FlightDEK-D180
Combined EFIS and EMS

Pilot's User Guide

Revision B
For use with firmware version 1.08

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Dynon Avionics

This product is intended for the experimental aircraft category and is not approved for installation in certified aircraft

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Table of Contents

1. INTRODUCTION

Welcome

Thank you for purchasing the Dynon Avionics FlightDEK-D180. This instrument combines state-of-the-art EFIS functionality with modern engine monitoring capabilities and displays this information in an easy-to-read format. As you will discover, the FlightDEK-D180 is a powerful tool, useful in a variety of small aircraft, at a price that small aircraft owners can afford.

The FlightDEK-D180's versatile design accommodates a wide range of engines and sensors to support most piston type aircraft. You may configure the system to meet your monitoring requirements covering both air and water-cooled engines with up to six cylinders.

The FlightDEK-D180 is also capable of displaying HSI information, provided it is properly connected to a Garmin SL30 or a compatible GPS device.

The latest version of this manual may be downloaded from our website at www.DynonAvionics.com.

Before You Fly

We strongly recommended that you read this entire guide before attempting to use the FlightDEK-D180 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 plane. Finally, we encourage you to keep this manual in the plane 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.

About this Manual

This guide serves two purposes. The first is to help you configure and get acquainted with the FlightDEK-D180's many functions. The second is to give you quick access to vital information.

In the electronic (.PDF) version of this manual, items in the Table of Contents and cross-references act as hyperlinks taking you to the relevant section in the manual that the word refers to.

2. PRODUCT OVERVIEW

FlightDEK-D180 Hardware

The information here 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. Please refer to the FlightDEK-D180 Installation Guide for detailed installation instructions.

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 is obtained from a Garmin SL30 or a compatible GPS unit through a unidirectional serial port.

Up to 27 sensors may be connected to the FlightDEK-D180 to present you with operational data for engines with up to six cylinders. When connected to the appropriate sensors, the instrument presents RPM, manifold pressure, oil temperature and pressure, exhaust gas temperature (EGT), cylinder head temperature (CHT), fuel levels for up to 4 tanks, voltage, current, fuel pressure, fuel flow, carburetor air temperature, coolant pressure and temperature, outside air temperature, flaps, and trim. Two external contacts may also be connected, providing status information for a variety of auxiliary aircraft systems such as canopy closure, etc.

Fuel endurance information can be obtained from a compatible GPS unit through a unidirectional serial port.

OUTPUTS

The FlightDEK-D180 has outputs to drive external visual and audible warning devices (not supplied) to alert the pilot whenever engine and AOA (if installed) alarms occur.

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.

BUTTONS

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

DISPLAY

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

POWER

The instrument requires 10 to 30 volts DC for operation.

The internal battery is an optional accessory to the FlightDEK-D180, allowing the unit to operate in the event of an external power failure.

- The lithium ion battery is rechargeable and is managed by the FlightDEK-D180 whenever an external power source is connected. If the always-on Keep Alive circuit is connected the FlightDEK-D180 will continue to charge the internal battery, even if the unit is turned off. This ensures that your internal emergency battery is always fully charged for maximum performance.
- 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 new, a fully charged internal battery is rated for a minimum of 1.5 hours of normal operation with the FlightDEK-D180.
- If the FlightDEK-D180 has switched to its internal emergency battery due to a power loss in your airplane, it is advised that you land as soon as possible.

3. PRODUCT OPERATION

After reading this section, you will be familiar with the basics of how to use the unit. For details regarding specific procedures (e.g., adjusting display brightness, fuel computer, clock) please refer to the EFIS Operation and Common Procedures sections.

Front Panel Layout

All normal operation of the FlightDEK-D180 happens via the front panel. The front panel contains buttons and a display.

- Buttons – There are six buttons on the front panel of the FlightDEK-D180. These buttons are numbered one through six, with button one being the leftmost and button six being the rightmost. FlightDEK-D180 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 and engine parameters, menus, and data obtained from other connected products.

User interaction takes place via the FLIGHTDEK-D180 main display and the six buttons beneath. Note: buttons are not labeled on actual product

Display

The FlightDEK-D180 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 FlightDEK-D180.
- 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. The FlightDEK-D180 is shipped with six screens included in the rotation: EFIS/EMS, EFIS/AUX, EFIS/FUEL, EFIS/TIMES, EFIS/HSI and EMS/HSI.

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

The FlightDEK-D180 has several pre-defined screen configurations. Screen configuration area allotment is represented by one of three icons show in the figure to the right.

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

 EFIS/EMS (default FlightDEK-D180 boot-up screen; in default rotation)
 EFIS/AUX (in default screen rotation)
 EFIS/FUEL (in default screen rotation)
 EFIS/TIMES (in default screen rotation)
 EMS/EFIS
 EMS/AUX
 EMS/TIMES
 EMS/FUEL
 EFIS
 EFIS/EMS
 EFIS/HSI (in default screen rotation)
 EMS/HSI (in default screen rotation)

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.

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.

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

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▼

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

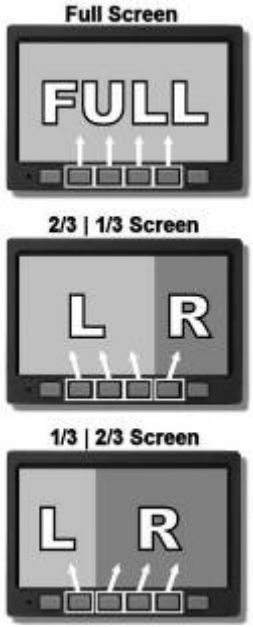
All interaction with the FlightDEK-D180 is accomplished through the use of its menu system. The menu system is accessed and navigated via the six buttons located on the front of the unit.

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 FlightDEK-D180 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

When a menu displays, it 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. You will also notice that many of the onscreen elements move up to avoid the menu. This prevents



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

the menu from obscuring useful data while it is up. Upon exiting the menu, the screen returns to its normal appearance.

Any given FlightDEK-D180 menu describes the functionality of the buttons below it. The label located directly above the button denotes its current function (e.g., pushing button two in the menu in the figure below will invoke the BARO command). 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 buttons. In this case, either button below the label invokes the command.

If a menu contains more options than there are buttons, you will see a MORE label 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.

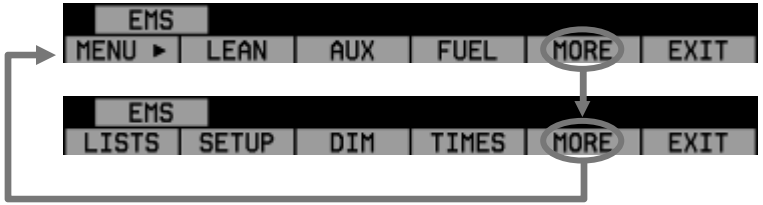
For example, the EFIS Main Page menu contains an EFIS menu tab and button labels for MENU►, BARO, BUGS, LISTS, MORE, and EXIT. Pressing MORE reveals the rest of the EFIS menu. This menu contains options for SETUP, INFO, DIM, TIMER, MORE, and EXIT. Pressing MORE on this menu simply returns you to the first part of the EFIS

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

menu.

