



AV-30

Multi-Mode Indicator

Part Number U-1011-0

Installation Manual

(D-0031-0, AV-30, INSTALLATION MANUAL, REV A)

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Revisions

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1 System Description

The AeroVonics AV-30 is a highly capable, fully digital, multi-mode instrument that mounts in the legacy 3 1/8" round instrument panel cutout. It can be field configured as either an Attitude Indicator (AI) or a Direction Indicator (DG), contains an internal battery and allows for a wide variety of pilot customization.



Figure 1 - AV-30-C Multi Mode AI/DG

When configured as an AI, primary attitude and slip are always displayed. The un-used portions of the display area can be customized by the pilot to show a variety of textual and graphical data-overlay fields. Up to 3 pages may be customized by the pilot with a forth dedicated fully decluttered page.

When configured as a DG, non-slaved direction of flight or GPS track may be configured for display. Multiple display presentations, including compass rose, GPS CDI, and GPS arc view can be selected by the pilot. The un-used portions of the display area can similarly be configured for a variety of textual data-overlays.

In both operating modes, the pilot may select from a variety of visual styles which are intended to improve visual compatibility with legacy aircraft instrumentation and preserve the look-and-feel of older aircraft applications. A wide variety of supplemental functions, including audio envelope alerting, derived angle of attack presentation, g-load display, and more are provided. An internal battery allows for operation for up to 2 hours in the event of aircraft power loss.

1.1 Model Applicability

The AV-30 is available in the following models:

Model	Part Number	Applications	Modes
AV-30-E	U-1011-0	Experimental Aircraft	AI & DG

Figure 2 - Model Applicability

The AV-30 supports operation as an Attitude Indicator or a Directional Gyro with the configuration determined during installation setup, or by pilot selection depending on the installation configuration.

2 Operating Modes & System Interfaces

2.1 Operating Mode

The operating mode can be set as follows:

- Unit locked as an Attitude Indicator (AI Mode)
- Unit locked as a Direction Indicator (DG Mode)
- Unit can be toggled between AI and DG mode by the pilot

Installations where dedicated functionality is required or desired, should set the functionality and enable the lock the setting. If the functionality is not locked, pressing and holding the rotary knob in will toggle between AI and DG mode. The functionality and lock settings are described later in this document.

2.2 Mode Feature Matrix

The following table describes the display data and data-overlays that are available in each operating mode. The required external interfaces are also specified.

Feature	AI Mode	DG Mode	Comment / Required Interface
Data			
Blank Overlay Field	✓	✓	Field can be left empty
Attitude	✓	✓	Available as Rev Mode on DG
Non-Slaved Heading	✓	✓	
Bus Voltage	✓	✓	
G Load	✓	✓	
Outside Air Temp (OAT)	✓	✓	Requires Optional OAT Probe
True Airspeed	✓	✓	Requires Optional OAT Probe
Density Altitude	✓	✓	Requires Optional OAT Probe
Indicated Airspeed	✓	✗	
Baro Corrected Altitude	✓	✗	
Angle Of Attack	✓	✗	
Vertical Trend	✓	✗	
Vertical Speed	✓	✗	
Set Altitude	✓	✗	Reference Only (No AP Interface)
Graphical Course Indication (Non-Slaved Heading, or GPS Track – Pilot Selectable)			
Direction Tape	✓	✗	Heading or GPS Track
Direction Rose	✗	✓	Heading or GPS Track
Direction Arc	✗	✓	Heading or GPS Track
Direction CDI	✗	✓	Heading or GPS Track
GPS Navigation / Route Data			
Textual Nav Data	✓	✓	Requires GPS Navigator Interface
Graphical CDI Deviation	✗	✓	Requires GPS Navigator Interface
Flight Plan Leg	✗	✓	Requires GPS Navigator Interface
Heading Bug			
Heading Bug	✓	✓	Reference Only (No AP Interface)
Audio and Visual Alerting			
AoA Alerting	✓	✗	Pitot and Static Pressure
G Limit Alerting	✓	✗	
Excessive Roll Alerting	✓	✗	
Misc.			
Internal Battery Operation	✓	✓	
Auto / Manual Brightness	✓	✓	

Table 1 – Feature Matrix

2.3 Equipment Connections

All connections are provided on the single 15-Pin D-sub connector and the two pneumatic fittings. The unit connects to aircraft power via a normal power circuit with a dedicated 2 Amp, pilot resettable breaker. See wiring diagrams for additional information.

