

EMS-D10

Engine Monitoring System

Preliminary



Pilot's User Guide

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

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Dynon Avionics



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INTRODUCTION



Welcome

Thank you for purchasing the Dynon Avionics EMS-D10 Engine Monitoring System. This small device, which fits into a standard 3 1/8 inch instrument panel hole, combines a graphical display/processing instrument together with an assortment of key sensors for monitoring your engine and other aircraft systems vital to the small aircraft pilot. As you will discover, the EMS-D10 is a powerful tool, useful in a variety of small aircraft, at a price that small aircraft owners can afford.

The EMS-D10's graphical color displays and menu system have been carefully designed to present data in an ergonomic manner facilitating quick scanning by the pilot. Its warning capability provides early notification of problems that might otherwise go unnoticed. By combining all the sensor inputs into one central processing/memory device, data may be stored for later retrieval and analysis via PC programs to enhance detection of future problems.

The EMS-D10's versatile design accommodates a wide range of engines and sensors to support most piston type aircraft. Users may configure the system to meet the monitoring requirements covering both air and water cooled type engines with up to 6 cylinders.

When connected to the Dynon EFIS-D10 series Electronic Flight Information System, the EMS-D10 will retrieve and display EFIS information at the push of a button.

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



About this manual

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

It is *strongly* recommended that you read the entire manual before attempting to utilize the EMS-D10 in an actual flying situation. Additionally, we encourage you to spend time on the ground to familiarize yourself with the operation of the unit. Finally, we encourage you to keep this manual in the plane with you at all times. This document has been designed to give you quick access to information that might be needed in flight. CAUTION: in a flying situation, it is the pilot's responsibility to use the product and the manual prudently.

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



QUICK OVERVIEW



This section is meant to give experienced pilots an easy way to get started with the EMS-D10. However, it is suggested that you read the entire manual and familiarize yourself with the EMS-D10 before using it in flight. This section assumes that you have completed the installation of the EMS-D10 as described in the EMS-D10 Installation Guide.



Menu Navigation System

The menu system for the EMS-D10 is designed to provide quick access to commonly used monitoring pages and functions while taking up a minimum amount of space on the screen.

All user interaction takes place via the 6 buttons at the bottom of the front panel of the EMS-D10. When no menu is present, pressing *any* of the six buttons will bring the main menu on the screen as shown at right. (See the [Hotkey Rapid Page Switching](#) Section for exception)

The six sections of any menu correspond respectively to the six buttons below them. Pressing the LEAN, AUX or FUEL buttons either activates the Peak Detection Mode or switches the display to one of the other pages offered.

If more options are available than can be shown on one screen of menus, pressing MORE will display these options.

Button 6 will usually display BACK (return to the previous menu) or EXIT (removes the menu system altogether). Refer to the [Menu Navigation](#) Section of this manual for complete details.



Throughout the manual, buttons are referred to using the numbers shown above. Button 1 is on the far left; button 6 is on the far right.



Hardware Information

The information presented here serves as a reference only and should not be used for diagnostic or reparative work. It will help you to familiarize yourself with the inner workings of the unit. For detailed installation instructions, please refer to the EMS-D10 Installation Guide.

- The display is a 450 nit LCD screen, much brighter than most laptop displays
- Up to 27 sensors may be connected to the EMS-D10 to present the pilot with operational data for engines with up to 6 cylinders. When connected with the appropriate sensor, the data available for presentation by this instrument includes RPM, Manifold Pressure, Oil Temperature & Pressure, Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT), Fuel Levels for up to 4 tanks, Volts, Amps, Fuel Pressure, Carburetor Air Temperature, Outside Air Temperature, Coolant Temperature & Pressure, and Turbine Inlet Temperature. Two external contacts may additionally supply status information for a variety of possible auxiliary aircraft systems such as canopy closure etc.
- The EMS-D10 provides two outputs to drive external visual and audible warning devices (not supplied) to alert the pilot whenever alarms occur.
- User interaction takes place via the 6 buttons along the bottom of the front panel of the unit. Button 1 is used to power up and turn off the instrument.
- The instrument will run when supplied with 10 to 30 Volts DC.

