

EFIS-D100

Electronic Flight Information System



Pilot's User Guide

P/N 100477-000, Revision H
For use with firmware version 5.4

August, 2010

Dynon Avionics

*This product is not approved for
installation in type certificated aircraft*

Contact Information

Dynon Avionics, Inc.
19825 141st Place NE
Woodinville, WA 98072
Phone: (425) 402-0433 - 7:00 AM – 5:00 PM (Pacific Time) Monday - Friday
Fax: (425) 984-1751

Dynon Avionics offers online sales, extensive support, and continually-updated information on its products via its Internet sites:

- www.dynonavionics.com –Dynon Avionics primary web site; including:
 - docs.dynonavionics.com – Current and archival documentation.
 - downloads.dynonavionics.com – Software downloads.
 - support.dynonavionics.com – Support resources.
 - store.dynonavionics.com – Dynon’s **secure** online store for purchasing all Dynon products 24 hours a day.
 - wiki.dynonavionics.com – Dynon Avionics’ Documentation Wiki provides enhanced, extended, continuously-updated online documentation contributed by Dynon employees and customers.
 - forum.dynonavionics.com – Dynon Avionics’ Internet forum where Dynon customers can interact and receive Dynon technical support outside of telephone support hours. A key feature of the forum is that it allows the exchange of diagrams, photos, and other types of files.
 - newsletter.dynonavionics.com – Dynon’s email newsletter.
 - blog.dynonavionics.com – Dynon’s blog where you can find new and interesting Dynon-related content.

Copyright

© 2003-2009 Dynon Avionics, Inc. All rights reserved. No part of this manual may be reproduced, copied, transmitted, disseminated or stored in any storage medium, for any purpose without the express written permission of Dynon Avionics. Dynon Avionics hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed for personal use, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.



Information in this document is subject to change without notice. Dynon Avionics reserves the right to change or improve its products and to make changes in the content without obligation to notify any person or organization of such changes. Visit the Dynon Avionics website (www.dynonavionics.com) for updates and supplemental information concerning the use and operation of this and other Dynon Avionics products.

Limited Warranty

Dynon Avionics warrants this product to be free from defects in materials and workmanship for three years from date of shipment. Dynon Avionics will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, improper installation or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE, AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY LIABILITY ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL DYNON AVIONICS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Dynon Avionics retains the exclusive right to repair or replace the instrument or firmware or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

These instruments are not intended for use in type certificated aircraft at this time. Dynon Avionics makes no claim as to the suitability of its products in connection with FAR 91.205.

Dynon Avionics' products incorporate a variety of precise, calibrated electronics. Except for replacing the optional internal backup battery in EFIS-based products per the installation guide, our products do not contain any field/user-serviceable parts. Units that have been found to have been taken apart may not be eligible for repair under warranty. Additionally, once a Dynon Avionics unit is opened up, it will require calibration and verification at our Woodinville, WA offices before it can be considered airworthy.

Table of Contents

Contact Information.....	ii
Copyright.....	ii
Limited Warranty.....	iii
1. Introduction	1-1
Before You Fly.....	1-1
OEM Installations.....	1-1
Warning.....	1-2
About this Guide.....	1-2
2. Product Overview	2-1
EFIS-D100 Hardware.....	2-1
ADAHRS Operation.....	2-3
3. Product Operation	3-1
Front Panel Layout.....	3-1
Display.....	3-2
Menus.....	3-6
4. Available Pages	4-1
EFIS Main pages.....	4-2
HSI Page.....	4-9
Times Page.....	4-10
Lists Pages.....	4-11



Menu Pages.....	4-11
5. EFIS Operation	5-1
POWER – Power on/off	5-1
BARO – Changing Altimeter Setting	5-1
BUGS – Setting Bug Markers	5-2
LISTS – Using Checklists and Data Panels	5-5
SETUP – Setting Preferences	5-7
INFO – Informational Items	5-11
DIM – Changing screen brightness.....	5-13
TIMER – Setting and using a timer	5-14
OATSET – Setting Temperature Offset	5-15
DATLOG – Logging and retrieving data.....	5-15
6. HSI Operation	6-1
Required Connections.....	6-1
Accessing the HSI/DG Page.....	6-1
HSI Display Basics	6-2
Navigation Radio Overlay	6-4
GPS Overlay	6-7
HSI Menu Structure.....	6-9
7. Autopilot Operation	7-1
Introduction and Resources	7-1
EFIS AP Indicators	7-2
AP Modes	7-5
AP Control Methods.....	7-9



EFIS Autopilot Control	7-9
AP74 Autopilot Control.....	7-11
Disengage/Control Wheel Steering (CWS) Pushbutton	7-15
Optional Preflight Checklist.....	7-17
8. Alerts	8-1
Alarm Indicators	8-1
Multiple Alarms.....	8-3
DSAB Alerts.....	8-3
9. Appendix	9-1
Appendix A: Serial Data Output.....	9-1
Appendix B: PC Support Program	9-3
Appendix C: Troubleshooting	9-3
Appendix D: EFIS-D100 Specifications.....	9-8

1. INTRODUCTION

Thank you for purchasing the Dynon Avionics EFIS-D100. This section provides some important cautionary information and general usage instructions for this manual.

Before You Fly

We strongly recommend that you read this entire guide before attempting to use the EFIS-D100 in an actual flying situation. Additionally, we encourage you to spend time on the ground familiarizing yourself with the operation of the product. While first learning to use the instrument in the air, we recommend you have a backup pilot with you in the aircraft. Finally, we encourage you to keep this manual in the aircraft with you at all times. This document is designed to give you quick access to information that might be needed in flight. **CAUTION:** in a flying situation, it is the pilot's responsibility to use the product and the guide prudently.

OEM Installations

If your EFIS-D100 is installed by an OEM distributor, you may find that you are unable to access some menus and settings. Some Dynon distributors customize various areas of the EFIS-D100 firmware to maintain a consistent pilot experience and minimize integration issues across a large number of installations. Currently, OEMs can customize access levels to the following settings on Dynon systems: EMS GLOBAL setup menu, EMS SENSOR setup menu, fuel calibration, trim calibration, flaps calibration, GPS/NAV setup menu, screen configurations, data logging, and checklists/data panels. OEM distributors have the option of customizing some or all of these areas. Please contact your aircraft's manufacturer if you have any questions about how your unit has been customized.



Warning

Dynon Avionics' products incorporate a variety of precise, calibrated electronics. Except for replacing the optional internal backup battery in EFIS-based products per the installation guide, our products do not contain any field/user-serviceable parts. Units that have been found to have been taken apart may not be eligible for repair under warranty. Additionally, once a Dynon Avionics unit is opened up, it will require calibration and verification at our Woodinville, WA offices before it can be considered airworthy.

About this Guide

This guide serves two purposes. The first is to help you configure and get acquainted with the EFIS-D100's many functions. The second is to give you quick access to vital information. For detailed technical and installation information, please refer to the EFIS-D100 Installation Guide.

In the electronic (.PDF) version of this manual, page and section references in the Table of Contents and elsewhere act as hyperlinks taking you to the relevant location in the manual. The latest version of this manual may be downloaded from our website at docs.dynonavionics.com.

This guide discusses the most common operation scenarios. If you have an operational issue that is *not* discussed in this guide, you can find additional operational information on Dynon's Internet sites:

- wiki.dynonavionics.com – Dynon's Documentation Wiki provides enhanced, extended, frequently updated online documentation contributed by Dynon employees and customers.
- forum.dynonavionics.com – Dynon's Online Customer Forum is a resource for Dynon Avionics customers to discuss installation and operational issues relating to Dynon Avionics products. The Forum is especially useful for pilots with uncommon aircraft or unusual installation issues. For customers that cannot call Dynon Technical Support during our normal business hours, the Forum is a convenient way to interact with Dynon Avionics Technical Support. The Forum allows online sharing of wiring diagrams, photos, and other types of electronic files.



The following icons are used in this guide:

HS34

Any text following this icon describes functionality available only with the HS34 HSI Expansion Module connected to your system.

AP74

Any text following this icon describes functionality available only with the AP74 Autopilot Interface Module connected to your system.

DSAB

Any text following this icon describes functionality that is possible when multiple Dynon Avionics products are networked together via the Dynon Smart Avionics Bus (DSAB).



Any text following this icon refers to a setting or situation which merits particularly close attention.

2. PRODUCT OVERVIEW

This section provides a general overview of the various parts of the EFIS-D100 as well as a theory of operation. The information in this section serves as a reference only and helps familiarize you with the inner workings of the unit. It should not be used for diagnostic or reparative work.

EFIS-D100 Hardware

The EFIS-D100 uses solid-state sensors to provide accurate and reliable information about your flying environment in an easy-to-use interface.

POWER

The EFIS-D100 requires between 10 and 30 volts DC for operation and has inputs for an external backup power supply and a keep-alive voltage. It is acceptable to have the EFIS-D100 turned on during engine start.

The EFIS-D100 can be ordered with an optional internal battery which allows the instrument to continue to operate in the event of an external power failure. This lithium-ion battery is rechargeable and is managed by the EFIS-D100. If the always-on Keep Alive circuit is connected, the EFIS-D100 continues to charge its internal battery even if the instrument is turned off. This ensures that your internal emergency battery is always fully charged. Under normal conditions, the internal battery should have a voltage between 13 and 16.8 volts. When the battery's voltage drops below 13 volts, the EFIS-D100 displays a low battery warning. When new, a fully charged internal battery is rated for a minimum of 1.5 hours of normal operation with the EFIS-D100. If the EFIS-D100 has switched to its internal emergency battery due to a power loss in your aircraft, it is advised that you land as soon as possible.



SENSORS AND INPUTS

Attitude information is obtained from 3 solid-state gyrometers, 3 solid-state accelerometers, and the airspeed pressure sensor. Heading information is obtained from 3 solid-state magnetometers housed in the EDC-D10A. Airspeed, altitude and angle of attack are obtained from three separate pressure transducers.

HSI information can be displayed when connected to Dynon's HS34, a Garmin SL30, or a compatible GPS unit.

DYNON SMART AVIONICS BUS

If you have multiple Dynon Avionics products in your aircraft, they may be networked together via the Dynon Smart Avionics Bus (DSAB). Units networked via DSAB have the ability to transmit information to each other. Any product's data can then be viewed on any other screen in the DSAB network. For example, an EFIS has the ability to display engine monitor information if it is connected to an EMS or FlightDEK-D180.

Note that the failure of a unit in a DSAB network may cause the loss of some or all data shared between units. In the above example, if the connected EMS/FlightDEK-D180 were to fail, the EFIS would no longer be able to behave as an engine monitor. For more information on DSAB-specific alerts, refer to the DSAB Alerts section on page 8-3.

OUTPUTS

The EFIS-D100 has an output to drive an external customer-supplied audible device for AOA (if installed) and altitude alerts.

A serial output is also provided for serial altitude encoder data. An optional Serial-to-Gray Code Converter is available for connection to Mode C Gray Code transponders.

AP74

HS34

A connected HS34 or AP74 can output voice annunciations for many of the alerts generated by the EFIS-D100.



DISPLAY

The display is a 7-inch, 854 by 480 pixel, 400 nit or 800 nit LCD screen, depending on the model.

BUTTONS AND KNOBS

User interaction takes place via the six buttons along the bottom of the front panel of the unit.

AP74

When an AP74 Autopilot Interface Module is configured to control the EFIS-D100, its VALUE knob changes values when in various EFIS menus. When no menus are displayed the AP74 can adjust the barometer, altitude bug, and heading bug. The AP74's buttons control the Autopilot operation mode (Heading Hold, Track Hold, GPS horizontal navigation, altitude hold), and allow you to engage and disengage the Autopilot.

HS34

When an HS34 is configured to control the EFIS-D100, its VALUE knob changes values when in various EFIS menus. When no menus are displayed the HS34 can adjust the barometer or altitude bug. The HS34's HEADING and COURSE knobs affect their respective parameters on the HSI page. The HS34's GPS and NAV buttons cycle through the available GPS and NAV sources connected to it.

ADAHRS Operation

The primary flight instruments on your EFIS display are generated using a group of calibrated sensors. All of them are solid state – that is, there are no moving parts. These sensors include accelerometers, which measure forces in all three directions; rotational rate sensors, which sense rotation about all three axes; pressure transducers for measuring air data; and magnetometers on all three axes for measuring magnetic heading. These sensors form the core of Dynon's Air Data Attitude and Heading Reference System (ADAHRS).

The table below describes which inputs and sensors are used within the EFIS to generate the different displayed instruments. It is not meant to enable in-flight troubleshooting, but is provided to convey how much of an integrated system your EFIS is.



	GPS	Pitot	Static	AOA	Magnetometers	Rate Sensors	Accelerometers
Ball							X
Altitude			X				
Airspeed		X	X				
AOA		X	X	X			
Turn Rate	X*	X	X			X	X
Heading	X*	X	X		X	X	X
Attitude	X*	X*	X			X	X

ATTITUDE CALCULATION

The EFIS-D100 artificial horizon display (attitude) is generated via a complex algorithm using a multitude of sensors. Your EFIS attitude is not reliant on any single external system. It can provide an accurate attitude - even in the event of airspeed loss (due to icing or other blockage) - via a redundant GPS aiding source. In normal operation the instrument uses airspeed to provide superior attitude accuracy. If a problem develops with your airspeed reading, a properly connected and configured GPS source acts as a substitute. When in this mode the instrument continues to provide accurate attitude.



*If a GPS is present upon the loss of airspeed, the EFIS-D100 uses the GPS ground speed in its attitude calculation. When in this mode, a magenta GPS ASSIST message is displayed over the horizon and the ground speed is displayed below the IAS indicator (as shown at right). If the connectivity with the GPS fails while in GPS assist mode, the attitude continues to be displayed, using the last known GPS ground speed as a reference. This mode is flagged on the horizon with a yellow CROSS CHECK ATTITUDE message. In the very rare case that





this sequence of event occurs, the EFIS-D100's attitude accuracy is reduced; use other references in the aircraft to cross-check against the EFIS-D100's attitude.

COMPASS ACCURACY AND AUTOPILOT PERFORMANCE

If you are using your EFIS-D100 to control Dynon's Autopilot, it is critical that the magnetic heading be as accurate as possible for comfortable operation in HDG mode and radio-based VOR/NAV mode. The aircraft's compass must be installed correctly, calibrated, and operating well *in all attitudes*.

3. PRODUCT OPERATION

After reading this section, you will be familiar with the basics of how to use your EFIS-D100. For details regarding specific procedures (e.g., adjusting display brightness, changing the altimeter setting, setting the clock, etc.) please refer to the EFIS Operation section.

Front Panel Layout

All normal operation of the EFIS-D100 happens via the front panel. The front panel contains buttons and a display.

- Buttons – There are six buttons on the front panel of the EFIS-D100. Throughout this guide, these buttons are referred to as one through six, with button one being the leftmost and button six being the rightmost. EFIS-D100 buttons are used to turn the instrument on and off, cycle between screens, scroll through menus, and adjust instrument parameters.
- Display – The display shows EFIS information, menus, and data obtained from other connected products.



