SkyView

System Installation Guide

This product is not approved for installation in type certificated aircraft

Document 101320-013, Revision N

For use with firmware version 5.1

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Dynon Avionics' products incorporate a variety of precise, sensitive electronics. SkyView products do not contain any field/user-serviceable parts. Units found to have been taken apart may not be eligible for repair under warranty. Additionally, once a Dynon Avionics unit is opened up, it is not considered airworthy and must be serviced at the factory.

Revision History

Revision	Revision Date	Description
A	December 2009	Initial release
B	March 2010	Document number changed to 101320-001. Minor style, grammar, and cross reference changes and corrections. Updated guide to reflect SkyView firmware version 1.5 behavior and requirements. Added servo installation information in various chapters. Clarified SV-ADAHRS-20X installation orientation requirements. Clarified SkyView display basic operation procedures. Most notably, added a screen synchronization section. SV-D700 / SV-D1000 Installation and Configuration Chapter Updates: • Called out the use of a 5 amp breaker instead of a 7.5 amp breaker on page 4-7. • Added important backup battery information on page 4-7. • Consolidated serial device installation into this chapter. • Added installation information for external dimming control and audio outputs. • Expanded the Brightness Setup Section. • Added a section regarding installed databases. • Added a section reminding users outside of North America that they will need to install an applicable terrain database file on page 4-14. • Added a section regarding Aviation Data. Cautioned against the use of ferrous pneumatic fittings on page 5-3. SV-EMS-220 Installation and Configuration Chapter Updates: • Clarified the theory behind and the use of EMS sensor definition and configuration files in SkyView. • Added a section regarding SV-EMS-220 wire harnesses. • Added example engine sensor and transducer installations. • Removed the requirement for a 200 ohm pull down resistor in the Rotax oil pressure sensor installation. • Removed the requirement for a 1.21k ohm pull up resistor in the Rotax CHT sensor installation. • The SV-EMS-220 is capable of measuring differential fuel flow. All information in the guide has been updated to reflect this. • Fixed the fuse call-out on in the Ammeter Shunt Section. Revision A called out a 7.5 amp fuse. This guide calls out a 1 amp fuse. • Documented other minor sensor installation requirements corrections as required. Clarified SV-GPS-250 installation requirements. Expanded Appendix C: Wiring and Electrical Connections.
C	May 2010	Document number changed to 101320-002. Minor style changes.

Revision	Revision Date	Description
		Added information in applicable locations regarding the SV-NET-SERVO wiring kit. Color-coded the connectors in the example SkyView systems figures to indicate gender. *Updated the guide to include HSI requirements and other related information.* *Updated the guide to reflect autopilot functionality, calibration, and testing information. The most notable changes are to the Autopilot Servo Installation, Configuration, and Calibration Section.* Expanded the Input Function Section under the Serial Port Configuration Section in the SV-D700 / SV-D1000 Installation and Configuration Chapter. Added an important note on page 5-7 regarding the necessity of configuring airspeed limitations for autopilot servo calibration. Specified that the SV-EMS-220 warning light pin (D37 pin 29) should not be connected in Table 15. The SV-GPS-250 should now be configured as INPUT FUNCTION = POS 1. Clarified servo installation instructions regarding the connection point on the servo arm with the linkage hardware on page 9-6. Updated the AP Disengage/CWS Button Section on page 9-10 to say that the button is required instead of just highly recommended.
D	June 2010	Document number changed to 101320-003. Added GPS Fix Status information. Added Fuel Flow pulses/gallon documentation. Clarified EMS GP input compatibility. Added information about obstacles and runways to synthetic vision section. Added information about new autopilot pitch axis settings. Added information about optional External Alarm Light connection. Added information about fuel computer settings. Updated autopilot test procedures with additional warnings and precautions.
E	October 2010	Reiterated the importance of proper ADAHRS orientation and other installation requirements. Added note about servo self-lubrication. Clarified lack of specific boom-mount AOA/Pitot installation instructions. Added information about serial device and display connection requirements. Added firmware upgrade information for servos being used from D10/D100 with older firmware. Clarified GPS serial connection wire functions and colors. Added SV-XPNDR-26X installation instructions and specifications. Added SV-ARINC-429 installation instructions and specifications. Added new requirement to connect TX and RX lines from serial devices to ALL displays in parallel. Added information about Autopilot servos not needing lubrication. Clarified lack of boom mount AOA/Pitot mount availability.
F	December 2010	Clarified that cable-side transponder TNC connector is not provided by Dynon. Added SV-BAT-320 connection information for customers making their own

Revision	Revision Date	Description
		harnesses. Added OAT connection information for customers making their own harnesses. Removed 30K resistor requirement for Rotax trigger coil RPM pickup. Clarified SV-GPS-250 connections when multiple displays and/or SV-GPS-250 modules are involved. Added pinout table for Dynon Capacitance-to-Voltage Converter.
G	March 2011	Added connector labels to SkyView Network Module and Display Diagrams. Fixed orientation of SkyView connectors on diagrams. Clarified acceptable SV-ADAHRS-20X orientation. Added additional Garmin 430 and SL30 configuration information. Fixed link to AOA information on Dynon web site. Added LED status troubleshooting information for SkyView modules. Added product registration information. Updated Garmin 480 connection details. Added warnings about modifying products and introduction of foreign debris. Described improved loss of external power with backup battery connected behavior. Added G meter setup information. Added recommended Ethernet connection information for multiple display SkyView systems. Clarified GRT hall effect amps sensor support. Added information about reconnecting repaired SkyView Network components to a system after repair. Added Synthetic Vision License and Purchase Information. Added SV-MAP-270 License and Purchase Information. Updated information about obtaining and managing aviation / obstacle databases, including Jeppesen data support.
H	April 2011	Removed Create System Backup description. Added description of EMS serial data. Changed Screen Hardware to Display Hardware. Add flight path marker and extreme pitch warning menu items. Clarified SV-GPS-250 connectivity. Clarified that Ethernet is designed to be connected permanently.
I	September 2011	Added angle of attack menu item. Added OAT probe adjustment setting information. Added Vertical Power VP-X License information and interfacing information. Clarified serial port connections for multi-display SkyView systems in Appendix E. Added information about which modules and devices the SV-BAT-320 can provide power to in the event of power failure. Added EI FT-60 fuel flow sensor orientation information. Added a note about the importance of external devices sharing ground with SkyView for proper operation.

Revision	Revision Date	Description
		Added Amps shunt fuse diagram. Added SV-XPNDR-26X power wire size recommendation. Added permission to print manual. Added information about taking screenshots for troubleshooting purposes. Added information about re-doing ADAHRS-based calibrations if an additional ADAHRS is installed after calibrations have been done. Consolidated all information about ADAHRS calibrations into the ADAHRS installation chapter. Added ADAHRS, SYSTEM, and NMEA Serial output information to Serial Data Output Appendix.
J	November 2011	Added Garmin GTN connection information. Added Garmin serial port setting for Garmin 430/530 ARINC-429 based connections.
K	March 2012	Added information about equipping for IFR. Clarified that Jeppesen data must be transferred to USB stick via the Jeppesen JSUM program. Added PocketFMS information. Clarified Honeywell oil pressure sensor connection information (Rotax). Added recommendation to ensure master contactor/relay is protected by a diode. Clarified fuel flow sensor connections. Added UMA differential pressure sensor information. Added backup battery test to initial installation procedures. Changed EMS wire harness tables to indicate pin 2 may not have a wire in it (all recent Dynon harnesses). Clarified future use of connected TSO'd GPS to transponder for ADS-B 2020 mandate compliance. Clarified that a broken shear screw may be indicative of a more systemic problem that needs to be resolved. Added serial port test to ensure that ports are configured correctly on all displays. Better explanation of cases when fuel tank / sensor geometry prohibits display of all fuel in tanks. Added Kavlico Fuel, Oil, and Coolant Pressure sensor information. Clarified external dimming input. Added Rotax 912 special oil temp / tachometer behavior. Added altitude alerter setup information. Added EMS 5/12V output current limitations information. Added 3rd party two wire oil temperature sensor connection instructions. Added procedure for performing pitot/static checks. Updated map setup instructions as former setup items are not user-accessible via normal SkyView UI. Clarified settings changes necessary to support capacitive fuel quantity senders. Added audio output connection instructions. Updated CWS Broken Line Detect instructions to reflect that the feature is now available.

Revision	Revision Date	Description
L	July 2012	Clarified obtaining hex codes for mode S operation. Added SV-NET-HUB drawing with dimensions. Location of pulses/gallon setting changed in setup menu. Added dual SV-GPS-250 + dual display example connection diagram. Clarified VP-X flaps and trim calibration procedures. Added Dynon Capacitance to Voltage Converter current draw information for power planning. Clarified that audio output from ALL SkyView displays must be connected to audio panels/intercom for proper audio operation. Clarified % power only available on Lycoming / Continental engines. Added crush washer spec for 100409-001 oil temp sensor. Updated pitot/static test instructions. Added metric units to most dimensions and weights. Explained presence of unused 1.21K resistor in transponder connector kit. Clarified fuel flow sensor placement recommendations. Changed max SkyView displays supported to three. Added instructions for using already-installed Dynon D10/D100 Series OAT Probes with SkyView. Added Rotax 912 iS information. Added SkyView Network redundancy information to SkyView Network and Troubleshooting sections. Expanded ADAHRS Source Selection section with new cross-checking features.
M	December 2012	Updated SV-XPNDR-26X Installation, Configuration, and Testing chapter, as well as relevant appendix data, to reflect updated ADS-B Out capability, improved squat-switchless air/ground detection and automatic mode switching. Added basic explanation of EMS voltmeter inputs. Clarified the boom mount does not incorporate drainage features. Added link to FAA AIM for further ADS-B and TIS system information. Clarified SV-XPNDR-26X serial port wiring. Added engine alert inhibit information. Added voltage measurement capability and ultimate limit for type “C” EMS inputs. Improved standby network error troubleshooting explanation. Updated recommendation to have servos powered whenever SkyView is powered on. Added description of take-off position marking for trim calibrations. Added SV-ADSB-470 installation information. Documented move of INHIBIT ENGINE ALERTS AT BOOT option to Engine Information menu. Updated return to service appendix.
N	January 2013	Updated Serial Data Output Format Specifications. SYSTEM and EMS formats have changed for 5.1. Documented new internal data logging feature. See appendix F. Added a note to reinforce that the servo shear screw should NEVER be removed or

Revision	Revision Date	Description
		adjusted in the normal process of installing an autopilot servo.

Table 1–SkyView System Installation Guide Revision History

Table of Contents

1. Introduction

The printed version of this guide is in grayscale. Some figures and diagrams contain important color information. Reference the electronic version of this guide to view it in color.

It is the installer's responsibility to conform to industry standards when applicable.

This guide provides information about the physical, electrical, and plumbing installation and configuration of the following SkyView system components:

- SV-D700 and SV-D1000 Displays
- SV-ADAHRS-200 and SV-ADAHRS-201 ADAHRS Modules
- SV-EMS-220 or SV-EMS-221 Engine Monitoring Module
- SV-GPS-250 GPS Receiver Module
- SV-BAT-320 Backup Battery
- SV-XPNDR-261 and SV-XPNDR-262 Transponders
- SV-ARINC-429 ARINC 429 Module
- SV-ADSB-470 Module
- SkyView Servos (SV32, SV42, and SV52 models)
- Angle-of-Attack (AOA) / Pitot Probe, Encoder Serial-to-Gray Code Converter, and the Capacitance to Voltage Converter
- Engine and environmental sensors purchased from Dynon Avionics

Additionally, this guide deals with setting up the installation-dependent firmware options. Because you may not have purchased all of the components mentioned above, you need only read through the relevant sections of this guide. Information about the operation of these instruments can be found in the SkyView Pilot's User Guide.

Warning

Dynon Avionics' products incorporate a variety of precise, sensitive electronics. SkyView products do not contain any field/user-serviceable parts. Units found to have been taken apart may not be eligible for repair under warranty. Additionally, once a Dynon Avionics unit is opened up, it is not considered airworthy and must be serviced at the factory.

Dynon Avionics Product Registration

Please take a moment to register your Dynon Avionics SkyView system at register.dynonavionics.com. Registering your product with Dynon ensures that your contact information is up-to-date. This helps verify product ownership, can expedite warranty claims, and allows us to notify you in the event a service bulletin is published for your product. You can also optionally sign up to receive other Dynon news and product announcements. Dynon will not share your contact information with third parties or send you announcements without your explicit consent.

About this Guide

In the electronic (.PDF) version of this guide, page and section references in the Table of Contents and elsewhere act as hyperlinks taking you to the relevant location in the guide. The latest electronic version (.PDF) of this guide is available on the Dynon Avionics website at docs.dynonavionics.com.

This icon denotes information that merits special attention.

This icon denotes a helpful installation tip.

Getting Started

This “getting started” section contains a very small amount of information that can be used to check out your SkyView system on the bench, or immediately after SkyView has been installed in the plane. This is not a substitute for reading the entire SkyView System Installation Guide, which provides instructions for wiring and configuring SkyView to the unique requirements of your particular airplane.

1. A SkyView display requires 10-30 VDC. You must connect BOTH of the (long) Red wires to POWER and BOTH of the (long) black wires to Ground. Current for each display can be up to 3.5A @ 12V (add 1.5A if the SV-BAT-320 battery is connected and being charged), so use a big battery or power supply.
2. Any devices connected to SkyView that do not receive their power from the SkyView Network (such as SV-XPNDR-261/262 and Dynon Autopilot servos) must also be powered ON to communicate with SkyView.
3. SkyView SETUP MENU is accessed by pushing and holding Buttons 7+8 together for 2-3 seconds.
4. Setting the Tail Number is required for before you can configure your SkyView Network (described below): SETUP > AIRCRAFT INFORMATION > TAIL NUMBER. If Tail Number has not yet been issued for your plane, set TAIL NUMBER to something other than DYNON.
5. Many SkyView displays and modules communicate over a common set of wires – the SkyView Network that terminates at the D9 connectors on the back of your SkyView display(s). Getting all modules and displays “talking” on SkyView Network is done by going to SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE > (click right one more time). If a module is noted as “requires update”, press the UPDATE button. Otherwise, press the FINISH button. Note that you will not see any flight instruments or engine instruments before a network configuration is performed, even if the SV-ADAHRS-200/201 and SV-EMS-220/221 have been wired properly and are connected.

6. Devices that do not utilize SkyView Network are connected via serial port connections. Dynon devices that use serial ports include the SV-GPS-250, SV-XPNDR-261/262, and various third-party devices. As serial devices are not part of the SkyView Network, they will not be seen on the list of devices seen as you configure SkyView Network above. Instead, configuring SkyView to communicate with SV-GPS-250 and SV-XPNDR-261/262 is done via a more manual process in SETUP > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.
7. After you've configured SkyView Network, have properly configured any serial devices, exit the Setup Menu. Your SkyView display should now display EMS, PFD, and MAP. Map will not display without a GPS fix (the airplane symbol on the Map page will also flash with "?" if it does not have a GPS fix.
8. Your SkyView may require various updates such as system software, databases, and Sensor Definitions. See http://www.dynonavionics.com/docs/support_software_SkyView.html for more details on the updates available for SkyView. If you are a non-US customer, the display of aviation and obstacle data on your SkyView system requires a database purchase from Jeppesen or PocketFMS. Note that firmware on each SkyView display must be updated individually.
9. Common issues for setting up SkyView engine monitoring:
    a. The configuration of sensors installed on SkyView at the factory is generic, therefore "Red X's" on the EMS for various sensors are normal until sensor configuration for your particular engine sensor configuration is complete.
    b. The layout of which sensor "widgets" are shown on the screen, sizes, styles, etc. is completely configurable: SETUP > EMS SETUP > SCREEN LAYOUT EDITOR
10. Common issues for setting up SV-XPNDR-261/262:
    a. Insure that there is a valid tail number set (see above)
    b. Insure that a valid HEX CODE is set: SETUP > TRANSPONDER SETUP > AIRCRAFT HEX CODE
    c. Traffic will not be displayed unless you are in an area covered by an TIS radar site (US only)
11. Common issues for setting up Dynon Autopilot
    a. Servos must be powered ON
    b. Servos must be recognized on SkyView Network (above)
    c. AIRSPEED LIMITATIONS must be set (at least one must be actively adjusted from the defaults) before the Autopilot can be configured: SETUP > PFD SETUP > AIRSPEED.
    d. SERVO CALIBRATION must be performed: SETUP > HARDWARE CALIBRATION > SERVO CALIBRATION > CALIBRATION.
    e. After SERVO CALIBRATION is successfully completed, AP status will now be displayed on the SkyView display top bar.

2. System Planning

Installers should read and understand this chapter before proceeding with physical installation. SkyView equipment installed contrary to the requirements outlined in this chapter may not operate within specifications.

The purpose of this chapter is to familiarize you with important SkyView system information and concepts including the following:

- Operating specifications
- Installation location requirements
- SkyView systems

SkyView modules have environmental and location requirements that must be adhered to for specified operation. This chapter helps installers make informed decisions regarding suitable SkyView equipment locations in aircraft. It contains electrical, mechanical and environmental specifications, installation requirements, and other important guidelines and suggestions.

When SkyView components are used together, they are referred to as a SkyView system. This chapter also explains what a SkyView system is and how to build one.

Power Consumption

Table 2 contains power specifications for typical SkyView systems. The table below accounts for the power that a SkyView display consumes while powering itself and its attached modules. It does not account for SkyView autopilot servo power because they are powered directly from aircraft master power.

Power Specifications	Approximate current consumption at 12 volts DC	Approximate current consumption at 24 volts DC
SkyView system no backup battery (per display)	3.5 amps	1.8 amps
SkyView system with backup battery (per display)	+1.5 amps additional during battery charging	+0.7 amps additional during battery charging
SV-XPNDR-26X	0.4 amps average	0.2 amps average
SV-ADSB-470	0.2 amps average	0.1 amps average

Table 2–SkyView System Power Specifications

Table 3 contains servo power specifications when servos are engaged and moving at 100% torque.

Power Specifications	Approximate current consumption at 12 volts DC	Approximate current consumption at 24 volts DC
SV32	1.3 amps	0.7 amps
SV42	2.0 amps	1.0 amp
SV52	2.8 amps	1.4 amps

Table 3–Servo Power Specifications

Major Component Physical Specifications

Table 4 contains physical specifications (dimensions are approximate—see respective installation chapters for exact dimensions).

Physical Specifications	Dimensions	Weight
SV-D700	7.64" W x 5.51" H x 2.14" D (194mm W x 140mm H x 54mm D)	2.4 lb. (1.1 kg)
SV-D1000	10.32" W x 7.06" H x 2.14" D (262mm W x 179mm H x 54mm D)	3.0 lb. (1.4 kg)
SV-ADAHRS-200 and SV-ADAHRS-201	4.71" W x 1.22" H x 2.61" D (120mm W x 31mm H x 66mm D)	8 oz. (.2 kg)
SV-EMS-220 and SV-EMS-221	6.35" W x 1.09" H x 2.99" D (161mm W x 28mm H x 76mm D)	10 oz. (.3 kg)
SV-GPS-250	2.19" W x 0.75" H x 3.44" D (56mm W x 19mm H x 87mm D)	7 oz. (.2 kg)
SV-BAT-320	3.30" W x 2.10" H x 3.90" D (84mm W x 53mm H x 99mm D)	13 oz. (.4 kg)
SV32	2.47” W x 4.20“ H x 3.98” D (63mm W x 107mm H x 101mm D)	2.0 lb. (.9 kg)
SV42	2.47” W x 5.13“ H x 3.98” D (63mm W x 130mm H x 101mm D)	3.0 lb. (1.4 kg)
SV52	2.47” W x 6.05“ H x 3.98” D (63mm W x 154mm H x 101mm D)	4.0 lb. (1.8 kg)
SV-XPNDR-26X	1.9”W x 2.5”H x 6.3”D (48mm W x 54mm H x 160mm D)	12.3 oz. (.35 kg)
SV-ARINC-429	4.75" W x 1.09" H x 2.61" D (121mm W x 28mm H x 66mm D)	6 oz. (.2 kg)
SV-ADSB-470	7.00”W x 1.19” H x 4.63” D (177.8mm W x 30.1mm H x 117.6 D)	12.5 oz. (.35 kg)

Table 4–SkyView System Component Physical Specifications

Temperature Specifications

Table 5 contains environmental specifications.

Environmental Specifications	Storage Temperature	Operating Temperature
SV-D700	-40 °C to +70 °C	-30 °C to +60 °C
SV-D1000	-40 °C to +70 °C	-30 °C to +60 °C
SV-ADAHRS-200 and SV-ADAHRS-201	-40 °C to +70 °C	-30 °C to +60 °C
SV-EMS-220/221	-40 °C to +70 °C	-30 °C to +60 °C
SV-GPS-250	-40 °C to +70 °C	-40 °C to +60 °C

Environmental Specifications	Storage Temperature	Operating Temperature
SV-BAT-320	-20 °C to +60 °C	-20 °C to +60 °C
SV32	-30 °C to +75 °C	-30 °C to +60 °C
SV42	-30 °C to +75 °C	-30 °C to +60 °C
SV52	-30 °C to +75 °C	-30 °C to +60 °C
SV-XPNDR-26X	-55 °C to +85 °C	-20 °C to +70 °C
SV-ARINC-429	-40 °C to +70 °C	-30 °C to +60 °C
SV-ADSB-470	-40 °C to +70 °C	-30 °C to +60 °C

Table 5–SkyView System Component Environmental Specifications

General System Installation Tips

Aircraft construction involves a variety of processes that create debris that can damage Dynon Avionics components. Metalwork, in particular, will produce metallic shavings and dust that may damage or destroy the electronics in Dynon Avionics products if they are contaminated with this debris. Care should be taken to ensure that Dynon Products are kept away from aircraft construction debris. Damaged caused by the introduction outside particulates will not be repaired under warranty.

Do not physically modify Dynon SkyView displays or modules in any way that is not specified in this manual. Damage caused to Dynon products due to physical modifications will not be repaired under warranty.

Installing SkyView in an IFR-Equipped Aircraft

If you are equipping an aircraft that is capable of being flown in IFR/IMC conditions, Dynon Avionics makes the following recommendations:

The entirety of the instrument panel and supporting avionics systems and instrumentation should be designed so that the display of information essential for continued safe flight and landing will remain available to the pilot after any single failure or probable combination of failures. In other words, a usable "partial-panel" of primary flight instruments should be preserved in the event of the failure of a SkyView display, systems that support it, or other instruments in the aircraft.

This level of redundancy can be obtained in different ways. For example, one could utilize multiple SkyView displays (with SV-BAT-320 backup batteries attached) including multiple ADAHRS units connected to protect against the failure of any single display, ADAHRS, or the electrical system. Flight instrument redundancy could also be preserved by using other separate and independent systems such as the Dynon EFIS-D6. Some builders may elect to combine SkyView with other more conventional “steam” gauges such as mechanical airspeed, altitude, and attitude indicators.

To protect against aircraft electrical failures and anomalies, Dynon Avionics STRONGLY RECOMMENDS that each SkyView display has an SV-BAT-320 Backup Battery connected to it.

SkyView’s attitude algorithm normally uses airspeed to provide superior accuracy. If a problem develops with your airspeed reading due to mechanical blockage of pitot, disconnection of pitot, or other pitot/static issues, a properly connected and configured GPS source acts as a substitute. Dynon SkyView systems typically have one or more GPS sources connected to enable Synthetic Vision and Mapping capabilities, but a primary and backup GPS connection is especially important to preserve the attitude indication in the event of loss of airspeed information in IFR aircraft.

In order to provide the most reliable airspeed (and therefore attitude) performance, Dynon Avionics STRONGLY RECOMMENDS the installation of a heated pitot probe in aircraft equipped for IFR to prevent loss of airspeed data due to icing.

Location Requirements

SV-D1000 and SV-D700

Observe the following guidelines when choosing a location for a SkyView display:

- Displays require about 2.4” (61mm) of free space behind the panel, depending on mounting surface thickness.
- The SkyView Display Harness (SV-HARNESS-D37) extends about 3” (76mm) from the back of the display.
- Add one inch beyond the physically required volume for the display’s heat sinks and fans to operate.
- Avoid placing the display near heater vents or any source of extremely hot air.
- The display should be easily viewable without any obstructions.
- Displays have no internal inertial sensors and do not need to be mounted in the same orientation as the ADAHRS or other modules.
- Displays only support a landscape viewing orientation; do not mount in portrait orientation.
- SkyView systems support up to three displays.

SV-ADAHRS-200 and SV-ADAHRS-201

Proper installation of the SkyView ADAHRS module(s) is critical. PFD performance is significantly linked to a proper ADAHRS installation. The installation location must meet all of the mechanical, magnetic, orientation, and environmental requirements detailed below.

An ADAHRS installation location should be a rigid surface within 12 feet longitudinally and 6 feet laterally of the aircraft's center-of-gravity. Figure 1 illustrates this criterion.

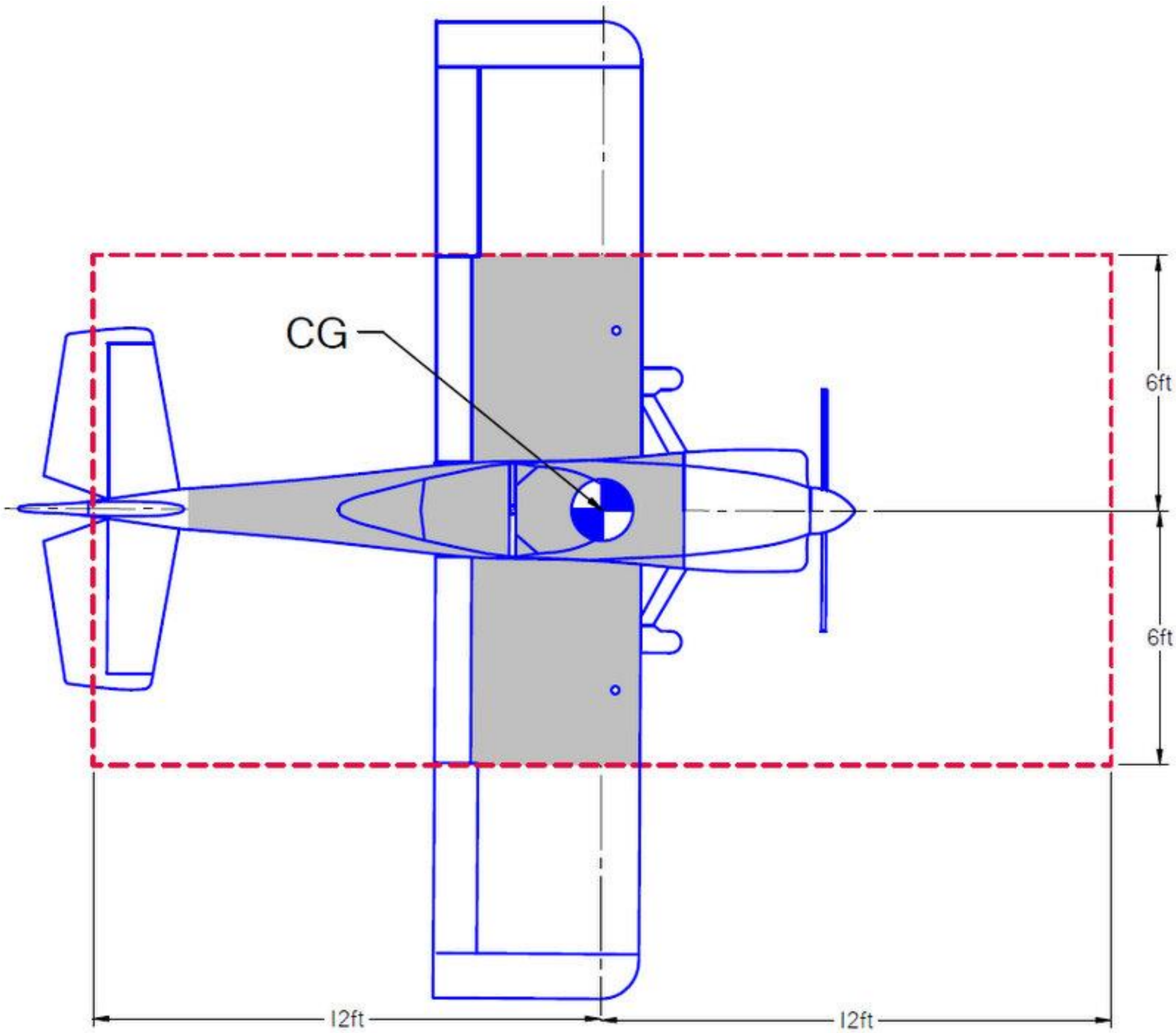


Figure 1–ADAHRS with Respect to Center-of-Gravity

The location should also be magnetically benign. Given that it may be difficult or impossible to avoid all sources of magnetic interference, it is possible to characterize and compensate for small, static magnetic fields with calibration. Calibration cannot, however, compensate for *dynamic* magnetic fields (e.g., AC currents, non-constant DC currents, and non-stationary ferrous material such as electric turn coordinators and control surfaces). Thus, you must avoid mounting the module close to sources of *dynamic* magnetic fields, avoid wires that carry large amounts of current, and use non-magnetic fasteners for installation. Dynon's general rule of thumb is that 1 to 2 feet between the module and sources of magnetic fields is generally good enough, but 2 or more feet is better.

Use of stainless steel mounting hardware is not recommended as it is not always non-magnetic.

Move a handheld compass throughout the space surrounding your intended location to get a rough idea of the suitability of the area. Note that this test should be done with major aircraft systems operating (e.g., strobe lights and radios on) because some systems can cause magnetic interference. If the compass needle deviates significantly from magnetic North or cycles back and forth, the location is not ideal for ADAHRS installation.

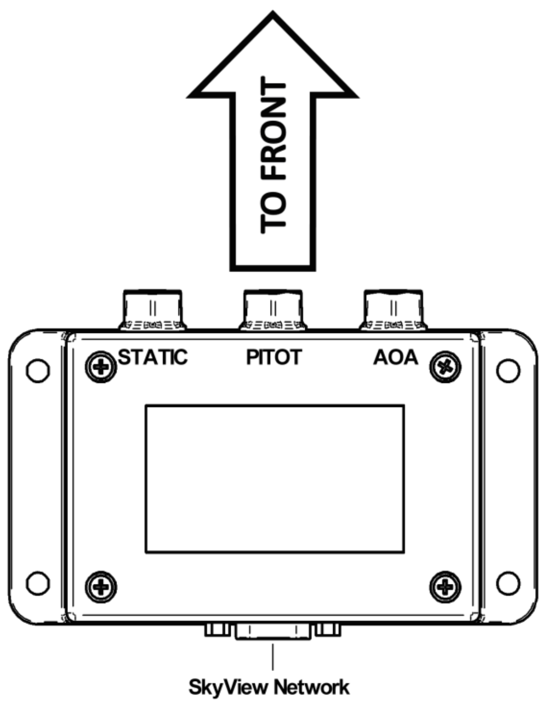


Figure 2–ADAHRS Installation Orientation

An ADAHRS module should be mounted within one degree of parallel to all three aircraft axes, with the pneumatic fittings facing toward the front of the aircraft. The module's mounting tabs must be on the bottom. The label must be on the top. Figure 2 shows the correct orientation of the ADAHRS as it would appear if you were above the aircraft, looking down at it. The module will not operate properly if it is rotated or inverted in any other orientation.

There are no module-to-module proximity requirements when installing multiple SV-ADAHRS-20X modules in an aircraft. For example, one SV-ADAHRS-20X may be installed on top of another SV-ADAHRS-20X module. Other installation location requirements still apply.

The ADAHRS installation location should also adhere to the following requirements:

- Avoid locations that are lower than the lowest point in the pitot/static system to reduce the chance of allowing moisture to enter the module.
- Avoid locations that are subject to severe vibration.
- Avoid locations that are subject to rapid changes in temperature.
- Avoid locations that are subject to extreme humidity.
- Leave ample working room for electrical and pneumatic connections.

SV-EMS-220/221

Observe the following guidelines when choosing a location for an SV-EMS-220/221 Engine Monitor module:

- *Do not* install on the engine side of the firewall.
- Avoid locations that are subject to severe vibration.
- Avoid locations that are subject to extreme humidity.
- Leave ample working room for electrical connections.
- SkyView systems support one SV-EMS-220/221 per network. Future updates may include support for more than one SV-EMS-220/221 for multiple engine support.

SV-GPS-250

Observe the following guidelines when choosing a location for an SV-GPS-250 GPS Receiver module:

- Optimal mounting location is a rigid surface on top of the aircraft.
- Mounting location should be relatively level.
- Avoid antenna shadows (i.e., obstructions that block the antenna’s view of the sky).
- Do not locate the receiver within 3 feet of transmitting antennas.
- All four of the SV-GPS-250 module’s wires should all be connected to each SkyView system display for redundancy.

The SV-GPS-250 can be mounted inside the aircraft, however some signal degradation will occur. If you are concerned with possible performance issues with the intended installation location, verify GPS functionality at that location with a temporary installation. For optimal performance, the GPS receiver must have a clear view of the sky during maneuvers.

SV-XPNDR-26X

The SV-XPNDR-26X Mode S transponder module is designed to be mounted in any convenient location in the cockpit, the cabin, or an avionics bay.

The following installation procedure should be followed, remembering to allow adequate space for installation of cables and connectors:

- Select a position in the aircraft that is not too close to any high external heat source. (The SV-XPNDR-26X is not a significant heat source itself and does not need to be kept away from other devices for this reason).
- Avoid sharp bends and placing the cables too near to the aircraft control cables.
- Secure the mounting tray to the aircraft via the three (3) mounting holes in the tray. The tray should be mounted to a flat surface - it is important that the tray is supported at the dimples as well as the three mounting points.
- Put the SV-XPNDR-26X transponder into the secured mounting tray by hooking the connector end under the lip on the tray.
- Lock the SV-XPNDR-26X transponder into the mounting tray by clipping the retaining wire over the lugs on the opposite end.

Cooling Requirements

The SV-XPNDR-26X Mode S transponder meets all applicable ETSO/TSO requirements without forced air-cooling.

Attention should however be given to the incorporation of cooling provisions to limit the maximum operating temperature if the SV-XPNDR-26X is installed in close proximity to other avionics. The reliability of equipment operating in close proximity in an avionics bay can be degraded if adequate cooling is not provided.

SV-BAT-320

Observe the following guidelines when choosing a location for an SV-BAT-320:

- There can be only one battery per display. *Do not connect a battery to more than one display.*
- Location should be near the display.
- *Do not* add more wire into the backup battery wire bundle.
- Avoid locations that are subject to severe vibration.
- Avoid locations that are subject to extended temperature ranges. *The battery module has a narrower operating temperature range than other SkyView modules.*
- Avoid locations that are subject to extreme humidity.
- Leave room for electrical connections.

Servos (SV32, SV42, and SV52)

Observe the following guidelines when choosing a location for servos:

- The location must allow the servo arm and associated linkage to move freely through the entire range of travel.
- Do not allow the servo arm to travel more than ±60° from neutral throughout the control system's range of travel. *Note that this requirement only applies to arm servos and not capstan servos.*
- Leave room for all mounting hardware, including brackets, fasteners, linkages, etc.
- Leave room for electrical connections.

SV-ARINC-429

Observe the following guidelines when choosing a location for the SV-ARINC-429 module:

- Avoid locations that are subject to severe vibration.
- Avoid locations that are subject to extreme humidity.
- Leave ample working room for electrical connections.
- SkyView systems support one or two SV-ARINC-429 per network.
- A common location for the SV-ARINC-429 is behind the instrument panel, keeping it close to the display and associated ARINC-429 capable device.

SV-ADSB-470

The SV-ADSB-470 is designed to be mounted in any convenient location in the cockpit, the cabin, or an avionics bay.

The following guidelines should be followed, remembering to allow adequate space for installation of cables and connectors.

- Select a position in the aircraft that is not too close to any high external heat source. (The SV-ADSB-470 is not a significant heat source itself and does not need to be kept away from other devices for this reason).
- Avoid sharp bends and placing the cables too near to the aircraft control cables.
- Avoid locations that are subject to severe vibration.
- Avoid locations that are subject to extreme humidity.
- Leave ample working room for electrical connections.

Mounting Requirements

Some SkyView modules include mounting fasteners, while some do not. Mounting fasteners are included as a convenience and installers are not required to use them. Use sensible mounting techniques when installing equipment in suitable locations. You should reference individual equipment chapters for information regarding installation instructions.

SkyView System Construction

Appendix C: Wiring and Electrical Connections contains complete details regarding pin-outs of all SkyView system component connectors and wire harness colors.

Overview

A SkyView system consists of displays, modules, and connection hardware. Displays manage power for modules (not servos) and control communication between devices. Modules provide data to the displays. *The connection between displays and modules is referred to as a SkyView network.*

SkyView Network

Displays and modules utilize standardized 9-pin D-sub (from now on referred to as "D9") network connectors and are compatible with premade connection hardware—network cables, splitters, and connector gender changers. Servos have un-terminated wires and we recommend the use of one servo cabling kit (SV-NET-SERVO) per servo. All of this connection hardware is available from Dynon.

Harnesses and Cables

Dynon's display harness and network cables use aircraft-grade Tefzel® wiring. The display harness breaks out power, serial, USB and other important pins from the back of the display. Network cables are available in a variety of lengths. The 3 and 6 foot cables have female D9 connectors on both ends. The longer cables have a female D9 connector on one end and open pins on the other end. The open end allows installers to run the cable in and through areas that would not be possible if a connector was present. The connector is installed after the cable has been run.

The servo cabling kit (SV-NET-SERVO: one kit per servo) makes it easy to connect the SkyView system to servos and includes 20 feet of pre-twisted wire (twisted pair 22 AWG wire for data; 20 AWG wires for power), D9 connectors, connector shells, crimp contacts, an insertion tool, heat shrink, and zip ties. It is recommended that you read and understand Appendix C: Wiring and Electrical Connections before working with this kit.

Splitters and Gender Changers

Splitters (SV-NET-SPL) use aircraft-grade Tefzel® wiring, consist of a male D9 input connector and two female D9 output connectors, are 1 foot long, and include a connector gender changer (SV-NET-CHG). They add another module connection point in the network. An example application for a splitter is the connection of primary and backup ADAHRS in a SkyView network off one network cable coming from a display. These can also be used when you require more network connections than the two SkyView connectors that are present on each display, though the preferred mechanism for adding SkyView connections is the SkyView Network Hub (described below).

Note that customers that purchased SkyView systems prior to March 2012 are likely to have splitters for all SkyView network expansion needs. More recent customers are likely to have fewer splitters (usually, just one at a dual ADARS installation), and one hub.

Connector gender changers allow SkyView network cables to connect to the output connector of a splitter. This allows a cable split to occur in the middle of a long run of cable.

SkyView Network Hub

The SV-NET-HUB SkyView Network hub contains 5 SkyView Network ports. All 5 ports are identical. In other words, any of them can be used to connect to your displays, modules, and/or autopilot servos. Servo power should be broken out, as is normally done. See the Autopilot Servo Installation section of this manual for more information about Servo wiring. The SkyView Network Hub is designed to ease the distribution of SkyView Network connections to multiple SkyView Network components by allowing easy expansion of a SkyView network without relying on a more expensive network of individual splitters. It also allows for fewer overall connections over the splitter-only method that was primarily used prior to March 2012 as the hub-based method requires no gender changer connectors.

Figure 3 - SV-NET-HUB SkyView Network Hub

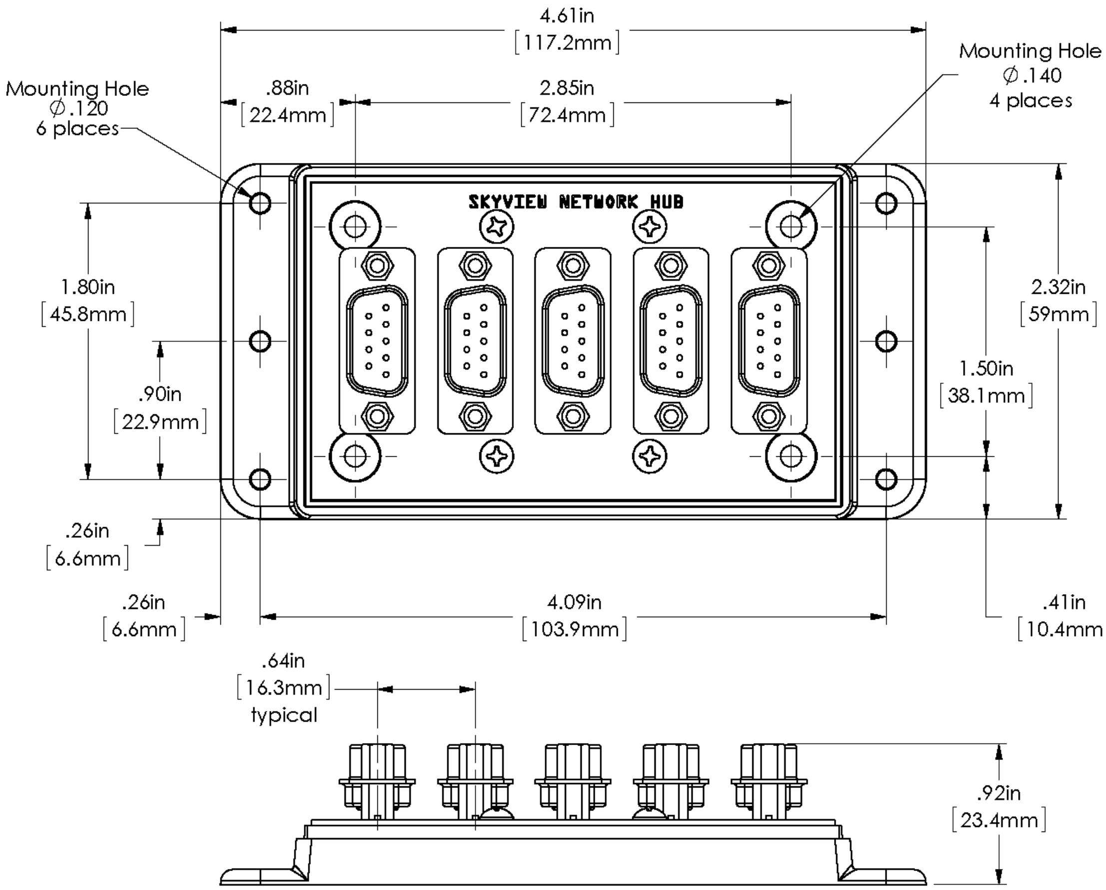


Figure 4 - SV-NET-HUB Dimensions

Test SkyView Network Cable

SkyView displays are supplied with a test SkyView network cable that is intended for bench top testing only. The test network cable is not built with aircraft-grade Tefzel® wiring and should not be permanently installed in an aircraft.

Ethernet Connection

SkyView systems that have more than one display should have their Ethernet ports permanently connected together. Though not a required connection, it allows aviation and obstacle databases to be transferred to all displays in a SkyView system when they are loaded on any one of them. If Ethernet is not connected, aviation and obstacle databases will need to be loaded on each display in the system individually.

Future SkyView functionality may require Ethernet to be connected as described in this section. Therefore, Dynon Avionics strongly recommends connecting all Ethernet ports together at this time.

The Ethernet connection between SkyView displays is made *in addition* to the 9 pin SkyView Network connections, and should be connected on a permanent basis like other SkyView wiring. Dynon Avionics strongly recommends “Low Smoke Zero Halogen” Ethernet cables for use in aircraft, but any Ethernet cable – whether it is a “crossover” or normal “straight” type Ethernet cable - will technically work. Low Smoke Zero Halogen Ethernet cables are available from Dynon Avionics (SV-ETHERNET-3CC). Aircraft containing more than two SkyView displays will need an Ethernet switch with enough ports to connect all SkyView displays together. Contact Dynon Avionics for Ethernet switch recommendations if your aircraft has more than two displays.

There are indicator lights on the Ethernet port that are usually indicative of data transfer on traditional Ethernet devices. In SkyView, they are used instead for display troubleshooting purposes. See the Maintenance and Troubleshooting chapter for more information about what these lights indicate.

Available Cables and Harnesses

The following table contains Dynon part numbers and descriptions for the components that will typically be used to test and build a SkyView system. Note: network cables with the “CP” suffix include the second connector—it just is not installed on the cable to facilitate easy routing through tight areas of an aircraft.

Dynon Part Number	Description
SV-HARNESS-D37	SkyView Display Harness with Aircraft-Grade Tefzel® Wiring
SV-ETHERNET-3CC	SkyView Ethernet Cable - Low Smoke Zero Halogen (3 foot)
SV-NET-3CC	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring Both Ends with Connectors (3 foot)
SV-NET-6CC	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring Both Ends with Connectors (6 foot)
SV-NET-10CP	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring 1 End with Connector, 1 End with Pins Only (10 foot)
SV-NET-15CP	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring 1 End with Connector, 1 End with Pins Only (15 foot)
SV-NET-20CP	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring 1 End with Connector, 1 End with Pins Only (20 foot)
SV-NET-25CP	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring 1 End with Connector, 1 End with Pins Only (25 foot)
SV-NET-30CP	SkyView Network Cable with Aircraft-Grade Tefzel® Wiring 1 End with Connector, 1 End with Pins Only (30 foot)
SV-NET-SPL	SkyView Network Splitter with Aircraft-Grade Tefzel® Wiring (1 foot)

Dynon Part Number	Description
SV-NET-SERVO	SkyView Network Cabling Kit for Autopilot Servos (includes 20 feet of wires, connectors, connector shells, crimp contacts, insertion tool, heat shrink, and zip ties). One SV-NET-SERVO is used for each servo in most installations.
SV-NET-TEST	SkyView Network Test Cable–Not Aircraft-Grade (10 foot)
SV-NET-HUB	SkyView Network Hub (5 SkyView Network connections)

Table 6–SkyView System Connection Hardware

Example SkyView Systems

SkyView systems are easily scalable and can accommodate a wide variety of components ranging from a single display with one module to multiple displays with multiple modules. The following diagrams illustrate several example SkyView systems and the components needed to build them. Diagrams do not show a connection to aircraft power and do not imply an installation location. Additionally, cable lengths and models pictured below should not be blindly used as a “prescription”. Always consider your aircraft’s particular geometry and module installation locations before purchasing harnesses, hubs, and splitters.

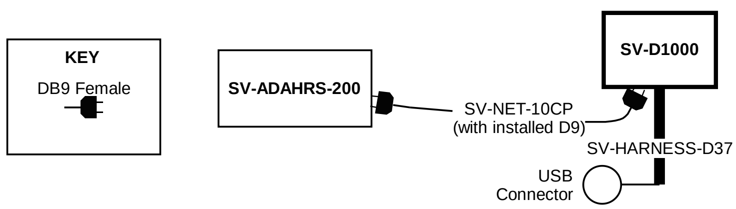


Figure 5–SkyView System with One Display and One ADAHRS

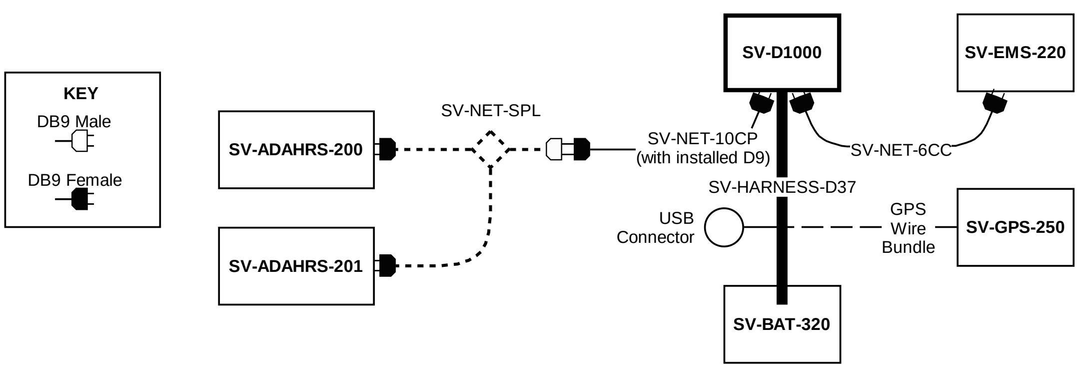


Figure 6–SkyView System with One Display, One EMS, One GPS, One Backup Battery, and Two Redundant ADAHRS

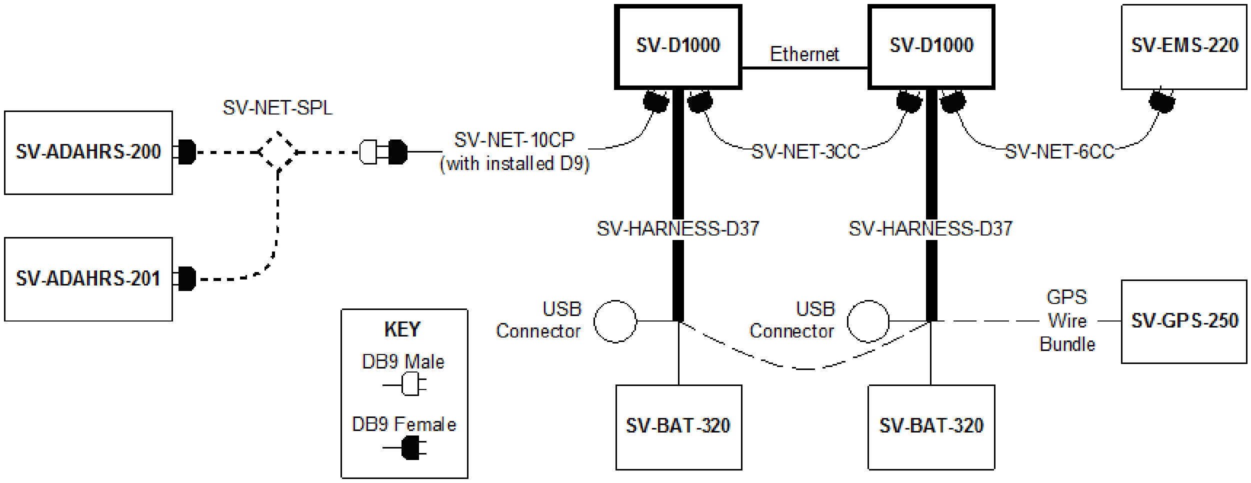


Figure 7–SkyView System with Two Redundant Displays, One EMS, Two Backup Batteries (One per Display), One GPS, and Two Redundant ADAHRS

Note, that in Figure 7, the SV-GPS-250's power, ground, and output wires are connected to both displays.

The following diagrams show two different ways to lay out a more complex system in which there are more SkyView Network modules than available SkyView Network ports.

The first diagram reflects the way that one would typically build a network when purchasing components prior to March 2012 before the SV-NET-HUB was available. It uses splitters to create all additional SkyView Network connections. This connection methodology is still valid and supported, although the use of a SV-NET-HUB is preferred going forward.

The second diagram reflects the way one can build a network utilizing the SV-NET-HUB to expand the number of available SkyView Network ports instead of splitters. It is both less expensive and utilizes fewer total connections (and no gender changers) when compared with the splitter-based method. Note that a splitter is still useful for wiring two co-located redundant ADAHRS modules. In most installations, this is the only application of the SV-NET-SPL that is necessary when utilizing the SV-NET-HUB to build a SkyView Network.

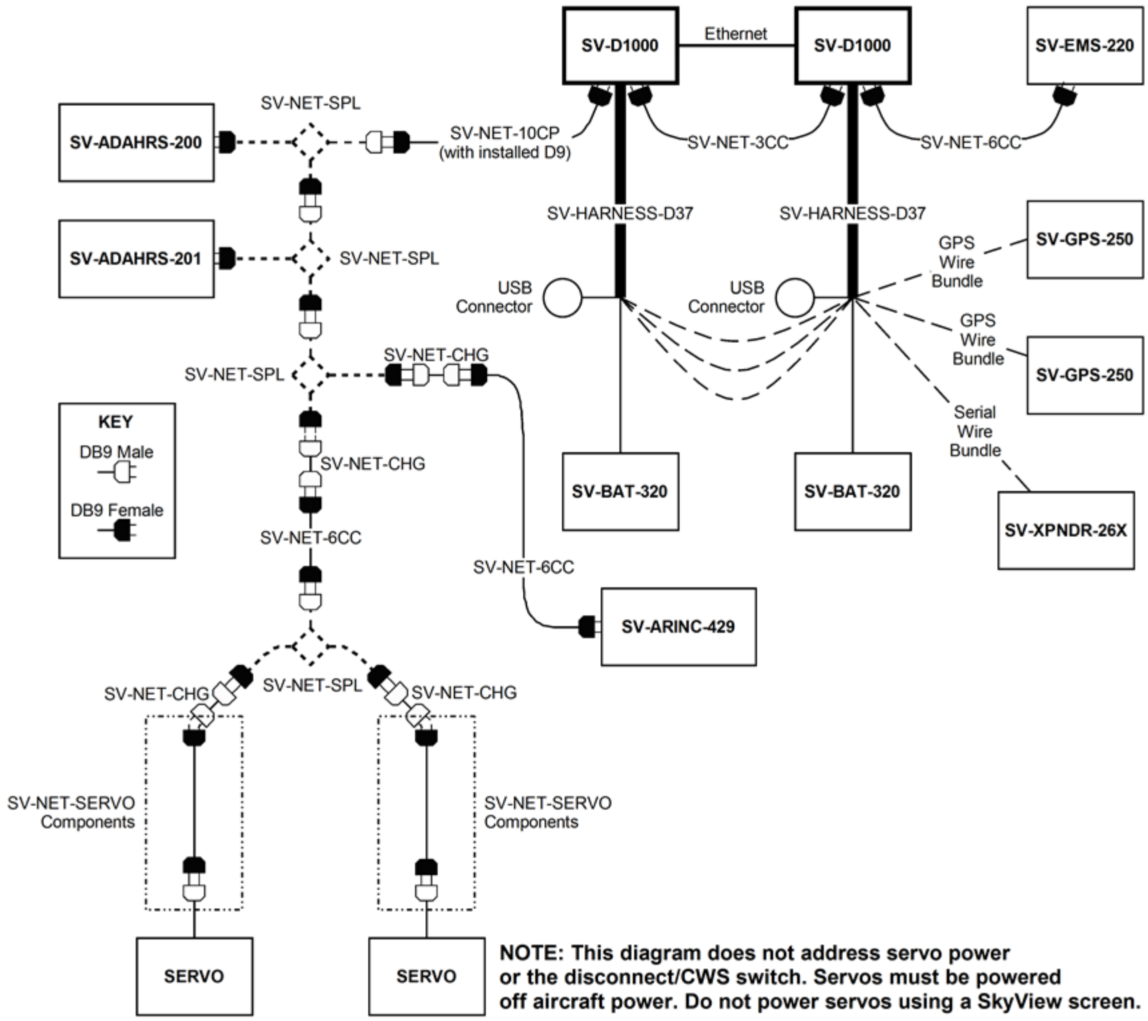


Figure 8– SkyView System with Two Redundant Displays, One EMS, Two Backup Batteries (One per Display), Two Redundant GPS, Two Redundant ADAHRS, Two Servos, and one Transponder using splitters (legacy installation method)

Note, that in Figure 8, each SV-GPS-250's power, ground, and output wires are connected to both displays on different serial ports. The primary SV-GPS-250 should be connected to serial port 5 on each display. The secondary SV-GPS-250 should be connected on another serial port on each display.

Additionally, if there are both multiple displays and multiple SV-GPS-250 units in the system, power for the secondary GPS should be sourced from the GPS power wire on the second display – in other words, each SV-GPS-250 should receive power from a different display. Reference the SV-GPS-250 Installation and Configuration Section for more information on this configuration.

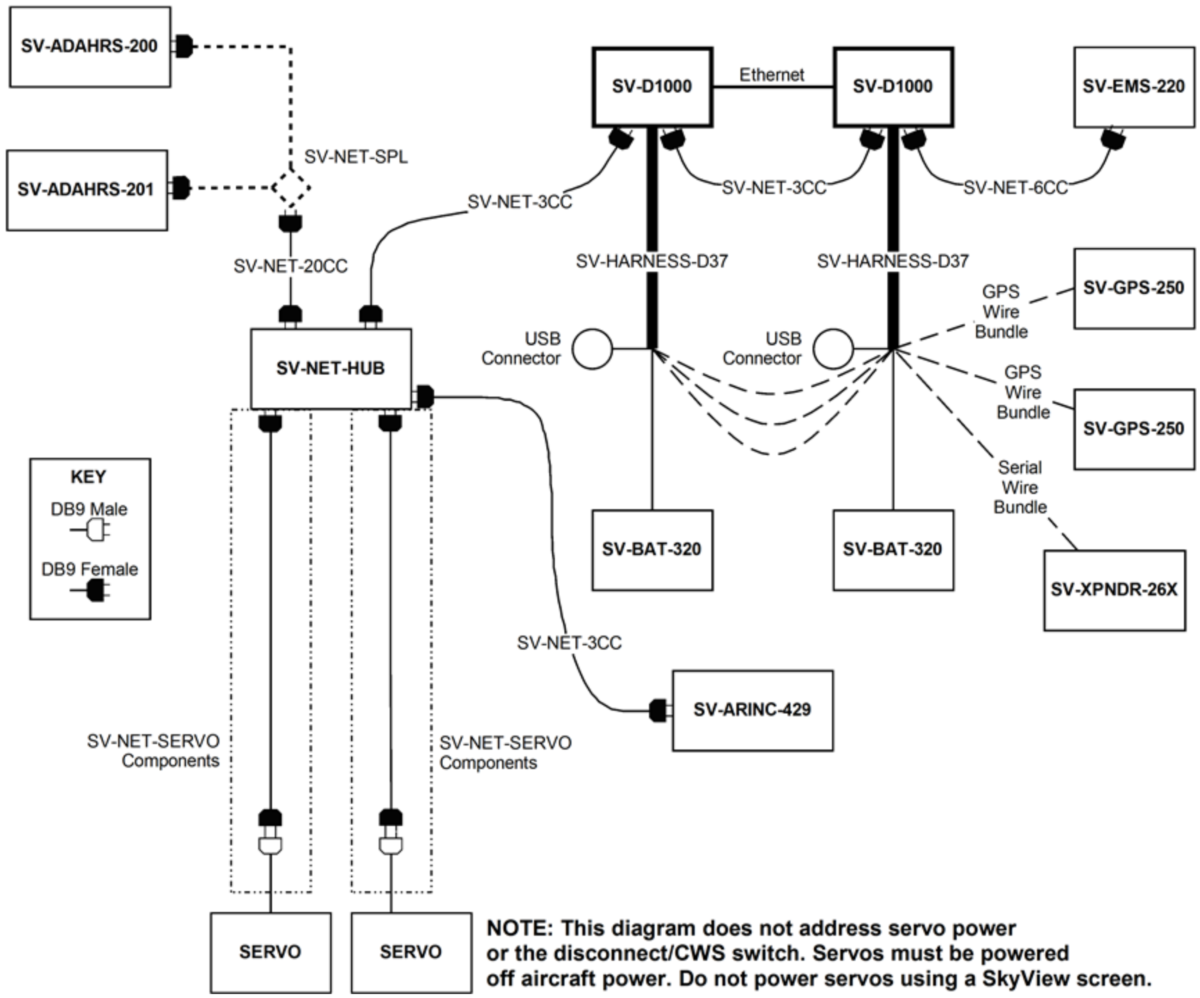


Figure 9 - SkyView System with Two Redundant Displays, One EMS, Two Backup Batteries (One per Display), Two Redundant GPS, Two Redundant ADAHRS, Two Servos, and one Transponder using a hub (recommended installation method)

Note, that in Figure 9, each SV-GPS-250's power, ground, and output wires are connected to both displays on different serial ports. The primary SV-GPS-250 should be connected to serial port 5 on each display. The secondary SV-GPS-250 should be connected on another serial port on each display.

Additionally, if there are both multiple displays and multiple SV-GPS-250 units in the system, power for the secondary GPS should be sourced from the GPS power wire on the second display – in other words, each SV-GPS-250 should receive power from a different display. Reference the SV-GPS-250 Installation and Configuration Section for more information on this configuration.

HSI Requirements

The SkyView HSI overlay on the PFD's DG requires an external GPS (e.g., Garmin X96) or NAV (e.g., Garmin SL30) radio. It can also be generated by SkyView when its Navigation Mapping

Software is in use. Reference the Serial Devices and SV-ARINC-429 Installation and Configuration sections of this guide for more information regarding external data sources.

The SV-GPS-250's GPS data alone is only a position source (and only a subset of the data provided by other, external GPS devices such as a Garmin X96). It cannot provide navigation without the Navigation Mapping Software and appropriate aviation databases installed.

Table 7 outlines the functionality enabled by each source.

Data	SV-GPS-250 GPS	Dynon Navigation Map Software	NMEA GPS	Aviation GPS	ARINC-429 GPS via SV-ARINC-429	ARINC-429/ Serial (SL30) NAV	SkyView ADAHRS
Bearing Pointers		✓	✓	✓	✓	✓	
Course Deviation		✓	✓	✓	✓	✓	
Course Direction		✓	✓	✓	✓	✓	
Waypoint or Station Identifier		✓	✓	✓	✓	✓	
To/From Flag		✓	✓	✓	✓	✓	
Lat/Long	✓		✓	✓	✓		
GPS Altitude	✓		✓	✓	✓[5]		
Ground Speed	✓		✓	✓	✓		
Ground Track	✓		✓	✓	✓		
Distance to Waypoint		✓	✓	✓	✓		
LPV/VNAV GPS Approaches					✓[1]		
VFR Vertical Guidance			✓[2]				
DME							
Glideslope						✓	
Tuned Frequency						✓	
True Airspeed							✓
Magnetic Heading							✓
SkyView Time Source	✓		✓		✓		
5HZ GPS Updates	✓						
Winds[4]	✓		✓	✓	✓		✓

Table 7–HSI Requirements

[1] Approach-certified WAAS GPS units only.

[2] Some models.

[4] Winds calculation specifically requires GPS, a connected OAT probe, IAS, and magnetic heading.

[5] Requires additional Aviation format serial input into SV-ARINC-429 module

3. Basic SkyView Display Operation

After reading this chapter, you should be familiar with basic SkyView display operation including how to use joysticks and buttons, how to turn displays on and off, how to access and navigate menus, how to configure SkyView networks, and how to perform firmware updates and other file operations.

The SkyView SV-D700 and SV-D1000 displays are identical in functionality and presentation. The only difference is in the size and resolution of the screen.

Screen Synchronization

SkyView is designed to operate as an integrated system. SkyView configurations with more than one networked display automatically share and synchronize settings on all displays. In-flight settings such as baro and bugs are synchronized in real time as they are adjusted. Setup menu items are synchronized when the user exits the setup menu and also at boot up. Aviation and obstacle databases are synchronized when they are loaded on any screen if Ethernet is connected.

It is not possible to have displays on the same network that do not share configurations, settings, and real time items. Even if a unit is off when settings are adjusted, they will be synchronized at boot.

For displays to properly synchronize settings their tail numbers must be the same and SkyView Network must be configured correctly. See the Network Setup and Status Section of this manual for information about these required setup steps.

Only one setup menu in the network may be open at once. If you try to open a setup menu on a display while it is open on another display, you will see OTHER SCREEN IN SETUP on the screen and not be allowed to open the setup menu. There is no "master" in the system; changes made on any screen in the system will be automatically reflected on all other screens.

Some things are purposefully not synchronized on displays: firmware, sensor configuration files (.sfg), and local display settings (such as serial port settings). You must ensure that each display is running the appropriate firmware, up-to-date databases, and sensor configuration file. All of these files are available for download at downloads.dynonavionics.com. Also ensure that each display's local settings are appropriately configured.

Display Bezel Layout

The following diagram illustrates the front of an SV-D1000 display and its important parts.

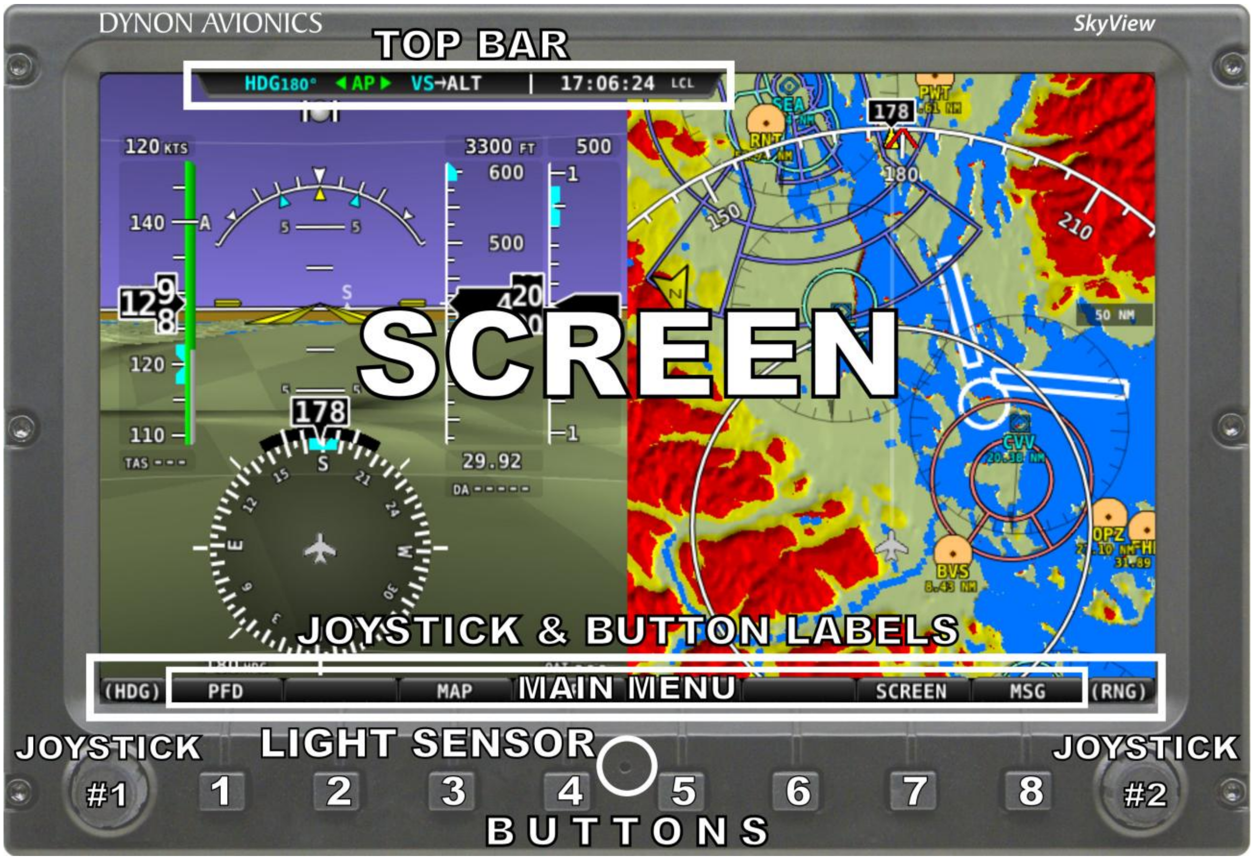


Figure 10–SkyView Display Front Bezel Layout

Note the top bar, screen, joystick and button labels, light sensor, two joysticks and eight buttons.

The top bar displays important textual information. The top bar shows time, autopilot status, and transponder status. Reference the Local Display Setup Menu Section of this guide for details on how to configure the top bar.

The screen shows PFD, Engine, and Moving Map data, configuration information, and system alerts. Its layout is user-configurable. Reference the SkyView Pilot's User Guide for instructions on how to configure the layout of your screen.

Joystick and button labels are also on the screen. *Joystick and button functionality is contextual based on what is onscreen and these labels show the user the current function.* For example, the (RNG) label above joystick 2 in Figure 10 shows that turning that joystick will either increase or decrease the range shown on the Moving Map.

The set of button labels displayed immediately after the display turns on is referred to as the *Main Menu*.

Each SkyView display has an integrated light sensor in the bezel. This light sensor can be used for automatic backlight level management. Reference the Display Setup Section of this guide for instructions on how to configure the display for automatic backlight level management.

Joystick and Button Operation

Joysticks and buttons are used for various functions including powering the unit on and off, entering and navigating menus, and adjusting values.

Operation Basics

Joysticks can be turned and moved. Specific joystick behavior is addressed in subsequent sections of this guide when necessary.

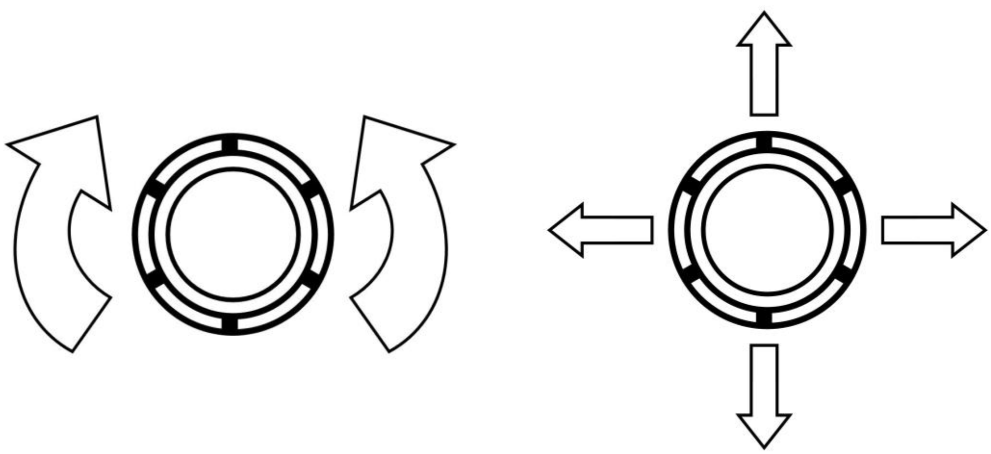


Figure 11–Joystick Turn (left) and Movement (right) Directions

A button has a function if there is a label above it. If there is no label, there is no function. The figure below shows an example button label.

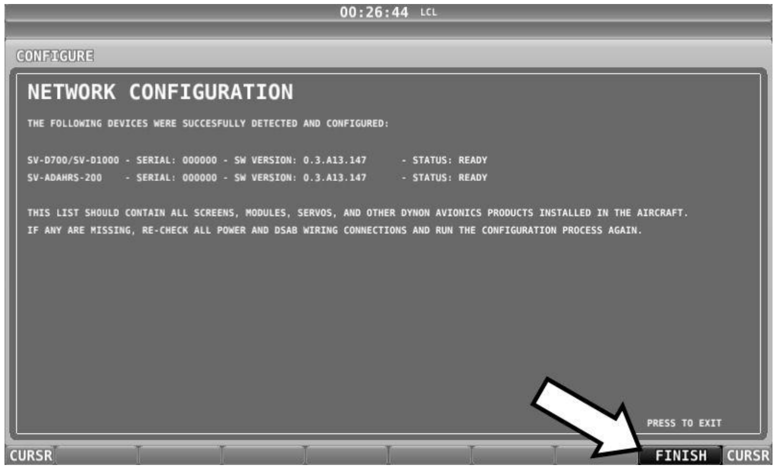


Figure 12–Example Button Label

When you press a button, its label is highlighted. When you let go, that button’s action is invoked.

Button labels are called out in all capital letters such as BACK, EXIT, FINISH, and CLEAR. This guide directs users to press a button by using its label. For example, when this guide asks you to press FINISH, it is asking you to press the button with the FINISH label above it.

Joystick and Button Operation Example

Some parameters may need to be adjusted using a joystick. When setting values with the joystick, each character (symbol, letter or digit) must be selected and adjusted successively.

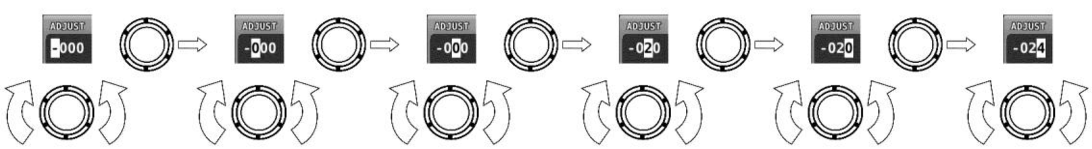


Figure 13–Adjusting Successive Characters

In this example, the first time you turn the joystick, you toggle between the “-“ and “+” symbols. To change the succeeding characters, you must move the cursor joystick to the right. In this example, you first adjust the “-“ or “+” character, move the joystick right, then adjust the one hundreds digit, and so forth. Once you have adjusted the value appropriately, press ACCEPT or move the joystick to the right again.

At times, the next item in the menu path in this guide may be a joystick selection OR a button push—the correct choice will be apparent.

Menu Navigation

After the display turns on, you will see a screen similar to the one in Figure 10. This guide refers to the label bar at the bottom of the screen as the *Main Menu*.

Throughout this guide, the ">" character is used to indicate a sequence of menu selections or other actions you would take as you navigate the menu system. Menu selections which are followed by "…" indicate full-screen wizard interfaces which guide you through the appropriate steps. These wizard interfaces are not described in detail in this guide, as the on-screen instructions provide adequate information.

SkyView menus follow this structure: SETUP MENU > MENU > ... > MENU > PAGE or WIZARD. The setup menus (In Flight Setup or Setup) are the root of most menu navigation. Each nested menu is more specific than the previous one and there is no set limit for the number of nested menus before reaching a page. A page or wizard is at the end of the chain and it is where the user can perform a specific action such as change a specific setting, configure a SkyView network, or set up the layout of the onscreen engine gauges. Wizards employ easy-to-follow onscreen instructions.

For example, SETUP MENU > SYSTEM SETUP > MEASUREMENT UNITS > BAROMETER indicates entering the SETUP MENU, then selecting SYSTEM SETUP, then selecting MEASUREMENT UNITS, and then entering the BAROMETER Menu to select INHG, MBAR, or MMHG.

Table 8 is a summary of menu navigation.

