



Integrated Cockpit Display System ICDS 1000 Pilot Operation Handbook

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Revisions

Rev	Description	Date
1.3	Updated manual graphics and descriptions for use with software version V930A PFD, EADI, and EHSI	06-01-02

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Limitations and Risks

CAUTION: *The ICDS 1000 display is only as accurate as the Navigation Systems attached (ILS, VOR, ADF, GPS). Errors in the Navigation Systems are passed on to the ICDS 1000. Consult your Navigation Systems manual for possible sources for errors.*

Data contained on the removable Data card is only as reliable as ARNAV's source of data. Reasonable care is taken to verify the data, but the data validity cannot be completely guaranteed even when current. The data on the Data card will become obsolete if not updated.

The optional Digital Obstacle File (DOF) is provided by the FAA NATIONAL AERONAUTICAL CHARTING OFFICE (NACO), and is a listing of verified and unverified obstacles in the U.S. with limited coverage of the Pacific, the Caribbean, Canada, Mexico, and Bahamas. The Digital Obstacle File contains only obstruction data for those man-made objects which affect domestic aeronautical charting products and does not purport to indicate the presence of all obstructions which may be encountered

The U.S. Geological Survey EROS Data Center is the source for the optional global digital elevation model (DEM) used for rendering terrain base maps. The Elevations in the DEM are regularly spaced at 30-arc seconds (approximately 1 kilometer).

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The ARNAV ICDS 1000 Multi-Function Display is a powerful tool designed to aid pilots in all phases of flight. The ICDS 1000 interfaces with other systems on the aircraft to provide a centralized display for integration, computation, and centralized control. The system displays information in text, numeric, and graphical formats. Benefits of the ICDS 1000 include enhanced spatial awareness, increased flight safety and efficiency, with a reduced pilot workload.

Important Facts

For safety reasons, the ICDS 1000 operations must be learned on the ground. During flight operations, the ICDS 1000 will aid and reinforce the pilot with menus and prompts.

Power - The ICDS 1000 receives power directly through the aircraft's avionics power bus. The Power-On Light indicator remains on as long as the ICDS 1000 is receiving power.

Card Access – The ICDS 1000 has two card slots located on the front side of the Remote Processing Unit (**RPU**). The left slot on the ICDS 1000 contains the Program card, and the right slot holds an optional data-recording card. The cards are inserted with the ARNAV label facing up until firmly seated.

WARNING: Do not install or remove the Program / Data card while the ICDS 1000 is turned on. Removing the Program / Data card while the ICDS 1000 is reading data could destroy data on the card.

Symbolic Notation Used in this Manual

A number of symbolic representations are used in this manual to represent specific actions by the pilot or responses by the system. The table below defines the notations used.

Notation	Notation Meaning	Notes and Comments
[ALT]	Represents pilot selection of a line-select-key.	The legend in the button area represents the “soft menu” legend associated with the selected key.
[<=][=>]	Pilot turns the turn-push knob to set a value.	The turn-push knob is on the lower-right side of the Control Display Unit.
{Submenu}	Represents a system response to the line-select-key push	Pilot action caused the appearance of a sub-menu to replace the main menu in the area adjacent to the line-select-keys.
Note:	Explanations and comments	Expanded explanations and recommendations
VHF Nav	Required pilot action on external Nav equipment.	Indicates an action on cockpit equipment that is not a part of the ICDS system.

Abbreviations used in this manual for the Line-select-keys begin with L or R, indicating Left or Right, followed by a number that represents the key location counting down from the top if the ICDS 1000. For example R-5 is the 5th line-select-key on the lower right side of the bezel.

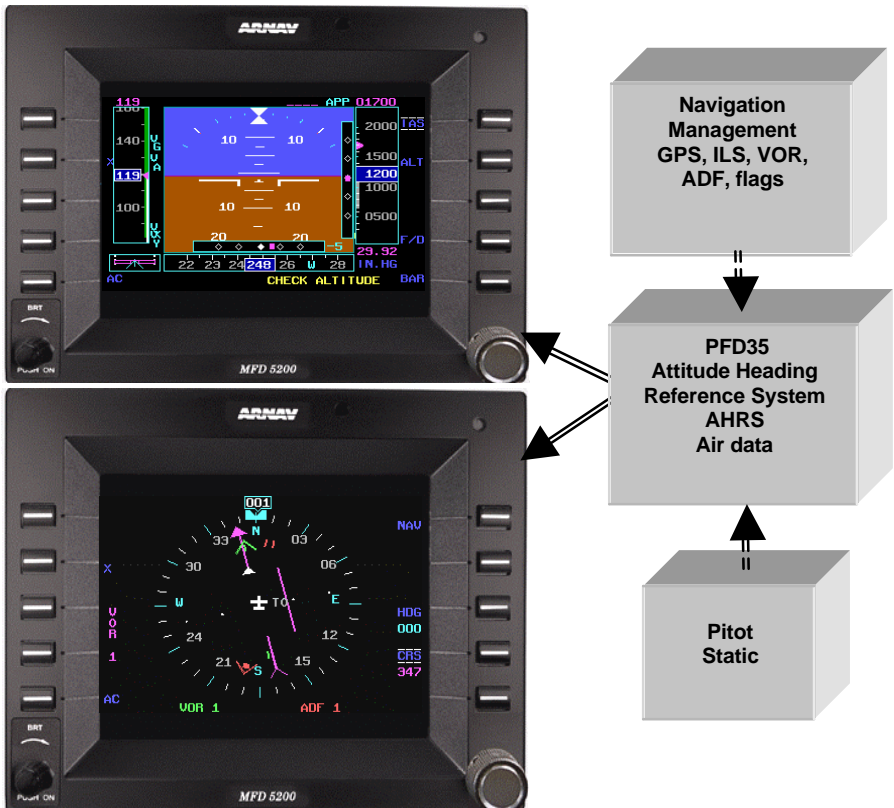
The line-select-key abbreviation applies to the Control Display Unit (CDU) under discussion, either the EADI or EHSI.