In all top-level page menus (EFIS, EMS, AUX, TIMES, FUEL), 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 will be displayed when pressing the button.

All EMS 1/3 pages (AUX, TIMES, FUEL) have shortcuts to their page and menu from within the EMS Main Page menu. This means that if you only want to glance at a parameter on another page, quickly returning to your original screen configuration, simply enter the EMS menu, and press the button for the page you'd like to momentarily view. For example, if your current screen configuration is 2/3 EMS on the left, 1/3 FUEL on the right, pressing the AUX button in the EMS menu will display the AUX page in place of the FUEL page and the AUX page menu. Pressing BACK will return you to the main EMS menu, and your original screen configuration (i.e., EMS/FUEL).



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

If you press the SETUP button on the EMS menu, the SETUP menu is displayed. The SETUP menu contains a menu tab and button labels for CLOCK, VRSION, GLOBAL, SENSOR, FUEL, and BACK. Pressing CLOCK displays options for specifying time format (i.e., standard AM/PM vs. military) and clock adjustment.

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.

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 FlightDEK-D180. Refer to the FlightDEK-D180 Installation Manual for a list of compatible equipment.

EMS pages use various combinations of circular gauges, vertical and horizontal bars, tic marks, and text to display EMS data. Appropriate units of measurement accompany their respective values. Color indicators (green, yellow, and red) are used to denote normal and abnormal operational ranges.

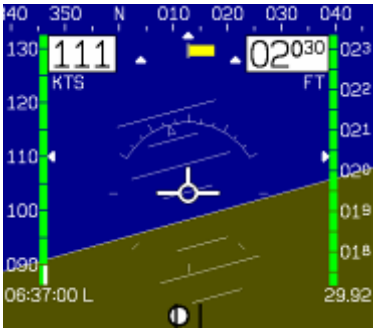
English and Metric units may be specified in the GLOBAL menu. Note that EMS information displayed on screen is unique to the aircraft's EMS installation.

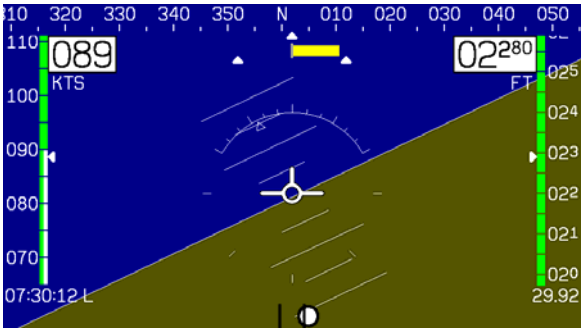
Both the EMS Main Pages and the EMS Auxiliary Page allow for "info items," user-configurable elements such as vertical info bars, contact input readouts, flaps/trim indication, and text-only items. Due to their width, text-only items can only be displayed on the EMS Auxiliary Page. Vertical info bars can display volts, amps, fuel pressure, carburetor air temperature, coolant temp/pressure, and outside air temperature. Contact input readouts can display discrete data (e.g., open/closed, on/off, etc.). Flaps and trim displays display icons indicating the absolute position of the flaps and trim. Vertical info bars, contacts, flaps/trim indicators, and text-only items are defined at time of installation and instrument setup. Text info items include fuel economy, engine timers, and times. For more information on configuring this display (as well as info items on the EMS Main Page), see the info item configuration section on page 9-5. Menu, Checklist, and EFIS pages may be displayed and are described in the following sections.

EFIS MAIN PAGES

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

The FlightDEK-D180 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-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. 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 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 visual representation of your current roll angle. Each tic mark represents 10 degrees of roll.

Stabilized heading tape

This element functions much like a standard slaved directional gyro. The triangle alerts you to your current heading allowing you to quickly ascertain the value in degrees based on the surrounding values. North, East, South, and West directions are labeled on the tape, “N,” “E,” “S,” and “W,” respectively.

Altitude tape & digital readout

The altitude tape gives you a visual representation of your altitude. The white triangle points to 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 smaller numbers.

The digital readout of your altitude displays thousands of feet using large numbers, hundreds of feet using smaller numbers, and tens of feet using even smaller numbers. Its proximity to the altitude tape will allow you to quickly and easily associate the two screen elements.

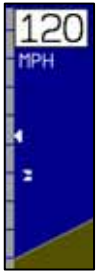
The FlightDEK-D180 will accurately display altitudes from -1200 to 30,000 ft (-365 to 9144 m).

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. Altitude units are displayed below the digital presentation.

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 FlightDEK-D180 Installation Guide for more information.

Airspeed tape & digital readout



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 set the values of the airspeed color thresholds via the SETUP menu. Please see the FlightDEK-D180 Installation Guide for more information on setting the airspeed color thresholds.

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 units are displayed below the digital presentation.

The FlightDEK-D180 will display airspeeds from 30 to 325 knots (35 to 374 mph).

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 marking the desired value on the tape. If the set heading, altitude, or airspeed is currently off-screen, the arrow appears at the edge of the moving tape closest to the desired value.

Turn rate indicator

Centered just below the heading moving tape, the turn rate 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 gray 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.

Slip/skid ball

The slip/skid ball works much like a standard mechanical one. It is a visual representation of lateral acceleration. If the ball is within the two vertical black lines, then you are in coordinated flight. Since the ball is located at the bottom of the screen, it will be moved up when the menu is displayed.

Barometer display

The current barometer setting is displayed at the bottom right of the screen below the altitude tape. This shows the value that you have entered for the barometer when setting your elevation. The value is shown in either inches of Mercury or millibars depending on your preference set in the BARO menu.

Clock/timer

The clock is displayed in the lower left-hand corner of the screen, below the airspeed tape. All setting of the clock occurs in the 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).

HSI PAGE

Available in 1/3 format

Your FlightDEK-D180 can function as a Horizontal Situation Indicator (HSI) when it is receiving input from either an external GPS or Garmin SL30 nav/comm. The HSI information is overlaid on a directional gyro (DG) representation of the EFIS's stabilized magnetic heading information. If neither a GPS nor SL30 connection is present, the HSI page will still display the DG, but without any additional navigation information. Throughout this guide, the HSI/DG page is referred to as the HSI page in all cases even if there is no HSI data present.

