Weather-alert sub-mode.

9) Press **ON GMAP (L8)** to enable ground map sub-mode. Annunciated in upper right corner.)

10) Press **ON WX (L8)** to resume normal weather radar mode of operation.

11) Rotate ❶ to alter range of weather radar from 5.00 NM to 320.00 NM. Rotation direction dependent upon EFIS limits setting. (Annunciated on the right side of the arc in NM or KM.)

NOTE:

Radar range limited to 160NM/240 KM when using RDR-2000 or RDR-1600.

WX 2.3.2. Managing RDR-2100 Weather Radar Menus (PFD) ACLTR, SCTR, and Roll Trim (Step-By-Step)

1) Repeat step 2 and press **CTRL (L6)**, to enter radar control menu then **WX RDR (R7)**. (Not shown when in OFF or STBY mode.)

2) Press **ACLTR ON (L6)** to toggle anti-clutter option ON and OFF.

3) Press **SCTR ON (L7)** to toggle sector scan option ON and OFF.

4) Press **ROLL TRIM (L8)** and then rotate ❶ to desired roll trim angle (increments of 0.125°) and push to enter.

WX 2.3.3. Managing RDR-2100 Weather Radar Menus (PFD) ASTEP, MAN/AUTO, TILT, Angle and GAIN (Step-By-Step)

1) Push ❷ to open the tilt menu.

2) Press **ASTEP ON (R6)** to toggle ON, and OFF. (Auto step scan is entered initially by adjusting the tilt to +15° or -15°.) Push ❷ to enter.

3) Press **MAN (R7)** or **AUTO (R7)** to toggle between either sub-modes.

4) Rotate ❷ to set tilt angle between ±15°. Set angle is annunciated above ❷ and in upper right corner.

5) When in tilt auto mode, annunciation is above ❷ and in upper right corner.

6) Press **ASTEP ON (R6)** or **ASTEP OFF (R6)** to toggle antenna tilt to sequentially step in 4° increments. (Auto step scan is entered initially by adjusting the tilt to +15° or -15°.)

7) Press **BACK (L1)** or **EXIT (R1)** to exit out of TILT sub-mode.

8) Repeat step 2, press **WX RDR (R7)** then **CTRL (L6)** to enter the track sub-mode.

9) Push ❸ and rotate or begin by rotating to set new track angle in 1° increments between limits set in EFIS limits. Read new track in two places. Push to enter.

10) Press **GAIN (R8)** to open gain menu and rotate ❶ to change gain in 0.5 dB increments. Push to set selected gain value.

WX 2.3.4. Managing RDR-2100 Weather Radar Menus (MFD) (Top Area) (Step-By-Step)

1) MFD with WX RDR in top area. Push ❷ and rotate to **WX-RDR (R7)** and push to enter.

2) WX RDR appears in top area. Press **MENU (R1)** to open menus.

3) Press **CTRL (L2)** to open WX RDR menus. (Not shown when in OFF or STBY mode.)

4) Press **ACLTR ON (L2)** to toggle anti-clutter option between ON and OFF.

5) Press **SCTR ON (L3)** to toggle Sector Scan option between ON and OFF.

6) Press **ROLL TRIM (L4)** and then rotate to ❶ desired roll trim angle (increments of 0.125°) and push to enter.

NOTE:

It is a design feature to retain most of the WX RDR menus in the top area with this configuration of the WX radar.

7) Press **ARL ON (R2)** to toggle automatic range limit option between ON and OFF.

8) Press **STAB ON (R3)** to toggle Stabilization mode ON or **STAB OFF (R3)** to toggle OFF.

9) Push ❶ or rotate to open Tilt menu and then press **MAN (R7)** or **AUTO (R7)** to toggle between either sub-mode.

10) In manual mode, rotate ❷ to set tilt angle between ± 15°. Set angle is annunciated above ❷ and in the upper right corner.

11) Press **ASTEP ON (R6)** or **ASTEP OFF (R6)** to toggle antenna tilt to sequentially step in 4° increments. (Auto step scan is entered initially by adjusting the tilt to +15° or -15°.)

12) Press **BACK (L1)** or **EXIT (R1)** to exit out of tilt sub-mode.

13) Press **GAIN (R4)** to open gain menu and then rotate ❶ to adjust.

14) Rotate ❶ to change gain in 0.5 dB increments between +0.0 dB to -31.5 dB. Push to set selected gain value.

15) Push ❸ and rotate or begin by rotating to set new track angle in 1° increments between limits set in EFIS limits.

WX 2.3.5. Managing RDR-2100 Weather Radar Menus (MFD) (BTM Area) (Step-By-Step)

1) Push ❶ and rotate to **WX-RDR (R7)** and push to enter. Press **MENU (R1)** and then **WX RDR (R7)**, within 10 seconds to open WX RDR options.

2) Press **OFF (R6)** to enable OFF mode.

3) Press **STBY (R7)** to enable standby mode. (This option not shown when in standby mode.)

4) Press **TEST (R8)** to enable test mode. (This option not shown when in TEST mode.)

5) Press **ON GMAP**, **ON WX**, or **ON WXA (L8)** to enable ground map, weather, or weather alert sub-modes.

6) Press **VP ON (L7)** to toggle between horizontal and vertical modes.

> **NOTE:**
>
> VP mode is automatically turned off if not showing any WX-RDR page on the onside IDUs.

7) Press **CTRL (L6)** to open **WX RDR** menus. (Not shown when in OFF or STBY mode.)

8) Rotate ❶ to alter range of weather radar from 5.00NM to 320NM. Rotation direction dependent upon EFIS limits setting. Range rings are on the right side of the arc.

9) Press **STBY (R7)** to enable standby mode. (This option not shown when in standby mode.)

WX 2.3.6. Managing RDR-2100 Weather Radar Menus (MFD) (BTM Area) ARL, TILT, ASTEP, and ROLL TRIM (Step-By-Step)

1) Press **ARL OFF (R2)** to toggle automatic range limit option between OFF and ON.
2) Push ❷ and rotate or rotate to open TILT menu and then press **MAN (R7)** to place enter tilt mode. This action toggles off AUTO sub-mode.
3) Push ❷ and rotate or rotate tilt angle between ± 15°. Set **TILT** angle is annunciated above ❷ and in upper right corner.
4) Press **ASTEP ON (R6)** or **ASTEP OFF (R6)** to toggle antenna tilt to sequentially step in 4° increments. (Auto step scan is entered initially by adjusting the tilt to +15° or -15°.)
5) Press **BACK (L1)** or **EXIT (R1)** to exit out of tilt sub-mode.
6) In the **CTRL** menu, push ❸ and rotate or begin by rotating to set new track angle in 1° increments between limits set in EFIS limits. Read new track in two places. Push ❷ to enter or press **BACK (L1)** to exit from track sub-mode.
7) Press **ROLL TRIM (L8)** to enter roll trim sub-mode.
8) Press **ROLL TRIM (L8)** and then rotate to ❶ desired roll trim angle (increments of 0.125°) and push to enter or press **BACK (L1)** or **EXIT (R1)** to exit menu.

WX 2.3.7. Managing RDR-2100 Weather Radar Menus (MFD) (BTM Area) SCTR, ACLTR, and TRACK ANGLE, and ROUTE (Step-By-Step)

1) Press **SCTR ON (L7)** to toggle Sector Scan option between ON and OFF.
2) Press **ACLTR ON (L6)** to toggle anti-clutter option between ON and OFF.
3) Push ❸ and rotate or begin by rotating to set new track angle in 1° increments between limits set in EFIS limits.
4) Push to enter and clear track sub-menu or press **BACK (L1)** or **EXIT (R1)** to exit menu.
5) Press **MENU (R1)**, then press **DCLTR (R8).** Rotate ❶ to **ROUTE** and push to toggle **ON** or **OFF** and rotate to **DONE** and push to enter or press **EXIT (R1)** to exit DCLTR sub-menu.

NOTE:

If the WX-RDR page is opened in both top and bottom areas, the top area is the dedicated priority display for WX-RDR menus.

WX 2.3.8. Managing RDR-2000 Weather Radar Menus (PFD) (Step-By-Step)

1) Push ❶ and rotate to **WX-RDR** and push to enter.
2) Press **MENU (R1)** then press **WX RDR (R7)**.
3) Press **OFF (R6)** to turn off WX-2000.
4) Press **STBY (R7)** toggles **WX RDR** to **STBY** mode, press **ON WX (L8)** to turn on RDR-2000.
5) Press **TEST (R8)** to enable test mode. (This option not shown when in test mode.)
6) Press **ON GMAP (L8)** to enable ground map sub-mode.
7) Press **VP ON (L7)** to toggle between horizontal and vertical modes.
8) Press **CTRL (L6)** to open **WX RDR** menus. (Not shown when in **OFF** or **STBY** mode.)
9) Press **STAB OFF (R7)** to toggle stabilization sub-mode **STAB ON** and **STAB OFF**. Annunciation is found in upper right corner.
10) Press **GAIN (R8)** to open gain menu and adjust (increments of 0.5 dB) with ❶.

WX 2.3.9. Managing RDR-2000 Weather Radar Menus (PFD) ROLL TRIM, and, ACLTR (Step-By-Step)

1) Press **ROLL TRIM (L8)** and then rotate to ❶ desired roll trim angle (increments of 0.125°) and push to enter or press **BACK (L1)** or **EXIT (R1)** to exit menu.
2) Press **ACLTR ON (L6)** to toggle anti-clutter option between ON and OFF.
3) Push to enter and clear track sub-menu or press **BACK (L1)** or **EXIT (R1)** to exit menu.

4) Press **ROLL TRIM (L8)** and then rotate to ❶ desired roll trim angle (increments of 0.125°) and push to enter or press **BACK (L1)** or **EXIT (R1)** to exit menu.

5) Push ❷ and rotate or rotate to open tilt menu. Rotate to desired tilt angle between ± 15°. Set angle is annunciated above ❷ and in upper right corner with “D” for down ° and “U” values. For up, push to enter or press **BACK (L1)** or **EXIT (R1)** to exit menu.

6) Push to enter or press **BACK (L1)** or **EXIT (R1)** to exit menu.

WX 2.3.10. Managing RDR-2000 Weather Radar Menus (MFD) (Step-By-Step)

The MFD weather radar menu for the RDR-2000 MFD is the same as for the RDR-2100 with the exception of fewer menu options as described § 0 for the RDR-2000 PFD.

WX 2.4. Horizontal/Vertical Profile Depiction

In a horizontal depiction, the weather page uses an arced format with the ownship symbol centered in the bottom of the display with the weather area depicted as an arc ahead of the ownship symbol.

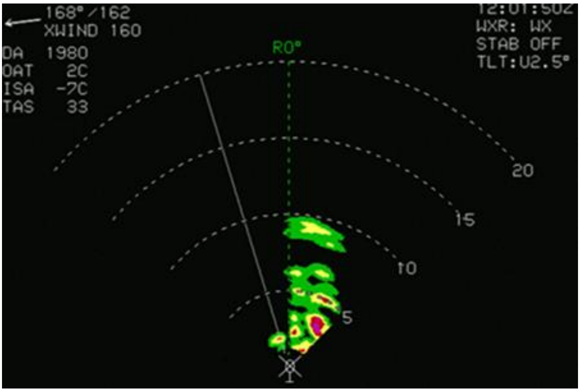


Figure WX-5: Radar Image in Arc Format

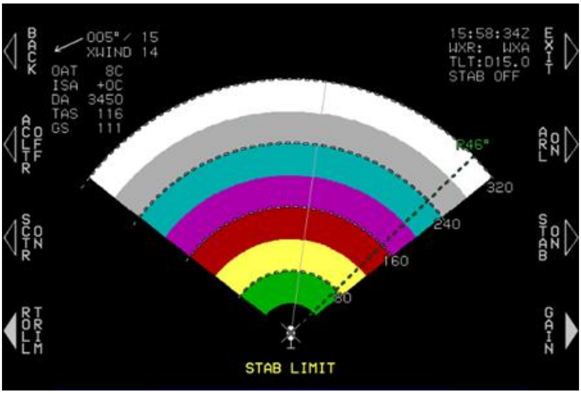


Figure WX-6: Radar Image in Arc Format (STAB LIMIT)

In vertical profile depiction, the weather page uses an arced format with the ownship symbol centered on the left side of the display and the weather area depicted as an arc to the right of the ownship symbol.

To select vertical profile depiction, use the weather radar control panel EFIS menu (see § WX 2.3). The EFIS ensures at least one weather radar-enabled page is showing the weather radar page prior to entering into profile depiction and disables profile depiction if the pilot sets the pages for no weather radar page on any weather radar-enabled page. The purpose is to maximize the availability of weather radar information on the Map page, which only shows a horizontal depiction and disables profile depiction, if the weather radar mode is set to off or standby via radar control panel.