INTEGRATED COCKPIT DISPLAY SYSTEM DESCRIPTION

The Integrated Cockpit Display System 1000 (ICDS 1000) includes three major sub-systems:

1. The 5 inch Electronic Attitude Direction Indicator (**EADI**);
2. The 5 inch Electronic Horizontal Situation Indicator (**EHSI**);
3. The **PFD35** with attached Attitude Heading Reference System and digital air data system (**AHRS/DADS**). The PFD35 provides the interface to other navigation equipment installed in the aircraft, to include GPS, ILS, VOR, and ADF systems.

These sub-systems work together to bring required information for display to the pilot.



Electronic Attitude Direction Indicator (EADI)

The Electronic Attitude Direction Indicator (**EADI**) is located in the pilot's primary field of view, and presents information on attitude, heading, altitude, airspeed, vertical rates, and other information to help the pilot control the aircraft.



Following standard conventions, the left section of the display is used for speed management, the right section of the display is used for altitude management, the center middle section displays attitude, and the center lower section is reserved for heading information. Annunciation areas are located above the ADI and below the heading tape.

There are three pilot selectable targets on the **EADI**, target airspeed, target altitude, and barometric pressure setting. The pilot selectable values are printed in magenta. The target airspeed value is located at the top of the airspeed tape; the target altitude is located at the top of the altitude tape, and the barometric setting value is located at the bottom of the altitude tape. A magenta pointer that represents target airspeed and target altitude will overlay the airspeed and altitude tapes.

The Electronic Attitude Direction Indicator (**EADI**) presents pitch and roll information that is derived from the Attitude Heading Reference (**AHRS**) sub-system.

The **EADI** has two modes of operation; 1) Enroute and 2) Approach. The mode annunciator is located above the EADI on the far right edge, and will show “---” in enroute mode, and “APP” in approach mode.



EADI
Enroute
Mode



EADI
Approach
Mode

APPROach mode is triggered when a valid localizer and glideslope signal is received by the **PFD35** sub-system. The localizer and glideslope indicator bars are presented at the bottom and right edge of the attitude indicator.

EADI Unusual Attitude

When pitch exceeds +/-25 degrees, Vee-pointers appear to indicate the direction of the horizon, as shown in the following figures.



Pitch down greater than 25 degrees

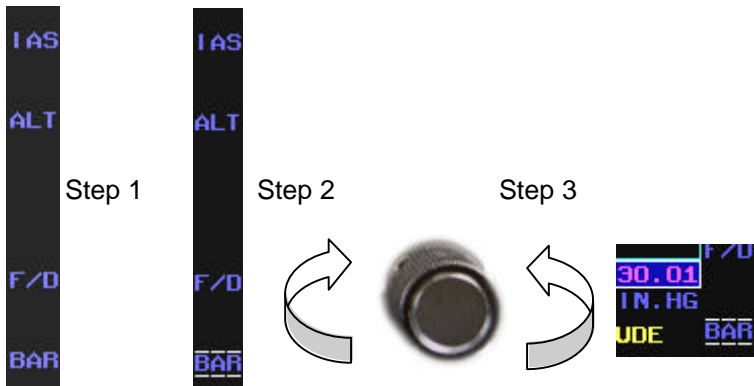


Pitch up greater than 25 degrees

EADI Pilot Mode Selectors

Mode Selection is performed by pressing line-select-keys located on the right side of the ICDS 1000 bezel. A line-select-key is pressed to adjust target airspeed, target altitude, Flight Director toggle on/off, and barometric pressure setting. To activate a Mode selection, perform the following three-step process:

1. Press any Right Line-select-key to pull up the pilot select buttons
2. Press the line-select-key associated with the desired mode – an underscore line will appear next to the selected function, and the indicator box that display numeric data for the selected function will be inverse lighted in blue.
3. Use the turn-push knob right (clockwise) to increment or left (counter-clockwise) to decrement the desired numbers.



For example, to adjust barometric pressure, press Line-select-key R5 twice, (the first time pulls up the selection menu, the second press highlights BAR). Use the turn-knob to increase or decrease BAR as needed. The barometric setting is shown at the bottom of the altitude tape.

Air data (Airspeed, Altitude, and VSI) Information

Airspeed



Airspeed is derived by converting pitot and static pressures into indicated airspeed, which is displayed as a moving tape to the left of the EADI.

An airspeed trending indicator provides a *10 second predictor* of airspeed changes. The predictor is superimposed upon the airspeed tape, and assumes that aircraft attitude, configuration, power, and atmospheric conditions will remain the same over the predictive interval.

V Speeds and Speed Ranges are shown on the airspeed tape. These speeds are used for pilot alerts in the AIRSPEED Message Window, located in the left and below the EADI.

Airspeed Message Window

The AIRSPEED Message WINDOW, located in the lower left section of the EADI, will issue the following warnings:

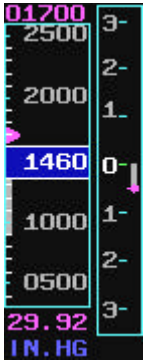
CHECK AIRSPEED – airspeed is outside (+/- 5 knots) of the selected TARGET AIRSPEED. To clear the message, the pilot will either change the current airspeed conditions, or press line select L5 to suppress the warning. Note: the tolerance for airspeed deviation may be re-configured in the PFD Setup Program. The PFD Setup Program is accessed within 10 seconds of system power-up by selecting the line-select key labeled “PFD START”



FLAP EXCEED – airspeed is outside of the flap extension range, as indicated as the white arc on the airspeed tape.

GEAR EXCEED – airspeed is outside of the gear extension range, as shown as VG next to the airspeed tape.

