

Esterline R&D: UAV Application and Product Guide

LOW G-SENSITIVITY TCXOS AND OCXOS FOR STABLE TIMING UNDER VIBRATION, SHOCK, AND TEMPERATURE DYNAMICS

The UAV Timing Tree

TCXO/OCXO Reference → PLL/Synth Reference → IF/LO Generation → ADC/DAC Sampling → FPGA/SoC Processing

Key point: The UAV's RF carrier (MHz/GHz) is generated and translated by the RF chain (multiply/mix/convert). The crystal oscillator's value is determined by reference, IF, and digital clock requirements—not the carrier frequency itself.

Where Quartz Timing Is Used in UAV Systems

Quartz oscillators provide the stable time base used across RF and digital subsystems:

- PLL/synthesizer reference for LO generation and channel agility
- IF/local oscillator reference for down conversion and coherent IF processing
- ADC/DAC sampling clocks (converter SNR, spurs, and timing margin)
- FPGA/SoC/MCU clocking, networking, time-stamping, and synchronization

What Drives Oscillator Selection

- Phase noise & integrated jitter: impacts EVM, spectral regrowth, receiver sensitivity, and converter performance
- Stability vs temperature & supply: preserves timing across altitude and thermal transients
- Aging & holdover: frequency drift over time; affects long-duration accuracy and GPS-out performance
- g-sensitivity (ppb/g): frequency modulation from vibration/shock; a primary driver in flight platforms

Why This Matters in UAVs

- Dynamic flight environments punish timing. Vibration, rotor/engine harmonics, maneuver-induced acceleration, and shock can modulate frequency through g-sensitivity, converting mechanical energy into phase/frequency perturbations (added phase noise/jitter).
- Low g-sensitivity improves real-world performance. Reducing vibration-induced modulation provides a cleaner reference into the PLL and clock tree, improving repeatability in flight.
- GPS and synchronization benefit from stable references. A low-noise, stable local reference supports receiver tracking robustness and timing consistency under high dynamics and weak-signal conditions.
- GPS-denied operation elevates holdover requirements. A GPSDO disciplines when GPS is available and provides holdover when GPS is lost; higher stability (TCXO/OCXO) improves timing continuity during outages.

System-level outcomes: improved RF coherence and repeatability in flight; tighter holdover across temperature/altitude; more predictable navigation/communications timing; higher confidence in mission-critical operation.

Esterline R&D UAV-Focused Product Quick Pick

Part	Type	UAV Value	Package
LGT014	TCXO	Low g-sensitivity	14 × 9 mm
LGT500	TCXO	Low g-sensitivity	½ DIP
LGT900	TCXO	Low g-sensitivity + GPSDO	1 in ²
LGH350	OCXO	Low g-sensitivity + ultra tight stability	1 in ²
SCH300	OCXO	Ultra tight stability	25 × 22 mm SMD

Interested in optimizing your timing solution?

[Reach out to our team](#) for personalized guidance and expert recommendations.