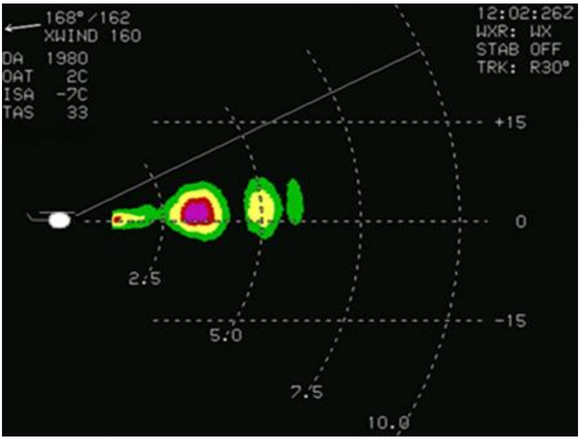


Figure WX-7: Radar Image in Profile Depiction

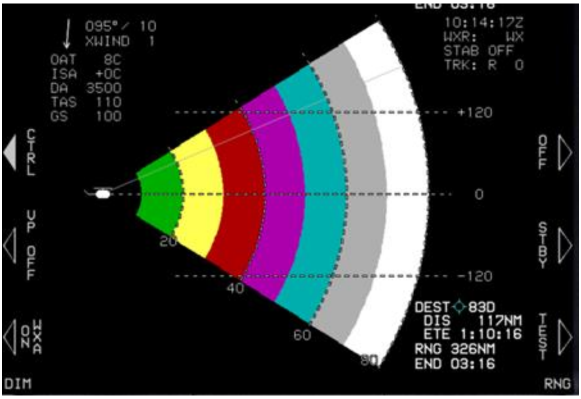


Figure WX-8: Radar Image in Profile Depiction (STAB LIMIT)

WX 2.5. Weather Page Screen Range

Weather page screen range is user-selectable with either ➊ (RDR-2000 or RDR-2100 weather radar types) or a control panel directly attached to the weather radar receiver-transmitter.

➋: On an MFD operating in Normal mode, if the top area is showing the Weather Radar page, rotate ➋ to change the display scale (CW to increase, CCW to decrease, or as set in EFIS limits).

➊: On a PFD or MFD operating in Normal mode, if the bottom area is showing the Weather Radar page, rotate ➊ to change the display scale (CW to increase scale, CCW to decrease or as set in EFIS limits.)

Weather page screen range is displayed NM of KM distances depending upon EFIS limits settings, as a series of equidistant dashed arcs centered upon the ownship symbol to help judge range to the displayed weather radar returns. For most screen ranges, there are four equidistant dashed arcs. When in 2.5NM or 5KM range, there are five equidistant dashed arcs.

Each arc is labeled with distance in units at the right (horizontal depiction) or bottom (profile depiction). In the profile depiction mode, there are also three horizontal altitude lines drawn relative to the aircraft's altitude to help the pilot judge the vertical distance to the displayed weather radar returns. The center line is level with the ownship symbol to represent the aircraft's altitude. The other two lines are equally spaced above and below the center line to represent altitude differences above and below the aircraft. The number of feet or meters above and below the aircraft vary with the selected range to compensate for the radar scan width at the different ranges.

With the exception of the RDR-2000, RDR-2100 or RDR-1600 weather radar types, available screen ranges are controlled by the weather radar and the IDU formats the dashed arcs as commanded by the range parameter settings.

In the case of RDR-2000, RDR-2100 or RDR-1600 weather radar type, screen range is an internally controlled parameter and the following weather screen ranges are available (all distances represent the distance from the ownship symbol to the outer dashed arc.)

Table WX-3: Weather Radar Page Range in NM

Range (NM)	RDR-2000	RDR-2100	RDR-1600
0.5			✓
1			✓
2			✓
5	✓	✓	✓
10	✓	✓	✓
20	✓	✓	✓
40	✓	✓	✓
80	✓	✓	✓
160	✓	✓	✓
240	✓	✓	✓
320		✓	
✓ indicates range is available			

Table WX-4: Weather Radar Page Range in KM

Range (KM)	RDR-2000	RDR-2100	RDR-1600
1			✓
2			✓
4			✓
10	✓	✓	✓
20	✓	✓	✓
40	✓	✓	✓
80	✓	✓	✓
160	✓	✓	✓
320	✓	✓	✓
480	✓	✓	✓
640		✓	
✓ indicates range is available			

WX 2.6. Track Line

When the weather radar type is RDR-2100 and in horizontal depiction, a dashed track line emanates from the ownship symbol to the outer dashed arc. The value of the track line in whole degrees left or right of aircraft heading is displayed adjacent to the outer end of the track line.

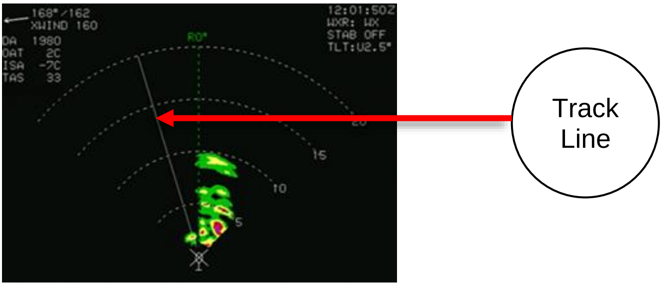


Figure WX-9: Radar Track Line

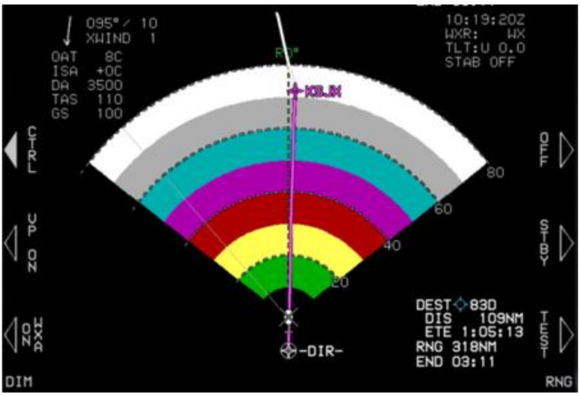


Figure WX-10: Radar Track Line with Menus

WX 2.7. Active Flight Plan Path/Manual Course/Runways

The active flight plan path (when selected), waypoints, and manual course appear, when the weather radar page is showing horizontal depiction. The weather radar page displays airport runways, when the weather radar page is showing horizontal depiction.

The weather radar screen displays airport runways when the weather radar screen is showing horizontal depiction.

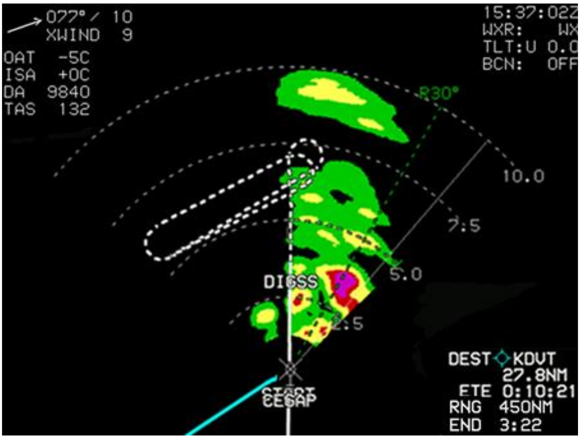


Figure WX-11: Radar Active Flight Plan

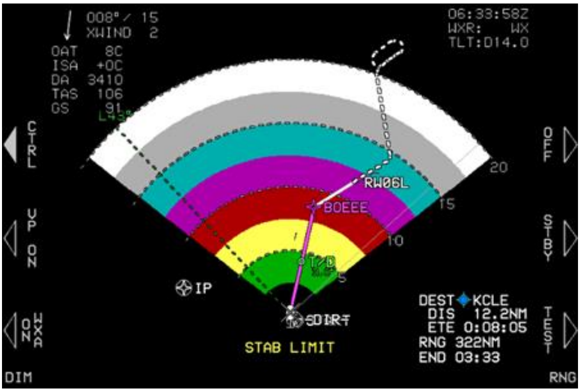


Figure WX-12: Radar Active Flight Plan with Menus

WX 2.8. Weather Radar Return Data

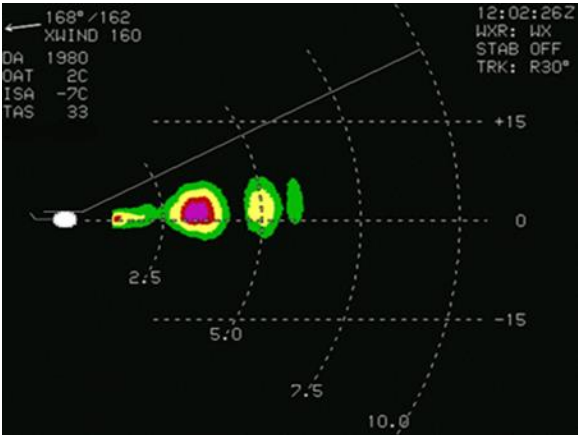


Figure WX-13: Radar Return Data

Weather radar return data are displayed in correct relationship to the ownship symbol as colored regions.

Table WX-5: Weather Radar Return Data

Color	Definition
BLACK	No Returns
GREEN	Low-Level Weather or Low-Level Ground Returns
YELLOW	Mid-Level Weather or Mid-Level Ground Returns
RED	Third-Level Weather Returns. With an RDR-1600 weather radar type, this color alternates between red and black at 1Hz when in WXA mode. For all other radar types, this color should be replaced with black when in MAP mode.
MAGENTA	Fourth-Level Weather or Third-Level Ground Returns. With an RDR-2000 or RDR-2100 weather radar type, this color alternates between magenta and black at 1Hz when the internal sub-mode is WXA.
CYAN	Automatic range limit returns. Indicates areas of unreliable returns due to radar power absorption
LIGHT GRAY	Moderate turbulence returns
White	Severe turbulence returns

The following weather radar-specific warnings appear in a conspicuous area adjacent to weather radar return data so they do not conflict with the weather radar return data. Only one warning appears at any given time, with the following order of precedence:

1) WX ALRT: Weather alert condition is active.

2) TURB ALRT: Turbulence alert condition is active.

3) STAB LIMIT: Aircraft attitude has moved to a point where the weather radar antenna can no longer be effectively stabilized.

4) ANT FAULT: Weather radar antenna is temporarily dislodged by turbulence.

WX 2.9. Air Data and Ground Speed

Wind in knots
Speed in knots
Altitude in feet

Wind in m/s
Speed in km/h
Altitude in meters

Figure WX-14: Air Data and Ground Speed

Air data is displayed in upper left corner of the weather radar page as specified in Section 3 Display Symbology. See Section 2 System Overview for EFIS Limits Options for Speed Units.

WX 2.10. Waypoint Distance

Displayed as specified in Section 3 Display Symbology.

WX 2.11. Clock/Options

Zulu Time

Local Time

Figure WX-15: Radar Clock/Options

The following are displayed in the upper right corner:

1) Zulu or Local Time: As in Section 3 Display Symbology

2) Weather Radar Mode Annunciation: As in Table WX-6 and Table WX-7.

Table WX-6: RDR 2100 Applicability

Mode	Annunciation
Off	WXR:OFF
Standby	WXR:STBY
Weather only	WXR:WX
Weather alert	WXR:WXA
Ground map	WXR:GMAP
Test	WXR:TEST
Not defined	WXR:----

Table WX-7: RDR 2100 Mode Annunciation

Annunciation	Conditions
Overlaid with Red X	Weather radar mode is off or not defined. Cooling fault condition exists. Attitude or range fault condition exists. T/R fault condition exists. For Honeywell RDR-2000 and 2100, or Telephonics RDR- 1600, The External Radar control panel is failed.
Overlaid with Green X	For Honeywell RDR-2000 and 2100, or Telephonics RDR- 1600, when RCP is not failed and the commanded RCP mode is OFF.
STAB OFF (Stabilization)	Mode annunciation not overlaid with a red “X” or green “X”; Mode not standby or forced standby; and Weather radar indicates stabilization is OFF
TGT ALERT (Target Alert)	Mode annunciation not overlaid with a red “X or green “X”; Mode not standby or forced standby; Weather radar presenting horizontal depiction. The weather radar type is Honeywell PRIMUS, Honeywell RDR-2000 or Honeywell RDR-2100.

