RC TECHNICAL SCRUTINEERING MANUAL: APPROVED BLINKY ESC INSPECTION GUIDE

Document Purpose: Official technical inspection manual and field reference guide for race directors, tech marshals, and scrutineers at sanctioned RC competition events (ROAR, IFMAR, EFRA, BRCA). This document provides exact protocols and visual/bench verification criteria to confirm that an Electronic Speed Controller (ESC) is operating in genuine **Zero-Timing "Blinky" Mode**.

1. Quick-Check Standard Operating Procedure (SOP)

Every vehicle entered in a spec/stock class (e.g., 21.5T, 17.5T, 13.5T, 1S 1/12) must pass the following **30-Second Scrutineering Flow** on the technical table before or immediately after a run:

STEP	INSPECTION PHASE	SCRUTINEER OPERATING PROCEDURE	PASS VERIFICATION CRITERIA	TECHNICAL OUTCOME
01	**Static Neutral Check**	• Transmitter powered **ON**, car powered **ON** (wheels off the ground) • Throttle trigger resting untouched at absolute neutral	Designated Blinky status LED is **FLASHING** steadily (or integrated TFT screen displays `ZERO TIMING`)	🟢 **PASS:** Proceed to Step 2 🔴 **FAIL:** Hold for Step 4 secondary audit
02	**Dynamic Drive Check**	• Apply gentle forward throttle (5–10% trigger pull) • Release trigger back to neutral position	• On throttle: Flashing LED turns **SOLID ON** (forward drive active) • On release: LED instantly resumes **FLASHING**	🟢 **PASS:** Dynamic circuit valid 🔴 **FAIL:** LED locked solid or non-reactive
03	**Wireless / Telemetry Audit**	• Inspect receiver and ESC data ports • Check radio throttle trim display	• Ensure **NO Bluetooth, Wi-Fi, or OTA dongles** are on the vehicle • Throttle trim is centered at absolute `0`	🟢 **PASS:** Hardware compliant 🔴 **FAIL:** Immediate disqualification if dongle present
04	**Disputed Bench Audit**	• Measure no-load free-rev RPM at 8.40V nominal • Connect official scrutineer program card	• Free-rev RPM within class ceiling (21.5T: ≤18,000 / 17.5T: ≤22,000 / 13.5T: ≤30,500 RPM) • Homologated firmware version & `Boost = 0°` / `Turbo = 0°`	🟢 **PASS:** Legal zero-timing approved 🔴 **FAIL:** Disqualified (Electronic Timing Detected)

> [!CAUTION] **Common False Failure — Radio Throttle Trim Offset:** If an approved ESC shows a solid LED instead of flashing at neutral, **do not immediately disqualify the driver**. Ask the driver to show the transmitter display: if Throttle Trim or Sub-Trim is set to +1 or -1 (or deadband is too narrow), the ESC senses an active throttle/brake command. Once trims are reset to absolute `0`, the LED must resume flashing. If it still does not flash, the unit fails tech.

2. Master Technical Scrutineering Reference Table

Use this master lookup table at the inspection table to instantly identify the model, expected LED behavior, and verify compliance:

MANUFACTURER	APPROVED MODEL(S)	NEUTRAL BLINKY INDICATOR	FORWARD THROTTLE TRANSITION	INSPECTION TYPE & PROTOCOL	SCRUTINEER NOTES & VERIFICATION
ABSIMA	Revenge CTS 10	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦🟥 Solid Blue & Red	⚖️ **Dual-Parameter Audit** CTS Program Box: Verify `Boost = 0°` and `Turbo = 0°`	Both Boost and Turbo parameters must read `0` on the CTS program box.
CORE RC	PACE 100RM 1s `[1S Pan Car Spec]`	🟢 **Flashing GREEN** (1 Hz pulse at neutral)	🟩 Solid Green	🔒 **Hardware-Locked** Physical Spec Audit: Electronic timing hardware physically omitted	1S LiPo spec ESC with built-in DC-DC step-up booster. Hardware-locked zero timing.
DUALSKY	850FT, 870FT	🔴🟢 **Alternating RED & GREEN** (Continuous dual flash)	🟩 Solid Green	📋 **Profile Audit** Dualsky Program Card: Confirm dedicated Stock Blinky profile loaded	Dedicated Stock profile. Distinct alternating dual-color LED flash pattern at neutral.
ELCERAM	Nitride, Oxide	🖥️ **Flashing LED + Screen** (Live color TFT display)	📊 Dynamic Bar Graph	🖥️ **Live Onboard Display** Integrated TFT Screen: Inspect live green `ZERO TIMING` badge	High-resolution color TFT screen prominently displays **"ZERO TIMING"** in green badge. No external programmer required.
HOBBYWING	Xerun XR10 Justock / Club SPEC `[Spec Stock / Club]`	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	🔒 **Hardware-Locked** Visual Spec Audit: Fixed zero-timing board; no timing menus exist	Timing circuits physically omitted from circuit board. Red LED blinks at neutral; Green LED turns solid at 100% throttle.
HOBBYWING	Xerun XR10 Stock Spec	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	📋 **Profile Audit** LCD Program Box: Parameter `1A (Profile)` set to `0 (Zero-Timing)`	Connect LCD Program Box: parameter `1A: Profile` must read `0 (Zero-Timing)`. Red LED blinks at neutral; Green LED blinks on throttle, solid at 100%.
HOBBYWING	Xerun XR10 Pro	🔴 **Flashing RED** (1 Hz pulse at neutral; pause pattern on ROAR FW)	🟩 Solid Green	📋 **Profile / Parameter Audit** LCD Box / App: Set to `Profile 0` or verify `Boost = 0°` & `Turbo = 0°`	Select `Profile 0 (Zero-Timing)` or verify both `Boost Timing = 0°` and `Turbo Timing = 0°`. Red LED blinks at neutral; Green LED solid at full throttle.
HOBBYWING	Xerun 120A / 60A-SD / Xtreme Stock	🔴 **Flashing RED** (At neutral with no-timing FW)	🟩 Solid Green	💾 **Firmware Hash Audit** USB PC Link: Query firmware string; verify `v508_No_Timing` or stock FW	Legacy competition platform. Must run official non-timing USB firmware (e.g. `V508_No_Timing`). Red LED blinks at neutral; Green solid at full throttle.
LRP	Flow X (TC Spec / Off-Road)	🔵 **Flashing BLUE** (1.3s pulse at neutral)	🟦 Solid Blue	💾 **Homologated Firmware Audit** USB Bridge / PC: Verify ROAR/EFRA stock firmware string `v4.1` or `v5.1`	Requires official competition stock firmware (`v4.1 Stock` or `v5.1 Stock`). Blue LED flashes every 1.30s at neutral in Boost 0.
LRP	Flow Works Team / Competition	🔵 **Flashing BLUE** (Continuous pulse in Boost 0)	🟦 Solid Blue	💾 **Firmware & Profile Audit** USB Bridge: Verify official `Boost 0` firmware loaded	Blue LED flashes continuously at neutral when Mode 5 and Mode 6 timing are set to 0.