2.3.1 Power Input (Required)

Power input is required and connects to the aircrafts power bus. Input range is compatible with both 12V and 24V aircraft. Internally, this power is diode or'ed with the internal battery via a processor-controlled switch. This architecture allows the unit to continue operation if external power fluctuates or is completely lost.

Each AV-30 must have a dedicated, pilot resettable circuit breaker as part of the installation process. Power for the unit must not be supplied from the "avionics" bus but instead should be tied to the essential or battery master bus.

2.3.2 Pitot and Static Interfaces (Required/Optional)

In addition to indicated airspeed and altitude, pitot and static inputs used to stabilize the attitude solution during long-term accelerations such as takeoff and landing. They are also utilized within the probeless Angle of Attack algorithm and provide the underlying source for various air-data type data overlays.

If indicated airspeed and altitude are not desired (or available) for display, and potential performance degradation is acceptable, the pitot and static lines may be left disconnected. This may be applicable in certain installations, or when installation as a dedicated DG is being performed.

Industry standard ¼" quick connect fittings are utilized. Reference the wiring diagram for details on how to release the tubing from the fitting.

2.3.3 Outside Air Temp Input (Optional)

The optional outside air temperature interface requires a dedicated external analog probe. This port connection is compatible with the Davtron probe analog probe P/N C307PS (not supplied). This is a simple two-wire current source based on the Analog Devices AD590KH component and supplies a current that corresponds to the ambient temperature.

If two displays are connected to the same probe, the current will be split between the two and incorrect readings will be shown by both.



The sensor reading must be trimmed during the installation process to compensate for probe-to-probe variations.



Do not tap into an existing OAT system that is in use (the probes may not be put in parallel or series).

In a dual installation, dedicated OAT probes may be connected to both the AI and DG units, but the DG wiring harness is not pre-wired for this connection.

2.3.4 Audio Output (Optional)

The optional audio panel connection is a low-voltage analog output that is designed to connect directly to an audio panel (typically a non-switched input). High power outputs capable of directly driving a cockpit speaker are not provided.

When installed as a DG, no audio output is supported.

2.3.5 GPS Interface (Optional)

The optional GPS interface is an RS-232 serial input that is compatible with the industry standard "Moving Map / Aviation Protocol" output provided by most panel mounted GPS units and various aviation handhelds. This data does not typically include vertical guidance nor does it contain appropriate information to perform GPS approaches; therefore its use is limited to VFR situational awareness use only.

This is a text/binary protocol output by the GPS navigator that contains basic navigational data such as ground speed, track, distance to destination, cross track, etc.

This serial interface may be connected in parallel between multiple AV-30 units and is supported in both the AI and DG modes.

2.3.6 Manufacturing and Spare Ports

A dedicated RS-232 bi-directional serial port is provided for manufacturing test and calibration purposes, in addition to serial ports for future expansion purposes. These lines are not connected in the aircraft installation.

3 Certification Basis

The AV-30-E (Part Number U-1011-0) is to be used for experimental aircraft applications only.

