DYNON AVIONICS

EFIS-D60

Installation Guide

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

P/N 101207-000, Revision A

For use with firmware version 1.0

May, 2009

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Contact Information

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

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Table of Contents

1. INTRODUCTION

This manual provides information about the physical, electrical, and plumbing installation of the EFIS-D60, EDC-D10A and optional AOA pitot probe purchased from Dynon Avionics. Additionally, this guide deals with setting up the installation-dependant firmware options. Because you may not have purchased all the components, you need only read through the relevant sections of this guide. Information about the *operation* of this instrument can be found in the EFIS-D60 Pilot's User Guide.

The EFIS-D60 uses solid-state sensor technology to give an accurate and easy-to-understand display. To ensure accuracy in its readings, it is very important that you install the instrument correctly and perform the specified calibration steps. This installation guide will help you through that process.

Warning

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

About this Guide

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

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

Menu Descriptions

Throughout this guide, the ">" character is used to indicate entering a deeper level of the menu system. For example, "SETUP > VRSION" indicates entering the EFIS menu, pressing MORE, then pressing SETUP, and then pressing VRSION to display the firmware version menu. Note that the MORE button is not shown in the sequence, since pressing MORE reveals more options in the same level of the menu system.

2. WIRING OVERVIEW

Please follow these instructions explicitly as improper wiring can result in permanent damage to your instrument and/or the accompanying sensors.

All electrical power and EFIS-specific lines interface with the EFIS-D60 via the female 25-pin D-sub connector on the back of the instrument. Ensure that the unit powers on and that all indicators display expected values before completing the final physical assembly.

Recommended Wiring Practices

For all electrical connections, use correct wiring techniques, taking care to properly insulate any exposed wire. A short circuit between any of the wires may cause damage to the EFIS-D60 and/or your aircraft. Make all connections to your harness before plugging it into any of the components of the system. Do not make connections while power is applied at any point in the system.

Dynon Avionics sells a wiring harness for all connections to the EFIS-D60. The harness is made up of 22 AWG wire and meets Mil Standard MIL-W-22759/16 (Tefzel insulation). If you have opted not to purchase this harness, please refer to the provided wiring diagrams for construction information. We recommend that all wire you use also meets Mil Standard MIL-W-22759/16; all wire supplied by Dynon Avionics (with the exception of thermocouple wire, which uses FEP insulation) meets this specification.

When using *any* pre-manufactured harness, verify that each pin has continuity with the expected wire on the wiring diagram. This test can be easily done with a multimeter. When verifying harnesses, use the wiring charts and diagrams in this guide as your ultimate authority on pin function (for any harness) and wire color (for harnesses purchased from Dynon Avionics).

Route all wiring such that there are no spots where it could chafe or break. Use appropriate strain relief at all junctions between wires and connectors. We recommend that you secure all wires at regular intervals along wiring runs to accommodate vibration effects.

All connections on the EFIS female 25-pin harness are described in the Instrument Installation section on page 3-1.

Power Requirements

22 AWG wire is normally sufficient for the power supply and ground lines, but we recommend that you consult a wire sizing chart and determine the size required for the wire routing in your particular aircraft. Ensure that the power lines include a circuit breaker or an appropriately sized fuse for the wire you select. Power is fed to the EFIS-D60 via pins in the female D-25 connector as shown on the 25-Pin Female EFIS Harness diagram on page 2-2.

The EFIS-D60 system-wide power requirement is **12 watts** typical and **17 watts** maximum. On a 12-volt system, this translates to about 1.5 amps of maximum current draw. On a 24-volt system, this translates to about 0.75 amps maximum current draw. Normally, a 3-amp circuit breaker or fuse is sufficient.

25-Pin Female EFIS Harness

Below is the wiring diagram of the EFIS 25-pin female harness. If you purchased your harness from Dynon Avionics, it is color coded according to the chart on the following page. Unless noted otherwise, all wires are 3 feet long on the Dynon-provided harness.
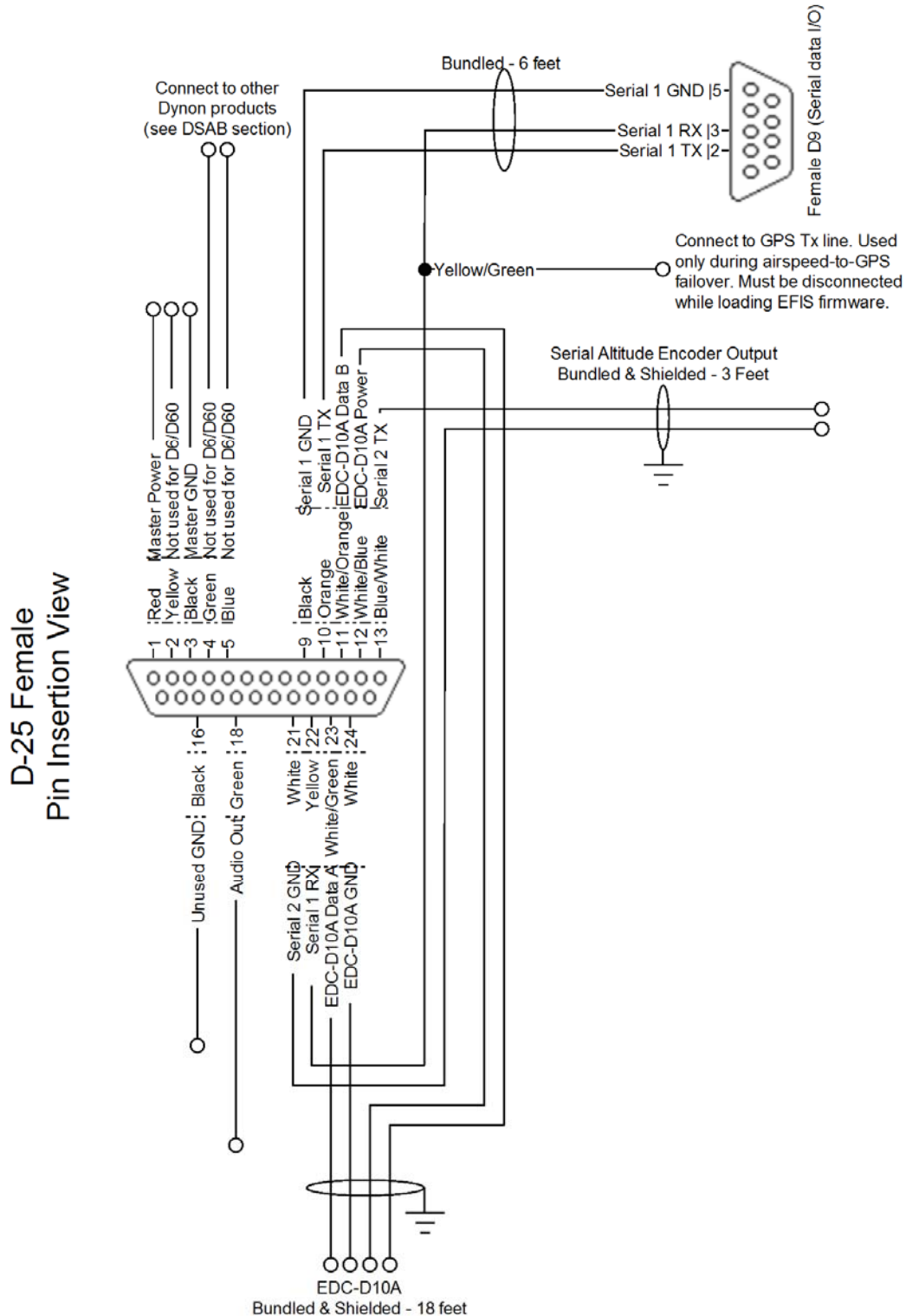
The pin assignments for the female 25-pin harness are repeated below. *Note that the pin numbers are labeled on the face of both the female and male connector.* Each connection on the harness supplied by Dynon is color-coded. These colors are listed in the following chart.

For wires that are marked "(Unused in EFIS-D60)", terminate these wires in an appropriate manner (insure that they do not short). Dynon recommends not cutting or removing these wires to preserve the option of upgrading the EFIS-D60 to a EFIS-D100

Female DB25 Pin #	Dynon Harness Wire Color	Function	Details
1	Red	Master Switch Power (10-30 volts)	Page 3-3
2	Yellow	(Unused in EFIS-D60)	
3	Black	Primary Ground	Page 3-3
4	Green	(Unused in EFIS-D60)	
5	Blue	(Unused in EFIS-D60)	
6	N/A	No Connect	
7	N/A	No Connect	
8	N/A	No Connect	
9	Black (bundled)	PC Serial Ground	Page 3-4
10	Orange (bundled)	EFIS-D60 Transmit / PC Serial Receive (RS-232)	Page 3-4
11	White/Orange (Red on some harnesses)	EDC-D10A Data B	Page 3-2
12	White/Blue (Black on some harnesses)	EDC-D10A Power (12V)	Page 3-2
13	Blue/White (Black on some harnesses)	Serial Encoder Transmit (RS-232)	Page 5-15
14	N/A	No Connect	
15	N/A	Emergency Backup Power	Page 3-3
16	Black	Ground	
17	N/A	No Connect	
18	Green	Audio out	Page 3-7
19	N/A	No Connect	
20	N/A	No Connect	
21	White (Bundled in Encoder cable)	Serial Encoder Ground	Page 5-15
22	Yellow (Bundled)	EFIS-D60 Receive / PC Serial Transmit (RS-232)	Page 3-4
23	White/Green (Green on some harnesses)	EDC-D10A Data A	Page 3-2
24	White	EDC-D10A GND	Page 3-2
25	N/A	No Connect	