Altitude



Aircraft altitude is displayed as a moving tape to the right of the EADI. The barometric corrected altitude; target altitude and barometric correction (altimeter setting) are shown on a vertical tape to the right of the EADI, consistent with the “Basic T” flight instrument layout used with conventional instruments.

Vertical Speed Indicator (VSI)

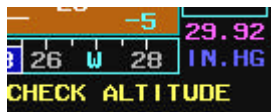
The VSI Trending Indicator predicts a 1-minute outlook of altitude. It is shown as a stand-alone gauge located to the right of the altitude tape, as well as a digital number imposed directly upon the lower right section of the EADI.

The VSI trending indicator is overlain upon the left edge of the altitude tape with twice the sensitivity of the stand-alone VSI gauge. This extra sensitivity allows for fine-tuning of altitude corrections.

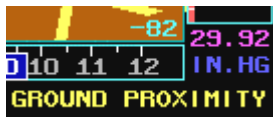
Altitude Message Window

The Altitude Message Window is located in the right lower section of the EADI, and will display alert information related to altitude. The ALTITUDE Message WINDOW includes the following warnings:

CHECK ALTITUDE – This message appears when the aircraft altitude is outside of the pilot selected Target Altitude (TALT) by more than +/- 200 feet. To clear the message, the pilot will either change altitude or press line select L5 to accept the present altitude as selected altitude.



If the optional Ground Proximity Warning System is installed, and the 1-minute VSI trending indicator is at or below ground level, **GROUND PROXIMITY** alert is given in the altitude message window.



Turn-bank Indicator

The turn-bank indicator is a graphical display of rate-of-turn. Turn-rate data is provided by the AHRS sub-system, and is based on a two-minute, 360-degree turn (3 degrees per second). No pitch information is provided from the Turn-bank Indicator.

If properly sensed, the turn-bank indicator will also show gear and flap configuration as shown in the following figures:



No Turn



Standard rate turn



No Turn, partial flaps and gear deployed



No turn, full flaps and gear deployed

Flight Director (FD)

The Flight Director wing level mode integrates input from the AHRS roll and pitch information with the pilot selected target altitude, and provides guidance cueing in both vertical and lateral directions. Vertical modes are controlled by pilot selection of altitude and pitch, and lateral guidance is derived from roll input to guide the aircraft to wings level condition.

The Flight Director provides guidance needles located in the center of the **EADI**. When engaged and **not** in approach mode, a magenta “WLV” annunciator is shown above the **EADI**.

To engage the Flight Director, press the Line-Select-Key R4. The continued pressing of Line-Select key R4 will toggle the Flight Director On and Off.



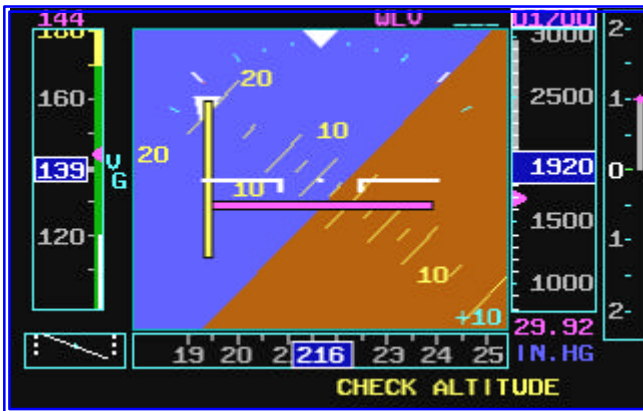
Flight Director engaged in Wing Level “WLV” mode

The vertical guidance needle is controlled by three variables; current pitch, current altitude, and target altitude. The pilot selects the target altitude by pressing Line-Select-Key R2, and turning the turn-push knob. The target altitude is displayed above the altitude tape. As the target altitude changes, the vertical guidance needle will move above or below the pitch bar, providing a command pitch to hold in order to climb or descend to the target altitude. The pitch guidance needle turns yellow if the commanded pitch exceeds +/- 5 degrees. The pitch guidance needle is removed when aircraft pitch exceeds +/- 30 degrees.

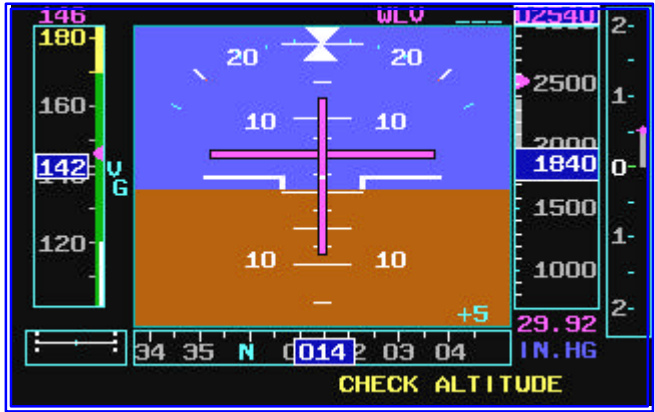


Flight Director engaged with target altitude set higher than current altitude. The pitch guidance needle turns yellow when the commanded pitch exceeds +/-5 degrees.

The roll guidance needle is inversely proportional to the roll, and will provide needle motion that will bring the aircraft back to level flight. The roll guidance needle turns yellow at +/- 45 degrees of roll, and is removed entirely when roll exceeds +/- 60 degrees.



The roll guidance needle turns yellow when commanded roll exceeds +/- 45 degrees.



As aircraft and target altitude converge, the vertical guidance needle commands a shallower pitch.



When the aircraft reaches target altitude, the vertical guidance needle commands straight and level pitch. The “CHECK ALTITUDE” message is removed when the aircraft altitude is within +/- 200 feet of the target altitude.

