

FlightMax *Entegra*

Primary Flight Display Pilot's Guide



Revision History		
Date	Revision	Description
Oct 25, 2002	00	Initial Release per ECO 02-284
Feb 03, 2003	01	Updated per ECO 03-046
Feb 04, 2003	02	Updated per ECO 03-049
Feb 06, 2003	03	Updated per ECO 03-055
Feb 20, 2003	04	Updated per ECO 03-067
May 23, 2003	05	Updated per ECO 03-159
Aug 1, 2003	06	Updated per ECO 03-194
Aug 12, 2003	07	Updated per ECO

Note: Cover picture depicts a standard SR20/SR22 Configuration.



Note: Above picture depicts a standard SRV Configuration.

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/VHF	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	28
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

Intentionally Left Blank

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.

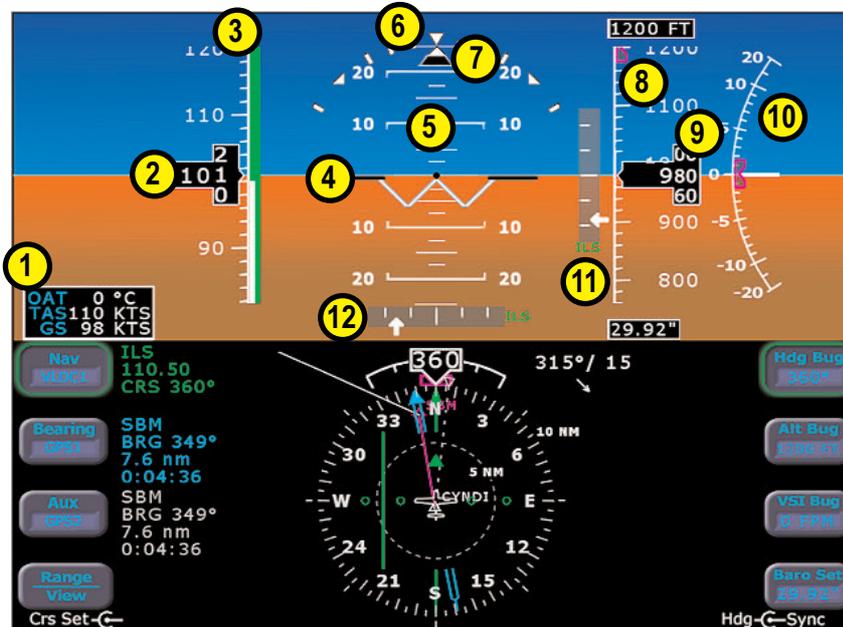


1. Brightness Control (BRT/DIM)- Controls display brightness. Power-on default is 75% brightness.

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 12.

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 a black dot in the center of the "Flying-W" against the pitch ladder.

ADI Symbology

System Overview

5. 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.

6. 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).

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

8. Altitude Tape- Displays pressure altitude (with barometric correction) with a display range from -1,000 feet to 25,000 feet. Each minor graduation represents 20 feet and each 100 foot graduation is labeled.

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

10. 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.

These features are only available in configurations that include at least one GPS/VHF navigator :

11. Vertical Deviation Indicator (VDI)- The VDI is 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.

12. Horizontal Deviation Indicator (HDI)- Displayed when VLOC is selected as NAV source and 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.

System Overview

HSI Symbology



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. **NOTE:** *This feature is not available in SRV configurations.*
- 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. **NOTE:** *This feature is not available in SRV configurations.*

HSI Symbology

System Overview



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. **NOTE:** *This feature requires that at least one GPS/VHF navigator be installed.*
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.



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

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.

***NOTE:** The VSI Bug is only available when equipped with full-featured autopilots.

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.

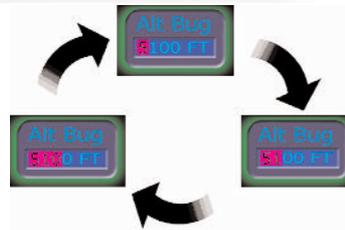
System Overview

Right Knob & Buttons



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 25,000 feet). The Alt Bug has three resolution setting modes: 1,000 ft, 100 ft, and 10 ft modes.

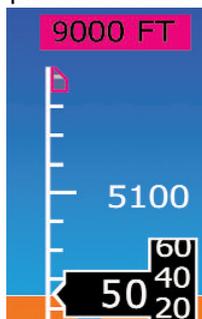
The default adjustment position is at the 1,000 ft mode and each button press steps the adjustment position down one place. The selected numeric value appears in the button and in the Altitude Preselect window.



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).

