

FRIENDLYPANELS EFD1000 PFD MANUAL

For Microsoft[®] Flight Simulator FSX



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WARNING

This operating manual has been written following the original ASPEN EFD1000 Pilot's Guide, but it's not intended to be valid for training purposes other than its use with Microsoft[®] Flight Simulator. We consider very interesting to read the original EFD1000 Pilot's Guide in order to better know this wonderful instrument.

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1. OVERVIEW

The EFD1000 Pro PFD is a powerful addition to any cockpit, providing far more capability, information and automation than the mechanical instruments it typically replaces. While it is simple and intuitive enough to start using with only a short orientation, fully understanding and exploiting all of its features requires some study and experience.

The EFD1000 PFD is a flat-panel LCD primary flight instrument that presents the pilot on a single display with all the information delivered by the traditional six-pack of mechanical instruments: Airspeed, Attitude, Altitude, Turn Coordinator, Heading Indicator (or HSI) and Vertical Speed Indicator (VSI). Modern technology and standard EFIS symbology enable the consolidation of all six instruments into a single display, tightening the pilot's instrument scan and reducing pilot workload.



1. Attitude display
2. Data bar
3. Navigation display
4. Left (CRS) Knob, Right (HDG) Knob
5. Left Button, CDI Button, Right Button
6. REV Key, RNG Key, MENU Key, Hot Key(s) (1-5)

The mouse clicking areas are marked in red

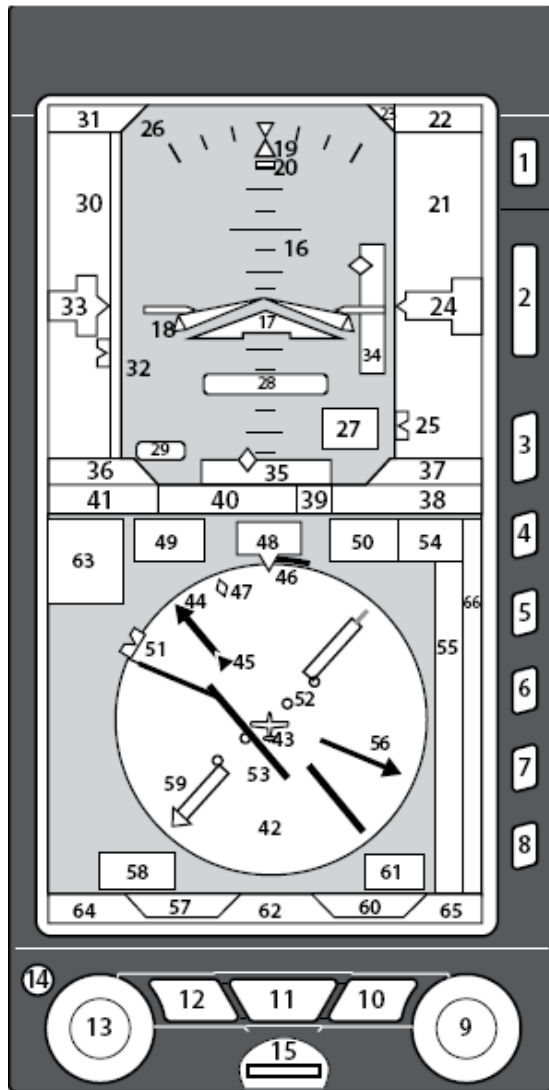


Figure 1

NAVIGATION DISPLAY

42. Navigation Display
43. Ownship Symbol
44. Course Pointer
45. TO/FROM Indicator
46. Rate of Turn Indicator
47. Track Marker
48. Magnetic Heading
49. Selected Course(CRS) Field
50. Selected Heading Field
51. Heading Bug
52. Course Deviation Scale
53. Course Deviation Indicator
54. Vertical Speed Digital Value
55. Vertical Speed Tape
56. Single-Line Bearing Pointer
57. Single-Line Bearing Pointer Source
58. Single-Line Source Info Block
59. Double-Line Bearing Pointer
60. Double-Line Bearing Pointer Source
61. Double-Line Source Info Block
62. CDI Navigation Source
63. CDI Source Information Block
64. Left Control Knob State
65. Right Control Knob State
66. Hot Key Legend

CONTROLS

1. Reversion and Power Control
2. Range Control
3. Menu Control
4. TPS Hot Key - Tapes On/Off
5. MIN Hot Key - Minimums On/Off
6. 360/ARC Hot Key - HSI View
7. MAP Hot Key - Map Declutter Logic
8. GPSS Hot Key - GPS Steering On/Off
9. Right Control Knob
10. Double-Line Bearing Pointer Source Select
11. CDI Source Select
12. Single-Line Bearing Pointer Source Select
13. Left Control Knob
14. Automatic Dimming Photocell
15. Micro SD card slot

ATTITUDE DISPLAY

16. Attitude display
17. Aircraft symbol
18. Flight director
19. Roll pointer
20. Slip/Skid indicator
21. Altitude tape
22. Selected altitude filed
23. Altitude alert
24. Altitude drum/Pointer
25. Altitude bug
26. Decision height annunciation
27. Selected minimums field
28. Minimums annunciation
29. LDI Navigation source annunciation
30. Airspeed indicator tape
31. Selected airspeed field
32. Airspeed bug
33. Airspeed drum/Pointer
34. Vertical deviation indicator
35. Lateral deviation indicator

DATA BAR

36. True Airspeed (TAS)
37. Barometric Pressure Setting Field
38. Wind Direction and Speed
39. Wind Direction Arrow
40. Outside Air Temperature (OAT)
41. Ground Speed (GS)

2. CONTROLS

The primary means for the pilot to control the EFD1000 are the two knobs and three buttons at the bottom of the display. The knobs control setting of CRS and HDG, and additional bugs and altitude settings. The three buttons control selection of navigation sources for the CDI and bearing pointers.

Additionally, five hot keys to the right of the Navigation Display toggle various features on and off. The function of each is indicated by the label on the screen to the left of each button. Three additional buttons above the hot keys control entering and exiting the Menu system, setting the Map range, and, in this version, only manual power control.

