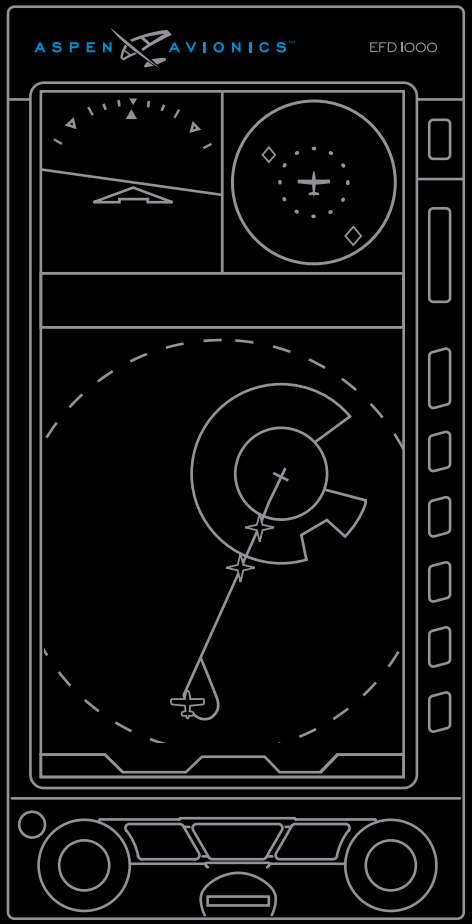
EVOLUTION
FLIGHT DISPLAY

EFD1000/500 MAX MFD
Pilot's Guide

ASPEN AVIONICS™



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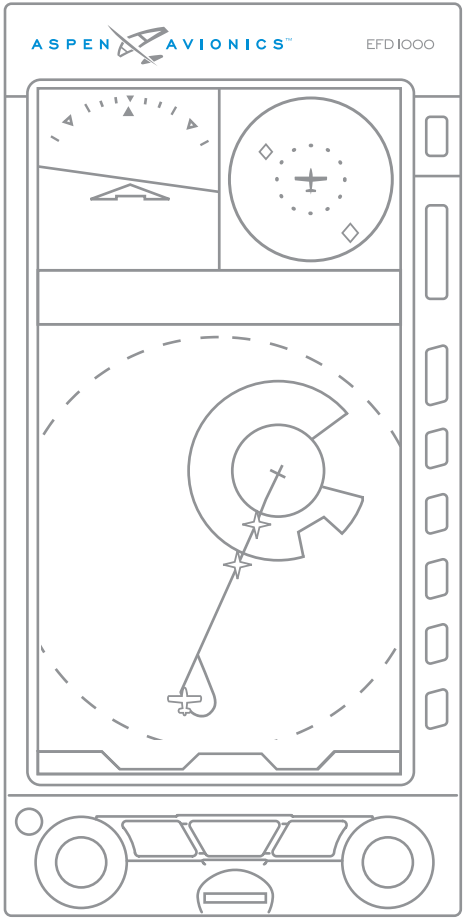

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Approvals

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

C2D, C3D, C4C, C6D, C8D, C10B, C106, C113, C165, C157 (Incomplete), C195a (Incomplete), C198 (Incomplete)

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 MAX MFD) and Evolution Flight Display 500 Multifunction Flight Display (EFD500 MAX 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 MAX MFD in a type-certificated aircraft must be performed in accordance with the latest revision of the Aspen Avionics EFD1000/500 MAX MFD Installation Manual, document number 900-00003-001.

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Covered Functionality

This guide covers all the functionality available in the EFD1000 MAX MFD and EFD500 MAX MFD. The EFD500 MAX MFD does not include an AHRS and ADC sensor, Secondary HSI, and does not support Reversionary mode. See Aspen Avionics document number 091 00005 002 () *EFD1000 MAX PFD Pilot's Guide* for complete instructions on the EFD1000 PFD.

Warnings, Cautions, and Notes

Where applicable; warnings, cautions, and notes are given. Aspen Avionics uses the icons and definitions described in **Table 1**.

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 1 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.

Pilot Familiarity

While the Evolution Flight Display System 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 get some dual instruction from an experienced instrument CFI, and spend some time becoming familiar with the display 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.

Chapter 1

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 EFD1000/500 MAX 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 MAX PFD and EFD500 MAX 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 E5 Electronic Flight Instrument, Pro and Pro Plus—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 00086 002 () *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 MAX 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 MAX MFD, when configured as a PFD includes all of the features and functions of the EFD1000 Pro MAX PFD.

You can add another MFD, an EFD500 MAX 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.

NOTE

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

1.1 System Overview

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 MAX MFD system typically consists of the following pieces of hardware:

- EFD1000 MAX display unit (MFD)
- Remote Sensor Module (RSM)
- Configuration Module (CM)
- Emergency Backup Battery (optional) or Extended Duration (internal) battery configurations
- microSDHC Card

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

- EFD500 MAX display unit
- Configuration Module (CM)
- microSDHC Card

1.1.1 **EFD1000/500 MAX Display**

The EFD1000/500 MAX 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 MAX 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**):

- 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 MAX MFD only).
- 44-pin D-sub connector for electrical connections to the EFD1000/500 MAX.
- A cooling fan, to cool the electronics and LCD backlights.

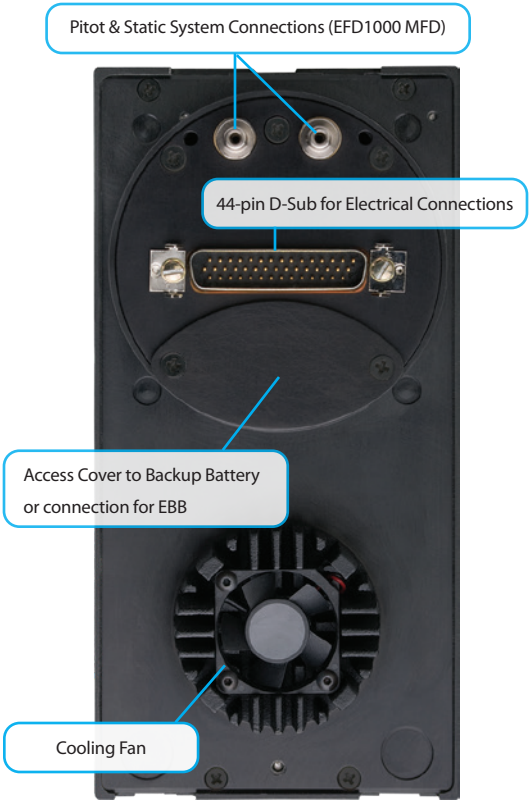


Figure 1-5
EFD1000/500 MAX MFD Rear Connections

Figure 1-6
Remote Sensor Module (RSM)

1.1.2 **Remote Sensor Module (RSM)** (EFD1000 MAX MFD only)

The Remote Sensor Module (RSM) is an integral part of the EFD1000 MAX 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**).

The RSM contains the following sub-systems:

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

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

1.1.3 **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

1.1.4 **Analog Converter Unit (ACU)** - optional

The optional ACU enables the all-digital EFD1000/500 MAX 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 MAX 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.

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

Figure 1-9
Micro Secure Data (SD) Card

1.1.5 **microSDHC Card**

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

For basic flight operations an SD card is required for Terrain, Obstruction, and Navigation database storage.

NOTE

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

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

This Pilot's Guide covers the EFD1000 MAX and EFD500 MAX 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 MAX MFD is configured alongside a PFD, the EFD1000 MAX MFD supports a reversionary mode which allows the EFD1000 MAX MFD to revert to a fully functional PFD. There is constant communication between the PFD and EFD1000 MAX MFD which provides cross communication of the barometric pressure.

NOTE

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

2.1 Navigation Map

The EFD1000/500 MAX 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 and Menu selections, including Airways, Traffic, Terrain, Selected Altitude Intercept Arc, Runway Centerline Extensions(for last waypoint in the active flight plan), Lightning and Spherics information, and data link weather.

Figure 2-1
Navigation Map Showing
VFR Style Map

Figure 2-2
Dedicated Terrain Display

2.2 **Terrain and Obstructions**

The EFD1000/500 MAX 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. When an altitude is set on the PFD the corresponding Altitude Intercept Arc will be displayed on the Dedicated Terrain view during both climbs and descents (**Figure 2-2**).

2.3 **Traffic**

The EFD1000/500 MAX MFD will support Traffic Awareness (**Figure 2-3**) when your aircraft is equipped with as TCAS-I, TAS, or TIS-B (ADS-B in) Receiver.

The MFD displays ADS-B traffic prioritized in the order received from the TAS or ADS-B receiver. The system displays multiple advisory levels: Traffic Advisory with and without direction, Basic "Other" Traffic with and without direction, and Proximity Advisory with and without direction.

The Traffic display is capable of displaying up to a maximum of 31 traffic symbols for high traffic areas. The system always displays the highest priority traffic symbols when a new traffic message is received.

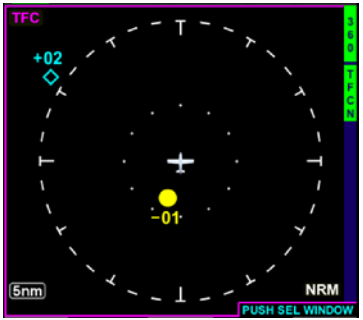


Figure 2-3
Dedicated Traffic Display

Integration with TCAD/TAS/TCAS/ Traffic System

Certain ADS-B systems can be integrated with an active traffic system such as TCAS I, TAS, or TCAD. When an active traffic system is integrated with the ADS-B system, targets from both the active traffic system and the ADS-B system are received and displayed on the EFDs without any duplication to provide the most accurate traffic.

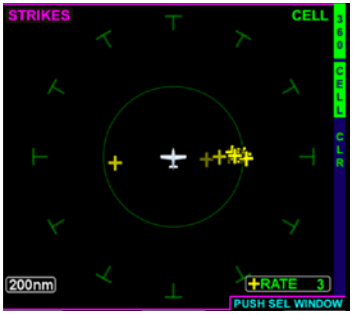


Figure 2-4
Stormscope® WX-500 Display

2.4 **Stormscope® WX-500**

If a Stormscope® WX-500 receiver is installed, the EFD1000/500 MAX MFD can be configured as the Stormscope® WX-500 control head or as a slaved display head (**Figure 2-4**). When the MFD is configured as the control head the MFD will support Operator Initiated Self Test function.

2.5 **Charts**

The EFD1000/500 MAX MFD CHARTS VIEW (**Figure 2-5**) contains a pilot selectable list of Airport Diagrams (APD), Take-Off and Alternate Minimums, Departures Procedures (DPs), Standard Instrument Arrivals (STARs) and Instrument Approach Procedures (IAPs) for all airports within the Seattle Avionics' subscription based database. APDs and IAPs can be georefenced (Ownship) for better situational awareness while taxiing or flying the approach. Some STARs and DPs are also capable of displaying ownship. Pilots can select between DAY and NITE viewing. A timer (TMR) feature is available on all IAPs to aid in timing on non-precision approaches.

See Section 7.2 for information on how to set up your Seattle Avionics account and getting three free months of Charts.

Figure 2-5
Charts View

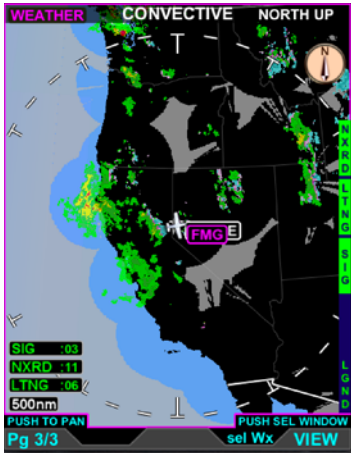


Figure 2-6
XM WX Satellite Weather Display

2.6 **Weather**

Weather provides information for the continental United States, its coastal regions, portions of Alaska, Hawaii, Puerto Rico and Guam (**Figure 2-6**). Situational awareness is provided through graphical and textual weather when equipped with either an ADS-B In Receiver or the legacy EWR50 XM Receiver. Some of the information available includes:

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

Additional ADS-B weather products may be added in future SW updates

2.7 **Evolution Synthetic Vision**

The Evolution Synthetic Vision (ESV) option (**Figure 2-7**), provides a real-time, computer-generated 3D view of terrain, obstacles, and traffic for the utmost in pilot situational awareness. ESV uses 9 arc-second and 3 arc-second resolution terrain data to render the Synthetic Vision VIEW. ESV may be presented on any of the window configurations – Full Screen, Split Screen, or Thumbnail LAYOUT.