4 Operating Limits

Operating Limits	
Angle of Attack Range	0° to +30°
Angle of Attack Resolution	1°
Angle of Attack Operation	+35 to +300 Knots
Angle of Attack Accuracy	2.5°
Density Alt Range (Accuracy)	-1,000 to +25,000 Feet (\pm 500ft)
TAS Range (Accuracy)	+35 to +300 Knots (\pm 20 kts)
Attitude Angle	No Limits
Attitude Rate Limit	\pm 250 Degrees / Second
Attitude Accuracy	1° Static, 2.5° Dynamic
G Alert Limits	\pm 8 g
OAT Range	-40°C to +70°C
OAT Accuracy	\pm 4°C
Slip Range (Accuracy)	\pm 7° (\pm 2°)
Bus Voltage Range	7 to 35 Volts
Bus Voltage Accuracy	\pm 1.0 Volt
Clock Accuracy	\pm 1 Second/Day
Timer Accuracy	\pm 1 Second/Hour

Table 2 - Operating Limits

5 System Specifications

Electrical Attributes	
Input Voltage Nominal	+10 to +32 VDC
Input Voltage Max	+60 VDC
Input Power Nominal	6 Watts (0.5 Amps @ 12VDC)
Input Power Max	12 Watts (1.0 Amps @ 12VDC)
Required Circuit Breaker	2 Amp
Operation on Battery	2 Hours Typ @ 20°C / 30 Minutes Min @ -20C
Physical Attributes	
Mounting Configuration	3 1/8" Round Instrument Hole
Dimensions wo/Connector	3.38 x 3.38 x 1.6 Inches
Weight	0.50 Lbs.
Electrical Connector	15 Pin Male D-Sub
Pneumatic Connectors	1/4" OD Quick Connect
Mounting	(4X) #6-32 Machine Screws
Case Material	Billet Aluminum
Environmental	
Operating Temp	-20°C to +55°C
Storage Temp (48 Hrs)	-30°C to +80°C
Humidity (48 Hrs)	90% RH
Optical Characteristics	
Diagonal Size	3" Circular
Contrast Ratio (Typical)	500
Brightness (Typical)	1000 cd/m ²
Viewing Angle Left/Right	60°
Viewing Angle Up	45°
Viewing Angle Down	10°
Backlight Lifetime (Typical)	50,000 Hrs

Table 3 - System Specifications

6 Intended Function

Reference the Pilots Guide for intended functionality.

7 Internal Battery Operation

The internal battery allows for operation in the event of aircraft power loss. When in-flight (airspeed above 40 KTS), and power is removed from the unit, the AV-30 will continue to operate but indicate an "On Battery" status.

When the airspeed is below 40 KTS, the unit will automatically shut-down when power is removed.

8 Installation

8.1 Overview

Installation consists of the following steps:

- Remove / relocate any old instrumentation
- Add or locate an appropriate power source / breaker
- Wire power and interfaces as needed
- Mount the unit to the instrument panel with supplied screws
- Apply power and perform setup

