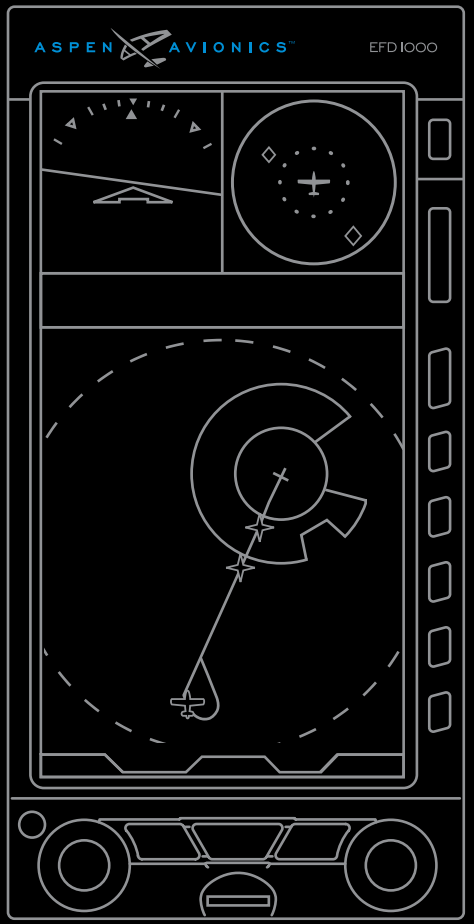
EVOLUTION
FLIGHT DISPLAY

EFD1000/500 MFD
Pilot's Guide

ASPEN AVIONICS™



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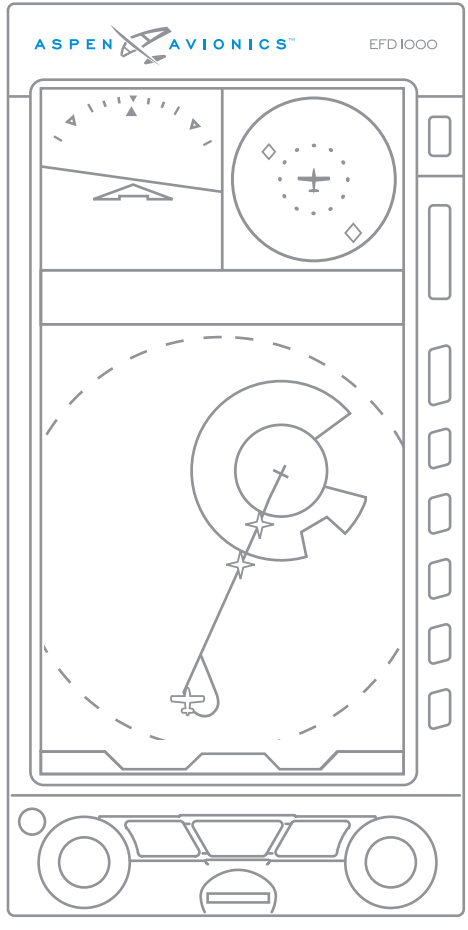

Document Revisions

Revision	Description of Change
( )	Initial Release
A	Added Index, updated terrain symbology
B	Administrative Release

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Copyrights and Trademarks

Approvals

The EFD1000/500 MFD is approved under the following Technical Standard Orders (TSOs):

C2D, C3D, C4C, C6D, C8D, C10B, C106, C113

The following certification levels also apply to this product:

- Environmental Certification Level: RTCA DO-160E
- Software Certification Level: RTCA DO-178B Level C

This Pilot's Guide provides information on the use and operation of the Evolution Flight Display 1000 Multifunction Flight Display (EFD1000 MFD) and Evolution Flight Display 500 Multifunction Flight Display (EFD500 MFD). This guide is current as of the Date Published. Specifications and operational details are subject to change without notice. Please visit the Aspen Avionics web site, aspenavionics.com, for the most up-to-date Pilot's Guide.

Installation of the EFD1000/500 MFD in a type-certificated aircraft must be performed in accordance with the latest revision of the Aspen Avionics EFD1000/500 MFD Installation Manual, document number 900-00003-001.

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Conventions

The following conventions, definitions, terminology and colors are used in this manual and the EFD1000 PFD.

Covered Functionality

This guide covers all the functionality available in the EFD1000 MFD and EFD500 MFD. The EFD500 MFD does not include an AHRS and ADC sensor, Secondary HSI, and does not support Reversionary mode. See Aspen Avionics document number 091-00005-001 *EFD1000 PFD Pilot's Guide* for complete instructions on the EFD1000 PFD.

Terminology

This guide uses the terminology listed in **Table 1** when referring to specific parts of the EFD1000/500 MFD. Refer to **Chapter 5, Reference Guide** for an in-depth discussion and step-by-step instructions for all the available functionality of the EFD1000/500 MFD.

Term	Definition
PAGE	A PAGE is the arrangement of information shown on the screen of the EFD1000/500 MFD. There are three pages available with the MFD. Each PAGE is based on one of the following three LAYOUTs.
LAYOUT	The LAYOUT defines how WINDOW and VIEW information are arranged on the EFD1000/500 MFD screen. The pilot can select a one, two or thee WINDOW display by rotating the Left Knob. The PAGE LAYOUT cannot be changed; however, the pilot can customize the VIEW displayed in a WINDOW. The EFD1000/500 MFD displays information in one of three PAGE LAYOUTS as shown in **Figure 1 – Figure 3**.
WINDOW	A WINDOW is a section of a PAGE where a VIEW is displayed, analogous to a window on a computer. The WINDOW "holds" the current VIEW.

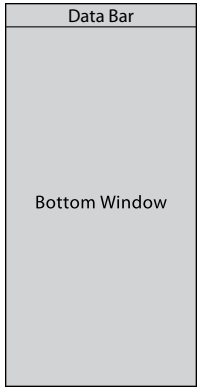

Figure 1
Full Screen LAYOUT

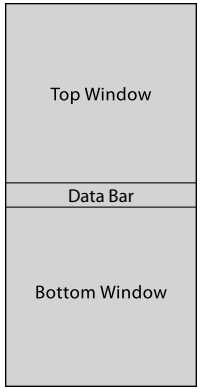

Figure 2
Split Screen LAYOUT

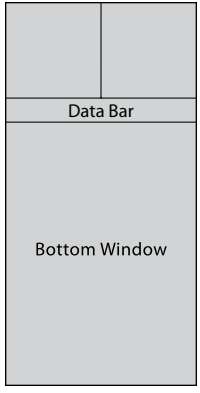

Figure 3
Thumbnail LAYOUT

NOTE

The Secondary AI and HSI VIEWS do not display a name label.

Figure 4
The Secondary Attitude Indicator has the FOCUS

Figure 6
Hot Keys

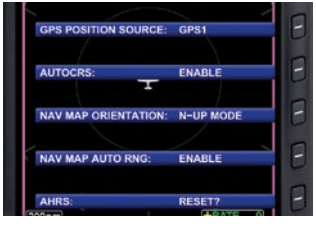

Figure 5
Main Menu Keys

Term	Definition
VIEW	A VIEW is the graphical content of a WINDOW. The VIEW presents specific information such as terrain, traffic, or weather. A VIEW is the same size as the WINDOW which holds it. The VIEW name is displayed in the upper left corner of the VIEW. See the Reference Guide chapter for detailed information about individual VIEWS.
FOCUS	FOCUS describes which WINDOW and VIEW are affected by pilot actions, i.e changing the VIEW or obtaining information. When a WINDOW and corresponding VIEW are selected they have the FOCUS, visually represented by a magenta border around the WINDOW (**Figure 4**). When the FOCUS is on a WINDOW, content-sensitive controls such as the range button, Hot Keys, and knob actions apply to the WINDOW and VIEW with the FOCUS.
Menu Key	Refers to the five hot keys on the right side of the display when the Main Menu has been enabled (**Figure 5**).
Hot Key	Refers to the five hot keys on the right side of the display when the Main Menu is not enabled (**Figure 6**).
North-Up	True North-Up, i.e. in the direction of the geographic North Pole. All North-Up maps are true North-Up.
Heading-Up	Aircraft magnetic heading.
Track-Up	Aircraft Magnetic track-up.

Table 1 EFD1000/500 MFD Terminology

Pilot Interface Modes

The EFD1000/500 MFD has several interface modes described in **Table 2**. The current mode determines the functionality of the content-sensitive pilot controls.

Term	Definition
PAGE Selection	When the EFD1000/500 MFD first initializes it is in PAGE (and VIEW) Selection mode. Rotating the Left Knob selects different PAGES. When PAGE Selection mode is active the Pg #/3 label above the Left Knob is magenta in color (# indicates the current page number). PAGE and VIEW selection mode deactivates automatically after 10 seconds of inactivity.
Change WINDOW	Pressing the Right Knob activates WINDOW Select mode and moves the FOCUS to different WINDOWS on the currently displayed PAGE. When WINDOW Selection mode is active, the magenta border around the selected WINDOW becomes thicker and the VIEW label above the Right Knob is magenta in color. WINDOW selection mode deactivates automatically after 10 seconds of inactivity.
Change VIEW	Rotating the Right Knob selects different VIEWS within the WINDOW with the FOCUS. VIEW selection mode deactivates automatically after 10 seconds of inactivity.
VIEW Control	When VIEW Control Mode is activated, the function of the Right and Left Knobs changes. VIEW Control Mode is available for those VIEWS that support additional functionality, such as map panning, data editing, product selection, and information scrolling. A button or knob is usually pressed to activate VIEW Control Mode and must be pressed to deactivate VIEW control mode. See the Navigation Map and Data Link Weather section in Chapter 5 for detailed information about different VIEW controls.
MENU	Pressing the MENU Button activates the Main Menu and displays a context-sensitive list of options, putting the MFD in MENU Mode. The five Hot Keys function as menu selection keys (Menu Keys). The pilot must press the MENU button to deactivate MENU mode. See Chapter 6, Customizing the EFD1000/500 MFD for complete Main Menu options.

Table 2 Pilot Interface Modes

Color Philosophy

Table 3 provides an overview of the color convention used on the EFD1000/500 MFD display.

NOTE

As the number of colors used on the display is limited, to ensure adequate color differentiation under all lighting conditions. There are a few cases where a given color is used in a slightly different context than described in the following table.

COLOR	PURPOSE	COLOR	PURPOSE
RED	Used to indicate flight envelope and system limits, and for warning annunciations that require immediate pilot recognition and which may require immediate pilot correction or compensatory action. Red is used to indicate Data Link Weather cell movement and precipitation areas, and terrain and obstruction data.	GREEN	Used for navigation information or mode data related to or provided by the selected navigation source (i.e. navigation deviations, equipment operating state, waypoint information). Green is also used to indicate Data Link Weather precipitation areas, terrain data, and the status of user controls (i.e., ON, enabled, or active).
AMBER	Used to indicate abnormal information sources, and for caution information that requires immediate pilot awareness and for which subsequent pilot action may be required. Amber is used to indicate Data Link Weather precipitation areas, WX-500 data and terrain and obstructions data.	WHITE	Used to show primary flight data (e.g. IAS, ALT, and HDG), scales, and menu items that are selectable for editing.
MAGENTA	Used for pilot-selectable references (bugs) that have been enabled for editing, to identify the selected WINDOW or field, for depicting the active GPS navigation leg on a moving map display, to indicate datalink weather precipitation areas, and for depicting the flight director.	GRAY	Used to show supplemental flight data and for hotkey and menu legends that are OFF, disabled, or inactive.
CYAN	Used to indicate editable values that are not currently selected for editing, for bearing pointers depictions, and for areas outside of the terrain database coverage area.	BLUE	Used to indicate the sky, Data Link Weather precipitation areas, and navigation map features.
		BROWN	Used to indicate the ground.

Table 3 Color Convention

Warnings, Cautions, and Notes

Where applicable; warnings, cautions, and notes are given. Aspen Avionics uses the icons and definitions described in **Table 4**.

Icon	Definition
Warning	Emphasizes a crucial operating or maintenance procedure, which, if not strictly observed, could result in injury to, or death of, personnel or long term health hazards. Indicates the possible need for immediate corrective action.
Caution	Indicates an essential operating or maintenance procedure, which, if not strictly observed, could result in damage to, or destruction of equipment. Indicates the possible need for future corrective action.
Note	Highlights an important operating or maintenance procedure, condition, or statement. Safe operation.

Table 4 Warnings, Cautions, and Notes

Example Graphics

The example graphics and screen shots used throughout this Pilot's Guide are provided for reference only and are taken from a simulated flight. They should not be used for actual flights.

Most of the example graphics and screen shots used throughout this Pilot's Guide & Reference are based on flying the ILS 16R instrument approach into Reno/Tahoe International Airport (KRNO) in Reno, Nevada, USA. Those images with the airplane in a right bank show the airplane completing the procedure turn in-bound to intercept the Localizer, descending through 8,660 feet to the target altitude of 8,500 feet. The other main group of images, showing the airplane straight and level, are earlier in the approach, tracking outbound for the procedure turn.

Pilot Familiarity

While the EFD1000 is reasonably intuitive and easy to use, some familiarity with Electronic Flight Instrument Systems (EFIS) and Horizontal Situation Indicators (HSI) is required. Aspen Avionics strongly recommends that new users of the EFD1000 get some dual instruction from an experienced instrument CFI, and spend some time becoming familiar with the PFD in day VFR conditions with a safety pilot, before flying in actual instrument meteorological conditions (IMC). To reduce pilot workload, the use of autopilot (when available) is strongly encouraged.

Map Orientation

All references are magnetic except the orientation of the North Up navigation map. Track display on the navigation map shows the actual aircraft direction, displaying the magnetic track plus the magnetic variation.

Chapter 1

Welcome & Introduction

Welcome to Aspen Avionics' Evolution Flight Display (EFD) system, the most flexible, expandable, and upgradable Electronic Flight Instrument System (EFIS) available for General Aviation aircraft. The EFD system is designed to replace traditional, mechanical primary flight instruments—in whole or in part, all at once, or in phases. This modularity and upgradability allow the system to grow with you and your airplane, over time and affordably.

The EFD system is built around the EFD1000/500 Display Unit, which replaces a vertical pair of your six primary flight instruments. The EFD1000/500 has a bright, high-resolution, six-inch diagonal LCD display, and a number of knobs and buttons the pilot uses to control the system. The three-inch diameter, four-inch deep can on the back of the display slides into existing panel cutouts (where the top mechanical instrument used to be) and it can also be recess mounted **(Figure 1-1)**.

Figure 1-1
EFD1000 PFD and EFD500 MFD Display Units

Figure 1-2
Single Display EFD1000 PFD System

The center of the EFD system is the EFD1000 Primary Flight Display (PFD), which replaces the traditional, mechanical Attitude Indicator (AI) and Directional Gyro (DG) or Horizontal Situation Indicator (HSI) **(Figure 1-2)**. The PFD is available in three models—the Pilot, Pro and ATP—each with increasing levels of features and capabilities, and each lower model is upgradable through software to the more capable models. For detailed information on the PFD see Aspen Avionics document number 091-00005-001 *EFD1000 PFD Pilot's Guide*.

Figure 1-3
Dual Display System: PFD & MFD

Add a second EFD1000 configured as a Multi-Function Display (MFD) **(Figure 1-3)**, replacing the altimeter and air speed indicators, and you'll double the capabilities of your system, while also providing complete redundancy and backup to your PFD. The EFD1000 MFD contains the same ADAHRS and I/O capabilities as the PFD for full redundancy, and can assume the role of PFD should your main PFD ever fail. The EFD1000 MFD, when configured as a V2.0 PFD includes all of the features and functions of the EFD1000 Pro and Pro Digital PFD.

You can even add another MFD, an EFD500 to round out a complete "six-pack" replacement and gain even more capability and flexibility **(Figure 1-4)**. When you are ready to upgrade, simply contact an Aspen Avionics Authorized Dealer for more information.

Figure 1-4
Trio Display System: PFD & dual MFDs

NOTE

Please spend some time with your avionics installer to understand exactly how your EFD system is installed and configured in your particular aircraft with your existing equipment. This will help you fully understand the features and capabilities available to you, and to understand how various aircraft system failures and abnormalities may affect your EFD.

1.1. System Hardware

Depending on the EFD configuration you have selected, you will have some, all or several of the following pieces of hardware installed in your aircraft. The EFD1000 MFD system typically consists of the following pieces of hardware:

- EFD1000 display unit
- Remote Sensor Module (RSM)
- Configuration Module (CM)
- Analog Converter Unit (ACU) – optional
- Evolution Weather Receiver (EWR) – optional
- Emergency Backup Battery – optional (required for certain configurations)
- microSDHC Card

The EFD500 MFD system is typically comprised of the following pieces of hardware:

- EFD500 display unit
- Configuration Module (CM)
- Analog Converter Unit (ACU) – optional
- Evolution Weather Receiver (EWR) – optional
- microSDHC Card

NOTE

The EFD1000 MFD comes standard without emergency GPS. Emergency GPS may be orderd as an option.

NOTE

Only one ACU and EWR are needed for all EFD1000/500 displays.

NOTE

Each individual EFD1000 requires a CM and an RSM. Each EFD500 requires a CM.

NOTE

Each MFD requires a microSDHC card.

1.1.1. **EFD1000 Display**

The EFD1000/500 display unit is a digital system that consists of a high resolution six-inch diagonal color LCD display, pilot controls, photocell, and microSD data card slot. The EFD display mounts to the front surface of most instrument panels. The following controls are present on the EFD1000/500 display bezel:

- Reversionary / Power Button (REV)
- Range Up / Range Down Buttons
- Menu Button
- Five Hot Key Buttons
- Dual Rotary Knobs with Push Feature
- Three Lower Push Buttons

The three-inch diameter, four-inch deep can on the back of the display contains the non-removable electronics module which includes **(Figure 1-5)**:

- A Sensor Board with solid-state Air Data and Attitude and Heading Reference System (ADAHRS) (EFD1000 only)
- A Main Application Processor (MAP) board with Central Processing Unit (CPU), graphics processor and system memory
- An Input-Output Processor (IOP) board for integrating communications with other aircraft systems
- An Internal Battery or connection for the EBB58 Emergency Backup Battery (EBB)
- An access cover for removing and replacing the internal battery or connection for the EBB58.
- Pneumatic connections to the aircraft's pitot and static systems (EFD1000 MFD only).
- 44-pin D-sub connector for electrical connections to the EFD1000/500.
- A cooling fan, to cool the electronics and LCD backlights.

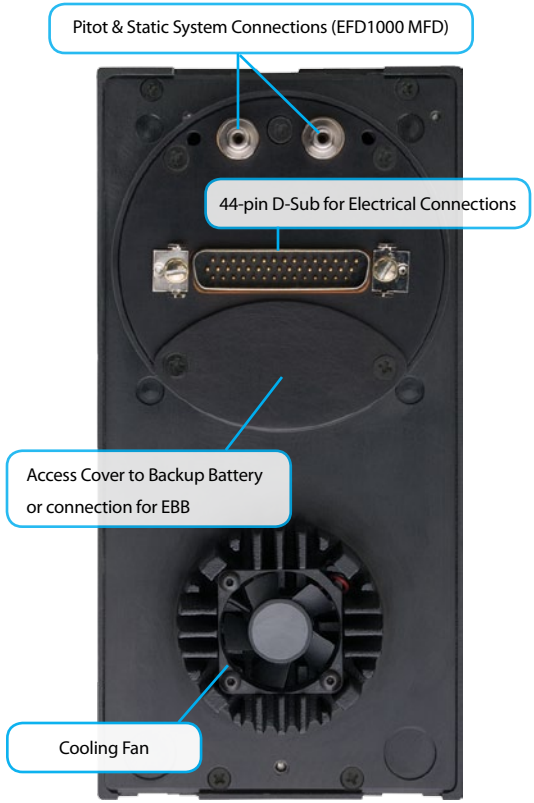

Figure 1-5
EFD1000/500 MFD Rear Connections

1.1.2. **EFD500 Display**

The EFD500 MFD display is similar to the EFD1000 MFD display, but excludes the ADAHRS, Secondary HSI, and backup battery. The EFD500 can only be used as a Multi-Function Display (MFD).

1.1.3. **Remote Sensor Module (RSM) (EFD1000 MFD only)**

The Remote Sensor Module (RSM) is an integral part of the EFD1000 system, and works together with the display unit sensors as part of the ADAHRS. The RSM looks and mounts like a GPS antenna, and is typically mounted on the exterior of the fuselage. **(Figure 1-6)**.

Figure 1-6
Remote Sensor Module (RSM)

The RSM contains the following sub-systems:

- 3D magnetic flux (heading) sensors.
- Outside Air Temperature (OAT) sensor.
- Emergency backup GPS engine and antenna (optional).

The RSM communicates with the EFD1000 system unit via a digital cable connection.

NOTE

The RSM is only available for the EFD1000 MFD. The EFD500 MFD does not include the AHRS and ADC sensor board.

1.1.4. **Configuration Module (CM)**

The Configuration Module contains an EEPROM device that retains system configuration and calibration data and provides two primary functions **(Figure 1-7)**:

- Retains aircraft-specific configuration information, calibration data, and pilot settings, allowing the PFD to be swapped for service purposes without re-entering or re-calibrating the installation.
- Contains a license key that configures the EFD system software features.

The CM is typically attached to the wire bundle coming out of the D-sub connector on the system unit.

Figure 1-7
Configuration Module

1.1.5. **Analog Converter Unit (ACU) - optional**

The optional ACU enables the all-digital EFD1000/500 system to interface to analog avionics when required. The ACU converts multiple analog interfaces to the digital ARINC 429 buses supported by both the EFD1000/500 displays. Control parameters, such as desired heading, are also sent from the EFD to the ACU for conversion to analog format for autopilot support. The ACU is required when any of the following capabilities are required **(Figure 1-8)**:

- Interface to supported autopilots.
- Interface to conventional VHF navigation radios.
- Interface to legacy (non-ARINC 429) GPS navigators.
- Interface to supported radar altimeter decision height annunciations.

If ARINC 429-based digital radios, such as the Garmin 400/500-series GPS/nav/comm radios, are installed in the aircraft, and no other aircraft interfaces are desired, the ACU is not required.

NOTE

The EFD500 MFD does not offer Autopilot or Decision Height.

Figure 1-8
Analog Converter Unit (ACU) - optional

NOTE

A single receiver will supply data to all EFD units installed on the aircraft.

Figure 1-9
Evolution Weather Receiver (EWR) and Antenna - optional

Figure 1-10
Micro Secure Data (SD) Card

NOTE

Ensure the EFD1000/500 MFD is powered off before inserting or removing an SD card.

1.1.6. Evolution Weather Receiver (EWR50) and Antenna - Optional

The optional Evolution Weather Receiver (EWR50) provides the ability to receive XM WX Satellite Weather data with a paid subscription to XM WX Satellite Weather. The EWR50 consists of a receiver and antenna. The EWR50 converts the XM WX Satellite Weather data into a digital format displayed on the EFD1000/500 MFD **(Figure 1-9)**.

1.1.7. microSDHC Card

The EFD1000/500 MFD is supplied with a microSDHC (Secure Data High Capacity) card that stores various data used for the Navigation Map information and Terrain Awareness. The microSDHC card is also used for field upgrades .

The EFD1000/500 MFD uses a Secure Digital (SD) card to load and store various types of data. For basic flight operations an SD card is required for Terrain, Obstruction, and Navigation database storage.

NOTE

*Refer to **Chapter 7, Appendices, Section 7.1. Downloads and Data Updates**, for specific instructions about updating the navigation and terrain database.*

Chapter 2

MFD Overview

This Pilot's Guide covers the EFD1000 and EFD500 MFD models. These systems are powerfully flexible and can be configured in a variety of ways, depending on the other aircraft systems with which they are integrated. When the EFD1000 MFD is configured alongside a PFD, the EFD1000 MFD supports a reversionary mode which allows the EFD1000 MFD to revert to a fully functional PFD. There is constant communication between the PFD and EFD1000 MFD which provides cross communication of the barometric pressure.

NOTE

The EFD500 MFD does not support the display of the secondary attitude data or the reversionary mode.

2.1. **Navigation Map**

The EFD1000/500 MFD Navigation Map VIEW is a pilot configurable moving map which can be rendered as either a VFR or IFR style map **(Figure 2-1)**. The map consists of symbols depicting the location of Navaids, intersections, airports, topographic information, boundaries, and GPS flight plan and waypoints. Various information overlays are accessible via Hot Keys, including Airways, Traffic, Terrain, Lightning and Spherics information, and data link weather.

Figure 2-1
Navigation Map Showing
VFR Style Map

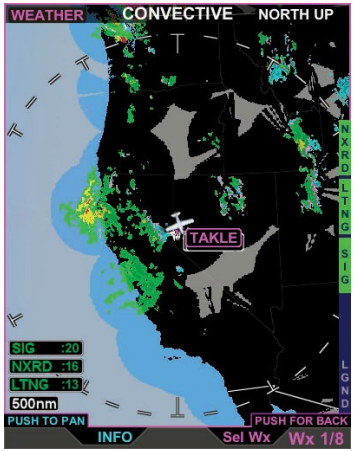

Figure 2-2
XM WX Satellite Weather Display on the EFD1000/500 MFD

2.2. **XM WX Satellite Weather**

The EFD1000/500 MFD supports XM WX Satellite Weather when the aircraft is configured with an Aspen EWR50 weather receiver **(Figure 2-2)**. You must also purchase a subscription to XM WX Satellite Weather. The EFD1000/500 MFD will display detailed weather information as described in detail in **Chapter 5, Reference Gudie, Section 5.2, Data Link Weather**. XM WX Satellite Weather provides information for the continental United States, portions of Canada, and Puerto Rico, providing situational awareness through graphical and textual weather updates. Some of the information available includes:

- High-Resolution NEXRAD Radar
- Lightning
- AIRMET/SIGMET
- Cloud and Echo Tops
- METARs and TAFs
- Winds Aloft
- TFRs

Figure 2-3
Dedicated Terrain Display on the EFD1000/500 MFD

2.3. **Terrain and Obstructions**

The EFD1000/500 MFD provides Terrain and Obstacle awareness using a built in database. Depiction is threat-based and highlights terrain in various colors depending on the vertical proximity of the terrain to the aircraft's current altitude **(Figure 2-3)**.

2.4. **Traffic**

The EFD1000/500 MFD will support Traffic Awareness **(Figure 2-4)** when your aircraft is equipped with at least one of the following traffic receivers:

- Avidyne TAS 600/610/620 (TAS)
- Bendix/King KMH 880 (TAS)
- Bendix/King KTA 870 (TAS)
- Garmin GTX 330 (TIS)
- RYAN 9900BX (TAS)
- SKYWATCH SKY 497 (TAS)
- SKYWATCH SKY 899 (TAS)

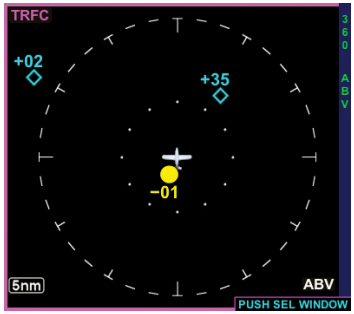

Figure 2-4
Dedicated Traffic Display on
the EFD1000/500 MFD

2.5. **Stormscope® WX-500**

If a Stormscope® WX-500 receiver is installed, the EFD1000/500 MFD can be configured as the Stormscope® WX-500 control head or as a slaved display head **(Figure 2-5)**. When the MFD is configured as the control head the MFD will support CELL/STRIKE mode selection, Operator Initiated Self Test function, and the Clear function. When configured as a slaved display, the Stormscope® WX-500 control functions are disabled.