WIRING SYSTEM OVERVIEW

The following block diagram depicts the basic layout of the EFIS DB25 electrical connections and is for reference only. Read the specific instructions for each connection prior to installation. The colors shown refer to the Dynon-supplied EFIS harness
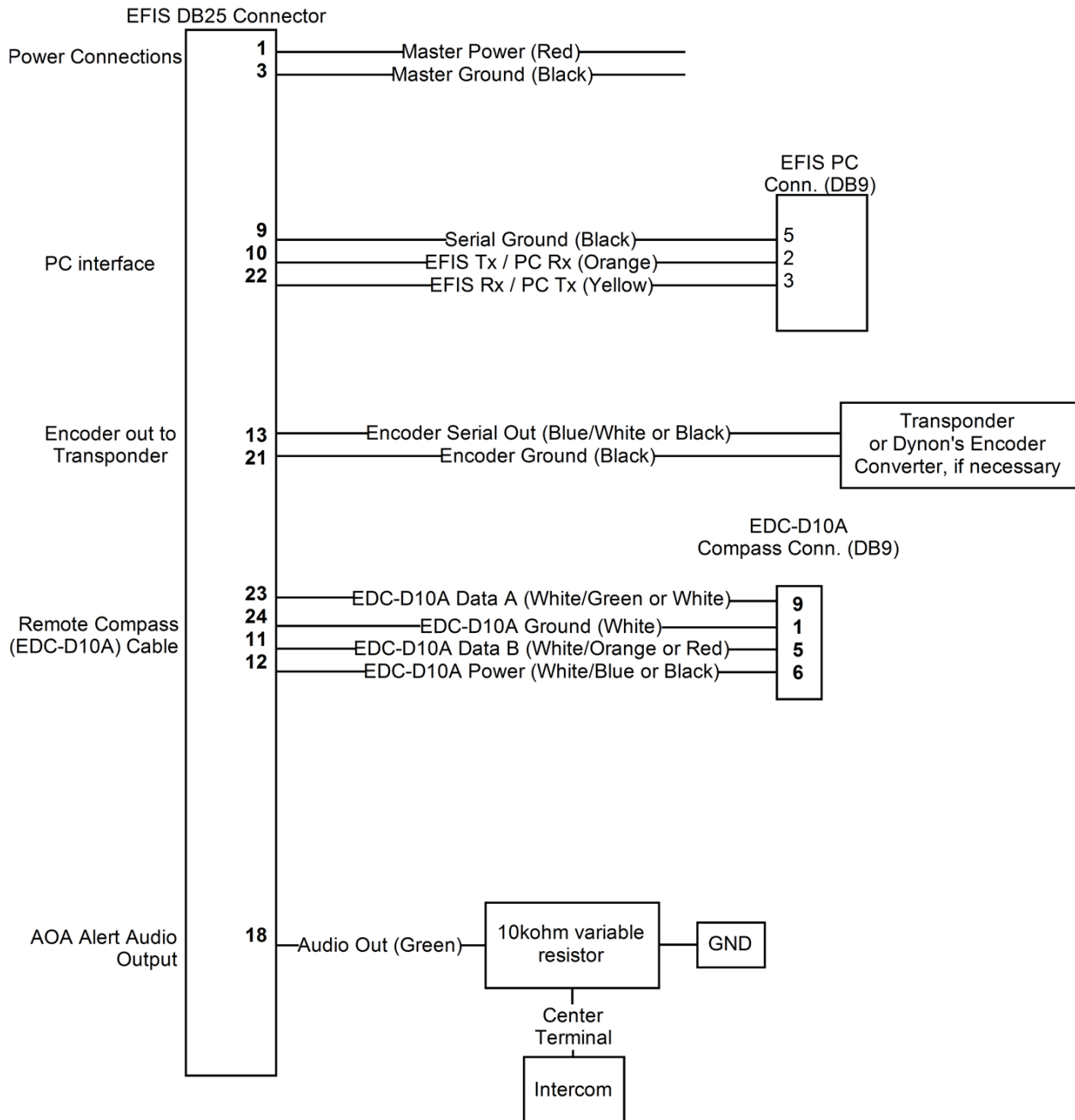
3. INSTRUMENT INSTALLATION

This section provides you with the information needed to physically and electrically install the EFIS-D60.

Selecting a Remote Compass Module Location

Finding a good location for the EDC-D10A remote compass module is critical to an accurate EFIS-D60 heading display. Keep in mind that calibration can compensate for small static magnetic fields superimposed upon the earth's field; it cannot take into account dynamic effects like AC currents, non-constant DC currents and non-stationary ferrous material (e.g., an electric turn coordinator). Use the following suggestions to help you find a good location for your EDC-D10A.

- Keep the EDC-D10A away from any source of magnetic fields (such as electrical equipment and current-carrying wires) and ferrous material.
- Move a handheld compass throughout the space surrounding your location to get a rough idea of the suitability of your chosen location. If the needle deviates significantly from magnetic north in any given area, that location would not be ideal for the EDC-D10A.
- The EDC-D10A can be mounted anywhere in the aircraft (away from magnetic interference) such that its pitch is as close to that of the EFIS-D60 as possible. It does not need to be directly along any axis of the EFIS-D60. It

Connector toward direction of flight

Connector forward and tabs mounted down

should be mounted with the long axis parallel to the wings, the electrical connector facing toward the front of the plane, and the mounting tabs on the bottom. The bracket used to hold the EDC-D10A must hold the EDC-D10A at the same pitch, roll, and yaw as the EFIS-D60 with respect to the airframe. We recommend that you use an electronic level, if available, to make sure the EDC-D10A is aligned with the EFIS-D60 to better than 1 degree.

Side view of EDC-D10A, tabs mounted down and aligned within 1 degree of pitch with EFIS-D60

• All mounting hardware needs to be made from non-ferrous material such as aluminum, plastic, or brass. Many stainless steel screws are magnetic. If the item is attracted to a magnet, it should not be used in the installation. The EDC-D10A needs to be mounted in a location as free from magnetic interference as possible. This means keeping the EDC-D10A away from any ferrous nuts, bolts, and screws, aircraft tubing, as well as from wires or devices carrying any appreciable current such as strobe light wiring, autopilot servos, or other electronics.

EDC-D10A Communication Cable

DO NOT ATTEMPT TO POWER UP THE EFIS-D60 WITH THE EDC CABLE LEADS EXPOSED (UNSHEATHED) AND NOT INSTALLED IN THE DB9 CONNECTOR. SHORTING THESE CONNECTIONS WILL CAUSE DAMAGE TO THE UNIT.

Like the RS-232 PC Communication cable, the EDC-D10A communications cable terminates in a standard female DB9 connector. While they look similar, do *not* plug the EDC cable into a PC or vice versa. The following table outlines the four connections that must be made to ensure proper communication between the EFIS-D60 and the EDC-D10A remote compass module. The Dynon-supplied harness colors are listed, as well.

EFIS DB25 pin#	EDC DB9 pin#	Function	Wire color
11	5	EDC Data B	White/Orange (or Red)
12	6	EDC Power	White/Blue (or Black)
23	9	EDC Data A	White/Green (or Green)
24	1	EDC Ground	White

The EDC cable in the harness supplied by Dynon consists of 4 conductors, surrounded by a metal shield and white insulation. These 4 wires are terminated with crimped female D-sub pins wrapped in plastic tubing. If you are building your own cable, we recommend that you use shielded cable as well.

• With the 25-pin EFIS harness disconnected from the EFIS-D60, carefully cut or pull the tubing off the 4 D-sub pins.
• Route the cable to the EDC-D10A mounting location chosen according to the instructions above.
• Install the female pins in the correct holes on the included DB9 connector, according to the chart above.
• Install the back shell around the DB9 connector.

Correct wiring installation can be easily verified once completed. Power on the EFIS-D60 with the EDC-D10A connected to it. If you have correctly wired your EDC-D10A wiring harness you will see the heading properly displayed at the top of the screen (provided you have turned on the heading display in the CLUTTR menu). If wiring is not correct, or the EDC-D10A is not communicating properly with the EFIS-D60, you will see the message REMOTE COMPASS NOT DETECTED in place of the heading onscreen.

The metal shield around the EDC communication cable is connected to the short black/white wire from the DB25. Connect this wire to ground.

Power Inputs

The EFIS-D60 has two separate power inputs, located on the DB25 EFIS connector. Only Master Switch Power is required to operate the instrument. The other input provides redundancy. Below is a table that explains both power inputs and their purposes. Both inputs share a common ground signal, wired to pin 3 on the connector.

EFIS DB25 pin#	Function	EFIS DB25 wire color	Description
1	Master Switch Power	Red	Provides primary power to the instrument. The EFIS-D60 will switch on upon application of power. Connect to a switched power source. Will not be adversely affected by engine cranking.
3	Primary Ground	Black	Connect to ground. Must carry as much as 3 amps.
15	Emergency Backup Power	(Not wired in Dynon harness)	Will operate the EFIS-D60 only if Master Switch Power is not present. The transition from Master Switch Power to Emergency Backup Power will display a warning, requiring you to press ACK within 30 seconds to keep the unit operating. This warning will also display when transitioning from either Master Switch Power or Emergency Backup Power to Internal Backup Battery power.

EFIS Serial Harness

The EFIS-D60 has one RS-232 serial port that can be used for two purposes. The EFIS Serial port (DB9) is used for:

Connecting to a PC to use the Dynon Support Program to perform firmware upgrades, configure checklists, and download internal logs. The Help Files of the Support Program provide detailed instructions on these functions. The latest version of the Dynon Support Program can be downloaded at downloads.dynonavionics.com.

- Connecting a compatible GPS receiver to serve as a backup to airspeed in the event of a blocked pitot.

PC CONNECTION FOR FIRMWARE UPDATES

On the EFIS 25-pin wiring harness available from Dynon, there are three wires bundled together, terminating in a standard DB9-pin female connector. This cable is 6' long and pre-assembled for connection to a PC-based laptop. Route this cable to a convenient location that can be accessed whenever you need to update your product's firmware or checklists.

EFIS DB25 Pin#	DB9 Pin#	Wire Color	RS-232 Function
9	5	Black	Signal ground
10	2	Orange	EFIS-D60 transmit / device receive
22	3	Yellow	EFIS-D60 receive / device transmit

If you did not purchase a harness from Dynon, obtain a 9-pin D-sub connector and make the three connections shown in the table.

To verify proper communication between the EFIS-D60 and the PC, use the Dynon Support Program's "Detect Firmware Version" function. Download the latest version of the Support Program at downloads.dynonavionics.com.

GPS CONNECTION FOR AIRSPEED FAILOVER

A yellow/green wire is spliced into the EFIS serial receive line. In the event of loss of airspeed data (e.g., via pitot icing), the EFIS-D60 uses GPS groundspeed. This allows the EFIS-D60's attitude to operate properly despite compromised airspeed accuracy. Connect this yellow/green wire to your GPS's serial transmit line. See the table at right for GPSs known to work.

GPS units known to work
AvMap EKP-IV (v2.06.116R, NMEA set to "processed")
Bendix/King Skymap (set to AR NAV 9600 output)
Garmin 96, 96c, 150XL, 195, 196, 295, 296, 396, 400, 420, 430, 430W, 496, 500, 520, 530, 530W, GX60, GX65
Lowrance handhelds
A frequently updated list of compatible GPS units and settings is available at our Documentation Wiki at wiki.dynonavionics.com.

To use the GPS-failover feature on your EFIS-D60, your GPS must output either "aviation format" or the $GPRMC and $GPGGA NMEA sentences in its serial stream. You must also have a supported cable that exposes your GPS's serial transmit line. If you own a Garmin 430 or 530, in the UNITS/MAGVAR option, set the MAGVAR to AUTO.