2.1 Left and Right Knobs

The Left and Right Knobs are both of the push and rotate type. Pressing the knob activates it for control, and subsequent presses cycle through its available control functions in round-robin sequence.

Each knob has an inactive Home state, to which it returns automatically after 10 seconds of inactivity. The inactive state is designed to prevent inadvertent adjustment of a setting. The Left Knob Home state is CRS, and the Right Knob Home state is HDG. A single push of the knob activates the Home state (CRS or HDG) for editing.

To change an available setting, repeatedly press the appropriate knob until the desired function appears in magenta above the knob (the setting you are changing will also appear in magenta on the display). With a little practice, you'll soon know exactly how many presses it takes from the Home state to get to what you want to set.

When the function you want to set is shown in magenta, dial the knob left or right to set the desired value, or press the knob to synchronize (SYNC) the setting. Once set, you can either press the knob again to advance to the next function you'd like to set, or you can do nothing and in 10 seconds the knob will return to its home state (CRS or HDG).



2.1.1 Right Knob Functions

The Right Knob Home state is Heading (HDG). The Right Knob is also used to set the Altitude Alerter selected altitude (ALT), barometric pressure (BARO) and instrument approach minimums (MIN). Successive presses of the right knob will cycle through HDG-ALT-BARO-MIN in round-robin sequence.

From the inactive Home state (HDG shown in cyan above the right knob):

- Press once to set the heading bug (HDG).
- Press twice to set target altitude (ALT)
- Press three times to set barometric pressure (BARO).
- Press four times to set approach minimums (MIN).

2.1.2 Left Knob Functions

The Left Knob Home State is Course (CRS). The Left Knob is also used to set the Airspeed Bug (IAS).

From the inactive Home state (CRS shown in cyan above the left knob):

- Press once to set the course (CRS). *When the CDI navigation source is selected to a GPS receiver, and Auto Course is enabled in the main menu, the course is set automatically by the GPS and is not pilot-adjustable. This case will be indicated by the CRS field and Knob label being shown in Green with an inverse "A". In this case, pressing the Left Knob will enable you to set only the airspeed bug (IAS).*
- Press twice to set the airspeed bug (IAS).

2.1.3 SYNC Function

Control Knob SYNC Function



1. Repeatedly press the control knob (**A area**) until the control knob label shows the value you want to set in magenta.
2. Press the control knob (**B area**) to synchronize the setting according to the rules shown below.
3. After 10 seconds of inaction, the knob reverts to its Home state (CRS or HDG), and the labels and field are shown in cyan (inactive).

2.1.3.1 Right Knob SYNC Action

1. ALT Bug and alerter are set to the current altitude.
2. MIN Set to the current altitude.
3. BARO Set to 29.92 InHg or 1013 mB.
4. HDG Set to the current heading.
5. Right Knob - Current Field Label [HDG] (cyan indicates field is inactive)

2.1.3.2 Left Knob SYNC Action

1. IAS Set to the current Indicated Airspeed.
2. CRS
 - 2.1 VOR navigation. Set to the reciprocal value of the current VOR radial. The deviation bar centers with a "TO" indication.
 - 2.2 ILS navigation Current aircraft heading.
 - 2.4 GPS AUTO CRS enabled No effect.
3. Left Knob - Current Field Label [CRS] (cyan indicates field is inactive, green with inverse A indicates Auto Course is enabled)

2.2 Navigation Source Select Buttons



The three buttons on the bottom of the EFD1000 PFD allow the pilot to select the navigation source for the CDI and Bearing Pointers.

1. Single-Line Bearing Pointer Source
2. CDI Nav Source
3. Double-Line Bearing Pointer Source

2.2.1 CDI Nav Source Control

The center button of the three buttons between the control knobs at the bottom of the EFD1000 PFD is the CDI Nav Source Select Button. It selects which of the available navigation sources will couple to the CDI, which in turn couples to the autopilot. Each press of the CDI Nav Source button selects the next available nav source, cycling through all available sources in round-robin sequence. The currently coupled CDI nav source is displayed directly above the CDI Nav Source Select Button.

In this version the available nav source choices are: GPS1 and VOR1.

If a nav source is configured to be available, but is not currently putting out valid navigation data, its identifier will be shown with a red slash through it, and the CDI bar will not be shown with the Course Pointer. The pilot will be able to select that invalid source, but no navigation data will be provided.

2.2.2 Bearing Pointer Nav Source Control

The two outer buttons between the control knobs are the Bearing Pointer Nav Source Select Buttons. The left-hand button controls BRG1 (the single-line bearing pointer) and the right-hand button controls BRG2 (the double-line bearing pointer), and each controls which nav source is coupled to that bearing pointer.



The bearing pointers act like a conventional RMI (Radio Magnetic Indicator): the needle points to the station. Unlike a conventional RMI, EFD1000 bearing pointers can also point to the active waypoint of a GPS navigator, whether that is a VOR, NDB, airport, intersection, or missed approach point.

Each bearing pointer can be coupled to any of the available navigation sources: GPS1, VLOC1, or VLOC2, or NDB to none. Each press of the Bearing Pointer Nav Source Select Button selects the next available nav source or NDB, cycling through all available nav sources and none, in round-robin sequence. The currently coupled nav source is displayed directly above the Select Button; blank indicates that no nav source is selected and the bearing pointer will not be displayed.

If coupled to a source that does not provide angular bearing data, such as a localizer, the bearing pointer is not presented and the source is flagged as invalid.

Each bearing pointer has an associated source information block that can display information about the source of the bearing pointer data. Information that can be displayed includes distance to station (if coupled to a GPS waypoint) and either the station identifier or the tuned frequency.

2.3 Hot Keys

The five keys along the lower right of the EFD1000 PFD function as either single-action Hot Keys for frequently used commands or as Menu selection keys when the Main Menu has been activated.