Table WX-7: RDR 2100 Mode Annunciation	
Annunciation	**Conditions**
REACT	Honeywell PRIMUS only. Annunciation is provided when all of the following conditions are true: Weather radar mode annunciation is not overlaid with a red “X”. Weather radar mode is not standby or forced standby.
“TLT:UXX.X” or “TLT:AUTO” (TILT)	U = Up or Down (either U or D, but not both, may appear – use “U” for 0°); “TLT:UXX.X” or “TLT:AUTO” XX.X represents absolute value of the tilt angle in degrees truncated to the nearest tenth; “TLT:AUTO” used where weather radar reports a value of -16°, representing automatic tilt. Weather radar tilt annunciation only appears when all following conditions are true: 1) Mode annunciation not overlaid with a red “X” or green “X”. 2) Mode not standby or forced standby; and 3) Radar not in vertical profile depiction.
TRK:LXX (TRACK)	Weather Radar Track Annunciation (RDR-2000/2100 only) A weather radar track annunciation appears to indicate the track of the profile depiction relative to the aircraft’s heading. The weather radar track annunciation only appears when all of the following conditions are true: L = Left or Right (either L or R, but not both, may appear – use “R” for 0°); and XX represents absolute value of the track angle in degrees. Weather radar track annunciation only appears when all following conditions are true: Mode annunciation not overlaid with a red “X”; or green “X”. Mode not standby or forced standby; and Radar in vertical profile sub-mode (Profile depiction).

Table WX-7: RDR 2100 Mode Annunciation	
Annunciation	**Conditions**
"GN:SXXDB," "GN:CAL," or "GN:MAX" (GAIN)	A weather radar gain annunciation is provided to indicate the manual gain setting of the weather radar where: S = Sign (either "+" or "-," but not both, may appear – use "+" for 0°); and XX represents the manual gain setting in decibels. (Used for ARINC 708-6, Collins 800/840 and Honeywell PRIMUS weather radar types). XX.X represents the manual gain setting with one decimal point in decibels. (Used for RDR-2000, RDR-2100 and RDR-1600 weather radar types.) "GN:CAL" represents the calibrated condition "GN:MAX" represents maximum manual gain Weather radar manual gain annunciation only appears when all following weather radar mode conditions are true: Mode annunciation not overlaid with a red "X" or green "X". Mode not standby or forced standby; and In an RDR-2000/2100 installation, the weather radar mode is Ground Map. In an RDR-1600 installation, the weather radar mode is any search modes.

WX 2.12. Fuel Totalizer/Waypoint Distance Functions

Fuel totalizer and waypoint distances are displayed in the lower right corner of the weather radar screen.

Distance in NM

Distance in KM

Figure WX-16: Radar Fuel Totalizer/Waypoint Distance Functions

WX 3. MFD Fault Display Menu

Upon selecting the MFD faults menu, the status of the following system parameters are displayed if weather radar is enabled:

1) Indicates weather radar power/communication status (WXR PWR X or WXR PWR OK). Status failed (WXR PWR X) reflects any one of the following conditions is true:
   a) Loss of weather radar communication.
   b) Weather radar mode is OFF.
2) Indicates weather radar fault status (WXR FAULT –, WXR FAULT X, or WXR FAULT OK). Status failed (WXR FAULT –) indicates it is not possible to determine weather radar faults. Status failed (WXR FAULT X) reflects any of the following conditions is true:
   a) A cooling fault condition exists.
   b) An attitude or range fault condition exists.
   c) A control fault condition exists.
   d) A T/R fault condition exists.
3) If weather radar type is RDR-2000 or RDR-2100, indicates radar control panel status (WXR RCP X or WXR RCP OK). Status failed (WXR RCP X) indicates loss of communication.

NOTE:

When using EFIS menu system for RDR-2XXX control, the weather radar mode received from the offside system is used to update onside weather radar mode as follows. This is to ensure weather radar power on/off is synchronized between both sides.

When offside mode is commanded to STBY, TEST, or ON and if onside mode is OFF, then the onside mode is set to STBY.

When offside mode is commanded to OFF, then the onside mode is also set to OFF.

NOTE:

Manufacturer's Fault Annunciations

Fault annunciations are a method of alerting the pilot that the radar system is not performing to established standards. Built-in test equipment automatically and constantly tests the radar system. If a fault occurs, the fault annunciation is presented on the display configured for WX-RDR.

See appropriate weather radar pilot guide for descriptions of failure descriptions.

WX 4. Menu Synchronization

See Section 5 Menu Functions and Step-By-Step Procedures for more information.

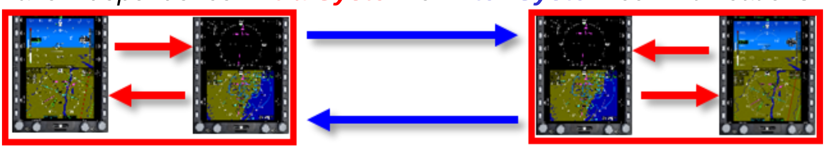
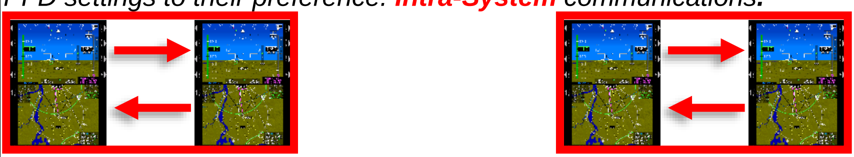
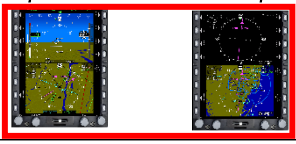
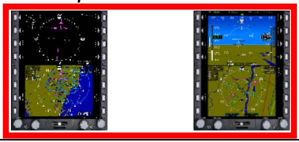
<table>
<tr><th colspan="2">Table WX-8: Menu Synchronization</th></tr>
<tr><th>Menu Parameter</th><th>Notes</th></tr>
<tr><td colspan="2">The following menu parameters are synchronized across all displays at all times. These are bugs and fundamental aircraft values that should never have independence. Intra-System or Inter-System communications.
</td></tr>
<tr><td>WX RDR Control Menu parameters</td><td>Used to synchronize certain RDR-2XXX modes. See note below.</td></tr>
<tr><td colspan="2">The following menu parameters are only synchronized onside. These parameters are usually sensor selections or PFD options used to keep the appearance of any pilot's PFD consistent in the case of PFD reversion. The onside characteristic means that individual pilots can still adjust their PFD settings to their preference. Intra-System communications.
</td></tr>
<tr><td>WX RDR Control Menu parameters</td><td>Synchronized onside when Honeywell RDR-2XXX is installed.</td></tr>
<tr><td>Weather Radar Scale</td><td>Onside because range is controlled by the weather radar.</td></tr>
</table>

Table WX-8: Menu Synchronization

Menu Parameter	Notes
The following menu parameters are independent between displays. These are used to support non-PFI area display options to give the pilot maximum MFD operating flexibility. Note that some of these parameters are also independent between top and bottom MFD areas as specified in the notes.	
	
MFD Selected Page	This parameter is transmitted to all other IDUs to support weather radar vertical profile mode selection.
MFD Map Page Settings	Map scale is transmitted onside to support weather radar range selection.

NOTE:

The WRM 429 output on each side (pilot and co-pilot PFDs and MFDs) can be wired to a separate control input on the RDR-2XXX. This allows each side to request separate modes from the RDR- 2XXX. The radar time-slices the radar sweeps between the 2 controllers. Thus, if the pilot requests a horizontal profile and the co-pilot requests a vertical profile, one sweep provides the requested return to the pilot, the dish repositions, and the next sweep provides the requested return to the co-pilot.

Video

V 1. Video Input Page

PAGE Menu ❶: **VIDEO** – opens Video Input page.

The video input page is an image of 640 by 480 pixels and accepts video input signals in the RS-170 composite format. The system is configurable to the NTSC, PAL (including the PAL-m and PAL-nc variants), or SECAM versions of RS-170 separately for each video input. In addition, an auto-detection mode, which programs the video input chip to process most standard RS-170 formats, is configurable for each video input.

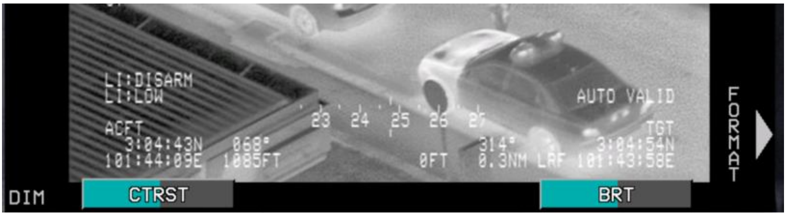
When no video signal is detected, the video input page is black and **NO VIDEO IMAGE AVAILABLE** is displayed in white on the center of the page. To aid in diagnosing problems with undetected video signals, the following annunciations are also displayed:

1) **NO INTERLACED SIGNAL**: No interlaced signal detected.
2) **NO HORIZ OR VERT SYNC**: No horizontal or vertical synchronization detected.
3) **NO COLOR SIGNAL**: No video chroma signal detected.
4) **LOAD ERROR DETECTED**: Video chip reports a load error.
5) **TRIGGER ERROR DETECTED**: Video chip reports a trigger error.
6) **PROGRAMMING ERROR DETECTED**: Video chip reports a programming error.

V 1.1. Top-Level Menu Option Descriptions

1) ❶: On a PFD or MFD operating in Normal mode, if the bottom area is showing a video page, and Zoom is enabled in EFIS limits, rotating the knob changes the zoom level (clockwise = increase, counterclockwise = decrease) or as set in EFIS limits.
2) ❷: On an MFD (IDUs other than #1) operating in Normal mode, if the top area is showing a video page, and zoom is enabled in EFIS limits, rotating the knob changes the zoom level (clockwise = increase, counterclockwise = decrease) or as set in EFIS limits.

V 1.2. PFD Page First-Level Option Descriptions

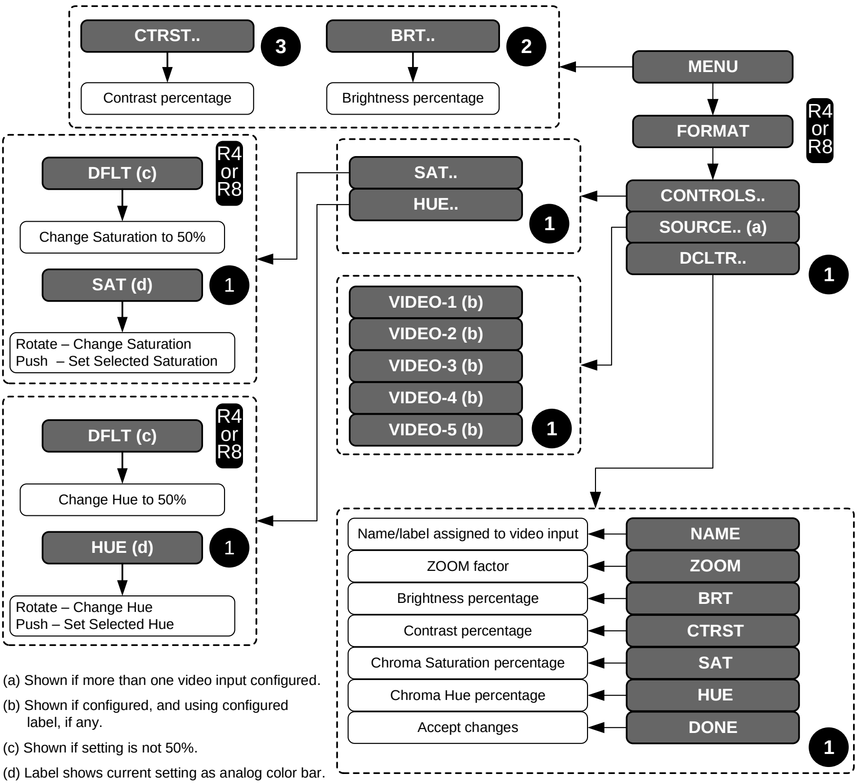


CTRST ❸: Adjusts contrast setting for the current video input

BRT ❷: Adjusts brightness setting for the current video input

Figure V-1: PFD Video Page First-Level Contrast and Brightness Setting

V 1.3. MFD Page First-Level Option Descriptions



(a) Shown if more than one video input configured.

(b) Shown if configured, and using configured label, if any.

(c) Shown if setting is not 50%.

(d) Label shows current setting as analog color bar.