See [EMS-D10 Specifications](#) in the Appendices for additional detail.

Multi-Page Presentation

The EMS-D10 utilizes a multi-page approach to extend the power and usefulness of the instrument. For in-flight monitoring, three primary pages are available to the pilot; they are:

- *Systems Overview Page (default page)*
- *Auxiliary Page*
- *Fuel Computer Page*

Additional useful information is provided by means of **Checklist Pages**. Up to 5 Checklists may be predefined and loaded into the EMS-D10.

A series of **Setup Pages** are included that facilitate the initial installation as well as permitting the pilot to set personal preferences.

Finally, if the EMS-D10 is connected to other Dynon Avionics instruments, such as the EFIS-D10 series of Electronic Flight Information Systems, data from these other instruments may be displayed directly on the EMS-D10 **Instrument Pages** screen.

Navigation to each page is accomplished via the [Menu Navigation System](#) as described below. Hotkeys may also be activated by the pilot to switch quickly between the three primary flight pages and between the displays of other connected Dynon products.





Hotkey Rapid Page Switching

Switching between pages is primarily facilitated via the standard softkey menu navigation system. Pilots may also enable the higher-level “Hotkey” functionality to switch more rapidly between the primary flight displays and/or other instruments.

Two Hotkeys may be activated: one on button 1, the other on button 6. When these are activated, users may no longer use these buttons to bring up the main menu system per the standard method. Bringing up the standard menu will only be available on the remaining four buttons.

Rapid Page Hotkey (button 1) – Button 1 facilitates switching between the EMS-D10 primary pages most often visited during flight. This Hotkey switches between the System Overview, Auxiliary and Fuel Computer Pages. Pilots wishing to switch from the System Overview page to the Fuel Computer Page would simply press the Rapid Page Hotkey twice in rapid succession.

Instrument Page (button 6) – Button 6 facilitates switching between the EMS-D10 engine monitor and other Dynon Avionics instruments like the EFIS-D10 series. This is only possible if other Dynon Instruments are installed and have a data connection wired into the EMS-D10. Refer to the EMS-D10 Installation Guide for more information about the physical connection between the EMS-D10 and other Dynon products.





MENU NAVIGATION



Menu Functions

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

- When no menus are displayed, pressing any button brings up Main Menu 1. (*or middle 4 buttons if Hotkeys are enabled*)
- The menu system operates as a hierarchy. When in any of the 2 main menus, pressing a button will show the next level down in the hierarchy. For ease of navigation, a tab located just above the currently displayed menu alerts you to the context of the menu.
- Button 6 (on the far right) is the universal “back-out” button.
 - In either of the two main menus, it is labeled EXIT and will remove the menus from the screen completely.
 - In any other menu, it is labeled BACK and will display the menu above the current one in the hierarchy.
- In addition to the two main menu lines, all menus have a tab directly above the menu line informing the user to the context of the menu. For example, when setting the display brightness, the text DIM is visible in the tab above the left side of the displayed menu.



- When changing values (alarm set points, clock, timer, etc), pressing and holding either the INC or DEC button to change values will cause the rate of change to increase.
- All text for buttons is limited to 6 characters to minimize the amount of screen space the menus take up. As a result many words are abbreviated, such as CHKLST for checklist and AUX for the Auxiliary Page.

Main Menu Flow

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





DISPLAY PAGES



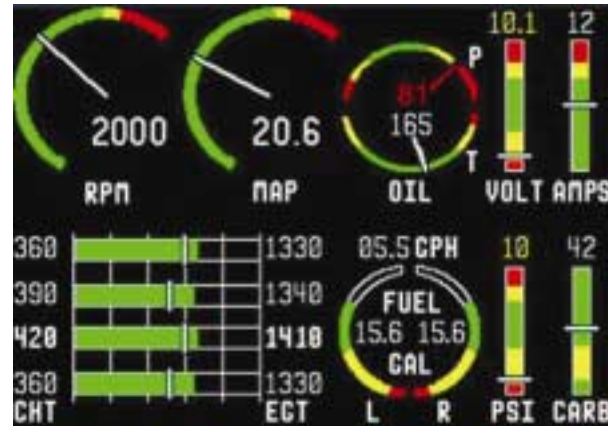
System Overview Page

This page is the default page and most common page the pilot is likely to use in flight. This page presents: RPM, Manifold Pressure (MAP), Oil Temperature, Oil Pressure, Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT), Fuel Level, and Fuel Flow. Up to 4 vertical Info Bars may additionally be displayed.