To verify your GPS connection, plug your pitot tube and taxi at a speed greater than 25 knots. If the GPS is properly connected, the alert GPS ASSIST is displayed on the attitude indicator. This verifies that, in the event of airspeed loss in flight, your GPS will be properly utilized for attitude calculation.

PC USB CONNECTION

If you do not have a serial port on your PC, use the included USB-to-Serial adapter to connect the EFIS-D60 to your PC's USB port. If you are using Windows 2000 or XP, ensure that the adapter driver CD is inserted in your PC before plugging the adapter into the USB port for the first time. If you are using Windows Vista or Windows 7, ensure that you are connected to the Internet and do not use the driver CD; the operating system will download the correct driver.

Also, do not have your EFIS-D60 plugged into the USB-to-Serial adapter while installing the driver.

Altitude Encoder Wiring

The EFIS-D60 outputs its altitude measurements in one of four standard serial outputs and is readable by many modern transponders. The EFIS-D60 will function properly whether or not this altitude encoder functionality is used. To use the EFIS-D60's altitude encoder functionality, simply wire the 2 encoder connections (GND and Encoder Transmit) from the DB25 connector to their respective connections on your transponder.

If your transponder requires parallel Gray code input, and you wish to use the EFIS-D60 as your altitude encoder, you will need to purchase Dynon Avionics' Encoder Serial-to-Parallel Converter. Please refer to page 5-13 for more information on the installation of this option.

Per ATC/FAA requirements, the serial encoder output of the EFIS-D60 reports pressure altitude, which, by definition, is indicated altitude when the baro is set to 29.92. So, when you set your EFIS-D60's baro adjustment to 29.92, its indicated altitude will match the altitude that is being reported to your transponder.

EFIS DB25 pin#	Function	Wire color
13	Encoder serial transmit	Blue/White (or black)
21	Ground	White

There are four different serial formats used by transponders. The EFIS-D60 can output any of these formats. To select which format the EFIS-D60 sends out its serial encoder output port, you must choose the appropriate format via the menu system. When the menu system is displayed, push the following sequence of buttons: SETUP > ALTENC. When in the Altitude Encoder Setup menu, you can toggle the resolution of the output between 10 and 100 feet; this accommodates some transponders which can input and display altitude in 10 foot increments. In this menu, you can also select between the four different output formats, which are described below.

Dynon's supplied EFIS harness has a serial altitude encoder cable which consists of 2 conductors, surrounded by a metal shield and white insulation. Dynon has shipped harnesses with different colors for Encoder serial transmit line. Determine your connections using the table above. Connect the Encoder serial transmit to your transponder's serial input or to Dynon's Serial-to-Parallel Converter as described in the Encoder Serial-to-Gray Code Converter Installation section on page 5-15 in the Appendix.

SERIAL ALTITUDE FORMATS

There are four formats used by serial transponders. Choose the correct format for your transponder in the ALTENC menu, using the FRMAT button.

Format 1

Used By	**Dynon Encoder Serial-to-Gray Code Converter**, Garmin AT (formerly UPS Aviation Technologies)
Baud rate	1200
Format	#AL, space, +/-sign, five altitude bytes, T+25, checksum, carriage return
Example message	#AL +05200T+25D7[CR]

Format 2

Used By	Magellan
Baud rate	1200
Format	$MGL, +/- sign, five altitude digits, T+25, checksum, carriage return
Example message	$MGL+05200T+25E3[CR]

Format 3

Used By	Northstar, Garmin
Baud rate	2400
Format	ALT, space, five altitude bytes, carriage return
Example message	ALT 05200[CR]

Format 4

Used By	**Garmin GTX327, GTX328, and GTX330** (set on Icarus input), Icarus, Trimble
Baud rate	9600
Format	ALT, space, five altitude bytes, carriage return
Example message	ALT 05200[CR]

Audio Alert Output

The EFIS-D60 has an audio alert output for sounding AOA and altitude alarms through an intercom or audio panel. You must have the optional AOA Pitot Probe to use this functionality.

DB25 pin#	Color	Function
18	Green	EFIS Audio Alert Output

Connect the alarm output from the EFIS-D60 to the outside terminal of a 10 kΩ variable resistor (not included). Ensure that audio outputs are connected similar to the following diagram. The 10 kΩ variable resistor can be obtained from Radio Shack (P/N 271-1715) or other electronics suppliers.

Outside terminal → To EFIS-D60 Audio Alert Out

Center terminal → To intercom/audio panel auxiliary input.

Outside terminal → To ground
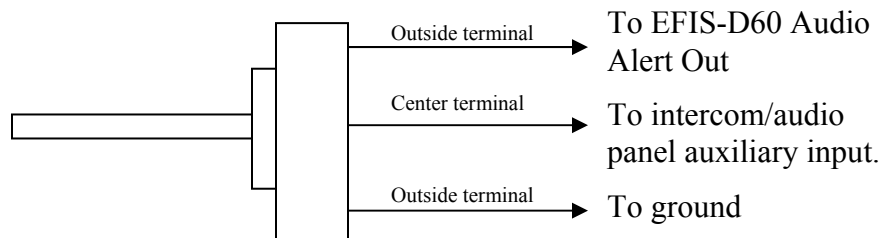
To set the volume of the AOA alarm, you will need your EFIS-D60 powered on and the alarm output wired as described above. Enter the EFIS menu by pressing any button (except the leftmost or rightmost) beneath an EFIS page. Press SETUP > AOAALM. In that menu, press the TEST button. While the button is held down, the AOA alarm will sound. Adjust the variable resistor until the volume in the intercom or audio panel is at an acceptable level.

Panel Location and Mounting

The diagram below shows the outside dimensions of the front bezel of the EFIS-D60. Note that the instrument and tray extend about 4.5" behind the panel, and the supplied harness extends three inches more. Use the dimensions (in inches) found on the diagram to plan for the space required by the instrument. Take the following considerations into account when selecting a mounting location for the EFIS-D60.

Avoid placing the instrument near heater vents or any source of extremely hot or cold air. Keep in mind that the air surrounding the EFIS-D60 during operation may be no warmer than 50 °C. Plan a panel location that allows convenient viewing of the instrument with no obstruction. When flying straight and level, the panel angle from vertical may not be greater than +/- 30 degrees. The unit must be aligned as close as possible with the longitudinal and lateral axes of the aircraft. The firmware supports an adjustment for panel tilt, but not for mounting errors in yaw or roll. Correct attitude performance depends on mounting the EFIS-D60 square with the direction of flight.

To mount the EFIS-D60, you must make a rectangular cutout in your panel. Ensure that the dimensions of the cutout are: **6.780" wide and 4.750" tall**. Place the D100-series mounting tray behind the cutout. Secure it to your panel in whatever way you desire. Riveting it to the panel is ideal, but drilling holes for mounting screws and nuts will work as well. You may cut off 2 horizontal or vertical tabs from the mounting tray to minimize the space taken up behind the panel. Upon securing the mounting rack to the back of your panel, slide the EFIS-D60 into it. Use the included 7/64" Allen wrench to secure the mounting screw (at the bottom left of the front bezel) into mounting rack. At your discretion, you can also screw a #6-32 screw into the back of the mounting rack on the opposite side. This screw should penetrate into the instrument no further than ¼".
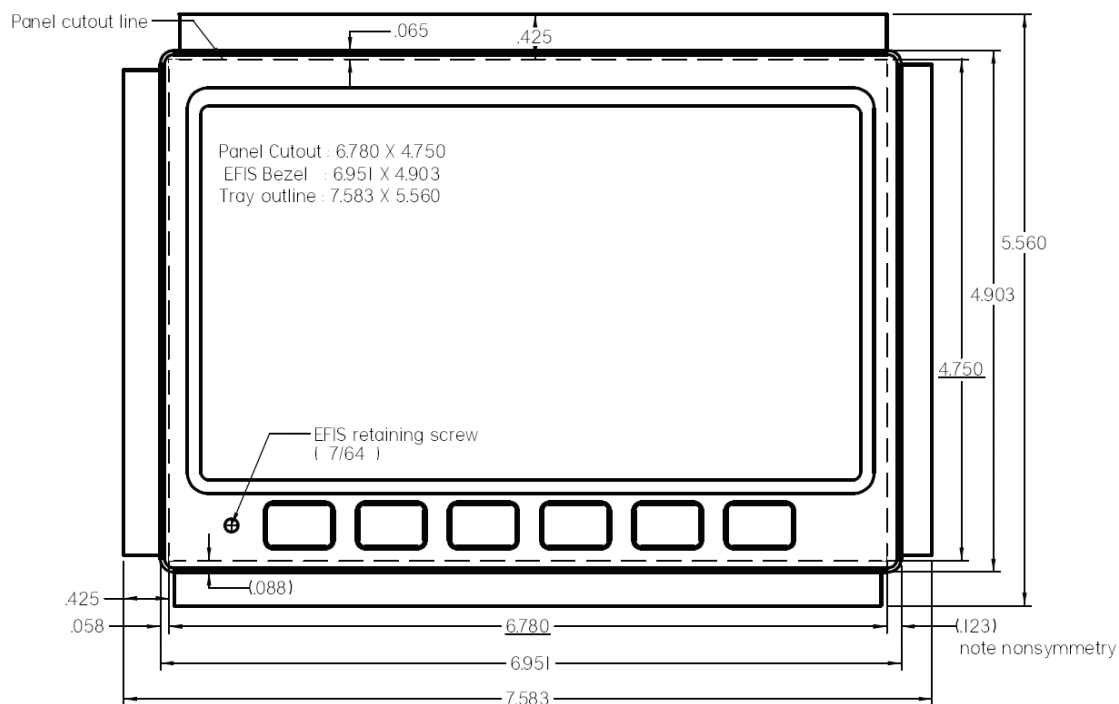
Connecting Static & Pitot Lines

The AOA, pitot, and static ports on the back of the EFIS-D60 are equipped with 1/8" NPT Female fittings. To attach your pitot and static lines to the back of the EFIS-D60, you must use standard 1/8" NPT Male fittings at the end of each of the lines.

To install, simply connect your static and pitot sources to the EFIS-D60. T'ing off of existing lines is acceptable if performing a retrofit or connecting in parallel with other instruments. View the following back view diagram the placement of your pressure lines.

The EFIS-D60's attitude calculation requires either airspeed (from pitot and static) or GPS data. To ensure proper operation, at least one of these data sources must be available. We recommend the EFIS-D60 be connected to pitot and static systems in all installations.

Use a wrench to secure the mating pressure line fittings to the corresponding locations on the back of the EFIS-D60. Do not over-tighten.