Figure 2-5
Stormscope® WX-500
Display on the
EFD1000/500 MFD

Figure 2-6
Revert the EFD1000/500 MFD to EFD1000 Pro PFD Operation

Figure 2-7
Switch Back to MFD Operating Mode

NOTE

Only the EFD1000 MFD supports reversionary mode since the EFD500 MFD does not incorporate the ADAHRS sensor set.

NOTE

Holding the REV Button for more than five (5) seconds will initiate a shutdown procedure.

2.6. **Manual Reversionary Mode** (EFD1000 MFD only)

When the EFD1000 MFD is configured alongside a PFD, the MFD supports a reversionary mode. The reversionary mode is a feature that allows the MFD to revert to a fully functional (except for tone generation and autopilot) Primary Flight Display. The MFD mode is the default mode on power-up and the "REV" Button is used to access the reversionary mode.

To switch to the PFD operating state press the REV Button once **(Figure 2-6)**. Pressing the REV Button again will return the unit to the EFD1000 MFD operation **(Figure 2-7)**. When operating as an EFD1000 PFD, the system performance and operation are the same as the PFD, except the EFD1000 MFD reversion mode may not include autopilot integration.

Switch to the PFD Operating Mode

- While in MFD mode, press the REV Button once.

Switch Back to MFD Operating Mode

- While in PFD mode, press the REV Button once.

2.7. **Secondary PFD Display**

The EFD1000/500 MFD and the EFD1000 PFD constantly communicate with each other. When communication with the PFD is lost, the MFD shall annunciate in amber CROSS LINK FAILURE above the current baro setting in the data bar (**Figure 2-8**). This message means that a failure has been detected in the intercommunications and barometric pressure setting synchronization may be inoperative.. The barometric pressure must be set in each individual EFD. Switch the MFD to PFD mode, by pressing the REV button, to adjust barometric pressure on the MFD.

Figure 2-8
MFD/PFD Communication Lost Annunciations

NOTE

Only the EFD1000 MFD supports the display of the Secondary Attitude Indicator and Secondary Horizontal Situation Indicator.

2.7.1 **Secondary Attitude Indicator**

The Secondary Attitude Instrument VIEW provides a secondary display of aircraft attitude, altitude, and airspeed. The VIEW consists of a basic attitude indicator overlaid with numerical airspeed and altitude data (**Figure 2-9**).

Figure 2-9
Secondary Attitude Indicator VIEW on the EFD1000 MFD

2.7.2 **Secondary Horizontal Situation Indicator**

The Secondary HSI VIEW provides a secondary display of the Direction Indicator and Course Direction Indicator (CDI) (**Figure 2-10**).

Figure 2-10
Secondary HSI VIEW on the EFD1000 MFD

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Chapter 3

Display & Controls

In order to best familiarize you with the features available for the EFD1000/500 MFD this chapter offers a quick overview of the display and Pilot Controls.

Figure 3-1
Actual view of EFD1000 MFD Display Unit

1	Reversion and Power Button
2	Range Buttons
3	Menu Button
4	Hot Key/Menu Key 1
5	Hot Key/Menu Key 2
6	Hot Key/Menu Key 3
7	Hot Key/Menu Key 4
8	Hot Key/Menu Key 5
9	Right Control Knob
10	Lower Right Button
11	Lower Center Button
12	Lower Left Button
13	Left Control Knob
14	Automatic Dimming Photocell
15	microSDHC Card Slot
16	Data Bar
17	Hot Key Legend
18	Full Screen Window
19	Upper Split Screen Window

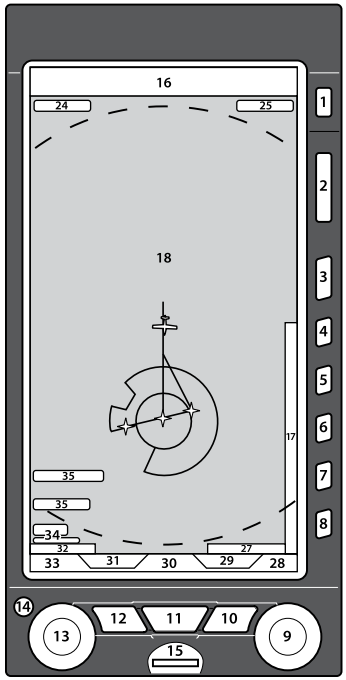

Figure 3-2 Full Screen LAYOUT

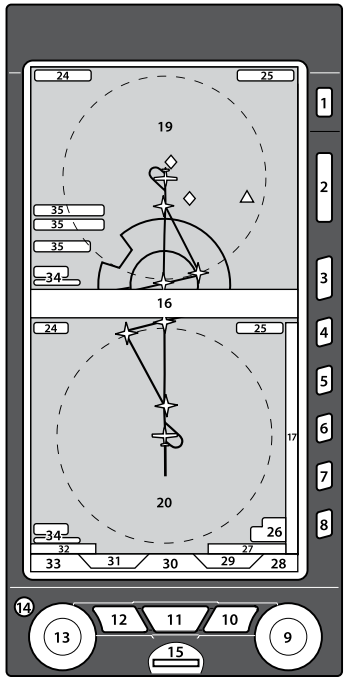

Figure 3-3 Split Screen LAYOUT

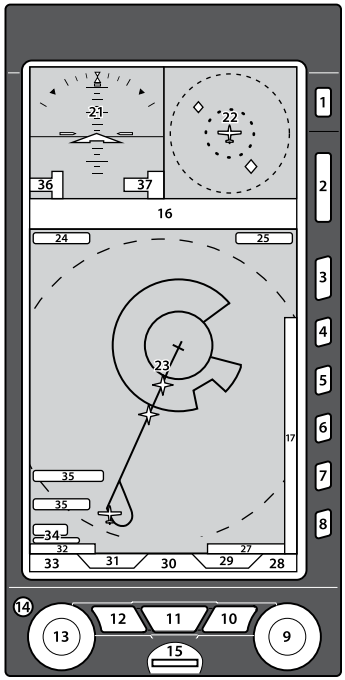

Figure 3-4 Thumbnail Screen LAYOUT

20	Lower Split Screen Window
21	Upper Left Thumbnail Window
22	Upper Right Thumbnail Window
23	Lower Thumbnail Window
24	VIEW Name
25	Heading / Strikes VIEW Mode
26	Terrain AGL, Traffic filter, Strikes Rate
27	Right Knob Label
28	Right Knob Status
29	Select Weather Label (Weather VIEW only)
30	Traffic Advisory Notification
31	Display Info Label (Nav Map & Weather only)
32	Left Knob Label
33	Left Knob Status
34	Map Range and Declutter Level
35	Annunciations
36	Airspeed (Secondary AI only)
37	Altitutde (Secondary AI only)

Table 3-1 EFD1000/500 MFD Display Components

3.1. **Default Display**

The EFD1000/500 MFD offers three different display options as described in the following paragraphs. The default VIEWs and other settings can be changed at any time. Any changes made to the PAGE are automatically saved and displayed over the power cycle of the unit. All three display options show the data bar (see **Section 3.1.1. Data Bar**).

The first PAGE is a one WINDOW, Full Screen LAYOUT, and the Left Knob label reads 1/3. The default display is the VFR Navigation Map VIEW **(Figure 3-5)**.

The following VIEWS will display in the Full Screen LAYOUT WINDOW:

- Navigation Map (NAV MAP)
- Terrain (TERR)
- Traffic (TRFC)
- WX-500 (STRIKES)
- Data Link Weather (WEATHER)

Figure 3-5
EFD1000/500 MFD PAGE 1/3

The second PAGE of the display is a two WINDOW, Split Screen LAYOUT, and the Left Knob label reads 2/3. The VFR Navigation Map VIEW is displayed in the top WINDOW with the Dedicated Terrain VIEW is displayed in the bottom WINDOW **(Figure 3-6)**.

Table 3-2 lists the VIEWS that will display in each of the Split Screen LAYOUT WINDOWS:

LAYOUT WINDOW	VIEW
Top WINDOW	• Terrain (TERR) • Traffic (TRFC) • WX-500 (STRIKES)
Bottom WINDOW	• Navigation Map (NAV MAP) • Terrain (TERR) • Traffic (TRFC) • WX-500 (STRIKES) • Data Link Weather (WEATHER) • Secondary HSI (EFD1000 MFD only)

Table 3-2 Split Screen LAYOUT WINDOW Supported VIEWs

NOTE

The Split Screen LAYOUT does not allow the display of the Navigation Map VIEW and the Data Link Weather VIEW at the same time..

Figure 3-6
EFD1000/500 MFD Page 2/3

NOTE

If a sensor is not configured in the Installation Menu (i.e., traffic, WX-500, or EWR50) the associated sensor VIEW shall not be displayed or selectable.

Figure 3-7
EFD1000/500 MFD PAGE 3/3

The last PAGE of the display is a three WINDOW, Thumbnail LAYOUT, and the Left Knob label reads 3/3. The Secondary Attitude Indicator VIEW is displayed in the top left WINDOW, Dedicated Terrain VIEW in the top right WINDOW, and VFR Navigation Map VIEW in the bottom WINDOW **(Figure 3-7)**.

Table 3-3 lists the VIEWS that will display in each of the Thumbnail LAYOUT WINDOWS:

Window	View
Left WINDOW	• Terrain (TERR) • Traffic (TRFC) • WX-500 (STRIKES) • Secondary Attitude Instrument (EFD1000 MFD only)
Right WINDOW	• Terrain (TERR) • Traffic (TRFC) • WX-500 (STRIKES)
Bottom WINDOW	• Navigation Map (NAV MAP) • Terrain (TERR) • Traffic (TRFC) • WX-500 (STRIKES) • Data Link Weather (WEATHER)

Table 3-3 Thumbnail LAYOUT WINDOW Supported VIEWs

3.1.1. **Data Bar**

The Data Bar is a multi-purpose text area that displays the information about the current flight plan and other relevant flight information. The Data Bar is not editable. The first line of the Data Bar displays flight plan information **(Figure 3-8)**:

- Last flight plan waypoint
- Active flight plan waypoint and desired track
- Next non-active flight plan waypoint

The second line of the Data Bar displays:

- GPS Source
- Estimated Time En route (ETE)
- Aircraft ground track (TRK)
- Barometer setting (BARO)

The active flight plan leg and TRK text are displayed in magenta text. All other information is displayed with green text. The next flight plan waypoint identifiers shall be displayed as depicted by the selected GPS unit (indicated on the second row of the data bar). The ETE is displayed in the format H:MM (where H is hours and MM is minutes). Active waypoint and ground track are displayed numerically with a resolution of 1 and a range of 001° to 360°.

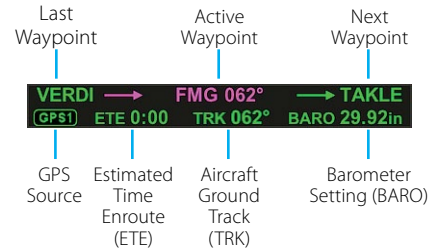

Figure 3-8 Data Bar

NOTE

When ground track is unavailable or invalid the numerical value is dashed.

NOTE

When the ETE is unavailable or invalid the numerical value is blank.

NOTE

The next flight plan waypoint identifiers are displayed as depicted by the GPS navigator. When the GPS data is unavailable all flight plan leg information is dashed.

NOTE

If a traffic advisory occurs, the Data Bar will display the word TRAFFIC in amber as discussed in **Chapter 5, Section 5.3.2. Traffic**.

3.2. **Controls**

Your EFD display is equipped with several pilot controls designed to simplify operation of your EFD system, minimize pilot workload, and reduce the time required to access functionality. Each display bezel has two dual rotary knobs with a push feature, three lower buttons, five context sensitive Hot Key buttons along the lower right, a MENU Button, RNG+/- Button, and a REV Button for reversion or manual power control. Most of the controls are content sensitive, i.e. the functionality of the control changes depending on the current selected VIEW and the current Interface Mode.

Figure 3-9
Lower Controls, Knobs and Buttons

3.2.1. **Lower Controls**

The EFD1000/500 MFD has two dual rotary knobs with a push feature. The knobs are used to select a different PAGE, WINDOW, or VIEW or move horizontally and vertically when panning the map. The three buttons at the bottom of the MFD have various functions as described in the following sections. All of the buttons and knobs are labeled on the display **(Figure 3-9)**.

3.2.1.1. **Left Knob**

Rotating the Left Knob selects a different PAGE for display. The initial rotation of the knob activates the selection process, and continued rotation will select different PAGEs. This feature helps to minimize inadvertent PAGE changes. Pressing the Left Knob activates panning mode. When panning mode is active the Left Knob scrolls horizontally across the map. When in the Secondary HSI VIEW the Left Knob performs a SYNC function for the CRS (EFD1000 MFD only).

When the INFO button is pressed rotating the Left Knob selects different objects on the Navigation Map (Airports/VORs) or METAR, AIRMET/SIGMET, and TFR weather pages. Pressing the Left Knob after the INFO button has been pressed will display the selected object's textual information, when available.

3.2.1.2 **Left Button**

The Left Button displays the label Select when the AIRMET/SIGMET, METAR, or TFR Weather view is displayed. Pressing the Left Button activates alert selection, and then rotating the Left Knob selects individual alerts. See **Section 5.2**. **Data Link Weather** for more information.

3.2.1.3. **Middle Button**

The Middle Button is used to select a navigation source for the Secondary HSI when the HSI VIEW has the FOCUS (EFD1000 MFD only). A navigation source label (e.g. GPS1, VLOC1) will display directly above the button when its functionality is available. During a traffic alert, pressing the Middle Button will display the Traffic VIEW; and when pressed a second time the display returns to the previous VIEW. See **Section 5.4.2. Secondary Horizontal Situation Indicator (HSI)** and **Section 5.3.2. Traffic** for more information.

3.2.1.4. **Right Button**

When the Data Link Weather VIEW is displayed and has the FOCUS, the Right Button displays the label Sel WX. Pressing the lower Right Button activates Weather Product Selection, and then rotating the Right Knob selects different Weather Products. See **Section 5.2**. **Data Link Weather** for more information.

Figure 3-10
Right Side Display Controls

3.2.1.5. **Right Knob**

Pressing the Right Knob moves the FOCUS and selects different WINDOWS on a PAGE. When a WINDOW has FOCUS, rotating the Right Knob changes the VIEW of the WINDOW. If the Right Knob is not pushed (to activate WINDOW selection) the initial rotation of the Right Knob will activate the selection process, and continued rotation will select different WINDOWs. This feature helps to minimize inadvertent PAGE changes.

The Right Knob is also used to back up through multiple information pages. The label PUSH FOR BACK displays above the Right Knob when this feature is available. Pushing the Right Knob will back the EFD1000/500 MFD out of information and panning, one level at a time, to return to the basic VIEW.

3.2.2. **Side Buttons**

There are several buttons along the right side of the EFD1000/500 MFD display. There is a REV button for reversionary and power control, two range buttons that allow the pilot to zoom in or out of the selected VIEW, a MENU button that activates the Main Menu, and five Hot Keys that provide access to VIEW content sensitive functionality or Main Menu options **(Figure 3-10)**.

3.2.2.1. **Reversion (REV) Button**

The REV Button is used to either manually turn off the MFD or switch (revert) the EFD1000 MFD between the MFD and PFD operating state.

3.2.2.2. **Range +/- Button**

The RNG+/- Button changes the map scale range for the selected VIEW, if it has a range function (i.e. the Navigation Map VIEW). Press the RNG+ Button to zoom out (i.e. from 20nm to 30nm) or press the RNG- Button to zoom in (i.e. from 30nm to 20nm). See **Section 5.1, Navigation Map** for more detailed information.

NOTE

The reversion function is only available on EFD1000 MFD units that are configured with an EFD1000 PFD.

3.2.2.3. **Menu Button**

The MENU Button is used to activate or exit the Main Menu. The first time the Main Menu is accessed the GENERAL SETTINGS menu page displays; subsequently, the last viewed menu page will display.

3.2.2.4. **Hot Keys/Menu Keys**

The five buttons along the lower right side of the EFD1000/500 MFD display offer either Hot Key functionality, to rapidly select a common command, or to select a menu option when the Main Menu is activated.

The functionality of the Hot Key is content sensitive based on which WINDOW/VIEW has the current FOCUS. The label to the left of the Hot Key changes to reflect the current functionality available. See **Chapter 5. Reference Guide** for detailed information about individual VIEWs and the associated Hot Keys.

NOTE

Not all Hot Keys are used in each VIEW. If a Hot Key does not have a label, it does not perform any function for that VIEW. The Navigation Map VIEW has two levels of Hot Keys; the first Hot Key is labeled 1/2 or 2/2 designating the Hot Key level currently displayed..

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Chapter 4

Getting Started

If you already have an EFD1000 PFD, you will probably find your new EFD1000/500 MFD fairly easy to use. However, because of all the information available to view, many of the controls on the EFD display unit have different functionality. You may want to familiarize yourself with the terminology and functionality of the EFD1000/500 MFD by reading Chapter 3; this will provide you with an understanding of the controls, operating logic, and display elements of your new EFD1000/500 MFD. Refer to Chapter 5 for more in-depth information and step-by-step instructions for each of the VIEWS on the EFD1000/500 MFD.

The EFD1000/500 MFD complements your current EFD1000 PFD and provides a fully functional Electronic Flight Instrument System (EFIS), offering the same capabilities and features found on larger glass cockpit systems in airliners, business jets, and newer general aviation aircraft. With the addition of an EFD1000/500 MFD, your EFD system is now capable of much more than the analog instruments it replaced.

Figure 4-1
EFD1000/500 MFD Initializing Screen

4.1. **Startup**

When the EFD1000/500 MFD initializes you are presented with the default PAGES pre-configured with what we thought would be the most useful VIEWS. This section will give you a quick overview of the default settings so that you can start flying with the EFD1000/500 MFD right away. You will learn how to change the backlighting, the Emergency Backup Battery (EBB) features (on the EFD1000 MFD only), how to manually power the system off and on, and how to navigate PAGES, VIEWS, Data Link Weather Products, and other screen elements.

When the EFD1000/500 MFD powers up the first screen you see is the Initializing Screen which displays the system configuration and any status annunciations **(Figure 4-1)**.

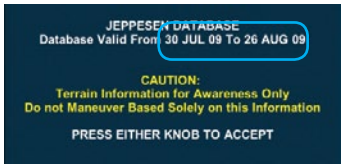
After the Initializing Screen, the EFD1000/500 MFD presents the Jeppesen Database Confirmation Screen, overlaid on the lower half of the EFD1000/500 MFD display. The confirmation screen displays the validity dates of the currently loaded Jeppesen Database and the terrain awareness message **(Figure 4-2)**.

Press either the Left or Right Knob to acknowledge and accept the information and display the first PAGE of the EFD1000/500 MFD. The validity and expiration date of all databases is displayed in the Main Menu, on the Database Menu page.

View Database Validity and Expiration Dates

1. Access the Main Menu.
2. Navigate to the Database page.
3. The database expiration dates are displayed next to the database titles as shown in **Figure 4-3**.
4. Push the MENU key to exit the Main Menu.

Figure 4-2
EFD1000/500 MFD Database Confirmation Screen



CAUTION

Terrain information is for awareness only. Do not Maneuver based solely on this information.

Figure 4-3
Database Expiration Dates

WARNING

Do not rely on the navigation data of the EFD1000/500 MFD Navigation VIEW as the primary reference for navigation. The EFD1000/500 MFD Navigation VIEW is intended to be a supplement to other approved navigation data sources, and enhance the pilot's overall situational awareness. The EFD1000/500 MFD Navigation VIEW is a situational awareness aid. The navigation databases must be updated on a regular basis to ensure the best possible accuracy; do not use outdated database information.

Figure 4-4 PAGE Selection Mode – Split-Screen LAYOUT

Figure 4-5 PAGE Selection Mode – Thumbnail LAYOUT

4.1.1. Select Different PAGE or WINDOW

As previously mentioned, a PAGE displays information on the EFD1000/500 MFD screen. When you make any changes to a PAGE, the PAGE settings are automatically updated and saved. Changes are made to the current PAGE by selecting the WINDOW and changing the VIEW or other options as desired. If you view another PAGE, then return to the previous PAGE you made changes to, it will have the same settings as when it was last displayed. PAGES can be modified at any time.

The EFD1000/500 MFD must be in Change VIEW Mode to change the current PAGE or WINDOW display. When the EFD1000/500 MFD is in Change VIEW Mode, the Right Knob label reads PUSH SEL WINDOW. When panning; viewing Airport, METAR, AIRMET/SIGMET, or TFR information; or editing the airport identifier in the METAR view, the EFD1000/500 MFD is in VIEW Control Mode. When in VIEW Control Mode the Right Knob label changes to PUSH FOR BACK to allow the pilot to quickly exit VIEW Control Mode and return to Change VIEW Mode.

Viewing PAGES

- Rotate the Left Knob clockwise to select the next PAGE, counter-clockwise to select the previous PAGE. The label above the Left Knob will change to indicate the page number currently displayed **(Figure 4-4 and 4-5)**.

Selecting WINDOWS

- Push the Right Knob to activate WINDOW selection mode. The magenta border around the current WINDOW with FOCUS becomes bolder and the VIEW label above the Right Knob turns magenta. Each consecutive push of the Right Knob selects the next WINDOW on the PAGE and the magenta border will outline the selected WINDOW **(Figures 4-6 and 4-7)**.

Figure 4-7
WINDOW Selection Mode –
Bottom WINDOW Selected

Figure 4-6
PAGE Selection Mode – Top
Right WINDOW Selected

Figure 4-8
Change VIEW – New VIEW Selected

4.1.2. Change VIEW

A WINDOW can display different VIEWs as outlined in **Section 3.1. Default Display**. To select a different VIEW in any WINDOW you must first move the FOCUS to the WINDOW you want to change, and then select a different VIEW. The current VIEW name displays in the upper left of the active WINDOW **(Table 4-1)**.

VIEW	NAME
Navigation Map	NAV MAP
Terrain Awareness	TERR
Data Link Weather	WEATHER
Traffic	TRFC
Stormscope	STRIKES
Secondary Attitude Indicator	NONE
Secondary HSI	NONE

Table 4-1 EFD1000/500 MFD VIEW Names

NOTE

Not all WINDOWS support all VIEWS. See the appropriate VIEW section for more detailed information.

Change the VIEW of a WINDOW

1. Push the Right Knob to select the WINDOW you want to change. The Magenta border will move from WINDOW to WINDOW as the Right Knob is pressed to indicate which WINDOW is selected. *The selected VIEW's name also displays in magenta.*
2. Rotate the Right Knob to display the available VIEWS for that WINDOW until the VIEW you want displays **(Figure 4-8)**.

NOTE

If the WINDOW you want to change already has a thin magenta border, there is no need to push the Right Knob. Simply rotate the Right Knob to select the VIEW you want.

4.1.3. **Panning**

The Navigation Map and Data Link Weather VIEWs support a panning feature that allows the pilot to view areas away from the aircraft's current position.

Use the Panning Feature

1. Select the WINDOW that contains the VIEW you want to pan. The PUSH TO PAN label displays in cyan above the Left Knob **(Figure 4-9)**.
2. Press the Left Knob to activate panning. The PUSH TO PAN label changes to PUSH TO CANCEL PAN, the Left Knob label changes to HORZ. The Right Knob label changes to VERT with PUSH FOR BACK above the label. All labels are magenta **(Figure 4-10)**.
3. Rotate the Left Knob to pan to left or right and rotate the Right Knob to pan up or down **(Figure 4-11)**.
4. Push the Left Knob to exit panning mode and return the VIEW to the original position with the aircraft centered in the VIEW.

Figure 4-9
PUSH TO PAN Displays Above the Left Knob

Figure 4-10
Panning Activated

Figure 4-11
Panning the Navigation Map

NOTE

You can also push the Right Knob to return back to the original VIEW mode.

Figure 4-12
METAR Weather Product Screen

Figure 4-13
Editing Airport Identifier

Figure 4-14
New Airport Identifier Entered

4.1.4. **Editing Airport Identifier Fields**

The METAR screen of the Data Link Weather VIEW allows the pilot to enter information by entering VIEW control mode and using the Data Field Edit functionality. For example, when looking for METAR information for a specific airport, the pilot can enter the airport identifier to display the required information.

> ***NOTE***
>
> *This task uses the METAR data editing capabilities as an example. The process is similar for any type of data field edits.*

Editing Airport Identifier Fields

1. Display the METAR screen of the Data Link Weather VIEW **(Figure 4-12)**.
2. Push the TEXT Hot Key to display the current airport's METAR. Data Field Edit mode is automatically active. The first character of the airport identifier is magenta and the Left Knob has two magenta labels, EDIT and PUSH TO ADVANCE **(Figure 4-13)**.
3. The airport identifier character that is magenta is selected. Rotate the Left Knob to select another available character (clockwise moves forward, counter-clockwise moves backward). Push the Left Knob to move the identifier selection to the next character, and then rotate the Left Knob as before **(Figure 4-14)**.
4. Push the TEXT Hot Key to exit the METAR.

NOTE

The TEXT function is a smart function. It only selects a METAR capable airport rather than permitting selection of a random string of letters. Additionally, editing is done using only one hand — twist to the desired letter then press to advance.

4.1.5. **Scroll Bar**

When text information is displayed (i.e. Airport, AIRMET/SIGMET, METAR, TFR) that exceeds the displayable limits of the WINDOW, a scroll bar is presented to the right of the text. The Right Knob label changes to Scroll and is magenta in color **(Figure 4-15)**.

Use the Scroll Bar

- When a scroll bar is presented in a text display rotate the Right Knob clockwise to scroll down the viewable text **(Figure 4.16)**, or counter-clockwise to scroll up the viewable text.

Figure 4-15
METAR with Information
Viewable by Scrolling

Figure 4-16
Use the Scroll Feature to
View a METAR

4.2. **Main Menu**

The MENU Button is used to access the EFD1000/500 MFD's Menu system to change options and also to change the EFD1000's LCD brightness controls.

4.2.1. **Using the Menus**

As previously discussed, you enter MENU mode by pressing the MENU Button. The Main MENU has several pages of information that allow the pilot to fully customize the EFD1000/500 MFD display. Pilot can view, manage, and change the settings of the EFD1000/500 MFD. Some EFD1000/500 MFD Main MENU options available are:

- Change VIEW settings
- Change declutter settings
- Check the battery status
- Check the database version
- Restart the system
- View the serial number of the unit

The first MENU page is the default page, following the power cycle of the MFD. Rotating the Right Knob navigates to different menu pages. When the EFD1000 MFD is operating in reversionary mode, pressing the MENU Button displays the PFD Main MENU.