Display Customization - The System Overview and other accompanying pages allow a degree of customization during the setup, so the actual screen presentation may differ from what is depicted depending upon the sensors employed, the selected position of the vertical Info Bars and the units of measurement selected (English or Metric).

Measurement Display Type - Measurement/status information is displayed using a combination of circular gauges, horizontal bars, vertical bars and simple text. The best display method is utilized for each measurement function and is not user selectable.

Color Indicators – Are used to signify normal and abnormal operational ranges.





Info Bars - Up to 4 vertical bars may be displayed covering either Volts, Amps, Fuel Pressure, Carburetor Air Temperature, Outside Air Temperature, Coolant Pressure, Coolant Temperature and Turbine Inlet Temperature. The measurement type and position are determined during the instrument setup process.

EGT/CHT - Up to 6 channels may be displayed simultaneously. The EGTs are depicted by the green horizontal bars with accompanying values to the right. The CHTs are the white vertical tick marks shown on top of the green EGT bars. Their measurement values are shown to the left.

Auxiliary Page

The Auxiliary Page presents additional information of interest to the pilot as an extension to that provided on the System Overview Page. This page presents a variety of information.

Timers

The System Clock presents a real time clock which may be set for local or Zulu time and be in either a standard or military format. The Flight Time keeps time of your current flight since the engine was turned on. The Trip Timer maintains an ongoing timer of successive flights since it was last manually reset via the TRPST function. This is ideal for tracking cross country trips with multiple legs.

The Tach Timer tracks RPM related time defined as the RPMs/hour at cruise speed. The cruise RPM value is set in the Setup parameters.

The Hobbs Timer tracks total engine time any time the oil pressure is 15 PSI or greater.

Info Bars

During the initial setup up to three Info Bars may be implemented. Refer to Info Bar section within the manual for more detail.

Contact Inputs

The EMS-D10 accepts two inputs from external contacts within the aircraft to provide status information. The list of functions includes canopy, landing gear, fuel tank, fuel pump, general purpose.





Fuel Computer Page

The Fuel Computer Page presents a comprehensive view of all fuel related parameters in one place. Pilots can quickly assess fuel level, fuel flow and fuel time remaining in one convenient view. The picture to the right depicts a fully configured system; your page may appear differently depending on your individual sensor input configuration.

All textual data in the center of the page represent the computed data (requires optional fuel flow sensor) whereas the analog gauges all depict sensor-fed data. Both Metric and English units are supported and are selectable by the pilot as a global parameter. See Pilot Configuration Selections in this manual for more detail.

The fuel levels are depicted by the four possible vertical bars. The two semi-circular gauges present the Fuel Flow Rate (GPH or LPM) and Fuel Pressure (PSI or BARS).

The Fuel Computer textual data displays the:

GALS (or LTRS) REM – Fuel remaining. This is the total sum of all the fuel computed to be in all the fuel tanks combined. This remaining amount displayed is calculated from the fuel quantities input by the pilot whenever fuel has been added less whatever fuel is used as sensed by the fuel flow sensor. This data may be compared to the sum of the fuel levels displayed on all tanks. See Fuel Computer Adjustment below for more detail on how pilots input data into the Fuel Computer.





GALS (or LTRS) USED – This is the total fuel used as sensed by the fuel flow sensor since the engine was last turned on.

TIME REM - This is the calculated time remaining before fuel exhaustion based upon the fuel computed to be on board at the present rate of consumption.

