AV-30-E

Pilot's Guide

REVISION N

UAV-1004233-001

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1. Table of Contents

2. REVISION HISTORY

Revision	Date	Comments
A	6/20/2020	Initial release
B	5/4/2021	Add AV-Link feature. Add traffic display feature. Add transponder control feature.
C	5/20/2021	§7.5.5 Correction of non-slaved DG
D	7/22/2021	Added features of tailBeaconX and software update aiding features.
E	1/5/2022	Added AeroCruze 100/TruTrak Vizion autopilot control feature
F	4/12/2022	Added AV-Mag external magnetometer.
G	10/11/2022	Added Set Altitude (SALT) visual alert. Changed TRUTRAK to AEROCRUZE. Added Trio PRO PILOT autopilot support. Added AV-Link reset feature. Added direct turn adjustment of barometer and heading bug. Added overlay elements on DG screens to support altitude controlling autopilots. Modified heading bug display to synchronize with autopilot usage. Modified PUSH-SET menu sequences to better support autopilot inputs. Missing magnetometer calibration now flagged with \“MAG CAL\” rather than \“NO MAG\”. Added a \“zero out\” action of the DG adjustment if using AV-Mag. Added table of checks and alerts for stored parameter integrity. Added three new autopilot heading modes and descriptions. Added GPS error messages table. Added AI screenshots illustrating 1:3, 2:3, 3:3 default screens.
H	2/27/2023	Updated Angle Of Attack Limit setting instructions to match the AV-30-C Pilot’s Guide. Updated CRC check splash messages. Update AV-Link for latest release (0.3.0) and new IP (192.168.5.1).
I	12/6/2023	Update for firmware version 2.4.1. Add AV-APA. Add Carbon Monoxide Overlay and Alert. Add GPS Rose, GPS HSI, and GPS ARC modes. Update guidance on vertical trend indicator specifying SVS bug requires digital autopilot. Update 5.8 with new MFD status message descriptions/locations and guidance about fallback GPS source. Update AV-Link sections for latest release (0.3.2). Update Table 11 – Operating Limits with expanded DALT Operational Range. Update 5.5.3 to indicate ALIGN flag can appear on all pages. Update 5.6.6 to indicate that entire flight plan is shown when using Aviation format. Update 5.5.7 for addition of hectopascals as an option for barometric setting. Update 5.2 with note about “SET BARO” quick-reset and recall. Update 5.11 with new squawk/flight ID/mode/VFR edit flow. Update 5.5.5 with new KPH option for IAS units. Update 4.4 to indicate ground speed units match IAS units. Add pitot static attitude aiding Update Mode C rebroadcast description in 7.8.9.1

J	4/5/2024	Add AV-HSI functionality throughout document Add new §7.12 CDI Mode Add ARINC 429 Autopilot option to §14
K	7/12/2024	Add VSI on MFD in §5.1, Table 7-3, and §7.8.9.3. Add GPS "MSG" indicator to §7.5.11 and §7.9. Add Turn Coordinator function to §5, §7.5.4, and Table 12-1. Add G Min and Max hold to §5.2, Table 7-2, and Table 12-1. Add Rate of Climb to §5.2 and Table 7-2. Add reference to AV-Link connected to AV-HSI to §6.8. Removed VFR indication from DG Arc when connected with AV-HSI in §7.6.6. Add over and under voltage alert thresholds to Table 12-1.
L	12/14/2024	Global formatting updates. Add Bus Voltage and G-Min/Max Reset to 5.7. Add transponder control overlay to 5.11. Add track bug description to 5.2. Update 5.12 to reflect updated brightness menu.
M	7/2/2025	Updates for software version 3.1.1 Add echoESX and beaconX transponder configurateion Add Wind indicators Add audio alert for Set Altitude Add flight plan overlay on MFD page Add Device ID usage Update AoA limit setting procedure Update AoA operational characteristic limits and airspeed range Add AoA override of battery shutdown due to low airspeed Add VSI to traffic filter options General updates to wording and formatting for clarity
N	11/24/2025	Add Wireless GPS (ForeFlight) Update Autopilot section with new 3.2.0 behavior Modify GPS and ADS-B status messages on MFD screen Update DG mode titles for consistency Add invalid AoA image

Table 1: Revision History

3. AV-30-E System Information

3.1. System Description

The uAvionix AV-30-E is a fully digital multi-mode instrument that mounts in the legacy 3-1/8″ round instrument panel cutout typically found in light general aviation instrument panels. It can be field configured as either an Attitude Indicator (AI) or a Directional Gyro (DG) indicator, is fully self-contained with dual-precision inertial and pressure sensors and allows for a wide variety of pilot customization. With optional accessories, the AV-30-E can also be configured as a Multi-Function Display (MFD) or Course Deviation Indicator (CDI).

Figure 1: AV-30-E Multi Mode AI/DG/Transponder - Basic Display

When configured as an AI, primary attitude and slip are always displayed. The unused portions of the display area can be customized by the pilot to show a variety of textual and graphical data-overlay fields. Up to three pages may be customized by the pilot while the last page presents a fully decluttered view of only attitude and slip or

control of a compatible uAvionix ADS-B transponder such as the tailBeaconX.

When configured as a Directional Gyro (DG), non-slaved direction of flight information is presented. The non-slaved direction can be manually adjusted by pilot input, aided by the optional AV-Mag accessory, or may be optionally slaved to GPS track. Multiple display presentations, including compass rose, GPS HSI, and GPS arc views can be selected by the pilot. The unused portions of the display area can similarly be configured for a variety of textual data overlays.

With an optional AV-Link accessory, the AV-30-E can be configured as a Multi-Function Display (MFD) that displays traffic from ADS-B receivers. MFD and DG modes are accessible when the AV-30-E is configured as a DG. As with other operating modes, the last page provides a reversionary AI.

With an optional AV-HSI accessory, the AV-30-E can be configured as a Course Deviation Indicator (CDI). Two CDI pages are available, with the third providing a reversionary AI. As with other modes, unused portions of the display area can be configured with textual data overlays.

In all operating modes, the pilot may select from multiple visual styles which are intended to improve visual compatibility with legacy aircraft instrumentation and preserve the look-and-feel of older aircraft applications.

When installed as a non-required instrument (not replacing the existing approved AI or DG), the functional mode of the unit can be toggled between AI, DG, MFD, and CDI modes by pressing and holding the center knob for 3 seconds.

3.2. System Functions

The AV-30-E includes the following functions:

Primary Functions

- Primary Attitude (AI Mode)
- Primary Slip (AI Mode)
- Primary Direction of Flight indication (DG Mode)
- Primary Navigation Information (with optional AV-HSI)

Supplemental Functions

- Indicated Airspeed

- Altitude
- Rate of Turn
- Standard Rate Bank Angle
- V-Speeds
- Wind Vector
- Angle of Attack
- Vertical Trend
- Vertical Speed
- Set Altitude (SALT)
- Set Vertical Speed (SVS)
- Heading
- Bus Voltage
- G Load
- G-Max and G-Min Hold
- Outside Air Temperature
- True Airspeed
- Density Altitude
- GPS Navigator / Waypoint Data
- GPS Navigator / Flight Plan
- Rate of Climb in Feet per Nautical Mile
- Heading Bug
- Traffic page (requires AV-Link)
- Transponder control (AI / DG / MFD / CDI Mode)
- Transponder setup and configuration
- Autopilot control

Audio and Visual Alerting Functions

- AoA Alerting
- G Limit Alerting
- Excessive Roll Alerting
- Set Altitude Alerting
- Attitude Miscompare (with AV-HSI)
- Carbon Monoxide (with AV-Link and Sentry)

Miscellaneous Functions

- Internal Battery Operation
- Auto/Manual Brightness

4. Unit Interfaces

4.1. Aircraft Systems Interfaces

The following describes each of the AV-30-E system interconnects for AI, DG, MFD, and CDI installation configurations. Note that, as shown in Figure 2, that some interfaces are optional and may not be available in each installation.

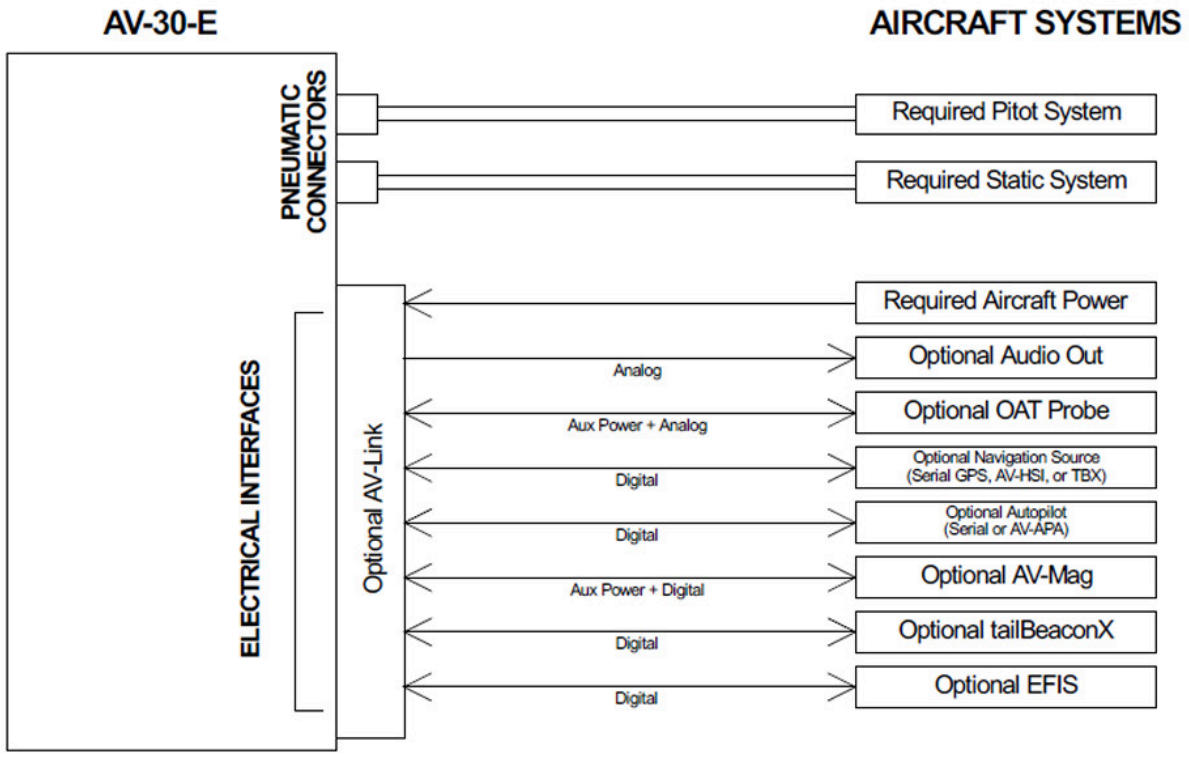


Figure 2: AV-30-E Aircraft Systems Interfaces – AI Mode

When installed as a DG, MFD, or CDI, no audio outputs are supported, and some air data related parameters are only available when the optional OAT probe is equipped.

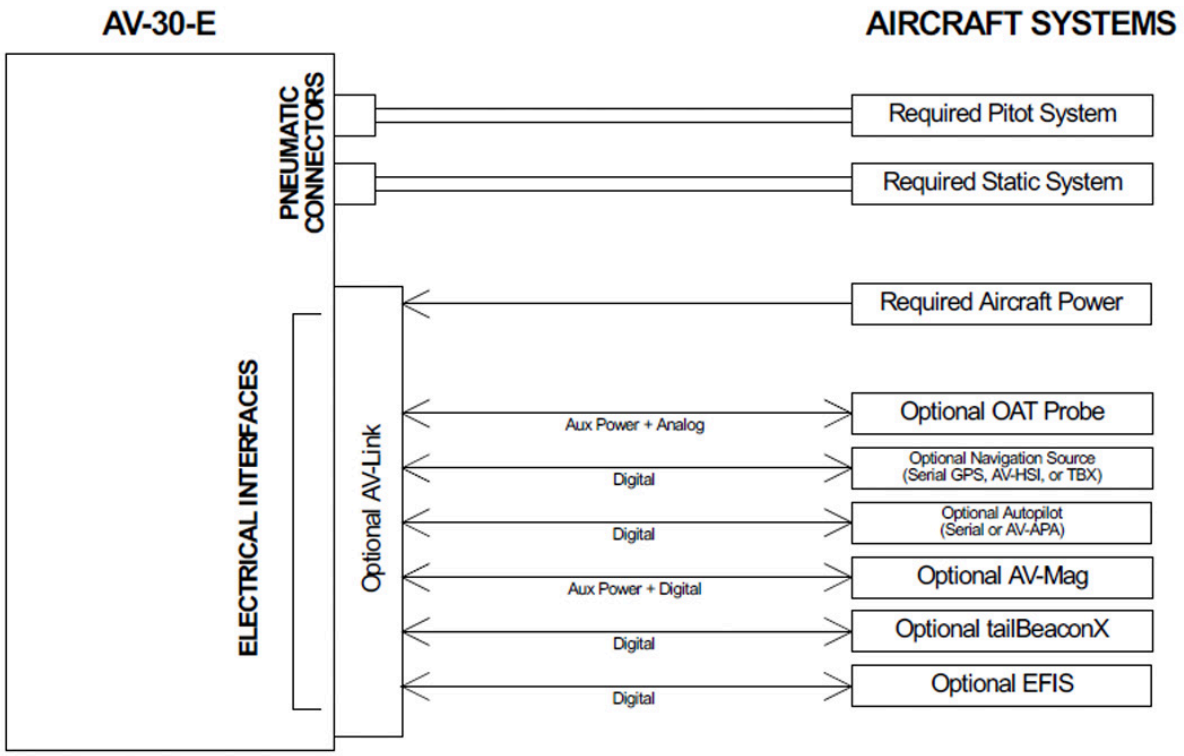


Figure 3: AV-30-E Aircraft Systems Interfaces – DG, MFD, or CDI Mode

4.2. Power Input (Required)

Power input is required in AI, DG, MFD, and CDI configurations and each unit has a dedicated circuit breaker. The power input is internally connected, and diode protected with the unit's internal battery via a processor-controlled switch. This architecture allows the unit to continue operation if external power fluctuates or is completely lost.

When external power is supplied to the AV-30-E, there is no mechanism to turn the unit off. When operating on battery, the unit may be forced off by pressing the left and right buttons simultaneously until the unit shuts off. See Section 8 for more information.

NOTICE

The AV-Link, AV-APA, AV-HSI, and Transponder are not powered by the AV-30-E internal battery. Wi-Fi traffic data provided to the MFD mode, autopilot interface, navigation, and transponder functions will be unavailable during a power loss.

4.3. Pitot and Static Interfaces (Required)

Pitot and static connections are required for all AV-30-E installations.

Pitot and static data are used to populate screen overlays, calculate angle of attack, and aids the attitude solution.

4.4. GPS Interface (Optional)

The AV-30-E can interface with a Global Positioning System (GPS) receiver directly or through an optional AV-HSI. The product can also interface with GPS systems wirelessely, as described in the AV-Link section below. GPS connected directly to the AV-30-E do not provide IFR compliant navigation guidance. In this configuration, lateral deviation will be presented as VFR-only. No vertical guidance will be displayed.

IFR-capable navigators connected through an AV-HSI using ARINC 429 can provide IFR compliant lateral and vertical guidance for display on the AV-30-E. An AV-30-E with an AV-HSI can display navigation guidance from one GPS and one VHF (VOR/ILS) source.

The AV-30-E will convert groundspeed units to match units of airspeed, but otherwise does not alter the data obtained from the GPS navigator.

The AV-30-E can use a parallel input from a tailBeaconX or echoESX to drive its GPS functions. A second AV-30-E is required to act as the transponder controller as per Section 4.8.