Desired Menu Action	User Action
Enter the Setup Menu	Simultaneously press and hold buttons 7 and 8 (if airspeed is greater than zero, you will enter the In Flight Setup Menu)
Scroll through different menus	Turn either joystick OR Move either joystick up or down
Enter menu	Move either joystick toward the right
Return to previous menu	Move either joystick toward the left (saves settings) OR Press BACK (saves settings) OR Press CANCEL (does not save settings)
Save adjusted value	Press ACCEPT
Reset adjustable value	Press DEFAULT
Save settings and return to Main Menu	Press EXIT

Table 8–Menu Navigation Summary

Basic Display Operation Procedures

This subsection covers basic operation procedures for displays. Detailed instructions for various menus and individual menu items are described later in this guide.

How to Turn the System On or Off

Table 9 summarizes the procedures for toggling SkyView system power states.

SkyView System Displays	Toggle SkyView System Power
One display	Toggle primary power state OR Toggle display power by pressing and holding button 1
Multiple displays	Toggle primary power state OR Toggle all displays off or on by pressing and holding button 1 on each display.

Table 9–How to Toggle SkyView System Power State

Loss of External Power with Backup Battery Connected

If external power is lost to a display that is connected to a backup battery, it will either stay on for an additional 30 seconds or stay on indefinitely depending on whether or not the aircraft is in flight. This feature minimizes backup battery discharge when on the ground and master/external power is shut off normally while simultaneously reducing pilot workload during an actual in-flight power loss.

If the aircraft is not in flight, SkyView displays the message “POWERING DOWN IN xx SECONDS” while counting down from 30 seconds. During this countdown, the menu displays the buttons STAY ON and PWR OFF at the bottom of the screen. Press PWR OFF to turn off the SkyView display immediately. Press STAY ON to keep the SkyView display on via the connected backup battery. If STAY ON is pressed, the display will continue to use the backup battery to power itself until the battery’s charge is depleted or the display is turned off manually pressing and holding button 1. Finally, if neither button is pressed before the countdown expires, the display will automatically turn off after 30 seconds to conserve the backup battery charge.

If the aircraft is in flight, SkyView displays the message “AIRCRAFT POWER LOST” with no additional count down. This ensures that active pilot action is required to turn off a display when power is lost in-flight and backup battery power is available. The STAY ON and PWR OFF buttons are still offered, but the display will stay on indefinitely unless PWR OFF is pressed.

How to Reboot the Display

Press and hold buttons 1, 2 and 5 simultaneously to instantly reboot the system. This may be helpful if you need to cycle power after changing certain settings and for general troubleshooting.

How to Manually Adjust the Backlight Brightness or Dim Level

Press SCREEN on the Main Menu and then press DIM (this is the Dim Menu). To decrease or increase the backlight brightness press DEC- or INC+, respectively. To set the backlight brightness to 100%, press FULL. Press BACK twice to exit the Dim Menu and return to the Main Menu.

If the display is set to automatic or external backlight brightness control, this operation will toggle the backlight brightness control to manual mode. You can determine if there was a change in control mode by the label over button 7 in the Dim Menu. If the display was set to manual mode in the Setup Menu, there will be no label. If the display was set to automatic or external, the label will toggle between MANUAL and AUTO or MANUAL and EXTERNAL, respectively. When set to MANUAL, you can change the display brightness by using the DIM item under the joystick function menu (described in the next section).

Reference the Display Setup Section of this guide for instructions on specifying the display’s backlight brightness control method.

How to Enter the Joystick Function Menu

Move a joystick up, down, left, or right to enter its Joystick Function Menu. These menus are used to specify which bug that joystick adjusts if rotated. For example, joystick 1 could be set to adjust the heading bug and joystick 2 could be set to adjust the altitude bug.

Figure 14 illustrates the joystick menu.

Figure 14–Joystick Menu

To set the function of a joystick:

12. Move a joystick up, down, left, or right to enter a Joystick Function Menu.
13. Choose the joystick function by moving the joystick up or down.
14. Confirm the highlighted function by moving the joystick left or right.

If the Map Page is onscreen, the joystick closest to the Moving Map is labeled (RNG) and is used to adjust the map’s range. It cannot be assigned a different function.

How to Enter the Setup Menus

There are two setup menus: the *Setup Menu* and the *In Flight Setup Menu*. Simultaneously pressing and holding buttons 7 and 8 will open one of these menus. If airspeed is zero, the Setup Menu opens. If airspeed is greater than zero, the In Flight Setup Menu opens.

You may also access the Setup Menu from the In Flight Setup Menu by using the ENTER FULL SCREEN SETUP MENU… option.

How to Adjust Time Zone Offset

Enter the Time Zone Offset Page (SETUP MENU > SYSTEM SETUP > TIME > TIME ZONE OFFSET) and adjust the time zone accordingly. *Note that this is the local offset from Zulu time.*

How to Configure Displayed Units

Displayed units can be configured for altitude, distance and speed, temperature, barometer, pressure, and volume. Displayed units are configured on the Measurement Units Page (SETUP MENU > SYSTEM SETUP > MEASUREMENT UNITS).

Screens and Menus

This section lists all of the screens, menus, and pages in the SkyView system.

Some menu options are dependent on installed, networked, and/or calibrated SkyView equipment. For example, if there are no servos present in the SkyView network, the AP Menu will not be present on the Main Menu. This guide makes it clear where these dependencies exist in their applicable sections.

Main Menu

This menu is displayed right after the SkyView display boots up similar to Figure 10 and contains links to the following menus:

- PFD–This menu allows users to turn the G Meter on and off, turn synthetic vision on or off, select the NAV source, select bearing sources, and toggle bugs on and off.
- AP–This menu allows users to toggle the status of each installed autopilot axis, set their respective modes, and engage the autopilot in a 180° turn from the current ground track. *This menu is only accessible if the autopilot servos have been properly installed, networked, calibrated, and tested*
- MAP–This menu allows users to control the Navigation Mapping Software features of SkyView. Note that this button only appears when the SV-MAP-270 software has been purchased and licensed, or when it is in its 30 hour free introductory trial period.
- SCREEN–This menu allows users to set the backlight level, toggle the state of the three information pages (PFD, ENGINE, and MAP), and change the layout of the screen.

Message Notification Area

Important alerts are relayed to users via the Message Notification Area. A flashing “Message”, “Caution”, or “Warning” label above the rightmost button indicates the presence of a message or alert. Press the rightmost button to bring up the Message Window to read the alert or message. More information regarding messaging and alerting behavior is in the SkyView Pilot’s User Guide.

In Flight Setup Menu

This menu contains links that may be useful during flight:

- ADAHRS Source Selection…
- Flight Angle Pitch Adjust…
- AOA Calibration…
- Autopilot Setup…
- Enter Full Screen Setup Menu…

Note that *this menu occupies only half of the screen* and that all of the links in the In Flight Setup Menu are accessible via the Setup Menu.

Setup Menu

This menu contains links to system configuration options:

- System Software
- System Setup
- Local Display Setup
- PFD Setup
- EMS Setup
- Map Setup
- Autopilot Setup
- Transponder Setup
- Traffic Setup
- Hardware Calibration

Note that this menu occupies the entire screen. The menus above have menus of their own. The information in this section contains information on the purposes of each of the above menus as well as a list of each menu's respective menus and their functions.

Pages and wizards that require users to do something have explicit onscreen instructions. Most actions are simple enough and onscreen instructions are more than adequate. In these cases, explicit instructions are not contained in this guide. In cases where onscreen instructions are not present, instructions are included in this guide.

System Software Menu

You must have a USB flash drive that is recognizable by the display in one of the USB slots to open this menu. All of the functions under this menu either write to or read from the flash drive.

Detailed instructions for all of the menus listed below are included in the Firmware Updates and File Operations Section of this guide.

The Software System Menu contains links to the following wizards:

- Upgrade System Software...–Use this wizard to update software on your SkyView system.
- Export System Settings...–Use this wizard to export the settings on your SkyView system to a USB flash drive.
- Export User Data Logs…–Use this wizard to export user data logs in human-readable CSV format. See the User Data Logs Appendix for further information about user data logs.
- Export System Data Log...– This data log is only useful to Dynon Avionics engineers, and has no end-customer readable data in it. Dynon Avionics Technical Support may request this log in the course of troubleshooting. Note that this log is very big - over 500 MB – and takes minutes to save off to a USB drive. Unless directed to export this log by Dynon Avionics, there is no reason to ever do so.
- Export User Waypoints…–Use this wizard to export all of the User Waypoints that are currently stored in your SkyView system.
- Load Files...–Use this wizard to load files such as settings or configuration files or delete files from the USB flash drive.

System Setup Menu

This menu contains links to the following menus and pages:

- Network Setup–Enter this menu to configure your SkyView network or to check on network status (i.e., display important SkyView module information).
- Audio Setup–Enter this menu to configure the options and volume for SkyView's audio output capability.
- Aircraft Information–Enter this page to record important information regarding your aircraft. Specifically, enter the tail number of your aircraft–it is used to create unique SkyView configuration files. It is also used for other purposes.
- Measurement Units–Enter this page to configure displayed units (e.g., feet or meters).
- Time–Enter this page to set the time zone offset from Zulu/GMT time.
- ARINC-429–Enter this page to set up ARINC-429 devices connected to SV-ARINC-429 modules.
- Screen Layout Setup–Enter this page to configure the availability of the PDF Page, Engine Page, and Map Page on this display and throughout the system (when more than one display is installed).
- Data Log Setup–Enter this page to configure the recording frequency of SkyView's internal data logging feature, or to clear recorded data. See the User Data Logs Appendix for further information about user data logs.

Local Display Setup Menu

This menu contains links to the following pages and menus:

- Installed Databases–This page shows the various databases that are installed on the display and their respective versions.

- Display Hardware Information–This page contains important hardware status information such as the serial number of your display and the voltage of the attached backup battery. Reference the
- Returning SkyView Components to Service after Repair Section of this guide for more information about the Display Hardware Information Page.
- Serial Port Setup–Enter this menu to configure the five general purpose serial ports on the display.
- Brightness Setup–Enter this page to choose between manual, automatic, or external screen backlight control. Manual screen backlight control is managed by the user in the DIM Menu with the DEC-, INC+, and FULL buttons. Automatic screen backlight control is managed by a default dimming profile in the display. A compatible external control signal is required for external backlight control. Reference the Brightness Setup Section for more information.
- Top Bar Setup–Enter this page to configure the top bar on the SkyView display's screen.
- GPS Fix Status–This page shows fix quality information for the GPS source that is being used as the active position source for SkyView's moving map and synthetic vision. Note that this does not show information about other GPS sources that may be available for HSI and backup position use.
- License–Enter this page to display the status of software products that can be purchased and licensed to add features to SkyView. This page is also the place where license codes can be redeemed to activate features on your SkyView System.

PFD Setup Menu

This menu contains links to the following pages:

- ADAHRS Source Selection–This page is a list of all configured SkyView ADAHRS modules and their respective statuses. Also use it to select which ADAHRS module is the PFD's primary source of data.
- Flight Angle Pitch Adjust–This page allows you to adjust the displayed pitch of the plane.
- Airspeed Limitations–Enter this menu to configure the V-speeds and specify optimal flight parameters such as best angle of climb speed, best rate of climb speed, and maneuvering speed.
- Vertical Speed Scale–Enter this page to configure the vertical speed tape's scale.
- G Meter–Enter this page to configure G values that will cause the G Meter to be automatically displayed when exceeded; to set the yellow/red cautionary color ranges of the G meter; and whether or not the max/min recorded Gs are reset at each SkyView boot-up.
- Flight Path Marker–Enter this page to enable/disable display of the flight path marker.
- Extreme Pitch Warning–Enter this page to enable/disable display of the extreme pitch warning indicators.
- Angle of Attack–Enter this page to enable/disable display of the Angle of Attack indicator.
- Altitude Alerter–Enter this page to configure the altitude alerter.

- CAPTURE BAND: When the altitude of the aircraft flies within this amount of feet/meters of the altitude bug (when displayed), SkyView will announce “approaching altitude” aurally (if audio output is configured)
- DEVIATION BAND: When the altitude of the aircraft climbs above or descends below the altitude bug by the amount of feet or meters set here, SkyView will announce “departing altitude” aurally (if audio output is configured).

EMS Setup Menu

This menu contains links to the following wizards and menu:

- Engine Information–Enter this wizard to record important information regarding the engine in your aircraft such as engine type and horsepower. The user-entered information here is used to calculate quantities such as % power and special operating limitations.
- Sensor Input Mapping...–Enter this wizard to map engine and environmental sensors to SV-EMS-220/221 pins. Reference the EMS Sensor Input Mapping Section of this guide for instructions on how to navigate and use this menu to map sensors.
- Screen Layout Editor–Enter this wizard to configure the placement and style of the onscreen EMS gauges on EMS pages. Reference the EMS Screen Layout Editor Section of this guide for instructions on how to use this wizard.
- Sensor Setup–Enter this menu to configure the graphical display properties of mapped sensors. Reference the EMS Sensor Setting Section of this guide for more information regarding sensor setup.

MAP Setup Menu

This menu contains links to the following wizards and menus:

- Terrain Warning Colors – Sets whether red and yellow terrain warning are provided on the Map Page
- Red and Yellow Start – When the above setting is set to “YES”, these settings how far above or below the aircraft’s current altitude the red and yellow colors persist.

Autopilot Setup Menu

This menu is not accessible until the autopilot servos in the system have been successfully calibrated and tested. Reference the Autopilot Servo Calibration and Test Procedures Section of this guide for more information.

This menu contains links to the following menus:

- Roll Axis–Enter this menu to configure autopilot roll axis parameters and options such as torque, sensitivity, mode, maximum bank angle, and turn rate target.
- Pitch Axis–Enter this menu to configure autopilot pitch axis parameters and options such as torque, sensitivity, default climb vertical speed, default descent vertical speed, maximum airspeed, and minimum airspeed.

- Disengage Button–Enter this menu to configure disengage button options such as hold to engage, enable broken line detect, and control wheel steering mode.

Transponder Setup Menu

This menu is not accessible unless a SV-XPNDR-26X is setup and configured. Reference the SV-XPNDR-26X Installation, Configuration, and Testing Section of this guide for more information.

This menu contains options that are used to set up and configure the SV-XPNDR-26X module. Reference the SV-XPNDR-26X Installation, Configuration, and Testing Section of this guide for more information.

Hardware Calibration Menu

This menu contains links to the following menus:

- ADAHRS Calibration–Enter this menu to make altitude adjustments (e.g., baro and altitude adjust) and access the compass and AOA calibration wizards.
- EMS Calibration–Enter this menu for EMS sensor calibration. You will have options to calibrate fuel tanks and position potentiometers that have been mapped in the Sensor Input Mapping Wizard. Calibration wizards contain onscreen instructions.
- Servo Calibration–Enter this menu for autopilot servo calibration. Reference the Autopilot Servo Installation, Configuration, and Calibration Section of this guide for more details.

Note that if an ADAHRS, EMS, or Servos are not present on the SkyView network, this menu will note the absence by displaying "(EMS NOT DETECTED)" ,"(ADAHRS NOT DETECTED)", or "(SERVOS NOT INSTALLED)"

Firmware Updates and File Operations

Dynon plans to provide new functionality and capability for the SkyView system via firmware updates. Use the resources mentioned in the Contact Information Section of this document to stay current on firmware availability for SkyView.

Firmware updates and file operations are performed using a USB flash drive. A flash drive with at least 50 Megabytes of storage is required for standard firmware updates. A drive with at least 4 Gigabytes of storage capacity is required for terrain file updates. *Note that a 4 Gigabyte USB flash drive is included with every SkyView display, and is the recommended USB flash drive for these operations.*

In order to open the System Software Menu, you must have a USB flash drive plugged in to your SkyView display.

Updating the firmware on a SkyView display automatically updates all of the modules connected on the same SkyView network, except for other SkyView displays. Each display must be updated individually.

How to Update Firmware

1. Download the latest SkyView firmware file from downloads.dynonavionics.com.
2. Copy the firmware file onto your USB flash drive. *The firmware file must be in the root directory of the drive in order to be recognizable by the display.*
3. Insert the USB flash drive into one of the display's USB sockets.
4. Go to the Upgrade System Software Wizard (SETUP MENU > SYSTEM SOFTWARE > UPGRADE SYSTEM SOFTWARE…).
5. Update the firmware on the unit by pressing UPDATE or press CANCEL to return to the System Software Menu.

How to Export System Settings

This operation creates a set of files on the USB flash drive that contain display settings, equipment settings, and important calibration information. All of the filenames contain the tail number and the firmware version.

1. Insert the USB flash drive into one of the display's USB sockets.
2. Go to the Export Settings Wizard (SETUP MENU > SYSTEM SOFTWARE > EXPORT SETTINGS…).
3. Create a file name for the settings file.
4. Save the settings file onto the flash drive by pressing EXPORT or press CANCEL to return to the System Software Menu.

How to Load and Delete Files

5. Download file from downloads.dynonavionics.com such as terrain or EMS files or use another source for the SkyView file.
6. Copy the file onto your USB flash drive. *The file must be in the root directory of the drive in order to be recognizable by the display.*
7. Insert the USB flash drive into one of the display's USB sockets.
8. Go to the Load Files Wizard (SETUP MENU > SYSTEM SOFTWARE > LOAD FILES…).
9. Select a file and press:
    a. LOAD to load the file onto the system.
    b. CANCEL to return to the System Software Menu.
    c. REMOVE to delete the file from the USB flash drive.

4. SV-D700 / SV-D1000 Installation and Configuration

This chapter contains information and diagrams that specifically apply to SkyView display installation. After reading this section, you should be able to determine how to prepare a panel for display installation, how to mount a display, how to make all necessary electrical connections, and also how to configure a display.

Figure 15 is a high-level overview of a suggested installation and configuration procedure for SkyView displays and their associated components.

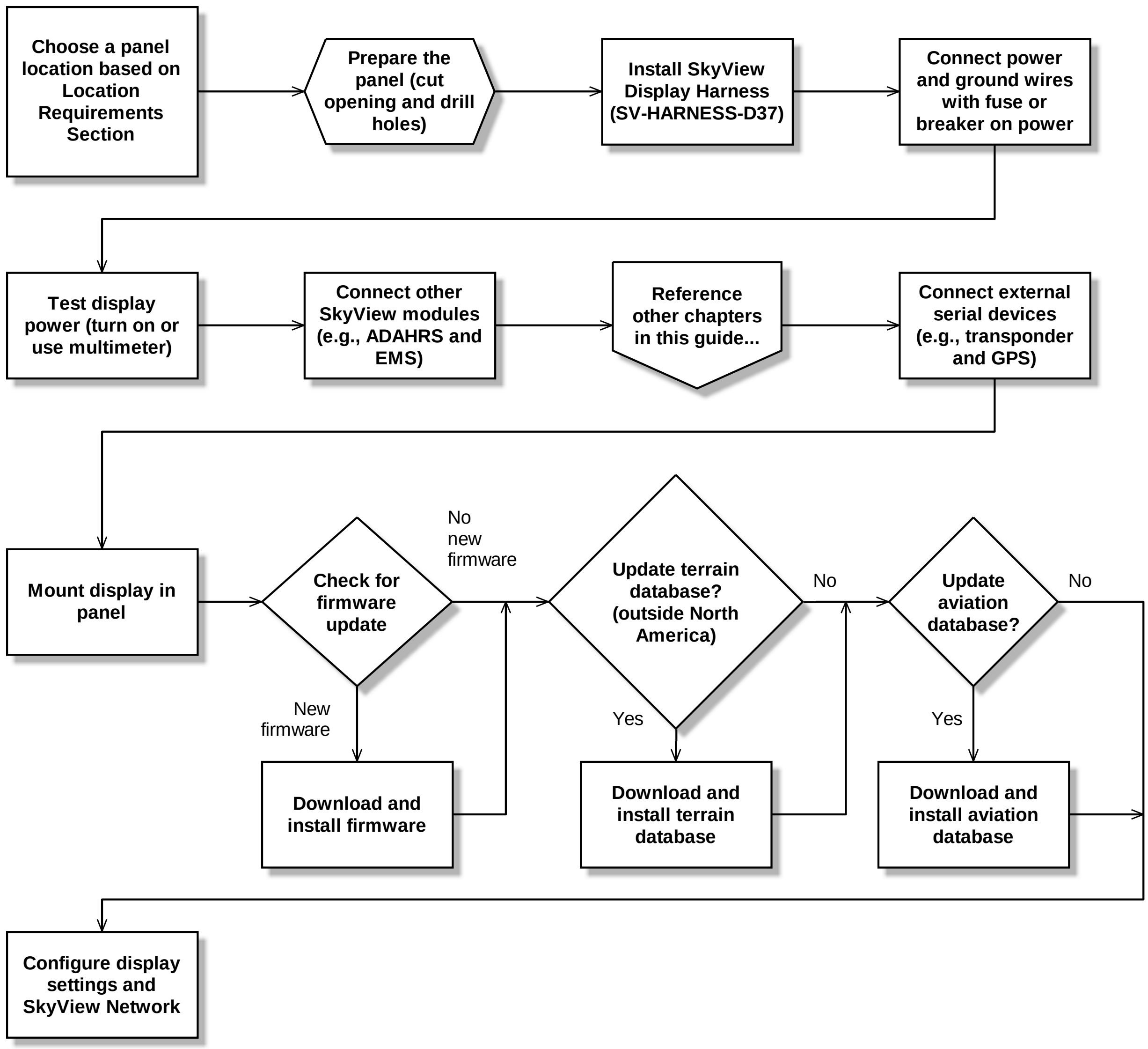


Figure 15–Suggested SkyView Display Installation Procedure

Physical Installation

SV-D700 Installation Dimension Quick Overview

- Panel Cutout: 6.97” x 5.35” (117.038 mm x 135.890mm)
- Bezel Outline: 7.636” x 5.512” (193.954 mm x 140.005 mm)

SV-D1000 Installation Dimension Quick Overview

- Panel Cutout: 9.68” x 6.90” (245.872mm x 175.260mm)
- Bezel Outline: 10.320” x 7.064”(262.128mm x 179.426mm)

For those upgrading from a D100 series product, note that the SV-D700 display has a slightly larger cutout than those products.

Figure 16 and Figure 17 on the following pages show recommended panel cutouts and mounting hole patterns for SV-D700 and SV-D1000 displays. Note that the SkyView 7" display has a smaller cutout size and fewer mounting holes than the SkyView 10" display.

Figure 18 and Figure 19 on the following pages show the mechanical dimensions of the SkyView displays. Use the dimensions (in inches) found in the appropriate diagram to plan for the space required by the display.

To mount a SkyView display, cut an appropriately sized rectangular opening in your panel, drill out the mounting holes, and use the included mounting screws to fasten the display to the panel.

SkyView displays are shipped with #6-32 hex-drive round head fasteners. Fasteners are 5/8” in length and require a 5/64” hex drive tool. Dynon recommends fastening the included mounting screws to nut plates installed behind the panel. If access behind the panel allows, standard #6-32 lock nuts or nuts with lock washers can be used. *Do not rivet the SkyView display to the aircraft as this will hinder future removal if necessary.*

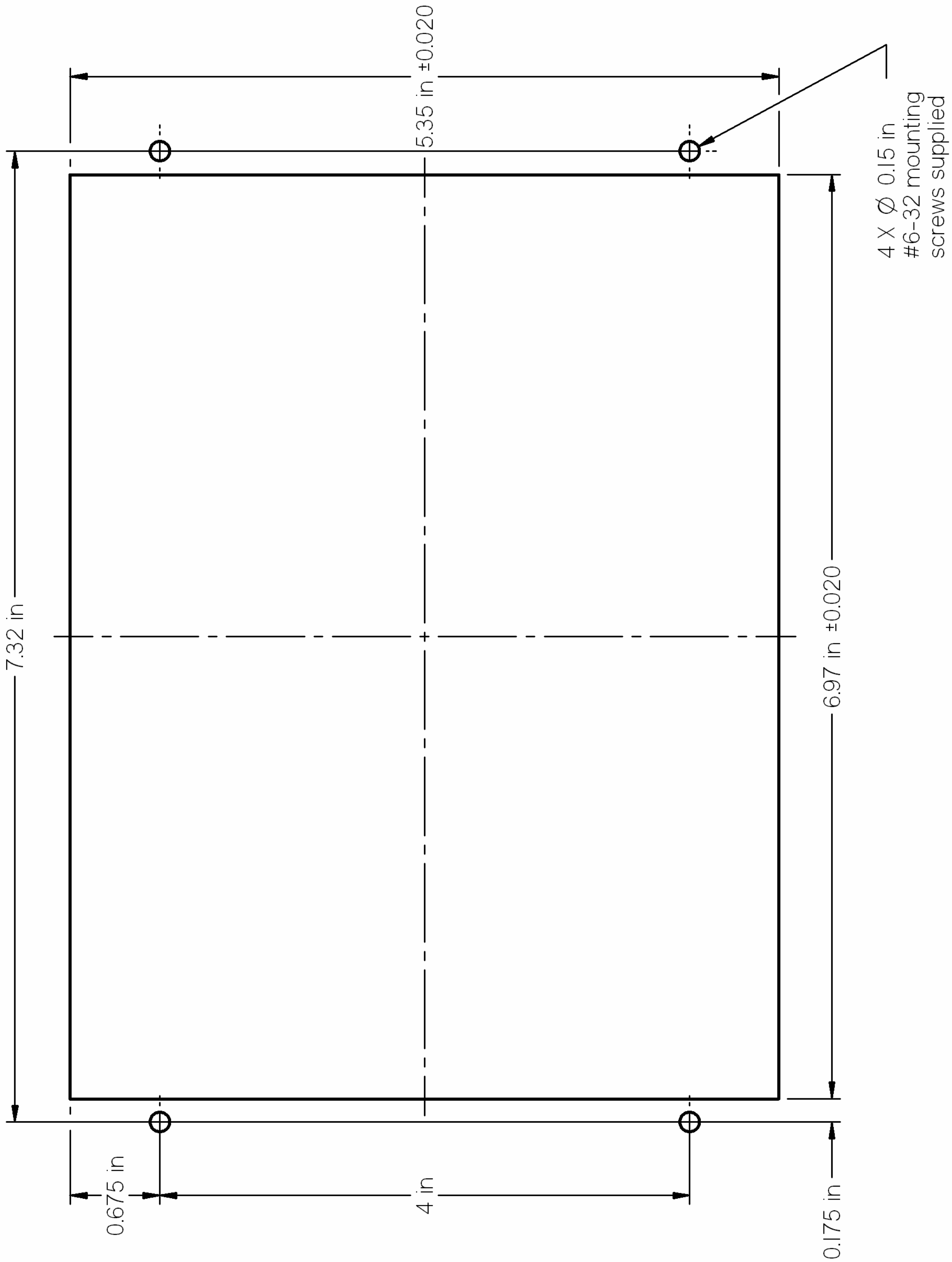


Figure 16–SV-D700 Panel Cutout and Mounting Hole Dimensions - NOT ACTUAL SIZE

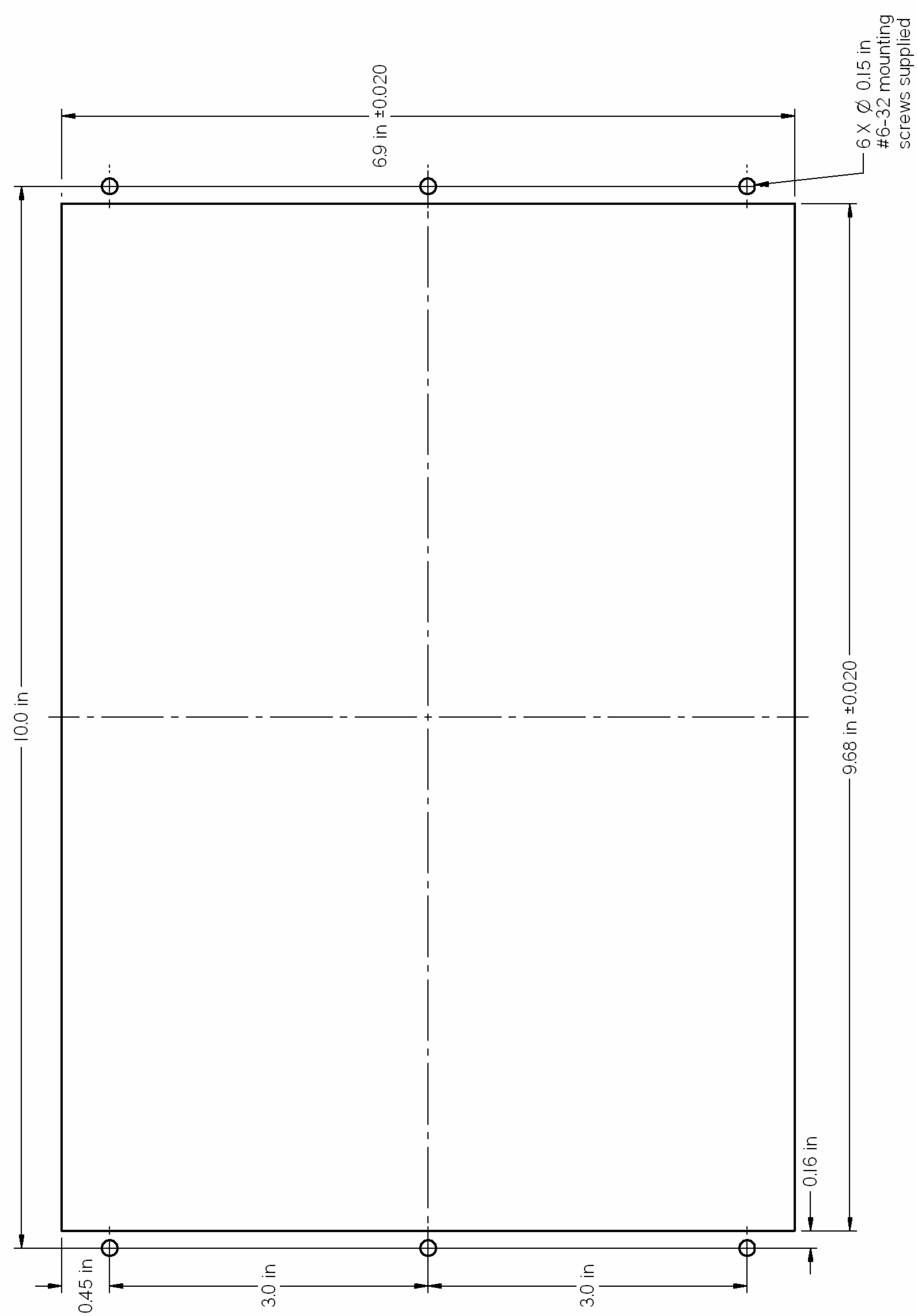


Figure 17–SV-D1000 Panel Cutout and Mounting Hole Dimensions – NOT ACTUAL SIZE

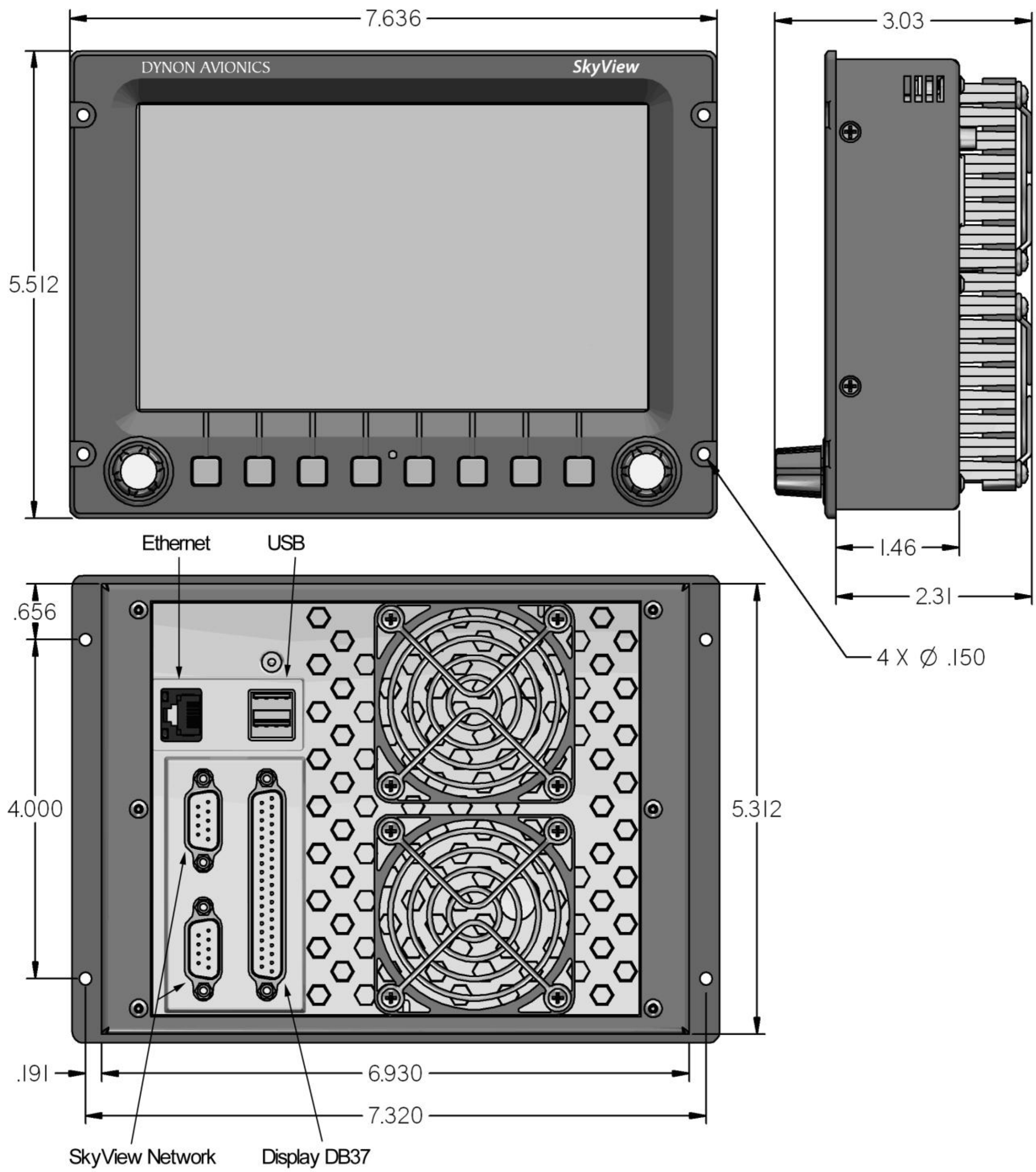


Figure 18–SV-D700 Dimensions

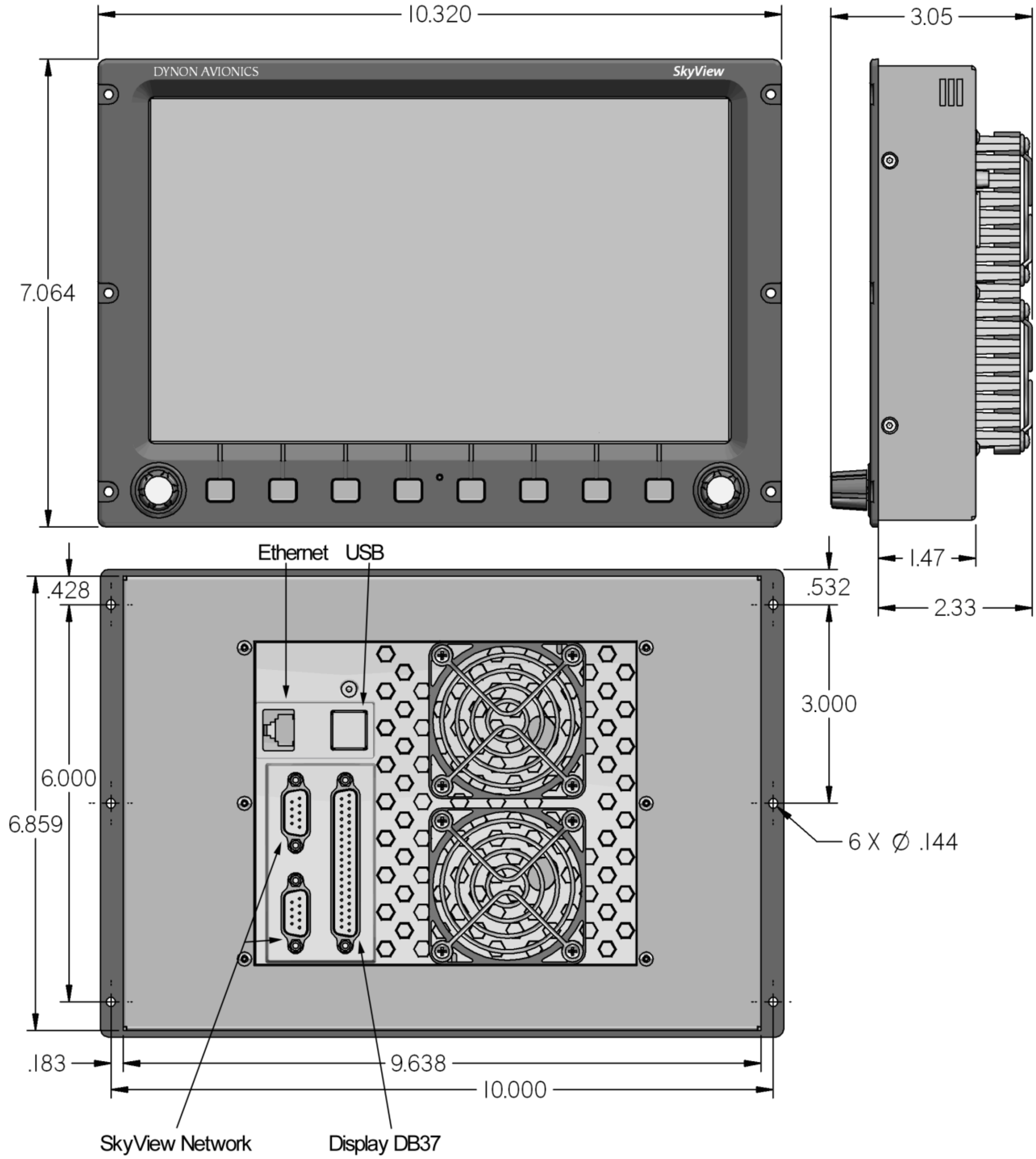


Figure 19–SV-D1000 Dimensions

Electrical Installation

Use this section in conjunction with the information contained in Appendix C: Wiring and Electrical Connections (notably Figure 98 on page 18-7). The wires and wire colors in this section refer to the wires on the included SkyView Display Harness (SV-HARNESS-D37).

Some wires that are used in SkyView harnesses are identified with secondary color stripes. Exposing these striped wires to solvents or abrasives can cause the stripe color to wear off. Handle these wires with care.

Power Input

SkyView displays have a primary power input that is compatible with 12 volt and 24 volt systems (10 to 30 volts DC). There are two unterminated solid red primary power input wires (to reduce current loading in each wire—these are not for redundancy and both should be connected to the same power source) and two unterminated solid black primary ground wires.

Ensure that there is an appropriately rated circuit breaker or replaceable fuse on the primary power input. For a SkyView system with one display, a *5 amp circuit breaker or replaceable fuse is sufficient for the majority of installations.* Reference the Power Consumption Section of the System Planning Chapter for more information.

Grounding

Ensure that all external devices that interface with SkyView have a common ground with SkyView. If a device does not share ground with SkyView, it may not communicate properly.

Airplane Master Contactor / Relay Considerations

If your aircraft is equipped with a master contactor or a relay that is operated by the master switch, it is imperative that the coil of the contactor or relay is protected by a diode to reduce the voltage spike seen when the contactor is turned off. Without this diode, the aircraft system can see spikes above 100V, which can damage Dynon equipment and other avionics.

While some contactors have this diode internally, many do not. Please verify the existence of this diode before operating your Dynon equipment. Any diode that is rated for more than 1A and more than 50V is suitable. Vans Aircraft part number ES DIODE MASTER is also a suitable option.

Backup Battery Connection and Operation Rules

SkyView displays have the option of an external backup battery (SV-BAT-320). The display harness has a connector that mates with the connector on the backup battery. Simply connecting the display to the battery using this connector enables backup battery functionality.

In the event of an electrical failure that causes SkyView to run on the SV-BAT-320, the SV-BAT-320 supplies power to the SkyView display it is connected to, along with any connected SV-ADAHRS-20X, SV-EMS-220/221, SV-ARINC-429, and SV-GPS-250 modules. Because of higher power requirements, the SV-BAT-320 does not power Autopilot servos, the SV-XPNDR-26X, or any other external device.

SkyView displays are only compatible with Dynon's SV-BAT-320 battery pack. Do not connect a lead-acid battery or any other battery as the charging algorithm is optimized for the SV-BAT-320. Connecting any other battery may have detrimental consequences. Damage caused by connecting such a battery will not be repaired under warranty.

In the event of primary power loss, a fully charged backup battery can keep most SkyView systems operating for at least 60 minutes. The backup battery provides power for its connected display and that display's attached SkyView modules and the SV-GPS-250. It does not provide power for other displays or servos as they are not powered by a display.

See the Homemade Wire Harness Considerations section for important specifications that must be adhered to for the SV-BAT-320 to charge properly when used with a non-Dynon harness.

SkyView Network Connectors

The two D9 connectors on the back of a SkyView display are SkyView network connectors. They have identical pin-outs and are electrically connected inside the display (i.e., they are completely interchangeable). Installers may use either connector or both connectors in SkyView installations. Reference Table 60 on page 18-8 for SkyView Network Connector pin-out information.

Note that these connectors are not serial port connectors.

Network Setup and Status

Once all SkyView modules are connected in a network, either in a bench top test or permanent installation, turn the display(s) on. You will see the display boot up and the status LEDs on the modules light up.

A tail number on the Aircraft Information Page (SETUP MENU > SYSTEM SETUP > AIRCRAFT INFORMATION) is required for network configuration.

If you have more than one display in your SkyView system, the tail number only needs to be set on the display that you initially perform the Network Configuration on. At network configuration time, all other displays that are set to the default tail number of DYNON will automatically have their settings and tail number synchronized with the display the configuration is performed from. After configuration, all displays' tail numbers and settings will be synchronized, and further setup tasks can be performed from any display.

Before you configure the SkyView network, the PFD and EMS pages will contain a big red "X" over a black screen. You must configure the network before PFD and EMS data is displayed on SkyView

Use the following procedure to configure a SkyView network:

1. *Navigate to the CONFIGURE… Page* (SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…).
2. *Press DETECT.* A successful network configuration yields the screen in Figure 20.
3. *Press FINISH* to close the screen and return to the Network Setup Menu.

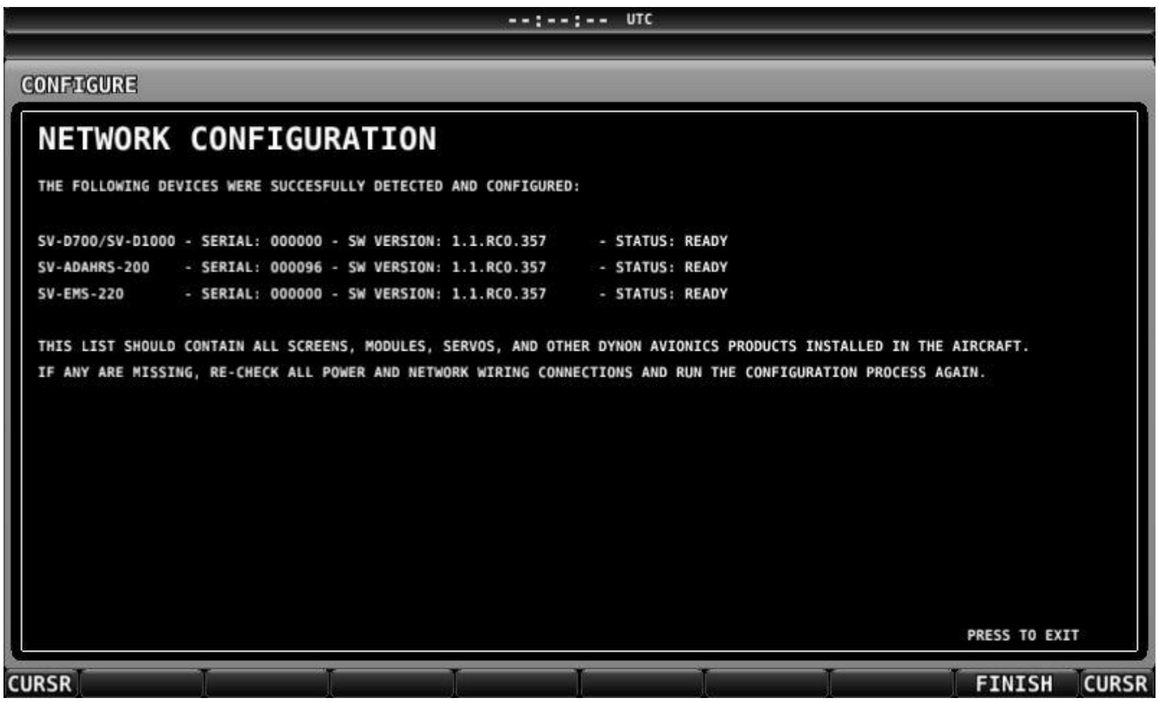


Figure 20–Successful SkyView Network Configuration Screen

If the SkyView network is successfully configured, but firmware versions on equipment are not synchronized, you will see a screen that is similar to Figure 21.

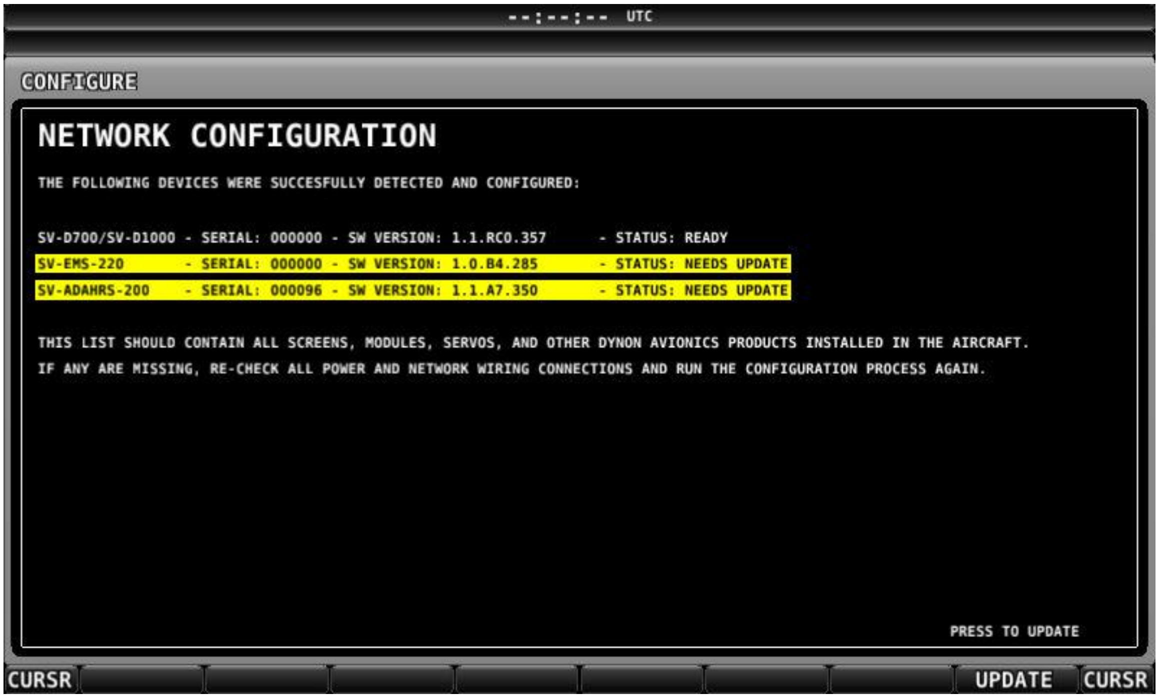


Figure 21–SkyView Network Configuration with Firmware Update

If you see a screen similar to the one in Figure 21, simply press UPDATE to synchronize the firmware running on the equipment in the SkyView network.

To check on SkyView network status, enter the NETWORK STATUS… Menu in the Network Setup Menu (SETUP MENU > SYSTEM SETUP > NETWORK SETUP > NETWORK STATUS…).

The Network Status Page shows all displays, modules, servos, and other Dynon Avionics products installed on the SkyView network via the D9 SkyView Network connectors. This includes the following devices: SV-D1000 and SV-D700 DISPLAYS, SV-ADAHRS-20X modules, SV-EMS-220/221 modules, SV-ARINC-429 modules, and Dynon Autopilot Servos. It does NOT include any non-Dynon devices or any of the following Dynon devices that connect via a method other than SkyView Network: SV-XPNDR-26X transponder, OAT or individual engine sensors, SV-GPS-250.

SkyView Network has redundancy and error detection features which allow it to detect and annunciate module and SkyView Network wiring faults. In the event that SkyView reports a problem with an ADAHRS, EMS module, autopilot servo, or a problem with the “standby network”, this NETWORK STATUS page will provide more information about the nature of the problem.

Ethernet Connection

SkyView systems containing more than one display should ideally have their Ethernet ports connected together for best operation. See the SkyView System Construction section in this manual for further information about Ethernet.

Internal Time Keeping

Zulu/GMT time is initially obtained from a GPS source. Time is displayed as "--:--:--"until a GPS fix containing time is found. When a display is turned off, a connected SV-BAT-320 enables the display to keep track of time. Displays that are not connected to a battery must obtain current time from a GPS source whenever they are turned on.

Serial Devices

Serial communication to non-Dynon devices and interfacing of other devices in general can be involved and detailed. This installation guide is intended to provide general installation advice for the most common devices and situations. Dynon's Documentation Wiki provides enhanced, extended, frequently updated online documentation contributed by Dynon employees and customers at wiki.dynonavionics.com.

There are five general purpose RS-232 serial ports available for use with compatible equipment on a SkyView display. Serial port transmit (TX) and receive (RX) wire sets are twisted together and connected serial devices must share a common power ground with the SkyView display(s).

Typically connected serial devices include the SV-GPS-250, transponders, NAV radio (e.g., Garmin SL30), and other GPS devices (e.g., Garmin X96). Reference the SV-GPS-250 Installation and Configuration Section of this guide for detailed installation and configuration instructions for Dynon's SV-GPS-250. Additionally, an external serial device (such as a PC or external serial data logger) can be connected and used to record real-time EMS module data that can be output by SkyView.

Serial port 5 is recommended for the SV-GPS-250 connection. Its wire bundle includes serial transmit, receive, ground, and power, and its wires are color-matched to the wire colors on the SV-GPS-250.

Transponders with serial altitude input can be directly connected to a display. To interface a SkyView display to a gray code transponder, the use of a Dynon Encoder Serial-to-Gray Code Converter Module (Dynon P/N 100362-000) is required. Reference the Encoder Serial-to-Gray Code Converter Installation and Configuration Section of this guide for more information.

If you have more than one SkyView display, each external serial device's serial TX wire needs to be connected to each screen so that it can send information to each display individually. Information that is received via serial connection is not automatically shared between multiple SkyView displays in an aircraft. Additionally, if the serial device you are connecting to your SkyView system can receive information from SkyView, that device's RX wire must be connected to all SkyView displays as well. SkyView has special hardware to allow multiple TX lines to be connected together for redundancy. Dynon generally recommends making all connections to/from a particular serial device to the same SkyView display serial port on every display in the SkyView system. This simplifies serial port settings by allowing you to set each display up identically.

The instructions above specify that both the TX and RX lines from external serial devices be connected to multiple screens in parallel. SkyView systems that were installed before the 2.6 version release may need some wiring changes to accommodate this. Specifically, if your system has multiple SkyView displays and your transponder is utilizing the serial altitude encoder output, the transponder would have only been connected to one screen when you configured your SkyView system. In 2.6 and all future firmware versions, one serial port from each screen needs to be connected and configured to provide serial altitude information to your transponder for this functionality to work correctly.

It is the installer's responsibility to determine how to connect external serial devices to the display using the included wire harness. Installers should reference serial device documentation for serial port specifications. The basic order for installing an external serial device is as follows.

1. Specify a serial port for the device.
2. Make the serial port electrical connection. If you have multiple SkyView displays, each serial port transmit and/or receive wire to or from a serial device should be connected to each display in parallel.
3. Configure the serial port on each D700 or D1000 (under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP) according to the device's documentation. Note that each SkyView display's serial ports need to be configured individually.
4. When serial port configuration is complete for all serial devices and displays, perform a final check by doing the following:
    a. Power down all displays except #1. Verify all serial port devices are working - transponder, GPS, radios, etc.
    b. Power down all display except #2. Verify all serial port devices are working - transponder, GPS, radios, etc.
    c. Continue for additional displays if installed.

A SkyView Display serial port can be configured to communicate with one device on its TX and a different device on its RX, but when doing so, the TX and RX speeds must be the same.

Table 10 contains serial port wire functions and wire harness colors.

Serial Port	Wire Function	SkyView Display Harness Wire Colors
1	TX	Brown with Orange stripe
	RX	Brown with Violet stripe
2	TX	Yellow with Orange stripe
	RX	Yellow with Violet stripe
3	TX	Green with Orange stripe
	RX	Green with Violet stripe
4	TX	Blue with Orange stripe

Serial Port	Wire Function	SkyView Display Harness Wire Colors
	RX	Blue with Violet stripe
5	TX	Gray with Orange stripe
	RX	Gray with Violet stripe
	SV-GPS-250 Power	Solid Orange
	SV-GPS-250 Ground	Solid Black

Table 10 - SkyView Serial Port Connections

Traffic Devices

SkyView has the ability to receive aircraft traffic information from different devices, including the SV-XPNDR-26X, the Zaon XRX (with the ZAON set to “Garmin” output), the Garmin GTX 330 transponder, and the Garrecht TRX-1500. If a device that can provide traffic is connected to SkyView and configured (usually as a TIS serial traffic device under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP), further traffic display options can be configured in SETUP MENU > TRAFFIC SETUP. The traffic display on both the PFD and MAP pages can be set to include just Traffic Advisories (TA), all targets, or no targets.

Only one device can provide traffic information to SkyView at any moment. If you have more than one device that is capable of providing traffic (such as, but not limited to, the SV-XPNDR-26X (TIS), the SV-ADSB-470, a Zaon, etc), the devices provide traffic information with the following priority, based on the completeness of the traffic portrait they provide: SV-ADSB-470 with full traffic (ADS-B ground station reporting with radar coverage) > TIS transponder from SV-XPNDR-26X or Garmin GTX 330 (when in an active TIS coverage area) > Flarm > Zaon > SV-ADSB-470 with partial traffic (ADS-B reception, but without ground ADS-B station coverage or radar target inclusion).

Dynon SV-XPNDR-26X Transponder

See the SV-XPNDR-26X Installation, Configuration, and Testing section for detailed instructions on how to set up the serial connection to the SV-XPNDR-26X.

Note that if you are using a Dynon SV-XPNDR-26X Transponder, none of the encoder options in the below sections should to be set for the Dynon SV-XPNDR-26X module to receive pressure altitude. Instead, when the Transponder is set up as described in the SV-XPNDR-26X Installation, Configuration, and Testing section, it is automatically configured to receive pressure altitude from SkyView. Alternatively, systems that require the use of an external altitude encoder can be configured per the following section to have SkyView pass along an external pressure altitude source.

Dynon SV-ADSB-470

See the SV-ADSB-470 Installation, Configuration, and Testing section for detailed instructions on how to set up the serial connection to the SV-ADSB-470.

External Serial Altitude Encoder Support

Some locales may require the use of a certified altitude encoder with the Dynon SV-XPNDR-26X Transponder. SkyView supports external serial altitude encoders that use Icarus/Garmin format. When one is connected, the SV-XPNDR-26X uses the external altitude encoder data source instead of SkyView's own ADAHRS-generated pressure altitude. However, the altitude displayed by SkyView on the PFD page is ALWAYS sourced from SkyView ADAHRS data.

To have SkyView use an external altitude serial encoder as the pressure altitude source for the SV-XPNDR-26X:

1. Wire a SkyView serial receive line to the respective serial transmit connection from the serial altitude encoder. If you have multiple SkyView displays, the serial transmit wire from the external serial altitude encoder should be connected to SkyView serial receive wire to each display in parallel.
2. Ensure there is a shared ground between the D700/D1000 and the serial altitude encoder.
3. Configure this serial port on each display under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP. The SERIAL IN device for this serial port should be set to ICARUS/GARMIN ALTITUDE.

Non-Dynon Transponder Serial Altitude Encoder Output

To use SkyView's altitude output functionality with your transponder that can receive serial altitude input:

1. Wire a SkyView serial transmit line to the respective receive connection on the transponder. If you have multiple SkyView displays, a serial transmit wire from each SkyView display should be connected to the external transponder in parallel.
2. Ensure there is a shared ground between the D700/D1000 and the transponder.
3. Configure the serial port on each display appropriately. There is an example serial port configuration on 4-20.

SkyView Altitude Encoder Output Formats

There must be a SkyView ADAHRS in the system for the altitude encoder output to function.

SkyView outputs its altitude measurements in two different formats. You can use either format on any of the serial ports. These formats are described in Table 11 and Table 12. SkyView will function properly whether or not this altitude encoder functionality is used.

ICARUS	
Used by	Garmin GTX330 (Garmin serial port must be set to Icarus input), Garmin GTX327 (Garmin serial port must be set to Icarus input), Garmin GTX328 (Garmin serial port must be set to Icarus input), Icarus, Trimble
Baud rate	9600
Format	ALT, space, five altitude bytes, carriage return
Example message	ALT 05200[CR]

Table 11–Icarus Format

DYNON CONVERTER	
Used by	Dynon Encoder Serial-to-Parallel 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]

Table 12–Dynon Serial-to-Gray Code Converter Format

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

Non-Dynon Transponder Serial Input Installation

SkyView can display the status of the Garmin GTX 327/330 transponders. To use this functionality with SkyView:

1. Wire a serial receive line to the respective transmit line on the transponder. If you have multiple SkyView displays, the serial transmit wire from the external transponder should be connected to a SkyView serial receive wire on each display in parallel.
2. Ensure there is a shared ground between the D700/D1000 and the transponder.
3. Configure the serial port on each display appropriately under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.
4. Configure the serial port on the transponder appropriately. For a Garmin GTX 327/330, the RS-232 output of the appropriate serial port should be set to REMOTE+TIS.

Gray-Code Transponder Installation

To use SkyView's altitude encoder functionality with your Gray Code transponder:

1. Follow the installation instructions in the Encoder Serial-to-Gray Code Converter Installation and Configuration Section.
2. Configure the serial port on each display according to the instructions on page 15-12.

Reference the Serial Port Configuration Section of this guide for serial port configuration information.

Garmin SL30

If you are using a Garmin SL30 NAV/COM radio with SkyView:

1. Connect SL30 serial RX pin 4 (RxD1) to one of the SkyView serial TX pins on each display.
2. Connect SL30 serial TX pin 5 (TxD1) to one of the SkyView serial RX pins on each display.
3. Configure the serial port on each display appropriately under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.
4. Configure the serial port on the SL30 appropriately. On the SL30, the Indicator Head Type should be set to NONE.

Dynon ADAHRS/EMS/SYSTEM/NMEA Data Outputs

To output real-time data to an external serial device, such as a serial data logger, ELT, or other device that accepts NMEA or Dynon formats:

1. Wire a serial transmit line from one display to the receive line on the external serial device.
2. Ensure there is a shared ground between the D700/D1000 and the external serial device.
3. Configure the serial port on the display appropriately under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP, selecting the desired output data format.

USB Usage and Accessibility

It is useful to have the USB socket on the display's wire harness accessible after installation for file uploads and downloads.

The USB connector is used during the following operations:

- System firmware updates
- Configuration file uploads and downloads
- Database updates

External Dim Control Connection

Users may control the backlight level on a SkyView display using a compatible external control signal. The external dim input on pin 25 on the display's D37 is compatible with a 0 to 36 volt DC control signal.

The external dim output on pin 26 is an open-collector PWM output. *This output is currently not supported. A future firmware update will enable this capability.*

Audio Output

Audio Output Electrical Connections

Dynon recommends that SkyView's audio outputs be connected to an unmuted input on your audio panel or intercom. When connected this way, critical audio alerts are not muted by ATC transmissions or other audio events that could cause SkyView's audio to be suppressed if it were connected to a muting input.

This output cannot be hooked in parallel with a radio to a headset. Doing so will significantly reduce the volume of the radio output, possibly to the level that it is not usable. An intercom or audio mixer is required to utilize this output.

If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove the variable resistor that is connected to the existing audio output wiring: SkyView has software-based volume controls.

The audio outputs on pins 13 and 31 (left and right, respectively) of the display's D37 connector can drive audio panel or intercom auxiliary inputs. When interfaced with such devices, they can generally be used with any input designated as an auxiliary input without any external resistors or other components needed between the SkyView and the intercom.

Use left and right audio outputs for stereo mode. If the audio panel or intercom only supports mono input, short the left and right audio outputs together and connect them to the mono input on the device. To minimize noise, ensure that your SkyView audio ground and intercom or audio panel ground are *directly connected together*, even though they nominally share a common ground via other aircraft wiring (audio ground is pin 30 on the D37).

If there is more than one display on a SkyView network, you MUST connect all displays' audio outputs to the same audio panel input to ensure that audio is always heard. Electrically short the respective left and right outputs together for stereo mode (i.e., left-to-left and right-to-right) or connect all audio outputs together for mono mode. The same rule applies for audio grounds.

To minimize the possibility of audio "humming", a 16 AWG wire may optionally be connected between the ground point for the intercom/audio panel/radio(s) and SkyView display case(s). To attach the wire to the SkyView display case, a 4-40 x 3/16" long screw maybe be screwed into the threaded boss above the USB ports on the back of the SkyView display.

Audio output volume will be controlled via the interface on a SkyView display, so no external hardware components are required. The audio output from SkyView has a maximum output of 10V p-p with 50 ohms of source impedance.

SkyView Audio Output Settings

Go to SETUP MENU > SYSTEM SETUP > AUDIO SETUP to configure audio output settings. Most of the items in this menu control whether the audio output for a particular alert or alert category is played or not. The settings that can be adjusted here that are not voice alert toggles are:

- Volume Control / Test: Sets the volume level. While in this menu, sound is played continuously so that proper audio connectivity and volume levels can be confirmed.
    - In this menu only, audio is only outputted from the actual display that is in the setup menu. This allows one to troubleshoot the physical audio connections. In actual operation, only one of the displays transmits audio at a time. Which display happens to be transmitting is automatically managed by SkyView. Since all displays' audio outputs are connected together (and to the intercom or audio panel), this is transparent in actual use.
- Boot Sound: When set to ON, the system will say "Dynon SkyView" when it first starts up.
- Angle of Attack: This sets a pulsing, progressive tone that increases in frequency, similar in nature to a conventional reed type aircraft stall warning sound to a reed-type stall warning sound, although it is much more predictable in its progression. It can be set to start its pulsing tones at either the border of the yellow/green marks on the AOA bars, the middle of the yellow, or the yellow/red border. The pulsing tones start at the level selected and get progressively quicker and closer together until a solid tone is played at critical AOA (in the red.)
    - Inhibit AOA Below Airspeed: Allows you to set an airspeed below which no AOA tones are played. This helps prevent nuisance alarms while on the ground and taxiing, especially in tail draggers.

Discrete Input Connections

Discrete input connections are currently not supported in SkyView. A future firmware update will enable this functionality. Do not connect anything to these pins at this time.

Reserved Connections for Future Use

Do not connect anything to unspecified D37 connector pins (directly or using the display harness). These are reserved for future use.

Display Setup

You can access important information about a SkyView display as well as configure serial ports, characterize your display backlight behavior and specify other display-specific settings.

How to Access Display Hardware Information

Enter the Display Hardware Information Page (SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION) to access important display hardware information. This menu contains status information only—nothing on it is configurable. Reference the Operation Section of this guide for more information about this menu.

Serial Port Configuration

Reference serial device documentation for serial communication specifications.

SkyView serial ports are configured in the Serial Port Setup Menu (SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP). SkyView serial ports have four parameters that must be defined:

- Input Device
- Input Function
- Baud Rate
- Output Device

Note that sometimes a parameter will be defined as NONE on the screen. For example, when a serial port is configured as only an output, the input device and input function will both be set to NONE.

Input Device

Set the input device to the data format the SkyView display should expect from an input device. The configurable options list contains equipment by brand and model and also generic data formats such as NMEA and aviation. NMEA is the standard format for most GPS units (including the SV-GPS-250). Aviation is used by some Garmin and Bendix/King panel mount equipment. *If your specific equipment is listed by brand and model, we recommend you configure SkyView to use this option instead of a generic data format.*

If you have any ARINC-429 devices, these are configured separately. See the SV-ARINC-429 Installation and Configuration Section of this guide for more information.

Input Function

SkyView has several options for input functions: NONE, GPS, NAV, or POS. Set the device's input function to NONE if it does not have an input function.

- **GPS devices** provide GPS position and navigational information. These devices are generally "moving maps" that depict airports, airspaces, etc., and can generate flight plans. They provide source data for the moving map, HSI, autopilot, synthetic vision, and the clock in the Top Bar. An example GPS device is a Garmin X96.
- **NAV devices** provide radio-based navigational information from a VOR or ILS. They provide source data for the HSI and autopilot. SkyView currently supports only the Garmin SL30 NAV Radio.
- **POS devices** provide only positional information. These are generally simple GPS receivers which cannot do flight planning. They provide source data for the moving map, synthetic vision, and the clock in the Top Bar. *Note that a POS device does not provide any data for the HSI and will not appear in the HSI NAVSRC rotation.* An example POS device is the Dynon SV-GPS-250.

Input Function Considerations and Priorities

Dynon's Moving Map Page uses POS and GPS sources for its data. Regardless of the number of data sources in your system, this page prioritizes these sources and fails over to them as follows:

POS 1 ▸ GPS 1 ▸ GPS 2 ▸ GPS 3 ▸ GPS 4 ▸ POS 2 ▸ POS 3 ▸ POS 4

For example, if your system has one SV-GPS-250 configured as POS 1 and a Garmin 396 configured as GPS 1, the Moving Map will always use the SV-GPS-250 as its primary data source. If the SV-GPS-250 fails or you configure its input function to NONE, the Moving Map Page will use the Garmin 396 (or other GPS source) configured as GPS 1 as its primary data source.

The SkyView HSI uses GPS and NAV sources for its overlays and the user must choose the source during operation.

SkyView's internal Navigation Mapping Software can generate navigation information which can be displayed on the HSI. The Navigation Mapping Software requires GPS position information, which is sourced from the active (highest priority in the above list) POS or GPS source. Regardless of what source is being used for position information, the navigation provided by the Navigation Mapping Software is always the GPS0 source on the HSI.

Baud Rate

Set this to match the baud rate of the serial device that is connected to the serial port. SkyView supports the following baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.

Note that if you use a serial port for a split function (e.g., GPS in and altitude encoder out), the input and output devices must use the same baud rate.

Output Device

Set output device to the data format the serial device should expect from the SkyView display (e.g., ICARUS (10ft)).

Example SkyView Serial Port Configuration for Icarus-Compatible Transponder

This example assumes that an Icarus format compatible transponder has been installed on serial port 1.

1. Enter the Serial Port 1 Setup Menu (SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP > SERIAL PORT 1 SETUP).
2. Set serial 1 input device to NONE (SERIAL 1 IN DEVICE: NONE).
3. Set serial 1 in function to NONE (SERIAL 1 IN FUNCTION: NONE).
4. Set serial 1 baud rate to 9600 (SERIAL 1 IN/OUT BAUD RATE: 9600)
5. Set serial 1 output device to ICARUS (100ft) or ICARUS (10ft) (SERIAL 1 OUT DEVICE: ICARUS (100ft) or ICARUS (10ft).
6. Press BACK or EXIT to save the settings.

Brightness Setup

Enter the Brightness Setup Page (SETUP MENU > LOCAL DISPLAY SETUP > BRIGHTNESS SETUP) to characterize the display's backlight behavior. The backlight level can be adjusted manually by the user, automatically by the display based on ambient light conditions, or by an external control signal while on the Brightness Setup Page and in normal flight. *Regardless of the specified control method, users always have the option of manually adjusting the backlight level in the Dim Menu.*

Manual Brightness Management

To set the backlight light level so that it is exclusively controlled manually (i.e., no automatic or external brightness control) set BRIGHTNESS SOURCE to MANUAL ONLY. In this mode, the backlight level is managed exclusively by the user in all situations in the Dim Menu. Reference the Basic Display Operation Procedures Section for instructions on how to manually adjust the backlight level in the Dim Menu.

Automatic Brightness Management

To set the backlight level so that it automatically adjusts, set BRIGHTNESS SOURCE to AUTO OR MANUAL. When this option is selected, dimming is normally controlled automatically via ambient light detection, but it can also be controlled manually by using the Dim Menu. Dynon has created a default dimming profile that should work well in most aircraft. If you find that this profile does not work well in your installation, it can be customized to suit your preferences using the tools on the Brightness Setup Page. This page displays several parameters, which are listed and briefly explained below.

- Current Brightness Sensor Value–This is an integer value ranging from 0 to 999 that represents the amount of light sensed by the display's integrated light sensor. Use this value to characterize the ambient light levels in your installation during characterization.
- Current Brightness Target–This is a percentage ranging from 0% to 100% that represents the calculated target backlight level based on the sensed ambient light level and the percent brightness sensor value map. *The actual brightness never drops below 20% when the Brightness Setup Page is displayed, even though the target value may be below 20%.*
- % Brightness Sensor Value–There are four percent brightness sensor values: 25%, 50%, 75% and 100%. These values are correlated to a user-specified brightness sensor value, which are to the right of the percent value. These percentages along with the minimum brightness sensor value (explained below) form the calibration points for the backlight management profile. When the current brightness sensor value matches one of these points, the target backlight level is adjusted to its matching percentage. When the current brightness sensor value is in between these points, the display interpolates between the points and calculates an appropriate target backlight level. These values must be set by the user.
- Minimum Brightness Sensor Value–This is an integer value ranging from 0 to 999 that represents the smallest amount of light that is expected to be sensed by the integrated light sensor. This must be set by the user.

- Minimum Brightness–This is an integer value ranging from 0 to 9 that represents the lowest backlight setting when the minimum brightness sensor value is measured by the integrated light sensor. This must be set by the user.

Use the RESET TO DYNON DEFAULTS option to start over if needed. Press BACK to save the settings and return to the LOCAL DISPLAY SETUP Menu or press EXIT to return to the Main Menu.

External Brightness Management

To set the backlight level so that it is controlled by an external variable voltage input (0-30V DC), set BRIGHTNESS SOURCE to EXTERNAL OR MANUAL. When this option is selected, dimming is normally controlled automatically via an external signal, but it can also be controlled manually by using the Dim Menu. If backlight control is set to external, you must configure the brightness settings on the Brightness Setup Page. This page displays several parameters, which are listed and briefly explained below.

- Current Brightness Sensor Voltage–This is the voltage level of the external control signal. Use this value to characterize the ambient light levels in your installation during characterization.
- Current Brightness Target–This is a percentage ranging from 0% to 100% that represents the calculated target backlight level based on the sensed ambient light level and the percent brightness voltage map. Note that this is a calculated value and is not set by the user. *The actual brightness never drops below 20% when the Brightness Setup Page is displayed, even though the target value may be below 20%.*
- % Brightness Voltage–There are four percent brightness values: 25%, 50%, 75% and 100%. These percentages are correlated to a brightness voltage, which are to the right of the percent value. These percentages along with the minimum brightness voltage (explained below) form the calibration points for the backlight management profile. When the current brightness voltage matches one of these points, the target backlight level is adjusted to that percentage. When the current brightness voltage is in between these points, the display interpolates between the points and calculates an appropriate target backlight level. These voltages must be set by the user.
- Minimum Brightness Voltage–This is a voltage that represents the external control signal's minimum voltage level. This must be set by the user.
- Minimum Brightness–This is an integer value ranging from 0 to 9 that represents the lowest backlight setting when the minimum brightness sensor voltage is present. This must be set by the user.

Press BACK to save the settings and return to the LOCAL DISPLAY SETUP Menu or press EXIT to return to the Main Menu.

Top Bar Setup

The top bar is the strip across the top of the screen. It displays textual information such as the clock and autopilot status. Future software updates will use this space for information such as radio status.

Enter the Top Bar Setup Page to configure the top bar (SETUP MENU > LOCAL DISPLAY SETUP > TOP BAR SETUP).

Aircraft Information

Use the Aircraft Information Page (SETUP MENU > SYSTEM SETUP > AIRCRAFT INFORMATION) to record important information about your aircraft.

The tail number must be present for SkyView network configuration and operation.

If you have more than one display in your SkyView system, the tail number only needs to be set on the display that you initially perform the Network Configuration on. At network configuration time, all other displays that are set to the default tail number of DYNON will automatically have their settings and tail number synchronized with the display the configuration is performed from. After configuration, all displays' tail numbers and settings will be synchronized, and further setup tasks can be performed from any display.

Screen Layout Setup

As of SkyView software 5.0, you can use Screen Layout Setup page (SETUP MENU > SYSTEM SETUP > SCREEN LAYOUT SETUP) to customize and restrict the ways that the PFD Page, Engine Page, and Map Page are displayed on your SkyView display(s). This feature can be used in a variety of ways:

- You can prohibit and restrict the use of certain menu items in the SCREEN menu. This can allow you to:
    - Enforce the relative layout of the PFD/Engine/Map pages on each display, for a consistent cockpit environment
    - Restrict the ability to remove Pages from a display. This can be used, for example, to force the PFD Page and the Engine Page always be displayed on a display or in the system.
- In multi-display systems, you can specify a reversion mode that automatically changes the screen configuration to a specific layout when only one display remains powered on. For example, if you normally have your left display showing PFD, and your right display showing Engine and Map, you could configure reversion mode to show all three pages automatically on the remaining single display should the other fail.

Menu items and settings available in the SCREEN LAYOUT SETUP menu include:

- General Rules – Settings under this menu control behavior of items contained under the SCREEN menu. This applies to all displays in the system, no matter which display you change these settings from.
    - Show Layout Button: Determines whether the SCREEN > LAYOUT button is available for use. The SCREEN > LAYOUT button allows the pilot to dynamically rearrange the order of the PFD/ENGINE/MAP pages on a display.