WARNING: The GAL REM and GAL USED values are not a true measurement of the fuel in the aircraft tanks but are CALCULATED values based upon data input by the Pilot. They are for informational purposes only and to be used as a cross reference to fuel level data. These calculated values should always be utilized as a tool for crosschecking purposes only and not as primary indicators. Pilots are responsible for the preflight routines for their aircraft and verifying they have sufficient fuel onboard per the FARs prior to departure.

Only when the system is properly calibrated and fuel data input correctly will these values accurately depict the measurement indicated. Pilots will need to verify the calibration over several tanks following initialization of the system. Refer to the EMS-D10 Installation Guide for instructions on adjusting the calibration.



Checklist Pages

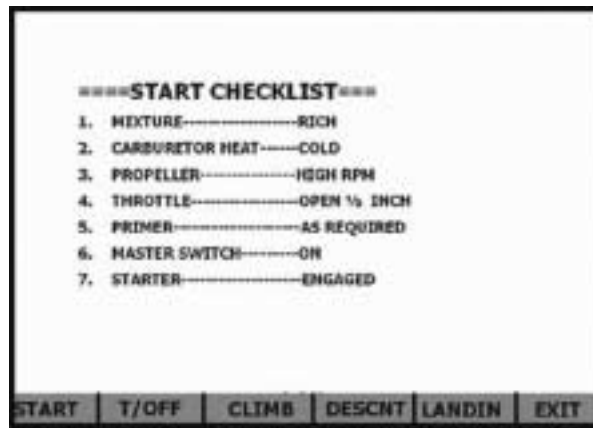
With Dynon's free "Dynon Product Support Program," you may define up to 5 different checklists and download them to the EMS-D10 via a serial port connection.

These pages permit pilots to display customized lists covering their particular aircraft. While most frequently used for "Checklists", these screens can cover any subject of interest whether it be waypoint info, a list of radio frequencies or other useful reminders.

The system supports up to 5 checklists each containing 14 lines of text per checklist. 40 characters can fit on each line of the screen.

To load checklists onto your EMS-D10, you must upload them as described in the help file that comes with the Dynon Product Support Program. You must also ensure that an RS232 serial port cable is properly connected between your EMS-D10 and your PC.

Pressing the CHKLST menu button will take you to the checklist submenu which will contain the checklist titles as defined by you during the setup process with the PC. You may customize the checklists and their titles as you wish.





Instrument Pages

If the EMS-D10 is connected to other Dynon Avionics instruments, data may be shared and displayed on the EMS-D10 screen. For example the EFIS-D10 and EFIS-D10A can have their displays presented on the EMS-D10's display as depicted to the right.

If multiple instruments are connected to the Dynon Avionics Smart Bus (a forthcoming feature), the INSTR menu will automatically display each available instrument for selection. If the EMS-D10 does not sense any other connected instruments, the INSTR menu will simply be blank.





ALARMS



Alarm Indications

Any time a preconfigured alarm setpoint is exceeded, a visual and audible alarm warning is posted to alert the pilot.

Visual indications include:

- 1) The measurement value and tick color is changed to red
- 2) The measurement value and tick blinks
- 3) A red alarm bar is posted across the middle of the screen that includes a message identifying the out of range measurement
- 4) Alarm menu is posted

Audio annunciation is made via an external device driven by the EMS-D10 instrument. If no audio device is provided or connected, no audible alarm will be manifested.



Alarm Silencing

To silence the audio alarm, press the SILNCE button.



Alarm Acknowledgement

To acknowledge the alarm, press the ACK button. This will simultaneously

- 1) Silence the audio alarm
- 2) Remove the alarm bar
- 3) Remove the alarm menu

The tic and numeric value will remain a red color in the blinking state until the condition no longer exists. The alarm automatically rearms whenever the alarm condition is removed.

Multiple Alarms

Any time multiple alarms occur the following sequence is performed:

- 1) Each numeric value and gauge posts its alarm as described above.
- 2) Alarm messages in the alarm bar are stacked into memory and presented in the order in which they occurred. Removal of the Alarm Bar requires separate pilot acknowledgement of each alarm.
- 3) When the last alarm is acknowledged, the Alarm Bar and Alarm Menu are removed from the screen.
- 4) All alarmed parameters remain in their alarmed state until the alarm condition no longer exists.
- 5) Pressing SILNCE removes the audio alert for all pending alarms.