4.5. OAT Probe (Optional)

The optional Outside Air Temperature (OAT) probe interface is compatible with the industry standard “Davtron” (C307PS) probe which is mounted external to the aircraft. OAT data is available as a textual data overlay and is used to compute temperature dependent data such as True Airspeed (TAS) and Density Altitude (DALT). Each AV-30-E requires a dedicated probe. A single OAT probe cannot be shared between multiple units.

The OAT probe is automatically detected by the system, and when present, allows temperature related parameters to be selected for display. If the OAT probe is not detected, display of these parameters is inhibited.

4.6. Audio Output (Optional)

The optional audio output provides audio alerts for the various alerting conditions. This output is typically connected to the aircraft’s non-

switched audio input on the audio panel. Audio alerting thresholds and alert enablement are configured by the pilot in the Setup Menu.

Audio alerting is only supported when configured as an AI.

4.7. Magnetometer Aiding (Optional)

Two magnetometer aiding devices are available: the AV-Mag external magnetometer and the internal magnetometer. Support for the AV-Mag external magnetometer is available in software version 2.3.0 or later and requires installation in the aircraft. If the AV-30-E is equipped with an internal magnetometer (AV-30-E part number UAV-1004035-002) it will be automatically detected by software in versions 2.1.1 and later. Both types of magnetometers require calibration before use. Only one magnetometer can be used at a time. See §13 of the *AV-30-E Installation Manual UAV-1004234-001* for details on how to calibrate either of the AV-30-E magnetometers.

NOTICE
The AV-Mag is powered by the AV-30-E. During a power loss, the AV-Mag will be powered by the AV-30-E internal battery and continue to provide aided heading data.

4.8. Transponder Control (Optional)

The AV-30-E has the option of being the control interface for select uAvionix transponders (including the tailBeaconX and echoESX). This provides pressure altitude, mode, squawk code and IDENT information to the transponder, and displays status and annunciations from the transponder.

See Section 5.11.

NOTICE
The transponder is not powered by the AV-30-E internal battery. Transponder operations will be unavailable during a power loss.
The transponder output can be shared in parallel between two AV-30-E devices. One device must act as the Transponder Controller and the other may use the transponder as a GPS-only input.

4.9. AV-Link (Optional)

The AV-Link adds a wireless interface to the AV-30-E, which has three functions: displaying ADS-B traffic from Wi-Fi capable ADS-B

receivers, updating the AV-30-E wirelessly, and displaying flight plan information from Electronic Flight Bag (EFB) applications like ForeFlight.

If a Sentry or Sentry Plus ADS-B receiver is connected to the AV-Link, carbon monoxide data will be available as an overlay and as an alert on the AV-30-E.

NOTICE

The AV-Link accessory is not powered by the AV-30-E internal battery. Wi-Fi traffic data provided to the MFD mode will be unavailable during a power loss.

The AV-Link can be connected directly to an AV-HSI, sharing data with all connected AV-30-E. Additionally, this configuration enables software updates of the AV-HSI and all connected AV-30-E from a single AV-Link.

If multiple AV-Link modules are installed in the aircraft, no more than two may be enabled.

4.10. Autopilot (Optional)

The AV-30-E has the option to control analog or digital autopilots. Analog autopilots are controlled through the optional AV-APA accessory. Digital autopilots can be controlled either directly with RS-232 or with ARINC 429 through the AV-HSI.

4.10.1. AV-APA – Analog Port Adapter (Optional)

The optional AV-APA enables direction control input to S-TEC 20/30/40/50/55/55X/60-1/60-2/65 autopilots. The AV-APA and AV-30-E are connected to one another via RS-232 serial.

The AV-30-E sends heading commands to the AV-APA which converts them to analog signals for the S-TEC autopilot. The pilot controls these via the center knob PUSH-SET menu. Information is displayed via graphical or text overlay fields.

NOTICE

To process steering commands from the AV-APA, the S-TEC autopilot should be set to heading mode. S-TEC navigation and approach modes function independently of the AV-APA

The AV-30-E and AV-APA support six autopilot control modes. Each mode uses a different combination of desired direction and current direction to achieve different types of flight goals. For further details on Autopilot control see Section 12.

Altitude is not controlled through the AV-APA. The altitude functions of your S-TEC, if equipped, are controlled through the autopilot control head.

4.10.2. Digital Autopilots – RS-232 (Optional)

The AV-30-E can also directly act as an altitude and direction control input for the BendixKing AeroCruze 100/xCruze 100/TruTrak Vizion (385 and PMA) autopilot or the Trio 'Pro Pilot' autopilot. The autopilot and AV-30-E are connected to one another via half duplex RS-232 serial.

4.10.3. Digital Autopilots – ARINC-429 (Optional)

When equipped with an AV-HSI and an Advanced Autopilot Software Unlock, the AV-30-E can control Aerocruze and Pro Pilot autopilots using ARINC 429.

The AV-30-E and AV-HSI sends the heading bug and Set Altitude (SALT) to the autopilot. Additionally, with an optional Advanced Autopilot Unlock and an ARINC-429 GPS Navigator, GPS Steering commands are forwarded to the autopilot. The pilot controls autopilot mode, heading bug, and set altitude via the center knob PUSH-SET menu and displays the data via graphical or textual overlay fields.

For further details on Autopilot control see Section 12.

4.11. AV-HSI – Horizontal Situation Indicator (Optional)

The optional AV-HSI accessory can be connected to one GPS navigator capable of IFR enroute navigation and approaches to LPV minimums and one VHF navigator capable of VOR enroute and ILS approaches.

The AV-HSI can connect multiple AV-30-Es and synchronize flight data between them. See Section 5.2 for more information.

4.12. Electronic Flight Instrument System (EFIS) (Optional)

The AV-30-E has the option to connect to a third-party EFIS to synchronize data between the two. Data that can be synchronized

includes heading bug, selected course, set altitude, set vertical speed, autopilot mode, CDI navigation source, altimeter setting, outside air temperature, and DG direction. See *AV-30-E Installation Manual UAV-1004234-001* for EFIS compatibility.

5. User Interface

5.1. Startup and Common Controls

The initial power-on splash screen presents the company logo, unit model number, and the currently installed software version.

Figure 4: Splash Screen

Operation in AI, DG, MFD, and CDI modes share the following common user interface controls.

Figure 5: Common User Interface Components

When installed as a non-required instrument, press and hold the center knob to switch between AI, DG, MFD, and CDI modes when the Function Lock feature is disabled. If the Function Lock feature is enabled, then the pilot may not switch between modes. However, the DG can be switched into MFD (Traffic) mode. See *AV-30-E Installation Manual UAV-1004234-001* for configuring the Function Lock feature.

5.2. "PUSH-SET" Control

Activate the PUSH-SET window for accessing context menus and settings by momentarily pushing and releasing the center knob. This activates a window along the bottom of the display to allow various parameters to be adjusted with the center knob. Pushing and releasing the knob advances through each available setting.

When you reach the option to change, rotate the knob to scroll through all available values for this option. If the range setting has reached a limit, the left or right indication arrows will indicate which direction the center knob will change the setting. Both arrows are visible when the setting can be increased or decreased.

Momentarily push and release the knob to save the updated option value. The settings window will disappear, and the new setting is saved.

In some cases where multiple settings are related, the window will stay open and advance to the next related setting.

The collection and order of PUSH-SET parameters vary based on the mode of the unit and current display configuration. In general, if a settable value is shown on screen it will appear in the PUSH-SET menu.

The following options are available:

PUSH-SET Option	Description
SET BARO	Sets the barometer. Available if baro or altitude are displayed on screen.
DG ADJ	Adjusts the directional gyro. The DG should be compared against the compass heading and adjusted as necessary in flight. AV-Mag aiding reduces the need to adjust the DG.
HDG BUG / TRK BUG	A pilot-selectable heading bug, also used for autopilot modes. Displayed as heading bug when displaying a DG heading and track bug when displaying a GPS track.
OBS	Available only with AV-HSI. Omni-Bearing Selector can be set to Auto or to a manual bearing. When set to Auto, the AV-30-E uses a bearing calculated by the GPS.
SRC SEL	Only available when multiple navigation sources are present. Sets the navigation source between GPS, VLOC and FOREFLIGHT.
SET ALT	The Set Altitude (SALT) used by an autopilot or as an overlay
SET VS	The Set Vertical Speed (SVS) used by RS-232 digital autopilots
AUTOPILOT	Sets the autopilot mode. Options are: • Heading Bug (HDG BUG) • Track Bug (TRK BUG) • GPS Steering (GPSS)* • Waypoint Desired Track (WPT DTRK) • Waypoint Bearing (WPT BRG) • FOREFLIGHT*
SQUAWK	Available if a transponder is connected and squawk is displayed on screen. Sets the squawk code.

Table 2: PUSH-SET Options

* Available with Advanced autopilot software unlock. See *AV-30-E Installation Manual UAV-1004234-001* for details.

NOTICE

The parameters that can be adjusted will vary, based on the mode of the unit and the current configuration of the display. Figure 6 shows how the barometric setting is adjusted when altitude has been configured for display.

Figure 6: Push-Set Example – SET BARO

When the “SET BARO” option holds a custom setting, it can be quickly reset to standard pressure, saving the current local setting. This allows

the pilot to quickly switch between a local setting and standard pressure.

To reset to standard pressure, press and hold the center knob until the standard pressure value appears or press the right “STD” button. To swap back to the local setting, momentarily push and release the right “RECALL” button.

If using multiple AV-30-Es with an AV-HSI, push-set parameters can be synchronized between all AV-30-Es. For example, setting the heading bug on one AV-30-E updates it on all connected AV-30-Es. The following parameters are synchronized:

- Heading Bug
- Selected Course/OBS
- Set Altitude
- Set Vertical Speed
- Autopilot Mode
- Nav Source Select
- Baro Setting
- Outside Air Temperature
- DG Heading Adjust

Synchronization of these parameters can be individually controlled. See the *AV-30-E Installation Manual UAV-1004234-001* for details.

5.3. Direct-Turn

Commonly used parameters may be adjusted quickly by simply turning the center knob.

In AI mode, the barometric pressure setting is adjusted by simply turning the knob to bring up the ‘SET BARO’ window.

In DG mode, the heading bug is adjusted by simply turning the knob to bring up the ‘HDG BUG’ window. Note that direct turn of heading bug is disabled when using an autopilot mode that doesn’t display the bug.

In MFD mode, the zoom range is adjusted by directly turning the knob. In CDI mode, the OBS is adjusted.

All adjusted values are active immediately. After adjustment, push and release the center knob to dismiss the window. If after 30 seconds the knob is not pressed, the window will be dismissed automatically.

5.4. User Interface Customization

DG, AI, and CDI display modes are customizable to display data in a format and position on the screen according to pilot preference. Each display mode has multiple, customizable pages that the pilot may switch between during flight. Each page can be customized to show different sets of data. For example, AI page 1:3 (first of three) may be configured to show different types of air data, while page 2:3 (second of three) is configured to show Angle of Attack and Vertical trend, while page 3:3 (third of three) is configured to show GPS navigation waypoints and related data. The number of available pages for each mode is configurable in the Installation menu.

Figure 7: Page 1 of 3 showing Air Data and DG Heading

Figure 8: Page 2 of 3 showing GPS Ground Track, AoA, and Vertical Trend

Figure 9: Page 3 of 3 showing Waypoint Data and SALT

Note that the fourth page is a simplified reversionary page and is not configurable. It only displays minimally required information.

NOTICE

In general, it is suggested that the display be customized prior to flight, and that each page be set up for the different basic modes of flight operations (Departure, En route, Terminal) prior to actual flight operations.

5.4.1. AI Mode Customization

Pressing the lower left options MENU button will bring up the first menu, which is the user interface customization menu. In this mode, the cursor can be moved to each customizable area by rotating the center knob.

Figure 10: UI Customization, Menu Entry

The currently selected field will be indicated by a darkened block with a cyan bracket. Rotating the knob left and right will change the currently selected field.

To edit the overlay value presented in the currently selected field, push and release the center knob then turn to change. Push and release the center knob to save the setting and finally, press DONE to close the menu.

Figure 11: UI Customization - Field Selection

A second push of the lower left options MENU button will bring up the second menu. Menu options related to the current screen are displayed.

5.4.2. Edit Presented Data

The following shows the display when the edit mode is active. Rotating the knob left and right will then select from the various overlay values that can be presented in the selected field.

NOTICE
When the desired data type is presented, pressing and releasing the knob will accept the current value, and the edit mode will remain active. Press the DONE shown in the lower left button to accept the current value and exit the UI customization mode

Figure 12: Display Edit Value

Note that not all data values can be presented in each editable field area. For example, airspeed will only be displayed on the left main area and altitude will only be displayed on the right side. Additionally, when operating in the DG mode, the available data displayed is different than when operating in the AI mode.

5.5. AI Mode Display Components

5.5.1. Basic Components

Figure 13 shows the basic AI with all customizable data overlay fields turned off. The data shown cannot be disabled or customized:

Figure 13: Basic AI Mode User Interface

5.5.2. Customizable Data Overlay Fields

Figure 14 shows the locations of the inner and outer customizable fields when operating in the AI mode.

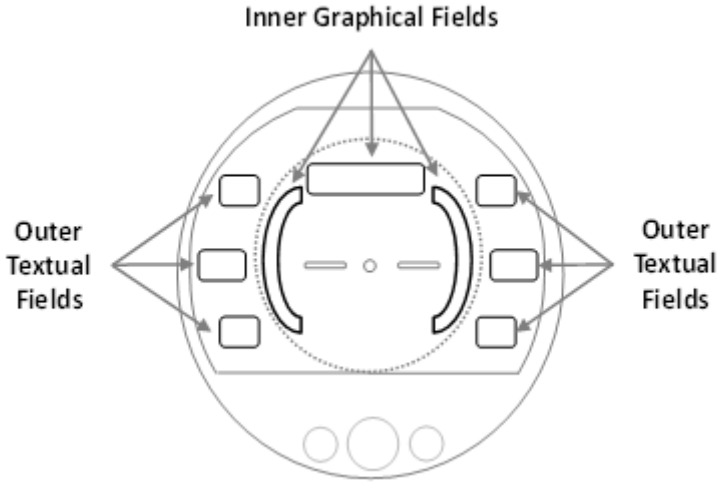


Figure 14: AI Mode, Customizable Field Locations

There are three independent pages on this screen that may be custom configured as desired by the pilot. Unneeded pages may be disabled in the Installation Menu. Refer to *AV-30-E Installation Manual UAV-1004234-001* for installation menu information.

Figure 15 shows an example of the pilot customizable data overlays (both textual and graphical), located in the non-utilized areas of the display area.

Figure 15: Data Overlay Examples

When in AI mode, there are three independently customizable pages which are selected round-robin fashion by momentarily pushing and releasing the right button repeatedly. The active page is displayed as 1:3, 2:3, and 3:3 on the lower right corner of the display.

A fourth, fully decluttered page allows all supplemental information to be hidden, leaving just attitude and slip displayed. This is accessed by momentarily pushing and releasing the right button a fourth time. Return to page 1 by momentarily pushing and releasing the right button.

5.5.3. Attitude / Slip

The basic display of attitude and slip consists of a traditional attitude indicator display and slip-ball as follows:

Figure 16: AI Mode, Attitude Indicator

NOTICE

On initial startup the red ALIGN flag will flash, indicating that the attitude is still stabilizing. Although this process mainly affects attitude display, this flag will appear on all pages and modes to ensure the proper function of the AI mode display and reversionary AI.

The aircraft should be held as motionless as possible during the alignment process.

If power is removed from the unit during the alignment phase the unit will remain on battery power until it has aligned.

When the ALIGN annunciator is displayed, the presented attitude may be incorrect. If ALIGN annunciator does not extinguish after 3 minutes, please contact uAvionix support.

Pitot and static data is used to aid the attitude algorithm. If pitot or static data becomes inaccurate due to ice or other obstructions, attitude accuracy may degrade. Increase vigilance in instrument cross scan.

