

ELECTRONIC SAFE AND ARMING DEVICE (ESAD)

Operator Reference Manual

1. OVERVIEW

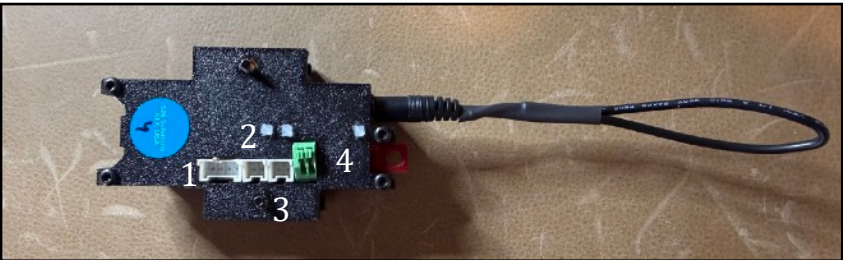
The 526 ESAD is an attritable, low-voltage hardware safety and arming device designed to control the firing of training payloads integrated with UAS platforms. It has two physical safeties before fully arming, an operator-egress countdown switch with different time options, and a selectable mission timer with different options that severs the electrical connection with the payload after the time expires to allow safe recovery of drone and payload if not expended in one way attack (OWA). Our ESAD can operate independently from or integrated with the onboard computer of the robotic mobility platform.

Physical Components



Fig. 1 (Left) - ESAD Components — clockwise from left - connectors, Safety #1 - Speaker Plug, ESAD top face with Safety #2 - Red Block, and battery door visible

Fig. 2 (Below) - ESAD Component assembled - Safety #1 and Safety #2 both inserted

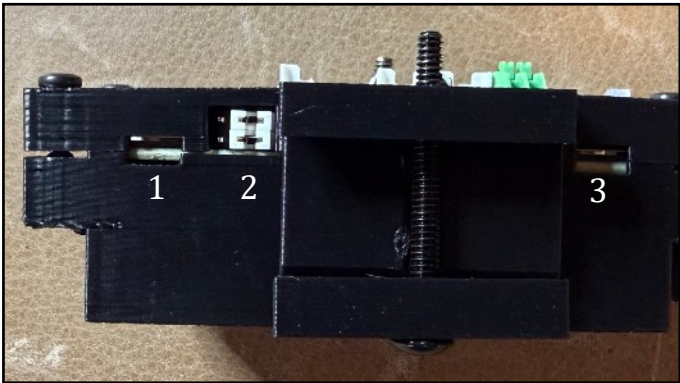


Component	Description
Safety #1 – Speaker Plug	COTS removable plug with pull loop. Must be inserted to enter arming sequence. Removal commits the selected mission timer and starts the egress countdown.
Safety #2 – Red Block	3D-printed polymer friction-fit block (no electrical contacts). Pre-seated on unit when issued. Removal transitions device from Stage 1 Armed to ARMED/FIREABLE. Final safety before live fire.
Mission Timer Switch	4-position selector on side face. Sets autonomous fire delay after Safety #2 removal. Must be set before Safety #1 is removed; locked once Stage 1 is entered. Positions: 1 = 10m, 2 = 15m, 3 = 20m, 4 = 30m.
Egress Countdown Switch	4-position selector on side face. Sets operator-egress window after Safety #1 removal. Positions: 1 = 10s (default), 2 = 20s, 3 = 30s, 4 = 60s.
Jumpers (J1 / J2)	Two-position jumpers on the side face. Configure power source and firing actuation mode. Default: Right/Right (fully self-contained 9V battery operation). See Section 4.

Component	Description
Connectors (1–4)	Five connectors on the panel face (left to right): FC I/O, External Fire Control, Pyro Output, Trigger Out. See Section 4.
Internal 9V Battery	Procell or equivalent 9V battery housed in integrated side-door compartment. Battery seats on a wired contact pad permanently connected to the PCB. Access via sliding side door.

LED SAFETY RULE: Any active Blue LED (blinking or solid) = system SAFE. Green LED on = system SAFE. Red LED on, Green off = ARMED.

Fig. 3 - ESAD Side View - 1) Egress Countdown Switch (10s (set), 20s, 30s, 60s), 2) Jumpers (Right/Right pictured), 3) Mission Timer Switch - 10m, 15m (set), 20m, 30m



2. SWITCH SETTINGS

Mission Timer Switch (4-Position)

Position	Timer Duration	Blue LED Blink Indicator (on Safety #1 insert)
1	10 minutes	1 slow blue blink per cycle
2	15 minutes (default)	2 slow blue blinks per cycle
3	20 minutes	3 slow blue blinks per cycle
4	30 minutes	4 slow blue blinks per cycle

Egress Countdown Switch (4-Position)

Position	Countdown Duration	Notes
1	10 seconds	Short-distance operations. Operator must be pre-positioned at safe distance BEFORE Safety #1 removal.
2	20 seconds (default)	Standard egress window for most UAS spin-up and launch sequences.