MANUFACTURER	APPROVED MODEL(S)	NEUTRAL BLINKY INDICATOR	FORWARD THROTTLE TRANSITION	INSPECTION TYPE & PROTOCOL	SCRUTINEER NOTES & VERIFICATION
LRP	SXX Stock Spec v2 / Comp / TC	🔵 **Flashing BLUE** (Dual LED 1 & 2 pulse)	🟦 Solid Blue	⚙️ **Register Setup Audit** Mode Button: Verify `Mode 4 (Boost)` disabled; LEDs 1 & 2 flash	Mode 4 Boost turned off (`#1`). LEDs 1 and 2 flash at neutral.
MUCHMORE	Fleta Euro `[Euro Spec Stock]`	🟢 **Flashing GREEN** (1 Hz pulse at neutral)	🟩 Solid Green	📦 **Factory Spec Locked** Visual Model Audit: Purpose-built Euro spec; zero-timing firmware locked	Purpose-built Euro stock ESC. Non-timing firmware locked at factory. Green LED blinks at neutral.
MUCHMORE	Fleta Pro / Fleta Pro V2	🟢 **Flashing GREEN** (1 Hz pulse at neutral)	🟩 Solid Green	📋 **Profile Audit** Fleta Program Card: Select `Profile 1 (Blinky)` or set Boost/Turbo to 0°	`Profile 1 (Zero Timing)` loaded or Boost/Turbo set to 0°. Green LED blinks at neutral (Red flash indicates error).
NOSRAM	Comet HD, Pearl, HD	🔵 **Flashing BLUE** (Continuous pulse in Boost 0)	🟦 Solid Blue	💾 **Firmware & Profile Audit** USB Link: Sibling to LRP Flow; verify official `Boost 0` firmware loaded	German sister architecture to LRP Flow. Blue LED flashes steadily at neutral in `Boost 0` mode.
ORCA	OE1, OE101, OE1 Mark II	🔵 **Flashing BLUE** (Rapid 1 Hz pulse)	🟦 Solid Blue	📋 **Profile Audit** ORCA Program Card: Parameter `Program Mode` set to `Profile 0 (Blinky)`	Connect ORCA program card: verify `Profile 0` is selected. Rapid blue flash confirms compliance.
ORCA	OE1-1S `[1S Pan Car Spec]`	🔵 **Flashing BLUE** (Rapid 1 Hz pulse)	🟦 Solid Blue	📋 **Profile Audit (1S Spec)** ORCA Card: Confirm 1S booster profile set to `Profile 0 (Zero-Timing)`	1S 1/12 scale spec ESC with built-in booster. Verify `Profile 0` loaded.
ORCA	BP1001 BlinkyPro / OE1WLE `[Blinky Spec]`	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦 Solid Blue	📦 **Factory Spec Locked** Visual Model Audit: Purpose-built BlinkyPro hardware; non-timing firmware	Purpose-designed spec stock controller. Factory non-timing compliance; blinks blue out of the box.
ORCA	Totem Series (Stock / 15 / Pro) `[Club Spec]`	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦 Solid Blue	📦 **Factory Spec Locked** Visual Model Audit: Factory non-timing spec firmware pre-installed	Compact spec ESC. Pre-programmed non-timing firmware.
R1WURKS	Digital Super Stock	🟢 **Flashing GREEN** (Rapid pulse with pause)	🟩 Solid Green	📋 **Profile Audit** Wireless App / Card: Confirm zero-timing Blinky profile active	Zero-timing profile selected via wireless app or handheld programmer. Rapid green flash with pause.
R1WURKS	R1 Super LCG80	🟢 **Flashing GREEN** (Rapid pulse with pause)	🟩 Solid Green	📋 **Profile Audit** Programmer / App: Confirm zero-timing stock map active	Ultra-low CG stock controller. Flashes green with pause at neutral in zero-timing mode.
RC OMG	Polaris	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦 Solid Blue	🎛️ **Dual-Parameter Audit** Polaris LCD Card: Confirm `Boost Timing = 0` & `Turbo Timing = 0`	Boost Timing = `0` , Turbo Timing = `0` verified via Polaris LCD program box. Blue LED blinks at neutral; solid if timing active.