The current Menu Page Name displays on the bottom center of the Display. Directly below the Menu Page Name is a segmented menu page bar, giving a graphical representation of the current page relative to the total number of menu pages. The current menu page number displays in the lower right of the Navigation Display.

The Menu system operates either in Navigation or Edit mode, as indicated by the label directly above the Right Knob. When the MENU Button is first pressed, the Menu system

NOTE

If a traffic advisory occurs when the Main Menu is enabled, the Main Menu is removed from the display.

is in Navigation mode, indicated by the magenta label SEL PAGE directly above the Right Knob **(Figure 4-17)**. When in Navigation mode, rotating the Right Knob navigates through the menu pages. Rotate the Right Knob clockwise to advance to the next menu page. Rotate the Right Knob counterclockwise to return to previous menu page.

Each Menu page provides up to five selectable options, each adjacent to one of the five Menu Keys. After navigating to the Menu Page containing the option you want to change, press the Menu Key adjacent to that option label, which initiates the menu's Edit mode. When the menu is in Edit mode, the label EDIT VALUE, displays above the Right Knob in magenta **(Figure 4-18)**, and the label of the item selected for editing is also shown in magenta. Rotate the Right Knob to change the value of the selected item.

When done, either select another displayed option to change, or push the Right Knob to exit Edit mode and return to Navigation mode to select another menu page. When you are finished changing menu options, press the MENU Button again to exit the menu system **(Figure 4-19)**.

Figure 4-17
Main Menu Navigation Mode

Figure 4-18
Main Menu Edit Mode

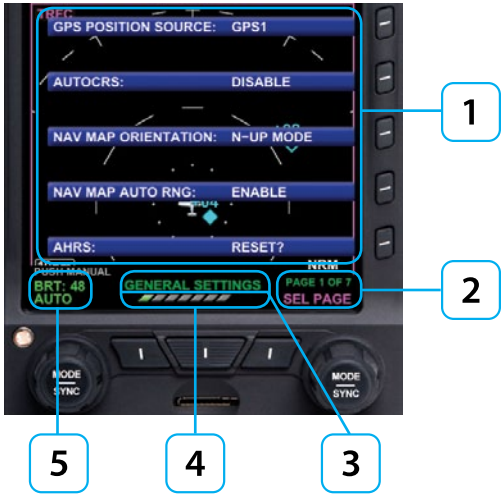


Figure 4-19 Main MENU

1 Main Menu

2 Menu Page number and mode (Navigation mode shown)

3 Menu Page Name

4 Menu Page graphical bar

5 Brightness Control

Figure 4-20 Main Menu Text - Editable

Figure 4-21 Main Menu Text - Enabled

Figure 4-22 Main Menu Text – Status Only

Figure 4-23 Main Menu Text - Disabled

Figure 4-24
Menu Display

The menu text will display in one of the four colors listed and described in **Table 4-2**.

DISPLAY TEXT	DESCRIPTION	DISPLAY
WHITE	Editable option	See **Figure 4-20**
MAGENTA	Editable option enabled	See **Figure 4-21**
GREEN	Non-Editable or "Status Only"	See **Figure 4-22**
GRAY	Disabled	See **Figure 4-23**

Table 4-2 Menu Text

NOTE

The following steps are provided as a basic overview.

Access and Navigate the Main Menu

1. Push the MENU Button. The Main Menu displays adjacent to the Hot Keys **(Figure 4-24)**.
2. Rotate the Right Knob to navigate through the different pages of the menu. Rotating the Right Knob clockwise advances forward one menu page at a time. Rotating the Right Knob counterclockwise reverses one menu page at a time.
3. When finished, press the MENU Button to exit the Main Menu.

Edit Main Menu Items

1. Access the Main Menu.
2. Navigate to the desired menu page.
3. Push the Menu Key of the desired option. The menu label turns magenta and the EDIT VALUE label displays above the Right Knob **(Figure 4-25)**.
4. Rotate the Right Knob to the desired value.
5. Push the Right Knob to save the value and return to menu navigation mode.
6. Push the MENU Button to exit the Main Menu.

Refer to **Chapter 5** for detailed information about Menu options for individual VIEWs.

Figure 4-25
EDIT VALUE Displays
Above Right Knob

NOTE

Upon reaching the end of a list of editable menu options, continued rotation of the knob does not result in the continuous "wrapping" through the available editable menu options.

NOTE

Pressing the Right Knob returns to navigation mode and allows selection of other menu options on different pages. Pressing another menu key on the current menu page saves any changes made, and activates the newly selected option for editing.

NOTE

The AUTOCRS and AHRS options on the Main Menu, General Settings page of the EFD500 MFD will display in gray since the EFD500 MFD does not incorporate the ADAHRS sensor set.

Figure 4-26
EFD1000/500 MFD photocell

4.3. **Display Lighting**

The EFD1000/500 MFD contains various lighting controls to maintain readability under all lighting conditions. Each EFD1000/500 MFD has an LED backlight, which illuminates textual content for better night operation. The controls are also backlit, at a fixed brightness, for visual location in dark conditions.

The display itself contains an adjustable backlight with a wide dimmable range. The pilot can choose between Automatic or Manual display lighting mode. By default, the EFD1000/500 MFD is in AUTO display lighting mode. The front mounted photocell measures the ambient light and adjusts the backlighting automatically to a readable level **(Figure 4-26)**.

When the MENU Button is pressed and the menu system is active, the Left Knob can be used to adjust the EFD1000/500 MFD display brightness.

By default, the LCD brightness operates in AUTO mode, and is adjusted based on photocell sensing of ambient lighting conditions. When the MENU is active and the display brightness is in AUTO, the word AUTO and a brightness level of 1-100 will be displayed in green above the Left Knob.

To override the AUTO brightness setting, press the Left Knob once to switch into Manual mode, and then rotate the Left Knob to set the brightness to the desired level. To return to AUTO brightness control, press the Left Knob again.

Display Lighting MODE	DESCRIPTION
Automatic AUTO	LCD backlight intensity is automatically adjusted based on the current light conditions sensed by the Automatic Dimming Photocell. When using the auto-brightness the display brightness will display up to 70%.
Manual ADJUST	Allows the pilot to adjust the LCD backlight intensity manually, from 1 - 100%.

Table 4-3 Lighting Mode Descriptions

Change the Display Brightness

1. Press the MENU Button. The Main MENU displays and the Left Knob label displays AUTO **(Figure 4-27)**. When the display brightness is in MANUAL mode the Left Knob label reads ADJUST. If so, skip step 2.
2. When the Left Knob label is AUTO, press the Left Knob once to change the display mode to ADJUST **(Figure 4-28)**.
3. Rotate the Left Knob to change the brightness to the level desired.
4. Press the MENU Button to exit the Main MENU.

Figure 4-27
Display Brightness in AUTO Mode

Figure 4-28
Display Brightness in ADJUST Mode

NOTE

The AUTO display brightness setting is determined by the amount of light detected by the photocell on the front of the unit. If you use a light to illuminate the instrument panel, the photocell will respond, resulting in a bright display. When this happens, use the MANUAL brightness setting to select a dimmer display setting.

NOTE

If the EFD1000 MFD is operating on the internal or emergency backup battery, the maximum brightness level is capped at 40% in automatic mode and 70% in manual mode to preserve emergency battery operating time.

NOTE

To facilitate cooling of the EFD1000/500 MFD display unit, when the backlight temperature is greater than or equal to 70°C the display brightness is limited to 30% in automatic mode and 70% in manual mode. The limit is removed when the EFD1000/500 MFD display temperature drops below 60°C.

4.4. **Backup Battery**

The EFD units all have an internal backup battery in case of degraded external power. The internal battery provides sufficient power for 30 minutes of display operation at temperatures that would be comfortable to the aircraft occupants. The battery is charged by the EFD1000/500 MFD whenever the EFD unit is running on aircraft power.

In the event that external power to the unit is degraded or fails, the MFD will automatically switch to its internal battery. When operating on internal battery, the display backlight intensity is limited to 40% in automatic mode and 70% in manual mode. An "ON BAT" annunciation and the estimated battery charge remaining is displayed on the display **(Figure 4-29)**.

Figure 4-29
Internal Battery Annunciation

Some installations include an alternate, higher-capacity, Emergency Backup Battery (EBB) connected to the EFD1000 MFD. The EBB assures 30 minutes of operation under all foreseeable operating conditions (i.e. extremely cold or hot conditions), and far exceeds the 30 minute capacity at normal temperatures. The purpose of the EBB is to provide assured power to the backup instruments when the EFD1000 MFD is the only airspeed and altimeter backup. Refer to the Aircraft Flight Manual Supplement to determine if your installation includes the EBB, and for usage instructions.

WARNING

When fully charged, the internal battery will operate the AHRS, display, and RSM emergency GPS for at least 30 minutes following loss of aircraft power. If aircraft power cannot be restored, the pilot should follow the electrical failure checklist in the Aircraft Flight Manual.

WARNING

When operating on the internal battery if the voltage level degrades to the point where unreliable operation may occur, the EFD will shutdown

WARNING

The backup battery operates the EFD1000 MFD Display and RSM. The ACU is not connected to the battery.

CAUTION

During situations where a high electrical demand is placed on the aircraft electrical system, electrical transients that cause aircraft voltage to momentarily drop below 12.5±0.3V (14V Electrical System) or 25.0±0.6V (28V Electrical System) will cause the MFD to automatically switch to the backup battery and display an ON BAT annunciation. The ON BAT annunciation should extinguish shortly after the electric transient demand goes away. If the ON BAT annunciation does not extinguish then an external power source failure has most likely occurred.

NOTE

When airborne, if the MFD input voltage is below the 12.5±0.3V (14V Electrical System) or 25.0±0.6V (28V Electrical System) automatic battery transition threshold, and EXT PWR is selected, the MFD will automatically transition back to the backup battery.

NOTE

If the internal battery housing temperature exceeds 65° C the power charge circuit is disabled. When temperatures drop below 0° C the battery does not charge.

Figure 4-30
Main Menu, Power Settings, BATTERY and EXT PWR MENU Button

Figure 4-31
Main Menu, POWER SETTINGS page, EXT PWR Status MENU Button

Figure 4-32
Main Menu, Power Settings, BAT MENU Button

4.4.1. **Power Override**

Override the Automatic Power Configuration

1. Push the MENU Button. The Main Menu displays.
2. Rotate the Right Knob until the POWER SETTINGS Menu page displays.
3. MENU Button 1 and 2 show the power source options of BATTERY and EXT PWR respectively. The current power source label is green; the other label is white **(Figure 4-30)**. Push either button to alternately switch between external power (EXT PWR) or the internal battery (BATTERY).
4. Push the MENU Button to exit the Menu

View External Voltage Status

1. Push the MENU Button. The Main Menu displays.
2. Rotate the Right Knob until the POWER SETTINGS Menu page displays.
3. The EXT PWR MENU Button, **(Figure 4-31)** displays the external power voltage.
4. Push the MENU Button to exit the Menu.

View Battery Status

1. Push the MENU Button. The Main Menu displays.
2. Rotate the Right Knob until the POWER SETTINGS Menu page displays.
3. The BAT MENU Button **(Figure 4-32)** displays the current battery status as a percentage of charge .
4. Push the MENU Button to exit the Menu.

4.5. **Power Off/REV Button**

The EFD1000/500 MFD is typically powered through a dedicated Power Control switch that is connected to the aircraft Battery bus. The system will power up, based on the position of the Power Control switch

Like the PFD, the power for the EFD1000/500 MFD is normally routed through a switch on the main battery bus. This permits continued PFD reversion capability even if it becomes necessary to turn off the avionics master switch.

Power Off Manually

- Press and hold the REV Button for 5 seconds.

OR

1. Push the MENU Button. The Main Menu displays.
2. Rotate the Right Knob until the POWER SETTINGS Menu page displays **(Figure 4-33).**
3. Press the RESTART MENU Button. The power down sequence initiates **(Figure 4-34).**

A powering off annunciation displays indicating that the unit will shut down in 5 seconds. The pilot can press any control to abort the power-down sequence.

Power On Manually

- Press and hold the REV Button until the EFD1000/500 MFD powers on.

Figure 4-33
Main Menu, Power Settings, RESTART Menu Button

Figure 4-34
EFD1000/500 MFD Powering Off

4.6. **Range Button**

When the MAP is enabled, the RNG (Range) button is used to zoom in or out in scale to display more or less of the map. The map range available depends on the VIEW. Press the top or (+) of the RNG key to increase map range. Press the bottom or (–) of the RNG key to decrease map range. Additionally an Auto Range feature is available.

Pressing and holding either the (+) or (-) of the RNG key will cause the map range to scale continuously to its maximum or minimum range, respectively. When the map range is at its maximum or minimum setting, pressing and holding the RNG key again will activate Auto Range mode (see **Section 5.1.3.** for complete details).

4.7. **Cleaning the Display Screen**

The EFD1000/500 MFD display is an LCD screen that is prone to damage from scratches, smudging, and clouding caused by the use of improper cleaning agents and harsh cloths. Use care when cleaning, using the following tips:

- Only clean the display when the unit is off.
- Use a clean, soft, lint free cloth dampened with a 50/50 solution of isopropyl alcohol and water, a pre-moistened lens cleaning tissue like Bausch & Lomb Sight Savers®, or a cleaning solution made especially for LCD displays.
- Never spray any cleaning solutions directly onto the screen, spray it into the cleaning cloth.
- Gently wipe the screen in a circular motion. Do not press hard on the cloth.
- Remove all excess moisture to prevent damage of the EFD1000/500 MFD display.
- The EFD1000/500 MFD display should be dry before powering the unit on.

NOTE

Use caution when using isopropyl alcohol as it is flammable. Using any other chemicals or materials voids the warranty.

Chapter 5
Reference Guide

The EFD1000/500 MFD is a panel-mounted Electronic Flight Instrument System (EFIS) that presents the pilot with a full-color moving Navigation Map VIEW and a dedicated Terrain VIEW. Additionally there are three optional VIEWS that provide Traffic, Stormscope® WX-500, and Weather information (all require additional receivers and possible subscriptions, see the appropriate sections for detailed information).

The Navigation Map VIEW displays aviation data (e.g., Navaids, intersections, airports, etc.) topographic information, boundaries, and GPS flight plan information. The Data Link Weather VIEW provides graphical Convective, METAR, Echo Tops, Cloud Tops, AIRMET/SIGMET, TFR, and Winds Aloft data. Each VIEW is clearly labeled in the upper left corner of the window.

The MFD1000 MFD also has a Secondary Attitude Indicator and Secondary HSI VIEW which provide the safety and confidence of DuoSafe™ full PFD instrument redundancy. If for some reason your EFD1000 PFD should fail, simply press the REV button on your EFD1000 MFD and your full PFD display is right back in your primary instrument scan.

The Reference Guide offers detailed information about each of the available VIEWS and step-by-step instructions to guide the pilot in the use and operation of each VIEW. **Sections 5.1. – 5.3.1.** provide information for VIEWS that all EFD1000/500 MFDs have. **Sections 5.3.2. – 5.3.3.** provide information for the three VIEWS that require additional equipment and subscriptions to third-party vendors for data link information.

NOTE

If the GPS becomes invalid an Invalid GPS annunciation displays. When the GPS position source is unavailable, map functions such as panning, info etc. will still be available. See ***Section 5.1.5.1. Invalid GPS*** *for detailed invalid GPS information.*

NOTE

The MFD uses azimuthal projection for all maps and geo-referenced data. .

Figure 5-1
Navigation Map VIEW,
IFR Style Map, Showing
Hot Key Menu 1/2

Figure 5-2
Navigation Map VIEW,
VFR Style Map, Showing
Hot Key Menu, Page 2/2

5.1. **Navigation Map**

The Navigation Map VIEW is a pilot configurable, moving map. The Navigation Map VIEW's default map style is a VFR map, oriented North-Up with the Ownship symbol located at the center of rotation of the map displaying a 360° range ring. The pilot can select either an IFR or VFR style map via a Hot Key. The remaining Hot Keys provide the pilot options to select the range ring type, change the map declutter settings, and will display airways, terrain, traffic, and weather overlays (**Figure 5-1** and **5-2**).

The Navigation Map VIEW has eight Hot Keys (two menus) with the first Hot Key labeled 1/2 or 2/2 (depending on the menu you are viewing) as outlined in **Table 5-1**.

Hot Key	Menu 1/2	Hot Key	Menu 2/2
VFR IFR	Selects the Navigation Map type.	TERR	Turns the terrain overlay on or off. (see note)
360 ARC	Selects the range ring type.	LTNG STRK CELL	Turns on satellite lightning (LTNG), WX-500 cell (CELL), or WX-500 strike (STRK) mode.
MAP	Selects declutter level.	NXRD	Turns the Data Link Weather overlay on including areas of no coverage. (see note)
ARWY LO HI	Turns the Airways overlay on (HI or LO) or off.	TRFC	Turns the Traffic overlay on or off.

Table 5-1 Navigation Map Hot Keys

NOTE

If the TRAFFIC, ERW50, and WX-500 ports are set to none the respective Hot Key labels will be blank.

The Range +/- button and the Map Hot Key allow the pilot to control the map range[1] and provide feature declutter. The current map range and declutter settings are shown in the lower left corner of the VIEW. Additionally, more detailed customization is available from the main menu, giving the pilot control over the symbols that can be shown on the map:

- Airports
- Hydrographic Features[2]
- Cultural Boundaries[2]
- Highways
- Airspace Boundaries[2]

NOTE

Terrain and NEXRAD are mutually exclusive. The Navigation map will only display one of these overlays at a time. Turning on the terrain overlay will remove NEXRAD information, and conversely turning on NEXRAD will remove Terrain information.

NOTE

When the ARC compass mode is selected the Ownship symbol is located at the bottom 1/3 of the VIEW.

1. The map range scale settings are 0.5, 1, 2, 3, 5, 10, 15, 20, 30, 40, 60, 80, 100, 200, 500, 1000 and 2000 nautical miles from the ownship position to the range ring.

2. Based on map range and declutter settings, see Table 5-6.

The data source for all but the active flight plan associated with the Navigation Map VIEW is obtained from the Jeppesen Database saved to the micro SD Card. If the Jeppesen Database is invalid or unavailable, DATABASE FAILURE is displayed in amber. While Navigation Map VIEW features (**Table 5-2**) are loading, a gray indicator displays on the bottom center of the Navigation Map VIEW.

Feature Group	Feature Details
Navigation	Flight plan waypoints, legs, intersections, VOR, NDB, DME, VORTAC, VOR/DME, and TACAN
Airports	Hard-surfaced and other than hard surface
Hydrographic Information	Oceans, lakes, and rivers
Boundaries	International, state or province, Air Defense Intercept Zones (ADIZ), Special Flight Rules Areas (SFRA)
Transportation	Main Highways, Roads, Railroads[1]
Controlled Airspace	Class B, C, and D airspace
Special Use Airspace	Prohibited, Restricted, Alert, Warning, MOA special use airspace, and TFRs
Obstructions	Towers and man made articles that are 250' high or taller
Relative Terrain	Color coded terrain relief based upon the relative altitude difference between the aircraft's indicated altitude and the elevation of the terrain

Table 5-2 Navigation Map Feature Groups

1. VFR style Map only.

5.1.1. **General Map Settings**

There are several options available to customize the Navigation Map VIEW. The default settings for the Navigation Map VIEW are found in the Main Menu on the GENERAL SETTINGS page and two MAP SETTINGS pages[1]. Based on your flying preferences you may want to change the Navigation Map orientation and other items you want to display. The default Map General Settings options are described in **Table 5-3**.

Main Menu Page	Menu Label	Available Settings	Default Setting
GENERAL SETTINGS	NAV MAP ORIENTATION	N-UP MODE HDG-UP MODE TRK-UP MODE	N-UP MODE
	AUTO RANGE	ENABLE/DISABLE	ENABLE
MAP SETTINGS A	CONTROLLED AIRSPACE	AUTO / OFF	AUTO
	SPECIAL USE AIRSPACE	AUTO / OFF	AUTO
	FLT PLN & WPTS	ON / OFF	ON
	INTRS	AUTO / OFF	AUTO
	VORS	AUTO / OFF	AUTO
MAP SETTINGS B	NDBS	AUTO / OFF	AUTO
	HARD SURFACE APTS	AUTO / OFF	AUTO
	OTHER APTS	AUTO / OFF	AUTO
	TRANSPORTATION	AUTO / OFF	AUTO
	BOUNDARIES	AUTO / OFF	AUTO

Table 5-3 Main Menu Navigation Map Settings

1. These settings are the default settings. Many of the Data Link Weather VIEW tabs have additional restrictions to facilitate declutter.

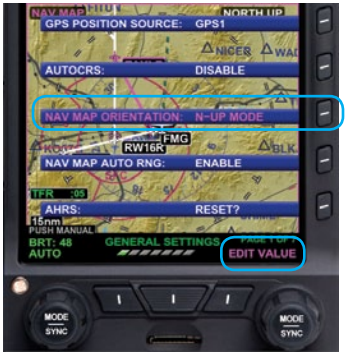


Figure 5-3
Map General Settings Page

Change Map Orientation

1. Access the Main Menu.
2. Navigate to the GENERAL SETTINGS menu page.
3. Push the NAV MAP ORIENTATION Menu Key. The menu label turns magenta and the EDIT VALUE label displays above the Right Knob (**Figure 5-3**).
4. Rotate the Right Knob to the desired value, HDG-UP, N-UP, or TRK-UP (see **Table 5-4**).
5. Push the Right Knob to return to menu navigation mode.
6. Push the MENU Button to exit the Main Menu.

5.1.2. **Map Symbols**

The EFD1000/500 MFD Navigation Map VIEW offers several feature groups that display as symbols on the map. The data source for rendering all but the active flight plan is the Jeppesen Database information on the micro SD card. If the Jeppesen Database is invalid or unavailable database information is not available outside of the viewable area. The symbols are layered on the map in the order outlined in **Table 5-5**.

The declutter options for each feature group is pilot selectable from the Main Menu as either automatic (AUTO), or always off (OFF). Feature groups that are set to AUTO will display based on the Declutter settings selected by the pilot and the selected Range as outlined in **Table 5-5**. When a feature group is turned OFF, the feature group will not display, regardless of the map range or declutter settings.

NOTE

Appendix 7.5. contains a complete listing of all map symbology.

North-Up	Heading-Up	Track-Up
• NORTH-UP label displays in the upper right corner of the VIEW. • Navigation Map VIEW is oriented North-Up, aligned with the vertical axis of the display. The ownship symbol is oriented in the direction of the aircraft's magnetic heading or if the heading is unavailable with the magnetic track. • If heading and GPS track information are unavailable, NORTH-UP (HDG FAIL) will display in the upper right corner of the VIEW. • If GPS track are unavailable the ownship is removed from the VIEW.	• HDG UP label displays in the upper right corner of the VIEW. • The aircraft heading is displayed in the top center of the VIEW. • Navigation Map VIEW is oriented with the aircraft's heading, aligned with the vertical axis of the display. • If the current heading is not available or invalid the map is oriented with the current GPS ground track and TRK UP (HDG FAIL) displays in the upper right corner of the VIEW. • If the current heading and GPS ground track are not available, the map will automatically be set to North-Up and the NORTH-UP (HDG FAIL) will display in the upper right corner, and the ownship is removed from the VIEW.	• TRK UP label displays in the upper right corner of the VIEW. • The aircraft ground track is displayed in the top center of the VIEW. • Navigation Map VIEW is oriented with the aircraft's current GPS ground track, aligned with the vertical axis of the display. The ownship is oriented to the aircraft's magnetic heading. • If the aircraft heading fails or is invalid the ownship is oriented to the aircraft's track and TRK UP (HDG FAIL) is displayed in the upper right corner of the VIEW. • If the GPS ground track is unavailable, the map will automatically be set to North-Up and the NORTH-UP will display in the upper right corner, and the ownship is removed from the VIEW.

Table 5-4 Navigation Map Heading Settings

Feature Group & Layer Order (top to bottom)		Feature	Max Range (nm)	Declutter Setting[6]			
				H	MH	ML	L
Traffic Symbols[1]	1	Overlay - enabled via TRFC Hot Key		N/A			
Ownship[2, 4]	2			N/A			
GPS Track Line[2, 4]	3			N/A			
Flight Plan Legs and Waypoints[4]	4		2000	●	●	●	●
Obstructions[1, 3, 4]	5	Overlay – enabled via TERR Hot Key	Limited to 40 but displayed to 2000	N/A			
WX-500[1]	6	Overlay – enabled via CELL/STRK Hot Key		N/A			
Data Link Weather[1, 4]	7	Overlay – enabled via LTNG/NXRD Hot Key		N/A			
Airports[4]	8	≥12,000 feet	500	●	●	●	
		> 12,000 to 5,000 feet	60	●	●	●	
		> 5,000 feet	40	●	●	●	
		Other than hard-surface/Seaplane Base	40	●	●	●	
Special Use Airspace	9	Prohibited[2]	2000	●	●	●	●
		TFRs[2, 5]	2000	●	●	●	●
		Restricted, Warning	500	●	●		
		MOA, Alert	500	●	●		
Controlled Airspace	10	Class B	500	●	●	●	
		Class C and D Sectors	100	●	●	●	
		Class B, C, and D Altitude Limits	40	●	●	●	

Feature Group & Layer Order (top to bottom)		Feature	Max Range (nm)	Declutter Setting[6]			
				H	MH	ML	L
NDBs	11		15	●			
VORs	12		200	●			
Intersections	13		15	●			
Airways[1, 4]	14	Overlay - enabled via ARWY Hot Key	200	N/A			
Transportation	15	Highways, Railroads	40	●			
Boundaries	16	State, Province, International, ADIZ[4], Special Flight Rule Areas (SFRA)[4]	2000	●			
Relative Terrain[1, 3, 4]	17	Overlay – enabled via Hot Key	Limited to 100 but displayed to 2000	N/A			

Table 5-5 Feature Group Layering, Range, and Declutter Behavior

CAUTION

If basemap features are invalid or unavailable, they are not displayed. An expired database does not render a basemap feature invalid.

NOTE

The Data Link Weather (NXRD) and Relative Terrain (TERR) overlay are mutually exclusive, i.e. only one overlay may be displayed at a time..