ESV also has a field of view option, narrow or wide, which allows you to toggle to the view that best suits the phase of flight. The wide field of view is suited for enroute, while the narrow field of view is best for zooming in on the approach environment.

ESV's features include: Flight Path Marker symbology that graphically depicts the lateral GPS track and vertical speed of the aircraft, a Distance Marker to assist in estimating the distance to a point ahead of the aircraft, and a Terrain Warning System (TWS) that provides visual, audio, and text warning annunciations when the system predicts a collision with terrain or an obstacle.

Figure 2-7
Evolution Synthetic Vision Display

Figure 2-8
Timers Display

2.8 **Timers**

The EFD1000/500 MAX MFD TIMERS VIEW (**Figure 2-8**) contains three pilot editable timers that can be set as TIMER, LEG TIMER or FUEL TIMER. Timers can be set to count up or down. When set to count down the pilot will get both a visual and audio warning that a timer has expired. The FLIGHT TIMER starts while the aircraft is on the takeoff roll without any pilot interaction and stops on the landing roll-out so the the pilot has an accurate flight time for logbook entries. The DEPARTURE TIME sets the departure time in Zulu when the flight timer starts for later reference.

2.9 **Angle of Attack (AoA)**

Aspen's Evolution Angle of Attack (**Figure 2-9**) can be displayed on the EFD 1000/500 MFD's. The EFD 1000 MFD Display calculates and displays AOA if the optional feature has been unlocked. To operate properly the AOA function must calibrated during installation.

The Evolution 500 MFD receives AOA from the PFD or the MFD 1000 and displays it on the PAGE and window views selected. Since the MFD 500 is not calculating AOA it will not need to be calibrated.

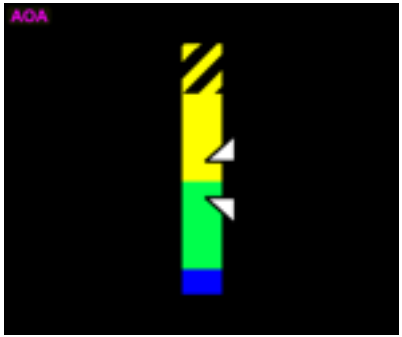


Figure 2-9
Angle of Attack Display

NOTE

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

Figure 2-10
Secondary Attitude Indicator VIEW

Figure 2-11
Secondary HSI VIEW

2.10 **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 2-10**).

2.11 **Secondary Horizontal Situation Indicator**

The Secondary HSI VIEW provides a secondary display of the Direction Indicator and Course Direction Indicator (CDI) (**Figure 2-11**).

2.12 **Manual Reversionary Mode**

When the EFD1000 MAX 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 2-12**). Pressing the REV Button again will return the unit to the EFD1000 MFD operation (**Figure 2-13**). When operating as an EFD1000 MAX PFD, the system performance and operation are the same as the PFD, except the EFD1000 MAX 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.

Figure 2-12
Revert the EFD1000/500 MAX MFD to EFD1000 Pro MAX PFD Operation

Figure 2-13
Switch Back to MFD Operating Mode

NOTE

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

NOTE

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

Chapter 3

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

Figure 3-1
Actual view of EFD1000 MAX 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
20	Lower Split Screen Window
21	Upper Left Thumbnail Window
22	Upper Right Thumbnail Window
23	Lower Thumbnail Window
24	VIEW Name
25	Orientation
26	Terrain AGL, Traffic filter, Strikes Rate
27	Select Weather Label (Weather VIEW only)
28	Right Knob Label
29	Lower Right Button Label
30	Lower Center Button Label
31	Lower Left Button Label
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 MAX MFD Display Components

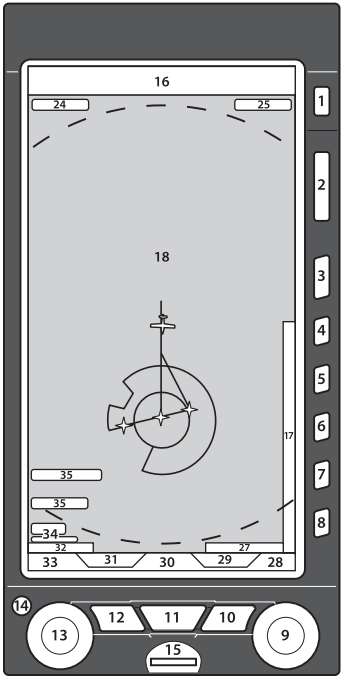


Figure 3-2
Full Screen LAYOUT

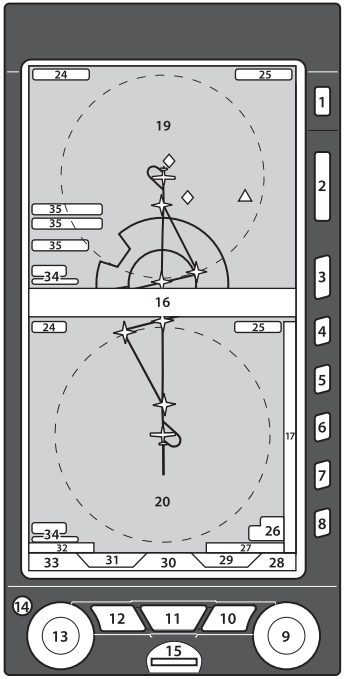


Figure 3-3
Split Screen LAYOUT

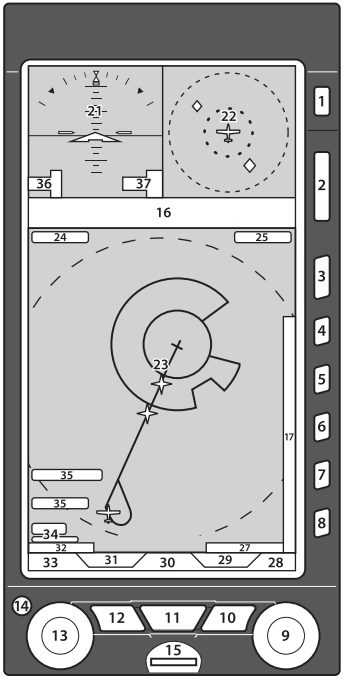


Figure 3-4
Thumbnail Screen LAYOUT

3.1 **Color Philosophy**

Table 3-2 provides an overview of the color convention used on the EFD1000/500 MAX MFD display.

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 3-2 Color Convention

3.2 **Display Pages**

The EFD1000/500 MAX 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 3.2.1 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 can be displayed in the Full Screen LAYOUT WINDOW

- Navigation Map (NAV MAP)
- Terrain (TERR)
- Traffic (TFC) WX-500 (STRIKES)
- Charts (CHARTS)
- Weather (WEATHER)
- Synthetic Vision (SYNTHETIC VISION),
- Timers (TIMER)

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

NOTE

Only a subset of these views may be display depending upon the installation settings and Unlocked Features.

1. Timers can be in either the top or bottom view, just not at the same time.

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

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

LAYOUT WINDOW	VIEW
Top WINDOW	• Navigation Map (NAV MAP) • Angle of Attack (ANGLE OF ATTACK) • Terrain (TERR) • Traffic (TFC) • WX-500 (STRIKES) • Weather (WEATHER) • Synthetic Vision (SYNTHETIC VISION), • Timers (TIMERS)
Bottom WINDOW	• Navigation Map (NAV MAP) • Angle of Attack (ANGLE OF ATTACK) • Terrain (TERR) • Traffic (TFC) • WX-500 (STRIKES) • Weather (WEATHER) • HSI (EFD1000 MFD only) • Synthetic Vision (SYNTHETIC VISION) • Timers (TIMERS)

Table 3-3 Split Screen LAYOUT WINDOW Supported VIEWs

NOTE

The Split Screen LAYOUT does not allow the display of the Navigation Map VIEW and either the Weather VIEW or HSI VIEW at the same time..

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 3-4 lists the VIEWS that will display in each of the Thumbnail LAYOUT WINDOWS:

Window	View
Left WINDOW	• Angle of Attack (ANGLE OF ATTACK) • Terrain (TERR) • Traffic (TFC) • WX-500 (STRIKES) • Attitude Instrument (EFD1000 MFD only) • Synthetic Vision (SYNTHETIC VISION)
Right WINDOW	• Angle of Attack (ANGLE OF ATTACK) • Terrain (TERR) • Traffic (TFC) • WX-500 (STRIKES) • Synthetic Vision (SYNTHETIC VISION)
Bottom WINDOW	• Navigation Map (NAV MAP) • Angle of Attack (ANGLE OF ATTACK) • Terrain (TERR) • Traffic (TFC) • WX-500 (STRIKES) • Weather (WEATHER) • Synthetic Vision (SYNTHETIC VISION) • Timers (TIMERS)

Table 3-4 Thumbnail LAYOUT WINDOW Supported VIEWs

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

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.

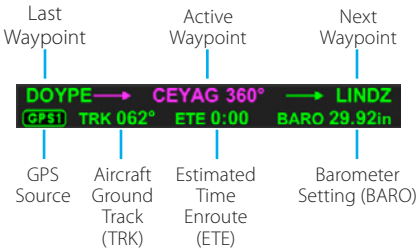


Figure 3-8 Data Bar

3.2.1 **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
- Aircraft ground track (TRK)
- Estimated Time En route (ETE)
- 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°.

3.3 **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

3.3.1 **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**).

3.3.1.1 **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 MAX 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.

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.

Figure 3-10
Right Side Display Controls

3.3.1.2 **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 5.6** Weather for more information.

3.3.1.3 **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 an alert, the label is changed to a quick access to the page generating the alert (TRC, APD, TMR, TERR), and pressing the Middle Button will display the VIEW associated with that alert and the label changes to (BACK). When pressed a second time (while label is BACK) the display returns to the VIEW displayed prior to the alert.

3.3.1.4 **Right Button**

When the 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 5.6** Weather for more information.

3.3.1.5 **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.

3.3.2 **Side Buttons**

There are several buttons along the right side of the EFD1000/500 MAX 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**).

3.3.2.1 **Reversion (REV) Button**

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

3.3.2.2 **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.

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.

NOTE

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

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.

3.2.2.4 **Hot Keys/Menu Keys**

The five buttons along the lower right side of the EFD1000/500 MAX 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.

Chapter 4

If you already have an EFD1000 MAX PFD, you will probably find your new EFD1000/500 MAX 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 MAX 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 MAX MFD. Refer to Chapter 5 for more in-depth information and step-by-step instructions for each of the VIEWS on the EFD1000/500 MAX MFD.

The EFD1000/500 MAX MFD complements your current EFD1000 MAX 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 MAX MFD, your display system is now capable of much more than the analog instruments it replaced.

Figure 4-1
EFD1000/500 MAX MFD Initializing Screen

4.1 **Startup**

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 MAX MFD presents the Jeppesen Database Confirmation Screen, overlaid on the lower half of the EFD1000/500 MAX 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 MAX MFD. The validity and expiration date of all databases is displayed in the Main Menu, on the Database Menu page.

When the EFD1000/500 MAX 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 MAX MFD right away. You will learn how to change the backlighting, the Emergency Backup Battery (EBB) features (on the EFD1000 MAX MFD only), how to manually power the system off and on, and how to navigate PAGES, VIEWS, Weather Products, and other screen elements.

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 4-2**).
4. Push the MENU key to exit the Main Menu.

Figure 4-2
Database Expiration Dates

CAUTION

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

WARNING

Do not rely on the navigation data of the EFD1000/500 MAX MFD Navigation VIEW as the primary reference for navigation. The EFD1000/500 MAX 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 MAX 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 4-3
PAGE Selection Mode –
Split-Screen LAYOUT

Figure 4-4
PAGE Selection Mode –
Thumbnail LAYOUT

4.1.1 **Select Different PAGE or WINDOW**

As previously mentioned, a PAGE displays information on the EFD1000/500 MAX 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 MAX MFD must be in Change VIEW Mode to change the current PAGE or WINDOW display. When the EFD1000/500 MAX 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 MAX 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 4-3** and **4-4**).

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 4-5** and **4-6**).

Figure 4-5
PAGE Selection Mode – Top Right WINDOW Selected

Figure 4-6
WINDOW Selection Mode – Bottom WINDOW Selected

Figure 4-7
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
Timer	TIMERS
Traffic	TRFC
Stormscope	STRIKES
Secondary Attitude Indicator	NONE
Secondary HSI	NONE
Angle of Attack	ANGLE OF ATTACK AOA
Synthetic Vision	SYNTHETIC VISION SV

Table 4-1 EFD1000/500 MAX MFD VIEW Names

NOTE

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

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.

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 4-7**).