MANUFACTURER	APPROVED MODEL(S)	NEUTRAL BLINKY INDICATOR	FORWARD THROTTLE TRANSITION	INSPECTION TYPE & PROTOCOL	SCRUTINEER NOTES & VERIFICATION
REDS RACING	TX2	🟢 **Flashing GREEN** (0.42s pulse at neutral)	🟩 Solid Green	📋 **Profile Audit** REDS Program Box: Confirm Stock zero-timing profile loaded	TX2 platform. Green LED flashes (0.42s/flash) at neutral when in Stock non-timing mode.
REDS RACING	ZX Pro 160A	🔵 **Flashing BLUE** (0.66s pulse at neutral)	🟦 Solid Blue	🎛️ **Dual-Parameter Audit** REDS LCD Box: Confirm `Boost = 0°` & `Turbo = 0°`	ZX Pro platform. Blue LED flashes (0.66s/flash) at neutral with 0° timing advance.
REEDY	Blackbox 800Z / 1000Z / 600Z `[Spec Stock / Club]`	🟢 **Flashing GREEN** (Continuous pulse)	🟩 Solid Green	🔒 **Hardware-Locked** Visual Model Audit: "Z" designation indicates hardware-locked zero timing	"Z" series indicates factory hardware-locked zero electronic timing. Green LED blinks at neutral.
REEDY	Blackbox 510R / 410R / 610R	🟢 **Flashing GREEN** (Continuous pulse)	🟩 Solid Green	📋 **Profile Audit** PRO Program Box: Confirm `Profile 1 (Zero-Timing / Blinky)` is active	Connect Blackbox PRO Program Box: verify `Profile 1 (Zero-Timing / Blinky)` is loaded. Green LED blinks at neutral; solid on throttle.
ROCKET	TS160 V2 / V3	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	🎛️ **Dual-Parameter Audit** Surpass LCD Box: Verify `Boost = 0°` and `Turbo = 0°` (Profile 0)	Surpass/Rocket platform. Verify `Boost = 0°` and `Turbo = 0°` (Profile 0). Red LED blinks at neutral; solid Red if timing active.
SANWA	Super Vortex Gen2 / Gen2 PRO / Stock / Zero	🔵🟢 **Flashing BLUE** (+ solid Green if SSL active)	🟩🟦 Solid Green & Blue	⚙️ **Register Setup Audit** Card / Button: Verify `Mode 4 (Boost) = #1 (Disabled)`; flash Blue at neutral	`Mode 4 (Boost)` must be `#1` (Disabled). Flashes Blue (or solid Green + flashing Blue if SSL receiver connected).
SANWA	SV-D2 *(Cross-Flashed)*	🔵🟢 **Flashing BLUE** (Identical to Gen2 PRO)	🟩🟦 Solid Green & Blue	🔄 **Cross-Firmware Flash Audit** Firmware Query: Native drift FW (`D2104100`) does not blink; verify Gen2 PRO FW (`G2103002`)	Native drift FW (`D2104100`) does **NOT** blink at neutral. When cross-flashed with official Gen2 PRO FW (`G2103002`), it blinks identically to Gen2 PRO, achieving full Blinky compliance.
SKY RC	TS50 `[Club Spec]`	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	🧱 **Factory Spec Locked** Visual Model Audit: Molded plastic club spec ESC; factory zero-timing only	Molded plastic-case club spec ESC. Factory zero-timing firmware. Red LED blinks at neutral.
SKY RC	TS160 Pro V2	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	🎛️ **Dual-Parameter Audit** SkyRC Box / App: Confirm `Boost Timing = 0°` & `Turbo Timing = 0°`	Full competition ESC. Both `Boost Timing = 0°` and `Turbo Timing = 0°`. Red LED blinks at neutral; solid Red if timing active.
SKY RC	Toro 1s 120A `[1S Pan Car Spec]`	🔴 **Flashing RED** (1 Hz pulse at neutral)	🟩 Solid Green	📋 **Profile Audit (1S Spec)** Program Box: Confirm 1S ROAR-approved zero-timing profile active	Dedicated 1S LMP pan car ESC with built-in booster. Red LED blinks in zero-timing mode.