Flight Director – Approach Mode

IF the flight director is engaged in approach mode, the vertical and horizontal guidance needles lock onto the glideslope indicators located at the right and bottom side of the EADI, and “ILS” and “APP” are annunciated above the EADI.



Flight Director engaged, “ILS” and “APP” annunciators on the upper right side of the EADI.



In approach mode, the vertical and horizontal guidance needles turn yellow when full needle deflection is detected on the ILS.

Electronic Horizontal Situation Indicator (EHSI)

The Electronic Horizontal Situation Indicator (**EHSI**) will display magnetic heading, selected heading, selected course, and bearing information from two Radio Magnetic Indicators.



The Horizontal Situation Indicator is depicted on a 360 degree rotating compass card. The aircraft heading is displayed numerically in white at the top center of the display. The magenta arrow in the center of the EHSI display is the course indicator. The selected course numeric value is displayed below the line-select-key R4 “CRS”. The pilot may change the course pointer by pressing the Line-select-key R4, and turning the turn-push knob to the desired course line.

The center section of the course indicator is the Course Deviation Indicator (**CDI**), and is deflected to the either side of the course pointer based upon signals from the selected Navigation Management System (**NMS**). If the CDI is fully deflected, the color will change from magenta to yellow. The course indicator (TO-FR-OFF) flag indicator is located directly to the right of the aircraft symbol. These flag indicators are controlled by the signals from the **NMS**.

The **EHSI** maintains a display of the navigation inputs currently selected for driving the Course Deviation Indicator (**CDI**) and up to two RMI needles. The display of the navigation source driving the CDI needle is located along the left side of the display. The selected RMI 1 and RMI 2 are shown at the bottom of this display, and the corresponding color-coded needles are superimposed on the **EHSI**.

EHSI Pilot Mode Selectors

Mode Selection is performed by pressing the Line-select-keys located on the right side of the EHSI bezel. To select Target heading or Target course:

1. Press the line-select-key adjacent to the desired selection, either R3 or R4.
2. Use the turn-push knob clockwise to increment or counter-clockwise to decrement the desired heading or course numbers. The associated pointers on the EHSI will revolve around the compass card as you change their respective values.



Note: The numeric values for HDG or CRS is shown below the legend. The heading "bug" on the EHSI is shown as a wide cyan "M" on the edge of the compass card.

CDI or RMI Mode Selection

To change the CDI or RMI drives:

1. Press the NAV selection (line-select-key R1); a secondary menu will appear as shown below.
2. Press the line-select-key repeatedly until the appropriate navigation signal is coupled with the desired needle drive. The options for the CDI and RMI selections will depend on the quantity and types of navigations systems installed in the aircraft.



Note: If “OFF” is selected for CDI, RMI 1, or RMI 2, the associated needle will be removed from the display.

PILOT PROCEDURES

The balance of this Pilot Operation Handbook is used to give detailed instructions of the procedures used to perform routine cockpit management functions related to the flight instruments and input selection from the navigation equipment.

The line-select-keys are located along the right side of ICDS 1000 front panel. Pressing any right side line-select key will pull up the main menu. Once the menu is displayed, press the line-select key associated with the desired function. If the desired function requires additional pilot selection, the turn-push knob is used to increase or decrease the value associated with the function. Rotating the knob counter-clockwise decreases the numeric value of the current function. Conversely, rotating the knob clockwise increases the value.

Target Airspeed

The target airspeed is set by using the "IAS" (R-1) line-select-key. The value of the target airspeed is located at the top of the Indicated Airspeed tape. The turn-push knob is used to increment or decrement the target airspeed value. As the target airspeed is modified, the airspeed reference pointer or "bug" will move vertically to the current reference airspeed value on the Indicated Airspeed vertical tape.

Target Airspeed Setup:

Keystrokes	Pilot Action	System Response
[IAS]	Pilot Pushes "IAS".	System connects turn-push knob to airspeed bug.
[<=] [=>]	Pilot uses turn-push knob to select target airspeed.	Target airspeed is displayed above the airspeed vertical tape; airspeed "bug" is moved up or down the vertical airspeed tape to the selected value.

Target Altitude

The target altitude is set by using the “ALT” (R-2) line-select-key. The value of the target altitude is located at the top of the Altitude tape. The turn-push knob is used to increment or decrement the target altitude. As the target altitude is modified, the reference pointer or “bug” will move vertically to the current reference altitude value on the Altitude tape.

Target Altitude Setup:

Keystrokes	Pilot Action	System Response
[ALT]	Pilot Pushes “ALT”.	System connects turn-push knob to altitude bug.
[<=] [=>]	Pilot uses turn-push knob to select target altitude.	Target altitude is displayed above the altitude tape; altitude “bug” is moved up or down the altitude tape to selected value.

Barometric Pressure

The barometric pressure is set by using the “BAR” (R-5) line-select-key. The value of the barometric pressure is located at the bottom of the Altitude tape. The turn-push knob is used to increment or decrement the barometric pressure. As the barometric pressure is modified, the altitude tape and VSI will move. The VSI will return to normal operations within 3 seconds.

Changing the Barometer Setting:

Keystrokes	Pilot Action	System Response
[BAR]	Pilot Pushes “BAR”.	System connects turn-push knob to barometer setting.
[<=] [=>]	Pilot uses turn-push knob to select current barometric altimeter setting.	Barometer setting is displayed below the altitude tape; current altitude is moved up or down with barometrically corrected value.

Target Heading

The EHSI heading reference index or “bug” is set by using the “HDG” (R-3) line-select-key to connect the target heading reference to the turn-push knob. The turn-push knob is then used to increment or decrement the target heading value. As the target heading is modified, the heading reference pointer or “bug” will move clockwise or counterclockwise around the EHSI compass rose perimeter inner edge.