HOT KEY		DESCRIPTION	OPTIONS	
1	TPS	Displays or hides air data tapes (airspeed and altitude).	TPS TPS	TAPE DISPLAYED TAPE HIDDEN
2	MIN	Enables and displays, or disables and hides, Minimums Alerter.	MIN MIN	Minimums displayed and alerter enabled Minimums alerter disabled
3	ARC/360	Toggles between 360 and ARC modes of Navigation Display .	ARC 360	ARC Compass Mode 360° Compass Mode
4	MAP	Selects Map display and feature levels .	MAP MAP MAP MAP	High Medium Low Flight Plan Only Off (See side figure)
5	GPSS	Toggles between GPS Steering (GPSS) Mode and HDG mode for Autopilot/Flight Director.	GPSS GPSS	GPS on GPS off

Hot Key functions are accessible anytime, except when the Menu is active. Each Hot Key provides instant access to the assigned command as listed above. Each press of a Hot Key toggles between the settings that key controls. The TPS, MIN and GPSS Hot Keys are either ON, with a green label, or OFF, with a gray label. The ARC/360 Hot Key label indicates which compass mode is currently active on the Navigation Display.

The MAP Hot Key displays the GPS flight plan, legs, waypoints, and base map on the Navigation Display, with one of four levels of declutter, and turns off the map. Pressing the MAP key cycles through these available options. When the MAP is turned off, or is unavailable, the label is gray.

When the function a Hot Key controls is unavailable or invalid, the label displays with a vertical red line, as shown.



2.4 Menu Key

The MENU Key is used to access the EFD1000 PFD's Menu system for changing options, and also to change the EFD1000's LCD brightness controls (this last feature is not available in this version of the gauge).

2.4.1 Using the Menus

Press the MENU Key to activate the Menu system. The current Menu Page Name displays in the lower center of the Navigation 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.



Menu Page 1, General Settings, is the one most commonly used in flight. It enables the pilot to enable or disable AUTO COURSE SELECT mode, to display or hide the V-speeds on the airspeed tape, and to choose the type of CDI display for ARC mode. The other menu pages are used for V-speed and map customization, for abnormal power management, and for displaying product version information.

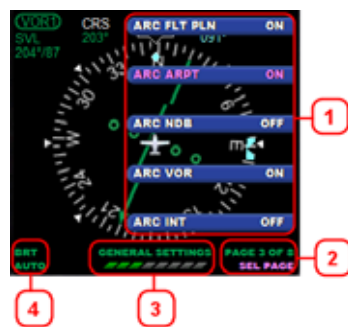


The Menu system operates either in Navigation or Edit mode, as indicated by the label directly above the Right Knob. When the MENU key is first pressed, the Menu system is in Navigation mode, indicated by the magenta label SEL PAGE directly above the Right Knob. When in Navigation mode, rotating the 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 displays up to five selectable options, each adjacent to one of the five Hot Keys (which double as Menu Select keys in the menu system). 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, 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 key again to exit the menu system.

1. Menu
2. Menu Page number and mode (Navigation mode shown)
3. Menu Page Name and Menu Page graphical bar
4. Brightness Control (not implemented)

2.4.2 Access and navigate the menus



1. Push the MENU key. The Menu displays on the Navigation Display adjacent to the Hot Keys.
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 advances backward one menu page at a time.
3. When finished, press the MENU key to exit the Main Menu.

2.4.3 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.
4. Rotate the Right Knob to the desired value.
5. Push the Right Knob to return to menu navigation mode.
6. Push the MENU key to exit the Main Menu.

2.5 Map Range Key

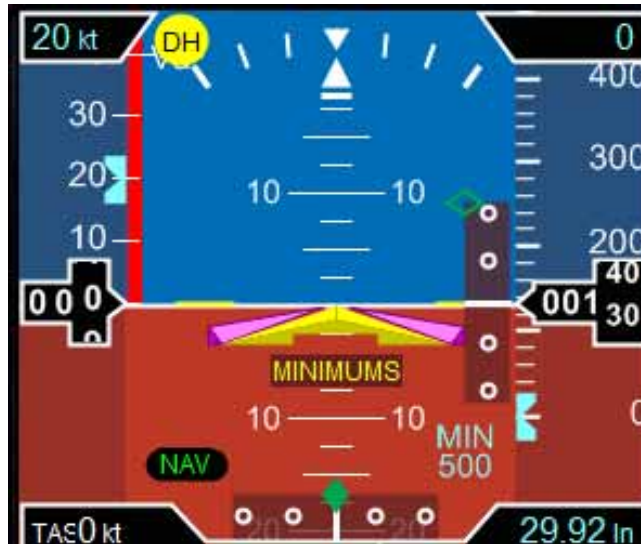
When the MAP is enabled, the RNG (Range) key is used to zoom in or out in scale to display more or less of the map. Range can be adjusted from 2.5 to 200 nautical miles. Press the top or (+) part of the RNG key to increase map range. Press the bottom or (–) part of the RNG key to decrease map range.

2.6 REV button

In this version the REV Button is used to power on or off the gauge.

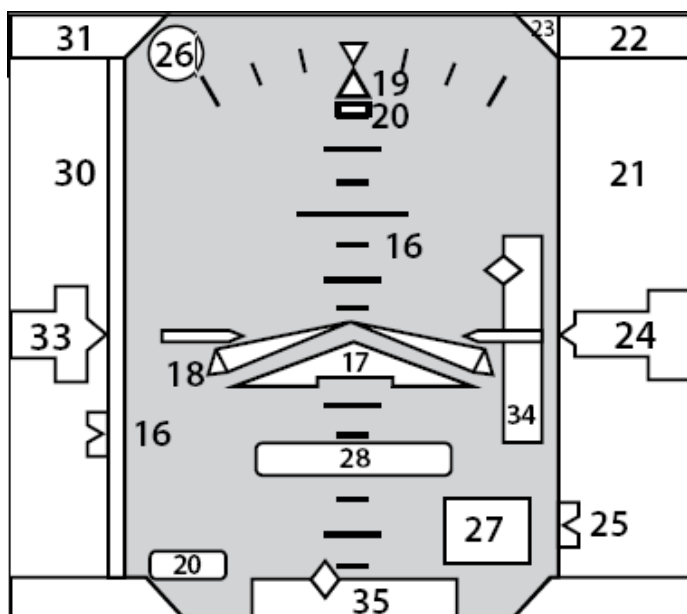
3. ATTITUDE DISPLAY

The Attitude Display includes an Attitude Director Indicator (ADI) with single-cue Flight Director command V-bars, an Airspeed tape, an Altimeter tape, an Altitude Alerter (with separate minimums alerting), and Instrument Approach indicators (See below).