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

EMS MAIN PAGES

Available in 1/3 and 2/3 formats

This page displays RPM, manifold pressure (MAP), oil temperature, oil pressure, exhaust gas temperature (EGT), cylinder head temperature (CHT), fuel level, fuel pressure and fuel flow. On the 2/3 page version, up to two user-configurable info bars may be displayed. For information on configuring the function of these info items, see the Common EMS Procedures section on page 9-3

Up to six EGT/CHT channels may be displayed simultaneously. Green horizontal bars depict exhaust gas temperatures with their respective values to the right of the bars. In the combined EGT/CHT display, cylinder head temperatures are denoted by the white vertical tic marks overlaying the EGT bars with their respective numeric values to the left of the bars. In the split EGT/CHT display (two and four cylinder engines only) CHTs are displayed using their own set of green bars on a different scale than EGTs with their respective numeric values displayed to the right of each bar. When displayed as a 1/3 page, with the exception of two cylinder engines, the EGT/CHT display is shown in combined mode.

EMS AUXILIARY PAGE

Available in 1/3 format

This is a customizable page where you may display up to six different info items. You may choose from any of the available info items. For more information on configuring this display (as well as info items on the EMS Main Page), see the Global Configuration Settings section on page 9-4.

Some info items, when displayed on the Aux Page, have quick commands to be displayed in the AUX menu. This menu is populated with commands in the order that the items appear on screen (from top left to bottom right). The commands are listed below.

Info item quick commands

- TIMERS info item – TRPRST (resets the trip timer), TIMER (shortcut to the general purpose timer menu)
- FUEL – FUEL (shortcut to the add fuel menu)

EMS TIMES PAGE

Available in 1/3 format

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

- The TIME section shows the present time (both local and Zulu) and can be displayed in either standard or military time formats.
- The Flight Timer shows the total amount of time that oil pressure was above 15 PSI since the FlightDEK-D180 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 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 Common EMS Procedures section on page 9-3 for instructions on adjusting clock and timer settings.

EMS FUEL COMPUTER PAGE

Available in 1/3 format

This page displays fuel level(s), fuel flow, fuel pressure, fuel remaining, fuel used, and time remaining. On this page, analog gauges display sensor information and textual readouts display computed data. Much of the computed data is reliant on the optional fuel flow sensor, available from Dynon Avionics. To obtain accurate data, you must reset the fuel computer *every time you add fuel to the aircraft.*

If a compatible GPS is connected to your Dynon system as described in the FlightDEK-D180 Installation Guide, this page will also display current distance per unit fuel, fuel at waypoint, and distance to empty (range).

Some user input is required for the FlightDEK-D180 Fuel Computer to function properly. Refer to Common EMS Procedures on page 9-2 for instructions on adjusting various Fuel Computer parameters.

WARNING: The Fuel Remaining, Time Remaining, Distance per Fuel Unit, Fuel Remaining at Waypoint, and the Calculated Range Remaining values are not directly measured. These values are calculated based upon measured flow rates and *user input* of fuel quantity. Do not use these values as primary indicators.

LISTS PAGES

Available in 2/3 format

This page displays user-defined checklists. Checklists may also be used for waypoint information, lists of radio frequencies, or other informational purposes. You may define up to twenty-five checklists. Each checklist may contain up to fourteen lines of text with each line containing a maximum of forty characters (14 lines by 40 characters).

Checklists must be defined and uploaded to the FlightDEK-D180 as described by the Dynon Product Support Program. Reference the help file that accompanies this software for more information. To download the Dynon Product Support Program, visit www.dynonavionics.com/downloads.

MENU PAGES

Available in 1/3 and 2/3 formats

Some of the setup menus require a full 1/3 or 2/3 page to display all the available options. Menu Pages use a ">" (a "caret") symbol to indicate which line is currently selected. Use the DOWN▼/UP▲ buttons to move down and up the displayed list of options.

Any line on a Menu Page that *is not* followed by ► indicates that its value can be toggled between its available options. When the caret is selecting a line followed by ►, press SEL► to toggle the selected value.

Any line on a Menu Page that *is* followed by ► indicates that it has more options to configure inside of it. When the caret is selecting a line followed by ►, pressing SEL► expands the menu into another list of options to the right.

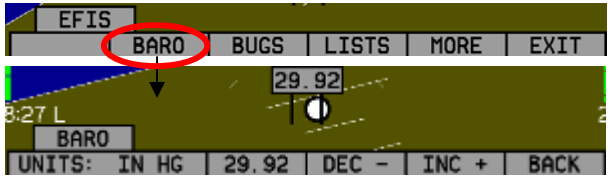
5. EFIS OPERATION

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 and EFIS main page as described on page 3-4.

POWER – Power on/off

When the FlightDEK-D180 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 FlightDEK-D180 on during engine crank. It will immediately power on upon application of external power.

BARO – Setting Barometer/ Altitude

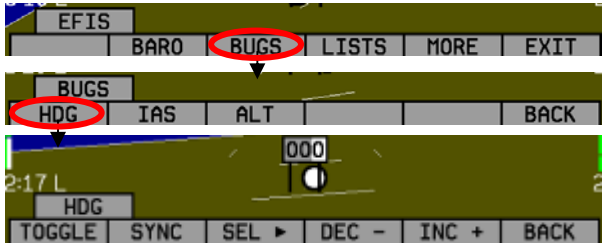


While in the EFIS page menu, press button 2, labeled BARO, to display the barometer/altitude set button. The last-set barometer value is displayed in the value-setting box above the menu. The DEC and INC buttons decrement or increment the barometer value by 1/100th inHg or 1 mbar, depending upon your currently displayed units. When the hundredths digit rolls 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.

The barometer can be set in units of inches of mercury (inHg) or millibars (mb). To change the units, simply press button 1, corresponding to the UNITS label. To reset the barometer to standard day pressure, press button 3, corresponding to 29.92 (inHg) or 1013 (mb), depending on your current barometer units.

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 type of bug. As can be seen by the diagram, pressing the BUGS button displays the BUGS submenu. From there, you may choose HDG, IAS, or ALT.



HEADING

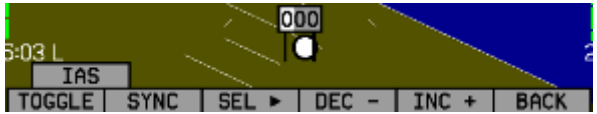
To set a marker (bug) at a target heading press BUGS while in Main Menu 1. This will bring you to the BUGS submenu, as seen above. Choosing the HDG option will bring you to the HDG submenu.

Pressing the TOGGLE button will alternately turn on or off the currently set heading bug display on the horizontal heading tape. 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. Press the SYNC button to synchronize the heading bug to your current heading.

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 tape 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 above. Choosing the IAS option will bring you to the menu shown at right.

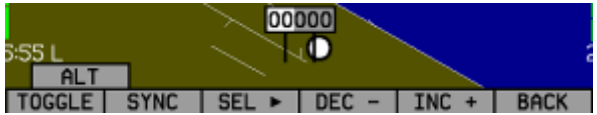


Pressing the TOGGLE button will alternately turn on or off the currently set airspeed bug display on the vertical airspeed tape. A black arrow located on the tape at the target airspeed represents the bug. Upon entry into the Airspeed Bug menu the Set Value dialog box is displayed in the lower center 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. Press the SYNC button to synchronize the airspeed bug to your current airspeed.

