

FlightMax *Entegra*

Primary Flight Display Pilot's Guide



Revision History		
Date	Revision	Description
Aug 25, 2003	Rev 00	Initial Release per ECO 03-210
Sep 24, 2003	Rev 01	Updated per ECO 03-227
Sep 24, 2003	Rev 02	Updated per ECO 03-227
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Table of Contents

Introduction	1
System Overview	
ADI Symbology	2
HSI Symbology	4
Right Knob & Buttons	6
Left Knob & Buttons	10
User's Guide	
Initialization	13
Default Settings	16
Setting up the HSI	17
Use of GPS/Nav	18
Precision Flight with PFD	19
Use of Trend Indicators	20
Autopilot Use and Control	21
Horizontal Modes	22
Vertical Modes	23
Autopilot Operation During PFD Failures	24
Winds Vector and Track Line	25
Precision Approaches	26
Non-precision Approaches	27
Missed Approach	29
Operation with Invalid Sensor Data	
Invalid Air Data	30
Invalid Heading	31
Crosscheck Monitor	32
Recoverable Attitude	33
Invalid Attitude & Heading	34
Appendix	
Warranty	35
Software License	36

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Introduction

Congratulations on choosing FlightMax *Entegra*, general aviation's most advanced Primary Flight Display (PFD) system. FlightMax *Entegra* represents Avidyne's commitment to providing simple, easy to use, integrated flight instrumentation, with all the situational awareness and safety benefits of air transport and business jet flight decks.

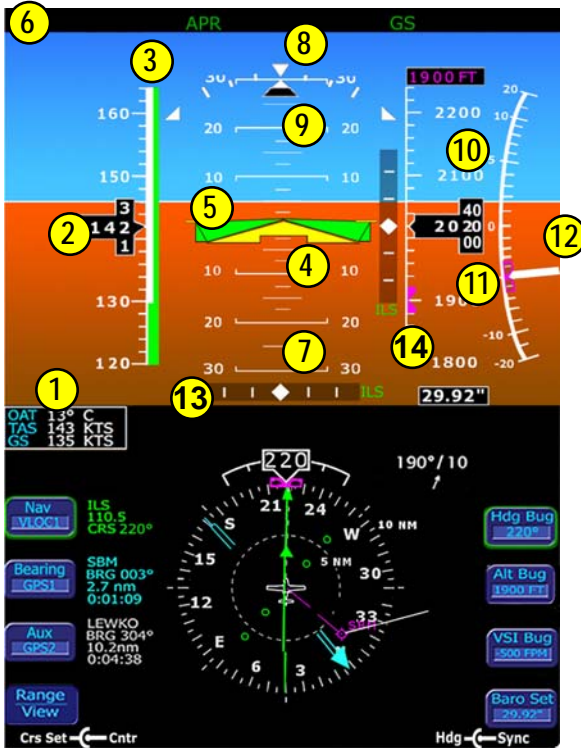


1. Brightness Control (BRT/DIM)- Controls display brightness. Power-on default is 75% brightness.

2. Buttons & Knobs - Used to select modes or change the display as indicated. Right knob and button functions are described in detail starting on page 8. Left knob and button functions are described in more detail starting on page 11.

System Overview






ADI Symbology



1. Air Data - Displays True Airspeed (TAS) and Ground Speed (GS) in knots, and Outside Air Temperature (OAT) in degrees Celsius. Invalid data is displayed as dashes (---). OAT will not be displayed on the PFD when the aircraft is equipped with an EX5000 MFD and Emax engine monitor.

2. Airspeed Window- Displays current indicated airspeed in knots. Hash marks are displayed below 20 knots.

3. Airspeed Tape- Indicated airspeed with a display range from 20 kts to 300 kts. Each minor graduation represents 2 knots and each 10 knot major graduation is labeled. Color bands are aircraft type specific:

-  **Red Band:** Never exceed speed, V_{NE} , up to top of the airspeed tape.
-  **Yellow Band:** Maximum structural cruise speed, V_{NO} , up to never exceed speed, V_{NE} .
-  **Green Band:** No flap stall speed, V_S , up to maximum structural cruise speed, V_{NO} .
-  **White Band:** Full flap stall speed, V_{SO} , up to maximum flap extension speed, V_{FE} .
-  **Red Band:** 20 kts up to full flap stall speed, V_{SO} .

4. Aircraft Reference Symbol- Current aircraft pitch angle is represented by the apex of the yellow delta-shaped reference against the pitch ladder.

5. Flight Director Steering Command Bars - Displays the accuracy of the pilot or autopilot tracking the autopilot commands. The pilot or autopilot is to steer the airplane toward the command bars until the delta shaped reference is tucked into the steering command bars.

6. Autopilot Annunciation Window - The Autopilot annunciation area repeats the 55X faceplate annunciations in the pilot's primary field of view.

7. Pitch Ladder- The pitch ladder has graduations every 2 1/2 degrees within the range of ± 20 degrees and graduations every 5 degrees from +20 degrees to +50 degrees and -20 degrees to -30 degrees. The 10 degree graduations of the pitch ladder have bar ends that point toward the horizon line. Large chevrons (see Page 18) visible at excessive pitch angles, point toward the horizon (above +50 degrees and below -30 degrees). ± 90 degrees is represented by small circles.

8. Bank Angle Indicator- Composed of an inverted white triangle and an upright white triangular Roll Pointer. The upright white triangle points to the current bank angle. Graduations at 0, 10, 20, 30, 45, & 60 degrees. (Note: the 0 and 45 degree marks are inverted triangles).

9. Skid/Slip Indicator- The black trapezoid is centered under the roll pointer in coordinated flight. Full scale deflection is the width of the trapezoid.

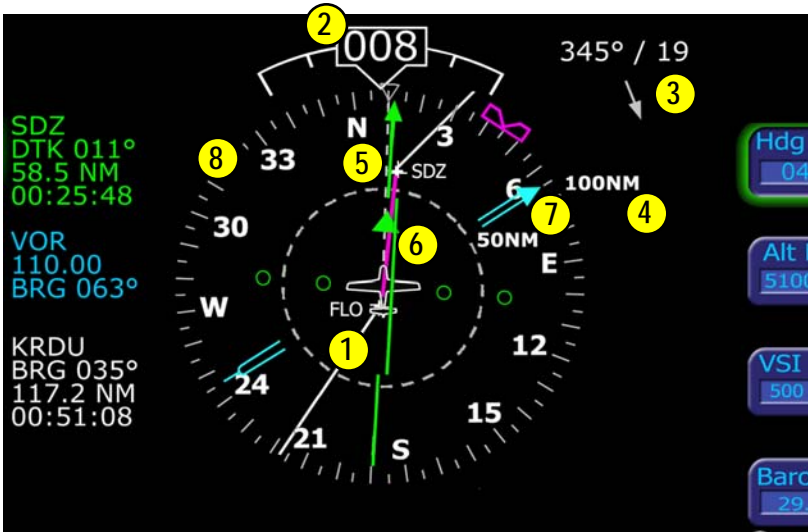
10. Altitude Tape- Displays pressure altitude (with barometric correction) with a display range from -1,000 feet to 35,000 feet. Each minor graduation represents 20 feet and each 100 foot graduation is labeled.

