EFIS-D10
Electronic Flight Information System

Pilot's User Guide

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Welcome

Thank you for purchasing the Dynon Avionics EFIS-D10 Electronic Flight Information System. This small device, which fits into a standard 3 1/8 inch instrument panel hole, combines the full functionality of 10 instruments vital to the small aircraft pilot. As you will discover, the EFIS is a powerful tool, useful in a variety of small aircraft, at a price that small aircraft owners can afford.

Because of recent advances in solid-state sensor technology, electronic flight instrument prices have drastically dropped. This allows us to create new instruments such as the EFIS-D10. Using solid-state gyros, magnetometers, and accelerometers the EFIS-D10 gives you reliable and accurate information about your flying environment. Your current altitude, airspeed, compass heading, vertical speed, pitch, and roll can all be displayed on one screen. Completely customizable, the EFIS-D10 allows you to display as much or as little information as you want, allowing you to tailor it to your needs.

The latest version of this manual may be downloaded from our website at www.DynonAvionics.com. From the main page, simply click the Documentation link under Products > EFIS-D10.

About this manual

This guide serves dual purposes. The first is to help you set up and get acquainted with the EFIS-D10's many functions. The second is to give you quick and easy access to vital information.

It is *strongly* recommended that you read the entire manual before attempting to utilize the EFIS-D10 in an actual flying situation. Additionally, we encourage you to spend time on the ground to familiarize yourself with the operation of the unit. This can be achieved either by using the unit's internal battery (which lasts a minimum of 2 hours on a full charge) or by using the unit in your plane while the master switch power bus is switched on. Finally, we encourage you to keep this manual in the plane with you at all times. This document has been 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 manual prudently.

As you read through this manual, you may come across words that are not familiar to you or for which you would like to know more about. The Glossary on page 29 will help you to more fully understand the many technical terms that are associated with solid-state technology.

In the electronic (.PDF) version of this manual, underlined words act as hyperlinks taking you to the relevant section in the manual that the word refers to. Additionally, clicking on any of the sections listed in the Table of Contents above will jump directly to that section.

This section gives you a brief overview of the various hardware components of your EFIS-D10. This section serves as a reference only and should not be used for diagnostic or reparative work. However, it will help you to familiarize yourself with the inner workings of the unit. For detailed installation instructions, please refer to the EFIS-D10 Installation Guide.

Main Unit

- The display is a 450 nit LCD screen, much brighter than most laptop displays

- Attitude information is obtained from 3 solid-state gyrometers and 3 solid-state accelerometers. Heading information is obtained from 3 solid-state magnetometers. Airspeed, altitude and angle of attack are obtained from three separate pressure transducers.

- User interaction takes place via the 6 buttons along the bottom of the front panel of the unit. Feedback is given via short text messages along the bottom of the screen.

Internal Battery

- The internal battery is an optional accessory to the EFIS-D10, allowing the unit to operate in the event of an external power failure.

- The lithium ion battery is rechargeable and is managed by the EFIS-D10 whenever an external power source is connected.

- Under normal conditions, the internal battery should have a voltage between 13 to 16.8 Volts. You will receive a low battery warning when the voltage drops below 13 volts.

- When fully charged, the internal battery is rated for a minimum of 2 hours of normal operation with the EFIS-D10.

This section is meant to give experienced pilots and technicians an easy way to get started with the EFIS-D10. However, it is suggested that you read the entire manual and familiarize yourself with the EFIS-D10 before using it in flight. This section assumes that you have completed the installation of the EFIS-D10 as described in the Installation Guide and performed all relevant calibration routines. The section first takes you on a tour of the main onscreen elements. Then, it gives you an overview of the menu system. For a more detailed look at the many functions of the menu system, refer to the Menu Functions section below this one.

Onscreen Elements

This section will give you a quick look at every piece of information available to you onscreen. Below, you will find a diagram showing you, at a glance, the *default* screen elements. Following that is a more detailed look at each item. Additionally, some items, like the VSI and the G-meter, are not shown by default but are dealt with in the next section on the menu system.
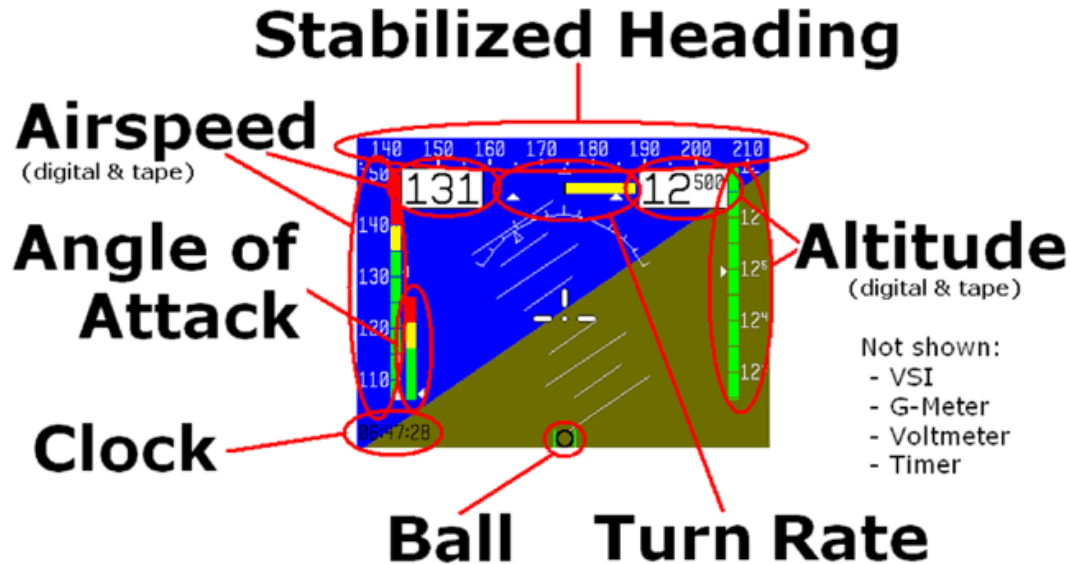
Horizon line, pitch and roll indicators