Figure 4-8
PUSH TO PAN Displays
Above the Left Knob

4.1.3 **Panning**

The Navigation Map and 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 4-8**).
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 4-9**).
3. Rotate the Left Knob to pan to left or right and rotate the Right Knob to pan up or down (**Figure 4-10**).
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
Panning Activated

Figure 4-10
Panning the
Navigation Map

NOTE

You can set the Panning Feature to automatically timeout in 30 second increments per Table 5-3 or you can also push the Right Knob to return back to the original VIEW mode.

Figure 4-11
METAR Weather Product Screen

Figure 4-12
Editing Airport Identifier

Figure 4-13
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 Weather VIEW (**Figure 4-11**).
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 4-12**).
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 4-13**).
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 4-14**).

Figure 4-14
METAR with Information Viewable by Scrolling

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 4-15**), or counter-clockwise to scroll up the viewable text.

Figure 4-15
Use the Scroll Feature to View a METAR

NOTE

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

4.2 Main Menu

The MENU Button is used to access the EFD1000/500 MAX 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 MAX MFD display. Pilot can view, manage, and change the settings of the EFD1000/500 MAX MFD. Some EFD1000/500 MAX 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 MAX 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

is in Navigation mode, indicated by the magenta label SEL PAGE directly above the Right Knob (**Figure 4-16**). 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 4-17**), 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 4-18**).

1	Main Menu	4	Menu Page graphical bar
2	Menu Page number and mode (Navigation mode shown)	5	Brightness Control
3	Menu Page Name		

Figure 4-16
Main Menu Navigation Mode

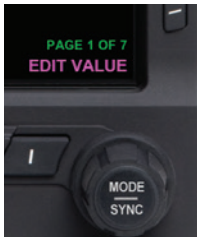


Figure 4-17
Main Menu Edit Mode

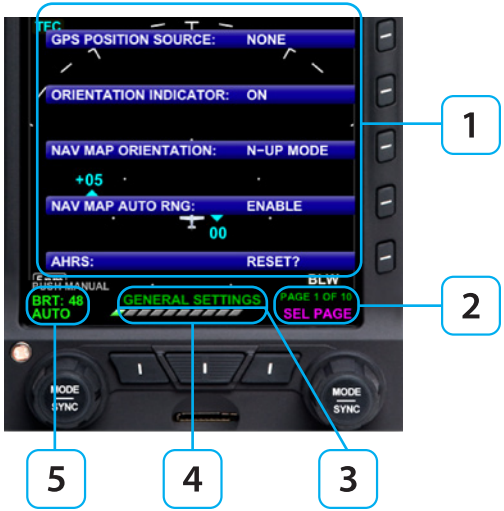


Figure 4-18
Main MENU

Figure 4-19 Main Menu Text - Editable

Figure 4-20 Main Menu Text - Enabled

Figure 4-21 Main Menu Text – Status Only

Figure 4-22 Main Menu Text - Disabled

Figure 4-23
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 4-19**
MAGENTA	Editable option enabled	See **Figure 4-20**
GREEN	Non-Editable or "Status Only"	See **Figure 4-21**
GRAY	Disabled	See **Figure 4-22**

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 4-23)**.
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 4-24**).
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 4-24
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.

Figure 4-25
EFD1000/500 MAX MFD photocell

4.3 **Display Lighting**

The EFD1000/500 MAX MFD contains various lighting controls to maintain readability under all lighting conditions. Each EFD1000/500 MAX 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. The front mounted photocell measures the ambient light and adjusts the backlighting automatically to a readable level (**Figure 4-25**).

When the MENU Button is pressed and the menu system is active, the Left Knob can be used to adjust the EFD1000/500 MAX 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 4-26**). 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 4-27**).
3. Rotate the Left Knob to change the brightness to the level desired.
4. Press the MENU Button to exit the Main MENU.

Figure 4-26
Display Brightness in AUTO Mode

Figure 4-27
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 MAX 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 MAX 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 MAX MFD display temperature drops below 60°C.

Figure 4-28
Internal Battery Annunciation

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 MAX 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 4-28**).

Some installations include an alternate, higher-capacity, Emergency Backup Battery (EBB) connected to the EFD1000 MAX MFD or the new Extended Duration (internal) battery. These batteries 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 these batteries is to provide assured power to the backup instruments when the EFD1000 MAX MFD is the only airspeed and altimeter backup. Refer to the Aircraft Flight Manual Supplement to determine if your installation includes the EBB or Extended Duration (Internal) Battery, and for usage instructions.

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 4-29
Main Menu, Power Settings, BATTERY and EXT PWR MENU Button

Figure 4-30
Main Menu, POWER SETTINGS page, EXT PWR Status MENU Button

Figure 4-31
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 4-29**). 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 4-30**) 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 4-31**) 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 MAX 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 MAX 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.

Figure 4-32
Main Menu, Power Settings, RESTART Menu Button

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 4-32**).
3. Press the RESTART MENU Button. The power down sequence initiates (**Figure 4-33**).

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.

Figure 4-33
EFD1000/500 MAX MFD Powering Off

Power On Manually

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

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).

NOTE

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

4.7 **Cleaning the Display Screen**

The EFD1000/500 MAX 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 MAX MFD display should be dry before powering the unit on.

Chapter 5

The EFD1000/500 MAX 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, Charts view and a Timers view. Additionally, there are five optional VIEWS that provide Traffic, Stormscope® WX-500, Weather, Angle of Attack and Synthetic Vision (all require additional receivers and/or subscriptions. See Chapter 7 for subscription information). Each view is clearly labeled in the upper left corner of the window.

The MFD1000 MAX MFD also has a Secondary Attitude Indicator and Secondary HSI VIEW which provide the safety and confidence of a full PFD. If for some reason your EFD1000 MAX PFD should fail, simply press the REV button on your EFD1000 MAX 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 MAX 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.

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

NOTE

Depending upon the installation settings, some Hot Key labels may be blank.

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 (**Figure 5-1**) or VFR (**Figure 5-2**) 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.

When climbing or descending toward the Altitude selected on the PFD, the Nav Map will display an altitude intercept arc that show the location the aircraft will reach the selected altitude at the current instantaneous vertical speed. This feature can be disabled in the main menu.

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 Navigation Map VIEW has either eight or twelve Hot Keys, organized into two or three menus depending upon what optional equipment is configured. The first Hot Key is labeled 1/X , 2/X, or 3/3 (depending on the menu you are viewing) as outlined in **Table 5-1**. If the feature controlled by the Hot Key is not configured, the associated Hot key Legend is blank. .

Hot Key	Menu 1/3	Hot Key	Menu 2/3	Hot Key	Menu 3/3
1/2 or 1/3	First Hot Key menu displayed	2/2 or 2.3	Second Hot Key menu displayed	3/3	Third Hot Key menu displayed. Only displayed if at least one of the menu 3 Hot Keys are configured.
VFR IFR	Selects the Navigation Map type.	TERR	Turns the terrain overlay on or off. (see note)	ID	Turns on display of flight ID for ADSB Out equipped traffic
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.	METR	Turns on display of METAR flags for reporting stations.
MAP	Selects declutter level.	NXRD	Turns the Weather overlay on including areas of no coverage. (see note)		
ARWY LO HI	Turns the Airways overlay on (HI or LO) or off.	TFC TFCN TFCU TFCA TFCB	Controls the Traffic Overlay.		

Table 5-1 Navigation Map Hot Keys

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.

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]

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.

1. The map range scale settings are 0.5, 1, 2, 3, 5, 10, 15, 20, 30, 40, 60, 80, 100, 200,350, 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.

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

Figure 5-3
Map General Settings Page

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**.

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

Main Menu Page	Menu Label	Available Settings	Default Setting
GENERAL SETTINGS	GPS POSITION SOURCE	GPS1/GPS2	GPS1
	ORIENTTION INDICATOR	ON / OFF	ON
	NAV MAP ORIENTATION	N-UP MODE HDG-UP MODE TRK-UP MODE	N-UP MODE
	NAV MAP AUTO RANGE	ENABLE/DISABLE	ENABLE
MAP SETTINGS A	NAV MAP CONTROLLED AIRSPACE	AUTO / OFF	AUTO
	NAV MAP SPECIAL USE AIRSPACE	AUTO / OFF	AUTO
	NAV MAP FLT PLN & WPTS	ON / OFF	ON
	NAV MAP INTRS	AUTO / OFF	AUTO
	NAV MAP VORS	AUTO / OFF	AUTO
MAP SETTINGS B	NAV MAP NDBS	AUTO / OFF	AUTO
	NAV MAP HARD SURFACE APTS	AUTO / OFF	AUTO
	NAV MAP OTHER APTS	AUTO / OFF	AUTO
	NAV MAP TRANSPORTATION	AUTO / OFF	AUTO
	NAV MAP BOUNDARIES	AUTO / OFF	AUTO
NAV MAP SETTINGS C	NAVMAP PAN TIMEOUT	OFF to 5.0 MIN in 30 second intervals	0.5 MIN
	SEL ALT ARC	ON / OFF	ON
	RWY CENTERLINE EXT	OFF, 3nm, 5nm, 10nm	OFF

Table 5-3 Main Menu Navigation Map Settings

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

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 MAX MFD Navigation Map VIEW offers several feature groups that display as symbols on the map (**Figure 5-4**). 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.

Navaids	
Active Waypoint	
Active Leg	
Other Waypoint	
Other Leg	
VOR	
VORTAC or VOR/DME	
DME or TACAN	
NBD	
INT	
Airports	
Control Tower	
No Control Tower	
Airways	
LO	V32
HI	J5

Figure 5-4
Map Symbols

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				
			H	MH	ML	L	OFF
Traffic Symbols			N/A				
Ownship			Always On				
GPS Track			Always On				
Flight Plan Legs and Waypoints		2000	●	●	●	●	
Obstructions		Limited to 40 but displayed to 2000	Always On				
Weather			N/A				
METAR		Same as the associated Airport (See below)	N/A				
Airports	Large Airport Symbol	2000	●	●	●	●	
	Large Airport Identifier	1000	●	●	●	●	
	Medium/Large Airport Symbol	500	●	●	●	●	
	Medium/Large Airport Identifier	100	●	●	●	●	
	Medium Airport Symbol	100	●	●	●	●	
	Medium Airport Identifier	80	●	●	●	●	
	Medium/Small Airport Symbol	100	●	●	●	●	
	Medium/Small Airport Identifier	60	●	●	●	●	
	Small Airport Symbol	60	●	●	●	●	
	Small Airport Identifier	40	●	●	●	●	

Feature Group & Layer Order (top to bottom)	Feature	Max Range (nm)	Declutter Setting				
			H	MH	ML	L	OFF
Water	Oceans/Seas	2000	●	●	●	●	
	Rivers/Lakes	2000	●	●	●	●	
Special Use Airspace	Prohibited	200	●	●	●	●	
	Prohibited number	40	●	●	●	●	
	TFRs*	2000	●	●			
	Restricted, warning	200	●	●			
	Restricted and warning number	40	●	●			
	MOA, alert	200	●	●			
	MOA alert and alert number	40	●	●			
	ADIZ	500	●	●			
	ADIZ identifiers	200	●	●			
Controlled Airspace	Class A, B and C without sectors	200	●	●	●		
	Class A, B and C with sectors	60	●	●	●		
	Class D with sectors	60	●	●	●		
	Class F with sectors	60	●	●	●		
	Various Aerodrome Traffic Zones	60	●	●	●		
	Class B, C and D altitude limits	40	●	●	●		
NDBs		15	●				
VORs		200	●				

Feature Group & Layer Order (top to bottom)	Feature	Max Range (nm)	Declutter Setting				
			H	MH	ML	L	OFF
Intersections		15	●				
Airways	Overlay - enabled via ARWY Hot Key	200	N/A				
Transportation	Roads, Railroads, Power lines, Pipelines	20	●				
Boundaries	State, Province, International, ADIZ[4], Special Flight Rule Areas (SFRA)[4]	2000	●				
Relative Terrain		Limited to 100 but displayed to 2000	N/A				
Runways	Runway Centerline Extension	20	●	●			

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

NOTE

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

Figure 5-5
Editing OTHER APTS Feature Group

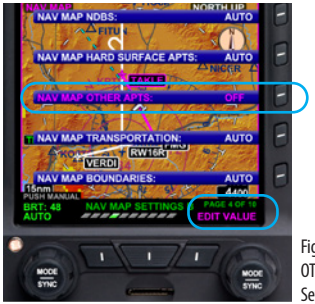


Figure 5-6
OTHER APTS Feature Group
Set to OFF

Changing Feature Group Display Setting

1. Access the Main Menu.
2. Navigate to the 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 5-5**).
4. Rotate the Right Knob to the desired value, AUTO/ OFF (**Figure 5-6**).
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 MAX 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 5-7**).