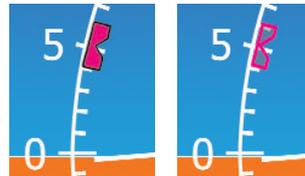
The bug is solid when coupled to the autopilot and hollow when not coupled (right).



6. Altitude Preselect - Displays the digital value of the altitude bug setting and, when enabled with a full-featured autopilot, 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. **NOTE:** This feature is only available when equipped with full-featured autopilots.

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. **NOTE:** This feature is only available when equipped with full-featured autopilots.



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. Digits appear as black numbers on white background when the Baro Set button is selected. The baro correction is capable of displaying units in inches of mercury. For software releases 530-00123-000, Rev 01 or higher, millibars or hectopascals are used. This selection is accomplished as a maintenance action at initial configuration/installation into the aircraft.

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/Center
VLOC1 or VLOC2*	Tuned NavAid is a VOR	Crs Set/Center
VLOC1 or VLOC2*	Tuned NavAid is an ILS or LOC	Crs Set (as reference)

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

***NOTE: This feature requires that at least one GPS/VHF navigator be installed.**

Left Knob & Buttons

System Overview

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.

***NOTE: This feature requires that at least one GPS/VHF navigator be installed.**

System Overview

Left Knob & Buttons



For SR20 and SR22 configurations:

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

For SRV configurations:

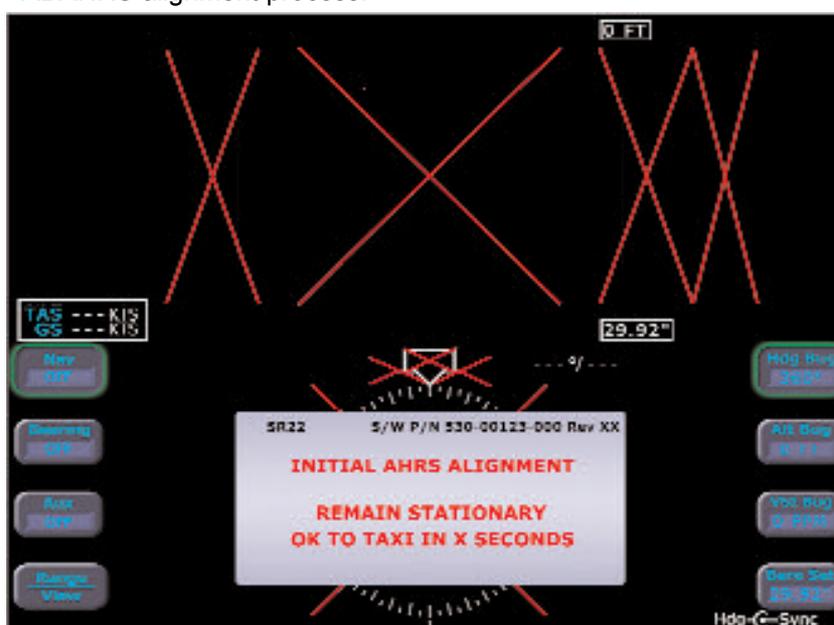
1. View Button (View) - When selected, the View button toggles the HSI compass rose view from 360 degrees to 120 degrees. When this button is active, the left knob is not labeled and is not functional.

Initialization

User's Guide

The Entegra PFD is equipped with a solid state Air Data and Attitude Heading Reference System (ADAHRS) which requires a 3 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 BAT1 and conduct the aircraft preflight during the ADAHRS alignment process.



The PFD presents the above 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 Vs speeds are set up for. Typical alignment time is 3 minutes but may take longer if the aircraft is subjected to forward motion. The third line, "OK TO TAXI IN X SECONDS," indicates when it is permissible to taxi while the system is still aligning. Air data (airspeed, altitude, vertical speed) will become valid prior to attitude data. The warmup block automatically transitions to the next several boxes depicted 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 screen is provided for increased flexibility during ground operations, but it may extend alignment time.

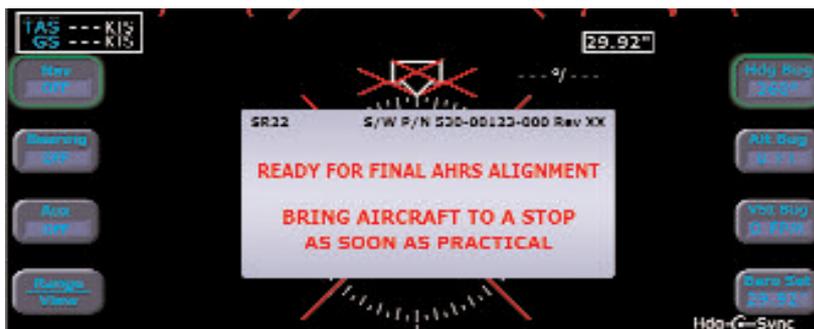
User's Guide

Initialization

The first initialization box is displayed for 30 seconds in nominal alignments. It is imperative to remain stationary during that time. At the completion of that 30 second period, the following message is displayed. This display will be up for approximately 90 seconds during which movement is acceptable. Movement beyond that 90 second window will extend overall warmup duration.