Bounded on the top by blue, and on the bottom by brown, the horizon line works in much the same way that you would expect a traditional gyro-based artificial horizon to work. The notable exception to this is the fact that it does not have a roll or pitch limitation in its display. The division between blue and brown stays parallel to the actual horizon line regardless of your pitch or roll. The parallel lines above and below the horizon line are the pitch indicator lines. Each line represents 5 degrees of pitch. Similarly the arrow rotating around the roll indicator gives you an idea as to the value of your roll. Each tic mark represents 10 degrees of roll.

Stabilized heading tape

This element functions much like a standard cockpit magnetic compass. The triangle alerts you to your current heading allowing you to quickly ascertain the value in degrees based on the surrounding values.

Altitude digital readout

The digital readout of your altitude, like the tape bar, displays thousands of feet using large numbers and hundreds of feet using small numbers. Its proximity to the altitude bar will allow you to quickly and easily associate the two screen elements. During the first 30 seconds of operation, the altitude digital readout and tape will not be displayed as the unit needs a small amount of time before altitude measurements are deemed accurate.

Altitude tape

The altitude tape bar gives you a visual representation of your altitude. The white triangle gives you an analog view of your current altitude while the digital readout gives you a more precise
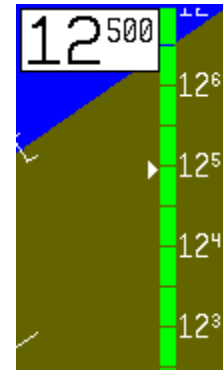
picture. Thousands of feet are displayed using large numbers while hundreds of feet are displayed in small numbers. As mentioned above, the altitude tape will not be displayed during the first 30 seconds of operation.

Angle of attack (AOA) tape

The angle-of-attack tape indicates the aircraft's current AOA relative to the stall AOA. The AOA calibration process, described in the AOA/Pitot Installation Guide, will nominally result in the lowest angle-of-attack stall (usually the "clean" configuration) occurring at the intersection of the yellow and red lines and the higher angle-of-attack stall (usually the "dirty" configuration) occurring at the top of the red. To properly use the AOA indicator, the pilot must keep in mind the present configuration of the aircraft and the corresponding stall indication on the AOA tape. Please refer to the AOA/Pitot Installation Guide for more information.
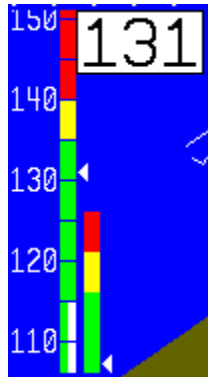
Airspeed digital readout

In the upper left region of the display, you will find the digital readout of your current airspeed. Like the altitude digital display, its numbers are the largest characters on the screen, giving you quick access to important information as you scan the display.

Airspeed tape

The airspeed tape utilizes 4 colors to give you a graphical representation of your speed. By default all of the color thresholds are set at 0, displaying a grey tape. You must utilize the EFIS-D10 Support Program on your PC to set the values of the airspeed color thresholds. Please see the Help File for the EFIS-D10 Support Program for more information.

Bug display

Bugs may be set to mark a desired heading, airspeed or altitude. These bugs are represented by a black (for airspeed and altitude) or white (for heading) arrow centered in the appropriate moving bar at the desired location (see picture). If the set heading, altitude or airspeed is currently not shown on its bar, the arrow appears at the edge of the moving tape closest to the desired value. For example, in the picture, if the airspeed bug is set at 160 knots, the arrow appears at the top of the bar pointing up past 150 knots, the highest displayed value. This indicates that the pilot must increase his or her airspeed to reach the target airspeed.
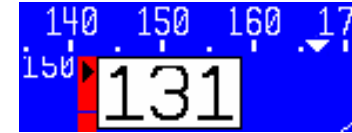
Turn coordinator

Centered just below the heading moving tape, the turn coordinator provides real-time feedback of the plane's current yaw rate. The yellow bar grows in the direction that the plane is currently yawing. The yellow bar grows to the right or left of a black vertical anchor line. The arrows on either side of the yellow bar's anchor line point to a place on the screen with which the yellow bar must line up for the plane to perform a standard rate turn. If the turn rate is so great that the yellow bar exceeds the screen space between the airspeed and altitude digital displays, its length is decreased by ½ and the standard turn rate arrows move closer to the black vertical anchor accordingly.