Position	Countdown Duration	Notes
3	30 seconds	
4	60 seconds	Extended egress for complex launch environments or longer required separation distances.

Fig. 2 - Egress Countdown Switch — 3-position selector. Default: position 2 (30 seconds).

3. OPERATING PROCEDURE

Follow each step in sequence. Re-inserting Safety #1 at any point before Safety #2 is removed returns the device to Initial State and resets both timers.

State	Description / Operator Action	LED Indication
INERT	No battery. Device fully inert. No power, no output. - Set Mission Timer Switch (1–4). - Set Egress Countdown Switch (1–4). - Verify Safety #2 (red block) is fully seated. - Slide battery door open, seat 9V battery on contact pad, close door.	All LEDs OFF
INITIAL STATE	Battery connected. Device SAFE. Cannot advance without Safety #1 inserted. - Insert Safety #1 (speaker plug) until it clicks. - Confirm blue blink count matches Mission Timer Switch position (1–4 blinks, 1s pause, repeating). - Confirm Egress Countdown Switch is set as intended.	GREEN solid BLUE rapid blink
ARMED STAGE 1	Safety #1 removed. Egress countdown begins (5s / 30s / 60s per switch). Blue solid + green solid during countdown. After countdown, blue extinguishes. Mission timer locked. - Remove Safety #1 (speaker plug). - Move immediately to safe distance from UAS — egress countdown is running. - Do not remove Safety #2 until at safe distance. <i>Re-insert Safety #1 at any time before Safety #2 removal to return to Initial State and reset timers.</i>	GREEN solid BLUE solid (countdown) then GREEN solid only
ARMED STAGE 2 (FIREABLE)	Safety #2 removed. All conditions for fire met. Green extinguishes. Red illuminates. Mission timer counting. - Confirm all personnel clear of target area. - Remove Safety #2 (red block). Device is now live. <i>Mission timer cannot be reset after Safety #2 removal. Battery disconnect is the only abort.</i>	RED solid GREEN OFF
MISSION COMPLETE	Mission timer expires. ESAD delivers 9V firing pulse to secondary charge, severing payload wires. Severed wires are visible from standoff distance as payload separation confirmation. Device returns to safe state. <i>No operator action required. Drone is recoverable. Reset via Safety #1 re-insertion.</i>	BLUE solid GREEN solid RED OFF

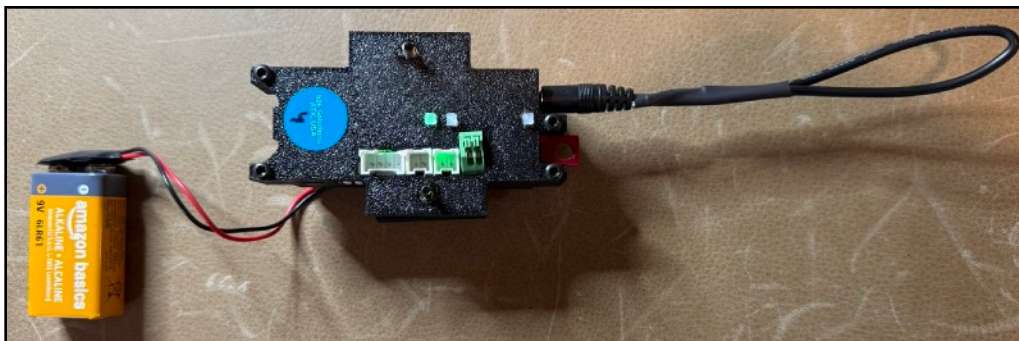


Fig. 4 - Initial State -
Green solid and blue
blinking - both safeties
inserted, power supplied