5.5.4. Turn Coordinator

Two turn coordinator options can be configured for display near the top of the screen, a Rate of Turn indicator and a Standard Rate Bank Angle indicator. Configuration of this option is in the setup menu.

The Rate of Turn indicator consists of a flag that grows left or right from the 0roll indicator. Alignment with the extended 30 degree roll mark indicates a 2-minute standard rate turn.

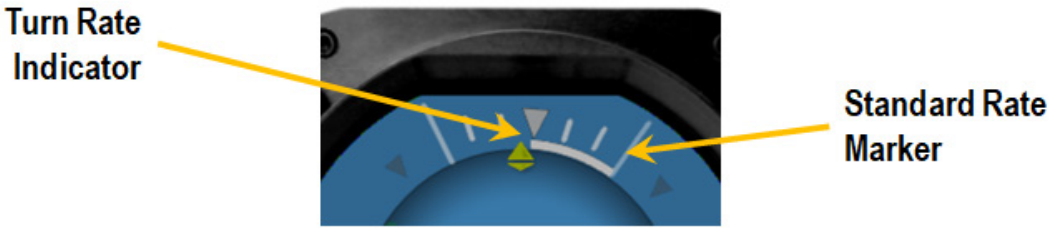


Figure 17: AI Mode, Rate of Turn Indicator

The Standard Rate Bank Angle indicator consists of a small airplane shape that is positioned at the bank angle necessary to fly a standard rate turn at the current true airspeed. Because this indicator is dependent on true airspeed, an OAT probe is required.

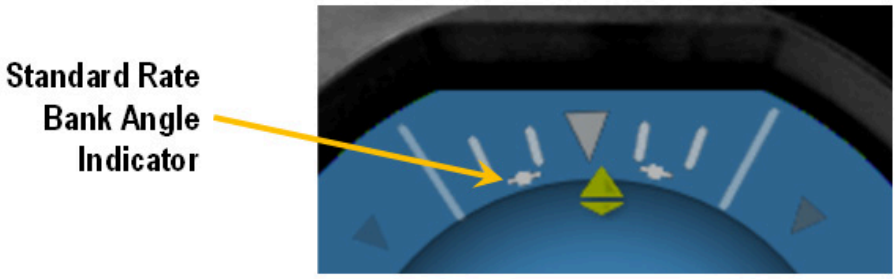


Figure 18: AI Mode, Standard Rate Bank Angle Indicator

5.5.5. Airspeed Indicator

Indicated airspeed is configured for display on the left side of the screen. The configured units of knots (KTS), miles per hour (MPH), or kilometers per hour (KPH) are displayed below the speed value.

Figure 19: AI Mode, IAS Indicator

The inner arc is a color-coded V-Speed band that rotates to show the configured V-Speed limits against the non-moving white tick mark. The lower arc portion below V_{S1} provides a red colored slow-speed band that is only displayed when the airspeed has been above V_{S1} for a given flight. If configured during installation, V_{MC} and V_{YSE} appear as red and blue radial tick marks, respectively.

The color of the indicated airspeed numerals will turn yellow when operating in the yellow speed arc, red when operating in a red speed arc, but are otherwise white.

Figure 20: AI Mode, V-Speed Limits

NOTICE

On initial startup, the airspeed field will display dashes while sensor stabilization occurs.

Airspeed display units and V-Speed limits are configured during installation and are not pilot accessible.

5.5.6. Flight Direction Indicator

The upper portion of the AI can be configured to display direction of flight in the form of either directional gyro heading (DG HDG) or GPS track (GPS TRK).

A heading bug will be available if the indicator is configured to display DG Heading. A magenta track bug will be available if the indicator is configured to display GPS Track. In the case where the AV-30-E is connected to an autopilot, a hollow bug will appear to indicate the direction commanded to the autopilot. The heading bug and hollow autopilot bug will be cyan if the direction sent is referenced to DG heading. Conversely, the bugs will be magenta if the direction sent to the autopilot is referenced to GPS track (See Section 4.10 for more details).

If GPS bearing is present a magenta bearing-to indicator will be drawn. Similarly, if VOR data is present from an AV-HSI, a green VOR bearing-to pointer will be drawn.

If this field is configured to display GPS track, and no data from the GPS receiver is detected (e.g. it is powered off or disconnected), an amber “NO DATA” will be displayed. If a GPS is detected but it has not achieved a fix or is otherwise not providing useful data, “NO GPS” will be displayed. When stationary, a GPS may not provide useful track data.

If either the direction or bearing-to bugs are off the left or right sides of the screen, a colored arrow will show the shortest-turn direction to the corresponding bug. To quickly align the heading bug to the current heading, select HDG BUG in the PUSH-SET menu, then push and hold the center knob.

Magnetometer aiding for DG heading is normally invisible to the pilot, however, there are two red warning flags that can occur. The first is “MAG CAL” which indicates a problem with the magnetometer calibration. The second is “NO MAG” which indicates that

magnetometer sensor data is absent (e.g. connection failure). If either of these occur, refer to *AV-30-E Installation Manual UAV-1004234-001* for more information.

Figure 21: Solid Magenta Bowtie for General Heading Bug, Bearing To Off-Screen

Figure 22: DG Heading with Cyan Hollow Bowtie for Autopilot

Figure 23: TRK Heading with Magenta Hollow Bowtie for Autopilot

5.5.7. Barometric Corrected Altitude Indicator

Barometric corrected altitude (ALT) can be configured for display on the right side of the screen and shows the barometric altitude in feet. When this field is configured for altitude display, the lower right field will be locked to the barometric setting and cannot be modified to display a different parameter.

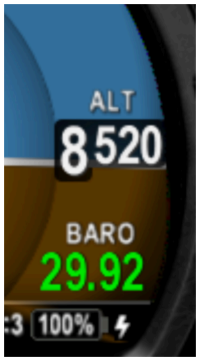


Figure 24: AI Mode, Altitude Indicator

Adjust the barometric setting utilizing the center knob. See Section 5.2 for addition details. Barometric setting in inches of mercury (INHG), millibars (MB), or hectopascals (HPA) are selected during installation and is not adjustable during ordinary operation.

NOTICE
On initial startup, the field will display dashes while sensor stabilization occurs.
On unit power-down, the current field elevation and barometric pressure are stored in internal non-volatile memory. On the next power-up, the saved field elevation is used to compute an estimated barometric setting, potentially reducing the required adjustment amount required by the pilot. During this process, the barometric value will be shown in light grey.

5.5.8. AoA Indication

Derived Angle of Attack can be configured for display in the inner left area of the screen and consists of a series of colored stacked bars that indicates the current AoA relative to the configured minimum and maximum limits.

The lowest green bar corresponds to a current AoA matching the configured lower limit point. The first red bar corresponds to a current AoA matching the configured upper limit.

NOTICE
AoA limit points are pilot selectable and are set in the Setup Menu

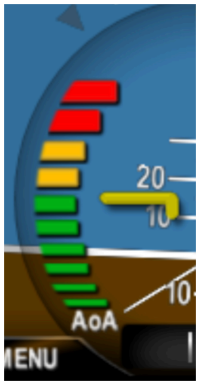


Figure 25: AI Mode, AoA Indication

AoA is determined by the difference between the aircraft's pitch angle and the path through the air. See Section 9 for additional details on the AoA operation and setup.

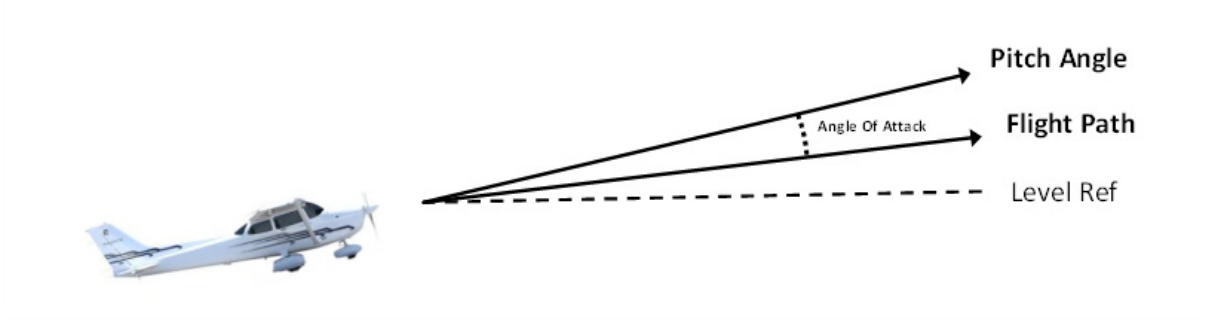


Figure 26: AoA Computation

NOTICE

The AV-30-E can not accurately calculate AoA below 25 knots. If the airspeed is too low or the AV-30-E is not otherwise able to provide AoA, the indicator will not be displayed and AoA label will be covered with a red X.

Figure 27: Invalid AoA - Red X

5.5.9. Vertical Trend Indicator

Vertical trend can be configured for display in the inner right area of the screen and consists of a white tick mark on a background scale. The upper and lower limits of the scale correspond to ±1000 feet per minute. This display augments the existing vertical speed in the aircraft but does not replace its functionality.

Figure 28: AI Mode, Vertical Trend Indication

If the AV-30-E is configured for an optional digital autopilot, the vertical trend indicator will display a magenta Set Vertical Speed (SVS) bug.

Figure 29: AI Mode, Vertical Trend Indicator and SVS Bug

If the SVS bug is above or below the display limits of the vertical Trend indicator, a second magenta arrow will appear alongside the bug pointing up or down to indicate the SVS value is above or below the scale.

Figure 30: SVS Bug value greater than scale

5.5.10. G-Load Indicator

The current G-Load can be configured for display on the inner right or inner left area of the screen and consists of a ball marker on a background scale. The upper and lower limits of the scale correspond to the upper and lower G limits set in the Setup Menu.

Figure 31: AI Mode, G-Load Indication

The center most tick mark represents 1.0 G. Values above the center mark represent positive G, while those below represent less than 1.0 G levels. The scale markers will change color based on G limits set.

Horizontal bars indicate the maximum and minimum G load experienced. This is reset on power cycle or can be reset in the setup menu.

See Section 7 for additional information about G limit alerts.

5.5.11. Course Deviation and Glideslope Indicator

When connected with an AV-HSI, course deviation and glideslope from a GPS or VHF navigation source can be displayed on the AI. These indicators can be enabled or disabled in the Setup Menu.

Figure 32: AI Mode, Course Deviation and Glideslope Indication

When enabled, the course deviation indicator bar will always be present. The arrow points upward to indicate “TO” and downward to indicate “FROM.” Magenta is used to indicate the data is from a GPS source. Green is used to indicate the data is from a VHF nav source.

Figure 33: AI Mode, ILS Course Deviation and Glideslope Indication

To declutter the screen, the glideslope indicator will only appear when vertical guidance is being provided by your navigator. Depending on your GPS navigator and approach type, this occurs at varying distances outside the final approach fix. Refer to your GPS navigator’s manual for details. For ILS approaches, the glideslope indicator will be present when a valid glideslope signal is received by your navigator.

If the screen location under the glideslope indicator was configured for vertical trend or G-load, those indicators will be suppressed while the glideslope is displayed.

When displaying GPS guidance and the GPS detects a Loss of Integrity, a yellow “GPS LOI” flag will appear above the lateral deviation bar. This indicates that the GPS data is not reliable and other means of navigation should be used.

Figure 34: AI Mode, GPS LOI Indication

When approaching a waypoint, a gray “WPT” indicator will appear. Similarly, when the navigator has a message for the pilot, a gray “MSG” indicator will appear.

Figure 35: AI Mode, Waypoint Indication

Navigation mode and approach type can be displayed on the AI using the “Nav Mode” overlay. See Section 5.7 for details.

5.5.12. Wind Vector and Components

Software version 3.1.1 adds wind calculation and display. GPS, AV-Mag, and an OAT probe are required to calculate wind. There are two types of Wind display in AI mode: a wind direction arrow with wind speed below it and a pair of wind component arrows with component speeds.

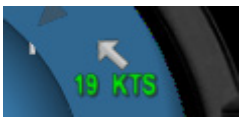


Figure 36: AI Mode, Wind Arrow

Note that the wind component vertical component indicates tail wind (up) or head wind (down) while the horizontal component indicates the side of the aircraft impacted by the wind. In other words, the horizontal arrow points right when the wind is coming from the right and points left when coming from the left.

Figure 37: AI Mode, Wind Components

Small errors in AV-Mag calibration or airspeed trim can result in significant errors in the wind speed and velocity calculations. See *AV-30-E Installation Manual UAV-1004234-001* for AV-Mag calibration and airspeed trim instructions.

5.5.13. Text Fields

The four corners of the display screen can be configured to show various textual parameters. In this example, distance to waypoint, waypoint identifier, set altitude, and barometric pressure are displayed.

Figure 38: AI Mode, Text Fields

If a given parameter is invalid or currently unavailable, it will be presented as dashes "- - -". See Section 5.7 for the list of parameters that can be displayed in these fields.

5.5.14. Accessing Reversionary AI

A reversionary style display of attitude and slip is available as the fourth page in AI mode. Push and release the right button multiple times to engage this page. Push and release the right button again to disengage. When a transponder is connected, this page allows control and monitoring of the transponder as detailed in Section 5.11.

This reversionary page cannot be customized by the pilot.

5.6. DG Mode Display Components

5.6.1. DG Mode Customization

The DG customization mode is like the AI customization and the same methods are used to customize screens and fields.

The uppermost field selects the base direction indication. The options are a compass rose, Horizontal Situation Indicator (HSI), and ARC. Prior to software version 2.4.1, the rose display was limited to DG heading and the HSI and ARC display were limited to GPS Track. Software Version 2.4.1 enabled the option for each to be driven by DG heading or slaved to the GPS ground track.

DG mode has three customizable pages plus a reversionary AI page for transponder control.

5.6.2. DG Heading Rose Mode

Figure 39 shows the DG heading mode (HDG ROSE). Six textual fields are available for customization.

Figure 39: Basic DG Rose Mode User Interface

The external magnetometer (AV-Mag) provides a source of high-quality data to aid heading stability. When configured for AV-Mag aiding, long term heading stability will be excellent, but the device is still non-slaved, meaning the user can adjust the DG heading.

5.6.3. GPS Track Rose Mode

Provides the same compass rose presentation as Figure 39, but is referenced to GPS Track instead of the DG.

5.6.4. DG Heading HSI Mode

When in DG HSI (HDG HSI) mode, the outer compass ring displays DG heading while the center of the page shows navigation data when connected to an external navigator. GPS Navigation data is displayed in magenta. VOR or ILS data is displayed in green.

Figure 40: DG Heading HSI User Interface

If an AV-Mag is installed and configured, the DG heading is aided by the AV-Mag. If the AV-30-E is used with an optional AV-HSI and IFR capable navigator, vertical deviation will be displayed when valid vertical navigation signals are available from the navigator. To declutter the screen the vertical deviation bar is hidden when no vertical navigation data is available.

The Nav Mode indicator will display the current navigation mode. When the GPS is connected over RS-232, all navigation is VFR Only. When connected to an IFR capable navigator through an AV-HSI, IFR capable navigation is displayed. GPS Navigation mode options are as follows:

- VFR (1nm of error per dot of deflection)
- ENROUTE
- OCEANIC
- TERM (Terminal)
- APPR (Approach)

When in enroute, oceanic, and terminal mode, a TO/FROM indicator will be present on the right side of the nav mode indicator. When in approach mode, the approach type will be displayed. Supported GPS approach types are:

- LP
- LNAV/VNAV
- LNAV

- LPV

Review your GPS manual for mode definitions.

When connected with an AV-HSI and a VHF navigator, VHF Nav guidance can be selected in the PUSH-SET menu by setting NAV SRC to VLOC.