The Airspeed and Altitude tapes are the most obvious differences from a mechanical ADI. These tapes are common on most EFIS PFDs, and will be immediately familiar to pilots with EFIS experience. Pilots without prior EFIS experience may need some time, experience, and training to get comfortable using the Airspeed and Altimeter tapes as their primary references.

If the tapes prove distracting at any time, however, the pilot can remove them from the display by pressing the TPS Hot Key.



ATTITUDE DISPLAY	
16	Attitude Display/Attitude Director Indicator (ADI)
17	Aircraft Symbol
18	Single-Cue Flight Director
19	Roll Pointer
20	Slip/Skid Indicator
21	Altitude Tape
22	Selected Altitude Field
23	Altitude Alert
24	Altitude Drum/Pointer
25	Altitude Bug
26	Decision Height Annunciation
27	Selected Minimums Field
28	MINIMUMS annunciation
29	LDI Navigation Source Indication
30	Airspeed Indicator Tape
31	Selected Airspeed Field
32	Airspeed Bug
33	Airspeed Drum/Pointer
34	Vertical Deviation Indicator
35	Lateral Deviation Indicator

3.1 Attitude Director Indicator (ADI)

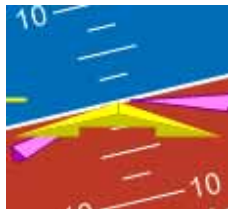
The Attitude Director Indicator (ADI) features a conventional blue (sky) over brown (ground) background, with a white horizon line dividing the two areas. A triangular aircraft reference symbol is in a fixed position, and shows aircraft attitude relative to the horizon.

The pitch scale (or ladder) indicates degrees of nose up (blue) or nose down (brown) pitch relative to the apex of the aircraft symbol. Minor pitch marks are shown every 2.5° of pitch, with major pitch marks every 10° of pitch. The distance between pitch marks is greater than on most mechanical attitude indicators, making it easier for the pilot to fly more precise pitch attitudes.



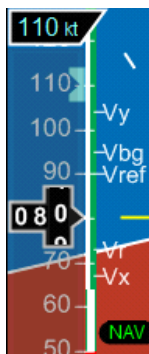
At the top of the ADI are the roll scale, roll pointer, and slip/skid indicator. The roll scale is indicated by tick marks at 10° , 20° , 30° , 45° , and 60° on both sides of the zero roll inverted solid white triangle. The 45° marks are represented as hollow triangles.

Slip/skid is indicated by the lateral position of the white rectangle under the roll pointer. One rectangle width is equivalent to one ball width of a conventional inclinometer.



When connected to a compatible autopilot system the EFD1000 will display a single-cue Flight Director. The Flight Director command bars visually represent the lateral and vertical steering cues transmitted to the EFD by the autopilot. When the FD output from the autopilot is unavailable or flagged invalid, the FD command bars are removed from the display.

3.2 Airspeed Tape and Bug



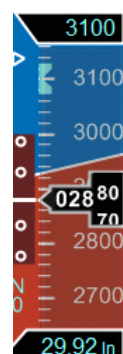
Airspeed is indicated by a moving airspeed tape against a fixed position airspeed pointer, shown on the left-hand side of the Attitude Display. A digital, rolling drum readout indicating airspeed values to the closest one knot is provided adjacent to the fixed pointer. Tick marks are provided on the airspeed tape every 10 knots.

Color speed bands are displayed on the indicated airspeed tape, corresponding to the colored arcs found on a traditional airspeed instrument.

A white triangle will be presented on the airspeed tape at the speed corresponding to initial flap extension speed.

Textual V-speed markers can also be shown on the airspeed tape (e.g., V_x , V_y , V_a , etc.). These are typically programmed at installation, and may also be programmed by the pilot. V-speed display can be enabled or disabled by the pilot from Page 1 of the Main Menu.

The pilot can set a target airspeed using the left-hand control knob. The target airspeed is shown on the Airspeed Tape in the form of an Airspeed Bug (blue color), and will also be displayed numerically above the Airspeed Tape. The bug and numerical value are for visual reference only, to help the pilot maintain a target airspeed; there is no alerting for deviations from the target.



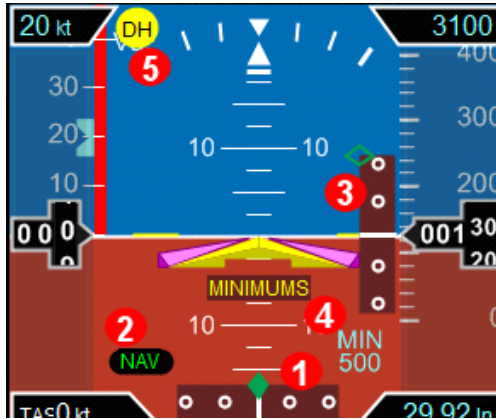
3.3 Altitude Tape and Alerter

Altitude is indicated by a moving altitude tape against a fixed position altitude, shown on the right-hand side of the Attitude Display. A digital, rolling drum readout indicating altitude values to the closest 10 feet is provided adjacent to the fixed pointer. Minor tick marks are provided on the tape at 20-foot intervals, and major tick marks are provided at 100-foot intervals.

The current altimeter barometric setting is shown just below the Altitude tape in the Data Bar, and can be adjusted using the Right Knob.