11. Altitude Window- Displays current baro-corrected altitude.

12. Vertical Speed Indicator (VSI)- The scale graduations between $\pm 1,000$ fpm, are every 100 fpm. Above scale limits, a digital readout of the current vertical speed is displayed on the appropriate end of the VSI scale. The max displayed value of the digital readout is $\pm 4,000$ fpm.

13. Horizontal Deviation Indicator (HDI)- Displayed when VLOC is selected as NAV source and the localizer signal is received. The source of the HDI data is displayed immediately to the right of the HDI (eg. LOC or ILS). If the signal is lost, the HDI is replaced with a red "X" and the source letters turn red. Once displayed, the HDI may be removed by changing the NAV Source or changing the VOR/LOC frequency.

14. Vertical Deviation Indicator (VDI)- Displayed when VLOC is selected as NAV source and the ILS glide slope signal is received. The source of the VDI data is displayed immediately below the VDI (eg. ILS). If the GS signal is lost, the VDI is replaced with a red "X" and the letters ILS turn red. Once displayed, the VDI may be removed by changing the NAV Source or changing the localizer frequency.



EHSI 360-degree View

1. **HSI Moving Map-** Displays up to a maximum of 15 waypoints and labels from the active flight plan. The active leg of the flight plan is depicted in magenta, and all other legs of the flight plan are depicted in white. The moving map will also display waypoints and labels of an approach and hold.
2. **Magnetic Heading-** A numeric indication of current aircraft magnetic heading.
3. **Wind Vector-** Displays the current wind speed and wind direction. The arrow indicates the direction of the wind relative to the current aircraft heading. There will be a several-second lag in updating current wind speed and direction after turns.
4. **HSI Map Range-** When the moving map is selected for display on the HSI via the “View” knob, the outer and inner rings of the compass rose are labeled with range in nautical miles. Selectable ranges for the outer ring are 2, 5, 10, 20, 50, 100, and 200 NM.



EHSI Arc View

5. Projected Track Line- The dashed white projected track line originates from the aircraft present position symbol and terminates at the triangle along the outer edge of the compass rose. It displays a projection of the current ground track of the aircraft.

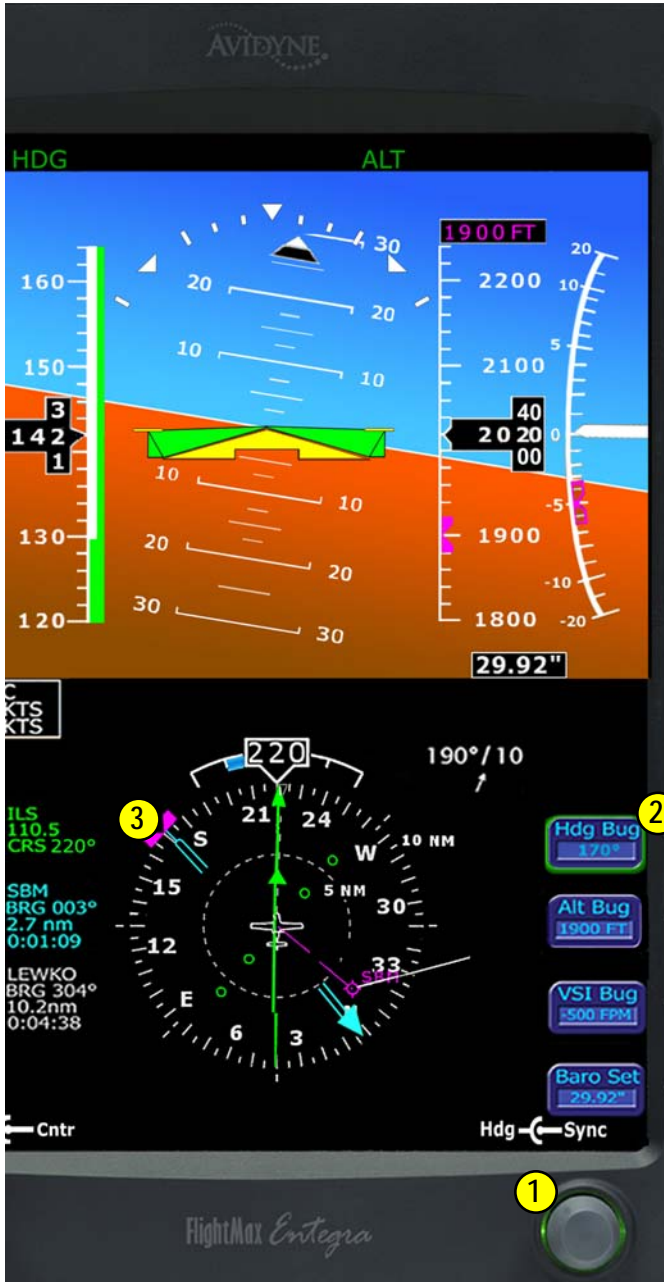
6. Course Deviation Indicator (CDI)- The green single-line CDI displays deviation from the set or desired course.

7. Bearing Pointer- The blue dual-line bearing pointer is associated with the Bearing source and displays the current bearing to the Bearing waypoint (GPS1 or GPS2) or bearing to the station (VLOC1 or VLOC2). A bearing pointer will not be displayed if the VLOC source is tuned to an ILS or LOC station.

8. Compass Rose- In both 360 degree full view and 120 arc view, the minor graduation marks represent 5 degrees, major graduation marks represent 10 degrees, with every 30 degrees labeled. The outer edge of the compass rose is marked with reference marks every 45 degrees.



System Overview





Right Knob & Buttons



Right Knob & Buttons

System Overview

1. Right Knob- The function of the right knob changes based on which button on the right side is selected (indicated by green highlighted ring around the button label). The symbol above the knob denotes the current function of the knob. The  symbol describes the rotary action of the knob. The  symbol describes the push button action of the knob.

Active Button	Knob Label	Rotary Action	Push Action
Hdg Bug	Hdg  Sync	Sets heading bug	Syncs heading bug to current magnetic
Alt Bug	Alt  Sync	Sets altitude bug	Syncs altitude bug to nearest 100'
VSI Bug	VSI  Sync	Sets VSI bug	Syncs VSI bug to nearest 50 fpm
Baro Set	Baro  Stnd	Sets Baro	Sets Baro to 29.92