Clock/Timer

The clock is always displayed in the lower right-hand corner of the screen. All setting of the clock occurs in the value setting box, which is visible in the center of the screen above the menu lines. When a count-down or count-up timer is enabled, it is displayed in place of the clock until the timer is stopped.

Menu system and User Interaction

The menu system for the EFIS-D10 is designed to provide quick access to commonly used functions while taking up a minimum amount of space on the screen. All user interaction takes place via the 6 buttons at the bottom of the front panel of the EFIS-D10. When no menu is present, pressing *any* of the six buttons will bring the main menu on the screen as shown at right. The six sections of any menu correspond respectively to the six buttons below them.

The overview below gives you a guide to the basics of operating the menu system. The operation section provides a more detailed look at each of the functions that can be accessed via the menu system.

Overview

The EFIS-D10 menu system is designed to be as unobtrusive and easy-to-navigate as possible. The following is a look at the general operation of the menu system. After reading this section, you should be comfortable with basic navigation of the menu system. The following few points will give you a basic understanding of the menu system, allowing you to better understand the more in-depth Operation section below. On the following page is a look at the main menu level flow.

- When no menus are displayed, pressing any button brings up Main Menu 1.

- The menu system operates as a hierarchy. When in any of the 2 main menus, pressing a button will show the next level down in the hierarchy. For ease of navigation, a tab located just above the currently displayed menu alerts you to the context of the menu.

- Button 6 (on the far right) is the universal "back-out" button.

  - In either of the two main menus, it is labeled EXIT and will remove the menus from the screen completely.

  - In any other menu, it is labeled BACK and will display the menu above the current one in the hierarchy.

- Aside from the two main menu lines, all menus have a tab directly above the left side of the menu line alerting the user to the context of the menu. For example, when in the barometer setting menu, the text BARO is visible in the tab above the left side of the displayed menu.

- When changing values (barometer value, clock, timer, etc), pressing and holding either the INC or DEC button to change values will cause the rate of change to increase.

- All text for buttons is limited to 6 characters to minimize the amount of screen space the menus take up. As a result many words are abbreviated, such as MLITRY for military and BARO for barometer.

Main Menu Flow

There are only 2 main menus. The following diagram shows their basic flow. As with all other menus, pressing MORE will show more options that are on the current hierarchical level.
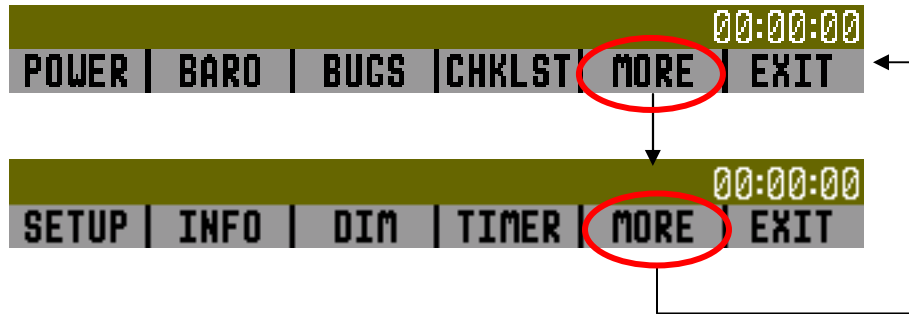
Operation

This section will guide you through each of main menu selections and their sub-menus.

POWER – Power on/off

When the EFIS-D10 is turned off but still has a power source via one of the three power inputs, pressing the far left button will turn the unit on. Likewise, once the unit is on and any button has been pressed, bringing up main menu 1, the leftmost button will turn the unit off. As can be seen in the picture above, this button is labeled POWER and must be held for 2 seconds to turn the unit 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 and detect a change in state of the POWER button.

BARO –Setting Barometer/ Altitude

While in main menu 1, pressing button 2, labeled BARO, displays the barometer/altitude set button. The last-set barometer value, in units of inHg, is displayed in the value-setting box beneath the BARO text label. The DEC and INC buttons increment the barometer value by 1/100ths as indicated by the highlighted text after the decimal place. When the hundredths roll over the tenths digit will change accordingly. As you increment or decrement the barometer value, you will see the altitude tape on the right and the digital display above change. Adjust the barometer until the altitude indicators display the correct altitude for your location or the barometer matches the current barometric pressure value as indicated by your nearest airport.
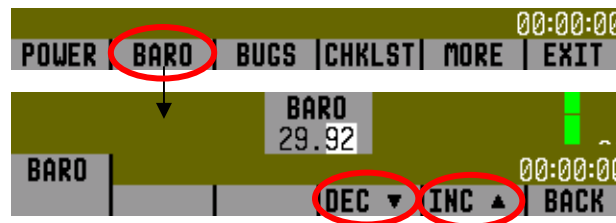
BUGS – Setting Bug Markers

You have the ability to set a "bug" on any or all of the three tapes. The setting and toggling of heading, airspeed, and altitude markers works essentially the same; however, a description is provided for setting each bug. As can be seen by the diagram, pressing the BUGS button displays the BUGS submenu. From there, you may choose HDING, AIRSPD, or ALTTUD.

