# LED Logic

**1. System-Wide Synchronized States (Primary Use)**

* **Flashing Green (Harmonized):** All boards are operational, communicating, and nominal.
* **Solid Green:** Board-specific "ready" state (e.g., power board armed, recovery board standing by for launch detect).
* **Flashing Red:** Critical fault (e.g., CAN bus failure, sensor error, pyro continuity fault).
* **Solid Red:** Non-critical fault (e.g., SD card write error, secondary sensor offline).
* **Alternating Red/Green:** Initialization/boot sequence (helps diagnose boot order or hangs).

**2. Algorithm (Decentralized Sync)**

Each board runs this logic independently:

**On Boot:**

* Start a **randomized delay** (e.g., 10–100ms) to avoid all boards transmitting at once.

**During Operation:**

1. **Listen for Sync:**
   * If a sync message (0x100) is received within the expected interval (e.g., every 500ms), reset the local sync timer and flash the LED.
   * If no sync is received after a timeout (e.g., 600ms), attempt to send one.
2. **Transmit Sync (If Needed):**
   * If the board’s internal timer expires, it broadcasts a sync message with a +1 counter.
   * After sending, it waits for a **"cooldown" period** (e.g., 2x sync interval) before being allowed to send again.
3. **Collision Handling:**
   * If multiple boards send syncs close in time, CAN FD’s arbitration ensures only one wins.
   * Other boards will see the sync and suppress their own.