Figure 5-7
Navigation Map VIEW at 15 nm Range

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 MAX 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 5-8**).

Figure 5-8
Navigation Map VIEW in Auto-Range mode

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 5-9**).
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.

Figure 5-9
Map General Settings Page Editing Auto Range Setting

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.

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.

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 5-10**).

Change the Map Feature Declutter Level

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

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

Figure 5-10
Map Declutter Settings

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), 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.

Figure 5-11
Other Valid GPS Reversion Mode

Figure 5-12
RSM Reversion Mode

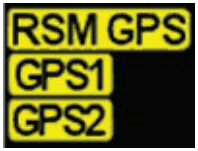


Figure 5-13
Invalid or Failed GPS Annunciations

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.

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 5-11**) ("#" 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 5-12**).

If a secondary GPS is not available then the EFD1000 MFD will use the RSM GPS (if an GPS equipped RSM is installed with the MFD). The annunciation RSM GPS REVERSION EMER USE ONLY will display in the Data Bar (**Figure 5-12**). 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 5-13**). 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 **NAVMAP Feature Detailed Information**

The Navigation Map can provide detailed information about Airport, Navaids, Airspaces and TFR 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 feature (**Figure 5-14**) and the Left Knob label changes to read Sel in magenta, with PUSH FOR DETAILS in cyan directly above the Left Knob label and the Hot Keys legends change to APT (Airports), SUA (Special Use Airspace), ATC (Class BCDE Airspace), NAV (Navaids) and TFR (Temporary Flight Restrictions).

Rotating the Left Knob rotates through selectable features on the NAVMAP. Pressing a Hot Key toggles on/off features which can be selected by the left Knob.

Once the desired feature is selected, pressing the Left Knob displays detailed textual information for that feature (**Figure 5-14**). If multiple pages of textual information are available (such as Airports), the Hot Keys allow for the selection of up to five pages of information to view (**Figure 5-15, 5-16, 5-17, 5-18**).

NOTE

If the range is set to a low setting there may not be any features 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.

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 5-14
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.

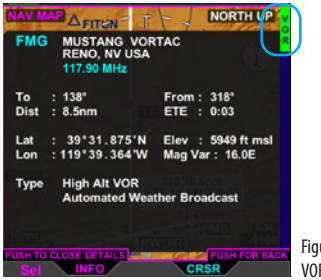


Figure 5-15
VOR Information Page

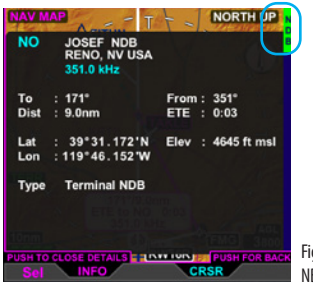


Figure 5-16
NBD Information Page

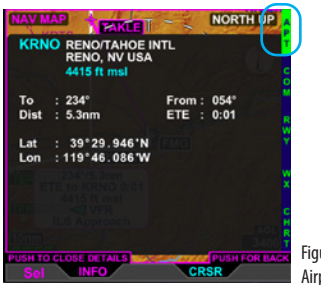


Figure 5-17
Airport Basic Information Page

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	5-15
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	5-16
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	5-17
COM	• Selected airport's frequencies and callsigns	5-18

Hot Key	Information Displayed (if available)	Figure
RWY	• Airport Identifier • Name of Airport • Runway • Runway Lengths and Widths • Runway Surface Type • Type of Runway Lighting	5-19
WX	• Selected airport's METAR and TAF information (displayed as described in **Section 5.2.3. METAR**)	5-20

Table 5-6 Airport/VOR Information

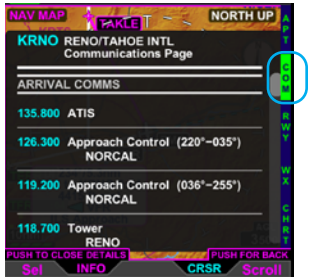


Figure 5-18
Airport Communication Information Page

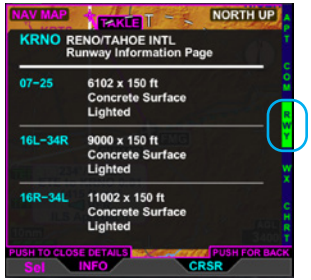


Figure 5-19
Airport Runway Information Page

Figure 5-20
Airport Weather Information Page

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.

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 5-21
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 MAX WMFD 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 5-21**):

- 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 5-22**) or VFR (**Figure 5-23**) 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, 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 5-22
Navigation Map VIEW with IFR Map Style Selected

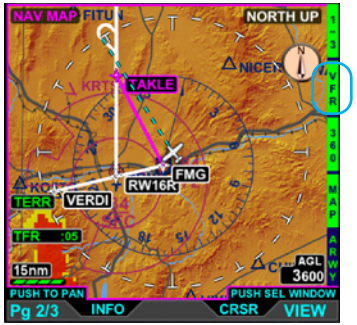


Figure 5-23
Navigation Map VIEW with VFR Map Style Selected

Figure 5-24
Navigation Map VIEW
Overlay Hot Keys, All
Overlays Disabled

Figure 5-25
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, ADS-B Weather, and Traffic. Each of these overlays is enabled or disabled via Hot Keys (**Figure 5-24**).

5.1.10 **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 5-25**).

NOTE

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

NOTE

Intersection names are only available at NavMap ranges 15nm and less.

5.1.11 **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

Figure 5-26
Terrain Overlay On

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 5-26**).

NOTE

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

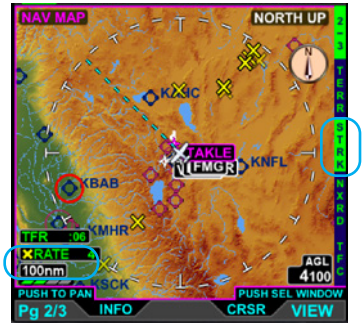


Figure 5-27
Lightning Overlay On Displaying WX-500 Cell Data

5.1.12 **Lightning Overlay**

The LTNG Hot Key permits display of lightning information overlaid on the Navigation Map VIEW. When configured, the Lightning overlay displays Stormscope lightning as defined in **Section 5.4** and/or XM/FIS-B Weather Lightning as defined in **Section 5.6.2**. The Hot Key label, LTNG/CELL/STRK, is green when enabled or blue when disabled. 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 5-27**).

   - LTNG – XM/FIS-B Weather
   - CELL – Stormscope Cells
   - STRK – Stormscope Strikes

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.

5.1.13 **Weather Overlay**

he Weather Hot Key enables the display of NEXRAD and precipitation data overlaid on the Navigation Map VIEW. Coverage is generally limited to the Continental United States, its coastal regions., portions of Alaska, Hawaii, Puerto Rico and Guam. The Hot Key label is green when enabled and blue when disabled. When enabled the NXRD annunciation displays above the current Range. The Weather overlay default setting is OFF.

Show the 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 Weather on (Hot Key label turns green) (**Figure 5-28**).

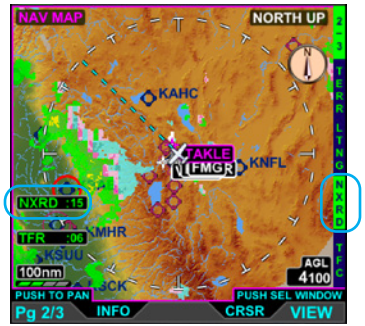


Figure 5-28
Weather Overlay On

NOTE

The 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 Weather coverage.

NOTE

*The Traffic overlay requires configuration with an appropriate traffic sensor and displays traffic using the Normal traffic altitude filter. See **Section 5.3.7. Altitude Filter** for detailed information about traffic filters.*

Figure 5-29
Traffic Overlay On

NOTE

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

5.1.14 **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**. Traffic, is oriented to the underlying Navigation Map using the selected altitude filter. The Hot Key label TFC is green when enabled and blue when disabled.

Show the Traffic Overlay

1. With the Navigation Map VIEW selected, display the 2/2 Hot Key menu.
2. Press the TFC Hot Key to turn Traffic on and select the desired altitude filter (label turns green) or off (label turns blue) and the TRC annunciation displays in the lower left of the display (**Figure 5-29**).

Each traffic symbol is accompanied by a data block displaying the 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.

5.2 **Terrain and Obstructions**

The Terrain VIEW displays relative terrain 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. The Terrain VIEW also displays an altitude intercept arc that shows where on the map the aircraft will intercept the selected altitude set on the PFD. (**Figure 5-30**).

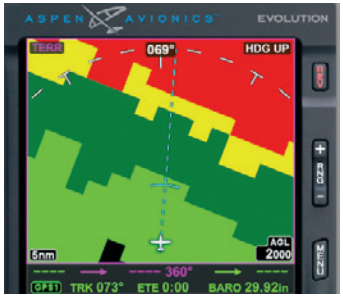


Figure 5-30
Terrain VIEW Showing an ARC Range Ring

5.2.1 **Terrain Compass Mode**

The Terrain view can be display as either 360 Compass mode (Ownship centered in the view), or ARC compass mode (Ownship near the bottom of the view).

- Press the 360/ARC Hot Key to select a different compass Mode.

5.2.2 **Terrain Orientation**

The Terrain view can be display as either 360 Compass mode (Ownship centered in the view), or ARC compass mode (Ownship near the bottom of the view).

- Press the 360/ARC Hot Key to select a different compass Mode.

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 EFD1000/500 MAX 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

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.

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.

information is invalid or unavailable, cyan is shown in place of the invalid or unavailable terrain.

5.2.3 **Terrain Relative Altitude**

Terrain and obstruction heights in the database are MSL measurements based on barometric pressure. The EFD1000/500 MAX 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 5-8**. 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 5-8 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.

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 5-31**). If Basemap features are invalid or unavailable all features except the flight plan are removed from the display.

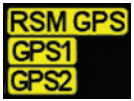


Figure 5-31
Invalid or Failed GPS Annunciations

Obstructions are displayed on Terrain VIEW within 40 nm of the ownship, as an inverted colored V symbol relative to ownship altitude **Table 5-9**. 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			
500' to 1000' below			

Table 5-9 Terrian Obstruction Type Coding

NOTE

A safety threshold of 100 feet is applied to the terrain and obstruction thresholds for all phases of flight, making the terrain and obstructions appear closer than computed.

Figure 5-32
EFD1000/500 MAX MFD
Traffic Display

5.3 **Traffic**

When the EFD1000/500 MAX MFD is configured with a traffic sensor the EFD1000/500 MAX MFD can display traffic information.

The map is oriented North-Up on a black background (**Figure 5-32**).

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 MAX MFD as the source of data for collision avoidance. It is the pilot's responsibility of the pilot to visually acquire other aircraft for safe flight.s 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.*

5.3.1 **Traffic Display**

The Traffic VIEW is oriented Heading-Up, with either a 360° or ARC compass view (**Figure 5-31**), 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
- 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. .

Change Traffic Range Ring

- Press the 360/ARC Hot Key to select a different Compass Mode (**Figure 5-33**).

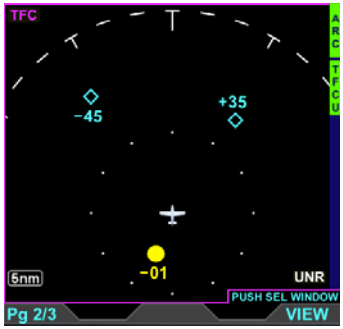


Figure 5-33
Traffic VIEW Showing an ARC Range Ring

Symbol Type	Non-Directional	Directional
Traffic Advisory		
Proximity Advisory		
Other Traffic		
Proximity Ground Traffic		
Other Ground Traffic		
Proximity Ground Vehicle		
Other Ground Vehicle		

Table 5-10 Traffic Symbols

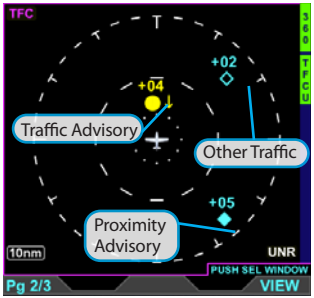


Figure 5-34
Traffic Symbols

5.3.2 **Display of Traffic Symbols**

The EFD1000/500 MAX MFD displays three threat levels using TCAS symbology; traffic advisory (amber), proximity advisory (solid cyan), and other traffic (hollow cyan). If supported by the Traffic Sensor, Directional and Ground traffic may also be shown. **Table 5-10** list the various types of traffic symbols that can be shown.