1. Overlays are not affected by map declutter setting. Airway and Terrain information is decluttered based upon map range.
2. Always ON regardless of range or declutter settings.
3. Refer to **Section 5.3.1. Terrain and Obstructions** for specific details and symbology.
4. Not configurable via the main menu.
5. The TFR annunciaiton is always displayed directly above the Range setting.
6. Declutter settings: H=High, MH=Medium High, ML=Medium Low, L=Low

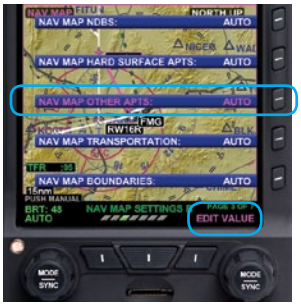


Figure 5-4
Editing OTHER APTS Feature Group

Figure 5-5
OTHER APTS Feature Group Set to OFF

Changing Feature Group Display Setting

1. Access the Main Menu.
2. Navigate to the MAP SETTINGS A or B page that lists the feature group you want to change.
3. Push the Menu Key that corresponds to the name of the feature group you want to change. The feature group menu label turns magenta and the EDIT VALUE label displays above the Right Knob **(Figure 5-4)**.
4. Rotate the Right Knob to the desired value, AUTO/ OFF **(Figure 5-5)**.
5. If you want to change other feature group settings, push the corresponding Menu Key. Your selection for the feature group changed in step 4 is saved and the new feature group label turns magenta.
6. Rotate the Right Knob to the desired value, AUTO or OFF.
7. Repeat steps 5 and 6 as desired.
8. Push the Right Knob to return to menu navigation mode.
9. Push the MENU Button to exit the Main Menu.

NOTE

You can change multiple feature group settings without exiting the Main Menu.

5.1.3. **Map Range**

The RNG +/- Button on the right of the EFD1000/500 MFD display is used to zoom in or out (respectively) to display more or less of the map. The pilot can select map ranges from 0.5 to 2000 nautical miles, incrementing one range value with each press of the RNG +/- button. The current map range is shown as a numeric value on the lower left of the Navigation Map VIEW (**Figure 5-6**).

Change the Map Range

- Press the RNG +/- Button until the desired map range is acquired. Press the RNG + Button to increase map range. Press the RNG - Button to decrease map range.

The EFD1000/500 MFD has an Auto-Range feature that automatically scales the range (to the closest range setting) to two times the distance between the ownship and the active waypoint, i.e. if the active waypoint is 84 miles away, auto-range will go to 200 nm (84x2=168, closest range setting is 200). When Auto-Range is active an inverted white A displays next to the numeric range value (**Figure 5-7**).

Figure 5-6
Navigation Map VIEW at 15 nm Range

Figure 5-7
Navigation Map VIEW in Auto-Range mode

Figure 5-8
Map General Settings Page
Editing Auto Range Setting

Turn Auto Range Off or On

1. Access the Main Menu.
2. Navigate to the GENERAL SETTINGS menu page.
3. Push the NAV MAP AUTO RNG Menu Key. The NAV MAP AUTO RNG label turns magenta (**Figure 5-8**).
4. Rotate the Right Knob to the desired value, either ENABLE or DISABLE.
5. Push the Right Knob to return to menu navigation mode.
6. Push the MENU Button to exit the Main Menu.

Activate Auto-Range

1. Press the RNG +/- Button to select the highest (2000) or lowest (0.5) map range (release the button).
2. Press and hold the RNG +/- button for two seconds. The map range changes and the new map range is indicated on the Navigation Map VIEW. An inverted white A displays next to the numeric range value.

Deactivate Auto-Range

- When Auto-Range is active, press the RNG +/- Button once to deactivate Auto-Range mode. The inverted white A next to the numeric range value is removed. Pressing RNG + moves to the next higher range, pressing RNG - moves to the next lower range.

5.1.4. **Map Declutter**

There are four map feature declutter levels available that work in conjunction with the map range to aid in map declutter. Each level is represented by a graphical bar below the numerical range display (**Figure 5-9**).

Change the Map Feature Declutter Level

- Press the MAP Hot Key until the desired map declutter level is selected.

5.1.5. **GPS Information**

On startup, the Navigation Map VIEW initializes using either the current position, the last known position (if current position is not available), or Albuquerque, New Mexico, USA (if last known position is unavailable) and the current heading from the EFD1000 PFD or the current track from the GPS system (if heading is invalid or unavailable). The aircraft position, current flight plan, and other navigation information are displayed on the Navigation Map based on information received from the selected GPS navigator. The GPS navigation source is selected from the Main Menu.

Change the GPS Navigation Source

1. Press the Menu Key to enter the Main Menu.
2. Display the General Settings page if it is not already displayed.
3. Press the first Hot Key, GPS POSITION SOURCE. The menu label turns magenta.
4. Rotate the Right Knob to select the desired GPS navigation source.
5. Press the Menu Key to exit the Main Menu and save your selection.

Declutter Range	Display
High (H)	
Med-High (MH)	
Med-Low (ML)	
Low (L)	
Off	

Figure 5-9
Map Declutter Settings

NOTE

Map features set to AUTO are decluttered according to Table 5-6 and the selected declutter range.

NOTE

When the EFD is connected to some GPS systems and the active flight plan is changed (e.g. "Direct To" is selected), the display of the active (magenta) leg on the Nav Map may be delayed for up to 20 seconds. The CDI course pointer and autopilot will react immediately to the flight plan change.

Figure 5-10
Other Valid GPS Reversion Mode

Figure 5-11
RSM Reversion Mode

Figure 5-12
Invalid or Failed GPS
Annunciations

NOTE

The flight plan information displayed in the Data Bar will display as dashes when the GPS data is invalid.

NOTE

Map functions such as panning, info etc. continue to be available when the GPS position source is not available.

5.1.5.1. **Invalid GPS**

If the aircraft GPS position data is no longer available or becomes invalid:

- The associated flight plan and basemap data are retained and displayed as long as aircraft position information is provided from the selected GPS.
- The flight plan and waypoints become inactive and are displayed in white.
- The aircraft position is provided by:
  1. Another configured GPS source is providing valid position data. In this case, a GPS# REVERSION annunciation is shown in the Data Bar (**Figure 5-10**) ("#" indicates the configured GPS source that is now providing the aircraft's position, either 1 or 2).
  2. The RSM GPS, if enabled, and position data are available. In this case, a RSM GPS REVERSION EMER USE ONLY annunciation is shown in the Data Bar (**Figure 5-11**).

If a secondary GPS is not available then the EFD1000 MFD will use the RSM GPS (the EFD500 MFD does not have an RSM). The annunciation RSM GPS REVERSION EMER USE ONLY will display in the Data Bar (**Figure 5-11**). The flight plan data is retained and displayed, however no flight plan legs or waypoints are rendered as active (magenta color).

When a GPS source's position data are invalid or no longer available, an amber annunciation, GPS1, GPS2, or RSM GPS, is shown to the left of the lower display to indicate which has failed (**Figure 5-12**). If Basemap features are invalid or unavailable they are not rendered and the automatic moving map feature is lost. Position awareness can be maintained by manually panning the map and visually associating the outside view with the displayed map position.

5.1.6. **Airport/VOR Information**

The Navigation Map provides detailed information about airports and VORs that are shown on the display. The lower left button is labeled INFO and when pressed, the EFD1000/500 MFD displays a label for the selected airport or VOR (**Figure 5-13**). The label text color matches the airport (airports with control towers are blue, all others are magenta) or VOR color and displays three lines of text as follows:

- Bearing and distance to the selected object
- Estimate time en route (ETE)
- VOR or NDB frequency or airport elevation

If the range is set to a low setting there may not be any airports, VORs or NBDs showing in the display area. If there are no objects displayed the lower left button will not display the INFO label. Changing the range to a larger scale will usually bring some objects into view and the INFO label will display. You can also pan to an area that has objects and get information about those objects.

The Left Knob label changes to read Apt/Vor in magenta, with PUSH FOR DETAILS in cyan directly above the Left Knob label. When the Left Knob is pushed, the selected airport/VOR/NBD textual information is displayed (**Figure 5-14**). The Navigation Map hot keys are replaced with either a VOR, NBD, or Airport Hot Key(s). There is only one page of textual information for VORs and NBDs, and the Hot Key has no function. Airports have four pages of information to view, selectable by the hot keys as outlined in **Table 5-6**.

CAUTION

When the aircraft position is unavailable, the ownship symbol is removed from the Navigation Map VIEW, Terrain VIEW, and Weather VIEW and the VIEW is centered over the last known position or Albuquerque, New Mexico, USA if the last known position is not available.

Figure 5-13
Navigation Map INFO Selection

NOTE

If GPS position is not available the display of bearing, distance, and ETE are dashed. If ETE is more than 9:59 hours the ETE is dashed.

Figure 5-14
VOR Information
Page

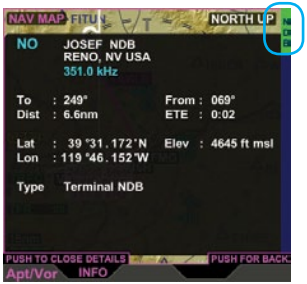


Figure 5-15
NBD Information
Page

Figure 5-16
Airport Basic
Information Page

Hot Key	Information Displayed (if available)	Figure
VOR	• VOR Identifier • Name and Type of VOR • Location of VOR (city, state, and country) • VOR Frequency • Bearing To and FROM VOR • Distance To VOR • Estimated Time En route (ETE) to VOR • Latitude and Longitude to VOR • Elevation of VOR • Magnetic Variation to VOR • Type of VOR	5-14
NBD	• NDB Identifier • Name of NDB • Location of NDB (city, state, and country) • NDB Frequency • Bearing To and FROM NDB • Distance To NDB • Estimated Time En route (ETE) to NDB • Latitude and Longitude to NDB • Elevation of NDB • Type of NDB	5-15
APT	• Airport Identifier • Name of Airport • Location of Airport (city, state, and country) • Elevation of Airport • Bearing To and FROM Airport • Distance To Airport • Estimated Time En route (ETE) to Airport • Latitude and Longitude to Airport	5-16

Hot Key	Information Displayed (if available)	Figure
COM	• Selected airport's frequencies and callsigns	5-17
RWY	• Airport Identifier • Name of Airport • Runway • Runway Lengths and Widths • Runway Surface Type • Type of Runway Lighting	5-18
WX	• Selected airport's METAR and TAF information (displayed as described in **Section 5.2.3. METAR**)	5-19

Table 5-6 Airport/VOR Information

NOTE

It is possible to select an item that is not in the current viewable display area. Use the Range +/- button to zoom out or in (respectively) to see selectable items. When viewing the map at a lower map range the selected item may be at the edge of the map display. and the selection will not be visible. In rare cases at larger zoom scales, it may be that the selected item is so small as to be less than one pixel in size. In this case, zooming in will reveal the selected item.

NOTE

Rotating the Left Knob will select another airport either before or after the textual information is displayed.

Figure 5-17
Airport Communication
Information Page

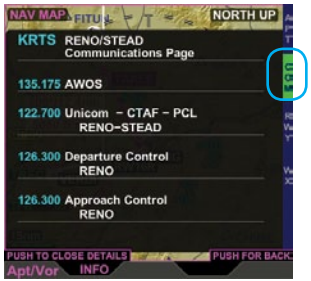


Figure 5-18
Airport Runway
Information Page

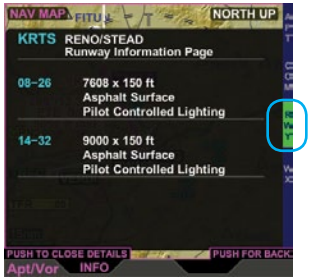
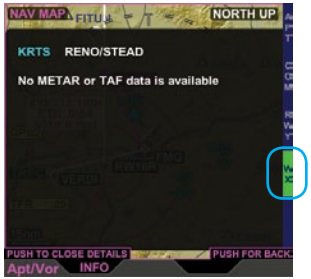


Figure 5-19
Airport Weather
Information Page



NOTE

On rare occassions when the EFD1000/500 is using the backup battery, the ON BAT annunciation may obscure the airport information when the display is using PAGE 3/3. Use the split screen LAYOUT, PAGE 2/3 with the Navigation VIEW in the lower WINDOW to avoid this issue.

Figure 5-20
Navigation Map VIEW
Showing the Current
Flight Plan

View Airport/VOR Information

1. With the Navigation Map VIEW selected (magenta border), press the lower Left Button labeled INFO. The Left Knob label changes to Apt/Vor and both the Left Knob and Left Button label turn magenta.
2. Press the Left Knob to display the selected airport's or VOR's pop-up information.
3. Rotate the Left Knob to scroll through each displayed airport and/or VOR.
4. Press the lower Left Button or the Right Knob, to exit selection mode. Both the Left Knob and Left Button label turn cyan.

5.1.7. Flight Plan

When configured with a compatible GPS, the EFD1000/500 MFD will display the current flight plan, which overlays all other symbology on the Navigation Map VIEW except for the ownship, GPS track, and traffic. The basemap will display all waypoints and legs. The active leg and waypoint are magenta, and all other waypoints and legs are white (**Figure 5-20**):

- Flight plan legs in excess of 50nm are computed as a great circle route and displayed as a contiguous series of line segments between the flight plan waypoints.
- Waypoint identifiers are displayed, when enabled, adjacent to their associated flight plan waypoint icon.
- Curved and straight flight plan paths, including flight plan path discontinuities (gaps), are displayed as received from externally connected navigators.
- Flight plan depictions are rotated within the display to maintain their correct map orientation.

5.1.8. **Map Styles**

The Navigation Map basemap is displayed as either an IFR (**Figure 5-21**) or VFR (**Figure 5-22**) style map. The map data source for the Navigation Map VIEW is the Jeppesen Database saved on the micro SD Card. Airways, Relative Terrain, Stormscope® WX-500, Data Link Weather, and Traffic are available as overlays via Hot Keys.

The VFR Map Style is a topographical style map similar to VFR Sectional Aeronautical Charts, coloring absolute terrain background based on MSL as described in **Appendix 7.5**. The VFR Map Style shows cultural data such as highways, roads, railroads, water, and boundaries. The pilot can control the data displayed via the Main Menu.

The IFR Map Style is a blank map background similar to IFR En Route Charts, showing navaids, airports, and controlled and special use airspace. Topographical data, highways, roads, and railroads are not shown.

Change the Map Style

- With the Navigation Map VIEW selected, push the IFR/VFR Hot Key.

Figure 5-21
Navigation Map VIEW with IFR Map Style Selected

Figure 5-22
Navigation Map VIEW with VFR Map Style Selected

Figure 5-23
Navigation Map VIEW
Overlay Hot Keys, All
Overlays Disabled

Figure 5-24
LO Airways Overlay On

5.1.9. **Overlays**

There are several additional map features that can be displayed on the Navigation Map VIEW, Airways, Relative Terrain, Stormscope® WX-500, Data Link Weather, and Traffic. Each of these overlays is enabled or disabled via Hot Keys (**Figure 5-23**).

5.1.9.1. **Airways Overlay**

The Airways Hot Key enables airway display and allows the pilot to select the type of airways that overlay the Navigation Map VIEW. When enabled, the Airway overlay displays airway legs and identifiers. Airways will display for 10 seconds, to provide orientation, then they are removed. The Hot Key label will display either LO, HI, or ARWY (OFF):

- Selecting LO displays Low Level (Victor) Airways
- Selecting HI displays High Level (Jet) Airways

Show the Airways Overlay

- With the Navigation Map VIEW selected, press the ARWY Hot Key until the desired Airway setting (LO/HI/ARWY) is displayed on the Hot Key label (**Figure 5-24**).

NOTE

When the selected Map Range is higher than the airway max range of 200 nm, Airways will not display.

5.1.9.2. **Terrain Overlay**

The Terrain Hot Key enables terrain and obstruction display as an overlay on the Navigation Map. When enabled terrain and obstructions display as outlined in **Section 5.3.1. Terrain and Obstructions** and the TERR annunciation displays above the current Range. Color coding for the Terrain Overlay is depicted in **Table 5-7**.

Relative Elevation	Color
greater than 100' Below - all terrain Above	**RED**
500' - 100' Below	**YELLOW**

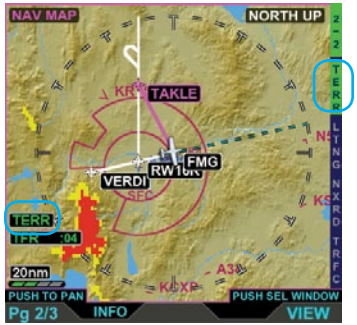
Table 5-7 Navigation Map Terrain Overlay Color Coding

Show the Terrain Overlay

1. With the Navigation Map VIEW selected, display the 2/2 Hot Key.
2. Press the TERR Hot Key to turn on the Terrain overlay (Hot Key label turns green) (**Figure 5-25**).

> **NOTE**
>
> *For detailed information about Traffic, Stormscope® WX-500, and Terrain/Obstructions see **Section 5.3. Dedicated Hazard Awareness Views**.*

Figure 5-25
Terrain Overlay On



> **NOTE**
>
> *The Relative Terrain overlay and Data Link Weather overlay are mutually exclusive. Only one can display at a time on the Navigation Map.*

Figure 5-26
Lightning Overlay On
Displaying WX-500 Cell Data

5.1.9.3. **Lightning Overlay**

The LTNG Hot Key is a three position Hot Key that permits display of satellite lightning information or WX 500 Spherics data overlaid on the Navigation Map VIEW. When enabled, the Lightning overlay displays lightning as defined in **Section 5.2. Data Link Weather**, storm strike or storm cell threats as defined in **Section 5.3.3. WX-500**. The Hot Key label, LTNG/CELL/STRK, is green when enabled or gray when disabled. When enabled the LTNG or RATE annunciation displays above the current Range. The default setting following a power cycle of the unit is disabled.

Show the Lightning Overlay

1. With the Navigation Map VIEW selected, display the 2/2 Hot Key menu.
2. Press the LTNG Hot Key to select the desired overlay (Hot Key label turns green) (**Figure 5-26**).

NOTE

Spherics data is removed from the Navigation Map at map ranges less than 20nm.

NOTE

Spherics data will not display if aircraft heading is unavailable.

5.1.9.4. **Data Link Weather Overlay**

The Data Link Weather Hot Key enables the display of NEXRAD and precipitation data overlaid on the Navigation Map VIEW. Coverage is limited to the US, Puerto Rico, and Canada. The Hot Key label is green when enabled and gray when disabled. When enabled the NXRD annunciation displays above the current Range. The Data Link Weather overlay default setting is OFF.

Show the Data Link Weather Overlay

1. With the Navigation Map VIEW selected, display the 2/2 Hot Key menu.
2. With the Navigation Map VIEW selected, press the NXRD Hot Key to turn Data Link Weather on (Hot Key label turns green) (**Figure 5-27**).

Figure 5-27
Data Link Weather Overlay On

NOTE

The Data Link Weather overlay and the Relative Terrain overlay are mutually exclusive. Only one overlay can display at a time on the Navigation Map.

NOTE

Areas with gray shading are areas with no Data Link Weather coverage.

NOTE

The Traffic overlay requires configuration with an appropriate traffic sensor and displays traffic using the Normal traffic altitude filter. See ***Section 5.3.2.1.5. Altitude Filter*** *for detailed information about traffic filters.*

Figure 5-28
Traffic Overlay On

NOTE

When the panning function is enabled, traffic symbols are removed from the map (indicated by the label TRFC RMVD); however the overlay is still active. Once panning is exited, traffic overlay symbols are restored to the display.

5.1.9.5. **Traffic Overlay**

The Traffic Hot Key enables the traffic display overlaid on the Navigation Map VIEW. When enabled, the Traffic overlay displays traffic threats as defined in **Section 5.3.2. Traffic**, is oriented to the underlying Navigation Map using the normal altitude filter. The Hot Key label TRFC is green when enabled and gray when disabled. The Traffic overlay defaults to enabled after a power cycle of the EFD1000/500 MFD. For detailed information on traffic alerts and how traffic is displayed, see **Section 5.3.2.2. Traffic Advisories**.

Show the Traffic Overlay

1. With the Navigation Map VIEW selected, display the 2/2 Hot Key menu.
2. Press the TRFC Hot Key to turn Traffic on (label turns green) or off (label turns gray) and the TFRC annunciation displays in the lower left of the display (**Figure 5-28**).

If your traffic interface is a TIS interface and traffic data is:

- Unavailable the traffic label displays TRFC UNVL
- Not refreshed within 6 seconds the traffic label displays TRFC COAST
- Not refreshed within 12 seconds the traffic label displays TRFC RMVD, and traffic objects are removed from the display
- Not refreshed for 60 seconds the label TRFC RMVD is replaced by TRFC UNVL

Traffic symbols are indicated as described in **Section 5.3.2.1. Traffic Display Traffic**. Each traffic symbol is accompanied by a data block displaying the type, relative altitude, and intruder vertical direction (as acquired from the sensor and if available) of the intruder. The data block text color is the same as the traffic symbol.

If your TAS sensor status is standby, test, or fail, the traffic label displays with a red horizontal line through the TRFC annunciation (**Figure 5-29**).

Figure 5-29 Traffic Sensor Invalid

NOTE

When GPS position or heading is invalid or unavailable the TRFC annunciation displays with a red horizontal line through the center of the text and traffic symbols are removed from the display.

NOTE

*For TIS traffic sensors the traffic overlay follows the messaging out lined in **Section 5.3.2.1.4. Traffic Operational Modes**. For TAS traffic sensors if the sensor status is Standby, Test, or Failure, the TRFC annunciation displays with a red horizontal line through the center of the text.*

NOTE

If the dedicated Traffic VIEW is selected for display in another WINDOW and the Navigation Map is oriented North-Up, the Traffic overlay is removed from the Navigation map to avoid confusion and the annunciation TRFC RMVD is displayed on the Navigation Map.

5.2. **Data Link Weather (optional)**

Data Link Weather provides graphical and textual descriptions of weather-related information received from XM WX Satellite Weather through the Aspen satellite receiver (Model EWR50) for the continental United States, Puerto Rico, and parts of Canada and Mexico. This VIEW requires a weather receiver configured with the EFD1000/500 MFD and a subscription to XM WX Satellite Weather. There are two ways that the EFD1000/500 MFD displays weather:

- Data Link Weather VIEW
- Data Link Weather Navigation Map Overlay
  (see the Navigation Map **Section 5.2. Data Link Weather**)

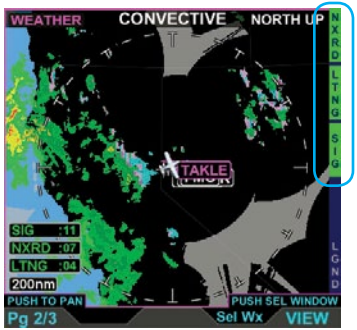
Several weather products are available; each weather product is presented on a separate screen in the Data Link Weather VIEW. Each weather product is initially displayed at the default map range of 200 nm. To display a different product screen, set the FOCUS on the Data Link Weather VIEW by pressing the Right Knob, press the lower right button Sel Wx, then rotate the Right Knob to select and view a different product screen (see **Section 5.2.1. Selecting Data Link Weather Products**). The Data Link Weather VIEW contains the following product screens:

- Convective (Radar, NEXRAD, Lightning, and Convective SIGMETs)
- METARs
- Echo Tops
- Cloud Tops
- AIRMETs/SIGMETs
- TFRs
- Winds Aloft
- XM Status

Each Data Link Weather product screen displays the ownship symbol and flight plan overlaid on a black background, oriented North-Up, centered in a 360° range ring. The available map ranges are the same as the Navigation Map, starting at 10 nm, with the default display at 200 nm. In order to provide situational awareness, each screen displays international boundaries, State or Province boundaries for the United States, Mexico and Canada, and water features. The METARs, AIRMETs/SIGMETs, and TFRs product screens provide the pilot with the option to select and view data. (**Figure 5-30**)

The Weather VIEW is oriented North-Up with the ownship oriented in the direction of the aircraft's true heading or its true track if heading information is unavailable. If the current heading or track is not available the label NORTH UP (HDG FAIL) is displayed in the upper right corner of the display. If both the heading and the track are unavailable the ownship is removed from the display.

Figure 5-30
Data Link Weather VIEW
Showing Convective Weather
Product Screen



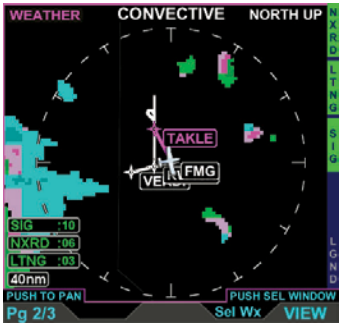


Figure 5-31
Data Link Weather
VIEW Selected

Figure 5-32
Weather Product
Selection Activated

5.2.1. **Selecting Data Link Weather Products**

The Data Link Weather VIEW offers several types of weather product information, each displayed in a different screen of the Data Link Weather VIEW. There is a screen for each of the following Data Link Weather VIEW options:

- Convection (NEXRAD, Lighting, Convective)
- METARs
- Echo Tops
- Cloud Tops
- AIRMETs/SIGMETs
- TFRs
- Winds Aloft
- XM Status

The current weather product name displays in the center of the Data Link Weather VIEW. Use the bottom Right Button to activate VIEW control mode and select another Data Link Weather product screen.

View Different Data Link Weather Products

1. Select the WINDOW that contains the Data Link Weather VIEW (**Figure 5-31**).
2. Press the lower Right Button, labeled Sel Wx, to activate Weather Product Selection. The Right Button and Knob labels turn magenta and the Right Knob label changes to Wx #/8 (the # represents the current weather product screen) (**Figure 5-32**).
3. Rotate the Right Knob to select another weather product screen. The Data Link Weather VIEW, hot keys, and Right Knob label change as you select different Weather product screens.
4. Press the lower Right Button to deactivate Weather Product Selection.

5.2.2. **Convective**

The EFD1000/500 MFD provides the pilot with several methods to view severe weather. On the Navigation Map VIEW, as previously discussed, severe weather is presented as an overlay. The Convective weather product screen presents severe weather information as a graphical depiction separate from the Navigation Map VIEW. The information available is outlined in **Table 5-8**:

Hot Key	Display
NXRD	• US and Puerto Rico NEXRAD • US Precipitation Type • Lightning • US NEXRAD Coverage • Canada Radar • Canada Coverage
LTNG	• Data Link Lighting
CONV	• Convective SIGMET
LGND	• NEXRAD Legend

Table 5-8 Convective Overlay Hot Keys

NOTE

Areas without radar coverage will display as a gray overlay when the NXRD Hot Key is enabled. The Convective Weather Product screen does not display Echo Tops or Cloud Tops, so as not to confuse the gray areas of No Coverage with either of these weather options.

NOTE

An age annunciation displays in the lower left corner of the screen for each of the enabled weather options

NOTE

If US NEXRAD or Canada radar exceed the specified expiration time, the radar depiction is rendered as no coverage. If Puerto Rico radar exceeds the update rate by one minute, the radar depiction is rendered as no coverage (i.e., transparent gray).