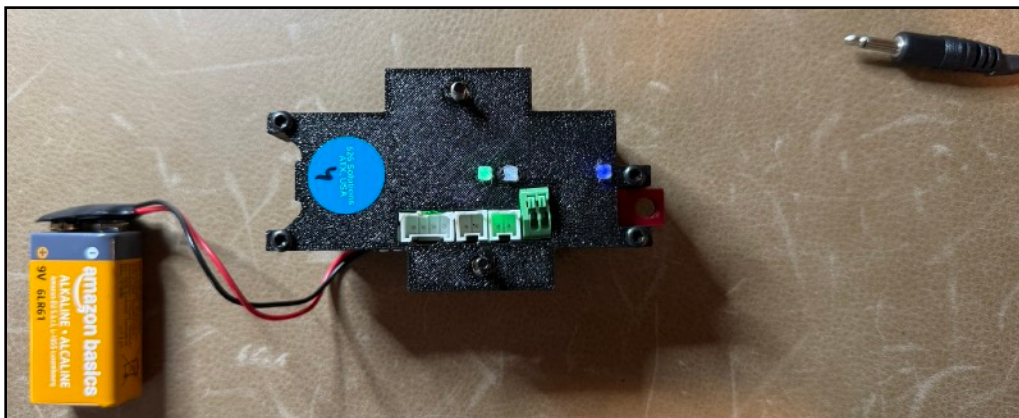


Fig. 5 - Armed Stage 1 -
Safety #1 removed, in
egress countdown in
progress, green solid,
blue solid

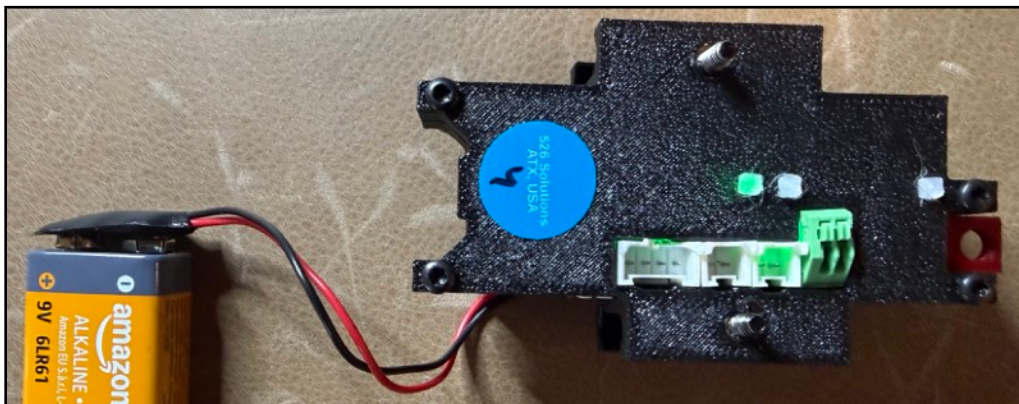


Fig. 6 - Armed Stage 1 -
Safety #1 removed,
egress countdown
complete, green solid
only

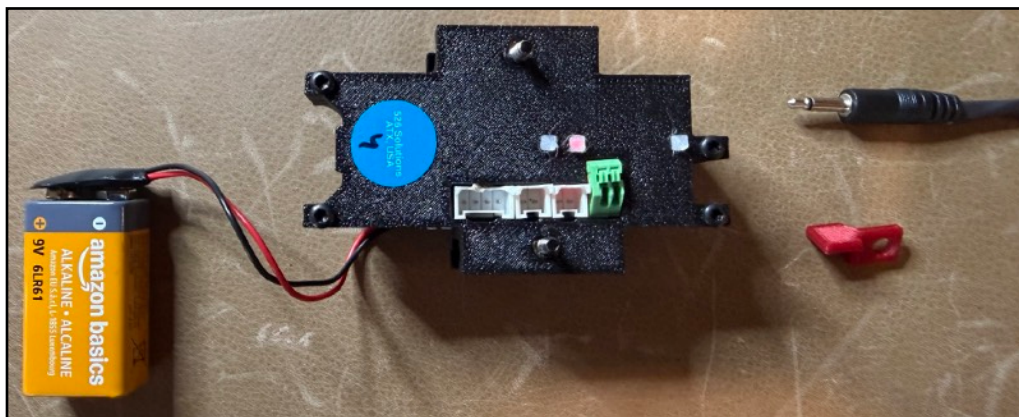


Fig. 7 - Armed Stage 2 -
Safety #1 removed,
Safety #2 removed,
egress countdown
complete, red solid

4. CONNECTORS, JUMPERS, AND SWITCHES

There are four connectors, two jumpers, and two selector switches on the faces of the ESAD.