User interaction takes place via the EFIS-D100 main display and the six buttons beneath. Note: buttons are not labeled on actual product



Display

The EFIS-D100 display is the most obvious and commonly used output of the device. It is capable of displaying EFIS, HSI, and/or engine data simultaneously.

SCREENS AND PAGES

The terms in the following bulleted list are used in this section and are defined as follows:

- Screen/Screen Configuration – Screens consist of one or two pages from the EFIS-D100 or from another DSAB-connected Dynon Avionics product.
- Page – A page is a section of the screen that contains a collection of related data. Pages may occupy the total area of the screen (i.e., 100%) or share the screen with other pages (e.g., 2/3, 1/3 split). Pages that occupy 1/3 of the screen area are sometimes abbreviated versions of their full size (100% or 2/3) counterparts.
- Screen Rotation – The rotation is the list of screen configurations which can be cycled to via the hotkeys. Your rotation is usually smaller than the total list of available screen configurations.



Screens contain one or two pages and pages contain groups of similar information.



The EFIS-D100 has several pre-defined screen configurations. The basic layout of a screen configuration is represented by one of three icons on D100-series product. The table at right shows the three icons and their meaning.

The predefined screen configurations with their respective icons are as follows:

Icon	Left Page Area	Right Page Area
	2/3	1/3
	1/3	2/3
	One page that occupies all of the screen area	

The SCREEN LIST Menu uses icons to illustrate the layout for each screen configuration.

- EFIS/EMS
- EFIS/AUX
- EFIS/FUEL
- EFIS/TIMES
- EFIS/HSI (in default screen rotation)
- EMS/EFIS
- EMS/AUX
- EMS/TIMES
- EMS/FUEL
- EMS/HSI
- EFIS (default EFIS-D100 boot-up screen; in default rotation)
- EFIS/EMS
- EMS/EFIS
- HSI/EMS



CYCLING BETWEEN SCREENS

There are two methods for cycling between pre-defined screens: via the menu and via hotkeys.

Screen Cycling Using the SCREEN LIST

Navigate to the SCREEN LIST menu by holding button six for at least two seconds when no menu is present (see the figure to the right). Note that if you only press button six momentarily, the display cycles to the next screen in your screen rotation. Use the DOWN ▼/UP ▲ buttons to move the caret (>). The caret denotes the selected screen. Press GOTO ► to remove the SCREEN LIST and display the selected screen. If you wish to stay on the same screen, you may either select your currently displayed screen with the caret and press GOTO ►, or press CANCEL.

Screen Cycling Using Hotkeys

With no menu displayed, press button one to cycle to the previous screen in your rotation. Likewise, press button six to cycle to the next screen in your rotation (see the figure on the next page). Cycling via hotkeys only allows you to display screens that are in your screen rotation. They are meant to give you quick access to the screen configurations that are most important to you. If you wish to access screens that are not in your rotation, use the SCREEN LIST as described above.



With no menus displayed, pressing button six for two seconds displays the SCREEN LIST menu, from which you may switch to, and set up, various screen configurations.



Changing the Screen Rotation

You may use the out-of-the-box screen rotation or define your own. If you desire to use the initial rotation, no user configuration is required. If you desire to use a custom cycling order, then user configuration is necessary.

To configure a custom rotation, navigate to the SCREEN LIST menu page by pressing button six for approximately two seconds when no menu is present. Press SETUP, then press ROTATN to display the menu used to change the boot and rotation screen. Scroll through the pre-defined screens using the DOWN ▼/UP ▲ buttons.

Press the BOOT* button on any selected screen configuration to make it the screen that is shown immediately after the instrument is turned on. Only one screen may be designated as the boot screen. Next, press the TOGGL↓ button on any selected screen to toggle the “↓” icon. All screens that show the “↓” icon are included in the rotation. Any screen in the rotation may be accessed via the button one and six hotkeys. Press BACK to save any settings.

Changing the Screen List Order

You may wish to change the order in which screen configurations are displayed in the SCREEN LIST, thus changing the order they are cycled to via hotkeys. To do this, navigate to the SCREEN LIST menu page by pressing button six for approximately two seconds when no menu is present. Press SETUP, then press ORDER to display the menu used to change the screen order. Scroll through the pre-defined screens using the DOWN ▼/UP ▲ buttons. Press the MV DN ▼



Buttons one and six cycle to the previous and next screens, respectively.



button to move the selected screen down in the screen list. Likewise, press the MV UP ▲ button to move the selected screen up in the screen list.

Menus

All interaction with the EFIS-D100 is accomplished through the use of its menu system. The menu system is accessed and navigated via the six buttons located on the front of the unit.

PAGE-SENSITIVE MENUS

On a screen where no menu is already present, buttons two through five are used to display a menu. With no menu displayed, pressing any one of these buttons causes the menu for the page above it to show at the bottom of the screen. For example, if a screen is divided into two pages with the left page occupying 2/3 of the screen and the right page occupying 1/3 of the screen, then pressing EFIS-D100 buttons two, three, or four (all below the left 2/3 of the screen) displays the main menu for the left page and pressing button five (below the right 1/3 of the screen) displays the main menu for the right page (see the figure to the right).

FUNCTIONALITY

A menu consists of two rows of gray boxes containing text. The upper row contains one tab that denotes the currently displayed menu. The lower row contains six labels that denote the function of the button below it. Many of the onscreen elements move up to avoid the menu. This prevents the menu from obscuring useful data while it is up. Upon exiting the menu, the screen returns to its normal appearance.



The configuration of the pages on the screen determines which buttons are used to display a page's menu.



Pressing a button either displays another menu or adjusts a parameter. If there is no text above a button, then that button does not have a function in the context of that menu. Occasionally, a button label spans two or more buttons. In this case, any button below the label invokes the command.

If a menu contains more options than there are buttons, the MORE label is displayed over button five. Pressing this button shows you the next set of options in the current menu.

In any menu, press the BACK button to return to the previous menu and save any changes. In all top-level menus, button six is the EXIT button. Pressing EXIT removes the menu system and moves many of the onscreen elements down to their original positions.

FLOW

Each page has its own main menu, which may contain options for navigating to other menus or choosing and adjusting parameters. For example, the EFIS Main Page menu contains an EFIS menu tab and button labels for MENU ►, BARO, BUGS, LISTS, MORE, and EXIT. Pressing MORE reveals the rest of the EFIS menu. This menu contains options for SETUP, INFO, DIM, TIMER, MORE, and EXIT. Pressing MORE on this menu simply returns you to the first part of the EFIS menu.

In all top-level page menus (EFIS and HSI), the leftmost button is the MENU button. If you have opened up the left page's menu, the label reads MENU ►. Pressing the button switches the menu to display the right page's menu, and the label switches to read ◀MENU. The arrow on this button always points to the side of the screen whose menu is displayed when pressing the button.



Each menu consists of labels above each button denoting their function.

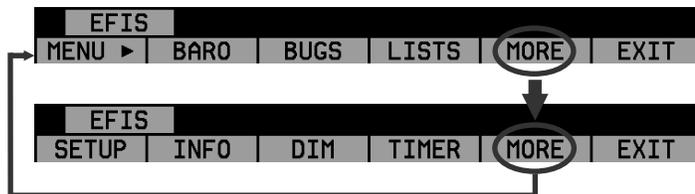


For example, if you press the BUGS button on the EFIS menu, there are options for HDG, IAS, ALT, and EXIT. Pressing HDG, IAS, or ALT allows the user to configure heading, indicated airspeed, or altitude bugs, respectively.

To exit the menu system, press the BACK button as many times as is needed to reach an EXIT button. This varies based upon how deep you are into the menu system.

DESCRIPTIONS IN THIS GUIDE

Throughout this guide, the “>” character is used to indicate entering a deeper level of the menu system. For example, “EFIS > INFO > LEFT” indicates entering the EFIS menu, pressing MORE, then pressing INFO, and then pressing LEFT to enter the left info item menu. Note that the MORE button is not included in the sequence, since pressing MORE reveals more options in the same level of the menu system.



In any menu with more options than will fit on a line, the MORE button displays the rest of the menu.

4. AVAILABLE PAGES

The EFIS main pages use various tapes, digital displays, and other indicators overlaid on an artificial horizon. On the 2/3 and full-screen pages, you may also display up to two “info items” on the left and right side of the main page. HSI pages use text and a DG style compass by itself or overlaid with lines and arrows of different colors.

Note: HSI pages use data that is obtained from a source external to the EFIS-D100. Refer to the EFIS-D100 Installation Manual for a list of compatible equipment.

Note: EMS-based pages use data that is obtained from Dynon’s EMS products. You may only display these pages on your EFIS-D100 if you own a Dynon EMS-based product, and the two units are connected via DSAB. Refer to the EFIS-D100 Installation Manual for details regarding proper connection between Dynon products and other devices in your system. Please see your EMS-based product’s Pilot’s User Guide for information on configuring the various displays sourced from it.



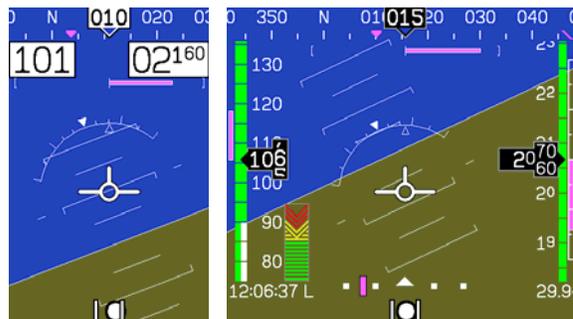
EFIS Main pages

Available in 1/3, 2/3 and full formats

The EFIS-D100 default screen rotation includes only 2/3 EFIS pages combined with the various EMS and HSI pages described below. However, you may also choose screen configurations that use 1/3 and full-screen pages. The 2/3 and full-screen pages can display EFIS- and EMS-related info items on the left and right side of the screen. You can enable any of the non-default EFIS screens as described in the Changing the Screen Rotation section on page 3-5. Some of the displayed items described below may not be onscreen, depending on whether or not they have been enabled in the CLUTTR menu.

Beginning with firmware revision 3.0, Dynon adopted a dramatically different EFIS display format than it had previously used. If your EFIS display does not resemble the layouts shown at right, first ensure that you are using firmware version 3.0 or higher. Then, ensure that the setting at EFIS > SETUP > STYLE is set to MODERN. If you prefer the previous display style, you can change this setting to CLASSIC. The classic display format is documented in previous revisions of this manual, available on Dynon Avionics' website at docs.dynonavionics.com. No further development will occur on the classic display format.

The following sub-sections describe the displayed items in detail.





Horizon line, pitch and roll indicators

Bounded on the top by blue, and on the bottom by brown, the horizon line behaves in much the same way as a traditional gyro-based artificial horizon. Unlike a mechanical artificial horizon, the EFIS-D100's horizon has no roll or pitch limitation. The horizon line stays parallel to the Earth's horizon line regardless of attitude. The parallel lines above and below the horizon line are the pitch indicator lines, with each line indicating 5 degrees of pitch. The end of each 10° pitch indicator line has a hooked barb that points towards the horizon line to aid attitude awareness.

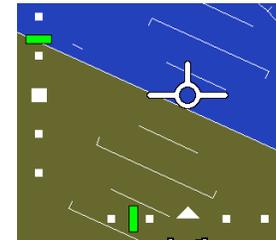


The roll scale has tic marks at 10, 20, 30, 45, 60, and 90 degrees of roll. In the CLUTTR menu (described on page 5-7), you can choose between a stationary roll indicator and one that rotates along with the horizon. The stationary roll indicator (type 1 in the EFIS > SETUP > CLUTTR > ROLL menu) has an internal arrow which moves to stay perpendicular to the horizon, like a jet EFIS presentation. The moving roll indicator (type 2) rotates the scale about a stationary internal arrow which points to the current roll angle on the scale, like most mechanical attitude instrument presentations.

Please see the ADAHRS Operation section on page 2-3 for important information about the theory of operation for the attitude and external data sources.

CDI/Glideslope Indicators

When the EFIS-D100 is receiving CDI or glideslope information from a GPS or NAV radio, they can be displayed on the main EFIS display as well as the on the full HSI page (as described in the HSI Operation section on page 6-1). The data source is chosen on the HSI page using the NAVSRC button; the EFIS and HSI CDI/GS displays are always synchronized to the same source. There is no way to change the source on the EFIS screen.



On the EFIS page, these two items are enabled via the EFIS > SETUP > CLUTTR menu under a single item, which can be set to either CDI:N, CDI:Y, or CDI+GS.



The CDI is located just above the slip/skid ball when displayed, and behaves much as described in the HSI Operation section on page 6-1. The CDI needle is green when sourced from a NAV radio and magenta when sourced from GPS. When to/from information is available, the center of the CDI is an arrow; when on an ILS, it is a filled-in square.

The glideslope indicator is located to the left of the roll scale tape, and behaves much as described in the HSI Operation section on page 6-1. The GS needle is green when sourced from a NAV radio and magenta when sourced from GPS, and appears only when tuned to an ILS or a GPS source with vertical guidance.

Due to screen space limitations, turning on the glideslope prevents a left info item from being displayed on the 2/3-screen EFIS page. Additionally, at extreme roll angles, the glideslope is hidden to provide space for other screen elements.

Stabilized heading tape and digital readout

Located at the top of the EFIS page, the heading indicator functions much like a standard slaved directional gyro. North,



East, South, and West directions are labeled on the tape, “N,” “E,” “S,” and “W,” respectively. The digital readout displays your current heading, while the surrounding tape scrolls beneath its arrow. You may set a yellow bug on this tape as a heading reminder. The pointer in the digital readout is hollow to allow the GPS ground track indicator, displayed as a magenta arrow, to show through. A difference between the ground track arrow and the current heading indicates that some wind is present. The currently set course heading is represented by a “V,” colored green when sourced from a NAV radio and magenta when sourced from GPS. When the CDI is centered, aligning the ground track pointer within the course pointer compensates for all wind and takes you directly to the waypoint or VOR. For course and ground track to be displayed on the heading tape, they must both be enabled in the CLUTTR menu.

Like a conventional gyro-stabilized magnetic compass, magnetic heading reacts immediately to turn rate so that heading changes are reflected immediately. It then uses magnetometer data over the long term to ensure that it remains correct. Additionally, heading is corrected for attitude so that it is accurate as you pitch and roll.



Turn rate indicator

Centered just below the heading digital readout, the turn rate indicator displays the aircraft's current rate of turn with respect to the ground. The magenta bar grows in the direction that the aircraft is currently turning, and is anchored at a white vertical anchor line. The brackets on either side of the bar's anchor line represent the turn rate which results in a standard rate turn. Turn rate takes attitude into account. This means that even when you are highly banked, it still shows rate of turn in relation to the aircraft's heading.



The turn rate indicator is scaled to indicate a 6-second heading trend. In the example above, the trend indicator is showing that the aircraft will be pointed at 17° in 6 seconds if the rate of turn does not change.

Altitude tape, digital readout, and VSI

The altitude tape scrolls beneath the altitude digital readout and arrow. The digital readout's digits scroll up and down, simulating an analog altimeter and giving a sense of the direction of movement. Thousands of feet are displayed using large numbers while hundreds of feet are displayed in smaller numbers. The EFIS-D100 accurately displays altitudes from -1200 to 30,000 ft (-365 to 9144 m).