Latching and Self-clearing Alarms

Depending upon how your EMS-D10 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 EMS-D10 Installation Guide for more information on configuring these values.

Latching alarms

If an alarm occurs on a sensor configured to be latching, the alert will display 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 EMS-D10 will continue to alarm on the condition until that is acknowledged.

Self-clearing alarms

If an alarm occurs on a sensor configured to be self-clearing, the alert will display on screen until either the ACK button is pressed *or* the alarm condition goes away. This means if, for example, your fuel pressure momentarily gets too high but returns to normal, the EMS-D10 will stop alarming on the condition even if you've never acknowledged it.



MONITORING FUNCTIONS



Leaning Using EGT Peak Detection

Maximizing performance by adjusting the fuel mixture and watching the EGTs is a key feature of the EMS-D10 instrument. Leaning to peak EGT can be accomplished via the System Overview display; however, an enhanced screen mode is available to make this process easier for the pilot.

This is accomplished by activating the main menu and pressing the LEAN button. With this mode activated, the "Lean Mode" label is displayed underneath the EGT/CHT bars to clearly differentiate it from the normal operating mode. 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 delta temperature 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 attain the best results, be sure to lean carefully by incrementally making adjustments and allowing some time for temperatures to normalize before leaning further. In addition to the EGT temperatures, you can also watch the fuel flow rate and CHT temperatures.





Unless you're already experienced with these modern type of instruments, it's a good idea to begin by using leaning techniques used beforehand while examining and familiarizing oneself with the corresponding EMS-D10 readings. Be sure to carefully read and follow the engine manufacturers leaning procedure for your particular configuration.

To exit the Lean mode, reactivate the main menu and press the LEAN button, the System Overview screen will then return to its normal display.

Characterization of Detonation

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. Aggressive leaning reduces the anti-knock rating to levels where the engine is susceptible to detonation. 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.

Characteristics of Preignition

Preignition is manifested by 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 combustion chamber or magneto cross-fire. A hot spot is typically the spark plug electrode or exhaust valve. When preignition occurs, ignition timing is lost and the upward movement of the piston is opposed by the high pressure generated by the early combustion.



Shock Cooling

Shock cooling can be caused by significantly reducing power and dropping the nose simultaneously. 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 CHT temperatures and may lead to cylinder cracking.

Data Logging

While many observations are clearly visible via the color graphical display, some destructive behaviors are too subtle to notice during routine flight. Data logging engine parameters at set intervals over longer periods of operation allow specially designed algorithms to highlight potential problems before they induce costly damage or result in a flight emergency.

The EMS-D10 is constantly streaming its data out its RS232 serial port during normal operation. The data format is described in [Serial Data Output](#) section. To log your engine data with this feature, you need a laptop connected. In a future release of the EMS-D10 software, the EMS-D10 will log data internally, allowing you to retrieve it from memory at a later time. Watch the Support section of Dynon's website at www.DynonAvionics.com for official release dates of this internal logging feature.



PILOT FUNCTIONS



Introduction

This section describes the functions performed by the pilot before, during and after flight. Pilots are encouraged to be familiar with all these functions prior to flying to ensure readiness as well as maximizing use of the full capability of the instrument.

Turning the Instrument On/Off

The instrument is designed to automatically turn on whenever power is applied through the power bus to which it's connected. Upon powering up, the instrument defaults to the Systems Overview Page. Pilots may power the instrument on and off manually by the following steps.

Momentarily pressing button 1 will activate the EMS-D10.

To turn the instrument off, press and hold button 1 for approximately 2 seconds. While power is still connected, the unit is never fully turned off. It simply enters an extremely low-power state, allowing it to keep track of time and detect a change in state of the POWER button.

Screen Brightness (DIM) Control

Pilots may adjust the display brightness for night time or daylight flying via the DIM command located within the main menu system. When initially powered on, the screen is automatically set to the full bright state. To adjust the display brightness, press any button to activate the main menu then press MORE and DIM. Pressing BRITR will increase screen brightness until it reaches its maximum. Pressing DRKR will decrease screen brightness until it reaches its minimum. It



is not possible to turn the screen completely black via this menu to prevent confusion between a dimmed state and a turned-off state.