If you purchased Dynon's AOA pitot tube, note that it has pitot and AOA ports on it, but not static. You will need to provide your own source of static pressure for the EFIS-D60 and any other instrument in your panel which requires it.
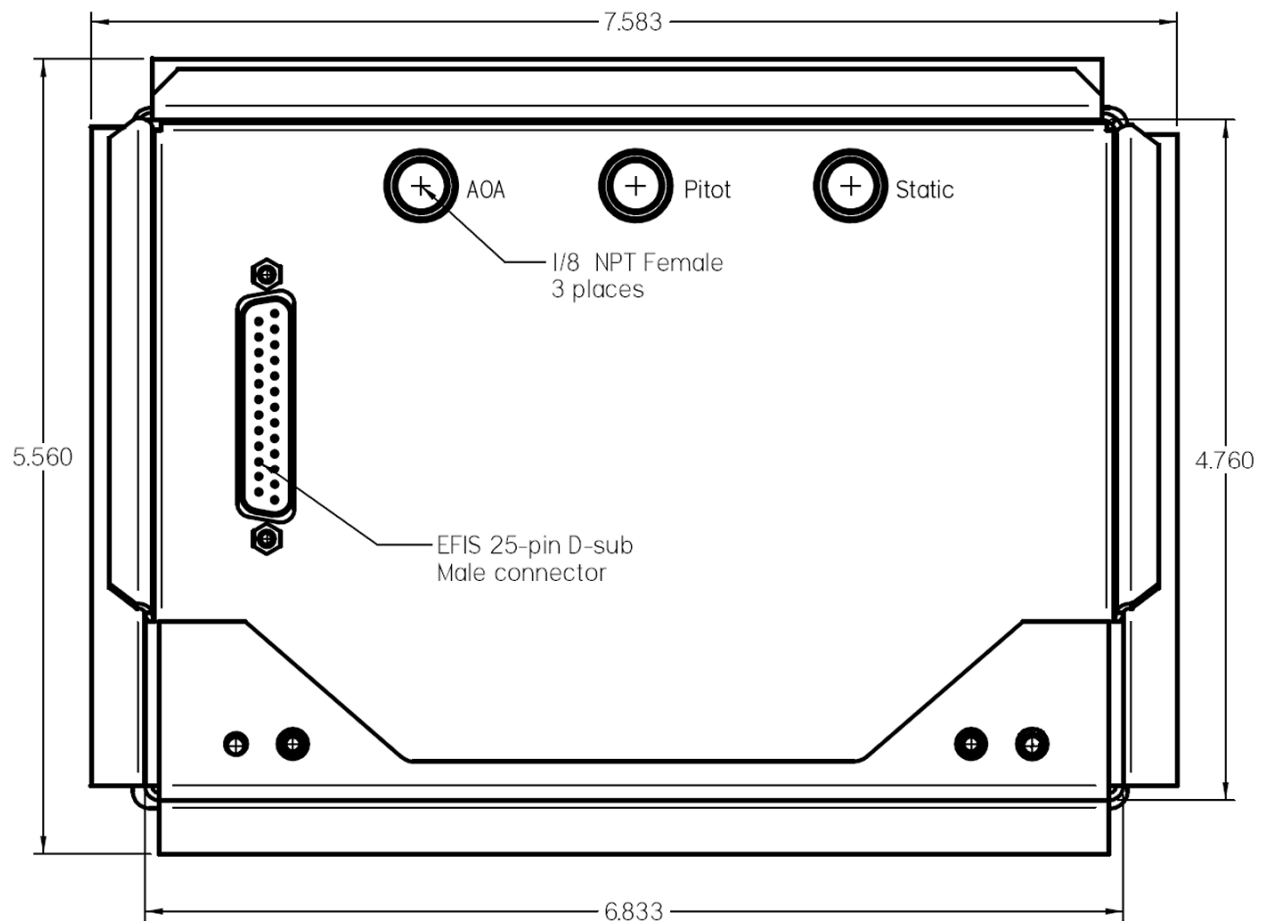
4. EFIS CALIBRATION AND CONFIGURATION

During manufacture, your EFIS-D60 underwent a comprehensive calibration, verification, and burn-in routine that minimizes setup time and ensures that your EFIS-D60 meets Dynon's stringent performance specifications. To account for your individual preferences and your aircraft's particular setup, there are a few simple calibration and configuration steps that you must complete before using your EFIS-D60. This section takes you through these steps to make sure that you have properly installed and configured your EFIS-D60.

ⓘ   CAUTION: It is your responsibility to fly your plane safely while performing any configuration or calibration in flight. The best scenario would include a second person to perform any necessary steps on the unit.

Ensuring Proper Installation

Turn your unit on by energizing the aircraft power to which it is connected. Ensure that the screen is bright and readable and that all instrument displays appear. *If a desired display item is not present, refer to the User's Guide to use the CLUTTR feature to display the missing item.*

Setting Zero Pitch (In flight)

ⓘ   For the purposes of this setting, level is defined as the attitude at which the aircraft's longitudinal axis is parallel to the ground. For most aircraft, the attitude the aircraft assumes at normal cruise speeds will be acceptable. Additionally, this feature should not be used to "zero out" pitch when the aircraft is at an attitude other than level. Do not think of this adjustment as you would the parallax adjustment on a normal attitude indicator. Instead, think of it as a calibration step which is not changed often.

With your aircraft flying straight and level, enter the SETUP > PITCH menu. Press INC or DEC until the horizon line intersects the center of the crosshairs. It is important that this be done while the aircraft is level to ensure proper pitch and roll display throughout all maneuvers.

Compass Heading Calibration

This section guides you through the calibration and configuration of your magnetic heading indication. Prior to calibrating your EDC-D10A, you must configure the local magnetic inclination and magnetic intensity as described in the sections below.

SETTING MAGNETIC INCLINATION ANGLE AND INTENSITY (REQUIRED)

ⓘ   To calibrate your EFIS-D60 heading, you must input your location's current magnetic inclination angle and intensity. Before doing this, you must obtain these two values for the geographic location where you will be performing the calibration. Note that this procedure only needs to be done once, prior to magnetic calibration. *Moving the aircraft to another location does not require repeating this procedure.*

Obtaining Magnetic Inclination and Intensity

1. Browse to web page: www.dynonavionics.com/docs/maginfo.html. (Looking up this information does not have to be done on a computer at the plane, with live Internet access.)

2. The Dynon Avionics "Magnetic Inclination and Intensity" web page is updated as needed; it contains a link to a NOAA web pages and instructions for easily finding your local magnetic inclination and intensity by inputting your ZIP code (in the US) or your latitude and longitude and inputting the resulting data into your Dynon EFIS.

3. Follow the instructions listed on the web page, especially clicking the "Compute Magnetic Field Values" button at the bottom of the linked page – the values required by your Dynon EFIS will be displayed only after clicking that button.

Entering inclination and intensity into the EFIS-D60

1. Enter the inclination setup menu by pressing any button beneath an EFIS page (except the far left or far right hotkeys), then SETUP > MAGINC

2. Press INC or DEC to increment or decrement the displayed inclination angle. Press and hold to change values more rapidly.

3. When the display shows the magnetic inclination angle for your location, press BACK to leave the menu.

4. Enter the magnetic intensity setup menu by pressing any button beneath an EFIS page (except the far left or far right hotkeys), then SETUP > MAGINT

5. Press SEL to change the digit being incremented or decremented. Press INC or DEC to increment or decrement the selected digit. Press and hold to change values more rapidly.

6. When the display shows the magnetic intensity for your location, press BACK to leave the menu.

EDC-D10A HEADING CALIBRATION (ON GROUND ONLY)

The procedure for in-plane calibration of the EDC-D10A involves pointing the aircraft in four directions and taking data at each direction using the EFIS-D60. The EFIS-D60 will then perform some calculations to ensure an accurate calibration.

❶   If you attempt a magnetic caibration without having performed the preceding section (Setting Magnetic Inclination Angle and Intensity), a warning message will be displayed: WARNING: MAGNETIC INCLINATION NOT SET.

❶   During magnetic calibration, do not turn the power off on the EFIS-D60. This will cause any recorded compass calibration data to be lost; the calibration will need to be restarted.

To perform the calibration, you will need the following:

1. EFIS-D60 and EDC-D10A installed in aircraft.

2. Magnetic inclination angle and intensity properly entered into the EFIS-D60 per the section above.

3. An accurate method of aligning the aircraft with *magnetic* North, East, South, and West, such as an airport's compass rose.

Once you have the installation completed, have verified that your EDC-D10A communicates with the EFIS-D60 (i.e., you see the heading tape displayed on the EFIS main page), and have located a suitable place to perform the calibration, perform the following steps:

1. Turn on the EFIS-D60 and allow it to warm up for at least 15 minutes before performing the calibration.

2. Align the aircraft pointing magnetic North as closely as possible.

3. On the EFIS-D60, enter the menu system by pressing any button beneath an EFIS page (except the far left or far right hotkeys) and press SETUP > MAGCAL. You should see a menu that reads NORTH, EAST, SOUTH, and WEST. If you do not, then the EDC-D10A is not properly communicating with your EFIS-D60.

4. Press the NORTH button; you will see the message, COLLECTING DATA FOR NORTH along with a 15 second timer. Let the time run out before proceeding.

5. Align the aircraft pointing magnetic East as closely as possible.

6. Press the EAST button; you will see the message, COLLECTING DATA FOR EAST along with a 15 second timer. Let the time run out before proceeding.

7. Align the aircraft pointing magnetic South as closely as possible.

8. Press the SOUTH button; you will see the message, COLLECTING DATA FOR SOUTH along with a 15 second timer. Let the time run out before proceeding.

9. Align the aircraft pointing magnetic West as closely as possible.

10. Press the WEST button; you will see the message, COLLECTING DATA FOR WEST along with a 15 second timer. Let the time run out before proceeding.

11. Press the END button. This will cause the EFIS-D60 to pause as it calculates. This pause should last between 1-20 seconds. However, if the collected data is poor, this can take as

long as 5 minutes. A message will be displayed onscreen: CALCULATING MAGNETIC CALIBRATION VALUES.

12. Wait for the message CALIBRATION COMPLETE before attempting to use the EFIS-D60 or remove power. Press BACK to leave the menu.

This completes the EDC-D10A calibration process. The process can be repeated as often as desired. The overall accuracy of the compass depends on the installation location (away from any ferrous materials or current carrying wires or devices), the installation alignment (aligned with the EFIS-D60 in pitch, roll, and yaw), and the calibration procedure (accurately aligning the aircraft with North, East, West, and South and having the correct magnetic inclination angle loaded into the EFIS-D60). If the compass performance is not adequate for your usage, we suggest that you investigate each of these factors and try to optimize your installation for each factor.