Figure 41: DG Heading HSI User Interface with VOR Guidance

The Nav Mode indicator will display the current navigation mode. When a VHF navigator is connected to the AV-HSI, supported modes are:

- ILS (Instrument Landing System)
- LOC (Localizer)
- VOR (VHF Omnidirectional Range)

When receiving a VOR signal, TO/FROM is indicated in the right side of the Nav Mode Indicator as well as by the arrow on the course deviation bar. This arrow will be on the “pointer” side of the bar to indicate TO. The arrow will be on the “tail” side of the bar to indicate FROM. When displaying VOR, each dot of deflection equals 5 degrees of course.

No TO/FROM indication is available when tuned to an ILS or Localizer. A glideslope indication is automatically displayed when available on an ILS approach.

5.6.5. GPS Track HSI Mode

The GPS Track HSI (GPS HSI) mode uses the same HSI presentation the DG Heading HSI mode but the compass ring is referenced to GPS Track instead of the DG.

This mode is particularly useful when tracking a course because it does not require the pilot to compensate for wind drift.

Figure 42: GPS Track HSI Mode with VFR GPS

Figure 42 depicts the GPS HSI mode of an AV-30-E configured with a VFR only GPS. However, IFR capable course deviation is available in DG Heading or GPS Track modes when used with an optional AV-HSI.

5.6.6. DG Heading Arc Mode

The display type can also be configured to show the current GPS flight plan in a map style presentation. In the DG Heading Arc (DG ARC) mode the outer compass ring displays the DG heading while the center of the page shows the GPS flight plan, if connected to a GPS navigator.

As depicted in Figure 44 the active leg is highlighted in magenta. Subsequent legs are gray.

Note: Software version 2.4.1 and newer display a full flight. Software versions 2.3.9 and prior display only the active leg and only allow the GPS-slaved Arc Mode.

The display scale is adjusted by rotating the center knob and represents the display distance from the ownship icon to the outer compass ring. The following scales may be selected for display:

Selectable Display Scales:

1, 2, 5, 10, 20, 50 and 100 nm

NOTICE

GPS flight plan depiction is for advisory use only. Navigating by the moving map alone is not sufficient for IFR operations.

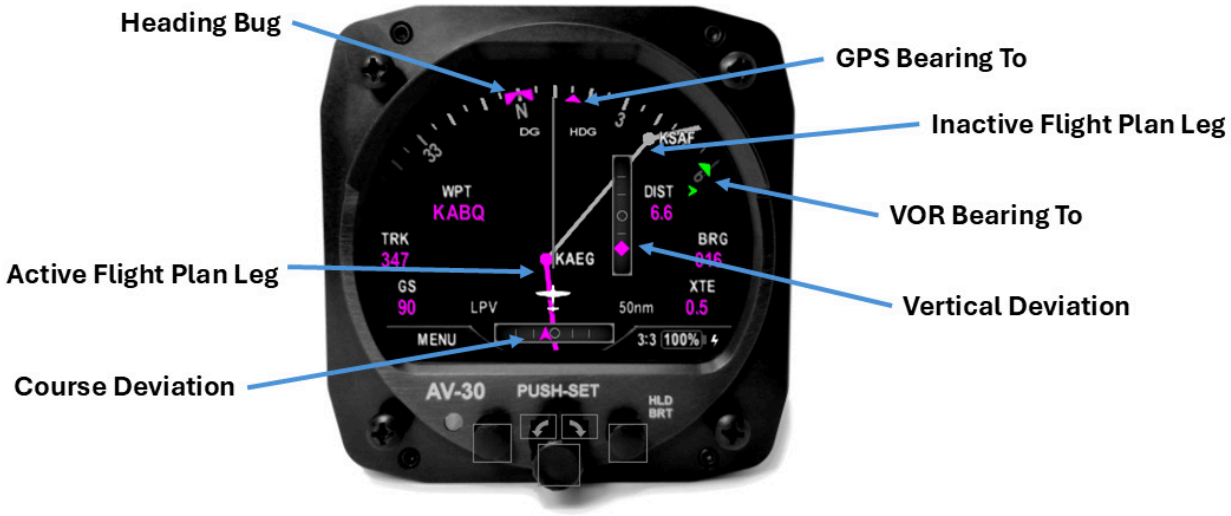


Figure 43: Arc Mode with Course Deviation and Glideslope

The AV-30-E works to prevent waypoint dots and labels from overlapping and will declutter overlapping items if necessary. By default, labels are drawn immediately to the right of their respective dot. If the label is moved from the default right position, a small leader line will be drawn connecting the label and dot.

If connected to an AV-HSI and ARINC 429 navigator, IFR lateral and vertical guidance can be overlayed on the Arc display. They are enabled or disabled in the Setup menu. The Course Deviation and Glideslope/Glidepath deviation bars can be used for approach guidance. The moving map itself is for VFR advisory use only.

If connected with an AV-HSI and GPS navigator that supports GAMA flight plan exchange, the Arc display will depict holding patterns and DME arcs.

Figure 44: Arc Mode with Holding Pattern

5.6.7. GPS Track Arc Mode

The GPS Track Arc (GPS ARC) mode uses the same arc presentation as described in the prior section, but the compass ring is referenced to GPS Track instead of the DG.

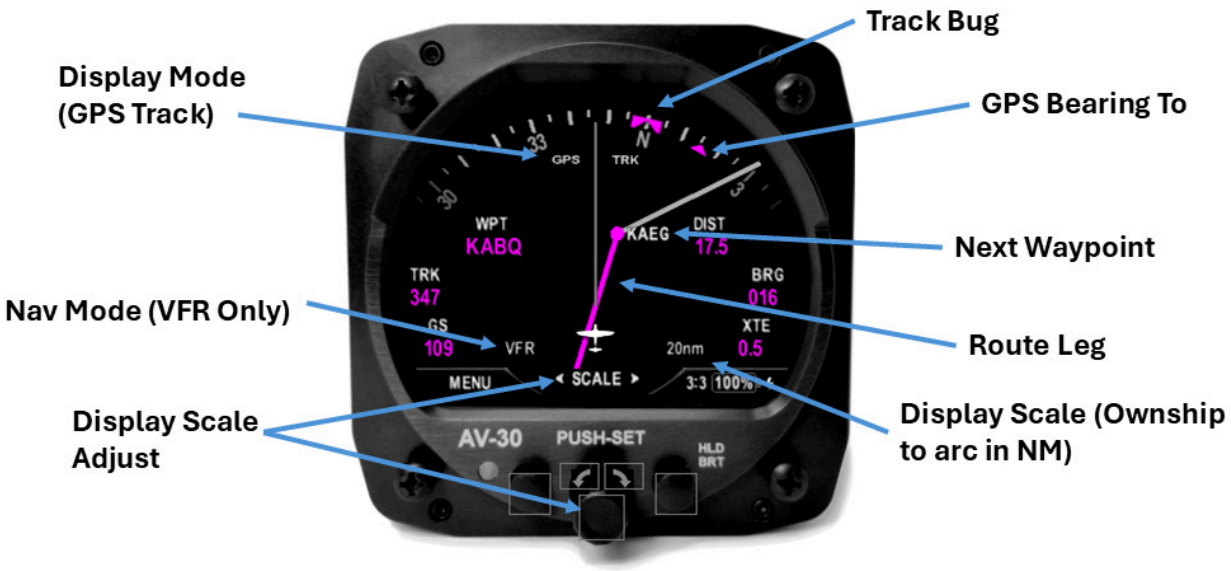


Figure 45: GPS Arc Mode

5.6.8. Operational Aspects

The following applies to operation in DG mode.

- As with the AI mode, three customizable pages can be set up by the pilot. Each page can be configured to show any of the above six display modes.

- DG heading modes require the pilot to set the initial heading and correct the heading as required based on the compass. The system will initialize to the last set heading on shutdown except when an AV-Mag external magnetometer is installed. Refer to *AV-30-E Installation Manual UAV-1004234-001* for information regarding the AV-Mag calibration procedure.
- In DG heading modes, the PUSH-SET menu brings up the DG ADJ entry on the first push of the center knob. However, if an AV-Mag is installed, HDG BUG will appear first and DG ADJ will be last.
- A pilot entered DG adjustment value can be cleared by entering the PUSH-SET menu, advancing to DG ADJ, then pushing and holding the center knob for 2 seconds. The heading will snap to the value indicated by the AV-Mag and the user entered adjustment will be set to zero. Note that this only applies when the AV-Mag is installed.
- If magnetometer aiding is configured but calibration is not complete the “MAG CAL” flag is indicated. If the AV-30-E is not receiving the magnetometer sensor data (e.g. connection failure), the “NO MAG” flag is indicated.
- GPS HSI and ARC modes are for VFR operations only. No vertical deviations are shown, and lateral deviations are not scaled for approach / IFR operations.
- Air data / temperature related parameters (TAS, DALT, OAT) are only available if an OAT is present. If multiple AV-30-E are connected to an AV-HSI, only one AV-30-E is required to have an OAT probe.
- The currently displayed GPS track may optionally be gyroscopically stabilized, allowing smoother operation when in turns. This option is configured in the Setup Menu (GPS Track Stabilization).
- When GPS Track is the base direction, any GPS error conditions that might occur are indicated according to Table 3.

GPS Error	Message Meaning
NO DATA	GPS powered off or connection failure. I.e. no data/messages are being received over the serial port.
NO GPS	No GPS Fix or some other condition is preventing the GPS receiver from providing useful data.
NO COURSE	No waypoint navigation information has been received yet. This message is suppressed when a tailBeaconX or echoESX is the primary GPS. Displayed on HSI page.
NO BEARING	No waypoint navigation information has been received yet. Displayed on ARC page.

Table 3: GPS Error Messages

5.6.9. Accessing Reversionary AI

A reversionary style display of attitude and slip is available in DG Mode. Push and release the right button multiple times to engage this page. Push and release the right button again to disengage. When a transponder is connected, this page also allows control and monitoring of the transponder as detailed in Section 5.11.

The Reversionary AI page cannot be customized by the pilot.

5.6.10. Wind Barb

Wind can be displayed in three ways in DG mode. The first two are the wind arrow and wind component overlays described in Section 5.5.12. The third wind indicator is unique to DG mode and is a 'barb' or arrow on the direction ring. The arrow is located on the ring at the direction from which the wind is blowing.

Figure 46: DG Mode Wind Barb

5.7. AI / DG Displayable Parameters

The following table shows which data fields can be displayed when operating in AI and DG modes.

The ‘Graphical’ presentation type indicates that the data is displayed in a graphical format (dial, tape, bug, etc.). The ‘Textual’ presentation type indicates that the data is displayed in text.

Data Type	Presentation	AI Mode	DG Mode	CDI Mode
Blank Overlay Field	N/A	✓	✓	✓
Attitude	Graphical	✓	✓	✓
Non-Slaved	Heading Graphical	✓	✓	×
Non-Slaved	Heading Textual	✓	✓	✓
Bus Voltage	Textual	✓	✓	✓
G Load Value	Textual	✓	✓	✓
G Load Max	Textual	✓	✓	✓
G Load Min	Textual	✓	✓	✓
G Load Indicator	Graphical	✓	×	×
Indicated Airspeed(1)	Textual	✓	×	×
Barometric Corrected Altitude(2)	Textual	✓	✓	×
Barometer Setting(3)	Textual	✓	✓	×
Angle of Attack	Graphical	✓	×	×
Vertical Trend Indicator	Graphical	✓	×	×
Vertical Speed	Textual	✓	✓	✓
Set Altitude	Textual	✓	✓	✓
Set Vertical Speed Bug(4)	Graphical	✓	×	×
Outside Air Temp(5)	Textual	✓	✓	✓
True Airspeed(5)	Textual	✓	✓	✓
Density Altitude(5)	Textual	✓	✓	✓
Direction Tape	Graphical	✓	×	×
Direction Rose	Graphical	×	✓	×
Direction ARC(6)	Graphical	×	✓	×
Direction HSI(6)	Graphical	×	✓	×
GPS Navigator Data(6)	Textual	✓	✓	✓
GPS HSI Indicator(6)	Graphical	×	✓	×
GPS Navigator Route(6)	Graphical	×	✓	×
Heading/Track Bug	Graphical	✓	✓	×
Autopilot Direction Bug(8)	Graphical	✓	✓	×
Carbon Monoxide(7)	Textual	✓	✓	✓
Nav Mode(6)	Textual	✓	✓	✓
AP Mode(8)	Textual	✓	✓	✓
OBS(9)	Textual	✓	✓	✓
SQUAWK(10)	Textual	✓	✓	✓
Climb (ft/nm) (6)	Textual	✓	✓	✓
Wind Vector (5)(6)(11)	Textual+Graphical	✓	✓	×
Wind Components (5)(6)(11)	Textual+Graphical	✓	✓	×

Table 4: Data Overlay Types vs Operational Mode

(1) Only available in the middle-left overlay location
(2) Only available in middle-right overlay location
(3) Only available in lower-right overlay location
(4) Only available when RS-232 Autopilot (AV-30-E only) is installed and Vertical Trend Indicator is visible
(5) Only available when OAT sensor is installed
(6) Only available when a GPS navigator is installed
(7) Available when a Sentry ADS-B receiver is connected to an AV-Link
(8) Only available when Autopilot is installed
(9) Only available when AV-HSI is installed
(10) Only available when tailBeaconX or echoESX is installed
(11) Only available when AV-Mag is installed

5.7.1. Bus Voltage Threshold

Bus Voltage (BUSV) is a textual overlay available on AI, DG, and CDI pages. Starting with software version 3.0.0, alerting thresholds can be set in the Setup Menu (See Section 10.1) to alert the pilot of an alternator failure or over-voltage condition. When BUSV is outside these thresholds the BUSV color changes to red to alert the pilot of the condition.

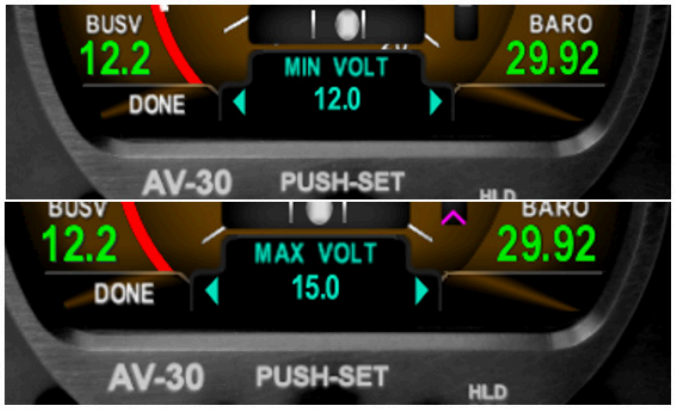


Figure 47: BUSV Threshold Setup

5.7.2. G-Min and G-Max Reset

Starting with software version 3.0.0, the AV-30-E can display the maximum and minimum G-Load as a textual overlay and on the G-Load graphical overlay.

G-Min and G-Max automatically reset on power cycle and can be manually reset in the Setup Menu (See Section 10.1).

5.8. MFD Mode

The AV-30-E can display real-time traffic data. This page will be accessible and display traffic (left example in Figure 48) only when AV-Link is connected to the AV-30-E or AV-HSI according to the *AV-30-E Installation Manual UAV-1004234-001*. If configured but not

properly connected, the words “NO DATA” will be displayed in the bottom-left corner of the screen (see the right photo in Figure 48).

Figure 48: AV-30-E Traffic Page

NOTICE

The AV-Link accessory is not powered by the AV-30-E internal battery. Wi-Fi traffic data provided to the MFD mode will be unavailable during a power loss.

Wi-Fi traffic is generated between a portable ADS-B receiver and AV-Link whenever SERIAL 3 is configured for AVLINK. In installations with multiple AV-Links installed on multiple AV-30-E, SERIAL 3 should only be set to AV-Link on the AV-30-E that is intended to be used as a traffic display. This eliminates redundant Wi-Fi traffic and will improve the performance of Wi-Fi devices in the aircraft.