Updating the Fuel Computer

Pilots can update the fuel computer via the softkey menu anytime fuel is added or removed from the plane. This is accomplished by selecting either:

ADD - add or subtract fuel from the Fuel Computer total by any value.

Pressing the ADD softkey opens a dialog box that permits the pilot to modify the stored value in the Fuel Computer by the amount of change. If there were 15.1 gallons previous to the pilot adding an extra 10 gallons, this menu permits the pilot to enter 10 gallons. The Fuel Computer will then add the 10 gallons to the 15.1 and display the new total of 25.1 gallons remaining.



To enter the desired value of total fuel added or withdrawn from the aircraft, press the DEC (decrement, or minus) or the INC (increment or plus) softkeys until the correct value is displayed. Once the correct value is indicated in the dialog box, press the SEL (Select) softkey to enter the value into the system. The new computed value will then be displayed. If correct, press the ACCEPT softkey. If not correct, press CANCEL.

FULL - reset the Fuel Computer to a predetermined value representing the fully filled condition. You can set this value from the main menu by pressing FUEL, CALIB then select FULL VALUE. Use the INC/DEC buttons to display the desired value and then press BACK to save it.

PRESET - reset the Fuel Computer to a predetermined value representing a level commonly filled to, i.e. half filled tanks. Pilots can set this value from the main menu by pressing FUEL, CALIB then select PRESET VALUE. Use the INC/DEC buttons to display the desired value and then press BACK to save it.



For the fuel level to work properly, the sensors need a one-time calibration after installation. Please see the EMS-D10 Installation Guide for more information.

Clock Setup

From the main menu, press MORE, SETUP and then the CLOCK button. This will display the clock-setting submenu. In the value-setting box, you will see a section for the local time and a section for Zulu time. Because local time is usually an offset in hours from Zulu time, when you set the minutes for local time, you will see the minutes for Zulu time change. However, you need to set the hours for local and Zulu times independently. Once you have set Zulu time, you should never need to change it, as it is independent of daylight saving time. To change the local clock for moving through time zones or to enter daylight saving time, simply change only the hours for the local time.

Be aware that connecting to the EMS-D10 with the Support Program (e.g. when downloading a new operating program), will reset the system time. Do not set the time until you have performed all of the PC interface operations.

To set the time, simply follow these guidelines:

- Set both the local and Zulu times in military time. This is to eliminate confusion during the clock setting process. You have the option, as described below in the Clock Format section, to *display* the time in either military or standard 12-hour format.
- Only the highlighted digits will be affected by increments or decrements.
- SEL moves the highlight to the next set of digits. The order of selection is 1. Local hours, 2. Local minutes, 3. Zulu hours. When Zulu hours are selected, pressing SEL will again highlight Local hours.
- DEC and INC decrement and increment the selected set of digits one at a time. To speed up the process, press and hold the desired button. If you pass the desired value, you may simply back down to it by pressing the button corresponding to the opposite direction.



-
- Incrementing or decrementing the minutes digits resets the second count to 0, allowing you to set the clock down to the second if you so desire.

Change clock format

Although you always set the clock in military time, you have the option to display it in either military or standard time. Additionally, if you desire, you may display either local or Zulu time in the lower right corner of the screen. To set these options, press the FORMAT button from the CLOCK submenu. This will display the FORMAT. 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.

Resetting the Trip Timer

The Trip Timer on the Auxiliary Page maintains an ongoing timer of successive flights since it was last manually reset. To reset this timer to zero, activate the main menu then press the AUX followed by TRPSET. Note that there is no Flight Timer reset function as this is automatically reset at the beginning of each power on.



Global Configuration Selections

Pilots may choose to alter some of the display and operational functions of the EMS-D10 from the way they were initially set during installation. This is accomplished via the Global Setup Screen which can be accessed by pressing MORE, SETUP, GLOBAL buttons in sequence starting from the main menu.