- Show Swap Button: Determines whether the SCREEN > SWAP button is available for use. The SCREEN > SWAP button allows the pilot to swap the entire contents and page layouts of displays in a two-display SkyView System.

- This Display – Normal Operation: The options under this menu apply only to the display that you are currently working with, and only when the system is operating normally (when the display is not in reversion mode or swapped)
  - PFD Page, Engine Page, Map Page: For each of these entries, you can control whether each page is:
    - Required: The relevant page is always shown on this display. This is always shown on this display. The relevant page button under the SCREEN menu is not available.
    - Allowed (Save State): This display remembers whether the relevant page was being shown across power cycles. The relevant SCREEN button turns that page on and off on this display.
    - Allowed (Not Shown at Boot): The relevant page is never on at boot. The relevant page button under the SCREEN menu turns that page on and off on this display.
    - Allowed (Shown at Boot): The relevant page is always on at boot. The relevant page button under the SCREEN menu turns that page on and off on this display.
    - NOT ALLOWED: The relevant page cannot be shown on this display. The relevant SCREEN button is not available.
- Reversion Mode Configuration – When only one display is powered on in a multiple display configuration, the layout picked here is forcibly displayed. This behavior applies equally whether all but one display in your system has failed or if you turn on one SkyView display before all others (as some customers do to see engine instruments before engine start). This setting applies to all displays in the system, no matter which display you change this settings from.
  - Disabled: Reversion Mode is disabled. The layout that was set on any display remains the same whether or not it is the only display powered on in a multi-display system.
    - PFD 40% / EMS / MAP 40%
    - PFD 50% / MAP 50%
    - PFD 50% / EMS 50%
    - PFD 80% / EMS 20%
    - PFD 100%

5. SV-ADAHRS-20X Installation and Configuration

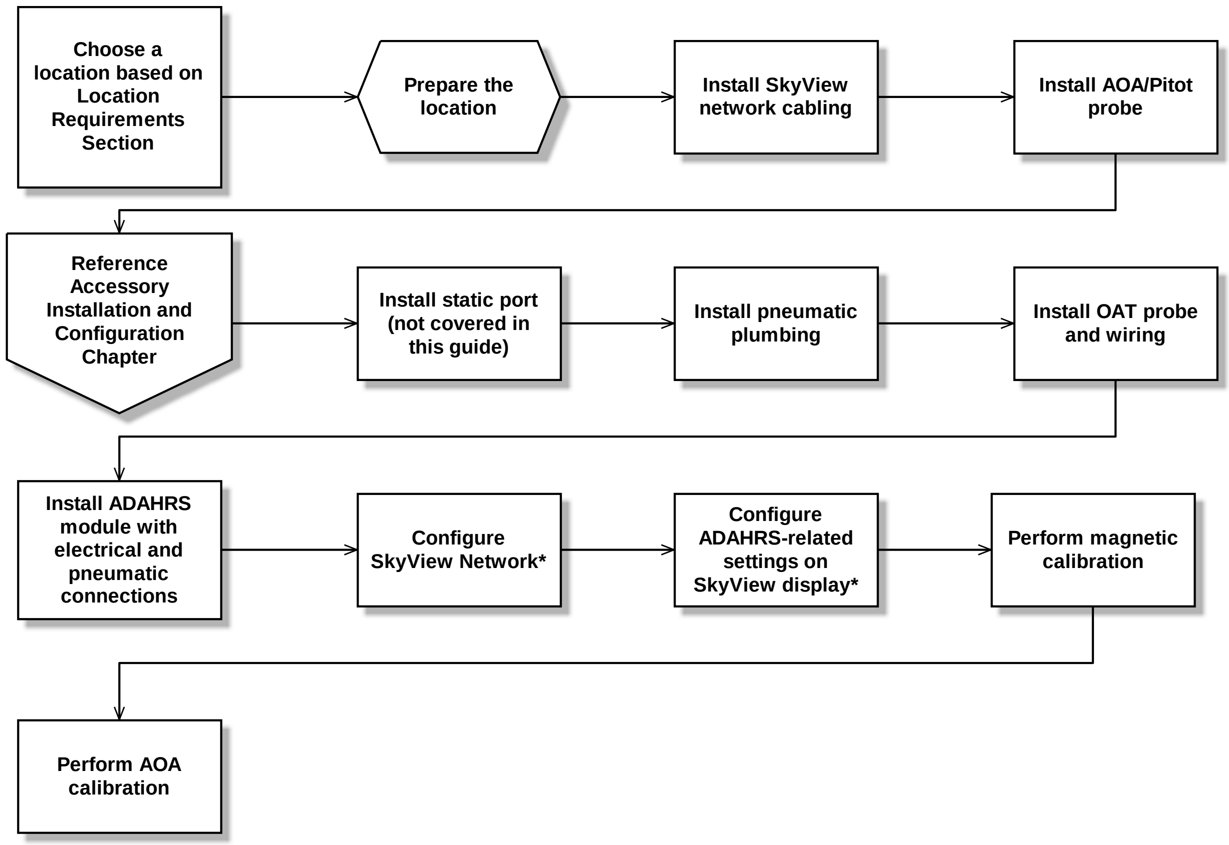
The SkyView ADAHRS module uses MEMS sensor technology to accurately measure inertial, magnetic, and air data. To ensure accuracy in its readings, it is very important that you install the module correctly and perform the specified calibration steps. This chapter guides you through that process.

Dynon sells a primary ADAHRS model (SV-ADAHRS-200) and a backup model (SV-ADAHRS-201). Throughout the guide, these models are collectively referred to as “SV-ADAHRS-20X.” The primary and backup models are identical in functionality.

Read and understand the System Planning Chapter before installing the ADAHRS.

If you have more than one ADAHRS in your SkyView system, all ADAHRS calibrations are applied to all ADAHRS simultaneously. In other words, you generally only need to go these steps once per system, provided all ADAHRS are calibrated, installed and are connected via SkyView Network. However, if an additional SV-ADAHRS-20X is installed and configured at a time after the original installation and calibrations in this chapter have been performed, all setup and calibration steps in this section of the SkyView Installation manual should be performed as if the ADAHRS is being installed for the first time.

Figure 22 is a high-level overview of a suggested and installation and configuration procedure for the SV-ADAHRS-20X.



*Assumes SV-D700 or SV-D1000 is properly installed and working.

Figure 22–Suggested SV-ADAHRS-20X Installation Procedure

Physical Installation

As previously mentioned in the System Planning Section, there are no module-to-module proximity requirements when installing multiple SV-ADAHRS-20X modules in an aircraft. For example, one SV-ADAHRS-20X may be installed on top of another SV-ADAHRS-20X module. Other installation location requirements still apply.

The diagram below shows the important mounting dimensions of the ADAHRS module with electronic and pneumatic connections. Note that the figure applies to both the SV-ADAHRS-200 and SV-ADAHRS-201 modules.

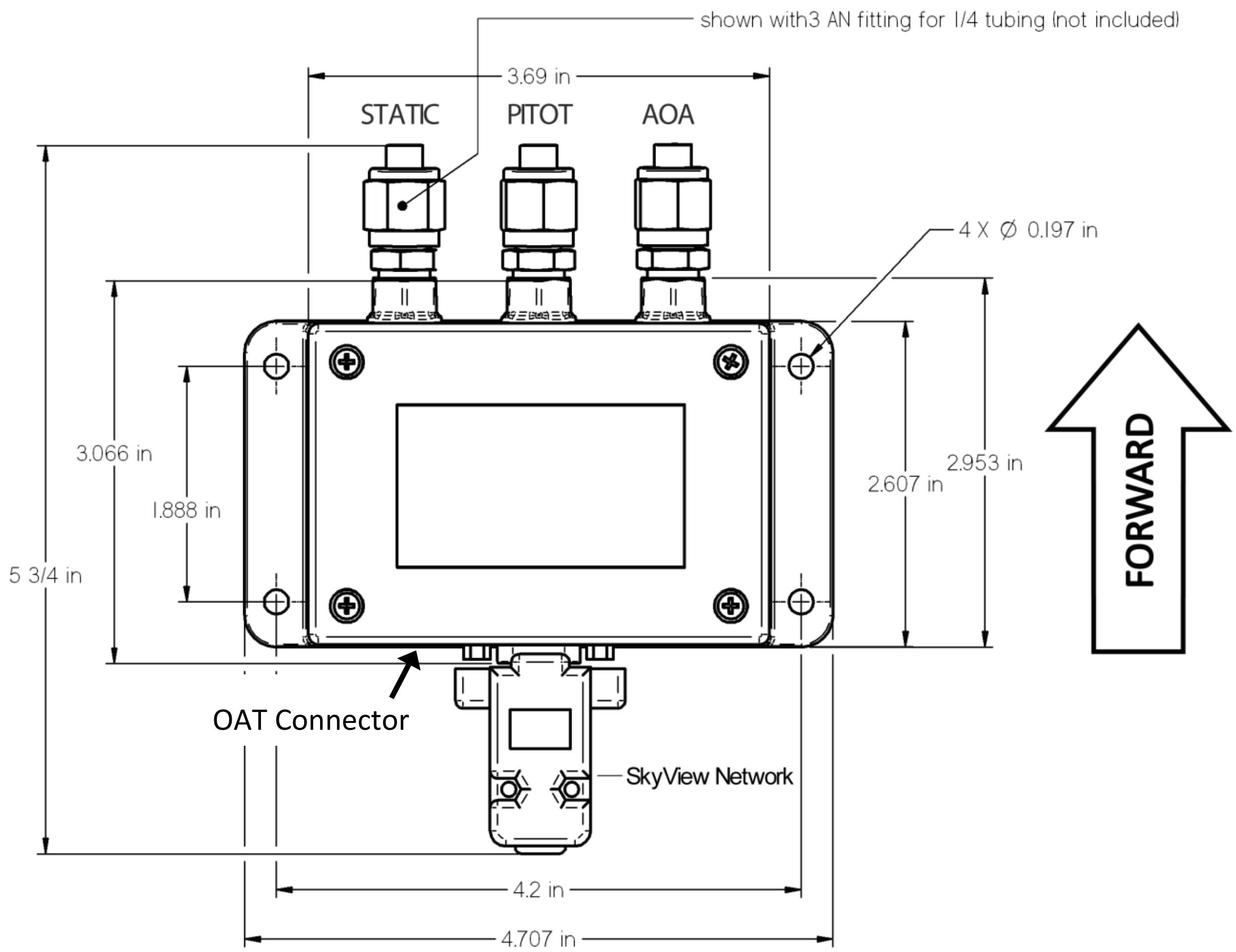


Figure 23–SV-ADAHRS-20X Mounting Dimensions with Electronic and Pneumatic Connections

Additional mounting location, orientation, and other installation requirements are described in the System Planning section earlier in this manual. Please review this section when physically installing your with SV-ADAHRS-20X module(s).

An ADAHRS module should be mounted within one degree of parallel to all three aircraft axes, with the pneumatic fittings facing toward the front of the aircraft. The module's mounting tabs must be on the bottom. The label must be on the top. Figure 23 shows the correct orientation of the ADAHRS as it would appear if you were above the aircraft, looking down at it. The module will not operate properly if it is rotated or inverted in any other orientation.

Dynon does not provide mounting hardware with SV-ADAHRS-20X. The mounting tabs on each side of the module have holes sized for #10 fasteners, but it is up to the installer to decide how the ADAHRS will be secured to the aircraft.

We recommend that installers use button-head style non-ferrous fasteners (e.g., stainless steel or brass) in this location. Follow recommended torque practices when tightening the mounting hardware. *Do not rivet the SV-ADAHRS-20X to the aircraft as this will hinder future removal if necessary.*

Do not use a magnetic driver when installing the ADAHRS. Doing so has the potential to affect the factory magnetic calibration.

SkyView Network Connection

Connect the ADAHRS module to the SkyView network using the hardware mentioned in the SkyView System Construction Section or using equivalent hardware.

If you have to install a connector on the end of a network cable, insert all pins into the D9 connector. Refer to Appendix C: Wiring and Electrical Connections for details on connector pin-outs and wire colors.

Remember to configure the network as described in the Network Setup and Status section after connecting all modules to a display.

Pneumatic Ports

The AOA, pitot, and static ports on the SV-ADAHRS-20X are equipped with 1/8” NPT Female fittings. To attach your pitot and static lines to the module, you must use standard 1/8” NPT male fittings at the end of each of the lines.

SkyView’s attitude calculation requires airspeed from pitot and static. A GPS source can be used as a backup if the pitot and/or static source fails, but should not be the primary source.

Do not use ferrous pneumatic fittings.

To install, simply connect your static and pitot sources to the SV-ADAHRS-20X. If you are performing a retrofit installation, consider “teeing” off of existing lines using a tee fitting. Reference the sticker on top of the respective module for pneumatic port identification.

Use a wrench to secure the mating pressure line fittings to the corresponding locations on the SV-ADAHRS-20X. Do not over-tighten.

If you purchased Dynon's AOA/Pitot Probe, note that it has pitot and AOA ports, but no static port. You will need to provide your own source of static pressure for the SV-ADAHRS-20X.

Magnetic Heading Calibration

Dynon calibrates every ADAHRS during manufacture, however a separate calibration is required to accurately measure magnetic heading in an aircraft installation. The calibration procedure in this section simultaneously calibrates every SV-ADAHRS-20X in the SkyView network.

Magnetic heading calibration requires pointing the aircraft in four directions and acquiring data at each direction. *The aircraft's configuration and major systems should be in a state that resembles flight conditions during calibration (i.e., the canopy should be closed, the aircraft's pitch attitude matches SkyView's attitude depiction, the engine should be running, and all electronic devices should be on).* An accurate method of aligning the aircraft with magnetic North, East, South, and West, such as an airport's compass rose, is required.

Tail wheel equipped aircraft can be calibrated in their normal nose up ground attitude as long as the SkyView attitude display shows the correct corresponding nose up attitude.

A working GPS receiver must be connected to the SkyView system in order to calibrate magnetic heading. SkyView uses GPS-derived position information to calculate magnetic intensity, declination, and variation.

Use the following procedure to calibrate the SV-ADAHRS-20X compass:

1. Turn on the SkyView system and allow it to warm up for several minutes.
2. Move the aircraft into position so that it is convenient to orient it in the four cardinal directions.
3. Enter the Setup Menu on the SkyView display and go to the Compass Calibration Wizard (SETUP MENU > HARDWARE CALIBRATION > ADAHRS CALIBRATION > COMPASS CALIBRATION). Note, GPS data on the Compass Calibration Page must be green. If it is red, GPS data is not valid.
4. Orient the aircraft to North, South, East, or West. When the aircraft is stable at the chosen orientation, the page will say READY TO TAKE DATA FOR: [DIRECTION].
5. Press ACQUIRE and wait for data collection to reach 100%.
6. Rotate to the next cardinal direction and repeat steps 4 and 5.
7. CALIBRATION COMPLETE appears when calibration is complete. Press FINISH to return to menu navigation mode.

SV-OAT-340 Location and Installation

The SV-OAT-340 is designed specifically to work with the SV-ADAHRS-20X.

For full redundancy, a second ADAHRS module requires its own OAT probe.

Probe Location

The SV-OAT-340 is an outside air temperature probe. In order for it work properly, it must be able to measure air temperature accurately. Avoid exposing the probe to sources of heat that would interfere with outside air temperature readings such as:

- Direct sunlight
- Engine heat and exhaust
- Aircraft interior (back side of probe)
- Heated air from the cabin exiting from an open window or cabin air exhaust port

The installation area should have space for a nut and wires on the back side of the probe. It is acceptable to extend or reduce the wire length if necessary. Reduce the wire length by cutting out the desired length from the middle of the wires and splicing together the remaining ends.

If there is a backup ADAHRS in the SkyView system, it is acceptable to install a backup OAT probe a few inches away from the primary probe. Consider running primary and backup OAT probe wiring together. Tape probe wire pairs together to avoid confusion later.

Installation

The following tools and materials are required for SV-OAT-340 installation:

- SV-OAT-340
- SV-ADAHRS-20X
- Drill with 3/8” drill bit
- 9/16” wrench

Do not insert the pins on the ends of the OAT probe wires into the included connector housing until you are done running probe wiring through the aircraft.

The following procedures apply to the both the primary and backup probes.

On the outside of the fuselage:

1. Drill a 3/8” hole at the installation location.
2. Feed the wires of the probe through the hole.
3. Feed the body of the probe through the hole.

On the inside of the fuselage (consider getting assistance for some of the steps below because it may be difficult to be simultaneously on the inside and outside of the fuselage):

1. Feed the nylon washer over the cable.
2. Feed the nylon nut over the cable.

3. Feed the nylon washer over the body of the probe.
4. Hand-thread the nylon nut onto the threaded body of the probe. *At this point, the nylon washer should be sandwiched between the nylon nut and the inside of the fuselage.*
5. Carefully tighten the nut using the 9/16” wrench.
6. Route and secure the probe wires to the location of the ADAHRS module. Keep wires away from radios, ignition, and other noisy electronics.
7. Carefully insert the pins on the wires into the connector housing. Pins are not polarized and lock into place when inserted correctly.
8. Connect the probe to the ADAHRS module.

If the OAT probe is installed correctly, there should be an outside air temperature reading on the PFD.

Adjusting OAT Offset

SkyView provides the ability to adjust the displayed OAT +/- 20F (11.1C). This adjustment is applied across the OAT’s entire temperature range. This adjustment can be made under SETUP MENU >HARDWARE CALIBRATION > ADAHRS CALIBRATION > OAT OFFSET.

Dynon D10/D100 Series OAT Probes

If your aircraft already has a Dynon Avionics OAT installed from an older Dynon Avionics product, and you do not want to reinstall the SV-OAT-340 in its place (difficult access, etc.), it is possible to use the older OAT with SkyView. Cut off as much wire as needed from the SV-OAT-340 - you will use the White w/Black wires with pins pre-crimped, and the connector.

- If your plane has a Dynon Avionics 100433-000 OAT installed (typically connected to the 37-pin EMS connector, two White w/Black Stripe wires), simply connect either White w/Black Stripe wire on the installed OAT with one of the wires from the SV-OAT-340. The OAT is not polarity-sensitive.
- If our plane has a Dynon Avionics 100433-001 OAT installed (typically connected to the EDC-D10A remote compass, shielded cable with Blue, Red, and Yellow wires):
    - Tape, heat shrink, or otherwise isolate the shield - it will not be used.
    - Tape, heat shrink, or otherwise isolate the Red wire - it will not be used.
    - Connect the Blue wire to either White w/Black Stripe wire (not polarity sensitive)
    - Connect the Yellow wire to the other White w/Black Strip wire (not polarity sensitive) from the SV-OAT-340.

PFD-Related Settings

Once the physical ADAHRS installation is complete, it may be necessary to configure PFD-related ADAHRS settings for the SkyView system. *All ADAHRS settings are automatically shared between displays in multi-display systems.*

Measurement Units

Set altitude, distance and speed, temperature, barometer, and pressure measurement units as detailed in the How to Configure Displayed Units Section of this guide.

ADAHRS Source Selection and Configuration

SkyView systems support multiple SV-ADAHRS-20X modules for redundancy and manage failure scenarios by automatically switching to backup modules should an ADAHRS completely fail.

Additionally, in the event that multiple ADAHRS disagree, the display will annunciate this with an on-screen alert that calls out which parameter(s) are not the same on all ADAHRS. The following parameters determine which ADAHRS is nominally preferred to be used. ADAHS can also be manually disabled and enabled from this menu.

Enter the ADAHRS Source Selection Page under PFD SETUP > ADAHRS SOURCE SELECTION.

ADAHRS Status

The ADAHRS labeled ACTIVE is the one displayed on the PFD.

An ADAHRS labeled STANDBY will be used for cross-checking, but will not be displayed on the PFD in normal operating conditions.

PRIMARY / ALTERNATE ADAHRS Selection

The ADAHRS labeled PRIMARY is the one that will be preferentially chosen by SkyView as the active ADAHRS that is displayed on the PFD.
An ADAHRS labeled ALTERNATE is one that is available to be used in the event of a failure or problem with the primary ADAHRS. However, it normally won't be chosen for display on the PFD unless the primary ADAHRS has failed or has manually been disabled.

To change which ADAHRS is the PRIMARY ADAHRS, highlight an ALTERNATE ADAHRS and press the PRIMARY button to elevate it to PRIMARY status.

To disable an ADAHRS until SkyView is next powered up, simply highlight it with the joystick and press the DISABLE button.

To see the same comparison screen that is presented when a cross-check error occurs, press the COMPARE button at the bottom of the display.

Press BACK to exit the ADAHRS Source Selection Page or press EXIT to return to the Main Menu. Either of these actions will save the ADAHRS source settings.

The SkyView system automatically switches to an alternate ADAHRS in the case of a failure.

Airspeed Limitations

Use the values on this page to set IAS tape colors. Set V-speed (e.g., stall speed in landing configuration) thresholds on the Airspeed Limitations Page (SETUP MENU > PFD SETUP > AIRSPEED LIMITATIONS). *The values on this page are default values that act as placeholders. You must adjust these values to work with your aircraft for any colors to show up on the IAS tape and also to be able to calibrate the autopilot servos.*

Vertical Speed Scale

Set the vertical speed scale on the Vertical Speed Scale Page (SETUP MENU > PFD SETUP > VERTICAL SPEED SCALE).

G Meter

Go to this page (SETUP MENU > PFD SETUP > G METER) to configure the G meter.

The pop-up thresholds are G values that, when exceeded, will cause the G meter to display automatically. The G meter replaces the HSI when it is displayed. In addition to popping up automatically, the G meter can be manually toggled on and off using the PFD > G METER button. If you do not want the G meter to ever be displayed automatically, set the positive pop-up threshold value very high and the negative pop-up threshold value very low.

You can also set yellow and red cautionary ranges of the G meter here, and whether or not the max/min recorded Gs are reset at each SkyView boot-up.

Synthetic Vision License

SkyView displays can be purchased with or without a license pre-installed that allows Synthetic Vision to be shown. In order to display Synthetic Vision, each SkyView display must be individually licensed to display it.

To check whether a display is licensed to display Synthetic Vision, go to SETUP MENU > LOCAL DISPLAY SETUP > LICENSE, and look at the status of the SYNTHETIC VISION line. If it is licensed, Synthetic Vision will be displayed as long as SkyView has a valid GPS position signal and has the appropriate high resolution terrain database installed for the region of the world that you are flying in. See the Terrain Data section of this manual for information about obtaining and loading terrain data to SkyView (high resolution terrain data is available for free from Dynon Avionics.)

To enable Synthetic Vision on displays that do not have it pre-installed, a license that allows a single display to display Synthetic Vision can be purchased in one of two ways:

1. Call Dynon Avionics directly at 425-402-0433 with your SkyView display model (SV-D100 or SV-D700) and serial number (as displayed on the case sticker, or in SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION). A License Code can be purchased for the particular display you wish to enable Synthetic Vision on. This six character License Code is then entered in SETUP MENU > LOCAL DISPLAY SETUP > LICENSE > LICENSE CODE.

2. A SkyView Synthetic Vision Certificate may be purchased from Dynon Avionics or any authorized Dynon Avionics retailer. This certificate can be redeemed for a license code that can be entered in SETUP MENU > LOCAL DISPLAY SETUP > LICENSE > LICENSE CODE to enable Synthetic Vision. To redeem a certificate simply follow the instructions on the certificate itself. Similar to the above, you will need to redeem your certificate by visiting license.dynonavionics.com with your SkyView display model and serial number ready. Alternatively, you can call Dynon Avionics directly at 425-402-0433 to redeem a certificate.

Other ADAHRS Calibrations

AOA/Pitot Probe Calibration

If the Dynon AOA/Pitot probe is installed, familiarize yourself with the AOA calibration procedure before flight by reading through the instructions in the AOA Calibration Wizard (SETUP MENU > HARDWARE CALIBRATION > ADAHRS CALIBRATION > AOA CALIBRATION).

Once you are flying straight and level at a safe altitude for stalls, go into the AOA Calibration Wizard (IN FLIGHT SETUP MENU > AOA CALIBRATION…) and follow the onscreen instructions to calibrate angle of attack while in flight.

More information about the physical installation of the AOA/Pitot probe can be found in the Angle of Attack Pitot Probe Installation and Configuration section of this manual.

Altitude Adjust

There is a single point altitude adjustment, located in SETUP MENU > HARDWARE CALIBRATION > ADAHRS CALIBRATION > ALTITUDE ADJUST that adjusts SkyView's barometric altimeter. This adjustment affects both the displayed altitude and the encoded altitude that is sent to other devices. It should only be adjusted if altitude is found to be incorrect (by comparing it against a known source or field elevation, AFTER the BARO setting has been set to correctly to known atmospheric conditions) after SkyView has fully warmed up.

Zero Pressure Airspeed Calibration

This calibration routine samples pitot and static pressures in a windless environment to allow SkyView to provide the best indicated airspeed readings that are possible at very low airspeeds. It is not a required calibration step, but performing this calibration may improve airspeed accuracy at very low indicated airspeeds. It is important that this calibration is done in an absolutely windless environment, such as a closed hangar. Additionally, before performing this calibration, cover both the pitot and static ports with a sock or cloth to minimize airflow WITHOUT putting any air pressure on the pitot or static ports.

Performing Pitot-Static Checks

Background

Dynon ADAHRS units use airspeed in the calculation of attitude (or GPS ground speed when airspeed is unavailable). The internal rate sensors are monitored and calibrated in flight using feedback from the accelerometers and from airspeed to achieve a highly accurate attitude solution.

When a pitot or static test is performed the ADAHRS is being exposed to dynamics that are impossible to achieve in a real aircraft flight environment, namely, large airspeed changes without the accompanying accelerations and rotations. This false condition will cause a well-calibrated unit to incorrectly adjust its calibration. Furthermore, when a unit is in a test situation a change in applied pitot or static pressure will cause the attitude to pitch up or down. This is expected.

Performing the following Dynon-prescribed pitot and static test procedure to a Dynon ADAHRS will prevent problems with the unit's performance in flight.

Pitot/Static Test Instructions

Basic Principles

- Ensure SkyView is warmed up during each test reading.
- SkyView should be powered off when changing pressures.
- Keep aircraft still (do not move) when pressure is applied.

Steps

1. The aircraft itself should be temperature stable. For example, if the aircraft is moved from outside in the sun to a hangar for testing, tests should not be started until the airplane has stabilized at the hangar temperature.
2. Turn SkyView on and let it warm up until the altitude reading is stabilized. This period should be at least 5 minutes, but may take longer depending on environmental conditions.
3. Turn SkyView off.
4. While SkyView is off, apply the pressure required by your test to pitot and/or static port via your test equipment.
5. Turn on SkyView (external or internal battery power is acceptable). Keep aircraft still while SkyView is powered on. Do not adjust the pitot or static pressures being applied to the ADAHRS while it is powered on.
6. Verify airspeed and/or altitude reading.
7. Turn SkyView off (using button 1 is a good option for this operation).
8. Repeat steps 4-7 for each required pressure point in the test.

6. SV-MAP-270 Navigation Mapping Software Purchase and Setup

Starting with SkyView software version 3.0, the SV-MAP-270 Navigation Mapping Software is available for purchase for $500. The Navigation Mapping Software replaces the free trial of the map that was previously available.

In place of the unlimited free trial period that existed prior to version 3.0, all SkyView systems have a 30 flight hour free trial of the Navigation Mapping Software that allows you to try it out before you purchase it. After the 30 flight hour free trial period expires, the MAP menu and all navigation and mapping features will not be available until a Navigation Mapping Software license is activated.

License Information

The SV-MAP-270 Navigation Mapping Software license is activated by purchasing a license code from Dynon Avionics and entering it into your SkyView system. Only **one** Navigation Mapping Software license is needed in a SkyView system, no matter how many displays are attached. That license is applied to only one display, but that display stores the license information for the entire system. In normal use, license information is shared with all displays connected via SkyView Network to allow the Navigation Mapping Software to be operated on any display in the system.

Checking License Status

To check whether a SkyView system is licensed to use the Navigation Mapping Software, go to SETUP MENU > LOCAL DISPLAY SETUP > LICENSE, and look at the status of the MAP line. Possible license statuses include:

- LICENSED (THIS DISPLAY): The SkyView system is licensed to use the Navigation Mapping Software. This display stores the license information and allows displays in an aircraft to also use the Navigation Mapping Software.
- LICENSED - CONNECTED DISPLAY ONLINE: The SkyView system is licensed to use the Navigation Mapping Software. This display is currently connected to a licensed display.
- LICENSED DISPLAY OFFLINE - XX HOURS REMAIN The SkyView system is licensed to use the Navigation Mapping Software. However, the display that actually stores the license information is not currently connected. When this happens, the Navigation Mapping Software will continue to operate for 30 flight hours beyond when it last saw the licensed display in the aircraft. Once the licensed display is seen again, this timer is cleared.
- NO LICENSE: No display in the SkyView system is licensed to use the Navigation Mapping Software.

Features Overview

Once licensed, the following features are enabled as long as SkyView has a valid GPS position signal, the appropriate high resolution terrain database installed for the region of the world that you are flying in, and aviation database installed.

- Use of MAP menu and features, including:
  - Display of airport, airspace, obstacles, traffic, and other aviation data that is available (capabilities depend on available databases and other installed equipment).
  - Display of basemap features, including roads, city names, railroads, rivers, and political boundaries.
  - All Navigation Mapping features available via the MAP menu.
  - Display of obstacles and runways on Synthetic Vision (if Synthetic Vision is licensed).
  - All future updates to the SV-MAP-270 Navigation Mapping Software product.

Purchasing and Installing a Navigation Mapping Software License

A license can be purchased and applied to your system in one of two ways:

1. Call Dynon Avionics directly at 425-402-0433 with your SkyView display model (SV-D100 or SV-D700) and serial number (as displayed on the case sticker, or in SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION). An SV-MAP-270 Navigation Mapping Software License Code can be purchased for the entire aircraft you wish to enable the Navigation Mapping Software on. This six character License Code is then entered in SETUP MENU > LOCAL DISPLAY SETUP > LICENSE > LICENSE CODE. If you have more than one display in the aircraft, choose one to install it onto and provide information for only that display. Once any display is licensed, all connected displays in the Aircraft can use the Navigation Mapping Software.
2. An SV-MAP-270 SkyView Navigation Mapping Software Certificate may be purchased from Dynon Avionics or any authorized Dynon Avionics retailer. This certificate can be redeemed for a license code that can be entered in SETUP MENU > LOCAL DISPLAY SETUP > LICENSE > LICENSE CODE. To redeem a certificate simply follow the instructions on the certificate itself. Similar to the above, you will need to redeem your certificate by visiting license.dynonavionics.com with your SkyView display model and serial number ready. Alternatively, you can call Dynon Avionics directly at 425-402-0433 to redeem a certificate.

Databases

SkyView utilizes a variety of databases to display information on the moving map and present options for navigation. These include:

- Terrain data: A high resolution terrain database data is used to display the topographic map. Available worldwide for free from Dynon Avionics.

- Aviation data: Airports, nav aids, airspace, airport information, etc. Available for free for US customers from Dynon. Jeppesen and PocketFMS data available for all other customers worldwide.
- Obstacles data: Available for free for US customers from Dynon. Jeppesen and PocketFMS data available for all other customers worldwide.
- Basemap and Cultural Data: Database is available for free for all customers from Dynon worldwide.

Viewing Information about Installed Databases

The Installed Databases Page (SETUP MENU > LOCAL DISPLAY SETUP > INSTALLED DATABASES) allows users to see the databases installed on their equipment as well as their respective versions and expiration dates. The sections below outline the various databases that are installed in SkyView.

Terrain Data

SkyView uses high resolution terrain data to display the base topographic map on the MAP page, as well as to display Synthetic Vision on the PFD page. SV-D1000s and SV-D700s ship preloaded with terrain data for North America (includes the continental United States, part of Alaska, most of Canada, Mexico, part of Central America, and the West Indies). Dynon offers downloadable high resolution terrain data files for other regions of the world on its website at www.dynonavionics.com/docs/terrain.html.

To update the terrain data in a SkyView display, download the appropriate file onto a USB flash drive (a 4 GB drive is included with every SkyView display) and then reference the How to Load and Delete Files Section of this guide for instructions on how to import the file onto a SkyView display. Because the terrain databases are large, only one can be installed in a SkyView display at a time. A large USB memory stick can hold multiple terrain databases for different regions of the world. However, each region's coverage area is chosen to cover most pilots' needs without having to ever switch between regions. Loading a new high resolution terrain database will automatically delete the one previously installed on your SkyView display.

Aviation/Obstacle Databases

Aviation and obstacle databases are used to display airports, runways, nav aids, airspace, obstacles, and other aviation data on the moving map. It also makes allows SkyView to provide detailed information about aviation features. SkyView can also provide navigation to these aviation features.

US Customers – Obtaining Free Dynon Data

Aviation and Obstacle data is available free-of-charge for US customers. Go to downloads.dynonavionics.com to download these databases to a USB memory stick. Reference the Loading Databases section of this guide below for instructions on how to import the file onto a SkyView display. Aviation data is updated every 28 days. Obstacle data is updated every 56 days.

Worldwide Customers - PocketFMS AeroData Subscriptions with Obstacles and Visual Reporting Points

The PocketFMS Foundation has been providing worldwide aeronautical data since 2003. AeroData is professionally maintained and updated for SkyView every 28 days, and is available as a yearly subscription including obstacles for €119. Coverage encompasses Europe, North America (including Canada), Australia, and New Zealand. It includes Aviation data (including visual reporting points) and obstacle data.

To order and download PocketFMS AeroData, visit their website at www.pocketfms.com/dynon/

Worldwide Customers - Jeppesen NavData® and Obstacle Data Services

Aviation and Obstacle for customers outside the US is available from Jeppesen. To purchase Jeppesen data:

- Visit www.JeppDirect.com/viewavionics for data subscription information from Jeppesen for your SkyView display.
- To order service, please call Jeppesen at:

U.S. & Canada	United Kingdom	Europe (except UK), Middle East, Africa and Asia	Australia
Toll-Free: 1-866-498-0213 Direct: 1-303-328-4030	Toll-Free: 0 (800) 085 5377 Direct: +44 129 384 2400	Toll-Free: 0 800 5377 3736 Direct: +49 6102 5070	Direct: +61 261 202 999

- Reference the Loading Databases section below of this guide for instructions on how to import the file onto a SkyView display.

Additional technical support from Jeppesen can be found online at http://www.jeppesen.com/support/technical-support.jsp.

Base map and Cultural Data

Base map and Cultural data is available free-of-charge for all customers for customers worldwide. This database contains roads, city names, railroads, rivers, and political boundaries. Like the terrain database, it is partitioned into different regions. Download the basemap database for your region from the Dynon website.

Go to downloads.dynonavionics.com to download the above databases to a USB memory stick. Reference the Loading Databases section below of this guide for instructions on how to import the file onto a SkyView display.

Loading Databases

1. Download database file(s) from downloads.dynonavionics.com, Jeppesen, or PocketFMS.
    a. If you've downloaded data from the Dynon website or PocketFMS: Copy the file onto your USB flash drive. *The file must be in the root directory of the drive in order to be recognizable by the display*
    b. If you've purchased data from Jeppesen: It is important that the Jeppesen JSUM program is used to place the Jeppesen data on the USB memory stick that will be used to load the data onto SkyView. If you manually copy Jeppesen data onto a USB memory stick, it will not load onto your SkyView system.
2. Insert the USB flash drive into one of the display's USB sockets.
3. Go to the Load Files Wizard (SETUP MENU > SYSTEM SOFTWARE > LOAD FILES…).
4. Select a file and press:
    a. LOAD to load the file onto the system.
5. Exit Setup
6. In SkyView systems that have more than one display, databases are automatically synchronized to other connected displays provided that those displays are connected via Ethernet. If they are, and you have the MAP page up on other displays, you may see a SYNCHRONIZING DATABASES message appear as this process occurs, followed by a display reboot. If you do not have your displays connected via Ethernet, simply load the database to each screen individually.

Removing Databases

SkyView automatically removes old databases when new ones are installed. Databases can also be removed manually by going to SETUP MENU > LOCAL DISPLAY SETUP > INSTALLED DATABASES. Highlight the database you wish to remove, and then press the REMOVE button.

Aviation Data updates are published periodically by Dynon, PocketFMS, and Jeppesen. It is the user's responsibility stay current with these updates and keep their equipment up to date.

7. SV-EMS-220/221 Installation and Configuration

This chapter contains information and diagrams that specifically apply to the installation of the SV-EMS-220/221 Engine Monitoring module and compatible transducers and sensors. After reading this chapter, you should be able to determine how to prepare an installation location, how to mount the module and its transducers and sensors, how to make all necessary electrical and transducer and sensor connections, and also how to configure the SkyView system for the installation's engine parameter sensing.

Dynon Avionics offers two engine monitor modules for SkyView. The SV-EMS-221 is only for use with the Rotax 912 iS. It differs from the SV-EMS-220 in that the four pins that can be used as optional thermocouple inputs on the SV-EMS-220 D37 connector (pins 27, 28, 36, and 37) are instead used for dedicated connection to the Rotax 912 iS's systems. Except for Rotax 912 iS compatibility and the lack of D37 thermocouple inputs, the SV-EMS-221 is identical to the SV-EMS-220. Conversely, the SV-EMS-220 cannot be used with the Rotax 912 iS. The Rotax 912 iS and SV-EMS-221 combination has a unique and somewhat simplified configuration compared to other engines. See the Rotax 912 iS example section below for further details.

Note that Dynon provides preconfigured sensor mapping and settings files as well as premade engine sensor connection wire harnesses. These resources support many popular four and six-cylinder engine installations. Reference the Example Engine Sensor and Transducer Installations Section for examples.

Figure 24 is a high-level overview of a suggested installation, configuration, and calibration procedure for the SV-EMS-220/221 and its associated wiring, sensors, and transducers.

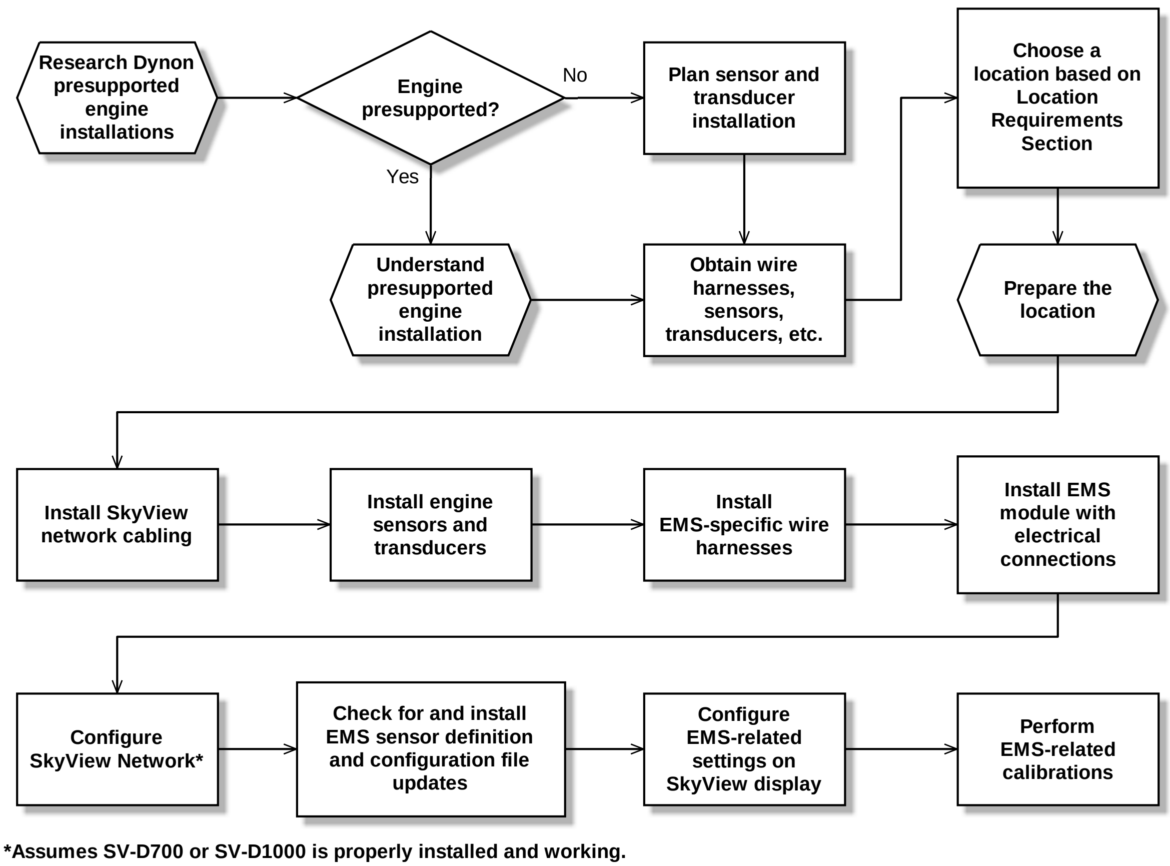


Figure 24–Suggested SV-EMS-220/221 Installation and Configuration Procedure

Physical Installation

The diagram below shows the mounting dimensions of the EMS module with electronic connections.

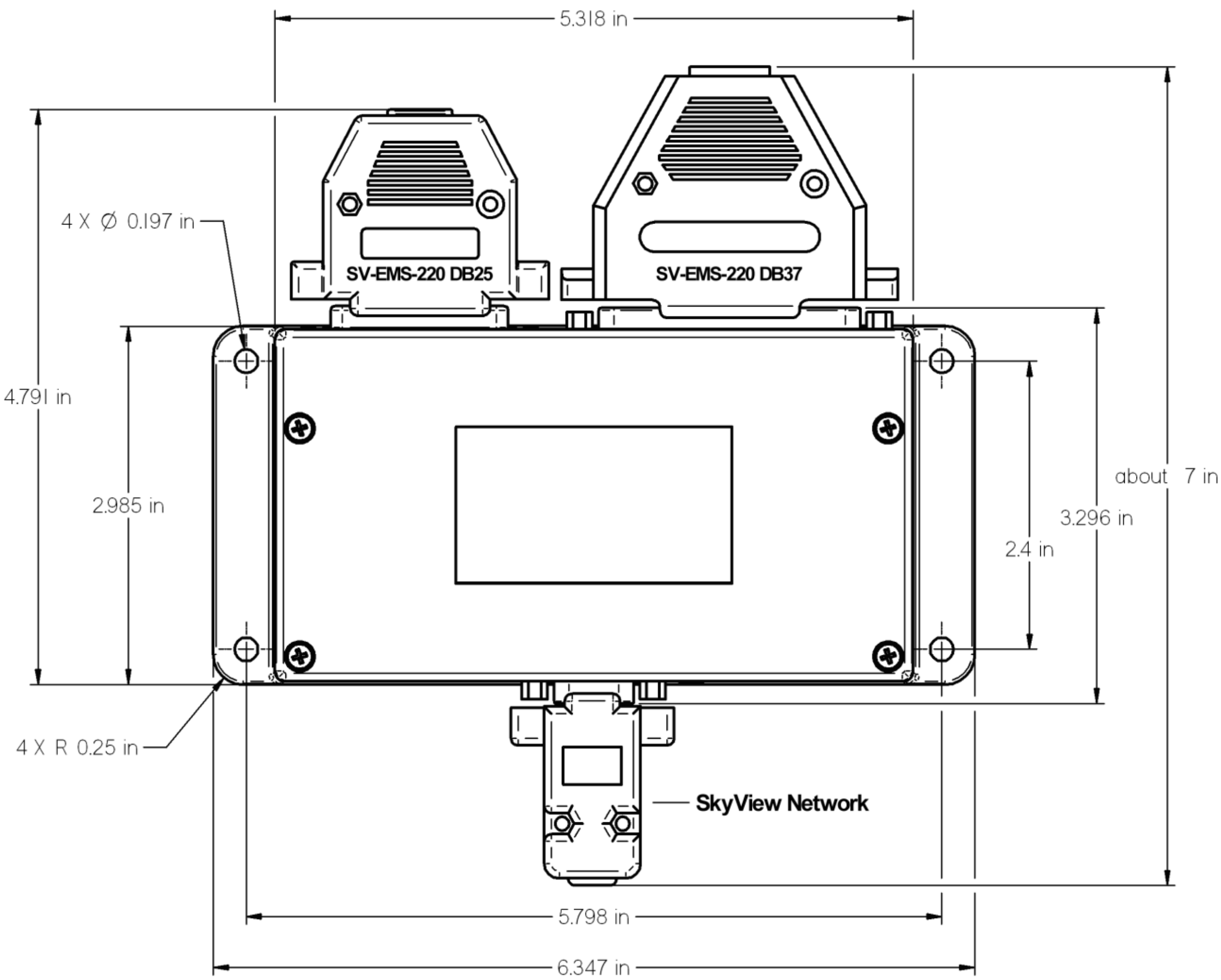


Figure 25–SV-EMS-220/221 Mounting Dimensions with Electronic Connections

Dynon does not include mounting hardware for use with the SV-EMS-220/221. The mounting tabs on each side of the module have holes sized for #10 fasteners, but it is up to the installer to decide how the EMS will be secured to the aircraft. Use of ferrous fasteners in this location is acceptable as the EMS is not adversely affected by small magnetic fields. Dynon recommends button head style AN hardware as spacing between the holes in the tabs and the body of the enclosure will limit what style tool can be used to tighten certain fasteners. Follow recommended torque practices when tightening the mounting hardware. *Do not rivet the SV-EMS-220/221 to the aircraft as this will hinder future removal if necessary.*

SkyView Network Connection

Connect the EMS module to the SkyView network using the hardware mentioned in the SkyView System Construction Section or using equivalent hardware.

If you have to install a connector on the end of a network cable, insert all pins into the D9 connector. Reference Appendix C: Wiring and Electrical Connections for details on connector pin-outs and wire colors.

Remember to configure the network after connecting all modules to a display.

SkyView EMS Sensor Definition and Configuration Files

The SkyView EMS utilizes a file to define sensor behavior and a file to map those sensors to pins on the SV-EMS-220/221 and configure the sensors' onscreen visual representations or widgets. The sensor definition file is preloaded onto all SkyView displays during manufacture and may need to be updated. The sensor mapping and configuration file is *not* preloaded onto displays and must be downloaded and installed by the user. Reference the EMS Sensor Definitions, Mapping, and Settings Section for more information.

Engine Sensor and Transducer Planning

In order to save installers time, Dynon provides preconfigured sensor mapping and settings files as well as premade engine sensor connection wire harnesses. These resources support many popular four and six-cylinder engine installations. Reference the Example Engine Sensor and Transducer Installations Section for examples.

Sensor mapping and settings files map SV-EMS-220/221 pins to engine transducers and sensors and also configure onscreen engine gauges with appropriate graphical settings. Reference Dynon's website at downloads.dynonavionics.com for more information.

The SV-EMS-220/221 is compatible with a wide range of sensors and transducers. Reference Table 53 on page 17-2 for a list of engine sensors and transducers that are known to be compatible with SkyView. Use the tools in this section as well as the worksheet on page 19-1 when planning sensor and transducer installation.

SV-EMS-220/221 Wire Harnesses

Engine and environmental sensors and transducers are connected to the SV-EMS-220/221 via two connectors on the module: one male 37-pin D-sub connector (D37) and one female 25-pin D-sub connector (D25). Dynon offers premade wire harnesses which break out the pins on these connectors and it is highly recommended that installers use these wire harnesses. Table 13 lists these wire harnesses and their respective connections to the SV-EMS-220/221.

Dynon Part Number	Description	Mates with…
100399-000	EMS 37-pin Main Sensor Harness	SV-EMS-220/221 Male D37
100399-001	EMS EGT/CHT 4-cylinder 25-pin Thermocouple Wire Harness	SV-EMS-220/221 Female D25
100399-002	EMS EGT/CHT 6-cylinder 25-pin Thermocouple Wire Harness	SV-EMS-220/221 Female D25
100399-004	EMS EGT 2-cylinder 25-pin Thermocouple Wire Harness	SV-EMS-220/221 Female D25

Table 13–EMS Wire Harnesses

A typical SV-EMS-220 installation will utilize one EMS 37-pin Main Sensor Harness and one of thermocouple wire harness. A typical SV-EMS-221 installation does not utilize a thermocouple harness. Choose a thermocouple wire harness based on the number of EGTs and/or CHTs that need to be monitored.

The EMS 37-pin Main Sensor Harness includes a D9 connector that is wired to pins 11 (Orange wire), 12 (Yellow wire), and 30 (Black wire). This connector is used for other Dynon products, is not used in SkyView installations. Thus, the D9 connector should be removed to use these wires for connecting sensors to the SV-EMS-220. Remove the connector by cutting the three wires close to the D9 connector.

The EMS 37-pin Main Sensor Harness (Dynon P/N 100399-000) may be wired with blue and green wires on pins 36 and 37, respectively. If you are going to use pins 36 and 37 for a thermocouple input such as a CHT or EGT (this is not possible on the SV-EMS-221 that is used with the Rotax 912 iS, as these wires are reserved for CAN communications), the blue and green wires should be removed and replaced with the appropriate type of thermocouple wire for thermocouple functionality on pins 36 and 37. If you are not going to use these pins for a thermocouple input, the blue and green wires do not need to be removed.

All of the ground wires on the SV-EMS-220/221 D37 are interchangeable, and can be used for any sensor that requires grounding. Additionally, one of these wires needs to be grounded to the aircraft locally to provide a good ground reference for the engine sensors. We suggest using the black ground wire connected to D37 pin 3 for this purpose.

Sensor and Transducer Compatibility Key

This section is primarily intended for users with installations that are not supported in or significantly deviate from the preconfigured installation resources available from Dynon. Reference Example Engine Sensor and Transducer Installations Section for installations which have downloadable preconfigured installation resources.

This section explains how to use Table 14–Sensor and Transducer Compatibility Level Key. There are three compatibility designations: A, B, and C. These designations are explained in the following paragraphs.

Sensor and transducer compatibility level A denotes that an SV-EMS-220/221 D37 pin labeled as “A” in Table 15 can be configured to support the vast majority of sensors and transducers used in aircraft installations, which are primarily *resistive* in nature. Sensors and transducers include contacts, fuel level, fluid pressure, fluid temperature, temperature, and position potentiometers. For example, SV-EMS-220/221 D37 pin 4 can be configured to read a resistive oil temperature sensor.

Sensor and transducer compatibility level B denotes that an SV-EMS-220/221 D37 pin labeled as “B” in Table 15 can be configured to support every sensor and transducer listed for “A” while also being compatible with 4 to 20 mA constant current source output sensors that are supported (currently only the Rotax P/N 956413 Honeywell and Rotax P/N 456180 oil pressure sensors).

Sensor and transducer compatibility level C denotes that an SV-EMS-220/221 D37 pin labeled as “C” in Table 15 can be configured to support every transducer and sensor listed for “A” while also being compatible with senders that employ active voltage output hardware including Dynon’s Capacitance-to-Voltage Converter.

If an SV-EMS-220/221 pin’s sensor config space is blank in Table 15, that means that pin has fixed functionality. This functionality is described under the Function column in the table.

Sensor and Transducer Compatibility Level	Example sensors and transducers
A	Contacts Fuel Level (resistive) 0-150 PSI Fluid Pressure (100411-002) 1/8”-27 NPT Fluid Temperature (100409-001) 5/8”-18 NPT Fluid Temp (100409-000) 0-30 PSI Fluid Pressure (100411-000) 0-80 PSI Fluid Pressure (100411-001) Jabiru Oil Temperature Jabiru Oil Pressure Dynon 2-Wire OAT Probe (100433-003) Dynon 2-wire Carburetor Temperature (100468-000) GRT Oil Pressure GRT Oil Temperature Rotax CHT or Oil Temperature (801-10-1) Flap/Trim Position
B	Everything in A, plus can be connected to a 4 to 20 mA current source sender (e.g., Rotax P/N 956413 Honeywell and Rotax P/N 456180 oil pressure sensors)

C	Everything in A, plus Dynon's Capacitance-to-Voltage Converter and other senders with active voltage output hardware. Type C inputs can measure 0-5V DC, but can accept up to 15V DC without damaging the input (any voltage above 5V is seen as 5V, however).

Table 14–Sensor and Transducer Compatibility Level Key

Future firmware updates may expand the scope of the compatibility levels listed in Table 14.

The tables on the following pages specify the sensor and transducer types that are supported by each pin on the male D37 and female D25 SV-EMS-220/221 connectors and the wire harness wire colors. Note that the only purpose of the 25-pin SV-EMS-220/221 wire harness is for thermocouple connections. This guide generally refers to the different variations of this as the thermocouple harness. Each connector's table is followed by a pin insertion view (rear) diagram.

Pin	EMS 37-pin Harness Wire Color	Function	Sensor Config
1	Red	Voltmeter 1 (0 to 30 volts DC)	
2	Yellow or Unwired	Voltmeter 2 (0 to 30 volts DC)	
3	Black	Ground	
4	Purple/Blue	General Purpose Input 1	A
5	Black	Ground	
6	White/Yellow	General Purpose Input 11	B
7	White/Brown	General Purpose Input 12	A
8	Brown	General Purpose Input 4	C
9	Brown/Blue	General Purpose Input 5	A
10	Brown/Yellow	General Purpose Input 6	A
11	Orange	General Purpose Input 7	A
12	Yellow	General Purpose Input 8	A
13	Black	Ground	
14	Yellow	Fuel Flow Input 1	
15	Red	Auxiliary 12 volt DC Output	
16	Black	Ground	
17	Black	Ground	
18	White/Red	Auxiliary 5 volt DC Output	
19	White/Black	Fuel Flow Input 2 (Return)	
20	Orange/Brown	General Purpose Input 9	A
21	Orange/Blue	General Purpose Input 10	A
22	Purple/Yellow	General Purpose Input 2	C
23	Purple/Green	General Purpose Input 3	A

Pin	EMS 37-pin Harness Wire Color	Function	Sensor Config
24	Orange/Green	Amps +	Amps Shunt
25	Orange/Purple	Amps -	Amps Shunt
26	Green/Red	Manifold Pressure Input	Manifold Pressure (100434-000)
27	Open	General Purpose TC Input 1+ (SV-EMS-220 only)	Thermocouple (SV-EMS-220 only)
28	Open	General Purpose TC Input 1- (SV-EMS-220 only)	Thermocouple (SV-EMS-220 only)
29	Yellow/Green	Warning Light	Optional External Alarm Light
30	Black	Ground	
31	White/Orange	General Purpose Input 13	C
32	White/Green	Standard RPM Input Left	
33	White/Blue	Standard RPM Input Right	
34	Blue	Low Voltage RPM Input Left	Do not connect to magneto
35	Green	Low Voltage RPM Input Right	Do not connect to magneto
36	Blue or Unwired	General Purpose TC Input 2+ (SV-EMS-220 only)	Thermocouple (SV-EMS-220 only)
37	Green or Unwired	General Purpose TC Input 2- (SV-EMS-220 only)	Thermocouple (SV-EMS-220 only)

Table 15–SV-EMS-220/221 Male D37 Pin-to-Sensor Compatibility

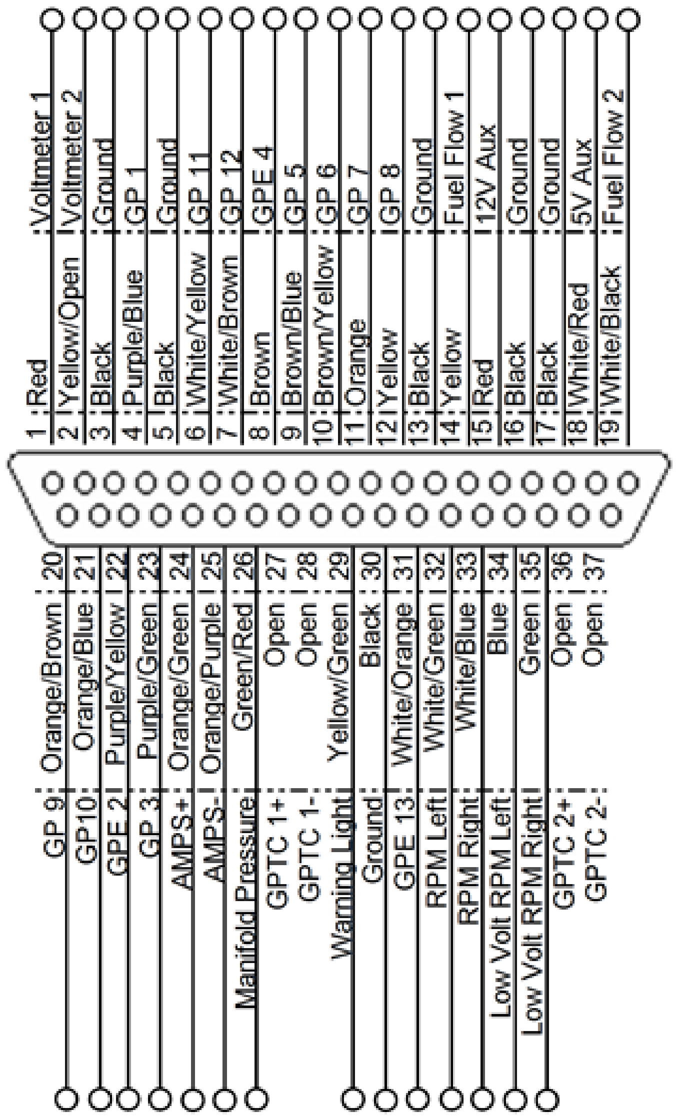


Figure 26– SV-EMS-220 37-pin Main Sensor Harness Female D37 Pin Insertion View (Rear)

Pin	Rotax 912 Harness (except 912 iS) (100399-004)	4-cyl Harness (100399-001)	6-cyl Harness (100399-002)	Wire Color	Function	Sensor Config
1	Do not connect					
2			✓	Red	CHT 6	J thermocouple
3			✓	Red	EGT 6	K thermocouple
4			✓	Red	CHT 5	J thermocouple

5			✓	Red	EGT 5	K thermocouple
6		✓	✓	Red	CHT 4	J thermocouple
7		✓	✓	Red	EGT 4	K thermocouple
8		✓	✓	Red	CHT 3	J thermocouple
9		✓	✓	Red	EGT 3	K thermocouple
10		✓	✓	Red	CHT 2	J thermocouple
11	✓	✓	✓	Red	EGT 2	K thermocouple
12		✓	✓	Red	CHT 1	J thermocouple
13	✓	✓	✓	Red	EGT 1	K thermocouple
14			✓	White	CHT 6	J thermocouple
15			✓	Yellow	EGT 6	K thermocouple
16			✓	White	CHT 5	J thermocouple
17			✓	Yellow	EGT 5	K thermocouple
18		✓	✓	White	CHT 4	J thermocouple
19		✓	✓	Yellow	EGT 4	K thermocouple
20		✓	✓	White	CHT 3	J thermocouple
21		✓	✓	Yellow	EGT 3	K thermocouple
22		✓	✓	White	CHT 2	J thermocouple
23	✓	✓	✓	Yellow	EGT 2	K thermocouple
24		✓	✓	White	CHT 1	J thermocouple
25	✓	✓	✓	Yellow	EGT 1	K thermocouple

Table 16–SV-EMS-220/221 Female D25 Pin-to-Sensor Compatibility

The Rotax harness only has EGTs 1 and 2 wired, as the EMS measures the Rotax-supplied resistive CHTs through its GP inputs. The four-cylinder harness only has EGTs 1 through 4 and CHTs 1 through 4 wired. On the supplied harness, each pair of wires is encased in brown insulation and labeled with corresponding cylinder number. Inside the outer insulations, each wire in the pair has the color listed in Table 16 and Figure 27.

If you make a custom thermocouple harness, note that all differential thermocouple inputs on the D25 and the D37 (SV-EMS-220 only) connectors are compatible with both J and K type thermocouples. Note that you will need to configure SkyView to support any installations that are not already supported in the preconfigured downloadable resources.

Figure 27 is a pin insertion view (rear) of the male D25 on the Thermocouple Wire Harness.

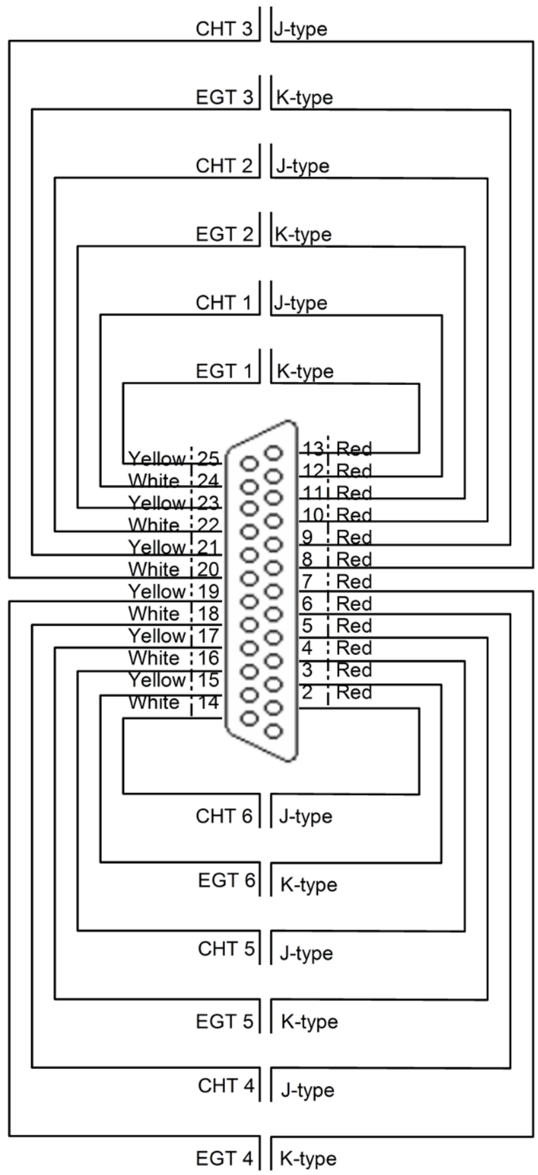


Figure 27– Thermocouple Wire Harness Male D25 Pin Insertion View (Rear)

Sensors Powered by the SV-EMS-220/221

Some sensors use a 5V (pin 18; white/red wire) or 12V (pin 15; red wire) power supply provided by the SV-EMS-220/221 module. These wires are designed to handle a limited amount of current. The typical Lycoming/Continental/Rotax/Jabiru installations as described in the rest of this chapter are designed to not exceed these current limitations. However, more complex and installations that differ significantly from these standard installations should be designed to not exceed the following current limitations:

EMS Module Output	Pin	Output Current Limit	Wire Color	Current Draw of Sensors that Use This Output
12V	15	80mA	Red	FloScan Fuel Flow Sensor (100403-001): 50mA EI Fuel Flow Sensor (100403-003): 15mA UMA Differential Fuel Pressure: 10mA Rotax Honeywell Oil Pressure Sensor: 20mA Rotax Oil Pressure Sensor P/N 456180: 20mA Dynon Capacitance to Voltage Converter: 25mA
5V	18	300mA	White/Red	Kavlico pressure sensors: 5mA 3rd party trim and flaps position: 5mA Manifold pressure sensor (100434-000): 10mA

Table 17- EMS Module Current Draw Limits for 5/12V Lines

Example Engine Sensor and Transducer Installations

This section contains *example* engine sensor and transducer installations for popular engines. Each engine subsection listed on the following pages contains tables for each SV-EMS-220/221 connector and *suggests* a way to connect that engine's required sensors to the EMS module. *These tables are based on the downloadable mapping and settings files available from Dynon's support forums and may need to be modified based on your particular installation.*

Example Lycoming/Continental 4-cylinder Carbureted (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Oil pressure (100411-002 or 101693-000)
7	White/Brown	Oil temperature (100409-000)
8	Brown	Fuel pressure (100411-000 or 101690-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Carburetor temperature (100468-000)
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Manifold Pressure (100434-000)
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 18–Example Lycoming/Continental 4-cylinder Carbureted 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Open	N/A
3	Open	N/A
4	Open	N/A
5	Open	N/A
6	Red	CHT 4 (J-type thermocouple, 100404-000*)
7	Red	EGT 4 (K-type thermocouple, 100405-000)
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	Open	N/A
15	Open	N/A

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
16	Open	N/A
17	Open	N/A
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 19–Example Lycoming/Continental 4-cylinder Carbureted 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity's sake.

Example Lycoming/Continental 4-cylinder Fuel Injected (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Oil pressure (100411-002 or 101693-000)
7	White/Brown	Oil temperature (100409-000)
8	Brown	Fuel pressure (100411-001 or 101716-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Not connected
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Manifold Pressure (100434-000)
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 20–Example Lycoming/Continental 4-cylinder Fuel Injected 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Open	N/A
3	Open	N/A
4	Open	N/A
5	Open	N/A
6	Red	CHT 4 (J-type thermocouple, 100404-000*)
7	Red	EGT 4 (K-type thermocouple, 100405-000)
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	Open	N/A
15	Open	N/A
16	Open	N/A
17	Open	N/A
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 21–Example Lycoming/Continental 4-cylinder Fuel Injected 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity’s sake.

Lycoming/Continental 6-cylinder Carbureted (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Oil pressure (100411-002 or 101693-000)
7	White/Brown	Oil temperature (100409-000)
8	Brown	Fuel pressure (100411-000 or 101690-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Carburetor temperature (100468-000)
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Manifold Pressure (100434-000)
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 22–Example Lycoming/Continental 6-cylinder Carbureted 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Red	CHT 6 (J-type thermocouple, 100404-000*)
3	Red	EGT 6 (K-type thermocouple, 100405-000)
4	Red	CHT 5
5	Red	EGT 5
6	Red	CHT 4
7	Red	EGT 4
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	White	CHT 6
15	Yellow	EGT 6
16	White	CHT 5
17	Yellow	EGT 5
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 23–Example Lycoming/Continental 6-cylinder Carbureted 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity's sake.

Example Lycoming/Continental 6-cylinder Fuel Injected (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Oil pressure (100411-002 or 101693-000)
7	White/Brown	Oil temperature (100409-000)
8	Brown	Fuel pressure (100411-001 or 101716-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Not connected
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Manifold Pressure (100434-000)
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 24–Example Lycoming/Continental 6-cylinder Fuel Injected 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Red	CHT 6 (J-type thermocouple, 100404-000*)
3	Red	EGT 6 (K-type thermocouple, 100405-000)
4	Red	CHT 5
5	Red	EGT 5
6	Red	CHT 4
7	Red	EGT 4
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	White	CHT 6
15	Yellow	EGT 6
16	White	CHT 5
17	Yellow	EGT 5
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 25–Example Lycoming/Continental 6-cylinder Fuel Injected 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity’s sake.

Example Jabiru 2200 (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Jabiru oil pressure
7	White/Brown	Jabiru oil temperature
8	Brown	Fuel pressure (100411-000 or 101690-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground
18	White/Red	Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Not connected
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Not connected
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 26–Example Jabiru 2200 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Open	N/A
3	Open	N/A
4	Open	N/A
5	Open	N/A
6	Red	CHT 4 (J-type thermocouple, 100404-000*)
7	Red	EGT 4 (K-type thermocouple, 100405-000)
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	Open	N/A
15	Open	N/A
16	Open	N/A
17	Open	N/A
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 27–Example Jabiru 2200 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity's sake.

Example Jabiru 3300 (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Elevator position potentiometer
5	Black	Ground
6	White/Yellow	Jabiru oil pressure
7	White/Brown	Jabiru oil temperature
8	Brown	Fuel pressure (100411-000 or 101690-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Not connected
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003)
16	Black	Ground
17	Black	Ground
18	White/Red	Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Flaps position potentiometer
23	Purple/Green	Not connected
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Not connected
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM Left (standard)
33	White/Blue	RPM Right (standard)
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 28–Example Jabiru 3300 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Red	CHT 6 (J-type thermocouple, 100404-000*)
3	Red	EGT 6 (K-type thermocouple, 100405-000)
4	Red	CHT 5
5	Red	EGT 5
6	Red	CHT 4
7	Red	EGT 4
8	Red	CHT 3
9	Red	EGT 3
10	Red	CHT 2
11	Red	EGT 2
12	Red	CHT 1
13	Red	EGT 1
14	White	CHT 6
15	Yellow	EGT 6
16	White	CHT 5
17	Yellow	EGT 5
18	White	CHT 4
19	Yellow	EGT 4
20	White	CHT 3
21	Yellow	EGT 3
22	White	CHT 2
23	Yellow	EGT 2
24	White	CHT 1
25	Yellow	EGT 1

Table 29–Example Jabiru 3300 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity's sake.

Example Rotax 912 (carbureted) (SV-EMS-220)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Ground
4	Purple/Blue	Rotax CHT or oil (801-10-1)
5	Black	Ground
6	White/Yellow	Rotax oil pressure (Honeywell or Rotax P/N 456180)
7	White/Brown	Rotax CHT or oil (801-10-1)
8	Brown	Fuel pressure (100411-000 or 101690-000)
9	Brown/Blue	Heated pitot status (contact input)
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Flaps position potentiometer
13	Black	Ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003) / Oil pressure (Honeywell and Rotax P/N 456180 only) sensor power
16	Black	Ground
17	Black	Ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Not connected
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Rotax CHT or oil (801-10-1)
23	Purple/Green	Elevator position potentiometer
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Manifold Pressure (100434-000)
27	Open	Not connected
28	Open	Not connected
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	RPM
33	White/Blue	Not Connected
34	Blue	Not connected
35	Green	Not connected

36	Blue or Unwired	Not connected
37	Green or Unwired	Not connected

Table 30–Example Rotax 912 37-pin Connector Sensor Map

Pin	EMS 25-pin Thermocouple Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Open	N/A
2	Open	N/A
3	Open	N/A
4	Open	N/A
5	Open	N/A
6	Red	N/A
7	Red	N/A
8	Red	N/A
9	Red	N/A
10	Red	N/A
11	Red	EGT 2 (K-type thermocouple, 100405-000*)
12	Red	N/A
13	Red	EGT 1
14	Open	N/A
15	Open	N/A
16	Open	N/A
17	Open	N/A
18	White	N/A
19	Yellow	N/A
20	White	N/A
21	Yellow	N/A
22	White	N/A
23	Yellow	EGT 2
24	White	N/A
25	Yellow	EGT 1

Table 31–Example Rotax 912 25-pin Connector Sensor Map

* Note that J-type and K-type thermocouples apply to all CHTs or EGTs, respectively. They are not repeated in the table for brevity's sake.

Example Rotax 912 iS (SV-EMS-221)

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Available ground
4	Purple/Blue	Not connected
5	Black	Available ground
6	White/Yellow	Not connected
7	White/Brown	Not connected
8	Brown	Fuel pressure (101716-000)
9	Brown/Blue	Not connected
10	Brown/Yellow	Not connected
11	Orange	Not connected
12	Yellow	Flaps position potentiometer
13	Black	Available ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003) / Oil pressure (Honeywell and Rotax P/N 456180 only) sensor power
16	Black	Available ground
17	Black	Available ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Return fuel flow (100403-003)
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Not connected
23	Purple/Green	Elevator position potentiometer
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Not connected
27	Open	RPM Signal to Rotax 912 iS Prop Controller (optional)
28	Open	NOTE: Must be grounded to common ground with Prop Controller
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	Not connected
33	White/Blue	Not Connected
34	Blue	Not connected

Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
35	Green	Not connected
36	Blue or Unwired	CAN High from 912 iS ECU
37	Green or Unwired	CAN Low from 912 iS ECU

The 912 iS ECU provides the following information to SkyView via a computerized CAN bus interface:

- Engine RPM (tachometer)
- Oil Temperature
- Oil Pressure
- Coolant Temperature
- Lane A Bus Voltage
- Lane B Bus Voltage
- EGT 1-4
- Manifold Pressure
- Fuel Flow
- Engine Time

Additionally, the SV-EMS-221 provides an RPM out signal that can be sent to the aircraft's propeller controller (if so equipped). The RPM out signal is nominally at 0 volts and steps to 12 volts for 0.1 milliseconds. The RPM out signal pulses once per engine revolution. The installer must verify compatibility between the RPM out signal and the RPM input requirements of the aircraft's propeller controller. The following diagram details all of the connections that need to be made between the Rotax 912 iS and the SV-EMS-221, as well as the optional RPM signal output to a propeller controller:

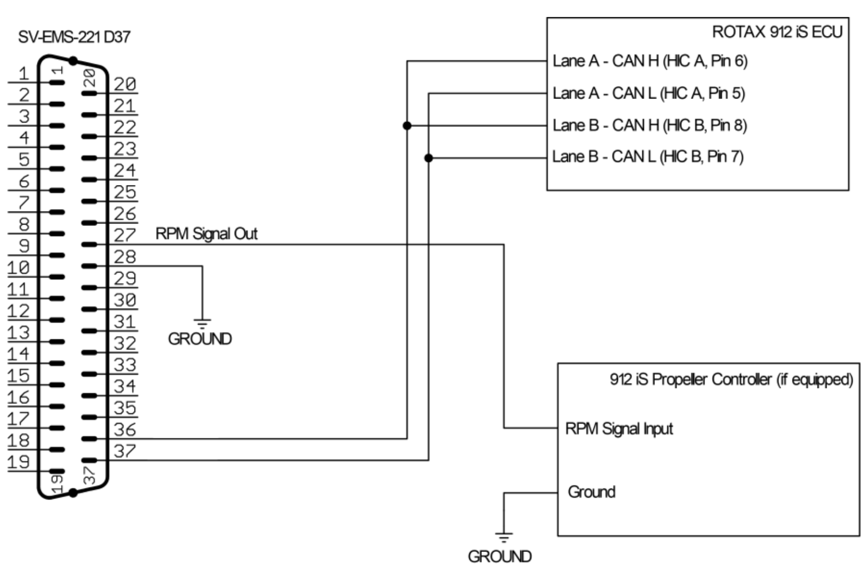


Figure 28 - SV-EMS-221 / Rotax 912 iS Connections

Other connections, including fuel pressure, amps, volts, trim/flaps, and fuel quantity sensors are made in the usual way between the individual sensors and the SV-EMS-221 directly.

