

RADIANT Angle of Attack (RAOA-022)

Panel-Mount Direct-Vane AOA Advisory Instrument

Technical Specifications / Operation

Last updated 8/25/2026 (rev. A) — firmware FW46

The RADIANT Angle of Attack (RAOA-022) displays live angle of attack from a direct-reading external vane sensor. AOA is presented three ways at once: a 16-segment color zone bar (green / yellow / red), a large digital AOA readout that changes color to match the active zone, and a live VANE angle readout with your calibrated STALL and CRUISE reference points displayed beside it at all times. A solid-tone aural alarm drives the included 110 dB external annunciator when AOA enters the critical alarm window beginning at the red zone. All information is presented on a single vivid color LCD.

1. Introduction

RAOA-022 is a panel-mounted, two-button AOA instrument for experimental, ultralight, and Light Sport aircraft. It reads a direct vane sensor and is calibrated on the ground, in a two-step process entered only at power-up (CRUISE reference, then STALL reference); from then on it presents AOA relative to those two points. RAOA-022 also includes a HUD display mode that flips the screen top-to-bottom for reflected / combiner installations. RAOA-022 is not TSO'd or NORSEE-approved and must be treated as an advisory aid only; do not use as a primary flight instrument or as a substitute for airspeed discipline and stall awareness.

2. What's in the Box

- Instrument head
- Carbon fiber shaft
- Sensor and vane assembly
- Fuselage mount adapter
- Leading edge adapter
- External 110 dB aural annunciator

What's Not Included

- 3' to 15' of 3-conductor cable, as required for installation location
- HUD film, if desired

3. Display & Indicators

- **Zone bar (center):** 16 vertical segments, filling upward as AOA increases. Green = normal range, yellow = caution, red = high AOA. The bar's upper segments flare wider toward the top for at-a-glance emphasis of the high-AOA region.
- **AOA readout (right, in bezel):** large digital AOA in degrees, referenced to your calibrated CRUISE point (CRUISE reads 0). The digits change color to match the active bar zone. Hidden automatically if the vane signal faults.

- **VANE readout (left, in bezel):** live vane angle in absolute degrees — a direct read of the sensor, always shown.
- **STALL reference (red, above VANE):** the vane angle you captured at SET HIGH during calibration, in the same units as VANE. Retained across power cycles; fixed until recalibrated.
- **CRUISE reference (green, below VANE):** the vane angle you captured at SET LOW during calibration, in the same units as VANE. Retained across power cycles; fixed until recalibrated.

STALL, VANE, and CRUISE together form a permanent sanity check: the live VANE number should sit near CRUISE in normal cruise flight and approach STALL as AOA increases. If the captured values do not look sensible for your aircraft, recalibrate.

- **MUTE / MUTED:** bottom row. Shows MUTED in blue while the aural alarm is muted.
- **DIM:** bottom row, labels the brightness control.
- **Part number / firmware:** RAOA-022 and the firmware revision are shown at the lower right.

4. Controls

- **Power switch (front panel):** immediate pilot ON/OFF control of the instrument and alarm.
- **Left (short press):** DIM — steps display brightness through 8 levels (...→7→0→1...). Brightness is not retained; the unit powers up at full brightness each time.
- **Right (short press):** MUTE — toggles the aural alarm mute. Mute is not retained; the unit always powers up unmuted, so a forgotten mute can never carry into the next flight. The bar and AOA readout continue to show red visually while muted.
- **Left (long hold, 2.0 s):** Day / Night theme toggle — swaps the display between dark-background and light-background themes. Retained across power cycles.
- **Both buttons held 5.0 s at power-up:** enters Setup (calibration) mode. See §6.
- **Left alone held 3.0 s at power-up:** toggles HUD display mode. See §8.

5. Installation

5.1 Instrument Head

The instrument head mounts in any standard 2-1/4" panel cutout. Slight trimming of the cutout is required to clear the power switch.

5.2 Power

Connect aircraft power to the red (+) and black (ground) leads, 9–16 VDC. The supply circuit must be fused or breakered; 500 mA is recommended.