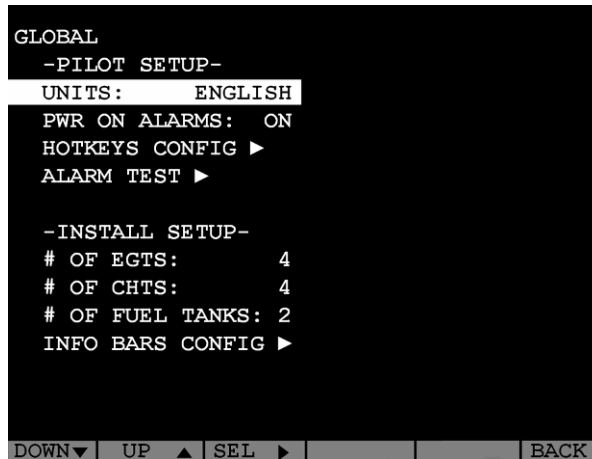
The Global screen is divided into two sections; Pilot Setup and Install Setup. The following subsections present the Pilot Setup selections. Refer to the Install Guide for changing any of the Install Setup parameters.

Editing

Changes to any of the Pilot Setup parameters are accomplished by pressing the DOWN or UP buttons until the highlighted bar rests on the desired parameter. Pressing the SEL (select) button will either toggle between the possible choices or bring up a submenu of choices. Once the selections have been made and are correct, press the BACK key to store them into memory. Pressing the BACK key also returns the screen to the previous screen. Repeating the BACK button will eventually return the menu sequence to where the EXIT button is displayed which allows one to exit from the menu system.

Units of Measurement

The EMS-D10 permits pilots to select between English or Metric units. Switching to either automatically changes all parameters using these units. There is no ability to individually change each measurement unit separately.





Power (PWR) on Alarms

This parameter controls whether alarms may occur immediately upon startup of the engine. With this parameter set to “ON” alarms will be generated upon startup (wherever alarms are configured to activate) anytime the parameters fall outside their limits. As many of these limits may fall outside initially or momentarily, one can expect to always see alarms upon startup. Many prefer alarms upon startup to verify operation of the EMS-D10 alarm function as well as to draw attention to critical engine functions during the startup process.

With this parameter set to “OFF”, all alarms are suppressed whenever ALL of the following conditions exist:

- * RPM less than 400
- * Oil pressure is less than 20 PSI
- * First 5 minutes after master instrument power applied

Any time any one of the three conditions are exceeded, all alarms become initialized and ready to post an alarm if its associated parameter is exceeded.

Hotkeys Configuration

This parameter permits you to activate two Hotkey functions to facilitate rapid page switching (via button 1) or switching between interconnected instruments (via button 6). To activate either, select the desired button number and select “ON.” Activating the Hotkey function removes that button’s ability to bring up the main menu navigation system.



Alarm Test

This parameter simultaneously activates the audio and visual alarm outputs which drive any connected external alarm lights and or audio devices. Once pressed, the alarms are activated for a brief period after which they are immediately extinguished.



APPENDIX



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



Serial Data Output

The EMS-D10 outputs text data through its serial port constantly during normal operation. This serial data can be logged using any standard serial terminal program such as Hyper Terminal. It can then be parsed into its respective columns by many spreadsheet programs including Microsoft Excel. All numbers are output in decimal and are standard ASCII. To view the data using a terminal program, the following settings should be used:

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

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

Parameter	ASCII Characters	Units	Example
Hour	2	Hours	12 (12 hrs)
Min	2	Minutes	12 (12 mins)
Sec	2	Seconds	12 (12 secs)
Fraction	2	1/64 of sec	12 (12/64 sec)
Manifold Pressure	4	inHg x 100	1215 (12.15inHg) (using 5/100 increments)
Oil Temp	3	° F	123 (123°F) or -12 (-12°F)
Oil Pressure	3	PSI	099 (99PSI)