The EFD1000/500 MAX MFD displays intruder information from the Traffic Sensor with the threat level assigned by the Traffic Sensor. Each traffic symbol is positioned at a location representing the relative range and bearing to the ownship symbol (**Figure 5-34**). All intruders within the current display range and the selected altitude filter are shown (up to a limit of 32 intruders, prioritized in the order received from the traffic sensor).

A data block is given for each reported intruder displaying the type, relative altitude, and intruder vertical direction as supplied by Traffic Sensor. The data block text color is the same as the traffic symbol, amber for Traffic Advisory and cyan for proximity and other traffic (**Figure 5-34**).

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.

For example, the intruder shown in (**Figure 5-35**) 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.

5.3.3 **Traffic ID**

If the Traffic Sensor is "ADS-B IN", then the Identifier of the traffic can be selected as part of the data block (**Figure 5-36**). Pressing the "ID" Hot Key toggles the display of the Traffic ID On and Off.

5.3.4 **Traffic Velocity Vector**

If the Traffic Sensor is "ADS-B IN", then the velocity vector of the traffic can be display as part of the data block (**Figure 5-37**). The length of the velocity is defined by the distance the intruder will travel at current ground speed in a specified number of seconds. The number of seconds to display is selectable in the Main Menu page "UAT", item "HORZ VERT SCALE" and can be set to 0, 10, 20, 30, 40, 50 or 60 seconds. If selected to 0 seconds, then the vector is not shown.

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 5-35
Intruder Data Block

Figure 5-36
Traffic Velocity Vector

Figure 5-37
Traffic Velocity Vector

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 5-38
Text-format Traffic Advisories

Figure 5-39
Off Scale and Symbol Overlap

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.

5.3.5 **Non-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 5-38**). The EFD1000/500 MAX 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.

5.3.6 **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 (**Figure 5-39**). 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.

.

5.3.7 **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 5-11**. Only traffic within the selected altitude filter value will display.

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

Table 5-11 Traffic Filter Parameters

The pilot adjusts the altitude filter value by pressing the TFCA/TFCB/TFCN/TFCU Hot Key, which cycles through each of the filter levels.

5.3.8 **Traffic PopUp Advisories**

When the aircraft's traffic sensor reports a Traffic Advisory, and the Dedicated Traffic VIEW is not displayed, the EFD1000/500 MAX MFD will display an amber TRAFFIC annunciation in the data bar (Figure 5-76). Additionally, the lower middle button displays the label TFC 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 TFC button switches the display to the split screen PAGE displaying the Traffic VIEW in the top WINDOW for situational awareness. The lower

Figure 5-40
Traffic Advisory

Figure 5-41
Displaying a Traffic Advisory

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 TFC button. The dedicated Traffic View displays in the top WINDOW of the split screen layout (**Figure 5-40**).
2. Press the lower middle BACK button to return to the previous PAGE.

NOTE

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

NOTE

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

5.4 **StormScope WX-500**

When configured with a WX-500 receiver the EFD1000/500 MAX 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 5-42**). 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 MAX MFD stores the last settings selected following the power cycle of the unit.

Figure 5-42
WX-500 VIEW
in Strike Mode

5.4.1 **Compass View**

The Strikes view can be display as either 360 Compass mode (Ownship centered in the view), or ARC compass mode (Ownship near the bottom of the view) (**Figure 5-43**)

- Press the 360/ARC Hot Key to select a different compass Mode.

Figure 5-43
WX-500 VIEW
in Cell Mode

According to the the 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 MAX 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 5-44**) When in Cell mode, thunderstorm activity is displayed as yellow crosses (**Figure 5-45**). 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 5-46**). Rate will display with a red horizontal line (**Figure 5-47**) when:

Figure 5-44
WX-500 Strike Symbol

Figure 5 -45
WX-500 Cell Symbol

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

Figure 5-46
WX-500 Strike Mode and Rate

Figure 5-47
WX-500 Invalid Rate

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 5-48
WX-500 VIEW in Self-Test Mode

5.4.2 **Strikes/Cell Mode**

- Press the LTNG /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.
- Press the LTNG /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

5.4.3 **Clearing Strike Data**

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

5.4.4 **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 5-48**). When the test is complete the WX-500 display returns to the previous mode.

5.5 **Charts**

The CHARTS VIEW can be configured by the pilot to present Instrument Approach Procedure (IAP) charts, Departure Procedure (DP) charts, Standard Terminal Arrival (STAR) charts, Airport Diagrams (APD), Take-off Minimums and Obstacle Departure Procedures (MIN), and Alternate Minimums (MIN). (see **Figure 5-49**).

5.5.1 **Selecting a Chart**

Pilots can select the airport of interest by first pressing the LIST Hot Key. When the LIST Hot Key is blue with a green back ground the pilot can then press either DEP for departure airport, DEST for destination airport or NRST for nearest airport (see **Figure 5-50**). Alternatively the pilot can press the left knob under PUSH FOR EDIT (see **Figure 5-51**) then turn the left knob to change the magenta character, then push the left knob to advance (see **Figure 5-52**) to the next character and repeat the process until the desired airport identifier is shown. Once the desired airport is selected use the right knob to scroll down to the desired chart. If after a chart has been selected and a different chart at the same airport needs to be reviewed you can either press the LIST Hot Key and use the right knob to scroll or press the lower right button under 'sel Chrt' (see **Figure 5-53**) then use the right knob to cycle through all available charts of the selected airport.

Figure 5-49
Charts Day VIEW Display

Figure 5-50
Push To Edit Button

Figure 5-51
Push To Edit Button

Figure 5-52
Desired Airport Identifier

Figure 5-53
Available Charts
Selection Button

5.5.2 **Day/Night View**

The normal chart view is DAY with black lettering on white background. However for night time viewing select NITE and the same chart will be presented with white lettering on black background (see **Figure 5-54)** to preserve night vision. Pilots may toggle between DAY and NITE views via the Hot Key.

5.5.3 **Ownship**

The Ownship Hot Key (OWN) is a powerful tool that overlays the aircraft position on select charts. If OWN is selected, but the aircraft's position is not within the boundaries of the chart an OWNSHIP OFF CHART (see **Figure 5-54**) annunciation will be presented at the top of the chart. If a chart is selected that is not geo-referenced such as a STAR or DP then an OWNSHIP NOT AVAILABLE (see **Figure 5-55**) annunciation will be presented at the top of the chart. When Ownship is available the ownship symbol is surrounded by a cyan halo for quick visual acquisition (see **Figure 5-56**).

Figure 5-54
Ownship Not Available
Night VIEW Display

Figure 5-55
Ownship Not Available
Day VIEW Display

5.5.4 **Orientation**

Chart orientation can either be in heading up (HDG) or North Up (N UP). When ownship is available the HDG or N UP Hot Key will be available directly below the OWN Hot Key. Pilots may toggle between the two orientations as long as the PAN function is not active. Along with the Hot Key informing the pilot of which orientation the selected chart is in there will also be either the HDG UP or NORTH UP annunciation in the top right corner of the chart. Additionally, when the orientation indicator setting of the main menu is set to on a North pointing arrow is presented in the top right corner of the chart (see **Figure 5-57**).

5.5.5 **Panning/Zooming**

Reviewing the selected chart is made easier by using the RNG button in conjunction with Pan feature of the MFD.

- The Range (RNG) button is used to zoom in/out from 1 to 4 times the normal scale. The zoom scale is presented in the lower left corner of the display
- In order to pan around the various zoom levels press the left knob under the cyan PUSH TO PAN annunciation. Once Pan is activated the left knob will control horizontal panning while the right knob will control vertical panning. To cancel the Pan feature press the left knob. To go back to the view prior to the start of panning simply press the right knob.

NOTE

If you change the view from the IAP chart then go back to the chart with the timer activated, the timer will be removed.

Figure 5-56
Ownship Available
Cyan Halo

Figure 5-57
North Pointing Arrow

Figure 5-58
Timer Hot Key

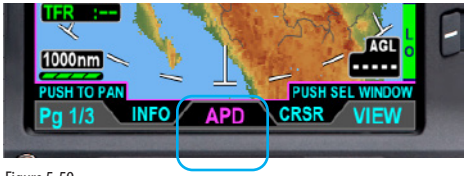


Figure 5-59
APD (Airport Diagram) Button

Figure 5-60
APD (Airport Diagram) Button

5.5.6 **Chart Timer**

The Chart Timer (TMR) function is only available when an IAP chart is selected. When executing a non-precision approach that requires timing from the final approach fix to the missed approach point press the TMR Hot Key when crossing the final approach fix. The TIMER box (see **Figure 5-58**) will appear in the lower right hand corner of the display to alleviate the pilot from having scan for a timer somewhere else in the panel.

5.5.7 **Chart QUICK ACCESS FUNCTION**

The APD (AirPort Diagram) QUICK ACCESS FUNCTION can be set to OFF, MANUAL or AUTO on page 2 of the Main Menu. With APD set to OFF the pilot would need to select the APD after landing from the List just like selecting an IAP.

With the APD set to MANUAL the APD becomes available upon landing with a single button press. The message APD: LOAD Airport Diagram will appear in the data bar along with a magenta APD above the middle button (see **Figure 5-59**). Pressing the button will cause the APD to pop up on the display.

With the APD set to AUTO, the APD is selected and the CHARTS view becomes active without any pilot action upon landing.

When the APD is display due to either MANUAL or AUTO chart selection, pressing "BACK" (lower middle button) will return the display the previously selected MFD view (**Figure 5-60**).

5.6 **Weather**

Weather information is supplied by an external ADS-B IN receiver connected the MFD. The legacy XM weather receiver is also supported by the MAX MFD.

Flight Information Services (ADS-B IN, FIS-B) provides graphical and textual descriptions of weather-related information for the continental United States, its coastal regions, portions of Alaska, Hawaii, Puerto Rico and Guam . This information is transmitted from UAT Ground Broadcast Transceivers, received by an ADS-B IN receiver and displayed on the MAX MFD. The following weather products are available:

- Convective (Regional, CNUS, and Convective SIGMETs[1])
- Lightning (XM, Future FIS-B)
- Cloud Tops (XM, Future FIS-B)
- Echo Tops (XM, Future FIS-B)
- AIRMET/SIGMET
- METARs and TAFs
- Winds Aloft
- Temperature (FIS-B only)
- PIREP (Future)
- Icing (Future)
- TFRs

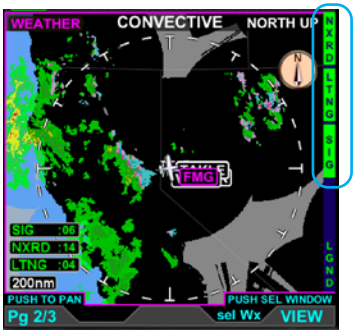


Figure 5-61
Weather VIEW Showing Convective Weather Product Screen

Weather Product	Expiration Time (Min)	Update Interval (Min)
CONUS NEXRAD	60	15
Regional NEXRAD	30	1-2
METAR	90	20
AIRMET'S	60	20
SIGMET'S	60	20
Winds & Temp Aloft	90	12 hr

Table 5-12 Weather Product Expiration Time

5.6.1 **Selecting Weather Products**

The Weather VIEW offers several types of weather product information, each displayed in a different screen of the Weather VIEW. The current weather product name displays in the top center of the ADS-B Weather VIEW. (**Figure 5-61**).

Changing Weather Product

1. Press the lower Right Button, labeled Sel Wx, to activate Weather Product. The Right Button and Knob labels turn magenta and the Right Knob label changes to Wx #/8 (the # represents the current weather product screen).
2. Rotate the Right Knob to select a weather product. The Weather VIEW, hot keys, and Right Knob label change as you select different Weather product screens.
3. Press the lower Right Button to deactivate Weather Product Selection

5.6.2 **Convective Weather**

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.

Several Hot Key control the specific information displayed on the Convective Weather view. When the Hot Key text is Blue, the information is displayed. When the Hot Key text is Green, the information is removed.

- NXRD – Displays/Removes the NEXRAD Radar information (**Figure 5-62**)
- SIG – Display/Removes Convective SIGMET regions (**Figure 5-63**)
- Both NXRD and SIG selected (**Figure 5-64**)

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).

NOTE

Sirius XM Weather Coverage is limited to Southern Canada.