Target Heading Setup:

Keystrokes	Pilot Action	System Response
[HDG]	Pilot Pushes “HDG”.	System connects turn-push knob to heading bug on EHSI.
[<=] [=>]	Pilot uses turn-push knob to select desired heading.	Desired heading is displayed below line-select-key; heading “bug” is moved around the compass rose to the selected value.

Target Course Indicator

The EHSI course indicator is set by using the “CRS” (R-4) line-select-key to connect the target course reference to the turn-push knob. When the ICDS 1000 connects the target course reference. The turn-push knob is then used to increment or decrement the target course value. As the target course is modified, the course indicator will rotate clockwise or counterclockwise around the center of EHSI compass. The course deviation indicator (**CDI**) portion of the course indicator will also move to indicate course offset as the turn-push knob is operated.

Target Course Setup:

Keystrokes	Pilot Action	System Response
[CRS]	Pilot Pushes “CRS”.	System connects turn-push knob to Course Indicator on EHSI.
[<=] [=>]	Pilot uses turn-push knob to select target heading.	Target course is displayed below line-select-key; course indicator is moved around the compass to selected value.

NAVIGATION RECEIVER EXAMPLES

This section provides an overview of the procedures for the selection and use of electronic navigation receivers that are installed in the aircraft. It does not describe the functions that each navigation receiver performs or how it is interconnected into the avionics suite. Refer to the manufacturer's literature for technical details and further information regarding navigation receivers.

Note: The examples in this section do not document all possible combinations for the selection of navigation signal source.

The selection of navigation receivers for use with the various navigation displays on the EHSI navigation display is made by using the "NAV" line-select-key to connect the navigation receiver to the appropriate navigation display indicator. Selecting the "NAV" key will cause the ICDS 1000 to display a submenu that requests the pilot to indicate the desired navigation display. Once the pilot responds by selecting the desired navigation receiver for each navigation display, the receiver is connected to the EHSI navigation display component.

Example 1: ILS Localizer during the departure segment.

Tune to ILS	Pilot Tunes VHF navigation receiver	VHF navigation receiver is tuned to Localizer frequency.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	Pilot Pushes CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Pilot selects desired VHF receiver.	Connects selected VHF receiver to CDI.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	Sets OBS to localizer course.	<i>This has no electronic effect; improves the course reference for the pilot on the EHSI.</i>
[HDG] [<=] [=>]	Pilot sets heading bug to runway heading.	<i>The heading bug may be used for reference during departure to the localizer course.</i>

Example 2: VOR receiver during the departure segment.

Tune to VOR	Pilot Tunes VHF navigation receiver	VHF navigation receiver is tuned to VOR station.
[NAV]	Pilot Pushes "NAV"	Activates Nav selection menu.
{Nav Submenu}	Pilot Pushes CDI, RMI-1, or RMI-2	Prompts pilot for Nav indicator.
[CDI]	Pilot selects desired VOR receiver.	Connects selected VOR to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>Sets the Desired Course to the desired VOR course on the EHSI course indicator.</i>
[HDG] [<=] [=>]	<i>Pilot sets heading bug to runway heading.</i>	<i>The heading bug may be used for reference during takeoff and initial climb to the VOR course.</i>

Note: If the departure will use the localizer main (approach) course for takeoff and climb, the steering indications will be reversed unless the VOR/ILS receiver has the ability to reverse the steering signal electronically. If the VOR/ILS receiver does reverse the steering signal to the localizer CDI, the PFD display will indicate that back course reversal is being displayed by a "BC" or "Back Course" annunciation.

Example 3: GPS receiver during the departure segment.

Setup GPS receiver	Pilot selects GPS flight plan or waypoints	Program GPS navigation receiver to departure waypoints.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2	Prompts pilot for Nav indicator.
[CDI]	Select appropriate GPS receiver.	Connects selected GPS receiver to EHSI CDI.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	Set EHSI course indicator using turn-push knob	EHSI course setup may be automatic when using certain GPS receivers
[HDG] [<=] [=>]	Pilot sets target heading to runway heading.	Target heading may be used for reference during takeoff and initial climb to the GPS course.

Example 4: ADF receiver during the departure segment.

Tune to Station	Pilot Tunes ADF navigation receiver	ADF navigation receiver is tuned to beacon frequency.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator to program.
[RMI-1] or [RMI-2]	Pilot selects desired ADF receiver.	Connects selected ADF receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu after Nav receiver selection.
[HDG] [<=] [=>]	Pilot sets heading bug to runway heading.	The heading bug may be used for reference during takeoff and initial climb to the flight planned bearing or station.

Note: If dual ADF receivers are installed, this procedure may be repeated to assign the other ADF to the remaining RMI needle. This makes dual ADF bearing navigation techniques as used with a mechanical RMI possible.

If ADF is tuned and receiving a signal, the RMI will indicate bearing-to-station. If ADF is not receiving a signal, RMI needle will "Park" in either the 3:00 o'clock or 9:00 o'clock position.

Example 5: VOR receiver during en-route navigation.

Tune to VOR	Pilot Tunes VHF navigation receiver	VHF navigation receiver is tuned to VOR station for navigation.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select appropriate VOR receiver.	Connects selected VOR receiver to EHSI CDI.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	<i>Set EHSI course indicator using turn-push knob</i>	<i>Sets the desired course to or from the VOR on the EHSI course indicator.</i>

Example 6: GPS receiver during en-route navigation.

Setup GPS receiver	Pilot selects GPS flight plan or waypoints	Program GPS navigation receiver to en-route waypoints.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select appropriate GPS receiver.	Connects selected GPS receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>EHSI course setup may be automatic when using GPS receivers that place the Desired Course to the current waypoint on the electronic interface.</i>

Example 7: ADF receiver during en-route navigation.

Tune to Station	Pilot Tunes ADF navigation receiver	ADF navigation receiver is tuned to beacon to be used for navigation.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[RMI-1] or [RMI-2]	Select desired ADF receiver.	Connects selected ADF receiver to RMI needle indicator.
[Exit]	End NAV Menu	System returns to main menu.