Parameter	ASCII Characters	Units	Example
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 table below
GP_2	8	See table below	3 char label; 5 char data; see table below
GP_3	8	See table below	3 char label; 5 char data; see table below
GP Thermocouple	4	° F	1234 (1234°F) or -123 (-123°F)
EGT_1	4	° F	1234 (1234°F) or -123 (-123°F)
EGT_2	4	° F	Same as above
EGT_3	4	° F	Same as above



Parameter	ASCII Characters	Units	Example
EGT_4	4	° F	Same as above
EGT_5	4	° F	Same as above
EGT_6	4	° F	Same as above
CHT_1	3	° F	123 (123°F) or -12 (-12°F)
CHT_2	3	° F	Same as above
CHT_3	3	° F	Same as above
CHT_4	3	° F	Same as above
CHT_5	3	° F	Same as above
CHT_6	3	° 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 product ID
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	° F	OAT	00123 (123 °F) or -0123 (-123 °F)
Carb Temp	° F	CRB	00123 (123 °F) or -0123 (-123 °F)
Coolant Temp	° F	CLT	00123 (123 °F) or -0123 (-123 °F)
Fuel Level 3	Gallons	FL3	00123 (12.3g)
Fuel Level 4	Gallons	FL4	00123 (12.3g)

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

```
0000366348953460004113400000000000000000000OAT-0004N/AXXXXXN/AXXXXX-0120013004100  
63006800390060-00442105486129399
```



PC Support Program

Dynon offers a free PC Support Program which facilitates maintenance and configuring the custom checklists. The latest version of this program is available from our website at <http://www.DynonAvionics.com/downloads>.





Troubleshooting

Service Details

Should you experience difficulty with your product, please contact us by calling us at (425) 402-0433 or emailing us at info@dynonavionics.com.

Software Version Display

The software version submenu gives you two important pieces of information: the version of EMS-D10 software that your unit is currently running and the number of hours the EMS-D10 has been on.

To obtain this information, activate the main menu then press MORE > SETUP > VRSION. When calling Dynon for assistance it is often helpful to know what software version the instrument is currently using. Aside from the BACK button, there is no user interaction in this submenu. It is simply for informational purposes.

To determine whether you have the latest version of EMS-D10 software, please refer to Dynon's website at: <http://www.dynonavionics.com/downloads> where the most recent program is freely available.

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



EMS-D10 Specifications

Mechanical

Mounting: Fits into standard 3 1/8" panel hole
Optional flush mount bracket available

Weight: 1 lb. 4 oz.

Operating Temperature

-22 to 122 F (-30 to 50 C)

Power

Voltage: 10 - 30 Vdc
Power: 10 Watts maximum

Connections

Wiring: D-25 & D-37 pin male connectors

Screen

Type: AMLCD, TFT (Thin Film Transistor)
Backlight: 450 nits
Size: 3.8" diagonal (96 mm)
Resolution: 320 x 240 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 (Canopy, Landing Gear, Fuel Switch, Carb Heat, Fuel Pump, Contact 1, Contact 2)
- 1 - Manifold Pressure
- 1 - Oil Temperature (Resistive)
- 1 - Oil Pressure (Resistive)
- 1 - Fuel Pressure (Resistive)
- 1 - Amp/Volts (Shunt)
- 1 - Turbine Inlet Temperature (Type K Thermocouple)
- 3 - General Purpose (Either resistive or voltage for OAT, Fuel Tanks 3&4, Coolant Temp, Coolant Press, Carburetor Temp)

Outputs

- 1 - Alarm Light Contact
 - 1 - Audio Alarm
 - 1 - RS-232
-



EMS-D10 Configuration Table

EMS-D10 Serial Number: _____ Installation Date: _____

Function	Installed (Y/N)	Bottom	Low Yellow/Red (alarm value)	Low Green/Yellow	High Yellow/Green	High Red/Yellow (alarm value)	Top
Tachometer							
Manifold Pressure							
Oil Pressure							
Oil Temperature							
EGT		800					1600
CHT		200					600
Fuel Level		0					
Fuel Pressure							
Fuel Flow							
Voltage							
Current (0 to 60)							
Current (-60 to 60)							
GP 1 – type: _____							
GP 2 – type: _____							
GP 3 – type: _____							