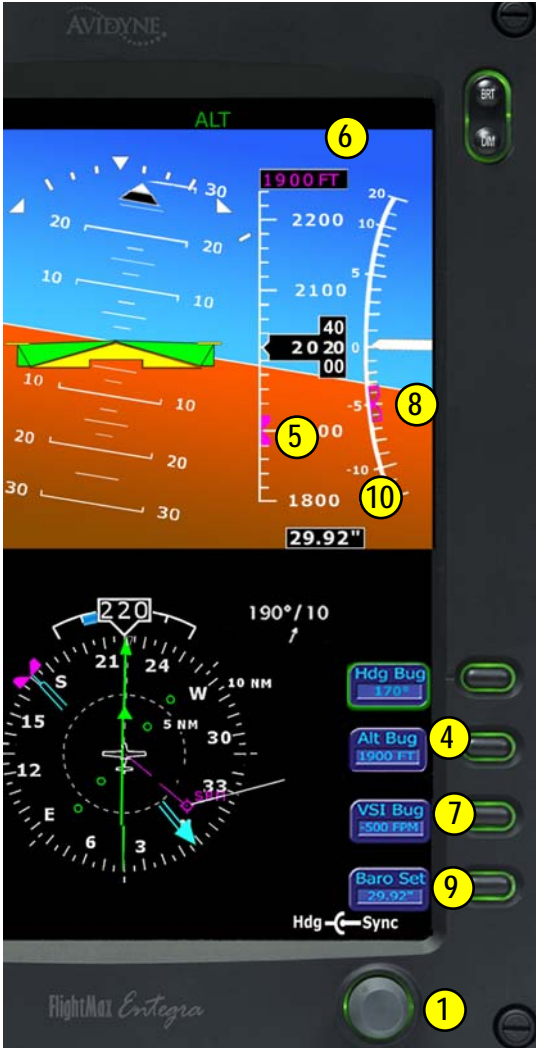
The Alt Bug, VSI Bug, and Baro Set button selections will all timeout back to Hdg Bug button selection ten seconds after they were last pushed or changed by knob rotation. Because of the button timeouts, a recommended technique is to always select the desired button prior to rotating the knob.

2. Heading Bug Button (Hdg Bug)- When selected, allows the right knob (1) to control the position and value of the heading bug (3) on the HSI compass rose. The range of the allowable values is 001 to 360 degrees. The selected numeric value appears in the button label.

3. Heading Bug- Controlled by the right knob when the “Hdg Bug” button is selected, the notched part of the magenta bug symbol indicates the current heading bug value.



The bug is solid when coupled with the autopilot, and hollow when not coupled. The heading bug is positioned at the appropriate side of the tape and remains in partial view when “arc view” is selected and the selected heading bug value is outside the current compass rose field of view.



4. Altitude Bug Button (Alt Bug)- When selected, allows the right knob to control the position of the altitude bug and the autopilot altitude preselect value. The range of values is the same as the altitude tape (-1,000 feet to 35,000 feet). The Alt Bug has three resolution setting modes: 1,000 ft, 100 ft, and 10 ft modes.

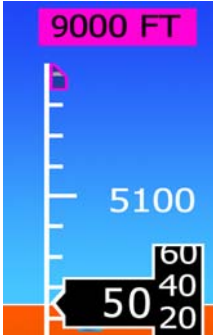
The default adjustment position is at the 1,000 ft mode and each button press steps the adjustment position down one place. The selected numeric value appears in the button and in the Altitude Preselect window.



Right Knob & Buttons

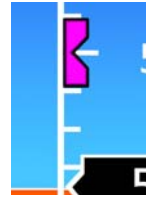
System Overview

5. Altitude Bug- Controlled by the right knob when the “Alt Bug” button is selected. The notched part of the magenta bug symbol indicates the current altitude preselect value.



When the selected value is outside the current altimeter field of view, the bug is positioned at the appropriate end of the tape and remains in partial view (left).

The bug is solid when coupled to the autopilot and hollow when not coupled (right).



6. Altitude Preselect - Displays the digital value of the altitude bug setting and, when enabled, the altitude that the autopilot is commanded to capture and hold. Digits appear as black numbers on magenta background when Alt Bug button is selected.

7. Vertical Speed Indicator Bug Button (VSI Bug)- When selected, allows the right knob (1) to control position of the VSI bug (8) and the autopilot vertical speed command. The range of allowable values matches the allowable rates of the autopilot. The selected numeric value appears in the button label.

8. VSI Bug- Controlled by the right knob when the “VSI Bug” button is selected. The notched part of the magenta bug symbol indicates the current VSI bug set value. VSI bug range is $\pm 1,600$ fpm. The bug is solid when coupled with the autopilot, and hollow when not coupled.





9. Barometric Correction Setting Button (Baro Set)- When selected, allows the right knob to control the value of the barometric correction setting. The range of allowable values is 27.50” to 31.50” (931 mb/HPa - 1067 mb/HPa). The selected value appears in the button label and in the Barometric Correction Setting window (10).

10. Barometric Correction Setting- Controlled by the right knob when the “Baro Set” button is selected, the boxed value indicates the current barometric correction setting in inches of mercury. Digits appear as black numbers on white background when the Baro Set button is selected.




System Overview

Left Knob & Buttons



1. Left Knob- The function of the left knob changes based on which button on the left side is selected (indicated by green highlighted ring around the button label). The  symbol describes the rotary action of the knob. The  symbol describes the push action of the knob.

2. Crs Set (Course Set)- Knob label is displayed when it is allowable to set a course, as indicated below:

NAV Source	GPS Nav Condition	Left Knob Label
GPS1 or GPS2	GPS in Auto-Leg mode	(No Label)
GPS1 or GPS2	GPS in OBS mode	Crs Set  Cntr
VLOC1 or VLOC2	Tuned NavAid is a VOR	Crs Set  Cntr
VLOC1 or VLOC2	Tuned NavAid is an ILS or LOC	Crs Set 

3. Nav (Primary Navigation)- Controls the source for the CDI and adjacent data block. In a dual GPS/Nav configuration, the available sources are: GPS1, VLOC1, GPS2, and VLOC2. The content of the associated data block varies according to the selected source as follows:

NAV Source	Data Block Format
GPS1 or GPS2	Waypoint Identifier Desired Track to Waypoint Distance to Waypoint Time-to-Go to Waypoint
VLOC1 or VLOC2 (VOR Tuned)	“VOR” VOR Frequency Course
VLOC1 or VLOC2 (ILS or LOC Tuned)	“ILS” or “LOC” Localizer Frequency Course

4. Bearing (Secondary Navigation)- The adjacent push button controls the source for the Bearing Pointer and adjacent data block. In a dual GPS/Nav configuration, the available sources are: GPS1, VLOC1, GPS2, VLOC2, OFF. The content of the associated data block varies according to the selected source as follows.

Bearing Source	Data Block Format
GPS1 or GPS2	Waypoint Identifier Bearing to Waypoint Distance to Waypoint Time-to-Go to Waypoint
VLOC1 or VLOC2 (VOR Tuned)	“VOR” VOR Frequency Bearing to station
VLOC1 or VLOC2 (ILS or LOC Tuned)	“ILS” or “LOC” Localizer Frequency
OFF	Blank

5. Aux (Auxiliary Navigation)- The adjacent push button controls the source of the adjacent data block only. In a dual GPS/Nav configuration, the available sources are: GPS1, VLOC1, GPS2, VLOC2, OFF. The content of the associated block varies according to the selected source as follows:

AUX Source	Data Block Format
GPS1 or GPS2	Waypoint Identifier Bearing to Waypoint Distance to Waypoint Time-to-Go to Waypoint
VLOC1 or VLOC2 (VOR Tuned)	“VOR” VOR Frequency Bearing to station
VLOC1 or VLOC2 (ILS or LOC Tuned)	“ILS” or “LOC” Localizer Frequency
OFF	Blank

The Bearing, Aux, and Range/View button selections will all timeout back to the Nav Button selection ten seconds after they were last pushed or changed by knob rotation. Because of the button timeouts, a recommended technique is to always select the desired button prior to rotating the knob.