If the heading shown onscreen is off by a small, but constant amount, you can change a heading offset in the EFIS-D60 which will correct this. Orient your plane in a known direction, preferably on a compass rose at the airport. Navigate to the Heading Adjustment menu by pressing SETUP > MAGADJ. Increment or decrement the value of the heading offset until the EFIS-D60 heading corresponds to the direction in which your plane is pointed.

Configure Airspeed Color Thresholds

To configure the airspeed bar color thresholds for your unit enter the SETUP > IASCLR menu. This displays the Airpseed Color Threshold menu. In this menu, enter the values for five airspeed constants (Vso, Vs1, Vfe, Vno, and Vne), each of which has its own button. Enter these values in units of knots, mph, or km/h depending on what airspeed units you are currently using (you may change the displayed airspeed units via SETUP > UNITS > IAS).

Perform the following steps for each airspeed constant:

1. Press SEL to select the digit you wish to increment or decrement.

2. Press DEC- or INC+ to decrement or increment the selected digit.

3. Press BACK to return to the previous menu.

🛈 You will not be able to see some of the colors until the aircraft has achieved airspeeds in the range of each threshold

5. APPENDIX

The appendices contain additional information pertaining to the installation and maintenance of the EFIS-D60. You will find here a table of weights, specifications, a configuration table, the maintenance manual, the AOA Pitot Installation Guide, and the Encoder Serial To Gray Code Converter Installation Guide.

Appendix A: Instructions for Continued Airworthiness

INTRODUCTION

This section gives the installer or mechanic information pertaining to maintenance of the EFIS-D60. Additionally, it provides the steps necessary to ensure continued airworthiness for the unit.

CAUTION

With the exception of replacing the Internal Backup Battery, the EFIS-D60 contains no user-serviceable parts. Refer all servicing to Dynon Avionics.

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

Other than for regulatory periodic checks and an annual Internal Backup Battery capacity test (if optional Internal Backup Battery is installed), maintenance of the EFIS-D60 is "on-condition" only. With the exception of the Internal Backup Battery, periodic maintenance of the EFIS-D60 is not required.

ALTIMETER CHECK

The following test can be performed on an as-needed basis. If the altimeter is found to be out of specification, the following single-point adjustment can be performed by navigating the menus to SETUP > ALTADJ. In the Altimeter Adjustment menu, you can change the displayed altitude by up to 500 feet up or down. After making this adjustment, ensure that the altimeter on the EFIS-D60 meets the tolerances allowed between 0 and 30,000 feet. If this adjustment does not bring the altimeter on the EFIS-D60 to within specification at all attitudes, please contact Dynon Avionics to return for service.

INTERNAL BACKUP BATTERY CHECK

If your EFIS-D60 has a rechargeable Internal Backup Battery, it is necessary to ensure that the battery capacity is such that it will last at least 2 hours on a full charge. At least once per year, perform the following test.

1. With the EFIS-D60 drawing power from an external source, allow it to charge its Internal Backup Battery above 16.0 volts. Observe the voltmeter (to display, use SETUP > CLUTTR > VMETER). The battery may charge to as high as 16.8 volts, but it is only necessary to charge it to 16.0 volts for this test.

2. Remove all sources of external power from the EFIS-D60, ensuring that it is operating off its Internal Backup Battery.

3. Ensure that the screen is at its full brightness level. To do this, enter the menu system by pressing any button and press DIM and increase the brightness until it will not increase anymore.

4. Let the unit remain on for 2 hours.

5. If, after these 2 hours, your EFIS-D60 has not turned off and does not display the INTERNAL BATTERY LOW warning, the Internal Backup Battery passes the capacity test.

6. Make sure you recharge your battery; a full charge is reached when the voltmeter shows at least 16.0 volts on the Internal Backup Battery.

If your Internal Backup Battery does not pass the above test, please contact Dynon Avionics and refer to Appendix E for instructions on how to replace the Internal Backup Battery.

FIRMWARE UPGRADE

Dynon Avionics provides free firmware updates for all its products, and continues to add new features periodically. We suggest that you regularly ensure that your EFIS-D60 has the latest firmware by visiting our website at downloads.dynonavionics.com and downloading the latest Dynon Product Support Program. This software contains the latest firmware updates for all Dynon products.

The EFIS-D60 is upgraded by connecting a PC to the EFIS-D60's serial port and starting the Dynon Support Program on the PC.

DISPLAYED ALERT MESSAGES

The following table describes the alert messages that the EFIS-D60 can display.

Alert Message	Description	End condition
INTERNAL ERROR SERVICE UNIT	This error can occur for a few reasons, including an aborted upload. It signifies that the EFIS-D60 has detected internal problems in its firmware or calibration tables.	When this error appears, it may be possible to recover your unit in the field. The best way of ensuring this is to call Dynon Avionics immediately. However, there is a good possibility that the unit will have to be returned for service.

Alert Message	Description	End condition
ATTITUDE RECOVERING…	This alert is displayed anytime the unit is rotated at a rate faster than 150 degrees/second or the unit is powered on with airspeed applied. Rotating the unit faster than this threshold will saturate the gyros, leading to potentially erroneous display. The blue/brown horizon indication will turn grey and black to indicate that the artificial horizon is not currently a trusted source. Note that this alert only appears when airspeed is non-zero; using the EFIS-D60 on the bench will not trigger this alert.	The grey/black horizon indication and onscreen message will remain until the unit has resumed normal operation. In the case of rotation rate greater than 150 degrees/second, the unit enters a fast recovery mode and usually recovers within 5 seconds of coordinated flight.
TEMPERATURE UNSTABLE	When the unit is turned on after having been off for a long period, its internal temperature will rise above ambient at a fast rate. This fast change in temperature can sometimes reduce the reliability of the output of the sensors. Therefore, this alert is displayed and the horizon indication is changed from blue/brown to grey/black.	The screen remains normal color, but the message is displayed until the temperature within the unit has stabilized. This temperature instability should last no longer than 2 minutes. For this reason, it is a good idea to turn the unit on before you run through any of the preflight procedures, so that it will be ready by the time you are ready to fly.
TEMPERATURE OUT OF SPEC	The temperature inside the unit is outside of -30ºC to 50ºC.	The screen remains normal color, but the message is displayed until the temperature within the unit is within the specified range. This is most common in unventilated panels during hot periods. If you continue to see this alert, provide more airflow to the space around the EFIS-D60.

Alert Message	Description	End condition
INTERNAL BATTERY LOW	You will see this alert only when operating the unit solely off the internal backup battery. When its voltage has dropped below a certain threshold, you will see this alert. Additionally, the voltmeter will be displayed onscreen. When you see this alert, it is advisable that you turn the unit off by pressing the POWER button in Main Menu 1.	The alert will disappear when you press any button; however, it is advised that you do not ignore this alert, as it appears when the unit's internal battery has very little life left. This alert will also go away upon the application of either the external backup battery or Master Power. At that point, the battery will begin charging off the external power.
REMOTE COMPASS NOT DETECTED	The EFIS-D60 is unable to communicate with the EDC-D10A. If you have an OAT connected to your EDC-D10A, you will lose this reading, as well.	Ensure that you a) have an EDC-D10A installed and b) have verified that the wiring to the EDC-D10A is correct. Please see the EFIS-D60 Installation Guide for more information on verifying the installation of the EDC-D10A. This error also can appear if you have updated the firmware in your EFIS-D60 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 EFIS-D60 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 EFIS-D60 and the EDC-D10A as well as that of the OAT sensor.

TROUBLESHOOTING GUIDE

The following table provides a list of potential issues that the EFIS-D60 may experience. The symptom is given on the left side while the probable solution is listed at the right. You may also post about your issue at forum.dynonavionics.com, where we and other active users may be able to assist you.

Problem	Solution
After performing a magnetic calibration the EFIS-D60'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 > MAGADJ. Increment or decrement the value of the heading until the EFIS-D60 heading corresponds to the direction in which your plane is pointed.
When the barometer on the unit is set correctly, the displayed altitude is wrong by a constant amount at all altitudes.	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 > ALTADJ. Increment or decrement the value of the altitude until the EFIS-D60 altitude corresponds to that of the current location of your plane. If you need to adjust by more than 200 ft, or find that you need to adjust frequently (after setting your baro), please contact Dynon Technical Support for assistance.
Airspeed is inaccurate by between 1 and 10 knots (or equivalent, in other units) at takeoff speed.	You may recalibrate your EFIS-D60'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 EFIS-D60, enter the EFIS main menu, press SETUP > 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.
EFIS-D60 displays continuous or blinking blue screen	Ensure that your power supply is capable of supplying at least 2 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 is necessary to contact Dynon Avionics.
EFIS-D60 screen stays black when power is applied	Verify Master Switch Power is connected. Verify Master Switch Power is above 10 volts.
EFIS-D60 indicates over temperature condition	Provide additional cooling to instrument
EFIS-D60 indicates incorrect heading	(Re)calibrate the magnetic heading using the procedure described above.

Problem	Solution
Internal Backup Battery life is too short	Verify Internal Backup Battery is charged to above 16 volts using EFIS-D60 voltmeter. Re-run capacity test. Replace battery if insufficient capacity.
Cannot make connection with PC	Verify wiring is correct. Verify no other programs using the COM port are running on the PC. Verify latest version of The Dynon Product Support Program is being used.

INSTRUCTIONS FOR RETURN

If none of the above sections have helped resolve an ongoing issue with your EFIS-D60, please contact Dynon Avionics to discuss the issue with Technical Support. If, after troubleshooting with a Dynon representative, the issue cannot be resolved, we will provide you with a Return Material Authorization (RMA) number to use when shipping the EFIS-D60 to us. If your unit is still under warranty, the repairs will be performed and the EFIS-D60 will be returned promptly. If your warranty has expired, the Dynon representative will make arrangements with you and make you fully aware of the costs before proceeding with the repair.

We recommend that you also send your EDC-D10A remote compass along with your EFIS-D60. This ensures that if we upgrade the firmware in your EFIS-D60, the EDC-D10A will have corresponding firmware.

While Dynon Avionics makes every effort to save and restore your unit's settings and calibrations, we cannot guarantee that this will happen. Please note that after you receive your unit back from Dynon Avionics with a factory calibration, the heading display on the EFIS-D60 may be inaccurate once re-installed in your aircraft. If this is the case, you will have to perform the magnetic calibration again. When you receive your EFIS-D60, it may have newer firmware installed on it than it did when you sent it in. Check downloads.dynonavionics.com for information on what's new.

Appendix B: Dynon AOA/Pitot Installation and Calibration

Thank you for your purchase of Dynon's AOA/Pitot Probe. This guide walks you through the steps to install and calibrate both the heated and unheated versions of the AOA/Pitot Probe. While the probe senses standard pitot pressure, allowing it to work with any standard airspeed indicator, its AOA functionality is designed specifically to work with Dynon's EFIS series of products. Do not expect it to work properly with another AOA system.