Figure V-2: MFD Page First-Level Menu

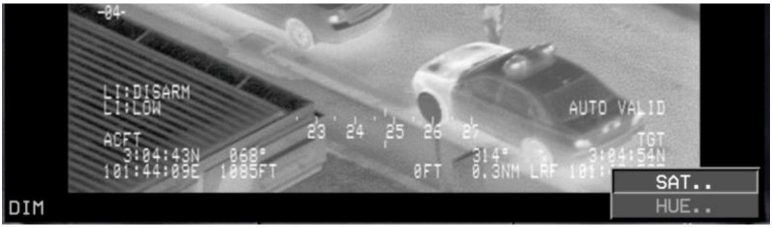


Figure V-3: Video Page Saturation and Hue Setting

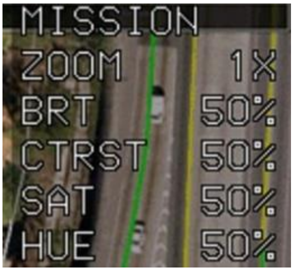


Figure V-4: Video Status

V 1.4. Pan Mode

When enabled in EFIS limits, and the zoom level is greater than 1, the Video page has a pan mode for selecting the portion of the video image displayed by replicating pixels. When pan mode is active, controls are present to allow moving the portion displayed up, down, left, and right.

Figure V-5: Video Pan Mode

A mini map of the displayed image's position in the full video image is displayed for 10 seconds after:

1) Entering pan mode;

2) Changing the zoom level to a value greater than 1;

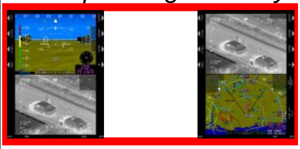
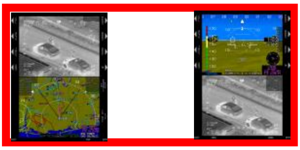
3) Panning the zoomed image.

Exiting pan mode removes pan mode controls and mini map, if any.

Table V-1: Pan Mode Function Descriptions

Top Area	Bottom Area	Tile Legend	Action
L2	L6	UP	Press to move the section of video image displayed in specified direction.
L3	L7	DOWN	
R2	R6	LEFT	
R3	R7	RIGHT	

V 2. Menu Synchronization

<table>
<tr><th colspan="2">Table V-2: Menu Synchronization</th></tr>
<tr><th>Menu Parameter</th><th>Notes</th></tr>
<tr><td colspan="2">The following menu parameters are independent between displays. These are used to support non-PFD display options to give the pilot maximum MFD operating flexibility.
 </td></tr>
<tr><td>MFD Video Page Settings</td><td>Independent between top and bottom MFD areas with exception of the following hardware settings:
• Selected Input
• Brightness
• Contrast
• Saturation
• Hue</td></tr>
</table>

Round Dials

RD 1. Primary Flight Instrumentation

The following details round dial display symbology used on the PFD and MFD IDU-680 in Normal and Essential modes. The round dials option is only available with pure digital ADC configured. Not all combinations of possible views are represented. See Section 3 Display Symbology for further information on the display symbology.

RD 1.1. Pitch Scale

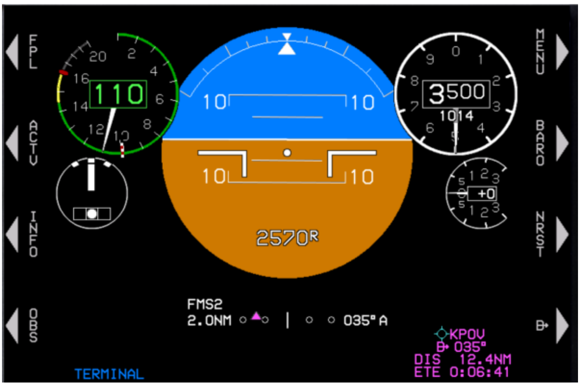
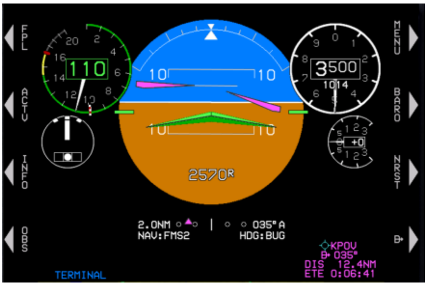


Figure RD-1: Pitch Scale

The white pitch scale and horizon rotates about the large aircraft symbol reference marks according to the aircraft's roll angle. The pitch scale has 5° with major increments and pitch scale labels every 10°. Pointer bars at the ends of each major increment indicate the direction to the horizon. Pitch scale increments automatically declutter to present the fewest possible increments needed.

RD 1.2. Flight Director Symbology

A pilot-selectable flight director is available through the menu system or integrated autopilot/flight director avionics. When selected, one of the symbology shown in Figure RD-2 appears when valid steering commands are received. When the aircraft is not equipped with an autopilot, no flight director is available.



FD1 Single Cue

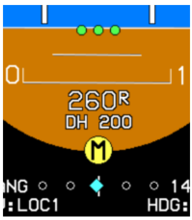
FD2 Dual Cue

Figure RD-2: Flight Director

RD 1.3. Marker Beacon Indicators

When enabled and valid marker beacon indicators with appropriate coloring and markings are displayed in the lower central portion of the PFD. During a built-in-test, more than one marker beacon can be active. Marker beacons are acquired from NAV VLOC1 or VLOC2. Marker beacons are disabled when the NAV source is other than VLOC1 and or VLOC2.

Inner Marker



Middle Marker

Outer Marker

Figure RD-3: Marker Beacon Indicators

RD 1.4. Bank Angle Scale

The bank angle scale and roll pointer are centered upon the waterline. During EFIS limits configuration, a sky pointer is designated as the type of bank angle type configured.

Roll Pointer Sky Pointer

Figure RD-4: Bank Angle Scale Type

RD 1.5. AGL Indication

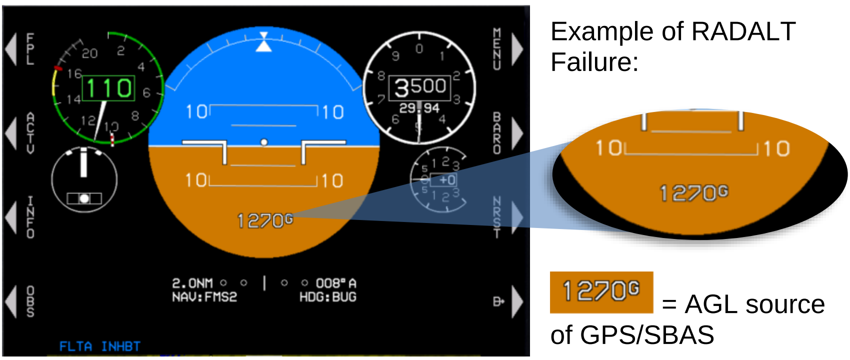


Figure RD-5: AGL Indicator

AGL altitude is displayed as shown in Figure RD-5 at the bottom of the display or above the CDI. The source for AGL indication is the source being used for the TAWS, which is designated as follows:

R = Radar Altitude

G = GPS/SBAS geodetic height less database found elevation.

B = Barometric altitude less database ground elevation.

AGL altitude is not displayed when it is greater than 2,500 feet and is not displayed when it is invalid. This area also includes a decision height set with the PFD bugs menu.

Table RD-1: AGL Altitude Values			
Value	**Resolution**	**Color**	
<300’	10’	White	
<100’ >300’	5’		
>100’	1’		
Decision Height	10’		White but turns amber (yellow) and flashes at and below DH.

RD 1.6. Airspeed Display Normal and with Loss of ADC

The airspeed display digitally displays indicated airspeed in knots, miles, or kilometers per hour (as per aircraft “Speed Units” system limit) and is scaled to show the entire operating range of the aircraft. Clockwise movement indicates increasing speed.

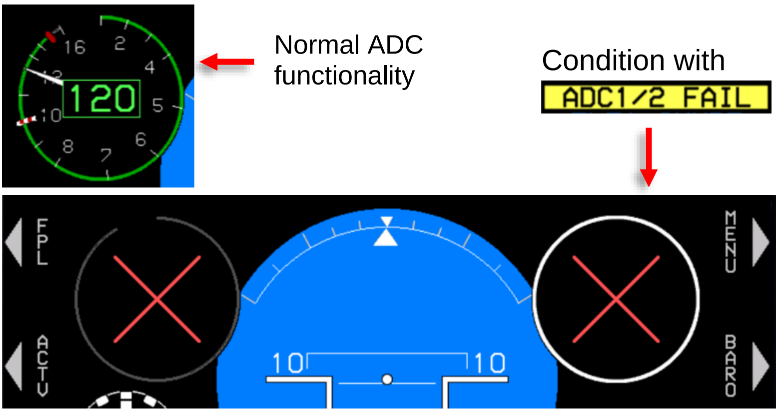


Figure RD-6: Airspeed Display with ADC Failure

Without airspeed bugs

IAS bug set to 80 and indicating 80 KIAS

IAS bug set to 80 and indicating 70 KIAS

Figure RD-7: Round Dials Airspeed Display Limits

1) Gray safe-operating area from bottom of dial to V_{MIN}. Airspeed is gray at 0 (indicating "dead" airspeed) but otherwise green.

2) Green safe operating range area from V_{MIN} to V_{NO}. V_{MIN} refers to the minimum speed for effective airspeed indication (usually 20KIAS, depending on the connected ADC). Airspeed readout is gray at 0 (indicating "dead" airspeed) but otherwise green.

3) Amber (yellow) caution range area from V_{NO} to V_{NE} (power-on). Airspeed readout is yellow.

4) Red radial line at V_{NE} (power-on). Airspeed readout is red at or above the red radial line.

The airspeed dial for Part 27 and Part 29 rotorcraft has additional specific airspeed markings displayed as a red cross-hatched radial line at V_{NE} (power-off).

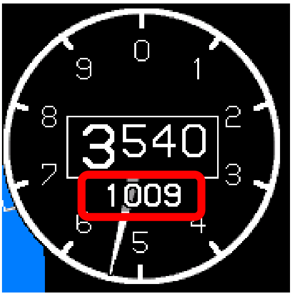
RD 1.7. Altimeter

The altimeter setting digitally displays the altimeter setting in inches of mercury (inHg) or millibars (mbar) according to the pilot-selected units. The mode is annunciated as QFE operations; otherwise, no mode is annunciated.

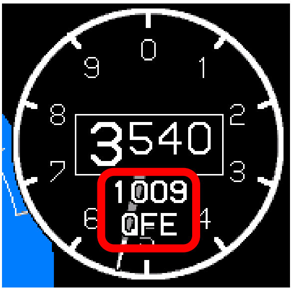
QFE: Barometric setting resulting in the altimeter displaying height above a reference elevation (i.e., airport or runway threshold). Mode is annunciated as "QFE" otherwise, no mode is annunciated.

QNE: Standard barometric setting (29.92 inHg or 1013 mbar) used to display pressure altitude for flight above the transition altitude.

QNH: Barometric setting resulting in the altimeter displaying altitude above mean sea level at the reporting station.



Altimeter QNH



Altimeter QFE

Figure RD-8: Altimeter

To change altimeter setting:

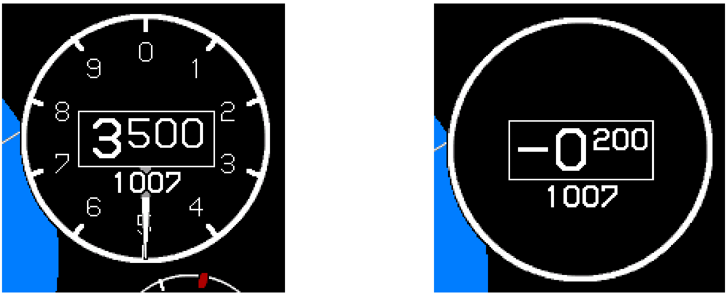
1) Press **BARO (R2)** to enter BARO mode and view the inches of mercury (inHg) or millibars (mbar) value in the lower right corner.

2) Rotate ❶ CW to increase or CCW to decrease QNH. Allowable setting limits are 22.00 inHg (745 mbar) at the lowest and 32.00 inHg (1100 mbar) at the highest setting.

3) Push ❶ or press **EXIT (R1)** to enter the new value.

RD 1.8. Altitude Display

The altitude readout digitally displays barometric altitude to the nearest ten feet as adjusted by an altimeter setting and shows a 1000-foot range with labels and graduations every 100 feet. CW rotation of the pointer indicates increasing altitude. All graduations are removed when below sea level.