The Airspeed Tape also includes a built-in altitude alerter, which consists of an Altitude Bug on the Airspeed Tape, a Selected Altitude display, a visual Altitude Alert. The Vertical Speed Indicator (VSI) is shown on the Navigation Display, to the right of the HSI.

3.4 Instrument Approach Indicators



Additional indicators are shown or available on the Attitude Display when flying certain types of instrument approaches. These enable the pilot to maintain a tighter instrument scan on the ADI, reducing workload and improving safety.

A Lateral Deviation Indicator (LDI)[1], is presented on the attitude indicator whenever the pilot has coupled an ILS, LOC, LOC(BC), or a GPS in Approach Mode to the HSI, and valid lateral guidance is being provided. The navigation source coupled to the LDI is annunciated to the left of the LDI [2].

A Vertical Deviation Indicator (VDI) [3] is presented on the attitude indicator whenever the LDI is shown and valid vertical guidance is provided, such as from an ILS.

Whenever the lateral or vertical deviation exceeds the maximum displayable range of 2.5 dots, the deviation diamond is rendered as a hollow, ghosted image pegged to the corresponding side. As soon as the deviation comes into range, the diamond turns solid green, making it easy to identify when the needle is alive.

Additionally, the pilot can pre-set the minimums (MIN) [4] for the approach, which will be displayed on the ADI until the pilot toggles off the display using the MIN hot key. Once the MIN data field value is set to a Decision Altitude or Minimum Descent Altitude, the EFD1000 PFD provides an alert when the aircraft reaches or descends below this altitude.

A Decision Height annunciation [5] will be displayed when the aircraft descends to or below the selected radar altitude.

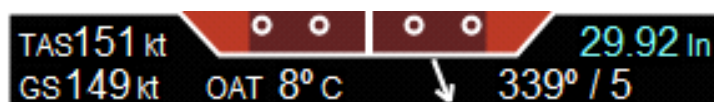
4. DATA BAR

36			37
41	40	39	38

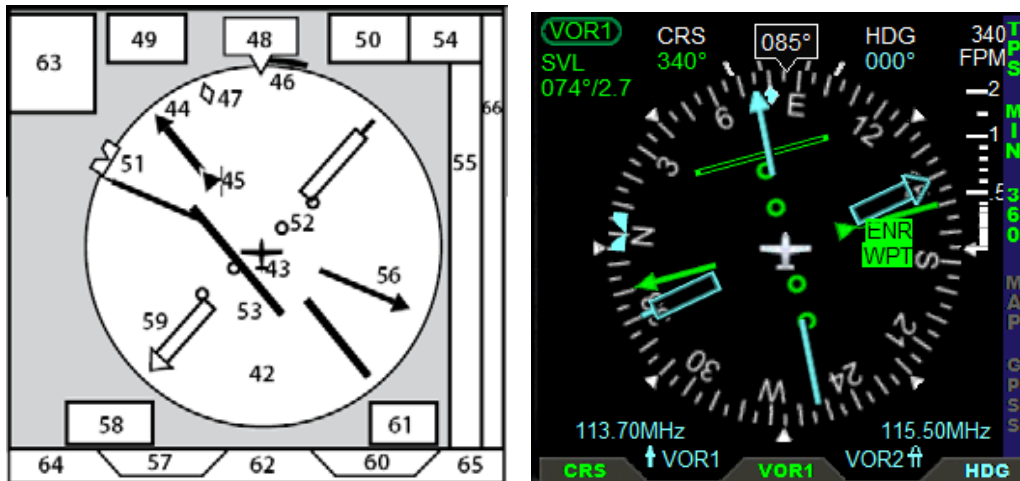
The Data Bar visually separates the upper and lower halves of the PFD display. When available, True Airspeed (TAS), GPS Ground Speed (GS), Outside Air Temperature (OAT), Wind Vector arrow, Wind Direction and Speed, and Barometric Pressure Setting data are presented in the data bar.

DATABAR	
36	True Airspeed
37	Barometric Pressure Setting Field
38	Wind Direction and Speed
39	Wind Direction Arrow
40	Outside Air Temperature
41	Ground Speed

When any of these values is unavailable or invalid, the corresponding data field is dashed. A GPS navigator must be connected and providing valid ground speed and track data to display GS and winds aloft data.



5. NAVIGATION DISPLAY



NAVIGATION DISPLAY			
42	Navigation Display	55	Vertical Speed Tape
43	Owship Symbol	56	Single-Line Bearing Pointer
44	Course Pointer	57	Single-Line Bearing Pointer Source
45	TO/FROM Indicator	58	Single-Line Source Info Block
46	Rate of Turn Indicator	59	Double-Line Bearing Pointer
47	Track Marker	60	Double-Line Bearing Pointer Source
48	Magnetic Heading	61	Double-Line Source Info Block
49	Selected Course (CRS) Field	62	CDI Navigation Source
50	Selected Heading Field	63	CDI Source Information Block
51	Heading Bug	64	Left Control Knob State
52	Course Deviation Scale	65	Right Control Knob State
53	Course Deviation Indicator	66	Hot Key Legend
54	Vertical Speed Digital Value		

The lower half of the EFD1000 PFD is the Navigation Display, which shows a wide range of navigation information and flight data, including:

- Horizontal Situation Indicator (HSI), with Course Pointer and Deviation Indicator (CDI), and Heading Bug, offering both 360° and ARC mode views.
- Digital readouts of current magnetic heading, selected heading (HDG), and selected course (CRS).
- Information about the currently selected navigation source, or active GPS waypoint.
- Ground Track indicator.
- Vertical Speed Indicator (VSI) tape and digital rate value.
- Rate of Turn indicator.
- Dual bearing pointers (RMI).
- Situational awareness Map display.
- Identification of the navigation sources to which the Course Deviation Indicator (CDI) and two bearing pointers are currently coupled.
- GPS Annunciations (TERM, APPR, WPT...)

When connected to a GPS navigator, basic mapping can also be displayed under the HSI display, including GPS flight plan legs and waypoints.