To ensure accuracy, it is very important that you install the probe correctly and perform the specified calibration steps. We recommend that you read the entire guide before proceeding with the installation.

Dynon's Heated AOA/Pitot Probe is nickel-plated. Do not polish the probe as this will cause the finish to come off.

AOA CALCULATION: PRINCIPLES OF OPERATION

Dynon Avionics' AOA/Pitot probe performs two functions: airspeed sensing and angle of attack sensing. These functions require two pressure ports on the tip of the probe. The normal pitot pressure port is on the front face of the probe and is designed to be insensitive to angle of attack. The second pressure port is located on an angled surface just under the pitot port and is designed to be very sensitive to AOA. The EFIS-D60 then uses the difference between these two pressures to calculate the current angle of attack.

HEATING: PRINCIPLES OF OPERATION

The heated version of Dynon's AOA/Pitot Probe utilizes a heating mechanism unlike any other heated pitot on the market. The probe is heated by a high-quality nichrome heating element whose temperature is accurately measured and regulated by the heater controller. This controller – located in an enclosure which can be mounted in a wing or elsewhere – regulates the heat at the tip of the probe to a constant temperature. There are several advantages to this, including: lower power consumption, increased heating element lifespan, and a much cooler pitot on the ground when de-icing is not necessary. This unique technique ensures that the pitot can be rapidly de-iced when required, but does not needlessly waste electricity when not in icing conditions.

While the probe does not operate like a normal heated pitot, it will still get fairly hot in normal ambient temperatures. When turned on, it will regulate its internal temperature to about 70°C to 80°C. To ensure that the heater is working, briefly touch the end of the pitot farthest from the snout after 1 minute of operation and verify that it is warm.

FAILURE WARNING

Designed to meet the indication requirements of FAR 23.1326, the heated pitot controller has an output that can trigger a warning light in the cockpit whenever the probe heater is turned off or is not functioning properly. While not required for Experimental and LSA category aircraft, this feature provides peace of mind, giving you instant feedback that your probe's heater is working as designed.

TOOLS AND MATERIALS REQUIRED

- Dynon Avionics AOA/Pitot probe.

- Two plumbing lines (usually ¼" soft aluminum or plastic tubing) routed from the EFIS-D60 to the probe mounting location.

- Adapters to interface with the 3/16" aluminum tubing from the probe to whatever plumbing lines are installed in the aircraft (AN919-2D for 3/16 to ¼ , AN819-4D sleeve AN818-4D nut, AN819-3D sleeve, and AN818-3D nut)

- #36 Drill and 6-32 tap

- AOA Pitot Mounting bracket. Models known to work well include:

    o Gretz Aero CBK12 (Chrome) and PBK12 (Paintable), available at www.gretzaero.com/mountbracket.html or from Aircraft Spruce.

    o SafeAir1 also makes a bracket with a joggled lip for the RV series. It is available from www.safeair1.com.

Please follow these instructions explicitly as improper installation can result in permanent damage to your device and/or aircraft.

HEATER CONTROLLER WIRING AND MOUNTING

If you have purchased the heated version of the probe, please follow the instructions in this section. If you have purchased the unheated version of the probe, you may skip to the AOA/Pitot Probe Mounting section on page 5-11. Please follow these instructions explicitly as improper installation can result in permanent damage to your device and/or aircraft.

Heater Controller Mounting

The heater controller box should *ideally* be mounted close to the AOA/Pitot Probe. The box's dimensions are found at right, for reference. When mounting the controller close to the probe, ensure that it is close enough for its wires to mate with the probe's wires, with room for strain-relief. If you find it difficult to mount the controller in the wing, or simply wish for the controller to be mounted closer to the battery, you must extend the lines using the correct wire gauge as described in the Wiring section below.

When the desired location is selected, secure the heater controller via the 4 mounting holes. Route the wiring between the probe, controller, panel, and power source, as described below.
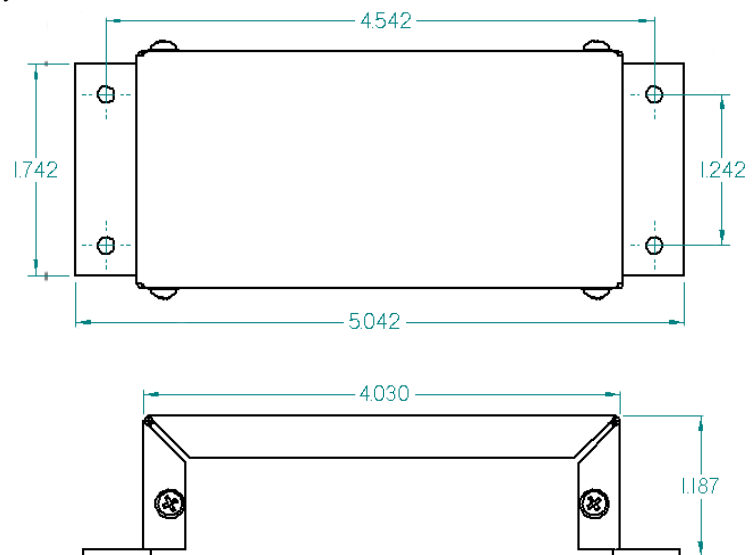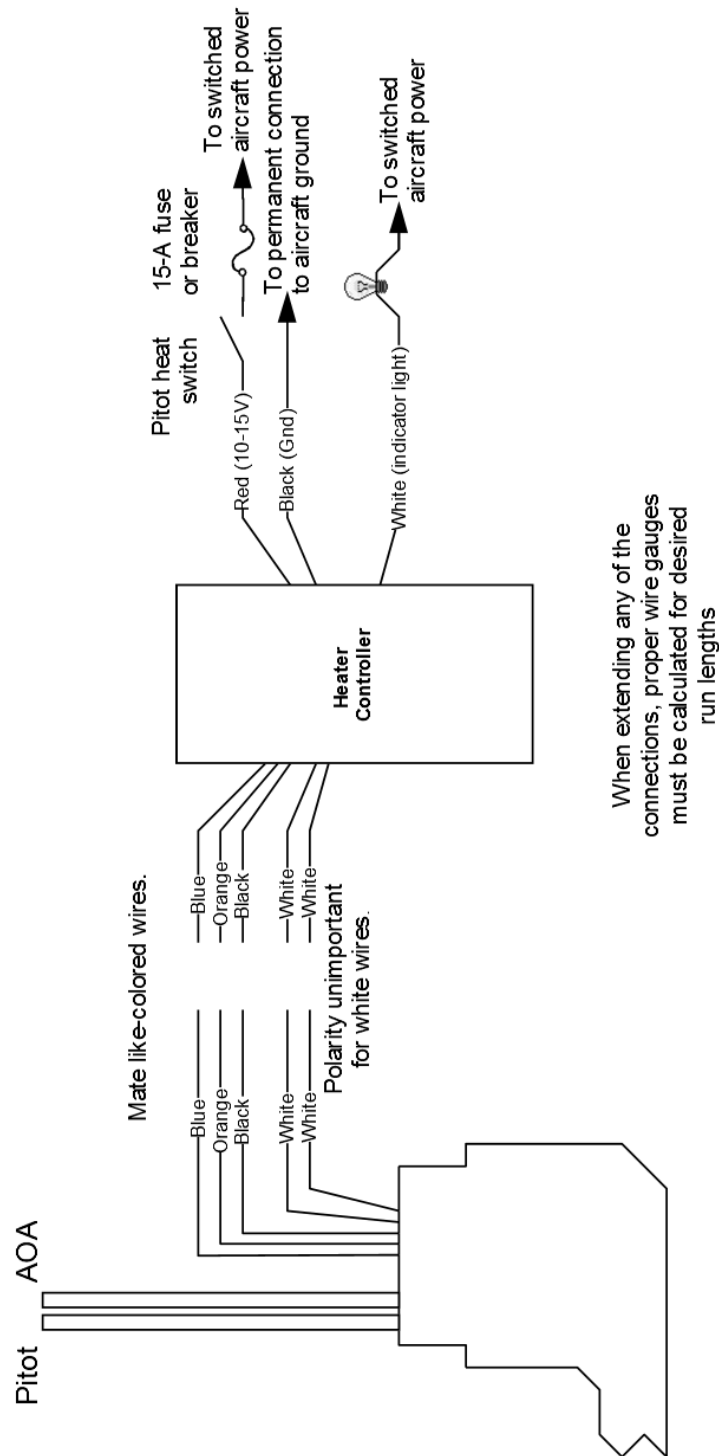
Heated AOA/Pitot Wiring System Overview

The following block diagram depicts the basic layout of the electrical connections between the probe and heater controller. This diagram should be used in conjunction with detailed

instructions on the following pages. Read the specific instructions for each connection prior to installation.

Heater Controller Wiring

Before making the connections to your Heated AOA/Pitot Probe and controller, refer to the Recommended Wiring Practices section on page 2-1. The chart at right provides general recommendations for wire gauge choice, given wiring run length.

| Recommended wire gauge for runs, given 10-amp peak current ||
Run length	Gauge
0' – 7'	18 AWG
7' – 9'	16 AWG
10' – 16'	14 AWG
17' – 24'	12 AWG
25' – 40'	10 AWG

From FAA AC 43.13-1B, page 11-30

Probe to Controller Wiring

As mentioned above, it is preferable that the heater controller box be mounted near enough to the probe that 5 wires between the controller and probe can be connected without extension. The three mating pairs of colored wires – terminated with Fastons – are used to carry the current to the heating element in the probe. The 2 white wires are for temperature measurement, and can thus be small. If you have mounted the heater controller near the probe and do not need to extend the wires between the two, simply plug each wire on the controller into its corresponding like-colored wire from the probe.

If you do need to extend the wires between the probe and the controller, use the recommended wire size (see chart on page 5-8) for your run length. Since extending the wire runs requires that you cut the connectors off the 5 wires between the probe and controller, splice the extension wires between the probe and controller using butt splices or other similarly secure method. The white wires are not polarity-dependant. Additionally, as the white wires do not carry any significant current, you may extend them with 26 AWG or larger for any run length.

Controller Power wiring

Three wires – colored red, black, and white – exit the controller for connection to your electrical system. Power (between 10 and 15 volts) is fed to the controller via the red and black wires. The maximum current draw of the heated pitot controller/probe is 10 amps. You must route your own appropriately-sized wires to where the heater controller is mounted. Both power and ground lines should be able to handle 10 amps with minimal voltage drop, as recommended in the chart on page 5-8.