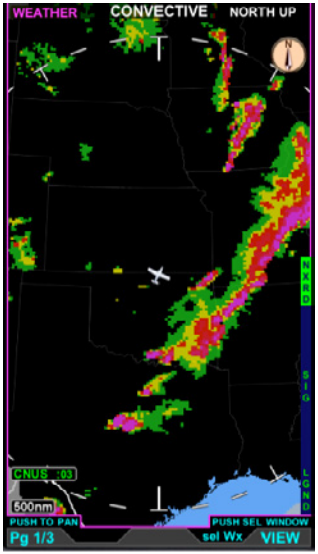


Figure 5-62
NEXRAD Selected

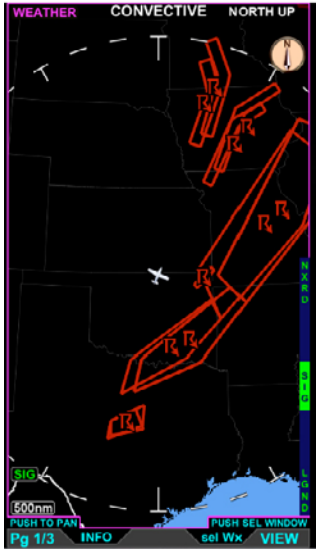


Figure 5-63
SIGMETs Selected

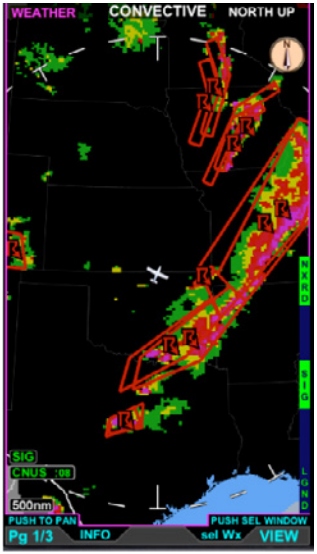


Figure 5-64
Both Selected

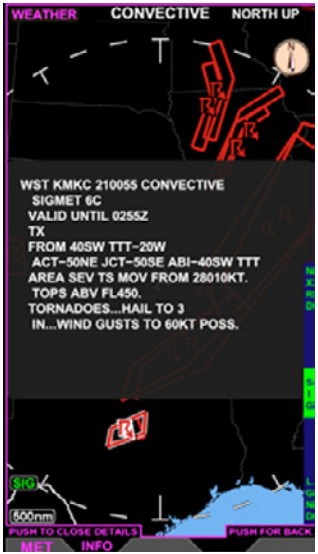


Figure 5-65
SIGMET Textual Display

NOTE

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

When a SIGMET Is displayed on the weather page, additional information about the SIGMET can be displayed by pressing the INFO (lower left button). The selected SIGMET is highlighted on the display and the Left Knob legend changes to "MET". The Left Knob can be used to rotate through all the SIGMETS to select the specific one of interest. When the Left Knob is pressed, a textual display of closest SIGMET is displayed in the center of the display (See **Figure 5-65**). Pressing the Knob again removed the Textual display. Pressing "INFO" closes the Textual display and highlighting of SIGMETs.

The NEXRAD Radar information is displayed using a color scale to represent the strength of the radar return, as represented in the legend when displayed. FIS-B and XM have similar but slightly different colors available, as shown respectively in (**Figure 5-66**) and (**Figure 5-67**).

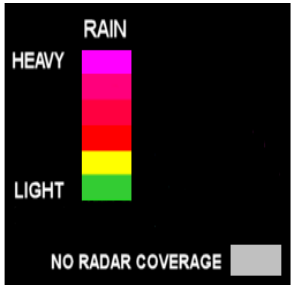


Figure 5-66
FIS-B NEXRAD Legend

Figure 5-67
XM NEXRAD Legend

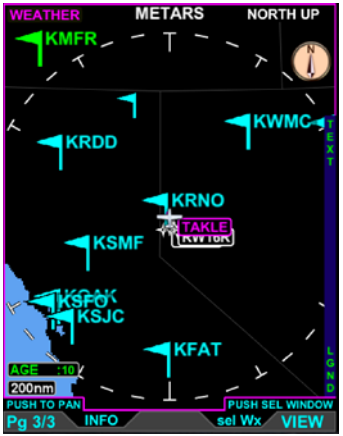


Figure 5-68
METAR Weather Product Page

Figure 5-69
METAR Flag Legend

5.6.3 **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 (**Figure 5-68**).

The EFD1000/500 MAX MFD displays METARs as colored flags, depending upon the conditions at the airport (Figure 5-40). The METAR screen displays the flags, at the airport location from which the METAR is reported, overlaid on a basic weather map.

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 5-69**).
- Press the LGND Hot Key again to remove the METAR legend.

METAR flags are decluttered based the range setting on the view and the size of the airport as outlined in **Table 5-13**.

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	◀						

Table 5-13 METAR Declutter Settings

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.

NOTE

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

1. Only the METAR Flag is displayed.

◀ METAR and airport identifier displayed

Figure 5-70
Selecting a
METAR to Display

Display 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 5-70**).
3. Press the Left Knob to display the METAR pop-up (**Figure 5-71**).
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.

NOTE

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

Figure 5-71
METAR Pop-up
for Reno Airport

NOTE

It is not 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.

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 5-72**).
2. Rotate the Left Knob to change the first character (**Figure 5-73**).
3. Press the Left Knob to advance to the second character. The first character changes to white and the second character is magenta (**Figure 5-74**).
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.

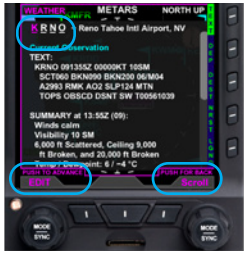


Figure 5-72
METAR Text Edit Pop-up Window

Figure 5-73
Selecting a Specific Airport with METAR Text Edit, First Character

Figure 5-74
Selecting a Specific Airport with METAR Text Edit, Second Character

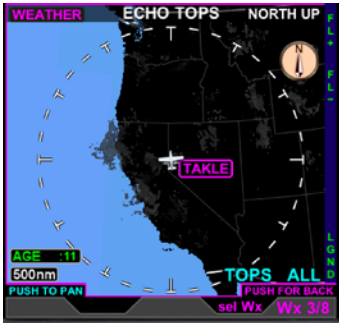


Figure 5-75
Echo Tops Screen

5.6.4 **Echo Tops** (XM only)

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 5-75**).

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.

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 5-76**).
- Press the LGND Hot Key again to remove the Echo Tops legend.

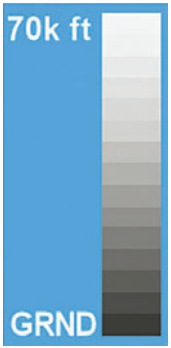


Figure 5-76
Echo Tops Legend

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.

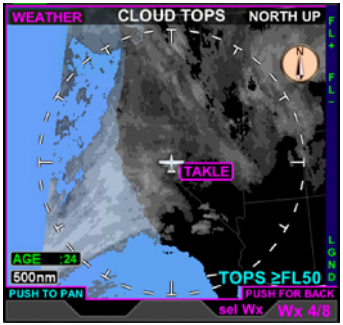


Figure 5-77
Cloud Tops Screen

5.6.5 **Cloud Tops** (XM only)

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 5-77**).

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 5-78**).
- Press the LGND Hot Key again to remove 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.

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.

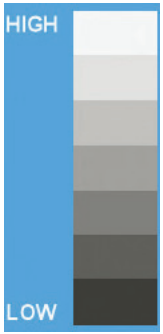


Figure 5-78
Cloud Tops Legend

5.6.6 **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 5-79**).

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.

Figure 5-79
AIRMET/SIGMET

Four Hot Key are provided to select specific categories of SIGMET/AIRMETs to display Table 5-11 so the types if SIGMET/AIRMET display by each Hot Key.

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 5-14 AIRMET/SIGMET Symbology and associated Hot Key

1. SIGMETs overlay AIRMETs.

Display the AIRMET/SIGMET Legend

- With the AIRMET/SIGMET weather product screen displayed, press the LGND Hot Key. The AIRMET/SIGMET legend displays on the right of the screen (**Figure 5-80**).
- Press the LGND Hot Key again to remove the AIRMET/SIGMET legend.

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 5-81 – 5-84**).

Figure 5-80
AIRMET/SIGMET Legend

Figure 5-81
Icing AIRMET

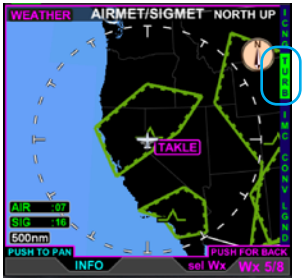


Figure 5-82
Turbulence AIRMET

Figure 5-83
IFR/Mountain Obstructions AIRMET

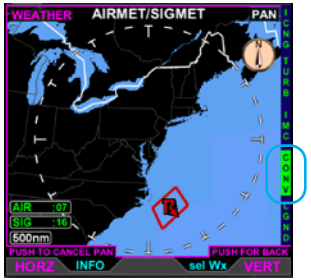


Figure 5-84
Convective SIGMET

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.

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 5-85**).
2. Rotate the Left Knob to select the desired AIRMET/SIGMET. A white border will surround the colored AIRMET/SIGMET border (**Figure 5-86**).
3. Press the Left Knob to display the selected AIRMET/SIGMET information (**Figure 5-87**).
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.

Figure 5-85
MTOS AIRMET Selected

Figure 5-86
IFR AIRMET Selected

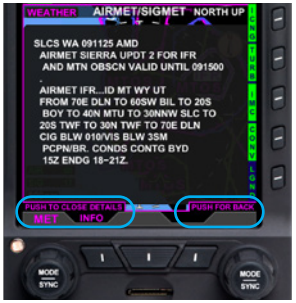


Figure 5-87
Selected IFR AIRMET Information Pop-up

5.6.7 **TFR**

The TFR screen displays a graphical depiction of Temporary Flight Restrictions, outlined in red, on a basic weather map (**Figure 5-88**). 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)

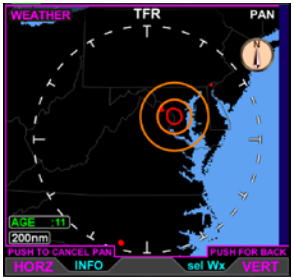


Figure 5-88
TFR

Figure 5-89
TFR Selected

Figure 5-90
Selecting Another TFR

Figure 5-91
Selected TFR Information
Pop-up

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 5-89**).
2. Rotate the Left Knob to select the desired TFR. A white border will surround the red TFR border (**Figure 5-90**).
3. Press the Left Knob to display the selected TFR information (**Figure 5-91**).
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.

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.

5.6.8 **Winds/Temperatures Aloft**

The Winds Aloft screen displays the forecast wind speed, direction and temperature at the selected altitude above MSL on a basic weather map (**Figure 5-92**).

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 5-93**).

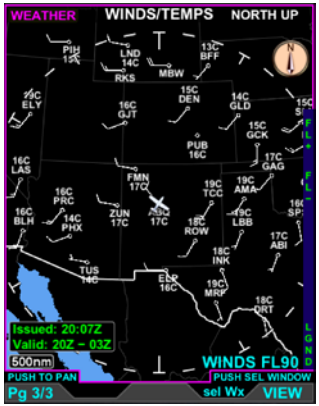


Figure 5-92
Winds Aloft Screen at 500 nm

NOTE

For XM Weather, Wind barbs are shown as a matrix, not at reporting stations and Temperatures are not shown.

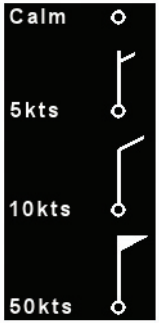


Figure 5-93
Winds Aloft Legend

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.
- Press the LGND Hot Key again to remove 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.

5.6.9 **Weather Age**

An age annunciation is shown in the lower left corner of each weather page which indicates the elapsed time in minutes since the information was generated and if the information was removed due to expiration. When more than one weather product is displayed on the same page, a separate annunciation is provided for each product.

Age Annunciation	Meaning
METAR:##	Weather data is being receive. "##"indicates the age of the last valid data in minutes being displayed
METAR:##	Weather data is not being received but has not yet expired. "##" indicates the age of the last valid data in minutes being displayed
METAR:	Weather data is not being received and the last valid data is expired or invalid. Data is removed from the display.

Table 5-15 Weather Age Annunications

Figure 5-94
XM Status

5.6.10 **XM Status**

Then XM is installed, the XM Status screen displays the status of the XM weather receiver (**Figure 5-94**). 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 5-16**, Status Message **Table 5-17**, and Control State **Table 5-18**.