When the system is approaching its final alignment phase, the message changes to the one depicted in the next figure, indicating that the pilot should bring the aircraft to a stop as soon as it is practical. This will be presented for several seconds, even if the aircraft is stationary.



Initialization

User's Guide

The final AHRS alignment phase is indicated by a change in the box message. This is typically a 40 second countdown, during which it is also imperative to remain stationary. Movement during this phase will result in the “READY FOR FINAL AHRS ALIGNMENT” message, and will extend alignment durations.

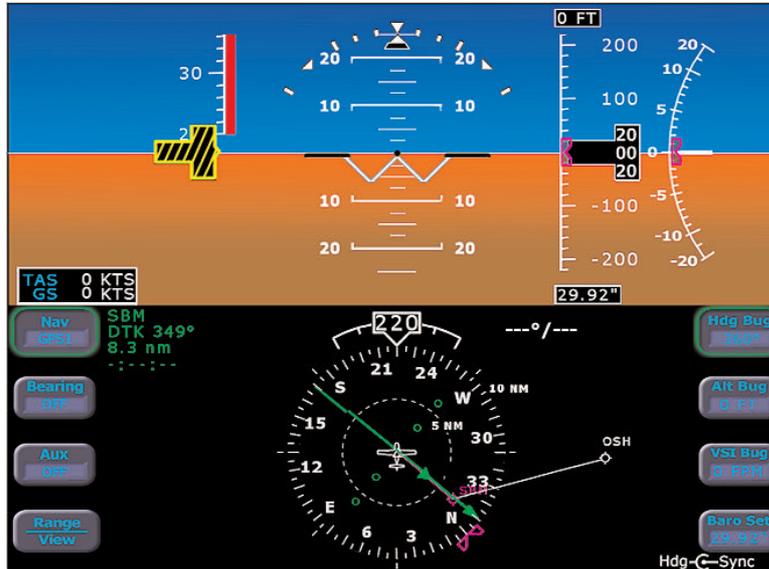


In the event that the AHRS is unable to complete its alignment, the following display is presented. If this occurs, wait approximately an extra two minutes in this state. If the system picks back up on the alignment, a nominal PFD will result. If the display does not clear itself, contact a service center and provide the displayed error code.



User's Guide

Default Settings



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

Alt Bug	The value just prior to previous shutdown.(*1)
Alt Bug Mode	Thousands mode
VSI Bug	The value just prior to previous shutdown.(*1,2)
Hdg Bug	The value just prior to previous shutdown.(*1)
Baro Set	The value just prior to previous shutdown.(*1)
Nav	GPS1
Bearing	OFF (*3)
Aux	OFF (*3)
View	360 degree view with flight plan (*4)
Range	10 NM (*3)
Right Side Active Button: ..	Hdg Bug
Left Side Active Button: ..	Nav
Right Knob:	Sets Hdg Bug
Left Knob:	Inactive

* NOTES:

1. For Software 530-00123-000, Rev 00, these values default after each power cycle to the following: Alt Bug = Nearest 100' to field elevation; VSI Bug = 0 fpm; Hdg Bug = 360 degrees; Baro Set = 29.92".
2. This feature is only available when equipped with full-featured autopilots.
3. This feature requires that at least one GPS/VHF navigator be installed.
4. 360 degree view with flight plan applies to SR20/22 models. For SRV models, the default view is 360 degree view (no flight plan).

Setting up the HSI

User's Guide

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

The “Nav” button (Primary Nav) is used to select the navigator source for the green single-line CDI and the moving map data. The active flight plan from the selected navigator 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 and arc view with map). Navigator # 1 is also the primary source for ground-speed readout and a required element for the wind vector calculation and display. In the event navigator # 1 is unavailable, ground speed and wind vector data are derived from navigator # 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. Remember that SRV configurations do not contain any moving map data on the HSI.

The Bearing button is used to select the navigator 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, navigator # 2 can be loaded with Direct-To waypoints, alternative flight plans, or Navaid frequencies to provide additional guidance beyond what is loaded into navigator # 1. This information can be selected for display on the *Entegra* PFD as the “Bearing” or “Aux.”