1. HSI Moving Map Range and View Button (Range/View) -

When selected, the Range/View button allows the left knob to control the HSI's moving map range and view. Pushing the left knob will cycle the HSI through the four HSI views. Turning the left knob will change the HSI moving map range (when in view). Only two of the four allowable modes will contain a moving map depiction. The allowable modes and knob label varies as follows:

View Selection	Left Knob Label
360 degree with moving map	Range ← View
360 degree with no moving map	← View
120 degree with moving map	Range ← View
120 degree with no moving map	← View

The Entegra PFD is equipped with a solid state Air Data and Attitude Heading Reference System (ADAHRS) which requires a 3 to 5 minute alignment time prior to flight.

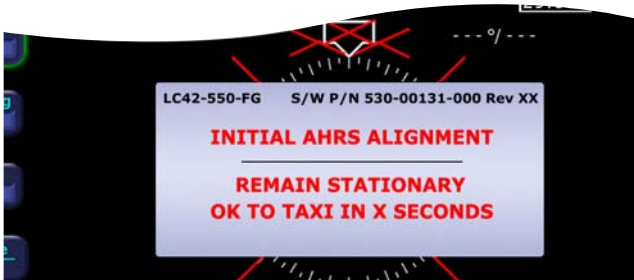
The Entegra PFD is designed to operate during engine start and shut down procedures. PFD start-up is automatic once power is applied via the battery switch. Engine start will not affect the ADAHRS alignment. A common Entegra PFD startup procedure is to turn on the battery and conduct the aircraft preflight during the ADAHRS alignment process.



Initialization box for Rev 00-03

For Software part number 530-00131-000 Rev 04 or higher:

The PFD presents the below Initialization Display immediately after power is applied. Note that the overall software version number is listed in the box as is the aircraft that the Vspeeds are set up for.



Initialization box for Rev 04 and higher

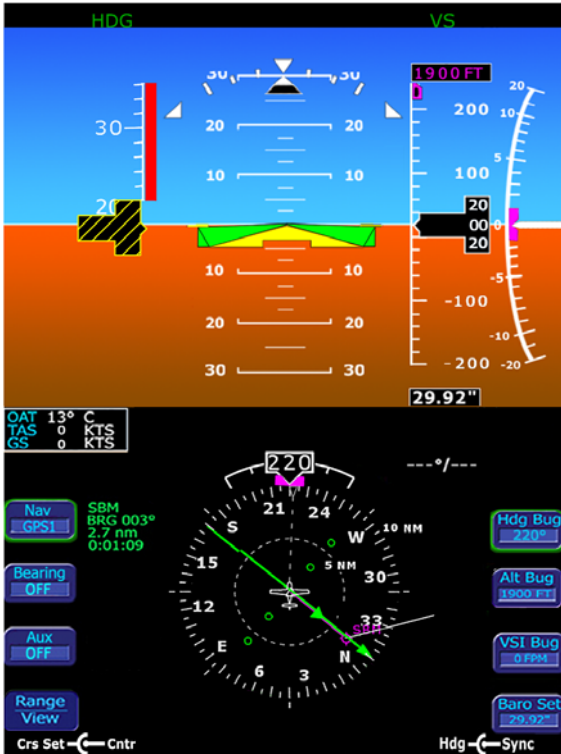
Typical alignment time is 3 minutes but may take longer if the aircraft is subjected to motion. Air data (airspeed, altitude, vertical speed) will become valid prior to attitude data. The warmup block automatically transitions to the next several boxes as described in the following table and then is automatically removed when warm-up is complete.

NOTE: For faster alignments (3 minutes or less), it is recommended that the aircraft not be moved until alignment is complete. The OK TO TAXI (displayed in Rev 04 and higher) screen is provided for increased flexibility during ground operations, but it may extend overall alignment time.

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<p>Alignment Phase & Message Displayed</p>	<p>Approximate Duration</p>	<p>Pilot Action</p>
<p>INITIAL AHRS ALIGNMENT REMAIN STATIONARY OK TO TAXI IN X SECONDS</p>	<p>30 Seconds</p>	<p>Remain Stationary</p>
<p>AHRS WARMING UP OK TO TAXI</p>	<p>90 seconds, if stationary; Up to several minutes if moving</p>	<p>Permissible to taxi but recommend remaining stationary for faster overall alignments</p>
<p>READY FOR FINAL AHRS ALIGNMENT BRING AIRCRAFT TO A STOP AS SOON AS PRACTICAL</p>	<p>5 seconds, if stationary; Up to several minutes if moving</p>	<p>If moving, bring aircraft to a stop as soon as practical</p>
<p>FINAL AHRS ALIGNMENT REMAIN STATIONARY READY TO GO IN X SECONDS</p>	<p>40 - 45 seconds</p>	<p>Remain stationary</p>
<p>READY FOR FINAL AHRS ALIGNMENT BRING AIRCRAFT TO A STOP AS SOON AS PRACTICAL XX</p>	<p>--</p>	<p>Remain stationary and wait an additional 2 minutes. If the message does not clear itself, contact a Service Center and provide the displayed AHRS Code.</p>

Rev 04 and higher initialization messages



Upon each power application, the *Entegra* PFD will assume the following default values.

- Alt Bug The value just prior to previous shutdown
- Alt Bug Mode Thousands mode
- VSI Bug The value just prior to previous shutdown
- HDG Bug The value just prior to previous shutdown
- Baro Set The value just prior to previous shutdown
- Nav GPS1
- Bearing OFF
- Aux OFF
- View 360 degree view with flight plan
- Range 10 NM
- Right Side Active Button: . . Hdg Bug
- Left Side Active Button: . . . Nav
- Right Knob: Sets Hdg Bug
- Left Knob: Inactive



Until a flight plan is activated in GPS/Nav 1, the HSI will show a red "X" in place of the CDI.

The FlightMax *Entegra* PFD can integrate with single or dual GNS 400/500-series GPS/NAV systems. At the time of initial install, the *Entegra* PFD is configured for the number of GPS/NAV systems on board.

The “Nav” button (Primary Nav) is used to select the GPS/NAV source for the green single-line CDI and the moving map data. The active flight plan from the selected GPS/NAV unit drives the moving map on the HSI and will display up to a maximum of 15 waypoints, including the ability to display curved approach path and holding pattern segments. Moving map data is displayed on the HSI portion of the *Entegra* PFD in two of the four possible view selections (full compass rose with map, arc view with map). GPS/NAV 1 is also the primary source for ground-speed readout and a required element for the wind vector calculation and display. In the event GPS/NAV 1 is unavailable, ground speed and wind vector data are derived from GPS/NAV 2. If the Nav source is selected to a VOR or localizer source, the HSI will display the course deviation indicator without a map display.