MANUFACTURER	APPROVED MODEL(S)	NEUTRAL BLINKY INDICATOR	FORWARD THROTTLE TRANSITION	INSPECTION TYPE & PROTOCOL	SCRUTINEER NOTES & VERIFICATION
TEAM CAYOTE	Crest X, Crest RS, Crest X Evo	🔵 **Flashing BLUE** (High-intensity pulse)	🟦 Solid Blue	📋 **Profile Audit** Xlink Box / BTUNE App: Confirm 32-bit zero-timing Blinky profile active	32-bit ARM Cortex-M4 architecture. Zero-timing Blinky profile selected via Xlink or BTUNE app.
TEAM POWERS	SportC, Mini Spec Radon `[Spec Stock / Club]`	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦 Solid Blue	🔒 **Hardware-Locked** Visual Spec Audit: Hardware-locked zero-timing; timing registers omitted	Dedicated club and mini spec ESCs. Hardware-locked zero-timing circuitry.
TEAM POWERS	Radon Pro, Radon Pro-C	🔵 **Flashing BLUE** (1 Hz pulse at neutral)	🟦 Solid Blue	📋 **Profile Audit** Radon Card: Verify `Profile 1 (Blinky)` or set Boost/Turbo to 0°	Select `Profile 1 (Blinky)` via Radon program box or verify Boost/Turbo registers are 0°.
TRACKSTAR	Sportsman `[Sportsman Spec]`	🔵🔴 **Flashing BLUE & RED** (Alternating pulse)	🟥🟦 Solid Red & Blue	🔒 **Hardware-Locked** Visual Spec Audit: Dedicated Sportsman spec; physical timing circuitry omitted	Spec stock ESC with physical electronic timing advance omitted from the PCB.
TRACKSTAR	TS160, GenII, GenII One Cell	🔵🔴 **Flashing BLUE & RED** (Alternating pulse)	🟥🟦 Solid Red & Blue	💾 **Firmware Hash Audit** USB Link / PC: Verify official ROAR-approved Blinky firmware flashed	Must be flashed with official ROAR Blinky USB firmware via PC software.
TRACKSTAR	Turbo	🔵🔴 **Flashing BLUE & RED** (Alternating pulse)	🟥🟦 Solid Red & Blue	💾 **Firmware Hash Audit** USB Link / PC: Must verify installation of official non-timing USB firmware	Requires official non-timing USB firmware flash to enable Blinky mode.
YOKOMO	BL-RPX3, BL-RPX4, BL-PRO4, BL-RS4	🟢 **Flashing GREEN** (Continuous pulse at neutral)	🟩 Solid Green	📋 **Profile Audit** RPX Programmer / Wi-Fi: Confirm `Program Mode 1 (Blinky)` selected	Connect RPX programmer or WiFi module: verify `Program Mode 1 (Blinky / Zero Timing)` is loaded. Green LED blinks at neutral.
YOKOMO	BL-R3	🟠 **Flashing ORANGE** (Continuous pulse at neutral)	🟧 Solid Orange	📋 **Profile Audit** YBP3 Programmer: Confirm zero-timing stock map active	Zero-timing stock map selected via YBP3 programmer. Flashes orange at neutral.

3. Brand-by-Brand Field Inspection Guides

1. Hobbywing Xerun Series

- **Blinky Indicator: RED LED flashes steadily** (approx. 1 blink per second; updated ROAR-approved firmwares feature a distinctive rhythmic blink with short pause). The **GREEN LED is completely OFF** at neutral.
- **Dynamic Throttle & Brake Check:**
  - **Partial Throttle (Acceleration):** Red LED turns OFF, and the **GREEN LED blinks** while the vehicle is moving forward.

  - **Full Throttle (100% Endpoint):** The **GREEN LED turns SOLID ON**.
  - **Braking:** Green LED blinks during braking, turning solid Green at full brake endpoint (if Max Brake Force is set to 100%).
  - When released back to neutral, the **RED LED resumes flashing**.
- **Illegal / Timing Active Condition:** If the **RED LED is SOLID ON** at neutral (instead of flashing), the ESC is running in normal/modified mode with timing advance (Boost or Turbo active).
- **Calibration Warning:** If the **GREEN LED flashes rapidly** at neutral with no throttle input, the ESC neutral throttle value does not match the transmitter signal (requires throttle recalibration, not Blinky).
- **Locked Models:** *XR10 Justock* and *Justock Club SPEC* cannot be programmed with timing advance; presence of a Justock chassis confirms compliance.
- **Programmable Models (XR10 Pro / Stock Spec):** If the Red LED is solid at neutral, connect the official Hobbywing LCD Program Box: parameter `1A: Profile` must be set to `0 (Zero-Timing)`, or both `Boost Timing` and `Turbo Timing` must read `0°` (and `Softening` = 0).