The red wire should be connected through a pilot-accessible switch to the main power source in the aircraft (limited to 15 volts). The switch allows you to manually turn the heater controller on and off, depending on the situation. Install a 15-amp fuse at any point along the power line to the heater

Color	Notes
Red	Connected through a pilot-accessible switch to 10–15V supply. Must handle up to 10 amps.
Black	Must have a constant connection to ground. This is required for the warning light to operate when controller is powered off or not functioning. Line must handle up to 10 amps.
White	Connected to a light bulb (or resistor & LED) tied to switched ship's power. This line is grounded when the heater controller is powered off or not functioning. Connection can handle no more than 1 amp. Current depends on light source connected.

controller. Remember that even when the controller is powered on, it only heats the probe the amount necessary to maintain temperature.

The black wire should be permanently connected to ground. Cutting power to the heater controller should occur via the red power line, not the black ground line.

Heater Status Connection

Note: The probe heater functions properly whether or not you make this connection. It is simply a status output for your convenience.

The white heater status wire is grounded when the probe heater is turned off or not functioning properly. This wire should be connected to a light on the panel, whose other terminal is connected to switched aircraft power. When the heater is on and functioning properly, the white heater status line is open, leaving the indicator light turned off. When there is no power to the heater controller – or it is not functioning properly – the white line is grounded, turning the indicator light on.

Aircraft Spruce P/N 17-410 is an example of a light that will work for this application. An LED and resistor in series will also suffice. If you use an LED as the indicator, you must choose a resistor that delivers the appropriate current to the LED, and can accommodate the power required for its current and voltage drop.

If you own a Dynon EMS-based product, you may also use one of its two contact input to display an onscreen indication. Connect this heater status output directly to the desired EMS contact input, with no additional resistors or lights. You must configure the contact display as described in your EMS-based product's Installation Guide.

AOA/PITOT PROBE MOUNTING

The Dynon Avionics AOA/Pitot probe has been designed as an under-wing pitot. The following information applies to this type of installation. If you wish to mount your pitot on nose boom mount, contact us so we can make the appropriate adjustments to your pitot. The heated version of Dynon's AOA/Pitot Probe does not come in a boom-mount configuration.

AOA/Pitot Probe Mount Location

The Dynon Avionics AOA/Pitot probe only functions correctly when mounted in a location where the airflow over the probe is relatively undisturbed by the aircraft. In general, we recommend that you mount it at least 6 inches below the wing and with the tip of the probe between 2 and 12 inches behind the leading edge of the wing. Typically, pitot probes are mounted about mid-wing span wise to minimize the effects of both the propeller and the wing tips. Testing during the probe development has shown that the standard mounting locations for the pitot probe in the RV series of aircraft also works for the Dynon probe.

AOA/Pitot Probe Mounting Instructions

After the mounting location has been determined, mount the pitot mounting kit per the included instructions or fabricate your own mount. In either case, mount the probe securely to the wing such that the body of the probe is horizontal during level flight. Drill and tap mounting holes (#6-32) on the probe to match your mounting bracket. Use caution when drilling the holes, ensuring that you avoid drilling into the pitot and AOA pressure lines. As long as you do not penetrate

these lines, you may drill all the way through the outer metal without affecting the probe's waterproofing.

DIMENSIONS

Standard mount
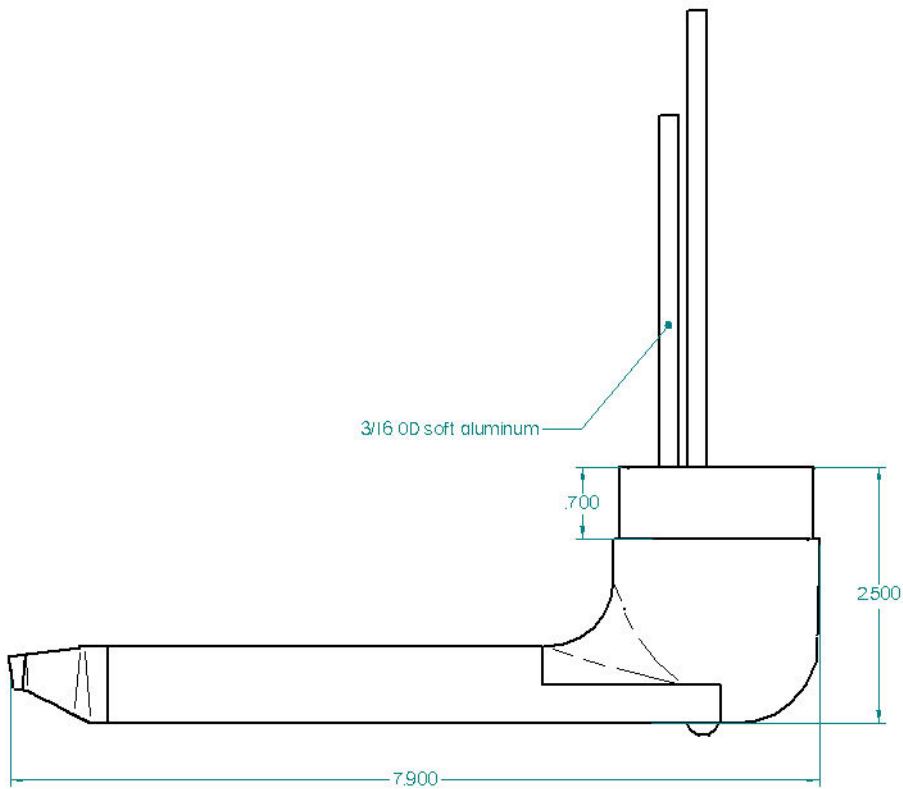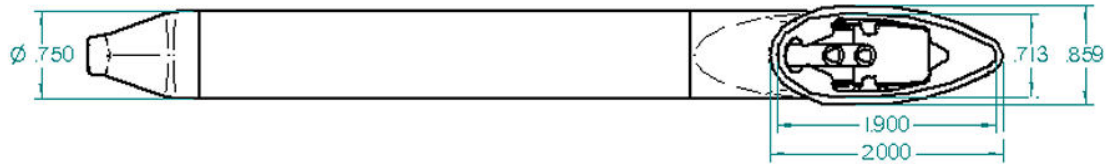
Boom mount

PLUMBING

NOTE: Because the pitot and AOA plumbing tubes have not been annealed, they work-harden rapidly when manipulated. Make gentle bends, and only bend any given section **once**.

After mounting the probe, route the pitot and AOA lines from the probe to your EFIS-D60. The tube closest to the snout is the pitot line, while the tube in the rear is the AOA line. There is no static source on the probe.

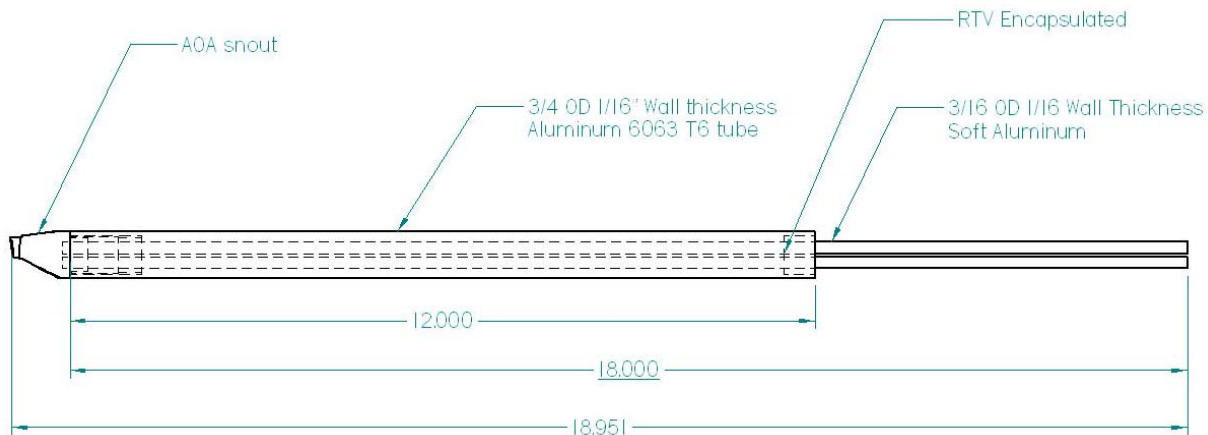After mounting the probe, install adapters to connect the 3/16 plumbing lines from the probe to whatever plumbing lines run back to the EFIS-D60 in your aircraft (AN 919-2D for 3/16 to ¼). We strongly recommend using aircraft grade fittings such as standard AN fittings. Make sure the plumbing lines do not chafe or interfere with any aircraft control systems.

PRESSURE CHECK

Dynon's pitot design deliberately has a pin-sized leak hole in each of the two tubes to permit draining any moisture which might accumulate inside. These holes are located in the middle of the tube at the bottom. Plugging these holes does *not* guarantee a pneumatic seal (although one is sometimes present). The leak that may exist does not affect the performance of the probe. You will, however, need to take it into account when doing pressure/leak tests on your pitot system

CALIBRATION

🛈 **CAUTION:** It is your responsibility to fly your plane safely while performing any configuration or calibration in flight. The best scenario would include a second person to perform any necessary steps on the EFIS-D60.

Once you are flying straight and level at a safe altitude for stalls, enter the SETUP > AOACAL menu. While the AOACAL menu is displayed, oscillate the aircraft between ± 5° pitch 4 times at fast cruise airspeed. During this maneuver the EFIS-D60 records the lowest angle of attack that you usually see during flight. You do not need to push any additional buttons before starting this maneuver.

Refer to the list below of the stalls recommended to complete the user calibration. The general idea is to record stall data to find the lowest angle of attack stall. The list we have suggested is a starting point and produces a good calibration under most circumstances. However, if there are

flight regimes not listed that you suspect would create stalls at lower angle of attack it would be good to record those as well.

  With full power, no flaps
  With no power, no flaps
  With full power, full flaps
  With no power, full flaps

Push the STALL button before performing each stall. When you push the STALL button, a 45-second timer starts. Notice the "T" next to the time that is counting down. During the 45 seconds that the timer is counting down, you are expected to have completed the stall maneuver. If any stall maneuver is not completed before the timer expires, the calibration will be invalid, and should be reset. To do this, push the CANCEL button. This exits the AOACAL menu; re-enter it to begin the calibration again. **After completing the stall, make sure you let the 45 second timer count down to 0 before you push the STALL button for the next stall.**

When the listed stall maneuvers have been completed according to the above procedure, push FINISH. At this point, the AOA indicator has been calibrated. If it is not visible, turn the display on in the SETUP > CLUTTR > AOABAR menu. This calibration should result in the lowest angle of attack stall occurring just above the red/yellow boundary. If this is not the case, please repeat the AOA user calibration, including flight configurations that resulted in stalls with incorrect indications. If the user calibration continues to be unsuccessful, please contact Dynon Avionics technical support.