The Bearing button is used to select the GPS/NAV source for the blue double-line bearing pointer. If the selected bearing source is a Localizer, the bearing pointer will not be displayed.

To take full advantage of the *Entegra* PFD, GPS/NAV 2 can be loaded with Direct-To waypoints, alternative flight plans, or Navaid frequencies to provide additional guidance beyond what is loaded into GPS/NAV 1. This information can be selected for display on the *Entegra* PFD as the “Bearing” or “Aux.”

For increased situational awareness, it is important to remember that the CDI on the *Entegra* PFD's HSI comes from the selected “Nav” source which may be different from the CDI displayed on the GPS/NAV 1 or GPS/NAV 2 displays. While using the crossfill capability of the GPS/NAVs in dual configurations is fully supported and a common technique, it can prevent one from taking full advantage of the multiple Nav source display capability of the *Entegra* PFD.

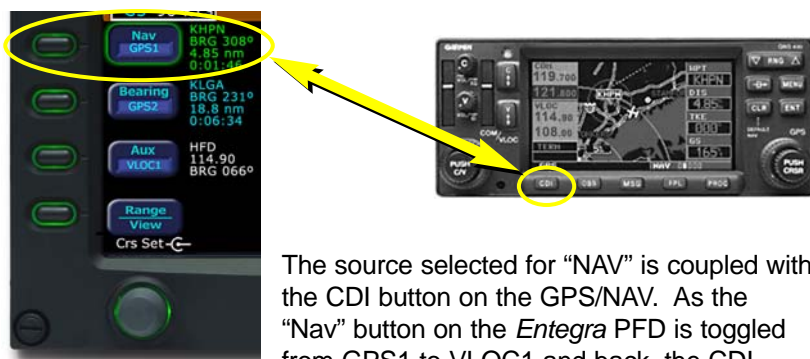
User's Guide

Use of GPS/NAV

Primary navigation course setting is allowed when one of three conditions is met:

1. **PFD Nav Source** = GPS1 or GPS2 and the requested GPS/NAV is in OBS mode, or;
2. **PFD Nav Source** = VLOC and the current frequency is a VOR station, or;
3. **PFD Nav Source** = VLOC and the current frequency is an ILS or localizer. In this case, the ability to set a course is for reference. The CDI is driven by the received localizer signal, regardless of the set course.

The scaling of the CDI on the *Entegra* HSI is automatically set by the GPS/NAV system as a function of the Nav source selected by the PFD Nav button.



The source selected for “NAV” is coupled with the CDI button on the GPS/NAV. As the “Nav” button on the *Entegra* PFD is toggled from GPS1 to VLOC1 and back, the CDI source on GPS/NAV 1 toggles from GPS to VLOC and back to match the current “Nav” setting. Similarly, as the CDI button on the GPS/NAV is toggled from GPS to VLOC and back, the “Nav” source of the *Entegra* PFD will change to follow.

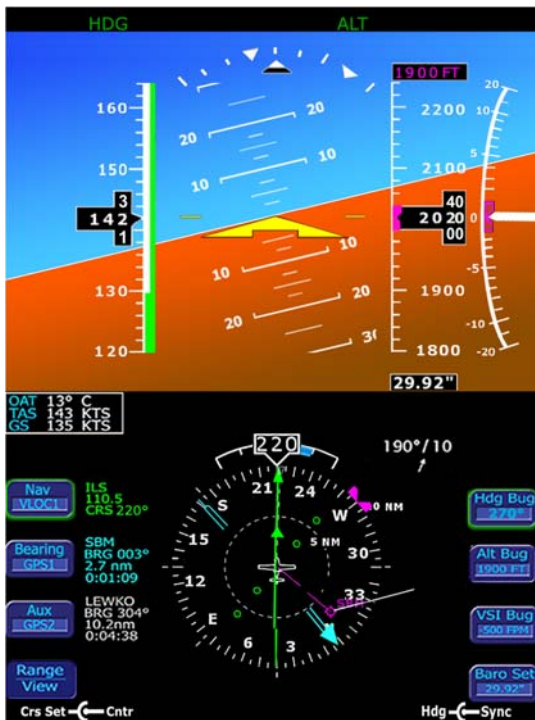
A recommended technique is to use the CDI button on GPS/NAV 1 to toggle the Nav source back and forth, especially in a dual-GPS/NAV installation where the PFD Nav button cycles through all four Nav sources (GPS 1, VLOC 1, GPS 2, VLOC 2), and the CDI button on the GPS/NAV 1 makes it easy to switch the PFD between GPS 1 and VLOC 1 and back.

Precision Flight with PFD

User's Guide

This section describes several techniques which take advantage of the *Entegra* PFD's features to produce precision flight performance.

Level flight may be obtained by placing the apex of the yellow delta-shaped reference symbol on the horizon line in cruise conditions of 6000' MSL at 160 KIAS. The pitch angle for level flight will vary with flight conditions, depending on speed, altitude and weight.



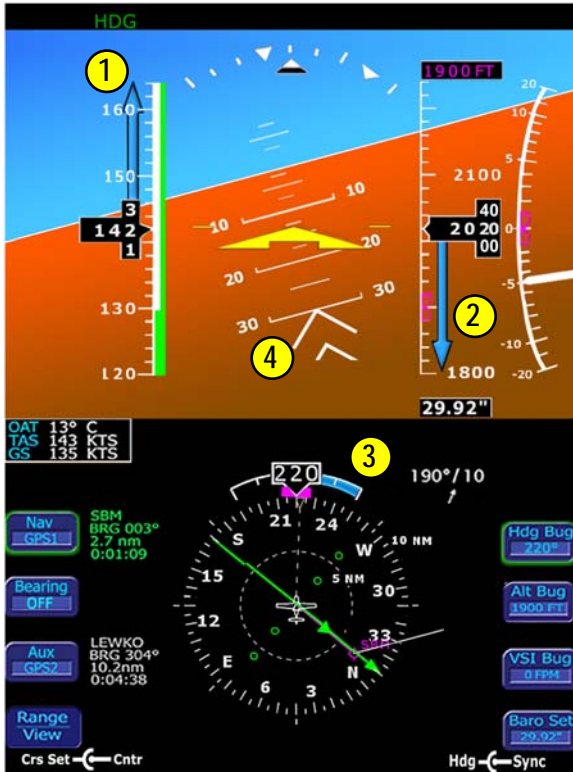
The proper technique for flying a constant rate turn involves using a combination of the turn indicator and the bank angle indicator. Typical bank angles for a standard rate turn are approximately 23 degrees in cruise conditions. This illustration shows an 11 degree turn to the right. Initiate the standard rate turn by banking to an initial bank angle of 20 degrees with reference to the bank angle indicator, then adjust the bank angle to standard rate by reference to the standard rate turn indicator. Deviations from an intended bank angle are extremely easy to notice with Entegra's wide screen ADI horizon line.

Capture and maintenance of desired airspeed and altitude can be accomplished using the aid of the trend indicators. Changes in speed greater than .8 knots/ sec are indicated by the airspeed trend bar. Changes in altitude greater than 240 feet / min are indicated by the altitude trend bar.