2. Sanwa Super Vortex & SV-D2 Series

- **Blinky Indicator: BLUE LED flashes steadily**.
- **SSL Indicator Note:** If connected to an SSL telemetry receiver (RX-472/482/491), the **GREEN LED is SOLID and the BLUE LED FLASHES**. If non-SSL, only the **BLUE LED flashes**. Both signify genuine Blinky Mode.
- **Illegal Condition:** If the Blue LED is **SOLID ON** at neutral, Boost is active (`Mode 4 = #2`). The driver must enter ESC setup (or Program Box) and set `Mode 4` to `#1` (Disabled).
- **SV-D2 Scrutineering Details:**
  - **With Native Drift Firmware (`D2104100`):** The SV-D2 does **NOT** blink its LED at neutral, regardless of parameter settings (it displays solid status LEDs typical of drift mode and is non-compliant for spec racing).
  - **With Gen2 PRO Firmware (`G2103002`):** When cross-flashed with the official Super Vortex Gen2 PRO firmware, the SV-D2 operates with full Gen2 PRO code and **blinks its Blue LED at neutral in the exact same way as a native Gen2 PRO** (flashing Blue, or solid Green + flashing Blue if SSL is active), making it fully compliant for Blinky scrutineering.

3. Reedy Blackbox Series

- **Blinky Indicator: GREEN LED flashes continuously** at neutral.
- **Dynamic Check:** When throttle is pulled, Green LED turns solid ON; when released, it resumes flashing.
- **Error Alert:** Simultaneous flashing of **Red & Green LEDs** indicates a motor sensor cable failure or connection error, NOT Blinky mode.
- **Locked Models (800Z, 1000Z, 600Z):** Hardware-locked zero-timing; no timing menus exist in the firmware.
- **Pro Models (510R, 410R, 610R):** Connect the Blackbox PRO Program Box: verify that `Profile 1 (Zero-Timing / Blinky)` is loaded (or Boost and Turbo timing registers are set to 0°).

4. LRP & Nosram Series

- **Blinky Indicator: BLUE LED flashes steadily** at neutral:
  - **Flow X:** Blue LED flashes rhythmically every **1.30 seconds** at neutral.
  - **Flow Works Team / Competition & Nosram Comet:** Blue LED flashes steadily at neutral in `Boost 0` mode.
- **Illegal Condition:** If the Blue LED is **SOLID ON** at neutral, timing advance (Boost) is active.
- **Firmware Verification:** LRP requires specific ROAR/EFRA approved firmware versions. If contested, connect the LRP USB Bridge to a laptop: verify firmware string reads `v4.1 Stock`, `v5.1 Stock`, or `Boost 0`.

5. ORCA Series

- **Blinky Indicator: BLUE LED flashes continuously** at neutral.
- **Dynamic Check:** When throttle is applied, Blue LED goes solid. At full throttle, a secondary red indicator confirms 100% endpoint.

- **Models (OE1, OE101, OE1-1S, Totem, BP1001):** BP1001 BlinkyPro and Totem Stock Spec are factory locked. For OE1/OE101, plug in the ORCA Program Card: verify `Profile 0` is active.

6. Muchmore Racing (Fleta Series)

- **Blinky Indicator: GREEN LED flashes continuously** at neutral in Blinky mode (`Profile 1` or Boost/Turbo = 0°).
- **Dynamic Check:** Green LED turns solid ON when throttle is applied.
- **Error Alert:** A **flashing RED LED** indicates a diagnostic error (sensor cable missing, motor connection fault, or receiver signal lost), NOT Blinky mode.

7. SkyRC & Surpass / Rocket (TS160 / TS50)

- **Blinky Indicator: RED LED flashes steadily** at neutral in zero-timing mode.
- **Illegal Condition:** If the **RED LED is SOLID ON** at neutral, Boost or Turbo timing is active.
- **Dynamic Check:** Green LED illuminates during throttle/calibration; 100% endpoint confirmed by solid Green/Red indicator.