Heading

To set a marker (bug) at a target heading press BUGS while in Main Menu 1. This will bring you to the BUGS submenu, as seen above. Choosing the HDING option will bring you to the HDING submenu.

Pressing the TOGGLE button will toggle the currently set heading bug display on the horizontal heading bar. A white arrow located on the heading tape at the target heading represents the bug. Upon entry into the Heading Bug menu the Set Value dialog box is displayed in the lower center of the display. Press SEL to select which digit to change and buttons 4 (DEC) and 5 (INC) to decrease and increase each digit's value respectively.

As you increment or decrement the heading bug value it will rollover at 360 degrees, returning the value to 0. If you have the bug toggled on, you will see the arrow move left or right across the heading bar as you decrement or increment its value.

Airspeed

To set a marker (bug) at a target airspeed, press BUGS (button 3) while in Main Menu 1. This will bring you to the
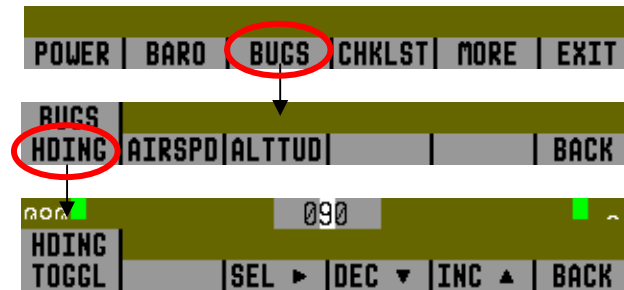
bugs submenu as seen in the diagram. Choosing the AIRSPD option will bring you to the following menu.

Pressing the TOGGLE button will toggle the currently set airspeed bug display on the vertical airspeed bar. A black arrow located on the tape at the target airspeed represents the bug. Upon entry into the Airspeed Bug menu the Set Value dialog box is displayed in the lower center of the display. Press SEL to select which digit to change and buttons 4 (DEC) and 5 (INC) to decrease and increase each digit's value respectively.

As you increment or decrement the airspeed bug value it will stop on the low end at 0 and 300 knots on the upper end. If you have the bug toggled on, you will see the arrow move up or down across the airspeed bar as you increment or decrement its value.

Altitude

To set a marker (bug) at a target altitude press BUGS (button 3) while in Main Menu 1. This will bring you to the bugs submenu (*see below*). Choosing the ALTTUD option will bring you to the following menu.

Pressing the TOGGLE button will toggle the currently set altitude bug display on the vertical altitude bar. A black arrow located on the altitude tape at the target altitude represents the bug. Upon entry into the Altitude Bug menu the Set Value dialog box is displayed in the lower center of the display. Press SEL to select which digit to change and buttons 4 (DEC) and 5 (INC) to decrease and increase each digit's value respectively.

As you increment or decrement the altitude bug value it will stop on the low end at -1200 ft and 30,000 ft at the upper end. If you have the bug toggled on, you will see the arrow move up or down the altitude bar as you increment or decrement its value.
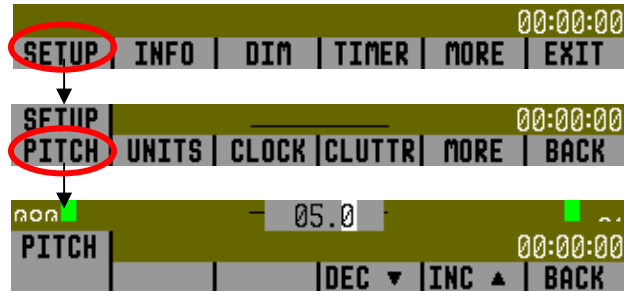
CHKLST – Using Checklists

POWER | BARO | BUGS | CHKLST | MORE | EXIT

In the current release of EFIS-D10 software, you are limited to 5 checklists each containing 14 lines of text per checklist. 40 characters can fit on each line of the screen. To load checklists onto your EFIS-D10, you must use upload them as described in the help file that comes with the EFIS-D10 Support Program. You must also have an RS232 serial port attached to the EFIS-D10 which allows for upload of new software. Pushing the CHKLST button will take you to the checklist submenu which will contain the checklist titles as defined by you during the setup process with the PC. You may customize the checklists and their titles as you wish. CAUTION: Once you select one of the checklists, the entire screen is covered up by it. **Do not select a checklist unless you do not actively need to view the display of the EFIS-D10.**

SETUP – Setting Preferences

In main menu 2, press the SETUP button to display the menu where configuration preferences may be set. In this submenu, you have 5 options to choose from. Each of these options is explained in more detail below.