5.3 Sensor Wiring

Connect the three marked wires (power, ground, and signal) between the AOA sensor and the instrument head. Use extension cable as required for your installation location — not supplied; plan for 3' to 15' of 3-conductor cable.

5.4 Annunciator

Plug the annunciator into the 3.5 mm jack. The annunciator may be mounted anywhere in the aircraft cabin.

5.5 Mounting the Vane Sensor

- **Leading-edge mounting (tractor aircraft):** use the leading-edge adapter with the carbon fiber shaft. Because the installation is experimental, we recommend checking with your aircraft kit manufacturer for allowable leading-edge mounting procedures. Run the three sensor wires from the sensor to the instrument.
- **Shaft length:** the 16" carbon fiber shaft may be shortened if desired. Cut with a hacksaw — since it is carbon fiber, expect the blade to be dulled. Longer shafts are better for reaching clean airflow.
- **Fuselage-side mounting (pusher aircraft):** use the fuselage adapter instead of the shaft and leading-edge mount. Glue the sensor assembly inside the adapter, then fasten the adapter to the fuselage.

5.6 Preparing for Calibration

Test fly the aircraft before calibration. In flight, mentally note the vane's position in cruise (it should be relatively flat) and at stall (typically a 15–30 degree different angle). Mark these spots mentally. Calibration itself is then performed on the ground, with the engine not running — hold the vane at each noted position using a helper or a piece of tape, and run the Setup procedure (§6).

6. Calibration (Setup Mode)

RAOA-022 must be calibrated to your aircraft before use. Calibration is performed on the ground, with the engine not running, and can be entered only during the power-up sequence — it is deliberately isolated from normal operation so settings cannot be changed accidentally in flight. Calibration captures two vane reference positions: the CRUISE reference (SET LOW) and the STALL reference (SET HIGH), at the positions you noted during your pre-calibration test flight (§5.6). Everything else — zone colors, the AOA readout, and the aural alarm window — is derived from these two points.

6.1 Entering Setup

- A new (uncalibrated) unit enters Setup automatically at power-up.
- A calibrated unit enters Setup by holding BOTH buttons from power-up for 5.0 seconds. The word SETUP is shown during the hold; releasing early boots normally.

Setup always displays in normal (non-HUD) orientation, regardless of the HUD mode setting.

6.2 SET LOW (Cruise Reference)

The SET LOW screen shows a live VANE reading and the prompt PRESS EITHER BUTTON TO SET LOW AOA – CRUISE. Hold the vane at the cruise position you noted in flight — with a helper or tape — then press and hold either button for 2.0 seconds. The reading is averaged over the full hold and saved. Release the button to advance.

6.3 SET HIGH (Stall Reference)

The SET HIGH screen works the same way: hold the vane at the stall position you noted in flight, then hold either button for 2.0 seconds. The averaged reading is saved and the instrument drops directly into normal operation.

There is no timeout in Setup — each screen waits indefinitely until a valid 2-second hold is completed. Releasing early simply resets the hold. Vane polarity (which direction the vane moves with increasing AOA) is detected automatically from the two captured points; no polarity setting is required.

6.4 Calibration Limitations

RAOA-022 stores one CRUISE/STALL calibration profile. It does not compensate for flap position or other aircraft-configuration changes; the stored calibration must be appropriate for the configuration in which the instrument will be used. Recalibrate after any movement or adjustment of the vane, shaft, or mount.

7. Aural Annunciator Alarm

The aural alarm is a solid, continuous tone on the external annunciator — no chirp pattern, no delay. It turns on the moment AOA enters the alarm window and stays on until AOA leaves it.

- Alarm window: from the start of the red zone through 10 degrees beyond the calibrated SET HIGH (stall) point.
- MUTE (right button, short press) silences the alarm; the display continues to show red. MUTED is shown in blue on the bottom row while muted.
- The alarm is always silent in Setup mode, with incomplete calibration, or during a vane signal fault.
- Two brief tones (approximately 500 ms each) sound at every power-up into normal operation, confirming the annunciator works. The self-test does not sound when booting into Setup.
- The annunciator connects to the instrument head through a 3.5 mm jack.