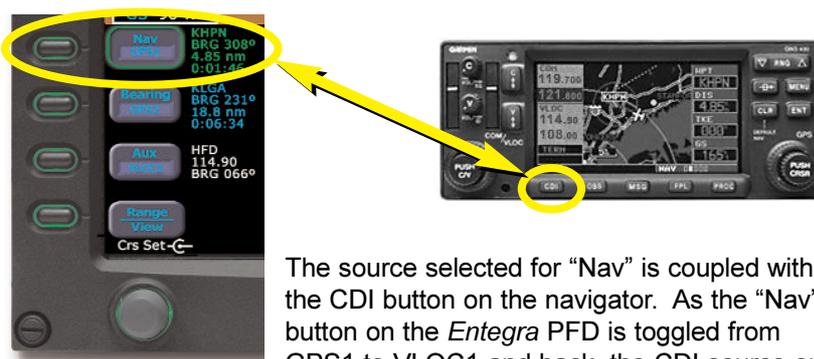
For increased situational awareness, it is important to remember that the CDI on the *Entegra* PFD's HSI comes from the selected “Nav” source which may be different from the CDI displayed on the navigator #1 or navigator #2 displays. While using the crossfill capability of the navigators in dual configurations 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 Dual GPS/VHF navigators

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

1. **PFD Nav Source** = GPS1 or GPS2 and the requested navigator 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 navigator 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 navigator. As the “Nav” button on the *Entegra* PFD is toggled from GPS1 to VLOC1 and back, the CDI source on navigator # 1 toggles from GPS to VLOC and back to match the current “Nav” setting. Similarly, as the CDI button on the navigator is toggled from GPS to VLOC and back, the “Nav” source of the *Entegra* PFD will change to follow.

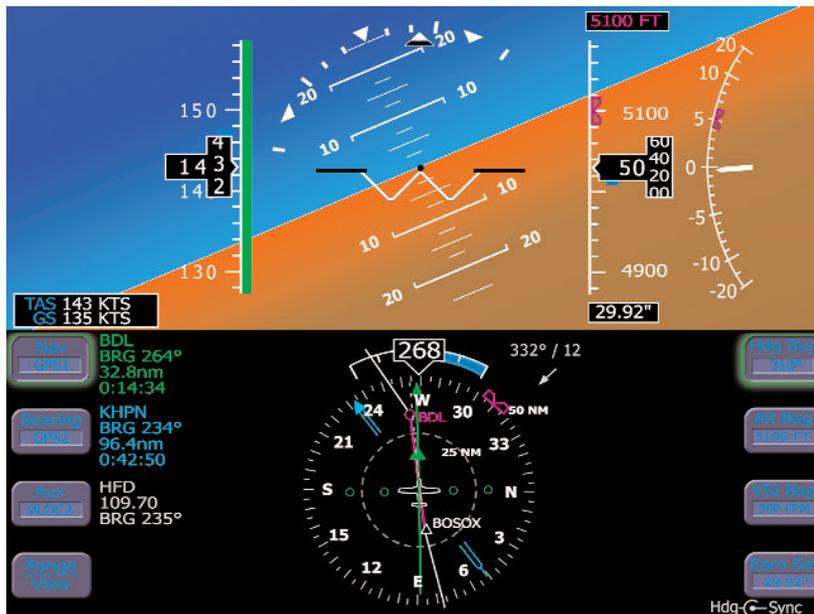
A recommended technique is to use the CDI button on navigator # 1 to toggle the Nav source back and forth, especially in a dual-GPS/VHF navigator installation where the PFD Nav button cycles through all four Nav sources (GPS 1, VLOC 1, GPS 2, VLOC 2), and the CDI button on the navigator # 1 makes it 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 black dot in the middle of the aircraft reference symbol ("flying-W") 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.



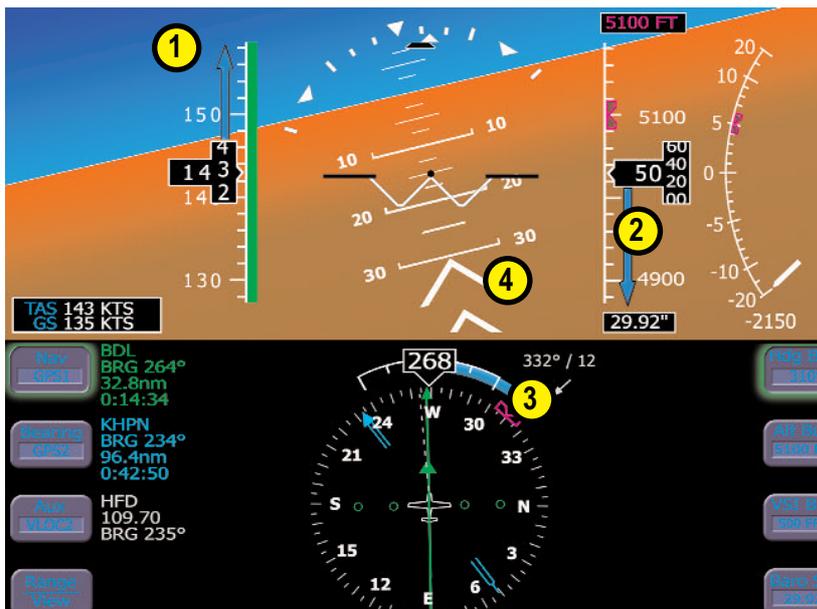
The proper technique for flying a constant rate turn involves using a combination of the turn indicator and the bank angle indicator. Typical bank angles for a standard rate turn are approximately 23 degrees in cruise conditions. This illustration shows a standard rate turn to the right. Initiate the 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.