8. Yokomo (RPX3 / RPX4 / BL-PRO4 / BL-RS4)

- **Blinky Indicator: GREEN LED flashes continuously** at neutral in Blinky mode (legacy BL-R3 flashes Orange).
- **Dynamic Check:** At neutral, Green LED blinks. On throttle application, Green LED switches to solid ON.
- **Programmer Check:** Connect the Yokomo Program Box or WiFi module: confirm `Program Mode 1 (Blinky / Zero Timing)` is selected.

9. Team Cayote (Crest X / Crest RS / Evo)

- **Blinky Indicator: High-intensity BLUE LED flashes** at neutral.
- **Dynamic Check:** Blue LED goes solid on throttle input.
- **Scrutineer Check:** If audited, the Cayote Xlink program box or the BTUNE smartphone interface will confirm "Zero-Timing Spec Active" with 0° advance.

10. Elceram (Nitride / Oxide)

- **Blinky Indicator:** Dual confirmation:
    1. Onboard status LED flashes continuously.
    2. The integrated **TFT color display** prominently reads `ZERO TIMING` in a green status badge.
- **Scrutineer Advantage:** Because Elceram ESCs carry their own color screen, scrutineers do not need an external box; inspect the screen directly on the car.

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4. Secondary Bench Scrutineering Protocols

If a vehicle's compliance is challenged, or if scrutineers conduct random post-race impound audits, execute the following technical bench tests:

Test A: Optical Bench Tachometer / Free-Rev RPM Test

Electronic timing advance works by dynamically advancing the motor stator commutation angle, which substantially inflates motor RPM under no-load conditions.

1. Place the vehicle on a secure chassis stand with drive wheels removed or suspended freely.
2. Connect a calibrated digital power supply or fully charged 2S LiPo battery at verified **8.40V terminal voltage** (or 4.20V for 1S pan cars).
3. Position an optical laser tachometer (or motor analyzer sensor) on the motor pinion/rotor.
4. Pull 100% full throttle for 3 seconds and record peak RPM.
5. **Evaluation Thresholds by Spec Motor Class (at 8.40V nominal / 2S LiPo):**

- **21.5T Spec Class (F1 / USGT / Club):** In zero-timing Blinky mode, free-rev RPM operates within **14,500 – 17,500 RPM** (legal scrutineering ceiling: **18,000 RPM** with maximum ~40°–45° mechanical can timing). Any reading exceeding **21,000+ RPM** indicates active electronic timing.
- **17.5T Stock Class (Stock TC / 2WD Buggy):** In zero-timing Blinky mode, free-rev RPM operates within **18,000 – 21,500 RPM** (legal scrutineering ceiling: **22,000 RPM** with maximum ~40°–45° mechanical can timing). Any reading exceeding **25,000+ RPM** indicates active electronic timing.
- **13.5T Super Stock Class (Super Stock TC / 4WD Buggy):** In zero-timing Blinky mode, free-rev RPM operates within **25,500 – 29,500 RPM** (legal scrutineering ceiling: **30,500 RPM** with maximum ~40°–45° mechanical can timing). Any reading exceeding **35,000+ RPM** indicates active electronic timing.
- *(Note for 1S Pan Car / 1/12 LMP @ 4.20V nominal: Divide RPM thresholds by 2; e.g., 13.5T 1S zero-timing ceiling is ~15,000 RPM).*

MOTOR CLASS (2S @ 8.40V)	TYPICAL KV RATING	LEGAL ZERO-TIMING RPM RANGE (0° ESC ADVANCE)	MAX SCRUTINEERING RPM CEILING	ILLEGAL BOOST/TURBO RPM SPIKE (>0° ADVANCE)	SCRUTINEER VERDICT
21.5T Spec (Formula 1 / USGT / Club)	~1,750 – 2,100 KV	**14,500 – 17,500 RPM**	**18,000 RPM**	**21,000 – 26,000+ RPM**	🟢 **PASS** if ≤ 18,000 RPM 🔴 **FAIL** if > 18,000 RPM
17.5T Stock (Stock Touring / 2WD Buggy)	~2,200 – 2,600 KV	**18,000 – 21,500 RPM**	**22,000 RPM**	**25,000 – 32,000+ RPM**	🟢 **PASS** if ≤ 22,000 RPM 🔴 **FAIL** if > 22,000 RPM
13.5T Super Stock (Super Stock TC / 4WD Buggy)	~3,100 – 3,700 KV	**25,500 – 29,500 RPM**	**30,500 RPM**	**35,000 – 44,000+ RPM**	🟢 **PASS** if ≤ 30,500 RPM 🔴 **FAIL** if > 30,500 RPM