Example 8: VOR receiver OBI input as an RMI reference bearing.

Tune to Station	Pilot Tunes VHF navigation receiver	VHF navigation receiver is tuned to station for reference bearing.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select appropriate VOR receiver.	Connects selected VOR receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu

If VOR is tuned and receiving a signal, RMI will indicate bearing-to-station. If VOR is not receiving a signal, RMI needle will not display.

Example 9: VOR receiver during a holding pattern.

Tune to VOR	Pilot Tunes VHF navigation receiver	VHF receiver is tuned to VOR station to be used for hold.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select desired VOR receiver.	Connects selected VOR receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu.
<i>[CRS] [<=] [=>]</i>	<i>Set EHSI course indicator using turn-push knob</i>	<i>Sets the inbound holding course on the EHSI course indicator.</i>

The holding pattern may now be flown with reference only to the head and tail of the EHSI CDI for inbound and outbound leg reference and course correction. DME or VOR station passage may be used to determine the end of the inbound leg. DME or time should be used to determine the end of the outbound leg.

Example 10: GPS receiver during a holding Pattern.

Setup GPS receiver	Pilot selects “hold” mode.	Program GPS navigation receiver to hold waypoint and procedures.
[NAV]	Pilot Pushes “NAV”.	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select appropriate GPS receiver.	Connects selected GPS receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>EHSI course setup may be automatic when using GPS receivers that place the Desired Course to the current waypoint on the electronic interface.</i>

NOTE: This procedure may require certain GPS receivers to be placed in a “hold waypoint” mode to avoid advancing the GPS flight plan beyond the hold waypoint. Refer to holding procedures in the GPS receiver documentation for details.

The holding pattern may now be flown with reference only to the head and tail of the EHSI CDI for inbound and outbound leg reference and course correction. GPS distance or waypoint passage (if in “hold waypoint” mode on the GPS receiver) may be used to determine the end of the inbound leg. GPS distance or time should be used to determine the end of the outbound leg.

Example 11: ADF receiver during a holding pattern.

Tune to Station	Pilot Tunes ADF navigation receiver	ADF receiver is tuned to “hold” beacon.
[NAV]	Pilot Pushes “NAV”.	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[RMI-1] or [RMI-2]	Select desired ADF receiver.	Connects selected ADF receiver to EHSI RMI needle.
[Exit]	End NAV Menu	System returns to main menu.
[CDI] [<=] [=>]	Pilot sets CDI to inbound course during hold. Note: this is the reciprocal of the hold bearing.	The CDI course needle is not used as an active navigation input during this procedure, but it is used as a convenient reference to the inbound and outbound bearings for the hold.

*Note: Using this procedure places the inactive EHSI course indicator on the correct INBOUND course. The outbound heading, uncorrected for drift, is the bearing indicated by the tail of the course indicator. The RMI bearing indicator for the holding station may be aligned with the head or tail of the course indicator as appropriate for the inbound or outbound leg. The hold can be flown using station passage (or second bearing) for the end of the inbound leg and timing for the end of the outbound leg. **All indications from the EHSI course deviation indicator should be ignored during this procedure.***

Example 12: VOR receiver - non-precision approach.

Tune to VOR	Pilot Tunes VHF navigation receiver	VOR receiver is tuned to approach VOR station.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, or RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select desired VOR receiver.	Connects VOR receiver to EHSI course indicator.
[Exit]	End NAV Menu	Returns to main menu.
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>Sets the procedure turn or initial segment course on the EHSI course indicator.</i>

During Approach, for each Approach Segment:

[ALT] [<=] [=>]	Set target altitude to next segment altitude	Should be performed before crossing the segment fix.
[IAS] [<=] [=>]	Set target airspeed to maneuvering airspeed for the next approach segment.	Should be performed just prior to crossing the approach waypoint; any flap or gear extension required for this airspeed should be completed.
Final Fix Inbound to MDA		
[IAS] [<=] [=>]	Set target airspeed to final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>Set the final approach course on the EHSI course indicator. Should be completed prior to crossing the final approach fix.</i>
[ALT] [<=] [=>]	Set target altitude to MDA or circling altitude.	May be performed after crossing the final approach fix.
[HDG] [<=] [=>]	Set target heading to runway heading.	May be performed after crossing final approach fix.

Example 13: GPS receiver - non-precision approach.

Setup GPS receiver	Pilot selects “approach” mode.	GPS receiver set to approach procedures.
[NAV]	Pilot Pushes “NAV”.	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select appropriate GPS receiver.	Connects selected GPS receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu

Note: Approach setup procedures vary widely among the approach certified GPS navigation receivers. Refer to the GPS manufacturer’s operating instructions for details. .

During Approach, for each Approach Segment:

[ALT] [<=] [=>]	Set target altitude to next segment altitude	Should be performed before crossing approach waypoint.
[IAS] [<=] [=>]	Set target airspeed to maneuvering airspeed for the next approach segment.	Should be performed prior to crossing the approach waypoint; any flap or gear extension for this airspeed should be completed before performing this action.
Final Fix Inbound to MDA		
[IAS] [<=] [=>]	Set target airspeed to final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[ALT] [<=] [=>]	Set target altitude to MDA or circling altitude.	May be performed after crossing the final approach fix.
[HDG] [<=] [=>]	Set target heading to runway heading.	May be performed anytime after crossing the final approach fix.

Example 14: ADF receiver during an ADF Approach.