Autopilot Use and Control

User's Guide

The *Entegra* PFD is fully integrated with the S-Tec System 55X and System 55SR autopilots. The Heading, Altitude and VSI (55X only) 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. If an active autopilot mode is not selected (i.e. "hand-flying"), the *Entegra* PFD does not provide guidance other than to display the position of the appropriate bugs as set by the pilot.

The reference bugs' status will indicate when *Entegra* is coupled with the autopilot. A solid magenta Heading, Altitude, or VSI (55X only) 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.

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

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 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 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 navigator (Nav=GPS1 or GPS2) or an active VOR or localizer (Nav=VLOC1 or VLOC2). The autopilot control head will indicate "NAV". 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.

3. GPS Roll Steering Mode (55X only) - In this mode, the autopilot tracks the active flight plan of the selected navigator (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 navigator. The autopilot control head will indicate "GPSS". GPSS mode is the recommended Nav Mode during autopilot operations due to 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.

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 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 (55X Only) - 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. When VS mode is cancelled, the VSI bug will become hollow 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 (55X Only) - 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. The autopilot will then follow the VSI bug to the selected target altitude. As the target altitude is approached, the VSI bug will automatically move toward zero and will become hollow when the target altitude is captured.

Autopilot Operation During PFD Failures (55X Only)

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.

Only navigator # 1 is capable of being the navigation source to the autopilot in the event of a PFD failure.

Wind Vector & Track Line

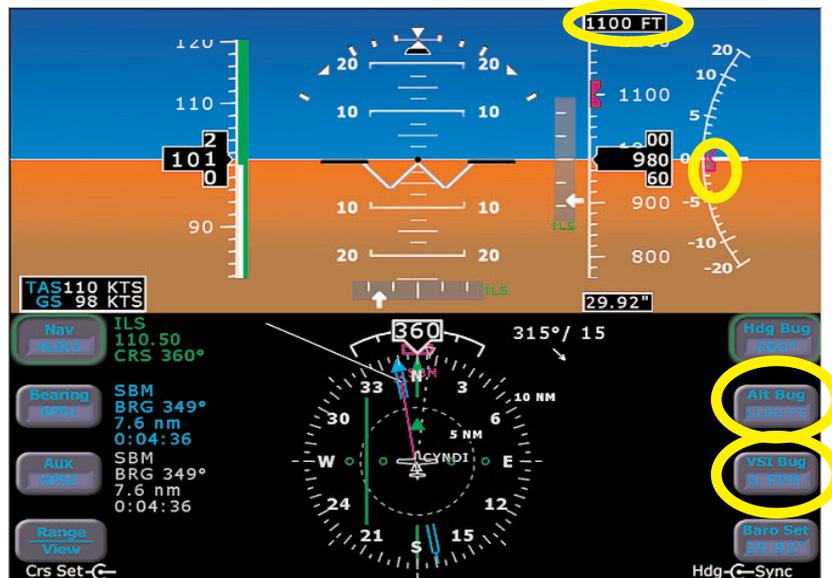
User's Guide



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.

User's Guide

Precision Approaches



The *Entegra* PFD is designed to take full advantage of the auto transition capability of the GPS/VHF navigator systems for flying a GPS flight plan ending in an ILS approach. In this case, the navigator 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/VHF navigator system has been setup to Autoslew. The CDI deflection will be driven by the localizer signal itself, regardless of the course setting.

Precision Approaches

User's Guide

When equipped with combined GPS/VHF navigator and Stec System 55X systems:

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/VHF navigator. 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.

User's Guide

Non-Precision Approaches

The *Entegra* PFD is also designed to aid in the flying of non-precision approaches. Once the published approach has been activated in the navigator 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 (55X Only) 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.

