

tBeacon Falcon - User Manual

Manual version 1.0

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What is tBeacon Falcon

tBeacon Falcon is an ultra-lightweight radio beacon for tracking birds (e.g., falcons). The beacon periodically transmits short "beeps" (CW pulses on carrier frequency), which the owner uses to locate the bird with a directional antenna and portable receiver.

Package Contents

- tBeacon Falcon beacon with installed spring and antenna
- Backpack (plastic base mounting part)
- Packaging: box with insert

Key Features

- Short CW pulses for reliable direction finding
- Adaptive period and power depending on battery status (period 1.5–5 s; power up to 100 mW)
- Powered by CR1/3N; power on/off by turning the cap
- CNC-anodized aluminum housing (black), threaded cap with gasket, IP67
- Compatibility with ready-made direction finders (Marshall) and radios with modified firmware (Quansheng UV-K5 with ARDF mod firmware)

Technical Specifications

- **Frequency:** 432–439 MHz. Default: 433.075 MHz (LPD Channel 1);
- **Signal:** CW pulses (unmodulated carrier)
- **Pulse duration:** 50 ms
- **Pulse period:** adaptive based on battery status, from 1.5 to 5 s
- **Peak output power:** adaptive based on battery status, up to 100 mW
- **Power supply:** lithium battery CR1/3N (3 V)
- **Operating time:** up to 7 days with fresh battery (may vary depending on conditions)
- **Antenna:** titanium rod ≈ 170 mm (1/4 wavelength); bending not recommended
- **Weight:** beacon 3.8 g without battery; battery ≈ 2.7 g; total ≈ 6.5 g
- **Dimensions:** $\varnothing 13 \times 30$ mm
- **Protection:** IP67 with undamaged gasket and properly tightened cap
- **Low battery indicator:** increased "beep" period (up to 5 s)

Compatibility

- Portable radios supporting AM/SSB reception in UHF range.
- Quansheng UV-K5 radio with ARDF mod firmware.
- Specialized direction finders Marshall, Ayama and similar.

Legal Information

- Use of radio frequencies, power, and transmission mode is regulated by local legislation.

- User is responsible for compliance with standards and terms of use.

Using tBeacon Falcon

Safety and Ethical Usage

- Recommended equipment mass ratio: total mass of beacon and mounting — up to ~5% of bird's mass.
- Monitor backpack fit: there should be no pressure on the chest or restriction of wing movements.
- Antenna is metal; use protective cap on the end if necessary. Be careful, protect your eyes.
- Bending the antenna is not recommended: this degrades radio communication and may damage the antenna.
- Do not use beacon on sick or injured birds without specialist consultation.
- Comply with local radio frequency and transmission power regulations. User is responsible for legality of use.

Installation on Bird (General Principles)

Backpack — plastic base part in which the beacon is secured by a spring. The specific method of mounting on the bird is chosen and performed by the user considering the bird species and their own experience.

Recommendations:

1. Inspect the mount for absence of sharp edges.
2. Adjust the fit: tight fixation without over-tightening and without restricting wing movement.
3. Observe the bird after installation at rest and in flight. Remove the beacon and reinstall if discomfort is observed.

Manufacturer is not responsible for choice and method of mounting on the bird.

Power On/Off

- **Power On:** insert battery, tighten cap completely. Battery will connect, pulses will begin.
- **Power Off:** unscrew cap until battery contact breaks.
- **Storage:** for long-term storage, slightly unscrew cap or remove battery.

Setting Working Frequency

If necessary, the beacon's working frequency can be changed using the procedure described below. Requires Quansheng UV-K5 with ARDF mod firmware or another radio with 1750 Hz calling tone support.

1. On the radio, set the desired frequency **within 432–439 MHz**.
2. **For ARDF mod:** Enter ARDF by pressing **0** and **enable 1750 Hz tone** by pressing **PTT**.
For other radios: start transmitting 1750 Hz calling tone.
3. Place the radio at a distance of about **1 meter** from the beacon.
4. **Power on the beacon.** During startup it "scans" **432–439 MHz** and when it hears a strong 1750 Hz tone, it **will accept the transmission frequency as working**.
5. After **~30 seconds stop the tone**. For ARDF mod - by pressing PTT again.

Search and Direction Finding

What you need: directional antenna (e.g., compact Yagi for 433 MHz) and receiver: Quansheng UV-K5 with ARDF mod firmware or another suitable direction finder.

Receiver setup:

- Set the required frequency. Default - 433.075 MHz.
- Reception mode: AM or SSB depending on your device; open squelch, reduce bandwidth to hear "beep" more clearly.
- For Quansheng UV-K5 ARDF mod simply enter ARDF mode by pressing **0**.

Method:

1. Slowly rotate the antenna in horizontal plane and listen for "beep". Maximum volume/indicator corresponds to direction toward the bird.
2. Use "shoulder method": slightly move antenna right/left from peak to distinguish main lobe from side lobes.
3. When approaching closely, reduce receiver gain or receive on back/side face of antenna to narrow maximum and avoid overload.
4. Take measurements from several points and mentally "triangulate" to identify search area.

Tips:

- In open terrain, orient by stable maximum.
- In forest and city, reflections are possible; recheck direction from another point.

Maintenance

- **Replacing CR1/3N battery:** unscrew cap, replace cell observing polarity. Use quality batteries.
- **Storage:** do not leave beacon powered on; for storage — slightly unscrew cap or remove battery.
- **Inspection:** periodically check all components for wear and damage.

Common Problems and Solutions

- **"Beep" not heard.** Check if beacon is powered on (cap tightened), battery freshness, correct set frequency, no receiver overload from strong nearby signals. Use frequency search mode on Quansheng UV-K5 ARDF mod.
- **"Beeps" became rare.** Likely battery discharge; replace cell.
- **Direction "jumps".** Reflections possible. Move and conduct series of measurements with direction averaging.

Working with tBeacon Falcon via Quansheng UV-K5 ARDF mod

Entry and Presets

- **Enter ARDF:** from normal radio mode **press 0**.
- **Exit:** EXIT .
- On entry, current radio frequency and presets are taken: **GAIN = 5, AM, beep enabled, bandwidth W.**

Display

- **Left:** vertical level scale.
- **Center:** large number **0...99** — relative RSSI level (99 = maximum, 0 = minimum).
- **Upper right:** history of **detected signal** level.
- **Lower right:** **running graph** of overall signal level (independent of detection).

Controls

1. **▲/▼ Gain (GAIN): 1...5;** 5 maximum.
2. **1 Frequency.** **▲/▼** buttons adjust by **1 kHz**; holding accelerates scrolling.
3. **2 Modulation:** A = AM, F = FM.

4. 3 **Beep on carrier detection:** + enabled, - disabled.
5. 4 **Bandwidth:** W 25 kHz → N 12.5 kHz → n 6.25 kHz.
6. * **Beacon search:** scan 420–440 MHz; upon completion radio **automatically tunes to found frequency** and returns to ARDF.
7. PTT (**push-to-talk**): transmit 1750 Hz tone; pressing again stops transmission.

Note: ARDF settings (frequency, mode, beep, bandwidth, gain) **are not saved** after power off.

Quick Search for Nearest tBeacon Falcon Frequency

Important: beacon must be in immediate proximity to radio.

1. In normal mode **press 0** to enter **ARDF**.
2. Press *. Radio will scan **420–440 MHz**.
3. When beacon is detected, frequency **automatically sets**, and radio returns to ARDF screen.