Test B: Handheld Programmer Memory Audit

1. Impound the vehicle immediately as it leaves the driver stand. Do not permit the driver or mechanics to touch the car.
2. Plug the manufacturer's official programming box into the ESC data/receiver port.
3. Power the system on and verify:
   - **Firmware Version String:** Matches the approved ROAR / IFMAR homologated whitelist version.
   - **Timing Registers:** `Boost Timing = 0°`, `Turbo Timing = 0°`, `Timing Advance = 0°`.

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5. Physical Transmitter & Telemetry Scrutineering

[!WARNING] **International Rule Warning (ROAR Rule 8.4 / IFMAR Section 5 / EFRA 5.3):**

- No dynamic remote adjustments of ESC parameters, throttle curves, or motor timing from the transmitter are permitted during a race heat or main.
- If a driver uses a radio system with real-time bidirectional telemetry tuning (e.g., Sanwa SSL with CODE AUX, Futaba S.BUS2, FlySky i-BUS):
    1. **Sanwa:** Mode 4 is physically isolated from SSL and cannot be defeated from the radio; however, if local track regulations mandate, scrutineers may require the `BATT/SSL` cable to be disconnected.
    2. **Wireless Modules:** Any external Bluetooth, Wi-Fi, or OTA programming dongle (Hobbywing OTA, Cayote BT-Link, Yokomo Wi-Fi) **must be physically removed** from the vehicle before placing the car on the starting grid. Leaving an active programming dongle in the car during a race is grounds for immediate disqualification.

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6. Official Scrutineering Checklist & Driver Pass/Fail Card

Technical Marshals Note: This section is formatted to start on a new page as a standalone document. Print directly for clipboard inspection or driver distribution.

INSPECTION STAGE	SCRUTINEERING PROTOCOL & INSTRUCTIONS	FIELD LOG & PARAMETERS	OFFICIAL VERDICT
Event & Class Log	Competition event details and category	• Event Name: `_____` • Date & Heat: `_____` • Racing Class: `[ ] 21.5T [ ] 17.5T [ ] 13.5T [ ] 1S` • Chassis Make/Model: `_____`	📋 **EVENT ENTRY**
Driver & Gear Identification	Record driver, transponder, ESC, and motor spec	• Driver Name: `_____` • Transponder / Car #: `_____` • ESC Make & Model: `_____` • Motor Turn / Stator Spec: `_____`	📋 **GEAR LOGGED**
Check 1: Static Neutral	Observe designated status LED at neutral throttle	Status indicator is **FLASHING** steadily (or integrated TFT screen shows `ZERO TIMING`)	`[ ] PASS` `[ ] FAIL`
Check 2: Dynamic Drive	Apply 10% forward throttle, then release to neutral	• Throttle applied: LED turns **SOLID ON** • Throttle released: LED resumes **FLASHING**	`[ ] PASS` `[ ] FAIL`
Check 3: Wireless / Telemetry	Inspect ESC programming port and transmitter trims	• Ensure **NO** Bluetooth / Wi-Fi / OTA dongles connected • Transmitter throttle trims set to absolute `0`	`[ ] PASS` `[ ] FAIL`
Check 4: Bench RPM Audit	(If contested / random audit) Optical tachometer at 8.40V	• Measured RPM: `_____ RPM` • Class Ceiling: 21.5T ≤ 18,000 / 17.5T ≤ 22,000 / 13.5T ≤ 30,500 RPM	`[ ] PASS` `[ ] FAIL`
FINAL TECHNICAL VERDICT	Post-race official sanction & sign-off	**[ ] APPROVED / PASS** **[ ] DISQUALIFIED** Inspector Signature: _____ Driver Signature: _____ Date: _____	🏁 **OFFICIAL**