SETUP | INFO | DIM | TIMER | MORE | EXIT   00:00:00

SETUP
PITCH | UNITS | CLOCK | CLUTTR | MORE | BACK   00:00:00

PITCH   − 05.0   00:00:00
                                        DEC ▼ | INC ▲ | BACK

Zero pitch

Frequently, pilots find that the normal cruise attitude for their plane does not correspond to an absolute zero pitch. This comes as a result of many factors including plane design and current weight load during a given flight. To accommodate this fact, you may "zero" the currently displayed pitch of the EFIS-D10. The best way to do this is to adjust the displayed pitch once you are flying straight and level and can observe that a non-zero pitch is displayed. From the SETUP submenu, press the PITCH button. This will display the pitch adjust submenu. From there, simply increment (INC) or decrement (DEC) the displayed pitch until the screen shows a zero pitch. This value is remembered by the unit

and used on all subsequent flights. Keep in mind that you must change it back if you intend for the setting to be only temporary due to an unusual weight load, for example.

Change displayed units

In the UNITS submenu, you will see two toggles for Airspeed and Altitude units. The current release of EFIS-D10 software supports airspeed units of Knots and Miles/Hour and altitude units of only feet. Future versions will support more options than these. To change airspeed units between knots and mph simply press either button 2 or button 3, which corresponds to the AIRSPD: label. As mentioned, the only option for altitude units is Feet, thus you are not able to toggle this value.

Set the clock

From the SETUP submenu, press the CLOCK button. This will display the clock-setting submenu. In the value-setting box, you will see a section for the local time and a section for Zulu time. Because local time is usually an offset in hours from Zulu time, when you set the minutes for local time, you will see the minutes for Zulu time change. However, you need to 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. To change the local clock for moving through time zones or to enter daylight saving time, simply change

only the hours for the local time. Be aware that connecting to the EFIS-D10 with the Support Program will reset the time; therefore, do not set the time until you have performed all of the PC interface operations. To set the time, simply follow these guidelines:

- Set both the local and Zulu times in military time. This is to eliminate confusion during the clock setting process. You have the option, as described below in the Clock Format section, to *display* the time in either military or standard 12-hour format.

- Only the highlighted digits will be affected by increments or decrements.

- SEL moves the highlight to the next set of digits. The order of selection is 1. Local hours, 2. Local minutes, 3. Zulu hours. When Zulu hours are selected, pressing SEL will again highlight Local hours.

- DEC and INC decrement and increment the selected set of digits one at a time. 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, allowing you to set the clock down to the second if you so desire.

Change clock format

Although you always set the clock in military time, you have the option to display it in either military or standard time. Additionally, if you desire, you may display either local or Zulu time in the lower right corner of the screen. To set these options, press the FORMAT button from the CLOCK submenu. This will display the FORMAT submenu as seen in the picture above. In this submenu, you toggle between local and Zulu time display by pressing either button 1 or button 2. The status text following the colon shows the current status of the LOC/ZU toggle. To toggle between standard and military time display, press either button 3 or button 4. Again, the status text following the colon shows the current status of the 12/24 toggle.

Show/hide display items

From the SETUP submenu, press button 5 corresponding to CLUTTR. The Clutter Menu will appear with the first four options. Each option corresponds to an item on the screen that can be turned on and off. As with all other menu items, these options are abbreviated to commands containing 6 letters or fewer. Four toggle options are listed per menu line. Pressing a button corresponding to one of these four options will turn the respective onscreen item on or off, depending on its current state. The first four options are: ALTBAR (altitude moving tape), ALTDIG (altitude digital readout), ASPBAR (airspeed moving tape), and ASPDIG (airspeed digital readout). By pressing button 5, corresponding to MORE on the menu readout, four more choices are presented. These are COMPSS (moving heading tape), LATBAL (lateral acceleration ball), TURNRT (turn rate indicator), and AOABAR (angle of attack tape). Pressing button 5, corresponding to MORE, will display a third menu of items that can be toggled on and off. These are CLOCK (clock and time zone information), ROLARW (roll angle indicator), and HORIZN (blue/brown horizon indicator). Pressing MORE will display the first set of items again. The menu flow is presented in the diagram.

Check software version

The software version submenu gives you two important pieces of information: the version of EFIS-D10 software that your unit is currently running and the number of hours
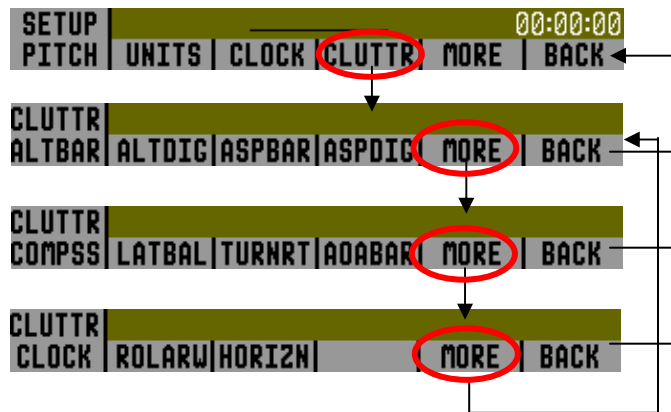
the EFIS-D10 has been on. From the second line (press MORE) of the SETUP submenu, press the VRSION button; this brings up the software version submenu. This submenu will also display the amount of hours of on-time the unit has had. Aside from the BACK button, there is no user interaction in this submenu. It is simply for informational purposes. If you should have need for technical support or other assistance from Dynon, please have your software version ready when you call or write.