The graphical Vertical Speed Indicator is located next to the altitude tape. The magenta bar grows in the direction of – and in proportion to – the rate of climb or descent. The numbers on the scale represent thousands of feet per minute. In the CLUTTR menu, the VSI scale can be set to display 1000 ft/min, 2000 ft/min, and 4000 ft/min. The 2000 ft/min scale is linear throughout the range, while the 1000 ft/min and 4000 ft/min are non-linear as shown on the scale. When set to display 2000 ft/min, the VSI bar is scaled to indicate a 6-second altitude trend based on its position with relation to the altitude bar. When set to display 4000 ft/min, the VSI bar is scaled to indicate a 6-second trend only up to 1000 ft/min. When set to display 1000 ft/min, the VSI bar is scaled to indicate a 12-second trend up to 500 ft/min.





During the first 30 seconds of operation, the altitude tape and digital readout are not displayed as the unit needs a small amount of time before altitude measurements are deemed accurate.

Elevator trim indicator

Located in the lower right corner of the EFIS page, the elevator trim indicator displays the relative trim of the elevator in graphic form. The elevator trim indicator can only be displayed on the EFIS-D100 if an elevator trim sensor is properly connected to one of the 3 EMS GP inputs (on a DSAB-connected EMS device), and is properly configured in the EMS setup. As with the EMS info item, the green line indicates takeoff trim. The two arrows indicate the current elevator trim.



Winds aloft arrow

Located in the lower right corner of the EFIS page, the winds aloft arrow indicates the wind direction relative to your current direction of flight. The number indicates the current absolute wind speed in the current airspeed units. If the EFIS-D100 cannot make an accurate winds aloft calculation, the arrow is not displayed and the numbers are replaced by dashes. The display of winds aloft requires an active GPS connection and an OAT probe. In very light winds, the wind speed number is not displayed, although the arrow is.



Angle of attack (AOA) indicator

The angle of attack indicator – available only with Dynon’s AOA Pitot Probe – displays the aircraft’s current AOA relative to the stall AOA. The AOA calibration process should result in the lowest angle of attack stall (usually the “clean” configuration) occurring between the yellow and red lines and the higher angle-of-attack stall (usually the “dirty” configuration) occurring at the top of the red. As your aircraft’s angle of attack increases, the bars in the indicator disappear, leaving the empty outline. As your aircraft’s AOA approaches stall, downward-pointing arrows are left. Depending on your installation and configuration, an audible alarm may also occur when near or in the stall. This audio alarm is accompanied by a flashing red triangle at the top of





the AOA display. To judge when a stall will occur, remember that the AOA indicator is showing actual AOA, and the stall AOA changes with configuration. Because of this, a stall could occur anywhere inside the yellow range, but will occur at the same point every time given a specific configuration. Refer to the EFIS-D100 Installation Guide for more information on calibrating the AOA indicator.

Airspeed tape, digital readout, and trend

The airspeed tape scrolls beneath the airspeed digital readout and arrow. The digital readout's digits scroll up and down, simulating an analog airspeed indicator and giving a sense of the increase or decrease in speed. The EFIS-D100 is factory-calibrated to be accurate for airspeeds between 15 and 325 knots (17 to 374 mph). As airspeed increases from 0 knots, the indicator becomes active at 20 knots. The indicator remains active until airspeed drops below 15 knots. The EFIS-D100 may display airspeeds above 325 knots, but it is not guaranteed to be accurate.

The airspeed tape utilizes 4 colors to give you a graphical representation of your speed with relation to your aircraft's limits. By default all of the color thresholds are set at 0, causing a grey tape to be displayed. You must set the values of the airspeed color thresholds via the SETUP menu. Refer to the EFIS-D100 Installation Guide for more information on setting the airspeed color thresholds.



The airspeed trend indicator is located to the left of the airspeed tape. The magenta bar grows in the direction of—and in proportion to—the rate of acceleration or deceleration. The trend indicator is scaled to indicate a 6-second airspeed trend. In the example at right, the trend indicator is showing that the aircraft will reach 124 knots in 6 seconds if the rate of acceleration does not change.

Bugs

Bugs may be set to mark a desired heading, airspeed, or altitude. These bugs are represented by a yellow inverted arrow located at the desired value on the tape. If the set heading, altitude, or airspeed is currently off-screen, the bug icon appears at the edge of the moving tape closest to the desired value.





Your airspeed, heading, or altitude is at its set bug value when the bug's inverted triangle encloses the triangle of the digital readout's pointer. The altitude bug also acts as an altitude alerter; see BUGS – Setting Bug Markers on page 5-2 for more information.

When a Dynon Autopilot is installed and configured, the heading and altitude bugs are repurposed as the target heading (in HDG mode), ground track (in TRK mode), and altitude (in ALT mode). With an AP installed, all bugs are hollow when not engaged in their respective AP modes, and filled in when they are. See Autopilot Operation on page 7-1.

Slip/skid ball

The slip/skid ball works much like a standard mechanical gauge. It is a visual representation of lateral acceleration. If the ball is within the two vertical lines, then you are in coordinated flight.



Altimeter setting display

The current altimeter setting is displayed at the bottom right of the screen below the altitude tape. The value is shown in either inches of Mercury or millibars depending on your preference set in the EFIS > BARO menu.



Clock/timer

The clock is displayed in the lower left-hand corner of the screen, below the airspeed tape. To set the clock, enter the EFIS > SETUP > CLOCK submenu. When a count-down or count-up timer is enabled, it is displayed in place of the clock until the timer is stopped. The character next to the clock indicates whether the unit is displaying Local time (L), Zulu time (Z), or a timer (T). If a GPS is connected to your Dynon network and is outputting time information, the Zulu time of all connected products is auto-set to that reported by the GPS.





Autopilot Status Indicator

When a Dynon Autopilot is installed and configured, an AP Status Indicator is displayed at the bottom left of the EFIS page. It provides information about whether the Autopilot is engaged and what mode(s) it is engaged in. See Autopilot Operation on page 7-1.



HSI Page

Available in 1/3 format

Your EFIS-D100 can function as a Horizontal Situation Indicator (HSI) when it is receiving data from Dynon's HS34 (connected to a NAV radio), an external GPS, or Garmin SL30 Nav radio. The HSI information is overlaid on a directional gyro (DG) representation of the EFIS's stabilized magnetic heading information. If no GPS or NAV radio source is present in the system, the HSI page will still display the DG, but without any additional navigation information.

For detailed information on using the HSI page, please see the HSI Operation section on page 6-1.





Times Page

Available in 1/3 format

There are two different versions of the Times Page. The EFIS version includes two sections of times and the EMS version includes three sections. There are some times that are common to both EFIS and EMS Times Pages.

The Times Page is divided into three sections: TIME, TIMERS, and ENGINE TIMERS.

- Native to both EFIS and EMS, the TIME section shows the present time (both local and Zulu) and can be displayed in either standard or military time formats.
- Only the timer in the TIMERS section is native to the EFIS, while the flight timer and the trip timer require a Dynon EMS product. The flight timer shows the total amount of time that oil pressure was above 15 PSI since the EMS-based product was turned on. The trip timer shows cumulative flight time since a manual reset. The third line of this section contains the general purpose timer which can be used for a variety of functions including a tank timer.
- The ENGINE TIMERS section is native to the EMS and will not appear on the EFIS-D100 unless a Dynon EMS product is properly connected and running. The tach timer keeps track of engine time (normalized to the user-configured cruise RPM). The Hobbs timer records the duration of time engine oil pressure is at 15 PSI or higher.

Refer to the EFIS Operation section on page 5-1 for instructions on adjusting clock and timer settings.

TIME		TIME	
LOCAL	0:38:11	LOCAL	0:38:11
ZULU	0:38:11	ZULU	0:38:11
TIMERS		TIMERS	
TIMER	0:00:00	FLIGHT	0:00
		TRIP	0:00
		TIMER	0:00:00
		ENGINE TIMERS	
		TACH	0.0
		HOBBS	0.0

EFIS Times

EMS Times

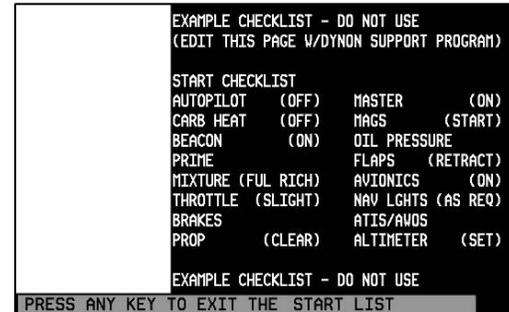


Lists Pages

Available in 2/3 format

This page displays user-defined checklists and data panels to be used for waypoint information, lists of radio frequencies, or other informational purposes. You may define up to twenty-five lists. Each checklist/data panel can contain up to 14 lines of text and 40 characters per line.

Checklists/data panels must be defined and uploaded to the EFIS-D100 as described by the Dynon Product Support Program, available at downloads.dynonavionics.com. Reference the help file that accompanies this software for more information.



Menu Pages

Available in 1/3 and 2/3 formats

Some setup menus require a 1/3 or 2/3 page to display all the available options. Menu Pages use a caret symbol (“>”) to indicate the currently selected line. Use the DOWN ▼ and UP ▲ buttons to scroll through the list of options.

Any line on a Menu Page that is followed by ► has more options to configure inside of it. Press SEL ► to expand the menu into another list of options to the right.

Any line on a Menu Page that *is not* followed by ► indicates that its value can be modified using the SEL ►, DOWN ▼, and UP ▲ buttons.



5. EFIS OPERATION

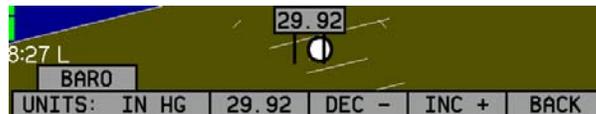
This section guides you through each of the EFIS main page menu selections and their sub-menus. To enter the EFIS menu system, press any button (except for buttons 1 and 6) directly beneath an EFIS main page. If no EFIS main page is displayed, you must switch to a screen configuration that includes an EFIS main page as described on page 3-4.

POWER – Power on/off

When the EFIS-D100 is turned off but still has a power source via one of the three power inputs, press the far left button to turn the unit on. Likewise, once the unit is on and no menus are displayed, *push and hold* the leftmost button to turn it off. While power is still connected, the unit is never fully turned off. It simply enters an extremely low-power state, allowing it to keep track of time. It is acceptable to have the EFIS-D100 on during engine crank. It immediately powers on upon application of external power.

BARO – Changing Altimeter Setting

In the EFIS > BARO menu, you can adjust the altimeter setting. When the BARO menu is displayed, the value-setting box shows the current altimeter setting. The DEC- and INC+ buttons change the altimeter setting by 1/100th inHg or 1 mbar, depending upon your selected units. As you change the altimeter setting, the altitude indicators change accordingly. Adjust the altimeter setting until the altitude indicators display the correct altitude for your location or the altimeter setting matches the current barometric pressure value.



The altimeter setting can be set in units of inches of mercury (inHg) or millibars (mb). To change the units, simply press buttons 1 or 2, corresponding to the UNITS label. To reset the altimeter setting to standard day pressure (29.92 inHg), press button 3, corresponding to 29.92 (inHg) or 1013 (mb).



HS34 The BARO setting can be changed using the HS34's VALUE knob, depending on the configuration settings in EFIS > SETUP > HSI > VALUE KNOB.

AP74 The BARO setting can be changed using the AP74's VALUE knob, depending on the configuration settings in EFIS > SETUP > AP > VALUE KNOB.

The current indicated altitude is preserved across a power cycle. When powered down, the instrument saves the indicated altitude. When it is powered up again, the instrument automatically adjusts the altimeter setting by exactly enough to preserve that saved value. This is not a replacement for modifying the altimeter setting by the pilot before takeoff; it makes it very close to the correct value, minimizing the amount of adjustment needed. To turn auto-set on or off, enter the EFIS > SETUP > BARO menu and set the ADJUST AT BOOT option to ON or OFF.

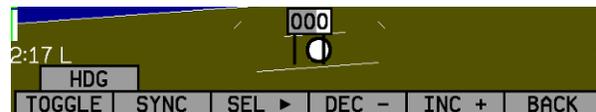
BUGS – Setting Bug Markers

You can set a marker – or “bug” – to display on any or all of the three tapes. To do this, enter the EFIS > BUGS menu (or EFIS > AP > BUGS, if an AP is installed), and choose the type of bug to configure: HDG (heading), TRK (track), IAS (Indicated Airspeed), or ALT (altitude). Note that if a bug is not currently displayed, changing its set value causes it to display on the relevant tape.



HEADING

In the BUGS menu, press HDG/TRK. *Note that, if an autopilot is installed, this bug will display as either HDG or TRK depending on the autopilot's mode of operation.* Press the TOGGLE button to turn on or off the heading or track bug display on the horizontal heading tape. Note that this affects the display of the heading bug on the HSI page as well.





In the HDG/TRK bug menu the value-setting box is displayed in the lower part of the display. Press SEL ► to select which digit to change and DEC- and INC+ to change the selected digit. Press the SYNC button to synchronize the heading/track bug to your current heading or track. As you increment or decrement the bug value it rolls over at 360 degrees, returning the value to 001. If you have the heading or track bug displayed, the marker moves left or right along the tape as you change its value.

DSAB The heading/track bug can be adjusted on any EFIS page displayed in the system and is synchronized across all EFIS-based units.

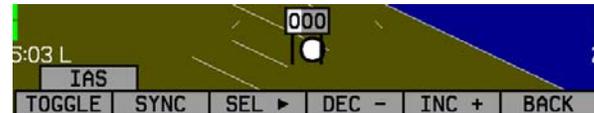
HS34 The heading/track bug can be adjusted at any time by rotating the HS34's HEADING knob. If the bug is currently toggled off, rotating the HEADING knob causes the bug to be displayed on the heading tape. To sync the bug to your current heading or track, press the HEADING knob briefly. To toggle the bug on or off, push and hold the HEADING knob for more than 1 second.

HS34 When in the BUGS > HDG or TRK menu, rotate the AP74's VALUE knob to quickly change the bug's set value. Alternately, the bug can be adjusted at any time by using the HS34's or AP74's VALUE knob. Exact behavior is defined in the SETUP > (HSI or AP) > VALUE KNOB menu.

AIRSPEED

In the BUGS menu, press IAS. Press the TOGGLE button to turn on or off the airspeed bug display on the airspeed tape.

In the IAS bug menu the value-setting box is displayed in the lower part of the display. Press SEL ► to select which digit to change and DEC- and INC+ to change the selected digit. Press the SYNC button to synchronize the airspeed bug to your current indicated airspeed. If you have the airspeed bug displayed, the marker moves up or down the airspeed tape as you change its value.





DSAB The airspeed bug can be adjusted on any EFIS page in the system and is synchronized across all EFIS-based units.

AP74

HS34 When in the BUGS > IAS menu, rotate the AP74's or HS34's VALUE knob to quickly change the bug's set value.

ALTITUDE

In the BUGS menu, press ALT. Press the TOGGLE button to turn on or off the altitude bug display on the altitude tape.