For Software 530-00123-000, Rev 01 or higher:

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 mode. Please consult the Autopilot POH for proper operation.

Missed Approach

User's Guide

When equipped with both a GPS/VHF navigator and Stec System 55X system:

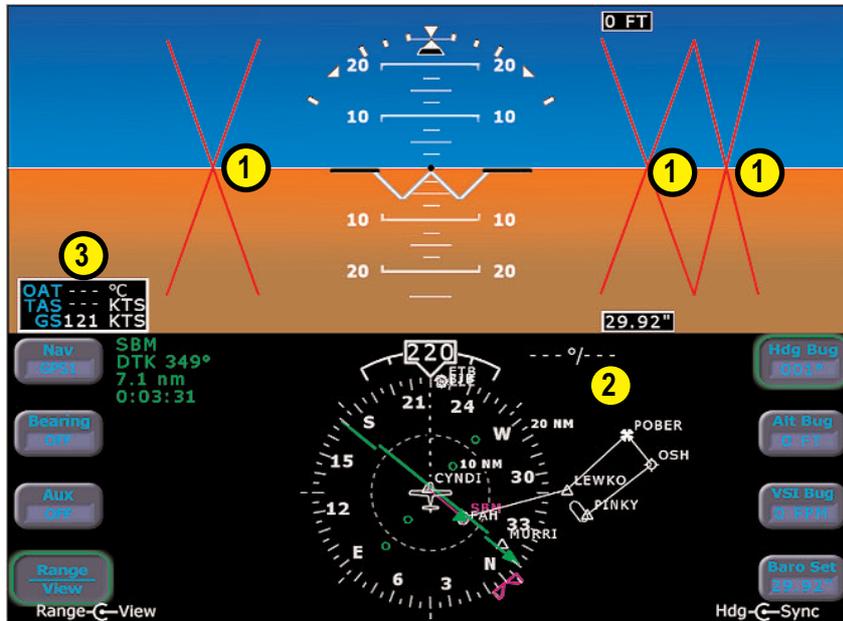
Missed Approach

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 navigator 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.

Invalid Sensor Data

Invalid Air Data



In the unlikely event that valid air data is unavailable:

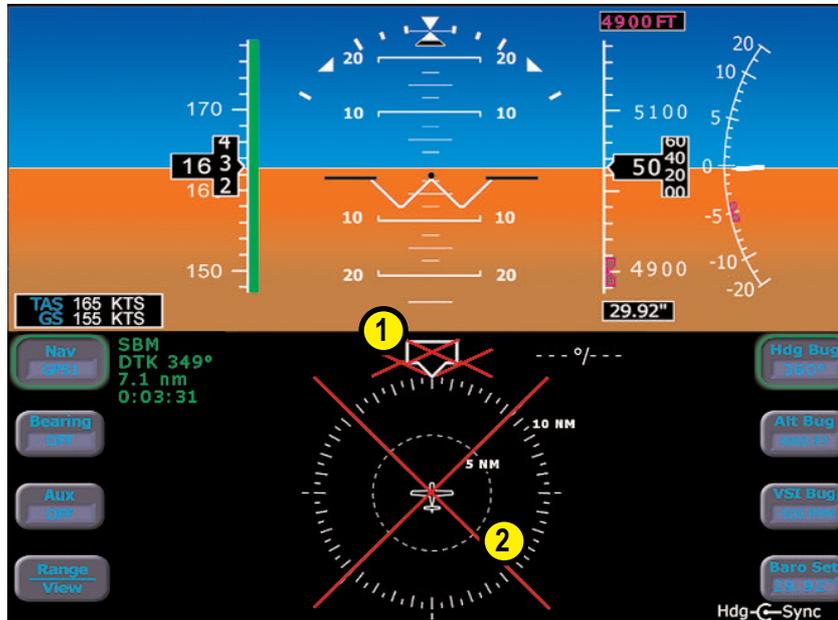
1. Airspeed, altitude, and vertical speed data will be removed and replaced by red-X's;
2. Wind Vector data will be removed and replaced by dashes.
3. Outside Air Temperature (if displayed) and True airspeed data will be removed and replaced by dashes;

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:

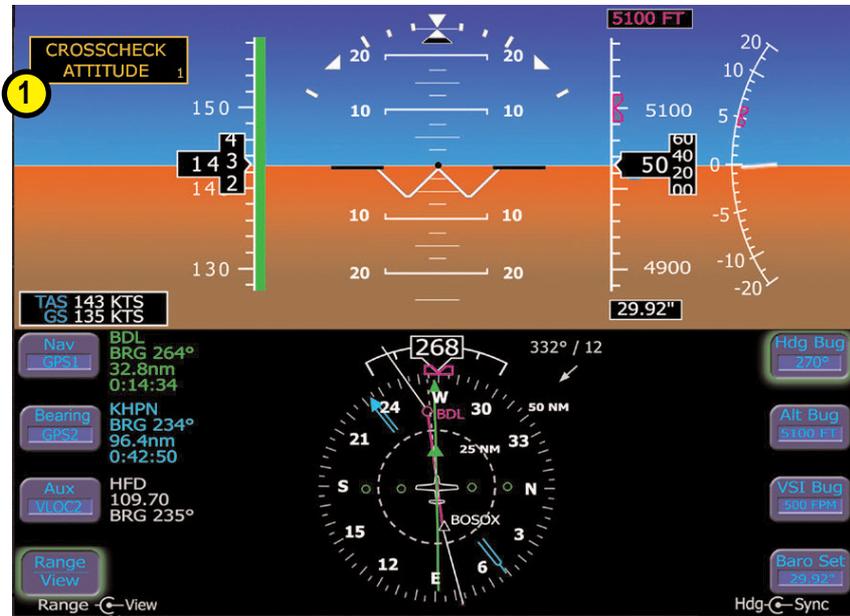
1. Heading data will be removed from the display;
2. HSI navigation data will be removed from the display;

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.

Invalid Sensor Data

Crosscheck Monitor



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 28). Cross referencing the PFD attitude to the backup ADI is recommended during flight with invalid air data.

Recoverable Attitude

Invalid Sensor Data



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

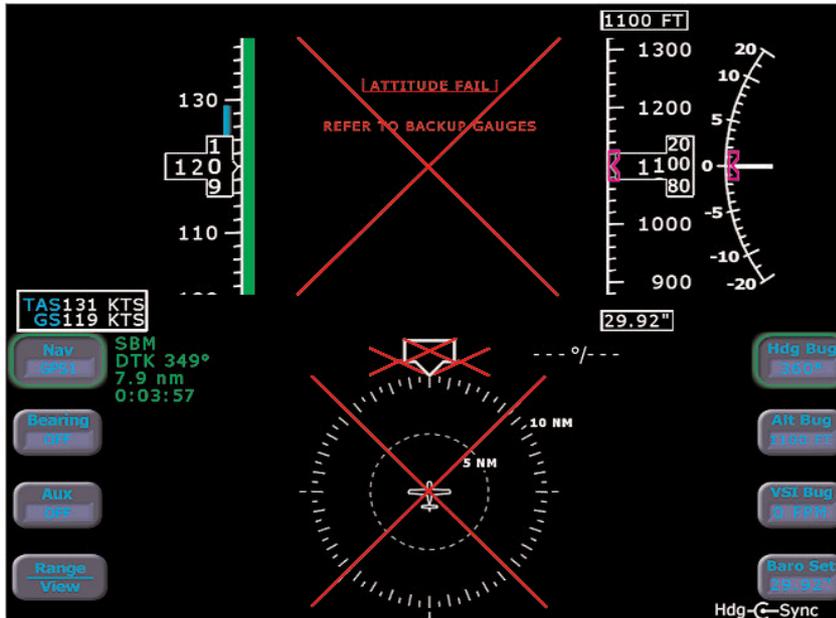
1. Attitude data will be removed from the display and replaced with a red "X" and;
2. An "Attitude Fail - Refer to backup gauges" message will be displayed and;

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.

Invalid Sensor Data Invalid Attitude & Heading



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, when equipped with a System 55X.

Avidyne Limited Warranty

Appendix

Avidyne warrants this Product against any defects in design, material and workmanship for a period of twenty four (24) months from delivery. If any Product supplied by Avidyne hereunder fails to conform to this warranty, Avidyne shall, at its sole discretion, cost and expense, either repair or replace the same or provide a refund for the Product. This

warranty is made upon the express condition that:

- (a) Avidyne is given prompt written notice upon discovery of any non-conformity, with explanation of the alleged deficiencies;
- (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.

This Warranty does not apply to failures caused outside of the normal use of the Product, including improper installation, physical damage, tampering, lightning or other electrical discharge, or to Product with altered serial numbers.

Avidyne will use reasonable efforts to repair or replace Product within ten (10) days, and will return repaired Product or will supply replacement Products to the customer at Avidyne's expense.

All Products that have been repaired or replaced by Avidyne shall have the remainder term of the original warranty or ninety days, whichever is greater.

THIS WARRANTY EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE. AVIDYNE WILL NOT, IN ANY EVENT, BE LIABLE FOR ANY DAMAGES INCLUDING ANY LOST PROFITS OR OTHER INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR TYPE ARISING FROM THE USE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT.