5.8.1. Features

When AV-Link is installed and configured to connect to a Wi-Fi capable ADS-B receiver both airborne and ground traffic display are available.

Only Wi-Fi capable ADS-B receivers are supported. Bluetooth enabled ADS-B receivers are not supported.

ADS-B Wi-Fi receivers that have been confirmed as compatible include:

- Sentry
- Sentry Mini
- skyEcho2
- skySensor
- echoUAT
- Stratus 3 (in Open GDL Mode only)
- Dynon Avionics DRX
- Levil Aviation iLevil 3 AW
- BOM, iLevil 3 SW, and Astro Link
- SkyGuardTWX
- Stratux
- Falken Avionics FlightBox

This is not an exhaustive list.

Some of these receivers will require setting the AV-Link to a custom port value if the ADS-B receiver transmits GDL90 information on a port other than 4000 (default).

More receivers may be compatible using the AV-Link ADS-B Wi-Fi settings custom port setting. See Section 11.5.1 to configure the AV-Link custom port setting.

A minimum software version of 2.5.0 is required to support MFD Mode.

5.8.2. Display Functions

The MFD requires ownship GPS information to display the relative positions of nearby traffic. This GPS information can come from the connected ADS-B receiver, the AV-30-E's connected GPS navigator, or traffic targets with an ICAO address matching the configured ownship ICAO (see Section 5.8.8.1).

In addition to displaying "NO DATA" when the AV-Link is not properly connected, the bottom left corner of the screen may show one of the following messages to describe the status of the MFD's position source, listed in order of descending severity and display priority:

- NO DATA – AV-Link is not connected or is not functioning.
- NO GPS SRC – None of the possible GPS sources are connected or sending position information.
- NO GPS FIX – None of the possible GPS sources have a valid GPS fix.

- NO ALTITUDE – Both barometric and GPS altitude are unavailable. Target relative altitude is unavailable.
- NO ADSB IN - No data is being received from an ADS-B In receiver.
- NO GPS HDG – Neither track nor heading are available. The display will default to a north-up orientation.
- GPS or VFR EFB - If the AV-30-E has a hard-wired GPS source as well as a wireless Electronic Flight Bag (EFB) like ForeFlight, the current source used will be annunciated. The VFR EFB indication will turn yellow if the AV-30-E is not currently receiving EFB data.

When “NO GPS SRC” or “NO GPS FIX” are displayed, a traffic count shall be displayed in the bottom right corner of the screen to warn about nearby traffic targets even when they cannot be displayed on screen.

Starting with software version 3.2.0, the direction bug, autopilot bug, and navigation bearing pointers are available while in MFD mode. These function identical to the indicators depicted in Section 5.6.6. Lateral and vertical deviation indicators are not provided in MFD mode.

Traffic displays, both airborne and ground, are available. Traffic is represented by a chevron icon, pointing in the direction of travel. Traffic on the ground is colored brown and traffic in the air is colored cyan.

Traffic that has no heading is classified as an airborne obstacle and is represented by a cyan diamond icon.

In normal monitor mode, the screen will display active traffic and has a zoom function to permit the pilot to view traffic from 1 nautical mile (nm) to 40 nautical mile range. Due to the placement of the ownship icon, more distance is displayed forward of ownship than behind.

Concentric rings display hints on distance. There are three in total. Depending on the range selected, these represent the 1/3, 2/3 and full display distance. Each are marked with the current range distance. For example, at 1 nautical mile range setting, the rings are set at 0.33 nm, 0.66 nm, and nm.

5.8.3. Display Zoom

Target detail will vary based on the current zoom level. This is to reduce visual clutter. As zoom is set to closer distances, extra target information will be placed next to the target icon. These include

relative altitude to ownship and the speed vector extending from the front of the target.

Figure 49: Traffic Display Zoom

Selectable Display Scales:

1, 2, 5, 10, 15, 20, 30 and 40 NM

5.8.4. Target Relative Altitude

Relative altitude is determined using real-time altitude information from ownship as well as each individual target. It is possible to have two types of altitude information: pressure altitude and geometric altitude.

In compliance with DO-317C §2.3.5.15.1, the target relative altitude is calculated by either (1) using the pressure altitude of both aircraft or (2) if valid pressure altitude is unavailable, by using the geometric altitude of both aircraft. The relative altitude shown for a target is positive when the target is higher than ownship and negative when the target is lower than ownship. If the same altitude type is not available for both ownship and the target, then no relative altitude is displayed for that target.

Note: AV-30-E must be connected to aircraft pitot and static pneumatic connections for correct relative altitudes to be displayed.

Figure 50: Traffic Target Relative Altitude

Some uncertified advisory display systems will use a combination of pressure altitude and geometric altitude for the calculation of the target relative altitude. This is not in compliance with DO-317C §2.3.5.15.1 and therefore may result in a difference between the relative altitude displayed on the AV-30-E and the other system.

Relative altitude is displayed in units of hundreds of feet. For example, a display of +335 indicates that the target is 33,500 feet above ownship. The "+" indicates the target is above ownship and the label is placed *above* the target icon. If the target is below ownship, then a "-" value is used, and the label is placed *below* the target icon.

5.8.5. Target Airspeed

Target airspeed is indicated by a vector line extending from the front of the target. A longer vector indicates that the target airspeed is faster than a different target with a shorter vector. This vector is visible only when the zoom range is 20 nautical miles or closer.

Tracking the target will provide detailed information about the target, including the current airspeed.

5.8.6. Target Tracking Function

Momentarily pushing and releasing the center knob activates the target tracking function. Rotate the center knob to select the target to track. Information details about the target will appear at the top of the display. This information includes callsign or flight plan identifier, information source, type of aircraft, distance, altitude, and airspeed. If

an information item is unavailable, then dashes “- - -” will appear for the item.

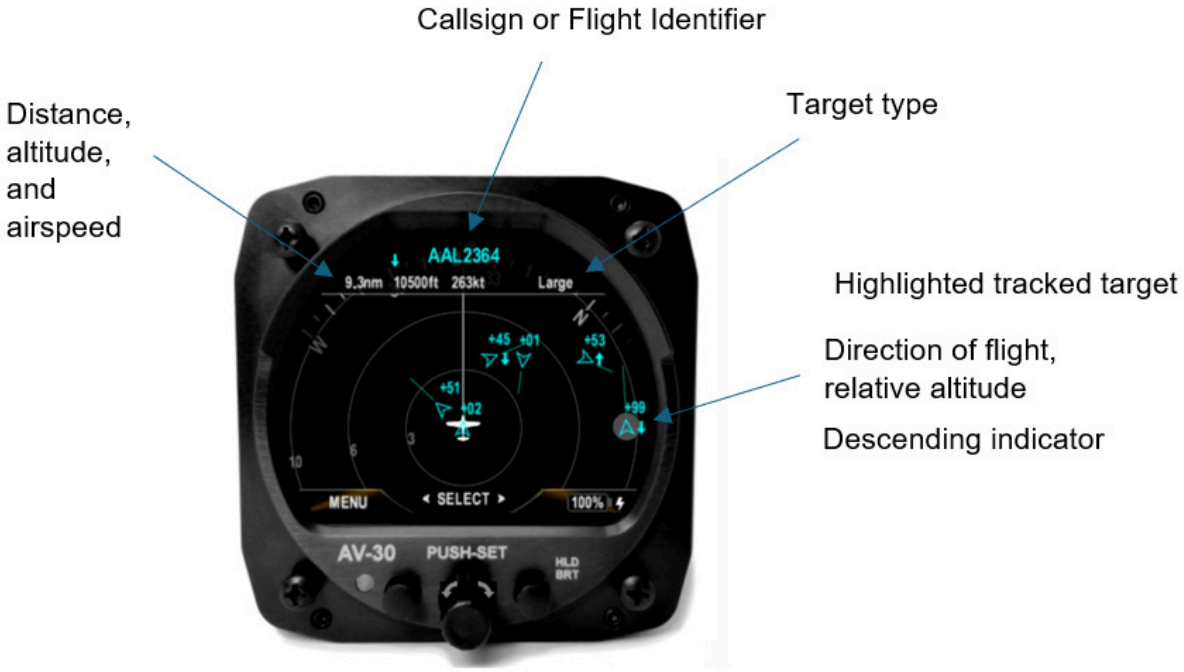


Figure 51: Traffic Target Tracking Function

The screen will stay in tracking mode until disengaged with a push and release of the center knob, at which point other PUSH-SET options will be presented. During tracking, the zoom function is disabled.

5.8.7. Accessing Reversionary AI

A reversionary style display of attitude and slip is available from the traffic page. Push and release the right button to engage this screen. Push and release the right button again to disengage.

Figure 52: Traffic Reversionary AI Activation

When a transponder is connected, this page also allows control and monitoring of the transponder as detailed in Section 5.11. This mode page cannot be customized by the pilot. The Reversionary AI page cannot be customized by the pilot.

5.8.8. Traffic Mode Configuration

The traffic mode has settings that can be configured for ownship identity, to prevent the ownship from being displayed as “ghost” aircraft, and traffic filtering for reducing the content displayed on the screen.

5.8.8.1. Ownship ICAO

If your aircraft is not equipped with an ADS-B Out system, Air Traffic Control (ATC) can rebroadcast your Mode C target to nearby aircraft using Traffic Information Service – Broadcast (TIS-B). TIS-B is a service that relays information derived from basic transponder equipped aircraft observed by Secondary Surveillance Radar (SSR) to ADS-B In equipped aircraft.

If you receive that transmission, it can cause your own aircraft to be displayed as a nearby target, usually slightly behind you and ± 100 to 200 feet in altitude, from the slight delay in the transmission reaching you due to the secondary surveillance radar processing and rebroadcasting delay.

Every ADS-B In system occasionally displays a ghost, even for those aircraft equipped with ADS-B Out. Entering your ownship ICAO can remove that identified ghost from the traffic screen.

Ownship ICAO can be entered manually using the OWNSHIP ICAO menu entry. Once entered, the value is saved but can be changed at any time.

If a uAvionix transponder is installed and transponder control is enabled, ownship is automatically detected and entered for you on this screen. Manual override of this value is not permitted when transponder control is enabled.

Finally, because the MFD screen requires a GPS source to draw the relative positions of nearby traffic, entering your ownship ICAO can allow the MFD screen to continue functioning even in the event of a GPS signal loss by your onboard GPS and ADS-B In systems. When configured with your ownship ICAO, when the AV-30-E receives traffic data for your aircraft via ADS-B, ADS-R, or other sources, the MFD screen will use those traffic reports as a fallback GPS data source.

5.8.8.2. Traffic Filtering

Traffic can be filtered by ownship relative altitude to reduce the information displayed on the screen. Ownship altitude is collected from one of multiple sources: ownship reports, GPS altitude, ownship barometric altitude.

Traffic filter selection options are Normal, Above, Below, Only Own and None. Full descriptions of each of these are found in Table 5.

Figure 53: Examples of Alternate Filter Values

Setting	Options	Description
Filter	Normal	Filter ownship, traffic above and below 2700 feet relative to ownship
	Above	Filter ownship, traffic above 8700 feet and below 2700 feet relative to ownship
	Below	Filter ownship, traffic above 2700 feet and below 8700 feet relative to ownship
	Only Own	Filter only ownship
	None	Displays all traffic
Ownship ICAO	Dependent on registration number	Press and release, then rotate center knob to select each number or letter associated with aircraft ICAO. This will allow for ownship filtering
VSI	DISABLED, ENABLED	Overlay a vertical speed indicator on the MFD

Table 5: Traffic Filter Options

5.8.8.3. Vertical Speed Overlay

Some pilots may wish to have a dedicated traffic display but do not have an extra instrument hole available. A vertical speed indicator overlay is available on the MFD page to allow an AV-30-E to replace a vertical speed indicator. This indicator will graphically display to +- 1,000 ft/minute. The numeric indicator will display up to 9,999 ft/minute.

Figure 54: MFD with VSI Overlay

5.8.8.4. Flight Plan Display

The current flight plan can be displayed in conjunction with traffic. Press the left button MENU bring up the menu then rotate the center knob to FLIGHT PLAN. Press and release the center knob to activate

the FLIGHT PLAN option. Rotate the center knob to ENABLED, then press the left button DONE to exit the menu.

Figure 55: Flight Plan on MFD

5.8.8.5. Wireless GPS

Starting with software version 3.2.0, the AV-30-E can use the AV-Link to display flight plans from ForeFlight. When combined with a GPS position from an ADS-B receiver or from ForeFlight's iPad or iPhone, the AV-30-E computes additional navigation data, including autopilot guidance, from ForeFlight's flight plan. This capability can be enabled from the traffic mode menu or the setup menu while in other modes. Press the left button MENU bring up the menu then rotate the center knob to WIRELESS GPS. Press and release the center knob to activate the WIRELESS GPS option. Rotate the center knob to FOREFLIGHT. A pop-up box will list the current status of the position and flight plan source.

A typical configuration for this is for ForeFlight and the AV-Link to be connected to the same ADS-B IN receiver, though an iPad with GPS or iPhone may be connected directly to the AV-Link Wi-Fi instead.

Figure 56: Wireless GPS on MFD

If the wireless GPS feature is used on a AV-30-E that also has a hard-wired navigation source, the SRC SEL option will be available to select the desired navigation source. This selection is available in all operating modes: AI, DG, MFD, and CDI.

Figure 57: Wireless GPS on MFD

When a ForeFlight instance is detected by the AV-30-E, an alert will be displayed, including ForeFlight's IP address. When the alert is displayed the pilot should verify that the IP address matches that of their iPad or iPhone and verify that the waypoints displayed match those in ForeFlight. This is particularly important if there are multiple devices running ForeFlight in the aircraft. Once the AV-30-E binds to a specific ForeFlight instance it will continue to use that instance until it times out.

Figure 58: Wireless GPS Alert

ForeFlight has the option to automatically and continuously send flight plan and active leg data to the AV-30-E. Otherwise, ForeFlight will send the data only when the pilot opts to send to panel. To view AV-Link options in ForeFlight, click the “More” tab, then select “Devices”, and then select AV-Link.

In addition to receiving flight plan data from ForeFlight, the AV-30-E also sends its AHRS data to ForeFlight. This can be viewed in ForeFlight’s synthetic vision display.

ForeFlight integration requires AV-30-E version 3.2.0 and AV-Link version 0.3.7 or newer. If using the AV-Link with an AV-HSI, AV-HSI version 1.1.0 or newer is required.

5.9. CDI Mode

When equipped with an AV-HSI, the AV-30-E can display a traditional Course Deviation Indicator. This mode is accessible when the AV-30-E when the function lock on the AV-30-E is not set. To cycle through modes to the CDI mode, press and hold the center button.

Figure 59: CDI Mode with GPS Guidance

The CDI mode can display lateral and vertical guidance for GPS or VHF navigators. Changing navigation source and OBS is done in the PUSH-SET menu.

Figure 60: CDI Mode with VOR Guidance

Like the DG HSI mode, a gray “MSG” and “WPT” indicator will appear when the GPS has a message for the pilot and when approaching a waypoint, respectively.

There are six configurable overlay positions available on the CDI. The CDI includes two independent pages and a reversionary AI.

5.10. Reversionary AI

Figure 61: Reversionary Attitude Indicator

The Reversionary AI page is the last page in all operating modes. It presents a reversionary style display of attitude and slip. When a transponder is connected, this page also allows control and monitoring of the transponder. This mode page cannot be customized by the pilot, but the transponder control can. See Section 5.11 for details on transponder control.

5.11. Transponder Control

When installed and configured, the AV-30-E can be used to control select uAvionix transponders (including the tailBeaconX and echoESX). The full set of transponder controls are available on the Reversionary AI page. Squawk and Ident can be controlled on pages other than Reversionary AI.

5.11.1. Reversionary AI Transponder Control

The reversionary AI page is accessed by pressing and releasing the right button repeatedly until AI appears in lower right corner of the display.

5.11.1.1. Status

The transponder control user interface, as presented on the reversionary AI page, is shown below.