Additional Rotax 912 iS Installation Instructions

When installing the 912 iS and setting it up to work with SkyView, please observe the following:

- The engine type under SETUP MENU > EMS SETUP > ENGINE INFORMATION > ENGINE TYPE must be set to ROTAX 912 iS(SV-EMS-221 Only) for 912 iS-specific indications to display properly.
- While the 912 iS ECU does report fuel flow information, but Rotax makes no claims about its accuracy. To allow the 912 iS ECU's fuel flow parameter to be used by SkyView for both fuel flow indications and fuel computer computations, simply make sure that pins C37P14 and C37P19 under SETUP MENU > EMS SETUP > SENSOR INPUT MAPPING are set to UNUSED. If, instead, you opt to use physical fuel flow senders, set these pins to fuel flow sensors in the usual way and the physical sender will automatically override the Rotax 912 iS ECU's fuel flow reports.
- The latest EMS sensor definitions file must be downloaded from the SkyView Downloads page at http://www.dynonavionics.com/docs/support_software_SkyView.html and loaded onto each display.
- See the EMS Engine Setups area at http://www.dynonavionics.com/docs/support_software_SkyView.html to download a file that sets up 912 iS-specific pin mappings. It also positions 912 iS-specific widgets on the EMS pages (such as ECU Lane A/B voltage, which must be monitored per Rotax).
- The Kavlico 50 PSI fuel pressure sensor (Dynon p/n 101716-000) is the **ONLY** sensor that can be used to monitor fuel pressure when SkyView is used to monitor a 912 iS. Additionally, when using the required 50 PSI Kavlico sensor for measuring fuel pressure, "KAV 50 PSI DIFFERENTIAL (101716-000)" sensor must be selected for fuel pressure sensor selection under SETUP MENU > EMS SETUP > SENSOR INPUT MAPPING instead of the KAVLICO 50PSI FLUID PRESS selection that is used for other configurations. If you use the EMS Engine Setup for the 912 iS that is available from the link above, this selection and setup is already correctly performed for you.

Engine Sensor and Transducer Installation

This section explains the steps required to install and connect all sensors and transducers supplied by Dynon Avionics. Additionally, connection instructions are given for some sensors and transducers that Dynon Avionics does not sell, like the tachometer, fuel level, flaps, trim, and contacts.

All sensors and transducers must be properly defined, mapped, and configured as described in the EMS Sensor Definitions, Mapping, and Settings Section of this guide.

Remember to configure the measurement units for your Engine Page as described in the How to Configure Displayed Units Section.

Engine Sensor Accuracy and Grounding

It is vitally important that all engine sensors, your Dynon SkyView display, your SV-EMS-220/221 module, and electrical system all share the same ground, and that there is virtually no measurable voltage between these grounds.

Large currents flow between your alternator and the rest of your aircraft. The ground for these currents is shared with your sensors. Because of the large currents involved, resistance in grounds that cannot be seen with a simple multimeter can still lead to significant voltage offsets. This can lead to errors in sensor readings.

These large currents exist in other places in the aircraft as well, such as between the battery ground cable and its connection to the airframe, and along the grounding points for the avionics bus. It is important that all of these ground paths be appropriately sized for the loads involved, and that the connections be clean, solid, and devoid of contamination.

In particular, be sure to connect a ground wire between your engine block or avionics ground block and any of the SV-EMS-220/221’s ground pins.

Please note that running a ground wire from the EMS to the engine block may not entirely solve grounding issue, as this adds just a small wire in parallel with another much larger wire, and the load will get transferred to this smaller wire, which itself is resistive due to its small size, and thus no real effect will be seen.

Though dealing with grounding issues can be time consuming and frustrating, errors that are seen on your Dynon Engine Monitor are caused by points in the aircraft where there is insufficient grounding. This can lead to weak starting, hot wires, and corrosion. Fixing the Engine Monitor readings by having a good ground will also lead to a healthier aircraft electrical system overall.

Tools and Equipment Required

The following list contains commonly used tools and equipment, however some of the tools or equipment listed below may not apply to your installation.

- Wire strippers
- 22 AWG wire
- D-sub pin crimper
- Faston/ring terminal crimp tool
    - Available from www.bandcspecialty.com – (316) 283-8000 – part number RCT-1
- Weather Pack crimp tool (common slip joint pliers will also work)
    - Available from www.whiteproducts.com/tools.shtml
- #2 Phillips screwdriver
- Flathead screwdriver
- ¼” ID tubes, any necessary adapters, and clamps for routing manifold pressure to the sensor.
- Drill and 1/8” bit

Voltmeter Inputs

Pins 1 and/or Pin 2 of the EMS D37 connector can be used to monitor voltage in your electrical system (or any other DC voltage source) from 10-30V DC. Connect either of the pins to a point in your electrical system that you wish to monitor.

Exhaust Gas Temperature (EGT) Probes

Correct placement of EGT probes on the exhaust manifold is critical to obtaining accurate readings. Placement differs between engine types and even specific models.

Consult the specific engine’s manual for proper EGT locations.

Rotax 912 (except 912 iS) Engines

For carbureted Rotax 912 engines, only two of the four cylinders are typically monitored for EGT. Unlike the CHT probes which are mounted on diagonal cylinders, the EGT probes should be mounted on the two rear cylinders’ exhaust manifolds. It is critical that the EGT probes be mounted to parallel cylinders’ exhaust manifolds for proper temperature comparison.

Most Other Engines

Once you have determined the appropriate EGT locations for your engine, drill 1/8” diameter holes at the specified positions in the exhaust manifold. Usually, this spot is 2 to 8 inches (50mm to 200 mm) from the cylinder. This spot should be on a straight portion of the exhaust manifold, as this provides a better fit for the hose clamps. For best results, mount all probes the same distance from each cylinder.

- Make sure the hole is placed to ensure that the probe does not interfere with the cowl or spark plug. Also, when making holes, keep in mind that the probe could inhibit the ability to perform routine maintenance if placed incorrectly.
- Place probe in exhaust manifold, and secure it by tightening the clamp with a flathead screwdriver. Make sure the clamp is tight and provides a secure fit, but do not over-tighten such that visible stress is put on the pipe.

Now, plug each thermocouple wire into its corresponding wire on the thermocouple harness. Ensure that you match the wire color pairs on the harness to those on the thermocouple. All thermocouple harnesses supplied by Dynon have each function (e.g., CHT1, EGT1) labeled on each thermocouple pair.

A loose probe could allow exhaust to leak. This can lead to carbon monoxide poisoning in the cabin and/or a potential fire. Have a knowledgeable mechanic inspect the installation.

The probe can come loose during flight, and could potentially come in contact with rotating engine parts or the propeller. We suggest a safety wire to keep the probe in place.

Cylinder Head Temperature (CHT) Probes

Dynon Avionics sells and supports a variety of CHT probes. All thermocouple harnesses supplied by Dynon have each function (e.g., CHT1, EGT1) labeled on each thermocouple pair.

Lycoming/Continental

Dynon Avionics sells bayonet style CHT probes (used in Lycoming and Continental engines). With each probe we sell, a bayonet adapter is included. Your specific engine manual should describe where to mount these bayonet adapters, but normally, there is a threaded hole (CHT well) near the bottom of the cylinder close to the lower spark plug. Screw the bayonet adapter into this hole. Screw the locking collar up or down the spring surrounding the probe such that the tip of the probe is pressed against the bottom of the CHT well when the collar is attached to the adapter. Insert the CHT probe into the well and lock the collar to the adapter. Now, plug each thermocouple wire into its corresponding wire on the thermocouple harness. Ensure that you match the wire color pairs on the harness to those on the thermocouples.

Rotax 912 (except 912 iS)

Rotax 912 engines use 2 resistive CHT probes that are included with the engine. These probes are preinstalled, but you need to route the connections from them to the SV-EMS-220. See the Rotax CHT Sensors Section for information on making the physical connection to the sensor.

Jabiru

Jabiru engines require a 12 mm ring-terminal CHT probe for each cylinder. First, slide the compression washer off the spark plug. Slide the 12 mm ring-terminal probe onto the plug. Now, slide the spark plug compression washer back onto the spark plug. Reinstall the spark plug into the spark plug hole. Please refer to the documentation that came with your engine for more information. Now, plug each thermocouple wire into its corresponding wire on the thermocouple harness. Ensure that you match the wire color pairs on the harness to those on the thermocouples.

Tachometer

Tachometer pulses/revolution must be set in the Engine Information Wizard (SETUP MENU > EMS SETUP > ENGINE INFORMATION).

Dynon Avionics does not sell a tachometer transducer.

Depending upon existing equipment and engine type, you have a few options for connecting the tachometer inputs on the SV-EMS-220/221. The following table revisits the SV-EMS-220/221 pins that are compatible with RPM sources.

Pin	Wire Color	Function
32	White/Green	Standard RPM Input Left (10+ volts)
33	White/Blue	Standard RPM Input Right (10+ volts)
34	Blue	Low Voltage RPM Input Left (2 to 10 volts)
35	Green	Low Voltage RPM Input Right (2 to 10 volts)

Table 32–SV-EMS-220/221 RPM Inputs

See the relevant subsections below for your particular method. You may connect different types of signals to the two different RPM inputs (e.g., p-lead to Standard RPM Left and a 12 volt transducer to Standard RPM Right).

If a standard RPM input is used, do not connect anything to the low voltage input of the same polarity (i.e., right or left). If a low voltage RPM input is used, do not connect anything to the corresponding standard RPM input.

Tachometer transducer

If you have a dedicated tachometer transducer (usually with a 12 volt output), you may simply connect its output to the *Standard RPM Left* input on the SV-EMS-220/221. Ensure that you follow all recommendations given in the manual for your individual tachometer transducer.

P-lead pickoff (Lycoming and Continental)

If you do not have a dedicated tachometer pickoff, you must follow the instructions below.

Use the two included 30 kΩ resistors (color bands: orange, black, brown, red, brown; connect in either direction) to attach left and right P-leads to the standard RPM Left

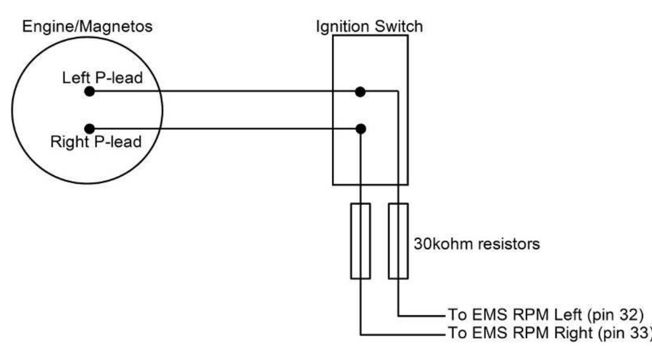


Figure 29–Magneto Pick Off

and RPM Right inputs on the SV-EMS-220/221. Connect them as shown in Figure 29. It is important to connect each resistor as close as possible to the spot where you tap into the P-lead. This minimizes the length of cable carrying high voltage spikes. Six-cylinder Lycoming engines sometimes need more inline resistance to prevent false readings by the SV-EMS-220/221. If you supply your own resistors, they need not be exactly 30 kΩ. Additionally, both 1/4W and 1/2W resistors are acceptable to use.

If, after setting the PULS/REV R and L values as described in the Engine Information Section, you see higher than expected RPM or unstable values, you may need to increase the series resistance to as high as 150 kΩ.

Trigger Coil (Rotax 912, except 912 iS)

The Rotax 912 engines have a 5th trigger coil for the purposes of electrically monitoring rev counts. This trigger coil outputs to a two-wire harness. Connect either of the two wires to ground; connect the other to the standard RPM Left input on the SV-EMS-220. If you observe erratic tachometer readings or momentary “spikes” in the display - particularly at higher RPM – install a 60K resistor inline (in series) between the trigger coil and SV-EMS-220 (RPM LEFT (Pin 32, White/Green wire).

Alternator Wire (Jabiru)

The most common tachometer pickoff location for Jabiru 2200 and 3300 engines is one of the alternator wires. Connect one of the two white alternator wires through a 1 amp fuse to the standard RPM Left input on the SV-EMS-220/221.

Digital Ignition and Other Pickoffs

The SV-EMS-220/221’s standard RPM inputs can read frequency-based RPM signals, provided the peak voltage goes at least 5.1 volts above ground, and crosses back down below 2.0V relative to ground. If the peak voltage exceeds 50 volts, use the included 30 kΩ resistors as described in the P-lead pickoff (Lycoming and Continental) Section above. Like the other methods above, you must know the number of pulses per revolution for your RPM transducer.

Low Voltage RPM Inputs

If you have an RPM source that outputs frequency-based RPM signals that are smaller than 10 volts above ground—such as Light Speed ignition outputs—use the low voltage RPM inputs. These inputs require that the peak voltage goes at least 2.1 volts above ground, and crosses back down below 0.8V relative to ground to be counted as a pulse.

Manifold Pressure Sensor

The manifold pressure sensor is an integral assembly consisting of three pins, a rubber seal, and a connector housing. Strip 3/16” insulation off the ends of the three wires listed at right. Slide the three rubber seals onto the three wires and the pins onto the ends of the wires. Crimp the 3 included pins onto the ends of the wires, ensuring that the long tabs that cradle the rubber seal wrap around the seal (see picture at right for example). For more details on preparing and crimping the Weather Pack pins, see www.whiteproducts.net/faqs.shtml.

Pin	Weather Pack Pin	Color	Function
18	C	White/red	+5 volt Auxiliary
26	B	Green/red	Manifold pressure
17	A	Black	Ground

Table 33–Manifold Pressure Sensor Pins

Note that you may need access to the SV-EMS-220/221’s +5 volt auxiliary supply for other sensor installations, so make allowances for breaking out the connection to other areas. Route the three wires to the location where you would like to mount the manifold pressure sensor.

Plug the crimped pins into the included Weatherpack connector. Now, mount the manifold pressure sensor in a secure fashion using the mounting holes on either side of the sensor.

The pressure port on the manifold pressure sensor requires 1/4” inner diameter tubing for a secure fit. You may need to use adapters to convert down to smaller inner diameter tubing for your specific engine. We recommend that you use pipe clamps at every transition point, including at the sensor itself.

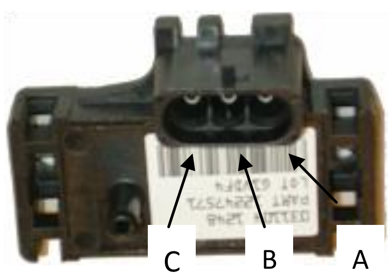


Figure 30–Connection diagram for sensor with all black wires only

Figure 32–Detail view of properly crimped pin.

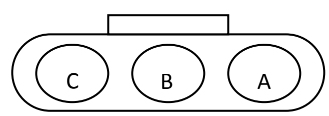


Figure 31–Pin insertion (rear) view of supplied connector.

Oil Pressure Sensor

The oil pressure sensor may be connected to any general purpose input pin on the SV-EMS-220/221’s D37, however, we recommend that it be connected to pin 6 on this connector.

The SV-EMS-220/221 supports several oil pressure sensor installations. The Dynon-supplied sensor and the Rotax and Jabiru pre-installed sensors are the most common.

Kavlico Brand Dynon-Supplied Brand Oil Pressure Sensor (101693-000)

Mount the oil pressure sensor securely using an Adel clamp or other method such as using a transducer mounting block on the firewall. Dynon does not recommend mounting the sensor directly to the engine to minimize the chance of mechanical failure of the transducer due to engine vibration. Unlike Dynon's older oil pressure sensor, the Kavlico pressure sensor has a dedicated ground wire, eliminating the need to use the sensor case as ground.

Connect the red wire to SV-EMS-220/221 D37 pin 18 (red/white). This connection may be shared with other sensors, depending on your installation.

Connect the green wire to SV-EMS-220/221 D37 general purpose input of your choosing (nominally pin 6)

Connect the black wire to Ground. Any the black ground wires on the SV-EMS-220/221 D37 harness are suitable for this purpose.

Legacy Dynon-Supplied Oil Pressure Sensor (100411-002)

1/8-27 NPT
0-150 PSI

Figure 33–Example Oil Pressure Sensor

First, mount the oil pressure sensor to a fixed location using an Adel clamp (see Figure 34) or other secure method. The oil pressure sensor must *not* be installed directly to the engine due to potential vibration problems. Dynon Avionics' sensor is supplied with a 1/8" NPT pipe thread fitting. An adapter might be necessary for some engines. Please see the manual supplied by the engine's manufacturer. You must use appropriate pipe fitting adapters and *ensure that the case of the sender has a connection to ground.* This is critical for functionality.

Figure 34–Adel Clamps

Crimp a standard #8 ring terminal onto general purpose input wire chosen for oil pressure. Unscrew the stud cap from the threaded stud. Place the ring terminal on the stud and secure the cap down sandwiching the ring terminal.

Due to vibration issues, never connect the sensor directly to the engine.

If you use Teflon tape or other seal, ensure the sensor casing still maintains a good connection to ground.

Rotax and Jabiru Oil Pressure

If you are installing on a Rotax or Jabiru engine, your engine comes with a pre-installed oil pressure sensor.

Prior to mid-2008, Rotax provided an oil pressure sensor with 2 tabs for electrical connection. If you are using this sensor, connect one of the tabs to a general purpose input pin and connect the other tab to ground (an SV-EMS-220/221 ground is appropriate).

In mid-2008, Rotax switched to a new type of oil pressure sensor made by Honeywell (Rotax P/N 956413) with an integrated cable. Connect the red wire of the newer sensor to SV-EMS-220/221 D37 pin 15 (+12 volt Auxiliary), the white wire to SV-EMS-220/221 D37 pin 6, and the black wire (if present) to ground. Select the correct sensor type as described in the EMS Sensor Definitions, Mapping, and Settings Section.

In late 2012, Rotax further switched to a new oil pressure sensor (Rotax P/N 456180). It is functionally identical to the previous Honeywell (Rotax P/N 956413) sensor, and connects in the same fashion as it. However, the connector and wiring for the sensor that Rotax includes with the engine may require some assembly. See the diagram below for the pinout of the connector.

Connect the wire connected to sensor pin B of the sensor to SV-EMS-220/221 D37 pin 15 (+12 volt Auxiliary), the wire connected to sensor pin C to SV-EMS-220/221 D37 pin 6. Sensor pin A need not be connected at all. Select the correct sensor type as described in the EMS Sensor Definitions, Mapping, and Settings Section.

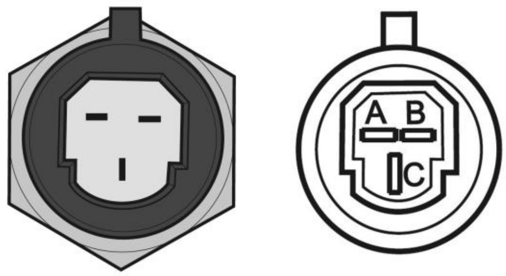


Figure 35 - Rotax Oil Pressure P/N 456180 pinout

Note: If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove any resistor that is connected to the existing oil pressure sensor. It is not needed when used with SkyView.

Rotax oil pressure sensor P/N 956413 is only compatible with SV-EMS-220/221 D37 pin 6. It will not work with any other pin.

Oil Temperature Sensor

The oil temperature sensor may be connected to any general purpose input pin on the SV-EMS-220/221's D37, however, we recommend that it be connected to pin 7 on this connector.

The oil temperature sensor needs to be installed according to the directions of the engine manufacturer. Dynon Avionics sells oil temperature sensors with both 5/8-18 UNF (Dynon P/N 100409-001) and 1/8-27 NPT (Dynon P/N 100409-000) threads. Ensure that you have the right sensor for your engine. Using a crush washer (not included; an AN900-10 type washer is appropriate for Dynon P/N 100409-001) between the sensor and the engine case, tighten the sensor according to your engine manufacturer's recommendations.

Route the wire from a general purpose input pin on the EMS 37-pin Main Sensor Harness to where the oil temperature sensor is mounted. When routing the wires, make sure that they are secured, so they will not shift position due to vibration. Strip ¼" of insulation off the end of the wire. Crimp a #10 ring terminal onto the end of the wire, ensuring that a good connection is made between the wire and the connector. Unscrew the nut from the stud on the oil temperature sensor. Slip the ring terminal onto the stud and secure the nut over it.

Figure 36–Example Oil Temperature Sensors

Some oil temperature sensors that SkyView supports (but are not sold by Dynon), such as the GRT FT-LC-01, have two wires. To connect this style of sensor, connect one wire to ground. Connect the other wire to the chosen general purpose input.

Fuel Pressure Sensor

The fuel pressure sensor may be connected to any general purpose input pin on the SV-EMS-220/221's D37, however, we recommend it be connected to pin 8 on this connector.

Kavlico Brand Dynon-Supplied Brand Fuel Pressure Sensors (101690-000, 101716-000, 101715-000)

Mount the fuel pressure sensor securely using an Adel clamp or other method such as using a transducer mounting block on the firewall. Dynon does not recommend mounting the sensor directly to the engine to minimize the chance of mechanical failure of the transducer due to engine vibration. Unlike Dynon's older fuel pressure sensor, the Kavlico pressure sensor has a dedicated ground wire, eliminating the need to use the sensor case as ground.

The fuel pressure sensor port has a 1/8-27 NPT pipe thread fitting; you may need adapters to connect to the pressure port on your engine. Locate the correct fuel pressure port for your engine. This port must have a pressure fitting with a restrictor hole in it. This restrictor hole ensures that, in the event of a sensor failure, fuel leakage rate is minimized, allowing time for an emergency landing.

Connect the red wire to SV-EMS-220/221 D37 pin 18 (red/white). This connection may be shared with other sensors, depending on your installation.

Connect the green wire to SV-EMS-220/221 D37 general purpose input of your choosing (nominally pin 8)

Connect the black wire to Ground. Any the black ground wires on the SV-EMS-220/221 D37 harness are suitable for this purpose.

Legacy Dynon-Supplied Fuel Pressure Sensors (100411-000 and 100411-001)

First, mount the fuel pressure sensor to a fixed location using an Adel clamp or other secure method such as using a transducer mounting block on the firewall. The fuel pressure sensor must *not* be installed directly to the engine due to potential vibration problems. Next, connect

the fuel sensor to the engine using appropriate hoses

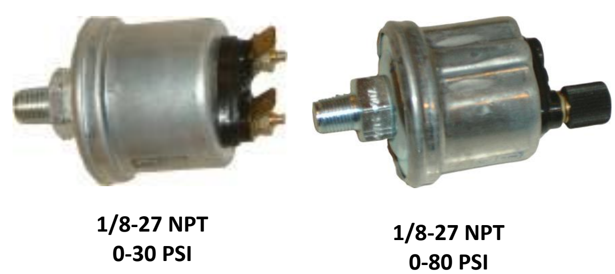


Figure 37–Example Fuel Pressure Sensors

and fittings. Its pressure port has a 1/8-27 NPT pipe thread fitting; you may need adapters to connect to the pressure port on your engine. Locate the correct fuel pressure port for your engine. This port must have a pressure fitting with a restrictor hole in it. This restrictor hole ensures that, in the event of a sensor failure, fuel leakage rate is minimized, allowing time for an emergency landing.

Carbureted engines–Use the 0-30 PSI sensor (Dynon P/N 100411-000). Crimp a standard ¼" female Faston onto one of the ground wires coming from the EMS 37-pin Main Sensor Harness or another ground source such as a local engine ground. Crimp another ¼" female Faston onto a general purpose input pin wire. Push the two Fastons onto the two terminals on the fuel pressure sensor. Polarity is not important. If you are converting from a GRT EIS system, you must disconnect the external resistor pull-up from the fuel pressure output. This will make the sensor output equivalent to the sensor supplied by Dynon Avionics.

Injected engines–Use the 0-80 PSI sensor (Dynon P/N 100411-001). Crimp a standard #8 ring terminal onto the SV-EMS-220/221 general purpose input wire of your choice. Unscrew the stud cap from the threaded stud. Place the ring terminal on the stud and secure the cap down sandwiching the ring terminal. If the connection between the sensor and your engine is non-metallic, you must connect the sensor case to ground through other means. The best way to accomplish this is by sandwiching a ground-connected ring terminal between the sensor and the mating fitting.

Due to vibration issues, never connect the sensor directly to the engine.

If you use Teflon tape or other seal, ensure the sensor casing still maintains a good connection to ground.

Rotax 914 Differential Fuel Pressure Sensor

The fuel pressure sensors that Dynon Avionics sells are not suitable for use with the Rotax 914 engine, as Rotax specifies that fuel pressure on the 914 engine be measured with respect to the air box pressure. All fuel pressure sensors sold by Dynon Avionics are only capable of measuring fuel pressure against ambient air pressure.

The UMA N1EU007D sensor is a third-party differential pressure sensor which measures fuel pressure with respect to air box pressure as required by the 914 engine. This sensor is not supplied by Dynon Avionics, but it is supported by SkyView.

Install the differential fuel pressure sender in an area convenient to the connections on the engine. The mounting threads are 5/8-18. Connect side of sender marked with a "W" to the fuel line close to the carburetors. Use 1/8-27 pipe thread fitting. Connect the other side of sender to the air box. This can be done by inserting a "T" in the carb vent lines that go to the air box. Use a 1/8-27 pipe thread, barbed insert into the sender. Make sure all fittings on the air box lines are tight using spring clamps or tie wraps.

Connect the red wire to EMS pin 15 (12V power). Connect the black wire to ground (an SV-EMS-220/221 ground is appropriate). Connect the white wire to any of the "C" type inputs on the SV-EMS-220/221 module - pins 8, 22, or 31 only.

Fuel Flow Sensor

The approximate pulses/gallon setting for the FloScan 201B (i.e., cast metal case legacy Dynon sensor) is 28,000 to 31,000. The approximate pulses/gallon for the Electronics International FT-60 (i.e., the red cube) is 68,000. You must configure the fuel flow sensor using this numerical value in the Sensor Setup Menu (SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION > FUEL FLOW CALIBRATION). More information on this topic is discussed in the Fuel Computer Configuration section of this chapter.

FloScan 201B sensor only: make note of the numbers on the tag (pulses / gallon) attached to the fuel flow sensor.

Dynon Avionics supplies the Electronics International FT-60 (Dynon P/N 100403-003) fuel flow transducer. Dynon no longer supplies the FloScan 201B, but SkyView is compatible with this sensor.

The SV-EMS-220/221 supports differential fuel flow sensor installations in Rotax 912 and 914 installations as illustrated in Figure 38.

Table 34 revisits which SV-EMS-220/221 pins are compatible with fuel flow sources.

Pin	Fuel Flow Sensor Wire Color	Dynon Harness Wire Color	Function
13 or 16 or 17	Black	Black	Ground
14	Yellow or White	Yellow	Fuel Flow Input 1 (From fuel tank)
15	Red	Red	+12 volt Auxiliary
19	Yellow or White	White/Black	Fuel Flow Input 2 for optional 2nd transducer (Return to fuel tank)

Table 34–SV-EMS-220/221 Fuel Flow Connections

General Placement Recommendations

- Do not install the Fuel Flow Transducer, hoses and fittings near exhaust system or turbocharger. Excessive heat can damage fuel system components.
- Do not install 90 degree fittings (elbows) on the input or output of the Fuel Flow Transducer. Doing so will cause turbulence in the fuel flow which causes inaccurate fuel flow data.
- Install the Fuel Flow Transducer with the three wires pointed UP.
- Install a fuel filter UPSTREAM of the fuel flow sensor to screen out debris.
- For best measuring performance, the fuel should travel uphill by one to two inches (25-50 mm) after leaving the fuel flow sender.
- Placement of the fuel flow sender relative to other items in the fuel system like fuel pumps is left to the builder. It is common to place the sender downstream of any auxiliary electric boost pumps but upstream of the engine driven fuel pump.

Due to vibration issues, never connect the sensor directly to the engine.

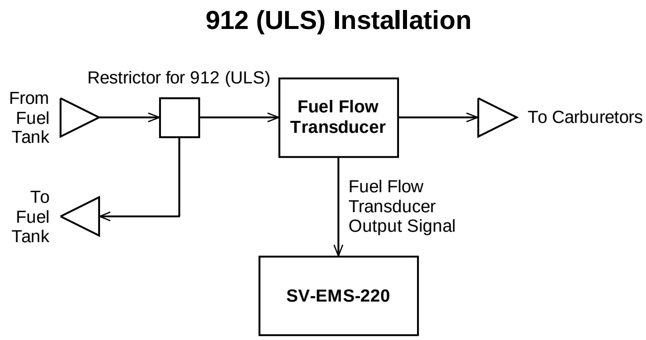
Do not use Teflon tape when screwing in any of the fittings.

EI “Red Cube” Installation

The Electronics International “Red Cube” FT-60 flow transducer has ¼” female NPT ports. Do not exceed a torque of 300 inch-lbs. (.112 Nm) when installing fittings into the transducer. The Red Cube FT-60 should NOT be installed with its wires pointing DOWN (the best situation is with the wires pointing UP). The fuel line on the outlet port should not drop down after exiting the transducer. This configuration can trap bubbles in the transducer, causing jumpy readings. The inlet port, outlet port, and flow direction are marked on the top of the FT-60.

Rotax Placement Recommendations

If installing on a Rotax 912, review Figure 38 for recommendations specific to these engines.



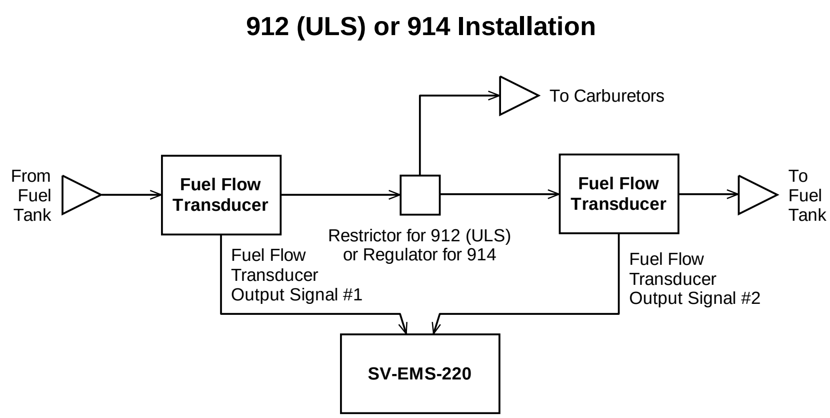


Figure 38–Rotax Fuel Flow Sensors (Single-ended Measurement on Top and Differential Measurement on Bottom)

In the differential fuel flow configuration in the lower portion of Figure 38, the first fuel flow transducer measures the fuel flow from the fuel tank. The second fuel flow transducer measures the unused fuel flow that returns to the fuel tank. The SV-EMS-220/221 takes data from both transducers and calculates net instantaneous burn rate.

Fuel Level Sensor

Dynon Avionics does not sell fuel level sensors.

The SV-EMS-220/221 supports both resistive type sensors as well as capacitive sensors which output a voltage (e.g., Princeton). If you have a capacitive sensor which does not output a voltage on its own, you may be able to use Dynon's Capacitance-to-Voltage Converter. Read the relevant section below for the type that you are installing.

After installation, fuel level sensors must be calibrated. Your SkyView display utilizes onscreen wizards that help you do this. Go to the EMS Calibration Menu to access these wizards (SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION).

Once a capacitive fuel level sensing system is calibrated for a certain type fuel, only that fuel should be used and the aircraft should be placarded for such. For example, ethanol has a dielectric constant much different than 100LL or Auto Fuel. If calibrated for 100LL, then by using Auto 10% Ethanol in the tanks the indications could off by 50%.

It is important to understand that fuel level measurements are subject to the physical limitations of the sensor. Depending on your fuel tank and sensor geometry, there may be some immeasurable fuel at one or both ends of the fuel level sensors' range. SkyView's fuel calibration process is designed with this in mind, and always takes the conservative approach to ensure that it does not report erroneous fuel readings that might indicate that there is more fuel on board than there actually is. The end result is that you may experience fuel readings at "full" that are numerically less than the physical capacity of the tanks, and in this case you may also see no apparent change in fuel level readings when the sensor is maxed out on the full side. Similarly, on the empty side, you may see a zero quantity indication before the tank is truly empty if the sensor has reached the bottom of its travel or measuring capability when the tank still in fact has fuel in it.

Resistive fuel level sensor

You may connect as many resistive fuel level sensors to the SV-EMS-220/221 as open general purpose inputs will allow. *We recommend that pins 20 and 21 of the SV-EMS-220/221 D37 are used before other general purpose inputs.*

Capacitive fuel level sensor

Capacitive fuel level sensors are only supported on pins 8, 22, and 31 on the SV-EMS-220/221 D37. Capacitive sensors need to output a variable voltage within the ranges of 0-5 volts DC.

First, supply the sensor with power according to the manufacturer's instructions. If the sensor manufacturer requires a sensor calibration, perform that calibration first. Be sure to configure the firmware to recognize the capacitive fuel level sensor on the enhanced general purpose inputs.

If you are installing Dynon's Capacitance-to-Voltage Converter (most commonly used with the capacitive plates in some RVs), please read the Capacitance-to-Voltage Converter installation instructions.

Note that SkyView displays are typically preconfigured to use resistive probes. Using capacitive sensors instead of resistive probes requires that you change EMS settings in a few places. First, change the pins used for fuel quantity via the SETUP MENU > EMS SETUP > PIN SENSOR INPUT MAPPING… menu. Then, delete the default fuel quantity widgets from each screen layout under SETUP MENU > EMS SETUP > SCREEN LAYOUT EDITOR. Finally add, the new fuel quantity widget(s) that will be available for the capacitive probes.

Ammeter Shunt

The ammeter shunt should be mounted so that the metal part of the shunt cannot touch any part of the aircraft. The ammeter shunt can be installed in your electrical system in one of three locations as shown in Figure 40.

Pin	Color	Function
24	Orange/green	amps high
25	Orange/purple	amps low

Table 35–Amps Pins

If you have a Vertical Power VP-X system in your aircraft, use either position A or position B. Position C is not useful in a VP-X installation because the VP-X measures aircraft loads directly.

- Position A–Ammeter indicates current flow into or out of your battery. In this position, it will show both positive and negative currents (i.e., -60 amps to +60 amps).
- Position B–Ammeter indicates only the positive currents flowing from the alternator to both the battery and aircraft loads. (0A-60A)

Figure 39–Amps Shunt

- Position C–Ammeter indicates the current flowing only into the aircraft loads. (0A-60A)

Note that the ammeter shunt is not designed for the high current required by the starter and must not be installed in the electrical path between the battery and starter.

The Ammeter Shunt packaging may be marked 40mV/40A. However, Dynon rates the shunt for up to 60A loads.

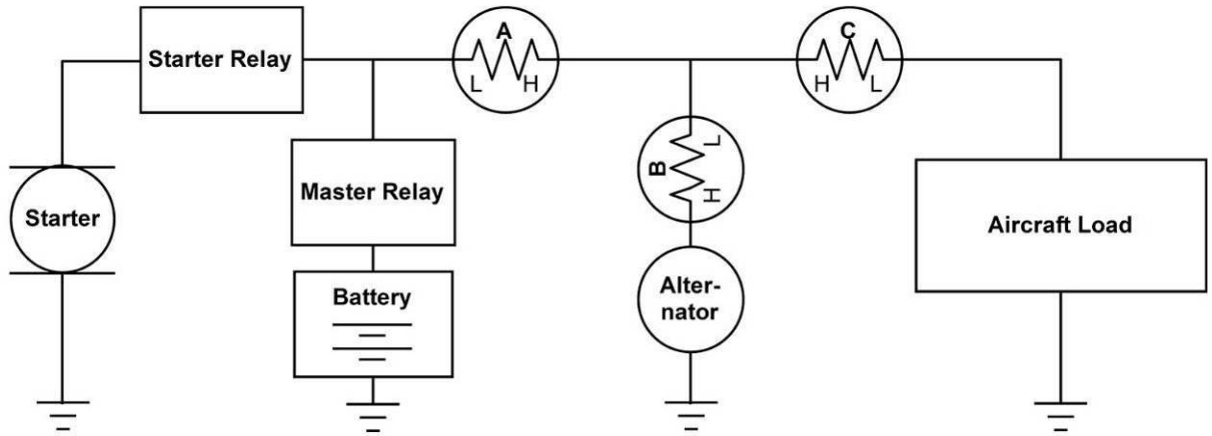


Figure 40–Recommended Amps Shunt Locations (simplified electrical diagram)

Use two ¼” ring terminals sized appropriately for the high-current wire gauge you will be routing to and from the ammeter shunt. Cut the wire where you would like to install the ammeter shunt. Strip the wire and crimp on the ring terminals. Using a Phillips screwdriver, remove the two large screws (one on either end of the shunt), slip the ring terminals on, and screw them back into the base.

We highly recommend that you fuse both the connections between the shunt and the SkyView as shown in Figure 41 below. There are two methods for accomplishing this. You may simply connect two 1 amp fuses in-line between the shunt and the SkyView. Or, you may use butt splices to connect 1” to 2” (25mm to 50mm) sections of 26 AWG wire between the shunt and each of the Amps leads connecting to the SkyView. These fusible links are a simple and cost-effective way to protect against short-circuits (fusible links in LSA installations may not be ASTM-compliant).

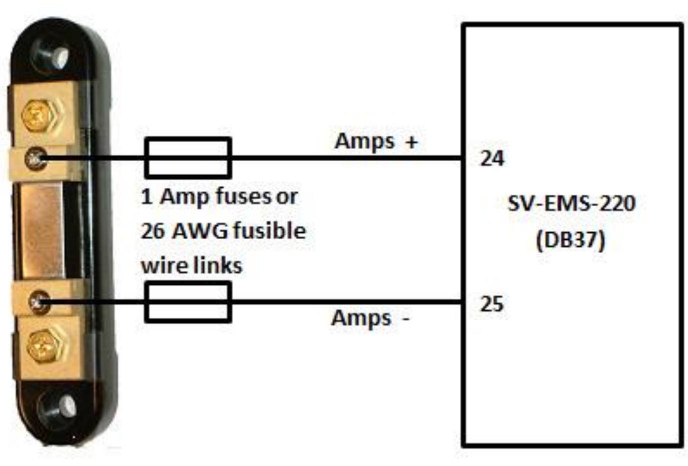


Figure 41- Amps Shunt Fuse / Wire Connection Diagram

Next, crimp the two supplied #8 ring terminals onto the wires using the fusing method chosen above. Connect the other ends of the fuses to the Amps High and Amps Low leads (pins 24 and 25) on the EMS 37-pin Main Sensor Harness. Unscrew the two smaller screws on the ammeter shunt. Slide the ring terminals onto them and screw them back into the base. Connect the "Amps High" lead to the side of the shunt marked by "H" in Figure 40; connect the "Amps Low" lead to the side marked by "L".

If you find that the current reading on the SkyView is the opposite polarity of what you want, swap the two signal inputs (Amps High and Amps Low) to obtain the desired result.

It is extremely important that you secure all loose wires and ensure that exposed terminals cannot touch or short out to other objects in the plane. All metal on the shunt is at the same voltage as–and carries the same risks as–the positive terminal on the battery. Improperly installing the ammeter shunt can result in high current flow, electrical system failure, or fire.

GRT CS-01 Hall Effect Current Sensor

Dynon does not supply this sensor. It is available from GRT Avionics, and can be used as an alternative to the Dynon-supplied amps shunt for measuring current

Note: The GRT CS-01 sensor does not connect to Pin 24/25 (Amps Shunt +/- Input). If you are converting from a Dynon EMS, you will have to change your wiring per the instructions below).

Route the main power cable through the CS-01 "donut". Connect the three CS-01 Wires to the SV-EMS-220/221 37-pin connector:

Function	CS-01 Wire Color	Dynon SV-EMS-220/221 pin	Dynon Harness Wire Color
Ground	Black	Any of 3,5,13,16,17,30	Black
Power	Blue	18 (+5V)	White/Red
Signal	Green	Any of 8,22,31	Varies

Figure 42 - GRT CS-01 EMS Connections

The CS-01 has some special considerations during setup. Configure the CS-01 using the following instructions:

- Go to SETUP MENU >EMS SETUP > SENSOR INPUT MAPPING. Choose one of Pin 8, 22, or 31, as is physically connected above.
- For the "FUNCTION" column selection, choose "AMP"
- For the "SENSOR" column selection, choose one of the AMMETER HALL EFF (offset value) (GRT CS-01), where offset value is chosen per the following:

  - Because each individual CS-01 varies somewhat, configuring the CS-01 typically requires an amps "offset" value to be utilized. SkyView provides 17 different offsets via different choices in the SENSOR column. These contain offsets that range from "-8" (offset of -8A) through "+8" (offset of +8A). If you wish the CS-01 value on your SkyView EMS to display most accurately at zero current, choose the offset that displays "0A" when zero current is flowing through system. This can be done by turning off all avionics power and operating SkyView on its backup battery. If you wish the current to display most accurately at normal current draw, choose whichever of the 17 offset values provides the most accurate current reading. (This will require some experimentation.)
- Set the name column to “AMPS” (default) or create a custom name.

Carburetor Temperature Sensor

The carburetor temperature sensor may be connected to any general purpose input pin on the SV-EMS-220/221’s D37, however, we recommend that it be connected to pin 23 on this connector.

Install the carburetor temperature sensor in the venturi area at the point where ice first begins to form. This is located after the main nozzle, before the throttle valve. You must remove the plug in the carburetor housing below the throttle valve. On four-cylinder engines which use the Marvel Schebler MA-3 carburetors, this plug is located on the forward side. On six-cylinder engines using the MA-4 carburetor, the plug is located on the rear. If your carburetor is not drilled and tapped for the plug, you must remove the carburetor from the engine and drill out the lead plug in the appropriate spot. Tap the hole with a ¼-28 tap. Remove all chips and burrs before reinstalling.

Route either of the two wires to an electrical ground on the SV-EMS-22X D37 connector. Route the other wire to the general purpose input of your choice.

Note: If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove any resistor that is connected to the existing carburetor temperature sensor. It is not needed when used with SkyView.

Rotax CHT Sensors

The Rotax CHT sensors may be connected to any general purpose input pin on the SV-EMS-220/221’s D37, however, we recommend that they be connected to pins 4 and 22 for left and right signals, respectively.

Crimp *bare* ¼” female Faston terminals (6.3x0.8 according to DIN 46247) onto the ends of two general purpose input wires on the EMS 37-pin Main Sensor Harness. Locate the left-side CHT sensor screwed into the bottom side cylinder head 2; slide the Faston connected to one of the general purpose inputs onto it. Locate the left-side CHT sensor screwed into the bottom side of cylinder head 3; slide the Faston connected to the other general purpose input onto it.

Note: If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove any resistor that is connected to the Rotax CHTs. They are not needed when used with SkyView.

Trim and Flaps Position Potentiometers

Position potentiometers may be connected to any general purpose input pin on the SV-EMS-220/221's D37 and must be calibrated according to the instructions found in the EMS Sensor Calibration Section. The number of position potentiometers in any installation is limited by the number of unused general purpose input pins on the SV-EMS-220/221's D37 connector. The tables in the Example Engine Sensor and Transducer Installations Section contains recommended input pins for position potentiometers.

Dynon Avionics does not sell trim or flaps position sensors. These are normally included with, or added onto, their respective servos.

Most flap and trim sensors are potentiometers (variable resistors) which require power and ground inputs, and supply an output that is a function of position. These potentiometers come in a variety of resistance ranges, but are typically 1 kΩ, 5 kΩ, 10 kΩ, and 20 kΩ. All of these values will work properly with the SkyView, as there is a calibration required. Connect the +5 volt Auxiliary pin from the SV-EMS-220/221's D37 to the +5 volt input on your trim/flap position sensor. Note that you may need access to the SV-EMS-220/221's +5 volt auxiliary supply for other sensor installations, so make allowances for breaking out the connection to other areas. Connect the ground input on the sensor to a ground common to the SV-EMS-220/221's signal ground. Connect the output of the sensor to the desired general purpose input. For physical installation, refer to the instructions that came with your position sensor.

If you are using the output from a Ray Allen servo or sensor, connect its white/orange wire to the SV-EMS-220/221's +5 volt Auxiliary pin (D37, pin 18), its white/blue wire to ground, and its white/green wire to the general purpose input of choice. Note that you may need access to the SV-EMS-220/221's +5 volt auxiliary supply for other sensor installations, so make allowances for breaking out the connection to other areas.

Trim and flaps position potentiometers must be calibrated. Your SkyView display utilizes onscreen wizards that help you do this. Go to the EMS Calibration Menu to access these wizards (SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION).

The take-off position will be shown as a green line on the trim widget. If you do not want this marking on your trim widget, press NONE during the take-off position portion of the trim calibration.

Coolant Pressure Sensor

The coolant pressure sensor may be connected to any general purpose input pin on the SV-EMS-220/221's D37.

Kavlico Brand Dynon-Supplied Brand Fluid Pressure Sensors (101716-000)

Mount the pressure sensor to a fixed location using an Adel clamp or other secure method such as using a transducer mounting block on the firewall. Unlike Dynon's older fluid pressure sensors, the Kavlico sensor has a dedicated ground wire, eliminating the need to use the sensor case as ground. Next, connect the sensor to the coolant line using appropriate hoses and fittings. Its pressure port has a 1/8-27 NPT pipe thread fitting; you may need adapters to connect to the pressure port on your engine. Locate (or drill and tap) the pressure port along the coolant line. This port must have a pressure fitting with a restrictor hole in it. This restrictor hole ensures that, in the event of a sensor failure, coolant leakage rate is minimized, allowing time for an emergency landing.

Connect the red wire to SV-EMS-220/221 D37 pin 18 (red/white). This connection may be shared with other sensors, depending on your installation.

Connect the green wire to SV-EMS-220/221 D37 general purpose input of your choosing.

Connect the black wire to Ground. Any the black ground wires on the SV-EMS-220/221 D37 harness are suitable for this purpose.

Legacy Dynon-Supplied Coolant Pressure Sensor (100411-000)

The Dynon-supplied coolant pressure sensor is a 0-30 psi sensor (Dynon P/N 100411-000). First, mount the pressure sensor to a fixed location using an Adel clamp or other secure method. The pressure sensor must *not* be installed directly to the engine due to potential vibration problems. Next, connect the sensor to the coolant line using appropriate hoses and fittings. Its pressure port has a 1/8-27 NPT pipe thread fitting; you may need adapters to connect to the pressure port on your engine. Locate (or drill and tap) the pressure port along the coolant line. This port must have a pressure fitting with a restrictor hole in it. This restrictor hole ensures that, in the event of a sensor failure, coolant leakage rate is minimized, allowing time for an emergency landing.

Crimp a standard ¼" female Faston onto one of the grounds coming from the SV-EMS-220/221's EMS 37-pin Main Sensor Harness. Crimp another ¼" female Faston onto the wire that corresponds to the desired general purpose input. Push the two Fastons onto the two terminals on the fuel pressure sensor. Polarity is not important.

Note: If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove any resistor that is connected to the existing coolant pressure sensor. It is not needed when used with SkyView.

Due to vibration issues, never connect the sensor directly to the engine.

If you use Teflon tape or other seal, ensure the sensor casing still maintains a good connection to ground.

Coolant Temperature Sensor

The coolant temperature sensor may be connected to any general purpose input pin on the SV-EMS-220/221's D37.

The coolant temperature sensor needs to be installed according to the directions of your engine's manufacturer. Dynon Avionics sells temperature sensors with both 5/8-18 UNF (Dynon P/N 100409-001) and 1/8-27 NPT (Dynon P/N 100409-000) threads; these are the same as those used by the oil temperature inputs. If neither of these threads matches those in your coolant line, you will need to use adapters or drill/tap your own. Using a crush washer between the sensor and the mating line, screw the sensor into the fitting. Do not over tighten.

Route the wire from the desired general purpose input pin on the SV-EMS-220/221's EMS 37-pin Main Sensor Harness to where the coolant temperature sensor is mounted. When routing the wires, make sure that they are secured, so they will not shift position due to vibration. Strip ¼" of insulation off the end of the wire. Crimp a #10 ring terminal onto the end of the wire. Ensure that a good connection is made between the wire and the connector. Unscrew the nut from the stud on the coolant temperature sensor. Slip the ring terminal onto the stud and secure the nut over it.

Note: If you are converting a Dynon D10/D100 product installation to a SkyView installation, you should remove any resistor that is connected to the existing coolant pressure sensor. It is not needed when used with SkyView.

Rotax Pre-installed Coolant Temperature Sensor: Wire the coolant temperature sensor in the same way as shown above for the Dynon-supplied sensor.

General Purpose Temperature Sensor

Any temperature sensor provided by Dynon may be utilized as a general purpose temperature sensor on any general purpose input pin on the SV-EMS-220/221's D37.

For example, you may connect an SV-OAT-340 probe and configure it as a general purpose thermometer (e.g., for cabin temperature). Connect one of the wires to the input pin, and the other wire to any available EMS GROUND.

Contacts

Contacts may be connected to any general purpose input pin on the SV-EMS-220/221's D37. The number of contacts in your SkyView system is only limited to the number of unused general purpose input pins on the connector.

Dynon Avionics does not sell contacts or switches.

Contacts are used for a variety of purposes, such as monitoring canopy closure. The EMS firmware reads the voltage state of general purpose inputs. To configure them as contacts, use two voltage ranges in your sensor setup. Set one to 0-2V, and the other from 2-5V. SkyView will then report whether each input is open (no connection to ground, which is the 2-5V state) or closed (connection to ground, which is the 0-2V state). You must ensure that when closed, the contact connects to a ground common to the SkyView system. The voltage on the general purpose inputs must not exceed 15 volts.

General Purpose Thermocouple

You may configure the SV-EMS-220 to monitor two J or K type thermocouples in addition to the twelve thermocouples available on the SV-EMS-220's D25. Note that the SV-EMS-221 uses these four pins for Rotax 912 is communication, and, therefore, these pins are not available for thermocouple use on the SV-EMS-221. Dynon Avionics does not supply a specific general purpose thermocouple probe for this purpose. However, our standard EGT and CHT probes will work, as will any other J or K type thermocouple.

The following table revisits which SV-EMS-220 pins are compatible with general purpose thermocouples.

Pin	Wire Color	Function
27	Not supplied	General Purpose TC Input 1+
28	Not supplied	General Purpose TC Input 1-
36	Blue	General Purpose TC Input 2+
37	Green	General Purpose TC Input 2-

Table 36–SV-EMS-220 D37 General Purpose Thermocouple Pins

If you use the second general purpose thermocouple input on pins 36 and 37, it is necessary to remove the blue and green wires from these pins on the EMS 37-pin Main Sensor Harness.

Dynon Avionics sells both J and K type thermocouple wire which may be used to connect the desired thermocouple to the SkyView. Ensure you order the correct wire type for the thermocouple you intend to use. Crimp a female D-sub pin on the end of each wire, and plug them into the SV-EMS-220's EMS 37-pin Main Sensor Harness D37. Polarity is important, so ensure that you are routing the positive side (yellow for K-type; white for J-type) of the thermocouple to pin 27 or pin 36 on the 37-pin harness, and the negative side to pin 28 or pin 37.

External EMS Warning Light

SV-EMS-220/221 D37 pin 29 can be wired and configured as an External Alarm Light

To wire EMS D37 pin 29 as an External Alarm Light, you may connect any standard LED or incandescent lamp (1.5 watts maximum), used during EMS-related "red" warning alarm conditions. Ensure that the LED or lamp is designed for the voltage of your system. Mount it to your panel according to its recommendations. Connect one of the lamp's leads to your plane's power. Connect the other lead to pin 29 on the SV-EMS-200 37-pin wiring harness. During an alarm condition, this pin is connected to ground, causing current to flow through the lamp.

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. Also note that the power and ground connections on LEDs are not reversible.

Engine Information

Use the Engine Information Wizard (SETUP MENU > EMS SETUP > ENGINE INFORMATION) to specify the engine type, its horsepower rating, its redline and cruise RPM, the RPM pulse configuration, and tach and Hobbs time (if installation is in a non-zero time engine).

The Inhibit Engine Alerts at Boot option: When set to YES, all engine alerts, both audio and visual, will occurs until after the first engine start, or 5 minutes, whichever comes first. This option can help inhibit nuisance alarms before the engine is started. When set to NO, engine alerts are always active.

If you have an engine type that is in the list, please choose the appropriate engine. This will allow the system to perform some calculations that are specific to that engine, such as % power (Lycoming / Continental only) and special operating limitations (Rotax only). If your engine is not listed, choose "Other."

Horsepower is used to do some of the % power calculations (Lycoming/Continental engines only) and the auto Rich-of-Peak and Lean-of-Peak detection. Set it to the engine manufacturer's rated HP for initial usage. You may need to adjust this number in order to get all calculations working correctly.

If you are getting an auto Lean-of-Peak indication that is coming on too early, before the engine actually peaks while leaning, lower this number. It is not meant to be a measure of actual horsepower produced, as engines that are more efficient will act as if they are lower horsepower in the calculation. This will be particularly true if you are running a higher compression ratio than the stock charts are based upon.

Cruise RPM is used when calculating tach time. Tach time is a measure of engine time normalized to a cruise RPM. If you spend one hour at your cruise RPM, tach time will increment one hour. If you spend 1 hour at 1/2 your cruise RPM, tach time will only increase by 1/2 hour. Tach time is defined as TIME x (CURRENT RPM / CRUISE RPM).

Hobbs time is a simple timer that runs whenever the oil pressure is above 15 PSI or the engine is above 0 RPM.

If you have connected an External Alarm Light to SV-EMS-220/221 pin 29, the Alarm Light setting determines how the light behaves after alarm acknowledgement. It can be set to either SOLIID AFTER ACK, which leaves the light lit continuously after acknowledgement (until the alarm condition ceases) or OFF AFTER ACK, which turns the light off after an alarm has been acknowledged.

Rotax 912 Behavior

Setting ENGINE TYPE to ROTAX 912 pre-configures some engine settings for a Rotax 912 engine. SkyView will automatically configure and dynamically change the oil temperature and tachometer scales and alert thresholds in accordance with Rotax's recommended ranges, described in detail below. When this mode is selected, EMS SETUP > SENSOR SETUP > OIL TEMPERATURE AND TACHOMETER settings are unavailable.

Tachometer for Rotax 912:

When OIL TEMP < 120ºF, the TACHOMETER displays these ranges:

- 0-1400 *and* 4000-6000 RPM in RED
- 1400-1800 *and* 2500-4000 RPM in YELLOW
- 1800-2500 RPM in GREEN

When OIL TEMP > 120ºF, the TACHOMETER displays *different* ranges:

- 0-1400 *and* 5800-6000 RPM in RED
- 1400-1800 *and* 5500-5800 RPM in YELLOW
- 1800-5500 RPM in GREEN

At 0 RPM, tachometer alerting is inhibited. When RPM advances above 0, the tachometer alert is inhibited for 10 seconds to avoid nuisance alarms as the engine starts.

The alarm type for the tachometer is the "self-clearing" type.

Oil Temperature Gauge for Rotax 912:

When OIL TEMP < 190ºF, the OIL TEMP gauge displays these ranges:

- 100-120 and 230-266ºF in YELLOW
- 120-190ºF in GREEN *if OIL TEMP has been above 190ºF "more recently" than OIL TEMP was below 120ºF;* otherwise 120-190ºF is displayed in BLACK OUTLINED IN WHITE
- 190-230ºF in GREEN
- 266-280ºF in RED.

When OIL TEMP is > 190ºF, the OIL TEMP gauge will display *different* ranges:

- 100-120 *and* 230-266ºF in YELLOW
- 120-230ºF in GREEN
- 266-280ºF in RED

The alarm type for oil temperature is the "self-clearing" type.

EMS Sensor Definitions, Mapping, and Settings

All sensors must be defined, mapped to SV-EMS-220/221 pins, and have their settings configured. This section describes how sensors are defined, mapped, and set in SkyView.

EMS Sensor Definitions

All EMS sensor installations require a SkyView Sensor Definitions file. This file is preloaded onto each display prior to shipment and contains all of the sensor types that SkyView supports. It may be updated in the future to include more sensors. This file is downloadable at downloads.dynonavionics.com.

If you need to update the SkyView Sensor Definitions file, download the file and use the instructions found in the How to Load and Delete Files Section.

The EMS sensor definition file has a .sfg file extension. *This file is not automatically shared between displays.* It must be loaded onto *each display in the system*.

EMS Sensor Input Mapping

In order to save installers time, Dynon provides preconfigured sensor mapping and settings files which support popular four and six-cylinder engine installations. All of the installations mentioned in the Example Engine Sensor and Transducer Installations Section have preconfigured mapping and settings files that are available for download at downloads.dynonavionics.com.

The file that contains sensor mapping, settings, and widget graphical properties information has a .dfg file extension and is automatically shared between displays. Installers do not need to transfer files between displays.

If your engine installation is listed in the Example Engine Sensor and Transducer Installations Section, we recommend you install one of the sensor mapping and settings files onto the SkyView display using the instruction found the How to Load and Delete Files Section. Then update or modify the sensor map and settings based on your installation.

Note that it is critical that you should check every setting before operating your engine with them as these files are only a starting point. While efforts were made to set up temperature, pressure, and other ranges to reasonable starting points, Dynon makes no claim that they are correct for your engine, as slightly different engines may have different limits.

Use this section as a guide when you review and update the sensor map and settings that were sourced from the preconfigured file. Also use this section if you are creating a sensor map and settings from scratch.

EMS Sensor Mapping Explanation

The SkyView system must be configured to map SV-EMS-220/221 pin numbers to physical sensors. This section contains an explanation of what it means to define a sensor for mapping purposes and also contains instructions on how to map sensors mentioned in this chapter to pins on the SV-EMS-220/221. Mapping can be accomplished using two methods: you can use a premade file as mentioned above or you can manually map engine sensors to EMS module pins.

All sensors and transducers are mapped in the Sensor Input Mapping Wizard. As mentioned earlier, some pins are compatible with a variety of sensors, while other pins have fixed functionality. A sensor is defined in the Sensor Input Mapping Wizard by the following parameters:

- Pin #–the pin or set of pins the sensor is connected to
- Function–the phenomenon the sensor measures (e.g., pressure and temperature)
- Sensor–the physical part used, for example 0-80 PSI Fluid Pressure (100411-001)
- Name–a six character field that names the sensor for use by the pilot in flight.

Loading a premade sensor mapping file onto SkyView can save installation time. These files define sensors with the four parameters mentioned.

Table 37 shows an example oil pressure sensor map on pin 6 of the SV-EMS-220/221 D37 connector.

PIN #	FUNCTION	SENSOR	NAME
C37 P6	PRESSURE	0-150 PSI FLUID PRESSURE (100411-002)	OIL

Table 37–Example Sensor Map

Manual Sensor Mapping

Appendix D: SV-EMS-220/221 Sensor Input Mapping Worksheet is a useful tool during sensor mapping. This section is intended for use only if the premade sensor mapping file does not contain the sensor definitions needed for your installation.

Go to the Sensor Input Mapping Wizard (SETUP MENU > EMS SETUP > Sensor Input Mapping…) and use the following procedure to manually map a sensor or transducer:

1. Scroll through the different parameters using a combination of joystick turns and movements in the up, down, left, and right motions. The selected parameter is highlighted and its text is enlarged.
2. Press SELECT to open the parameter for editing.
3. Edit the parameter using a series of joystick turns and movements.
4. Save the parameter edit by pressing ACCEPT or by moving either joystick to the right or the left. Press CANCEL to back out of the parameter edit mode without saving.

EMS Sensor Settings

Mapped sensors that are displayed on the Engine Page should have their alert and graphical properties appropriately configured. This section explains the settings that are required for EMS sensors, contains instructions for manually configuring sensor settings, and uses several sensor settings examples to further explain sensor settings.

SkyView EMS sensor settings are defined by the following parameters in the Sensor Setup Menu:

- Alarm

- Maximum Graphical Display
- Minimum Graphical Display
- Ranges

EMS Sensor Alarms

There are three alarm options for EMS sensors:

- OFF–no alarm for the sensor.
- SELF-CLEAR–When an alert is triggered, it is annunciated both on the engine page and in the messaging system. When the alert condition ceases, all of these annunciations cease, even if the precise alert message was not acknowledged by pressing the rightmost button on the display to bring up the message window.
- LATCHING– When an alert is triggered, it is annunciated both on the engine page and in the messaging system. However, when the alert condition ceases, the message notification area above the rightmost button will continue to show the unacknowledged alert state until the alert message is viewed in the message window, even though the offending parameter has returned to within limits. This behavior ensures that the pilot is aware that an alert was triggered, even though the condition no longer exists.

Reference the SkyView Pilot's User Guide for information regarding how sensor alarms show up onscreen during operation.

EMS Sensor Graphical Display Limits

The settings here define the minimum and maximum values that will be shown graphically on the sensor's gauge. Effectively, this is the start and stop point of the gauge. If the indicator you choose for this value shows digital numbers for the value, they will not be limited by this setting. The system will not allow you to set these numbers higher or lower than the sensor can support.

EMS Sensor Ranges

The order that ranges are configured has no effect on the functionality or display of the gauge. Ranges are defined with the following properties: enable, color, top, and bottom. Enable is used to tell SkyView if that range is on or off. If it is off, it will not be considered or displayed.

There are five configurable ranges for each gauge and four colors for any given range (black, green, yellow, or red.). If a range is not defined, it is considered black, so there is not generally a reason to configure black ranges. If ranges overlap, red trumps yellow, yellow trumps green, and green trumps black. For example, you could set up two ranges for the same gauge, each 0-10, one red, and one green, and that range would be red. To further illustrate this behavior, if another range for that same gauge was configured from 5-15 and set to yellow, only 10-15 would be yellow.

The two edge ranges are considered to go on "forever," so if a gauge is set up as yellow from 10 to 20 and red from 20 to 30, and the sensor reads 35, it will still be considered red since that is above the highest range. It will be considered yellow below 10. If you wish for this not to occur, you must make your edge ranges black.

Alarms are only triggered when the value enters the red range on a gauge.

Fuel Computer Configuration

Setting Pulses/Gallon

To find and configure the pulses/gallon value associated with your fuel flow transducer:

If you have the **Floscan 201B (Dynon P/N 100403-001)**, this number can be found on the tag that came with the transducer. The pulses/gallon value for transducer is 10 times the number shown after the dash. So, if your transducer had the tag that is labeled “16-2959”, you would enter a pulses/gallon value of 29590 in the pulses/gallon section of SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION > FUEL FLOW CALIBRATION. If you have lost your tag, a starting pulses/gallon of 30000 will be close enough to begin using the function.

If you have the **EI FT-60 “Red Cube” (Dynon P/N 100403-003)**, enter a starting K-VALUE of 68000 under SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION > FUEL FLOW CALIBRATION.

Over time, you may notice that the instrument’s computation of gallons or liters remaining (based on fuel flow) is either high or low. This is a result of many factors, including individual installation. To correct for this, follow this procedure:

Over several fill-ups keep a running total of the amount of fuel added. Keep a running total of the GALS (or LTRS) USED parameter over this same time span.

Perform the following calculation: $\frac{FuelUsed\,(computed)}{FuelFilled\,(actual)}$. You should obtain a number that is close to 1. We’ll call this number, FuelFlowRatio.

Now perform this calculation: *CurrentPulsesPerGallon*FuelFlowRatio*. Enter this number as your new pulses/gallon value.

Observe the results over your next tank for accuracy. Repeat the above if necessary.

The general rule of thumb: if your GALS (or LTRS) USED reads higher than you expect, *increase* the pulses/gallon; if it reads lower than you expect, *decrease* the pulses/gallon.

If your engine has a return fuel flow sensor, note that there is a second pulses/gallon setting that is mapped to a second set of input pins. When a second fuel flow sensor is connected and the pulses/gallon is adequately set, the fuel seen returning through the second fuel flow sensor is automatically subtracted from the flow that is seen through the primary sensor. If you do not have a second fuel flow sensor, you may ignore this setting entirely.

Fuel Computer Presets

Fuel Computer computations are based on measured fuel flow and the pilot’s input of the aircraft’s starting fuel state. SkyView offers a few settings that allow the pilot to pre-program full fuel and an optional second "preset" fuel quantity. Once programmed, typical aircraft fuel loads are then quickly recalled under in the EMS > FUEL menu as described in the Pilots User Guide.

There are three fuel computer options, found under SYSTEM SETUP > SYSTEM SETUP > AIRCRAFT INFORMATION. They are only applicable if you have a fuel flow sensor installed:

- Total Fuel Capacity–set this to the total usable fuel on board when the tanks are full. Once this is set, the pilot is prevented from accidentally setting more than this amount of fuel on board.
- Preset Fuel Capacity–this can be used to quickly recall a second, non-full starting fuel state. For example, if your tanks have tabs so that you can easily fill to ¾ of your normal full fuel load, you would enter this number here so that you can quickly set your fuel computer to this second preset when you fill to the tabs.
- Fuel Added Detect–When set to yes, SkyView will check for discrepancies between the physical fuel quantity senders and the fuel computer's calculated fuel load on boot-up. If one is found, SkyView will prompt the user to adjust the fuel computer's fuel state. This option should only be set to YES on one display if you have more than one in the system.

Manual EMS Sensor Settings Configuration

Go to the Sensor Setup Menu (SETUP MENU > EMS SETUP > SENSOR SETUP) to manually configure the settings of an EMS sensor. Once there, a list of every mapped sensor is displayed.

Follow this basic procedure to configure sensor settings:

1. *Choose a sensor.* Scroll through the menu to a sensor and move the joystick right to enter to the sensor configuration menu.
2. *Set the alarm.* Scroll to the ALARM configuration line, move the joystick right to enter the Alarm Adjust Menu, choose the appropriate alarm for the sensor, and then press ACCEPT. Press BACK to return to the sensor configuration menu.
3. *Set the graphical display limits.* Scroll to the MAXIMUM and MINIMUM GRAPHICAL DISPLAY lines, move the joystick right to enter the respective menus, adjust the values appropriately - and then press ACCEPT. Press BACK to return to the sensor configuration menu.
4. *Set the ranges.* Scroll the menu and configure enable, color, and top and bottom.
5. *Save the settings.* Press BACK to return to the Sensor Setup Menu. Press EXIT to return to the Main Menu.

The examples on the following pages show four configured sensors: a voltmeter, a contact, RPM, and an oil temperature sensor.

Example Voltmeter Setup

Assume this sensor was mapped on the Sensor Input Mapping Wizard as:

PIN #	FUNCTION	SENSOR	NAME
C37 P1	VOLTS	VOLTAGE MEASURE	MAIN

Now, we want to configure its alert and graphical properties. Go to the Sensor Setup Menu and open the MAIN VOLTS Page (SETUP MENU > EMS SETUP > SENSOR SETUP > MAIN VOLTS).

Configure MAIN VOLTS with the following properties:

- ALARM: OFF
- MAXIMUM GRAPHICAL DISPLAY: 15.0 VOLTS
- MINIMUM GRAPHICAL DISPLAY: 10.0 VOLTS

- RANGE 1
  - ENABLE YES
  - COLOR RED
  - TOP 11.0 VOLTS
  - BOTTOM 10.0 VOLTS
- RANGE 2
  - ENABLE YES
  - COLOR YELLOW
  - TOP 12.0 VOLTS
  - BOTTOM 11.0 VOLTS
- RANGE 3
  - ENABLE YES
  - COLOR GREEN
  - TOP 13.6 VOLTS
  - BOTTOM 12.0 VOLTS
- RANGE 4
  - ENABLE YES
  - COLOR YELLOW
  - TOP 14.6 VOLTS
  - BOTTOM 13.6 VOLTS
- RANGE 5
  - ENABLE YES
  - COLOR RED
  - TOP 15.0 VOLTS
  - BOTTOM 14.6 VOLTS

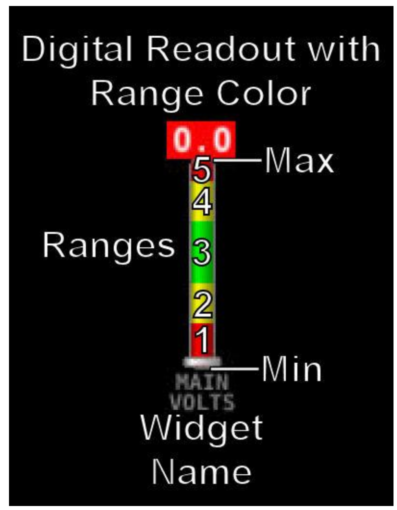


Figure 43—Anatomy of a Widget: Main Volts

Example Contact Sensor Setup

Assume this sensor was mapped on the Sensor Input Mapping Wizard as:

PIN #	FUNCTION	SENSOR	NAME
C37 P9	CANOPY	Contact	CANOPY

Now, we want to configure its alert and graphical properties. Go to the Sensor Setup Menu and open the CANOPY CONTACT Page (SETUP MENU > EMS SETUP > SENSOR SETUP > CANOPY CONTACT).

Note that although inputs set up as contacts can physically accept up to 15V (so that they can accept nominal aircraft voltage as one of their two states), the maximum the EMS can measure is 5.0V. This means that as depicted below, the two measured ranges should be set to 0-2.5V and 2.5-5V to measure the absence and presence of power.

Configure CANOPY CONTACT with the following properties:

- ALARM: OFF
- MAXIMUM GRAPHICAL DISPLAY: 5.0 VOLTS
- MINIMUM GRAPHICAL DISPLAY: 0.0 VOLTS
- RANGE 1
  - ENABLE YES
  - NAME OPEN
  - COLOR RED
  - TOP 5.0 VOLTS
  - BOTTOM 2.5 VOLTS
- RANGE 2
  - ENABLE YES
  - NAME CLOSED
  - COLOR GREEN
  - TOP 2.5 VOLTS
  - BOTTOM 0.0 VOLTS
- RANGE 3
  - ENABLE NO
  - NAME R3
  - COLOR GREEN
  - TOP 20.0 VOLTS
  - BOTTOM 10.0 VOLTS
- RANGE 4
  - ENABLE NO
  - NAME R4
  - COLOR YELLOW
  - TOP 10.0 VOLTS
  - BOTTOM 5.0 VOLTS
- RANGE 5
  - ENABLE NO

Figure 44–Anatomy of a Widget: Canopy Contact

Example RPM Setup

Assume this sensor was mapped on the Sensor Input Mapping Wizard as:

PIN #	FUNCTION	SENSOR	NAME
C37 P32/34	RPM	RPM	RPM

Now, we want to configure its alert and graphical properties. Go to the Sensor Setup Menu and open the RPM RPM Page (SETUP MENU > EMS SETUP > SENSOR SETUP > RPM RPM).

Configure RPM RPM with the following properties:

- ALARM: OFF
- MAXIMUM GRAPHICAL DISPLAY: 3000 RPM
- MINIMUM GRAPHICAL DISPLAY: 0 RPM
- RANGE 1
  - ENABLE YES
  - COLOR GREEN
  - TOP 2000 RPM
  - BOTTOM 0 RPM
- RANGE 2
  - ENABLE YES
  - COLOR YELLOW
  - TOP 2250 RPM
  - BOTTOM 2000 RPM
- RANGE 3
  - ENABLE YES
  - COLOR GREEN
  - TOP 2700 RPM
  - BOTTOM 2250 RPM
- RANGE 4
  - ENABLE YES
  - COLOR YELLOW
  - TOP 2750 RPM
  - BOTTOM 2700 RPM
- RANGE 5
  - ENABLE YES
  - COLOR RED
  - TOP 3000 RPM
  - BOTTOM 2750 RPM

Figure 45–Anatomy of a Widget: RPM

Example Oil Temperature Sensor Setup

Assume this sensor was mapped on the Sensor Input Mapping Wizard as:

PIN #	FUNCTION	SENSOR	NAME
C37 P7	TEMPERATURE	5/8”-18 NPT FLUID TEMP (100409-000)	OIL

Now, we want to configure its alert and graphical properties. Go to the Sensor Setup Menu and open the OIL TEMPERATURE Page (SETUP MENU > EMS SETUP > SENSOR SETUP > OIL TEMPERATURE).

Configure OIL TEMPERATURE with the following properties:

- ALARM: LATCHING
- MAXIMUM GRAPHICAL DISPLAY: 260 °F
- MINIMUM GRAPHICAL DISPLAY: 80 °F
- RANGE 1
  - ENABLE YES
  - COLOR YELLOW
  - TOP 165 °F
  - BOTTOM 80 °F
- RANGE 2
  - ENABLE YES
  - COLOR GREEN
  - TOP 220 °F
  - BOTTOM 165 °F
- RANGE 3
  - ENABLE YES
  - COLOR YELLOW
  - TOP 240 °F
  - BOTTOM 220 °F
- RANGE 4
  - ENABLE YES
  - COLOR RED
  - TOP 260 °F
  - BOTTOM 240 °F
- RANGE 5
  - ENABLE NO
  - COLOR RED
  - TOP 5 °F
  - BOTTOM 0 °F

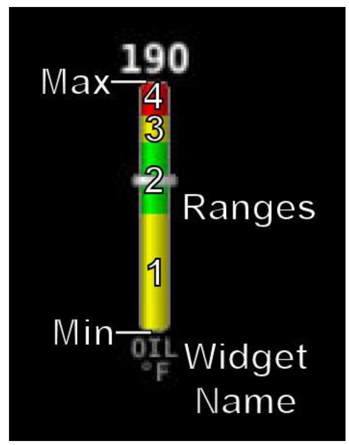


Figure 46–Anatomy of a Widget: Oil Temperature

Note that oil temperature is configured with a latching alarm in this example. If oil temperature ever reaches a range configured as red, an alarm will trigger and a message will show up in the message box on the Main Menu.

EMS Screen Layout Editor

Dynon offers preconfigured Engine Page layouts that support popular engine sensor installations. Check our website at www.dynonavionics.com for more details.

All sensor mapping, settings, and widget graphical properties are automatically shared between displays. Installers do not need to transfer files between displays.

Use this wizard to configure the style and layout of the engine and environmental sensor gauges and calculated parameters (e.g., % power) on the 100%, 50%, and 20% Engine Pages. Note that sensors must be defined, mapped, and configured in order to show up on an Engine Page (reference the EMS Sensor Definitions, Mapping, and Settings Section of this guide for instructions on how to do this).