Compass Modes: 360° vs. ARC



The HSI on the EFD1000 can be presented in either a full 360° compass rose mode (**Left picture above**), or in a 100° ARC format (**Right picture above**). In 360 Mode, the HSI resembles the mechanical instrument, with the ownship position in the center of the display. ARC Mode provides an extended forward view with the ownship position at the bottom of the display. The ARC mode is especially good for map displays. The middle Hot Key is used to toggle the display between 360 and ARC modes, with the current mode shown in green adjacent to the Hot Key.

Navigation Setting Information



Regardless of compass mode setting, the current magnetic heading is always shown at the top center of the Navigation Display. The current setting of the HDG Bug is always shown to the right of the ship's heading, even if the HDG Bug itself may not be visible in ARC mode. Similarly, the current Course setting (CRS) is always shown to the left of the ship's heading, whether or not the Course Pointer itself is visible in ARC mode.



A Navigation Source Information Block is presented in the upper left corner of the HSI display area. The Source Information Block indicates the navigation source coupled to the CDI and its associated mode (e.g. VOR, ILS, LOC, etc). Information is provided related to the coupled source, including, when available, waypoint or navaid identifier or frequency, bearing and distance, and the estimated time to the active waypoint.

Course Pointer and Deviation Indicator (CDI)

In the 360° compass mode, the Course Pointer and Deviation Indicator (CDI) resemble those of a mechanical HSI, with an arrowhead pointing to the selected course, and a movable center section indicating course deviation against a scale of two dots to either side of the center. A TO/FROM indication is shown as a triangle above (TO) or below (FROM) the end of the deviation bar.



Within the ARC mode, the pilot may select (via the Main Menu) between two different formats of CDI presentation – ARC HSI mode and ARC CDI mode. The ARC HSI mode, presents a full rotating Course Pointer with CDI, which resembles that used in the HSI 360 Compass mode. The ARC CDI mode presents a short Course Pointer stub on the compass arc, and a fixed CDI at the bottom of the display, similar to the LDI and resembling that used in contemporary GPS navigation displays. ARC CDI mode leaves more open space for map presentation. A TO indication is shown to the left of the LDI, while a FROM indication is shown to its right.

Deviation Off Scale Indication

Whenever the course deviation exceeds the maximum displayable range of 2.5 dots, the CDI bar or deviation diamond is rendered as a hollow, ghosted image pegged to the corresponding side. As soon as the deviation comes into range, the CDI or diamond turns solid green, making it easy to identify when the needle is alive.

Auto Course Select



When a GPS is selected as the CDI navigation source, the default setting of the EFD1000 is “Auto Course Select”, in which mode the GPS will automatically set the Course Pointer to the current GPS course (CRS) value whenever the GPS sequences between waypoints. This capability relieves the pilot from manually setting the course at each waypoint transition along a GPS route. When Auto Course Select is active, the pilot cannot adjust the CRS value.



Auto Course Select is indicated by an “A” on a green background, adjacent to both the numerical CRS value and the “CRS” knob legend.

Ground Track Indicator



Ground Track is shown as a blue diamond rendered on the compass scale at the value that corresponds to the current aircraft track.

When the blue track diamond is aligned with the Course Pointer, the aircraft is tracking on or parallel to its desired track. To align the track diamond with the Course Pointer, turn away from the direction in which the diamond is offset from the Course Pointer (think of it as “pulling” the track diamond toward the Course Pointer).

Vertical Speed Indicator (VSI)

Whenever the vertical speed exceeds +/- 100 FPM, the vertical speed is indicated by presenting a rising/sinking white vertical tape and associated scale markers immediately to the right of the compass rose.



A numerical indication of current aircraft vertical speed is shown directly above the tape. Rates of up to ± 2000 feet per minute (FPM) are indicated by the tape, while the numerical value will display rates of up to ± 9990 FPM. A triangle caps the tape whenever rates exceed ± 2000 FPM. The vertical speed data field will be “dashed” whenever the vertical speed is 10,000 FPM or greater.



In the ARC compass mode, only the digital vertical speed value is presented.

Rate of Turn Indicator

The Rate of Turn Indicator consists of a curved white line originating from the corresponding side of the aircraft heading (i.e., a left turn indication starts on the left side of the index mark), and extends in the direction of the turn along the outer radius of the compass scale. The turn rate indication is provided for every compass mode, 360° and ARC (except when terrain mode is visible).



The Rate of Turn Indicator features tick marks for full and half-standard rates of turn (a standard rate of turn = 3° per second) in both directions.

The Rate of Turn Indicator has a range of $0^\circ - 6^\circ$ per second. When the turn rate exceeds 6° per second, an arrowhead is added to the end of the tape to show that the rate of turn has exceeded the limits of the instrument.

Bearing Pointers



One or two bearing pointers that show the bearing to a VOR station or GPS waypoint can be overlaid on the HSI. BRG#1 is a single needle, and BRG#2 is the double needle. Use the Nav Source Select Buttons to select the nav source for a Bearing Pointer, or select none (blank) to remove the Bearing Pointer from the display.

The head of the needle always points to the station or waypoint. When coupled to a VOR source, the tail of the needle indicates the VOR radial on which the aircraft is currently located. Bearing pointers are excellent tools for identifying crossing radials, flying DME arcs, and for general situational awareness.

Bearing Pointers are only available in the 360 Compass mode. Any available navigation source may be coupled to either bearing pointer. If coupled to a source that does not provide angular bearing data,

such as a localizer, the bearing pointer is not presented and the source is flagged as invalid.

Each bearing pointer has an associated source information block that can display information about the source of the bearing pointer data. Information that can be displayed includes distance to station (if coupled to a GPS waypoint) and either the station identifier or the tuned frequency for a VLOC radio.

Situational Awareness Map Display



The EFD1000 can display a base map underneath the HSI in either 360° or ARC modes. The active GPS flight plan leg, waypoint, and its identifier are shown in magenta. Other waypoints and legs are shown in white.

The base map is always oriented with magnetic heading up and centered so that the current aircraft position coincides with the aircraft ownship symbol. These base map elements underlay all other instruments and annunciations in the Navigation Display.