8.2 Mechanical Drawing

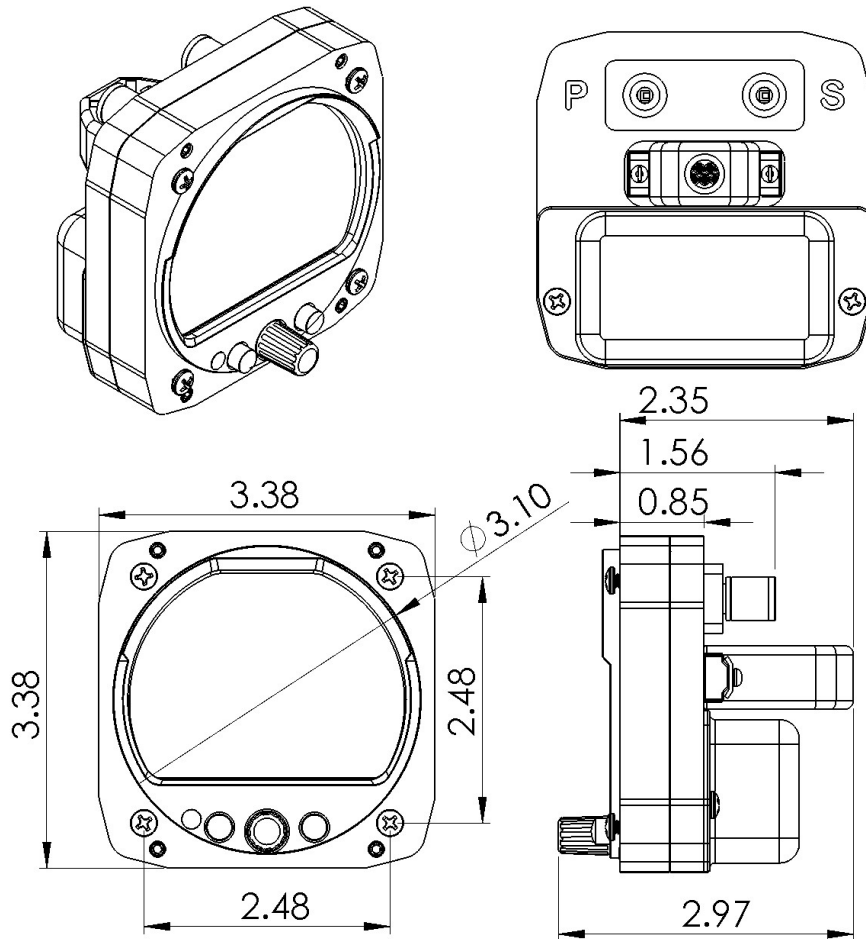




Figure 3 – Mechanical Drawing

8.3 Mounting Screw Length Restriction

The AV-30 is fastened to the instrument panel with four 6-32 screws. The unit mounts from the rear of the instrument panel, with the screws being inserted from the front of the panel.

- 

The four 6-32 Mounting screws must observe depth limits given the internal component design.
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The threaded hole in the AV-30 bottoms out prior to the internal components, so installing a mounting screw that is longer than optimal will not damage the unit but will result in the unit not being fully fastened to the panel.

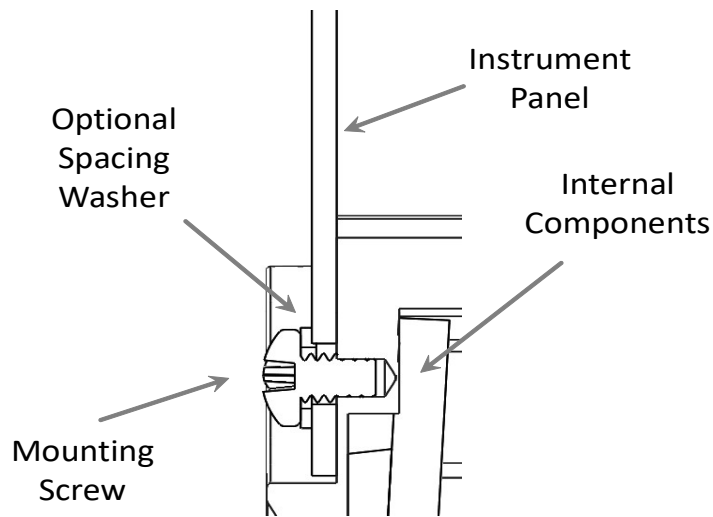


Figure 4 – Mounting Screw Dept Limits

The installation kit contains multiple length screws to assist in compensating for different instrument panel thicknesses.

8.4 Wiring Diagrams

The AV-30 performs different functions when installed as an AI or DG, and therefore is wired differently at installation time. The following diagrams show connections for each configuration.