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 tape 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 as seen in the diagram. Choosing the ALT option will bring you to the menu shown at right.



Pressing the TOGGLE button will alternately turn on or off the currently set altitude bug display on the vertical altitude tape. 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. Press the SYNC button to synchronize the altitude bug to your current altitude.

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 tape as you increment or decrement its value.

LISTS – Using Checklists and Data Panels

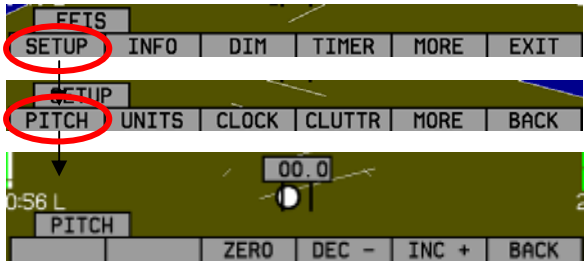
Note that the lists accessed from the EFIS and EMS menus are the same. Only one set of lists are uploaded via the Dynon Support Program.

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 FlightDEK-D180 for quick access from the main menu. 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 FlightDEK-D180 is loaded with the following 5 categories: CHKLIST, RADIO, POH, EMGNCY and MISC.

To load checklists and data panels onto your FlightDEK-D180, you must upload them as described in the help file that comes with the Dynon Product Support Program. Pushing the LIST button will display 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 select the desired checklist, the right 2/3 of the screen will display the checklist while the left 1/3 will display a stripped down version of the EFIS screen. Please see the Dynon Support Program for more detailed information on entering checklists and data panels. It can be downloaded from our website at www.dynonavionics.com/downloads

Note that each checklist/data panel is limited to 14 lines of text and 40 characters per line.

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.

PITCH ADJUST

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 panel tilt, plane design, and current weight load during a given flight. To accommodate this fact, you may "zero" the currently displayed pitch of the FlightDEK-D180. 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 achieved. 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 FlightDEK-D180 firmware supports airspeed units of knots, miles/hour, and kilometers/hour; and altitude units of feet or meters. To change airspeed units between knots, mph, and km/hr, press either button 1 or button 2, which corresponds to the SPD: label. To change altitude units between feet and meters, press either button 3 or button 4, which corresponds to the ALT: label. Pressing MORE displays the next set of units which you can change. You can

toggle temperature display, used for outside air temperature, between celsius and fahrenheit and the barometer between inHg and mbars.

SET THE CLOCK

You may set the clock from either the EMS setup menu or the EFIS setup menu. The two menus set the same clock. Note that if a GPS is connected to your Dynon network, the Zulu time of all connected products will be auto-set to that reported by the GPS. You may still adjust the local time.

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 Zulu time, you will see the minutes for local 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 (and, if necessary for the time zone, the half-hour offset) for the local time. Be aware that connecting to the FlightDEK-D180 with the Dynon Product 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 steps:

- 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 are 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 is selected, pressing SEL will again highlight Local hours. When connected to a GPS, you are not permitted to adjust the Zulu time on the FlightDEK-D180

- 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 left 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

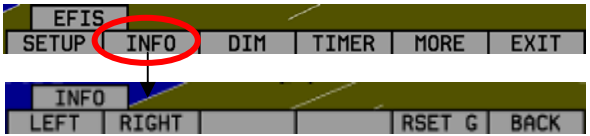
From the SETUP submenu, press button 4 corresponding to CLUTTR. The Clutter Menu will appear with the first four options. Each option corresponds to an item on the screen that can be turned on and off. As with all other menu items, these options are abbreviated to commands containing 6 letters or fewer. 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), IASBAR (airspeed moving tape), and IASDIG (airspeed digital readout). By pressing button 5, corresponding to MORE on the menu readout, four more choices are presented. These are HDG (moving heading tape), BALL (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), BARO (current barometer setting on the bottom right), ROLL▲ (roll angle indicator), and HZNMKR (horizon marker). Pressing MORE will display the first set of items again. The menu flow is presented in the diagram above.

CHECK FIRMWARE VERSION

The firmware version submenu gives you two important pieces of information: the version of FlightDEK-D180 firmware that your unit is currently running and the number of hours the FlightDEK-D180 has been on. From the second line (press MORE) of the SETUP submenu, press the VRSION button; this brings up the firmware version submenu. This submenu will also display the number 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 firmware version ready when you call or write.

INFO – INFORMATIONAL ITEMS

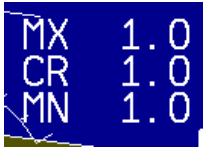


The informational display items submenu is reached from Main Menu 2 as shown in the diagram. From within this menu, you have the option to display up to two of the four options at a time. As can be seen by the INFO submenu, you may display one of the four items on the upper left of the EFIS main page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

Voltmeter

The voltmeter displays 3 rows of information corresponding to the three power inputs on the FlightDEK-D180. 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 FlightDEK-D180 internal battery voltage. If any of the 3 voltage inputs are not present, 00.0V will be displayed for the respective voltage values. The letter V follows all three values, denoting the fact that voltages are being displayed. The FlightDEK-D180 alerts you when the internal battery is low by displaying a low battery alert.

G-meter



The g-meter displays the current vertical acceleration experienced by the FlightDEK-D180 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 FlightDEK-D180 since reset. The middle row, labeled CR, is the current g-force experienced by the FlightDEK-D180. The bottom row, labeled MN, is the minimum g-force

experienced by the FlightDEK-D180 since reset. This last value can be viewed as the maximum negative g-force experienced by the FlightDEK-D180.

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)

The FlightDEK-D180 supports two different types of OATs connected to the EFIS connector and one type connected to the EMS connector, as well as a manual input of the outside temperature. If you have connected just the EMS OAT to the 37-pin EMS connector, and configured it correctly in the EMS setup, no configuration is needed for the EFIS side. Simply display the OAT as described below.

Installed Type	Sensor
N	No OAT installed, dial in OAT value in OATSET menu
1	100240-000
2	100433-001 – marked with a black band near the OAT sensor

If you have connected either of the two types of EFIS OATs to the EDC-D10A or want to use the manual OAT setting, enter the menu system and press MORE, SETUP, MORE, OAT. Push the INSTALLED button to switch between N, 1, and 2. Refer to the chart at right to determine what sensor you need to set it up as. Note: A box will be present around the temperature value if the OAT INSTALLED parameter is set to N.

To display the data from the OAT probe, bring up the menu system and navigate to the INFO menu (MORE > INFO). Select the side of the screen that you wish to display TAS/DA information on (LEFT or RIGHT). Push the button labeled OAT. The values for outside air temperature, density altitude, and true airspeed should display in the format seen at right.

If you would like to use the TAS/DA calculator, but do not have an OAT installed, you may set the INSTALLED type to N. Then, navigate to the OATSET menu (MORE>MORE>OATSET) to manually enter the outside air temperature value.