5.6.10.1 **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 5-16 XM Signal Quality Levels

5.6.10.2 **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 5-17 XM Status Messages

5.2.10.3 **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 5-18 XM Control States

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 5-19** and Error Messages are described in **Table 5-20**. 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 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 5-19 XM Status Operational Messages

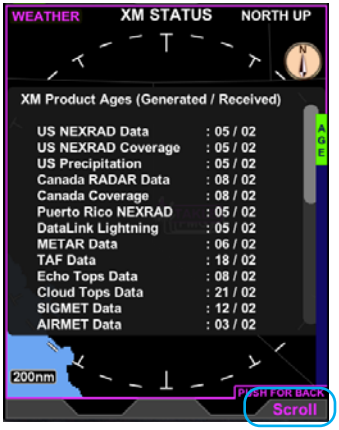


Figure 5-95
XM Status Product Ages Screen

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 5-20 XM Status Error Messages

XM Product Age Page

Each Weather feature includes a time annunciation that displays the age[1] 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 5-95**). 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.

1. All times are displayed in minutes.

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 5-21**.

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 5-21 Weather Product Age Limits and Update Frequency

NOTE

All 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 5-22** outlines the weather age annunciations:

Message	Description
NXRD :06	• Data is being received and updated.
NXRD :	• 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
NXRD : NXRD :	• A weather product is enabled and the age of the data exceeds the expiration time identified in **Table 5-21**, additionally, the corresponding graphical data is removed from the display
NXRD :- -	• Upon start up, if no valid data has been received from the receiver • When the generated data age is not available

Table 5-22 Weather Age Annunciations

5.7 **Evolution Synthetic Vision**

Evolution Synthetic Vision (ESV), when selected on your flight display depicts a real-time, computer-generated 3D view of terrain, obstacles, and traffic for the utmost in pilot situational awareness. ESV uses 9 arc-second and 3 arc-second resolution terrain data to render the Synthetic Vision VIEW.

When selected, "SYNTHETIC VISION" appears momentarily in the upper left of the Synthetic Vision view (Figure 3-22). After a few seconds, the phrase contracts to "SV" to provide more room for ESV depiction (**Figure 5-96**).

ESV can be presented on any window of the MFD. However, the Nav Map cannot be shown on the same screen as ESV. The MFD can be reverted to an SV-enabled PFD showing SV in any of the PFD SV mode.

ESV also has a field of view option, narrow or wide, which allows you to toggle to the view that best suits the phase of flight. The wide field of view is suited for enroute, while the narrow field of view is best for zooming in on the approach environment.

ESV's easy-to-read display features include: Flight Path Marker symbology that graphically depicts the lateral GPS track and vertical speed of the aircraft, a Distance Marker to assist in estimating the distance to a point ahead of the aircraft, and a Terrain Warning System (TWS) that provides visual, audio, and text warning annunciations when the system predicts a collision with terrain or an obstacle.

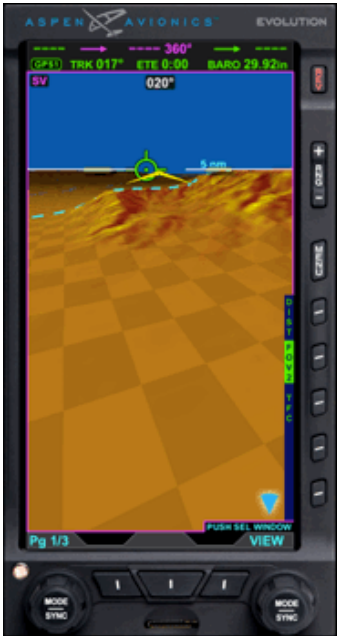


Figure 5-96
Synthetic Vision Indication

NOTE

The following VIEW combinations are not possible. ESV and the Nav Map presented at the same time. ESV presented in multiple WINDOWs at the same time.

Figure 5-97
ESV in Bottom Window

The following ESV display features are shown:

- Zero Pitch Line
- Flight Path Marker
- SV Distance Marker
- Wide Field of View Icon

ESV can be displayed in any window of the Split Screen or Thumbnail LAYOUT.

In these examples, ESV is presented in the Bottom WINDOW (**Figure 5-97**) and in the Thumbnail WINDOW (**Figure 5-98**).

Figure 5-98
ESV in Thumbnail Window

5.7.1 **Terrain Warning System**

When an advisory occurs on the MFD and Synthetic Vision is not shown, pressing the Lower Middle TERR button will switch the display to the Full Screen LAYOUT, presenting the Synthetic Vision VIEW for situational awareness (**Figure 5-99**). After selection, the Lower Middle button changes to BACK to enable the pilot to quickly return to the previous display (**Figure 5-100**).

If the BACK button is not pressed, the BACK label will be removed after 30 seconds and the Full Screen (Pg 1/3) LAYOUT remains. Rotate the Left Knob to return to the previous display.

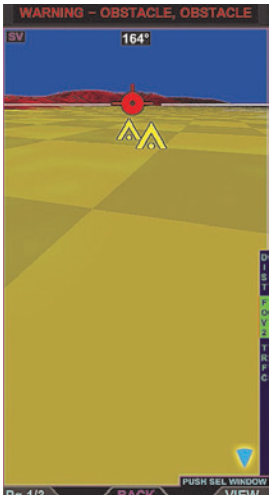


Figure 5-99
MFD Obstacle WARNING,
Synthetic Vision Selected

Figure 5-100
MFD Obstacle WARNING,
Synthetic Vision VIEW

Figure 5-101
MFD Timers VIEW

5.8 **Timers**

The EFD1000/500 MAX MFD TIMERS VIEW contains three pilot selectable general timers, a pilot selectable flight timer and departure time (see **Figure 5-101**). Timer functions are accessed by selecting the desired timer with the hot key (1/4, 2/4, 3/4 and 4/4). The timer selected with the Hot Key will have a cyan box around it.

5.8.1 **General Purpose Timers**

With one of the three general timers selected the pilot can perform the following operations:

- RSET - Resets the timer to ZERO time if the counts is set to UP, or to the "PRESET" time if the counts is set to DOWN.
- STRT/STOP – Toggles between the timer running and stopped. When STRT is pressed the timer resumes counting from its current value.
- UP/DOWN – Toggles the counter between operation as a count UP or Down timer. Toggling the timer also performs a reset such that the value is either zero or the preset value.
- PSET – Only enabled if the timer Hot Key is DOWN. Pressing the PSET Hot Key enables editing of the PRESET value (see **Figure 5-102**),
  - Pressing the left Knob cycles between selecting Hours/Minutes/Seconds for Editing
  - Turning the Left Knob edits the selected field of the preset value
  - Pressing the Right Knob or pressing the PSET key again exits the PRESET Edit mode

5.8.2 **Changing Timer Legend**

The three general timers can be labeled as TIMER 'X', LEG TIMER 'X' or FUEL TIMER 'X' in the TIMER page of the main menu (see **Figure 5-103**).

Figure 5-102
MFD Timers VIEW
Close Up

NOTE

After a power cycle, the three general timers will be set to count UP, however the preset value is retained.

Figure 5-103
Timer Legend

Figure 5-104
Timer Alert Message VIEW

5.8.3 **Timer Expiration**

When a count down timer expires a timer expired annunciation will appear in the data bar of the MFD. Additionally, an audio TIMER alert message will be heard through the audio panel. If the TIMERS view is not currently displayed on the MFD, white TMR legend will be displayed above the middle button (see **Figure 5-104**). Pressing the middle button while TMR is above it will select the TIMER page and "BACK will be displayed above the middle button (**Figure 5-104**). To go back to the previous VIEW press the middle button again.).

5.8.4 **Flight Timer**

With the Flight Timer (4/4) selected the only option available is to reset (see **Figure 5-105**). The flight timer will automatically start as the aircraft is accelerating on takeoff. The flight timer automatically stops as the aircraft is decelerating upon landing. The flight timer will reset to zero only after a power cycle. If multiple flights are to take place without a power cycle of the display the RSET Hot Key can be used to reset the flight timer to zero.

5.8.5 **Departure Timer**

The DEPARTURE TIMER shows the actual departure time in GMT (see **Figure 5-106**). It sets GPS (either from a panel mounted GPS system or the RSM GPS) time as the aircraft is accelerating on takeoff. Upon power cycle it resets to "--:--Z"

Figure 5-105
MFD Flight Timer VIEW

Figure 5-106
MFD Departure Time

WARNING

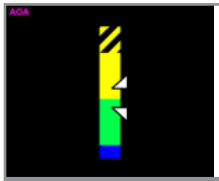
It's vital you refer to the pointer that corresponds to the current aircraft Flaps configuration for an accurate AOA indication. Failing to do so may result in inadvertently entering into a dangerous AOA condition.

5.9 **Angle of Attack (AOA)**

The Evolution Angle of Attack provides the pilot a visual display of the AOA trend and the trend towards stall simultaneously in both the Flaps UP and Flaps DOWN configuration. The AOA indicator can be displayed on any of the Split Screen (2/3) and Thumbnail (3/3) tiles. For details on the AOA features and general operation refer to the MAX PFD Pilots guild.

When selected, "ANGLE OF ATTACK" appears momentarily in the upper left of the view. After a few seconds, the phrase contracts to "AOA".

The Aspen AOA indicator is comprised of a fixed colored tape with Blue, Green, Yellow and Yellow - Black Cross Hatch bands. Two pointers point to the AOA colored tape indicator. The top Flaps UP pointer and the bottom Flaps DOWN pointer. Due to the difference in the Flaps DOWN or Flaps UP aircraft performance it is possible for the two AOA pointers to simultaneously indicate two different AOA performance regions.

	AOA indicator on. Top pointer indicates Flaps UP AOA, Bottom pointer indicates Flaps DOWN AOA
	AOA indicator pointers fade out when the aircraft is on the ground and the wings are not creating lift.

Color	AOA Condition
	Warning AOA
	Caution/High AOA
	Normal Approach AOA
	Low AOA, Cruise flight

Table 5-23 AOA Color Band Key

5.10 **SecondaryAttitude Instrument** (EFD1000 MFD only)

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 5-107**).

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

NOTE

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

Figure 5-107
Secondary Attitude Instrument

Figure 5-108
ADAHRS FAIL

Figure 5-109
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 5-108**).

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 5-109**).

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.

5.11 **Secondary Horizontal Situation Indicator** (EFD1000 MFD only)

The Horizontal Situation Indicator VIEW is available when the EFD1000/ MAX MFD is configured with a GPS. 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 5-110**).

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

Figure 5-110
Secondary HSI

Modify the Course Setting

1. Select the Secondary HSI VIEW WINDOW.
2. Press the Left Knob. The Course field is rendered in magenta (**Figure 5-111**).
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 5-111
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 MAX Pilot's Guide** *for detailed information on course SYNC.*

Figure 5-112
Secondary HSI Displaying the VDI

NOTE

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

Vertical Deviation Indicator (VDI)

The secondary HSI displays the VDI scale and diamond only when a vertical deviation signal is available (**Figure 5-112**). 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.

5.12 **MFD Reversionary Mode Operation** (EFD1000 MAX MFD only)

Select REV Mode

1. EFD1000 MAX 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 MAX MFD (**Figure 5-113**) 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

For all reversionary PFD functionality refer to the PFD1000 Pilot guide.

Figure 5-113
The EFD1000 MAX MFD is on the Right of a Three-Display Setup

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.

Chapter 6

Unusual Conditions and Annunciations

This section provides supplementary information regarding certain emergency and abnormal conditions described in the FAA-approved Airplane Flight Manual Supplement (AFMS). The AFMS is the FAA-approved source for limitations and procedures regarding the MAX systems.

6.1 **Attitude Degraded Mode**

The EFD1000 MAX uses airspeed-aiding to support the attitude indication, and GPS for backup. When the EFD1000 MAX detects a failure of airspeed (through a GPS groundspeed comparator) the system will automatically revert to GPS groundspeed-aiding and present the "Attitude Degraded" message. Limit maneuvering to half standard rate and ±5º in pitch for satisfactory attitude indicator performance. Exiting IMC is appropriate unless the failed airspeed condition can be cleared.

6.2 **Airplane Electrical Failure: "ON BAT" Annunciation**

Each of the EFD systems each have an internal battery that automatically operates when the ship's power fails. The internal battery permits operation of the EFD systems without presenting a load to the airplane battery. If "ON BAT" is displayed, turn off the EFD switch to isolate the EFD system from the rest of the electrical system. The display brightness is automatically reduced. Manually reducing the brightness to 40 or less will extend the battery duration.

When displaying "ON BAT", a fully charged battery will indicate a charge level of 99% for some time before beginning to decay. The charge level will steadily decrease (at 5% intervals) when below 95%, with a slight acceleration as the battery nears 0%.

The MFD with EBB is designed to remain operational for at least 30 minutes when the battery shows 80% remaining. If your airplane is equipped in this way (See Table 1 of the airplane AFMS), it is important to verify the battery performance before takeoff. See the AFMS Normal Procedures, Before Takeoff Checks.