A	Configured Callsign / Flight ID
B	Current Squawk Code.
C	Mode Selection (STBY, ON, ALT).
D	GPS NIC (integrity metric).
E	GPS NACp (accuracy metric).
F	Pressure Altitude - Green indicates radar interrogation and will change to IDT if IDENT is active.
G	Transponder status.

Table 6: Transponder Control

The current transponder status is indicated by the STAT field. The following status annunciations may be displayed.

Status	Description
OK	Status good, no fault
NOPOS	No GNSS position information, ensure clear sky view
FAIL	Transponder device failure (broadcast monitor or transmission system)
TMOUT	Timeout, unable to communicate with transponder
MAINT	Maintenance required, ensure proper configuration (e.g. ICAO address)
WAIT	Retrieving configuration from transponder
FAULT	Unknown or generic fault
XPRST	Transponder reset. Maintenance required, ensure proper power connections to transponder

Table 7: Transponder Status

5.11.1.2. Changing Squawk

1. Press and release the center knob to bring up the squawk edit menu. The first digit of the squawk will be highlighted.
2. Rotate the center knob to change the highlighted squawk digit.
3. Press and release the center knob to move the highlight to the next squawk digit.
4. Repeat steps 2 and 3 until the desired squawk code has been set. The squawk edit menu will close after pressing and releasing the center knob while the last digit is highlighted or by pressing the left “Done” button.

NOTICE

Press and release the right button to quickly set the Squawk to 1200 (or an alternative VFR value if one is programmed into the transponder).

5.11.1.3. Changing Flight ID

1. Press and release the center knob to open the squawk edit menu.
2. Push and hold the center knob until FLIGHT ID appears. The first character of the flight ID will be highlighted.
3. Rotate center knob to change the highlighted character.
4. When desired character appears, push the center knob to accept it and highlight the next character.
5. Repeat steps 3 and 4 until the desired flight ID is set.
6. Push and release the right button (CLEAR) at any time to clear the Flight ID completely.
7. Press and release the left button (DONE) to close the flight ID edit menu and save the setting.

NOTICE

No spaces are permitted in the FLIGHT ID. The highlighted character must not be blank to advance to the next character.

5.11.1.4. Changing Transponder Mode

1. Press and release the center knob to open the squawk edit menu
2. Press and hold the right button to cycle between ‘VFR’ and ‘MODE’

1. With 'MODE' highlighted, a single press and release of the right button will cycle through each mode selection (STBY, ON, ALT).
2. Press the left 'Done' button to close the menu

5.11.1.5. To Send IDENT

To trigger transponder IDENT:

1. If in Reversionary AI, press and release the left button, labeled IDENT. IDT will be displayed green in the lower left of the screen to indicate that IDENT is active.
2. If on other pages displaying squawk, press and release the center knob until SQAUWK is displayed in the PUSH SET Menu. Press the right button, labeled IDENT. The IDENT text will change from white to green to indicate that IDENT is active.

5.11.1.6. Quick Squawk VFR

tailBeaconX and echoESX store a VFR squawk code internally. By default, this is set to 1200 for U.S. operations but may be set to another value via a separate transponder configuration application.

During operation, the quick way to change the squawk code to VFR is:

- Press and release the center knob to open the squawk edit menu
- Press and release the right button to quick squawk VFR

5.11.2. Squawk Overlay

The current squawk code can be displayed on screen for AI, DG, and CDI modes. See Section 5.4 for guidance on configuring overlay fields.

To change squawk on non-Reversionary AI pages, open the PUSH-SET menu and cycle through to SQUAWK. To send IDENT, push and release the right button while in the squawk edit menu. Pressing and holding the center knob will set squawk to the VFR value.

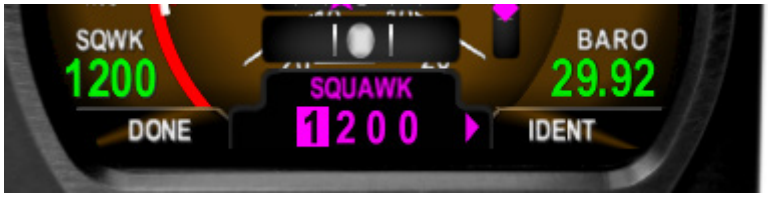


Figure 62: Squawk Overlay Push-Set Menu

5.12. Brightness Menu

Brightness adjustment is quickly accessed using the button labeled HLD BRT on the case. The brightness menu is activated by pressing and holding the lower right button until the brightness option appears.

Figure 63: Brightness Menu

The MODE button toggles between AUTO BRT (automatic brightness mode), and MANUAL BRT (manual brightness mode). Automatic brightness mode is the default setting on power up.

When in manual brightness mode, rotate the center knob to adjust brightness from 0 to 100. When in automatic brightness mode, the AV-30-E automatically adjusts the screen brightness to match ambient light levels detected by the bezel-mounted photocell in the lower left.

Press DONE to exit the menu.

6. User Interface and Font Style Options

Three different cosmetic styles and two different fonts are selectable by the pilot. The three UI styles are LEGACY, EFIS and VINTAGE. The two font selections are ARIAL and LCD.

Figure 64: UI Style Options

These settings only affect the displayed colors and font style. All functional operations are identical regardless of style settings.

7. Alerts and Alert Limits

The AV-30-E supports flight envelope, altitude, and carbon monoxide alerts when configured accordingly.

7.1. Airframe Envelope Alerts

Flight envelope alerts provide both visual and aural alerts on the AI mode only.

- Excessive Bank Angle Alerts.
- Excessive G-Load Limit Alerts.
- Excessive Angle of Attack (AoA) Limit Alerts.

Figure 65 shows an example how the visual alerts are displayed.

Figure 65: Example of Alert Annunciator on Screen

The priority and warning / alert levels, from the lowest priority to the highest priority are found in Table 8.

Type	Priority	Percent	Aural	Visual
Roll	7	100%	“Roll”	
AoA	6	80%	One Tone	
AoA	5	90%	Two Tones	
AoA	4	100%	“Check Angle”	
G Limit	3	80%	One Tone	
G Limit	2	90%	Two Tones	
G Limit	1	100%	“G Limit”	

Table 8: Alert Types and Priorities

The thresholds for each alert are pilot adjustable, and each alert type can be independently enabled or disabled.

NOTICE

Pressing the center knob when an alert is active will clear alert.

7.2. Altitude Alert

The Set Altitude alert is aural and visual. Achieving the Set Altitude is signaled by the Set Altitude text display changing from white to green. Green indicates that the barometric corrected altitude is within ±100′ of the Set Altitude. The text flashes yellow and a double beep audio alert is generated when the aircraft reaches an altitude within ±200′ of the Set Altitude. A double beep is also generated when departing more than ±200′ from the Set Altitude.

In order to minimize nuisance alerts, The double beep will not recur unless the altitude differs by more than ±400′ from the Set Altitude after which, re-achieving the Set Altitude will again cause a double beep.

7.3. Carbon Monoxide Alert

When configured with an AV-Link and a Sentry ADS-B receiver, the AV-30-E will display Carbon Monoxide status and alerts.

Carbon Monoxide (CO) Status is an overlay that is pilot selectable. It will display “OK” for CO levels below 75ppm. At CO Levels between greater than or equal to 75ppm the numerical level will be displayed in yellow. At CO levels greater or equal to 200ppm the numerical level will be displayed in red and a red alert will appear in the center of the AI. This alert may be dismissed by pressing the center knob.

The CO alert will trigger even if CO is not currently displayed as an overlay. The CO alert is not user configurable.

7.4. Attitude Miscompare Alert

When multiple AV-30-E are connected to an AV-HSI, the AV-HSI continuously compares the attitude solution on each AV-30-E and will alert the pilot if the attitude solutions disagree by more than 8 degrees of pitch or 8 degrees of roll.

This case will be annunciated on the AI with an alert “CHK ATTITUDE” and an audible double beep.

This alert informs the pilot that the attitude solution may not be correct and that they should maintain a diligent cross-scan and use partial-panel techniques or visual reference to conclude the flight.

Nuisance alerts may require gyro calibration. See the *AV-30-E Installation Manual UAV-1004234-001* for details. This alert may be disabled in the Installation Menu under the State Sync submenu.

8. Internal Battery Operation

8.1. General

The internal battery consists of a rechargeable battery system with automatic recharge, self-test, and power switching capability. The internal battery capacity will provide approximately 2 hours of operation at standard temperatures and 30 minutes (minimum) of operational capacity over the operational temperature range.

8.2. Battery Transition Logic

The AV-30-E uses airspeed and aircraft bus voltage to manage the battery system.

8.2.1. Power-On Self-Test (Pre-Flight)

On powerup, the battery charge status will show “TEST” in amber. During this process, an internal load is applied to the battery to determine general capacity capability. If the battery fails this self-test, the charge status field will show “FAIL” in red, and no battery capability will be available.

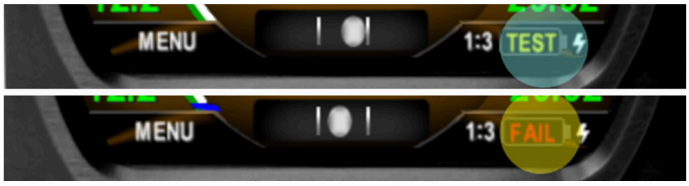


Figure 66: Battery Test Indicators

NOTICE

If the battery status shows “FAIL,” departure into actual or planned IFR conditions must not be performed.

8.2.2. Power Loss, Airspeed Above 40 Knots (In-Flight)

When in flight and the bus voltage drops below 7 VDC, the unit will automatically transition to internal battery operation; no pilot action is required for continued operation.

The “ON BATTERY” annunciation will be displayed:

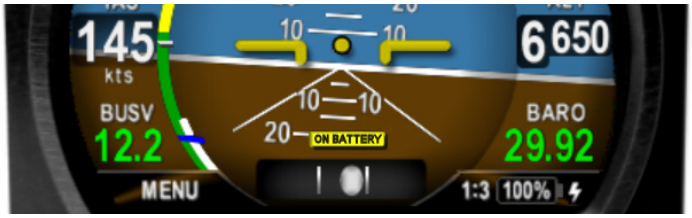


Figure 67: On Battery Operation

If bus voltage returns, the unit will automatically transition back to aircraft bus power; no pilot action is required. The “ON BATTERY” annunciation will extinguish.

8.2.3. Power Loss, Airspeed Below 40 Knots (On-Ground)

When on ground and the bus voltage drops below 7 VDC, the unit will initiate a shut-down sequence. This is the normal “on-ground” shutdown method. Pilot may discontinue the shutdown with any knob or button push.

If bus voltage returns, the shutdown sequence will automatically discontinue, and the unit will return to normal operating mode.

If bus voltage is not returned and the unit remains on, it can be shut down by pressing and holding the left and right buttons until screen goes black.

8.3. Battery Charge Status

The battery charge state is shown in percentages from 0 to 100. An internal battery charger will re-charge the battery if bus voltage is above approximately 10 VDC. The battery charge icon (presented adjacent to the battery charge state), will be illuminated during the charge cycle as shown in Figure 68.

Figure 68: Battery Charge Status

It is normal for the battery charge icon to intermittently flash during the battery charge cycle.

NOTICE

Prior to use in IFR conditions, the battery should be charged to 95% or greater.

9. AoA Operation and Configuration

The following provides a description of how the derived Angle of Attack (AoA) operates and presents the corresponding AoA information to the pilot.

One of the main advantages of an AoA system is that it can provide an early indication of a stall, bringing enhanced awareness to the pilot.

NOTICE

The AV-30-E system is supplemental in nature and does not replace the functionality provided by the aircraft's existing stall warning system.

9.1. Operational Methodology

Angle of attack is determined by comparing aircraft pitch to the aircraft flight path angle through the air. In level flight this directly corresponds to the angle at which the wing is intercepting the body of air surrounding the aircraft, correlating to the current AoA.

Pitch is determined by the precision internal AHRS and flight path angle is determined by air-data based airspeed versus vertical speed measurements.

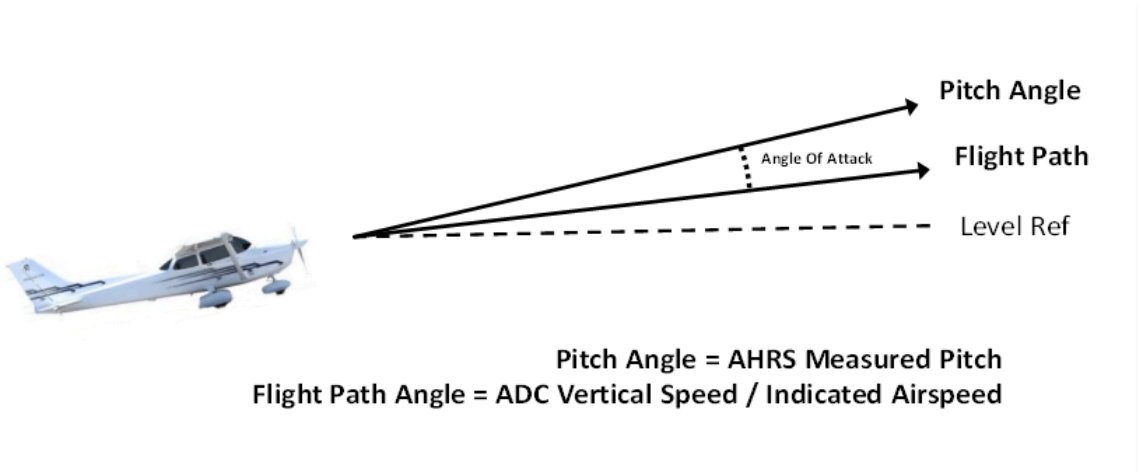


Figure 69: AoA Computation

As an example of this relationship, during a climb, if the pitch angle is 10 degrees upward, and the aircraft's flight path through the air (forward airspeed and vertical speed) is also 10 degrees upward, the equivalent AoA is 0 degrees. If, however, the pitch angle is 10 degrees upward, and the aircraft's flight path through the air is only 5 degrees, this corresponds to a positive 5-degree AoA.

A second example is where the pitch is 0 degrees, but the aircraft is descending. The AoA is then equivalent to the descent angle, which will be a negative AoA.

9.2. Configured Limits

As each aircraft make and model has different flight characteristics and post-production modifications such as altered wing tips, performance kits and other related modifications may change the flight dynamics of the aircraft, each aircraft has unique configuration limits that must be set for proper AoA operation.

An upper and lower configuration limit is pilot adjustable and provides the scaling mechanism for individual aircraft flight characteristics as it relates to the corresponding AoA display.

NOTICE

The setting of these configuration limits is implemented with a pilot-lockout feature that prevents inadvertent modification.

The upper near-stall configuration limit is set when the aircraft is in the “base-to-final” configuration with flaps and gear set to their normal positions for this maneuver. This provides the best protection when the aircraft is low-and-slow, and the pilot may inadvertently stall based on over-corrections.

- The upper limit is configured to coincide with the aircraft’s existing stall warning system and is typically on the order of 10 to 15 degrees. This visually correlates to the first red bar on the AoA display with the second (upper most) red bar providing indication for operation between the aircraft’s stall warning and actual stall point.
- A lower limit is configured to coincide with the AoA at which the aircraft flies under normal cruise conditions. This is typically on the order of 3 to 4 degrees. This visually correlates to the lowest one or two green bars on the AoA display.

The figure below shows how the configured upper and lower limits are mapped onto the color coded AoA indication.