Altimeter display with labels and graduations

Altitude display when below sea level

Figure RD-9: Altitude Display

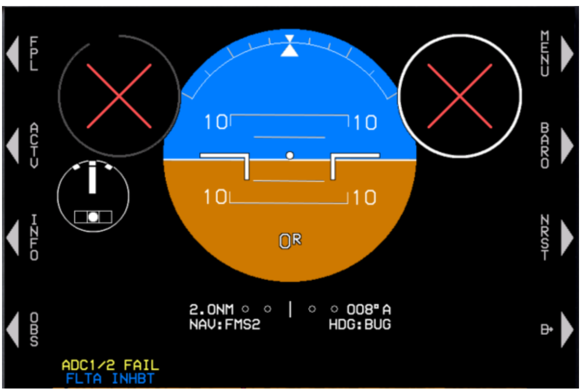


Figure RD-10: Airspeed and Altitude with Loss of ADC

Altitude sub-mode user-selectable triangular target altitude bug shown here at 4,400’. The bug is limited to -1,000’ up to the service ceiling and is removed when more than 500’ away from current altitude.

Figure RD-11: Target Altitude Bug

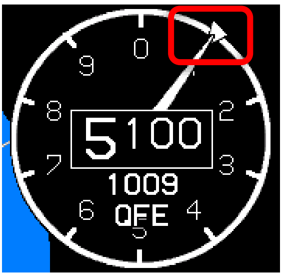
The target altitude bug can be used as a visual reference or when vertically integrated with the Genesys HeliSAS-E or other autopilot, the bug characteristics indicate the following modes:

1) Filled-white when in altitude hold mode.

2) Hollow-white when in a climb or descent mode.

3) Filled-white during altitude hold capture.

When not vertically integrated with the Genesys HeliSAS-E or other autopilot, the target altitude bug is filled-white at all times.



When in VNAV sub-mode, the VNAV altitude bug appears when within 500’ from the current altitude. In this example, the VNAV altitude is 5,100’.

Figure RD-12: VNAV Sub-Mode

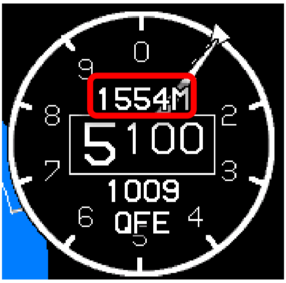
The VNAV bug can be used as a visual reference or when vertically integrated with the Genesys HeliSAS-E or partially integrated through use of the vertical mode discrete input as a control parameter for climbs or descents with another autopilot. The bug characteristics indicate the following modes:

1) Filled-magenta when in altitude hold mode.

2) Hollow-magenta when in a climb or descent mode.

3) Filled-magenta during altitude hold capture.

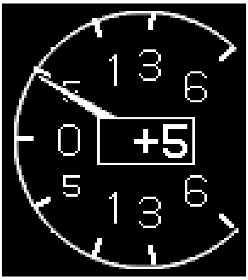
When not vertically integrated with an autopilot, the VNAV bug is filled-white at all times.



Metric altitude values may be selected from within the declutter menu with a resolution of 1 meter.

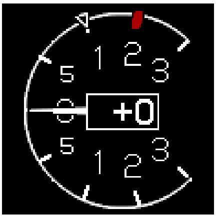
Figure RD-13: Metric Altitude

RD 1.9. Vertical Speed Indicator

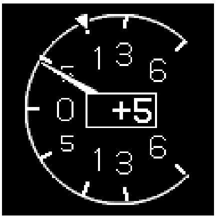


The VSI is located below the altitude display with a readout and dial pointer and scale of ±6,000 feet per minute. The integral scale graduations are ±500, ±1,000, ±3,000, and ±6,000 feet per minute. CW (upward) rotation of the pointer indicates increasing vertical speed while CCW indicates decreasing speed.

Figure RD-14: Vertical Speed Indicator



VSI bug set to +1,000 fpm with HeliSAS enabled



VSI bug set to +1,000 fpm without autopilot enabled

Figure RD-15: VSI Bugs

The vertical speed bug is mutually exclusive with the IAS bug and can be used either as a visual reference or when vertically integrated with the HeliSAS-E or other autopilot as a control parameter for climbs or descents. When vertically integrated, the vertical speed bug is filled-white when in VSI climb or descent mode. Otherwise, the vertical speed bug is hollow-white as shown above on the left. When not vertically integrated with an autopilot, the vertical bug is filled-white at all times.

RD 1.10. Heading Display

The heading display appears in a blacked-out area on the bottom to emulate a “Basic-T”. The heading display automatically declutters when a compass rose is shown in the bottom area.

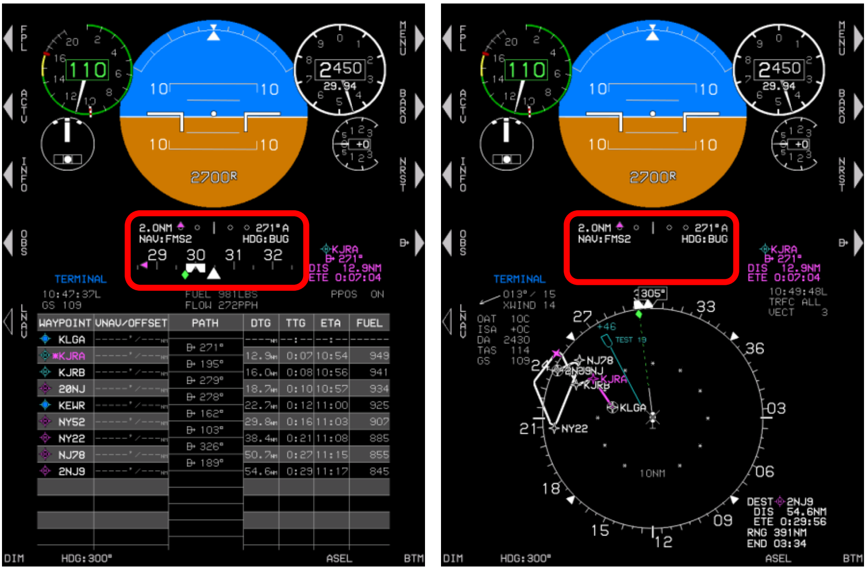
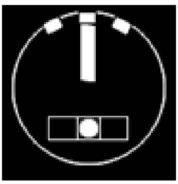


Figure RD-16: Heading Display

RD 1.11. Turn Rate Indicator



The turn rate indicator is displayed below the airspeed display. This standard turn needle displays marks representing a standard rate turn. The full scale for the turn needle is beyond the standard rate turn mark. This allows the pilot to fly a standard rate turn. The balance ball is driven from accelerometers within the AHRS.

Figure RD-17: Turn Rate Indicator

RD 1.12. Vertical Deviation Indicator (VDI)

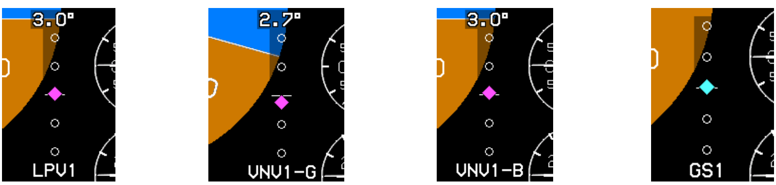


Figure RD-18: Vertical Deviation Indicator (VDI)

The vertical deviation indicator (VDI) on the right side displays vertical deviation for the selected vertical navigation source for displaying descent profile but disappears in unusual attitude mode.

1) LPV Mode and LPV1 or LPV2: When descending on final approach segment in LPV mode. GPS altitude used to generate VDI; pilot may follow guidance to LPV minima regardless of temperature.

2) LNAV Mode and VNAV1-G or VNAV2-G: When descending on final approach segment in LP, LNAV/VNAV, and LNAV or RNP modes when using GPS VNAV. GPS altitude used to generate VDI; pilot may follow guidance to LNAV minima regardless of temperature.

3) LNAV Mode and VNV1-B or VNV2-B: Default FMS barometric VNAV mode. Using barometric altitude to generate the VDI, pilot may follow guidance to LNAV minima as long as the specified temperature is within limits.

4) GS1 or GS2: Glide slope receiver #1 or #2 as indicated. Pilot follows guidance to published barometric DH.

RD 1.13. Timer Indication

A countdown or count-up timer can be displayed above the large aircraft reference marks when selected through the menu as described in Section 3 Display Symbology.

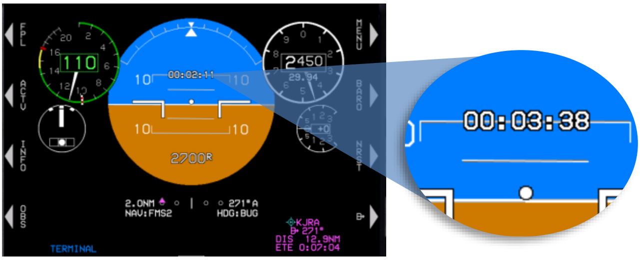


Figure RD-19: Timer Indication

Search and Rescue (SAR) Patterns

SAR 1. Search and Rescue (SAR) Patterns

When enabled by EFIS system limits, the pilot can create one SAR pattern at an eligible flight plan waypoint and only one waypoint within the active flight plan. The current position of the aircraft is determined relative to the desired path for lateral deviation for display on the GPS/SBAS CDI. In most cases, the IDU auto-sequences from one waypoint to the next similar to all other flight plan sequencing along the flight path.

The SAR option is available for any waypoint except the following:

1) Suppressed waypoint
2) Skipped waypoint
3) Manual termination waypoint
4) Waypoint that is part of an IFR or VFR approach
5) Holding pattern waypoint
6) SAR pattern exit waypoint
7) Waypoint that begins a departure procedure
8) Parallel offset entry or exit waypoint
9) Dynamic termination waypoint (altitude termination, DME termination, radial termination or intercept termination)

NOTE:

Flight plans can be saved with a SAR between waypoints or at the end of the flight plan. When a saved flight plan includes a SAR pattern, the following route appears.

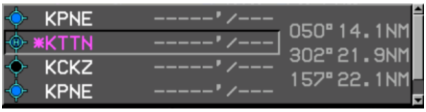
SAR patterns can be created in the **RUN DEMONSTRATOR/TRAINING PROGRAM** Ground Maintenance Page or the EFIS Training Tool. After the

SAR pattern is created and saved, that flight plan can be uploaded to any IDU or all IDUs in an aircraft for later use.

The desired flight path is created from a sequence of straight, left, and right turning leg segments to provide smooth skyway, GPS/SBS CDI, and lateral autopilot guidance. SAR patterns are drawn at the lowest of holding or procedure speed.

SAR 1.1. SAR Pattern Step-by-Step Procedures

To select a SAR pattern, follow these step-by-step procedures. Refer to subsequent sections for additional details and examples for the individual patterns.



1) Press **ACTV (L2)** and rotate ❶ to desired eligible waypoint to begin SAR pattern creation process and then push to enter.

2) Press **ACTV (L2)** and then rotate ❶ to **SAR PTRN..** and then push to enter.

3) Rotate ❶ to one of the five SAR pattern options and then push to enter. *Pattern includes the option to select individual legs within the SAR pattern for navigation guidance.

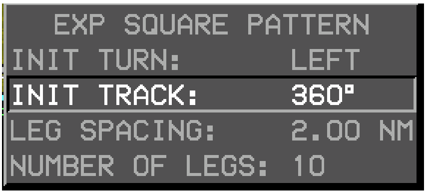
    a) Expanding Square*

    b) Rising Ladder*

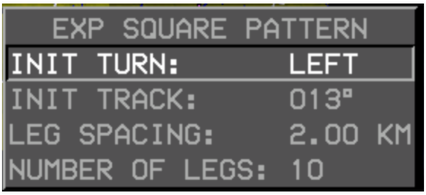
    c) Orbit

    d) Race Track

    e) Sector Search*



4) Rotate ❶ through each step, create the desired parameters (e.g., direction, track, leg length, leg spacing, and number of legs), and then push to enter.



See following sub-sections for more details for parameters of each pattern.

5) After SAR pattern is created, it appears on the map, mini map, and active flight plan.

6) To select a SAR pattern individual leg, rotate ❶ to SAR pattern exit waypoint as it appears in white and then push to enter, to make this the active waypoint.

7) Push ❶ to accept **WAYPOINT** as the active waypoint without any changes. Press **ACTV (L2)** to view active flight plan.

8) Now the SAR exit is the active waypoint. Push ❶ to enter.

9) Rotate ❶ to **SAR SGMNT..** and then push to enter.

10) Rotate ❶ CW or CCW to advance forward or backwards through all legs to begin leg selection process. When desired leg is magenta, then push ❶ to select and exit menu.

11) Control the aircraft to new magenta line for maneuvering to begin following navigation guidance.