In the ALT bug menu the value-setting box is displayed in the lower part of the display. Press SEL ► to select which digit to change and DEC- and INC+ to change the selected digit. Press the SYNC button to synchronize the altitude bug to your current altitude. If you have the altitude bug displayed, the marker moves up or down the altitude tape as you change its value.

DSAB The altitude bug can be adjusted on any EFIS page in the system and is synchronized across all EFIS-based units.

HS34

HS34 When in the BUGS > ALT menu, rotate the AP74's or HS34's VALUE knob to quickly change the bug's set value. Alternately, the altitude bug can be adjusted at any time by using the HS34's or AP74's VALUE knob. Exact behavior is defined in the SETUP > (HSI or AP) > VALUE KNOB menu.

If the BUGS > ALM button is toggled to ALT, then turning the altitude bug on enables the **altitude alerter** function with the bug value as the target altitude. While climbing or descending toward the target altitude a level-off alert sounds when passing through 500 feet from the target altitude. The target altitude is considered captured when altitude is within 150 feet of the target. Flying more than 200 feet away from the target triggers a short audio alert and alternates the bug in



red and yellow as a visual alert. When below the 200-foot window, a rising tone is sounded; when above the 200-foot window, a descending tone is sounded. The visual climb or descend alert clears after recapturing the target altitude or 30 seconds. Flying back inside the 150-foot capture window re-arms the alerter without any user interaction.

AP74**AP74**

If your system is configured to output voice via an HS34 or AP74 module, the voice alerts “climb” or “descend” are sounded, instead of tones. Additionally as you approach the altitude bug, the voice alert “altitude” is sounded when crossing 500 feet away from the bug.

To simulate the altitude alerter on the ground, SYNC the altitude bug to your current altitude and then adjust the altimeter setting up or down. When you adjust the altimeter setting enough that the altitude is outside the 200-foot window, observe that the audio alert triggers and the bug alternates red and yellow.

If you do not wish to use the altitude alerter function, push the ALM button in the BUGS menu to toggle it to OFF.



LISTS – Using Checklists and Data Panels

The Dynon Support Program allows you to enter your own checklists or select from included data panels. These checklists and data panels can then be uploaded to your EFIS-D100 for quick access from the main menu or from your screen rotation. Data panels and checklists can be included beneath 5 user-configurable categories and each category can contain up to 5 checklists or data panels. By default the EFIS-D100 is loaded with the following 5 categories: CHKLIST, RADIO, POH, EMGNCY and MISC. Each checklist/data panel can contain up to 14 lines of text and 40 characters per line.

To load checklists and data panels onto your EFIS-D100, you must upload them as described in the Dynon Product Support Program help file. Pushing the LIST button displays the 5 main categories as set up in the Dynon Support Program. Press a button corresponding to the desired category to show the checklists and data panels beneath it. When



you display a checklist, the right 2/3 of the screen displays the checklist while the left side displays a 1/3 format EFIS page. See the Dynon Support Program for more detailed information on entering checklists and data panels. It can be downloaded from our website at downloads.dynonavionics.com.



SETUP – Setting Preferences

Enter the EFIS > SETUP menu to make changes to preferences. Many of the settings in this menu should only be changed by the installer, and are described in the EFIS-D100 Installation Guide. The preferences and settings that are relevant to the pilot and in-flight operation are explained below.



CHANGE DISPLAYED UNITS

In the UNITS submenu, you may change the system-wide displayed units for the following units. See the following table for a list of available units for each displayed parameter.



Parameter	Available units
Airspeed (IAS)	Knots, miles/hour, kilometers/hour
Altitude (ALT)	Feet, meters
Temperature (TEMP)	Celsius, Fahrenheit
Barometric Pressure (BARO)	inHg, mbar
Distance (DIST)	Nautical miles, statutory miles, kilometers

DSAB In a DSAB network, unit preferences are shared between all connected instruments.

SET THE CLOCK

Entering the EFIS > SETUP > CLOCK menu displays the local and Zulu times in the value-setting box. Because local time is usually an offset in hours from Zulu time, set the minutes value in the Zulu time portion of the box; notice that the local time minutes setting change at the same time. Then, set the hours for local and Zulu times independently. Once you have set Zulu time, you should never need to change it, as it is independent of daylight saving time. When connected to a GPS which is outputting time information, Zulu time is synchronized to the GPS and cannot be set on the EFIS-D100.





DSAB In a DSAB network, you can only set the Zulu time on the DSAB master, and only if it is not synchronized to GPS time. You can set the local time on all units individually.

To change the local clock when moving through time zones or to enter daylight saving time, simply change only the hours (and, if necessary for the time zone, the half-hour offset) for the local time. Be aware that connecting to the EFIS-D100 with the Dynon Product Support Program resets the time; do not set the time until you have performed all of the PC interface operations. Refer to the following set of tips as you set the clock:

- Set both the local and Zulu times in military time. You have may display the time in either military or standard 12-hour format, as described below.
- SEL ► moves the highlight to the next set of digits. The order of selection is 1. Local hours, 2. Local minutes (adjustable only as ½-hour offsets from Zulu minutes), 3. Zulu hours, 4. Zulu minutes. When connected to a GPS, you are not permitted to adjust the Zulu time on the EFIS-D100
- DEC- and INC+ change the selected set of digits. To speed up the process, press and hold the desired button. If you pass the desired value, you may simply back down to it by pressing the button corresponding to the opposite direction.
- Incrementing or decrementing the minutes digits resets the second count.
- In the CLOCK > FORMAT menu, press LC/ZU to change between local and Zulu time display on the EFIS page. Press 12/24 to change between standard and military time display on the EFIS page

SHOW/HIDE DISPLAY ITEMS

In the EFIS > SETUP > CLUTTR menu, you can turn on or off almost every item displayed on the EFIS page. As with all other menu items, these options are abbreviated to commands containing 6 letters or fewer. Pressing a button



corresponding to one of these options turns the respective onscreen item on or off. The following table summarizes the display item abbreviations and their function.

Abbreviation	Display Item	Function
ALTBAR	Altimeter Bar	Toggles the display of the graphical altitude tape.
ALTDIG	Altimeter Digital	Toggles the display of the digital altitude window.
IASBAR	Indicated Airspeed Bar	Toggles the display of the graphical airspeed tape.
IASDIG	Indicated Airspeed Digital	Toggles the display of the digital airspeed window.
HDG	Heading	Toggles the display of the heading tape and digital display.
BALL	Slip/skid Ball	Toggles the display of the slip/skid ball and associated center markers.
TURNRT	Turn Rate	Toggles the display of the turn rate indicator and associated scale markers.
AOABAR	AOA Bar	Toggles the display of the angle of attack indicator. The AOA indicator requires the use of a Dynon heated or unheated AOA probe.
CLOCK	Clock	Toggles the display of the clock. Setting Zulu/local and 12/24 hour time is done in the EFIS > SETUP > CLOCK menu.
BARO	Altimeter Setting	Toggles the display of the current altimeter setting (also known as the Kollsman setting). This display is not required to adjust the altimeter setting. While in the EFIS > BARO menu, a separate value-setting box appears, allowing adjustments to be made.
ROLL	Roll Scale	Toggles and configures the display of the roll scale. When set to "N", the roll scale is not displayed. When set to "1," the roll scale stays fixed on the screen and the pointer moves along the scale, like a jet EFIS presentation. When set to "2", the roll scale moves with the horizon, while the pointer stays fixed on the screen, like most mechanical attitude instrument presentations.



Abbreviation	Display Item	Function
GTRK	Ground Track	Toggles the display of the ground track indicator on the heading tape. The track indicator is a magenta arrow and is only displayed when the EFIS-D100 is receiving valid GPS data from an external source. If the GTRK button status displays “Y” and no ground track arrow is displayed, the EFIS-D100 cannot detect your GPS, or the GPS does not yet have a satellite lock.
WIND	Winds Aloft	Toggles the display of the wind arrow and speed indicator. The display of winds aloft requires an active GPS connection and an OAT probe. If the WIND button status displays “Y” and no wind indicator is displayed onscreen, the EFIS-D100 cannot detect your GPS, the GPS does not yet have a satellite lock, the FlightDEK-D180 does not have a connection to the remote compass (EDC) or the FlightDEK-D180 does not have an OAT.
ASTRND	Airspeed Trend	Toggles the display of the 6-second airspeed trend indicator next to the IAS tape.
VSI	Vertical Speed Indicator	Toggles and configures the display of the VSI tape next to the altitude tape. The VSI can be hidden (“N”), or can be set to 1k, 2k, or 4k ft/min scaling. The 2000 ft/min display is linear throughout the range, while the 1000 and 4000 ft/min displays incorporate a non-linear scale to increase low vertical speed resolution.
CDI	Course Deviation Indicator	Toggles and configures the display of the CDI and glideslope. Choosing “CDI” causes the course deviation indicator to display above the slip/skid ball. Choosing “CDI+GS” causes both the CDI and glideslope indicators to display, with the glideslope indicator displayed next to the roll scale. If the CDI button status displays “Y” or “CDI+GS” and no CDI or glideslope is displayed onscreen, the EFIS-D100 cannot detect your NAV radio or GPS, there is no active course, or there is no NAVSRC chosen on the HSI page.



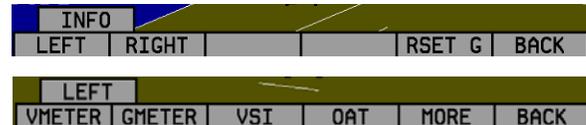
Abbreviation	Display Item	Function
CRS	Course Pointer	Toggles the display of a “V”-shaped course pointer on the heading tape. Like the CDI, this can only be displayed when the EFIS-D100 is receiving a valid course from the NAV source selected on the HSI page. If the CRS button status displays “Y” and no course pointer is displayed on the heading tape, the EFIS-D100 cannot detect your NAV radio or GPS, there is no active course set, or there is no NAVSRC chosen.
TRIM	Elevator Trim	Displays the elevator trim. This can only be displayed when an elevator trim sensor is properly connected to a DSAB-connected EMS device, and configured in the EMS setup.

CHECK FIRMWARE VERSION

The EFIS > SETUP > VRSION menu gives you two important pieces of information: your EFIS-D100’s current firmware version; and the number of hours the EFIS-D100 has been on. If you require technical support or other assistance from Dynon, please have your firmware version ready when you call or write.

INFO – Informational Items

In the EFIS > INFO menu, you have the option of displaying an informational display item on either the left or right side, or both. You may display a voltmeter (VMETER), *g*-meter (GMETER), vertical speed indicator (VSI), OAT/true airspeed/density altitude (OAT), and engine RPM/MAP info (ENGINE). More detail about each of these is given below.



Voltmeter



The voltmeter displays 3 rows of information corresponding to the three power inputs on the EFIS-D100. The first row, labeled M, displays the Master Switch voltage. The second row, labeled E, displays your optional external backup voltage. The third row, labeled I, displays the EFIS-D100 internal battery voltage. If any of the 3 voltage inputs are not present, 00.0V is displayed for the respective voltage values. The letter V follows all three values, denoting the fact that voltages are being displayed. The EFIS-D100 alerts you when the internal battery is low by displaying a low battery alert.

M	04.0V
E	00.0V
I	00.0V

G-meter

The *g*-meter displays the current vertical acceleration experienced by the EFIS-D100 measured in *g*'s, where 1 *g* is the amount of acceleration due to the earth's field experienced by an object at sea level. Positive *g*-force is defined as upward vertical acceleration, making you feel heavier. Negative *g*-force is defined as downward vertical acceleration, making you feel lighter. As can be seen in the picture, there are three rows of text that make up the *g*-meter. The top row, labeled MX, is the maximum positive *g*-force experienced by the EFIS-D100 since reset. The middle row, labeled CR, is the current *g*-force experienced by the EFIS-D100. The bottom row, labeled MN, is the minimum *g*-force experienced by the EFIS-D100 since reset.

MX	1.0
CR	1.0
MN	1.0

To reset the max and min *g*-force values to the current *g*-force value, enter the EFIS > INFO menu and press the RSET G button.

VSI (Rate of Climb)

The vertical speed indicator (VSI) consists of a single line with your current rate of climb or descent. If you are currently gaining altitude, an up arrow is displayed to the right of the vertical speed value. If you are losing altitude, a down arrow is displayed to the right of the vertical speed value. The units of VSI are feet/minute. Note that in the MODERN display (EFIS > SETUP > STYLE), found in EFIS-D100 firmware version 3.0 and higher, VSI can be displayed as a graphical indicator next to the altitude tape.

VS	0000
----	------



OAT (Outside Air Temperature)

The EFIS-D100 supports the connection of an OAT to its EDC-D10A. If no OAT is connected to the EFIS-D100, or to any other device in a DSAB system, you may manually set the outside temperature.



The OAT info item displays 3 lines of text, containing outside air temperature, density altitude, and true airspeed. To use the TAS/DA calculator without an OAT installed, manually enter the outside air temperature in the EFIS > OATSET menu. When a temperature is manually input via the OATSET menu, a box is displayed around the temperature in the info item, as shown in the image above.

DSAB

When multiple units are connected to a DSAB network, one primary OAT is shared between all units. This can be an OAT connected to an EFIS or an EMS. If the EFIS-D100 is displaying an OAT provided by another unit in the system, changing the OAT type or install status on the EFIS-D100 has no effect on the displayed OAT. This change is only used if the primary OAT (or entire DSAB network) fails and the EFIS switches to the locally connected OAT.

ENGINE (Manifold Pressure and RPM)

The engine informational item allows you to display engine manifold pressure and RPM on the EFIS page. This requires that the manifold pressure sensor and tachometer pickoff are properly installed and configured on a DSAB-connected EMS-based product.



DIM – Changing screen brightness

In the EFIS > DIM menu, press BRITR or DRKR to change the brightness of the display. It is not possible to turn the screen completely black. Note that if power to the EFIS-D100 is cycled, the screen is reset to full brightness.

The DIM function also exists in the EMS main page menu. You may dim the display via either menu.

**DSAB**

All screens in a DSAB network share a common dim level. Pressing BRITR or DARKR on one unit changes the brightness level on all screens if the change is possible. If you have any D100-series bright screen units in the system, you must press BRITR on any bright screen unit to get the bright screen units to their final step of brightness.

AP74**HS34**

The HS34 and AP74 have built-in light sensors which can be used to automatically dim all of the screens connected to a DSAB network (if both installed, their sensor values are averaged). To turn this function on, press AUTODIM. When you enable auto-dim, the screen does not immediately change brightness. Instead, the system records the unit's current brightness level as the desired brightness. From that point on, all networked units react to changes in light intensity and maintain perceived brightness at the desired level. If auto-dim is enabled and the screen is too bright or dark, continue to use the BRITR or DARKR buttons as you would without auto-dim. The system records the new set level as the desired brightness, and auto-adjusts around the new set point.

TIMER – Setting and using a timer

Enter the EFIS > TIMER menu. In the value setting box, the DOWN or UP label is displayed, depending on which timer type is currently selected. The currently running timer is displayed on the Times Page, as described on page 4-10. Use the following points as you work with the timer.



- The UP/DN button toggles the menu and timer between an up timer and a down timer. When switching to an up timer, the timer set value resets, allowing the up timer to count up from 0:00:00.
- To reset the timer, press the UP/DN button twice.