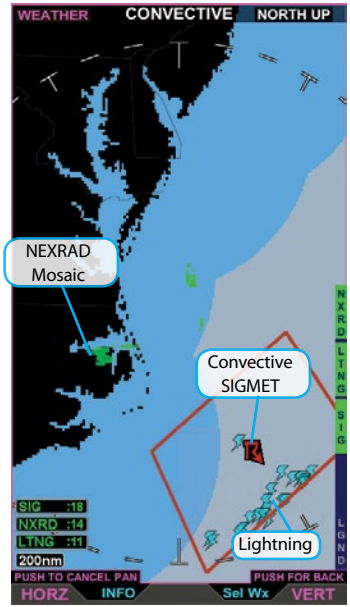


Figure 5-33
Convective Screen

The Convective screen displays severe weather information overlaid on a basic weather map. Precipitation is displayed as a color coded NEXRAD radar overlay on the basic weather map. The LGND Hot Key displays a legend for the precipitation coloring. Satellite lightning is displayed as cyan colored lightning symbols on top of the NEXRAD radar information. Lighting symbols show the reported approximate location of cloud-to-ground lightning strikes. The lightning symbols are displayed at full intensity fading out over a 15 minute period. (**Figure 5-33**)

NEXRAD (Next-Generation Radar) is a network of 159 high-resolution Doppler radars operated by the National Weather Service (NWS) to detect meteorological data for the United States. The data can be processed and displayed in a mosaic map showing patterns of precipitation and its movement. Each NEXRAD radar site has a maximum range of 250 nm. Since NEXRAD data is not real-time, data is updated about every 10 minutes not including processing and dissemination time, it should be used for long-range planning only. Do not use NEXRAD to penetrate severe weather. NEXRAD has some limitations including:

- Although reflectivity echoes are possible up to 248 nm, the interpretation of the data doesn't work beyond 186 nm, beyond which only the general shape of storms can be made out.
- The inability to differentiate between types of precipitation, e.g. hail versus heavy rain.
- Since the radar beam is oriented five degrees above the horizon, the farther from the antenna, the higher the area scanned by the beam. This translates to limited low storm detection farther from individual radar locations (i.e. tornados), and conversely, limited high altitude storm detection directly above the radar location.

NOTE

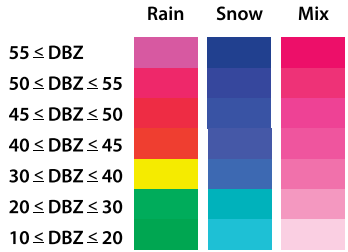
If coverage is not available, but radar is available, the image is rendered as if all radar sites are valid.

NEXRAD weather surveillance can detect most precipitation within 80 nm, and intense rain or snow within 140 nm, of the radar. NEXRAD measures moisture in DBz or decibels of Z, with Z representing the reflection back to the radar. NEXRAD does not report precipitation below 10 DBz. The EFD1000/500 MFD displays NEXRAD precipitation data using the colors and DBz ranges outlined in **Figure 5-34**.

NEXRAD coverage displays using the following methodology:

- If US Precipitation Type is not available and US NEXRAD Radar is available, the US weather depiction is displayed as rain.
- If US Precipitation Type is available and US NEXRAD Radar is not available, the US weather depiction is not displayed.
- If US coverage is not available or expired and US NEXRAD is available, the US weather depiction is displayed as if all US radar sites are valid.
- If Canada coverage is not available and Canada Radar is available, the Canada weather depiction is displayed as if all US radar sites are valid.
- If US NEXRAD Radar or Canada Radar exceed the specified expiration time, the depiction for the respective radar is displayed as no Radar Coverage.
- If Puerto Rico NEXRAD Radar exceeds the specified expiration time, the Puerto Rico NEXRAD Radar depiction for the respective radar displays as no Radar Coverage.

Figure 5-34 NEXRAD Precipitation Colors



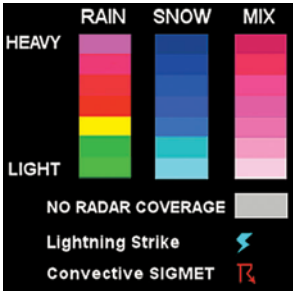


Figure 5-35
Convective Legend

Display the Convective Legend

- With the Convective weather product screen displayed, press the LGND Hot Key. The Convective legend displays on the right of the screen (**Figure 5-35**).

Hide the Convective Legend

- Press the LGND Hot Key to hide the Convective legend.

Hide or Display Convective Overlays

- With the Convective screen selected, press any of the Hot Keys to enable (green) or disable (gray) the applicable weather feature (**Figure 5-35–5-38**).

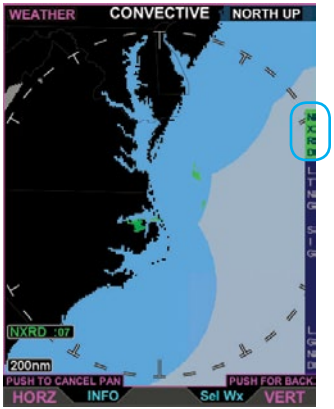


Figure 5-36 NEXRAD Coverage On

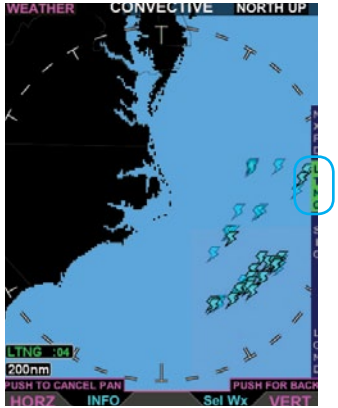


Figure 5-37 Lightning Coverage On

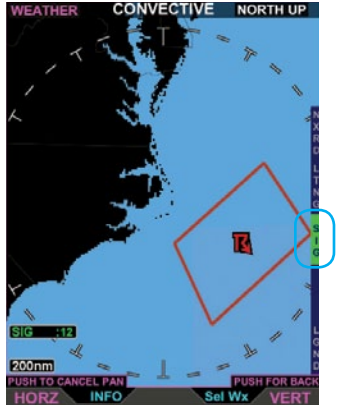


Figure 5-38 Convective SIGMET Coverage On

5.2.3. **METAR**

The METAR screen displays graphical Aviation Routine Weather Reports with a color coded flag at weather reporting airports. A METAR is an hourly Aviation Routine Weather Report from the reporting airport (not all airports have a forecast). METARs issued in the U.S. and Canada generally provide METAR information about the airport, date and time, wind direction and speed, visibility, precipitation, current weather conditions, cloud cover and layer, temperature, barometric pressure, and any other critical data. International METARs vary slightly (**Figure 5-39**).

The EFD1000/500 MFD displays METARs as colored flags. The METAR screen displays the flags, at the airport location from which the METAR is reported, overlaid on a basic weather map. A legend is available that describes the colors of the METAR flags used. METAR flags are decluttered based on the size of the airport as outlined in **Table 5-9**.

Airport Size	Map Range in nm						
	10 - 60	80	100	200	500	1000	2000
Large Airports	◀	◀	◀	◀	◀	◀	◀ [1]
Medium/Large Airports	◀	◀	◀	◀	◀ [1]		
Medium Airports	◀	◀	◀	◀ [1]			
Medium /Small Airports	◀	◀	◀ [1]				
Small Airports	◀	◀ [1]					

Table 5-9 METAR Declutter Settings

1. Only the METAR Flag is displayed.

◀ METAR and airport identifier displayed

Figure 5-39 METAR Weather Product Page

Figure 5-40
METAR Flag Legend

NOTE

If an airport does not report METAR data there is no METAR symbol for that airport.

Display the METAR Legend

- With the METAR weather product screen displayed, press the LGND Hot Key. The METAR legend displays on the right of the screen (**Figure 5-40**).

Hide the METAR Legend

- Press the LGND Hot Key to hide the METAR legend.

The pilot can display full textual details for any METAR. The text display will show the latest METAR and if available the previous METAR and latest TAF. If the latest METAR is a special observation, Special Observation displays above the METAR text in cyan. Previous METAR information is identified by Previous Observation displaying above the METAR text in cyan. When the latest TAF is displayed Terminal Forecast displays above the TAF text in cyan. There are two options for viewing textual METARs; either rotating through multiple airports' METARs, or viewing an individual airport METAR by entering the airport identifier.

Display Multiple Airports' METAR Information

1. With the METAR weather product screen displayed, press the lower Left Button labeled INFO. The Left Knob label changes to APT and both the Left Knob and Left Button label turn magenta.
2. Rotate the Left Knob to scroll through each METAR reporting airport. As each airport is selected, the METAR flag displays at a larger size (**Figure 5-41**).
3. Press the Left Knob to display the METAR pop-up (**Figure 5-42**).
4. Press the Left Knob, to close the pop-up. Press the INFO button to exit selection mode. The Left Knob and Left Button label turn cyan.

Figure 5-41
Selecting a
METAR to Display

NOTE

Pressing the Right Knob twice will also exit selection mode and return to the basic METAR product window.

Figure 5-42
METAR Pop-up
for Reno Airport

NOTE

It is possible to select a METAR item that is not in the current viewable display area. Use the Range +/- button to zoom out or in (respectively) to see selectable items.

Selecting a higher map range may make it easier to see selected items. When viewing the map at a lower map range the selected item may be at the edge of the map display and the expanded flag will not be visible.

Figure 5-43
METAR Text Edit Pop-up Window

Figure 5-44
Selecting a Specific Airport with
METAR Text Edit, First Character

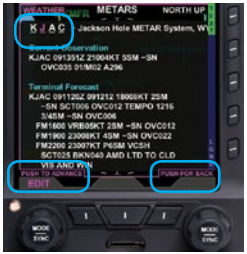


Figure 5-45
Selecting a Specific Airport with
METAR Text Edit, Second Character

Display an Individual Airport's METAR Information

1. With the METAR weather product screen displayed, press the TEXT Hot Key. The METAR pop-up displays with a four character pilot-selectable airport identifier field. The first character placeholder is selected indicated by the magenta color (**Figure 5-43**).
2. Rotate the Left Knob to change the first character (**Figure 5-44**).
3. Press the Left Knob to advance to the second character. The first character changes to white and the second character is magenta (**Figure 5-45**).
4. Rotate the Left Knob to change the second character.
5. Repeat steps 2– 4 for each character.
6. Press the TEXT Hot Key to close the METAR pop-up.

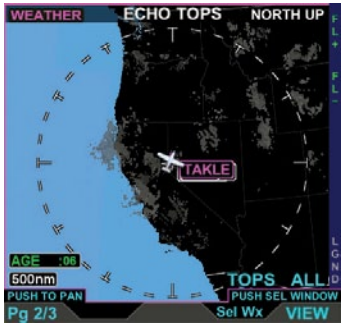
5.2.4. **Echo Tops**

The Echo Tops screen displays a graphical representation of the radar indicated top of an area of precipitation, the precipitation echo, as derived from NEXRAD information. Echo tops are displayed overlaid on a basic weather map (**Figure 5-46**).

The display shows the location and elevation (above MSL) of the highest radar echo. This is similar to cloud tops; however, in most cases the top of the cloud will be somewhat higher than the top of the precipitation echoes. Echo tops are useful when determining the intensity of a storm's updrafts. In general, that the higher the echo tops, the stronger the updraft within a storm, which make convective wind gusts and large hail more likely.

The Echo Tops screen displays radar generated precipitation height and coverage, and are displayed in 15 shades of gray proportional in brightness to the echo top altitude, in 5000 ft increments, ranging from dark to 100% brightness at 70,000 feet. Areas with no radar returns are depicted by full transparency (i.e., fully visible map background). A legend is available for display that shows the different gradients used.

Figure 5-46
Echo Tops Screen



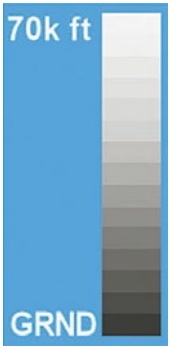
Display the Echo Tops Legend

- With the Echo Top weather product screen displayed, press the LGND Hot Key. The Echo Top legend displays on the right of the screen (**Figure 5-47**).

Hide the Echo Tops Legend

- Press the LGND Hot Key to hide the Echo Tops legend.

Figure 5-47
Echo Tops Legend



The Echo Tops screen has an altitude filter, controlled by the Hot Keys, allowing the pilot to set the altitude for echo top display. Only echo tops at or above the selected altitude filter value will display. The pilot adjusts the altitude filter value by pressing either the FL + or the FL- Hot Key. The Echo Tops altitude filter increments up to 70,000 feet (displayed as TOPS >FL700). When the FL + Hot Key is pressed, the altitude filter advances to the next filter increment. When the FL- Hot Key is pressed, the altitude filter decreases to the next filter increment. The default setting is ALL or the previous setting.

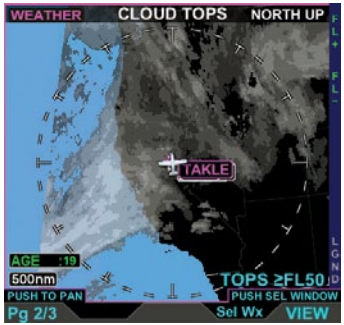
Increase or Decrease Echo Top Altitude Filter

- Press the FL+ Hot Key to increase the altitude filter to the next altitude increment.
- Press the FL- Hot Key to decrease the altitude filter to the previous altitude increment.

5.2.5. **Cloud Tops**

The Cloud Tops screen displays a Cloud Top graphical depiction. Cloud Tops are the given height of convective and upper-level clouds determined from satellite mosaic. The Cloud Tops screen displays the graphical cloud images overlaid on the basic weather map (**Figure 5-48**).

Figure 5-48
Cloud Tops Screen



Display the Cloud Tops Legend

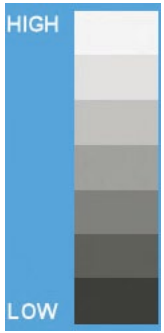
- With the Cloud Top weather product screen displayed, press the LGND Hot Key. The Cloud Top legend displays on the right of the screen (**Figure 5-49**).

Hide the Cloud Tops Legend

- Press the LGND Hot Key to hide the Cloud Tops legend.

The Cloud Tops screen uses an altitude filter, controlled by Hot Keys, allowing the pilot to select the altitude for cloud top display. Only cloud tops at or above the selected altitude filter value will display. The pilot adjusts the altitude filter value by pressing either the FL+ or the FL- Hot Key. The Cloud Tops altitude filter increments based on the current data link information. The current filter level is shown in the lower right of the screen labeled TOPS >FL XX (with XX being the filter level). When the FL+ Hot Key is pressed, the altitude filter advances to the next filter increment. When the FL- Hot Key is pressed, the altitude filter decreases to the next filter increment. The default setting is the lowest altitude filter above the ownship or the previous setting.

Figure 5-49
Cloud Tops Legend



Increase or Decrease Cloud Top Altitude Filter

- Press the FL+ Hot Key to increase the altitude filter to the next altitude increment.
- Press the FL- Hot Key to decrease the altitude filter to the previous altitude increment.

Figure 5-50
AIRMET/SIGMET

5.2.6. **AIRMET/SIGMET**

The AIRMET/SIGMET screen displays a graphical depiction of AIRMETs (AIRman's METeorological Information) and SIGMETs (SIGnificant METeorological Information). AIRMETs and SIGMETs are weather advisories broadcast by National Weather Service for the lower 48 states and adjacent coastal waters. Both AIRMETs and SIGMETs warn pilots of potentially hazardous weather. AIRMETS warn of less severe weather than SIGMETs. The AIRMET/SIGMET screen displays these advisories as graphical images overlaid on the basic weather map (**Figure 5-50**).

There are three AIRMET types: S (sierra) for mountain obscuration and IFR conditions, T (tango) for turbulence, and Z (zulu) for icing. They are all issued for six hour periods beginning at 0245 UTC, and are amended when necessary for changing weather conditions or issuance/cancellation of a SIGMET.

There are two types of SIGMETs, non-convective and convective. Non-convective SIGMETs warn about severe Icing, extreme turbulence, dust storms and/or sandstorms lowering visibilities to less than three (3) miles, and volcanic ash. Convective SIGMETS are issued hourly for thunderstorm-related aviation hazards. SIGMETS are issued for 6 hour periods for conditions associated with hurricanes and 4 hours for all other events. If conditions persist beyond the forecast period, the SIGMET is updated and reissued.

The Hot Keys provided allow the pilot to enable and disable AIRMETs and/or SIGMETs to aid in declutter. There is a Hot Key for each type of AIRMET/SIGMET as outlined in **Table 5-10**. Each type of AIRMET/SIGMET will display outlined in the color indicated with a symbol centered in the outlined area affected by the AIRMET/SIGMET. Stippled lines outline AIRMETs, and smooth lines outline SIGMETs. Unknown AIRMET/SIGMETs are always shown. A legend is available that displays the different AIRMET/SIGMET symbols used.

Hot Key	Symbol[1]	Definition
ICNG		ICING AIRMET
ICNG		ICING SIGMET
TURB		Turbulence AIRMET
TURB	WINDS	Surface Winds AIRMET
TURB		Turbulence SIGMET
IMC	IFR	IFR AIRMET
IMC	MTOS	Mtn. Obscr. AIRMET
IMC	DUST	Dust storms SIGMET
IMC	SAND	Sandstorms SIGMET
IMC	ASH	Volcanic Ash SIGMET
CONV		Convective SIGMET
Always shown	UNKN	Unknown AIRMET
Always shown	UNKN	Unknown SIGMET

Table 5-10 AIRMET/SIGMET Symbology and associated Hot Key

1. SIGMETs overlay AIRMETs.

Figure 5-51
AIRMET/SIGMET Legend

Display/Hide the AIRMET/SIGMET Legend

- With the AIRMET/SIGMET weather product screen displayed, press the LGND Hot Key. A legend displays. Press the LGND Hot Key again to hide the legend (**Figure 5-51**).

Display AIRMET/SIGMET

- With the AIRMET/SIGMET screen displayed and selected, press any of the Hot Keys to display or hide the applicable overlay (**Figure 5-52 – 5-55**).

Figure 5-52
METAR Product VIEW
Showing Icing AIRMET

Figure 5-53
METAR Product VIEW
Showing Turbulence AIRMET

Figure 5-54
METAR Product VIEW Showing
IFR and Mountain Obstructions

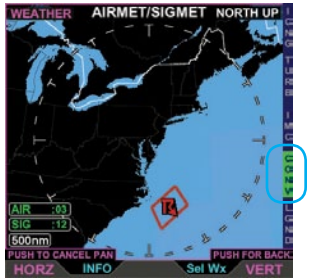


Figure 5-55
METAR Product VIEW
Showing Convective SIGMET

The pilot can display full textual details for any AIRMET/SIGMET. First selection mode must be activated on by pressing the lower left Detail button. Next select the particular AIRMET/SIGMET you want to read, then press the Left Knob labeled INFO to view the AIRMET/SIGMET.

Display AIRMET/SIGMET Information

1. With the AIRMET/SIGMET weather product screen displayed, press the lower Left Button labeled INFO. The Left Knob label changes to MET and both the Left Knob and Left Button label turn magenta (**Figure 5-56**).
2. Rotate the Left Knob to select the desired AIRMET/SIGMET. A white border will surround the colored AIRMET/SIGMET border (**Figure 5-57**).
3. Press the Left Knob to display the selected AIRMET/SIGMET information (**Figure 5-58**).
4. Repeat steps 2 and 3 as desired.
5. Press the lower Left Button, to exit selection mode. The Left Knob and Left Button labels turn cyan.

NOTE

It is possible to select an AIRMET/SIGMET item that is not in the current viewable display area. Use the Range +/- button to zoom out or in (respectively) to see selectable items.

Selecting a map range of 500 nm or higher might make it easier to see selected items. When viewing the map at a lower map range the selected item may be at the edge of the map display. and the white border will not be visible. In rare cases at larger zoom scales, it may be that the selected item is so small as to be less than one pixel in size. In this case, zooming in will reveal the selected item.

Figure 5-56 METAR Product VIEW with MTOS Selected

Figure 5-57 METAR Product VIEW with IFR AIRMET Selected

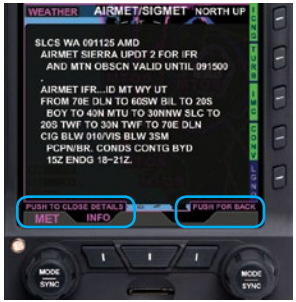


Figure 5-58
Selected IFR AIRMET Information Pop-up

5.2.7. **TFR**

Figure 5-59 TFR

The TFR screen displays a graphical depiction of Temporary Flight Restrictions, outlined in red, on a basic weather map (**Figure 5-59**). These restrictions are usually issued in the United States and are typically short term. They can include major sporting events, air shows, natural disaster areas, space launches, and Presidential movements.

The Pilot can display textual information about a selected TFR. The information displayed includes the:

- Type of restricted area (i.e., National Security Area)
- Name (i.e., DC Amendment)
- Affected altitudes
- Date and time the TFR was created and modified
- Date and time the TFR is active and expires (if available)

NOTE

TFR Data is acquired from XM WX Satellite Weather.

Display TFR Information

1. With the TFR weather product screen displayed, press the lower Left Button labeled INFO. The Left Knob label changes to TFR and both the Left Knob and Left Button label turn magenta (**Figure 5-60**).
2. Rotate the Left Knob to select the desired TFR. A white border will surround the red TFR border (**Figure 5-61**).
3. Press the Left Knob to display the selected TFR information (**Figure 5-62**).
4. Repeat steps 2 and 3 as desired.
5. Press the lower Left Button, to exit selection mode. The Left Knob and Left Button label turn cyan.

Figure 5-60
TFR Selected

Figure 5-61
Selecting Another TFR

Figure 5-62
Selected TFR Information
Pop-up

NOTE

It is possible to select a TFR item that is not in the current viewable display area. Use the Range +/- button to zoom out or in (respectively) to see selectable items.

Selecting a map range of 500 nm or higher might make it easier to see selected items. When viewing the map at a lower map range the selected item may be at the edge of the map display. and the white border will not be visible. In rare cases at larger zoom scales, it may be that the selected item is so small as to be less than one pixel in size. In this case, zooming in will reveal the selected item.

Figure 5-63
Winds Aloft Screen at 500 nm

5.2.8. **Winds Aloft**

The Winds Aloft screen displays the forecast wind speed and direction at the selected altitude above MSL on a basic weather map (**Figure 5-63**). Winds are depicted as barbs up to a map range of 500 nm; for map ranges of 1000 nm and above winds are not rendered and the XM Receiver Status is displayed (**Figure 5-64**).

When the map range is below 500 nm the wind direction is depicted by wind pointer lines extending upwind from the reporting weather station (the small dot on the bottom of the shaft). Wind speed is depicted by pennants or short lines (barbs) on the upwind end of the shaft. Each short barb represents 5 kts, each long barb represents 10 kts and a pennant represents 50 kts. Wind pointer lines can depict winds up to 190 kts (3 pennants and 4 long barbs). The Winds Aloft legend provides a depiction of each type of measurement (**Figure 5-65**).

Figure 5-64
Winds Aloft Screen Above 500 nm

Display the Winds Aloft Legend

- With the Winds Aloft weather product screen displayed, press the LGND Hot Key. The Winds Aloft legend displays on the right of the screen.

Hide the Winds Aloft Legend

- Press the LGND Hot Key to hide the Winds Aloft legend.

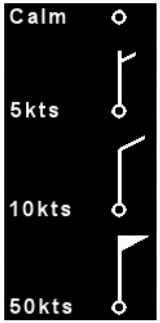
Winds are displayed using the selected altitude filter. The pilot adjusts the altitude filter value by pressing either the FL+ or the FL- Hot Key. The default Winds Aloft altitude filter is surface (SFC) if not previously set. Once the altitude filter has been changed, the selected setting becomes the default setting. The Winds Aloft filter level is displayed in the lower right corner of the display.

The Winds Aloft altitude filter increments in 3,000 foot increments ranging from the surface winds (displayed as SFC WINDS) to 42,000 feet (displayed as WINDS FL420). When the FL+ Hot Key is pressed, the altitude filter advances to the next filter increment. When the FL- Hot Key is pressed, the altitude filter decreases to the next filter increment.

Increase or Decrease Winds Aloft Altitude Filter

- Press the FL+ Hot Key to increase the altitude filter to the next altitude increment.
- Press the FL- Hot Key to decrease the altitude filter to the previous altitude increment.

Figure 5-65
Winds Aloft Legend



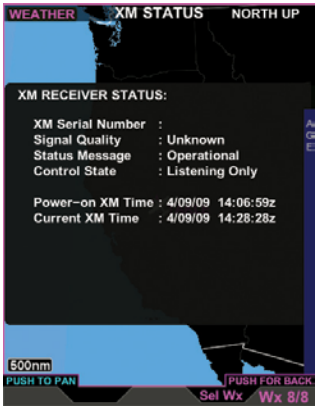


Figure 5-66 XM Status

5.2.9. **XM Status**

The XM Status screen displays the status of the XM weather receiver (**Figure 5-66**). The status includes the XM serial number (eight digit alpha numeric number), Signal Quality, Status Message, Control State, Time, and descriptive messages. The following tables provide a description of the different messages that may display for Signal Quality (**Table 5-11**), Status Message (**Table 5-12**), and Control State (**Table 5-13**).

5.2.9.1. **Signal Quality**

Message	Description
Good	The receiver is detecting a normal satellite signal and data is reliable.
Marginal	XM receiver is receiving some signal, but the quality is marginal, which may prevent some of the data products from being received and displayed.
No Signal	No satellite signal is being received. This could be a reception problem, or caused by a broken or missing antenna.
Unknown	No signal information has been received.
Weak	XM receiver is receiving some signal, but the quality is low, which may prevent the data products from being received and displayed.

Table 5-11 XM Signal Quality Levels

5.2.9.2. **Status Message**

Message	Description
Activation Required	The XM receiver is indicating that the receiver is not activated. Follow the instructions to activate the receiver.
Antenna Failure	The XM receiver is reporting that no antenna is connected.
Data Unavailable	The receiver has tuned to the satellite, but data is not available (such as: off the air, weak signal condition, or service blocked for some reason).
No Communications	The XM receiver is not communicating with the EFD. Continued failure to power up would most likely mean an issue with power to the receiver, the connection between the EFD and receiver, or the XM receiver itself.
No Service	No Service is available
No Signal	The XM receiver is indicating the No Signal has been found
Operational	The XM receiver is initialized and ready to received data
Powering Up	The XM receiver is in the process of initializing. If the receiver does not communicate or fails to initialize, the EFD will attempt to power up again after 15 seconds. Continued failure to power up would most likely mean an issue with power to the receiver, the connection between the EFD and receiver, or the XM receiver itself.
Saving Config	Periodically, the unit's configuration is saved (such as subscription data) and reboots. This is done automatically and is synced by XM such that no weather data products are lost during the cycling.
Tuning	The XM receiver is attempting to locate the satellite and tune to the correct channel to receive the weather products. If this state persists, then it could mean a broken or disconnected antenna, or the satellite signal is being obstructed.
Unknown Error	An error has been indicated, but the receiver does not specify what the error is.
XM Error Indicated	The XM receiver has indicated that there is an error, but did not specify the source of the error.