12) To delete existing SAR pattern, Press **ACTV (L2)**. Rotate ❶ to SAR pattern and press **DELETE (R3)**.

13) Push ❶ to confirm.

SAR 2. Expanding Square Pattern

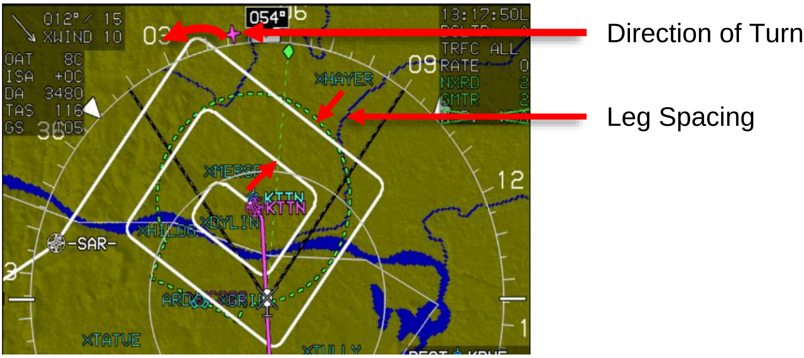


Figure SAR-1: Expanding Square Pattern-Turn, Leg, and Track

Distance in NM

Distance in KM

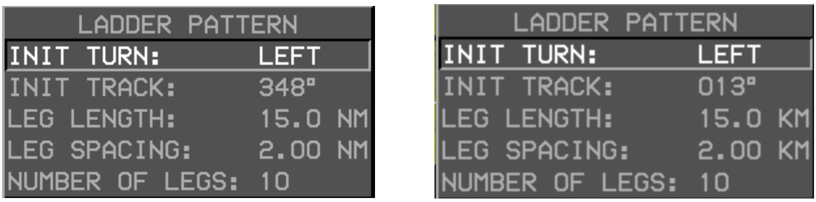
Figure SAR-2: Expanding Square Pattern Parameters

Table SAR-1: Expanding Square Pattern Parameters

Parameters	Increments (Range)/Direction	Notes
Initial Turn	Left or Right	
Initial Track	Outbound from previous waypoint in 1° increments	Magnetic or True
Leg Spacing	NM or KM 0.25 unit increments between 0.25 unit and 10 units.	
Number of Legs	1 to 50	

SAR 3. Rising Ladder Pattern

Figure SAR-2: Rising Ladder Pattern



Distance in NM　　　　Distance in KM

Figure SAR-3: Rising Ladder Pattern Parameters

Table SAR-2: Rising Ladder Pattern Parameters

Parameters	Increments (Range)/Direction	Notes
Initial Turn	Left or Right	
Initial Track	Outbound from previous waypoint in 1° increments	Magnetic or True
Leg Length	NM or KM 0.5-unit increments between1 and 100 units.	
Leg Spacing	NM or KM 0.10-unit increments between 0.10 and 10 units.	
Number of Legs	1 to 50	

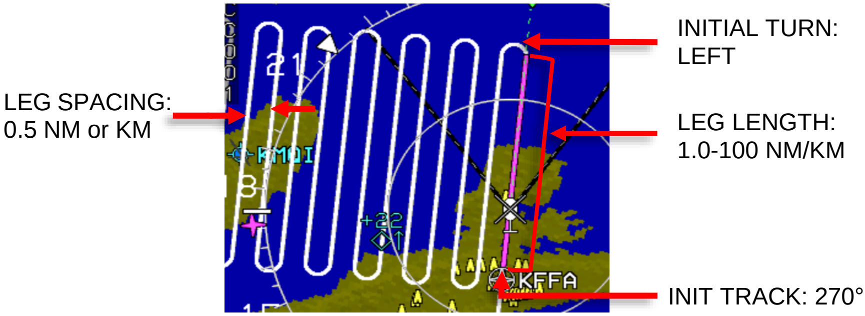


Figure SAR-4: Rising Ladder Pattern-Turn, Leg, and Track

Figure SAR-5: Rising Ladder Pattern-Individual Leg Selected

SAR 4. Orbit Pattern

The SAR exit waypoint is a duplicate of the previous waypoint. This SAR pattern is unique in that the navigation path never goes through the waypoint. The path is a circle around the waypoint intercepted along tangents. With no other menus displayed on the PFD and a waypoint following the active waypoint, **CONT (L6)** appears to allow for continuing out of the orbit and normal sequencing in the active flight plan.

Figure SAR-6: Orbit Pattern

Table SAR-3: Orbit Pattern Parameters	
Parameters	**Increments (Range)/Direction**
Turn Direction	Left or Right
Radius	0.25NM (0.25NM to 10NM)

Distance in NM

Distance in KM

Figure SAR-7: Orbit Pattern Parameters

Table SAR-4: Orbit Pattern Parameters	
Parameters	**Increments (Range)/Direction**
Turn Direction	Left or Right
Radius	NM or KM 0.25 unit increments between 0.25 unit and 10 units
The SAR exit waypoint is a duplicate of the previous waypoint. The orbit pattern does not pass through the waypoint. The path is a circle around the waypoint intercepted along tangents.	

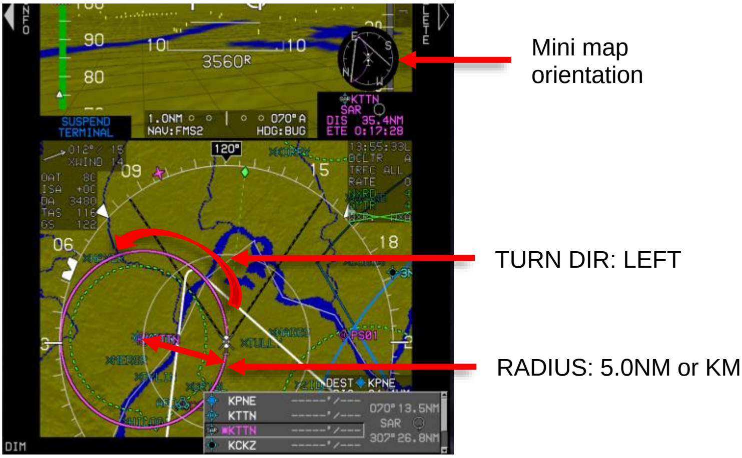


Figure SAR-8: Orbit Pattern-Turn and Radius

SAR 5. Race Track Pattern

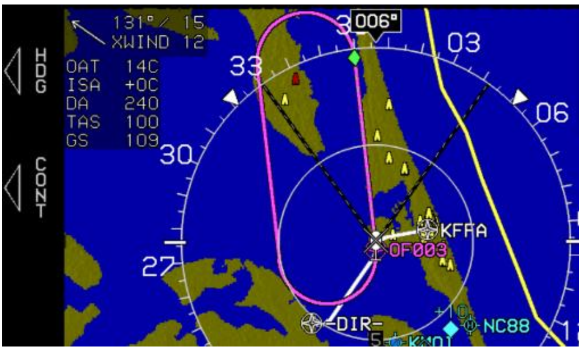
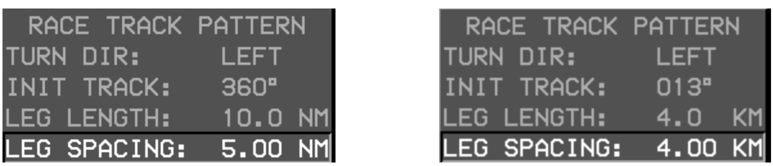


Figure SAR-9: Race Track Pattern

With no other menus displayed and a waypoint following in the flight plan, **CONT (L6)** appears for continuing out of the racetrack and normal sequencing in the active flight plan.



Distance in NM

Distance in KM

Figure SAR-10: Race Track Pattern Parameters

Table SAR-5: Race Tack Pattern Parameters

Parameters	Increments (Range)/Direction	Notes
Initial Turn	Left or Right	
Initial Track	Outbound from previous waypoint in 1° increments	Magnetic or True
Leg Length	NM or KM 0.5 unit increments between 1 unit and 100 units.	
Leg Spacing	NM or KM 0.25 unit and 10 units.	
SAR exit waypoint is a duplicate of the previous waypoint.		

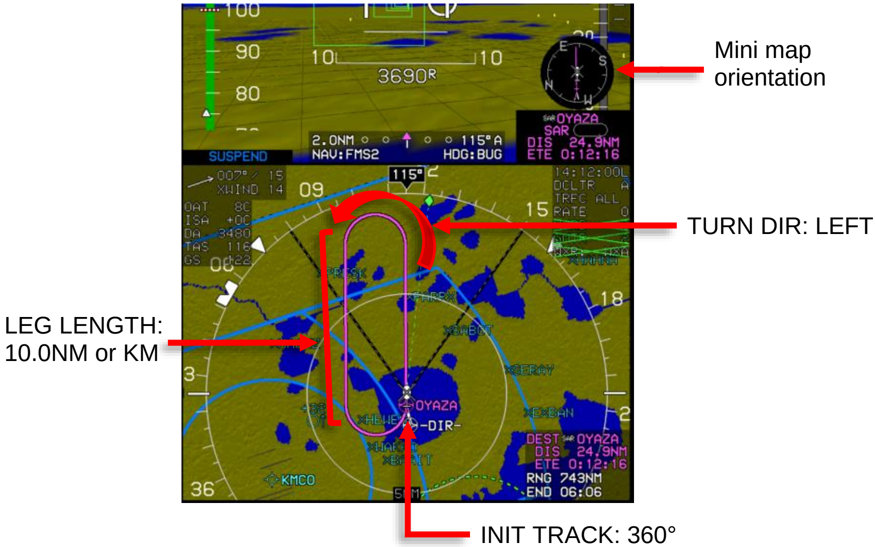


Figure SAR-11: Race Track Pattern-Turn, Leg, and Track

SAR 6. Sector Search Pattern

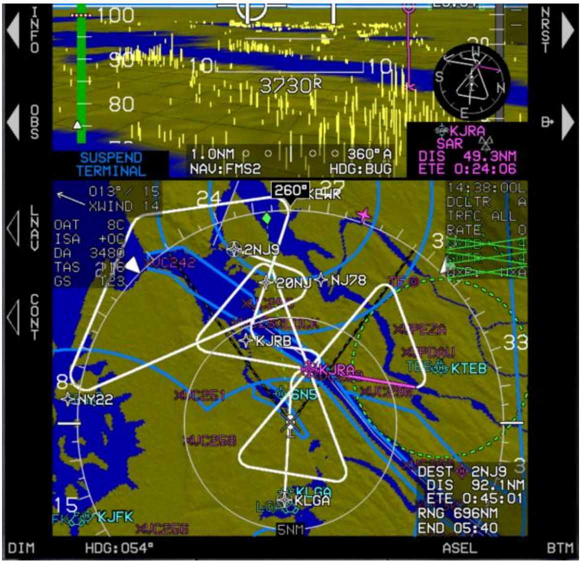
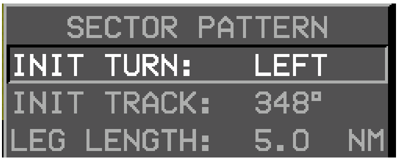


Figure SAR-12: Sector Search Pattern

Table SAR-6: Sector Search Pattern Parameters		
Parameters	**Increments (Range)/Direction**	**Notes**
Initial Turn	Left or Right	
Initial Track	Outbound from previous waypoint in 1° increments	Magnetic or True
Leg Length	NM or KM in 0.5 unit increments between 1 unit and 100 units.	
Exit waypoint is a duplicate of the previous waypoint.		



Distance in NM

Distance in KM

Figure SAR-13: Sector Search Pattern Parameters

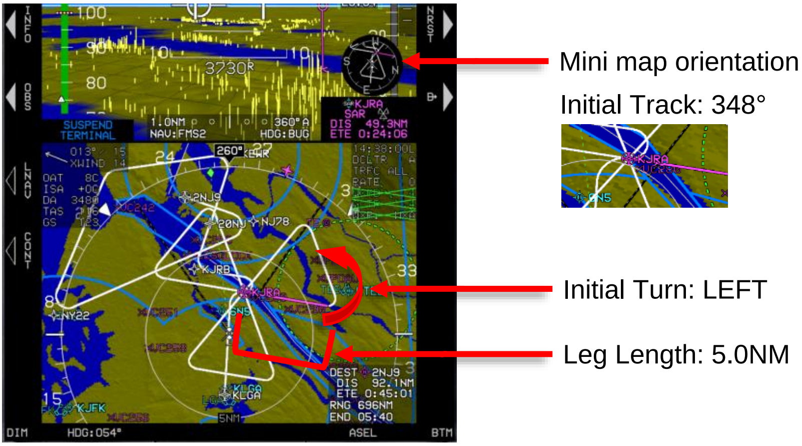


Figure SAR-14: Sector Pattern-Turn and Track

Figure SAR-15: Sector Search Pattern-Individual Leg Selected

Electronic Circuit Breaker Unit (ECBU)

ECBU 1. Electronic Circuit Breaker Page

The EFIS supports interface to electronic circuit breaker unit (ECBU). ECBU replaces conventional thermal mechanical circuit breakers and functions as both a breaker and a switch for controlling loads. Each ECBU comprises of multiple solid-state electronic circuit breaker (ECB) devices that actually control the loads. The breaker page acts as the user interface for controlling individual ECB state and to display tripped, pulled or collared circuit breaker lists.