- To start the timer, press START. Once started, the button's label changes to STOP. To stop the timer, press STOP.
- To set the down timer, press HOUR, MIN, and SEC to adjust the timer to the desired value.
- You may not have an up timer and a down timer running at the same time.

DSAB

Multiple Dynon products connected via a DSAB network share one timer. Starting, stopping, or configuring the timer on one instrument causes all other instruments to reflect the change.

OATSET – Setting Temperature Offset

If you did not purchase an EFIS or EMS outside air temperature sensor from Dynon Avionics, you may still manually adjust the OAT to an approximate value. With this manually entered information, the EFIS-D100 calculates and displays true airspeed (TAS) and density altitude as it does when an OAT is connected. Ensure that you have indicated that an EFIS OAT is not installed; enter the EFIS > SETUP > OAT menu and press INSTALLED until the value is “N.”

In the EFIS > OATSET menu, press INC- or DEC+ until the value-setting box above the menu displays the current outside air temperature. This value is then used in the OAT/TAS/DA info item on the EFIS screen. For more information on setting up that display, see page 5-13.

DATLOG – Logging and retrieving data

The EFIS-D100 provides two options for logging data. You may configure the EFIS-D100 to log data to its internal memory for later retrieval or you may record streaming data serial output to an external device (such as a laptop computer) in real-time from the EFIS serial port (as documented on page 9-2). The former option has the advantage that it does not require an external device in the aircraft while recording. Additionally, the internal storage logs provide an indication of alarm events, while the real-time output does not. When data logging is activated, two logs are recorded -



“all data” and “MIN/MAX”. Both logs can be downloaded using the “Retrieve Logged Data” option of the Dynon Support Program. On certain Dynon Avionics EFIS and EMS units, a “SNAPSHOT” log is also recorded and can be downloaded. The snapshot log records the value of all parameters anytime an alert occurs.

To activate internal data logging, enter the EFIS > SETUP > DATLOG and set RECORDING to ON. Set the INTERVAL depending on how frequently you wish data to be stored. Data can be stored at intervals of 1, 3, 5, 10, 30, and 60 seconds. Leaving the RECORD AT BOOT option set to NO causes the RECORDING option to be reset to OFF every time power to the EFIS-D100 is cycled. Setting it to YES ensures that the EFIS-D100 begins logging data automatically at boot up. If you wish to mark the data log at any point, select the MARK NOW function and press SEL▶. This inserts a notation in the data log retrieved by your PC, allowing you to quickly find the place in your data when you marked the record. For information about retrieving data and reading the file produced, please see the help file included in the Dynon Product Support Program (version 5.0 and higher).

The EFIS-D100 has a limited amount non-volatile internal storage for the data log. With a 1-second recording interval, at least 2 hours of *cumulative* data can be recorded; with a 10-second interval, at least 20 hours; with a 30-second interval, at least 60 hours, and with a 60-second interval, at least 120 hours. When the EFIS-D100 internal storage fills up, new records overwrite the oldest records. To delete the records in internal storage, select ERASE LOG, ERASE MIN/MAX LOG, or ERASE SNAPSHOT LOG (only available on certain units).

The data format and connection settings for the internally-recorded data are described in the Help Files of the Dynon Support Program.

6. HSI OPERATION

This chapter explains how to use the EFIS-D100's HSI functionality.

Required Connections

To display an HSI on the screen, an external receiver is needed. The currently supported data sources are a Garmin SL-30 Nav/Comm radio via a serial connection (Nav data), a Garmin GNS-430/530 GPS/Nav/Comm (GPS data), or any GPS that outputs in either NMEA-0183 or aviation format. Please refer to the EFIS-D100 Installation Guide for instructions on how to connect these devices to your Dynon network. Also, ensure your GPS device is configured to output magnetic heading since all calculations and displays are done in reference to the local magnetic heading.

HS34 The HS34 supports a variety of connections to navigation receivers via serial, ARINC-429, and analog connection. A connection to the HS34 generally carries more information than a serial-only connection to an EFIS- or EMS; when an HS34 is installed, connections to navigation receivers and GPSs must be made to it. Please see the EFIS-D100 Installation Guide for detailed installation and connection information.

Accessing the HSI/DG Page

The HSI is displayed as a 1/3 page, next to either a 2/3 EFIS or 2/3 EMS page. If the HSI is defined as part of a screen setup in your rotation, display the HSI page using either of the screen rotation hotkeys (buttons 1 and 6) until the appropriate page is displayed. If no screen configuration including the HSI is in your rotation, you can access the HSI by holding down the right button with no menus displayed and selecting a screen that includes the HSI. See page 3-2 for more information on screen configuration.



**DSAB**

All HSI screens in a DSAB network share their configuration and are identical to one another at all times. Changing the source of information on one HSI page affects all units, as does changing scaling, bugs, or bearing pointers. It is not possible to show a NAV radio on one screen and a GPS on another screen.

HSI Display Basics

There are three possible sources of information on the HSI page: GPS, NAV, and internal EFIS data. It is important to know what equipment is sourcing your data, so most displayed data is color coded so that it is easy to identify the source of the data. Data that is sourced from a GPS unit is color coded in magenta, and includes course direction, course deviation, vertical guidance, ground track, ground speed, altitude, distance to waypoint, and other data. Data that comes from a navigation radio (VOR / LOC) is green in color and includes the course, course deviation, glideslope, NAV mode, to/from, OBS setting, tuned frequency, station identifier, and more. The final data source is information that comes from the EFIS itself and is color coded in white. The EFIS-sourced data includes magnetic heading, true airspeed, winds, and various other data points. Below are some of the basics

1. Mode flag. This indicator, located at the upper left of the HSI page, tells you what mode the radio and display are in. There are five options for this indicator.
 - a. "GPS" in magenta text: This indicates the data source for the overlay is a GPS stream.
 - b. "NAV" in black letters on a green background. This indicates that the system is in NAV mode, but there is no active VOR or localizer tuned. This is the same as a cross hatch indicator in the TO/FROM flag on a mechanical CDI. Do not rely on any indications on this page except for the DG and TAS when this flag is set.
 - c. "VOR" in green text. This means the radio is tuned to a standard VOR station and is giving a valid TO or FROM indication.

GPS

NAV

VOR

LOC



- d. "LOC" in green text. This indication means that the radio is tuned to a localizer. The glideslope scale is visible as well, but may be flagged invalid.
 - e. "BC" in yellow text. This indication means that the radio is tuned to a localizer and is in back course mode. The glideslope scale is visible as well, but may be flagged invalid. **Note:** when flying a back course on an HSI, no reversal is needed since the CDI indicator spins with the DG. If the course is set to the runway heading of the ILS, when flying the back course, the CDI is flipped 180 degrees and indicates properly with no reversal needed. If you put the SL-30 into back course mode, you need to set the course to the heading of the back course runway. Setting the course to the heading of the primary ILS runway causes the CDI needle to be reversed.
2. Digital heading indicator. The number in this box is the current magnetic heading of the aircraft in degrees from 001 to 360. The accuracy of this data depends on the accuracy of the heading calibration for your EFIS-D100.
 3. Directional Gyro (DG). The ring of tick marks and numbers acts as a traditional directional gyro. The current magnetic heading of the aircraft is the heading that is at the top of the page and is being pointed to by the heading indicator.
 4. Bug indicator. This user-settable bug also appears on the EFIS heading tape. Colored yellow, it can be toggled on and off using the HSI menu or the main EFIS menu.

BC



HS34

- The HEADING knob on the HS34 always controls the heading bug. Turning the knob when the bug is not displayed switches the bug to the on state. Press the HEADING knob to sync the bug to the current heading.
5. True Airspeed Indicator. If it is possible to calculate true airspeed on the device then it is displayed here. In order to do this the device must have access to an outside air temperature from an EFIS or an EMS.

030°/20 KTS TAS 092 KTS
XW10 KTS



- Winds aloft. This indicator, located at the bottom of the HSI page, appears only when you have GPS data and true airspeed available to the instrument. The arrow is the wind direction relative to your aircraft. It is always the same size and only indicates wind direction. The numbers below are absolute wind direction (magnetic) and absolute wind speed. Below that, labeled as "XW" is the crosswind component of the wind. Wind data is calculated while in stable flight with very little turn rate. It uses the GPS ground speed and track to compare to the magnetic heading and the true airspeed that the EFIS calculates. In order for winds to be correct, the airspeed, OAT, and compass on the EFIS must all be accurate.

Navigation Radio Overlay

The figure at right shows an HSI page with information sourced from a navigation radio. This data could be a VOR or a localizer. The various elements are described below.

- Text displays. The text displays (located at the top of the HSI Page) provide a variety of information. Displayed here is the course/OBS setting, the active frequency that the SL-30 is tuned to, the identifier for the tuned frequency, and the bearing to the active and secondary frequencies. When the data is not available or is not valid, the various data fields in this area are replaced by dashes.
- Course indicator. The green course indicator (shown pointing to 273° at right) has an arrow at its end which points to the currently selected course (OBS) on your NAV radio. This setting is also shown in the text area as "OBS." When tuned to a VOR, this is the radial that you wish to fly. When tuned to an ILS, this is set to the runway heading. In a situation with no winds, keeping the course indicator pointed straight up and in line with the heading pointer keeps the aircraft on course. This indicator is fixed to the rotation of the DG, so it is easy to see which way you must turn to get on course. The course indicator is only present when you are tuned to a VOR or a localizer. If the NAV radio indicates that you are not currently tuned to an active frequency, this indicator is not displayed. The direction of this course is set



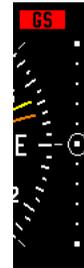


externally using the knob that is on the SL-30 when in VOR mode. When in ILS mode, the SL-30 disables the OBS knob, and thus you must use the soft keys below the HSI in order to set the course.

HS34

When using the HS34 you can set the OBS using the COURSE knob. When properly configured, the HS34 sends course information to the NAV radio, just like a mechanical HSI or CDI does. When using an SL-30, the HS34's knob *must* be used to set the OBS; the SL30's OBS is overridden by the course information sent out by the HS34.

3. **Course Deviation Indicator (CDI).** When tuned to a VOR, the CDI indicates how far to the left or right of your selected radial you are. Full scale deviation indicates ten degrees of deviation from the radial that has been chosen as the course. When tuned to a localizer, full scale represents 2.5 degrees of deviation. When on course, the course indicator and the CDI make a solid line, making it easy to see when there is little error in your aircraft's position. Unlike a CDI indicator found in basic aircraft, the CDI needle on an HSI rotates with the DG and course indicator. By turning the aircraft towards the CDI needle you reduce your deviation.
4. **To/From indicator.** Because an HSI rotates the course line on top of the DG, the to/from indicator always points TO the physical VOR or localizer transmitter. If it is pointing the same direction as the arrow at the end of course line, then that is a "to" indication. If it is pointing the opposite direction of the arrow at the end of the course line, then that is a "from" indication. This data comes from the to/from flag indicator provided by your Nav radio. In the image above, the to/from indicator is showing a "from" indication.
5. **Glideslope Indicator.** This appears only when tuned to an ILS. It displays deviation as 0.5 degrees when deflected full scale. This does not have an indicator on it unless the glideslope is valid as defined by the glideslope flag.





6. Glideslope flag. This appears when the radio is tuned to a localizer and the glideslope is not valid. When this is active, there is no indicator mark on the GS scale.
7. Bearing To indicators. These arrows show you the bearing to the active and standby VORs. This is the direction that you would need to fly to go directly from where you are to the transmitter. When flying directly on course, your bearing and course lines overlap one another. The primary bearing indicator is depicted by a yellow diamond and the standby indicator is depicted by an orange circle. These elements only appear when the active and/or standby VORs are tuned to an active frequency. A numerical display of your primary (labeled NAV) and standby (labeled SBY) bearings and a reminder of which symbol represents each bearing is in the text area of the page.



HS34 The HS34 adds the possibility of having many more bearing sources in the system. Pressing the BRG SRC button highlights the first bearing source. Turning the VALUE knob allows you to choose your bearing source from all options. Pressing the bearing source again chooses the second bearing source. If you wait more than 5 seconds without adjusting anything or pressing any buttons, the selection self-clears.

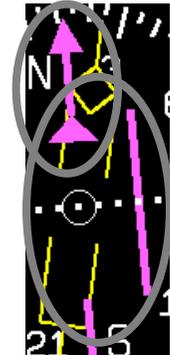
HS34 The HS34 adds the ability to display information from a marker beacon receiver. If you have marker beacon receiver connected and configured (as described in the EFIS-D100 Installation Guide), the “O,” “M,” and “I” indications are displayed on the HSI page. If configured, the HS34 plays the appropriate Morse Code tones on its audio output.



GPS Overlay

The figure at right shows an HSI page with information sourced from a GPS receiver while the GPS has an active flight plan between two points. The various elements are described below.

1. Text displays. In this area a variety of information is displayed in text format. Displayed here is the ground track (TRK), the course (CRS), ground speed (SPD), distance to next waypoint (DTW), and up to two bearing pointer selections.
2. Course indicator. The course indicator points in the direction of the course that the GPS is reporting*. This is usually the direction of the line between the start and end waypoints. This setting is also shown in the text area as "CRS." In a situation with no winds, keeping the course indicator pointed straight up and in line with the heading pointer keeps the aircraft on course. This indicator is fixed to the rotation of the DG, so it is easy to see which way you must turn to get on course. The course indicator is only present when you have an active flight plan in your GPS and are navigating to a point.
*Some GPS units do not report course direction. In this case, a COURSE menu item is made available in the HSI menu to manually set it.
3. Course Deviation Indicator (CDI). When a flight plan is active in the GPS, the CDI indicates how far to the left or right of your selected ground course you are (CDI in large oval at right). Depending on the scale that you are in, each dot indicates 0.06 n.m. (Approach), 0.2 n.m. (Terminal), or 1.0 n.m. (Enroute). When on course, the course indicator and the CDI make a solid line, making it easy to see when there is little error in your aircraft's position. Unlike a CDI indicator found in basic aircraft, the CDI needle on an HSI rotates with the DG and course indicator. By turning the aircraft towards the CDI needle so the CDI needle is "on top" of the course line you reduce your deviation.





4. To indicator. There is no "from" indication with GPS data, since the GPS is the source of the course line. This arrow always points the same way as the course line, as indicated in the small oval in the previous figure.
5. Vertical Guidance Indicator. When connected to a Garmin 396/496 the glideslope indicator mimics the GPS's vertical guidance display. This appears only when a VNAV profile is active on the GPS.

HS34

When the HS34 is connected to a WAAS-enabled GPS that can provide vertical guidance, this vertical guidance is displayed as specified by your GPS user manual.

6. Bearing to waypoint (BTW) indicator. This thin yellow diamond shows the bearing to the destination waypoint. The diamond points in the direction you would need to fly from your present location to the waypoint. When flying directly on course, your BTW and course lines overlap one another. The text area of the page contains a numerical display of this bearing and a diamond icon to signify its symbol on the display.