Perform magnetic calibration

Pressing the MAGCAL button will bring you to the magnetic calibration menu. To learn more about this function, please refer to the Installation Guide.

INFO – Informational Items

The informational display items submenu is reached from main menu 2 as shown in the diagram. From within this menu, you have the option to display up to two of the three options at a time. As can be seen by the INFO submenu, you may display one of the three items on the upper left of the screen and one on the upper right of the screen. More detail about each of the three items is given below.
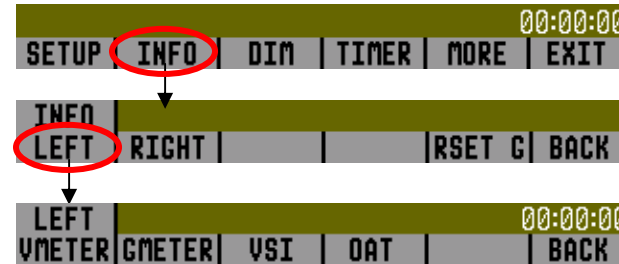
Voltmeter

The voltmeter displays 3 rows of information corresponding to the three power inputs on the EFIS-D10. The first row, labeled M, displays the Master Switch voltage. The second row, labeled E, displays your optional external backup battery voltage. The third row, labeled I, displays the EFIS-D10 internal battery voltage. If any of the 3 voltage inputs are not present, 0.0V will be displayed for the respective voltage values. The letter V follows all three values, denoting the

fact that voltages are being displayed. The EFIS-D10 will alert you when the internal battery is low by displaying a low battery alert (see Errors and Warnings below).

G-meter

The g-meter displays the current vertical acceleration experienced by the EFIS-D10 measured in G's, where 1 G is the amount of force 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-D10 since reset. The middle row, labeled CR, is the current g-force experienced by the EFIS-D10. The bottom row, labeled MN, is the minimum g-force experienced by the EFIS-D10 since reset. This last value can be viewed as the maximum negative g-force experienced by the EFIS-D10.
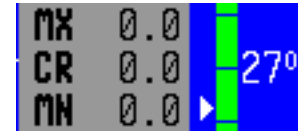
To reset the max and min g-force values to the current g-force value, simply enter the INFO submenu and push the RSET G button.

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.

OAT (Outside Air Temperature)

If you have installed the optional OAT/TAS/DA sensor, the OAT function provides you with the current outside air temperature, true airspeed, and density altitude. The temperature is given in degrees C, the altitude in feet, and the airspeed in knots. For more information on the OAT function, please refer to the OAT installation and calibration guide that came with your sensor.

DIM – Changing screen brightness

From main menu 2, press the DIM button, which causes the brightness control submenu to appear. Pressing BRITR will increase screen brightness until it reaches its maximum. Pressing DRKR will decrease screen brightness until it reaches its minimum. It is not possible to turn the screen completely black via this menu to prevent confusion between a dimmed state and a turned-off state.
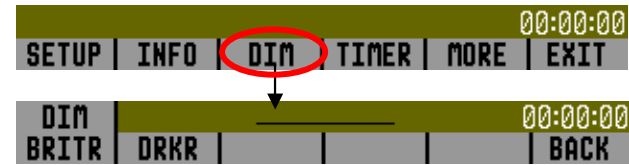
TIMER – Setting and using a timer

To access the timer, navigate to Main Menu 2, and press the TIMER button. This will take you to the Timer menu seen in the diagram.

In the value setting box, you will see either UP TIMER or DN TIMER with the current timer value below. The following points will assist you 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. This will bring you back to the same state (i.e. UP or DOWN TIMER) that you were in before.
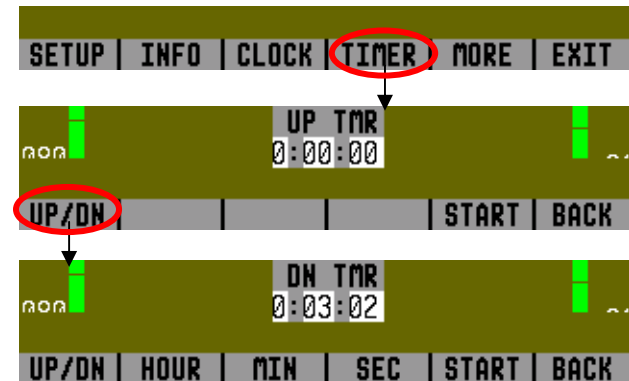
- To start the timer, press START. Once started, the button's label changes to STOP. To stop the timer, press STOP.

- You may not have an up timer and a down timer running at the same time.

This appendix contains information not covered in the main section of the manual. Here you will find useful reference tools such as a specifications sheet, operating tips, and a glossary. This section also contains details regarding the EFIS-D10 warranty and service.

Operating Tips

- If the outside temperature is below -30°C, let the unit run for at least 10 minutes before using it in flight. You may see a TEMPERATURE OUT OF SPEC warning on the screen during this time. While this warning is present, unit accuracy may be degraded. Waiting until the warning turns off will ensure that the unit has enough time to heat itself up to a temperature at which the sensors will be accurate.