6.3 **Power Override**

It is possible to override the automatic "ON BAT" condition and force the EFD to use ship's power. Use caution because this will result in an electrical drain on the ship's battery, which may be needed for other functions. Proceed as follows:

1. MENU..... Turn the right knob to the "POWER SETTINGS" Page

2. EXT PWR..... PRESS this hot key To switch FROM Battery TO aircraft Power

6.4 **Annunciations Summary**

Table 6-1 is a summary of the Annunciations that can be displayed on the EFD1000 MAX PFD. The annunciation color is used to indicate the alert level of the annunciation. The Alert Levels are:

Refer to the EFD1000 MAX AFMS for specific information on actions/procedures to be followed when an Annunciation occurs.

Warning	Requires immediate pilot attention
Caution	Abnormal condition that may require pilot intervention
Advisory	General information to the pilot

Table 6-1 Annunications Summary Color Key

WARNINGS

Annunciation	Description
	Presented whenever the EFD system is operating on the internal battery or EBB. The countdown timer appears first, and is then replaced by the ON BAT and % charge annunciation.
	Attitude and Heading indications have failed.
	Red chevrons displayed on the Attitude Indicator's pitch scale to indicate extreme pitch up and down attitudes and direction to restore level flight.
	Synthetic Vision Flight Path marker. Terrain or obstacle conflict within 30 seconds.

WARNINGS

Annunciation	Description
RA	Radar Altimeter has failed.
WARNING – TERRAIN, TERRAIN WARNING – OBSTACLE, OBSTACLE	Synthetic Vision system terrain or obstacle conflict within 30 seconds. Accompanied by the following audible annunciation: "Warning Terrain Terrain!" and "Warning Obstacle Obstacle!"
TFC	Traffic Failure
GNUS : AGE : RGNL :	FIS-B Weather data is not valid
AIR SIG	FIS-B AIRMET/SIGMET data is not valid.

WARNINGS

Annunciation	Description
	FIS-B wind and temperature data is not valid
	FIS-B TFR data not received.
	Stormscope (STRK) has failed.
	The navigation source is not available.
	The Angle Of Attack System has failed
	The Angle Of Attack System has failed

CAUTION

Annunciation	Description
Panel Mounted Indicator Lamp A/P AHRS Fail Or A/P AHRS Fail	The attitude system provided to the autopilot has failed.
PDF: ATTITUDE DEGRADED MFD: ATT DEGRADED	ATTITUDE DEGRADED mode. The Pitot input has failed (perhaps due to icing), and GPS aiding is used for the attitude indication. The attitude indication can be in error and maneuvering limitations are to be followed.
CROSS CHECK ATTITUDE	The attitude indication could be in error.
ADAHRS FAIL	MFD Attitude failure.

CAUTION

Annunciation	Description
CHECK AHRS	MFD attitude could be degraded.
CROSS LINK FAILURE	No communication between PFD and MFD(s).
(HDG FAIL)	Failed heading on the MFD
CHECK PITOT HEAT	Possible Pitot Obstruction. Accompanied by Red X attitude and heading.
GPS1 GPS2 RSM GPS	GPS Invalid indications
GPS1 REVERSION	GPS 2 is invalid and the EFD1000 has automatically selected GPS 1.

CAUTION

Annunciation	Description
GPS2 REVERSION	GPS 1 is invalid and the EFD1000 has automatically selected GPS 2.
RSM GPS REVERSION EMER USE ONLY	GPS 1 and GPS 2 are invalid and the EFD1000 has automatically selected the Emergency RSM GPS.
	Synthetic Vision Flight Path marker. Terrain or obstacle conflict within 45 seconds.
CAUTION – TERRAIN, TERRAIN CAUTION – OBSTACLE, OBSTACLE	Synthetic Vision system terrain or obstacle conflict within 45 seconds Accompanied by the following audible annunciation "Caution Terrain Terrain!" and "Caution Obstacle Obstacle!"
GPS POS FAILED	NAV and Terrain Map indication when of all Navigation GPS devices have failed.
INTEG	GPS Integrity indication

CAUTION

Annunciation	Description
	The aircraft has reached or is below the set MINIMUMS. Accompanied by a one-second stuttered tone when the optional tone generator is installed. Accompanied by the following audible annunciation (software 2.10 (MAX) and subsequent): (at Minimums) "Minimums"
	The aircraft is approaching (steady) or deviated from (flashing) the selected altitude. Accompanied by a one-second steady tone when the optional tone generator is installed. Accompanied by the following audible annunciation (software 2.10 (MAX) and subsequent): "Altitude"
	The optional radar altimeter Decision height input indicates the aircraft is at or below the radar altitude set by the pilot.
	Indicates the GPSS source is invalid (e.g. the flight plan was deleted) or a different GPS was selected by the pilot. The autopilot will fly wings-level until valid GPSS signal is available and GPSS is re-engaged.

CAUTION

Annunciation	Description
TERRAIN FAIL	The dedicated terrain display is unusable.
TRAFFIC	Traffic Alert. TFC is shown instead of TFC for MAP SW 2.8 and later.
TFC UNAV	TIS-A option: Traffic data is unavailable.
TFC RMVD	TIS-A option: Traffic was removed. The PFD does not display the AGE.
TFC FAIL	TIS-A option: Traffic sensor failure.
UAT LINK	ADS-B OUT: The UAT link between the ADS-B system and the PFD has failed. This message can only be presented when integrated with the Aspen or FreeFlight ADS-B OUT System.

CAUTION

Annunciation	Description
UAT POS	ADS-B OUT: The UAT position source has failed. This message can only be presented when integrated with the Aspen or FreeFlight ADS-B OUT System.
UAT FAIL	ADS-B OUT: The UAT transmitter has failed. This message can only be presented when integrated with the Aspen or FreeFlight ADS-B OUT System.
TFC DEGRADED	No ADS-B Traffic data uplinked from the ground or GDL 88 or GTX 345 is in Standby.
TFC	No ADS-B Traffic data uplinked from the ground or GDL 88 or GTX 345 is in Standby.
CSA FAIL	Conflict Situational Awareness -traffic alerting is inoperative. GDL 88 or GTX 345 integration only.
FAIL	Stormscope Option: Sensor has failed.
ERROR	Stormscope Option: Sensor has failed.

CAUTION

Annunciation	Description
NXRD : CNUS : AGE : ISSUED: ––:––Z VALID: ––:– ––Z AIR SIG TFR LTNG : SIG : AIR : TFR : RGNL :	Weather product data not received.

CAUTION

Annunciation	Description
	Software Version 2.10 (MAX) and subsequent when the EFD1000 MFD is used for attitude backup. The aircraft is approaching an area where the external magnetic field is insufficient for Attitude and Heading operation.
	Annunciation presented when the external magnetic field is insufficient for Attitude and Heading operation. After four minutes of Free Gyro operation the attitude and heading indications will Red-X.
	Annunciation presented in the menus when the connected EFD battery is not detected or failed
	GPSS is operational

CAUTION

Annunciation	Description
	GPS annunciations that are provided by the GPS source. TERM can also be displayed in the same location as APPR.
UAT CTL: MENU	When this message is displayed, the PFD is the UAT controller.
TFC TFC ID	Green annunciation that indicates that the traffic sensor is enabled. ID after TFC indicates that traffic identification is displayed if available. This annunciation does not indicate the status of the ADS-B traffic data uplinked from the ground.
TFC STBY	Green annunciation that indicates that the traffic sensor is in standby.
TFC COAST	Green annunciation that indicates that the TIS A traffic data has not been refreshed within 6 seconds.
XRATE 9	Stormscope (strike) option: The rate indicates the approximate number of lightning strikes detected per minute.

CAUTION

Annunciation	Description
+RATE 6	Stormscope (strike) option: Cell clustering display mode selected. The rate indicates the approximate number of lightning strikes detected per minute.
AGE :05 AIR :02 SIG :11 NXRD :08 LTNG :03	A data age annunciation for XM Datalink products.
RGNL :	A data age annunciation for ADS-B weather products.
AGE : TFR Issued: 02:02Z Valid: 02Z – 09Z AIR SIG	A data age annunciation for ADS-B weather products.

CAUTION

Annunciation	Description
DATABASE FAIL	Database Failure
MAP LOADING...	The Database for the NAV Map is loading
OWNSHIP NOT AVAILABLE	Charts Option: The ownship cannot be displayed.
OWNSHIP OFF CHART	Charts Option: The ownship is off the chart.
SV UNAVAILABLE : ADAHRS FAIL	Synthetic Vision Option: Failed
SV POSITION INVALID	Synthetic Vision Option: Failed
DATABASE FAIL	Synthetic Vision Option: Failed
DATABASE INIT	Synthetic Vision Option: Not yet operational
SV DATABASE UNAVAILABLE	Synthetic Vision Option: Failed

CAUTION

Annunciation	Description
SV LOADING...	Synthetic Vision Option: Not yet operational
MAP LOADING...	Synthetic Vision Option: Not yet operational
	A white flight path marker indicates that approach TWS alerts are available (Terrain Alerts will be generated by terrain 100 feet higher than the runway elevation and all mapped obstacles).
OBSTACLE BEHIND AOA	Synthetic Vision Option: An obstacle that is behind the AOA indicator for more than five seconds will elicit this message.
AOA AUTO	The AOA indicator is available for display but removed to reduce clutter. This message will be shown until the AOA indicator presents useful information.
TIMER 1 EXPIRED	Indication that a timer has expired (software 2.10 (MAX) and subsequent). Accompanied by the following audible annunciation:"Timer"

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. Dealer must have activated your product warranty prior to you being able to register on the customer port.*

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 **Seattle Avionics Data**

The Seattle Avionics data includes the following elements: Instrument Approach Procedure (IAP) charts, Departure Procedure (DP) charts, Standard Terminal Arrival (STAR) charts, Airport Diagrams (APD), Take-off Minimums and Obstacle Departure Procedures (MIN), and Alternate Minimums (MIN). All data types will be preloaded onto the micro SD card that is shipped with the unit. The data is combined and presented as a single update file from Seattle Avionics every 28 days.

Activate Seattle Avionics Data Service

1. Create a new account with Seattle Avionics (https://seattleavionics.com/ChartData/default.aspx?TargetDevice=Aspen)

2. Customers will receive a confirmation email from Seattle Avionics indicating service activation as well as an automatic renewal option for continuing the data service after the 90 day trial period ends.

The Seattle Avionics Updates are located in the Seattle Avionics ChartData Manager. The Data Manager must be downloaded onto your computer to obtain updates from the Seattle Avionics ChartData Manager. A compatible computer with the ability to write to a microSD card is required.

Overview for downloading the Seattle Avionics Updates

1. Insert the card in your computer's card slot.
2. Start the Data Manager application and login to your Seattle Avionics account.
3. From the Seattle Avionics ChartData Manager, select Aspen
4. Click on the Download Now button to initiate the download.

For complete detailed instructions, refer to seattleavionics.com/aspen and click on *How to download and install new data or contact Seattle Avionics Technical Support Staff (425-806-0249)*.

Figure 7-1
XM RECIEVER Main Menu Page

7.3 **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.

7.3.1 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.

1. EFD1000 MFD Only.

7.4 **Optionally Enabled Features**

The following are separately purchased features that can be enabled on the EFD1000/500 MAX MFD. See your dealer for information on enabling these features.

- Evolution Synthetic Vision
- Aspen Angle of Attack (AOA)
- ADS-B In
- Flight Director Input
- Evolution Hazard Awareness
  - Includes Traffic, XM Weather, and Stormscope

7.5 **Warnings, Cautions, Notes**

WARNING

Do not rely on the navigation data of the EFD1000/500 MAX MFD Navigation VIEW as the primary reference for navigation. The EFD1000/500 MAX 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 MAX 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

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 MAX MFD on the ground and under VFR conditions to become completely familiar with the product. Always compare indications from the EFD1000/500 MAX 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 MAX 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 MAX 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 MAX MFD Navigation VIEW as the primary reference for navigation. The EFD1000/500 MAX 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 MAX 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 MAX 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 MAX MFD XM WX Satellite Weather VIEW will have some delay from real time to the EFD1000/500 MAX 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 MAX 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 MAX MFD navigation maps are not a replacement for required charts and other navigation data required for flight.

WARNING

The EFD1000/500 MAX 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 MAX MFD. Only Aspen Avionics Authorized Dealers can make repairs on the EFD1000/500 MAX 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 MAX 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 MAX MFD. The AFMS has information specific to your installation and may contain operating limitations applicable to your aircraft configuration.

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
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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