Table 5-12 XM Status Messages

5.2.9.3. **Control States**

Message	Description
Configuring	The XM unit is being configured to send certain periodic messages (such as signal quality and time)
Listening Only	The EFD is in listen only mode, which means that a different EFD is controlling the XM receiver, but this unit will still display any weather product that is received. Initializing the XM unit and responding to errors is the responsibility of the other EFD, and this unit is only passively listening.
Operational	Normal operations mode, where any data products received will be displayed.
Powering Up	Initializing communications with the XM unit
Retrying	Doing a "Soft Boot" of the XM unit by sending a power down command and waiting 15 seconds.
Saving Config	Periodically, the unit's configuration is saved (such as subscription data) and reboots. This is done automatically and is synced by XM such that no weather data products are lost during the cycling.
Tuning	Searching for the satellite signal, and tuning to the correct frequency for the weather products
Validating - Done	The validation of the content channels is complete
Validating - x	Validating the content channels for the weather products. There are 11 content channels that can be used for the XM weather products, so each one is individually validated.

Table 5-13 XM Control States

5.2.9.4. **Descriptive Messages**

Two types of descriptive messages may be displayed, operational and error messages. Only one message will display at a time, with error messages taking precedence over operational messages. Error messages are displayed when the XM receiver becomes non-operational. Operational Messages are described in **Table 5-14** and Error Messages are described in **Table 5-15**. Each table lists the messages in order of precedence.

Message	Description	Message
Loading	Upon initialization, when the XM receiver becomes operational, the Loading operational message displays in the XM Receiver Status page.	**The XM receiver is now operational, but may take several minutes before data products are displayed.**
Geo Limit	If XM data is not available for the current position, the Geo Limit operational message displays on all selected Data Link Weather pages.	**Geographic limitation: XM Weather is not available**
Winds Aloft	If a range above 500 nm is selected for the Winds Aloft product page, the XM Status Overlay displays with the Winds Aloft message.	**Winds Aloft data removed for ranges > 500nm**

Table 5-14 XM Status Operational Messages

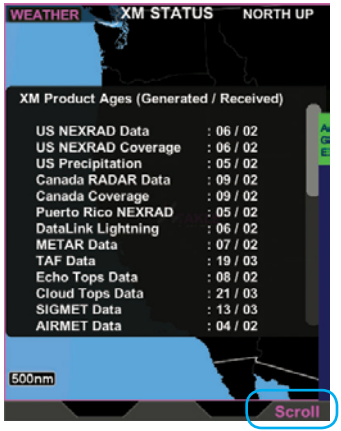


Figure 5-67
XM Status Product Ages Screen

Message	Description	
Communication Error	The XM receiver is not communicating with the EFD.	**XM receiver is not communicating with the EFD, check power and connections**
Antenna Error	The antenna status is not detected.	**XM Receiver is not receiving satellite data. Check antenna connections**
Activation Error	The XM receiver is not activated.	**XM receiver is not activated, Call 800.985.9200, or go to xmweather.com, to subscribe**

Table 5-15 XM Status Error Messages

5.2.9.5. **XM Product Page**

Each Data Link Weather feature includes a time annunciation that displays the age of the data being displayed. Additionally the XM Status weather product screen provides the age of all weather products listing the elapsed time since the information was generated followed by the elapsed time since the product was received by the weather receiver (**Figure 5-67**). The age of each product is displayed in time annunciations on each weather page; additionally, the pilot can view a list of each product's age from the XM Status weather product screen.

Display XM Products' Age

1. With the XM Status weather product screen displayed, press the AGE Hot Key. A pop-up screen displays showing the age of each of the XM products.
2. Press the AGE Hot Key again to close the pop-up.

The age annunciation on each weather page indicates the elapsed time, in minutes, since the information was generated. Each weather product has an age limit and is usually updated at the Update Rate indicated in **Table 5-16**.

Weather Product	Expiration Time[1]	Update Frequency[1]
US NEXRAD	30	5
Puerto Rico NEXRAD	30	5
High Resolution (Canada) Radar	30	10
US Radar Coverage	30	5
Canada Radar Coverage	30	10
Precipitation Type	30	5
Echo Top	30	7.5
Cloud Top	60	15
Data link Lightning	30	5
SIGMET	60	12
AIRMET	60	12
METAR	75	12
Winds Aloft	140	12
TFR	60	12
TAFs	75	12

Table 5-16 Weather Product Age Limits and Update Frequency

1. All times are displayed in minutes.

NOTE

All Data Link Weather feature time stamps are labeled AGE, except for Convective (NXRD, LTNG, SIG) and AIRMET/SIGMET (AIR, SIG).

The data age (except Puerto Rico NEXRAD) will display in black text on an amber background if the XM receiver is not operational for 30 seconds after an error is detected. When the Expiration time has been reached, and no updates have been received, the age annunciation will display with a red slash and all data is removed from the display. **Table 5-17** outlines the weather age annunciations:

Message	Description
	• Data is being received and updated.
	• An error was detected but information has not expired and may still be valid • XM receiver is not operational for 30 seconds after an error is detected
 	• A weather product is enabled and the age of the data exceeds the expiration time identified in **Table 5-16**, additionally, the corresponding graphical data is removed from the display
	• Upon start up, if no valid data has been received from the receiver • When the generated data age is not available

Table 5-17 Weather Age Annunciations

5.3. **Dedicated Hazard Awareness Views**

The EFD1000/500 MFD Dedicated Hazard Awareness Views provide advisory information of potential hazards to flight safety associated with Terrain, Traffic, and Weather. The EFD1000/500 MFD offers three VIEWS that are dedicated solely to hazard awareness:

- Terrain
- Traffic
- Stormscope® WX-500

Each Dedicated VIEW is presented on a black background, oriented Heading-Up with a full-range ring. The name of the VIEW is displayed in the upper left corner of the WINDOW (**Figure 5-68**). Each VIEW's range ring is unique to provide the pilot with an additional method to quickly differentiate between the different hazard awareness VIEWS. Any annunciations will display on the bottom edge of the VIEW.

Figure 5-68
Dedicated Hazard Awareness
– Terrain

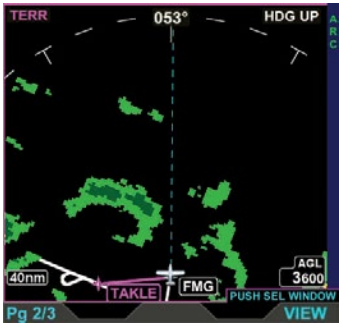


Figure 5-69
Terrain VIEW Showing an ARC Range Ring

WARNING

The Terrain and Obstruction information provided is based on elevation information from a third party database and contains some inaccuracies and/or omissions. This information should only be used as an aid to situational awareness. The information provided should never be used for primary terrain avoidance or navigation.

5.3.1. **Terrain and Obstructions**

Relative terrain is displayed on a black background, with a 360° or ARC range ring, and is overlayed by the current flight plan if available. The displayable range is 5 – 100 nm with a default display of 15 nm (**Figure 5-69**).

Change Terrain Range Ring

- Press the 360/ARC Hot Key to select a different range ring.

Terrain VIEW is oriented Heading-Up with the aircraft's magnetic heading aligned with the vertical axis of the display. The label HDG UP displays in the upper right corner of the display and the current heading is displayed in the upper middle of the display. If current heading is invalid or unavailable the current heading from the EFD1000 PFD or the current track from the GPS system is used.

The EFD1000/500 MFD uses information from the Jeppesen Database to display terrain data. If the database information, altitude, GPS position, and/or GPS track are invalid all terrain and obstacle data is removed from the display. If terrain information is invalid or unavailable, cyan is shown in place of the invalid or unavailable terrain

Terrain and obstruction heights in the database are MSL measurements based on barometric pressure. The EFD1000/500 MFD uses the GPS position and MSL altitude of the aircraft to calculate and predict a picture of the surrounding terrain and obstructions relative to the aircraft's flight path.

Terrain data color coding and display is based on the difference between the terrain height (MSL) and the aircraft height (MSL) as shown in **Table 5-18**. The relative terrain height is determined by computing the altitude difference between the terrain height and the computed Baro Corrected Altitude. The alerts displayed are advisory only, not for primary terrain avoidance.

Relative Terrain Height	Color Code
100' below and higher	RED
100' - 500' below	YELLOW
500' - 1500' below	DARK GREEN
1500' - 2500' below	LIGHT GREEN
More than 2500' below	BLACK
Data unavailable	CYAN

Table 5-18 Terrain Color Coding

The current height above ground (AGL), as computed from ownship altitude and terrain height directly below the aircraft, is shown in the AGL box in the lower right of the display. The AGL values are rounded down to the next hundreds of feet (i.e., 899' is rounded to 800'). The AGL will:

- Be removed if GPS position data is not available.
- Display dashes if there is no terrain coverage.
- Display dashes if the AGL value is above 50,000 ft or below 500 ft.

When the GPS sensor providing position information for terrain awareness fails or becomes invalid, the terrain awareness function fails. The annunciation GPS1, GPS 2 or RSM GPS is displayed in amber on the center left of the display. The TERRAIN FAIL annunciation is displayed in amber when the GPS position, altitude, heading and GPS Track data are invalid. In addition, the AGL field, orientation annunciations, and range display are removed. If the Jeppesen Database is invalid or unavailable, cyan coloring is used to depict unavailable data in place of the terrain data.

CAUTION

Correct barometric pressure is essential to accurate terrain depiction.

NOTE

When the aircraft latitude is greater than 75° North or 60° South, terrain data is not displayed.

NOTE

If the aircraft is partially outside of the terrain coverage provided by the database, unavailable terrain data is shown in Cyan.

NOTE

If the current heading is invalid or unavailable the map is oriented to the current GPS ground track and TRK UP displays in the upper right corner of the display the current track is displayed in the upper middle of the display.

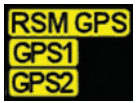


Figure 5-70
Invalid or Failed GPS Annunciations

When a GPS source's position data are invalid or no longer available, an amber annunciation, GPS1, GPS2, or RSM GPS, is shown to the left of the lower display to indicate which has failed (**Figure 5-70**). If Basemap features are invalid or unavailable all features except the flight plan are removed from the display.

Obstructions are displayed on Terrain VIEW within 40 nm of the ownship, as an inverted colored V symbol relative to ownship altitude (**Table 5-19**). When enabled for display, obstructions are rendered as follows:

Relative Altitude	Obstruction Type		
	Small Tower (<1000' AGL)	Tall Tower (>1000' AGL)	Group Obstructions
At and above			
Within 500' below			

Table 5-19 Obstruction Symbology

NOTE

A safety threshold of 200 feet is applied to the terrain and obstruction thresholds for all phases of flight, making the terrain and obstructions appear closer than computed.

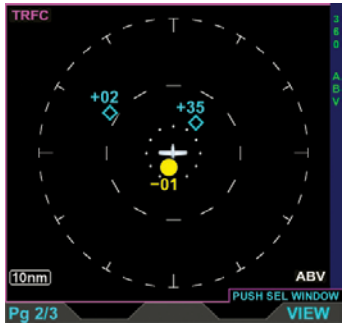
5.3.2. **Traffic (optional)**

When the EFD1000/500 MFD is configured with one of the following traffic sensors the EFD1000/500 MFD can display traffic information. The map is oriented North-Up on a black background (**Figure 5-71**).

- Avidyne TAS 600/610/620 (TAS)
- Bendix/King KMH 880 (TAS)
- Bendix/King KTA 870 (TAS)
- Garmin GTX 330 (TIS)
- RYAN 9900BX (TAS)
- SKYWATCH SKY 497 (TAS)
- SKYWATCH SKY 899 (TAS)

TAS systems use an airborne interrogator with a half-second update rate; coverage follows the aircraft. The TIS system uses a GTX transponder with a five-second update rate; coverage is limited to specific areas listed in the Aeronautical Information Manual (AIM).

Figure 5-71
Dedicated Hazard Awareness – Traffic



NOTE

Refer to your traffic sensor's Pilot Guide for detailed information about the sensor's limitations and operational ranges. Additionally, see the ***Aeronautical Information Manual*** *section titled "Traffic Information Service (TIS)" for detailed information about TIS requirements, capabilities, and limitations.*

NOTE

Do not rely on the EFD1000/500 MFD as the sole source of data for collision avoidance. It is the pilot's responsibility to visually acquire other aircraft for safe flight. Maneuver your aircraft based only on ATC guidance or positive acquisition of conflicting traffic. Traffic information is:

- *Provided as a proximity warning only*
- *To assist the pilot in the visual acquisition of intruder aircraft*
- *Does not provide recommended avoidance maneuvers*
- *Not provided for aircraft that are not transponder equipped, experiencing a transponder failure, or aircraft out of radar coverage*

5.3.2.1. **Traffic Display**

The Traffic VIEW is oriented Heading-Up, with either a 360° or ARC compass view, with a white outer and inner range ring. The pilot selects the compass view by pressing the 360/ARC Hot Key; 360° is the default when not previously set. The range is pilot-selectable with the outer-range ring and inner-range ring representing the following range selections from the ownship position:

- 2 nm outer-range ring
- 3 nm outer-range ring and 2 nm inner-range ring
- 5 nm outer-range ring and 2 nm inner-range ring (Default if not previously set)
- 10 nm outer-range ring, 5 nm middle-range ring, and 2 nm inner-range ring
- 15 nm outer-range ring and 7.5 nm inner-range ring
- 20 nm outer-range ring and 10 nm inner-range ring
- 30 nm outer-range ring and 15 nm inner-range ring
- 40 nm outer-range ring and 20 nm inner-range ring

NOTE

The 2 nm inner-range ring has dots at the clock positions; all other inner-range rings have dashes at the clock positions. .

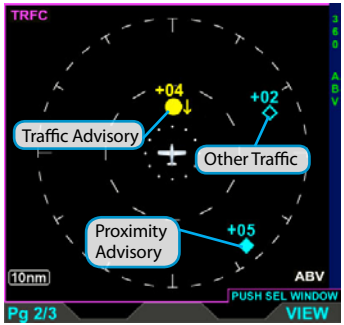
Figure 5-72
Traffic VIEW Showing an ARC Range Ring

Change Traffic Range Ring

- Press the 360/ARC Hot Key to select a different range ring (**Figure 5-72**).

The EFD1000/500 MFD will display intruders prioritized in the order received from the configured traffic sensor. The EFD1000/500 MFD includes three threat levels using TCAS symbology; traffic advisory (amber circle), proximity advisory (cyan diamond), and other traffic (hollow cyan diamond). All intruders within the current display range and the selected altitude filter are shown. Intruders generating a traffic advisory with range and bearing data are displayed as a traffic symbol at the location representing its position relative to the ownship symbol (**Figure 5-73**).

Figure 5-73
Traffic Symbols



5.3.2.1.1. **Display of Traffic Symbols**

The EFD1000/500 MFD displays intruder information from the sensor with the threat level assigned by the sensor. The sensor and type of traffic system defines the threat data, range, bearing, altitude, and altitude trend. Each traffic symbol is positioned at a location representing the relative range and bearing to the ownship symbol.

A data block is given for each reported intruder displaying the type, relative altitude, and intruder vertical direction (as acquired from the sensor). The data block text color is the same as the traffic symbol, amber for Traffic Advisory and white for proximity and other traffic (**Figure 5-74**).

Figure 5-74 Intruder
Data Block

When an intruder's altitude and vertical speed are available, they are displayed as part of the on-screen data block. The relative altitude is shown as two digits indicating the relative altitude difference, in hundreds of feet, from the ownship. The altitude value for traffic above the ownship is preceded by a plus symbol (+) and is on top of the symbol. The altitude value for traffic below the ownship is preceded by a minus symbol (-) and is on the bottom of the symbol.

An arrow next to the traffic symbol gives the direction of vertical movement in relation to the ownship. Intruders climbing or descending at a rate greater than 500 fpm display an up-arrow (climbing), or down-arrow (descending) to the right of the traffic symbol. Traffic that is at co-altitude with the aircraft and has no vertical trend is indicated by an altitude value of 00 below the traffic symbol.

NOTE

Traffic that is within 100 feet of the ownship displays an altitude value of 00, above or below the traffic symbol as appropriate. .

NOTE

If an intruder is flying level no arrow is shown. If the intruder is not reporting altitude, neither the arrow or the altitude indication are shown.

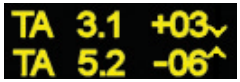


Figure 5-75
Text-format Traffic Advisories

NOTE

Altitude and vertical trend data are displayed on No Beary Advisiories as previously described with the exception of position relative to the traffic symbol.

NOTE

Depending on the position of the traffic Advisory, at the edge of the screen, the data block may or may not display.

For example, the intruder shown in **Figure 5-74** is a Traffic Advisory 400 feet above the ownship and is descending. No altitude information is shown in the intruder data block when the altitude is unavailable.

5.3.2.1.2. **No Bearing Advisories**

If the traffic sensor reports Traffic Advisories without bearing information, the advisory is displayed as a text only data block centered on the display below the ownship symbol (**Figure 5-75**). The EFD1000/500 MFD displays up to two Traffic Advisories at a time, with the most urgent listed first. Non-bearing Traffic Advisories outside the displayable range are displayed based on priority. Intruders generating a Proximity Advisory or Other Traffic Advisory without bearing data or outside the displayable region are not displayed.

5.3.2.1.3. **Off Scale and Symbol Overlap**

Traffic Advisories that are outside the current range are indicated by a half-symbol at the edge of the display with the appropriate data block. Proximity Advisories and Other Traffic that are outside of the current range are not displayed.

When multiple traffic symbols partially or completely overlap, the symbols are visually stacked, with the highest priority alert data on top, obscuring the lower priority alert. When a traffic symbol and the ownship symbol partially or completely overlap, the traffic symbol and data block will overlay the ownship symbol and indicate if the traffic is above or below the aircraft.

5.3.2.1.4. **Traffic Operational Modes**

There are four possible modes for TAS traffic sensor status:

- Operational
- Standby
- Test
- Failure

Traffic symbols are removed from the display and the EFD1000/500 MFD displays an annunciation when your traffic sensor is operating in any mode other than operational as outlined in **Table 5-20**.

Type of Sensor	Status	Annunciation
TAS	Standby	TRFC STBY
	Test	TRFC TEST
	Failure	TRFC FAIL
TIS	Unavailable or out of range	TRFC UNAV

Table 5-20 Traffic Sensor Status Display Annunciations

TIS traffic is usually displayed in real time. If for some reason the traffic sensor information has not been refreshed for 6 seconds the EFD1000/500 MFD will display an age indicator and an a TRFC COAST annunciation. After 12 seconds of no updates, the EFD1000/500 MFD will continue to display the age indicator and the annunciation will change to TRFC RMVD. Finally after 60 seconds both the age indicator and the annunciation are removed. (**Table 5-21**)

Type of Sensor	Status	Annunciation
≥ 6 seconds	Yes	TRFC COAST
≥ 12 seconds	Yes	TRFC RMVD
≥ 60 seconds	Yes	TRFC UNAV

Table 5-21 TIS Traffic Annunciations

5.3.2.1.5. **Altitude Filter**

The Traffic VIEW has an altitude filter, controlled by a Hot Key, allowing the pilot to set the altitude for traffic display. There are four altitude filters available: Above, Below, Normal, and Unrestricted (**Table 5-22**). Only traffic within the selected altitude filter value will display. Normal is the default Traffic altitude filter unless it has been previously set.

Hot Key Label	Filter Level	Traffic Display Volume
ABV	Above	+9,900 ft to -2,700 ft
BLW	Below	+2,700 ft to -9,000 ft
NRM	Normal	±2,700 ft
UNR	Unrestricted	±9,900 ft

Table 5-22 Traffic Filter Parameters

NOTE

*The altitude filters listed in **Table 5-23** are the EFD1000/500 MFD's altitude thresholds. The traffic sensor configured with the EFD1000/500 MFD may have different (i.e. lower) altitude thresholds. Check your traffic sensor's Pilot's manual for specifics.*

The pilot adjusts the altitude filter value by pressing the ABV/BLW/NRM/UNR Hot Key, which cycles through each of the filter levels.

Change the Traffic Altitude Filter

- Press the ABV/BLW/NRM/UNR Hot Key to select the desired altitude filter.

5.3.2.2. **Traffic Advisories**

When the aircraft's traffic sensor reports a Traffic Advisory, and the Dedicated Traffic VIEW is not displayed, the EFD1000/500 MFD will display an amber TRAFFIC annunciation in the data bar (**Figure 5-76**). Additionally the lower middle button displays the label TRFC in amber. Once the intruder is no longer a threat, or the pilot presses the lower middle button, the annunciation is removed from the data bar.

Pressing the lower middle TRFC button switches the display to the split screen PAGE displaying the Traffic VIEW in the top WINDOW for situational awareness. The lower middle button label changes to BACK to enable the pilot to quickly switch back to the previous display.

Display a Traffic Advisory

1. When a Traffic Advisory occurs, press the amber TRFC button.
   The dedicated Traffic View displays in the top WINDOW of the split screen layout (**Figure 5-77**).
2. Press the lower middle BACK button to return to the previous PAGE.

NOTE

If the Main Menu is active when a Traffic Advisory occurs the Traffic Advisory will caused the Menu to close.

Figure 5-76
Traffic Advisory

NOTE

The BACK button will time out after the duration of the Traffic Advisory plus ten seconds.

Figure 5-77
Displaying a Traffic Advisory

Figure 5-78
WX-500 VIEW
in Strike Mode

Figure 5-79
WX-500 VIEW
in Cell Mode

Figure 5-80
WX-500 Strike Symbol

Figure 5-81
WX-500 Cell Symbol

Figure 5-82
WX-500 Strike Mode and Rate

Figure 5-83
WX-500 Invalid Rate

5.3.3. **WX-500 (optional)**

When configured with a WX-500 receiver the EFD1000/500 MFD displays Stormscope® WX 500 data, oriented Heading-Up. The default display shows the 360° view, with a 200 nm range ring on a black background (**Figure 5-78**). The WX-500 VIEW supports an ARC or 360° compass ranging from 20, 30, 40, 60, 80, 100 or 200 nm as selected using the range buttons. The EFD1000/500 MFD stores the last settings selected following the power cycle of the unit.

Change WX-500 Range Ring

- Press the 360/ARC Hot Key to select a different range ring (**Figure 5-79**).

According to the he Stormscope® WX-500 User Guide, the WX-500 receiver "…detects the electric and magnetic fields generated by intra-cloud, inter-cloud, or cloud-to-ground electrical discharges that occur within a 200 nm radius of the aircraft and sends the resulting "discharge signals" to the processor." The EFD1000/500 MFD displays those discharge signals on the Stormscope® WX-500 VIEW or as an overlay on the Navigation Map VIEW.

When in Strike mode, thunderstorm activity is displayed as yellow Xs (**Figure 5-80**) When in Cell mode, thunderstorm activity is displayed as yellow crosses (**Figure 5-81**). The current mode name is displayed in the upper right corner of the VIEW (i.e. STRK or CELL) and the current rate is displayed in the lower right of the VIEW (**Figure 5-82**). Rate will display with a red horizontal line (**Figure 5-83**) when:

- The receiver reports a fault error.
- Heading is invalid or unavailable.
- Spherics data is not detected.

Display WX-500 Strikes

- Press the STRK/CELL Hot Key until the Hot Key label displays STRK, in green text. A STRK label displays in the upper right corner of the display and the current strike rate displays lower right corner.

Display WX-500 Cells

- Press the STRK/CELL Hot Key until the Hot Key label displays CELL, in green text. A CELL label displays in the upper right corner of the display and the current cell rate displays lower right corner.

Clear WX-500 Rate

- Press the CLR Hot Key. The rate is reset to zero (0) and all symbols are removed from the display.

Activate WX-500 Self-Test

- Press the TEST Hot Key. The lower right label reads TEST, the ownship is removed, and TEST INIT displays in the center of the display (**Figure 5-84**). When the test is complete the WX-500 display returns to the previous mode.

NOTE

Refer to the Stormscope® WX-500 User Guide for detailed information about storm mapping, operation, and weather display interpretation of the Stormscope® WX-500 receiver.

Figure 5-84
WX-500 VIEW in Self-Test Mode

5.3.3.1. **WX-500 Annunciations**

WX-500 data is removed from the display, the rate annunciation displays with a horizontal red line, and the ownship symbol is removed from the display when any of the following situations occur (**Table 5-23**).

Error Message	Explanation
TEST INIT	Sensor is in self-test mode.
FAIL	Sensor status is an unrecoverable fault or undefined.
TEST INIT FAIL	Self Test report not received in 10 seconds.
ERROR	Undefined recoverable error.
ERROR ANT ERR	Recoverable antenna error.
ERROR MIC INHIBIT STUCK	Recoverable inhibit line stuck error.
ERROR ANT JMP CHG	Recoverable Antenna Jumper Changed error.
FAIL HDG INVALID	Heading information is unavailable or invalid
FAIL NO LINK	Configured but data is not detected.

Table 5-23 WX-500 Annunciations

5.4. **Secondary Views (EFD1000 MFD only)**

The Secondary Attitude Instrument and Secondary HSI VIEWs are only available with the EFD1000 MFD. The Horizontal Situation Indicator VIEW is available when the EFD1000/MFD is configured with a GPS. Both VIEWs provide the pilot with a visual cross-check of the primary instruments.

5.4.1. **Secondary Attitude Instrument (AI)**

The Secondary Attitude Instrument VIEW provides a secondary display of aircraft attitude, altitude, and airspeed. The VIEW consists of a basic attitude indicator overlaid with numerical airspeed and altitude data displayed in the upper left WINDOW of the thumbnail LAYOUT (PAGE 3/3) (**Figure 5-85**).

5.4.1.1. **Airspeed and Altitude**

The Indicated Airspeed (IAS) is displayed in a rolling drum format using the same units of measure (i.e., Knots or Miles per Hours) as the PFD. The IAS displays with a resolution of 1 unit and a range of 20 to 999 units and is dashed if the IAS is below 20.

The IAS is rendered in red if the current IAS is greater than Vne or is less than Vso and the red low speed band is enabled. The red low speed band enables when the IAS exceeds (Vs + 10) units for more than 30 seconds. The red low speed band remains in its enabled or disabled state for IAS values between 20 units and (Vs + 10) units.

The altitude indicator is displayed in a rolling drum format displaying all height values in feet. The altitude is displayed with a resolution of 20 units and a range of -1,600 to 51,000 units.

NOTE

Aircraft with an EFD500 MFD configured with an EFD1000 PFD will not receive heading information if the PFD fails.

NOTE

Refer to the EFD1000 PFD Pilot's Guide for detailed information about the Attitude Indicator and HSI.

Figure 5-85
Secondary Attitude Instrument

Figure 5-86
ADAHRS FAIL

Figure 5-87
CHECK AHRS

When altitude, attitude or airspeed ADAHRS is invalid or unavailable the ADAHRS FAIL message displays in amber on the lower right of the data bar (**Figure 5-86**).

When a cross check attitude condition occurs in the EFD1000 MFD the CHECK AHRS message displays in amber on the lower right of the data bar (**Figure 5-87**).

The Barometric Pressure of the MFD is received from the PFD. Any changes made to the Barometric Pressure from the PFD or from the Reversionary mode of the MFD is reflected on both the PFD and the MFD. See the **PFD Pilot's Guide, Chapter 4 Reference Guide, Barometric Pressure Adjustment Section** for detailed information about setting the Barometric Pressure.