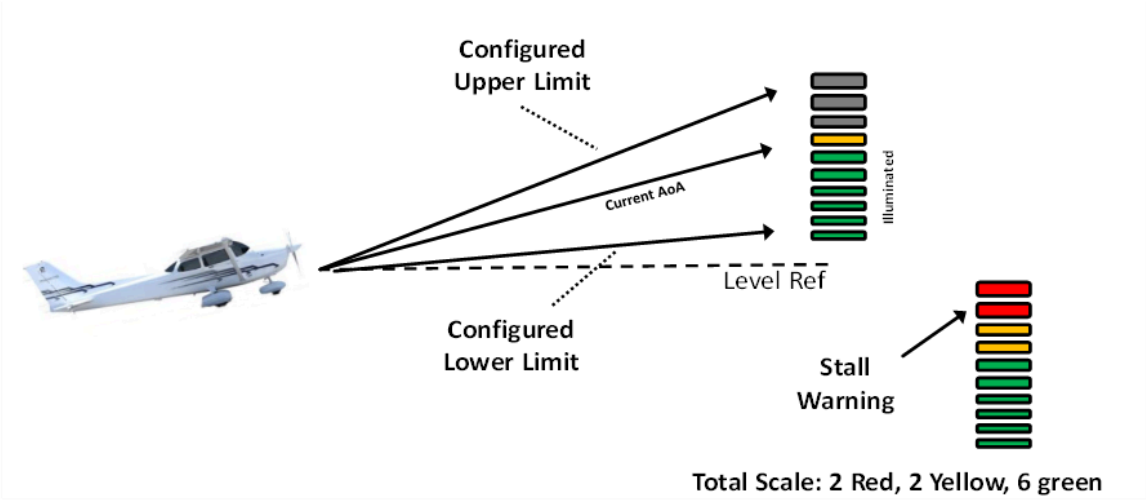


Figure 70: AoA Upper and Lower Limits

9.3. Stable Flight Conditions

Stable flight conditions should be present when determining the upper and lower AoA limits. The in-flight procedures described should be executed when there is minimal turbulence, minimal crosswinds, and the pilot should operate the aircraft as closely as possible to the following:

Stable power setting
± 5° Heading
± 5 Knots Airspeed
± 50 Feet Altitude
± 50 Ft/Min Vertical Speed

Any offsets beyond the parameters above may directly correlate with AoA errors.

9.4. Setting AoA Limits

Do this exercise with the help of a co-pilot or assistant who can observe and manipulate the AV-30-E while you concentrate on flying.

- Ensure the AV-30-E is in INSTALLATION MODE (see Section 10.2) before you take off.
- Set AOA HIGH LIM to 15 and AOA LOW LIM to 0 for starting values. Note that these values are in the SETUP menu not the installation menu.

- Select a safe altitude suitable for stalls, minimum 1,500 feet AGL and fly on a day with minimal winds.

9.4.1. Lower Limit

The AoA lower limit value is set so that the first green indicator lights up at V_A (Gross weight adjusted maneuvering speed).

- Fly at V_A, wings level with Flaps 0°
- If no green bars are showing, decrement the AoA lower limit value one or two at a time until the first green bar is fluctuating or solid. If more than one bar is showing, increment the limit.

9.4.2. Upper Limit

The AoA upper limit value is set so that the first red indicator lights up when the stall horn sounds.

- Fly a low speed, wings level stall with flaps 20°
- Start at V_{FE} then reduce speed at a rate of 1 knot per second while maintaining a constant altitude.
- Have your assistant watch the AoA bar graph display and note what level it shows when the stall horn sounds.
- If the bar graph does not show red at the time of the horn, the AoA range is too large so decrease the upper limit value by one or two.
- If the bar graph reaches red well before the horn, the AoA range is too small so increase the upper limit value by one or two.
- With the new setting, re-fly the stall and check its accuracy.
- Repeat until the indicator is matched to the stall horn.
- Check that the lower limit is still accurate.
- Note that if your aircraft is not equipped with a stall horn, other stall indications can be used, e.g. buffeting.

NOTICE

The minimum separation between low and high limits is 2

9.5. AoA Alert Types and Thresholds

Angle of attack alerts consist of both aural and visual alerts. Three alert levels are provided and are triggered on how close the current AoA is to the configured upper limit (as a percentage).

Level	Percent	Aural	Visual
Alert 1	80%	One Tone	
Alert 2	90%	Double Tone	
Alert 3	100%	“Check Angle”	

Table 9: AoA Alert Limits

When an alert is being generated, pressing any button will mute the alert. AoA alerts can also be completely disabled under the pilot preference settings.

NOTICE

If the AV-30-E is operating on battery power and the AoA is high, the normal shutdown rule for airspeed < 40 kts will be suspended to keep the indicator active in a low speed situation.

9.6. Flap Setting Observations

When the upper AoA limit is configured for the “base-to-final” flap setting, and the lower AoA limit is configured for the normal “cruise” flap configuration, the indicated AoA will vary from this baseline when flaps are configured for other phases of flight. The pilot should document the actual indications provided for the various phases of flight.

In Table 10, please highlight the actual AoA presentation for the indicated phase of flight.

Flap Setting	Flaps Up	Flaps Down
Pre-Stall		
Climb Vx		
Climb Vy		
Cruise		
Best Glide Speed		
Approach		
1.3. Vs		
1.2 Vs		
1.1 Vs		

Table 10: AoA Observations

10. Setup Menu

The setup menu allows customization of settings that are pilot-accessible. Installer-only related settings are found in *AV-30-E Installation Manual UAV-1004234-001*. Installation settings must be adjusted on the ground.

To access the Setup Menu, push the Menu button twice until the SETUP is shown in the lower window.

Figure 71: Setup Menu Access

Rotating the knob left and right will access the various parameters that may be configured.

Figure 72: AOA Alert Setting

Press and release the knob when the desired field is shown to adjust the associated setting. After adjustment, pressing and releasing the knob again will exit editing mode. Pressing DONE or a lack of user input for 30 seconds will exit the setup menu and return to the primary screen.

10.1. Pilot-Accessible Setup Menu

Table 11 contains all the setup menu settings.

Setting	Description	Options / Setting Range
UI STYLE	Sets Visual Style	LEGACY, EFIS, VINTAGE.
UI FONT	Sets Font Style	ARIAL, LCD.
G RESET	Rests the G Load Min and Max hold	PUSH TO RST
WIRELESS GPS	Enables or Disables ForeFlight as a Wireless GPS source	DISABLED, FOREFLIGHT
COURSE DEV	Enables course deviation on AI and DG ARC modes	DISABLED, ENABLED
GLIDESLOPE	Enables glideslope (when valid signals are received) on AI and DG ARC modes	DISABLED, ENABLED
AUDIO VOL	Audio Volume for Alerts	0 to 10.
AOA ALERT	Enable AoA Alerts	DISABLED, ENABLED.
AOA HIGH LIM*	Upper AoA Limit	−8 to 30.
AOA LOW LIM*	Lower AoA Limit	−10 to 28.
G ALERT	Enable G Load Alert	DISABLED, ENABLED.
G POS LIM	Positive G Limit	2 to 8.
G NEG LIM	Negative G Limit	−1 to −8.
ROLL ALERT	Enable Roll Alert	DISABLED, ENABLED.
ROLL LIM	Roll Alert Threshold	30 to 80.
TURN COORD	Sets the depiction used for turn coordinator – rate of turn or standard rate bank angle	TURN RATE, BANK ANGLE
MIN VOLT	Minimum voltage threshold. Below this number the BUSV indicator will turn red, indicating a charging system problem	10.0 to 32.0
MAX VOLT	Maximum voltage threshold. Above this number the BUSV indicator will turn red, indicating a charging system problem	10.0 to 32.0
TRAK STAB	Inertial Track Smoothing	DISABLED, ENABLED.
HOURS	Lifetime hours of operation	For reference.

Table 11: Setup Menu Settings

NOTICE
(*)AoA limits cannot be changed unless installation mode is enabled. The high and low limit ranges are interdependent.
AoA limits are locked out during normal operation to prevent inadvertent modification.
To access these settings, activate the INSTALLATION MODE by pressing the center knob while initial power is being applied to the unit. See *AV-30-E Installation Manual UAV-1004234-001* for details. These settings are then available to be modified until the unit's power is cycled.
Also note that in installation mode, an additional Install Menu is available. The pilot should not make any changes to settings in the Install Menu.

10.2. Non-Pilot Accessible Install Menu

The AV-30-E also includes an Install menu that is used for configuration. This menu should not be used in flight and should only be used by authorized individuals. Additional information about the Install menu can be found in *AV-30-E Installation Manual UAV-1004234-001*.

11. AV-Link

11.1. Overview

The AV-Link is an integrated Wi-Fi bridge that allows for communication between AV-30-E and Wi-Fi enabled devices.

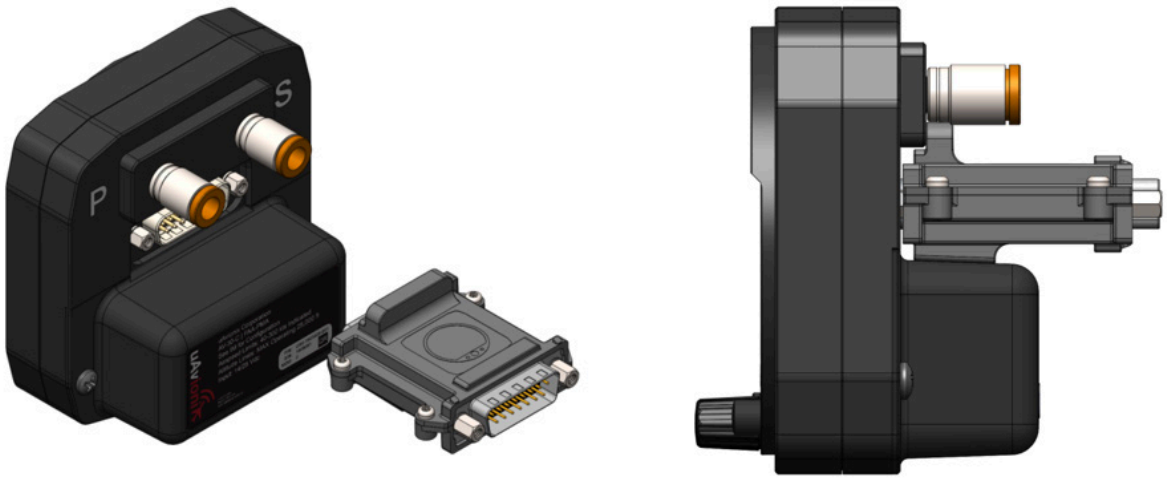


Figure 73: AV-Link Attached to AV-30-E

The AV-Link allows for the integration of portable ADS-B devices such as Sentry and Sentry Mini to provide ADS-B traffic and GPS to an AV-30-E. Software updates for the AV-Link and AV-30-E can be performed via the embedded web page. AV-Link configuration settings and device status are also accessible through the embedded web page.

When connected to a Sentry with a Carbon Monoxide (CO) sensor, the AV-Link will display CO status and alerts on the AV-30-E.

NOTICE

The AV-Link accessory is not powered by the AV-30-E internal battery. Wi-Fi traffic data provided to the MFD mode will be unavailable during a power loss.

If multiple AV-Link modules are installed in the aircraft, no more than two may be enabled.

11.2. Additional Required Equipment

AV-Link is designed to interface with an existing Wi-Fi capable ADS-B receiver and the AV-30-E display. To fully take advantage of the AV-Link, the following equipment is required:

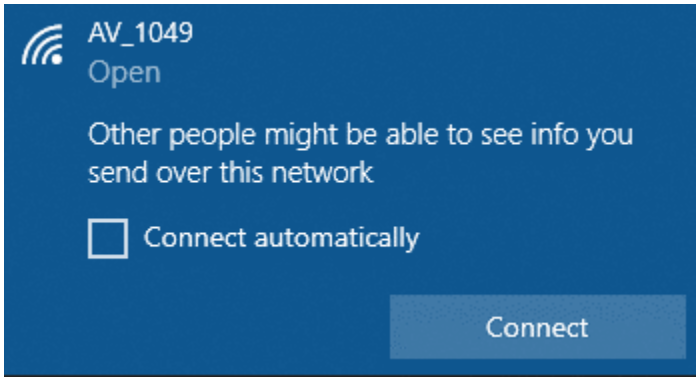
- AV-30-E Display
- ADS-B Receiver with GPS and Wireless capability

11.3. Connecting

Support for Windows, MacOS, iOS and other devices are supported, using the built-in web browser support on your computer. To connect to the AV-Link, configure your computer to connect to the AV-Link Wi-Fi connection.

1. Power the AV-Link by attaching AV-Link to AV-30-E to provide power. See *AV-30-E Installation Manual UAV-1004234-001* for details.

2. Once the AV-Link is powered, on your computer, connect to the AV-Link Wi-Fi hotspot, which will have a “AV_XXXX” SSID, where XXXX is a combination of alpha-numeric characters.



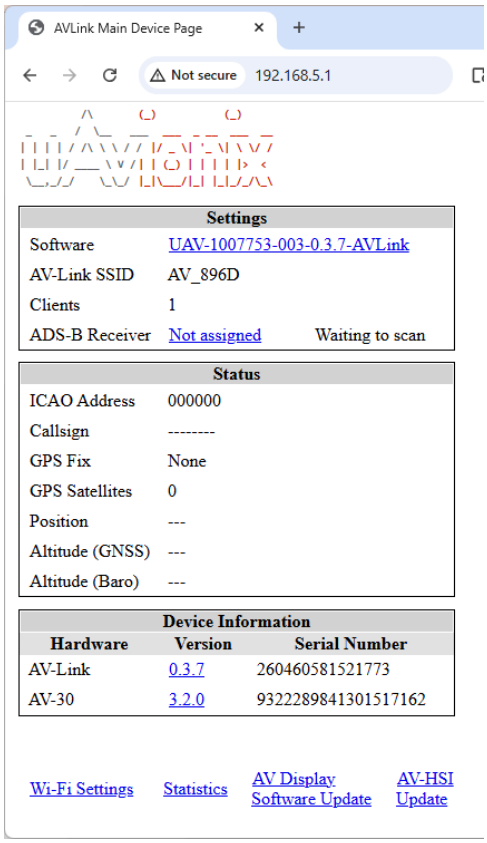
   If the AV-Link Wi-Fi network does not appear in your connection list, power cycle the AV-Link and check again. As of AV-Link version 0.3.2, the AV-Link Wi-Fi access point will turn off automatically after 5 minutes if no clients connect to it and there is no connected AV-30-E configured to interface with it. Power-cycling the AV-Link refreshes this timeout.

3. Once connected, use your web browser to navigate to 192.168.5.1. From there, you will see the AV-Link main web page.

11.4. Home Page

Note: Accessing the AV-Link web pages while in flight is not recommended and may disrupt normal operations of the AV-Link. All settings changes should be performed while on the ground.

The AV-Link main web home page provides both status information and methods to control settings. The screen is separated into three sections, the Settings, Status, and connected Device Information.



11.4.1. Settings

The settings panel contains information about the AV-Link. The software version, AV-Link SSID, number of clients connected to the AV-Link and information about any ADS-B receiver connected via Wi-Fi.

11.4.2. Status

When connected to an ADS-B receiver, information received such as the ownship ICAO address, callsign, GPS location information as well as the current altitude is frequently updated.

11.4.3. Device Information

Connected devices, such as the uAvionix AV-30-E display or the Sentry ADS-B receiver, will be shown with the device serial number and version, if available. When the device is disconnected, it is removed from this list.

If the AV-Link is attached to an AV-HSI, multiple connected AV-30-Es will appear in the device list. Use the DEVICE ID in the AV-30-E installation menu to identify devices in the list.

11.4.4. Navigating to Other Pages

Navigating to other AV-Link web pages is done using the web links at the bottom of the page.

Wi-Fi Settings is used to configure the AV-Link and ADS-B Wi-Fi settings, Statistics is used to provide access to real-time system statistics and AV Display Software Update is used to update a connected AV-30-E display with new firmware.

11.5. Wi-Fi Settings Page

The AV-Link Wi-Fi settings page provide a way for the user to configure wireless connections. The screen is separated into two sections, the main Wi-Fi settings for the AV-Link (upper) and Wi-Fi settings for connecting to a remote ADS-B receiver (lower).