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. Note that if power to the FlightDEK-D180 is cycled, the screen will be restored to full brightness.

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

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.

Note that the currently running timer is displayed on the Times Page, as described on page 4-8.

- 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.
- To set the down timer, press HOUR until the hours digit increments to the desired value, press MIN until the minutes digits increment to the desired value, and press SEC until the seconds digits increment to the desired value.
- You may not have an up timer and a down timer running at the same time.

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 FlightDEK-D180 can calculate and display 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 menu and press MORE > SETUP > MORE > OAT. Press INSTALLED until the value is "N."

Now, in the EFIS main menu, after pressing MORE twice, you should see the OATSET button. Press INC or DEC until the value setting box above the menu displays the current outside air temperature. This value will be used in the OAT/TAS/DA info item on the EFIS screen. For more information on setting that display up, see page 5-10.

6. HSI OPERATION

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 FlightDEK-D180 Installation Guide for instructions on how to connect these devices to your Dynon network. Also ensure your GPS device is configured to output magnetic headings since all calculations and displays are done in reference to the local magnetic heading.

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.

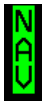
HSI Display Basics

There are three possible sources of information on the HSI page: GPS, NAV, and internal. 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, 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, 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.

   d. "LOC" in green text. This indication means that the radio is tuned to a localizer. The glideslope scale will be visible as well, but may be flagged invalid.

   e. "BC" in green text. This indication means that the radio is tuned to a localizer and is in back course mode. The glideslope scale will be 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 will be flipped 180 degrees and will indicate 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, not the primary ILS runway, or the CDI needle will 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 FlightDEK-D180.

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.

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.

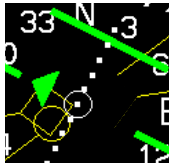
6. Winds aloft. This indicator, located at the bottom of the HSI page, appears only when you have GPS data and true airspeed available to the instrument. The arrow is the wind direction relative to your aircraft. It is always the same size and only indicates wind direction. The numbers below are absolute 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 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.

1. Text displays. In this area you will find a variety of information in text format. 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. The various data fields in this area will be replaced by "---" when the data is not available or is not valid.

2. Course indicator. The course indicator points to the current course that you have selected on your nav radio, often referred to as the OBS. 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 will keep 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 will only be 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 will disappear. 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.



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. Each dot indicates two degrees of deviation from the radial that has been chosen as the course. When tuned to a localizer, each dot represents 0.5 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 will 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 way as the course line, then that is a "to" indication. If it's pointing away from the course line, then that is a "from" indication. This data comes from the to/from flag indicator.

5. Glide Slope Indicator. This appears only when tuned to a localizer. It displays deviation as 0.1 degrees per dot. This will not have an indicator on it unless the glideslope is valid as defined by the glideslope flag.

6. Glide slope flag. This will appear 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.

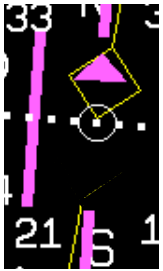
7. Bearing To indicators. These arrows show you the bearing to the active and standby VOR's. This is the direction that you would need to fly to go directly from where you are to the transmitter. When flying directly on course, your BTA and course lines will be overlapping one another. As indicated by the symbols on the left side of the page, the active indicator is depicted by a diamond shape and the standby indicator is depicted by a circle. These elements will only appear when the active and/or standby are tuned to an active frequency. A digital display of these bearings and a reminder of which symbol represents each bearing is in the text area of the page.

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 you will find a variety of information in text format. Displayed here is the ground track (TRK), the course (CRS), ground speed (SPD), MSL altitude (ALT), distance to next waypoint (DTW), and the direct bearing to the next waypoint (BTW).

2. Course indicator. The course indicator points to the course heading that the GPS is reporting. This is usually the heading 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 will keep 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 will only be present when you have an active flight plan in your GPS and are navigating to a point.



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. 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 will 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 and indicates the direction to the destination waypoint.

5. 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 will be overlapping one another. A digital display of this bearing and a reminder of which symbol represents it in the text area of the page.

6. 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)

7. Track indicator. This indicates your direction over the ground as reported by the GPS. This will be different than your magnetic heading when there are crosswinds present. Since this is your actual ground track, keeping this directly above your course pointer will keep you on course, even if your magnetic heading is different.

HSI Menu Structure

- NAVSRC - This is used to choose what navigation source will be displayed on the HSI page. Pressing this button steps through the three options: DG, NAV, and GPS. This button only cycles through overlays that are available in the system, so you will not see the NAV or GPS pages if you don't have these data sources hooked up.

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

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

7. EMS ALARMS

Alarm Indicators

Any time a built-in or preconfigured alarm set point is exceeded, you are alerted via both visible and audible (if connected) alarms.

Visual indications include:

- The measurement's value and tick color are highlighted red
- The measurement's value and tick blink
- 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
- If an external light is connected to the FlightDEK-D180 EMS main harness, the light turns on

The alarm menu appears below the red alarm bar. See Alarm Silencing and Alarm Acknowledgement below for more information on this menu. Note, alarms may be silenced immediately; they may not be acknowledged during the first half second of the alarm.

In an alarm condition, the FlightDEK-D180 also alerts you audibly, provided the EMS Audio Alert output is connected to your intercom as described in the FlightDEK-D180 Installation Guide. If no audio device is connected, you will not hear an audible alarm.

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 SILENCING

To silence the audio alarm, press the SILNCE button.

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:

- Silences the audio alarm
- Removes the alarm bar and alarm menu (if no other alarms are stacked up)
- 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 highlighted red until the condition no longer exists. The alarm automatically rearms whenever the alarm condition is removed.

Multiple Alarms

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

1. Each numeric value and gauge posts its alarm by being highlighted 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. All alarmed parameters remain in their alarmed state until the alarm condition no longer exists.
6. Pressing SILNCE removes the audio alert for the displayed pending alarm.
7. Once the top alarm is acknowledged, the next alarm in the stack is shown, triggering the audio alarm again.

Latching and Self-clearing Alarms

Depending upon how your FlightDEK-D180 was set up, some of the sensors' alarms may be set to be latching, while others may be self-clearing. The distinction is described below. See the FlightDEK-D180 Installation Guide for more information on configuring this setting for each alarm.

LATCHING ALARMS

If an alarm occurs on a sensor configured to be latching, the alert displays on screen until the ACK button is pressed, even if the alarm condition goes away. This means if, for example, your oil pressure momentarily gets too high but returns to normal, the instrument continues to alarm on the condition until that alarm is acknowledged. Latching alarms let you to know if an alarm happened momentarily, when you might have otherwise missed it.