To use this tool, enter the wizard (SETUP MENU > EMS SETUP > SCREEN LAYOUT EDITOR), then choose the page size to edit. Once in the Screen Layout Editor, follow this procedure:

1. *Add a sensor or info widget to the screen.* Press either SENSOR or INFO to show their respective menus and scroll through available sensors or info parameters, highlight one, and then press ACCEPT or move either joystick to the right to add it to the screen.
2. *Change the style of the widget.* Press STYLE or turn the joystick until the widget's style is acceptable.
3. *Change the size of the widget.* Press SIZE until the widget's size is acceptable.
4. *Change the location of the widget on the screen.* Move the CURSR joystick in up, down, right, and left directions until the location is acceptable. Hold the joystick in those movement positions for accelerated widget movement.
5. *Repeat* the above steps for all sensors that you want displayed on the Engine Page.
6. *Save* the page by pressing SAVE.

Press REMOVE to remove the chosen widget from the screen. Press CANCEL to return to the EMS Setup Menu without saving any changes.

Example widget configuration

This example configures an oil temperature widget using the instructions mentioned above. This is the same oil temperature sensor that was configured earlier (see Example Oil Temperature Sensor Setup).

Open the Screen Layout Editor for the 100% page (SETUP MENU > EMS SETUP > SCREEN LAYOUT EDITOR > 100% PAGE…). Now press SENSOR, scroll to the OIL TEMPERATURE sensor, and press ACCEPT. The following widget shows up on the middle on the screen:

Figure 47–Oil Temperature Widget

The white box around the widget denotes that that widget is the one that is currently being configured.

You can scroll through the available styles of the widget by pressing STYLE or by turning either joystick. The following widgets illustrate different styles for oil temperature:

Figure 48–Example Oil Temperature Widget Styles

You can also adjust the size of the widget by pressing SIZE.

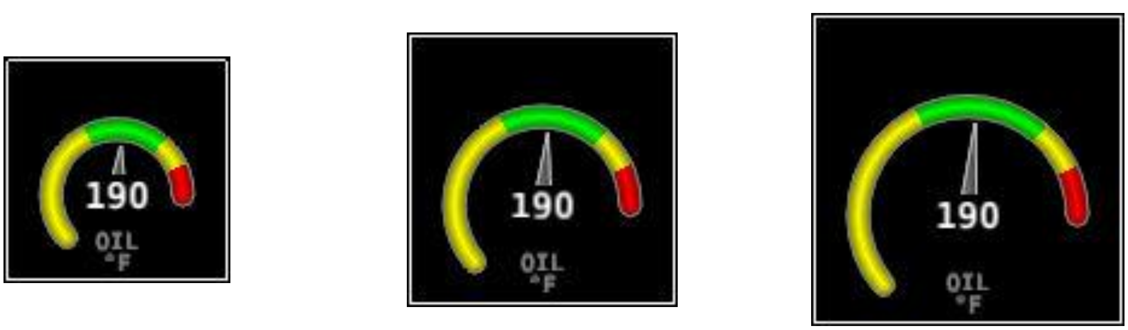


Figure 49–Example Oil Temperature Widget Sizes

Now, locate the widget on the screen by moving the joysticks left, right, up, and down. Once you have decided on a location for this widget, you can add and configure more widgets (press SENSOR to add another widget and follow the procedure on the preceding page) and then save the page layout by pressing SAVE.

Specific Widget and Info Item Data Requirements

In order for the % Power and LOP/ROP status info items to calculate values, the following data must be present / conditions must be met:

- Barometric altitude (from an SV-ADAHRS-20X) must be present.
- EMS SETUP > ENGINE INFORMATION > ENGINE TYPE must be set to Lycoming/Continental. Percent power calculations are not available for other engine types at this time.
- EMS SETUP > ENGINE INFORMATION > HORSEPOWER must be set.
- OAT sensor installed / working.
- Fuel flow sensor must be installed and configured.
- MAP sensor must be installed and configured.

EMS Sensor Calibration

Fuel level sensors and position potentiometers must be calibrated. Your SkyView display utilizes onscreen wizards that help you do this. Go to the EMS Calibration Menu to access these wizards (SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION).

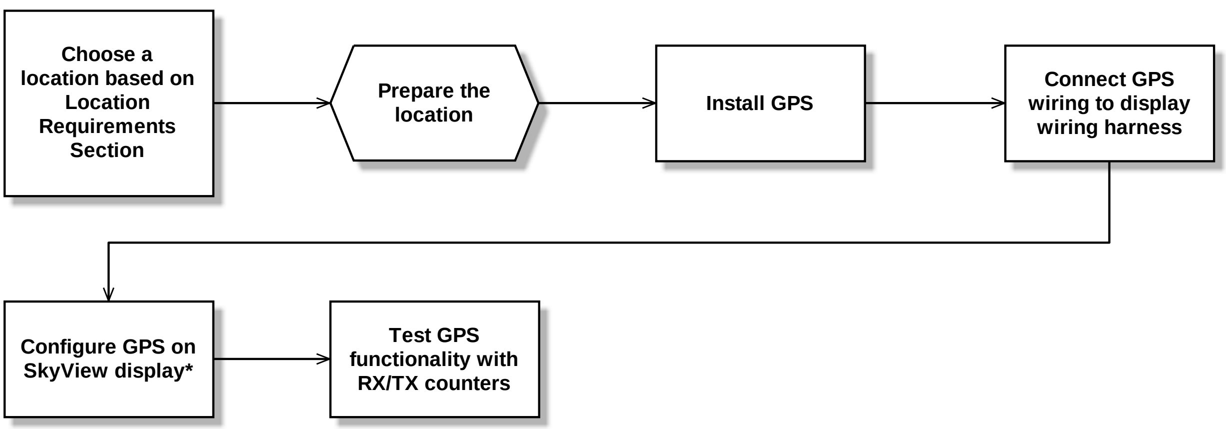
8. SV-GPS-250 Installation and Configuration

This chapter contains information that specifically applies to the installation and configuration of the SV-GPS-250 GPS Receiver module. After reading this chapter, you should be able to determine how to prepare the installation location, mount the module, connect it to a display, and configure it.

A valid GPS signal is required for time, magnetic heading calibration, and moving map functionality. *This signal does not need to come from an SV-GPS-250. However, the SV-GPS-250 provides positional updates five times per second. This makes mapping and synthetic vision display look smoother over receiving their positional updates at once per second from other GPS devices.*

If your installation has two or more displays, the primary GPS power, ground, and transmit lines must be connected to all displays.

Figure 50 is a high-level overview of a suggested SV-GPS-250 installation and configuration procedure.



*Assumes SV-D700 or SV-D1000 is properly installed and working.

Figure 50–Suggested SV-GPS-250 Installation and Configuration Procedure

Physical Installation

The diagram below shows the mounting dimensions of the GPS module. Note that it utilizes a common bolt pattern found in much of general aviation.

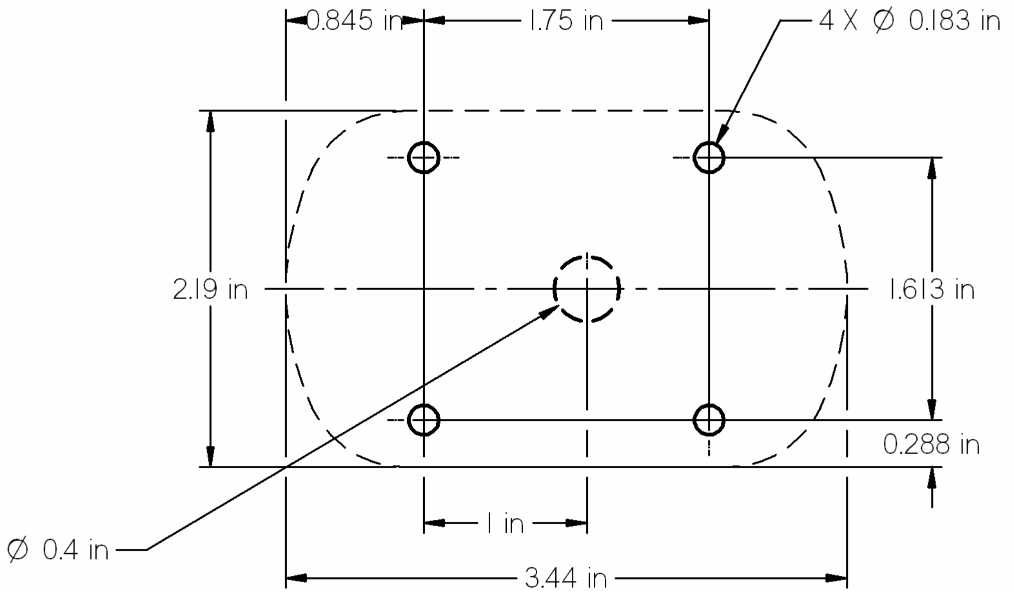


Figure 51–SV-GPS-250 Mounting Dimensions

Mounting hardware is not included. The SV-GPS-250 is designed to work with #8 fasteners with 100 degree countersunk heads. The use of nut plates is recommended for convenience, but other hardware can be used if space allows. Specific hardware selection is determined by the installer.

We recommend you use weather sealant around the fastener heads to keep moisture from entering the aircraft through the mounting holes. The module itself is sealed and includes a rubber gasket that seals the inner wire hole. It also allows the module to be mounted on slightly curved surfaces. For extra protection, you may use weather sealant around the outside of the SV-GPS-250 module where it meets the skin of the aircraft.

Serial Connection

SkyView uses the SV-GPS-250 device set to POS 1 as its primary position source.

The SV-GPS-250 includes 18 feet of twisted wire for a serial connection to the SkyView display via the display. This wire may be trimmed or lengthened as needed to suit the installation.

The color of the SV-GPS-250 wires matches the colors of the wires of the main display harness that are intended for the GPS serial connection. The following table contains information regarding the wires.

Function	Harness and SV-GPS-250 Wire Color	SkyView Display D37 Pin
SV-GPS-250 Tx / Serial Port 5 Rx	Gray with Violet stripe	11
SV-GPS-250 RX / Serial Port 5 Tx	Gray with Orange stripe	12
SV-GPS-250 Ground	Black	24
SV-GPS-250 Power	Orange	29

Table 38–SV-GPS-250 Serial Connection Details

As mentioned before, if there are two or more displays in your SkyView system, all four of the SV-GPS-250 module's wires should be connected to all displays in parallel. This wiring scheme is illustrated in Figure 52.

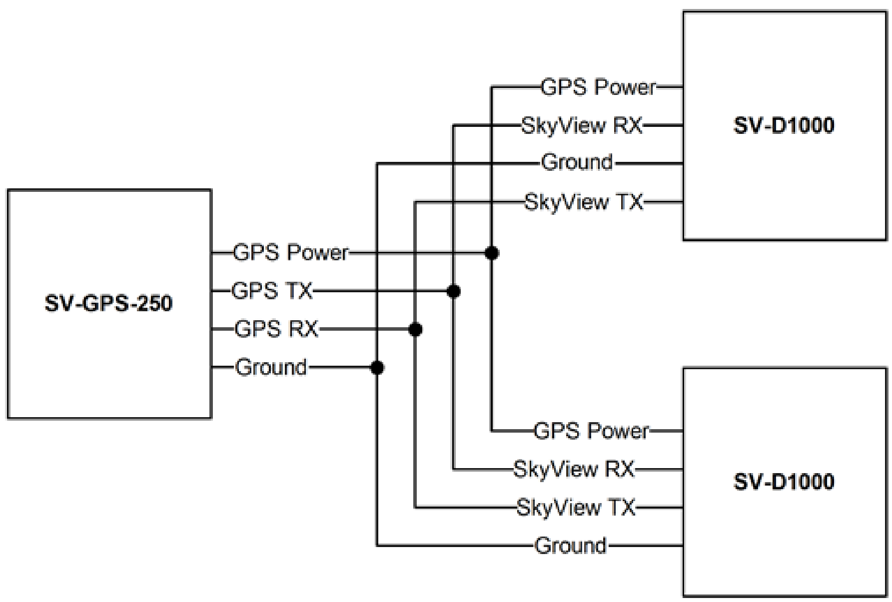


Figure 52–SV-GPS-250 Connected to Multiple SkyView Displays

If there is more than one SV-GPS-250 in your system, use the same scheme in Figure 52 on different display serial ports for the other SV-GPS-250 modules, but connect power and ground for the other SV-GPS-250 modules to the same power and ground connections (black and orange wires) that are provided in the serial port 5 wiring bundle on the display harnesses. An example of this configuration follows.

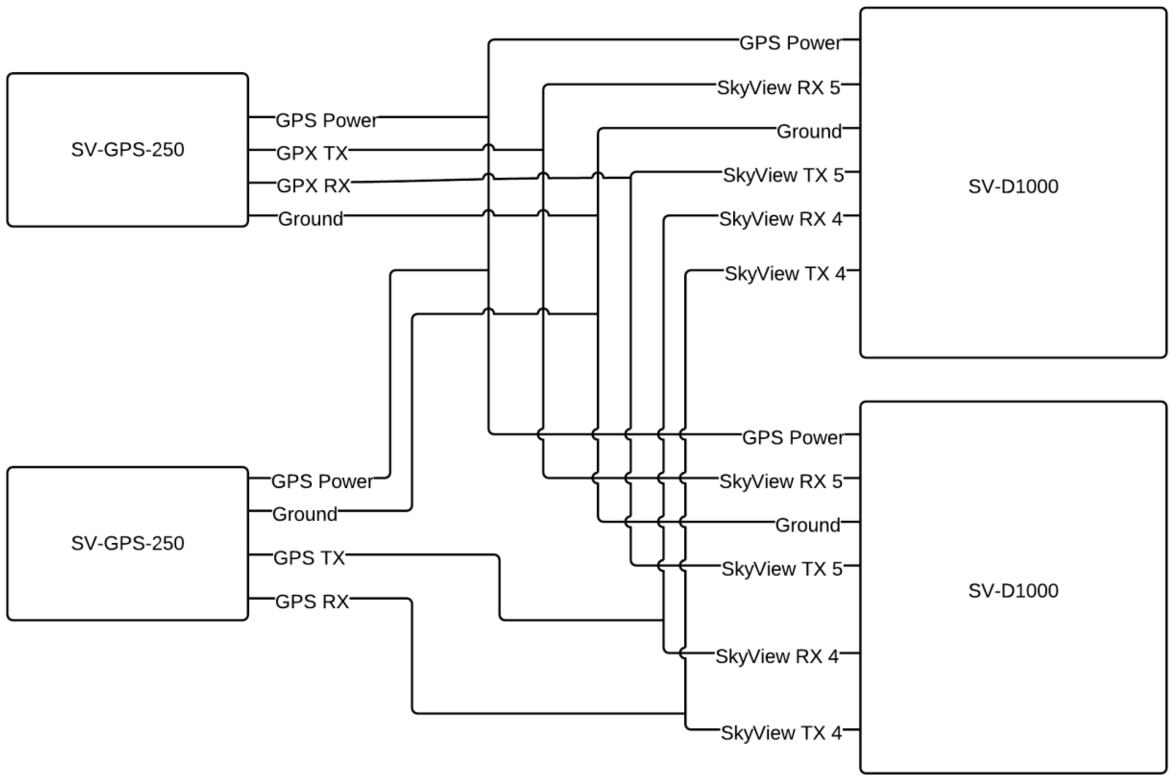


Figure 53 - Dual SV-GPS-250 Connected to Multiple Displays

Configuration

Go to the Serial Port Setup Menu (SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP>SERIAL PORT 5 SETUP) and then configure serial port 5 as follows:

SERIAL IN DEVICE:	Dynon SV-GPS-250
SERIAL IN FUNCTION:	POS 1
SERIAL IN/OUT BAUD RATE:	38400
SERIAL OUT DEVICE:	NONE

If you connect an SV-GPS-250 to multiple screens, you must configure each display to support it (i.e., DYNON GPS, POS 1, 38400, NONE). If you have multiple SV-GPS-250 modules, connected as shown above, you will also need to configure the second serial port (serial port 4 if done as shown) as an SV-GPS-250 as well. Its SERIAL IN FUNCTION should be set to POS 2.

9. SV-BAT-320 Installation

This chapter contains information that specifically applies to the installation of the SV-BAT-320 Backup Battery. After reading this chapter, you should be able to determine how to prepare the installation location, mount the module, connect it to a display, monitor its voltage, and make sure it is charged.

SkyView displays are designed to work with the SV-BAT-320 Backup Battery. Using any other different battery will void any warranties and is a significant safety hazard. *Do not* extend the SV-BAT-320's battery wiring.

Figure 54 is a high-level overview of a suggested SV-BAT-320 installation, configuration, and maintenance procedure.

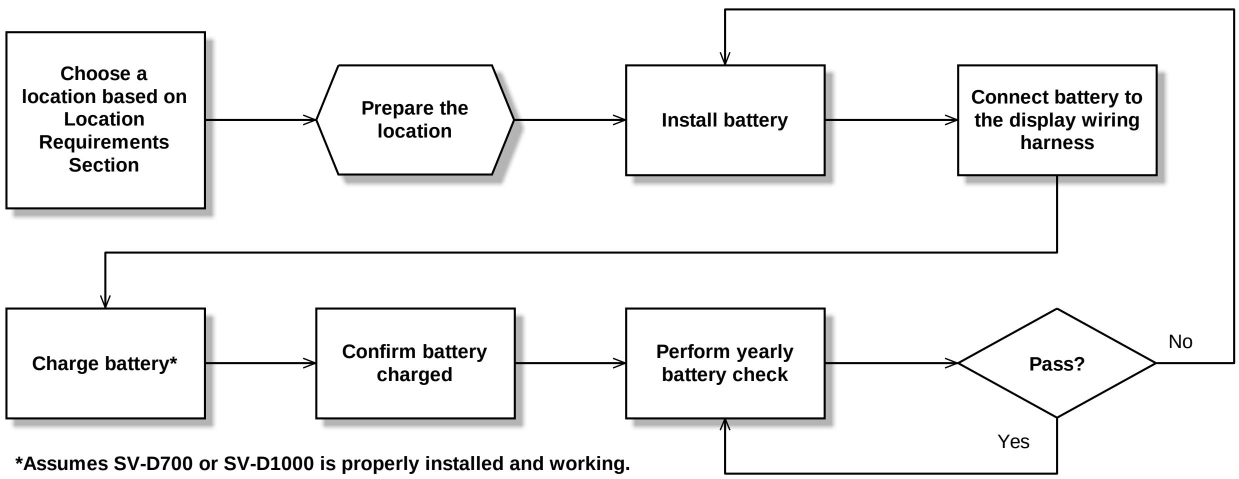


Figure 54–Suggested SV-BAT-320 Installation, Configuration, and Maintenance Procedure

Physical Installation

The diagram below shows the mounting dimensions of the backup battery.

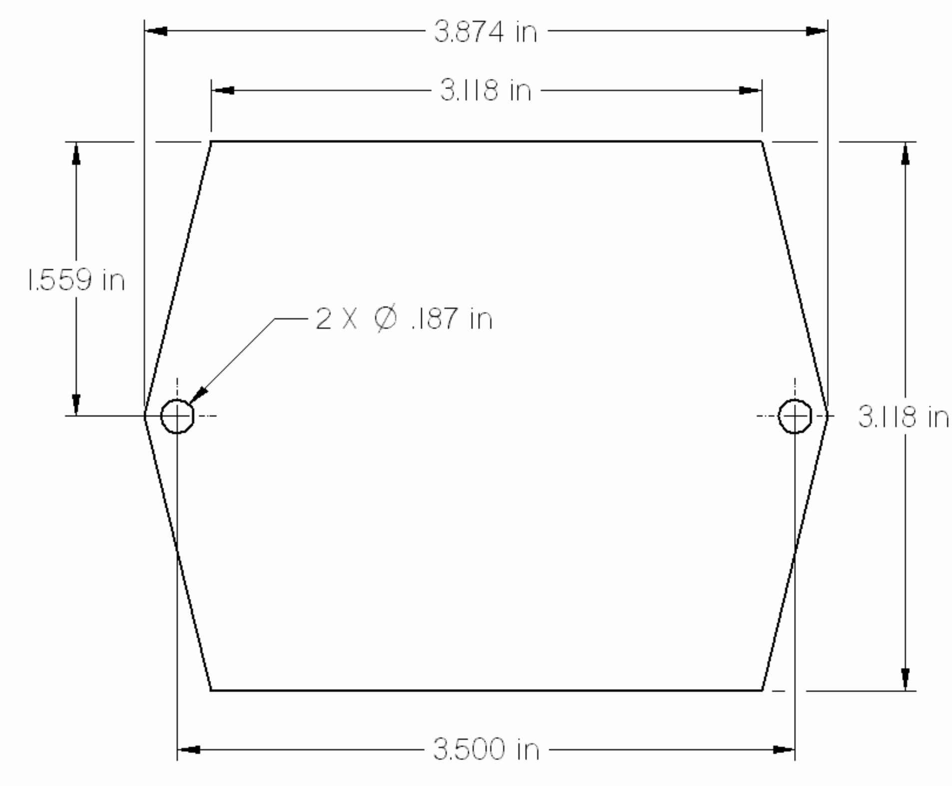


Figure 55–SV-BAT-320 Mounting Dimensions

Dynon does not provide mounting hardware for use with the SV-BAT-320. The mounting tabs on each side of the module have holes sized for #8 fasteners. Button head style AN hardware is recommended as spacing between the holes in the tabs and the body of the enclosure limits what style tool can be used to tighten certain fasteners. Follow recommended torque practices when tightening the mounting hardware.

Use of ferrous fasteners in this location is acceptable. *Do not rivet the SV-BAT-320 to the aircraft as this will hinder future removal if necessary.*

Electrical Connection

Connect the SV-BAT-320 module's connector to the mating connector on the main display harness.

Battery Charging

SkyView displays automatically manage their connected battery's charge level. If it becomes discharged, simply turning the SkyView display on will cause the battery to charge.

Battery Status Check

Enter the Display Hardware Information Page (SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION) to check the status of the battery. The BATTERY STATUS line shows the voltage of the display's backup battery.

An SV-BAT-320 is fully charged when it reaches 12.25 volts. Charging a completely discharged battery may take up to 4 hours. To conserve your aircraft battery, the SV-BAT-320 only charges when SkyView detects that your alternator or generator is running (whenever your engine is running), which is when SkyView's input voltage is above 12.25V. Alternatively, connecting a battery charger to your aircraft battery will also raise the input voltage to a level that will allow SkyView's SV-BAT-320 to charge.

The SV-BAT-320 must only be charged by SkyView. External charging of the battery is not supported. External charging of the battery can damage it or cause it to explode.

Initial Backup Battery Test

Perform this test to ensure each backup battery in the SkyView system is fully functional. A fully charged SV-BAT-320 should power a typical SkyView system for at least 60 minutes if primary power is lost.

If the SkyView system has more than one display with a backup battery installed, perform the test for each display individually. Power off all but one display during the test.

Test Procedure

1. Set the SkyView display to full brightness (PFD > press SCREEN > press DIM > press FULL)
2. Fully charge the SV-BAT-320 Backup Battery. Reference the Battery Charging and Battery Status Check sections for battery charging instructions.
3. Disconnect primary power from the SkyView display—ensure that the display is not powered from another source.
4. Clear the POWERING DOWN IN # SECONDS message (press STAY ON).
5. Allow the SkyView system to run off the backup battery

The system passes if, after 60 minutes, it has not turned off.

Repeat the test procedure for each backup battery in the system.

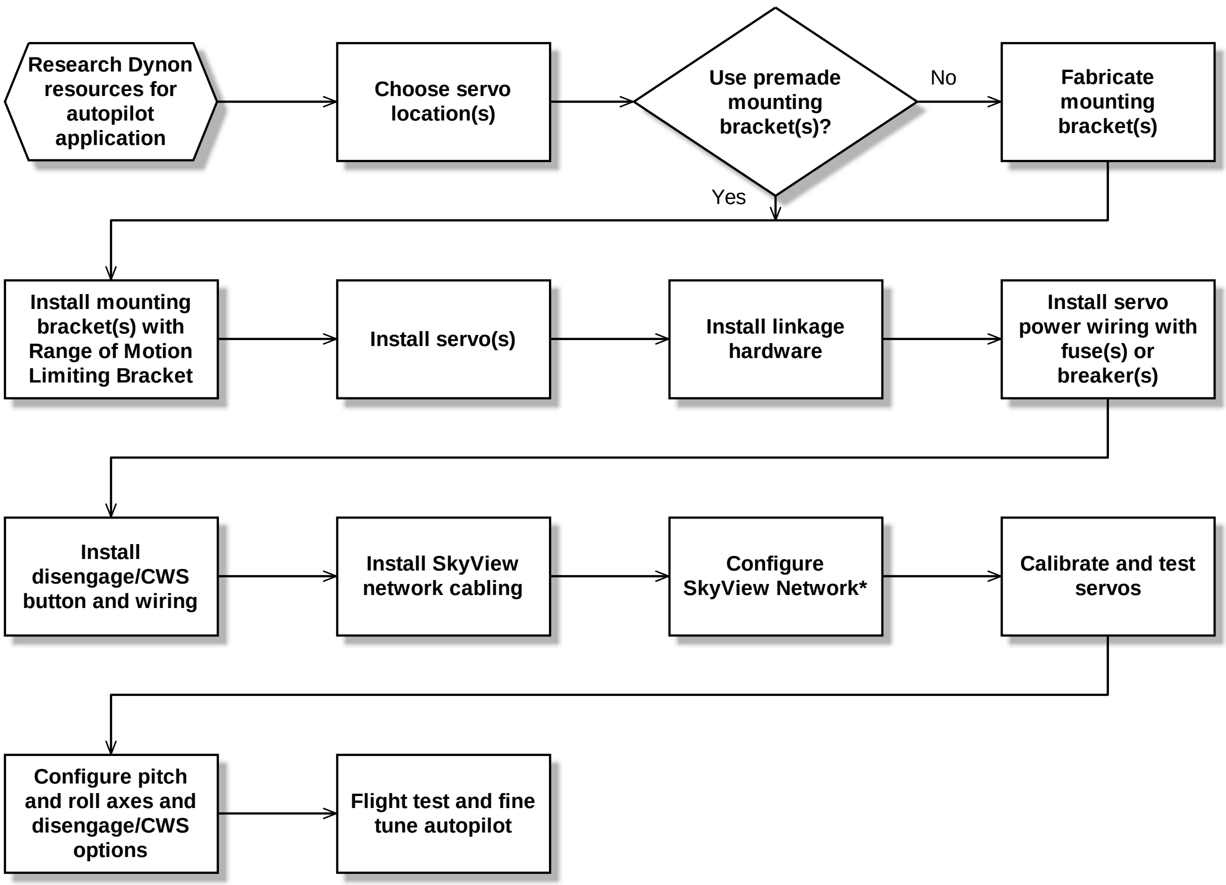
This test discharges the backup battery. Recharging the battery after the test is recommended. Do this by applying primary power to the display. The backup battery is fully charged when its voltage reaches 12.25 volts.

If a tested battery does not pass the initial backup battery test, please contact Dynon Avionics technical support for further assistance.

10. Autopilot Servo Installation, Configuration, and Calibration

This chapter contains generic mechanical and electrical installation guidelines for the Dynon servos mentioned in Table 39. Plane-specific kits purchased from Dynon contain detailed drawings and diagrams which are intended to be used in conjunction with this guide as a complete set of installation instructions. A complete list of aircraft mounting kits is available on the current Price List/Order Form at store.dynonavionics.com. Drawings and diagrams are also available at docs.dynonavionics.com.

Figure 56 is a high-level overview of a suggested servo installation, configuration, and calibration procedure.



*Assumes SV-D700 or SV-D1000 is properly installed and working.

Figure 56–Suggested Servo Installation, Configuration, and Calibration Procedure

Of note to customers that are either upgrading their D10A/D100 series products to SkyView: Autopilot servos shipped prior to December 1st, 2009, require that they be upgraded to Version 5.2 Software or higher before they can connect to a SkyView Network. Autopilot servos shipped prior to this date MUST be upgraded to the latest version using a D10/D100 Series product BEFORE they are connected to SkyView. This will then allow the SkyView Network to communicate with the servo.

If you no longer have this capability, contact Dynon Technical Support. Your servos can be returned to Dynon for a firmware update.

Dynon Autopilot Servo Models

Dynon currently offers the following servo models:

Model Number	Torque	Attachment
SV32	36 inch-pounds	Standard Arm
SV32L		Long Arm
SV32C		Capstan
SV42	55 inch-pounds	Standard Arm
SV42L*		Long Arm
SV42C		Capstan
SV52	72 inch-pounds	Standard Arm
SV52L*		Long Arm
SV52C		Capstan

Table 39–Dynon Servos

* SV42L/SV52L servos are special order items–contact Dynon Avionics for details.

Compass Calibration Requirement

The SkyView autopilot requires an accurate magnetic heading to operate efficiently and comfortably in heading mode and the radio-based VOR/NAV mode. Therefore it is critical that the ADAHRS be installed correctly, calibrated, and operating well in all attitudes.

Additional Resources

Dynon's Internet sites provide frequently updated information on installation and operation issues:

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

forum.dynonavionics.com – Dynon's Online Customer Forum is a resource for Dynon Avionics customers to discuss installation and operation issues relating to Dynon Avionics products. The

Forum is especially useful for pilots with uncommon aircraft or unusual installation issues. For customers that cannot call Dynon Technical Support during our normal business hours, the Forum is a convenient way to interact with Dynon Avionics Technical Support. The Forum allows online sharing of wiring diagrams, photos, and other types of electronic files.

Dynon will continue to develop kits and installation instructions for more aircraft based on demand. It is also expected that aircraft manufacturers will develop their own mounting kits for Dynon servos or offer the Dynon AP as a factory option. If Dynon does not currently offer a mounting kit for your particular aircraft, and you would be inclined to assist in developing a kit and documentation, please send an introductory email message about your interest to betatest@dynonavionics.com.

Servo Mechanical Installation

Dynon Avionics has researched suitable mounting points for a number of popular aircraft and offers mounting kits and instructions for them. If you have purchased one of these kits, use the instructions included with it as your primary guide; the following mechanical installation information is more general in nature. If you have purchased cable-drive capstan servos (SV32C or SV42C), refer to the documentation that came with the included Capstan Accessory Kit (101116-000).

For installing Dynon Avionics servos in aircraft for which Dynon does not offer kits, we offer a Generic Servo Installation Kit (101020-000) of basic parts and basic installation instructions. The generic servo push-pull mounting kit includes some of the hardware to mount a servo and connect to the aircraft controls, but requires the installer to fabricate mounting brackets. This kit can be used in either pitch or roll applications that use a servo with an output arm (not suitable for use with pulley/cable servos). Some additional fasteners (not supplied by Dynon) and brackets will be required depending on the installation method chosen.

Neglecting to properly install and/or use Dynon Avionics AP hardware can result in failures which could cause loss of aircraft control resulting in aircraft damage, personal injury, or death. If there are any questions on the part of the installer it is mandatory to resolve these questions prior to flight.

When installing the servo, you must first determine a mount location for proper interaction with the existing control system. The mounting point that is chosen must allow the servo arm and associated linkage to move freely through the entire range of travel. To prevent the possibility of the servo arm going OVER CENTER, the servo arm must not travel more than a total of +/-60° from neutral position. When the aircraft controls are centered, the arm of the servo should be perpendicular to the attaching push rod. If this is not the case, we recommend adjusting the length of the push rod or consider a different mounting point. For maximum efficiency and the lightest drag on the flight controls, you should choose the smallest servo that provides sufficient torque to move and hold the flight controls with a minimum of slippage. A diagram of servo torque versus mount position is shown on page 10-6.

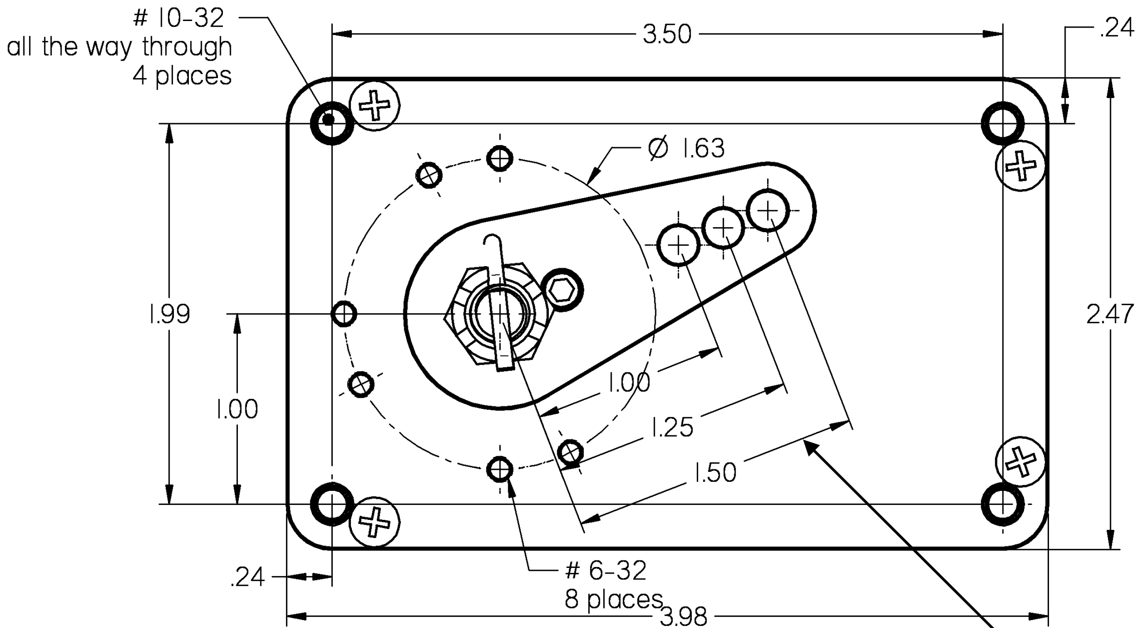
The servo arm must not rotate even near to the point called OVER CENTER, the point at which the primary aircraft control would “lock up”. Over center happens when the angle between the servo arm and the attached push rod becomes so great that the control system cannot drive against the servo arm. To protect against this possibility, a Range of Motion Limiting Bracket is supplied with each Dynon Avionics servo. These brackets are drilled so that they can be mounted at different angles as required (18° intervals). The brackets are supplied for the protection of the pilot, and we recommend that the Range of Motion Limiting Bracket be installed to ensure that an OVER CENTER condition cannot occur. *During normal servo operation, the Range of Motion Limiting Bracket should never be used. It is only intended for use as a safety mechanism in the SkyView Autopilot system.* When installing the Range of Motion Limiting Bracket, only use the supplied screws. Using longer screws to install the bracket, you will penetrate and damage the electronics.

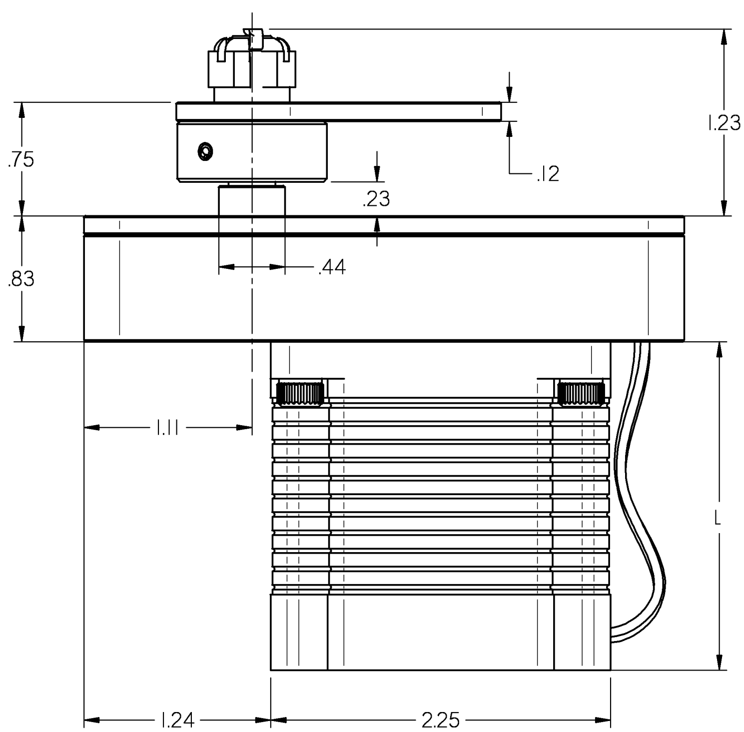
Once a suitable mounting point for each servo has been determined, the next step is to fabricate a mount for the servo to attach to the aircraft. Generally this will be a bracket made of sheet metal or corner stock. Dynon recommends using 6061 T6 aluminum with a minimum thickness of 0.050” for the best balance of strength to weight. When fabricating a mounting bracket, refer to the servo dimensions below. Be sure to leave ample room for the arm and attached linkage to move through a complete range of motion without interference.

In normal operation, Dynon’s servos can reach temperatures that can be very uncomfortable to, and perhaps cause burns to unprotected skin. Thus, servos should be mounted in an area, or in such a manner to prevent accidental skin contact. If mounting the servo in an exposed area *is* necessary, a shroud should be installed (that doesn’t restrict ventilation) that protects against accidental skin contact with the servos.

Push-Pull Servo Dimensions

Use the following dimensions (in inches) for reference when planning and implementing your installation.



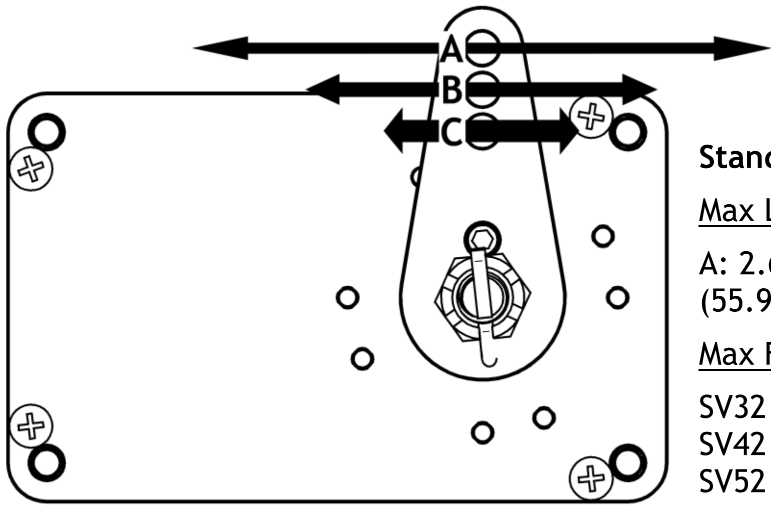


Long-arm variants (not needed in most installations) have linkage mount holes at 1.5” (38.1mm), 1.75” (44.5mm) , and 2.0” (50.1mm)

	L	Weight
SV32	2.17” (55.1mm)	2 lb (.91 kg)
SV42	3.10” (78.7mm)	3 lb (1.36 kg)
SV52	4.02” (102.1mm)	4 lb (1.81 kg)

Linkage Mount Position Force and Travel

The two diagrams below illustrate the maximum travel and force available at each linkage mounting point. As can be seen, the closer you mount the linkage to the shaft, the more force the servo can deliver. However, this also means the travel of the arm is shorter. *Again, ensure that the servo arm is nowhere near going over-center throughout the entire range of the control system.*



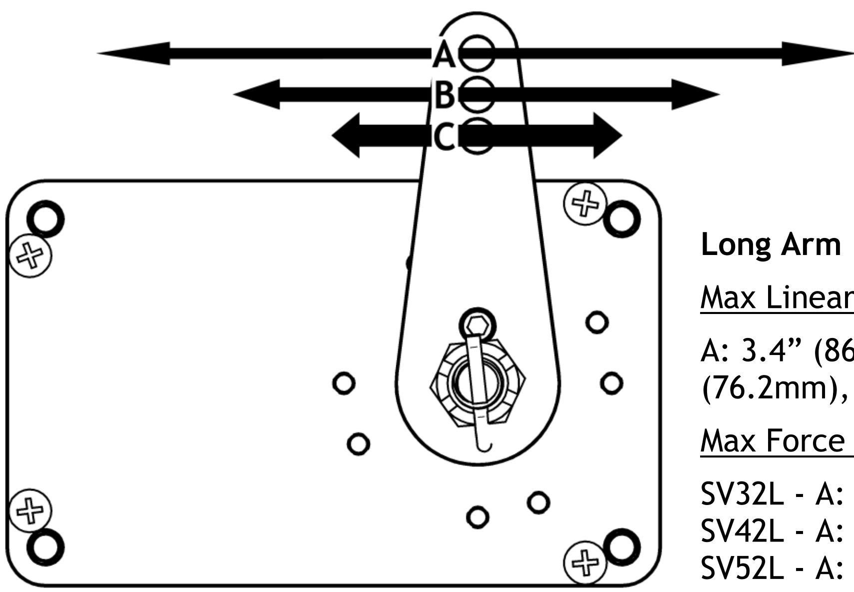
Standard Arm

Max Linear Travel

A: 2.6" (66mm), B: 2.2" (55.9mm), C: 1.8" (45.7mm)

Max Force @ 100% Torque

SV32 - A: 24lb B: 29lb C: 36lb
SV42 - A: 36lb, B: 44lb, C: 55lb
SV52 - A: 48lb, B: 58lb, C: 72lb



Long Arm

Max Linear Travel

A: 3.4" (86.4mm), B: 3.0" (76.2mm), C: 2.6" (66.1mm)

Max Force @ 100% Torque

SV32L - A: 18lb, B: 20lb, C: 24lb
SV42L - A: 27lb, B: 31lb, C: 36lb
SV52L - A: 36lb, B: 41lb, C: 48lb

The maximum linear travel specifications called out above denote the distance traveled by the location on the arm such that it is 60° from center at maximum distance in either direction (e.g., the A hole on the standard servo arm can linearly travel 1.3"(33mm) from center in either direction).

During installation, the linkage hardware must be connected to the servo arm such that the servo can actuate the connected control surface while approaching, but not exceeding the called out maximum linear travel specification. If too much slippage occurs during servo flight testing, it may be necessary to use a stronger servo.

Each Dynon Avionics servo includes a precision-machined brass shear screw that pins the servo arm to the servo arm attachment, providing an ultimate manual override. Servo shear screws will break at the application of 100 inch-pounds of torque, at which point the servo arm will travel freely. *If the brass shear screw is broken during autopilot installation or usage, do not replace it with a standard screw*– contact Dynon Technical Support for a replacement shear screw. Instruction for replacing the shear screw can be found at http://docs.dynonavionics.com.

A broken shear screw indicates an abnormal condition in the installation and/or operation of the autopilot and servo, much as a blown fuse or circuit breaker indicates a problem in the electrical system. Shear screws should be replaced with proper parts only after any problems are corrected.

The servo shear screw should NEVER be removed or adjusted in the normal process of installing an autopilot servo. Instructions for both replacing a broken shear screw and instructions for changing or replacing the servo arm/capstan assembly can be found at http://docs.dynonavionics.com.

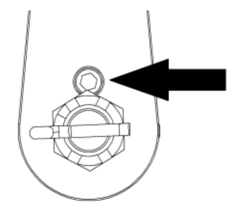


Figure 57 - Shear Screw

There will be a variety of methods used to install the other end of this control linkage to the existing mechanicals of the aircraft. Some systems will use a hole drilled into the bell crank as the point where the servo push rod/rod end combination interfaces with the controls. Others will use an attachment to existing linkage. Others may attach directly to the control stick itself. It is up to the installer to decide which method is best in terms of safety and AP functionality.

Installers should always keep in mind the range of motion of the servo. Total servo arm travel needs to be limited to prevent an OVER CENTER condition (see caution note above), while still preserving the control surfaces' full range of motion. Carefully consider the prevention of an over center condition when selecting the mounting location and linkage attachment point for any servo installation. The built-in control stops of the aircraft will limit the servo arm travel when installed correctly. Again, Dynon strongly recommends that the included Range of Motion Limiting Bracket be installed in order to absolutely prevent the possibility of an over center condition. The Range of Motion Limiting Bracket should not be used as a normal stop; the aircraft's built-in stops should always be the primary range limit. The Range of Motion Limiting Bracket can be installed in different orientations depending on the aircraft geometry. However, it is important that it constrain the servo arm such that is unable to travel over center in either direction. An example of how the Range of Motion Limiting Bracket can be installed is demonstrated below. Use only the screws that are provided or specified in the Range of Motion Limiting Bracket Kit Installation Instructions (include with the Bracket Kit).

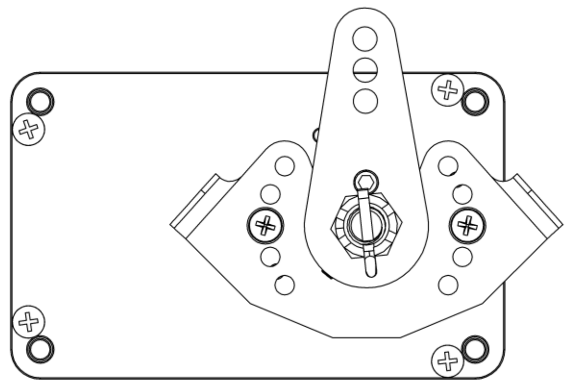


Figure 58 - Servo Range of Motion Limiting Bracket, Front

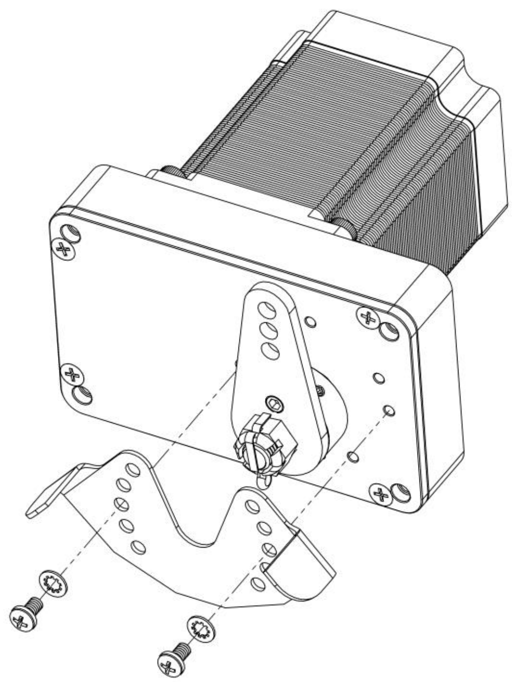
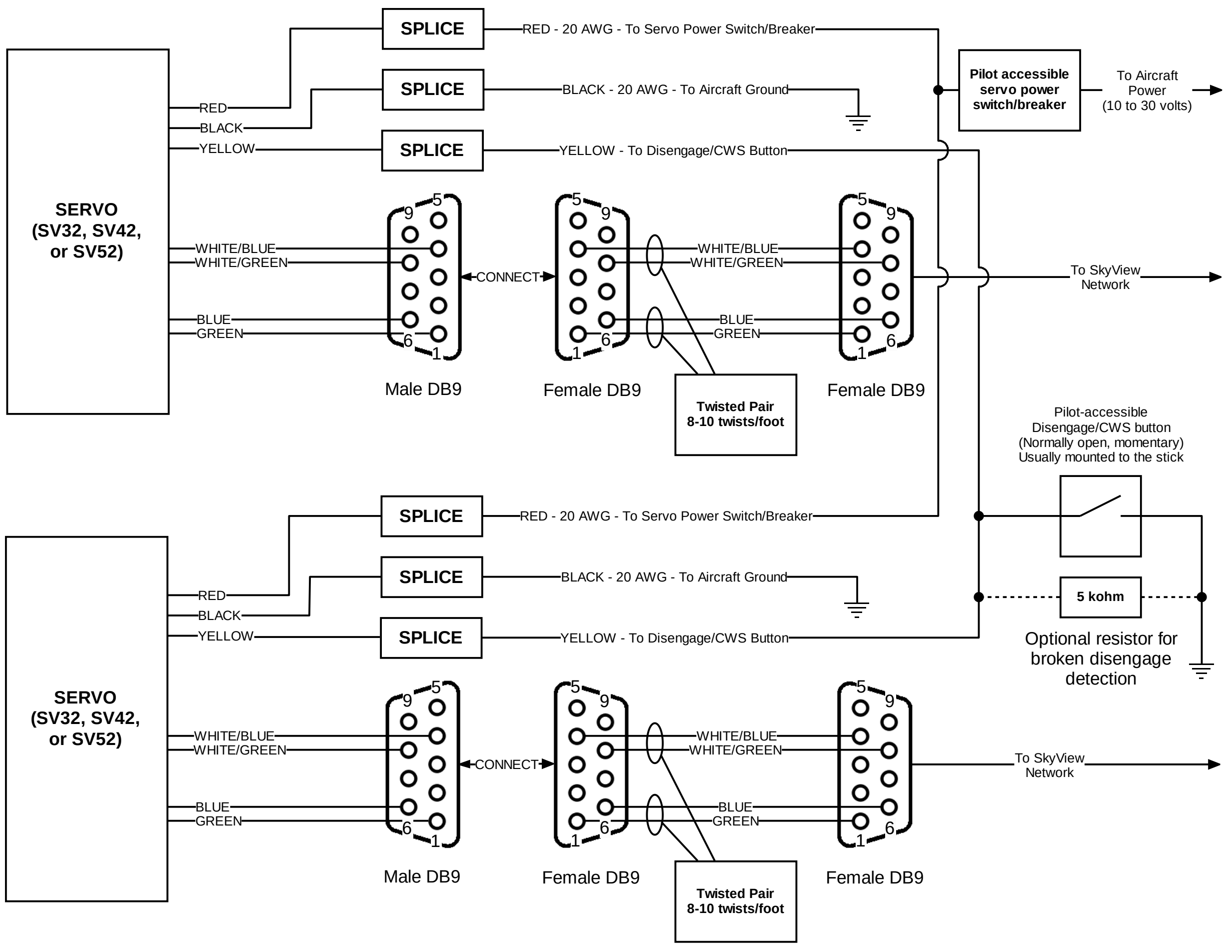


Figure 59 - Servo Range of Motion Limiting Bracket - Isometric

The bushings other mechanical components in Dynon Avionics Autopilot servos are self-lubricating and should not be additionally lubricated.

Autopilot System Electrical Installation

Figure 60 provides an overview of the autopilot electrical system. Note that SkyView supports up to two servos.



- SERVO CURRENT DRAW AT 12 VOLTS - (halve the current for 24 volt systems)				
Servo	Powered, disengaged	Engaged, holding, 100% torque	Engaged, moving, 100% torque	Unit
SV32	0.10	0.80	1.33	amps
SV42	0.10	1.11	2.03	amps
SV52	0.10	1.52	2.80	amps

Figure 60–SkyView Autopilot System Electrical Installation Overview (All Connectors Rear View)

The following sections describe the electrical installation of each subsystem in detail.

Servo Electrical Installation

Dynon Avionics' servos are supplied with 7 unterminated wires, each about 8" in length. We recommended that you use the SV-NET-SERVO (one per servo) network cabling kit when installing servos; however, it is ultimately the responsibility of the installer to decide on connectors and associated wiring.

Table 40 describes servo wire colors and functions.

Color	Function	SV-NET-SERVO D9 Pin	Notes
Red	Power	N/A	10 to 30 volts DC*
Black	Aircraft Ground	N/A	Can be locally grounded
Green	SkyView Network Data 1 A	1	Connected in parallel with other SkyView Network devices
Blue	SkyView Network Data 1 B	6	Connected in parallel with other SkyView Network devices
Yellow	AP Disengage/Control Wheel Steering (CWS) Button	N/A	Connected through a normally-open pushbutton switch to Ground (disengages AP when button is pushed). If two servos are installed, the yellow wire from each servo is connected in parallel to a single pushbutton.
White/Green	SkyView Network Data 2 A	8	Connected in parallel with other SkyView Network devices
White/Blue	SkyView Network Data 2 B	4	Connected in parallel with other SkyView Network devices

Table 40–Detailed Servo Wiring

*Reference the Power Consumption Section of the System Planning Chapter for details regarding servo current consumption at 12 and 24 volts DC.

Circuit Breaker/Fuse

We recommend that electrical power for the all servos be protected with an appropriately sized circuit breaker or fuse that is accessible to the pilot while in flight.

SkyView does continuously look for the presence of powered-up servos, even when the autopilot is disengaged, and will show an error condition if they are not seen. Therefore, Dynon

Avionics recommends that the servos be designed to receive power whenever SkyView is powered on in routine operation. When the servos are receiving power but the autopilot is not engaged, the servos draw negligible power.

SkyView Network Connection

Connect the servos to the SkyView network according to Figure 60 and Table 40. Installers should strongly consider using the SV-NET-SERVO cabling kit (one per servo) for completing the network connection to the servos in the system. Figure 61 is the recommended pin insertion scheme for the three D9 connectors present in the SV-NET-SERVO cabling kit.

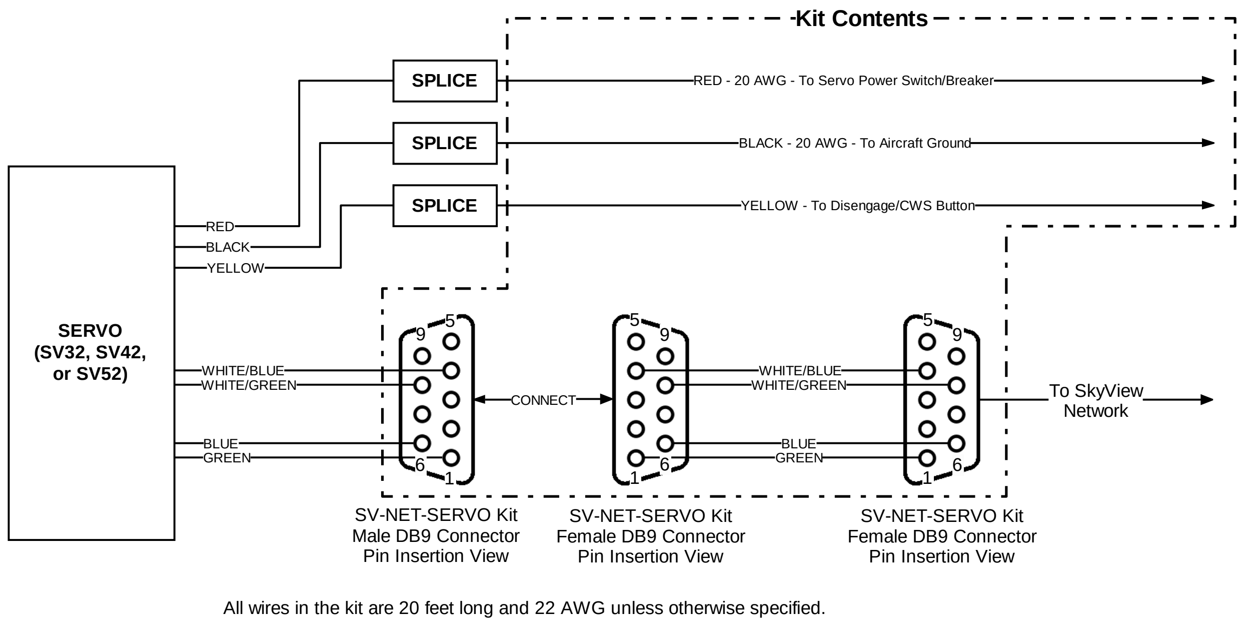


Figure 61–SV-NET-SERVO Recommended Pin Insertion (All Connectors Rear View)

Note that the kit contains 20 feet of wire of each color, which should be sufficient for most servo installations. Also note that the white/blue, white/green and blue, green wire combinations come pretwisted.

Remember to configure the network after connecting all modules to a display.

AP Disengage/CWS Button

The installation of the AP Disengage/CWS button is required.

The AP Disengage/CWS button should be in a very accessible location, usually mounted to the stick or yoke. This button's primary purpose is to immediately disengage the autopilot. *It is also required for autopilot calibration, control wheel steering functionality, and can be used to engage the autopilot.*

This button should be a single pole, normally open, momentary button. Verify that two terminals of the button are shorted when the button is pressed and open (no-connect) when the button is released. One terminal of the button should connect to the servos' yellow wires, and the other should connect to ground.

While not required, you may install a 4.7 - 5.3k ohm resistor across the AP Disengage/CWS button. This allows SkyView to detect a break in this circuitry and alert the pilot if this resistor is present in the installation.

Wire Sizing

While it is beyond the scope of this installation guide to advise on specific types of wiring for a particular aircraft, choice of wiring should be sized to 1) minimize voltage drop over the length of the particular wiring run, and 2) conduct the amount of current required by the subsystem without the wiring becoming warm to the touch. Appendix C: Wiring and Electrical Connections contains information and suggested resources for wiring and electrical connections. Generally, 20 AWG wire is a suitable gauge for the servo power / ground wires for lengths up to 20' of wire.

Wiring Installation

Care should be taken such that aircraft wiring is not subjected to chafing, excessive flexing, or connections/junctions subjected to excessive vibration which may cause the connection/junction to fail or short-circuit.

Autopilot Servo Calibration and Test Procedures

You must calibrate, test, fine tune, and flight test the autopilot servos in order to complete the autopilot installation.

Adjusting autopilot settings while the autopilot is engaged is not recommended, as some settings changes may cause the autopilot to react immediately and counter to the pilot's immediate expectations.

All servos must be properly networked into the SkyView system and IAS tape colors / v-speeds must be configured prior to any servo calibration, testing, or tuning. Reference the Network Setup and Status Section for instructions on how to network the servos into the system and the Airspeed Limitations Section for instructions on how to set IAS tape colors.

Servo Calibration Procedure

The servo calibration procedure identifies the orientation and range of motion of each servo and must be performed before the servo test procedure. SkyView uses this procedure to automatically differentiate between the pitch and the roll servos.

To calibrate the servos, enter the Servo Calibration Wizard (SETUP MENU > HARDWARE CALIBRATION > SERVO CALIBRATION > CALIBRATION) and follow the onscreen instructions to calibrate the servo(s). *If the servo calibration procedure is successful, SkyView will automatically instruct you to run the servo test procedure.*

Servo Test Procedure

The servo test procedure requires a successful servo calibration. The servo test procedure verifies that each servo is configured properly by moving the control surfaces while the installer verifies the correct movement. You may run this procedure on its own at any time after a successful servo calibration. *SkyView will not display AP status on the Top Bar until after this test procedure is successfully completed.*

To run this procedure on its own (after a successful servo calibration procedure), enter the Servo Test Wizard (SETUP MENU > HARDWARE CALIBRATION > SERVO CALIBRATION > TEST) and follow the onscreen instructions to test the servo(s).

Autopilot Servo Setup and Fine Tuning

There are several parameters in the Autopilot Setup Menu (SETUP MENU > AUTOPILOT SETUP) that allow you to fine tune the behavior of the SkyView autopilot system. This section describes these adjustable parameters. *Note that the Autopilot Setup Menu is only accessible after a successful servo test procedure.*

Roll Axis Configuration

Roll Axis Torque

The roll axis torque parameter specifies how much torque the servo will exert before slipping. Servo slip is indicated by the word SLIP in black letters in a yellow box on the Top Bar for the roll axis as shown in Figure 62.

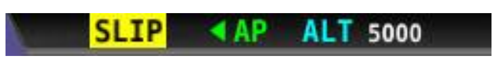


Figure 62–Example Roll Axis Servo Slip Warning

Torque must be set high enough to prevent any slip due to air loads, but low enough that the pilot can comfortably override the autopilot should the need arise. If the servo slips continuously, the autopilot cannot fly the aircraft. Torque is specified in percent (%) of maximum the servo is capable of exerting. The minimum is 10%, the maximum is 100%, and the default value is 100%.

To adjust the roll axis torque value:

1. Go to the Roll Axis Torque Adjust Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > TORQUE).
2. Adjust the torque %.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

It may take some experimentation to find the right value for your aircraft, but if you are comfortable overriding the servo at 100% torque, it is safe to leave that setting at its default value.

To test roll axis servo override:

1. Return to the Main Menu.
2. Center the aircraft controls.
3. Enter the Autopilot Menu (MAIN MENU > AP).
4. Press HDG:OFF. Note that the mode toggles to HDG:ON and the roll servo engages.

Now, take the controls and override the servo by moving to either roll left or roll right (remember, you are only overriding the roll servo, so you should feel no resistance in the pitch axis). Ensure that you are comfortable with the amount of force it takes to override the servo. If you are not, decrease the roll servo torque value by 10% and repeat the test. *Do note that air loads may decrease the amount of effort required to override the servo.*

Roll Axis Sensitivity

The roll axis sensitivity parameter specifies the how fast or slow the AP responds to deviations between commanded direction and actual heading or track. If sensitivity is set too low, the aircraft will wallow during changes in heading. If sensitivity is set too high, the aircraft will be twitchy, with frequent, fast, aggressive adjustments. Sensitivity is specified in digits. The minimum is 1 and the maximum is 24 (low to high sensitivity, respectively). The default value is 10.

This parameter can be tuned in flight in the Roll Axis Setup Menu (IN FLIGHT SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > SENSITIVITY). Leaving it at the default of 10 is sufficient for initial setup. If the autopilot is not as decisive as you would like, increase this value. If it is too aggressive, decrease it.

To adjust the roll axis sensitivity value:

1. Go to the Roll Axis Sensitivity Adjust Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > SENSITIVITY).
2. Adjust the sensitivity number.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Roll Axis Mode

You can set the roll axis mode to either bank angle or turn rate. If the roll axis is set to the bank angle mode, the autopilot will more directly control the bank angle of the aircraft instead of targeting a specific turn rate during autopilot-commanded turns. The maximum bank angle that the autopilot allows is set by the bank angle target parameter.

If the roll axis is set to turn rate mode, the autopilot will more directly control the average turn rate of the aircraft during autopilot-commanded turns while still obeying the maximum bank angle. The maximum turn rate and bank angle that the autopilot allows are set by adjusting the turn rate target and maximum bank angle parameters.

To choose the roll axis mode:

1. Go to the Roll Axis Mode Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > MODE).
2. Choose the mode.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Maximum Bank Angle

The maximum bank angle parameter specifies a maximum bank angle which the autopilot will not exceed during turns. An appropriate maximum bank angle protects against overbank conditions. If the maximum bank angle is reached during a turn, the autopilot limits the bank to that value and then reduces it as needed to complete the turn.

If the maximum bank angle is reached, the turn rate target is ignored until the aircraft returns to within 5° of level in the roll axis.

To derive an appropriate maximum bank angle, calculate the bank angle that results from your desired turn rate limit and cruising airspeed. Then set the maximum bank angle to at least 5° above this value. If you are not comfortable with this bank, decrease the turn rate target. The bank angle minimum is 5° and the maximum is 45°. Its default value is 35° and it is adjustable in 1° increments.

To adjust the maximum bank angle:

1. Go to the Roll Axis Maximum Bank Angle Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > MAXIMUM BANK ANGLE).
2. Adjust the maximum bank angle.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Turn Rate Target

The turn rate target parameter specifies the desired average turn rate for autopilot-commanded turns. For example, a setting of 3.0°/SEC will ideally complete a 90° turn in 30 seconds. Due to flight dynamics and the time it takes the autopilot to initiate a turn, there may be points during a turn where the turn rate target is exceeded. Turn rate target is specified in degrees per second (°/SEC). The minimum turn rate target value is 0.5°/SEC and the maximum is 3°/SEC. Its default value is 1.5°/SEC and it is adjustable in 0.1°/SEC increments.

To adjust the turn rate target:

1. Go to the Roll Axis Turn Rate Target Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > TURN RATE TARGET).
2. Adjust the turn rate target value.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Pitch Axis Configuration

Pitch Axis Torque

The pitch axis torque parameter specifies how much torque the pitch servo will exert before slipping. Servo slip is indicated by the word SLIP in black letters in a yellow box on the Top Bar for the pitch axis as shown in Figure 63.

Figure 63–Example Pitch Axis Servo Slip Warning

Torque must be set high enough to prevent any slip due to air loads, but low enough that the pilot can override the autopilot should the need arise. If the servo slips continuously, the autopilot cannot fly the aircraft. Torque is specified in percent (%) of maximum the servo is capable of exerting. The minimum is 10%, the maximum is 100%, and the default value is 100%.

To adjust the pitch axis torque value:

1. Go to the Pitch Axis Torque Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > TORQUE).
2. Adjust the torque %.
3. Press ACCEPT to save the value or press CANCEL to return to the Pitch Axis Menu.

It may take some experimentation to find the right value for your aircraft, but if you are comfortable overriding the servo at 100% torque, it is safe to leave that setting at its default value. *Do note that air loads may decrease the amount of effort required to override the servo.*

To test pitch axis servo override:

1. Return to the Main Menu.
2. Center the aircraft controls.
3. Enter the Autopilot Menu (MAIN MENU > AP).
4. Press ALT:OFF. Note that the mode toggles to ALT:ON and the pitch servo engages.

Now, take the controls and override the servo by moving to either pitch down or pitch up (remember, you are only overriding the pitch servo, so you should feel no resistance in the roll axis). Ensure that you are comfortable with the amount of force it takes to override the servo. If you are not, decrease the pitch servo torque value by 10% and repeat the test.

Pitch Axis Sensitivity

The pitch axis sensitivity parameter specifies the how fast or slow the autopilot responds to deviations between commanded altitude and actual altitude. If sensitivity is set too low, the aircraft will wallow during changes in altitude. If sensitivity is set too high, the aircraft will be twitchy, with frequent, fast, aggressive adjustments. Sensitivity is specified in digits. The minimum is 1 and the maximum is 24 (low to high sensitivity, respectively). The default value is 10.

This parameter can be tuned in flight in the Pitch Axis Setup Menu (IN FLIGHT SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > SENSITIVITY). Leaving it at the default of 10 is sufficient for initial setup. If the autopilot is not as decisive as you would like, increase this value. If it is too aggressive, decrease it.

To adjust the pitch axis sensitivity value:

1. Go to the Pitch Axis Sensitivity Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > SENSITIVITY).
2. Adjust the sensitivity number.

3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Advanced Pitch Gain and Rate Adjustments

There are several additional advanced parameters that can be used to fine tune the performance of the pitch axis. They should be considered secondary to the primary Pitch Axis Sensitivity adjustment. When used, they should be adjusted in the following order:

- Pitch Gain: Use only after sensitivity is set as well as it can be. Increase gradually if airplane does not settle on altitude. The default setting is 2.
- Altitude Gain: Use only after sensitivity and all of the above settings are set as well as they can be. Increase gradually if airplane levels off too soon. Reduce gradually if airplane overshoots altitudes after climbs and descents. The default setting is 0.6.
- Pull Rate: Use only after sensitivity and all of the above settings are set as well as they can be. Controls the rate the AP will push or pull when changing vertical speed. The default setting is 1.
- VSI Gain: Use only after sensitivity and all of the above settings are set as well as they can be. Increase gradually if overshooting altitude after climbs or descents, decrease if rounding out too early. The default setting is 1.5.
- G Error Gain: Use only after sensitivity and all of the above settings are set as well as they can be. Increase gradually if vertical speed changes are not smoothed enough; Decrease if ride is too harsh. G Error Gain adjustments affect the most noticeable changes while the aircraft is in turbulence. The default setting is 1.
- G Error Limit: Use only after sensitivity and all of the above settings are set as well as they can be. Controls the max additional G the autopilot will push or pull to control vertical speed (up to the G limiter). G Error Limit adjustments affect the most noticeable changes while the aircraft is in turbulence. The default setting is 0.25.

Default Climb Vertical Speed

The default climb vertical speed parameter sets the average speed the autopilot will command for climbs when the pitch axis is configured in the VS:DFLT mode. *You may also control the climb vertical speed with the vertical speed bug in VS:BUG mode. Reference the SkyView Pilot's User Guide for more information on these two modes.* If you set this parameter above a vertical speed the aircraft can achieve, the autopilot will run into the airspeed limiter in a climb.

The default climb vertical speed parameter is specified in the units set in the Measurement Units Menu (i.e., feet per minute or meters per second; reference page 3-8 for more information regarding configuring the measurement units). The default value is 500 feet per minute and the value is adjusted in 1 unit increments. The maximum value is 3,000 feet per minute.

To adjust the default climb vertical speed:

1. Go to the Pitch Axis Default Climb Vertical Speed Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > DEFAULT CLIMB VERTICAL SPEED).
2. Adjust the default climb vertical speed.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Default Descent Vertical Speed

The default descend vertical speed parameter sets the average speed the autopilot will command for descents when the pitch axis is configured in the VS:DFLT mode. *You may also control the climb vertical speed with the vertical speed bug in VS:BUG mode. Reference the SkyView Pilot's User Guide for more information on these two modes.*

The default descend vertical speed parameter is specified in the units set in the Measurement Units Menu (i.e., feet per minute or meters per second; reference page 3-8 for more information regarding configuring the measurement units). The default value is 500 feet per minute and the value is adjusted in 1 unit increments. The maximum value is 3,000 feet per minute.

To adjust the default descend vertical speed:

1. Go to the Pitch Axis Default Descend Vertical Speed Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > DEFAULT CLIMB VERTICAL SPEED).
2. Adjust the default climb vertical speed.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Maximum Airspeed

If the AP is engaged and the Maximum Airspeed limit is changed to a value that is lower than the current airspeed, the AP will immediately act to reduce the airspeed to the new maximum airspeed setting, and may do so aggressively. Dynon recommends that this setting only be adjusted with the AP disengaged.

The pitch axis maximum airspeed parameter is the highest airspeed at which the pilot may engage the autopilot. If the autopilot is engaged at the time the aircraft's airspeed exceeds the maximum, the autopilot enters an airspeed hold mode and pitches the aircraft up to prevent increasing airspeed. SkyView simultaneously indicates that the aircraft has exceeded the parameter by displaying SPD indicators in the Top Bar and in the AP menu as illustrated in Figure 64 and Figure 65, respectively.

Figure 64–Top Bar SPD Indicator

Figure 65–AP Menu SPD Indicators

If the aircraft's altitude rises above the target altitude bug and the autopilot cannot pitch the aircraft down without going above the maximum airspeed, SkyView presents the prompt:

REDUCE POWER

The maximum airspeed parameter cannot be set to a value above 95% of VNE, which should be set to the specifications of your aircraft in the Airspeed Limitations Menu (reference page 5-7 for more information) and is specified in the units set in the Measurement Units Menu (i.e., miles per hour, knots, or kilometers per hour; reference page 3-8 for more information regarding configuring the measurement units). As mentioned previously, the maximum value for this parameter is 95% of VNE. This is also the default value.

To set the maximum airspeed:

1. Go to the Pitch Axis Maximum Airspeed Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > MAXIMUM AIRSPEED).
2. Adjust the maximum airspeed.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Minimum Airspeed

If the AP is engaged and the Minimum Airspeed limit is changed to a value that is higher than the current airspeed, the AP will immediately act to increase the airspeed to the new minimum airspeed setting. Dynon recommends that this setting only be adjusted with the AP disengaged.

The pitch axis minimum airspeed is the lowest airspeed at which the pilot may engage the autopilot. *The autopilot cannot be engaged at airspeeds below the minimum airspeed, with the exception of 0 knots, allowing for ground testing.*

When flying at airspeeds lower than the minimum airspeed or when the autopilot is engaged and the aircraft airspeed drops below the minimum, SkyView indicates that the aircraft has dropped below the parameter by displaying SPD indicators in the Top Bar and in the AP menu as illustrated in Figure 64 and Figure 65, respectively.

If the aircraft's altitude drops below the target altitude bug and the autopilot cannot pitch the aircraft up without dropping below the minimum airspeed, SkyView presents the prompt:

ADD POWER

The minimum airspeed parameter must be set to at least (and defaults to) 30% above VS1, which should be set to the specifications of your aircraft in the Airspeed Limitations Menu (reference page 5-7 for more information) and is specified in the units set in the Measurement Units Menu (i.e., miles per hour, knots, or kilometers per hour; reference page 3-8 for more information regarding configuring the measurement units). As previously mentioned, the minimum value for this parameter is 30% above VS1. This is also the default value.

To set the minimum airspeed:

1. Go to the Pitch Axis Minimum Airspeed Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > MINIMUM AIRSPEED).
2. Adjust the minimum airspeed.
3. Press ACCEPT to save the value or press CANCEL to return to the Roll Axis Menu.

Disengage Button Options

Hold to Engage

Hold to Engage may be set to YES or NO. Setting HOLD TO ENGAGE to YES allows you to engage the autopilot by holding the Disengage/CWS Button for more than 2 seconds. This allows for a convenient alternative to engaging the autopilot via the AP Menu. Default is YES.

When HOLD TO ENGAGE is set to YES, anytime the autopilot is disengaged you can engage it by pressing and holding the Disengage/CWS Button for more than 2 seconds. Note that after 2 seconds, the autopilot status indicator in the Top Bar on the SkyView displays CWS CWS, as illustrated in Figure 66.

Figure 66–Autopilot Control Wheel Steering Mode

This indicates that the servos are in control wheel steering mode and are waiting for the button to be released before engaging.

To set the hold to engage mode:

1. Go to the Hold to Engage Adjust Page (SETUP MENU > AUTOPILOT SETUP > DISENGAGE BUTTON > HOLD TO ENGAGE).
2. Set to YES or NO.
3. Press ACCEPT to save or press CANCEL to return to the Disengage Button Menu.

Enable Broken Line Detect

The ENABLE BROKEN LINE DETECT option may be set to YES or NO. *It should only be set to YES if the optional 5 kΩ resistor is installed across the Disengage/CWS Button, as shown in Figure 60.* If the resistor is installed and this option is set to YES, SkyView continuously monitors the AP Disengage/CWS Button circuit for proper resistance. If a broken line is detected, SkyView will display the following message:

AP BROKEN DISCONNECT

If the autopilot is engaged when this condition is detected, it will remain engaged.

Set to YES if the optional 5 kΩ resistor is installed across the 2 terminals of the Disengage/CWS Button. Set to NO if the resistor is not installed. Default is NO.

To set the broken line detection mode:

1. Go to the Enable Broken Line Detect Adjust Page (SETUP MENU > AUTOPILOT SETUP > DISENGAGE BUTTON > ENABLE BROKEN LINE DETECT).
2. Set to YES or NO.
3. Press ACCEPT to save or press CANCEL to return to the Disengage Button Menu.