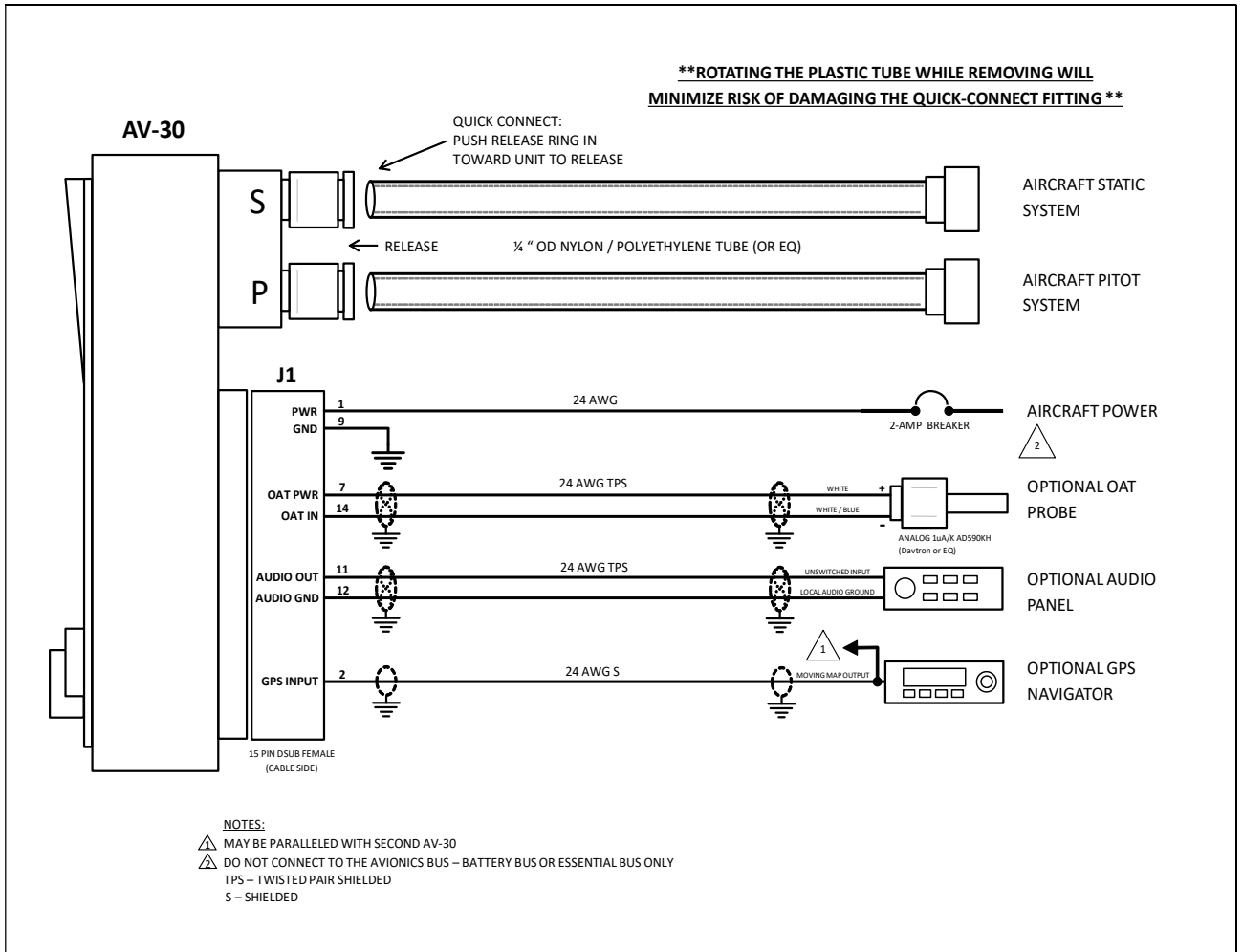


Figure 5 - Wiring Diagram – AI and AI/DG Installation

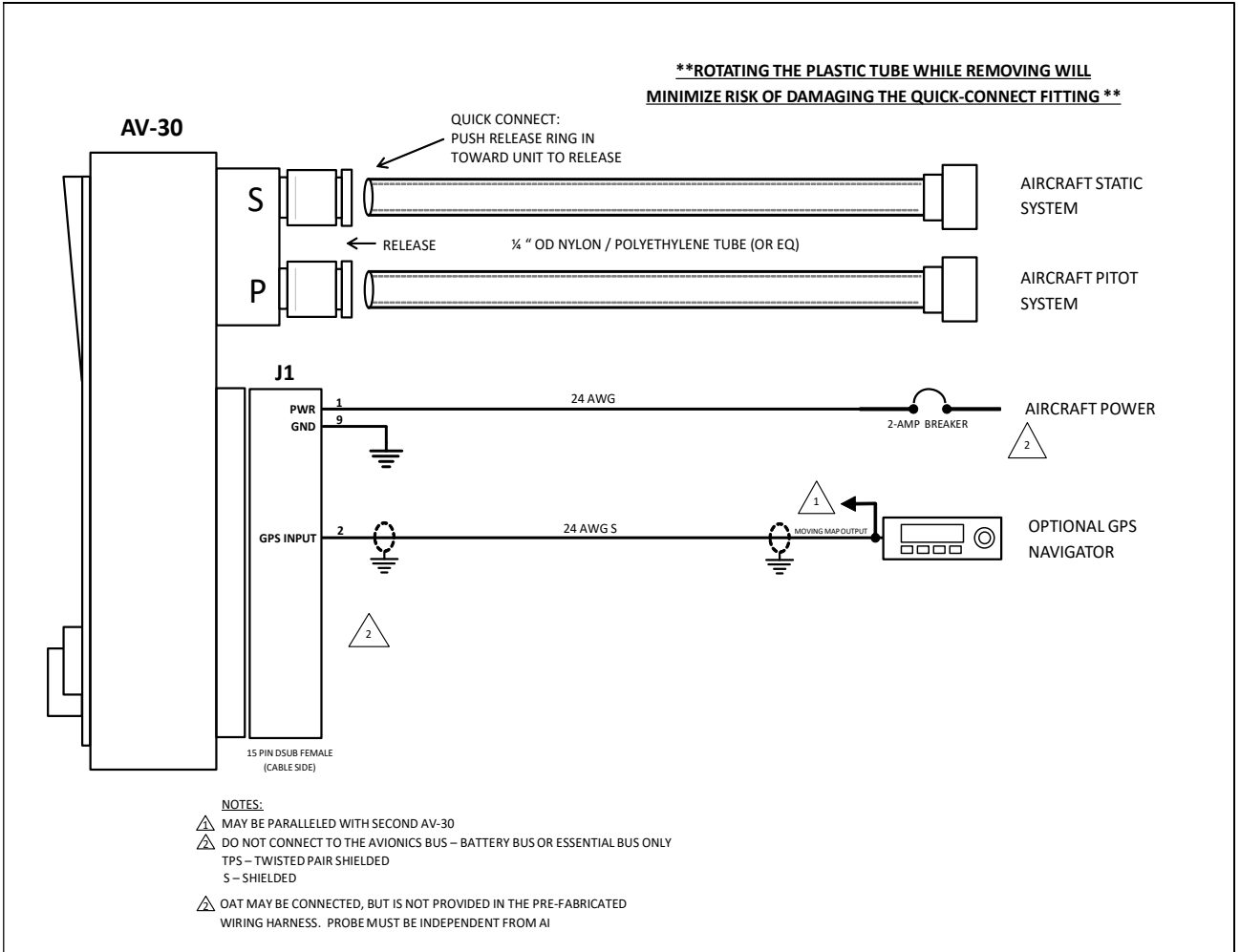


Figure 6 - Wiring Diagram – DG Installation

Pin	Function	Type	Comment
1	Power	Power	+12 to +28 VDC
2	GPS Navigator	Input	GPS RS-232
3	Spare Serial	Output	Reserved - DNC
4	Spare Serial	Input	Reserved - DNC
5	Spare Serial	Output	Reserved - DNC
6	Spare Serial	Input	Reserved - DNC
7	OAT Supply	Output	White Probe Wire
8	Mfg Serial	Input	Reserved - DNC
9	Ground	Power	Aircraft Ground
10	Aux Power Ret	Power	Reserved - DNC
11	Audio H	Output	Audio Alerts
12	Audio L	Output	Audio Panel Ground
13	Aux Power Out	Power	Reserved - DNC
14	OAT Return	Input	White / Blue Probe Wire
15	Mfg Serial	Output	Reserved - DNC