SELF-CLEARING ALARMS

If an alarm occurs on a sensor configured to be self-clearing, the alert displays on screen until either the ACK button is pressed *or* the alarm condition goes away. Consider the example where you have configured your fuel pressure alarm to be self-clearing. If your engine's fuel pressure momentarily rises too high but then returns to normal, the FlightDEK-D180 alarms for that brief instant, but stops as soon as the alarming condition has ceased; no acknowledgement is needed.

8. EMS MONITORING FUNCTIONS

This section describes just a few of the advanced ways to use your FlightDEK-D180 to monitor the health and operation of your engine.

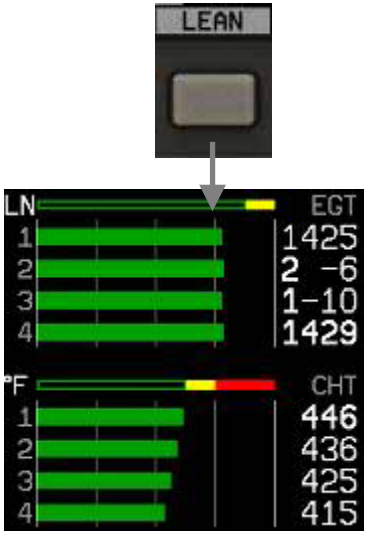
Engine Leaning

You may lean your engine by adjusting the fuel mixture and watching the EGTs. Leaning to peak EGT can be accomplished via the EMS Main Page; however, an enhanced mode is available to make this process easier for you

This is accomplished by activating the main menu and pressing the LEAN button. With this mode activated, the label "Lean Mode" is displayed underneath the EGT/CHT bars to clearly differentiate it from the normal operating mode. In split EGT/CHT mode, the label “LN” is displayed at the upper left of the EGT/CHT display. Additionally, the absolute EGT temperatures (indicated on the right side of the graph) are replaced with new data as each cylinder peaks.

As each cylinder peaks, the absolute number is replaced by the number indicating the order (i.e., 1, 2, 3,…) in which it peaked followed by the temperature difference from its peak temperature. Given this new data, pilots can set their mixture more accurately to attain a given EGT delta value on either the rich or lean side of peak EGT. To exit the Lean mode, reactivate the main menu and press the LEAN button; the Systems Overview page then returns to its normal mode.

For best results, lean carefully by making small adjustments and allowing some time for temperatures to stabilize before leaning further. In addition to the EGT



In the above example, cylinder 3’s EGT peaked first and is now 10 degrees below its peak temperature; cylinder 2 peaked second and is 6 degrees below its peak.

temperatures, you can also watch the fuel flow rate and CHT temperatures. Carefully read and follow your engine manufacturer's leaning recommendations for best performance.

Detonation Characterization

Detonation is defined as the uncontrolled explosion of the fuel/air mixture. It occurs when the anti-knock rating of the fuel is lower than required by the pressure and temperature generated during engine operation. Using a fuel octane number less than that required, or over-leaning the engine can result in detonation and induce engine damage. Leaning too aggressively can leave little margin between normal combustion and detonation. Any defect like a bad spark plug, partially blocked fuel injector nozzle or intake manifold leak combined with a minimum margin can result in detonation and engine damage. One key characterization of detonation is lower EGT temperatures with corresponding higher cylinder head temperatures.

Pre-ignition Characteristics

Pre-ignition manifests itself as high EGT and high CHT temperatures resulting from premature ignition of fuel/air mixture in advance of normal ignition. This is usually caused by a hot spot in a combustion chamber. A hot spot is typically the spark plug electrode or exhaust valve. When pre-ignition occurs, ignition timing is lost and the upward movement of the piston is opposed by the high pressure generated by the early combustion.

Ignition Misfire

When a magneto fails or a plug gets fouled, one of the plugs in the cylinder stops firing. This causes the fuel to burn slower than it usually does, since only one plug ignites the mixture. This slow burn means some unburned fuel makes its way into the exhaust stack and burns there, causing high EGT values. This also means less energy is being put into the

head, so the CHTs will also fall. If it occurs on one cylinder, suspect a fouled plug and try clearing it out. If it occurs on all cylinders at once, suspect a magneto and take appropriate action for your aircraft.

Shock Cooling

Significantly reducing power and dropping the nose simultaneously can cause shock cooling. This can cause the engine to cool rapidly and unevenly. When this happens, the rear of the engine is exposed to less cooling air than the front of the engine. Shock cooling is characterized by rapidly dropping and uneven CHT temperatures and may lead to cylinder cracking. You may configure shock cooling and span alarms; see the FlightDEK-D180 Installation Guide for more details.

Data Logging

While many observations are clearly visible via the color graphical display, some destructive behaviors are too subtle to be noticed during routine flight. Logging engine data over longer periods of operation allows you to spot potential problems before they induce costly damage or result in a flight emergency.

The FlightDEK-D180 constantly streams data out of its RS-232 serial port during normal operation. The data format is described in on page 10-2. To log engine data, you need a laptop (or RS232 data collection device) connected to, and storing data from, your FlightDEK-D180.

9. COMMON EMS PROCEDURES

This section contains common step-by-step procedures performed by the pilot before, during, and after flight. Pilots are encouraged to be familiar with all of these procedures prior to flying to ensure readiness as well as maximizing use of the capabilities of the instrument.

All menu navigation in this section is done with respect to the EMS Main Menu (EMS). A ">" denotes user navigation via the menu to a specified button label.

We recommend that you review and understand the Product Operation section of this guide before reading this section.

ON / OFF

Turn ON: Press and hold button one.

Turn OFF: Exit all menus and press and hold button one.

You must hold button one down for approximately two seconds for either action. When power is connected, the unit does not completely turn off. It enters a low-power state, and keeps track of time as well as detects changes in the state of button one (the POWER button). It is acceptable to have the FlightDEK-D180 on during engine crank. It will immediately power on upon application of external power.

Display Brightness (DIM)

Adjust Display Brightness: EMS > MORE > DIM > BRITR/DRKR

- BRITR increases display brightness.

- DRKR decreases display brightness.

Each press of a button increases or decreases display brightness.

Note: The initial setting of the FlightDEK-D180 display is maximum brightness. There is no way for you to adjust the display to be completely black.

Fuel Computer

Add Fuel: EMS > MORE > FUEL > ADD > INC+/DEC- > SEL► > ACCEPT/CANCEL

Use this to add to or subtract fuel from the EMS Fuel Computer. Press INC+ to add fuel. Press DEC- to subtract fuel. Press SEL► to enter the value into the computer. Press ACCEPT to confirm the value. Press CANCEL if the value is not correct. Note that you can also access the FUEL menu from the Auxiliary page, if you have the fuel computer info item displayed on it.

Reset fuel level to pre-configured value: EMS > MORE > FUEL > PRESET

You may configure the PRESET value using the following path: EMS > MORE > SETUP > FUEL > PRESET VALUE > INC+/DEC- > BACK.

Reset fuel level to full: EMS > SETUP > FUEL > FULL

You may configure the FULL value using the following path: EMS > SETUP > FUEL > FULL VALUE > SEL► > INC+/DEC- > BACK.