Control Wheel Steering Mode

To set the control wheel steering mode:

1. Go to the Control Wheel Steering Mode Adjust Page (SETUP MENU > AUTOPILOT SETUP > DISENGAGE BUTTON > CONTROL WHEEL STEERING MODE).
2. Select a setting.
3. Press ACCEPT to save or press CANCEL to return to the Disengage Button Menu.

There are three settings for Control Wheel Steering Mode:

1. Off
2. HOLD HDG/ALT
3. LAST HDG/ALT

Off is the default setting.

If you set the control wheel steering mode to hold heading and/or altitude (HOLD HDG/ ALT), the autopilot is configured to hold the heading and/or altitude that the aircraft is in when you exit control wheel steering mode by releasing the disconnect switch.

If you set the control wheel steering mode to last heading and/or altitude (LAST HEADING / ALTITUDE), the autopilot is configured to return the aircraft to the heading and/or altitude the autopilot was set to before you entered control wheel steering mode.

Autopilot Flight Test and Calibration

Flight Test Preparation

The flight test should be conducted on a clear, VFR day.

The remaining configuration steps are done while flying. At many points, the pilot's attention will be divided between documentation, configuring SkyView, and maintaining situational awareness. Before commencing these configuration steps, ensure that you have adequate altitude, clear weather, no traffic, no obstructions in the flight path, great visibility, etc. *If possible, bring someone along on the first configuration flight.*

If autopilot behavior, performance, or interference with the controls is cause for concern while flying, remember that *the autopilot can be disengaged in any of the following ways:*

- Turn off the autopilot circuit breaker/switch or remove the fuse.
- Press the Disengage/CWS button.
- Enter the AP Menu (MAIN MENU > AP MENU) and press buttons 2 and 4 until they are labeled with HDG:OFF (or TRK:OFF if in GPS ground track mode) and ALT:OFF to disengage the roll and pitch axes, respectively, as illustrated in Figure 67.

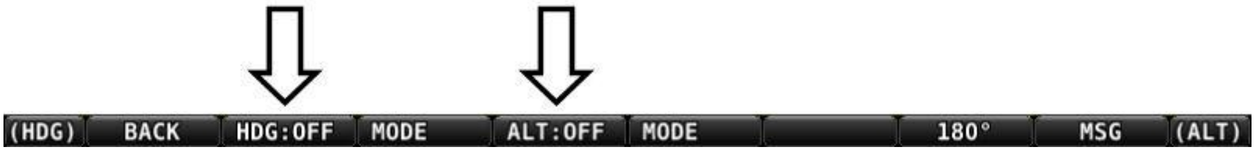


Figure 67–Disengage the Autopilot in the AP Menu

Before commencing the remaining autopilot configuration steps, verify (on the ground with 0 airspeed indicated on the SkyView PFD) that the autopilot status on the Top Bar indicates the autopilot is off.

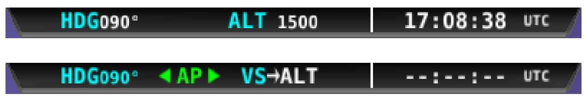


Figure 68–Example Top Bars

The first Top Bar example in Figure 68 indicates the autopilot is disengaged by the absence of ◀ AP ▶ . The bottom Top Bar example in the figure indicates that both autopilot axes are engaged. The arrow to the left of AP denotes an engaged roll axis and the arrow to the right of AP denotes an engaged pitch axis. Reference the SkyView Pilot's User Guide for more information regarding autopilot symbology in the Top Bar.

Roll Servo Flight Tuning Procedure

This procedure tunes the roll autopilot servo and thus, the flight characteristics of the aircraft in heading holds and turns. This procedure should be performed with the autopilot roll axis in track (TRK) mode, where the purpose of the autopilot is to keep the aircraft's GPS ground track aligned with the track bug.

Use the following procedure to arm the roll axis in track mode:

1. Enter the AP Menu (MAIN MENU > AP).
2. Press button 3, MODE.
3. Press TRK. It should be highlighted and look like  and the AP Menu will automatically show up on the screen and show a TRK:OFF label above button 2.

Note that the heading (HDG) bug under the DG changes to the track (TRK) bug in track mode.

Roll Servo Flight Tuning Procedure Overview

The following list is an overview of the roll servo flight tuning procedure. Each step is described in more detail after the list.

1. Verify preferred turn rate limit and bank angle limit.
2. Ensure the aircraft is in trim.
3. Engage the autopilot in track mode.
4. Allow a few minutes of stable flight under autopilot control.
5. Adjust roll servo torque and/or sensitivity values as needed.
6. Change the track bug 90 degrees from the current track.
7. Verify roll torque and sensitivity settings during turn(s).
8. Verify turn rate limit and bank limit settings during turn(s).
9. Disengage the autopilot.

Verify preferred turn rate limit and bank angle limit

Perform the following steps:

1. Enter the Roll Axis Menu (SETUP MENU > AUTOPILOT SETUP MENU > ROLL AXIS).
2. Verify the TURN RATE TARGET and MAXIMUM BANK ANGLE are set to values that are within your comfort limits.
3. These values are configurable before, during, and after flight. Use the instructions found in previous sections (i.e., the Maximum Bank Angle and the Turn Rate Target sections) to adjust these values.

Ensure the aircraft is in trim

This test procedure tunes the autopilot's roll axis control. It is critical to isolate this axis and thus, you should start the procedure when the aircraft is in neutral trim and maintain a constant altitude during the following steps.

Engage the autopilot in track mode

1. Enter the AP Menu (MAIN MENU > AP MENU).
2. Press button 2 to engage the autopilot in track mode. The button label should change from TRK:OFF to TRK: ON and the Top Bar autopilot status indicator should change to ◄AP.
3. Ensure that the autopilot pitch axis is disengaged. If needed, press button 4 until its label looks like ALT:OFF.

Allow a few minutes of stable flight under autopilot control

Note that the autopilot is flying in track hold mode, so you will need to control the aircraft's pitch. Ensure that you are not affecting the autopilot's control of the roll axis, so you can determine the autopilot's track hold and change performance.

Adjust roll servo torque and/or sensitivity values as needed

Observe the autopilot status indicator on the Top Bar while the autopilot flies. If the roll axis indicator frequently looks like SLIP ◄AP, it is an indication that the roll servo is slipping and the torque needs to be increased. Occasional slips due to turbulence are acceptable.

If necessary, adjust the torque percentage on the Roll Axis Torque Adjust Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > TORQUE).

If you have adjusted the roll servo torque to 100% and are still seeing frequent slips, you may need to try a higher strength servo (e.g., if you have an SV32 installed, try swapping for an SV42).

After verifying that the torque percentage is set appropriately, watch closely for autopilot wandering around the target track. The autopilot should keep the triangle of the track bug closely aligned with the small, magenta ground track triangle.

If excessive wandering is observed, increase the sensitivity level on the Roll Axis Sensitivity Adjust Page (SETUP MENU > AUTOPILOT SETUP > ROLL AXIS > SENSITIVITY). If the autopilot control seems twitchy or aggressive, decrease the sensitivity. All adjustments of sensitivity should be done in increments of 1 or 2, allowing you to notice subtle changes in control.

Change the heading bug 90 degrees from the current heading

Change the heading bug to 90 degrees to the left or right of current heading.

1. Configure a joystick to control the heading bug as enumerated in the How to Enter the Joystick Function Menu Section of this guide. The label above the joystick should read (HDG).
2. Turn the joystick either way until the track bug reads 90 degrees to the left or right of current heading.
3. As soon as the track bug is changed, the autopilot begins changing the aircraft's direction to follow.

Verify roll torque and sensitivity settings during turn(s)

During an autopilot-controlled turn, observe the autopilot status indicator on the Top Bar as you did earlier. If excessive slipping is observed (i.e., SLIP ◄AP), then increase the roll servo's torque percentage.

Repeat the 90 degree autopilot-controlled turns and torque adjustments until the autopilot roll axis indicator does not display a slip indication.

Continue performing autopilot-controlled turns and observe the overall behavior of the aircraft. If the aircraft wallows, or rolls out of turns slowly as it reaches the target heading, that is an indication that the roll servo sensitivity needs to be increased. If, upon reaching the target heading, the stick twitches excessively, that is an indication that the Roll Servo SENSITIVITY needs to be decreased.

You should be able to find a sensitivity level that is acceptable for both heading holds and turns in smooth air. You may, however, find that in periods of extended turbulence, a lower sensitivity level must be set.

Verify turn rate limit and bank limit settings during turn(s)

During an autopilot-controlled turn, verify that the time to complete a turn matches your expectations given the setting for the turn rate target. For example, if the turn rate target is set to 3 degrees per second, a 90 degree turn should take about 30 seconds. If this is not the case, the bank angle required by the target turn rate may exceed the set maximum bank angle.

Ensure that during an autopilot-controlled turn, the bank angle indicated on the PFD does not reach your maximum bank angle. If it does, you must either increase the maximum bank angle or decrease the turn rate target.

At this point, all the parameters in the Roll Axis Menu should be appropriately tuned.

Disengage the autopilot

Disengage the autopilot by either pressing and holding the disengage button for 2 seconds or by entering the AP Menu (MAIN MENU > AP MENU) and toggling both axes to off (i.e., HDG:OFF and ALT:OFF).

Pitch Servo Flight Tuning Procedure

This procedure tunes the pitch autopilot servo and thus, the flight characteristics of the aircraft in altitude holds, climbs, and descents.

Pitch Servo Flight Tuning Procedure Overview

The following list is an overview of the pitch servo flight tuning procedure. Each step is described in more detail after the list.

1. Verify preferred airspeed minimum and maximum values and default climb and descent vertical speeds.
2. Ensure the aircraft is in trim.
3. Engage the autopilot in altitude mode.
4. Allow a few minutes of stable flight under autopilot control.
5. Adjust roll servo torque and/or sensitivity and/or pitch gain values as needed.
6. Initiate autopilot-controlled climbs and descents.
7. Verify roll torque, sensitivity, and the other available advanced gain and rate settings during climbs and descents.
8. Verify airspeed minimum and maximum values and default climb and descent vertical speeds during altitude changes.
9. Execute several autopilot-controlled changes of altitude and observe the overall aircraft performance.
10. Observe and verify trim indications during altitude holds and changes.

Verify preferred airspeed minimum and maximum values and default climb and descent vertical speeds

Perform the following steps:

1. Enter the Pitch Axis Menu (SETUP MENU > AUTOPILOT SETUP MENU > PITCH AXIS).
2. Verify the DEFAULT CLIMB VERTICAL SPEED, DEFAULT DESCENT VERTICAL SPEED, MAXIMUM AIRSPEED, and MINIMUM AIRSPEED are set to values that are within your comfort limits.
3. These values are configurable before, during, and after flight. Use the instructions found in previous sections (i.e., the Default Climb Vertical Speed, Default Descent Vertical Speed, Maximum Airspeed, and Minimum Airspeed sections) to adjust these values.

Ensure the aircraft is in trim

This test procedure tunes the autopilot’s pitch axis control. It is critical to isolate this axis and thus, you should start the procedure when the aircraft is in neutral trim and maintain a constant heading during the following steps.

Engage the autopilot in altitude mode

1. Enter the AP Menu (MAIN MENU > AP MENU).
2. Press button 4 to engage the autopilot in altitude mode. The button label should change from ALT:OFF to ALT: ON and the Top Bar autopilot status indicator should change to AP ▶.
3. Ensure that the autopilot roll axis is disengaged. If needed, press button 2 until its label looks like HDG:OFF.

Allow a few minutes of stable flight under autopilot control

Note that the autopilot is flying in altitude hold mode, so you will need to control the aircraft in roll. Ensure that you are not affecting the autopilot’s control of the pitch axis, so you can determine the autopilot’s altitude hold and change performance.

Adjust pitch servo torque and/or sensitivity values as needed

Observe the autopilot status on the Top Bar while the autopilot flies. If the pitch axis indicator frequently looks like AP ▶ SLIP, that is an indication that the pitch servo is slipping and the torque needs to be increased. Occasional slips due to turbulence are acceptable.

If necessary, adjust the torque percentage on the Pitch Axis Torque Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > TORQUE).

If you have adjusted the roll servo torque to 100% and are still seeing frequent slips, you may need to try a higher strength servo (e.g., if you have an SV32 installed, try swapping for an SV42).

After verifying that the torque percentage is set appropriately, watch closely for autopilot wandering around the target altitude. The autopilot should keep the triangle of the altitude bug (shown in Cyan in Figure 69) closely aligned with the triangle of the numerical altitude indicator.

Figure 69–Altimeter and Altitude Bug

If excessive wandering is observed, increase the sensitivity level on the Pitch Axis Sensitivity Adjust Page (SETUP MENU > AUTOPILOT SETUP > PITCH AXIS > SENSITIVITY). If the autopilot control seems twitchy or aggressive, decrease the sensitivity. All adjustments of sensitivity should be done in increments of 1 or 2, allowing you to notice subtle changes in control.

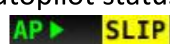
After sensitivity is adjusted as well as it can be, PITCH GAIN may be gradually increased if the airplane does not settle on altitude.

Initiate autopilot-controlled climbs and descents

Change the ALT bug to 500 feet above your current altitude.

1. Configure a joystick to control the altitude bug as enumerated in the How to Enter the Joystick Function Menu Section of this guide. The label above the joystick should read (ALT).
2. Turn the joystick either way until the altitude bug reads 500 feet above the current altitude.
3. As soon as the altitude bug is changed, the autopilot begins changing the aircraft's altitude to follow.
4. Repeat this step, except set the altitude bug for 500 below the current altitude.

Verify pitch torque and sensitivity settings during climbs and descents

During an autopilot-controlled climb, observe the autopilot status indicator on the Top Bar as you did earlier. If excessive slipping is observed (i.e., 

) then increase the pitch servo's torque percentage. Repeat this verification in a descent.

Repeat the autopilot-controlled climbs, descents, and torque adjustments until the pitch axis indicator on the Top Bar does not display a slip indication.

Continue performing autopilot-controlled climbs and descents, and observe the overall behavior of the aircraft. If the aircraft oscillates in holds or overshoots as it reaches target altitude, it is an indication that the pitch servo sensitivity needs to be increased. If, upon reaching the target altitude the stick twitches excessively, it is an indication that the pitch servo sensitivity needs to be decreased.

After sensitivity is adjusted as well as it can be, PITCH GAIN, ALTITUDE GAIN, PULL RATE, VSI GAIN, G ERROR GAIN, and G ERROR LIMIT may be adjusted to further improve autopilot pitch axis performance. These should be adjusted in the above order. G ERROR GAIN and G ERROR LIMIT adjustments affect the most noticeable changes while the aircraft is in turbulence. Each of these settings' effects are explained in the Advanced Pitch Gain and Rate Adjustments section above, and in the individual settings menus themselves.

Verify airspeed minimum and maximum values and default climb and descent vertical speeds during altitude changes

During an autopilot-controlled climb, verify that the time to complete the climb matches your expectations given the setting for the default climb vertical speed. If it does not, the climb rate may be limited by the minimum airspeed parameter, and the ADD POWER message will be displayed.

Likewise, during an autopilot-controlled descent, verify that the time to complete the descent matches your expectations given the setting for the default descent vertical speed. If it does not, the descent rate may be limited by the maximum airspeed parameter, and the DECREASE POWER message is displayed.

If necessary, adjust the default climb vertical speed, the default descent vertical speed, maximum airspeed, and minimum airspeed as described above.

At this point, all the parameters in the Pitch Axis Menu should be appropriately tuned.

Execute several autopilot-controlled changes of altitude and observe the overall aircraft performance

There may be some interaction between pitch servo torque and sensitivity settings and it may be necessary to repeat the above steps to achieve acceptably smooth overall autopilot response during altitude holds and changes.

Observe and verify trim indications during altitude holds and changes

Find an area with a lot of clearance above and below the aircraft's altitude and disengage the autopilot. Then follow this procedure:

1. Put the aircraft into neutral trim.
2. Engage the autopilot in ALT mode (and HDG or TRK mode if desired) and allow the autopilot to maintain altitude (and heading, if engaged).
3. Trim the aircraft nose down. The autopilot will maintain the target altitude, despite the nose down trim. Continue trimming nose down just until you see a trim up indicator on the Top Bar (i.e., TRIM alternating with ▲). This indicator displays when the AP senses too much nose down trim.
4. Trim the aircraft nose up until the indicator disappears.
5. Disengage the AP to observe the state of the aircraft's trim.

Repeat the above procedure, trimming the aircraft nose up until you see the trim down indicator on the Top Bar (i.e., **TRIM** alternating with ▼). Then, trim nose down until the indicator disappears.

During turbulence and small bumps the trim indicator may flash on and off. Do not take action based on the trim indicator until it remains on for several seconds.

Verify Overall Autopilot Performance

Engage both roll and pitch servos and execute a number of autopilot-controlled changes of heading, altitude, and combinations of the two and observe the overall aircraft performance under autopilot control.

There may be some interaction between the various pitch and roll servo settings, so it may be necessary to repeat some of the later steps in each axis' procedure while adjusting torque and sensitivity to completely optimize the autopilot for the aircraft.

11. SV-XPNDR-26X Installation, Configuration, and Testing

SkyView software version 5.0 contains a software upgrade to the SV-XPNDR-26X. This software update adds the option to have the transponder automatically switch modes as the transition between ground operation and flight is detected.

This software upgrade also updates the ADS-B out capability of the transponder to meet TSO-C166B for ADS-B Out functionality. This change **REQUIRES** that the physical transponder module be labeled to indicate the new TSO authorization. Failure to perform this physical modification at the same time as the software update will result in a transponder which is likely not considered airworthy by aviation regulatory agencies.

Please refer to the Transponder Software Updates section of this chapter for further details about this process.

There are two transponder modules offered by Dynon Avionics. The SV-XPNDR-262 is a Class 2 transponder that is limited to use beneath 15,000 feet and under 175 knots. The SV-XPNDR-261 is a Class 1 transponder that can be used above those limitations. Throughout this manual, they are often referred to together as the SV-XPNDR-26X for instructions that apply to both versions.

The SV-XPNDR-26X Mode S transponder models are DO-181D compliant Mode S level 2els datalink transponders, with support for ADS-B extended squitter, which also meets the relevant environmental requirements of DO-160F/ED-14F. The SV-XPNDR-262 has a nominal power output of 125 Watts, and meets the power output requirements for Class 2. The SV-XPNDR-261 has a nominal power output of 250 watts, and meets the power output requirements for Class 1. The ADS-B function meets DO-260B class B0 for the SV-XPNDR-262 and class B1S for the SV-XPNDR-261. The SV-XPNDR-26X is certified to ETSO 2C112b and ETSO C166a, and to FAA TSO C112c and C166b.

The FAA's ADS-B rule currently permits class A1, A1S, A2, A3, B1S, or B1 transponder-based 1090ES ADS-B transmissions for compliance once the ADS-B Out rules go into effect. Therefore, only the higher power class B1S SV-XPNDR-261 will be able to meet the 2020 ADS-B Out requirement.

The SV-XPNDR-26X transponder is controlled using SkyView's on-screen menu system. This allows the transponder to be mounted separately from the instrument panel and reduces the amount of panel space taken by the transponder. SkyView also provides pressure altitude directly to the transponder, eliminating the need for a separate altitude encoder.

The SV-XPNDR-26X transponder runs from either 14 volt nominal or 28 volt nominal DC power supply with no configuration changes required.

The SV-XPNDR-26X transponder responds to both legacy Mode A/C interrogations and to Mode S interrogations from both ground radar and airborne collision avoidance systems. In all cases, the interrogations are received by the transponder on 1030MHz, and replies are transmitted on 1090MHz.

Read and understand the System Planning Chapter before installing the SV-XPNDR-26X.

Figure 70 has a high-level overview of a suggested SV-XPNDR-26X installation, configuration, and testing procedures:

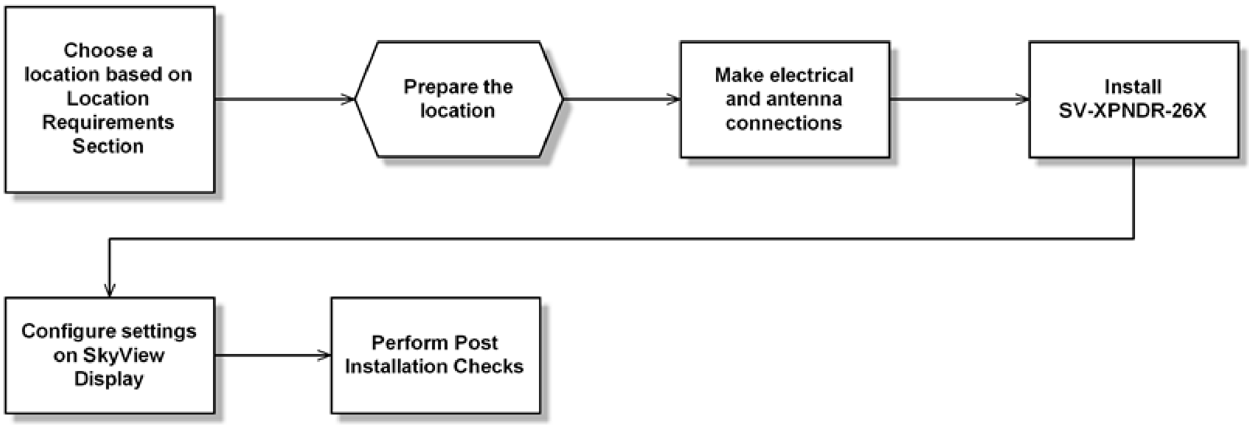


Figure 70 - Suggested SV-XPNDR-26X Installation, Configuration, and Testing Procedure

Physical Installation

Mounting Tray and SV-XPNDR-26X Dimensions

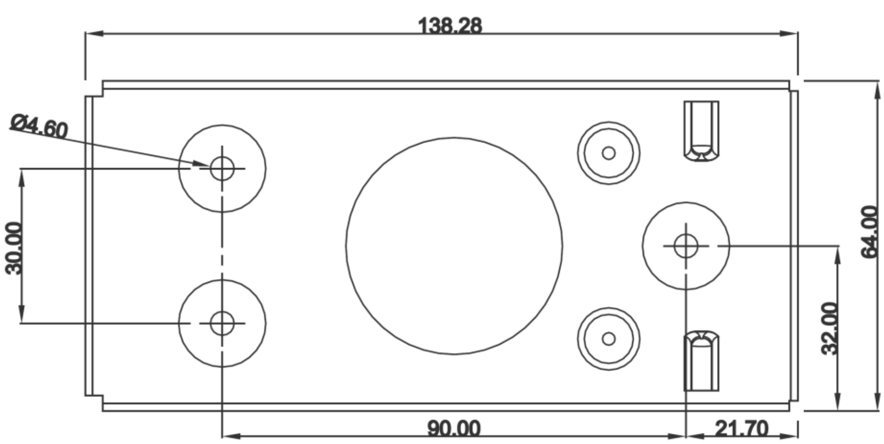


Figure 71 - SV-XPNDR-26X Mounting Tray Dimensions

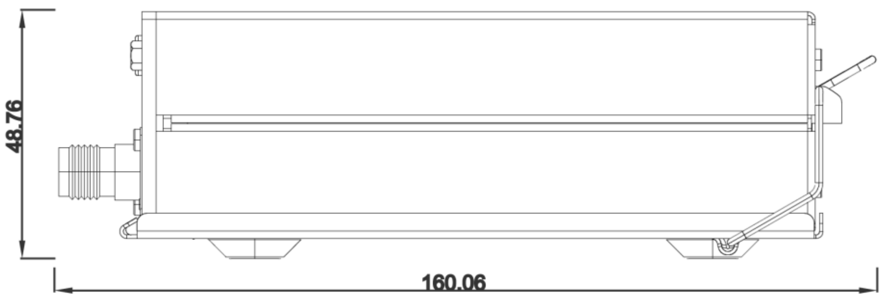


Figure 72 - SV-XPNDR-26X Dimensions with Mounting Tray (dimensions in millimeters)

Installation Instructions

The SV-XPNDR-26X Mode S transponder is designed to be mounted in any convenient location in the cockpit, the cabin, or an avionics bay.

The following installation procedure should be followed, remembering to allow adequate space for installation of cables and connectors.

- Select a position in the aircraft that is not too close to any high external heat source. (The SV-XPNDR-26X is not a significant heat source itself and does not need to be kept away from other devices for this reason).
- Avoid sharp bends and placing the cables too near to the aircraft control cables.
- Secure the mounting tray to the aircraft via the three (3) mounting holes in the tray. The tray should be mounted to a flat surface - it is important that the tray is supported at the dimples as well as the three mounting points.
- Put the SV-XPNDR-26X transponder into the secured mounting tray by hooking the connector end under the lip on the tray.
- Lock the SV-XPNDR-26X transponder into the mounting tray by clipping the retaining wire over the lugs on the opposite end.

Additional items you will require, but which are not in the SV-XPNDR-26X package, include:

- Antenna and fixing hardware. The SV-XPNDR-26X is compatible with transponder antennas commonly available.
- Cables and male TNC connector. You need to supply and fabricate all required cables. Guidance on cable types is given below.
- Mounting hardware: To secure the transponder tray to the airframe you will need at least 3 flat head screws and three self-locking nuts. If the aircraft does not have existing mounting provisions you may need to fabricate additional brackets to support the transponder tray.

Electrical Connections

Harness Construction

Because the SV-XPNDR-26X can be mounted in a variety of locations, the harness length requirements will vary from airplane to airplane. Therefore, Dynon Avionics does not supply pre-manufactured harnesses for the SV-XPNDR-26X. Instead, your SV-XPNDR-26X shipped with enough connectors and pins to generate a wide variety of harness configurations. Refer to the sections below for detailed wiring information. Note that your connector kit may contain a 1.21K resistor. This is only used for SV-XPNDR-26X installations that incorporate a certified GPS receiver for ADS-B Out functionality.

If you do not own a D-sub machined-pin crimping tool, they can be obtained for under $50 from many retailers. See http://wiki.dynonavionics.com/Tools_not_supplied_by_Dynon for known sources of these products. You may also find it helpful to own a pin insertion/extraction tool as well.

Additional harness construction and wiring information can be found in Appendix C: Wiring and Electrical Connections.

The SV-XPNDR-26X has a single D25 female connector which provides the data and power inputs to the transponder. A single TNC coaxial connector attaches to the antenna.

SV-XPNDR-26X Interface – Pinout (Female D25)

Pin	Function	Notes
1	Loopback 1	Connect to Pin 2
2	Loopback 1	Connect to Pin 1
3	GPS Serial Input	Certified GPS Only for ADS-B Out (see explanation below)
4	No Connect	-
5	Transponder Serial RX	Data Input from SkyView
6	No Connect	-
7	Transponder Serial TX	Data Output to SkyView
8	No Connect	-
9	No Connect	-
10	No Connect	-
11	No Connect	-
12	Loopback 2	Connect to Pin 13
13	Loopback 2	Connect to Pin 12
14	Ground	Connect to Aircraft Ground

Pin	Function	Notes
15	11-33V DC	Connect to Aircraft Power
16	No Connect	-
17	External Standby In	Optional: Not Commonly Connected
18	Mutual Suppression	Optional: Not Commonly Connected
19	Squat Switch In	Optional: Not Commonly Connected
20	Ident Switch In	Optional: Not Commonly Connected
21	No Connect	-
22	No Connect	-
23	No Connect	-
24	No Connect	-
25	No Connect	-

Table 41 - SV-XPNDR-26X Female D25 Pinout

The following figure depicts how the SV-XPNDR-26X connects with other SkyView and aircraft components. Note that many of the connections shown here are optional and will not be used in the vast majority of installations.

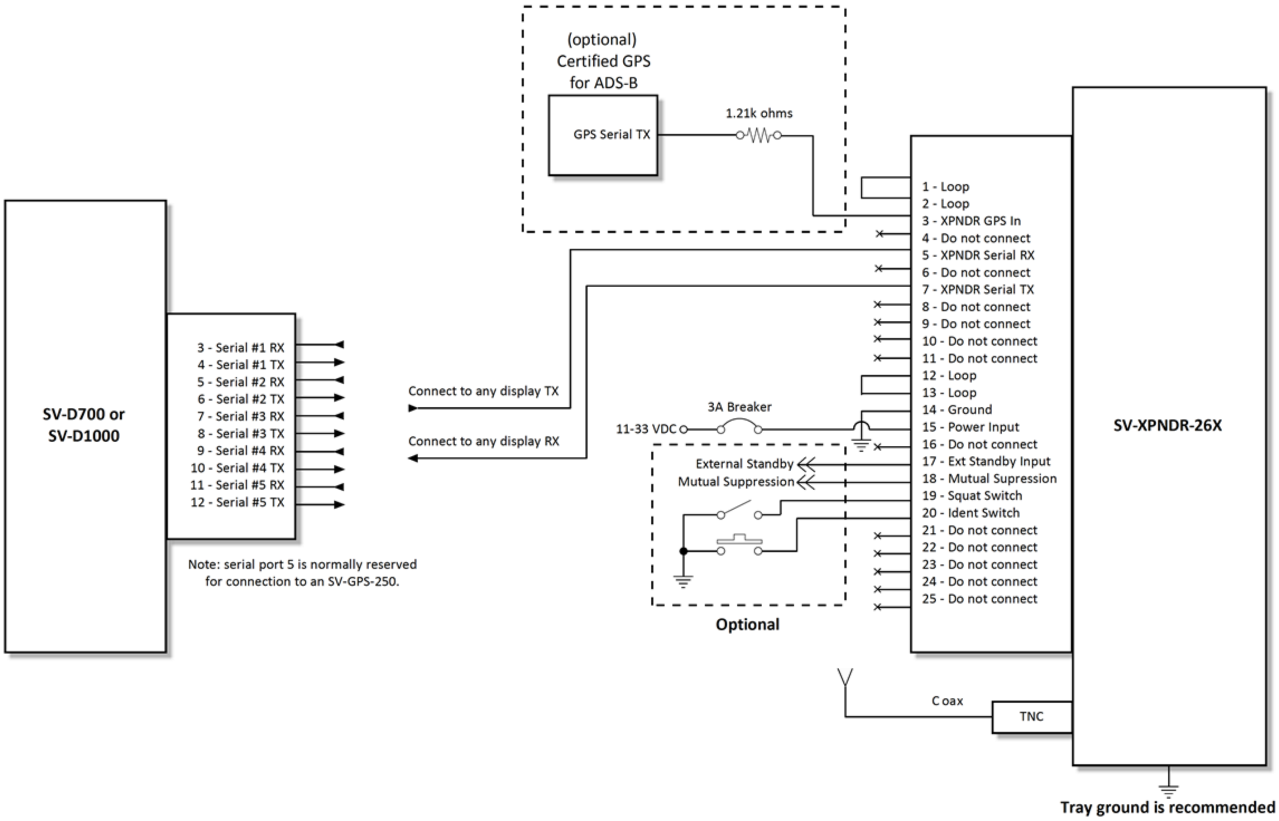


Figure 73 - SV-XPNDR-26X Wiring Diagram

The following table shows the connections for each of SkyView's nominally available serial ports (serial port 5 is usually used for connection to the SV-GPS-250 module). Only ONE of the following serial ports will be used:

Serial Port	SkyView D37	SV-XPNDR-26X D25
1	Pin 3 (RX) Brown/Violet	Pin 7 (TX)
	Pin 4 (TX) Brown/Orange	Pin 5 (RX)
2	Pin 5 (RX) Yellow/Violet	Pin 7 (TX)
	Pin 6 (TX) Yellow/Orange	Pin 5 (RX)
3	Pin 7 (RX) Green/Violet	Pin 7 (TX)
	Pin 8 (TX) Green/Orange	Pin 5 (RX)
4	Pin 9 (RX) Blue/Violet	Pin 7 (TX)
	Pin 10 (TX) Blue/Orange	Pin 5 (RX)

Table 42 - Example SkyView/SV-XPNDR-26X Serial Port Connections

The following figure shows a typical installation, as viewed from the wiring side of the D25 connector:

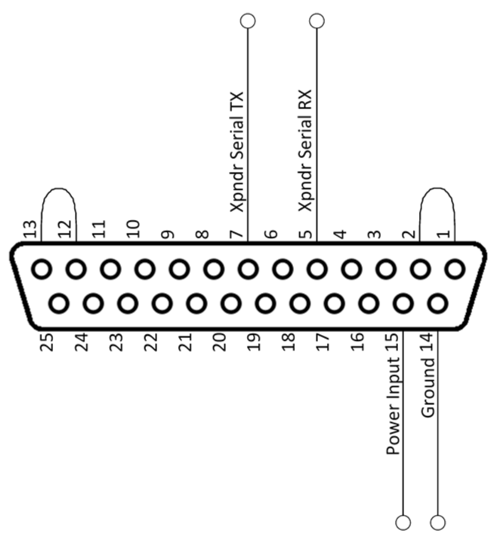


Figure 74 - Typical SV-XPNDR-26X Connections (Rear Pin Insertion View)

The following figure shows all possible connections, as viewed from the wiring side of the D25 connector:

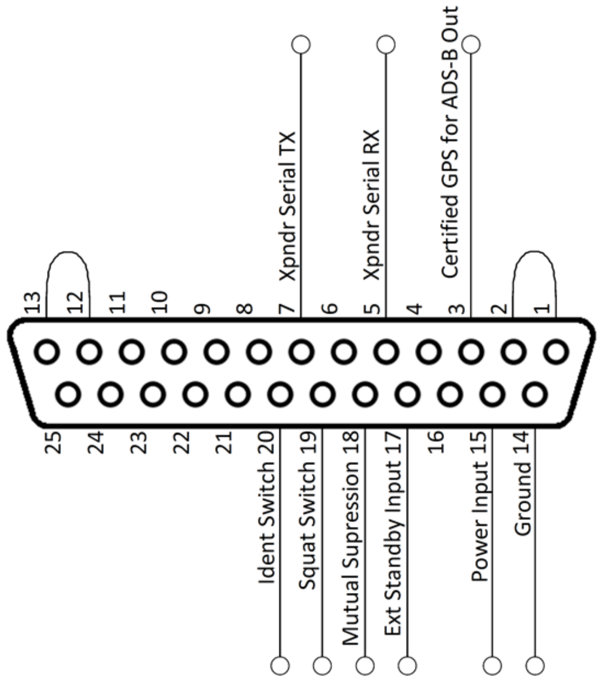


Figure 75 - All Possible SV-XPNDR-26X Connections (Rear Pin Insertion View)

Note that pins 1 / 2, and pins 12 / 13 must be connected to each other as depicted above via your wiring harness. They are not shorted internally.

Power/Ground Input

The power supply can be 11-33 Volts DC; no voltage adjustment is required. 20 AWG wire is sufficient for wire runs up to 50’ for this application. Use a 3 or 5 Amp fuse or circuit breaker for power supply protection to the SV-XPNDR-26X. Note that none of SkyView’s voltage outputs can provide a sufficient amount of power to power the transponder module. The transponder must be connected to aircraft power.

Power Specifications	Approximate current consumption at 12 volts DC	Approximate current consumption at 24 volts DC
SV-XPNDR-26X	0.4 amps average	0.2 amps average

Table 43 - SV-XPNDR-26X Power Consumption

It is always good practice to use more than one ground path in an installation. With only one wire there may be only a single grounding path for the transponder, controller and antenna. This can allow static electricity to build up and damage your SkyView display(s). Ensuring that the mounting tray is grounded provides an adequate alternative ground path to protect against such events. This is particularly important when the transponder is mounted on a nonconducting surface, such as a composite structure, where the mounting tray is often not grounded. Therefore, make sure that the mounting tray is grounded in addition to having the ground wire connected as depicted above.

Note: The transponder power input is not protected against reversed power connections. Reversing the power and ground inputs to the transponder will destroy it. Check wiring before applying power.

Pin 1/2 and 12/13 Loopbacks

Pins 1/2, and pins 12/13 must be connected to each other as depicted in the figures above.

Serial RX/TX

All communication between the SV-XPNDR-26X module and SkyView is accomplished via a single bidirectional serial connection. To accomplish this:

- Choose an unused serial port on each display to connect the SV-XPNDR-26X to. Note that both the TX and RX sides of the serial port are needed, and both the RX and TX lines must be connected to all displays in parallel. It is helpful, but not required, to choose the same numerical serial port on each display. This lets you configure each display's serial ports identically.
- Connect the SV-XPNDR-26X TX wire (pin 7) to the SkyView serial RX of your choosing. If you have multiple displays, the transponder TX wire must be connected to a serial RX wire on each display.
- Connect the SV-XPNDR-26X RX wire (pin 5) to the SkyView serial TX of your choosing. If you have multiple displays, the transponder RX wire must be connected to a serial TX wire on each display.
- Record the SkyView serial port that you have chosen on each display as you will need to configure it later for use with the transponder.

Mutual Suppression (optional)

Mutual Suppression allows two or more transmitters on adjacent frequencies to inhibit the other transmitters when one is active to limit the interference effects. It is commonly used between transponders and DME systems, and between transponders and collision avoidance systems. Most installations will not make use of this feature, since most Dynon-equipped aircraft have only one transponder and often do not have DME equipment or other active traffic system that interrogate other aircraft.

The Mutual Suppression pin (18) is an ARINC compatible suppression bus interface, which acts as both an input and an output. The SV-XPNDR-26X will assert this signal when it is transmitting, and can be suppressed by other equipment that asserts the signal. The SV-XPNDR-26X will drive approximately 24 Volts on the output (independently of supply voltage), and will treat the input as active whenever the bus has greater than 10 Volts.

If you are using the Mutual Suppression feature, simply connect all of the Mutual Suppression wires from devices that use them together.

Ident Switch Input (optional)

SkyView has an IDENT button in its transponder menu that is normally used to ident when requested by ATC. However, the ident switch input allows the IDENT function to be selected using a remote switch. The input is active low, and will be asserted when the voltage to ground is pulled below approximately 4 Volts. Therefore, a momentary switch to ground should be installed on this output if a remote ident switch is desired.

Squat Switch Input (optional)

The Squat switch input allows the transponder to automatically switch between Airborne and Ground modes, and affects both the Mode S reply behavior and the ADS-B reporting behavior. The input will be asserted when the voltage to ground is pulled below approximately 4 Volts. The logical sense of the input can be programmed to be either active low or active high in the SkyView Setup Menu.

This must be a mechanical switch that accurately reflects the aircraft's on-ground status. Mode-S certification requirements state that this cannot be a simple airspeed switch.

On an aircraft with no appropriate squat switch circuit this input should be left unconnected, and the transponder programmed to either ignore the input or use its "automatic" airborne/ground capability. See the AUTO ALT/GND SWITCH setting in the Transponder Settings section of this chapter for further information about this capability.

External Standby Input (optional)

This input, when held low, places the transponder in Standby mode. It should be used to switch between transponders in an installation with two transponders. The input is active low, and will be asserted when the voltage to ground is pulled below approximately 4 Volts.

Direct Serial GPS Position Input

Although SkyView can send its GPS information to the SV-XPNDR-26X for use with its ADS-B position-reporting capability, SkyView's GPS does not meet any certification standard, and is not TSO'd. Additionally, appropriately certified GPS units that can provide position for regulatory-compliant ADS-B installations may need to be connected directly to the ADS-B Out device (in this case, the SV-XPNDR-26X) for compliance credit. For these purposes, a dedicated direct serial input is provided on the SV-XPNDR-26X module that allows an appropriate GPS receiver serial output to be connected directly to the SV-XPNDR-26X.

If you connect a GPS to this direct input, you must install a 1.21k resistor (included with the SV-XPNDR-26X) between the GPS and the SV-XPNDR-26X as shown in Figure 73.

The SV-XPNDR-26X GPS input can recognise the following protocols:

- Industry standard "Aviation" protocol
- Freeflight GPS proprietary protocol

- Garmin proprietary ADS-B protocol (compatibility not verified)

Some of the protocols listed above may not contain all the required data for a compliant ADS-B message, depending on the intended airspace regulations. Further information can be found in the GPS Data section under the Transponder Settings of this chapter.

(US-Only) Direct Serial GPS Position Input for FAA 2020 ADS-B Out Mandate Compliance

To comply with the 2020 ADS-B Out Mandate in the US, the GPS position used for ADS-B Out position reports must be directly connected to a suitable ADS-B Out device (in this case, the SV-XPNDR-26X), and, that GPS must meet TSO C166b. DO NOT connect any GPS (including SkyView's own GPS outputs) that does not meet TSO C166b directly to the transponder.

It is important to note that in the US, the ADS-B Out "mandate" and its associated GPS requirements do not go into effect until 2020. If you do not already have an appropriately TSO'd WAAS IFR GPS in the aircraft, you may continue to leave this Direct Serial unconnected for the time being. Instead SkyView has the capability to send its GPS position to the SV-XPNDR-26X using the SkyView<>SV-XPNDR-26X serial connectivity (see the GPS DATA option under the "Transponder-Related SkyView Display Settings" in this section for more information about configuring this option). Although SkyView's GPS output does not meet the 2020 requirements, it can be used until then to "wake up" the ADS-B ground stations so that they report back traffic targets around your aircraft's position.

Antenna Installation

The antenna should be installed according to the manufacturer's instructions.

The following considerations should be taken into account when siting the antenna:

- The antenna should be well removed from any projections, the engine(s) and propeller(s). It should also be well removed from landing gear doors, access doors or others openings which will break the ground plane for the antenna.
- The antenna should be mounted on the bottom surface of the aircraft and in a vertical position when the aircraft is in level flight.
- Avoid mounting the antenna within 3 feet of the ADF sense antenna or any COMM antenna and 6 feet from the transponder to the DME antenna.
- Where practical, plan the antenna location to keep the cable lengths as short as possible and avoid sharp bends in the cable to minimize the VSWR (voltage standing wave ratio).

Electrical connection to the antenna should be protected to avoid loss of efficiency as a result of the presence of liquids or moisture. All antenna feeders shall be installed in such a way that a minimum of RF energy is radiated inside the aircraft.

Antenna Ground Plane

When a conventional aircraft monopole antenna is used it relies on a ground plane for correct behaviour. For ideal performance the ground plane should be very large compared to the wavelength of the transmission, which is 275 mm. In a metal skinned aircraft this is usually easy to accomplish, but is more difficult in a composite or fabric skinned aircraft. In these cases a metallic ground plane should be fabricated and fitted under the antenna.

As the ground plane is made smaller, the actual dimensions of the ground plane become more critical, and small multiples of the wavelength should be avoided, as should circles. Rectangles or squares are much less likely to create a critical dimension that resonates with the transmissions. The smallest practical ground plane is a square around 120 mm per side; as the size increases the performance may actually get worse, but will be better by the time the ground plane is 700 mm on each side. Anything much larger than that size is unlikely to show significant further improvement.

The thickness of the material used to construct the ground plane is not critical, providing it is sufficiently conductive. A variety of proprietary mesh and grid solutions are available. Heavyweight cooking foil meets the technical requirements, but obviously needs to be properly supported.

Antenna Cable

The SV-XPNDR-262 is designed to meet Class 2 requirements with an allowance of 2 dB for loss in the connectors and cable used to connect it to the antenna. The SV-XPNDR-261 is designed to meet Class 1 requirements with the same 2 dB allowance. Excessive loss will degrade both transmitter output power and receiver sensitivity.

Allowing 0.25dB loss for the connector at each end of the antenna cable assembly leaves an allowance of 1.5dB maximum loss for the cable itself.

An acceptable cable:

- Has less than 1.5 dB loss for the run length needed
- Has a characteristic impedance of 50 Ohms
- Has double braid screens or has a foil and braid screen

Once the cable run length is known, a cable type with low enough loss per metre that meets the above requirements can be chosen. Longer runs require lower loss cable. Consider moving the SV-XPNDR-26X closer to the antenna to minimize the losses in the antenna cable – subject to the limits identified above, the SV-XPNDR-26X can be at any distance from the SkyView display(s) without affecting performance in any way.

> *Note: Low loss cable typically uses foamed or cellular dielectrics and foil screens. These make such cables especially prone to damage from too-tight bends or from momentary kinking during installation. Once kinked, these cables do not return to full performance when straightened.*

The following table is a guide to the maximum usable lengths of some common cable types. Actual cable loss varies between manufacturers, there are many variants, and the table is therefore based on typical data. Use it as a guide only and refer to the manufacturer's data sheet for your specific chosen cable for accurate values.

Max Length in Meters	Max Length in Feet	Insertion Loss dB/meter at 1090MHz	MIL-C-17 Cables	Electronic Cable Specialists Type	SSB Electronic
2.54	8' 4"	0.59	M17/128 (RG400)		
3.16	10' 4"	0.47		3C142B	
3.81	12' 6"	0.39	M17/112 (RG304)		
4.50	14' 9"	0.33			Aircell 5
5.25	17' 3"	0.29	M17/127 (RG393)	311601	
6.42	21' 1"	0.23		311501	
6.81	22' 4"	0.22			Aircell 7
8.22	26' 11"	0.18		311201	
12.59	41' 3"	0.12		310801	

Contact Electronic Cable Specialists on +1 414 421 5300 or at www.ecsdirect.com for their data sheets. Contact SSB-Electronic GmbH on +49-2371-95900 or at www.ssb.de for their data sheets.

When routing the cable, ensure that you:

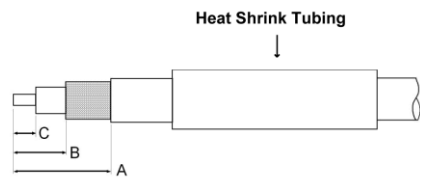
- Route the cable away from sources of heat.
- Route the cable away from potential interference sources such as ignition wiring, 400Hz generators, fluorescent lighting and electric motors.
- Allow a minimum separation of 300 mm (12 inches) from an ADF antenna cable.
- Keep the cable run as short as possible.
- Avoid routing the cable round tight bends.
- Avoid kinking the cable even temporarily during installation.
- Secure the cable so that it cannot interfere with other systems.

Antenna TNC Connector

This section describes the technique for attaching the antenna cable to a TNC connector. A TNC connector is not supplied with the SV-XPNDR-26X. The SV-XPNDR-26X has a female TNC connection. Therefore, you will need to source a male TNC connector that is compatible with the antenna cable type that meets your aircraft's needs.

A dual crimp style TNC connector can be completed using a wide range of commercial crimp tools (for example the Tyco 5-1814800-3). The die apertures for the inner pin and the outer shield should be approximately 1.72 mm and 5.41 mm respectively.

- Strip back the coax cable to the dimensions in the table, as shown in the diagram below. Slide 25 mm (1 inch) of heat shrink tubing over the cable.
- Slide the outer crimp sleeve over the cable – it must go on before securing the center contact.



Dimension	Cut size (mm)	Cut size (inches)
A	17.5	0.69
B	7.2	0.28
C	4.8	0.19

- Crimp the center contact to the cable.
- Insert the cable into the connector – the center contact should click into place in the body, the inner shield should be inside the body of the connector and the outer shield should be outside the body.
- Crimp the outer sleeve over the shield.
- Slide heat shrink tubing forward (flush to connector) and heat to shrink the tubing.

Transponder-Related SkyView Display Settings

Serial Port Setup

Before the TRANSPONDER SETUP menu can be accessed, the SV-XPNDR-26X needs to be set up as a serial device on each SkyView display on the system. To accomplish this:

- Go to SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.

- Navigate to the serial port that you physically connected the transponder module to in the previous steps.
- Select either "Dynon 261 Transponder" or "Dynon 262 Transponder" as appropriate for the module you own. Note that other fields are automatically configured and cannot be changed. Press ACCEPT.
- Exit SETUP. Repeat on any other displays on your SkyView system.

The data transmitted between the SkyView display and the SV-XPNDR-26X nominally includes encoded altitude data from SkyView's ADAHRS. Therefore, no other altitude encoder hardware or SkyView serial port setup is required. However, some locales may require the use of a certified altitude encoder with the Dynon SV-XPNDR-26X Transponder. SkyView supports external serial altitude encoders that use Icarus/Garmin format. When one is connected, the SV-XPNDR-26X uses the external altitude encoder data source instead of SkyView's own ADAHRS-generated pressure altitude. However, the altitude displayed by SkyView on the PFD page is ALWAYS sourced from SkyView ADAHRS data.

To have SkyView use an external altitude serial encoder as the pressure altitude source for the SV-XPNDR-26X:

1. Wire a SkyView serial receive line to the respective serial transmit connection from the serial altitude encoder.
2. Ensure there is a shared ground between the D700/D1000 and the serial altitude encoder.
3. Configure this serial port on each display under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP. The SERIAL IN device for this serial port should be set to ICARUS/GARMIN ALTITUDE.

Transponder Settings

The aircraft tail number must be set in SETUP > SYSTEM SETUP > AIRCRAFT INFORMATION > TAIL NUMBER prior to configuring the transponder.

The following settings need to be configured before testing and using the transponder. They are all accessed under SETUP MENU > TRANSPONDER SETUP:

- AIRCRAFT HEX CODE: The Mode S Code is a 24 bit number issued to the aircraft by the registration authority for the aircraft. The website http://www.airframes.org provides hex codes for most countries' aircraft that can be directly inputted into SkyView. The hex code is the value shown in the ICA024 result field. Alternatively, Mode S codes for US-registered aircraft can be found at the FAA aircraft registry at http://registry.faa.gov/aircraftinquiry/. The FAA aircraft register shows both the octal number and the hexidecimal. Setting up the SV-XPNDR-26X requires the hexidecimal number. If you only have the octal number, you must convert it to hexadecimal. There is an Octal to Hexadecimal converter tool available in the support section of http://www.trig-avionics.com/.

The hex code needs to be set to the aircraft's assigned code for the transponder to function properly. The default code of 000000 is not a valid code. If the code is left at 000000, the transponder will only work in SBY mode.

- VFR CODE: When the pilot presses the VFR button, a pre-programmed code will replace the current squawk code. The pre-programmed code is set up here; the choice of code will depend on the normal location of the aircraft. In the USA, the VFR squawk code is 1200. In most parts of Europe, the VFR squawk code should be set to 7000.
- AUTO ALT/GND SWITCH: Allows the transponder to automatically switch between Airborne and Ground modes. Available options include:
    - NONE : Automatic switching disabled
    - SQUAT SWITCH LOW ON GND: Utilizes a physical squat switch connected the SV-XPNDR-26X per the above instructions. When this option is selected, the transponder will consider the aircraft to be on the ground when this switch is low (electrically grounded).
    - SQUAT SWITCH LOW IN AIR: Utilizes a physical squat switch connected the SV-XPNDR-26X per the above instructions. When this option is selected, the transponder will consider the aircraft to in flight when this switch is low (electrically grounded).
    - AUTOMATIC (AIR DATA): The transponder automatically determines whether the aircraft is in flight or not by using a combination of GPS and air data changes from SkyView. Note that this option only works with transponder software 2.02 or above. See the Transponder Software Updates section below for more information about transponder software.
- AIRCRAFT CATEGORY: To assist ATC tracking of aircraft, an aircraft category can be transmitted by Mode S transponders. Set as appropriate for your aircraft.
- AIRCRAFT LENGTH and AIRCRAFT WIDTH: On the ground, ADS-B transmits encoded aircraft size information which is used by ATC to identify taxiing routes and potential conflicts. Using the aircraft length and width (wingspan), in your current distance/speed units (meters or feet), the SV-XPNDR-26 will calculate the appropriate size code for transmission.
- MAXIMUM CRUISE SPEED: Mode S transponders can transmit their maximum airspeed characteristics to aircraft equipped with TCAS. This information is used to help identify threats and to plan avoiding action by the TCAS equipped aircraft. The airspeeds are grouped in ranges. Set as appropriate for your aircraft.
- TIS TRAFFIC: Enables the display of TIS traffic on the SkyView Map page when in an area served by a TIS-enabled radar. Note that TIS is a Mode S uplink service that is provided by some US approach radars. TIS coverage is limited to the coverage areas of those radars; there is no TIS provision outside the USA. If another traffic device is connected to

SkyView and is set up correctly, its traffic information will trump the TIS traffic from the SV-XPNDR-26X, regardless of this setting.

- GPS DATA: Determines the source of GPS position updates for ADS-B Out:

  Use of any of the DIRECT GPS-to-transponder position reporting methods below require that the GPS that is connected to the transponder be TSO'd when used in the US. Additionally, only specific models are supported via these connections. Other counties may have different regulatory requirements for GPS position indicators that are connected directly to the SV-XPNDR-26X's direct serial input.

  - DIRECT (AVIATION): Generic GPS outputting Aviation format data, connected directly to SV-XPNDR-26X pin 3, transmitting at 9600 baud. As this data format does not contain all of the information that ADS-B position inputs require, Dynon does not recommend using this connection for any purposes. Using this setting causes the transponder to transmit the following ADS-B performance parameters:
    - SIL: 0 (Unknown integrity)
NACp: 0 (Unknown position accuracy)
NIC: 0 (Unknown containment)
NACv: 1 (10m/s accuracy)
  - DIRECT (FREEFLIGHT): Freeflight 1201 or 1204 GPS, connected directly to SV-XPNDR-26X pin 3, transmitting at 19200 baud. Using this setting causes the transponder to transmit the following ADS-B performance parameters:
    - SIL: 2 (Level C integrity)
NACp: Sent from GPS to transponder. Refer to GPS documentation.
NIC: Sent from GPS to transponder. Refer to GPS documentation.
NACv: 1 (10m/s accuracy)
  - DIRECT (GARMIN ADS-B): Garmin GNS 400W/500W series (WAAS) or Garmin GTN series, both with appropriate software updates as designated by Garmin, connected directly to SV-XPNDR-26X pin 3, transmitting at 9600 baud. Note that this option only works with transponder software 2.02 or above. See the Transponder Software Updates section below for more information about transponder software. Using this setting causes the transponder to transmit the following ADS-B performance parameters:
    - SIL: 2 (Level C integrity)
NACp: Sent from GPS to transponder. Refer to GPS documentation.
NIC: Sent from GPS to transponder. Refer to GPS documentation.
NACv: 1 (10m/s accuracy)
  - SKYVIEW: SkyView reports its GPS position to the transponder via its nominal SkyView<>SV-XPNDR-26X serial connection. Using this setting causes the transponder to transmit the following ADS-B performance parameters:

- SIL: 0 (Unknown integrity)
  NACp: 8, 9 or 10. Dynamic, as reported by GPS.
  NIC: 8 (Containment radius <0.1 NM)
  NACv: 1 (10m/s accuracy)

- GPS STATUS: Displays whether the SV-XPNDR-26X is receiving valid GPS data.
- ADS-B IN FREQUENCY: Tells the ADS-B system which frequency (US-only) the aircraft can receive traffic/weather information on.

If an SV-ADSB-470 is installed and configured under SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT, this option will be unavailable: The SV-ADSB-470 automatically receives ADS-B In traffic and weather via the UAT frequency band.

Note that the options in the ADS-B IN FREQUENCY only have an effect with transponder software 2.02 or above. See the Transponder Software Updates section below for more information about transponder software.

- NONE: The aircraft does not have ADS-B In capability
- 978 MHz UAT: The aircraft can receive ADS-B traffic and/or weather information via a non-Dynon UAT band (978 Mhz) device.
- 1090 MHz ES: The aircraft can receive ADS-B traffic information via a 1090 Mhz ES (extended squitter) device.

Altitude Encoder Calibration

In most transponder systems, a calibration is normally carried out every 24 months, as part of the altimeter checks on the aircraft. The maximum allowed difference between the primary altimeter and the altitude encoder is 125 feet in ETSO C88a and TSO C88b. The primary altimeter in SkyView and the altitude encoder are one and the same device. It is therefore impossible for the encoder and the primary altimeter to exceed 125 feet of altitude difference. They will always be exactly the same as each other, thereby meeting the TSO requirements. Therefore, no altitude encoder calibration is possible or necessary.

At times it may be useful to know the altitude that is being reported to the transponder. Since SkyView sends pressure altitude to the SV-XPNDR-26X, setting BARO to 29.92 will display the pressure altitude being transmitted to the transponder in the normal SkyView altitude display on the right side of the PFD page.

However, do note that there is a single point altitude adjustment, located in SETUP MENU > HARDWARE CALIBRATION > ADAHRS CALIBRATION > ALTITUDE ADJUST that adjusts SkyView's barometric altimeter. This adjustment affects both the displayed altitude and the encoded altitude that is sent to other devices.

Post Installation Checks

Post installation checks should be carried out in accordance with your certification requirements. These checks should include:

- Mode S interrogations to verify correct address programming.
- Verification of the reported altitude using a static tester.
- Where installed, verification of correct squat switch ground/airborne indications. In an aircraft with a squat switch, setting the Mode switch to ALT when the aircraft is on the ground should leave the transponder in GND mode; when the aircraft becomes airborne, the mode should switch automatically to ALT.
- Interrogations to verify the receiver sensitivity. A Mode S transponder should have a minimum triggering level (MTL) of between -77 dBm and -71 dBm. Failure to meet this requirement usually indicates antenna or coaxial cable problems.
- Interrogations to verify the transmitted power. A Class 1 installation should have no less than 125 Watts at the antenna (and no more than 500 Watts). A Class 2 installation should have no less than 71 Watts at the antenna (and no more than 500 Watts). Failure to meet this requirement is also generally due to antenna or wiring issues.
- Where installed, verification of the GPS position source and ADS-B outputs. Whenever a valid position is received by the transponder and the transponder is in any mode other than Standby, ADS-B Extended Squitters should be observed on the transponder test set.
- Ensure all regulatory requirements are met. In the United States, the transponder must be tested and inspected per FAR 91.413.

Transponder Software Updates

If a software update for the SV-XPNDR-26X is available, the transponder will continue to operate with no degradation of performance or annunciation of the available update during SkyView's normal operation. However, the transponder setup menu under SETUP MENU > TRANSPONDER SETUP will be highlighted in yellow to indicate that an optional update is available.

SkyView 5.0 Transponder Software Version (SW) 2.02 Update

The optional transponder software (SW) version 2.02 software update that is contained within software version 5.0 updates the ADS-B out capability of the transponder so that it meets the latest TSO C166b. This TSO will be required by the FAA 2020 ADS-B Out mandate and other regulatory agencies around the world.

The version 2.02 transponder update contained in SkyView 5.0 also enables an AUTOMATIC option for the AUTO ALT/GND SWITCH setting which allows the transponder to automatically determine whether the aircraft is in flight or not by using a combination of GPS and air data changes from SkyView.

Note that after the 2.02 transponder update, only the SV-XPNDR-261 is capable of meeting the 2020 ADS-B Out mandate, because of power transmission requirements that the FAA ADS-B rules imposes. In other words, the SV-XPNDR-262, even if it is updated to this software, cannot be used for 2020 ADS-B Out compliance credit.

Transponder Software Version (SW) 2.02 Labeling Requirements (US Registered / Operated Aircraft Only)

This section applies to aircraft operated or registered in the US only.

In the US, updating your transponder software to SW version 2.02 **REQUIRES** that the physical transponder module be labeled to indicate the new TSO authorization. Failure to perform this physical modification at the same time as the software update will result in a transponder that is not considered airworthy by the FAA.

Applicability/Compliance

If your transponder shipped from Dynon Avionics after September 2012, it likely shipped with software version 2.02 and is labeled with its TSO C166b appropriately. However, this is not authoritative.

To determine whether your transponder has an optional software update available for it, which will require that it be labeled should you choose to update it:

1. Go to SETUP MENU > TRANSPONDER SETUP > STATUS. If the STATUS line is yellow, there is a software update available for the transponder.
2. If you choose to update the transponder, you need to physically label it concurrently.
3. Before you press LOAD in the above menu, first, please visit **http://www.dynonavionics.com/transponder** to download the label which you can print out and apply to the transponder module.
4. When you have the label available, go to SETUP MENU > TRANSPONDER SETUP > STATUS and press the LOAD button and follow the instructions to update the software.
5. You must apply the label before the transponder's next use:
    a. Cut out the label contained within the PDF.
    b. Permanently affix the label to your physical SV-XPNDR-26X module. **Do not cover any existing labels.**
    c. Ensure that the method that you use to secure the label is durable. Fully covering the label with transparent packing tape would satisfy this requirement, for example.

12.SV-ARINC-429 Installation and Configuration

SkyView can connect to advanced GPS/NAV devices like the Garmin GNS 430/530 and similar Via the SV-ARINC-429 module.

Read and understand the System Planning Chapter before installing the SV-ARINC-429.

Figure 76 is a high-level overview of a suggested and installation and configuration procedure for the SV-ARINC-429.

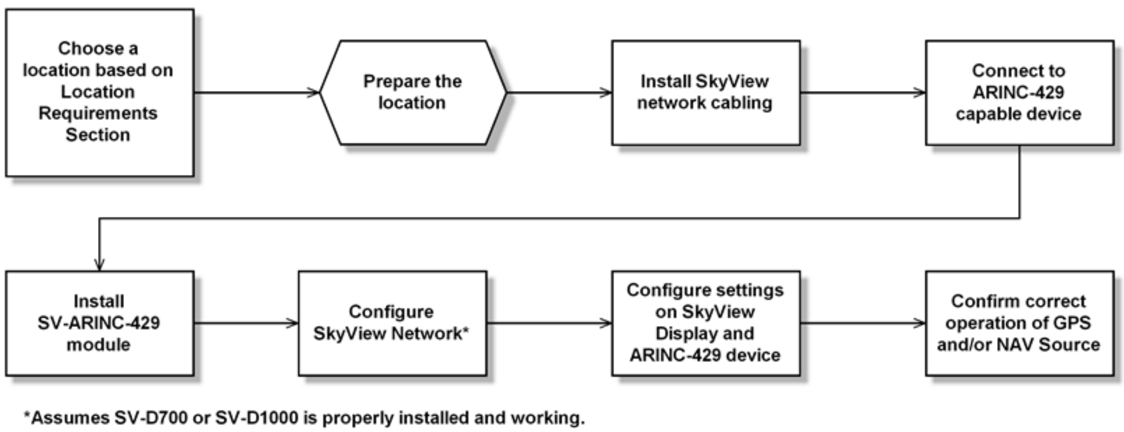


Figure 76 – Suggested SV-ARINC-429 Installation and Configuration Procedure

Physical Installation

The diagram below shows the important mounting dimensions of the SV-ARINC-429 module with electronic connections.

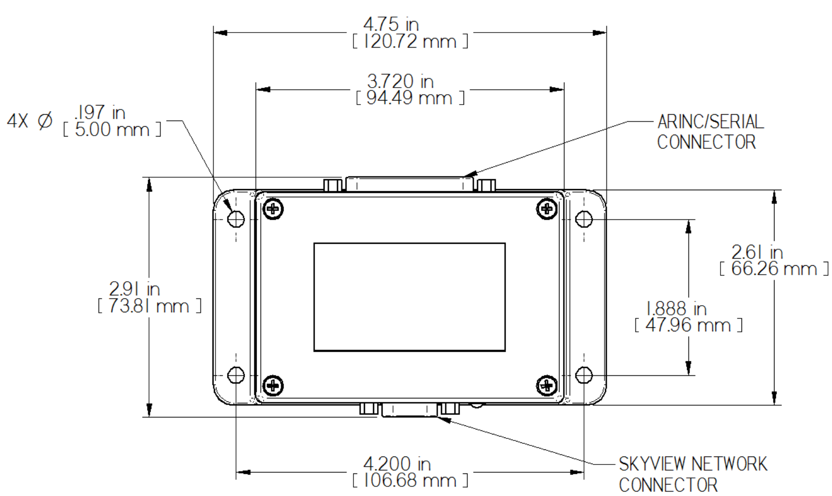


Figure 77 - SV-ARINC-429 Mounting Dimensions with Electrical Connections

Additional mounting location, orientation, and other installation requirements are described in the System Planning section earlier in this manual. Please review this section when physically installing your with SV-ARINC-429 module(s).

Dynon does not provide mounting hardware with SV-ARINC-429 module. The mounting tabs on each side of the module have holes sized for #10 fasteners, but it is up to the installer to decide how the SV-ARINC-429 will be secured to the aircraft.

Follow recommended torque practices when tightening the mounting hardware. *Do not rivet the SV-ARINC-429 to the aircraft as this will hinder future removal if necessary.*

SkyView Network Connection

Connect the SV-ARINC-429 module to the SkyView network using the hardware mentioned in the SkyView System Construction Section or using equivalent hardware.

If you have to install a connector on the end of a network cable, insert all pins into the D9 connector. Refer to Appendix C: Wiring and Electrical Connections for details on connector pin-outs and wire colors.

Remember to configure the network as described in the Network Setup and Status section after connecting all modules to a display.

ARINC-429 Device Connection

Harness Construction

Because the SV-ARINC-429 can be connected to a variety of devices, the harness requirements will vary from airplane to airplane. Therefore, Dynon Avionics does not supply pre-manufactured harnesses for the SV-ARINC-429 module. Instead, your SV-ARINC-429 shipped with enough connectors and pins to generate a wide variety of harness configurations. Refer to the sections below for detailed wiring information.

If you do not own a D-sub machined-pin crimping tool, they can be obtained for under $50 from many retailers. See http://wiki.dynonavionics.com/Tools_not_supplied_by_Dynon for known sources of these products. You may also find it helpful to own a pin insertion/extraction tool as well.

Additional harness construction and wiring information can be found in Appendix C: Wiring and Electrical Connections.

The SV-ARINC-429 has a single 25 pin female D-Sub socket which is used for all data connections to your compatible ARINC-429 device. The pin out depicted in Figure 78 below depicts the view from the rear of your male D25 connector – the view you will have of your harness connector as you are inserting pins into the harness. Note that the pin numbers are labelled on the face of both the female and male connector.

SV-ARINC-429 Pinout

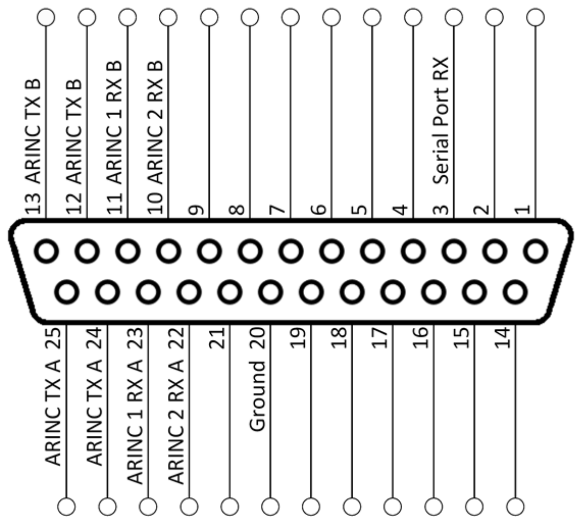


Figure 78 - SV-ARINC-429 Male D25 Pin Insertion View (Rear)

Pin	Function	Notes
1	No Connect	-
2	No Connect	-
3	Serial RX	Aviation Format Only From Connected ARINC-429 GPS
4	No Connect	-
5	No Connect	-
6	No Connect	-
7	No Connect	-
8	No Connect	-
9	No Connect	-
10	ARINC 2 RX B	-
11	ARINC 1 RX B	-
12	ARINC TX B	Pins 12/13 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
13	ARINC TX B	Pins 12/13 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
14	No Connect	-
15	No Connect	-
16	No Connect	-
17	No Connect	-
18	No Connect	-
19	No Connect	-
20	Ground	-
21	No Connect	-
22	ARINC 2 RX A	-
23	ARINC 1 RX A	-
24	ARINC TX A	Pins 24/25 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
25	ARINC TX A	Pins 24/25 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.

Table 44 - SV-ARINC-429 Pinout

ARINC Device Connections

The SV-ARINC-429 has two ARINC-429 receivers and one transmitter. The single transmitter may be connected to multiple devices that can accept the ARINC-429 information that SkyView transmits.

The SV-ARINC-429 also has a serial input that is designed to provide auxiliary information that ARINC-429 GPS outputs do not provide (such as altitude). SkyView needs this data to consider the input a valid and complete GPS position source. This input is not a general purpose serial port, and cannot be configured for other uses. Input coming into this serial port is assumed to be in Aviation format, which most ARINC-429 capable panel mount GPS units can output.

The following several diagrams show some common radios and GPSs, and the preferred connection schemes between them and the SV-ARINC-429.