ALARM SETUP

Enter the SETUP > AOAALM menu and press any of the buttons beneath the AUDIO label to select the point on the AOA bar at which you wish the alarm to sound:

AUDIO: ALWAYS OFF
AUDIO: ON IN RED
AUDIO: START YLW TOP
AUDIO: START YLW MID
AUDIO: START YLW BTM

The latter three alarms (the ones that begin with START) are progressive, meaning the audio alert gets more intense as your angle of attack increases. You may set these progressive alarms to start at the top, middle, or bottom of the yellow section of the AOA bar. Setting AUDIO to ON IN RED configures an intense alarm to occur only when the AOA indicator is in the red.

To reduce nuisance audible AOA alarms – such as when taxiing, taking off and landing – the alarm can be inhibited below a selected airspeed. While in the SETUP > AOAALM menu, press MINSPD to configure the minimum airspeed at which an AOA alarm can occur. Anytime airspeed is below the MINSPD value, AOA alarms will not occur; anytime it is above the MINSPD value, alarms can occur. If the AOA alarm is already sounding as airspeed falls below this threshold, it will continue to sound until the high AOA condition is resolved.

Appendix C: Encoder Serial-to-Gray Code Converter Installation

INTRODUCTION AND DESCRIPTION

The Encoder Converter is an electronic device that receives the serial encoder data from the EFIS-D60 and outputs standard Mode-C parallel Gray code into your Mode-C transponder. This Encoder Converter requires data from the EFIS-D60 and is not to be confused with other standalone encoders available on the market. While the installation is not complex, it is important that you install the unit correctly. The Encoder Converter does not output an encoder strobe signal.

The Encoder Converter is designed to be powered off voltages between 10 and 30 volts.

TOOLS AND EQUIPMENT

The following parts are not included with your Encoder Converter purchase but may be necessary to complete the installation.

- Wire cutters
- Connector crimp tool
- Crimp pins
- 25-pin EFIS harness to mate with EFIS-D60 (may have been purchased with your EFIS-D60)
- Connector to mate with Gray code transponder

ELECTRICAL INSTALLATION

The following section describes the wiring requirements for using the Encoder Converter. Please follow these instructions explicitly as improper wiring can result in permanent damage to your unit.

RECOMMENDED WIRING PRACTICES

NOTE: Use correct splicing techniques for all electrical connections, taking care to properly insulate any exposed wire. A short circuit between any of the wires may cause damage to the Encoder.

The wire used in construction of your Encoder Converter is 22 gauge avionics grade Tefzel wire, which meets Mil Standard MIL-W-22759/16.

Installing: Make sure all connections are secure and all wires are routed and strain relieved to ensure that the wires will not chafe against any other object in the aircraft.

STEP 1: TRANSPONDER WIRING

Wire the Encoder Converter signals to their respective connections on your Mode-C transponder. Mode-C transponder pin-outs vary from device to device. To find the correct pin-out, look at the manual for your transponder or contact its manufacturer. The table below details which color wire should be connected to each Transponder pin. All of the wires listed in the table leave one end of the Encoder Converter in a single bundle. If your transponder has a switched power output, connect this to the power inputs on the Encoder Converter. If your transponder does not include this switched power output, the Encoder Converter power connections should be made

directly to your switched avionics power. Ensure that all avionics power is off before performing the wiring step of this installation.

If your Altitude Transponder has either a strobe signal or a D4 pin, leave these pins unconnected.

Transponder Pin	Encoder Converter Wire Color
A1	Yellow
A2	Green
A4	White with Blue
B1	Blue
B2	Orange
B4	White with Red
C1	White with Green
C2	White
C4	White with Black
Power (10V-30V)	Red
Gnd	Black
Strobe Signal	No Connection

The Gray code output of the Encoder Converter reports altitude not adjusted for barometric pressure, as required by FAA specification. The altitude reported by the EFIS-D60 encoder will always match the altitude shown on screen when the BARO value is set to 29.92 inHg.

STEP 2: CONNECTING TO THE EFIS-D60

Before wiring connections to the EFIS-D60 check to ensure that the wire length between your Encoder Converter and your EFIS-D60 is appropriate. Add or remove wire length if needed or desired. Customizing the wire length will facilitate an installation that is both cleaner and more secure.

The only pins of interest on the EFIS-D60 connector for the Encoder Converter installation are pins 13 and 21. The two wires exiting the Encoder Converter are the EFIS-TX and the EFIS-Ground, which are green (or red) and black respectively, and 2 feet in length. Connect these wires to the EFIS-D60 25-pin female harness.

Ensure that your EFIS-D60 is powered off. Then connect the black EFIS Ground wire to pin 21. Then, connect the green wire to pin 13 (Serial Encoder Transmit) on the EFIS harness.

EFIS DB25 Pin#	Dynon EFIS harness color	Encoder Converter Wire Color	Function
13	Blue/White (may be black on some harnesses)	Green (May be Red on older models)	Serial Encoder Transmit
21	White	Black	Serial Encoder Ground
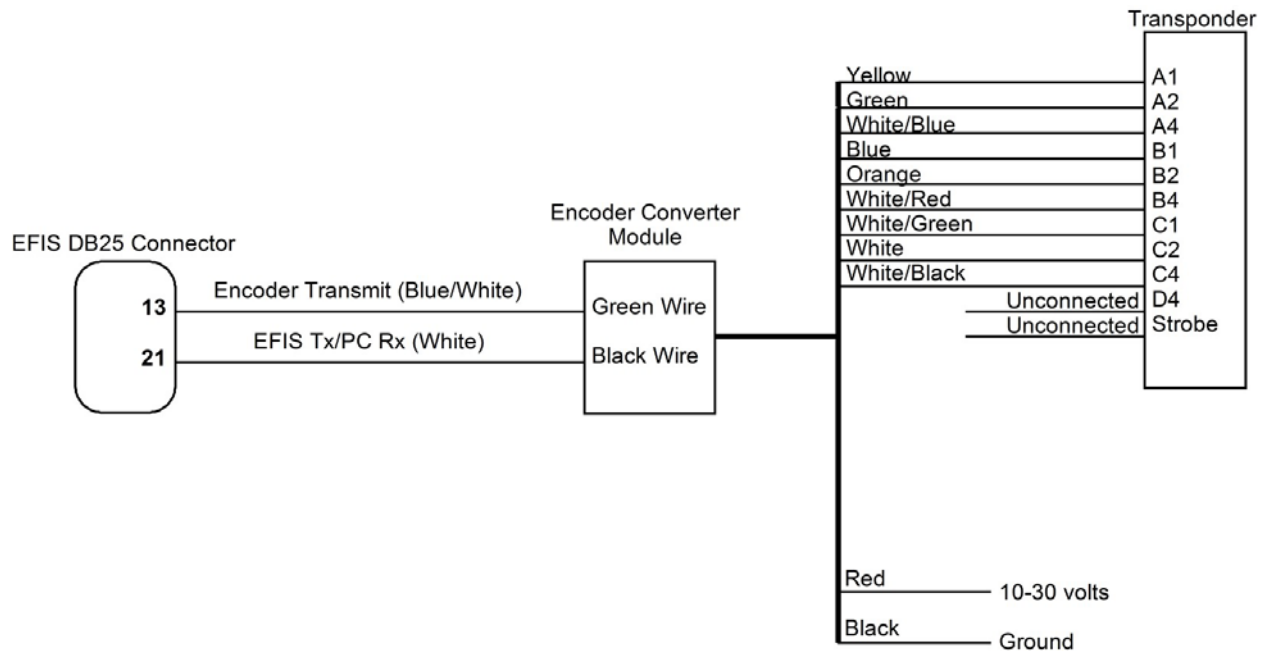
STEP 3: EFIS-D60 ENCODER FORMAT

For proper communication the EFIS Altitude Encoder format must be set to format number one. To change this setting, from the main menu, select: SETUP > ALTENC. Press FRMAT until it reads "1."

Appendix D: Replacing the EFIS-D60 Internal Backup Battery

1. Remove the two screws (either #1 Phillips or 7/64" hex, depending on when your unit was manufactured) from the small, rectangular battery door on the side of the EFIS-D60. Remove the battery door. Do not remove any other screws from the case of the unit.

2. If you previously had a battery, disconnect it from the EFIS-D60 by unplugging the battery connector and gently pulling out old battery. It is safe to *gently* pull on the battery wire to remove the battery.

3. Insert the new battery with the bumpy side up.

4. Connect the battery connector to the battery. The connector is keyed; make sure it is positioned correctly.

5. Position the connector so it is centered on the end of the pack. Verify that the battery pack will not interfere with insertion of either of the door screws.

6. Reinsert screws and tighten to 12 in-lbs.

Appendix E: Upgrading EFIS-D60 to EFIS-D100

The EFIS-D60 is Dynon's simple, more affordable version of Dynon's full-featured EFIS-D100. Your EFIS-D60 can be upgraded to the feature set of the EFIS-D100, which provides the following features and more:

- HSI Capability
- Optional autopilot interface
- GPS and NAV radio interconnectivity
- Interoperability with other Dynon instruments
- Checklists
- Bugs
- Timers
- On-screen information such as clock, VSI, OAT, *G*-meter

The upgrade process can only be done at the factory. Contact Dynon Customer Support (support@dynonavionics.com or 425-402-0433) for upgrade pricing, turnaround time, and other details.

Appendix F: Weights

Adding any new instrument to an aircraft requires the installer to be aware of its weight and how that affects the overall weight and balance of the plane. The following are the weights of the EFIS-D60 and associated Dynon-supplied sensors.

Installed EFIS-D60 ....2 lb 13.5 oz (1.287 kg)

EFIS-D60 + Internal Backup Battery ....3 lb 4 oz (1.465 kg)

EFIS 25-pin wiring harness ....11.2 oz (0.32 kg)

EDC-D10A ....3.6 oz (0.102 kg)

EFIS OAT ....3.2 oz (0.08 kg)

Heated AOA/Pitot Probe & Heater Controller ....11.2 oz (0.32 kg)

Unheated AOA/Pitot Probe...5.6 oz (0.16 kg)

Appendix G: EFIS-D60 Specifications

Mechanical	6.95" wide x 4.90" tall x 4.51" deep (177 x 125 x 115 mm)
Operating Temperature	-22° to 122° F (-30° to 50° C)
Power	Voltage: 10 - 30 Vdc Power: **12 watts** typical; **17 watts** maximum
Connections	Wiring: DB25 male connector
Screen	Type: AMLCD, TFT (Thin Film Transistor) Backlight: 800 nits Size: 7.0" diagonal (178 mm) Resolution: 854 x 480 color pixels
Inputs/Outputs	1 - AOA Audio Alarm 1 - RS-232 bidirectional PC communication and GPS aiding input 1 - RS-232 serial encoder output