Table 4 – Connector Pinout

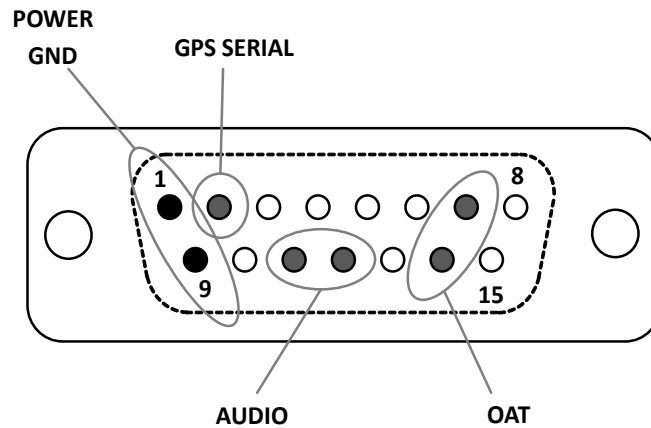


Figure 7 – Unit Connections – DB-15, Male (Rear Unit View)

9 Autopilot Integration

Section Reserved

10 Setup & Configuration

Setup and configuration is divided into two categories as follows:

- Pilot Selectable Options
- Installation Configuration

The pilot selectable options are those that are intended to be adjusted in flight, during normal operation. These include setting cosmetic preferences, data-overlay configuration, alerting features and associated limits.

The installation configuration are those settings that are not normally required to be adjusted during flight. These include mode settings, one-time calibrations and operational units (Mph vs Knots for example).

10.1 Pilot Configuration

Setting	Description	Range
UI Style	Sets Visual Style	LEGACY, EFIS, VINTAGE
UI Font	Sets Font Style	ARIAL, LCD
Alert Volume	Audio Volume for Alerts	1 to 10
AoA Alert Enable	Enable AoA Alerts	ENABLE, DISABLE
AoA High Limit	Upper AoA Limit	-28 to +30
AoA Low Limit	Lower AoA Limit	-30 to +28
G Alert Enable	Enable G Load Alert	ENABLE, DISABLE
G Positive Limit	Positive G Limit	+8
G Negative Limit	Negative G Limit	-8
Roll Alert Enable	Enable Roll Alert	ENABLE, DISABLE
Roll Alert Thresholds	Roll Alert Threshold	30 to 80
GPS Track Stabilization	Inertial Track Smoothing	ENABLE, DISABLE

Table 5 - Pilot Adjustable Settings

10.2 Install Configuration

Setting	Description	Range
Unit Function	Unit Functionality	AI, DG
Function Lock	Functionality Locked	YES, NO
Pitch Trim	Pitch Trim	±20 Degrees
Roll Trim	Roll Trim	±5 Degrees
Slip Trim	Slip Trim	±5 Degrees
OAT Trim	OAT Probe Trim	±200 (Unitless)
IAS Trim	IAS Trim	±50 (KTS or Mph)
ALT Trim	Baro Altitude Trim	±500 Feet
IAS Units	IAS Display Units	KTS, MPH
VSpeed Limits	Vso, Vs1, Vfe, Vno, Vne	40 to 300 (KTS or Mph)
Baro Units	Baro Setting Units	HG, MB
Temp Units	OAT Units	C, F

GPS Input Config	Serial Input	NONE, AV1 9600, NMEA1 4800
Demo Mode	Demo Mode	DISABLED, DEMO1, DEMO2
Software Version	Software Version	Major.Minor.Build Number
Software Checksum	Software Checksum	Computed Checksum

Table 6 - Installer Configuration Settings

11 Instructions for Continued Maintenance & Operation

11.1 Airspeed Calibration

Airspeed can be calibrated in the field utilizing a standard pitot-static air data test set.

11.2 Altitude Calibration

Altitude can be calibrated in the field utilizing a standard pitot-static air data test set.

