

Ham Gaming

User Manual

Version 1.0.0

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Introduction

Welcome to Ham Gaming — a collection of friendly amateur-radio mini-games. Tap a game tile on the home screen to start; tap the back arrow to return to the list.

All games are short, gentle, and encouraging. They speak in your chosen language and reward correct answers with cheerful voice feedback.

What is Ham Gaming?

Ham Gaming is a sibling app to Ham Setting, Ham Logging, and Ham Learning. It ships with no telemetry, no accounts, and no required network connections.

Who is it for?

Anyone preparing for an amateur radio exam, sharpening their phonetic alphabet, practising Morse code, or just enjoying short brain-teaser sessions. Gentle enough for beginners; the Speed Drill can challenge experienced operators.

What's inside

Twelve games at launch: Phonetic Trainer (tap), Phonetic Voice (push-to-talk), Q-Code Quiz (tap), Q-Code Voice (push-to-talk), Morse Listen, Morse Send, Callsign Country, Speed Drill (mixed quiz), Follow That Satellite (turn yourself + tilt your phone), Prepare Your Gadgets (pack a scenario kit), Bands & Meters (match band names to frequency ranges), and Modes & Terms (CW, USB, APRS, FT8, and more).

Getting Started

On first launch, Ham Gaming opens to the Game List page. From there you can pick any game tile or use the bottom navigation to reach Settings and About.

First Launch

The app may ask permission to use the microphone — only if you start a voice game. You can grant or deny without affecting other games.

The Game List

The home page is a vertically scrollable list of game tiles. Each tile shows the game name, a short tagline, and an icon. Tap to play; the back arrow returns to the list with your scroll position preserved.

Settings

All app-wide preferences live in the Settings page. Tap the small (i) icon next to any setting to see a short explanation.

Email

Your email — used to pre-fill the Support page when you contact us. Stored only on your device, never shared.

Language

Choose the app language. Ten languages: English, Arabic (العربية), Spanish (Español), French (Français), German (Deutsch), Japanese (日本語), Chinese (中文), Portuguese (Português), Russian (Русский), Italian (Italiano). Game prompts and labels update instantly.

Font Scale

Resize all text across the app for reading comfort. Range: 80% to 140%.

Dark Mode

Switch between light and dark themes. Easy on the eyes in dim rooms.

Show Tips & Tricks

Show a quick tip on app launch about a feature you may not have tried.

Morse Code Settings

A dedicated subpage with four sliders that the Morse games read from.

Words Per Minute (WPM)

Overall Morse speed. Lower = slower dits and dahs. Beginner default: 12 WPM.

Farnsworth Character WPM

Speed of each character. Keep this higher than WPM so characters sound natural but gaps are wider — easier to learn.

Tone Frequency (Hz)

Pitch of the dit/dah tone. Typical: 550–750 Hz. Adjustable 400–1000 Hz.

Send Sensitivity

How strictly the app times your taps in Morse: Send. Lenient = more forgiving, strict = sharper timing required.

The Games

Each game runs as its own page. Tap a tile on the home list to enter; tap the back arrow to leave.

Phonetic Trainer

Tap-only. The app shows a letter; pick the correct NATO phonetic word from 4 options.

Phonetic Voice

Voice. Press and hold the fingerprint button, speak the phonetic word for the letter shown, then release. The app evaluates instantly using on-device speech recognition.

Q-Code Quiz

Tap-only. Match a Q-code to its meaning from 4 options.

Q-Code Voice

Voice. Press and hold the fingerprint button and say the Q-code (e.g., 'Q-T-H') or its meaning ('my location is'). Either is accepted.

Morse: Listen

Audio + tap. The app plays a Morse pattern at your configured speed and tone; pick the matching letter from a grid.

Morse: Send

Tap input. The app shows a target letter; tap short for a dit, hold longer for a dah. The app times your gaps and grades against your sensitivity setting.

Uses the same circular paddle button as the QSO CW Simulator, with a feathered halo blink on every key-press so each dit and dah leaves a clean visual reinforcement under your finger.

Callsign Country

Tap-only. The app shows a callsign prefix; pick the matching country from 4 options.

Speed Drill

60-second timer. Mixed pool across four categories: NATO phonetics, Q-codes, bands & meters, and amateur-radio modes & terms (CW, USB, APRS, FT8, and more). Streaks of 3+ correct answers score bonus points.

Follow That Satellite

Hold your phone like a pair of binoculars and physically turn yourself left or right to swing the crosshair across the sky; raise or lower the phone to move the crosshair up or down. Hold steady inside the capture circle for ~1.6 seconds to capture. Ten named pass profiles (LEO gentle rise, ISS overhead, NOAA weather pass, sun-synchronous polar, AO-91 FM bird, CubeSat sprint, retrograde orbit, grazing horizon, tumbling debris, Iridium flare window) — each faster, lower-elevation, and harder than the last.

Uses your device's sensor-fused heading (the same source the Ham Satting AR page uses) so turning your body sweeps smoothly without magnetometer glitches. Each level re-anchors the centre direction to wherever you're facing when the pass starts — you never have to reset compass calibration.