User's Guide

Use of Trend Indicators

The trend indicators display the aircraft's projected airspeed and altitude six seconds in the future. To capture and maintain a desired airspeed or altitude, adjust pitch and/or power to align the trend indicator with the desired airspeed or altitude. This will result in a smooth capture of the desired airspeed and altitude.



1. Airspeed Trend Indicator- The tip of the blue airspeed trend indicator displays the predicted airspeed six seconds into the future at the current rate of change. An arrowhead indicates a value beyond the current tape field of view.

2. Altitude Trend Indicator- The tip of the blue airspeed trend indicator displays the predicted altitude six seconds into the future at the current rate of change. An arrowhead indicates a value beyond the current tape field of view.

3. Rate of Turn Indicator- The tip of the blue rate of turn indicator displays the current rate of turn. The indicator is marked for 1/2 and full standard rate of turn. An arrowhead indicates a value beyond 1 1/2 standard rate.

4. Excessive Pitch Chevrons- The large white chevrons are displayed at pitch values greater than +50 degrees and less than -30 degrees. In all cases, the chevrons point towards the horizon line.

The *Entegra* PFD is fully integrated with the S-Tec System 55X autopilot. The Heading, Altitude and VSI reference bugs are provided on the *Entegra* PFD to aid in pilot situational awareness and autopilot control.

When an active autopilot mode is selected, full guidance is provided from the *Entegra* PFD to the autopilot, including smooth transitions to altitude and heading captures.

The reference bugs' status and the flight director steering command bars will indicate when *Entegra* is coupled with the autopilot. A solid magenta Heading, Altitude, or VSI bug indicates that the function is currently coupled to an active mode of the autopilot. A hollow magenta bug indicates that the function is not currently coupled to the autopilot in an active mode. In other words, a hollow bug indicates manual or "hand-flying" status.

When a vertical mode is being used, a green set of flight director command bars will indicate the required steering of the aircraft to achieve the commanded tracking from the autopilot.

The following is a description of the six autopilot modes supported by the *Entegra* PFD. The autopilot may only be coupled to the GPS/NAV selected as the PFD Nav source. The autopilot may not be coupled to the GPS/NAV selected as the PFD Bearing source.

Horizontal Modes

1. Heading Capture/Hold Mode- Press the Hdg Bug button on the PFD and rotate the right knob to set a desired heading. Press the HDG button on the autopilot control head to engage heading mode. At this point, the heading bug will become solid magenta and the autopilot will track the input heading. The autopilot control head and the PFD will indicate "HDG". The heading bug will remain solid magenta until heading mode is cancelled. Select a new heading at any time while the autopilot is in heading mode and the autopilot will track the new heading bug value.

2. Nav/Apr Mode- Press the NAV button on the autopilot control head to engage Nav mode. The autopilot will intercept and track the desired course. In this mode, the autopilot tracks the active plan of the selected GPS (Nav=GPS1 or GPS2) or an active VOR or localizer (Nav=VLOC1 or VLOC2). The autopilot control head and the PFD will indicate "NAV". If a localizer is selected, the autopilot will automatically select APR mode. Both the autopilot control head and the PFD will annunciate "NAV APR". Glideslope capture is supported while in "NAV APR ALT" mode. In Nav/Apr mode, the heading bug will be hollow and remains at its last set value, which is not necessarily aligned with the Nav course.

3. GPS Roll Steering Mode- In this mode, the autopilot tracks the active flight plan of the selected GPS (Nav=GPS1 or GPS2). Press the NAV button on the autopilot control head twice to engage GPSS mode. The autopilot will then begin tracking the GPS steering commands from the selected GPS. The autopilot control head and the PFD will indicate "GPSS". Use of GPSS mode is recommended during GPS navigation, including GPS and GPS-overlay approaches due to its increased accuracy. In this mode, the heading bug will be hollow and remains at its last set value, which is not necessarily aligned with the Nav course.

CAUTION: If a VLOC is selected in NAV on the PFD and GPSS mode is engaged on the autopilot, the autopilot will track the active flight plan in GPS1 if VLOC1 is selected or GPS2 if VLOC2 is selected and not track VLOC1 or VLOC2 as the selected source in NAV on the PFD. Therefore the course deviation on the PFD CDI and the course deviation flown by the autopilot can be different. This situation may be confusing and should be avoided. During this condition, the normally green "GPSS" annunciation on the PFD changes to amber to alert the pilot to this condition

CAUTION: GPSS mode must not be used on the final approach segment of a VLOC approach (ILS, LOC or non-GPS-overlay VOR). GPSS mode must be deselected (i.e., NAV mode selected) prior to the turn onto the final approach course.

One of the Horizontal Modes (HDG or NAV) must be engaged on the autopilot control head before a vertical mode can be used.

1. Altitude Hold Mode- Push the ALT button on the autopilot control panel to enable altitude hold. Current altitude at the time of button press will be selected as the target altitude and the autopilot will hold that altitude. The Alt bug will be set to the nearest 100 feet of the current altitude and will become solid magenta. The Flight Director steering command bars will be present when the aircraft is setup to display the flight director.

The knob on the right side of the autopilot control head can be used as an altitude “bump,” such that each rotational click of the knob will change target altitude by 20 feet. The altitude bug setting will not change.

2. Vertical Speed Mode- Push the VSI Bug button and rotate the PFD knob to set the desired vertical speed. The VSI bug is hollow at this point. Engage the VS mode by pressing the VS button on the autopilot control head. At this point, the VSI bug will become solid magenta. The Flight Director steering command bars will be present when the aircraft is setup to display the flight director. When VS mode is cancelled, the VSI bug will become hollow and the flight director will be removed, but remains at its last value.

The VSI Bug may be set to a range of +/- 1,600 fpm. This range coincides with the VS limits of the autopilot.

3. Altitude Capture Mode- Push the Alt Bug button on the *Entegra* PFD and rotate the right knob to set a desired target altitude. Engage Altitude Capture mode by pressing the ALT and VS buttons on the autopilot control head simultaneously. The Alt Bug and VSI Bug will become solid magenta while the flight director steering command bars, if configured on aircraft, are shifted to correspond with the autopilot commands. In AP or AP/FD modes, the autopilot will then follow the VSI bug to the selected target altitude. In FD mode, the flight director command bars will move to the appropriate location but it is the pilots responsibility to match the command bars. As the target altitude is approached, the VSI bug will automatically move toward zero and will become hollow when the target altitude is captured. At the target altitude, the delta-shaped aircraft reference symbol is tucked into the flight director command bars.

Flight Director Modes

The flight director is a display of the flight profile commanded from the autopilot. A remote switch on the instrument panel allows the control of the autopilot modes between off, autopilot, autopilot with flight director, and flight director only (a manual mode in which the pilot is expected to manually fly toward the command bars).

The flight director command bars are limited to +/- 30° in roll and +/- 10° in pitch with respect to the aircraft reference symbol.