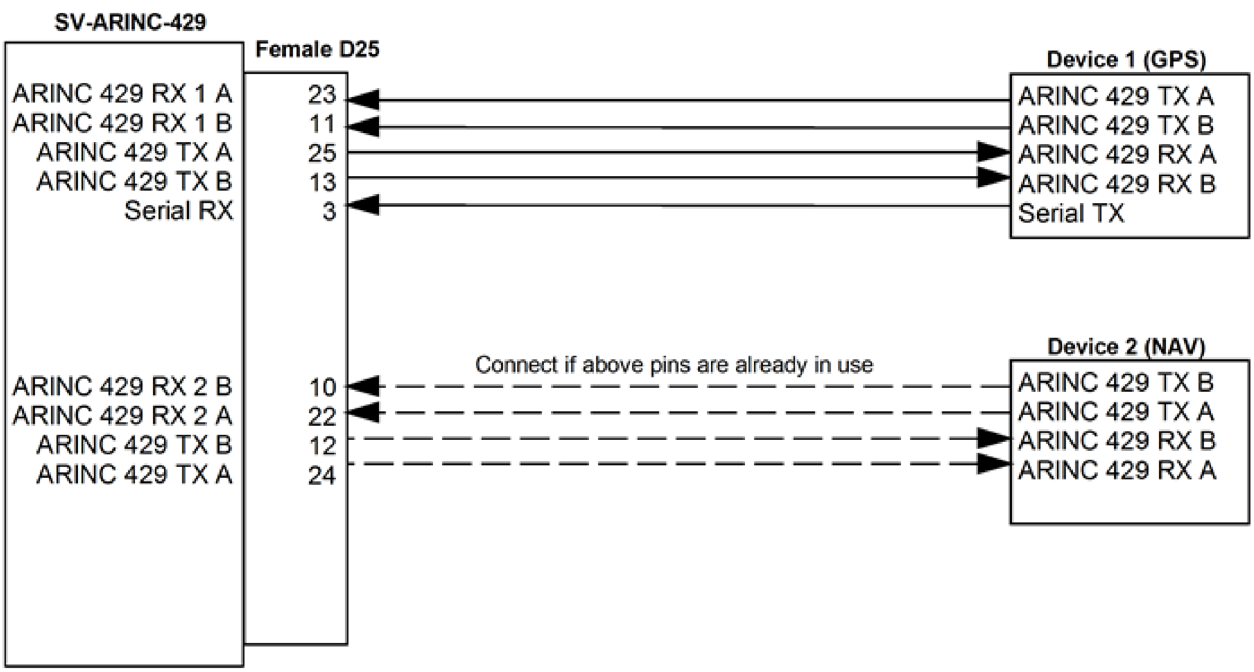


Figure 79 - Generic SV-ARINC-429 Connections

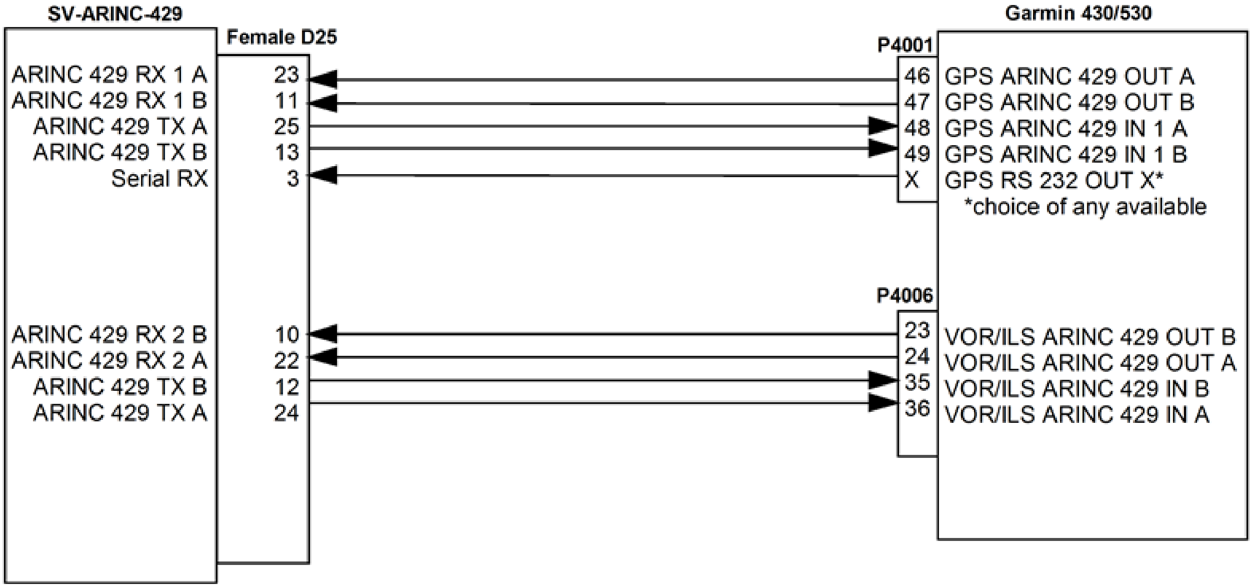


Figure 80 - Garmin 430/530 SV-ARINC-429 Connections

Additional Garmin 430/530 Configuration Information

The following are the typical Garmin and SkyView configuration settings when this combination of products is used:

Garmin Settings

"Main ARINC 429 Config" page

In 1 : High | EFIS / Airdata
In 2 : Unused by SkyView, configure as needed for other equipment
Out : High | GAMA 429
SDI : Common
VNAV : Enable Labels

"VOR / LOC / GS ARINC 429 Config" Page

TX: High
RX: High
SDI: Common
DME: Unused by SkyView

“Main RS232 Config” Page

Chan X (where X is the physically connected port) Output: Aviation

SkyView Settings

SETUP MENU -> ARINC-429:

INPUT SPEED: HIGH
INPUT 1: GPS X
INPUT 2: NAV X
OUTPUT SPEED: HIGH

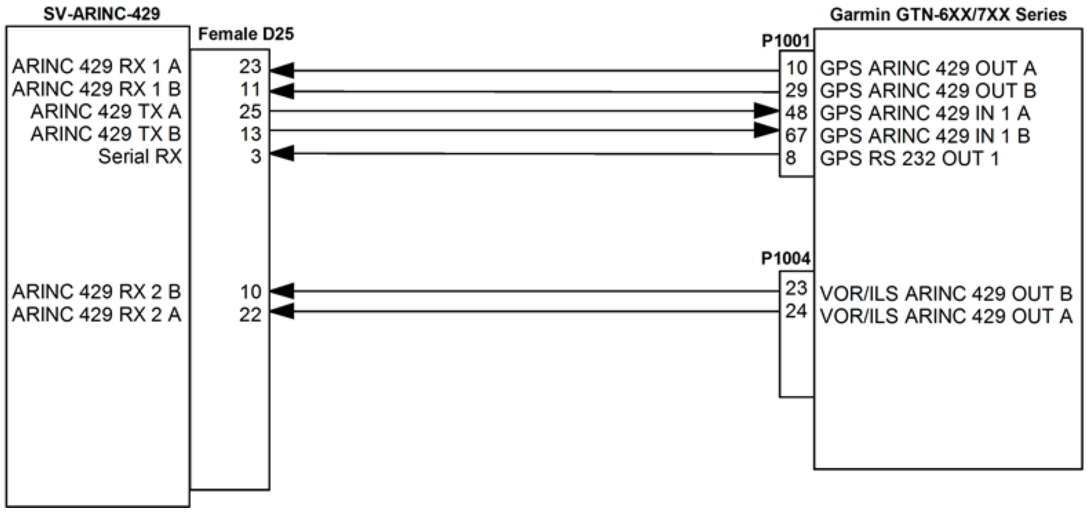


Figure 81 - Garmin GTN Series SV-ARINC-429 Connections

Additional Garmin GTN Series Configuration Information

The following are the typical Garmin and SkyView configuration settings when this combination of products is used:

Garmin Settings

"ARINC 429 Configuration" page

In 1 : High | EFIS Format 2
In 2 : Unused by SkyView, configure as needed for other equipment
Out : High | GAMA Format 2
SDI : Common

"VOR/LOC/GS Configuration Page

Nav Radio: Enabled
ARINC 429 Configuration:
Tx Speed: High
SDI: Common
Other Settings: Unused by SkyView

“RS-232 Configuration” Page

RS232 1 Output: Aviation Output 1

SkyView Settings

SETUP MENU -> ARINC-429:
INPUT SPEED: HIGH
INPUT 1: GPS X
INPUT 2: NAV X
OUTPUT SPEED: HIGH

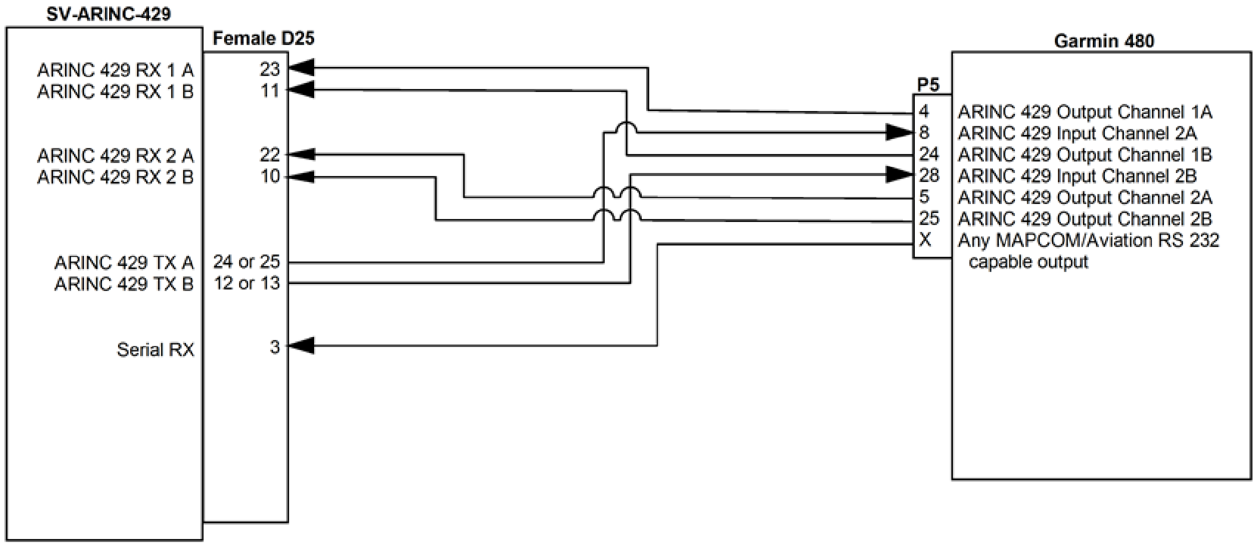


Figure 82 - Garmin 480 SV-ARINC-429 Connections

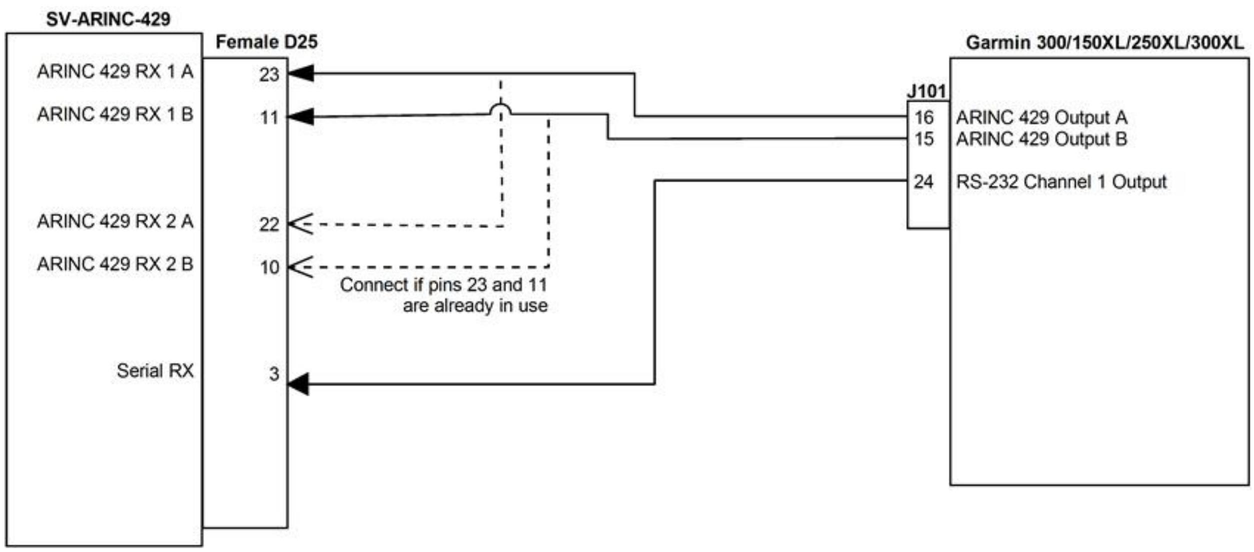


Figure 83 - Garmin 300/150XL/250XL/300XL SV-ARINC-429 Connections

SV-ARINC-429 Related Settings

Go to the ARINC-429 SETUP under SETUP MENU > SYSTEM SETUP > ARINC-429.

SkyView supports up to two SV-ARINC-429 modules, but since most aircraft will only have one installed, the “MODULE 2” section is normally disabled. If your aircraft does actually have two SV-ARINC-429 modules, note that the serial numbers of each module are provided so you can determine which module is which.

For each module, Set INPUT1 to the type of device connected to the SV-ARINC-429’s ARINC-429 RX 1 A and B inputs, any of GPS X or NAV X. The numerical designation of the device determines what it will be called on the HSI. Note that any GPS/NAV slots that are highlighted in red are already being used for other devices. Also note that though POS X is a possible setting, it should generally not be used for ARINC devices.

Next set the INPUT SPEED parameter (HIGH or LOW), based on the output speed of your two ARINC devices.

The SV-ARINC-429 has one ARINC output channel with 2 sets of pins on the connector for wiring convenience. If one or both of your ARINC devices can accept commands, configure OUTPUT SPEED appropriately.

If you have connected a device to ARINC-429 RX 2 A and B, repeat the above configuration for the INPUT2 parameter; otherwise, leave it set to NONE.

Your ARINC-429 capable GPS and/or NAV will need to be configured appropriately as well. Suggested settings for common devices can be found at http://wiki.dynonavionics.com.

13.Vertical Power VP-X Integration and Configuration

Dynon SkyView can interface with the Vertical Power VP-X System to provide robust monitoring and control of your electrical system via your SkyView system. In order to use this feature, a Vertical Power VP-X system is required, along with a software license for the VP-X features within SkyView.

License Information

The VP-X software features are enabled on Dynon SkyView by purchasing a VP-X license code from Dynon Avionics and entering it into your SkyView system. Only **one** VP-X license is needed in a SkyView system, no matter how many displays are attached. That license is applied to only one display, but that display stores the license information for the entire system. In normal use, license information is shared with all displays connected via SkyView Network to allow the VP-X features to be operated on any display in the system.

Checking License Status

To check whether a SkyView system is licensed to use the VP-X software features, go to SETUP MENU > LOCAL DISPLAY SETUP > LICENSE, and look at the status of the Vertical Power line. Possible license statuses include:

- LICENSED (THIS DISPLAY): The SkyView system is licensed to enable the use of the Vertical Power software features. This display stores the license information and also allows other displays in the aircraft to access the Vertical Power features.
- LICENSED - CONNECTED DISPLAY ONLINE: The SkyView system is licensed to use the Vertical Power software features. This display is currently connected to a licensed display.
- LICENSED DISPLAY OFFLINE - XX HOURS REMAIN The SkyView system is licensed to use the Vertical Power software features. However, the display that actually stores the license information is not currently connected. When this happens, the Vertical Power software features will continue to be accessible for 30 flight hours beyond when it last saw the licensed display in the aircraft. Once the licensed display is seen again, this timer is cleared.
- NO LICENSE: No display in the SkyView system is licensed to use the Vertical Power features.

Purchasing and Installing a VP-X License

A license can be purchased and applied to your system in one of two ways:

3. Call Dynon Avionics directly at 425-402-0433 with your SkyView display model (SV-D100 or SV-D700) and serial number (as displayed on the case sticker, or in SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION). A VP-X License Code can be purchased for the entire aircraft you wish to enable the VP-X software features on. This six character License Code is then entered in SETUP MENU > LOCAL DISPLAY SETUP

> LICENSE > LICENSE CODE. If you have more than one display in the aircraft, choose one to install it onto and provide information for only that display. Once any display is licensed, all connected displays in the Aircraft can use the Vertical Power software features.

4. An SV-VPX-290 VP-X Software Certificate may be purchased from Dynon Avionics or any authorized Dynon Avionics retailer. This certificate can be redeemed for a license code that can be entered in SETUP MENU > LOCAL DISPLAY SETUP > LICENSE > LICENSE CODE. To redeem a certificate simply follow the instructions on the certificate itself. Similar to the above, you will need to redeem your certificate by visiting license.dynonavionics.com with your SkyView display model and serial number ready. Alternatively, you can call Dynon Avionics directly at 425-402-0433 to redeem a certificate.

Physical and Electrical Installation

Refer to the Vertical Power installation documentation for instructions on the physical and electrical installation of the VP-X system.

Up-to-date installation manuals, wiring diagrams, and "how-to" guides for the VP-X system can be found at http://verticalpower.com/documents/.

SkyView modules such as the SV-ADAHRS-20X, SV-EMS-220/221, and SV-ARINC-429 receive power via the SkyView Network. Their power supplies are managed entirely by the SV-D1000 and SV-D700 displays, and cannot be separately monitored by the VP-X system. However, SkyView components that have power supplied by ship's power, such as the SV-XPNDR-26X, Autopilot Servos, and the heated AOA/pitot probe can have their power monitored by the VP-X by routing the power connections for those components via the VP-X

A Dynon SkyView D37 harnesses for a single display contains a pair of power and ground wires. These pairs of wires are a SINGLE power input, and should be connected to a single VP-X input when using the VP-X to provide power to SkyView displays. The dual wiring scheme is needed to provide adequate power to the SkyView displays given the electrical constraints of the particular wires and D-sub connections used. These wires should not be sent to separate power channels or be considered redundant power sources.

Serial Port Connection

All communication between the VP-X system and SkyView is accomplished via a single bidirectional a serial connection. To accomplish this:

- Choose an unused serial port on each display to connect the VP-X to. Note that both the TX and RX sides of the serial port are needed, and both the RX and TX lines must be connected to all displays in parallel. It is helpful, but not required, to choose the same numerical serial port on each display. This lets you configure each display's serial ports identically.

- Connect the VP-X serial TX wire from VP-X connector J1, pin 20 to the SkyView serial RX of your choosing. If you have multiple displays, the VP-X TX wire must be connected to a serial RX wire on each display.
- Connect the VP-X serial RX wire from VP-X connector J1, pin 22 to the SkyView serial TX of your choosing. If you have multiple displays, the VP-X RX wire must be connected to a serial TX wire on each display.
- Connect VP-X the VP-X ground wire from VP-X connector J1, pin 21 any of the ground wires on the SkyView D37 connector (any of pins 21-24)
- Record the SkyView serial port that you have chosen on each display as you will need to configure it later for use with the VP-X.

VP-X SkyView Display Settings

Serial Port Setup

Before the VP-X SETUP menu can be accessed, the SkyView system must be licensed to use the VP-X features, and VP-X should additionally be set up as a serial device on each SkyView display on the system. To configure your SkyView displays' serial ports to work with the VP-X:

- Go to SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.
- Navigate to the serial port that you physically connected the VP=X module to in the previous steps.
- Select VP-X. Note that other fields are automatically configured and cannot be changed. Press ACCEPT.
- Exit SETUP. Repeat on any other displays on your SkyView system.

VP-X Settings

Most VP-X setup – such as setting circuit breaker limits - is NOT done via SkyView, but instead via a Windows-based application called VP-X Configurator. See your Vertical Power documentation for full VP-X installation and setup information.

Though the VP-X's trim and flaps calibrations are not used by SkyView, leaving any of the VP-X trim or flaps end points or neutral positions to "0" in the VP-X Configuration program will cause SkyView's trim or flaps indications to not display properly. To avoid this, set all of the trim and flaps end points and neutral points to "1" in the VP-X Configurator.

The VP-X settings in the SETUP MENU > VP-X SETUP menu mainly concern how information from the VP-X is displayed in SkyView:

- MAIN BATTERY WARNINGS: Sets the main battery voltage levels at which caution and warning indications are provided visually on the VP-X page.
- AUX BATTERY WARNINGS: Sets the auxiliary battery voltage levels at which caution and warning indications are provided visually on the VP-X page. If you do not have an auxiliary aircraft battery (note that this is NOT the SkyView SV-BAT-320) installed, this setting can be ignored.
- SYSTEM AMPS: Sets the current levels for the entire electrical system at which caution and warning indications are provided visually on the VP-X page.
- ALTERNATOR AMPS: Sets the current levels for the alternator at which caution and warning indications are provided visually on the VP-X page.
- BATTERY AMPS: Sets the discharge rate at which caution and warning indications are provided visually on the VP-X page.
- SKYVIEW AMPS SHUNT LOCATION: Depending on your electrical layout, your SkyView shunt may be in one of a few places in your electrical system.
- AILERON TRIM POSITION / ELEVATOR TRIM POSITION / FLAP POSITION: Set to SkyView EMS if your trim and/or flaps position signal input is routed to your SV-EMS-220/221 module, or to VP-X if it is connected to your VP-X system instead. If set to VP-X, the engine page trim and/or flaps widgets will be sourced from the VP-X position information. Note that even when using the VP-X as your trim and/or flaps position source, you do still need to perform the SkyView-based calibration routine for the trim information to display properly in SkyView. These calibrations can be found under SETUP MENU > HARDWARE CALIBRATION > EMS CALIBRATION. You do not need to perform that VP-X Configurator-based calibration. However, set all of the points in the VP-X Configurator to “1”.

Post Installation Checks

- Follow all installation, configuration, and test procedures as instructed by the Vertical Power documentation.
- Ensure that your VP-X system is powered on and functioning normally.
- On a SkyView display that is displaying the Engine Page (enabled by toggling MENU > SCREEN > EMS PG), press to MENU > ENGINE > VP-X. The Engine page will automatically re-arrange itself to show VP-X information as seen in the image below. If the VP-X page is covered by a red “X”, the VP-X is either not communicating with SkyView, is not properly configured, or is inoperative.

Figure 84 - VP-X Example

14. SV-ADSB-470 Installation, Configuration, and Testing

SkyView can receive traffic and weather via the SV-ADSB-470 UAT Band Traffic and Weather Receiver. The SV-ADSB-470 is a remote mounted module that connects to SkyView via a serial port on your SkyView display(s). It also requires the installation of a dedicated antenna for ADS-B signal reception.

Read and understand the System Planning Chapter before installing the SV-ADSB-470.

The SV-ADSB-470 receives traffic and weather via the 978 MHz UAT ADS-B frequencies, which are only utilized in the US. Therefore, traffic and weather are only available in the US. Dynon Avionics does not recommend the use of the SV-ADSB-470 outside the US.

Although weather and TFR information (FIS-B services) available any time the SV-ADSB-470 is in an ADS-B ground station coverage area, ADS-B FIS-B traffic is only available if an SV-XPNDR-26X is installed and is providing ADS-B out position reports into the ADS-B system.

Figure 85 has a high-level overview of a suggested SV-XPNDR-26X installation, configuration, and testing procedures:

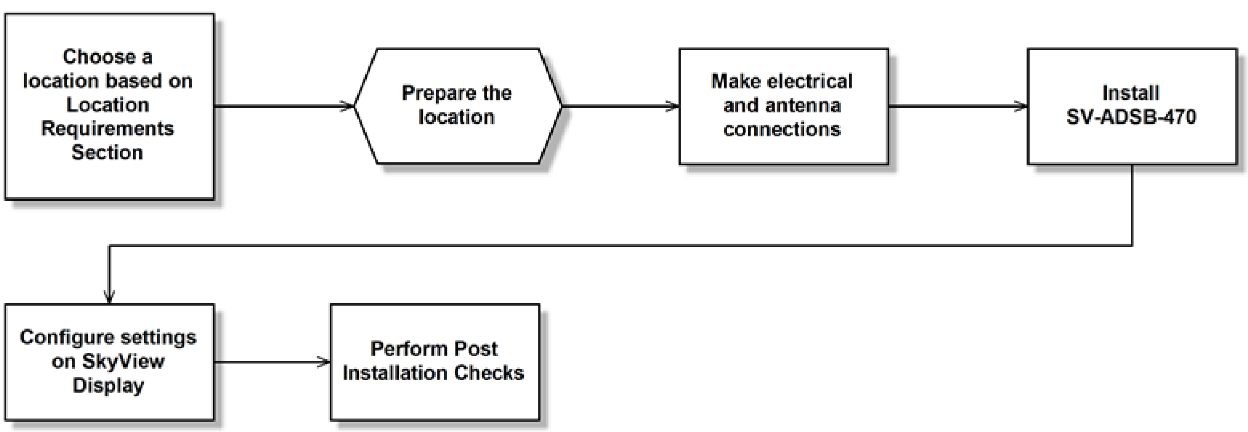


Figure 85 - Suggested SV-ADSB-470 Installation and Configuration Procedure

Physical Installation

SV-ADSB-470 Dimensions and Connections

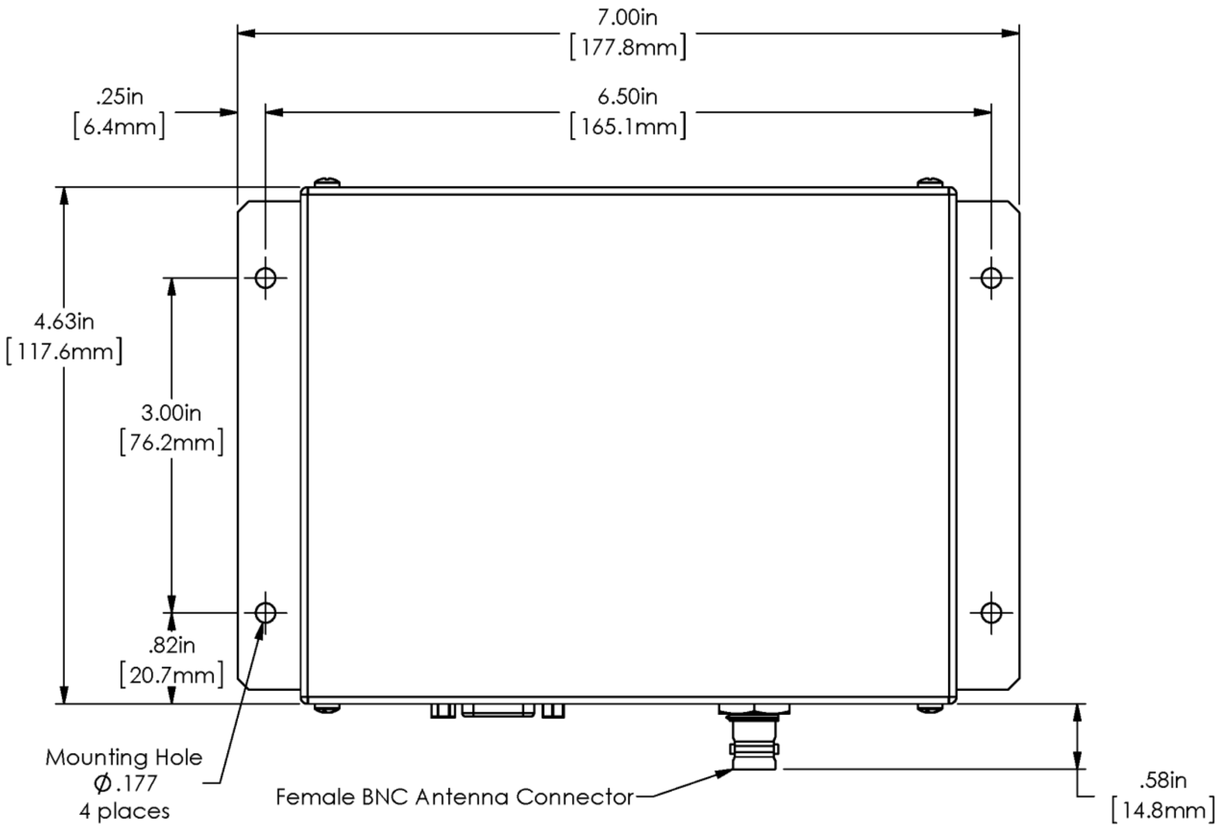


Figure 86 - SV-ADSB-470 Dimensions (top view)

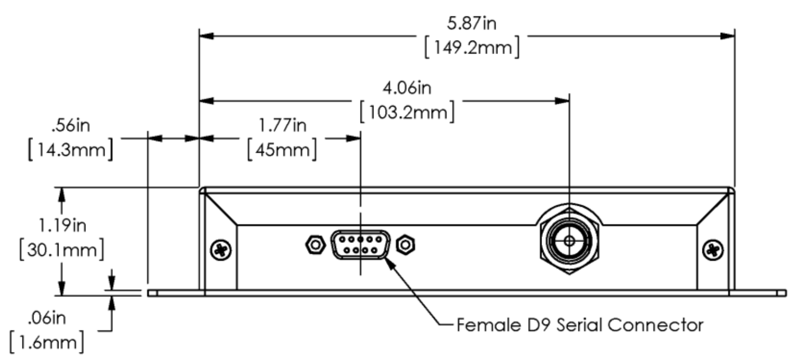


Figure 87 - SV-ADSB-470 Dimensions/Connections (front vieww)

Installation Instructions

The SV-ADSB-470 is designed to be mounted in any convenient location in the cockpit, the cabin, or an avionics bay.

The following installation procedure should be followed, remembering to allow adequate space for installation of cables and connectors.

- Select a position in the aircraft that is not too close to any high external heat source. (The SV-ADSB-470 is not a significant heat source itself and does not need to be kept away from other devices for this reason).
- Avoid sharp bends and placing the cables too near to the aircraft control cables.
- Secure the SV-ADSB-470 to the aircraft using its four (4) mounting holes. The device should be mounted to a flat surface. The mounting tabs on each side of the module have holes sized for #8-32 fasteners, but it is up to the installer to decide how the module will be secured to the aircraft.

Additional items you will require, but which are not in the SV-ADSB-470 package, include:

- Antenna and fixing hardware. Antenna selection suggestions are available in the following section.
- Cables and female BNC connector. You need to supply and fabricate all required cables. Guidance on cable types is given below.
- Mounting hardware: To secure the SV-ADSB-470 to the aircraft.

Electrical Installation

Because the SV-ADSB-470 can be mounted in a variety of locations, the harness length requirements will vary from airplane to airplane. Therefore, Dynon Avionics does not supply pre-manufactured harnesses for the SV-ADSB-470. Instead, your SV-ADSB-470 shipped with the required D9 connector and pins to generate a suitable harness. Refer to the sections below for detailed wiring information.

If you do not own a D-sub machined-pin crimping tool, they can be obtained for under $50 from many retailers. See http://wiki.dynonavionics.com/Tools_not_supplied_by_Dynon for known sources of these products. You may also find it helpful to own a pin insertion/extraction tool as well.

Additional harness construction and wiring information can be found in Appendix C: Wiring and Electrical Connections.

The SV-ADSB-470 has a single D9 female connector which provides the data and power inputs to the module. A single BNC connector attaches to the antenna.

SV-ADSB-470 Interface – Pinout (Female D9 on module / Male D9 on harness)

Pin	Function	Notes
1	10-30V DC	Connect to Aircraft Power
2	SV-ADSB-470 Serial RX	Data Input from SkyView
3	SV-ADSB-470 Serial TX	Data Output to SkyView
4	Ground	Connect to Aircraft Ground
5	No Connect	-
6	No Connect	-
7	No Connect	-
8	No Connect	-
9	No Connect	-

Table 45 - SV-ADSB-470 Female D9 Pinout

The pin out depicted in Figure 88 below depicts the view from the rear of your male D9 connector – the view you will have of your harness connector as you are inserting pins into the harness. Note that the pin numbers are labelled on the face of both the female and male connector.

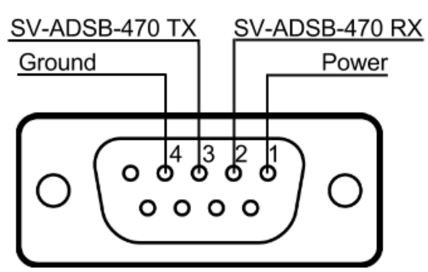


Figure 88 - SV-ADSB-470 connector diagram (from back side of male D9 connector on the wiring harness)

The following table shows the connections for each of SkyView's nominally available serial ports (serial port 5 is usually used for connection to the SV-GPS-250 module. Only ONE of the following serial ports will be used:

Serial Port	SkyView D37	SV-ADSB-470 D9
1	Pin 3 (RX) Brown/Violet	Pin 3 (TX)
	Pin 4 (TX) Brown/Orange	Pin 2 (RX)
2	Pin 5 (RX) Yellow/Violet	Pin 3 (TX)
	Pin 6 (TX) Yellow/Orange	Pin 2 (RX)
3	Pin 7 (RX) Green/Violet	Pin 3 (TX)
	Pin 8 (TX) Green/Orange	Pin 2 (RX)
4	Pin 9 (RX) Blue/Violet	Pin 3 (TX)
	Pin 10 (TX) Blue/Orange	Pin 2 (RX)

Table 46 - Example SkyView/SV-ADSB-470 Serial Port Connections

Power/Ground Input

The SV-ADSB-470 can be powered by 10-30 Volts DC. 22 AWG wire is sufficient for wire runs up to 50’ for this application. Use an appropriate size fuse or circuit breaker for power supply protection to the SV-ADSB-470. If 22 AWG wire is used, a 1 or 3 amp fuse/circuit breaker is acceptable. The SV-ADSB-470 must be connected to aircraft power, and not to any of SkyView’s power outputs.

Power Specifications	Approximate current consumption at 12 volts DC	Approximate current consumption at 24 volts DC
SV-ADSB-470	0.2 amps	0.1 amps

Table 47 - SV-XPNDR-26X Power Consumption

Serial RX/TX

All communication between the SV-ADSB-470 module and SkyView is accomplished via a single bidirectional serial connection. To accomplish this:

- Choose an unused serial port on each display to connect the SV-ADSB-470 to. Note that both the TX and RX sides of the serial port are needed, and both the RX and TX lines must be connected to all displays in parallel. It is helpful, but not required, to choose the same numerical serial port on each display. This lets you configure each display’s serial ports identically.
- Connect the SV-ADSB-470 TX wire (pin 3) to the SkyView serial RX of your choosing. If you have multiple displays, the SV-ADSB-470 TX wire must be connected to a serial RX wire on each display.
- Connect the SV-ADSB-470 RX wire (pin 2) to the SkyView serial TX of your choosing. If you have multiple displays, the SV-ADSB-470 RX wire must be connected to a serial TX wire on each display.

- Record the SkyView serial port that you have chosen on each display as you will need to configure it later for use with the SV-ADSB-470.

Antenna Selection and Installation

The SV-ADSB-470 requires its own antenna; it cannot share the transponder's antenna. The selected antenna should be installed according to the manufacturer's instructions. A UAT-specific antenna or a transponder antenna may be used with the SV-ADSB-470. Antennas available include (but are not limited to):

- UAT Antennas
  - Delta Pop (non-TSO):
    - http://www.deltapopaviation.com/UAT_Antenna.html
  - Rami AV-74 (TSO'd):
    - http://www.rami.com/product-view.php?pid=24
- Transponder Antennas: Any antenna suitable for use with an aircraft transponder will work with the SV-ADSB-470.

The following considerations should be taken into account when siting the antenna:

- The antenna should be well removed from any projections, the engine(s) and propeller(s). It should also be well removed from landing gear doors, access doors or others openings which will break the ground plane for the antenna.
- The antenna should be mounted on the bottom surface of the aircraft and in a vertical position when the aircraft is in level flight.
- Where practical, plan the antenna location to keep the cable lengths as short as possible and avoid sharp bends in the cable to minimize the VSWR (voltage standing wave ratio).
- The SV-ADSB-470 should not be placed within 2 feet of the transponder antenna.

Antenna Ground Plane

When a conventional aircraft monopole antenna is used it relies on a ground plane for correct behaviour. For ideal performance the ground plane should be very large compared to the wavelength of reception, which is 305 mm. In a metal skinned aircraft this is usually easy to accomplish, but is more difficult in a composite or fabric skinned aircraft. In these cases a metallic ground plane should be fabricated and fitted under the antenna.

As the ground plane is made smaller, the actual dimensions of the ground plane become more critical, and small multiples of the wavelength should be avoided, as should circles. Rectangles or squares are much less likely to create a critical dimension that resonates with the transmissions. The smallest practical ground plane is a square around 130 mm per side; as the size increases the performance may actually get worse, but will be better by the time the ground plane is 780 mm on each side. Anything much larger than that size is unlikely to show significant further improvement.

The thickness of the material used to construct the ground plane is not critical, providing it is sufficiently conductive. A variety of proprietary mesh and grid solutions are available. Heavyweight cooking foil meets the technical requirements, but obviously needs to be properly supported.

Antenna Cable

An acceptable cable:

- Has less than 3.0 dB loss for the run length needed. For runs less than 17 feet, RG58 is acceptable.
- Has a characteristic impedance of 50 Ohms
- If running the antenna cable in a bundle with or in close proximity to the transponder antenna cable:
    - Has double braid screens or has a foil and braid screen. For runs less than 17 feet, RG400 is acceptable.

When routing the cable, ensure that you:

- Route the cable away from sources of heat.
- Route the cable away from potential interference sources such as ignition wiring, 400Hz generators, fluorescent lighting and electric motors.
- Keep the cable run as short as possible.
- Avoid routing the cable round tight bends.
- Avoid kinking the cable even temporarily during installation.
- Secure the cable so that it cannot interfere with other systems.

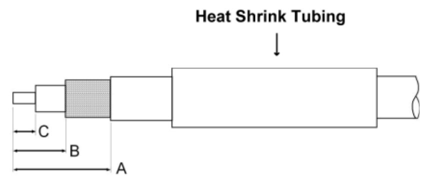
Antenna BNC Connector

This section describes the technique for attaching the antenna cable to a BNC connector. A BNC connector is not supplied with the SV-ADSB-470. The SV-ADSB-470 has a female BNC connection. Therefore, you will need to source a male BNC connector that is compatible with the antenna cable type that meets your aircraft's needs.

A dual crimp style BNC connector can be completed using a wide range of commercial crimp tools (for example the Tyco 5-1814800-3). The die apertures for the inner pin and the outer shield should be approximately 1.72 mm and 5.41 mm respectively.

- Strip back the coax cable to the dimensions in the table, as shown in the diagram below. Slide 25 mm (1 inch) of heat shrink tubing over the cable.
- Slide the outer crimp sleeve over the cable – it must go on before securing the center

contact.



Dimension	Cut size (mm)	Cut size (inches)
A	17.5	0.69
B	7.2	0.28
C	4.8	0.19

- Crimp the center contact to the cable.
- Insert the cable into the connector – the center contact should click into place in the body, the inner shield should be inside the body of the connector and the outer shield should be outside the body.
- Crimp the outer sleeve over the shield.

Slide heat shrink tubing forward (flush to connector) and heat to shrink the tubing.

SV-ADSB-470-Related SkyView Display Settings

Serial Port Setup

Before the ADS-B STATUS menu can be accessed, the SV-ADSB-470 needs to be set up as a serial device on each SkyView display on the system. To accomplish this:

- Go to SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP.
- Navigate to the serial port that you physically connected the SV-ADSB-470 module to in the previous steps.
- Select DYNON SV-ADSB-470. Note that other fields are automatically configured and cannot be changed. Press ACCEPT.
- Exit SETUP. Repeat on any other displays on your SkyView system.

Post Installation Checks

After the SV-ADSB-470 has been configured, confirmation that communication has been established with the module by performing the following procedure:

- Go to SETUP MENU > ADS-B STATUS.
- Confirm that the DEVICE line reads SV-ADSB-470.

- Use the STATUS line to determine whether the SV-ADSB-470 is successfully communicating with SkyView. It can also be used to determine whether the as well as if it is able to see any ADS-B ground stations. The status line can display any of the following states:
  - NOT FOUND: The device is not communicating with SkyView. This usually implies a connectivity/wiring problem between the SV-ADSB-470 and SkyView, or that the SV-ADSB-470 is not receiving power.
  - NO SIGNAL: The device is communicating with SkyView, but data is not being received from an ADS-B ground station. This may occur when you are on the ground and do not have line-of-sight reception of an ADS-B ground station, or if you are in the air and are out of range of all ADS-B ground stations. If there is an ADS-B ground station in range, and NO SIGNAL is persistently displayed, it may imply a connectivity problem with your ADS-B antenna or an installation issue that is preventing the ADS-B antenna from receiving ADS-B ground station broadcasts. Note that when in flight, the Map Page displays a status widget in its lower left corner that contains the same information as this menu status item. That widget will be more useful for ascertaining proper operation once you are in the air and are most likely to be receiving data from ADS-B ground stations.
  - RECEIVING: The device is communicating with SkyView AND data is being received from an ADS-B ground station.
- You may also observe the red LED light on the physical SV-ADSB-470 module to confirm proper hardware operation:
  - Flashing Fast: The module is operating normally, is configured and communicating with SkyView over a correctly-configured serial port, and is receiving GPS data from SkyView.
  - Flashing Slowly: The module is operating, but is not fully communicating with SkyView.
  - Off: The module is not receiving power.
  - On Solid - the module is receiving power, but is not operating normally. Contact Dynon Technical Support for assistance if power cycling your avionics does not help.

15. Accessory Installation and Configuration

This chapter contains information regarding installation and configuration of various Dynon-supplied accessories for the SkyView system.

Angle of Attack Pitot Probe Installation and Configuration

This section walks you through the general steps to install and calibrate both the heated and unheated versions of the AOA/Pitot Probe. The heated probe consists of a heater controller module and a probe while the standard version is a probe only.

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 and understand this entire section 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 SkyView system 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 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: 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.

The probe operates at a fairly hot temperature. During normal operation, it regulates its internal temperature to about 70°C to 80°C. You can verify nominal operation by touching the end of the pitot farthest from the snout after one minute of operation. It should be 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 SV-ADAHRS-20X to the probe mounting location
- Tubing interface hardware
  - Reference our wiki at wiki.dynonavionics.com for tubing interface hardware recommendations.
- #36 drill and #6-32 tap
- AOA Pitot Mounting bracket. Models known to work well can be found at http://wiki.dynonavionics.com/AOA_Pitot_Brackets_and_Parts.

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

Heater Controller Module Installation

This section addresses heater controller module installation. If you are installing the unheated version of the probe, you may skip to the AOA/Pitot Probe Mounting Section.

Heater Controller Module Physical Installation

Figure 89 shows the dimensions of the heater controller module.

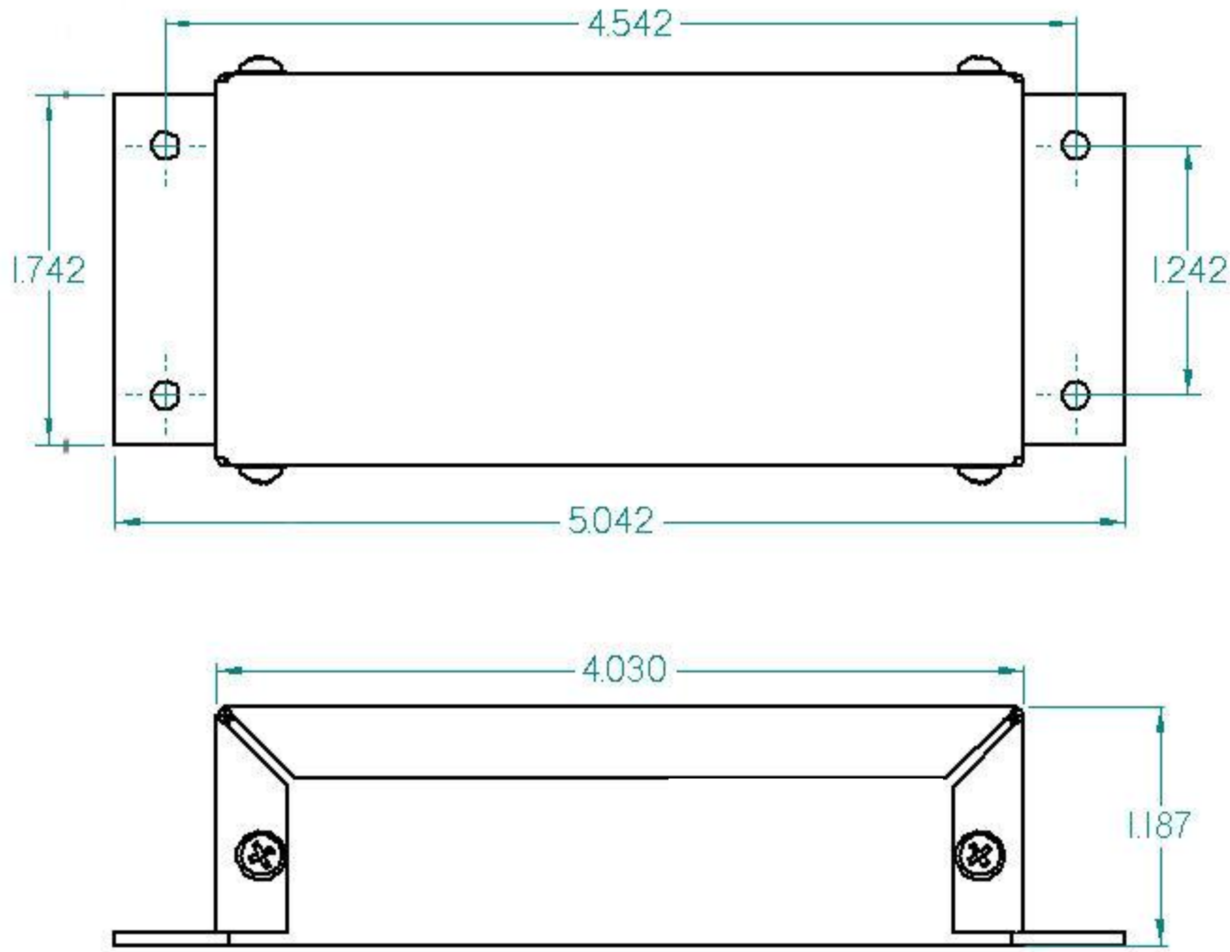


Figure 89–Heater Controller Module Dimensions

The heater controller module requires #6 mounting hardware and should ideally be mounted close to the AOA/Pitot Probe. 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 Appendix C: Wiring and Electrical Connections.

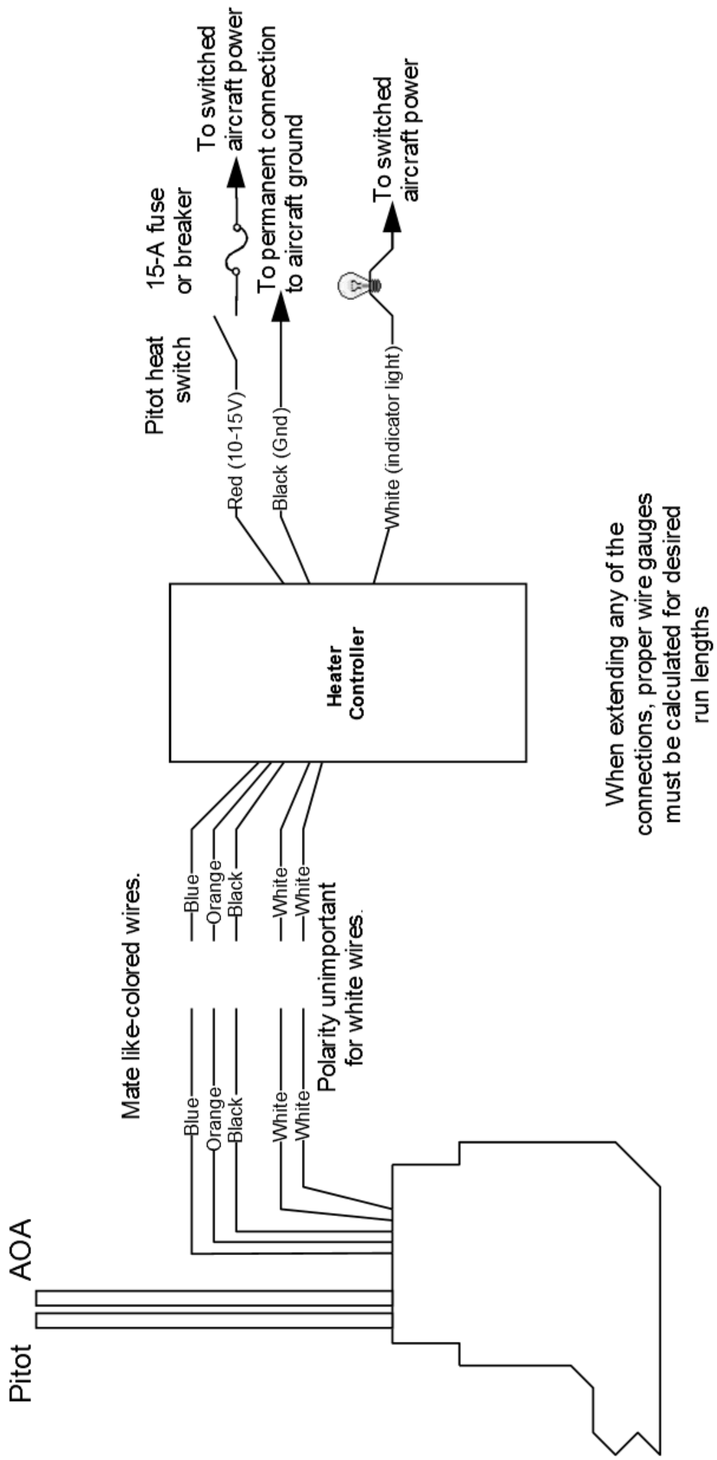


Figure 90–Heated AOA/Pitot Probe Wiring Overview

Heater Controller Wiring

Before making the connections to your Heated AOA/Pitot Probe and controller, refer to Appendix C: Wiring and Electrical Connections. The table below provides general recommendations for wire gauge choice, given wiring run length. It assumes 10 amps of current.

Run length (in feet)	Gauge
0 to 7	18 AWG
7 to 9	16 AWG
10 to 16	14 AWG
17 to 24	12 AWG
25 to 40	10 AWG

Table 48–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 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 Table 48) 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-dependent. 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 DC) 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 Table 48.

The red wire should be connected through a pilot-accessible switch to the main power source in the aircraft (limited to 15 volts DC). 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 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.

Wire Color	Notes
Red	Connected through a pilot-accessible switch to 10 to 15 volt DC 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.

Table 49–Controller Power Wiring Details

Heater Status Connection

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. *This parallels annunciator behavior in FAA certificated aircraft.*

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. Also note that the power and ground connections on LEDs are not reversible.

If there is an SV-EMS-220/221 in the same SkyView system, consider using one of its general purpose inputs configured as a contact for heated pitot operational status. Connect the heater status output directly to the EMS module's pin. There is no need for additional resistors or lights. Reference the EMS Sensor Definitions, Mapping, and Settings Section for general purpose input configuration details.

AOA/Pitot Probe Mounting

Dynon's standard AOA/Pitot Probes are designed to mount under the wing. The information in this chapter primarily applies to an under-wing installation.

Dynon does additionally make a straight boom-mount AOA/Pitot for customers that have unique mounting requirements. It is available only in an unheated version. As the boom-mount AOA/Pitot installations are usually custom/unique, no mounting brackets or mounting instructions are provided by Dynon. The methods and materials needed to install the boom-mount AOA/Pitot are left to the customer to best determine.

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 (150 mm) below the wing and with the tip of the probe between 2 and 12 inches (50mm to 300 mm) 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.

AOA/Pitot Probe Dimensions

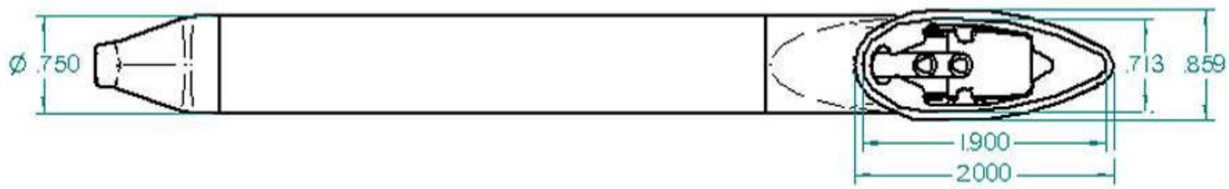


Figure 91–Standard Mount AOA/Pitot Probe Dimensions (Top View)

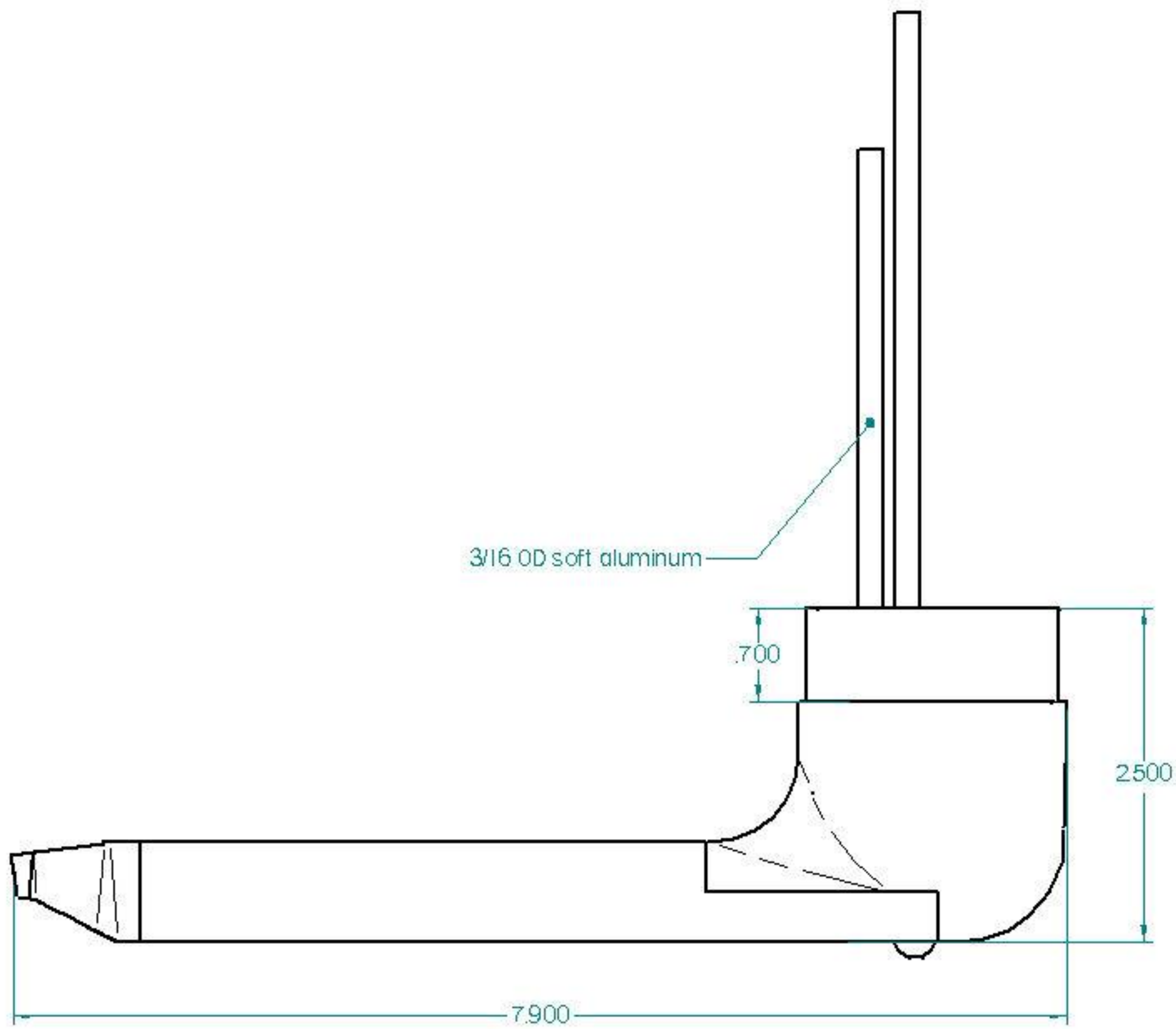


Figure 92–Standard Mount AOA/Pitot Probe Dimensions (Side View)

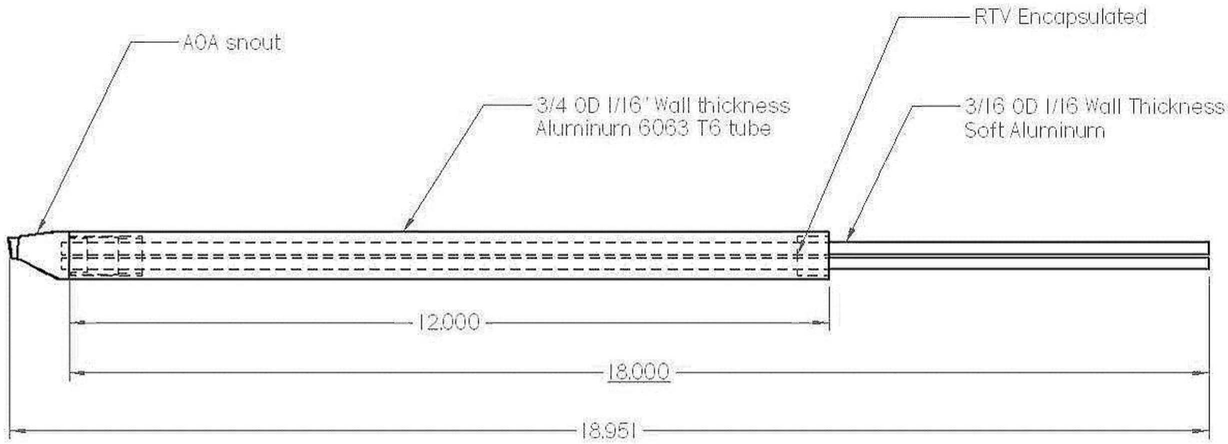


Figure 93–Boom Mount AOA/Pitot Probe Dimensions

Plumbing

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 the SV-ADAHRS-20X. 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 tubing interface hardware to connect the 3/16 plumbing lines from the probe to whatever plumbing lines run back to the SV-ADAHRS-20X in your aircraft. Make sure the plumbing lines do not chafe or interfere with any aircraft control systems.

Although the Standard Mount AOA/pitot design incorporates a drain feature, the buildler/installer should ensure that the design and installation of each pitot/AOA system provides positive drainage of moisture from the plumbing.

Pressure Check

Dynon's Standard Mount AOA/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

It is your responsibility to fly your plane safely while performing any configuration or calibration in flight. The best scenario includes a second person to perform any necessary steps on any SkyView components.

You should familiarize yourself with the AOA calibration procedure before flight by reading through the instructions in the AOA Calibration Wizard (SETUP MENU > HARDWARE CALIBRATION > ADAHRS CALIBRATION > AOA CALIBRATION).

Once you are flying straight and level at a safe altitude for stalls, go into the AOA Calibration Wizard (IN FLIGHT SETUP MENU > AOA CALIBRATION…) and follow the onscreen instructions to calibrate angle of attack.

Encoder Serial-to-Gray Code Converter Installation and Configuration

This section guides you through the installation of Dynon's Encoder Converter (Dynon P/N 100362-000). The Encoder Converter is an electronic device that receives the serial encoder data from a SkyView display and outputs standard Mode-C parallel Gray code into your Mode-C transponder.

This Encoder Converter requires data from a SkyView display and is not to be confused with other standalone encoders available on the market. 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 DC.

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
- SkyView Display Harness (SV-HARNESS-D37)
- Connector to mate with Gray code transponder

Electrical Installation

The following sections describe 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 Wire Practices

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 AWG avionics grade Tefzel wire, which meets Mil Standard MIL-W-22759/16.

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.

Transponder Wiring

Wire the Encoder Converter signals to their respective connections on your Mode-C transponder according to Table 50. 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 stripe
B1	Blue
B2	Orange
B4	White with Red stripe
C1	White with Green stripe
C2	White
C4	White with Black stripe
Power (10 to 30 volts DC)	Red
Ground	Black
Strobe Signal	Do not connect

Table 50–Transponder to Encoder Converter Wiring

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 SkyView encoder will always match the altitude shown on screen when the BARO value is set to 29.92 inHg.

SV-D700 or SV-D1000 Connection

Before wiring connections to the SkyView display check to ensure that the wire length between your Encoder Converter and your display 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.

If you have more than one SkyView display, note that like all other serial devices, the encoder converter module needs to be connected to a serial TX from each display simultaneously. See the Serial Devices section for more information about this requirement.

Any general purpose SkyView display serial port is compatible with the Encoder Converter module. Connect the Encoder's input (green or red) to an appropriate wire on the display harness (reference the SV-D700 / SV-D1000 Electrical Installation Section for details on which pins to use). Also ensure that the display and the Encoder Converter Module share a ground.

Figure 94 illustrates the basic electrical connection between the SkyView display and the Encoder Converter module.

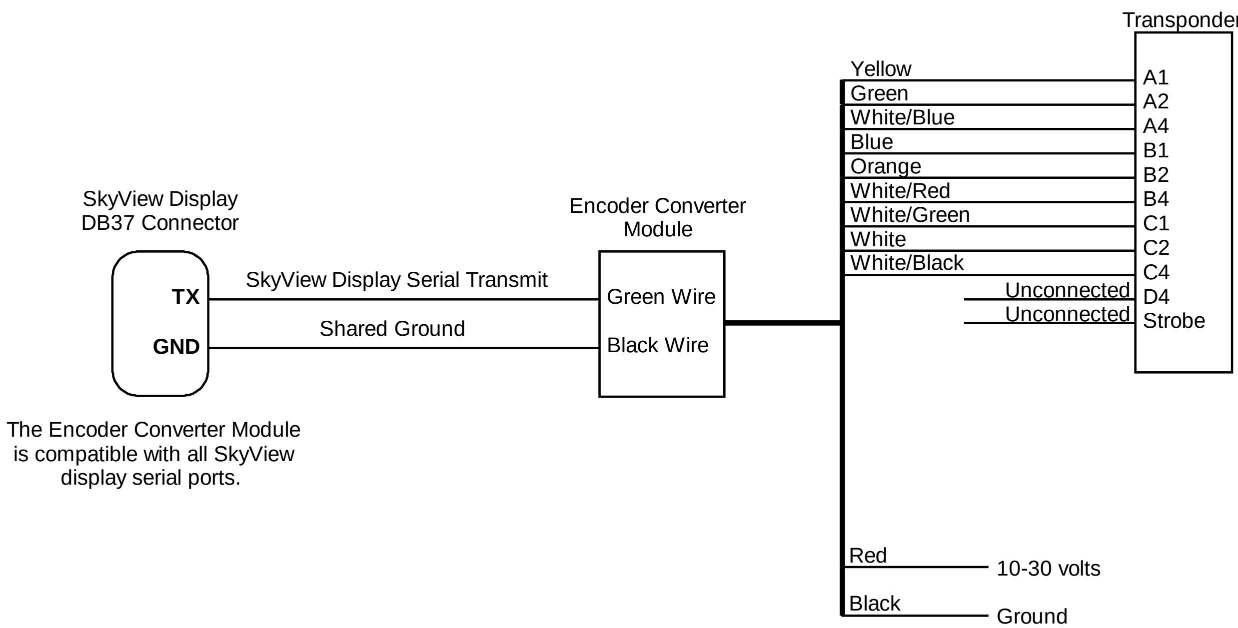


Figure 94–Encoder Converter Module Electrical Connections

Serial Port Setup–DYNON CONVERTER Format

Enter the Serial Port Setup Menu (SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP) on each display and configure the appropriate serial port for use with the Encoder Serial-to-Gray Code Converter module with the following settings:

SERIAL # IN DEVICE:	NONE
SERIAL # IN FUNCTION:	NONE
SERIAL # IN/OUT BAUD RATE:	1200
SERIAL # OUT DEVICE:	DYNON CONVERTER

Capacitance-to-Voltage Converter Installation and Configuration

Dynon Avionics' Capacitance-to-Voltage Converter (Dynon P/N 100654-000) is suitable for general use with most capacitive plate fuel level sensors. It accepts an input via a female BNC and outputs a DC voltage signal that can be read by the SV-EMS-220/221. It requires 10 to 15 volts DC for power and draws minimal current. We recommend that you connect the

Capacitance-to-Voltage Converter to the SV-EMS-220/221 for power as shown in the table below. It will also work properly when connected directly to standard 12 volt DC aircraft power. If your aircraft runs on 24 volt DC power, you must connect the Capacitance-to-Voltage Converter to the SV-EMS-220/221 for its power source. Voltage inputs higher than 15 volts DC will damage the device.

General Installation Recommendations

Connect the female BNC to the male BNC included with your capacitive fuel level sensor. Connect the wires as shown in the table to an enhanced general purpose input on the SV-EMS-220/221. If you need to extend the wire beyond the supplied length, we recommend avionics grade 22 AWG wire with Tefzel® type insulation.

Refer to the Fuel Level Sensor Section for EMS pin-out information when connecting this product to your SV-EMS-220/221.

You must configure the input type on the SV-EMS-220/221 to capacitive sender before calibrating this product. Refer to the EMS Sensor Definitions, Mapping, and Settings Section for configuration instructions and the EMS Sensor Calibration Section for calibration procedures.

Wire	SV-EMS-220/221 Pin	Function
Black	Any of 5,13,16,17,20	Ground
White	Any one or two of 8,22, or 31	Capacitance converter output to EMS fuel level input (0 Vdc to 5 Vdc)
Red	15	12 Vdc Power (normally used for fuel flow)

Table 51 – Capacitance-to-Voltage Converter Wiring

16.Appendix A: Maintenance and Troubleshooting

This appendix provides builders, installers and technicians basic information regarding SkyView maintenance and troubleshooting.

Dynon's internet sites may provide more up-to-date information on maintenance and troubleshooting than this document. The following sites should be used a reference:

- docs.dynonavionics.com–Dynon's documentation download area allows customers (and prospective customers) to download the most up-to-date versions of all Dynon documentation. Older versions of Dynon documentation may be shipped with OEM and dealer-provided units, so it is a good idea to periodically check for new versions of documentation.
- wiki.dynonavionics.com–Dynon's Documentation Wiki provides enhanced, extended, and frequently updated online documentation contributed by Dynon employees and customers.
- forum.dynonavionics.com–Dynon's Online Customer Forum is a resource for Dynon Avionics customers to discuss installation and operational issues relating to Dynon Avionics products. The Forum is especially useful for pilots with uncommon aircraft or unusual installation issues. For customers that cannot call Dynon Technical Support during our normal business hours, the Forum is a convenient way to interact with Dynon Avionics Technical Support. The Forum allows online sharing of wiring diagrams, photos, and other types of electronic files.

Dynon Technical Support is available 7:00 AM–4:00 PM (Pacific Time) Monday – Friday. For phone support, call +1(425) 402-0433. Email our tech support staff at support@dynonavionics.com.

There are no user-serviceable parts (such as replaceable fuses) inside any SkyView system unit. Refer all servicing to Dynon Avionics.

Taking a Screenshot

It is sometimes helpful to have a screenshot of a behavior to share with Dynon technical support. To accomplish this:

- Insert a USB memory stick into your SkyView USB port.
- When you want to save a screenshot of the display, press buttons 2 and 7 on that display simultaneously. SkyView will display a message indicating that a screenshot has been saved.
- The screenshot can be found in the "screenshots" folder on the USB memory stick when the USB memory stick is connected to a computer.

Returning SkyView Components to Service after Repair

SkyView Network enabled components such as modules and servos are shipped in a “like new” state after repair. To return a SkyView Network component to SkyView Network, follow the following directions. Note that there are 3 different procedures for returning SkyView SV-D1000/SV-D700 displays to service, depending on how the display is returned :

SV-D1000 / SV-D700 Display Scenario 1: When the documentation furnished with the repaired display indicates that is being returned to you with the exact same settings/configuration as it was sent to Dynon with

1. In this case, the display contains EXACTLY the same configuration as it did when you sent it in. If your system was working properly before the display failed and was sent in for repair:
    a. Reinstall the display, reconnecting all harnesses and connections as originally installed.
2. Power up the entire SkyView System (all displays, modules, servos, etc)
3. If this is the only display installed:
    a. Reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
    b. Confirm all SkyView Network components are found, including ALL displays that are in the aircraft.
4. If there is another display installed in the aircraft:
    a. Using a display that never left the aircraft (and is presumably configured and working correctly):
        i. Reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
        ii. Confirm all SkyView Network components are found.
5. Confirm that all settings, behavior, and configuration are normal.
6. If your SkyView system is not working normally, contact Dynon Avionics Technical Support for further assistance.

SV-D1000 / SV-D700 Display Scenario 2: When repaired display is the ONLY display in the aircraft, and the documentation furnished with the repaired unit indicates that the display was shipped “like new”

1. Reinstall the display, reconnecting all harnesses and connections as originally installed.
2. Power up the entire SkyView System (all displays, modules, servos, etc).
3. If you have a settings backup on a USB memory stick:
    a. Load settings backup via SETUP MENU > SYSTEM SOFTWARE > LOAD FILES.
    b. Confirm that the tail number under SYSTEM SETUP > AIRCRAFT INFORMATION is now set to the actual aircraft tail number, not DYNON.
    c. Reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
    d. Confirm all SkyView Network components are found.

   e. Confirm all settings, calibrations, and behaviors are as expected. Dynon recommends using the Installation Guide to walk through each set up section to confirm proper system operation.
4. If you do not have a settings backup, use the SkyView Installation Guide to perform ALL setup and configuration steps as if the entire system is being installed for the first time.

SV-D1000 / SV-D700 Display Scenario 3: When other display is part of a multi-display system in the aircraft, and the documentation furnished with the repaired unit indicates that the display was shipped "like new"

1. Your repaired display will have the latest version of SkyView software on it. All displays in the aircraft must be on the same SkyView software version. Therefore, before doing anything with the repaired display, confirm that your OTHER (still installed) SkyView displays are running the latest system software by comparing the version available at http://downloads.dynonavionics.com with the version that is listed in SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION. If the version displayed here does not match what is available on the web site, update these displays to the most current version of firmware before proceeding further. Instructions for updating your displays can be found in the Firmware Updates and File Operations section of this manual.
   a. If you have to update SkyView System Software, look through all the settings in the SETUP MENU after the update, as there may be some new options. Use the Revision History at the beginning of the SkyView System Installation Guide to help determine what has changed between versions.
2. Reinstall the repaired display, reconnecting all harnesses and connections as originally installed.
3. Power up the entire SkyView System (all displays, modules, servos, etc).
4. From the display that never left the airplane, save your settings files to a USB memory stick by using SETUP MENU > EXPORT SETTINGS …
5. Move this USB stick to the repaired display, and load both the .dfg and .sfg files that were created on the USB memory stick by using SETUP MENU > SYSTEM SOFTWARE > LOAD FILES…
6. Set the tail number of the repaired display (SYSTEM SETUP > AIRCRAFT INFORMATION) to DYNON.
7. Going back to a display that never left the aircraft, which is configured properly and working correctly:

   It is important that the following steps are done from a display which has remained in the aircraft, and NEVER the newly repaired display. If network configuration is done from the repaired display, it is possible for it to overwrite the correct settings that are stored in your good display with the Dynon default factory settings.

   a. On the display that stayed in the plane, confirm that the tail number under SYSTEM SETUP > AIRCRAFT INFORMATION is set to the actual <u>aircraft tail number</u>, not DYNON.

   b. On the display that stayed in the plane, reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
   c. Confirm all SkyView Network components are found, including ALL displays that are in the aircraft.
   d. Exit Setup mode.
8. On the recently repaired display, confirm that the tail number under SYSTEM SETUP > AICRAFT INFORMATION is now set to the actual aircraft tail number, not DYNON. This implies that all settings and configurations have been synchronized from the other display.

SV-ADAHRS-20X Modules

1. Reinstall the ADAHRS in the aircraft.
2. Reconnect all harnesses and connections as originally installed.
3. Power up the entire SkyView System (all displays, modules, servos, etc).
4. From any display in the aircraft, reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
5. Confirm all SkyView Network components are found, including the reinstalled ADAHRS.
6. If the ADAHRS is the same serial number as the one you returned for repair, no further actions should be required. However, Dynon recommends double checking the performance of magnetic heading and AOA calibration. If these do not seem to work as well as they previously did, redo those calibrations.
7. If the ADAHRS is not the same serial number as the one you returned for repair, all setup and calibration steps in the SV-ADAHRS-20X Installation and Configuration section of the SkyView Installation manual should be performed because this ADAHRS is being installed for the first time.

Autopilot Servos

1. Reinstall the servo in the aircraft.
2. Reconnect all harnesses and connections as originally installed.
3. Power up the entire SkyView System (all displays, modules, servos, etc).
4. From any display in the aircraft, reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
5. Confirm all SkyView Network components are found, including the reinstalled servo.
6. Assuming the Autopilot was previously set up and working correctly, you only need to recalibrate the servos by going to SETUP MENU > HARDWARE CALIBRATION > SERVO CALIBRATION > CALIBRATION and following the on-screen instructions.

All other SkyView Network Components

1. Reinstall the SkyView Network component in the aircraft.
2. Reconnect all harnesses and connections as originally installed.
3. Power up the entire SkyView System (all displays, modules, servos, etc).
4. From any display in the aircraft, reconfigure SkyView Network under SETUP MENU > SYSTEM SETUP > NETWORK SETUP > CONFIGURE…
5. No further action should be required.

Operational Status

SkyView displays give users access to vital operational information in the Display Hardware Information Page (SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION). Note that the information in this menu may be useful during troubleshooting. The information here cannot be edited on this screen; however, some parameters are editable by the user on other screens.

This menu contains the following information:

- Display serial number
- Firmware version
- Display input voltage
- Backup battery charge state
- Operational state of the internal battery management circuitry
- Operational state of the internal voltage rails
- Screen brightness level
- Local light sensor output
- External light sensor output
- Brightness level output
- Contact input status
- Serial port status and current baud rate
- Button and joystick states
- Operational hours

Display Serial Number

The serial number of the display is noted here as SERIAL NUMBER: XXXXXX.

Display Firmware Version

The firmware version of the display is noted here as FIRMWARE VERSION: X.X.XX.XXX.

Display Input Voltage

The display's input voltage is list here as VOLTAGE: XX.XXV.

Backup Battery Module Charge State

If there is an SV-BAT-320 backup battery connected to the display, its voltage level is shown here as BATTERY STATUS: XX.XXV. The battery is fully charged at 12.25V. Charging a completely discharged battery may take up to 4 hours. To conserve your aircraft battery, the SV-BAT-320 is only charged with SkyView detects your alternator/generator to be online.

Operational State of the Internal Battery Management Circuitry

The operational state of the display's internal battery management circuitry is listed here. If there is an SV-BAT-320 backup battery connected to the display, you will see one of the following states:

- CHARGING: SkyView system voltage is above 12.25V. SkyView is running on master power and is charging the SV-BAT-320.
- DISCHARGING: SkyView system voltage is below 10V. SkyView runs on the SV-BAT-320. The SV-BAT-320 discharges.
- CHARGED: SkyView system voltage is above 12.25V, and the SV-BAT-320 is fully charged.
- STANDBY: SkyView system voltage is above 10V, but below 12.25V: SkyView runs on master power but does not charge the SV-BAT-320. To conserve your aircraft battery, the SV-BAT-320 is only charged with SkyView detects your alternator/generator to be online.
- NO BATTERY: No SV-BAT-320 is connected.

Operational State of the Internal Voltages

There are several important voltages in the display. You will find their statuses here. If they are all operating at specified levels, then you will see OK. If any voltage is operating out of specification, you will see X.XV FAIL for that voltage.

Screen Brightness Level

The screen's brightness level is shown here as a percent. For example, 100.0 means 100% and 50.0 means 50%.

Local Light Sensor Output

Each SkyView display has an integrated light sensor on the front bezel and its output is shown here.

External Light Control Signal Output

SkyView displays are compatible with external light control signals. The state of the external light control signal is shown here. *This feature is not supported in the current release of SkyView.*

Brightness Level Output

SkyView displays can output a brightness level signal to control the brightness of compatible external equipment screens. The level of the output is shown here. *This feature is not supported in the current release of SkyView.*

Contact Input Status

Each SkyView display has four contact inputs. The status of each contact input is shown here as either HIGH or LOW. *This feature is not supported in the current release of SkyView.*

Serial Port Status and Current Baud Rate

Each SkyView display has five general purpose serial ports. The status of each serial port is shown with transmit (TX) and receive (RX) character counters and the ports current baud rate. The character counters show any outgoing or incoming character and roll over at 9999.

Button and Joystick States

The state of each button is shown on the BUTTON STATE line. You will see 1 2 3 4 5 6 7 8 on the line. When you press a button, its respective number on the button state line is replaced with an asterisk (*). For example, if you press and hold button 3, you will see 1 2 * 4 5 6 7 8.

The state of each joystick is shown on the JOYSTICK STATE line. Each joystick is denoted with an L or R (left or right, respectively), a counter to show joystick turns, and the letters UDLRC to denote moving the joystick **U**p, **D**own, **L**eft, **R**ight, and *C*enter (when pressed like a button).

Operational Hours

This is a running count of the hours a screen has been on since was initially manufactured.

Instructions for Continued Airworthiness

Follow these steps for continued airworthiness:

- Conduct any periodic checks that are mandated by local regulations (IE, FAA for US Aircraft). If this includes a pitot/static test, ensure that the procedure at the end of the SV-ADAHRS-20X Installation and Configuration section of this guide are followed.
- Annually test the optional backup battery (SV-BAT-320).
- Any other issues should be addressed on an as-needed basis.

Annual Backup Battery Test

Perform this test on a yearly basis to ensure each backup battery in the SkyView system is fully functional. A fully charged SV-BAT-320 should power a typical SkyView system for at least 60 minutes if primary power is lost.

If the SkyView system has more than one display with a backup battery installed, perform the test for each display individually. Power off all but one display during the test.

Test Procedure

6. Set the SkyView display to full brightness (PFD > press SCREEN > press DIM > press FULL)
7. Fully charge the SV-BAT-320 Backup Battery. Reference the Battery Charging and Battery Status Check sections for battery charging instructions.
8. Disconnect primary power from the SkyView display—ensure that the display is not powered from another source
9. Clear the POWERING DOWN IN # SECONDS message (press STAY ON)
10. Allow the SkyView system to run off the backup battery

The system passes if, after 60 minutes, it has not turned off.

Repeat the test procedure for each backup battery in the system.

This test discharges the backup battery. Recharging the battery after the test is recommended. Do this by applying primary power to the display. The backup battery is fully charged when its voltage reaches 12.25 volts.

If a tested battery does not pass the annual backup battery test, please contact Dynon by phone or the online store (store.dynonavionics.com) to obtain a replacement battery.

Please dispose of non-functional SkyView backup batteries in a responsible manner. SkyView backup batteries are lithium-ion and similar in construction to cordless tool batteries. They can likely be recycled wherever cordless tool battery recycling is available. For a list of recycling locations in your area (USA only), call 1-800-8-BATTERY or see the Call 2 Recycle website at www.rbrc.org.

Troubleshooting

The Display Hardware Information Page (SETUP MENU > LOCAL DISPLAY SETUP > DISPLAY HARDWARE INFORMATION) can be a valuable resource when troubleshooting SkyView and is described in the previous section.

If the suggestions below do not help, or your issue is not listed below, please call Dynon Technical Support at +1(425) 402-0433 or email at support@dynonavionics.com.