Note: It is necessary to calibrate the EMS Fuel Computer with the sensors for fuel level to work correctly. Reference the FlightDEK-D180 Installation Guide for more details.

Engine Leaning

Enter Lean Mode: EMS > LEAN

This puts the EGT display into lean mode, changing the numerical values for each cylinder to the format "order peaked-temperature below peak."

Exit Lean Mode: EMS > LEAN

This returns the EGT display to normal.

Clock Setup

Set Time: EMS > MORE > TIMES > CLOCK > SEL► > INC+/DEC- > BACK

This menu, and corresponding dialog box, allows you to set both your local time and Zulu time in 24-hour format. You may display times in either 12-hour or 24-hour format as described in the next section. Set the local and Zulu times independently. Highlight values using SEL►. Adjust highlighted values with INC+/DEC-. Each time a button is pressed, the value changes by one. Hold down INC+ or DEC- to adjust values rapidly. Seconds are reset to zero when minutes are adjusted.

Clock Format

Set 12/24 Display: EMS > MORE > SETUP > CLOCK > FORMAT

Press the 12/24 button to toggle between STNDRD (12 hour AM/PM format) and MILTRY (24 hour military format).

Timers

Reset trip timer to zero: EMS > MORE > TIMES > TRPRST

The Trip Timer is a Hobbs timer which you can reset. To reset, simply press the TRPRST button in the TIMES page menu.

Set recurring tank timer: EMS > MORE > TIMES > TIMER

The general purpose timer can be configured to be either an up timer or down timer. For the purposes of tank switch timing, set the timer to count down by pressing UP/DN until you see DOWN in the dialog box above the menu. Push the HOUR, MIN, and SEC button until the desired interval is shown in the dialog box. When ready, press START. When the timer expires, the alert menu will present the RESTRT button. Pressing this button restarts the down timer to the value you initially set it to.

Global Configuration Settings

Configure global settings: EMS >MORE > SETUP > GLOBAL

The Global page is divided into three sections: PILOT SETUP, SCREEN SETUP, and INSTALL SETUP. Pilot settings and screen settings are addressed in this guide. If you or your installer have completed the procedures outlined in the FlightDEK-D180 Installation Guide, you do not need to modify anything in the INSTALL SETUP section.

You may edit settings for the measurement system (i.e., English or Metric), alarm power, test alarms, and configure FlightDEK-D180 screen and hotkey settings. Scroll between settings by using the UP▲/ DOWN▼ buttons. Chosen settings are highlighted. Toggle between parameter settings or display a menu of choices by pressing SEL►. Press BACK to save.

Change power on alarms status: EMS > MORE > SETUP > GLOBAL > DOWN▼ > SEL► > BACK

Set this parameter to "ON" to enable alarms before engine startup. With this parameter set to "OFF", all alarms are suppressed whenever ALL of the following conditions exist:

- RPM less than 400
- Oil pressure less than 20 PSI
- First five minutes after master instrument power applied

All alarms are initialized when any of the above conditions are exceeded.

Test light/audio alarm(s): EMS > SETUP > GLOBAL > DOWN▼ > DOWN▼ > SEL►

Note: You must select an alarm to test using the UP▲/ DOWN▼ buttons. Hold TEST to test an alarm.

Configure info items: EMS > SETUP > GLOBAL > DOWN▼ > DOWN▼ > DOWN▼ > SEL►

The INFO ITEM CONFIG submenu allows you to configure the display of up to 8 different sensors as simple analog bars, on/off contacts, or (Aux Page only) text items. Press the DOWN▼ button to select the item, INFO ITEM CONFIG►. Press SEL► to enter the INFO ITEM CONFIG submenu.

The first two info items are displayed on the EMS Main Page. Info item 1 is at the top right of the page, and info item 2 is at the lower right of the page. The other six info items are located on the Aux Page and are numbered 2 through 5 on the top row and 6 through 8 on the bottom row.

The Info Items Config submenu appears, allowing you to move up and down the list, selecting which parameter you would like displayed at each info item position. To change the function that a given item displays, press UP▲ or DOWN▼ until it is selected (the > symbol is to its left), and press SEL► to cycle through the available functions. Repeat this for each info item you'd like displayed. One of the options available is NONE, which prevents that info item from displaying.

Any function that you have selected to be an info item has that fact reflected in its corresponding SENSORS configuration page. In its configuration page (EMS > MORE > SETUP > SENSORS > relevant sensor type), you will see a label indicating which info item the parameter is set up to be displayed at.

10. 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 FlightDEK-D180, a specifications sheet, and a troubleshooting guide. This section also contains details regarding FlightDEK-D180 servicing.

Appendix A: Serial Data Output

The FlightDEK-D180 has two RS232 serial ports: one on the EFIS 25-pin connector and one on the EMS 37-pin connector. Each of these serial ports outputs data for its respective instrument function. Technical information on the installation and connection to these serial ports can be found in the FlightDEK-D180 Installation Guide. To log both EFIS and EMS data, you must connect both serial ports 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 sections detail the format used for both EFIS and EMS data output.

EMS SERIAL DATA OUTPUT

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

Parameter	ASCII Characters	Units	Example
Hour	2	Zulu time Hours	12 (12 hrs)
Min	2	Zulu time Minutes	12 (12 mins)
Sec	2	Zulu time Seconds	12 (12 secs)
Fraction	2	1/64 of sec	12 (12/64 sec)

Parameter	ASCII Characters	Units	Example
Manifold Pressure	4	inHg x 100	1215 (12.15inHg) (using 5/100 increments)
Oil Temp	3	º F	123 (123ºF) or -12 (-12ºF)
Oil Pressure	3	PSI	099 (99PSI)
Fuel pressure	3	PSI x 10	123 (12.3psi)
volts	3	volts x 10	123 (12.3V)
amps	3	amps	012 (12A) or –12 (-12A)
RPM	3	RPM/10	123 (1230 RPM)
Fuel Flow	3	GPH x 10	123 (12.3gph)
Gallons remaining	4	Gallons x 10	1234 (123.4g) or –123 (-12.3g)
Fuel_Level_1	3	Gallons x 10	123 (12.3g)
Fuel_Level_2	3	Gallons x 10	123 (12.3g)
GP_1	8	See table below	3 char label; 5 char data; see GP output table
GP_2	8	See table below	3 char label; 5 char data; see GP output table
GP_3	8	See table below	3 char label; 5 char data; see GP output table
GP Thermocouple	4	º F	1234 (1234ºF) or –123 (-123ºF)
EGT_1	4	º F	1234 (1234ºF) or –123 (-123ºF)
EGT_2	4	º F	Same as above
EGT_3	4	º F	Same as above
EGT_4	4	º F	Same as above
EGT_5	4	º F	Same as above
EGT_6	4	º F	Same as above
CHT_1	3	º F	123 (123ºF) or –12 (-12ºF)

Parameter	ASCII Characters	Units	Example
CHT_2	3	º F	Same as above
CHT_3	3	º F	Same as above
CHT_4	3	º F	Same as above
CHT_5	3	º F	Same as above
CHT_6	3	º F	Same as above
Contact_1	1	Boolean	'0' or '1'
Contact_2	1	Boolean	'0' or '1'
Product ID	2	ASCII hex	Internal use - ignore
Checksum	2	ASCII hex	Sum of all preceding bytes
CR	1		0x13
LF	1		0x10

GP output table

General purpose inputs have a unique format in the data output stream. As shown in the table above, they each have 8 characters. 3 are used as a label for the function; 5 are used for the data.