- The static pressure sensor is sensitive to high rates of temperature change as is usually seen during the first few minutes of unit operation. As a result, more accurate altitude measurements will be obtained if you wait for about 5 minutes before setting the barometer to give a correct starting altitude.

- During the first few minutes of a cold boot-up (i.e. the unit is turned on after having been off for at least 2 hours), the TEMPERATURE UNSTABLE warning may appear onscreen and the horizon will turn from blue/brown to grey/black, alerting you to the possible inaccuracy of the unit's altitude measurements.

Serial Data Output

The EFIS-D10 outputs text data through its serial port constantly during normal operation. This data is useful for a variety of applications. All numbers are in decimal and are standard ASCII. To view the data using a terminal program, the following settings should be used:

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

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

Char	Width	Description	Notes
1	2	Hour	00 to 23, current hour according to EFIS-D10A's internal clock
3	2	Minute	00 to 59, current minute according to EFIS-D10A's internal clock
5	2	Second	00 to 59, current second according to EFIS-D10A's internal clock
7	2	Fractions	00 to 63, counter for 1/64 second. Data output frequency.
9	1	Pitch Sign	'+' or '-' (positive means plane is pitched up)
10	3	Pitch	000 to 900, pitch up or down from level flight in 1/10 degrees (900 = 90°)

Char	Width	Description	Notes
13	1	Roll Sign	'+' or '-' (positive means plane 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
30	1	Turn Rate Sign	'+' or '-' (positive means plane is turning right)
31	3	Turn Rate	000 to 999, 1/10 degrees/second rate of yaw change
34	1	Lateral G's Sign	'+' or '-' (positive means plane is experiencing leftward lateral acceleration)
35	2	Lateral G's	00 to 99, lateral G's in units of 1/10 G (99 = 9.9 G's)
37	1	Vertical G's Sign	'+' or '-' (positive means plane is experiencing upward vertical acceleration)

Char	Width	Description	Notes
38	2	Vertical G's	00 to 99, vertical G's in units of 1/10 G (99 = 9.9 G's)
40	2	Angle of Attack	00 to 99, percentage of stall angle.
42	6	Status Bitmask	An internal-use status bitmask containing 24 bits
48	2	Product ID	Ascii-hex Dynon product ID: 01=EFIS-D10A, 10=EFIS-D10, 03=EMS-D10
50	2	Checksum	The ascii-hex 2 byte sum of all 49 preceding bytes
52	2	CR/LF	Carriage Return, Linefeed = 0x13, 0x10

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

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

This serial data can be logged using any standard serial terminal program such as Hyper Terminal. It can then be parsed into its respective columns by many spreadsheet programs including Microsoft Excel.

Glossary

Accelerometer   We use accelerometers in the EFIS-D10 to measure the acceleration of the aircraft, which is an important factor in determining the pitch and attitude of the aircraft. The accelerometers used in the EFIS-D10 are solid state Micro-electromechanical Systems or MEMS accelerometers.

Analog   Describes signals that can have an infinite number of values. All of the EFIS-D10's transducers sample analog values such as the earth's magnetic force, acceleration, and pressure.

Angle Of Attack   The acute angle between the chord of an airfoil and a line representing the undisturbed relative airflow.

Attitude   The rotational status of the unit with respect to the surface of the earth, displayed on the main screen using an artificial horizon line.

Digital   Describes signals that have discreet values. Much of the EFIS-D10 is based on digital technology. This means that analog values that are brought in by the various transducers are converted into a digital format to be read and interpreted by the onboard microprocessors

Gyro   The EFIS-D10 uses solid-state rate gyros to measure the rate of rotation around each of X, Y, and Z axes. These provide to the attitude equation information about turn rates and they are integrated to provide position information.

Heading   The line of path along which the unit moves with respect to the earth's magnetic north pole, measured in degrees.

Magnetic field sensor   The EFIS-D10 uses magnetic field sensors as a three dimensional electronic compass. The onboard circuitry uses these sensors to resolve the earth's magnetic field. With this information the device can

calculate and display compass heading independent of attitude.

Nit A unit of illuminative brightness equal to one candle per square meter, measured perpendicular to the rays of the source. The EFIS-D10's LCD screen is rated at 450 nits. For comparison, laptop screens usually are rated at about 250 to 300 nits.

Pressure transducer The EFIS-D10 uses three pressure transducers to measure the altitude, airspeed, and angle of attack. The altitude pressure transducer measures the absolute pressure of the static port which is used in calculating the barometric-based altitude. The airspeed and angle of attack pressure transducers are differential pressure transducers that measure their respective ports verses the static port in order to calculate airspeed and angle of attack.

Sleep Mode The state that the unit enters when powered off via the POWER button. It does not completely power off, but simply enters a very-low-power state monitoring battery voltages and keeping track of time.

Solid-state Describes silicon transistor-based technology. The advantage of solid-state technology is that it requires no moving parts and thus has fewer susceptibilities to mechanical failure.