The foregoing warranty represents Avidyne's exclusive liability

Appendix

Software License

Avidyne Corporation ("Avidyne") is willing to license this software, pilot's guide, and related materials (the "Software") only on the condition that you agree to all the terms of this agreement. Please read these terms carefully.

Trademarks

Avidyne, the Avidyne logo, FlightMax, and the FlightMax logo are trademarks of Avidyne Corporation. Other brands or products are the trademarks or registered trademarks of their respective holders and should be treated as such.

License and Certain Restrictions

You may use the Software on the FlightMax on which it was delivered. You may not copy the Software for any purpose. You may not transfer the Software or any rights under this Agreement to another party without this Agreement. The other party must agree to accept the terms of this Agreement. The Software contains trade secrets. You may not decompile, reverse engineer, disassemble, or otherwise reduce the Software to human-readable form. You may not modify, adapt, translate, rent, sublicense, assign, lease, loan, resell for profit, distribute, or network the Software, disk or related materials or create derivative works based upon the software or any part thereof. Title, ownership rights, and intellectual property rights in and to the Software belongs to Avidyne and its licensors. The Software is protected by the copyright laws of the United States and by international copyright treaties. Title, ownership rights and intellectual property rights in and to the content accessed through the Software is the property of Avidyne, and where applicable, to the licensor content owners and may be protected by applicable copyright or other law. This Agreement gives you no rights to such content.

Government Licensee

If you are acquiring the Software on behalf of any unit or agency of the United States Government, this provision applies. The Government acknowledges Avidyne's representation that the Software and its documentation were developed at private expense and no part of them is in the public domain. The Government acknowledges Avidyne's representation that the Software is "Restricted Computer Software" as that term is defined in Clause 52.227-19 of the Federal Acquisition Regulations (FAR) and is "Commercial Computer Software" as that term is defined in Subpart 227.401 of the Department of Defense Federal Acquisition Regulation Supplement (DFARS). The Government agrees that: If the Software is supplied to the Department of Defense (DoD), the Software is classified as "Commercial Computer Software" and the Government is acquiring only "restricted rights" in the Software and its documentation as that term is defined in Clause 52.227-7013(c)(1) of the DFARS, and If the Software is supplied to any unit or agency of the United States Government other than DoD, the Government's rights in the Software and its documentation will be as defined in Clause 52.227-19(c)(2) of the FAR.

Restricted Rights Legend

Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 52.227-7013, and when applicable subparagraphs (a) through (d) of the Commercial Computer-Restricted rights clause at FAR 52.227-19, and in similar clauses in the NASA FAR Supplement. - Avidyne Corporation, 55 Old Bedford Road, Lincoln, MA 01773.

Export Law Assurances

You acknowledge and agree that the Software is subject to restrictions and controls imposed by the United States Export Administration Act and Arms Export Control Act (the "Acts") and the regulations thereunder. You agree and certify that neither the Software nor any direct product thereof is being or will be acquired, shipped, transferred or exported, directly or indirectly, into any country prohibited by the Acts and the regulations thereunder or will be used for any purpose prohibited by the same.

Miscellaneous

This Agreement will be governed by the internal laws of the State of Massachusetts. If any provision of this Agreement is held to be unenforceable, that provision will be removed and the remaining provisions will remain in full force. This Agreement is the complete and exclusive statement of the agreement between us which supersedes any other communications between us in relation to the subject matter of this Agreement. This Software contains dated information. Use of the Software is based on your understanding that this Software may not include all the information or the most current information relevant to your particular situation. If you have any questions concerning this Agreement, you may contact Avidyne by writing to Avidyne Corporation, 55 Old Bedford Road, Lincoln, MA 01773. You acknowledge that, in providing you with the Software, Avidyne and its licensors rely upon you to read this Agreement, understand it, and agree to be bound by its terms and not those contained in your purchase order.

If you do not agree to the terms of this license, Avidyne is unwilling to license the product to you. In such event, you may not use or copy the product, and you should promptly contact Avidyne for instructions on return of the unused product(s) for a refund.

Copyright

© 2003 Avidyne Corporation. All rights reserved. Reproduction of this publication or any portion thereof by any means without the express written consent of Avidyne Corporation is prohibited. For further information contact Avidyne Corporation, 55 Old Bedford Road, Lincoln, MA 01773, 781-402-7400. Information in this document is subject to change without notice. Avidyne reserves the right to change or improve their products and to make changes in the content of this material without obligation to notify any person or organization of such changes or improvements.



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

P/N 600-00081-000 Rev 07 2/03

© 2003 Avidyne Corporation All Rights Reserved.

Avidyne® and FlightMax® are trademarks of Avidyne Corp.