5.4.2. **Secondary Horizontal Situation Indicator (HSI)**

The Secondary HSI VIEW provides a secondary display of the Direction Indicator and Course Direction Indicator (CDI). The Secondary HSI displays on a black background with a 360° compass, the ownship symbol, and digital display of aircraft direction of flight on the bottom WINDOW of the split screen LAYOUT (PAGE 2/3) (**Figure 5-88**).

Figure 5-88
Secondary HSI

All GPS annunciations that display on the PFD (i.e., TERM, WPT, MSG, and APPR) will display on the Secondary HSI. A Vertical Deviation Indicator (VDI) is displayed to the left of the HSI using the same logic as the PFD VDI. The navigation source is pilot selectable, from any of the configured navigation sources for the PFD CDI, using the lower center button. The course value is selectable via the Left Knob. Refer to the EFD1000 PFD Pilot's Guide for detailed information about GPS annunciations, the VDI, and navigation source selection.

Modify the Course Setting

1. Select the Secondary HSI VIEW WINDOW.
2. Press the Left Knob. The Course field is rendered in magenta (**Figure 5-89**).
3. Rotate the Left Knob change the value of the Course field. Rotate clockwise to increase, or counterclockwise to decrease, the value.
4. Press the Left Knob to save the new Course setting.

Figure 5-89
Editing Course Value

NOTE

When course selection has been activated, pressing and holding the Left Knob will activate a course SYNC, i.e. the MFD will select the current heading as the selected course. See the **EFD1000 Pilot's Guide** *for detailed information on course SYNC.*

Figure 5-90
Secondary HSI
Displaying the VDI

NOTE

The VDI scale and symbol (diamond) will not display when LOC (BC) mode is active.

5.4.2.1. **Vertical Deviation Indicator (VDI)**

The secondary HSI displays the VDI scale and diamond only when a vertical deviation signal is available (**Figure 5-90**). The VDI scale and symbol (diamond) display to the left of the direction indicator when:

- A VHF navigation radio is selected as the CDI Navigation source, the radio is in ILS mode, and is receiving valid localizer and glide slope data.
- GPS mode is active, the GPS is in approach mode and valid, and a valid GPS vertical deviation signal is being received.

Vertical deviation is represented on the VDI scale by the position of the tip of the VDI diamond at the scale dot that corresponds to the received or computed vertical deviation value. When the vertical deviation exceeds the displayable range, the VDI symbol is a hollow "ghosted" diamond pegged on the appropriate edge of the scale.

Chapter 6

Expanded Emergency & Abnormal Procedures

This section supplements and provides an expanded description of the emergency and abnormal procedures included in the FAA approved Aircraft Flight Manual Supplement. The data provided here is intended to provide additional background information to enhance the pilot's understanding of the emergency and abnormal conditions, and the associated procedures provided in the AFMS. This pilot guide is provided for supplementary purposes only. The approved cockpit reference for in-flight use is the AFMS, which must be immediately available to the pilot at all times in flight. In the event of any conflict between this document and the FAA approved AFMS, the AFMS instructions must be followed.

6.1. **Pitot/Static System Blockage**

A pitot line blockage will result in the airspeed indicator behaving like an altimeter when the aircraft's altitude changes and it will not respond to airspeed changes. A pitot line blockage can also affect the EFD1000's attitude indication.

A static line blockage will result in altitude remaining fixed and a zero vertical speed despite aircraft pitch and/or power setting changes. In addition, IAS indications will be incorrect if the static line is blocked. Errors will typically be noticed during climbs or descents. When descending, ambient pressure increases which will result in the indicated airspeed reading less than the actual airspeed. The opposite effect will be observed in a climb. A static line blockage can also affect the EFD1000's attitude indication.

CAUTION

Most light aircraft have only a single pitot and static pneumatic system available for flight instrument use. Should these lines become blocked, both the standby indicators and the EFD1000 (PFD and MFD) indicators will display erroneous airspeed and altitude information.

The EFD1000 (PFD and MFD) also uses pitot and static pressures as part of the attitude and heading solution. Loss or corruption of this data will affect the accuracy or availability of attitude and heading information.

If an erroneous pitot input is detected by the EFD1000 (PFD or MFD) in flight, the EFD1000 will present red "X"s over the attitude and heading indicators, and display an amber "CHECK PITOT HEAT" annunciation.

Indication of an obstructed pitot system is provided for EFD1000s when configured as a PFD, a MFD, and MFD in reversionary mode. If the EFD1000's indicated airspeed is less than 30 KIAS (35 mph) and GPS groundspeed is > 50 kts (58 mph), then attitude and heading instruments are replaced with red "X"s and textual annunciations to indicate their failure. In this case, an amber "CHECK PITOT HEAT" annunciation accompanies the "ATTITUDE FAIL" annunciation. If the pitot obstruction is subsequently removed and indicated airspeed ≥ 30 KIAS (35 mph), the "CHECK PITOT HEAT" annunciation will be removed in 15 secs. This indicates that the EFD1000 is performing an automatic AHRS reset in the background. No pilot action is required to reset the system.

Blocked Pitot or Static Line Suspected

1. PITOT HEAT.....ON
2. ALTERNATE STATIC SOURCE.....SELECT OPEN
3. ATTITUDE .....Maintain straight and level flight by reference to standby sources of attitude until the obstruction is cleared
4. Consider exiting IMC

NOTE

The CROSS CHECK ATTITUDE message indicates that the statistical confidence in the ADAHRS solution is degraded. Momentary annunciations may be seen during aggressive maneuvers, such as 60 deg turns or aerobatics, which are normal.

6.2. CROSS CHECK ATTITUDE Message

Persistent or frequent CROSS CHECK ATTITUDE annunciations during normal maneuvers are indicative of a degraded ADAHRS solution.

Cross Check Attitude

1. ATTITUDE .....Maintain by reference to other instruments or the visible horizon
2. Consider exiting IMC

6.3. **Abnormal Shutdown Procedure**

In the event of an EFD malfunction requiring in-flight shut down of the equipment, proceed as follows

Abnormal Shutdown Procedure

EFD1000 MFD (with EBB)

1. EFD Circuit Breaker / Switch.....OFF / PULL
2. EBB Disconnect Switch.....DISC

OR -

EFD1000/500 display with internal battery

1. EFD Circuit Breaker / Switch.....OFF / PULL
2. REV Button .....PUSH AND HOLD UNTIL DISPLAY BLANKS (**Figure 6-1**)

NOTE

Each EFD1000/500 has a dedicated circuit breaker and master switch or combined circuit breaker switch. These switches are mounted on or adjacent to the instrument panel and within the pilot's reach. The switches are arranged left-to-right or top-to-bottom to match the left-to-right orientation of the EFDs in the panel.

Figure 6-1
Powering Off the
EFD1000/500 MFD

Figure 6-2
The EFD1000 MFD is on the Right of a Three-Display Setup

6.4. MFD Reversionary Mode Operation (EFD1000 MFD only)

Select REV Mode

1. EFD1000 MFD REV Button.....MOMENTARY PRESS
2. REVERSIONARY PFD Display.....Configure as desired
3. BARO SETTING.....Verify

In the unlikely event of a failure of the PFD, including the loss of ADC or ADAHRS functions, the EFD1000 MFD (**Figure 6-2**) can revert to PFD operation. With a single press and release of the red text REV key located on the MFD bezel the MFD will immediately change to the PFD operating mode. To return to the MFD operating mode, press the REV key again. In the MFD Reversionary PFD mode, operation is identical to the PFD except the optional tone generator will no longer function. In addition, selection of the REV mode does not switch autopilot outputs to the MFD. Rather, autopilot outputs remain connected to the EFD1000 PFD. If the PFD is failed, autopilot operation may be unavailable or limited.

Information that is not related to Primary Flight Information (e.g. navigation configuration data such as navigation source, selected course, selected heading, altitude bug, minimums bug, airspeed bug) is not passed between the displays, and, therefore, must be configured or verified by the pilot, as necessary, prior to entering critical phases of flight. After configuring the MFD REV mode, the unit may be returned to normal MFD operation. This simple step will ensure that the MFD is ready to assume all of the duties performed by the PFD should that equipment experience a failure.

NOTE

Pressing and holding the REV key for 5 seconds will shut off the unit. The REV button is located on the EFD bezel, marked with "REV" in red text.

NOTE

When reversion mode is selected, verify that the display is configured as necessary. Items to consider include Baro Setting, Altitude Bug, Airspeed Bug, Minimums, CDI Nav Source, Selected Course and Heading, ARC/360 Mode, Map configuration, Weather, Traffic and Lightning overlays, etc.

6.5. **Loss of or Degraded Aircraft Power or ON BAT Annunciation**

In the event that aircraft generated power to the EFD is degraded or fails, each EFD will automatically switch to its own dedicated battery (**Figure 6-3**). When continued safe operation depends on the EFD1000, **UNRESTORABLE LOSS OF EXTERNAL POWER IS AN EMERGENCY SITUATION**. The aircraft should divert to the nearest suitable airport.

Figure 6-3
Internal Battery Operational

Loss of or Degraded Aircraft Power or ON BAT Annunciation

1. Electrical System.....Follow AFM procedures to restore power
2. If unable to restore power.....Land as soon as possible

The internal battery will normally provide between 30-60 minutes of operation at approximately 20°C and warmer. At extreme cold temperatures operation of the internal battery is not assured.

The external Emergency Backup Battery will provide at least 30 minutes of operation with an 80% charge state at 20°C. When fully charged and at a nominal temperature of 20°C or warmer, the EBB will typically provide power to operate the EFD1000 for two or more hours.

When on battery (internal or EBB) the auto backlight intensity defaults to 40% and manual backlight intensity is limited to 70%. Changing the backlight intensity will affect the battery duration, which is reflected in the % remaining indication.

A fully charged battery will indicate a charge level of 99% for some time before beginning to decay. The charge level will steadily decrease when below 95%, with a slight acceleration as the battery nears 0%.

The "ON BAT" annunciation, along with the estimated battery charge remaining, is displayed whenever the system is operating on battery.

CAUTION

If any EFD system battery is permitted to operate until it is exhausted, the screen may go solid white for several seconds before blanking. To avoid this condition at night, the pilot should manually turn off the EFD when the display reaches 0% battery remaining.

NOTE

Whenever it is operating from the internal battery or the EBB, the EFD also powers the RSM GPS, if installed.

Figure 6-4
Operating in GPSS Mode

Figure 6-5
GPSS in Wings Level Mode

6.6. GPSS Operation, Annunciations, and Autopilot Modes

GPSS is available from the EFD1000 PFD. Three modes, Enabled, Wings Level, and Disabled, are possible and annunciated in the EFD's lower display. When enabled, the configured GPS source not only provides the basemap and flight plan data in the lower display, but also provides GPSS as the heading input to a configured autopilot. When engaged, a configured autopilot will interpret GPSS commands as heading inputs and follow the active GPS flight plan, including anticipated turns, if provided. The GPSS Enabled mode is indicated by a green "GPSS" hotkey annunciation and a "GPSS1" with an inverted "A" placed next to the "HDG" reference in the lower display to detail the source (**Figure 6-4**) .

If GPSS is enabled and the GPS source is lost or changed, the GPSS mode automatically changes to the Wings Level mode and annunciates as shown in **Figure 6-5**.

This removes roll steering inputs to the autopilot, causing the aircraft to roll wings level. The red slash through the annunciated "A HDG" and "GPSS#" source. The amber "GPSS" hotkey annunciation requires pilot action. If this occurs use the following steps:

NOTE

When using GPSS with combined GPS / VLOC navigators (e.g., GNS-430/530), VLOC may be selected as the navigation source while GPSS is engaged. To avoid confusion, note that the EFD1000's selected navigation source controls the CDI and the autopilot's navigation and approach modes when engaged. GPSS reflects the heading commands required to navigate the active flight plan leg and controls the autopilot's heading mode when engaged. Complete understanding of autopilot mode functions and their proper selection is recommended.

When GPSS Automatically Changes to Wings Level Mode

1. Check the configured GPS source.
2. Check the EFD1000 navigation source select.
3. If selected GPSS source is restored or changed and GPSS is still desired, press the "GPSS" Hot Key to activate GPSS (GPSS Hot Key label turns green).

Disable GPSS

1. Press the GPSS Hot Key until the Hot Key label is gray (**Figure 6-6**).
2. Check or set the Autopilot Control Panel modes as desired.
3. Adjust the EFD1000 HDG bug as desired.

Figure 6-6
GPSS Disabled

NOTE

The configured GPS source must provide an active flight plan for the GPSS to remain engaged or to be restored.

If the EFD1000 navigation source is changed to another configured GPS or VLOC source for longer than 2 seconds, the GPSS mode will change to Wings Level. The pilot must then press the GPSS hotkey to restore or disable GPSS, as desired.

NOTE

If GPSS is enabled and the autopilot is engaged in the heading mode, disabling the GPSS will cause the autopilot to follow HDG bug steering.

6.7. **EBB Disconnect (EFD1000 MFD only)**

To isolate the EBB in the event of an EBB or EFD1000 MFD malfunction, proceed as follows:

Isolate the Emergency Backup Battery

1. EBB Switch.....Select DISC

The EBB is protected by thermal and short-circuit sensing circuitry to prevent battery overheating or damage. The battery is normally connected to its EFD1000 MFD. If it is desired to remove battery power from the EFD1000 MFD, or to otherwise isolate the EBB, the EBB includes an externally activated isolation relay integral to the EBB aluminum housing. This relay is activated by the EBB Disconnect Switch installed in the instrument panel.

The EBB Emergency Disconnect switch is either a guarded or lever-lock switch mounted on or adjacent to the instrument panel and within the pilot's reach. The switch should be left in the NORM position at all times, including when away from the aircraft. When it is desired to disconnect the EBB from the EFD1000 MFD display, move the switch to the DISC position.

NOTE

When in the "DISC" position, the EBB isolation relay is powered from the EBB. Thus, when the switch is in the disconnect position, the Emergency Backup Battery will gradually discharge.

NOTE

Setting the disconnect to EMER. DISC. closes the relay to the EFD and therefore will drain the EBB battery. As such do not set the EBB to EMER. DISC. when garaging the aircraft.

If the EBB is inadvertently drained, apply auxillary power to the aircraft, turn on the EFD1000 MFD and allow the EBB to recharge. The EBB takes approximately three (3) hours to recharge when the temperature is at 25°C.

The EBB will not recharge at temperatures below 0°C or above 25°C.

6.8. **Power Override**

In the event that the pilot wishes to override the automatic power configuration of the equipment, proceed as follows:

Power Override

1. MENU.....“POWER SETTINGS” Page

To switch FROM aircraft power to Battery:

2. “BATTERY” LINE SELECT KEY.....PRESS

To switch FROM Battery TO aircraft power:

3. “EXT PWR” LINE SELECT KEY.....PRESS

View External Voltage Status

1. Push the MENU Key. The Main Menu displays.
2. Rotate the Right Knob to the POWER SETTINGS menu displays.
3. The EXT PWR Menu Key (**Figure 6-7**) displays the external power voltage.
4. Push the MENU key to exit the Menu.

View Internal Battery Status

1. Push the MENU Key. The Main Menu displays.
2. Rotate the Right Knob to the POWER SETTINGS menu displays.
3. The BAT Menu Key (**Figure 6-8**) displays the current battery status as either charging or a percentage of charge.
4. Push the MENU key to exit the Menu.

Figure 6-7
External Power Voltage Status

Figure 6-8
Battery Status

CAUTION

The EFD1000 PFD and MFD may share a common pitot/static system and their otherwise independent attitude solution may be similarly affected by pitot/static faults.

6.9. **ADAHRS Attitude Disagreement**

Should differences be observed between one or more EFD1000 displays and/or the standby instruments, monitor all available attitude, airspeed, and altitude information to diagnose faulty indicator(s). Reset the EFD1000 ADAHRS.

6.10. **In-Flight ADAHRS Reset**

In the unlikely event the EFD1000 determines a potential degradation of attitude information, a warning annunciation, CROSS CHECK ATTITUDE, displays (**Figure 6-9**). If the attitude pitch or roll data become invalid, a red "X" and the textual annunciation of "ATTITUDE FAIL" display on the Secondary Attitude Indicator and all aircraft roll, pitch, and slip information is removed from the Attitude Indicator display (**Figure 6-10**). Use alternate, mechanical, flight instruments and reset the AHRS as soon as possible.

Figure 6-9
Attitude Degraded Performance

Figure 6-10
Attitude Failure

Reset EFD1000 ADAHRS

1. ATTITUDE ..... MAINTAIN STRAIGHT AND LEVEL FLIGHT by visual reference, or by standby instruments
2. AUTOPILOT ..... DISCONNECT
3. MENU ..... Select GENERAL SETTINGS A page
4. ADAHRS: RESET?"LINE SELECT KEY ..... PRESS (**Figure 6-11**)
5. ADAHRS: RESET? LINE SELECT KEY ..... PRESS AGAIN TO CONFIRM ADAHRS RESET (**Figure 6-12**)
6. Activate any other control to cancel the reset

The EFD1000 ADAHRS is normally stable, self-correcting, and accurate. The pilot may elect to manually reset it if pitch and roll indications disagree with the standby attitude indicator, or the ADAHRS is suspected to be inaccurate (e.g., following aerobatic maneuvers). The ADAHRS reset function is analogous to "caging" a gyroscopic attitude indicator.

NOTE

When an EFD1000 ADAHRS is manually reset in flight, it performs an abbreviated initialization that usually takes less than 30 seconds.

During the initialization, the attitude and direction information are removed and replaced with red "X"s and the annunciations, "ATTITUDE FAIL" and "DIRECTION INDICATOR FAIL" are presented.

Gentle maneuvering during the initialization is permitted.

The ADAHRS reset is considered complete when the EFD1000 attitude and heading are once again displayed and the attitude display is stable and correct with respect to other sources of attitude information.

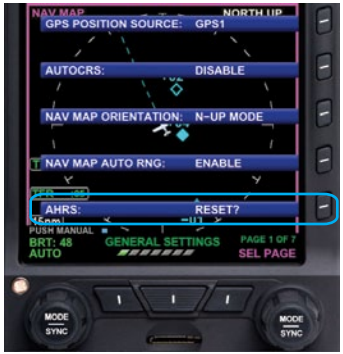


Figure 6-11
Main Menu GENERAL SETTINGS Page

Figure 6-12
AHRS Reset Menu Key

CAUTION

Relative terrain is based on the barometric altitude from the EFD1000 displays. BARO setting may not be shared between the EFD1000 displays during this Cross Link Failure condition. It is necessary to set BARO individually on both EFD1000 displays to prevent the display of erroneous relative terrain.

6.11. **EFD1000/500 Intercommunications Failure**

In the event of a "CROSS LINK FAILURE" message, verify that barometric altimeter setting information is correctly transferred between the displays. On the EFD1000 MFD, the barometric altimeter setting can only be set from the MFD REV mode.

Intercommunications Failure

1. BARO SETTING.....VERIFY

If EFD1000 Baro Setting must be set

2. EFD1000 MFD REV Button.....PRESS TO DISPLAY PFD
3. BARO SETTING.....SET

An intercommunications link exists between the EFD1000 PFD, EFD1000 MFD, and EFD500 MFD to share various information, including barometric setting, heading, airspeed and altitude information. The EFD1000 PFD and EFD1000 MFD both receive and transmit data to each other, and each also transmits data to the EFD500 MFD. The EFD500 MFD only receives data, but does so from each installed EFD1000 display.

In the event of an intercommunication failure between the EFD1000 PFD, EFD1000 MFD, or EFD500 MFD, a CROSS LINK FAILURE annunciation will be presented in the affected PFD/MFD's data bar. When this occurs, the altimeter's barometric pressure setting may not be communicated between EFDs. It will be necessary to confirm if the baro setting information is being transferred. If it is not, the pilot should manually adjust the BARO setting on the affected display. For the EFD1000 MFD, this is accomplished in the PFD Reversion Mode.

In a three display configuration it is possible for the EFD500 MFD to display this message, but still maintain synchronization. This indicates that only one of the intercommunications buses to the EFD500 has failed.

6.12. **Loss of GPS information**

Position and flight plan data for the PFD and MFD is provided from aircraft GPS equipment. The EFD displays may be configured to receive data from one or two external GPS systems. In addition, when an RSM connected to the EFD includes an emergency GPS, this information may be used if the aircraft GPS system(s) fail.

The Nav Map function in either the PFD or MFD follows an automatic position reversion scheme to determine which GPS is the position source for the map. The primary GPS is always the one selected by the pilot, either by the associated CDI nav source (PFD), or via the menus (MFD). If the selected GPS fails, the EFD automatically switches to another GPS (when installed), and will annunciate "GPS# Reversion", where # represents the GPS source providing position data.

If all external GPS systems fail, and an RSM GPS is connected to that display, the EFD will use position data from the RSM and annunciate RSM GPS REVERSION EMER USE ONLY." In this case, the map data is approved for emergency use only.

Whenever the map has reverted to an alternate position source, all map features and capabilities are retained, including the display of the flight plan from the selected GPS. However, when the GPS position source is different from the source that generated the flight plan, the flight plan is presented without showing an active (magenta) leg. The flight plan and map data from each external GPS is retained independently. If two external GPS were connected prior to, and if each had a different flight plan at the time of failure, both of these flight plans are retained and can be viewed by the pilot.

In the unlikely event that there is a complete loss of all GPS data to an MFD, including loss of the RSM GPS (if installed), the NAV Map is retained, the flight plan is removed, and the map is no longer updated with aircraft position information. An annunciation of "GPS POS FAILED" is presented in the center of the map, the airplane symbol is removed,the map changes to a North-up orientation, and the map will no longer move with the aircraft. Manual panning is still possible and all map features that are not GPS position dependent continue to remain available, including relative terrain overlays.

CAUTION

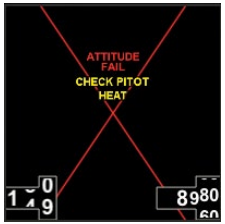
In the event of complete GPS failure, the Nav Map stops moving and orients North Up, the airplane symbol is removed and reverts to a stationary map with an accompanying "GPS POS FAILED" is annunciated. In this case, the Nav Map may be manually panned to correlate to the estimated aircraft position determined by other means.

6.13. **MFD Database Card**

Each EFD1000 MFD and EFD500 MFD includes a microSDHC (SD card, High Capacity) card slot into which a database card with terrain and Nav Map data may be inserted. The database card must remain in the EFD display as data is dynamically loaded from the microSDHC into the EFD memory during flight as the aircraft position changes.

In the event that the microSDHC database card is removed from the card slot, or communications with the card fails, the MFD will continue to operate using the last data that was loaded into memory. As the aircraft position changes, the software will attempt to access the data card to retrieve additional data for the new location. When this occurs, if the data card cannot be detected, an annunciation of "DATABASE FAILURE" is displayed at the bottom of the Nav Map. When this occurs the previously loaded data remains available, but new data information (such as roads, rivers, navaids, and detailed terrain data that has not yet been loaded into memory) will not be available to add to the navigation map.

6.14. **Warning, Caution, and Advisory Summary**

WARNINGS			Applicability		
			MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-13 Battery Countdown	 Figure 6-14 Battery Operational	Presented when the EFD is operating on the internal or Emergency Backup Battery (EBB) (as configured). The countdo replaced by the ON BAT annunciation with the battery's % charge remaining. **NOTE** *If the battery temperature is less than 0 deg C, the countdown timer will begin at 10 minutes.*	✔	✔	✔
 Figure 6-15 Attitude Fail	 Figure 6-16 Direction Indicator Fail	Presented when the EFD1000 has determined that the associated function is invalid or failed and should not be used. The data is removed from the display and replaced by a red "X" over the affected display feature. **NOTE** *Since the EFD1000 MFD only has a SAI and SHSI, only the "ATTITUDE FAIL" and DIRECTION INDICATOR FAIL" annunciations are possible.*		✔	✔

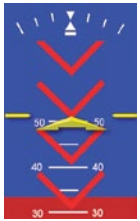
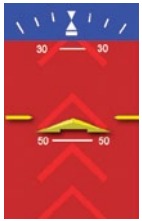
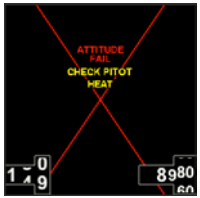
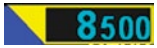
WARNINGS			Applicability		
			MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-17 Extreme Pitch Up	 Figure 6-18 Extreme Pitch Down	Red chevrons displayed on the Attitude Indicator's pitch scale to indicate extreme pitch up and down attitudes and direction to restore level flight.		✔	✔

Table 6-1 Warning Annunciations

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-19 Cross Check Attitude	Presented when the EFD1000 AHRS internal integrity monitor determines that attitude is potentially degraded. If a CROSS CHECK ATTITUDE annunciation is provided the pilot should cross check attitude, airspeed and altitude indications.		✔	✔
 Figure 6-20 ADAHRS FAIL	Amber annunciation displayed in the data bar of the EFD1000 MFD when its internal ADAHRS reports a failure (e.g. during ADAHRS Reset).		✔	
 Figure 6-21 CROSS LINK FAILURE	Amber annunciation presented in the EFD100 MFD Data Bar when it loses communication with the PFD, and in the EFD500 MFD data bar when it loses communication with either the PFD or the EFD1000 MFD.		✔	✔
 Figure 6-22 CHECK AHRS	Amber annunciation presented on the EFD1000 MFD when its internal ADAHRS reports a "CROSS CHECK ATTITUDE" condition.		✔	

CAUTION			Applicability		
			MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-23 Check Pitot Heat		Annunciation accompanies an ATTITUDE FAIL, presented when indicated airspeed is less than 30 KIAS (35 mph) and GPS groundspeed is greater than 50 kts (58 mph). This provides an indication of a potentially obstructed pitot system. This annunciation is removed when indicated airspeed is restored to ≥ 30 KIAS (35 mph), indicating that an automatic AHRS reset has begun.		✔	✔
 Figure 6-24 GPS Invalid	 Figure 6-25 RSM GPS	Presented when a configured GPS source's data is invalid or not available. GPS# or RSM REVERSION annunciations indicate the current GPS basemap source.	✔	✔	✔
 Figure 6-26 GPS Reversion	 Figure 6-27 GPS Reversion Emergency Use Only	**NOTE** *The EFD500 MFD does not offer RSM GPS Reversion. As such only GPS1 and GPS2 annunciations will display on the EFD500 MFD.*			

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-28 GPS POS Failed	Presented in the center of the NAV Map when all GPS sources have failed. When presented, the map changes to a North-up orientation and the map no longer moves with the aircraft. Manual panning is still possible and all map features that are not GPS position dependent continue to remain available, including relative terrain overlays.	✔	✔	
 Figure 6-29 GPS Integrity Flag	Presented when the GPS source coupled to the Horizontal Situation Indicator (HSI) "flags" the GPS integrity. See the GPS AFMS for more information.		✔	✔
 Figure 6-30 Minimums Caution	Presented when the aircraft is at or below the MINIMUMS altitude set by the pilot. May be accompanied by an optional one-second stuttered tone.			✔