The MAP hot key is used to cycle through four levels of map features display and to turn off the base map display. Each successive press of the MAP hot key selects the next feature level or OFF.

The map display range is controlled by the Range Control toggle button, enabling the pilot to zoom in or out on the map. Automatic declutter logic changes the map features display depending on the selected map range.

The current map settings (range and feature level) are shown in the lower left-hand corner of the navigation display whenever the map is not OFF. The current map range is displayed in nautical miles, measuring the distance from the ownship symbol to the edge of the map display. The current map feature level is indicated by one to four green trapezoids underneath the range value (one mark is flight plan-only, while four marks is the highest map feature level).

6. USING THE EFD 1000

Set the Barometric Pressure

1. Press the Right Knob until BARO displays above the knob and the Barometric Pressure field is enabled for editing, both rendered in magenta. From the Home state, press the Right Knob 3 times to enable setting baro pressure.



2. Rotate the Right Knob to change the value of the Barometric Pressure field. Rotate clockwise to increase, or counterclockwise to decrease, the value. Once the correct value is selected and after 10 seconds of inaction, the field is disabled and the label and field are rendered in cyan.

Set the Heading Bug

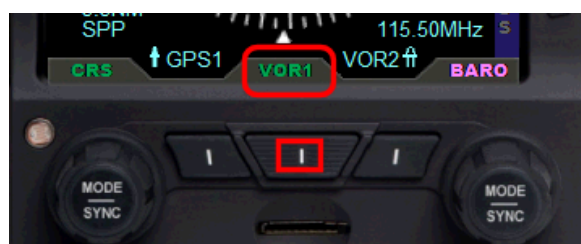
1. Press the Right Knob until HDG displays above the knob and the HDG field is enabled for editing, both rendered in magenta. The Heading Bug will also be rendered in magenta, and a dashed magenta line will extend from the ownship symbol to the Heading Bug to make it easier to see the bug position.



2. Rotate the Right Knob to change the value of the Heading field. Rotate clockwise to increase, or counterclockwise to decrease, the value. Once the correct heading is selected and after 10 seconds of inaction, the field is disabled and the label and field are rendered in cyan.

Select The CDI Navigation Source

- Press the CDI Navigation Source Select button until the desired navigation source is shown above the button (e.g. GPS1 or VLOC1).



Select Bearing Pointer Nav Sources

Press the BRG#1 (single-line) or BRG#2 (double-line) Bearing Pointer button until the desired navigation source is shown above the button.



Select Map Level of Detail

1. Press the MAP Hot Key to bring up the base map. Use the Range Control buttons to select the range desired.




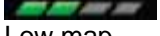
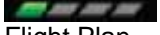


2. Continue pushing the MAP Hot Key (fourth hot key) to cycle through and select the desired level of detail or exit map display. Each time the hot key is pressed, the Map Display Level changes to the next option.

Customizing the Map

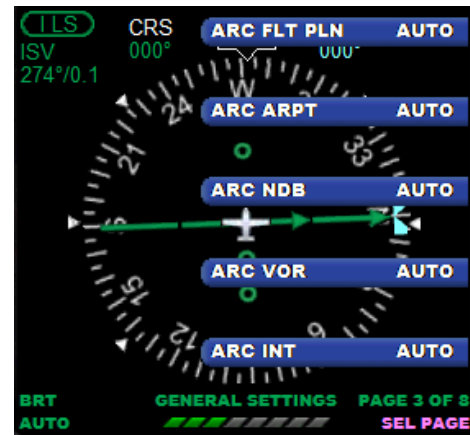
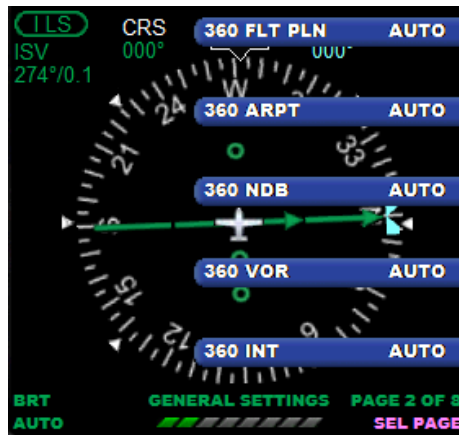
The pilot can customize the display setting for the map symbol levels HIGH, MEDIUM, and LOW; choosing from:

- ON Display symbol is always on.
- AUTO The selected display level and range, as described in table below, determine which map symbols are displayed. Symbol labels may also display adjacent to their associated symbol.
- OFF Display symbol is always off.

LEVEL	DISPLAY	DESCRIPTION											
OFF	 No map	No symbols, legs, or waypoints - regardless of selected range - are displayed. When selected, the map symbol level and range icons display for two seconds and then are removed from view. The MAP Hot Key legend displays in gray.											
		RANGE (NM)	2.5	5	10	15	20	30	40	60	80	100	200
HIGH	 High map	Waypoints	D*	D*	D*	D*	D*	D*	D	D	D	D	D
		Airports	D*	D*	D*	D*	D*	D*	D	D	D		
		NDBs	D*	D*	D*	D*	D	D					
		VORs	D*	D*	D*	D*	D*	D	D	D			
MEDIUM	 Medium map	Waypoints	D*	D*	D*	D*	D*	D*	D	D	D	D	D
		Airports	D*	D*	D*	D*	D*	D*	D	D	D		
		VORs	D*	D*	D*	D*	D*	D	D	D			
		NDBs	D*	D*	D*	D*	D	D					
LOW	 Low map	Airports	D*	D*	D*	D*	D*	D*	D	D	D		
		VORs	D*	D*	D*	D*	D*	D	D	D			
FP ONLY	 Flight Plan Only map	Waypoints	D*	D*	D*	D*	D*	D*	D	D	D	D	D
		D – symbol displayed D* - symbol displayed with identifier											

Set Map Symbol Display

Each compass mode has its own Menu page for Map Setting symbol display. Menu Page 2 offers Map Setting options for the 360° Compass mode. Menu Page 3 offers Map Setting options for the ARC Compass mode. The default setting is AUTO.