HS34

The HS34 adds the possibility of having many more bearing sources in the system, so the behavior of the BRG SRC button is dependent on how many devices you have connected. When you press this button, if you have only one possible bearing source, the bearing source toggles on and off. If you have two or more bearing sources, pressing the BRG SRC button highlights the first bearing source. Turning the VALUE knob allows you to choose your bearing source from all options. Pressing the bearing source again chooses the second bearing source. If you wait more than 5 seconds without adjusting anything or pressing any buttons, the selection self-clears.

7. Scale indicator. This shows you what scale the CDI is using. Since serial GPS streams do not indicate the correct scaling mode, this must be configured manually with the "scale" button under the HSI menu. The three options are "E" for enroute (5 n.m. full scale), "T" for terminal (1 n.m. full scale), and "A" for approach (0.3 n.m. full scale). The current scale name and full scale range is indicated on the screen.

E | 5.0NM

**HS34**

When the HS34 is hooked to a GPS unit via ARINC-429, the system can read the scaling from the ARINC-429 connection. When connected this way, the scaling auto-updates and follows the GPS. The indication on the screen for mode and range should match the mode and range of the GPS at all times. When in this mode, the range is not limited to just 5/1/0.3nm, as the GPS may slide between scales, so it would not be unexpected to see a number such as 0.8 on the screen. Because of this behavior, on the final phases of an approach, a GPS hooked to the HS34 via ARINC-429 acts much like a VOR receiver would with the CDI acting as angular deflection, not linear distance. There are still only three master modes of Enroute, Terminal, and Approach, which are annunciated on the screen.

8. Track indicator. This indicates your direction over the ground as reported by the GPS. This is different than your magnetic heading when there are crosswinds present. Since this is your actual ground track, keeping this directly above your course pointer (when the CDI is centered) keeps you on course, even if your magnetic heading is different. As long as a valid GPS source is detected by the system, the ground track indicator can be displayed. This is not dependent on the currently set NAV source.



HSI Menu Structure

NAVSRC - This is used to choose what navigation source is displayed on the HSI page and the EFIS main page. Pressing this button steps through the three options: DG, NAV, and GPS. This button cycles through only the overlays that are available in the system; NAV or GPS pages are not available if these data sources are not hooked up.

HS34

The NAV SRC button on the HS34 performs the same function as this NAVSRC menu button, but may cycle through NAV1, NAV2, etc, if you have multiple units connected. The NAV SRC button on the HS34 only works when the HSI page is displayed on the DSAB master. If it is pressed when no HSI is displayed, it has no effect.



BUG - This is the same menu as EFIS > BUGS > HDG. This menu allows you to adjust and toggle a heading bug that appears on the DG display as well as the EFIS heading tape.

HS34 The heading bug can be adjusted at any time by rotating the HS34's HEADING knob. If the bug is currently toggled off, rotating the HEADING knob causes the bug to be displayed on the HSI display. To sync the bug to your current heading, press the HEADING knob briefly. To toggle the heading bug on or off, push and hold the HEADING knob for more than 1 second.

COURSE (Nav mode, Localizer active) - This is used to set the OBS/course. The SL-30 does not allow you adjust the OBS when tuned to a localizer so this must be done locally on the instrument.

HS34 When you have an HS34 with any NAV instrument, the course knob on the HS34 adjusts the course/OBS. You can adjust the course when in NAV or localizer mode. When using a GPS such as the 430/530, that allows an external course command to control the instrument, this course adjustment also works. If the GPS or NAV device is in a mode where it is ignoring course commands, turning the course knob results in no change on the screen. This is true when you are in most GPS modes.

SCALE (GPS mode) - This is used to cycle through the three GPS scale modes.

HS34 The scale button only exists if the source you are connected to is not providing scale information.

7. AUTOPILOT OPERATION

This section guides you through the indicators and operation of Dynon’s EFIS-based Autopilot (AP) system. This section assumes that the AP has already been installed, configured, and tuned according to the EFIS-D100 Installation Guide. Additionally, it assumes that you are already familiar with the operation of the EFIS-D100 menu system, documented throughout this guide.

Introduction and Resources

Dynon Avionics’ Autopilot (AP) system is a competitively priced product for the Experimental & Light Sport Aircraft (LSA) aircraft market. Unlike standalone AP systems, Dynon’s AP is an enhancement to the Dynon Avionics EFIS-D10A, EFIS-D100, and FlightDEK-D180 products (beginning with firmware version 5.0). The Dynon Avionics AP provides roll (aileron) and/or pitch (elevator) control, leveraging the proven sensors, algorithms, and display systems of Dynon’s modern EFIS products. Another innovative element of the Dynon Avionics AP is that the servomotors (servos) responsible for actuating the control surfaces are “smart” devices. Dynon’s servos not only accept commands from the AP but also report “health,” resistance to commanded movements, motor override (or “slip”), and many other data elements back to the EFIS. This level of communication between AP control and motors provides the pilot with an unprecedented degree of awareness of the overall performance of the AP.

Because the Dynon Avionics Autopilot is a new product and we expect that it will be installed in a wide variety of aircraft, Dynon’s Internet sites provide up-to-date information on installation and operation issues:

wiki.dynonavionics.com – Dynon’s Documentation Wiki provides enhanced, extended, continuously-updated online documentation contributed by Dynon employees and customers.

forum.dynonavionics.com – Dynon’s Online Customer Forum is a resource for Dynon Avionics customers to discuss installation and operational issues relating to Dynon Avionics products. The Forum is especially useful for pilots with uncommon aircraft or unusual installation issues. For customers that cannot call Dynon Technical Support during our



normal business hours, the Forum is a convenient way to interact with Dynon Avionics Technical Support. The Forum also allows online sharing of wiring diagrams, photos, and other types of electronic files.

All Dynon instruments connected via DSAB must be running the same firmware version. This applies to the servos and AP74 as well, which are updated via the Bus Master EFIS. See the Autopilot Installation and Configuration section in your EFIS-D100 Installation Guide for more information.

- ! As with any autopilot, Dynon's AP is no substitute for the pilot remaining in full control of the aircraft. The AP is a supplement in the operation of the aircraft. While the AP is engaged, you should not engage in activities (such as sleeping, reading, etc.) that detract from your overall situational awareness.
- ! The Dynon Avionics AP requires an accurate magnetic heading to operate efficiently and comfortably in HDG and NAV/VOR modes. Therefore it is critical that the aircraft's compass be installed correctly, calibrated, and operating well *in all attitudes*.

EFIS AP Indicators

When 1 or more servos are installed and configured, the EFIS-D100's EFIS presentation includes some new indicators, described below. If these indicators do *not* appear on the EFIS page, the AP installation procedure must be performed per the AP Installation and Configuration chapter of the EFIS-D100 Installation Guide.

AP MENU AND STATUS INDICATOR (LOWER LEFT CORNER)

When 1 or 2 servos are installed, a new AP menu is available, replacing the BUGS menu on the EFIS main menu (BUGS is now available below the AP menu).

Additionally, an Autopilot status indicator is always displayed at the lower left side of the EFIS page, as shown at right. In a 2-axis system, the left indicator displays the state of the roll servo, and the right indicator displays the state of the pitch servo. If





only a pitch or only a roll servo is installed, that axis' indicator is shown just to the right of the "AP:" display. When either the roll or pitch axis is engaged, the entire indicator has a black background. The following table describes the different states for each axis and the relevant text descriptions in the AP status indicator.

- Example 1: **AP:OFF-OFF** (Roll and Pitch servos installed, AP disengaged)
- Example 2: **AP:HDG-ALT** (Roll and Pitch servos installed, AP engaged in HDG + ALT mode)
- Example 3: **AP:ALT** (Only Pitch servo installed, AP engaged in ALT mode, display of Roll mode suppressed)
- Example 4: **AP:HDG** (Only Roll servo installed, AP engaged in HDG mode, display of Pitch mode suppressed)

AP Status Indicator Modes		
AP State	Roll Display	Pitch Display
Status: Servo disengaged	OFF	OFF
Status: Heading Hold Mode; AP uses HDG Bug as target magnetic heading	HDG	<i>N/A</i>
Status: Track Hold Mode; AP uses HDG Bug (colored magenta) as target	TRK (<i>Magenta Text</i>)	<i>N/A</i>
Status: Control Wheel Steering Mode (When CWS is configured, and AP Disengage/CWS button held for more than 2 seconds). See: EFIS > SETUP > AP > BUTTON CONFIG.	CWS	CWS
Status: Currently in middle of 180 degree turn	180	ALT
Status: GPS Horizontal Navigation Mode	GPS (<i>Magenta Text</i>)	<i>N/A</i>
Status: ARINC GPS Steering Horizontal Navigation Mode	GST (<i>Magenta Text</i>)	<i>N/A</i>
Status: Radio-based VOR Horizontal Navigation Mode	VOR (<i>Green Text</i>)	<i>N/A</i>
Status: Radio-based LOC Horizontal Navigation Mode	LOC (<i>Green Text</i>)	<i>N/A</i>
Status: Altitude Hold Mode; AP uses Altitude Bug as target altitude	<i>N/A</i>	ALT



AP Status Indicator Modes		
AP State	Roll Display	Pitch Display
Warning: Servo slipping	<i>Mode display with yellow background</i>	<i>Mode display with yellow background</i>

AP Status Indicator Errors		
AP State	Roll Display	Pitch Display
Warning: Servo has been calibrated but not tested (See: SETUP > AP > SERVO TEST)	TST (<i>red text</i>)	TST (<i>red text</i>)
Warning: Airspeed outside min or max airspeed. See: SETUP > AP > PITCH SERVO.	SPD (<i>red text</i>)	SPD (<i>red text</i>)
Warning: Servo error condition detected, or servo not found. Check DSAB configuration, wiring, and servo power.	ERR (<i>red text</i>)	ERR (<i>red text</i>)

Any axis that is in any of the above error states cannot be engaged.

FAILURE MODES

The EFIS continuously monitors the overall operation of the AP as well as the state of incoming GPS data. If an error is detected, the subsystem where the error has occurred is restricted and reported. Some examples:

- If an error in the Pitch servo is detected, the AP reports an error in the Pitch servo, but continues operation of the Roll servo.
- If, while flying in GPS NAV mode, the user cancels the active waypoint or the GPS sends malformed navigation data, the AP fails over to TRK mode.



- If, while flying in HDG mode and compass data is lost, the AP fails over to TRK mode (if valid GPS data is present).
- If, while flying in NAV or TRK mode and GPS data is lost, the AP fails over to HDG mode (if valid compass data is present).

BUGS DISPLAY (LOWER RIGHT CORNER)

Whenever either the heading or altitude Bug is toggled ON (via the BUGS menu or the AP74) its current value is displayed in the lower right corner of the EFIS page.

Example: **005°/2250FT** (HDG bug toggled ON, set to 005° and ALT bug toggled ON, set to 2250 Feet). In the example at right, the heading bug is toggled on (i.e., displayed on the heading tape), but the AP HDG mode is currently disengaged.



BUGS GRAPHICAL APPEARANCE

When an AP is installed and configured, the appearance of the IAS, HDG, and ALT bugs is changed to reflect AP status. When the Autopilot is *not* engaged for a given axis, the respective bug is hollow (as shown at right). When the Autopilot *is* engaged for a given axis (HDG, TRK, ALT), the respective bug is solid, or “filled in.” Because the Autopilot does not currently have a settable airspeed mode, the IAS Bug is always displayed as a hollow outline.



AP Modes

The Autopilot can be engaged in the following modes. During AP-controlled heading/ground track changes, the AP turns the aircraft at the target turn rate specified in the EFIS > SETUP > AP > ROLL SERVO menu. The AP will not exceed the maximum bank angle, set in that menu. See the EFIS-D100 Installation Guide for detailed information on configuring these parameters.



HDG: HEADING MODE – ROLL SERVO

When the AP is engaged in Heading Mode, it uses the roll servo to control the aircraft's magnetic heading, with the goal of following the heading bug. You may adjust the heading bug, causing the AP-controlled aircraft to turn toward the new target heading. The AP's goal in the roll axis is to align the triangle of the numeric magnetic heading box with the inverted triangle of the heading bug.

TRK: GROUND TRACK MODE – ROLL SERVO

When the AP is engaged in Track Mode, it uses the roll servo to control the aircraft's GPS ground track, with the goal of following the heading bug (colored magenta to signify GPS mode). You may adjust the heading/track bug, causing the AP-controlled aircraft to turn toward the new target ground track. In Track Mode, the AP's goal in the roll axis is to align the magenta ground track triangle with the inverted triangle of the heading bug.

180: 180° TURN MODE – ROLL AND PITCH SERVOS

This special mode is a way to initiate a “quick turnaround.” When 180 Mode is initiated, the AP immediately engages in Altitude and Track Hold modes with the heading bug set to 180° from current ground track. (If a GPS is not connected or available, it engages in Heading Hold Mode.) The AP then turns the aircraft to the left until it is flying in the opposite direction, and then remains in Track and Altitude Hold Modes.

NAV: GPS NAVIGATION MODE – ROLL SERVO

To use the GPS-based NAV mode, your connected GPS must have an active waypoint (and must be outputting course and course deviation information). Additionally, the EFIS's HSI screen must have the GPS selected as the current NAVSRC (i.e., the CDI and other HSI information is colored magenta). When the AP is engaged in GPS Navigation Mode, it takes its instruction from the GPS unit's horizontal navigation information. The AP's goal in the roll axis is to center the CDI, flying you to the active waypoint on the desired course.



NAV: VOR NAVIGATION MODE – ROLL SERVO

NAV/VOR mode is available whenever a NAV radio source is selected as the HSI page's NAVSRC and the CDI reads TO or FROM. NAV/VOR mode is indicated by the annunciation "VOR" in the AP LAT:LON status. NAV/VOR mode intercepts from any position relative to the station and flies the radial specified on the OBS. It may not be able to complete an intercept within 10 miles if the aircraft is far from the desired course.

Note that NAV/VOR mode requires a working, calibrated compass and uses no references other than the compass and the NAV radio. (GPS is not required.) NAV/VOR reverts to and stays in HDG mode if the VOR indicates OFF, as when crossing the station.

NAV: LOCALIZER TRACKING MODE – ROLL SERVO

NAV/LOC mode is available whenever a LOC source is selected as the HSI's NAVSRC and is valid. NAV/LOC mode must be engaged only when the CDI needle is near center (not pegged at either end of the scale) and the airplane is on a heading near that of the runway. Runway heading for the ILS must be set via the OBS. NAV/LOC mode is indicated by the annunciation "LOC" in the AP LAT:LON status.

Note that NAV/LOC mode requires a working, calibrated compass and uses no references other than the compass and the NAV radio (GPS is not required). NAV/VOR reverts to HDG mode if the localizer signal becomes invalid.

NAV: GPS STEERING MODE – ROLL SERVO

The AP follows GPS Steering/ARINC roll commands from GPSs which produce them (such as the Garmin 430). An ARINC connection via an HS34 is required. This mode is available when the GPS is selected as the HSI page's NAVSRC and is outputting ARINC roll steering commands. NAV/GPSS mode is indicated by the annunciation 'GST' in the AP LAT:LON status. Note that GPSS is always used when the GPS provides roll steering commands.