11.3 Internal Battery

The AV-30 incorporates a small Li-Po battery that may require replacement on an as-desired basis. It is suggested to replace the battery if any of the conditions are present:

AV-30-E Model:

- The on-battery operation time drops below 1 hour when operated at nominal temperatures (10°C to 30°C).

11.4 Field Update Capability

The unit software is field updateable and requires an in-line harness and Windows based PC. Contact the factory for additional information.

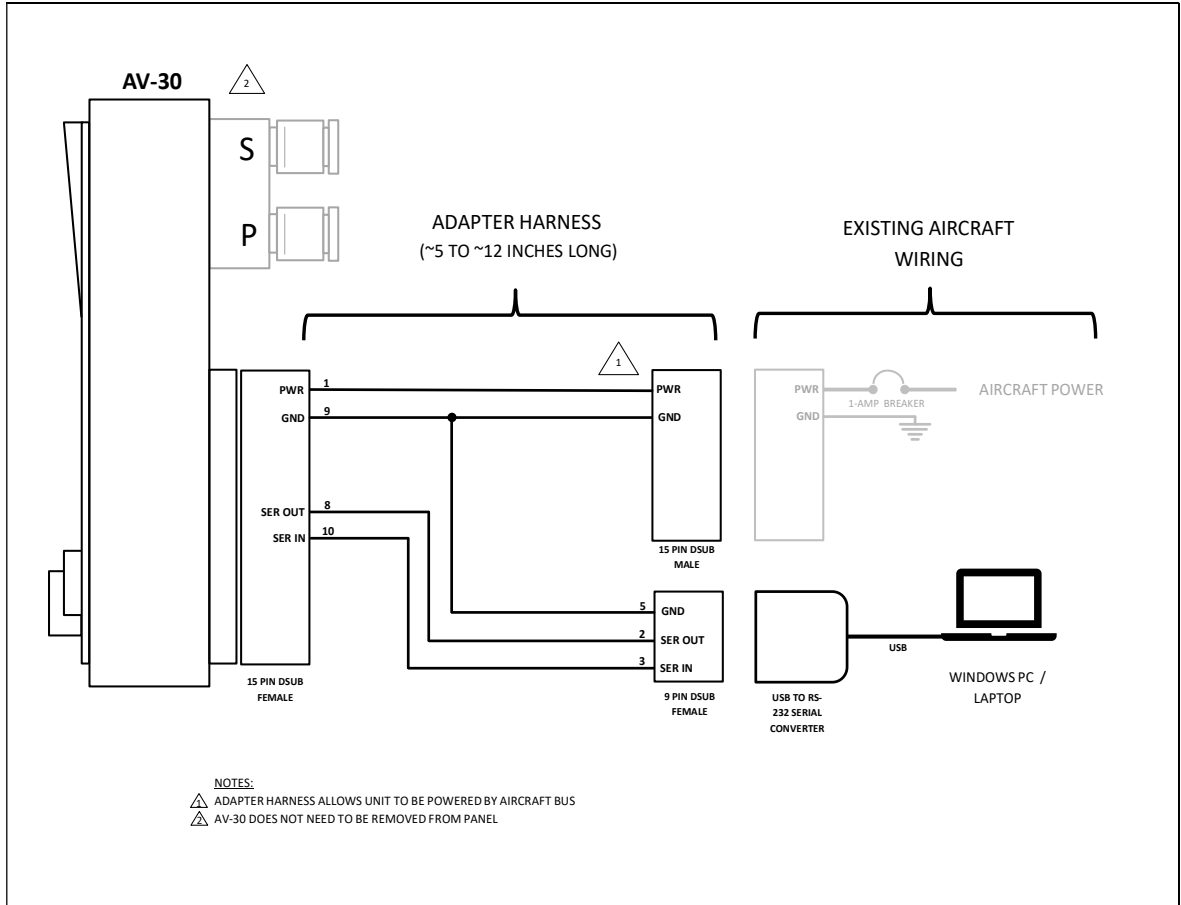


Figure 8 - Field Update Harness