1. Push the MENU key. The Menu displays on the Navigation Display.
2. Rotate the Right Knob to navigate to the appropriate Map Settings menu page (either page 2 or 3).
3. Push the desired Map Symbol Menu Key. The menu label turns magenta and the EDIT VALUE label displays above the Right Knob.
4. Rotate the Right Knob to the desired value.
5. Either select another Map Symbol Menu Key and edit another display option or push the MENU key to exit the Menu.

Change The Basemap Range

- Press the Range key UP (+) to increase the range, or DOWN (-) to decrease the range, until the desired range is reached.



Set the Altitude Alerter

1. Press the Right Knob until ALT displays above the Right Knob and the Altitude numerical field and bug are enabled for editing, all three rendered in magenta.



2. Rotate the Right Knob to change the value of the Altitude field. Rotate clockwise to increase, or counterclockwise to decrease, the value. Once the correct value is selected and after 10 seconds of inaction, the field is disabled and the label, numerical field, and bug are rendered in cyan.

NOTE.- Synchronizing the altitude sets the selected altitude to the current altitude. Setting the Altitude Alerter provides visual and aural cues to help the pilot capture and maintain target altitudes. When set to a new altitude, the Alerter will illuminate a yellow flag adjacent to the target altitude display 200 feet before the aircraft will reach the target altitude. The yellow flag will go black upon attaining the target altitude.

Set the Airspeed Bug

1. Press the Left Knob until IAS displays above the Left Knob and the Selected Airspeed field and bug are enabled for editing, all three rendered in magenta.

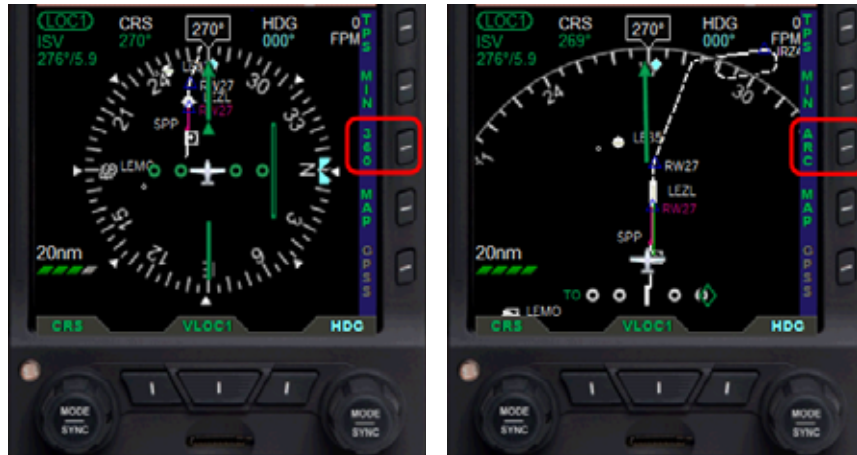


2. Rotate the Left Knob to change the value of the Selected Airspeed field. Rotate clockwise to increase, or counterclockwise to decrease, the value. Once the correct value is selected and after 10 seconds of inaction, the field is disabled and the label and field are rendered in cyan.

NOTE.- Synchronizing the airspeed sets the selected airspeed to the current airspeed.

Select a Compass Mode

1. Press the 360 Hot Key, and observe the HSI changes to its ARC view, and the legend adjacent to the Hot Key changes to ARC in GREEN.



2. Adjust the map range to suit your preference.

Configuring V-speeds

V-speeds are used to designate different operating speeds of the aircraft and are defined in table below:

V-SPEED	DEFINITION	V-SPEED	DEFINITION
Va	Maneuvering at maximum gross weight	Vle	Maximum landing gear extension speed
Vbg	Best glide	Vso	Full flap stall
Vref	Approach speed	Vno	Maximum structural cruising rate
Vr	Rotation speed	Vne	Never exceed
Vx	Best angle of climb	Vfe	Maximum full flap extension speed
Vy	Best rate of climb	Vmca	Minimum control speed
Vlo	Retract maximum landing gear operation speed	White triangle	Initial flap extension

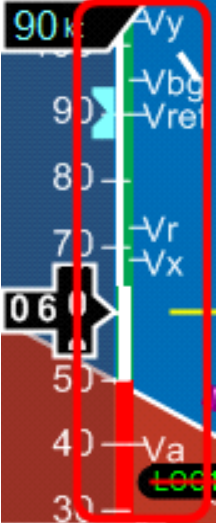
You can use the menu Hot Keys to change V-Speed values. These values are saved for the next time you load the AC.

Setting any of the adjustable V-speed values to zero (0) disables the applicable label.



The EFD1000 PFD uses colored speed bands and textual labels to help the pilot recall V-speed settings and limits. This is determined by the Federal Regulations, and correspond to the aircraft limiting speeds that are identified in the Aircraft Flight Manual. They have a range between two speeds, that are pre-set at installation as outlined in table and figure below.

BAND COLOR	SPEED RANGE	
Red Band (High Speed)	Vne - top tape	Never Exceed
Yellow Band	Vno – Vne	Caution Range
Green Band	Vs – Vno	Normal Operating Range
White Band	Vso – Vfe	Flap Operating Range
Red Band (Low Speed)	Bottom of tape – Vso	



As said before the textual V-speed labels are pilot adjustable.

ENABLE V-speed Textual Labels

1. Push the MENU key. The Menu displays on the Navigation Display.
2. Rotate the Right Knob until Page 1 of the Menu displays.
3. Push the VSPEEDS Menu Key (Key 2). The menu label turns magenta and the EDIT VALUE label displays above the Right Knob.



4. Rotate the Right Knob to select ENABLE. The textual V-speed labels are enabled.
5. Push the MENU key to exit the Menu.

7. TECHNICAL SUPPORT

If you have any question, please contact FriendlyPanels at:

fpanels@friendlypanels.com

Web page:

www.friendlypanels.com