ALT: ALTITUDE MODE – PITCH SERVO

When the AP is engaged in Altitude Mode, it uses the pitch servo to control the aircraft's altitude. You may adjust the altitude bug, causing the AP-controlled aircraft to climb or descend toward the new target altitude at the average vertical speed defined during setup. In Altitude Mode, the AP's goal in the pitch axis is to align the triangle of the numeric altitude box with the inverted triangle of the altitude bug.

During AP-controlled altitude changes, the AP causes the aircraft to climb or descend at the target vertical speed specified in EFIS > SETUP > AP > PITCH SERVO. When the AP is engaged and aircraft airspeed rises above the maximum, the AP enters an airspeed hold mode, pitching the aircraft up to prevent exceeding the maximum airspeed. When the aircraft's altitude rises above the target ALT bug and the AP cannot pitch the aircraft down without going above the maximum airspeed, the EFIS presents the prompt:

MAX AIRSPEED – REDUCE POWER

Likewise, when the AP is engaged and aircraft airspeed drops below the minimum, the AP enters an airspeed hold mode, pitching the aircraft down to prevent dropping below the minimum airspeed. When the aircraft's altitude drops below the target ALT bug and the AP cannot pitch the aircraft up without going below the minimum airspeed, the EFIS presents the prompt:

MIN AIRSPEED – ADD POWER

When the Autopilot is flying the aircraft in Altitude Mode, an out-of-trim indicator can appear to the right of the AP Status Indicator. This alerts you when the pitch servo detects excessive load on the elevator which would result in a large pitch excursion when the AP is disengaged. The indicator instructs you in the direction to trim the nose to produce more neutral trim. In the example at right, the indicator appears until the pilot trims the aircraft nose up until neutral trim. During turbulence and small bumps the trim indicator may flash on and off. Do not take action based on the trim indicator until it remains on for several seconds.





AP Control Methods

The AP can be controlled and monitored in a number of ways (described in detail in the sections below):

- EFIS menus: Set HDG or TRK and ALT bugs (AP targets), change AP modes, engage/disengage AP
- AP74 AP Control Panel: Set HDG or TRK and ALT BUGS (AP targets), arm AP modes, engage/disengage AP
- HS34 HSI Control Panel: Set HDG or TRK and ALT BUGS (AP targets)
- Disengage/Control Wheel Steering (CWS) pushbutton: engage/disengage AP

EFIS Autopilot Control

This section describes the various AP control functions available via the EFIS > AP menu.

With an AP installed and configured, the AP menu is shown on Button 3 (hereafter, shown in documentation as “EFIS > AP”). This replaces the BUGS menu (relocated under the AP menu).



The AP menu includes the following buttons and functionality:

- **BUGS:** Works as the BUGS menu has in previous firmware versions and is documented on page 5-2. The HDG or TRK (*note that this bug will display as either HDG or TRK depending on autopilot's mode of operation*) and ALT bugs now control the targets for the autopilot's HDG/TRK and ALT modes, respectively.
- **MODE-(H, T, or N):** The MODE button is followed by the currently active lateral mode: H (HDG), T (TRK), or N (NAV). When the roll axis of the AP is engaged (by pressing button 3, the lateral engage button), it flies in the mode set in this menu. Pressing this button brings up another menu where you can select the armed AP mode. As soon as you select a mode, the AP menu is immediately displayed again.





- **(HDG, TRK, or NAV)OFF/ON**: The menu label also reflects the currently active lateral mode, and whether or not the AP is engaged in that mode. Pushing this button toggles between ON and OFF, activating and deactivating the roll servo in the specified mode. ALT and HDG or TRK modes can be enabled independently of each other. When the Autopilot is engaged in HDG or TRK mode, the heading bug is synchronized to the current heading or ground track, respectively. The heading or track bug can then be adjusted while the AP is engaged.
- **ALT OFF/ON**: The menu label reflects whether the AP is currently engaged in Altitude Mode. Pushing this button toggles between ON and OFF, activating and deactivating the pitch servo in altitude mode. When the Autopilot is engaged in ALT mode, the altitude bug is synchronized to the current altitude. The altitude bug can then be adjusted while the AP is engaged. When ALT mode is deactivated, the altitude bug is toggled off.
- **180**: Puts the AP into 180 Mode TRK (or HDG, if no GPS available) and ALT modes, and sets the heading bug to 180° from the current ground track. While in 180 Mode, the 180 button is highlighted, and the AP Status Indicator displays “180” in the roll axis position.



AP74 Autopilot Control

This section describes how to control the Autopilot via the AP74. When an AP74 is installed, the Autopilot can still be controlled via the EFIS-based AP menu. The AP74 has all the functionality of the EFIS > AP menu, while providing a more efficient way to interpret and use the Autopilot. It also provides some additional features, such as the ability to arm modes prior to engagement, and easy adjustment of AP targets via its dedicated knob.

AP74 INDICATORS

The AP74's button indicators (red lights) have the following meanings:

- AP button indicator: ON when *any* Autopilot axis is active (i.e., servo controlling aircraft).
- HDG button indicator: ON when lateral/roll servo is armed or active in Heading Mode. If the AP button indicator is on, the roll servo is *active* in Heading Mode. If the AP button indicator is off, the roll servo is *armed* in Heading Mode.
- TRK button indicator: ON when lateral/roll servo is armed or active in Track Mode.
- NAV button indicator: ON when lateral/roll servo is armed or active in Navigation Mode.
- ALT button indicator: ON when vertical/pitch servo is armed or active in Altitude Mode.

AP74 CONTROLS

AP Button: When its indicator is off, pressing the AP button engages the AP in the pre-armed mode(s) indicated by the Horizontal and Altitude Mode button indicators below. Depending on how you have configured bug synchronization, the AP may synchronize the bugs for pre-armed HDG, TRK, or NAV modes upon pressing the AP button. Read Pre-select Configuration on page 7-14 for more details on configuring this behavior for your needs. If no mode is armed, pressing the AP button engages the AP in HDG mode only.





AP Button: When its indicator is off, pressing the AP button engages the AP in the pre-armed mode(s) indicated by the Horizontal and Altitude Mode button indicators below. Depending on how you have configured bug synchronization, the AP may synchronize the bugs for pre-armed HDG, TRK, or NAV modes upon pressing the AP button. Read Pre-select Configuration on page 7-14 for more details on configuring this behavior for your needs. If no mode is armed, pressing the AP button engages the AP in HDG mode only.

When the AP button's indicator is on, pressing the AP button disengages all axes of the AP, but leaves the last-used modes armed (unless configured to clear modes in setup). If you push and hold the AP button for 2 seconds, the AP engages in 180 Mode.

VALUE Knob: When no menus are displayed, the VALUE knob changes the BARO, ALT bug, and HDG bug settings. When in any EFIS menu which adjusts a numerical value, turning the VALUE knob adjusts the selected parameter. Pressing the VALUE knob when in any menu exits the menu system completely. Pushing and holding the knob while changing a bug synchronizes the bug to the current value. Pushing and holding the knob while changing the BARO sets the barometer to 29.92 inHg. Further behavior can be configured, as described on page 7-13.

HDG Button: When its indicator is off, pressing the HDG button arms the roll servo in Heading Mode and turns on the indicator. Depending on how you have configured bug synchronization, the heading bug may be synchronized to the current heading value upon pressing the HDG button. Read Pre-select Configuration on page 7-14 for more details on configuring this behavior for your needs. The heading bug can always be adjusted while the AP is engaged.

When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button's indicator.

TRK Button: When its indicator is off, pressing the TRK button arms the roll servo in Track Mode and turns on the indicator. Depending on how you have configured bug synchronization, the heading/track bug may be synchronized to the current GPS ground track upon pressing the TRK button. Read Pre-select Configuration on page 7-14 for more details on configuring this behavior for your needs. The heading/track bug can always be adjusted while the AP is engaged.



When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button's indicator.

NAV Button: When its indicator is off, pressing the NAV button arms the roll servo in Navigation Mode and turns on the indicator. If the AP is already engaged, pressing the NAV button activates the roll servo in Navigation Mode. In Navigation Mode, the AP flies the aircraft based on the navigation information displayed on the HSI page.

When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button's indicator.

ALT Button: When its indicator is off, pressing the ALT button arms the pitch servo in Altitude Mode and turns on the indicator. Depending on how you have configured bug synchronization, the altitude bug may be synchronized to the current altitude value upon pressing the ALT button. Read Pre-select Configuration on page 7-14 for more details on configuring this behavior for your needs. The altitude bug can then be adjusted while the AP is engaged.

When its indicator is on, pressing the button disarms/deactivates the pitch servo and turns off the button's indicator. When ALT mode is deactivated, the altitude bug is toggled off, disabling the altitude alerter.

VALUE KNOB CONFIGURATION

The VALUE knob changes the BARO, ALT bug, and HDG bug settings and is configured in the -VALUE KNOB- portion of this menu.

The VALUE knob can be configured to require an initial push before rotating the knob has any effect (REQUIRE PUSH: YES / NO).

The default mode of the VALUE knob is configured by setting FIRST ACTION: to ALT, HDG, or BARO. This configures whether the altitude bug, heading bug, or barometer is the first action to be adjusted by the knob.

If REQUIRE PUSH is set to YES:

- The first push of the VALUE knob activates the FIRST ACTION mode (ALT, HDG or BARO) and displays a “pop-up” window indicating the current mode and value. Rotating the knob within 5 seconds changes the value of the



FIRST ACTION mode. A second push of the VALUE knob within 5 seconds after rotating the knob de-activates the VALUE knob and closes the pop-up window. If there is no further action (either a knob push or knob rotation), the VALUE knob automatically de-activates (times out) after 5 seconds and closes the pop-up window.

- If, after the first push of the VALUE knob, the knob is *not* rotated, subsequent pushes cycle through the 2nd and 3rd settings in the rotation, in the order BARO, HDG, ALT, <off>.

If REQUIRE PUSH is set to NO:

- Rotating the VALUE knob changes the value of the FIRST ACTION mode (ALT, HDG, or BARO) and displays a pop-up window indicating the current mode and value. Pushing the VALUE knob again within 5 seconds of the last knob rotation closes the pop-up window.
- Pushing the VALUE knob without first rotating it cycles through the remaining modes (not chosen by FIRST ACTION above). Pushing the VALUE knob cycles through these modes in the order BARO, ALT, HDG, <off>.
- If there is no further action (either a knob push or knob rotation) within 5 seconds, the pop-up window automatically closes.

PRE-SELECT CONFIGURATION

In the -BUGS- section of the AP74/76 SETTINGS menu, you can choose when the heading and altitude bugs should be synchronized to their respective current values:

- ON ENGAGE: The HDG and ALT bugs are synchronized to the heading and altitude values each time the AP is engaged (via the AP button on the AP74 or in the EFIS AP menu). This is the default setting.
- ON MODE ARM: The HDG and ALT bugs are synchronized when their respective mode is armed. When the HDG or TRK buttons are pushed on the AP74, the HDG/TRK bug is synchronized to the current heading. When the ALT button is pushed on the AP74, the ALT bug is synchronized to the current altitude. When the autopilot is engaged, the bug settings are not modified. This allows you to enter a desired heading and/or altitude prior to engaging the AP.



- **NEVER:** The HDG and ALT bugs are never automatically modified by turning on the AP or changing AP modes. Be aware that the bugs are highly likely to be set far away from the current heading and altitude at the time of AP engagement; **this will result in the AP immediately commanding a turn and a climb or descent at time of engage. When using this mode, we recommend that you verify the EFIS' bugs settings prior to EVERY Autopilot engage.**

MODE CLEARING CONFIGURATION

In the –CLEAR MODES– section, you can configure whether the autopilot clears the active modes (HDG, TRK, or NAV; and ALT) on AP disengage. If you select NO, the AP leaves the mode(s) pre-armed when the AP is off. This leaves the last-used roll mode (HDG, TRK, or NAV) and/or pitch mode (ALT) lights lit on the AP74. You may, of course, switch to new modes prior to re-engaging the AP. If you select YES, the AP disarms all modes upon disengaging the AP, turning off all mode lights on the AP74. You must then select the active modes prior to re-engaging the AP (although if no modes are pre-armed, pressing the AP button causes the HDG mode to be engaged by default).

Clearing modes on disengage is most useful when used in conjunction with the ON MODE ARM pre-select configuration above. This forces you to explicitly enable (and thus synchronize) the modes you wish the autopilot to control when you press the AP button.

The default value for this setting is NO, leaving all modes pre-armed after turning off the AP.

Disengage/Control Wheel Steering (CWS) Pushbutton

The primary function of the Disengage/CWS pushbutton is to disengage the Autopilot. While the AP Disengage/CWS button is held down, the servos are electrically disengaged and cannot control the aircraft. If configured in the EFIS > SETUP > AP > BUTTON CONFIG menu, the button can also serve as a control wheel steering mechanism, as described below.



HOLD TO ENGAGE

Setting HOLD TO ENGAGE to Y allows you to engage the Autopilot by holding the Disengage/CWS Button for more than 2 seconds. This allows for a convenient alternative to engaging the Autopilot via the menus and/or AP74 AP button. Default is N.

When this mode is active, anytime the autopilot is disengaged you can engage it by pressing and holding the Disengage/CWS Button for more than 2 seconds, then releasing. Note that after 2 seconds, the AP status indicator at lower left of the EFIS screen shows **AP:CWS-CWS**. This indicates that the servos are in Control Wheel Steering mode and are waiting for the button to be released before reengaging.

CONTROL WHEEL STEERING

When set to Y, the BUTTON CONFIG > CTRL WHEEL STEER > ENABLED option enables a secondary mode of the AP Disengage/CWS Button. This mode allows you to be flying under AP control, press *and hold* the Disengage/CWS Button while flying to a new heading and/or altitude, then release the button to reengage the Autopilot. The Autopilot reengages in the mode set by the MODE parameter, described below. Note that while holding down the button, the AP status indicator at lower left of the EFIS screen shows **AP:CWS-CWS**. This indicates that the servos are in Control Wheel Steering mode and are waiting for the button to be released before reengaging.

When the Control Wheel Steering ENABLED parameter is set to Y, the MODE parameter selects between two different ways of reengaging the Autopilot after the AP Disengage/CWS Button is released:

- Last Heading and/or Altitude (LAST HDG/ALT) - the AP is engaged and returns to the selected Heading and/or Altitude
- Hold Heading and/or Altitude (HOLD HDG/ALT) - the AP is engaged and changes the selected Heading and/or Altitude to match the current Heading and/or Altitude.



If CWS mode is engaged and during this time *airspeed exceeds AIRSP MAX* (SETUP > AP > PITCH SERVO) releasing the AP Disengage/CWS Button will *not* re-engage the AP. The Autopilot can only be re-engaged when airspeed is below AIRSP MAX.

Optional Preflight Checklist

If you desire an Autopilot preflight test, the following can be used as a baseline.

1. With the circuit breaker for the servos powered OFF, test the controls for proper operation of the control surfaces. The controls should feel normal; the servos should add little resistance. The EFIS-D100 should display an alert regarding DSAB connectivity. Additionally, the AP Status display should show AP:ERR:ERR.
2. With circuit breaker for the servos powered ON, observe the EFIS. Verify that the AP Status indicator now shows AP:OFF:OFF.
3. Repeat Step 1; the “feel” should be the same as with servo power OFF.
4. Enter the EFIS > SETUP > AP > SERVO TEST menu and follow on-screen instructions. This verifies proper operation of the AP servos and AP Disengage/CWS button.