Connectors (Left to Right, Green Connector on Right)

#	Connector	Pins	Pin Assignment (Left→Right)
1	Flight Controller I/O	4-pin	GROUND — ARM — FIRE — POWER
2	External Fire Control	2-pin (no switch)	FIRE — 5.0V
3	Pyro Output	2-pin	PYRO — GROUND
4	Trigger Out (GREEN)	2-pin	FIRE — GROUND

Jumper Configuration Matrix

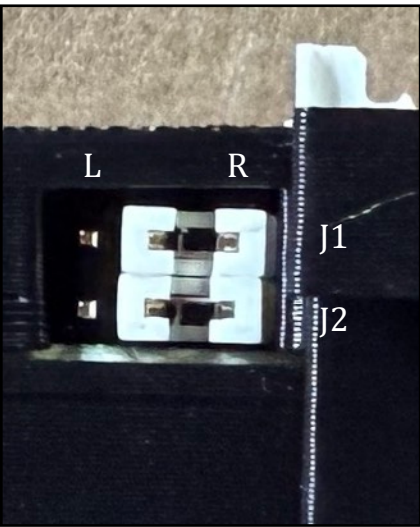


Figure 8 - J1 (Top/Row A): Left = FC Arm enable. Right = Pull-tab arm. J2 (Bottom/Row B): Left = Fire voltage from FC. Right = Fire voltage from 9V battery.

J1 (A)	J2 (B)	Power Source	Firing Actuation	Primary Use Case
Right	Right	9V battery (self-contained)	ESAD mission timer (autonomous)	DEFAULT — fully self-contained
Left	Left	Flight controller (PWM)	Flight controller (PWM command)	Full FC integration
Left	Right	Flight controller (PWM)	ESAD mission timer (autonomous)	FC power, autonomous fire
Right	Left	9V battery (self-contained)	Flight controller (PWM command)	Battery power, FC fire command

5. BATTERY

The 9V battery is housed in an internal compartment at the bottom of the ESAD accessible via a sliding side door. The battery seats on a wired contact pad permanently connected to the PCB — no external battery connector is required.

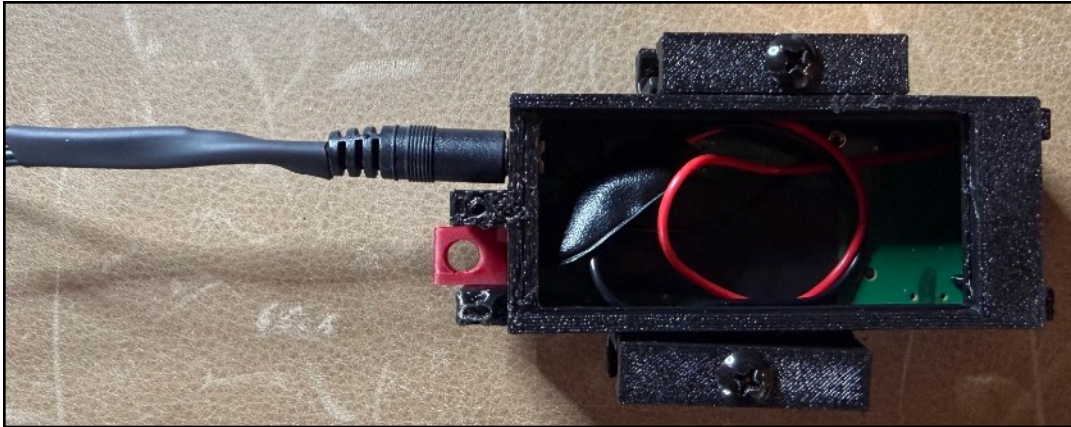


Fig. 8 - Battery door open with 9V pad



Fig. 9 - Battery door closed with screw closure on right

Battery Replacement Procedure

1. Ensure ESAD is in INERT state (Safety #1 and Safety #2 inserted) before opening battery door
2. Remove screw and slide battery door open on the side of the enclosure.
3. Remove spent 9V battery from internal contact pad.
4. Seat replacement 9V battery firmly on contact pad
5. Slide battery door closed until flush with enclosure face and screw back on
6. Verify green LED solid + blue LED rapid blink confirming power-on and INITIAL STATE.

Recommended battery: Duracell Procell 9V. Replace when green LED fails to illuminate at power-on.

6. MISSION RESET

To reset for a new mission without full battery replacement:

7. Re-insert Safety #1 (speaker plug). Device returns to Initial State; both timers reset.
8. Adjust Mission Timer Switch and/or Egress Countdown Switch if different settings are needed.
9. Re-seat Safety #2 (red block) if previously removed.
10. Confirm blue blink count matches Mission Timer Switch position, then proceed through arming sequence.

QUICK REFERENCE — Mission Timer: 1=10m 2=15m(def) 3=20m 4=30m | Egress Countdown: 1=10s 2=20s, 3=30s, 4=60s | Jumpers default: Right/Right