Tune to Station	Pilot Tunes ADF receiver	ADF receiver is tuned to approach beacon.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[RMI-1] or [RMI-2]	Pilot selects desired ADF receiver.	Connects ADF receiver to EHSI course indicator.
[Exit]	End NAV Menu	System returns to main menu.
[CDI] [<=] [=>]	Sets CDI to approach course during final segment.	The CDI needle is not used as an active navigation input during this procedure, but it is used as a reference to the inbound and outbound legs for the approach.
[HDG] [<=] [=>] (Procedure Turn Only)	<i>If procedure turn is used.</i>	<i>After establishing outbound on the procedure turn, the pilot should set the heading bug to the offset course for the procedure turn teardrop, if a teardrop. The heading bug may be used for reference during the first part of the procedure turn.</i>

*Note: Using this procedure places the inactive EHSI course indicator on the final approach course. The outbound heading, uncorrected for drift, is the initial outbound segment leading to the procedure turn. The RMI bearing indicator for the holding station may now be aligned with the head or tail of the course indicator as appropriate for the outbound and inbound legs. The approach can now be flown using the EHSI course indicator and heading bug as references for the outbound leg bearing, offset leg heading and inbound leg bearing. **All indications from the EHSI course deviation indicator should be ignored during this procedure.***

During Approach:

Initial Fix to Procedure Turn		
[ALT] [<=] [=>]	Set target altitude to procedure turn altitude	Perform anytime prior to entering the procedure turn.
[IAS] [<=] [=>]	Set target airspeed to maneuvering airspeed for procedure turn.	Perform prior to entering the procedure turn; flap or gear extension required for this airspeed should be completed before performing this action.
Final Fix Inbound to MDA		
[IAS] [<=] [=>]	Set target airspeed to final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[ALT] [<=] [=>]	Set target altitude to MDA or circling altitude.	Perform anytime after crossing the final approach fix.
[HDG] [<=] [=>]	Set target heading to runway heading.	Perform anytime after crossing the final approach fix.

Example 15: LOM navigation to an ILS Approach

This example describes the procedures required to select an ADF receiver input for navigation to an ILS outer marker compass locator and then for selection of the ILS for use during an approach.

Initial Segment Navigation Receiver Setup:

Tune to Station	Pilot Tunes ADF receiver.	ADF receiver is tuned to LOM compass locator.
[NAV]	Pilot Pushes NAV".	Activates Nav selection menu.
{Nav Indicator Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[RMI-1 or RMI-2]	Select desired "RMI" key.	Selects RMI bearing indicator.

The initial approach segment may now be flown with reference to the RMI needle selected above. Once established on the initial segment, the ILS setup procedure below is performed.

Approach Setup:

Tune to ILS	Pilot Tunes VHF navigation receiver	VHF receiver is tuned to Approach Localizer.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, r RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select desired VHF receiver.	Connects selected VHF receiver to localizer CDI.
[Exit]	End NAV Menu	System returns to main menu.
[CRS] [<=] [=>]	Sets OBS to localizer course.	<i>This has no electronic effect; improves the course reference for the pilot on the EHSI.</i>
[HDG] [<=] [=>]	Pilot sets target heading bug	<i>The target heading may be used for reference during procedure turns or intercepts.</i>

If the approach will use the localizer back course and during the procedure turn on the localizer main course, the steering indications will be reversed unless the VOR/ILS receiver has the ability to reverse the steering signal electronically. If the VOR/ILS receiver does reverse the steering signal to the localizer CDI, the PFD

display will indicate that back course reversal is being displayed by a “BC” or “Back Course” annunciation.

The ILS localizer frequency may be tuned and the above procedure completed at anytime during the initial approach segment. Selecting the APP mode and ILS signal source will not remove or change the function of the RMI needle that is being used for navigation to the compass locator beacon. The CDI needle in the EHSI display will not be visible once the APP mode is selected. The localizer CDI located at the bottom of the ADI window is used for localizer reference and will display a guidance needle when the localizer is intercepted.

During Approach, Initial Fix to Procedure Turn:

[ALT] [<=] [=>]	Set target altitude to procedure turn altitude	Perform anytime prior to entering the procedure turn.
[IAS] [<=] [=>]	Set airspeed to maneuvering airspeed for procedure turn.	Perform prior to entering the procedure turn. Any flap or gear extension required for this airspeed should be completed before performing this action.
Final Fix Inbound to DH		
[IAS] [<=] [=>]	Set target airspeed to final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[ALT] [<=] [=>]	Set target altitude to DH.	Perform anytime after crossing final approach fix.

Additional Recommendations

The EHSI heading bug is not used in this procedure. It is recommended that once established on the localizer, the heading bug be used to mark any heading that will be used for the missed approach.

Example 16: GPS receiver ILS outer marker, then ILS approach.

Setup GPS receiver	Pilot selects GPS waypoints to Initial Approach Fix	Program GPS navigation receiver to terminal waypoints.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Select desired GPS receiver.	Connects selected GPS receiver to EHSI CDI.
[Exit]	End NAV Menu	System returns to main menu
[CRS] [<=] [=>]	Set target course	

*The initial approach segment may now be flown with reference to the EHSI course indicator selected above. Once established on the initial segment, the ILS setup procedure below is performed. The VHF navigation receiver may be tuned to the ILS at any time. However, **if the VHF receiver and GPS receiver are on the same PFD-35, the PFD should not be placed into approach mode until nearing the interception with the localizer.** Early selection of the approach mode will result in loss of the in-use GPS navigation on the EHSI course indicator. The loss of this display may be acceptable if course guidance information is available directly on the face panel of the GPS navigation receiver.*

Tune to ILS	Pilot Tunes VHF Nav receiver	VHF receiver tuned to Approach Localizer.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Pilot selects desired VHF receiver.	Connects selected VHF receiver to localizer CDI. The EHSI course indicator will only remain visible if it is connected to the VHF receiver not being used for the approach.
[Exit]	End NAV Menu	System returns to main menu
[CRS] [<=] [=>]	Sets OBS to localizer course.	
[HDG] [<=] [=>]	Set target heading	The heading bug may be used for reference during procedure turns or intercepts.