Network Configuration Does Not Work or SkyView Network Module Is Not Working Properly

If you try and configure a SkyView network and it does not work, try the following:

- Check network wiring and try again. There may be a short or an open somewhere.
- Unplug network modules one by one and try again. It is possible that one of the modules could cause the network to stop functioning.
- Try again.
- For modules such as the SV-ADAHRS-20X, the SV-EMS-220/221, and SV-ARINC-429, observe the red LED light near the SkyView Network connector:
    - Flashing Fast: The module is operating normally and is configured and communicating on a SkyView Network.
    - Flashing Slowly: The module is operating normally, but is not active on SkyView Network.
    - Off: The module is not receiving power (from a SkyView Network / Display)
    - On Solid - the module is receiving power, but is not operating normally.

SkyView Reports STANDBY NETWORK ERROR

SkyView has detected a problem with the SkyView Network wiring between one or more modules. Go to SETUP MENU > SYSTEM SETUP > NETWORK SETUP > NETWORK STATUS for a description of the problem. Module failures and/or wiring faults (via SkyView D9 connector pin callouts) will be annunciated here to aid troubleshooting. The fault will be below the component(s) that SkyView can see the fault in. This may help you narrow down the wiring run or connector that is faulty.

For example, a “Connection Fault: 4/8” listed below an SV-ADAHRS-200 listing in the network status page means that pins 4 and 8 on a SkyView Network harness or connector that goes to that component has a connectivity problem. This could be a broken wire, swapped wires, bad connection, etc, and should be analyzed with a multimeter or other direct method.

If the fault were instead listed under a SkyView display listing in the network status page, that means that the fault is seen on devices connected to that display, and is likely due to a connectivity issue at or very near the display in your SkyView Network wiring scheme.

Compass Calibration Fails

If you try to calibrate your compass and it does not work, try the following:

- Ensure SkyView is receiving data from the system’s GPS receiver. Go to the Display Hardware Information Page as mentioned at the beginning of this section, scroll down the menu to the serial port status section, and confirm that the receive (RX) counter is active on the GPS serial port.
- Ensure the SkyView network status includes the ADAHRS you’re trying to calibrate. Use the Network Status Wizard and confirm that the ADAHRS is present in the system.
- Ensure the ADAHRS location is compatible with the requirements outlined in the General System Installation Tips Section of this guide.

Display does not Turn On

If your SkyView display does not turn on, try the following:

- Check power wiring and fuses and try again. There may be a short or an open somewhere.
- Observe the lights on the Ethernet port. Unlike other Ethernet ports, these lights are used for display status:
    - Yellow light on: Power on pins 1/20 (power/ground).
    - Yellow light off: Display not receiving power.
    - Green light flashing: Normal when display is turned on, or turned off with a backup battery connected.
    - Green light solid on or off: Something is wrong with the SkyView display. Contact Dynon Technical Support for further support.

No GPS

GPS is an essential part of a SkyView system. If you do not have a working GPS, you cannot set the system time, calibrate the compass, or use the moving map. If you are experiencing these symptoms, try the following:

- Check wiring and connections. Make sure all wiring runs are complete, that connections are solid, and that transmit (TX) and receive (RX) are not swapped. If you are using the SV-GPS-250 GPS Receiver module, make sure that power and ground wires are also installed correctly.
- Ensure that the GPS serial port's parameters are configured correctly. Go to the Serial Port Setup Menu (SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP > SERIAL PORT # SETUP) and check the input device, function, baud rate, and output device properties of the port. This menu also contains serial transmit (TX) and receive (RX) counters. These show activity on the transmit and receive lines of that port and can indicate if the GPS is at least active on that port. Reference the SV-GPS-250 Serial Connection Section for SV-GPS-250 serial port settings. Also reference the Serial Devices Section on page 4-11 of this guide if a comprehensive explanation of SkyView serial connections is necessary.

Engine Sensor Does Not Show Up Onscreen

Make sure the sensor is installed, defined, mapped, and configured according to the instructions found in the SV-EMS-220/221 Installation and Configuration Chapter.

17.Appendix B: Specifications

SkyView Equipment Weights

SkyView Equipment Description	Weight
SV-D1000 with mounting screws	3 lb 0.7 oz (1.38 kg)
SV-D700 with mounting screws	2 lb 6.1 oz (1.08 kg)
SV-ADAHRS-20X	8.2 oz (0.23 kg)
SV-EMS-220/221	9.6 oz (0.27 kg)
SV-GPS-250	6.7 oz (0.19 kg)
SV-BAT-320	13.1 oz (0.37 kg)
SV-XPNDR-26X	14.4 oz (0.4kg)
SV-ARINC-429	6.0 oz (0.17kg)
SV-ADSB-470	12.5 oz (0.35kg)
SV32	2.0 lb. (0.91 kg)
SV42	3.0 lb.(1.36 kg)
SV52	4.0 lb.(1.81 kg)
SV-OAT-340	1.5 oz (0.04 kg)
SV-HARNESS-D37	7.5 oz (0.21 kg)
SV-NET-CHG	0.4 oz (0.01 kg)
SV-NET-SPL	3.2 oz (0.09 kg)
SV-NET-3CC	3.2 oz (0.09 kg)
SV-NET-6CC	4.6 oz (0.13 kg)
SV-NET-10CP	6.7 oz (0.19 kg)
SV-NET-15CP	8.8 oz (0.25 kg)
SV-NET-20CP	11.3 oz (0.32 kg)
SV-NET-30CP	15.2 oz (0.43 kg)
SV-NET-HUB	3.1 oz (0.09 kg)
Heated AOA/Pitot Probe and Heater Controller (100667-000)	11.3 oz (0.32 kg)
Unheated AOA/Pitot Probe (100141-000)	5.7 oz (0.16 kg)
Encoder Serial-to-Gray Code Converter (100362-000)	1.6 oz (0.05 kg)
EMS 37-pin Main Sensor Harness (100399-000)	13 oz. (0.37 kg)
EMS EGT/CHT 6-cylinder 25-pin Thermocouple Wire Harness (100399-002)	11 oz (0.31 kg)
Manifold Pressure Sender (100434-000)	3.2 oz (0.09 kg)
Oil Pressure Sender (100411-002)	3.9 oz (0.11 kg)
Fuel/Coolant Pressure Sender (100411-000)	3.9 oz (0.11 kg)
Oil Temperature Sender (100409-000 and 100409-001)	2.1 oz (0.06 kg)
Single EGT Probe	1.4 oz (0.04 kg)*
Single CHT Probe	1.4 oz (0.04 kg)*
OAT Sender (100433-000)	3.2 oz (0.09 kg)
Fuel Flow Sender (100403-003)	3.9 oz (0.11 kg)
Carburetor Air Temperature Sender (100468-000)	2.1 oz (0.06 kg)
Ammeter Shunt (100412-000)	5.0 oz (0.14 kg)

Table 52–SkyView Equipment Weights

*This is for a single probe. Multiply by the number of probes to obtain total weight of probes.

SkyView Compatible Engine Sensors

Description	Range/Type	Fittings	Dynon P/N
Amps Shunt or Ammeter Shunt	0-60 A (can be configured to display -60 A to +60 A)	2 each 1/4" Ring Terminals	100412-000
Capacitance to Voltage Converter for Vans Capacitive Plates	50 pF to 1000 pF	BNC connector to Van's RV fuel tank sensor	100654-000
Carburetor Air Temperature	-50° F to 150° F	1/4-28 UNF	100468-000
CHT (for Jabiru)	J-Type Thermocouple	12mm Ring Terminal	100578-000
CHT (for Lycoming/ Continental/Superior)	J-Type Thermocouple	Bayonet 3/8-24 UNF	100404-000
EGT (for Jabiru)	K-Type Thermocouple	1/8" hole, Hose Clamp 3/4" – 1 3/4"	100405-002
EGT (for Lycoming/ Continental/Superior)	K-Type Thermocouple	1/8" hole, Hose Clamp, 1" – 2"	100405-000
EGT (for Rotax)	K-Type Thermocouple	1/8" hole, Hose Clamp 1/4" – 1 1/4"	100405-001
Fuel Flow Transducer (EI FT-60)	0.6 GPH -70+ GPH	1/4" Female NPT	100403-003
Fuel Pressure (carbureted)	0-30 PSI	1/8-27 NPT	100411-000
Fuel Pressure (fuel injected)	0-80 PSI	1/8-27 NPT	100411-001
Manifold Pressure (MAP)	0-60 In Hg	Nipple fitting: 1/4" ID tubing recommended	100434-000
OAT Probe	-40° F to 150° F	3/8" hole in fuselage, 9/16" nut	100433-001 100433-002 100433-003
Oil Pressure	0-150 PSI	1/8-27 NPT	100411-002
Oil Temperature (for Lycoming/ Continental/Superior)	-10° F to 300° F	5/8-18 UNF	100409-001
Oil Temperature (for older Continental 0-200s)	-10° F to 300° F	1/8-27 NPT	100409-000

Table 53–SkyView Compatible Engine Sensors

SV-XPNDR-261 Specifications

Specification	Characteristics
Compliance	ETSO 2C112b Class 1 Level 2els, ETSO C166a Class B0, TSO C112c Class 1 Level 2els, TSO C166b Class B1S
FCC Identification	VZI00745
Applicable documents	EUROCAE ED-73C, EUROCAE ED-14F (RTCA DO-160F), RTCA DO-181D, RTCA DO-260B
Software	ED-12B (RTCA DO-178B) Level B
Hardware	DO-254 Level C
Power Requirements	11 – 33 Volts DC. Typical 6 Watts @ 14Volts.
Altitude	35,000 feet
Humidity	95% @ +50°C for 6 hours; 85% @ +38°C for 16 hours. Tested to Category A in DO-160F
Operating Temperature	-20°C to +70°C
Transmitter Frequency	1090MHz ± 1MHz
Transmitter Power	250 Watts nominal; 125 Watts minimum at antenna after allowing for 0.5dB connector losses and 1.5dB cable losses.
Transmitter Modulation	6M75 V1D
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74Dbm ± 3Db
Physical Specifications (in the mounting tray)	
Height	48mm (1.9”)
Width	66mm (2.5”)
Length	160mm (6.3”)
Weight	0.77lbs. (350 g)

Table 54 - SV-XPNDR-261 Specifications

SV-XPNDR-262 Specifications

Specification	Characteristics
Compliance	ETSO 2C112b Class 2 Level 2els, ETSO C166a Class B0, TSO C112c Class 2 Level 2els, TSO C166b Class B0
FCC Identification	VZI00675
Applicable documents	EUROCAE ED-73C, EUROCAE ED-14F (RTCA DO-160F), RTCA DO-181D, RTCA DO-260B
Software	ED-12B (RTCA DO-178B) Level B
Hardware	DO-254 Level C
Power Requirements	11 – 33 Volts DC. Typical 5 Watts @ 14Volts.
Altitude	< 15,000 feet
Speed	< 175 knots
Humidity	95% @ +50°C for 6 hours; 85% @ +38°C for 16 hours. Tested to Category A in DO-160F
Operating Temperature	-20°C to +70°C
Transmitter Frequency	1090MHz ± 1MHz
Transmitter Power	125 Watts nominal; 71 Watts minimum at antenna after allowing for 0.5dB connector losses and 1.5dB cable losses.
Transmitter Modulation	6M75 V1D
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74Dbm ± 3Db
Physical Specifications (in the mounting tray)	
Height	48mm (1.9”)
Width	66mm (2.5”)
Length	160mm (6.3”)
Weight	0.77lbs. (350 g)

Table 55 - SV-XPNDR-262 Specifications

18.Appendix C: Wiring and Electrical Connections

SkyView utilizes standardized network connectors and wire harnesses for equipment-to-equipment connections as well as other connections. Installers should rarely have to build custom wire harnesses. This appendix is included as a reference for those rare times when custom wiring is required.

Improper wiring can result in permanent damage to your instrument and/or the accompanying sensors.

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.

Wire Gauge

Unless otherwise specified, 22 AWG wire is normally sufficient for the power supply and ground lines, but we recommend that you consult a wire sizing chart to 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.

Smaller gauge wire is sufficient for lines that only carry data.

FAA Advisory Circular AC 43.13-1B is an excellent resource for wire sizing requirements as well as other acceptable methods, techniques, and practices in aircraft inspection and repair.

Grounding

Many of the engine sensors require a connection to a ground on the SV-EMS-220/221. There are many places on an aircraft where you could connect these sensors. However, the ideal location to ground these sensors is to one of the SV-EMS-220/221 ground pins. Connecting the sensor's ground pin directly to the SV-EMS-220/221 minimizes any voltage difference between sensor ground and SV-EMS-220/221 ground.

You can measure the voltage difference between grounds to check if the connection has a minimal voltage drop. Set a multimeter to the DC voltages setting and place one probe tip on one ground and place the other probe tip on the other. Measurements close to 0 mV (within 5 mV) are, in most cases, acceptable.

Other grounding recommendations include:

- Ensure that solid, thick electrical connections exist between engine and battery ground.
- Do not paint over surfaces that are ground connection points.

D-subminiature Crimp Contacts and Tools

D-subminiature crimp contacts can be obtained from a variety of sources. Dynon recommends the use of the following Mil Spec types in avionics applications.

Gender	Mil Spec #	Wire AWG
Female/Socket	M39029/63-368	20, 22, 24
Male/Pin	M39029/64-369	

Table 56–Recommended D-subminiature Crimp Pins

Use a high quality 4-way indentation contact crimper when working the Mil Spec contacts in Table 56. Paladin Tools P/N 1440 (for 20 to 26 AWG wire) is an example of such a contact crimper tool.

Homemade Wire Harness Considerations

Each SkyView display includes its own wire harness (SV-HARNESS-D37) for connection to power, serial ports, USB, the external battery, and other connections. We recommend that you use this harness for display installations instead of building your own.

Here are some considerations if you build your own SkyView network wire harnesses.

Wire Insulation

We recommend that all wire harness wires that are installed in aircraft utilize Tefzel® insulation.

Twisted Pairs

SkyView networks utilize two data wire pairs for communication between devices. This guide refers to these pairs as Data 1 and Data 2 and each have an A and a B wire. These pairs should have 8 to 10 twists per foot over their entire length.

Heat Shrink Bundling and Strain Relief

All wires should be bundled together with heat shrink and then strain relieved when exiting the connector shell or hood.

SV-BAT-320 Connection

To connect a homemade harness to an SV-BAT-320, the following specifications must be followed closely for the SV-BAT-320 to charge and work correctly:

Connector:	Molex Micro-Fit P/N 43640-0301 (Digi-Key P/N WM1856-ND)
Pins:	Molex Micro-Fit P/N 43031-0007 (Digi-Key P/N WM1841-ND)
Wire:	22 AWG Tefzel, NO MORE THAN 24” LONG; red w/yellow: M22759/16-22-24; black: M22759/16-22-0

Function	SkyView D37 Connector Pin	Molex Connector Pin
Power	2	3
Ground	23	1

Table 57 - SV-BAT-320 Wiring

OAT Connection

For customers that are converting from other Dynon products, you can use your installed OAT with the addition of the connector below. Both 100433-000 and 100433-001 are compatible. The OAT wiring can be extended as required. If you have 100433-001, ignore the red wire and connect the yellow and blue wires to the connector below. The OAT is non-polarized; either wire can connect to either pin.

Connector: Molex Micro-Fit P/N 43645-0200 (Digi-Key P/N WM1845-ND)
Pins: Molex Micro-Fit P/N 43030-0007 (Digi-Key P/N WM1837-ND)
Wire: 22 AWG Tefzel

SkyView Equipment Electrical Connections

A SkyView display (SV-D700 and SV-D1000) has six connectors on the back of the unit as illustrated in Figure 95:

- One male D37 for connection to the SkyView Display Harness (SV-HARNESS-D37)
- Two male D9 SkyView network connectors
- Two Standard 4-pin USB 2.0 jacks for use with USB Series A plugs. Note that there is also a USB port on the SV-HARNESS-D37 for convenience.
- One standard 8-pin RJ45 connector for use with twisted pair category 5 Ethernet cable

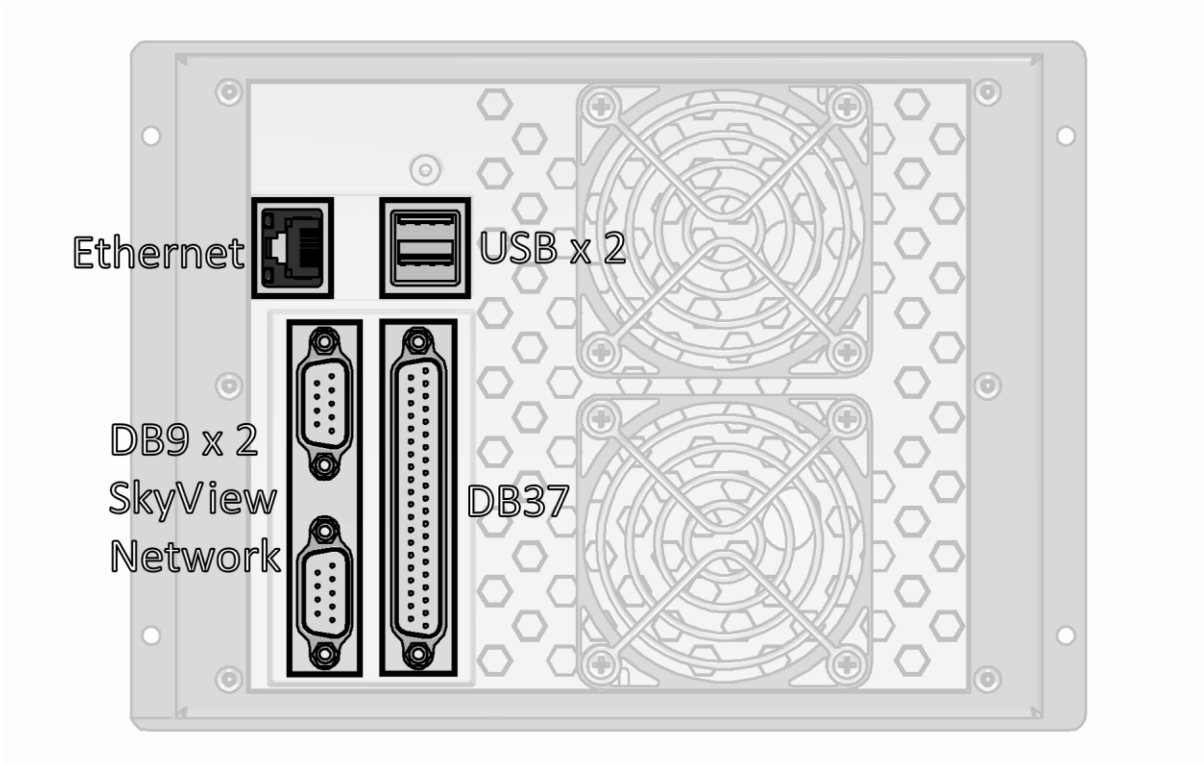


Figure 95–SV-D700 and SV-D1000 Connectors

A SkyView ADAHRS module (SV-ADAHRS-20X) has two connectors as illustrated in Figure 96:

- One male D9 SkyView network connector
- One 2-pin OAT probe connector (only compatible with the SV-OAT-340)

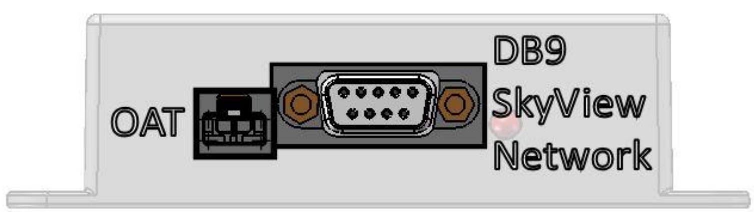


Figure 96–SV-ADAHRS-20X Connectors

The SkyView EMS Module (SV-EMS-220/221) has three connectors as illustrated in Figure 97:

- One male D9 SkyView network connector
- One male D37 for various transducer connections
- One female D25 for thermocouple connections

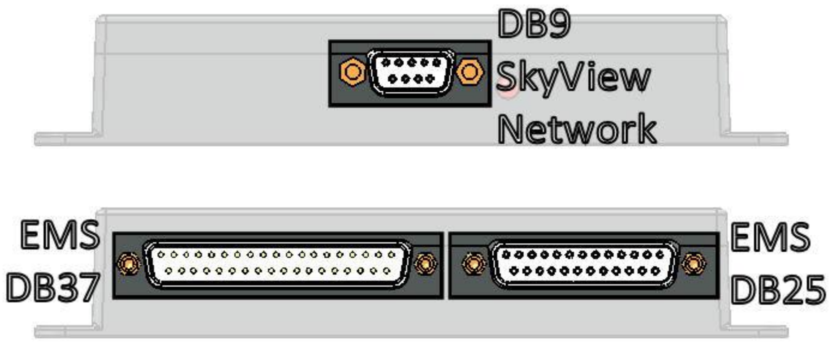


Figure 97–SV-EMS-220/221 Connectors

The SkyView GPS Receiver module (SV-GPS-250) includes four unterminated wires. These wires may be trimmed or spliced and extended as needed to suit the installation location. Match the colors of these wires with the corresponding colors on the display harness as mentioned in the Serial Connection Section of the SV-GPS-250 Installation and Configuration Chapter.

The SkyView Backup Battery (SV-BAT-320) has one connector. *Do not add more wire into the backup battery wire bundle.*

Each SkyView servo has seven unterminated wires. Reference the Autopilot Servo Installation, Configuration, and Calibration section for more information.

SkyView Equipment Electrical Connector Pin-Out Tables

See tables on the follow pages for connector pin function descriptions. Tables for the USB jacks, RJ45 jack, OAT connector, and battery connector are not included.

Servo Harness Pin-Out

Servo Wire Color	Description
Red	Power (10 to 30 volts DC)
Black	Aircraft Ground
Green	SkyView Network Data 1A
Blue	SkyView Network Data 1B
Yellow	AP Disengage/Control Wheel Steering (CWS) Button
White/Green	SkyView Network Data 2A
White/Blue	SkyView Network Data 2B

Table 58–Servo Wiring

SkyView D37 Harness Pin-Out

SkyView Display Male D37 Pin	SV-HARNESS-D37 Wire Color	Description
1	Red	Power Input
2	Red with Yellow stripe	Backup Battery Input
3	Brown with Violet stripe	Serial Port 1 RX
4	Brown with Orange stripe	Serial Port 1 TX
5	Yellow with Violet stripe	Serial Port 2 RX
6	Yellow with Orange stripe	Serial Port 2 TX
7	Green with Violet stripe	Serial Port 3 RX
8	Green with Orange stripe	Serial Port 3 TX
9	Blue with Violet stripe	Serial Port 4 RX
10	Blue with Orange stripe	Serial Port 4 TX
11	Gray with Violet stripe	Serial Port 5 RX
12	Gray with Orange stripe	Serial Port 5 TX
13	Brown	Audio Output Left
14	Orange with Yellow stripe	Contact Input 3
15	Orange with Green stripe	Contact Input 4
16	Red	USB Power
17	Black	USB Ground
18	White	USB-
19	Green	USB+
20	Red	Power Input
21	Black	Ground
22	Black	Ground
23	Black	Ground
24	Black	Ground
25	Violet	Dim Input
26	White	Dim Output
27	Orange with Red stripe	Contact Input 2
28	Orange with Black stripe	Contact Input 1
29	Orange	SV-GPS-250 Power Output
30	Black	Audio Ground
31	Gray	Audio Output Right
32	Do Not Connect	Do Not Connect
33	Do Not Connect	Do Not Connect
34	Do Not Connect	Do Not Connect
35	Do Not Connect	Do Not Connect
36	Do Not Connect	Do Not Connect
37	Do Not Connect	Do Not Connect

Table 59–SkyView Display Male D37 Pin-out with Harness Wire Colors

SkyView D37 Block Diagram

Figure 98 illustrates basic SkyView display D37 electrical connections.

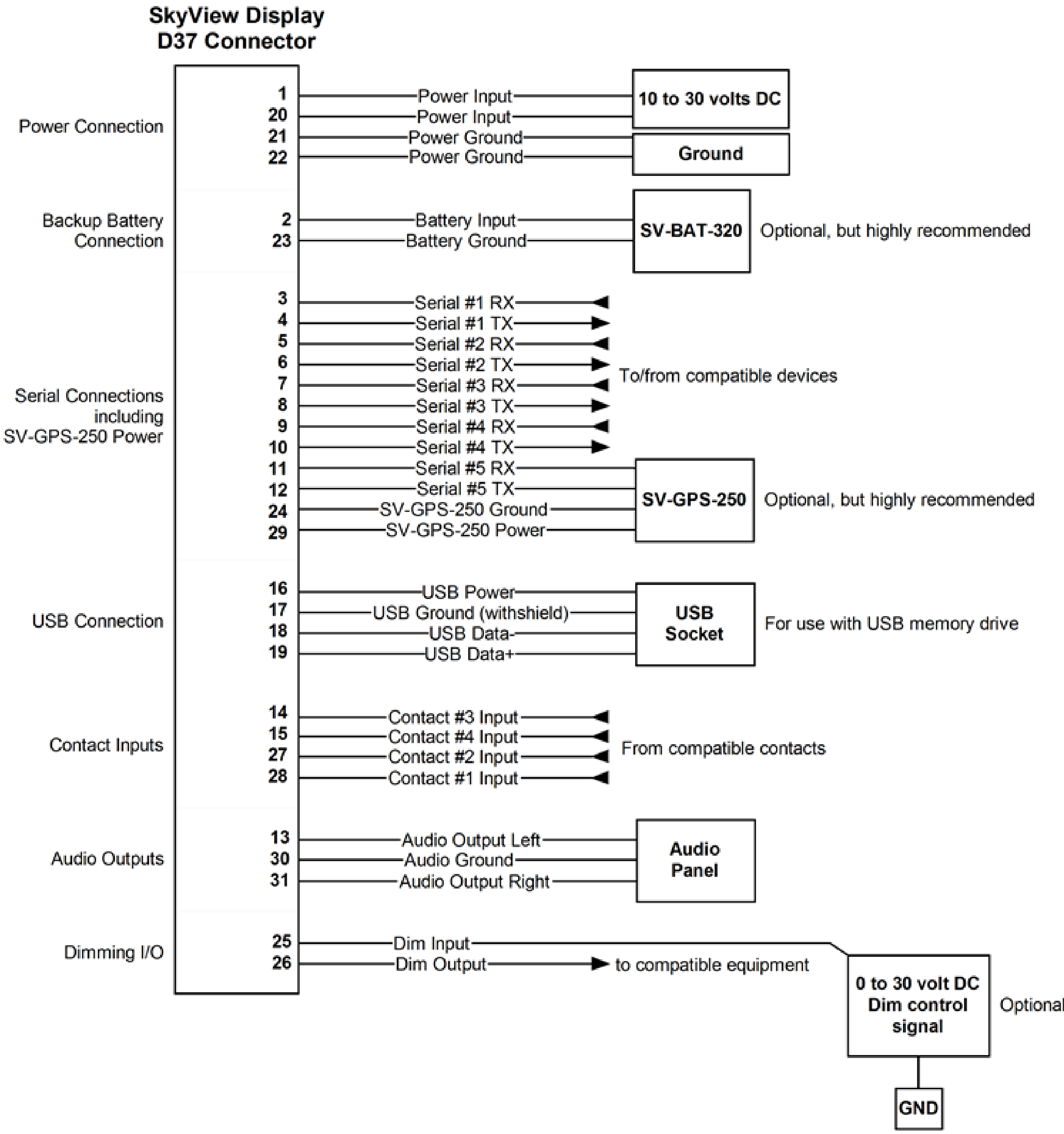


Figure 98–SkyView D37 Connector Electrical Connections

The current release of SkyView does not support discrete inputs. These features will be available through a future firmware update.

SkyView Network Connection Pin-Out

SkyView Network Male D9 Pin	SkyView Network Cable Wire Color	Description
1	Green	SkyView Network Data 1 A
2	Black	SkyView Network Ground 1
3	White with Black Stripe	SkyView Network Ground 2
4	White with Blue Stripe	SkyView Network Data 2 B
5	Orange	SkyView EMS Auxiliary Voltage
6	Blue	SkyView Network Data 1 B
7	Red	SkyView Network Power 1
8	White with Green stripe	SkyView Network Data 2 A
9	White with Red stripe	SkyView Network Power 2

Table 60–SkyView Network Male D9 Pin-out and Wire Harness Colors

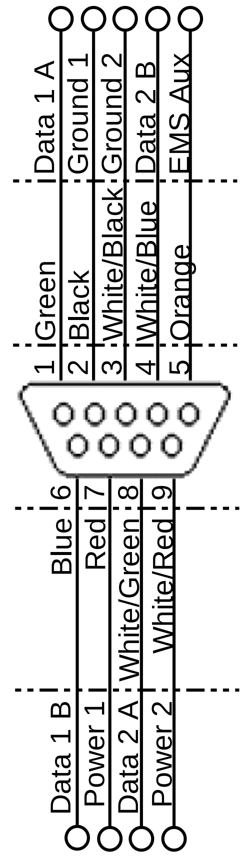


Figure 99–SkyView Network Female D9 Pin Insertion View (Rear)

SV-EMS-220/221 Pin-Out

SV-EMS-220 Male D37 Pin	EMS 37-pin Harness Wire Color	Description
1	Red	Voltmeter 1 (0 to 30 volts DC)
2	Yellow or Unwired	Voltmeter 2 (0 to 30 volts DC)
3	Black	Signal Ground
4	Purple/Blue	General Purpose Input 1
5	Black	Signal Ground
6	White/Yellow	General Purpose Input 11
7	White/Brown	General Purpose Input 12
8	Brown	Enhanced General Purpose Input 4
9	Brown/Blue	General Purpose Input 5
10	Brown/Yellow	General Purpose Input 6
11	Orange	General Purpose Input 7
12	Yellow	General Purpose Input 8
13	Black	Signal Ground
14	Yellow	Fuel Flow Input 1

SV-EMS-220 Male D37 Pin	EMS 37-pin Harness Wire Color	Description
15	Red	+12 volts DC Auxiliary Power Output
16	Black	Signal Ground
17	Black	Signal Ground
18	White/Red	+5 volts DC Auxiliary Power Output (Fuse limited to 500 mA)
19	White/Black	Fuel Flow Input 2
20	Orange/Brown	General Purpose Input 9
21	Orange/Blue	General Purpose Input 10
22	Purple/Yellow	Enhanced General Purpose Input 2
23	Purple/Green	General Purpose Input 3
24	Orange/Green	Amps+ Input
25	Orange/Purple	Amps- Input
26	Green/Red	Manifold Pressure Input
27	Open	General Purpose TC Input 1+
28	Open	General Purpose TC Input 1-
29	Yellow/Green	Optional External Alarm Light
30	Black	Signal Ground
31	White/Orange	Enhanced General Purpose Input 13
32	White/Green	Standard RPM Left Input
33	White/Blue	Standard RPM Right Input
34	Blue	Low Voltage RPM Left Input
35	Green	Low Voltage RPM Right Input
36	Blue	General Purpose TC Input 2+
37	Green	General Purpose TC Input 2-

Table 61–SV-EMS-220 Male D37 Transducer Connector

SV-EMS-221 D37 Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
1	Red	Battery voltage (voltmeter input)
2	Yellow or Unwired	Not connected
3	Black	Available ground
4	Purple/Blue	Not connected
5	Black	Available ground
6	White/Yellow	Not connected
7	White/Brown	Not connected
8	Brown	Fuel pressure (101716-000)
9	Brown/Blue	Not connected
10	Brown/Yellow	Not connected
11	Orange	Not connected

SV-EMS-221 D37 Pin	EMS 37-pin Harness Wire Color	Sensor (with Dynon part number if applicable)
12	Yellow	Flaps position potentiometer
13	Black	Available ground
14	Yellow	Fuel flow (100403-003)
15	Red	Fuel flow power (100403-003) / Oil pressure (Honeywell and Rotax P/N 456180 only) sensor power
16	Black	Available ground
17	Black	Available ground
18	White/Red	Manifold Pressure Sensor Power (+5 volt) / Kavlico Pressure Sensors
19	White/Black	Return fuel flow (100403-003)
20	Orange/Brown	Fuel level left (resistive)
21	Orange/Blue	Fuel level right (resistive)
22	Purple/Yellow	Not connected
23	Purple/Green	Elevator position potentiometer
24	Orange/Green	Ammeter shunt + (100412-000)
25	Orange/Purple	Ammeter shunt -
26	Green/Red	Not connected
27	Open	RPM Signal to Rotax 912 iS Prop Controller (optional)
28	Open	NOTE: Must be grounded to common ground with Prop Controller
29	Yellow/Green	Optional External Alarm Light
30	Black	Not connected
31	White/Orange	Not connected
32	White/Green	Not connected
33	White/Blue	Not Connected
34	Blue	Not connected
35	Green	Not connected
36	Blue or Unwired	CAN High from 912 iS ECU
37	Green or Unwired	CAN Low CAN High from 912 iS ECU

Table 62 - SV-EMS-221 Male D37 Transducer Connector

SV-EMS-220/221 Female D25 Thermocouple Connector Pin	EMS 25-pin Thermocouple Harness Wire Color*	Description
1	Do Not Connect	Do Not Connect
2	Red	CHT6 RED
3	Red	EGT6 RED
4	Red	CHT5 RED

SV-EMS-220/221 Female D25 Thermocouple Connector Pin	EMS 25-pin Thermocouple Harness Wire Color*	Description
5	Red	EGT5 RED
6	Red	CHT4 RED
7	Red	EGT4 RED
8	Red	CHT3 RED
9	Red	EGT3 RED
10	Red	CHT2 RED
11	Red	EGT2 RED
12	Red	CHT1 RED
13	Red	EGT1 RED
14	White	CHT6 WHITE
15	Yellow	EGT6 YELLOW
16	White	CHT5 WHITE
17	Yellow	EGT5 YELLOW
18	White	CHT4 WHITE
19	Yellow	EGT4 YELLOW
20	White	CHT3 WHITE
21	Yellow	EGT3 YELLOW
22	White	CHT2 WHITE
23	Yellow	EGT2 YELLOW
24	White	CHT1 WHITE
25	Yellow	EGT1 YELLOW

Table 63–SV-EMS-220/221 Female D25 Thermocouple Connector

*Note, this is the 6-cylinder harness.

SV-ARINC-429 Pin-Out

Pin	Function	Notes
1	No Connect	-
2	No Connect	-
3	Serial RX	Aviation Format Only From Connected ARINC-429 GPS
4	No Connect	-
5	No Connect	-
6	No Connect	-
7	No Connect	-
8	No Connect	-
9	No Connect	-
10	ARINC 2 RX B	-
11	ARINC 1 RX B	-
12	ARINC TX B	Pins 12/13 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
13	ARINC TX B	Pins 12/13 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
14	No Connect	-
15	No Connect	-
16	No Connect	-
17	No Connect	-
18	No Connect	-
19	No Connect	-
20	Ground	-
21	No Connect	-
22	ARINC 2 RX A	-
23	ARINC 1 RX A	-
24	ARINC TX A	Pins 24/25 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.
25	ARINC TX A	Pins 24/25 are the same TX signal. Provided for convenience when connecting to multiple ARINC receivers.

Table 64 - SV-ARINC-429 Female D25 Connector

SV-ADSB-470 Pin-out

Pin	Function	Notes
1	10-30V DC	Connect to Aircraft Power
2	SV-ADSB-470 Serial RX	Data Input from SkyView
3	SV-ADSB-470 Serial TX	Data Output to SkyView
4	Ground	Connect to Aircraft Ground
5	No Connect	-
6	No Connect	-
7	No Connect	-
8	No Connect	-
9	No Connect	-

Table 65 - SV-ADSB-470 Female D9 Pinout

SV-XPNDR-26X Pin-Out

SV-XPNDR-26X D25 Pin	Function	Description
1	Loopback 1	Connect to Pin 2
2	Loopback 1	Connect to Pin 1
3	GPS Serial Input	Aviation Format Only
4	No Connect	-
5	Transponder Serial RX	Connect to Pin 4, 6, 8, or 10 on SkyView Display D37 connector
6	No Connect	-
7	Transponder Serial TX	Connect to Pin 3, 5, 7, or 9 on SkyView Display D37 connector
8	No Connect	-
9	No Connect	-
10	No Connect	-
11	No Connect	-
12	Loopback 2	Connect to Pin 13
13	Loopback 2	Connect to Pin 12
14	Ground	Connect to Aircraft Ground
15	11-33V DC	Connect to Aircraft Power

16	No Connect	-
17	External Standby In	Optional: Not Commonly Connected
18	Mutual Suppression	Optional: Not Commonly Connected
19	Squat Switch In	Optional: Not Commonly Connected
20	Ident Switch In	Optional: Not Commonly Connected
21	No Connect	-
22	No Connect	-
23	No Connect	-
24	No Connect	-
25	No Connect	-

Table 66 - SV-SPNDR-26X D25 Connector

SV-XPNDR-26X Qualification Forms

Nomenclature:	TT21 Mode S Transponder (Dynon Avionics SV-XPNDR-262)	
Part Number: 00675-(XX)	ETSO: 2C112b, C166a	
Manufacturer:	Trig Avionics Limited	
Address:	Heriot Watt Research Park, Riccarton, Currie, Scotland, EH14 4AP	
Conditions	**DO-160F Section**	**Description of Conducted Tests**
Temperature and Altitude	4.0	Equipment tested to Categories A2, C1
Low temperature ground survival	4.5.1	-55°C
Low temperature short-time operating	4.5.1	-40°C
Low temperature operating	4.5.2	-20°C
High temperature operating	4.5.4	+70°C
High temperature short-time operating	4.5.3	+70°C
High temperature ground survival	4.5.3	+85°C
Loss of Cooling	4.5.5	Cooling air not required (+70°C operating without cooling air)
Altitude	4.6.1	35,000 feet
Decompression	4.6.2	8,000 to 35,000 feet in 15 seconds
Overpressure	4.6.3	-15,000 feet
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Operational Shocks	7.2	Equipment tested to Category B
Crash Safety	7.3	Equipment tested to Category B type 5
Vibration	8.0	Aircraft zone 2; type 3, 4, 5 to category S level M, type 1 (Helicopters) to category U level G
Explosion	9.0	Equipment identified as Category X – no test required

Waterproofness	10.0	Equipment identified as Category X – no test required
Fluids Susceptibility	11.0	Equipment identified as Category X – no test required
Sand and Dust	12.0	Equipment identified as Category X – no test required
Fungus	13.0	Equipment identified as Category X – no test required
Salt Spray	14.0	Equipment identified as Category X – no test required
Magnetic Effect	15.0	Equipment tested to Category Z
Power Input	16.0	Equipment tested to Category BX
Voltage Spike	17.0	Equipment tested to Category B
Audio frequency conducted susceptibility	18.0	Equipment tested to Category B
Induced signal susceptibility	19.0	Equipment tested to Category AC
Radio frequency susceptibility	20.0	Equipment tested to Category TT
Radio frequency emission	21.0	Equipment tested to Category B
Lightning induced transient susceptibility	22.0	Equipment identified as Category XXXX – no test required
Lightning direct effects	23.0	Equipment identified as Category X – no test required
Icing	24.0	Equipment identified as Category X – no test required
Electrostatic Discharge	25.0	Equipment identified as Category X – no test required
Fire, Flammability	26.0	Equipment identified as Category C
Nomenclature:	TT22 Mode S Transponder (Dynon Avionics SV-XPNDR-261)	
Part Number: 00745-(XX)	ETSO: 2C112b, C166a	
Manufacturer:	Trig Avionics Limited	
Address:	Heriot Watt Research Park, Riccarton, Currie, Scotland, EH14 4AP	
Conditions	**DO-160F Section**	**Description of Conducted Tests**
Temperature and Altitude	4.0	Equipment tested to Categories A2, C1
Low temperature ground survival	4.5.1	-55°C
Low temperature short-time operating	4.5.1	-40°C
Low temperature operating	4.5.2	-20°C
High temperature operating	4.5.4	+70°C
High temperature short-time operating	4.5.3	+70°C
High temperature ground survival	4.5.3	+85°C
Loss of Cooling	4.5.5	Cooling air not required (+70°C operating without cooling air)
Altitude	4.6.1	35,000 feet
Decompression	4.6.2	8,000 to 35,000 feet in 15 seconds
Overpressure	4.6.3	-15,000 feet
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Operational Shocks	7.2	Equipment tested to Category B
Crash Safety	7.3	Equipment tested to Category B type 5
Vibration	8.0	Aircraft zone 2; type 3, 4, 5 to category S level M, type 1 (Helicopters) to category U level G
Explosion	9.0	Equipment identified as Category X – no test required
Waterproofness	10.0	Equipment identified as Category X – no test required

Fluids Susceptibility	11.0	Equipment identified as Category X – no test required
Sand and Dust	12.0	Equipment identified as Category X – no test required
Fungus	13.0	Equipment identified as Category X – no test required
Salt Spray	14.0	Equipment identified as Category X – no test required
Magnetic Effect	15.0	Equipment tested to Category Z
Power Input	16.0	Equipment tested to Category BX
Voltage Spike	17.0	Equipment tested to Category B
Audio frequency conducted susceptibility	18.0	Equipment tested to Category B
Induced signal susceptibility	19.0	Equipment tested to Category AC
Radio frequency susceptibility	20.0	Equipment tested to Category TT
Radio frequency emission	21.0	Equipment tested to Category B
Lightning induced transient susceptibility	22.0	Equipment identified as Category XXXX – no test required
Lightning direct effects	23.0	Equipment identified as Category X – no test required
Icing	24.0	Equipment identified as Category X – no test required
Electrostatic Discharge	25.0	Equipment identified as Category X – no test required
Fire, Flammability	26.0	Equipment identified as Category C

Table 67 - SV-XPNDR-26X Qualification Forms

SV-XPNDR-26X ADS-B Information

SV-XPNDR-26X transponder modules include support for Extended Squitter ADS-B out. The SV-XPNDR-26X with SV-XPNDR software 2.02 or higher is a DO-260B compliant broadcast participant.

ADS-B Parameters Supported

The following table lists the ADS-B parameters that are transmitted by the SV-XPNDR-26X transponder when connected to an appropriate GPS receiver.

Parameter		BDS Register
SPI		0,5
Emergency Indicator		0,5
Barometric Altitude		0,5
Quality Indicator (NIC)		0,5
Airborne Position	Latitude	0,5
	Longitude	0,5
Quality Indicator (NIC)		0,6
Surface Position	Latitude	0,6
	Longitude	0,6

Surface Ground Speed	0,6
Surface Ground Track	0,6
Aircraft Identification	0,8
Airborne Ground Velocity	0,9
Geometric to Barometric altitude difference	0,9
Geometric Vertical Rate	0,9
Squawk Code	6,1
Emergency Status	6,1
Quality Indicator (NACp)	6,5
Quality Indicator (NACv)	6,5
Quality Indicator (SIL)	6,5
Version Indicator	6,5
Surface Length/Width	6,5
Surface Antenna Offset	6,5

Table 68 - SV-XPNDR-26X ADS-B Parameters Supported

In all cases, uncompensated latency due to the transponder is less than 10 milliseconds. Analysis of the system latency should add this to the latency of the GPS system and the transmission time of the position data from the GPS to the transponder to determine the overall latency.

FAA 91.227 Compliance

The SV-XPNDR-26X transponder can be connected to the following GPS units to form the basis of a 14 CFR 91.227 compliant ADS-B installation:

- Freeflight 1201 & 1204 WAAS/GPS Sensors
- NexNav MINI & NexNav MAX WAAS/GPS Sensors

For installations seeking certification to 91.227 or other applicable standards, additional compliance information may be available on request from Dynon Avionics or Trig Avionics Limited.

AMC 20-24 Compliance

The TT21 or TT22 transponder can be connected to the following GPS units to form the basis of an AMC20-24 compliant ADS-B installation:

- Freeflight 1201 & 1204 WAAS/GPS Sensors

- NexNav MINI & NexNav MAX WAAS/GPS Sensors
- Garmin GNS 400W/500W series

For installations seeking certification to AMC 20-24 or other applicable standards, additional compliance information is available on request from Trig Avionics Limited.

Automatic Air/Ground Determination

The SV-XPNDR-26X can report ADS-B surface and airborne messages. This can be accomplished via a squat switch input that is designed to be used with an automatic air/ground switching device, or via automatic detection. These options are fully explained in the SV-XPNDR-26X Installation, Configuration, and Testing Section of this guide.

19.Appendix D: SV-EMS-220/221 Sensor Input Mapping Worksheet

Use this worksheet to record SV-EMS-220/221 sensor input mapping.

IMPORTANT INSTALLATION INFORMATION	
SV-EMS-220/221 Serial Number	
Installer	
Installation Completion Date	

Pin	Function	Sensor	Name
C37 P1			
C37 P2			
C37 P4			
C37 P6			
C37 P7			
C37 P8			
C37 P9			
C37 P10			
C37 P11			
C37 P12			
C37 P14			
C37 P19			
C37 P20			
C37 P21			
C37 P22			
C37 P23			
C37 P24/25			
C37 P26			
C37 P27/28			
C37 P31			
C37 P32/34			

Pin	Function	Sensor	Name
C37 P33/35			
C37 P36/37			
C25 P2/14			
C25 P3/15			
C25 P4/16			
C25 P5/17			
C25 P6/18			
C25 P7/19			
C25 P8/20			
C25 P9/21			
C25 P10/22			
C25 P11/23			
C25 P12/24			
C25 P13/25			

20.Appendix E: Serial Data Output

Any of SkyView's five RS232 serial ports can be configured to output various types of serial data via SETUP MENU > LOCAL DISPLAY SETUP > SERIAL PORT SETUP. Technical information on the installation and connection to the serial ports can be found in the Serial Devices section of the SkyView Installation Guide. To output serial data, you must select either DYNON EMS, DYNON ADAHRS, DYNON SYSTEM, DYNON ADAHRS + SYSTEM, DYNON ADAHRS + EMS, or DYNON ADAHRS + SYS + EMS, NMEA OUT (BASIC), or NMEA OUT (FULL) as a Serial Out device, select a baud rate, and connect the serial port to an external serial device such as a PC. The serial data can be logged using any standard serial terminal program, a data logger program, or dedicated data logger device. All numbers are output in decimal except where noted and are standard ASCII. To view the data using a terminal program, that program should be configured to receive data in the following format:

- Baud rate: Set baud rate to match the baud rate selected on SkyView's serial port
- Data: 8 bit
- Parity: none
- Stop: 1 bit
- Flow control: none

Multiple SkyView display systems: SkyView's serial ports are designed in a way that allows serial transmission to continue, uninterrupted, as long as at least one SkyView display is operational. SkyView accomplishes this by only transmitting from exactly one display's serial ports in a multi-display system. SkyView manages which display is the "actual transmitter" automatically to avoid serial port conflicts. However, the display that transmits is not user-selectable. Therefore, for reliable serial reception in multi-display systems, a SkyView serial data output wire should be wired from each display, in parallel, to the external serial device that is being used to capture SkyView's serial data. Then, the serial port employed in all displays (it is useful to use the same serial port on each display for ease of setup) should be set to output the format desired. If the serial outputs are not configured in this fashion, serial data will not be seen by your external serial device at all times.

DYNON ADAHRS Serial Data Format

The following section details the format of DYNON ADAHRS serial output data:

Position	Width	Name	Description
1	1	Start Character/Data Type	'!'
2	1	Data Type	1 = ADAHRS data. Other Dynon formats look similar, and may be interleaved. This bit tells you what kind of data will follow.
3	1	Data Version	Currently 1. This is the version of the data represented below and will change if there is a future version that changes data. Has not changed to date.
4	8	System Time	HHMMSSFF, current Zulu time according to SkyView's internal clock which is synchronized with GPS time if GPS is available. HH is the hour from 00 to 23. MM is the minute from 00 to 59. SS is the second from 00 to 59. HHMMSS are '--------' if GPS time has never been available. FF is the 1/16-second fraction counter from 00 to 15, and may skip digits if baud rate is too low to send data at 16Hz.
12	4	Pitch (deg)	+/- then 000 to 900, pitch up or down from level flight in degrees * 10 (900 = 90°), positive meaning the aircraft is pitched up. XXXX when not available.
16	5	Roll (deg)	+/- then 0000 to 1800, roll left or right from level flight in degrees * 10 (1800 = 180°), positive meaning the aircraft is banked right. XXXXX when not available.
21	3	Magnetic Heading (deg)	000 to 359 in degrees. XXX when not available.
24	4	Indicated Airspeed (knots)	0000 to 9999, indicated airspeed in units of knots * 10 (1234 = 123.4 knots). XXXX when not available.
28	6	Pressure Altitude (ft)	+/- then 00000 to 99999, altitude in units of feet, at a baro setting of 29.92" Hg, positive meaning altitude is above sea-level. XXXXXX when not available.

Position	Width	Name	Description
34	4	Turn Rate (deg/s)	+/- then 000 to 999, rate of yaw change in degrees/second * 10, positive meaning the aircraft is turning right. XXXX when not available.
38	3	Lateral Accel (g)	+/- then 00 to 99, lateral g's in units of g * 100 (99 = 0.99 g's), positive meaning the aircraft is experiencing leftward lateral acceleration (slip / skid ball is deflected to the right). XXX when not available.
41	3	Vertical Accel(g)	+/- then 00 to 99, vertical g's in units of g * 10 (99 = 9.9 g's), positive meaning the aircraft is experiencing upward vertical acceleration. XXX when not available.
44	2	Angle of Attack (%)	00 to 99, percentage of critical angle of attack. XX when not available.
46	4	Vertical Speed (ft/min)	+/- then 000 to 999, feet/minute / 10 (42 = 420 feet per minute), positive meaning the aircraft is climbing. XXX when not available.
50	3	OAT (deg C)	+/- then 00 to 99. Outside Air Temperature in Degrees C. XXX when not available.
53	4	True Airspeed (knots)	0000 to 9999, true airspeed in units of knots * 10 (1234 = 123.4 knots). XXXX when not available.
57	3	Barometer Setting (inHg)	000 to 400. Baro setting in inHg * 100, offset by 27.50 inHg. Total range is 27.50 inHg to 31.50 inHg. (242 = 29.92 inHg). XXX when not available.
60	6	Density Altitude (ft)	+/- then 00000 to 99999, altitude in units of feet, positive meaning altitude is above sea-level. XXXXXX when not available.
66	3	Wind Direction (deg)	000 to 359. Wind direction in degrees magnetic. XXX if unknown.
69	2	Wind Speed (knots)	00 to 99. Wind Speed in Knots. XX if unknown.
71	2	Checksum	The 1 byte sum of all 70 preceding bytes. In ascii-hexformat, so 3A = 0x3A
73	2	CR/LF	Carriage Return, Linefeed = 0x0D, 0x0A.

Table 69 - SkyView ADAHRS Serial Data Output Format

As an example, the following is one line of DYNON ADAHRS serial output data:

!1121144703-014+00003310811+01736+003-03+1013-033+110831245+01650023176C

DYNON SYSTEM Serial Data Format

The following section details the format of DYNON SYSTEM serial output data:

Position	Width	Name	Description
1	1	Start Character	'!'
2	1	Data Type	2 = System Info. Other Dynon formats look similar, and may be interleaved, this bit tells you what kind of data will follow.
3	1	Data Version	Currently 2. This is the version of the data represented below and will change if there is a future version that changes data. Data version changed at SkyView version 5.1.
4	8	System Time	HHMMSSFF, current Zulu time according to SkyView's internal clock which is synchronized with GPS time if GPS is available. HH is the hour from 00 to 23. MM is the minute from 00 to 59. SS is the second from 00 to 59. HHMMSS are '--------' if GPS time has never been available. FF is the 1/16-second fraction counter from 00 to 15, and may skip digits if baud rate is too low to send data at 16Hz.
12	3	Heading Bug (deg)	000 to 359 in degrees. XXX if heading bug is not displayed.
15	5	Altitude Bug (ft)	+/- then 0000 to 9999, altitude in units of tens of feet (1234 = 12,340 ft). XXXXX if altitude bug is not displayed.
20	4	Airspeed Bug (knots)	0000 to 9999, airspeed in units of knots * 10 (1234 = 123.4 knots). XXXX if airspeed bug is not displayed.
24	4	Vertical Speed Bug (ft/min)	+/- then 000 to 999, tens of feet/minute. (123 = 1230 ft/min), positive meaning climb. XXXX if vertical speed bug is not displayed.
28	3	Course (deg)	000 to 359 in degrees.
31	1	CDI Source Type	0-2. 0=GPS, 1=NAV, 2=LOC.
32	1	CDI Source Port	0-5. GPSX, NAVX, or LOCX.
33	2	CDI Scale (NM)	00-50. In tenths of NM, 50 = 5.0 NM. Output 'XX' when not in GPS mode as there is no scale in NAV or LOC
35	3	CDI Deflection (%)	+/- then 00 to 99 percent of deflection, + meaning deflected to right, 'XXX' w/o valid CDI.
38	3	Glideslope (%)	+/- then 00 to 99 percent of deflection, + meaning deflected upward, 'XXX' w/o valid GS.

Position	Width	Name	Description
41	1	AP Engaged	0-7. 0=Off, 1= roll only, 2=pitch only, 3= roll+pitch, 4=yaw, 5=roll+yaw, 6=pitch+yaw, 7=pitch+roll+yaw (yaw doesn't currently exist, but format supports it). Will read 0 all the time if no AP is installed.
42	1	AP Roll Mode	0-4. 0=Heading, 1=Track, 2=NAV, 3=GPS Steering. Always reads zero when AP roll not engaged.
43	1	UNUSED	Reserved for future usage. Always reads 'X'. Parsers should not read this value.
44	1	AP Pitch Mode	0. 0=Altitude. Always reads zero when AP pitch not engaged.
45	1	UNUSED	Reserved for future usage. Always reads 'X'. Parsers should not read this value.
46	3	AP Roll Force	+/- then 00 to 80. Raw force number from servo, + meaning that a force is being exerted in the right-wing-downward direction against the servo. 80 is theoretical maximum before slipping. Always reads zero when AP roll not engaged.
49	5	AP Roll Position (steps)	+/- then 0000 to 9999. Position of servo output shaft relative to that at power-on, in steps, + meaning in the right-wing-downward direction. 800 steps represent a full rotation of the output shaft. Outputs "XXXXX" when not available.
54	1	AP Roll Slip (bool)	0 or 1. 0 = No slipping on this servo. 1 = At least one slip on this servo in the last 3 seconds. Always reads zero when AP roll not engaged.
55	3	AP Pitch Force	+/- then 00 to 80. Raw force number from servo, + meaning that a force is being exerted in the nose-upward direction against the servo. 80 is theoretical maximum before slipping. Always reads zero when AP pitch not engaged.
58	5	AP Pitch Position (steps)	+/- then 0000 to 9999. Position of servo output shaft relative to that at power-on, in steps, + meaning in the nose-upward direction. 800 steps represent a full rotation of the output shaft. Outputs "XXXXX" when not available.
63	1	AP Pitch Slip (bool)	0 or 1. 0 = No slipping on this servo. 1 = At least one slip on this servo in the last 3 seconds. Always reads zero when AP pitch not engaged.

Position	Width	Name	Description
64	3	AP Yaw Force	+/- then 00 to 80. Raw force number from servo, + meaning that a force is being exerted in the rightward direction against the servo. 80 is theoretical maximum before slipping. Always reads zero when AP yaw not engaged.
67	5	AP Yaw Position	+/- then 0000 to 9999. Position of servo output shaft relative to that at power-on, in steps, + meaning in the rightward direction. 800 steps represent a full rotation of the output shaft. Outputs "XXXXX" when not available.
72	1	AP Yaw Slip (bool)	0 or 1. 0 = No slipping on this servo. 1 = At least one slip on this servo in the last 3 seconds. Always reads zero when AP yaw not engaged.
73	1	Transponder Status	0-3. 0=SBY, 1= GND, 2=ON, 3=ALT.
74	1	Transponder Reply (bool)	0 or 1. 0 = No reply in last second, 1 = at least one reply within last second.
75	1	Transponder Identing (bool)	0 or 1. 0 = not IDENT'ing, 1 = IDENT active, as reported by Transponder.
76	4	Transponder Code (octal)	0000-7777
80	10	UNUSED	Reserved for future usage. Always reads 'XXXXXXXXXX'. Parsers should not read this value.
90	2	Checksum	The 1 byte sum of all 73 preceding bytes. In ascii-hexformat, so 3A = 0x3A
92	2	CR/LF	Carriage Return, Linefeed = 0x0D, 0x0A.

Table 70 – SkyView SYSTEM Serial Data Output Format

Note 1: Yaw axis AP does not exist at this time, but the serial output format supports it.

As an example, the following is one line of DYNON SYSTEM serial output data:

!2221144704359XXXXX1600+010XXX00XXXXXXXX00X0X+00-
99990+00+99990+00XXXXX00104543XXXXXXXXXX3A

DYNON EMS Serial Data Format

The following section details the format of EMS data output to the serial port:

Position	Width	Name	Pin	Description
1	1	Start Character		'!'
2	1	Data Type		3 = EMS Data. Other Dynon formats look similar, and may be interleaved, this bit tells you what kind of data will follow.
3	1	Data Version		Currently 2. This is the version of the data represented below and will change if there is a future version that changes data. Data version changed at SkyView version 5.1.
4	8	System Time		HHMMSSFF, current Zulu time according to SkyView's internal clock which is synchronized with GPS time if GPS is available. HH is the hour from 00 to 23. MM is the minute from 00 to 59. SS is the second from 00 to 59. HHMMSS are '--------' if GPS time has never been available. FF is the 1/16-second fraction counter from 00 to 15, and may skip digits if baud rate is too low to send data at 16Hz.
12	3	Oil Pressure (PSI)	Varies (see note 1)	000 to 999 or XXX. Oil pressure in PSI. There must be a pressure sensor named "OIL" for this to work. See note 2.
15	4	Oil Temp (deg C)	Varies (see note 1)	+/- then 000 to 999 or XXX. Oil temperature in C. There must be a temperature sensor named "OIL" for this to work. See note 2.
19	4	RPM L	C37 P32/34	0 to 9999. RPM from Left input.
23	4	RPM R	C37 P33/35	0 to 9999. RPM from Right input.
27	3	Manifold Pressure (inHg)	C37 P26	0 to 600. Manifold Pressure in 0.1 inHg. 299 = 29.9 inHg. There must be a pressure sensor named "MAP" for this to work. See note 2.
30	3	Fuel Flow 1 (gal/hr)	C37 P14	000 to 999. Fuel flow in 1/10th Gallons Per Hour. 086 = 8.6 GPH. See note 2.
33	3	Fuel Flow 2 (gal/hr)	C37 P19	000 to 999. Fuel flow in 1/10th Gallons Per Hour. 086 = 8.6 GPH. This is usually return flow. See note 2.

Position	Width	Name	Pin	Description
36	3	Fuel Pressure (PSI)	Varies	000 to 999 or XXX. Fuel pressure in 1/10th PSI. 274 = 27.4 PSI. There must be a pressure sensor named "FUEL" for this to work. See note 2.
39	3	Fuel Level L (gal)	Varies	000 to 999 or XXX. Fuel level in 1/10th Gallons. 128 = 12.8 Gallons. There must be a Level sensor named "LEFT" for this to work. If there is no "LEFT" OR "RIGHT" but there is a "MAIN", this will be MAIN. See note 2.
42	3	Fuel Level R (gal)	Varies	000 to 999 or XXX. Fuel level in 1/10th Gallons. 128 = 12.8 Gallons. There must be a Level sensor named "RIGHT" for this to work. See note 2.
45	3	Fuel Remaining (gal)	Fuel Computer	000 to 999 or XXX. Fuel level in 1/10th Gallons. This is derived from the fuel computer and is based on the fuel on board added set by the user and the decremented by fuel flow. See note 2.
48	3	Volts 1	C37 P1	000 to 360 in 1/10th Volts. 284 = 28.4 volts. See note 2.
51	3	Volts 2	C37 P2	000 to 360 in 1/10th Volts. 284 = 28.4 volts. See note 2.
54	4	Amps	C37 P24/25	+/- then 000 to 999. 1/10th Amps . -083 = -8.3A. See note 2.
58	5	Hobbs Time	Calculated	00000 to 99999. In 1/10 hours. 12345 = 1234.5 hours.
63	5	Tach Time	Calculated	00000 to 99999. In 1/10 hours. 12345 = 1234.5 hours.
68	4	Thermocouple 1 (deg C)	C25 P2/14	+/- then 000 to 999. In degrees C. See note 2.
72	4	Thermocouple 2 (deg C)	C25 P3/15	+/- then 000 to 999. In degrees C. See note 2.
76	4	Thermocouple 3 (deg C)	C25 P4/16	+/- then 000 to 999. In degrees C. See note 2.
80	4	Thermocouple 4 (deg C)	C25 P5/17	+/- then 000 to 999. In degrees C. See note 2.
84	4	Thermocouple 5 (deg C)	C25 P6/18	+/- then 000 to 999. In degrees C. See note 2.
88	4	Thermocouple 6 (deg C)	C25 P7/19	+/- then 000 to 999. In degrees C. See note 2.

Position	Width	Name	Pin	Description
92	4	Thermocouple 7 (deg C)	C25 P8/20	+/- then 000 to 999. In degrees C. See note 2.
96	4	Thermocouple 8 (deg C)	C25 P9/21	+/- then 000 to 999. In degrees C. See note 2.
100	4	Thermocouple 9 (deg C)	C25 P10/22	+/- then 000 to 999. In degrees C. See note 2.
104	4	Thermocouple 10 (deg C)	C25 P11/23	+/- then 000 to 999. In degrees C. See note 2.
108	4	Thermocouple 11 (deg C)	C25 P12/24	+/- then 000 to 999. In degrees C. See note 2.
112	4	Thermocouple 12 (deg C)	C25 P13/25	+/- then 000 to 999. In degrees C. See note 2.
116	4	Thermocouple 13 (deg C)	C37 P27/28	+/- then 000 to 999. In degrees C. See note 2.
120	4	Thermocouple 14 (deg C)	C37 P36/37	+/- then 000 to 999. In degrees C. See note 2.
124	6	GP Input 1	C37 P4	+/- then 0000 to 9999, then units. See notes. Example: +1234C = 123.4 degrees C.
130	6	GP Input 2	C37 P22	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
136	6	GP Input 3	C37 P23	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
142	6	GP Input 4	C37 P8	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
148	6	GP Input 5	C37 P9	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
154	6	GP Input 6	C37 P10	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
160	6	GP Input 7	C37 P11	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
166	6	GP Input 8	C37 P12	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
172	6	GP Input 9	C37 P20	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
178	6	GP Input 10	C37 P21	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
184	6	GP Input 11	C37 P6	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
190	6	GP Input 12	C37 P7	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.

Position	Width	Name	Pin	Description
196	6	GP Input 13	C37 P31	+/- then 0000 to 9999, then units. +YYYYZ. See note 3.
202	16	Contacts	Not used in SkyView	Z*16 (ZZZZZZZZZZZZZZZZ).
218	3	Percent Power		000 to 199 in percentage of engine reference power. XXX when not determined or invalid.
221	1	EGT Leaning State		The state of EGT leaning. L: Lean of peak, P: Peak, R: Rich of peak. X when not determined or invalid.
222	2	Checksum		The 1 byte sum of all 217 preceding bytes. In ascii-hexformat, so 3A = 0x3A.
224	2	CR/LF		Carriage Return, Linefeed = 0x0D, 0x0A.

Table 71 – Dynon EMS Serial Output Format

Note 1: These sensors can be connected to various pins on the EMS 37-pin D-sub connector (D37). See the SkyView Installation Guide for more information.

Note 2: If the value is invalid, or out of range for the sensor, or the sensor is not configured, or if the sensor is configured but not calibrated, then an 'X' is output for each character in the field instead of a value.

Note 3: Units for each GP input depends on the type of sensor that is connected to the pin. See GP Inputs

Rotax 912 iS Note: When the engine type is 912iS, the following fields in the serial output source their data from the 912 iS's computer instead of conventional sensors: Oil Pressure, Oil Temp, RPM L, RPM R, Manifold Pressure, Fuel Flow 1, Fuel Flow 2 (always 0).

GP Inputs

The output for GP input pins is:

- Each output is in the format +YYYYZ
    - + is the +/- sign for the value
    - YYYY is the value of the signal
    - Z is the units for the signal
        - C if the signal is in temperature, and the units are 1/10th degrees C
            - YYYY is 1/10th degrees C, so 1234 = 123.4 C
            - XXXX if the signal is out of range (red X on ems page)
            - ZZZZ if the input is not configured
        - P if the signal is in pressure, and the units are 1/10 PSI
            - YYYY is 1/10th PSI, so 0123 = 12.3 PSI
            - XXXX if the signal is out of range (red X on ems page)

        - ZZZZ if the input is not configured
    - G if the signal is in volume, and the units are 1/10th Gallons
        - YYYY is 1/10th gallons, so 0183 = 18.3 Gallons
        - XXXX if the signal is out of range or not calibrated (red X on ems page)
        - ZZZZ if the input is not configured
    - V if the signal is in volts (contact input)
        - YYYY is 1/1000th volts, so 3852 = 3.852V
        - ZZZZ if the input is not configured
    - T if the signal is position
        - If elevator, rudder, and aileron trim, YYYY is percent travel, so 0047 = 47%
        - If flaps, this is the angle shown on the screen, so 0038 = 38 degrees
        - XXXX if the signal is out of range or not calibrated (red X on ems page)
        - ZZZZ if the input is not configured

As an example, the following is one line of DYNON EMS serial output data:

!3221144705060+09323632363272057057164263263000280280+1200001300020+197+592+1
97+592+197+592+197+592+197+592+197+592+197+197-
0012T+0013T+0001T+0164P+1990P+0928C+0001T+0000G+0263G+0263G+0599P+0928C+0928
CZZZZZZZZZZZZZZZZ045L26

DYNON ADAHRS / SYSTEM / EMS Serial Data Output Combinations

DYNON ADAHRS + SYSTEM Serial Data Format

DYNON ADAHRS+SYSTEM output data alternates between DYNON ADAHRS data and DYNON SYSTEM data. For example, the following is one cycle of DYNON ADAHRS+SYSTEM serial output data where the first line is ADAHRS output and the next line is SYSTEM output:

!1121144703-014+00003310811+01736+003-03+1013-033+110831245+01650023176C

!2221144704359XXXXX1600+010XXX00XXXXXXXX00X0X+00-
99990+00+99990+00XXXXX00104543XXXXXXXXXX3A

DYNON ADAHRS + EMS Serial Data Format

DYNON ADAHRS+EMS output data alternates between DYNON ADAHRS data and DYNON EMS data. For example, the following is one cycle of DYNON ADAHRS+EMS output data where the first line is ADAHRS output and that is followed by EMS output:

!1121144703-014+00003310811+01736+003-03+1013-033+110831245+01650023176C

!3221144705060+09323632363272057057164263263000280280+1200001300020+197+592+1
97+592+197+592+197+592+197+592+197+592+197+197-
0012T+0013T+0001T+0164P+1990P+0928C+0001T+0000G+0263G+0263G+0599P+0928C+0928
CZZZZZZZZZZZZZZZZZ045L26

DYNON ADAHRS + SYS + EMS Serial Data Format

DYNON ADAHRS+SYS+EMS output data alternates between DYNON ADAHRS data, DYNON SYSTEM data, and DYNON EMS data. For example, the following is one cycle of DYNON ADAHRS+SYS+EMS serial output data where the first line is ADAHRS output, the second is SYSTEM output, and that is followed by EMS output:

!1121144703-014+00003310811+01736+003-03+1013-033+110831245+01650023176C

!2221144704359XXXXX1600+010XXX00XXXXXXXX00X0X+00-
99990+00+99990+00XXXXX00104543XXXXXXXXXX3A

!3221144705060+09323632363272057057164263263000280280+1200001300020+197+592+1
97+592+197+592+197+592+197+592+197+592+197+197-
0012T+0013T+0001T+0164P+1990P+0928C+0001T+0000G+0263G+0263G+0599P+0928C+0928
CZZZZZZZZZZZZZZZZZ045L26

NMEA OUT Serial Data Formats

NMEA output data consists of industry standard NMEA 0183 Version v4.00 sentences. A reference for Version 4.00 of the standard can be found here:

http://www.nmea.org/content/nmea_standards/nmea_083_v_400.asp

NMEA OUT (BASIC)

NMEA OUT (BASIC) serial output data consists of GGA, GSA, GSV, RMC, and VTG sentences nominally output at a rate of 1 Hz. The rate is reduced if necessary to transmit the entire set of data at the selected baud rate. This format outputs GPS data for position, speed, altitude, and heading.

For example, the following is one cycle of NMEA OUT (BASIC) serial output data:

```
$GPGGA,214921,3121.6199,N,00000.0000,E,1,04,1.90,3000.0,M,33.9,M,,0000
*62
$GPGSA,A,3,01,02,03,04,00,00,00,00,00,00,00,00,1.00,1.90,1.90*07
$GPGSV,1,1,04,01,20,100,10,02,30,200,56,03,45,300,32,04,62,045,05*7A
$GPRMC,214921,A,3121.6199,N,00000.0000,E,82.07,1.00,300811,0.51,W,A*01
$GPVTG,1.00,T,0.51,M,82.07,N,151.99,K,A*1E
```

NMEA OUT (FULL)

NMEA OUT (FULL) data consists of all of the NMEA OUT (BASIC) sentences followed by RMB, GLL, BWC, XTE, BOD, and APB sentences nominally output at a rate of 1 Hz. The rate is reduced if necessary to transmit the entire set of data at the selected baud rate. This format outputs navigation information derived by SkyView, and is similar to the output that many handheld portable aviation GPS navigators generate.

For example, the following is one cycle of NMEA OUT (FULL) serial output data:

```
$GPGGA,221755,3157.4430,N,00000.0000,E,1,04,1.30,3000.0,M,33.9,M,,0000
*66
$GPGSA,A,3,01,02,03,04,00,00,00,00,00,00,00,00,1.00,1.30,1.40*00
$GPGSV,1,1,04,01,20,100,10,02,30,200,56,03,45,300,32,04,62,045,05*7A
$GPRMC,221755,A,3157.4430,N,00000.0000,E,82.07,1.00,300811,0.49,W,A*06
$GPVTG,1.00,T,0.49,M,82.07,N,151.99,K,A*17
$GPRMB,A,9.99,L,FHAW,TUPJ,1826.7333,N,06432.4998,W,999.9,273.6,005.1,V
,A*41
$GPGLL,3157.4430,N,00000.0000,E,221755,A,A*42
$GPBWC,221755,1826.7333,N,06432.4998,W,273.6,T,274.1,M,999.9,N,TUPJ,A*
67
$GPXTE,A,A,9.99,L,N,A*0A
$GPBOD,299.3,T,299.8,M,TUPJ,FHAW*4F
$GPAPB,A,A,9.99,L,N,V,V,299.8,M,TUPJ,274.1,M,274.1,M,A*4E
```

21.Appendix F: User Data Logs

SkyView continuously stores two retrievable data logs that can be exported for analysis. These data logs are stored on SkyView's internal flash memory and are exported to a USB memory stick.

User Data Log

The User Data Log contains plain-text tabular data that records the entire state of your SkyView system at a recording rate of your choosing. This includes over 100 items, and includes all ADAHRS (flight instrument) data, Engine parameters, GPS data, Autopilot status, Transponder status, time, and more.

When exported, the data log is a standard CSV (comma separated value) file and can be viewed in spreadsheet programs such as Microsoft Excel once exported from the system. The top row of the CSV file is a header row which documents the format of the file. Each row beneath that header row contains an individual record – or instantaneous snapshot – of all of the recorded fields.

The User Data Log records at the selected Record Rate (see below) any time the SkyView system is powered on.

A sample of what a few columns and rows of data would look like when viewed in a spreadsheet program is shown below. An actual user data log would have over 100 columns of data, and many thousands of rows:

System Time	Pitch (deg)	Roll (deg)	Magnetic Heading (deg)	Indicated Airspeed (knots)	Pressure Altitude (ft)
1:50:38	0.2	-1.7	134.4	0	4364
1:50:38	0.2	-1.8	134.4	0	4364
1:50:38	0.2	-1.8	134.3	0	4364
1:50:38	0.2	-1.8	134.4	0	4364
1:50:39	0.2	-1.8	134.4	0	4364
1:50:39	0.2	-1.7	134.4	0	4364

Table 72 - User Data Log Excerpt Example

Recent Flight Data Log

The Recent Flight Data Log captures the most recent 15 minutes of flight at a data recording rate of 16 times per second, in the same manner as described above. Its recording rate cannot be changed.

The Recent Flight Data Log records data whenever SkyView believes that it is in flight, which it determines by observing IAS and/or GPS ground speed.

Data Logging Recording Options

Record Rate

You can choose the frequency of the data that is recorded from SkyView's various systems for your particular needs. SkyView can record data as frequently as 16 times per second or as infrequently as once every 10 seconds. Recording more frequently trades off the amount of time that the data log covers. At once every 10 seconds, SkyView's User Data Log can store up to about 150 hours of data. At 16 times per second, the log stores about 2 hours of data. When the data log fills up, the oldest data is automatically discarded to make room for new data.

Navigate to SETUP MENU > SYSTEM SETUP > DATA LOG SETUP > RECORD RATE to choose the frequency that data is recorded to the internal User Data Log.

Clearing Data Logs

Navigate to SETUP MENU > SYSTEM SETUP > DATA LOG SETUP > CLEAR ALL DATA to erase both the User Data Log and the Recent Flight Data Log.

Exporting Data Logs

Connect a USB memory stick with at least 100 MB of available storage capacity to your SkyView display. Then, navigate to SETUP MENU > SYSTEM SOFTWARE > EXPORT USER DATA LOGS to export the stored data logs to the USB memory stick.

When you view the contents of the USB memory stick on a computer, the User Data Log will contain "USER_LOG_DATA" in the exported file name. The Recent Flight Data Log contains "BLACK_BOX" in the file name. Additionally, the time and date in data log file names reflect the time of export.

If your SkyView system has not yet flown, or has not flown since the data logs were last cleared, there may not be a Recent Flight Data Log available.

The data logs that are exported are in CSV (comma separated values) format and can be opened by common spreadsheet programs such as Microsoft Excel.