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-31 Altitude Caution	Presented to indicate the aircraft is reaching (steady) or deviating (flashing) from the preselected altitude. May be accompanied by an optional one-second steady tone.			✔
 Figure 6-32 Decision Height Caution	Presented when a connected radio altimeter indicates it has reached the altitude set by the pilot. See the Radio Altimeter AFMS for more information.			✔

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-33 GPSS Source Lost/Changed	Presented when the previously enabled and valid GPSS source is lost or has changed.			✔
 Figure 6-34 Terrain Fail	Presented if GPS position or track is invalid or not available, altitude is invalid, or heading is invalid.	✔	✔	

CAUTION	Applicability		
	MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-35 Traffic Advisory	Presented when a Traffic Advisory is indicated and a dedicated traffic view is not currently displayed. Push the "TRFC" prompts the pilot to select lower, middle button to view a dedicated traffic display.	✔	✔	✔

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-36 TIS Traffic Unavailable  Figure 6-37 TIS Traffic Unavailable	Presented when TIS data is unavailable.	✔	✔	✔
 Figure 6-38 Traffic Removed	Presented when that indicates traffic data has not been refreshed within 6 seconds.	✔	✔	
 Figure 6-39 Traffic Sensor Failure	Presented that indicates a traffic sensor failure.	✔	✔	
 Figure 6-40 Traffic Sensor Link Lost	Presented that indicates that the link between the EFD and traffic has been lost (e.g., traffic sensor is OFF).	✔	✔	

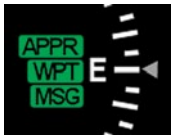
CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-41 WX-500 Self Test Failure	Presented when a lightning (spherics) sensor self-test report is not been received within 10 seconds.	✔	✔	
 Figure 6-42 WX-500 Self Test Failure	Presented for a failed lightning (spherics) sensor self-test or sensor status is a fatal fault or undefined.	✔	✔	
 Figure 6-43 WX-500 Sensor Error	Presented when the lightning (spherics) sensor has an undefined recoverable error	✔	✔	
 Figure 6-44 WX-500 Antenna Error	Presented when the lightning (spherics) sensor has a recoverable antenna error	✔	✔	

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-45 WX-500 Inhibit Line Error	Presented when the lightning (spherics) sensor has a recoverable inhibit line stuck microphone error	✔	✔	
 Figure 6-46 WX-500 Antenna Jumped Error	Presented when the lightning (spherics) sensor has a recoverable changed antenna jumper error.	✔	✔	
 Figure 6-47 WX-500 Heading Invalid Error	Presented when the lightning (spherics) sensor has lost heading reference and, therefore, a removal of lightning (spherics) sensor data.	✔	✔	
 Figure 6-48 WX-500 Link Error	Presented when the lightning (spherics) sensor is enabled and no data is detected	✔	✔	

CAUTION		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-49 Datalink Weather Data Error	Datalink weather product data not received for 30 seconds after an error is detected. **NOTE** *Some weather product pages have a different label.*	✔	✔	✔
 Figure 6-50 Free Gyro Mode				✔
 Figure 6-51 Battery Failed		✔	✔	✔

Table 6-2 Caution Annunciations

ADVISORY		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-52 REV Button Off	Presented when the EFD500 MFD's "REV" button is pressed.	✔		
 Figure 6-53 REV Button Off	Presented when the EFD1000 MFD's "REV" button is pressed and held when operating as a MFD.		✔	✔
 Figure 6-54 GPSS On	Presented when GPSS is enabled and the GPS source is valid. Either "GPSS1" or "GPSS2" may be annunciated, depending on selection and the number of configured GPS navigators. This also indicates the autopilot heading source. **NOTE** *GPSS will always reflect the GPS basemap in the lower display and follow its source.*			✔

ADVISORY		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-55 GPS Annunciations	Associated with the GPS coupled to the HSI or Secondary HSI. See the GPS AFMS for more information.		✔	✔
 Figure 6-56 Traffic Enabled	Indicates the traffic sensor is enabled	✔	✔	✔
 Figure 6-57 Traffic Sensor Standby	Indicates the traffic sensor is in standby.	✔	✔	
 Figure 6-58 Traffic Sensor Self-Test	Indicates the traffic sensor is in the self-test mode.	✔	✔	

ADVISORY		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-59 Traffic Data Older Than Six Seconds	Indicates the traffic data has not been refreshed within 6 seconds.	✔	✔	
 Figure 6-60 WX-500 Strike Rate	Lightning (spherics) Strike display mode selected. The rate indicates the approximate number of lightning strikes detected per minute.	✔	✔	✔
 Figure 6-61 WX-500 Cell Rate	Lightning (spherics) Cell clustering display mode selected. The rate indicates the approximate number of lightning strikes detected per minute.	✔	✔	✔
 Figure 6-62 WX-500 Self-Test	Self-test mode annunciation that replaces lightning (spherics) Strike / Cell rate information.	✔	✔	✔
 Figure 6-63 WX-500 Self-Test	Lightning (spherics) Self-test mode selected.	✔	✔	

ADVISORY		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-64 Datalink Weather Product Data Age	Data age presented for all Data Link Weather products when the XM receiver is operational. Elapsed time is expressed in minutes (e.g., :05). **NOTE** *Some weather product pages have a different label.*	✔	✔	✔
 Figure 6-65 Data Invalid or Unavailable	A horizontal red line through any legend indicates that the data is invalid or unavailable.	✔	✔	✔
 Figure 6-66 Source Invalid or Unavailable	A horizontal red line through the selected navigation source indicates that the data is invalid or unavailable. HSI and SHSI only.			✔
 Figure 6-67 GPSS Off	Grey annunciation that indicates that GPSS is disabled.			✔

ADVISORY		Applicability		
		MFD 500	MFD 1000	MFD 1000 (REV)
 Figure 6-68 Database Failure	Annunciation presented at the bottom center of the Nav Map if the software is unable to access the data base stored to the microSDHC memory card	✔	✔	
 Figure 6-69 Loading Airways	Annunciation presented at the bottom center of the Nav Map when data is being loaded from the micro SD card at start up. The current data type and total number of data types to be loaded is identified (i.e. "11/11"), along with an indication of the type of data that is currently being loaded (i.e. "AIRWAYS")	✔	✔	

Table 6-3 Advisory Annunciations

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Chapter 7
Appendices

7.1. **Jeppesen Data**

The Jeppesen data includes the following elements: NavData®, Obstacles, Cultural, and Terrain as outlined in **Table 7-1**. All data types will be pre-loaded onto the micro SD card that is shipped with the unit[1]. NavData, Obstacle, and Cultural data are combined and presented as a single update file which is delivered via JSUM every 28 days (www.jeppesen.com/jsum/download).

Activate Jeppesen Data Service

1. Register your Aspen product at www.aspenavionics.com/customerport.
2. It is important for the customer to fill out the "Service Activation Date" field of the online form as accurately as possible. This is the date Jeppesen will use to begin the service. Resets will be handled on a case by case basis.
3. Customers will receive a confirmation email from Jeppesen indicating service activation as well as an automatic renewal option for continuing the data service.

NOTE

*If this is your first visit to the Aspen Avionics Customer Port, click the **Register** button on the login screen to register all your Aspen products and gain access to the Aspen Customer Port. If you have previously registered an EFD1000 PFD, and have a login and password, please login to the Customer Port and use the **Register Your Product** link on the sidebar to register additional Aspen Products.*

Data Type	Description
NavData®	Enroute, SID, STAR and Terminal approach procedure information, Airports, Runways, Frequencies, Waypoints, Navaids, Controlled Airspace, Restricted Airspace.
Obstacle data	Depiction of the location and height of man-made obstacles that extend above the ground.
Cultural data	Contains boundary and reference information for countries, other major political subdivisions, large water bodies, coastlines, time zones, and other physical and political features.
Terrain data	Data that depicts the contours and shapes of the surface of the earth. The primary source for Jeppesen terrain is the SRTM Shuttle Radar Topography Mission terrain database.

Table 7-1 Jeppesen Data Types

1. Customers may purchase a terrain card from Jeppesen if they lose a card or wish to have a backup card.

If you lose your microSDHC card or would like to have an extra one, contact Jeppesen directly to purchase an additional or replacement terrain card. Jeppesen Customer Service: 1-800-621-5377 or email captain@jeppesen.com

7.1.1. **Jeppesen Technical Support**

For questions and troubleshooting on installing and/or using the JSUM application and loading data from JSUM to the micro SD card, contact Jeppesen Technical Support. This team can also direct your call if you have questions about the content of your Jeppesen data.

800-732-2800 or 303-328-4587 (24/7)
pctechsupport@jeppesen.com (24/7)
Live Chat (Mon-Fri 8am-4pm MST)
www.jeppesen.com > Support > Technical Support

For questions about Customer accounts, username/passwords, other Jeppesen products and services contact Jeppesen Customer Service.

800-621-5377 or 303-799-9090
captain@jeppesen.com

For questions about Evolution Flight Display functionality, contact Aspen Avionics.

salessupport@aspenavionics.com
505-856-5034

7.2. **XM Weather Receiver Activation**

An Evolution Weather Receiver (or equivalent) and subscription to XM WX Satellite Radio Service is required for display of the EFD1000/500 MFD Weather Products. If the EFD1000/500 MFD is installed with a weather receiver, when the EFD1000/500 MFD is turned on for the first time an annunciation will display alerting you that the XM WX Satellite Radio Service is not yet activated.

To activate the XM WX Satellite Radio Service contact XM WX Satellite Radio through the e-mail address listed on their web site (www.xmradio.com) or by the customer service phone number listed on the web site (1-800-985-9200). Follow the instructions provided by XM Satellite Radio services.

You will need the XM Serial Number found on the XM RECEIVER page of the Main Menu.

View the XM Serial Number

1. Push the MENU Button. The Main Menu displays adjacent to the Hot Keys.
2. Navigate to the XM RECEIVER menu page (**Figure 7-1**).
3. Note the number.
4. Push the MENU Button to exit the Main Menu.

Figure 7-1
XM RECIEVER Main Menu Page

7.3. **Specifications**

7.3.1. **EFD Display Unit**

GENERAL SPECIFICATIONS:		
Width	3.50 in. (Measured at Bezel)	
Height	7.00 in. (Measured at Bezel)	
Can Depth	4.15 in. (Rear of Bezel to Rear of Can)	
Overall Depth	6.35 in. (Knob to Rear Pressure Fitting)	
Weight	EFD1000	2.9 lbs (with Mounting Bracket)
	EFD500	2.6 lbs (with Mounting Bracket)
Display Type	6.0 in. Diagonal TFT Active Matrix LCD (400x760)	
Display Colors	32,768	
Face	Anti-Reflective Coated Glass	
Backlight	High Intensity White LED	
Rotary Knobs	Optical Encoder with Momentary Push	
Dimming	Manual & Automatic (Front Bezel Mounted Sensor)	
OPERATIONAL SPECIFICATIONS:		
Operating Temp	-20°C to +55°C	
Storage Temp	-55°C to +85°C	
Max Un-Pressurized Operating Altitude	35,000 ft	
Max Pressurized Operating Altitude	55,000 ft	
Cooling	Integral Fan	
Max Humidity	95% at 50°C	
Input Voltage	+8 to +32 Volts DC	
Max Current	2.4 Amps @ 28 VDC	
	4.8 Amps @ 14 VDC	
I/O SPECIFICATIONS:		
ARINC 429 Inputs	5	
ARINC 429 Outputs	1	
RS-232 Inputs	5	
RS-232 Outputs	3	
Pitot / Static	Quick Connect	
CERTIFICATION SPECIFICATIONS:		
Technical Standard Order	TSO-C2d	Airspeed Instruments [1]
	TSO-C3d	Turn and Slip Instrument [1]
	TSO-C4c	Bank and Pitch Instruments [1]
	TSO-C6d	Direction Instrument Magnetic (Gyroscopically Stabilized) [1]
	TSO-C8d	Vertical Velocity Instrument (Rate of Climb) [1]
	TSO-C10b	Altitude Pressure Activated Sensitive Type [1]
	TSO-C106	Air Data Computer [1]
	TSO-C113	Airborne Multipurpose Electronic Displays
Software	RTCA DO-178B Level C	
Environmental	RTCA DO-160E	
Categories	See Environmental Qualification Sheet found in the installation manual.	

Table 7-2 EFD1000 Display Unit Specifications

1. EFD1000 MFD Only.

7.3.2. **Remote Sensor Module (RSM)** [1]

Width	2.65 in.
Length	4.40 in
Height	1.00 in.
Weight	0.2 lbs
Input Voltage	Provided by EFD1000
Max Current	Included in EFD1000 Current

Table 7-3 Remote Sensor Module (RSM) Specifications

7.3.3. **Analog Converter Unit (ACU)**

Width	5.75 in. (including mounting flange)
Length	4.30 in. (including connector)
Height	1.60 in. (including mounting flange)
Weight	0.8 lbs
Input Voltage	+10 to +32 Volts DC
Max Current	0.5 Amps @ 28 VDC 1.0 Amps @ 14 VDC
Interfaces	ARINC-429 and RS-232

Table 7-4 Analog Converter Unit (ACU) Specifications

7.3.4. **Operational**

Airspeed Range	Minimum displayed airspeed	20 KIAS
	Maximum displayed airspeed	999 KIAS
Altitude Range	Minimum displayed altitude	-1,500 ft MSL
	Maximum displayed altitude	60,000 ft MSL
Vertical Speed Range	Maximum displayed vertical speed rates (tape)	+/-2,000 fpm
	Maximum displayed vertical speed rates (numerical value)	+/- 9,990 fpm
Turn Rate	Maximum displayed turn rate	4.5 °/second
Barometric Pressure Correction Range	28.10 to 30.99 InHg (946 to 1049 mB)	
Internal Battery	Minimum operating time while on internal battery	30 minutes

Table 7-5 Operational Specifications

1. EFD1000 MFD Only.

7.3.5. **Emergency Backup Battery** [1]

Width	3.6 in. (Widest Point on Mounting Clips)
Height	1.7 in.
Length	8.52 in. (Rear of Mounting Tray to Connector)
Weight	2.25 lbs (with Mounting Bracket)
Operating Temp	-20°C to +55°C
Storage Temp	-55°C to +85°C
Max Un-Pressurized Operating Altitude	35,000 ft
Max Pressurized Operating Altitude	55,000 ft
Cooling	None Required
Max Humidity	95% at 50°C
Input Voltage	Powered by EFD1000
Nominal current	Powered by EFD1000

Table 7-6 Emergency Backup Battery Specifications

1. EFD1000 MFD Only.

7.4. **Warnings, Cautions, Notes**

WARNING

This manual assumes that the reader is an appropriately certified pilot. To reduce the risk of unsafe operation, carefully review and understand all aspects of this Pilot's Guide. Aspen Avionics highly recommends learning how to operate the EFD1000/500 MFD on the ground and under VFR conditions to become completely familiar with the product. Always compare indications from the EFD1000/500 MFD with all available navigation sources, including any information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, resolve discrepancies before continuing navigation. If you have any questions, please contact Aspen Avionics at (888) 992-7736 before flying with the EFD1000/500 MFD under IFR conditions.

WARNING

Every effort has been made to ensure that the EFD1000/500 MFD operates at the highest degree of functional integrity. However, it is the pilot's responsibility to cross-check data displayed on the EFD1000/500 MFD with all other redundant or correlated information available. This includes other flight instruments and current charts.

WARNING

Do not rely on the navigation data of the EFD1000/500 MFD Navigation VIEW as the primary reference for navigation. The EFD1000/500 MFD Navigation VIEW is intended to be a supplement to other approved navigation data sources, and enhance the pilot's overall situational awareness. The EFD1000/500 MFD Navigation VIEW is a situational awareness aid. The navigation databases must be updated on a regular basis to ensure the best possible accuracy; do not use outdated database information.

WARNING

Use the EFD1000/500 MFD Terrain VIEW, and the displayed terrain and obstruction indicators, for advisory purposes only. The EFD1000/500 MFD Terrain VIEW is never to be used as a primary reference for terrain avoidance. It is the pilot's responsibility to be aware of surroundings during flight. Terrain data is obtained from third party sources. Aspen does not independently verify accuracy of third party data.

WARNING

Transmission of data to the EFD1000/500 MFD XM WX Satellite Weather VIEW will have some delay from real time to the EFD1000/500 MFD display. Use the XM WX Satellite Weather VIEW and Stormscope® WX-500 VIEW displayed information for long-range planning purposes only, not for short-range avoidance. Do not use the information provided on the EFD1000/500 MFD to penetrate weather, thunderstorms, cells or lines of cells. Always avoid severe weather as advised by both the FAA Advisory Circular, Subject: Thunderstorms, and the Airman's Information Manual (AIM) "by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."

WARNING

The XM WX service is not for "safety for life," but is merely supplemental and advisory in nature, and therefore cannot be relied upon as safety-critical in connection with any aircraft or other usage. XM is not responsible for accidents resulting from or associated with use of the XM WX Service.

WARNING

The EFD1000/500 MFD navigation maps are not a replacement for required charts and other navigation data required for flight.

WARNING

The EFD1000/500 MFD Traffic VIEW provides traffic information as an aid to assist visually acquiring traffic. Maneuver the aircraft based only upon ATC guidance or positive visual acquisition of conflicting traffic.

WARNING

GPS receivers calculate altitude as the height above Mean Sea Level which may have a significant variation from actual altitude. GPS altitude should never be used for vertical navigation; always use pressure altitude.

CAUTION

There are no pilot-serviceable parts on the EFD1000/500 MFD. Only Aspen Avionics Authorized Dealers can make repairs on the EFD1000/500 MFD. Unauthorized repairs or modifications could void the warranty, certification, and the pilot's authority to operate this device under FAA/FCC regulations.

CAUTION

The EFD1000/500 MFD displays use an LCD display that is susceptible to scratches, skin oils, and abrasive cleaners. Do not use cleaners containing ammonia (window cleaners). See the Chapter 4 section Cleaning the Display Screen for detailed information about cleaning the EFD1000/500 MFD display.

NOTE

This guide is written as if all available sensors and software options are installed in your aircraft. The figures and descriptions may differ slightly from your aircraft depending on options, receivers, and equipment installed. The images and screen shots in this guide are for reference only and are as accurate as possible at the time this manual was published.

NOTE

Consult all Aircraft Flight Manual Supplements (AFMS) provided by the aircraft manufacturer and/or installed sensors prior to operation of the EFD1000/500 MFD. The AFMS has information specific to your installation and may contain operating limitations applicable to your aircraft configuration.

7.5. **Symbology**

Navaids	
Active Waypoint	
Active Leg	
Other Waypoint	
Other Leg	
VOR	
VORTAC or VOR/DME	
DME or TACAN	
NBD	
INT	

Figure 7-2
NAVAID Symbols

Airports [1,2]	
Control Tower	
No Control Tower	

Figure 7-3
Airport Symbols

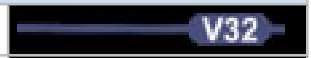
Airways	
LO	
HI	

Figure 7-4
Airway Symbols

Declutter	
High	
Med-High	
Med-Low	
Low	
Off	

Figure 7-5
Declutter Symbols

1. Blue symbols represent an airport with a control tower. Magenta symbols represent an airport without a control tower.
2. Airport Icons will display as a scaled runway image when the range scale is reduced to a value where the scaled runway image would be larger than the airport icon image.

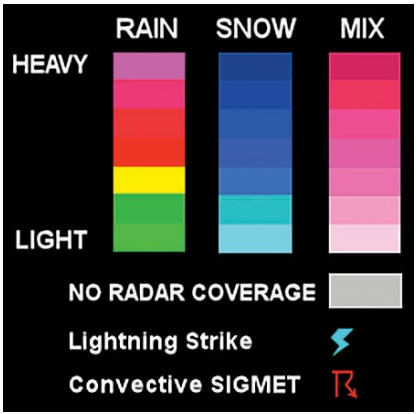


Figure 7-6
NEXRAD Legend

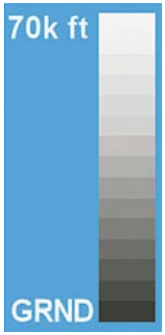


Figure 7-8
Echo Tops Legend

Figure 7-7
METAR Legend

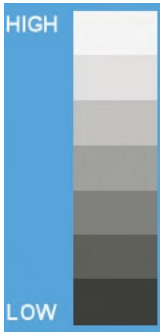


Figure 7-9
Cloud Tops Legend

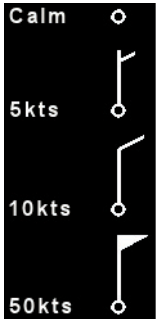


Figure 7-10
Winds Aloft Legend

AIRMET/SIGMET	
ICING AIRMET	
ICING SIGMET	
Turbulence AIRMET	
Surface Winds AIRMET	WINDS
Turbulence SIGMET	
IFR AIRMET	IFR
Mtn. Obscr. AIRMET	MTOS
Dust storms SIGMET	DUST
Sandstorms SIGMET	SAND
Volcanic Ash SIGMET	ASH
Convective SIGMET	
Unknown AIRMET	UNKN
Unknown SIGMET	UNKN

Figure 7-11
AIRMET/SIGMET Symbology

Terrain	
Terrain Height	**Color Code**
100' below and higher	RED
100' - 500' below	YELLOW
500' - 1500' below	DARK GREEN
1500' - 2500' below	LIGHT GREEN
More than 2500' below	BLACK
Data unavailable	CYAN

Figure 7-12
Dedicated Terrain Colors

Terrain Overlay	
Terrain Height	**Color Code**
100' Below - ≥1500' Above	RED
500' - 100' Below	YELLOW

Figure 7-13
Terrain Overlay Colors

Relative Altitude	Obstruction Type		
	Small Tower (<1000' AGL)	Tall Tower (>1000' AGL)	Group Obstructions
At and above			
Within 500' below			

Figure 7-14
Obstruction Symbols

7.6. **Glossary**

Accuracy	Estimated position accuracy in feet or meters.
A/D	Analog to Digital
AC	Alternating Current
ACU	Analog Converter Unit
ADC	Air Data Computer
ADI	Attitude Director Indicator
ADIZ	Air Defense Identification Zone
AFMS	Airplane Flight Manual Supplement
AGL	Above Ground Level
AHRS	Attitude Heading Reference System
AI	Attitude Indicator
AIM	Aeronautical Information Manual
AIRMET	Airman's Meteorological Information
Altitude	Elevation above sea level.
APPR	Approach
APT	airport
ARC	Partial heading arc format (100°)
ARINC	Aeronautical Radio Inc.
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
AWOS	Automated Weather Observing System
Back Course	Localizer back course approach where the signal on the back side of the localizer is used for alignment to the runway opposite of normal localizer alignment. Without compensation the CDI would reverse sense.
Battery Time	The time remaining on the battery before it is fully discharged.
BC	Back Course
Bearing	The compass direction from the current position to the destination.
BP	Bearing Pointer
Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
CDI	Course Deviation Indicator
CFR	Code of Federal Regulations
CM	Configuration Module
COM	communication radio
Course	The route taken from the starting position to destination.
Course to Steer	The recommended direction to steer in order to reduce cross-track error and return to the course line.
Cross Track	The perpendicular distance, left or right, away from the selected course.
Crosstrack Error	The distance the aircraft is off the desired course

CRS	Course
CTS	Course to Steer
dBZ	decibels 'Z' (radar return)
DC	Direct Current
Decision Height	A specified height or altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been acquired. This allows the pilot sufficient time to safely reconfigure the aircraft to climb and execute the missed approach procedures while avoiding terrain and obstacles.
Declutter	Reduce amount of objects displayed on screen.
deg	degree
Desired Track	The desired course between the active "from" and "to" waypoints.
DH	Decision Height
Distance (Next)	The great circle distance from current location to a Go To destination, or the final waypoint in a route.
DME	Distance Measuring Equipment
DTK	Desired Track
EFD	Evolution Flight Display
EFIS	Electronic Flight Instrument System
Elevation	The height above mean sea level.
Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan.
ETA (Destination)	Estimated Time of Arrival. The estimated time you will reach a Go To destination, or the final waypoint in a route.
ETA (Next)	Estimated Time of Arrival. The estimated time you will reach a Go To destination, or the next waypoint in a route.
ETE (Destination)	Estimated Time En route. The estimated time required to reach a Go To destination, or the final waypoint in a route
ETE (Next)	Estimated Time En route. The estimated time required to reach a Go To destination, or the next waypoint in a route.
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FD	Flight Director
Flight Timer	The length of time for the current flight.
Fpm	Feet Per Minute
ft	Feet
Fuel Timer	The fuel required to travel from current location to the indicated route waypoint.
Glide Ratio, G/R	The estimated distance an aircraft will move forward for any given amount of lost altitude.

GPS	Global Positioning System
GPSS	GPS Steering
Ground Track	see Track
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.
GS	Glide Slope or Ground Speed
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.
Hg	Mercury
HSI	Horizontal Situation Indicator
Hz	Hertz (frequency)
IAF	Initial Approach Fix
IAS	Indicated Air Speed
IAT	Indicated Air Temperature
IFR	Instrument Fight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
in Hg	Inches of Mercury
Indicated	Information provided by properly calibrated and set instruments on the aircraft panel.
IOP	Input/Output Processor
kHz	Kilohertz
KIAS	Knots Indicated Air Speed
km	kilometer
kts	Knots
LAT	Latitude
LCD	Liquid Crystal Display
LDI	Lateral Deviation Indicator
Leg	The portion of a flight plan between two waypoints.
LOC	Localizer
MAP	Main Application Processor
METAR	Aviation Routine Weather Report
MFD	Multi-Function Display
MHz	megahertz
Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
MOA	Military Operations Area
MSA	Minimum Safe Altitude
MSG	Message
MSL	Mean Sea Level
NAVAID	Navigation Aid
NDB	Non-Directional Beacon
NEXRAD	Next Generation Radar
nm	Nautical Miles

NRST	Nearest
OAT	Outside Air Temperature
OBS	Omni-Bearing Selector
ºC	Degrees Celsius
ºF	Degrees Fahrenheit
PFD	Primary Flight Display
RMI	Radio Magnetic Indicator
RSM	Remote Sensor Module
RSS	Roll Sum Steering
SBAS	Satellite-Based Augmentation System
SD	Secure Digital
SIGMET	Significant Meteorological Information
TA	Traffic Advisory
TACAN	Tactical Air Navigation System
TAF	Terminal Aerodrome Forecast
TAS	True Air Speed
TCAS	Traffic Collision Avoidance System
TERM	Terminal Mode
TERR	Terrain
TFR	Temporary Flight Restriction
TIS	Traffic Information System
Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'
TRSA	Terminal Radar Service Area
Vac	Volts, alternating current
VDC	Volts, direct current
VDI	Vertical Deviation Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VLOC	VOR/Localizer
VOR	VHF Omni-Directional Radio Range
VORTAC	Very High Frequency Omni-Directional Radio range station and tactical air navigation
VSI	Vertical Speed Indicator
VSR	Vertical Speed Required
VTF	vector to final
WAAS	Wide Area Augmentation System
WPT	Waypoint
WX	Weather

7.7. **Index**

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