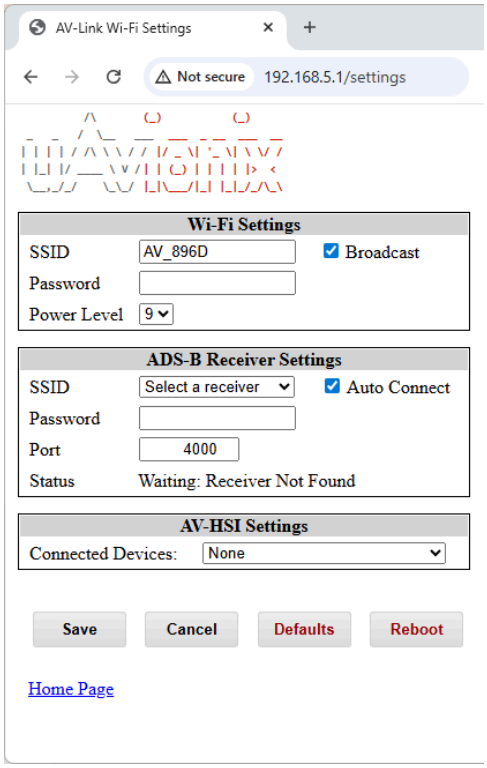


Figure 74: AV-Link Wi-Fi Settings

11.5.1. ADS-B Receiver Settings

SSID The AV-Link will automatically connect to any uAvionix manufactured ADS-B receiver.

If connecting to a different receiver, it is necessary to populate the Service Set Identifier (SSID) field with the name of the Wi-Fi network used by that receiver. If this value is set, the AV-Link will first attempt to connect to the named device.

When the AV-Link scans for available ADS-B receivers, the SSID drop down list is populated with the device names that it discovers.

If a custom ADS-B is desired, select ‘Enter a custom receiver’ and enter the name of the custom device.

If removing the custom ADS-B receiver is desired, select ‘Remove custom receiver’ and click Save.

AUTO CONNECT

By default, AV-Link will automatically identify preferred uAvionix ADS-B devices and connect to them, making the initial use very simple.

If AV-Link has been configured with a preferred device and the named device is not available and Auto Connect is checked, then AV-Link will attempt to connect to any of the preferred uAvionix ADS-B devices it discovers. Examples of these are:

- Sentry
- Sentry Mini
- SkyEcho
- echoUAT/echoALT
- skySensor

Unchecking Auto Connect will disable auto-discovery of uAvionix preferred ADS-B devices.

NOTICE

In order to preserve resources of an ADS-B receiver when there are multiple AV-Links in a cockpit, and because a connection to an ADS-B receiver is only required for use with the AV-30-E MFD, the AV-Link will not connect to any ADS-B receiver unless the MFD mode is enabled by setting the SERIAL 3 installation option to AVLINK.

PASSWORD

If password security is used on the ADS-B receiver, entering a password into this field and clicking on Save will set this password. The password must be a minimum of 8 characters to meet security requirements.

PORT

If the ADS-B receiver being used transmits GDL90 packets on a port that is different than 4000, entering the port number and clicking on Save will set this custom port. Valid values are 1-65535.

STATUS

This status reference will frequently update with the current status of the Wi-Fi connection to your ADS-B receiver.

AV-HSI Settings

The AV-Link can be connected directly to an AV-30 or directly to an AV-HSI. If connected directly to an AV-HSI, specify this connection here.

12. Autopilot

The AV-30-E can control select autopilots using the following interfaces:

- Digital heading, altitude, and vertical speed using RS-232
- Digital heading, course, and altitude using ARINC 429 with the AV-HSI
- Analog heading and course using the AV-APA

RS-232 may be used to control a BendixKing xCruze / AeroCruze 100 / TruTrak Vizion (385 and PMA) or a Trio Pro Pilot autopilot. Heading, Set Altitude and Set Vertical Speed, and Autopilot Mode are selected on the AV-30-E and sent to the autopilot via a serial link.

When configured with the AV-HSI, ARINC 429 may be used to control a BendixKing xCruze / AeroCruze 100 / TruTrak Vizion (385 and PMA) or a Trio Pro Pilot autopilot. Heading, OBS, Set Altitude, and Autopilot Mode are selected on the AV-30-E and sent to the autopilot via the AV-HSI.

With the optional AV-APA installed and configured, the AV-30-E can be used to control S-TEC 20/30/40/50/55/60-2 autopilots. Heading modes are selected on the AV-30-E and sent to the autopilot through the AV-APA. The AV-30-E does not provide vertical guidance to analog autopilots connected to the AV-APA.

12.1. Autopilot Modes

Depending on your autopilot configuration, up to six autopilot modes available in the PUSH-SET menu.

Autopilot indications were updated in software version 3.2.0. If your AV-30-E is using a prior version, consider upgrade or reference a prior verion of this Pilot’s guide.

The direction being commanded to the autopilot is displayed as a hollow bug. A hollow cyan bug indicates an autopilot mode that is tracking against a DG heading. For example, following a heading bug.

Figure 75: Hollow Cyan Autopilot Bug

A hollow magenta bug indicates an autopilot mode that is tracking against a GPS-based ground track. For example, GPSS or Track Bug.

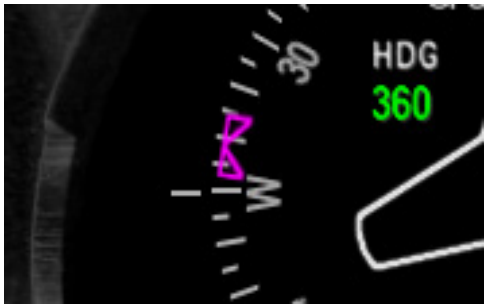


Figure 76: Hollow Magenta Autopilot Bug

If the current direction indicator is driven by DG heading but the autopilot mode is based on a GPS track, a short magenta track line will appear indicating the current track.

Figure 77: DG Heading Indicator on GPS Track Rose

Conversely, if the current direction indicator is driven by GPS track but the autopilot mode is based on DG heading, a short cyan heading line will appear indicating the current heading. ground track. For example, GPSS or Track Bug.

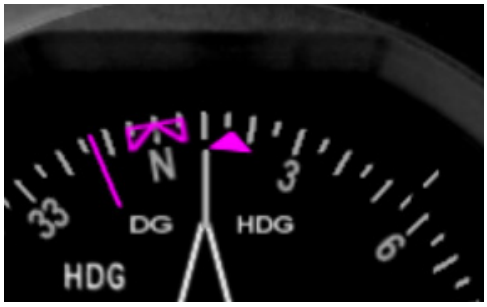


Figure 78: GPS Track Indicator on DG Heading Rose

Digital Autopilot using AV-HSI

If a digital autopilot is connected to the AV-30-E using the ARINC 429 interface of the AV-HSI, the following lateral modes are available:

- Off
- Heading Bug (HDG BUG)
- GPS Steering (GPSS)
- ForeFlight

Set Altitude (SALT) from the AV-30-E is sent to the autopilot. Vertical speed is controlled directly on the autopilot control head.

Digital Autopilot using RS-232

If the digital autopilot is connected directly to the AV-30-E using the RS-232 interface, the following lateral modes are available:

- Off
- Heading Bug (HDG BUG)
- Track Bug (TRK BUG)
- GPS Steering (GPSS)
- Waypoint Desired Track (WPT DTRK)
- Waypoint Bearing (WPT BRG)
- ForeFlight

Set Altitude (SALT) and Set Vertical Speed (SVS) from the AV-30-E are sent to the autopilot.

Analog Autopilot using AV-APA

If the analog autopilot is connected to the AV-30 through the AV-APA, the following lateral modes are available:

- Off
- Heading Bug (HDG BUG)
- Track Bug (TRK BUG)
- GPS Steering (GPSS)
- Waypoint Desired Track (WPT DTRK)

- Waypoint Bearing (WPT BRG)
- ForeFlight

Autopilot vertical guidance is controlled on the autopilot control head, independently of the AV-30-E.

When using the AV-APA, a red ‘NO AP’ flag will appear if the AV-30-E does not have the required data to support the selected autopilot mode. For example, the flag will appear if the pilot selects “WPT DTRK” but the GPS doesn’t have a next waypoint. The ‘NO AP’ flag will also appear if the AV-30-E loses communication with the AV-APA. Either case is an indication to the pilot that the AV-30-E and AV-APA are not providing valid direction input to the Autopilot.

12.1.1. Heading Bug

The autopilot will fly the heading specified by the heading bug, relative to the directional gyro indicated heading. This heading will not compensate for wind or gyro drift. The autopilot commanded heading is indicated by a hollow cyan bowtie.

12.1.2. Track Bug

The autopilot will fly the GPS track specified by the track bug. This is ground track and therefore compensates for wind. The autopilot commanded track is indicated by a hollow magenta bowtie.

12.1.3. GPS Steering (GPSS)

When using the GPS Steering autopilot mode the autopilot will join and track a GPS flight plan. Most WAAS capable GPS also provide autopilot guidance for holding patterns and course reversals.

When flying in any of the GPS-based autopilot modes, the autopilot guidance is displayed as a hollow magenta bowtie. An independent heading bug is still provided as a reference tool for the pilot.

GPSS mode requires the Advanced Autopilot Unlock.

12.1.4. Desired Track to Waypoint

The autopilot will fly the desired track, as specified by the GPS, to the next waypoint. If the aircraft is off course, this mode will result in the aircraft flying a path parallel to GPS magenta course line. The aircraft will continue flying on this desired track until the GPS sequences to the next waypoint, at which time the aircraft will begin a turn to the next desired track.

12.1.5. Bearing to Waypoint

The autopilot will fly the bearing to the next waypoint, as specified by the GPS, to the next waypoint. If the aircraft is off course, this mode will result in the aircraft flying a path directly to the next waypoint. The aircraft will continue flying this bearing until the GPS sequences to the next waypoint, at which time the aircraft will begin a turn to the next waypoint bearing.

12.1.6. ForeFlight

If using ForeFlight as a wireless GPS as described in Section 5.8.8.5, ForeFlight autopilot mode couples the autopilot to the route defined in ForeFlight.

ForeFlight autopilot mode requires the Advanced Autopilot Unlock.

12.2. Autopilot Control

Controlling the autopilot with the AV-30-E involves setting autopilot parameters on the AV-30-E and setting the autopilot control head to accept input from the AV-30-E.

Autopilot behavior varies by vendor. Below is general guidance on using the autopilot with the AV-30-E. Refer to documentation for your specific autopilot for additional details.

Trio Pro Pilot

When interfacing with a Trio Pro Pilot, the AV-30-E continuously sends heading bug and GPSS guidance. Use the H MODE button on the Pro Pilot to toggle between heading guidance, indicated as TRK on the Pro Pilot and GPSS, indicated as CRS.

Note that in ForeFlight autopilot mode the AV-30-E manipulates the heading bug output to follow the ForeFlight flight plan. Therefore, the Pro Pilot should be in TRK mode to couple the autopilot with ForeFlight.

Aerocruze/TruTrak

When interfacing with the Aerocruze, the AV-30-E sends either heading guidance or GPSS. The MODE button on the Aerocruze control head toggles the Aerocruze to accept guidance from the AV-30-E. To change between autopilot modes on the Aerocruze, first select the desired autopilot mode in the AV-30-E PUSH-SET menu and then use the MODE button on the Aerocruze command the Aerocruze to follow guidance from the AV-30-E.

If connected using the AV-HSI, the Aerocruze will annunciate EXT HDG or GPSS if receiving guidance from the AV-30-E. If connected directly to the AV-30-E using RS-232, the Aerocruze will annunciate SKYVIEW if it is receiving guidance from the AV-30-E.

S-TEC

When interfacing with an S-TEC autopilot, the AV-30-E and AV-APA emulate a heading bug signal from a traditional mechanical DG or HSI.

Set the S-TEC control head to accept signal from the AV-30-E, by setting the S-TEC to heading mode, regardless of the autopilot mode set in the AV-30-E. The AV-30-E produces the more advanced GPS autopilot modes by automatically manipulating its heading bug output signal.

Approach and nav modes on the S-TEC will continue to function, but this behavior operates independently of the AV-30-E. These modes are supported by a direct connection between the navigation source and the S-TEC, without the AV-30-E’s involvement.

12.2.1. Selecting Heading

- In AI mode, push and release the center knob multiple times until ‘HDG BUG’ appears
- In DG mode, either turn the center knob directly or push and release the center knob to bring up the ‘HDG BUG’ adjustment window
- Rotate the knob clockwise or counterclockwise to select the heading
- Push and release the center knob to advance to the next setting

12.2.2. Selecting Altitude

- Push and release the center knob to open the PUSH-SET menu
- Push and release the center knob until ‘SET ALT’ appears
- Rotate the center knob to set the desired SALT
- The SALT value displayed in the overlay field will change from white to green when the aircraft altitude reaches ±100’ of the SALT value
- Note that SALT has a default value of 5000’ on first use. On subsequent uses the AV-30-E will recall the last value entered

12.2.3. Selecting Autopilot Mode

- If not already on the ‘AUTOPILOT’ entry field, push and release the center knob until ‘AUTOPILOT’ appears
- Rotate the center knob to select the desired mode. The new mode is not engaged until you push and release the center knob
- If the knob is not pushed and released within 30 seconds, the menu window will be dismissed automatically, and the prior autopilot mode is retained

13. Stored Data Integrity Check

Configuration and calibration data stored in non-volatile memory is checked with Cyclic Redundancy Check (CRC) checksums on every power up event. If a data section is found to be corrupted, the user is notified at the power-up splash screen. In some cases, the corrupted values will be set to their defaults. Any additional restoration remedy varies with the type of data. See Table 12.

Message	Data Type and Description	Remedy
"WARNING: OVERLAY reset to defaults. Reconfig required."	Overlay settings. This data is used to determine which fields are active and which data are displayed in those fields.	User to reconfigure overlay fields on AI, DG, and CDI pages as per preference or installation log.
"WARNING: CFG reset to defaults. Reconfig required."	Configuration settings. Trim settings, page selection, AI/DG mode selection, function lock, etc.	Re-set configuration items as per recorded setting in the installation log. AV-Mag calibration, airspeed trim, and altitude trim are not affected.
"ERROR: F-CAL value check failure. Verify user calibration data."	Field Calibration. Magnetometer calibration, Altitude trim calibration, pitot-static zero-point setting.	If applicable, recalibrate: • magnetometer • altitude trim • indicated airspeed • re-zeroing of the pitot-static zero-point
"ERROR: PROV value check failure. Service required."	Provision settings. These are settings set at the factory.	Contact customer support. Cannot be reconfigured by the user.
"ERROR: Problem with calibration or bootloader. Factory service required"	Factory calibration values or Bootloader software. Software that launches the main software after power-up.	Contact customer support. Cannot be corrected by the user.

Table 12: Integrity Checked Data and Remedies

14. Operating Limits & System Specifications

Parameter	Value
Startup Time	< 3 Minutes
Attitude Rate Limit	±250 degrees per second
Attitude Operational Range	360° Roll, 180° Pitch
Attitude Accuracy	1° Static, 2.5° Dynamic
Airspeed Operational Range	40 to 300 kts
Altitude Operational Range	−1,000 to +25,000 ft
AoA Operational Range	−10° to +30°
AoA Resolution	1/10 of (Upper - Lower)
AoA Valid Speed Range	+25 to +300 kts
AoA Accuracy	2.5°
DALT Operational Range	−5400 to +35,700 ft
DALT Accuracy	± 500 ft
TAS Operational Range	+35 to +300 kts
TAS Accuracy	± 20 kts
G-Load Operational Range	± 8 g
OAT Operational Range	−40°C to +70°C
OAT Accuracy	±4°C
Bus Voltage Range	7 to 35 Volts
Bus Voltage Accuracy	±1.0 Volt

Table 13: Operating Limits

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