NOTE:

ECBU functionality is only available as a prototype version in EFIS software. The functionality is not TSO'd. GMF option is available to either upload or delete the ECBU configuration file.

ECBU 2. Top-Level Menu (PFD/MFD Essential Mode/MFD Normal Mode)

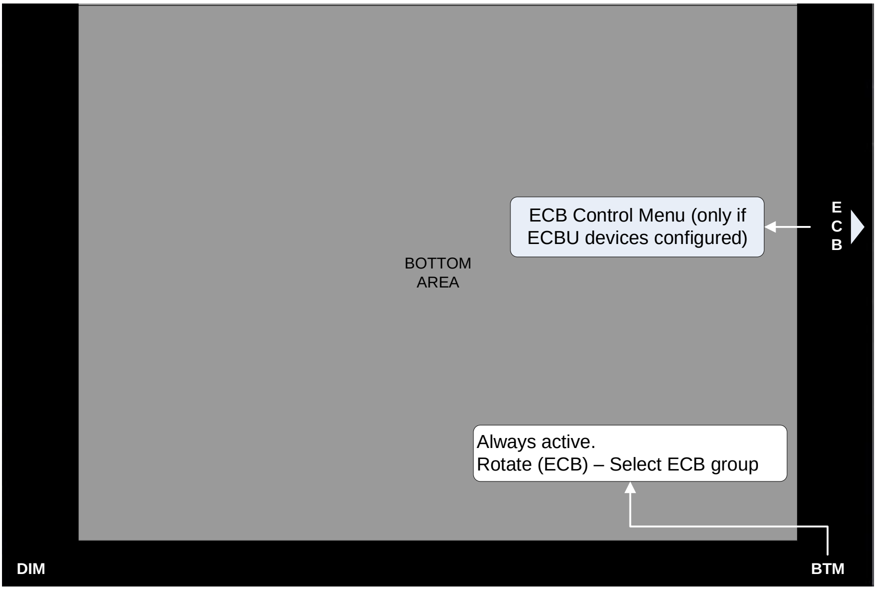


Figure ECB-1: Top-Level Menu (PFD/MFD Essential Mode/MFD Normal Mode)

ECBU 3. First-Level Menu Option Descriptions

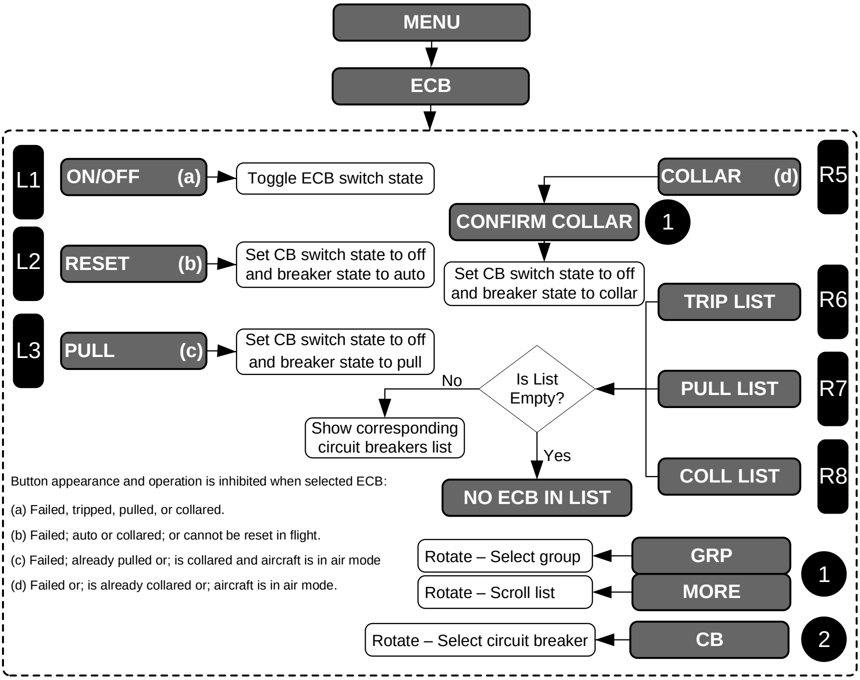


Figure ECB-2: ECB Control Menu

> **NOTE:**
>
> On a PFD or MFD operating in Normal mode, if the bottom area is showing a breaker page configured with more than one ECB group, rotate ➊ to select ECB group (CW to select next group, CCW to select previous group).

ECBU 4. PFD Page First Level

ECB (R6): Activates the ECB control menu option.

ECBU 5. MFD Page First Level

ECB (R6): Same function as PFD Page First Level. **SET FUEL (R6)** has precedence over **ECB**.

ECBU 6. Warning/Caution/Advisory Alerts

The following warning, caution, and advisory alerts are only active when ECBU is configured. See Section 2 System Overview for more information on warning, caution, and advisory alerts.

Table ECB-1: Warning Alerts

Visual Alert	Voice Alert	Condition
CHECK BREAKER	"Check Electric, Check Electric"	Alert condition exists for more than 1 second.

Table ECB-2: Caution Alerts

Visual Alert	Alert Tone	Condition
CHECK BREAKER	Alert Tone	Alert condition exists for more than 1 second.

Table ECB-3: Advisory Alerts

Visual Alert	Alert Tone	Condition
CHECK BREAKER	Chime	Alert condition exists for more than 1 second.

ECBU 7. Breakers Page

BREAKERS ➊: Shows the Electronic Circuit Breakers page (only available if ECBU devices are configured). Breakers page is not available when in Essential Mode when "Essential EICAS Page (MFD Overlay)" is assigned.

AGL Indication (Rad Alt, GPS Alt, Baro Alt) – Display of altitude above the ground, with designation of the altitude source as R (radio altitude), G (GPS SBAS/WAAS geodetic altitude less local ground elevation), or B (barometric altitude less local ground elevation in feet or meters as configured in EFIS limits.

Air Data and Ground Speed – Display of outside air temperature (°C or °F), ISA temperature deviation (°C or °F), density altitude (feet or meters), true airspeed (knots, MPH, or Km/h), and ground speed (knots, or, Km/h) as configured in EFIS limits.

Airspeed Information – Display of airspeed is the indicated airspeed tape and airspeed readout with associated data. The airspeed function includes color-coded caution bands for minimum and maximum speeds based on airspeed units (knots, MPH or Km/h) as configured in EFIS limits.

Altitude Information – Display of altitude information is the altitude tape and altitude readout in feet or meters as configured in EFIS limits.

Approach Mode Signal Output – Conventional autopilot approach mode signals are course error output, the left/right deviation signal (localizer output) and the up/down deviation signal (glide slope output). Signals are based on the selected navigation source.

Attitude Information – Display of attitude information includes pitch and roll. The bank angle scale may be set to auto-declutter by the user when the bank angle is less than 2.8°. The pitch ladder is limited to ±10° from the flight path marker or aircraft waterline, whichever is greater. The unusual attitude display appears when the aircraft pitch exceeds ± 30° or bank angle exceeds 65°.

Autoset – Automatically selects features or settings.

Azimuth – Angle between the north vector and the perpendicular projection of the star down onto the horizon. Usually measured in degrees (°).

Barometric Altimetry – Measurement of altitude based on the atmosphere (pressure and temperature.)

Barometric Correction – Display and altitude correction for local barometric pressure.

Bezel – Faceplate of the IDU comprised of pushbuttons along the sides and rotary knobs along the bottom.

Chroma – Colorfulness relative to the brightness.

Clock, Timers – Display of Zulu time (based on GPS data) or local time (based on UTC Offset) and user-selected timers.

Conformally – Angle-preserving. Example: Traffic appears conformally on the PFI area.

Course Deviation Indicator – Display of course deviation from selected course, including a To-From indicator, and source of information.

Critical Flight Phase – Phase(s) of flight where the failure mode would result in a hazard condition using flight phases. For example, failure of ILS would only be a hazard condition during approach and landing.

Crossfill – Transfer of data and information between IDUs in a dual-sided system with two PFDs configured.

Cross-linked – Synchronized across both pilot and co-pilot sides.

Datalinked – Display of received data such as weather or traffic from peripheral systems such as ADS-B.

dBZ – Decibel relative to radar reflectivity (Z). Composite reflectivity shows the highest dBZ (strongest reflected energy) at all elevations. Unlike base reflectivity, which only shows reflected energy at a single elevation scan of the radar, composite reflectivity displays the highest reflectivity of all elevations scans. If there is heavier precipitation in the atmosphere over an area of lighter precipitation (i.e. rain has yet to reach the ground), the composite reflectivity displays the stronger dBZ level.

Deadband – Space between software parameters or setpoints where no action or changes are made.

Directional Scale (Compass Rose or Arc) and Ownship Symbol – Display of general directional information. All MFD pages include a form of the compass rose with current heading pointer and aircraft ownship symbol.

Display of ADF – Display of single and or dual ADF bearing information in the form of an RMI pointer (when enabled in EFIS limits).

Display of Glide Slope – Display of glide slope 1 or glide slope 2 in the form of vertical deviation dots and deviation on PFD VDI or MFD HSI page VDI.

Display of Lightning Cell Information – Display of lightning information from a WX-500 system and shown in the form of lightning cells. The user may show individual lightning strike data by selecting the dedicated WX-500 page when enabled in EFIS limits.

Display of Localizer – Display of VLOC1 or VLOC2 in the form of horizontal deviation dots and deviation.

Display of Marker Beacon – Display of outer, middle, and inner marker beacons in the form of a color-coded circle with the corresponding letter. 

Display of Traffic Information – When integrated with an appropriate traffic system, the PFD and MFD display traffic information in two formats. One format is via traffic symbols as shown on the PFI area, MFD Map page, and Traffic page. The second format is with the traffic pop-up mini traffic display showing traffic position in a full 360° format on the PFD. Distance displayed in NM or KM as configured in EFIS limits.

Display of VOR RMI – Display of VOR1 and VOR2 bearing in the form of RMI pointers.

Dot – (CDI scale referenced) represents an additional 2° for VOR and 1.25° for Localizer.

EFIS-Coupled – The EFIS is coupled to an autopilot and controls the lateral and/or vertical modes of the autopilot.

Failure Condition Hazard Description – A description of the failure mode to be analyzed.

Flight Director (Selectable Function) – Display of flight director in a single or dual cue format when selected for display on the PFD or MFD in Essential mode.

Flight Path Marker (Velocity Vector) – Display of aircraft's actual flight path, showing where the aircraft is going as opposed to where the aircraft is pointed.

Flight Plan and Navigation Display – Display of the active GPS SBAS/WAAS-based flight plan, including course line, waypoints, ground track, glide range (NM or KM), projected path, altitude capture predictor, approach procedure, missed approach procedure, and the aircraft present position on the active leg.

Geodetic – Set of reference points used to locate places on the earth.

Geodesic – A generalization of the notion of a straight line to curved spaces. The shortest route between two points on the Earth's surface.

Geoid – Global mean sea level.

Glide Slope Sidelobes – False glide slope signals.

GPS SBAS/WAAS Course Deviation Indicator (CDI) – Display of CDI relative to selected course, either automatic based on active flight plan or manual based on user-selected OBS when in OBS manual mode.

When following an FMS path, the bearing indication is the instantaneous desired bearing to follow the magenta line.

GPS/SBAS Functions – The EFIS meets the GPS SBAS/WAAS navigation and flight planning/management requirements of TSO-C146c (RTCA/DO-229D) for Class Gamma 3 equipment. These functions include navigation, flight planning (function select, flight plan generation and editing, selected waypoints, user waypoints, etc.), path definition including approach and departure paths, GPS altitude, dead reckoning, navigation modes with automatic mode switching, loss of navigation monitoring, loss of integrity monitoring, etc. The database used with the GPS SBAS/WAAS functions meets the integrity requirements of RTCA/DO-200A.

Ground-Based Utility – The compatible program used for the creation, deletion, editing, or reversing of locked flight plans, routes and User Waypoints for later uploading into the IDU.