Autopilot Operation During PFD Failures

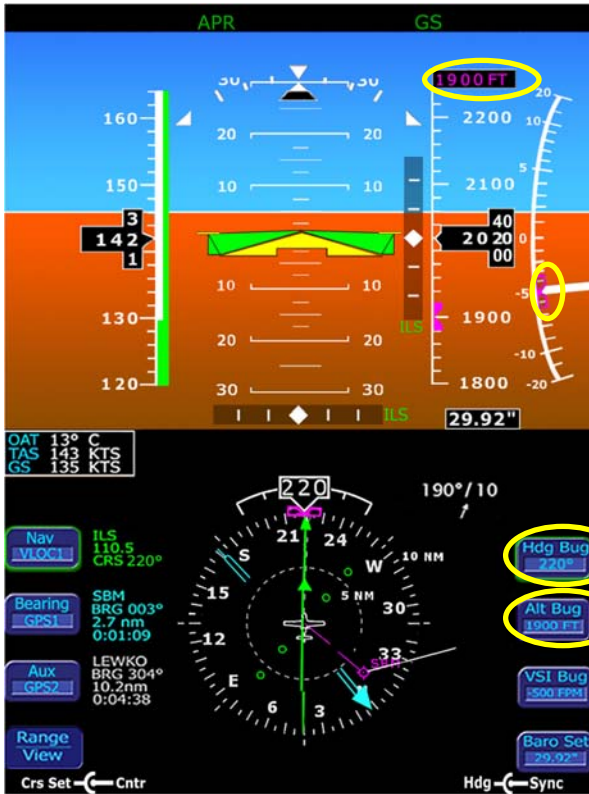
In the unlikely event of a total PFD failure, the autopilot can still be controlled via its control head. GPS roll steering (GPSS Mode) is the only autopilot horizontal mode available. Alt Hold Mode and VS mode are still available and may be controlled using the Alt and VS buttons and the rotary knob on the autopilot control head. See the autopilot user's guide for usage instructions.

CAUTION: When engaging the altitude capture mode, confirm that both ALT and VS are engaged on the autopilot. If VS is not engaged, the autopilot will level the aircraft at the current altitude when ALT is engaged on the autopilot.

Only GPS/NAV 1 is capable of being the navigation source to the autopilot in the event of a PFD failure.



The wind vector on the HSI is very useful in any phase of flight where winds aloft should be taken into account. A combination of the wind vector and projected track line can be used to your advantage in navigation tasks. A very useful technique is to align the projected track line with the desired course. This will take the guess work out of determining proper crab angles for wind corrections.



The *Entegra* PFD is designed to take full advantage of the auto transition capability of the GPS/NAV systems for flying a GPS flight plan ending in an ILS approach. In this case, the GPS/NAV CDI source automatically switches from GPS to VLOC when it begins receiving the glideslope/glidepath signal. At that time, the *Entegra* PFD “Nav” source also changes and the horizontal deviation indicator (HDI) and vertical deviation indicator (VDI) windows are displayed on the ADI. The CDI course is automatically set to the inbound localizer course resulting in a hands-free transition.

As long as a localizer or ILS has been selected via the *Entegra* PFD “Nav” button, the HDI and VDI will be automatically displayed when applicable localizer and glideslope signals are received. No pilot action is required for the horizontal and vertical deviation indicators to be displayed.

It is recommended that the inbound course be set via the *Entegra* PFD course set knob to serve as reference during the localizer intercept and tracking. This is automatic if the GPS/NAV system has been setup to Autoslew. The CDI deflection will be driven by the localizer signal itself, regardless of the course setting.

To perform an autopilot-coupled approach, ensure the approach has been activated in the GPS selected as the Nav source. At that point, press the NAV button on the autopilot control head to activate Nav mode. Press the APR button on the Autopilot control head to activate the glideslope capture capability. The autopilot will then track the glideslope and localizer. Refer to the autopilot user's guide for glideslope capture scenarios.

It is recommended that the altitude bug be set to the published approach decision height to serve as a visual reference during the approach.

For maximum situational awareness during all types of precision and non-precision instrument approaches, always select and activate the approach in the GPS/NAV. This will enable the *Entegra* PFD to display the approach waypoints on its moving map.

Upon reaching the FAF, ensure that the correct baro is entered in both the PFD and standby altimeter. Also verify that the PFD and standby altimeter indicate the same altitude.

The *Entegra* PFD is also designed to aid in the flying of non-precision approaches. Once the published approach has been activated in the GPS/NAV system, the inbound course on the *Entegra* PFD will be automatically set to match the inbound course of the published approach.

A recommended technique when performing an autopilot-coupled non-precision approach is to select the HDG, NAV and ALT buttons on the autopilot while still outside the FAF. Prior to reaching the FAF, use *Entegra's* VSI bug to set the desired VS descent rate, use *Entegra's* HDG Bug to set the desired heading for climbout/missed approach, and use *Entegra's* Alt Bug to set the desired intermediate level off altitude or the MDA as a visual reminder. Crossing the FAF, VS mode should be selected on the autopilot and just prior to reaching MDA, ALT should be selected on the autopilot to command altitude hold.

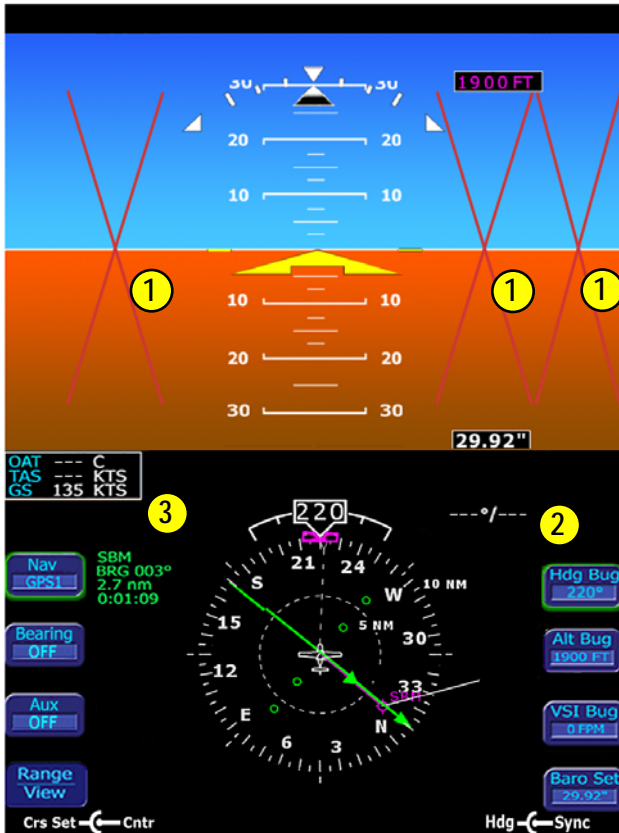
The *Entegra* PFD is designed to fully support flying back course localizer approaches. To perform a back course localizer, ensure the front course value is set via the *Entegra* PFD course knob. As soon as the *Entegra* system determines itself to be established on the back course localizer, the HDI source label indicates "LOC BCRS" and both the HDI and CDI display correct sensing. There is no further pilot action required.