Standby Mode When in standby mode, the EFIS-D10 does not display anything on the screen. It consumes only enough power to run the internal clock and charge the internal backup battery. To exit standby mode and resume normal operation, press any one of the 6 menu keys.

Transducer A sensor that converts a non-electrical value, such as acceleration or rotation rate, into a voltage, which can be read by a microprocessor. The transducers on the EFIS-D10 are what allow it to correctly display, attitude, heading, airspeed and altitude data.

TFT display The Thin Film Transistor display is the most obvious and visible part of the EFIS-D10. Its technology is the same as that of standard flat-panel PC displays. The model that the EFIS-D10 uses

has a brightness rating of 450 nits with exceptional contrast, meaning it is sunlight-readable.

Value Setting Box	A box that appears near the bottom of the screen when the user is performing any kind of manipulation of a value. This includes setting a bug, setting the barometer, and adjusting the clock.
VSI	Vertical Speed Indicator.

Troubleshooting

Unit Errors

Problem	Solution
After performing a magnetic calibration the EFIS-D10's heading is wrong by a constant amount.	Orient your plane in a known direction, preferably on a compass rose at the airport. Navigate to the Heading Adjustment menu by pressing SETUP -> MORE -> MAGADJ. Increment or decrement the value of the heading until the EFIS-D10 heading corresponds to the direction in which your plane is pointed.
When the barometer on the unit is set correctly, the displayed altitude is wrong by a constant amount.	Set the barometer to the correct value for your current location and altitude. Note the difference between the displayed altitude and the actual altitude for your location. Navigate to the Altitude Adjustment menu by pressing SETUP -> MORE -> ALTADJ. Increment or decrement the value of the altitude until the EFIS-D10 altitude corresponds to that of the current location of your plane. See diagram below for more information.

The unit blinks a blue screen continuously when on.	Ensure that your power supply is capable of supplying at least 1 amp and that it is at least 10 Volts. If, after verifying that you have met these two conditions the unit does not operate normally, it may be necessary to contact Dynon Avionics.

Alert Messages

The following table describes the error/warning messages that the EFIS-D10 could display. The meaning of the message is given here as well as information about when the error message conditions will go away.

Warning Message	Meaning	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 switch power. At that point, the battery will begin charging off the external power.
TEMPERATURE OUT OF SPEC	You will see this alert when the ambient temperature sensed by the unit is below -30ºC or above 50ºC. The sensors in the unit have a certain temperature range within which they are specified to operate normally. If they operate outside this temperature range, the attitude result can be compromised. Therefore, the horizon indication will turn from blue/brown to grey/black to indicate the potential unreliability of the sensors while outside the specified temperature range.	The text portion of the alert will disappear when you press any of the buttons. However, the horizon will not display blue/brown until the unit senses temperature within its specified range. If ambient temperature is above 50ºC, the unit will always display the horizon as grey/black. However, if ambient is below 30ºC, it is possible that the unit will heat itself up enough to operate normally.

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 alert will disappear when you press any of the buttons. The screen will remain grey and black 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.
ATTITUDE INDETERMINATE	You will see this alert anytime the unit is rotated at a rate faster than 150 degrees/second. 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 the fact that the artificial horizon cannot be trusted.	Pressing any button will remove the text of the alert. However, the horizon indication will remain grey/black until the unit has resumed normal operation. Once an indeterminate attitude is detected, the unit enters a fast recovery mode and usually recovers within 30 seconds.
TIMER EXPIRE	This alert appears when you have a down timer enabled and it has reached 0. Additionally, as mentioned in the Timer section above, the up timer menu will display and the timer will flash the timer, alerting you that the down timer has expired.	Pressing any button will remove the alert and stop the timer from flashing. However, you must press STOP in the Up Timer menu to stop the up timer. This allows you to see how much time has elapsed since the down timer has expired.

HOLD FOR 2 SECS	This alert appears when you have pressed the POWER button in Main Menu 1. If the button is held for 2 seconds, the unit will turn off.	Releasing the POWER button will cause the alert to disappear and the unit will continue normal operation.
POWER OFF 30 SECS.	This alert appears when master switch power has been switched off but either the internal or the external emergency batteries are still connected. If no button is pressed within 30 seconds of when the alert appears, the unit turns off. The voltmeter also appears onscreen to show you the currently measured battery voltages	If any button is pressed, the alert will disappear and the unit will stay on. This will cause the unit to continue full operation on battery power. Remember that the internal battery is rated for a minimum of 2 hours when fully charged. If no button is pressed within 30 seconds, the unit will turn itself off, entering extremely low power mode.

PC/EFIS Interface

Please refer to the EFIS-D10 Support Program help-file by pressing the Help button in the program main window. Please download the latest version of the EFIS-D10 Support Program from our website at http://www.DynonAvionics.com/downloads

Service Details

Should you experience difficulty with your product, please contact us by one of two methods. If you have a computer with an internet connection, point your browser to http://www.DynonAvionics.com/support.htm, and fill out the form giving every detail about the circumstances of the equipment failure. A customer service representative will contact you regarding your problem. Alternatively, if you do not have an internet connection, you may call or write to us at our published phone or address giving us a detailed description of your problem.

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