If the approach will use the localizer back course and during the procedure turn on the localizer main course, the steering indications will be reversed unless the VOR/ILS receiver has the ability to reverse the steering signal electronically. If the VOR/ILS receiver does reverse the steering signal to the localizer CDI, the PFD display will indicate that back course reversal is being displayed by a "BC" or "Back Course" annunciation.

The ILS localizer frequency may be tuned and the above procedure completed at anytime during the initial approach segment. Selecting the APP mode and ILS signal source will not remove or change the function of the RMI needle that is being used for navigation to the compass locator beacon. The CDI needle in the EHSI display will not be visible once the APP mode is selected. The localizer CDI located at the bottom of the ADI window is used for localizer reference and will display a guidance needle when the localizer is intercepted.

During Approach, Initial Fix to Procedure Turn (If Required):

[ALT] [<=] [=>]	Set target altitude to procedure turn altitude	Perform anytime prior to entering the procedure turn.
[IAS] [<=] [=>]	Set target airspeed for procedure turn.	Perform anytime prior to entering the procedure turn. Any flap or gear extension that will be required for this airspeed should be completed before performing this action.
Final Fix Inbound to DH		
[IAS] [<=] [=>]	Set target airspeed to final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[ALT] [<=] [=>]	Set target altitude to DH.	May be performed anytime after crossing the final approach fix.

Additional Recommendations

The EHSI heading bug is not used in this procedure. It is recommended that once established on the localizer, the heading bug be used to mark any heading that will be used for the missed approach.

Missed Approach segments utilizing VOR or ADF segments may be setup on the RMI bearing indicators for quick reference during a missed approach.

Example 17: VOR receiver to an intersection, then ILS approach.

In this example, a procedure turn on the localizer is used. ***It is recommended that two VHF navigation receivers be used for this procedure whenever possible, because EHSI course deviation indications will not be present when retuning a single VHF receiver from the VOR initial segment to the localizer frequency. If the use of two VHF receivers is not possible, the heading bug should be used to mark the stabilized heading required to maintain the initial segment course while changing to the localizer frequency.***

Tune to Terminal VOR	Pilot Tunes VHF navigation receiver	VHF receiver is tuned to VOR station initial approach segment.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu.
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator.
[CDI]	Pilot Pushes "CDI".	Selects EHSI course indicator.
{Nav Submenu}	VOR-1, VOR-2	Prompts pilot for Nav receiver to use with EHSI CDI.
[Exit]	End NAV Menu	Returns to main menu
[CRS] [<=] [=>]	<i>Pilot sets EHSI course indicator using turn-push knob</i>	<i>Set the initial approach segment on the EHSI course indicator.</i>

*The initial approach segment may now be flown with reference to the EHSI course indicator selected above. Once established on the initial segment, the ILS setup procedure below is performed. The unused VHF navigation receiver may be tuned to the ILS at any time. However, **if only one VHF receiver is being used for the approach, the PFD should not be placed into approach mode until nearing the interception with the localizer.** Early selection of the approach mode will result in loss of navigation on the EHSI course indicator.*

Tune to ILS	Pilot Tunes VHF receiver	VHF navigation receiver is tuned to Approach Localizer.
[NAV]	Pilot Pushes "NAV".	Activates Nav selection menu. .
{Nav Submenu}	CDI, RMI-1, RMI-2.	Prompts pilot for Nav indicator
{Nav Submenu}	VHF-1, VHF-2, GPS-1, GPS-2.	Prompts pilot for Nav receiver to use with the selected indicator.
[VHF-1] or [VHF-2]	Pilot selects appropriate VHF receiver.	Connects selected VHF receiver to localizer course deviation indicator. The EHSI course indicator will only remain visible if it is connected to the VHF navigation receiver not being used for the approach.
[HDG] [\leftarrow] [\rightarrow]	Pilot sets heading bug as necessary for reference during localizer intercept	The heading bug may now be used for short-term course maintenance when switching navigation modes.

If the approach will use the localizer back course and during the procedure turn on the localizer main course, the steering indications will be reversed unless the VOR/ILS receiver has the ability to reverse the steering signal electronically. If the VOR/ILS receiver does reverse the steering signal to the localizer CDI, the PFD display will indicate that back course reversal is being displayed by a "BC" or "Back Course" annunciation.

The ILS localizer frequency may be tuned and the above procedure completed at anytime during the initial approach segment. Selecting the APP mode and ILS signal source will not remove or change the function of the RMI needle that is being used for navigation to the compass locator beacon. The CDI needle in the EHSI display will not be visible once the APP mode is selected. The localizer CDI located at the bottom of the ADI window is used for localizer reference and will display a guidance needle when the localizer is intercepted.

During Approach Initial Fix to Procedure Turn (If Required):

[ALT] [<=] [=>]	Set target altitude to procedure turn altitude	Perform anytime prior to entering the procedure turn.
[IAS] [<=] [=>]	Set target airspeed to maneuvering airspeed for procedure turn.	Perform anytime prior to entering the procedure turn.
Final Fix Inbound to DH		
[IAS] [<=] [=>]	Set target airspeed final approach airspeed.	Final flap and gear extension should be completed before performing this action.
[ALT] [<=] [=>]	Set target altitude bug to DH.	Perform anytime after crossing the final approach fix.

Additional Recommendations

The EHSI heading bug is not used in this procedure. It is recommended that once established on the localizer, the heading bug be used to mark any heading that will be used for the missed approach.

For approaches using a single VHF receiver, it is recommended that the heading bug be used as a stabilized course reference when near the localizer intercept. The VHF receiver can then be tuned to the ILS for localizer intercept.

Missed Approach segments utilizing VOR or ADF segments may be setup on the RMI bearing indicators for quick reference during a missed approach.