8. HUD Mode

HUD mode flips the entire display top-to-bottom for reflected / combiner ("heads-up") installations. To toggle: with the unit off, hold the LEFT button alone and apply power; keep holding for 3.0 seconds. The word HUD is shown during the hold. When the timer completes, HUD mode flips, is saved, and the unit continues into normal operation. Releasing early boots normally with no change.

- The setting is retained across power cycles. Repeat the gesture to toggle back.
- In HUD mode, the DIM and MUTE labels relocate to flank the top of the zone bar, matching the physical button positions in a HUD installation. Button functions are unchanged.
- Setup mode always displays in normal orientation, even on a HUD-configured unit.

9. Troubleshooting

- **Large AOA readout missing / bar not filling:** vane signal fault or incomplete calibration. Check vane sensor wiring; recalibrate (§6).
- **STALL / CRUISE values look wrong:** these display exactly what was captured at SET HIGH / SET LOW. Recalibrate at the correct reference positions.
- **Alarm sounds when not expected:** confirm the SET HIGH capture was taken at the correct reference position; the alarm window extends 10° beyond it. Use MUTE for temporary silence — remember it resets at power-up.
- **No alarm audio:** listen for the two power-up self-test tones. If absent, check the 3.5 mm annunciator connection. Confirm the unit is not muted.
- **Display upside-down / flipped:** HUD mode is toggled on. Hold LEFT alone for 3.0 s from power-up to toggle it back (§8).
- **Display too bright / dim:** Left short press cycles 8 brightness levels. Long-hold Left (2.0 s) toggles the day/night theme.

If problems persist, contact support@radiantinstruments.com with your order information and a description of the behavior.

10. Specifications (typical)

- Display: 3.2" color TFT LCD, 320 × 240, sunlight-readable, 8-level dimming, day/night themes
- Power input: 9–16 VDC; 150 mA typical (includes annunciator operation). Fused or breakered supply required; 500 mA recommended
- Sensor: balanced, ball-bearing-supported direct-reading AOA vane (included)
- Extension shaft: 16" carbon fiber (included); may be shortened during installation
- Mounting: leading-edge assembly and fuselage-side adapter for pusher aircraft (both included)
- Alarm: 110 dB external aural annunciator (included), 3.5 mm jack connection; solid tone, active from start of red zone through SET HIGH + 10°
- Calibration: two-point (CRUISE / STALL) ground calibration, entered at power-up; averaged 2-second captures, retained in nonvolatile memory
- Display modes: normal and HUD (top-to-bottom flip), retained across power cycles
- Controls: front-panel power switch; two buttons — DIM (Left short), MUTE (Right short), day/night theme (Left long 2.0 s), Setup (Both 5.0 s at power-up), HUD toggle (Left 3.0 s at power-up)
- Panel: standard 2-1/4" cutout
- Warranty: 3 years

Regulatory: Advisory use only. Not TSO'd / NORSEE-approved. Do not rely on RAOA-022 as a primary flight instrument.

11. Disclaimers

Products from Radiant Technology are not designed to be used in applications where their failure would endanger safe flight or human life in any way. They are intended solely for use in VFR conditions. They are not certified to meet any Technical Standard Order and are not produced under a Parts Manufacturing Authority (TSO / PMA). As a result, if permanently installed in the aircraft, they are suitable only for use in experimental and ultralight aircraft, and in Light Sport Aircraft, if meeting the requirements of the respective manufacturer. Specifically not for use as a primary display instrument in certified aircraft. An AOA indicator is an aid to stall awareness, not a replacement for it; always fly the aircraft within its published limitations.

12. Warranty

Your new Radiant Technology instrument carries a three-year warranty from the invoice date. Please contact us at support@radiantinstruments.com should your product need warranty service. There is an additional charge for international warranty service.

13. Return / Refund Information

Must be returned in new, uninstalled, resalable condition within 60 days after receipt. Ship to Radiant Technology, PO Box 20690, Wichita KS 67208.