8. ALERTS

Alarm Indicators

Any time a built-in or preconfigured alarm set point is exceeded, you are alerted to the fact via the alarm bar and menu at the bottom of the screen.

When an alarm is triggered, the following things occur:

- A red alarm bar appears at the bottom of the screen with a message identifying the out of range measurement
- Below the alarm bar, the alarm menu gives you options for what to do next. See the following subsections for more information

Note that alarms may not be acknowledged during the initial two seconds of the first alarm.

In an alarm condition, the EFIS-D100 does not alert you audibly. The audio out connection on the EFIS-D100 is for AOA and autopilot alerts only. If you have a Dynon EMS-based product installed, connected to both your EFIS-D100 and cockpit audio system, EMS-based alarms will still sound an audible alarm.

DSAB

If your EFIS-D100 is networked to other Dynon products via DSAB, alarms sourced from those products will appear on your EFIS-D100 as well. Alert messages sourced from your EFIS-D100 are preceded by the label “THIS.” Alert messages sourced from another Dynon product are preceded by the label “DSAB.” Pressing SILNCE or ACK on any unit in the system silences or confirms the alarm on all units in the system. See the EFIS-D100 Installation Guide for more information.

AP74

HS34

If installed, either the HS34 or AP74 (but not both) can be configured to output EMS, EFIS, and AOA alarm information with tones (such as with direct audio connections to the EMS and EFIS), or via spoken voice alerts.



When configured for voice alerts, the HS34 reads out an alarm that occurs, such as “CHT 1 HIGH” or “LOW FUEL.” These voice alarms can be acknowledged and silenced just like the EMS tone.

SHOW PAGE

If the alarming measurement is not displayed on your current screen, or is available on a page which displays it better, a SHOW [PAGE] button is included in the alarm menu. [PAGE] is replaced with the name of the actual page that is displayed when you press the button. Press this button to display the page where the alarming measurement is best displayed. From there, you may press GO BACK to return to your original screen, leaving the alarm indications active, or press ACK to remove the alarm indications and return to your original screen.

ALARM ACKNOWLEDGEMENT

To acknowledge the alarm, press the ACK button. The ACK button has a number next to it indicating the number of currently posted alarms. If this number is higher than 1, after you press ACK, you will see the alarm text for the next posted alarm. Pressing ACK does the following:

- Removes the alarm bar and alarm menu (if no other alarms are stacked up), and brings up the previous menu.
- Stops the blinking of the relevant display
- Returns the display to the screen configuration displayed before the alarm occurred (if you pressed SHOW [PAGE])

The tic and numeric value remain red until the condition no longer exists. The alarm automatically rearms whenever the alarm condition is removed.

AP74

HS34

When acknowledging a voice alert from the HS34 or AP74, the full text of the current alarm is read before it is silenced; no other queued alarms will be announced after that.



Multiple Alarms

Any time multiple alarms occur in quick succession, they are handled in the following way:

1. Each numeric value and gauge posts its alarm by turning red, blinking, bringing up the alarm bar, and triggering the external light and audio alert.
2. Alarm messages in the alarm bar are stacked into memory and presented in the order in which they occurred, unless a higher priority alarm occurs. Removal of the Alarm Bar requires separate pilot acknowledgement of each alarm.
3. The ACK button displays a number indicating the number of stacked up alarms.
4. When the last alarm is acknowledged, the Alarm Bar and Alarm Menu are removed from the screen.
5. Once the top alarm is acknowledged, the next alarm in the stack is shown.

DSAB Alerts

DSAB

When multiple Dynon Avionics instruments are networked together via DSAB, there are a few error messages designed to warn you of failures or reduced functionality.

NETWORK CONFIGURATION ERROR: This error can only occur within a short period of time after the system is turned on. This error indicates that a unit that was expected to be on the DSAB network was not found. For example, if – in a system consisting of a FlightDEK-D180, EFIS-D100, and an HS34 – all three units are not present, this error appears. This error is displayed when any part of the system is not working, including backup EDCs or OATs.

If this error is unexpected, check all Dynon equipment for proper function, and cycle the power to all units. Additional information on the missing unit can be found on the network status page under **SETUP > DSAB > STATUS**. If a unit is purposefully removed from the system, refer to the EFIS-D100 Installation Guide for instructions on reconfiguring the network.



NETWORK CONNECTION LOST: This error means that all network communication has stopped. In this event, no instruments share data or settings until the cause of the communication problem is resolved and all units are power cycled. Individual units that are powered on and functioning continue to function using their internally-derived data.

<INSTRUMENT FUNCTION> CONNECTION LOST: This indicates that the network is still functioning, but a device in charge of providing a specific role on the network has stopped communicating. This means that other screens in the system can no longer display information related to that function. If you receive an “EMS LOST” message on an EFIS product, all EFIS-related pages still function, but all EMS pages are blank. This failure can warn about subsystem failures, such as an EDC or an OAT. In these cases, the device falls back to a local OAT or EDC, if it is available. The <INSTRUMENT FUNCTION> LOST message is preceded by “THIS:” or “DSAB:” on each connected display instrument. If the label is “THIS:” then the screen with this label is the source of the failure. If the message begins with “DSAB:” then the message indicates a failure on another device.

This message relates to the function on the network that goes missing, not the specific name of the unit that fails. A FlightDEK-D180 can be a provider of EFIS and/or EMS data, so the failure of a D180 would present as "EMS" and/or "EFIS" lost, depending on its function in the network.

HS34 If the HS34 is not communicating on DSAB properly, both the NAV and GPS lights are illuminated. During normal system operation both lights will never be illuminated simultaneously; dual illumination indicates a communication failure. Additionally, if the DSAB network fails in flight “DSAB ERROR” will be annunciated via HS34’s the audio output.

9. APPENDIX

This appendix contains information not covered in the main section of the manual. This section contains reference tools such as a detailed description of the serial data format output by the EFIS-D100, a specifications sheet, and a troubleshooting guide. This section also contains details regarding EFIS-D100 servicing.

Appendix A: Serial Data Output

The EFIS-D100 has one RS232 serial port which outputs EFIS data. Technical information on the installation and connection to these serial ports can be found in the EFIS-D100 Installation Guide. To log EFIS data, you must connect the serial port to a PC. This serial data can be logged using any standard serial terminal program such as HyperTerminal®. It can then be parsed into its respective columns by many spreadsheet programs including Microsoft Excel®. All numbers are output in decimal and are standard ASCII. To view the data using a terminal program, the following settings should be used for both serial ports:

Baud rate: 115200
Data: 8 bit
Parity: none
Stop: 1 bit
Flow control: none

The following section details the format used for EFIS data output.



EFIS SERIAL DATA OUTPUT

The format for the data sent out the EFIS RS232 port is:

Start Char	Width	Description	Notes
1	2	Hour	00 to 23, current Zulu time hour according to EFIS-D100's internal clock.
3	2	Minute	00 to 59, current Zulu time minute according to EFIS-D100's internal clock.
5	2	Second	00 to 59, current Zulu time second according to EFIS-D100's internal clock.
7	2	Fractions	00 to 63, counter for 1/64 second. Data output frequency.
9	1	Pitch Sign	'+' or '-' (positive means aircraft is pitched up).
10	3	Pitch	000 to 900, pitch up or down from level flight in 1/10 degrees (900 = 90°).
13	1	Roll Sign	'+' or '-' (positive means aircraft is banked right).
14	4	Roll	0000 to 1800, roll left or right from level flight in 1/10 degrees (1800 = 180°).
18	3	Yaw	000 to 359 in degrees (000 = North, 090 = East, 180 = South, 270 = West).
21	4	Airspeed	0000 to 9999, airspeed in units of 1/10 m/s (1555 = 155.5 m/s).
25	1	Altitude Sign	'+' or '-' (positive means altitude is above sea-level).
26	4	Altitude	0000 to 9999, altitude in units of meters; alternates between pressure and displayed altitude, depending on status bitmask, starting at character 42.
30	1	Turn Rate/VSI Sign	'+' or '-' (positive means aircraft is turning right). Alternates between turn rate and VSI sign, depending on status bitmask, starting at character 42.
31	3	Turn Rate or VSI	Alternates between turn rate and VSI, depending on status bitmask, starting at character 42. When turn rate, 000 to 999, 1/10 degrees/second rate of yaw change. When VSI, 000 to 999, 1/10 feet/second.
34	1	Lateral g's Sign	'+' or '-' (positive means aircraft is experiencing leftward lateral acceleration).
35	2	Lateral g's	00 to 99, lateral g's in units of 1/100 g (99 = 0.99 g's).



Start Char	Width	Description	Notes
37	1	Vertical <i>g</i> 's Sign	'+' or '-' (positive means aircraft is experiencing upward vertical acceleration).
38	2	Vertical <i>g</i> 's	00 to 99, vertical <i>g</i> 's in units of 1/10 <i>g</i> (99 = 9.9 <i>g</i> 's).
40	2	Angle of Attack	00 to 99, percentage of stall angle.
42	6	Status Bitmask	A 6-character ascii-hex field representing a 24-bit status bitmask. When the value of bit 0 (LSbit) is 0, the altitude field is displayed altitude, and turn rate is output in characters 30-33. When the value of bit 0 is 1 the altitude field is pressure altitude, and VSI is output in characters 30-33.
48	2	Internal use	Internal use – ignore
50	2	Checksum	The ascii-hex 2 byte sum of all 49 preceding bytes.
52	2	CR/LF	Carriage Return, Linefeed = 0x0D, 0x0A.

As an example, the following is what one line of serial data looks like:

```
00082119+058-00541301200+9141+011-01+15003EA0C701A4<CR><LF>
```

Appendix B: PC Support Program

Dynon offers a free PC Support Program which allows you to upload new firmware and checklists. The latest version of this program is available from our website at downloads.dynonavionics.com.

Appendix C: Troubleshooting

See the EFIS-D100 Installation Guide Appendix for a variety of troubleshooting tips and solutions. You may also reach us and other active users at our online support forums located at: forum.dynonavionics.com.



Should you experience difficulty with your product that is not solved by reading the troubleshooting section or by posting on our forum, please call us at (425) 402-0433 or email us at support@dynonavionics.com. Be sure to have the EFIS-D100's firmware version number ready when you contact us. To locate your product's firmware version, refer to the Check firmware version section on page 5-11.

See the following list of alert messages displayed by the EFIS-D100. The list provides information about what they mean and what to do about them.

DISPLAYED ALERT MESSAGES

The following table describes the alert messages that the EFIS-D100 can display.

Alert Message	Description	End condition
INTERNAL ERROR SERVICE UNIT	This error can occur for a few reasons, including an aborted upload. It signifies that the EFIS-D100 has detected internal problems in its firmware or calibration tables.	When this error appears, it may be possible to recover your unit in the field. The best way of ensuring this is to call Dynon Avionics immediately. However, there is a good possibility that the unit will have to be returned for service.



Alert Message	Description	End condition
ATTITUDE RECOVERING...	This alert is displayed anytime the unit is rotated at a rate faster than 150 degrees/second or the unit is powered on with airspeed applied. Rotating the unit faster than this threshold will saturate the gyros, leading to potentially erroneous display. The blue/brown horizon indication will turn grey and black to indicate that the artificial horizon is not currently a trusted source. Note that this alert only appears when airspeed is non-zero; using the EFIS-D100 on the bench will not trigger this alert.	The grey/black horizon indication and onscreen message will remain until the unit has resumed normal operation. In the case of rotation rate greater than 150 degrees/second, the unit enters a fast recovery mode and usually recovers within 5 seconds of coordinated flight.
TEMPERATURE UNSTABLE	When the unit is turned on after having been off for a long period, its internal temperature will rise above ambient at a fast rate. This fast change in temperature can sometimes reduce the reliability of the output of the sensors. Therefore, this alert is displayed and the horizon indication is changed from blue/brown to grey/black.	The screen remains normal color, but the message is displayed until the temperature within the unit has stabilized. This temperature instability should last no longer than 2 minutes. For this reason, it is a good idea to turn the unit on before you run through any of the preflight procedures, so that it will be ready by the time you are ready to fly.
TEMPERATURE OUT OF SPEC	The temperature inside the unit is outside of -30°C to 50°C.	The screen remains normal color, but the message is displayed until the temperature within the unit is within the specified range. This is most common in unventilated panels during hot periods. If you continue to see this alert, provide more airflow to the space around the EFIS-D100.



Alert Message	Description	End condition
INTERNAL BATTERY LOW	You will see this alert only when operating the unit solely off the internal backup battery. When its voltage has dropped below a certain threshold, you will see this alert. Additionally, the voltmeter will be displayed onscreen. When you see this alert, it is advisable that you turn the unit off by pressing the POWER button in Main Menu 1.	The alert will disappear when you press any button; however, it is advised that you do not ignore this alert, as it appears when the unit's internal battery has very little life left. This alert will also go away upon the application of either the external backup battery or Master Power. At that point, the battery will begin charging off the external power.
REMOTE COMPASS NOT DETECTED	The EFIS-D100 is unable to communicate with the EDC-D10A. If you have an OAT connected to your EDC-D10A, you will lose this reading, as well.	Ensure that you a) have an EDC-D10A installed and b) have verified that the wiring to the EDC-D10A is correct. Please see the EFIS-D100 Installation Guide for more information on verifying the installation of the EDC-D10A. This error also can appear if you have updated the firmware in your EFIS-D100 while the remote compass was <i>not</i> connected. If this is the case, try uploading the new firmware again with the EDC-D10A connected. Attempt the connection within the first few seconds of operation. Note that the EFIS-D100 does not have internal magnetic sensors and thus <i>requires</i> the EDC-D10A be connected.



Alert Message	Description	End condition
OAT SENSOR NOT DETECTED	This alert appears when the EFIS has an OAT connected and then loses that connection for some reason. Either the EDC-D10A has become disconnected, or the OAT sensor itself has become disconnected from the EDC-D10A.	Double-check your wiring between the EFIS-D100 and the EDC-D10A as well as that of the OAT sensor.



Appendix D: EFIS-D100 Specifications

Mechanical	Mounting:	6.95" wide x 4.90" tall x 4.51" deep (177 x 125 x 115 mm)
	Weight:	2 lb 13.5 oz. (1.29 kg) 3 lb 4 oz. (1.47 kg) with internal battery AP74: 10.7 oz. HS34: 11.3 oz.

Operating Temperature	-22° to 122° F (-30° to 50° C)
------------------------------	--------------------------------

Power	Voltage:	10 - 30 Vdc
	Power:	12 watts typical; 17 watts maximum

Connections	Wiring:	D-25 male
--------------------	---------	-----------

Screen	Type:	AMLCD, TFT (Thin Film Transistor)
	Backlight:	400 nits or 800 nits
	Size:	7.0" diagonal (178 mm)
	Resolution:	854 x 480 color pixels



Inputs/Outputs

- 1 - Audio Alarm
 - 1 - RS-232 bidirectional PC communication
 - 1 - RS-232 data input (GPS, SL30, etc.)
 - 1 - Dynon Smart Avionics Bus (DSAB)
-