Description	Units	Label (3-Bytes)	Example (5-Bytes)
Unused		N/A	XXXXX ('X's will output as place holders)
OAT	º F	OAT	00123 (123 ºF) or –0123 (-123 ºF)
Carb Temp	º F	CRB	00123 (123 ºF) or –0123 (-123 ºF)
Coolant Temp	º F	CLT	00123 (123 ºF) or –0123 (-123 ºF)
Fuel Level 3	Gallons	FL3	00123 (12.3g)

Description	Units	Label (3-Bytes)	Example (5-Bytes)
Fuel Level 4	Gallons	FL4	00123 (12.3g)

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

```
00003663489534600041134000000000000000000000OAT-0004N/AXXXXXN/AXXXXX-0120013004100
63006800390060-00442105486129399
```

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 FlightDEK-D180's internal clock
3	2	Minute	00 to 59, current Zulu time minute according to FlightDEK-D180's internal clock
5	2	Second	00 to 59, current Zulu time second according to FlightDEK-D180'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^{o})
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^{o})
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. Bit 0 (LSbit) of the Status Bitmask is 0 when this field is *displayed altitude*, 1 when *pressure altitude*.
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 1/100 G (99 = 0.99 G's)
37	1	Vertical G's Sign	'+' or '-' (positive means plane is experiencing upward vertical acceleration)

Start 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. Bit 0 (LSbit) is 0 when the altitude field is *displayed altitude*, 1 when *pressure altitude*.
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 www.dynonavionics.com/downloads.

Appendix C: Troubleshooting

Should you experience difficulty with your product that is not solved by reading the section below, please call us at (425) 402-0433 or email us at support@dynonavionics.com.You may also reach us and other active users at our online support forums located at: www.dynonavionics.com/forum/

UNIT ERRORS

Problem	Solution
After performing a magnetic calibration the FlightDEK-D180'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 FlightDEK-D180 heading corresponds to the direction in which your plane is pointed.
When the barometer on the unit is set correctly, the displayed altitude is inaccurate by a constant amount.	Set the barometer to the correct value for your current location. 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 FlightDEK-D180 altitude corresponds to that of the current location of your plane. See diagram below for more information.

Problem	Solution
Airspeed is inaccurate by between 1 and 10 knots (or equivalent, in other units) at takeoff speed.	You may recalibrate your FlightDEK-D180's zero pressure value. With your plane in as windless an environment as possible (e.g., a hangar), cover both the pitot and static ports with a sock or cloth to minimize airflow without putting pressure on the ports. Next, on the FlightDEK-D180, enter the EFIS main menu, press MORE > SETUP > MORE > MORE > MORE > SPDCAL. When you are confident that there is no pressure on the pitot and static ports, press either button corresponding to SET ZERO PRESSURE. Press YES to confirm you have zero pressure on the pitot and static ports. You will see a message indicating that the unit is calibrating. This should only take a few seconds. On your next flight, verify that the airspeed is what you expect. To reset the airspeed calibration to factory defaults, enter the SPDCAL menu, and press RESET DFLTS.
The unit blinks a blue screen continuously when on.	Ensure that your power supply is capable of supplying at least 1.5 amps 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 FlightDEK-D180 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	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

Warning Message	Meaning	End condition
	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.	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	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

Warning Message	Meaning	End condition
	and black to indicate the fact that the artificial horizon cannot be trusted.	usually recovers within 5 seconds of coordinated flight.
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 clock display, 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.
REMOTE COMPASS NOT DETECTED	The FlightDEK-D180 is unable communicate with the EDC-D10A.	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 FlightDEK-D180 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 FlightDEK-D180 while the remote compass was *not* 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 FlightDEK-D180 does not have internal magnetic sensors and thus *requires* the EDC-D10A be connected.
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 FlightDEK-D180 and the EDC-D10A as well as that of the OAT sensor.

Warning Message	Meaning	End condition
HOLD TO POWER DOWN	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 DOWN IN 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 prior to the unit turning off.	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.

FIRMWARE VERSION DISPLAY

The firmware version submenu gives you two important pieces of information: the version of FlightDEK-D180 firmware that your unit is currently running and the number of hours the FlightDEK-D180 has been on.

To display this information, activate the either the EMS or EFIS Main Page menu then press MORE > SETUP > VRSION. When calling Dynon for assistance it is often helpful to know what firmware version the instrument is currently using. This menu is simply for informational purposes; pressing any button besides BACK has no effect.

To determine whether you have the latest version of FlightDEK-D180 firmware, please refer to Dynon's website at: www.dynonavionics.com/downloads here the most recent program is freely available.

If you should have need for technical support or other assistance from Dynon, please have your firmware version ready when you call or write.

Appendix D: FlightDEK-D180 Specifications

Mechanical	Mounting:	6.95” wide x 4.90” tall x 4.51” deep (177 x 125 x 115 mm)
	Weight:	3 lb. (1.36 kg) 3 lb. 6 oz. (1.6 kg) with internal battery
Operating Temperature	-22° to 122° F (-30° to 50° C)	
Power	Voltage:	10 - 30 Vdc
	Power:	**14 watts** typical; **26 watts** maximum
Connections	Wiring:	D-25 male, D-25 female, & D-37 male connectors
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

Sensor Inputs	6 - EGT (Type K Thermocouple) 6 - CHT (Type J Thermocouple) 2 - Fuel Level (Resistive or Capacitance with 5 volt output) 2 - RPM (P-lead or pickup) 2 - Contacts 1 - Manifold Pressure (voltage) 1 - Oil Temperature (Resistive) 1 - Oil Pressure (Resistive) 1 - Fuel Pressure (Resistive) 1 - Fuel Flow (Frequency) 1 - Current (Shunt) 1 - Voltage (from supply power) 3 - General Purpose (Either resistive or voltage for OAT, Fuel Tanks 3&4, Coolant Temp, Coolant Press, Carburetor Temp, Flaps, Trim)
Inputs/Outputs	1 - Alarm Light Contact 2 - Audio Alarm 1 - RS-232 bidirectional PC communication or external data input 1 - RS-232 data input (GPS, SL30, etc.) 3 - Dynon Smart Avionics Bus (DSAB)