For coupled approaches, the autopilot may have to be set to reverse (REV) mode. Consult the Autopilot POH for proper orientation

Missed Approach

Prior to missed approach, disconnect the autopilot, ensure the aircraft is trimmed for the power setting, establish a climb attitude and use *Entegra's* Alt Bug to set the desired missed altitude. On the climbout, select HDG or NAV (depending on missed approach instructions) on the autopilot, press ALT and VS simultaneously on the autopilot, and press OBS on the GPS/NAV to continue the coupled missed approach.

CAUTION: If an altitude capture is attempted to a target altitude above current aircraft altitude and a negative value has been set in the VSI Bug, the system will not proceed with the altitude capture but will transition into altitude hold mode instead. The same is true for target altitudes below current aircraft altitude but positive values set in the VSI Bug.



In the unlikely event that valid air data is unavailable:

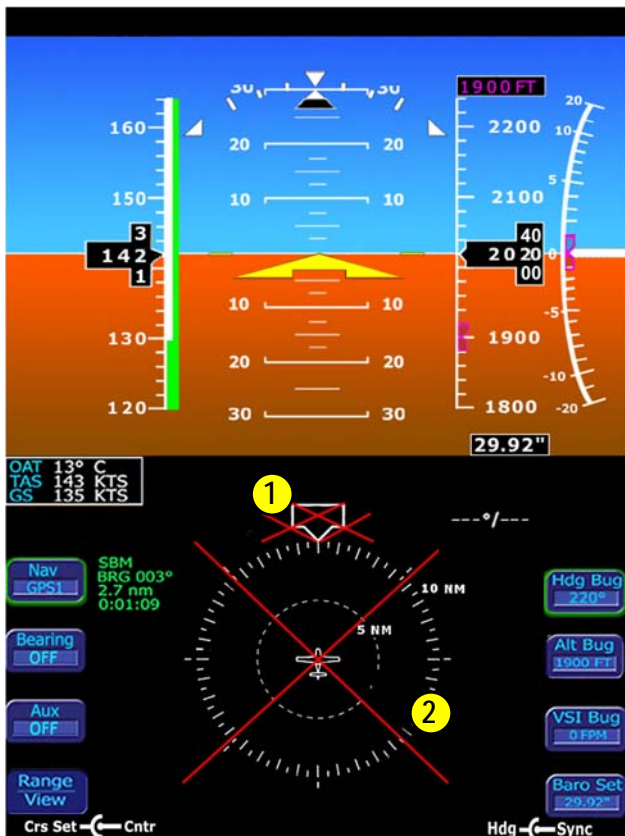
1. Airspeed, altitude, and vertical speed data will be removed and replaced by red-X's;
2. Wind Vector data will be removed and replaced by dashes.
- 3 Outside Air Temperature (if displayed) and True airspeed data will be removed and replaced by dashes;

If this occurs, revert to the mechanical backup airspeed indicator and altimeter. Cross referencing the PFD attitude to the backup ADI is recommended during flight with invalid air data.

When air data is determined to be valid, the display of air data will be restored.

Invalid Heading

Invalid Sensor Data



In the unlikely event that valid heading data is unavailable:

1. Heading data will be removed from the display;
2. HSI navigation data will be removed from the display;

Refer to the aircraft compass for heading. Refer to the EX5000 MFD or GPS navigator for ground track and flight plan.

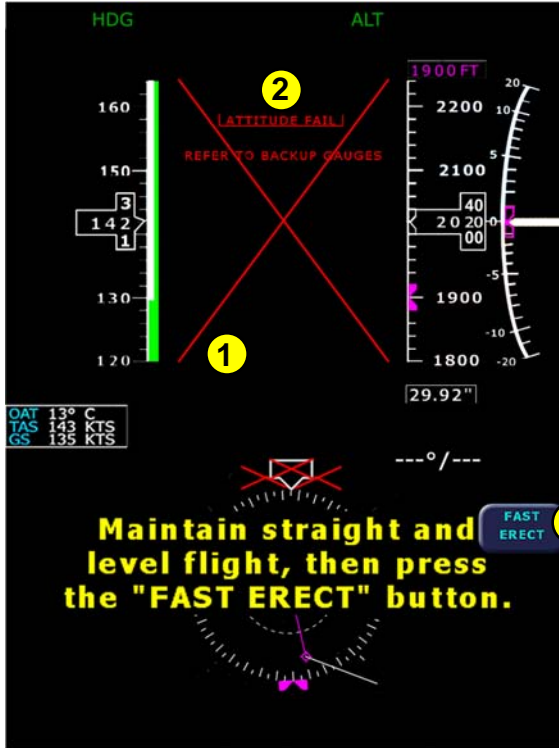
When heading data is determined to be valid, the display of heading and HSI navigation data will be restored.



The *Entegra* PFD comes equipped with a self-check monitor. When the self-check monitor detects a condition that doesn't warrant removal of data, a directive warning message is displayed to the pilot to "CROSSCHECK ATTITUDE."

1. When this message is displayed, the pilot should scan all backup instruments and auxiliary instruments (backup attitude indicator, backup airspeed indicator, and back up altimeter) to crosscheck the aircraft attitude. The warning message is automatically removed when the self-check monitor confirms the PFD attitude is valid.

The Crosscheck Attitude message will not be displayed when air data is invalid (as shown on page 30). Cross referencing the PFD attitude to the backup ADI is recommended during flight with invalid air data.



In the unlikely event of a recoverable attitude data failure, all normal button labels will be removed and:

1. Attitude data will be removed from the display and replaced with a red “X” and;
2. An “Attitude Fail - Refer to backup gauges” message will be displayed and;

Use the backup instruments and/or outside visual references to obtain straight and level conditions.

3. A “Fast Erect” button label and message will be displayed;
4. When the “Fast Erect” button is pressed, the message will change to “Maintain straight and level flight” until the 10 second count-down timer expires. At that point, all attitude data will be restored.

It is imperative that straight and level flight is obtained prior to pressing the “Fast Erect” button.



In the unlikely event that valid attitude and heading data are unavailable:

1. Attitude data will be removed from the display;
2. An “Attitude Fail - Refer to Backup Gauges” message will be displayed;
3. Wind vector data will be removed from the display;
4. Heading data will be removed from the display and;
5. HSI navigation data will be removed from the display.

Use back-up instruments for attitude and heading for the remainder of the flight. During IFR flights, proceed to the nearest VMC conditions and do not re-enter IMC. There is no in-flight pilot action that can be performed to correct this condition.

Consider using the autopilot to reduce workload. Use GPSS mode to maintain flight plan route.

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- (b) Such Product is returned to Avidyne or an Avidyne authorized service facility;
- (c) The Product has not been altered, modified or changed in any other manner than has been previously authorized by Avidyne; and
- (d) Repairs to the Product have not been made by anyone other than Avidyne or an Avidyne authorized service facility.

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AVIDYNE CORPORATION
55 Old Bedford Road
Lincoln, MA 01773
Telephone: 781-402-7400
Toll Free: 800-AVIDYNE (800-284-3963)
FAX: 781-402-7599
www.avidyne.com

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