Heading Bug – Display and control of selected heading using a bug. May be used to drive heading bug output to autopilot for HSI-based heading mode or visual reference.

Heading Display – Display of heading with directional scale is provided at the top of the PFD in SVS mode and as defined in section 3. This is the same heading information provided on the ND or MFD.

Heading Mode Signal Output – Conventional autopilot heading mode signal is a heading error output based on the difference between the EFIS desired heading and the actual aircraft heading. The EFIS desired heading is either the user-selected heading bug or a heading designed to achieve and maintain the active GPS-based flight plan.

Hectopascal (hPa) – International System of Units (SI) unit measure of pressure, equals one millibar (mbar).

HeliSAS – Genesys Aerosystems' helicopter autopilot and stability augmentation system.

Horizontal Situation Indicator (Selectable Function) – Display of GPS, VOR or localizer and glide slope deviation when selected for display on the PFD, MFD, or MFD top or bottom areas.

HOTAS – Hands-On Throttle And Stick

Hover Vector Display – Display of hover drift in a rotorcraft installation when the helicopter is traveling less than 30 knots ground speed.

Inches of Mercury (inHg) – Unit of atmospheric pressure used in the United States. Named for the use of mercurial barometers, which equate height of a column of mercury with air pressure.

Inhibit – Prevention of activity or occurrence. Examples are: XFILL INHBT, FLTA INHBT, FPM INHBT, TAS INHBT, and TAWS INHBT.

Integrated Peripherals – Internal devices of the essential unit.

Ionosphere – Region of the atmosphere between the stratosphere and exosphere, 50 to 600 miles (80 to 1,000 km) above the surface of the earth.

International Standard Atmosphere (ISA) – Standard model of the change of pressure, temperature, density, and viscosity over a wide range of altitudes or elevations. (°C or °F configured in EFIS limits.)

Landing Gear Indication – When enabled on retractable landing gear aircraft, PFD (PFI area), and MFD PFI area (when in Essential mode) shows indication of landing gear extended.

Level of Service – Standard Positioning Service (SPS) for general civil use. With selective availability (SA), SPS provides predictable accuracies of 100m in the horizontal plane and 146m in the vertical plan 95% of the time. Without (SA) SPS, accuracy would be approximately 25m in the horizontal plane and 43m in the vertical plane 95% of the time. ARINC-424 Level of Service indicates a particular type approach minimum is approved, e.g. LP APPR, LPV APPR RNP: 0.10A RNP: 15.0A.

Lubber Line – Green-dashed line marked on the compass showing the direction straight ahead.

Magnetic Declination (MAGVAR) – Sometimes called magnetic variation; the angle between magnetic north and true north.

Map Data – Display of map data, including airspace, VFR/IFR airports, VHF navaids such as VOR/NDB/DME, H Airway, and L Airway, IFR/VFR fixes, ARSPC CTRL, ARSPC SUA Y, ARSPC R, and display range rings.

Menu Functions – The EFIS includes menus to access functions on both the PFD and the MFD.

Mesocyclonic – Contains a vortex of air within a convective; air rises and rotates around a vertical axis, often in the same direction as low-pressure systems.

Millibar (mbar) – Metric (not SI) unit of pressure, one thousandth of a bar, which is about equal to the atmospheric pressure on Earth at sea level - 1013 millibars.

Miscompare – Disparity of data or information. Examples are:

ALT MISCOMP, GS MISCOMP, LOC MISCOMP, ATT MISCOMP, HDG MISCOMP, PLT MISCOMP, CPLT MISCOMP, GPS MISCOMP, IAS MISCOMP, RALT MISCOMP, and BARO MISCOMP.

NavData® – Jeppesen's aeronautical database to navigate the global airspace system.

Navigation Data Display – Display of active waypoint, bearing to waypoint, and ground track based on active flight plan. The user may also select flight plan information as a mini map. These functions are analyzed as part of the GPS/SBAS WAAS functions not the PFD functions.

Navigation Log – Display of navigation information based on active flight plan, including next waypoint, destination, estimated time remaining, and fuel totalizer-based range and endurance. This function may be deselected by a setting in the IDU configuration (limits) file. These functions are analyzed as part of the GPS SBAS/WAAS functions not the MFD functions. (As configured for Wpt to Wpt or PPOS to Wpt.)

Navigation Mode Signal Output – Conventional autopilot Navigation mode signals are the course error output and the left-right deviation signals. Course error output is based on the difference between the EFIS selected course (OBS) and the actual aircraft heading. These signals are based on the selected navigation signal (VOR, LOC, TAC, ADF or GPS).

Nondirectional – Functions in all directions.

Nanoteslas (nT) – A unit of measurement of the strength of the magnetic field. Earth's strongest magnetic field is located at the poles, and the weakest field is near the equator.

Obstructions Display – Display of obstructions identified in the embedded obstruction database which are within 8.5 NM (MAP), 12 NM (PFI wide FOV), and 17NM (PFI narrow FOV) of the aircraft present position. Non-threatening obstructions are displayed by color to identify altitude relative to the aircraft's current altitude. Obstructions with tops lower than 2000 feet below aircraft altitude are not depicted. Obstructions with tops within 2000 feet but at or below aircraft altitude are depicted in amber. Obstructions with tops above aircraft altitude are depicted in deep red. Threatening obstructions, defined as those that pierce the

TAWS envelope, are identified by highlight when producing a caution and identified by flashing highlight when producing a warning. Distance is always referencing NM and altitude always in feet.

Omnibearing – Magnetic bearing of an omni-range station.

Offset – When referring to parallel track of an active flight plan, offset implies the distance paralleling the original track. When referring to VNAV altitudes, offset refers to the distance before or after the waypoint the VNAV altitude must be reached in NM or KM units.

Ownship – Principal eye-point; referring to icon of aircraft represented on PFD or MFD (MAP), HSI, Map, Traffic, WXR-RDR, WX-500 Lightning, or Datalink pages.

Projected Path (Noodle) – Navigation Display (ND) projected; curving path based upon the aircraft bank angle and ground speed used effectively to assist in course interception and making small adjustments to bank angle for proper roll out.

Q-Routes – Published RNAV routes, including Q-Routes and T-Routes, can be flight planned for use by the Genesys EFIS, subject to any limitations or requirements noted on enroute charts, in applicable advisory circulars, or by NOTAM. RNAV routes are depicted in blue on aeronautical charts and are identified by the letter “Q” or “T” followed by the airway number, e.g., Q35, T-205. Published RNAV routes are RNAV-2 except when specifically charted as RNAV-1.

QFE – Barometric setting that results in the altimeter displaying height above a reference elevation (e.g., airport or runway threshold).

QNE – Standard barometric setting (29.92 inHg or 1013 mbar) used to display pressure attitude for flight above the transition attitude.

QNH – Barometric setting that results in the altimeter displaying altitude above mean sea level at the reporting station.

Recency – State of occurrence, appearance, or origin.

Selection and Display of Selected Course – Omni-Bearing Select (OBS) function for the user to select the course for navigation. Selected course is displayed for reference.

SI Units – International Speed Units according to the following:

Speed	Knots (nautical), MPH (statue), Kilometers per hour (Km/h)
Altitude	Feet, Meters
Rate	FPM, Meters per second (m/s)

Side in Command – Side of aircraft control responsible for its operation. Side of aircraft control responsible for its operation. This display of steady green arrow in the center of the PFD mode annunciation area is displayed on dual-sided systems only to show which side is commanding the autopilot.

Skipped Waypoint – A skipped waypoint is a waypoint associated with a dynamic termination leg with a zero length. These are either:

1) An altitude termination leg when current aircraft altitude is above the termination altitude; or

2) System-created (i.e., not NavData® specified) intercept to a "Course to a Fix" leg where there is insufficient distance to calculate an intercept heading.

Skyway VNAV/LNAV Guidance (Synthetic Vision) – Display of GPS-based active navigation route, flight plan, procedure, or OBS course in a three-dimensional series of skyway boxes. Also known as Highway in the Sky (HITS).

Slip Indicator – Display of aircraft lateral accelerations via an integral slip/skid indicator function. The slip indicator is a rectangle just below the heading pointer that moves left and right to indicate the lateral acceleration sensed by the AHRS in the same manner as the ball in a mechanical slip indicator.

Strikefinder – Lightning detector system (WX-500) connected to EFIS and enabled through factory program settings.

Suppressed Waypoint – A suppressed waypoint (designated by brackets) is an airport associated with an IFR or VFR approach procedure.

Symbology – Use of symbols.

T-Routes – T-Routes are available for use by GPS or GPS/SBAS equipped aircraft from 1,200 feet above the surface (or in some instances higher) up to but not including 18,000 feet MSL. T-Routes are depicted on enroute low altitude charts and considered to include the same attributes of Low altitude airways in the Genesys Aerosystems EFIS declutter menus. (Altitudes always in feet.)

Terrain Display (PFD Artificial Horizon) – Conformal display of surrounding terrain presented with the artificial horizon, shown in the correct scale and perspective for the aircraft's current position and altitude. Includes conformal display of known runway locations, direction, scale, and perspective based on aircraft's current position and altitude.

Terrain Display (PFD Artificial Horizon) – Display of terrain, including identification and annunciation of threatening terrain in accordance with Terrain Awareness Warning System (TAWS) requirements. (All altitude references are in Feet) Coloring scheme for SVS-TAWS PFD and MAP has been simplified as follows:

Terrain at or below 100 feet less than aircraft altitude – Olive shades

Terrain above 100 feet less than aircraft altitude – Brown shades

TAWS FLTA Caution Terrain – Amber (Yellow)

FLTA alerts – Amber and Red

Obstacles Below aircraft – Amber (Yellow)

Obstacles at and above aircraft – Deep Red

When over water – Deep Blue

Threatening terrain is determined by the requirements of and TSO-C194 HTAWS. Threatening terrain is shaded amber (yellow) for caution situations or shaded red for warning situations per TSO-C194. TAWS cautions and warnings are accompanied by an amber (yellow) or red flag and an aural annunciation. Enhanced HTAWS, or HTAWS functions may be activated in the system prior to installation. The database used with the TAWS functions meets the integrity requirements of RTCA/DO-200A.

Time Indication – User-selected function for count-up or countdown timers, flight time, local time, and Sunrise/Sunset.

Time Zone – Derived from Time menu when setting UTC offset for purposes of displaying the local time. On dual-sided systems, it is possible to have different time zones on each side.

Traffic Display – When integrated with an appropriate traffic system, traffic is shown using standard TCAS symbology showing relative position, altitude, climb/decent, and color. The user may also show traffic information by selecting the dedicated traffic display page.

Transmit-Enabled – IDU providing data to external sensors and generating aural alerts. IDUs depend upon intra-system communications to determine which IDU on a side takes over transmit-enabled responsibilities. Only one transmit enabled per side, two talkers in a dual-side system, and a master PFD when considering aircraft limits. Any IDU may become transmit-enabled through auto reversionary means in the event of the PFD failing.

Vertical Speed Display – Display of altitude rate of change (vertical speed or climb rate). Display of altitude rate of change (vertical speed or climb rate) (fpm or m/s as configured in EFIS limits.)

V_{HOLD} (Holding Speed) – The aircraft's normal speed (in airspeed units and configured in EFIS limits) for flying holding patterns. This value is used for calculating the turn radius of holding patterns.

V_{PROC} (Procedure Speed) – The aircraft's normal speed (in airspeed units and configured in EFIS limits) for flying instrument approaches (DPs, IAPs, STARs). This value is used for calculating the turn radius used for instrument procedure legs. This speed is not seen on the airspeed tape and only found in the aircraft speed settings inside the limits.

Warning, Caution, and Advisory Flags – Time-critical warning and caution alerts in the primary field of view remain present until acknowledged by pressing master caution switch. Display of warning, caution, and advisory indications accompanied by aural indications. The flags are stacked in the lower left corner of the PFD. Warnings are always shown at the top of the flag stack, followed by cautions and then advisories. These flags remain in view for as long as the situation exists.

Waterline – Indication of the aircraft's longitudinal axis or waterline (attitude).

Wide Area Augmentation System (WAAS) – Developed by Federal Aviation Administration to provide accurate positioning part of the Satellite Based Augmentation System (SBAS). Other countries have similar systems: Europe: European Geostationary Overlay System (EGNOS); Japan: MTSAT Satellite-based Augmentation System (MSAS); India: GPS Aided GEO Augmented Navigation system (GAGAN).

Wind Information – Display of wind direction, wind speed (knots or m/s), and cross wind component (knots or m/s as configured in EFIS limits.)

Zulu – Display of Zulu time (based on GPS data).

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