Prepare Your Gadgets

Pick a scenario (Home rig, Handheld, Mobile, Portable, POTA, SOTA, IOTA, DX chase, Quick spot). Tap each item you'd pack, then submit. Scored by accuracy + difficulty stars.

Bands & Meters

Match an amateur-radio band's meter name (e.g. "20 m") to its frequency range — and vice versa. Mixed question direction so the player learns both halves of the pairing. Covers 16 bands from 160 m down to 23 cm.

Modes & Terms

Quick-fire multiple-choice quiz on amateur-radio modes and abbreviations. "What is CW?" → Continuous Wave. "What does APRS stand for?" Forty entries covering voice modes, digital modes, satellite jargon, antenna terms, and emergency-comms acronyms.

Voice & Microphone

The two voice games use your microphone to check your spoken answers. The app never uploads audio — speech recognition happens on-device using the platform speech engine.

Fingerprint Push-to-Talk Button

The fingerprint-shaped button is the universal 'hold to speak' control. Press and hold while you speak, release to send. The button pulses while listening.

Microphone Permissions

On first voice-game launch, your phone will ask for microphone access. Grant to play; deny and the tap-based games still work.

Voice Recognition

Recognition uses your device's built-in speech engine. Accuracy varies by language and accent — if a word isn't recognised, just try again.

About, Support & Privacy

About the App

The About page shows the app version, key features, and links to the user manual and support page.

Getting Help

Use the Support page (linked from About) to email the developer. Your email from Settings is pre-filled as a Cc; the body includes the app version automatically.

Privacy

Ham Gaming stores all preferences locally on your device. No accounts, no analytics, no third-party data sharing. The only outbound network access is when you tap 'Send email' on the Support page.

Rig Simulator

A virtual transceiver face: drag the VFO knob to tune, pick a band, choose a mode (CW, LSB, USB, FM, AM, or DIG for digital data modes — only those valid for the band are enabled), adjust RF + AF gain sliders, and watch the S-meter. The VFO knob is weighted — flick it fast and it coasts under inertia (~900 ms) like a real heavy-flywheel rig knob, so you can fast-scan across a band; a bright accent tick on the dial makes the rotation visible.

Bands available — laid out left-to-right by descending frequency (highest at left, lowest at right): 23 cm, 70 cm, 2 m, 6 m, 10 m, 12 m, 15 m, 17 m, 20 m, 30 m, 40 m, 60 m, 80 m, 160 m. Fourteen bands total covering UHF, VHF, and HF, including all three WARC bands (30 m, 17 m, 12 m). The selector lays out as two rows of seven buttons; no horizontal scrolling.

DIG (digital) mode covers FT8, FT4, PSK31, RTTY, JS8, WSPR, Olivia, and similar data modes. Available on every band. Either NAR (narrow, ~500 Hz — best for FT8/FT4/PSK/RTTY) or MED (medium, ~2.4 kHz — best for SSB-style digital) counts as a valid filter for DIG; only WID is wrong.

RIT (Receiver Incremental Tuning) is a fine ± 2 kHz offset applied to the receiver only. Tune the VFO close to a ghost, then use RIT for the last sliver of fine-tuning without disturbing your transmit frequency.

Filter width selector — NAR (≈ 0.5 kHz) for CW, MED (≈ 2.4 kHz) for SSB, WID (≈ 12 kHz) for AM/FM. Picking the right filter for the mode unlocks the full S-meter and the score; the wrong filter caps the meter at faint copy and blocks the lock-in. Lock-in also requires the player's mode to match the ghost's mode (a CW filter on an SSB signal sounds like a tone, not the voice — so the rig sim refuses to count it as a copy).

Below the LCD, a live spectrum waterfall scrolls top-to-bottom at about 25 frames per second. Background noise shows as faint green pixels (brighter with higher RF gain). Ghost stations within ± 15 kHz of your VFO paint bright green-to-yellow vertical traces at their frequency — CW carriers appear as thin spikes, voice modes as wider traces, DIG as slim 2-3 column traces.

PTT is a real press-and-hold microphone button. While you hold it, on-device speech recognition transcribes you live on the LCD, the waterfall's centred red TX strip brightens with your voice volume (silence \approx dim brick-red, peak voice \approx vivid red), and the S-meter bars grow with mic level — silence \approx 1 bar, peak voice \approx 13 bars, never dead. The TX-strip width follows the mode's occupied bandwidth: narrow for CW, slim for DIG, medium for SSB, wide for AM/FM.

Background noise stays visible outside the strip so the rest of the band is still readable. On release, if a voice-mode ghost is locked in matching mode, the station replies contextually based on keywords you said — signal-report, name + QTH exchange, antenna talk, rig talk, weather chat, or a sign-off — across ~80 distinct smart-reply lines so the conversation stays fresh.

Each round seeds 3-5 ghost stations at random frequencies within the selected band. Drag the knob clockwise to tune up, counter-clockwise to tune down. As you approach a ghost the S-

meter rises. Tune within ± 2 kHz with the matching mode and filter to lock the station — each successful lock-in scores 2 points.

CW ghost lock-ins play real Morse — the standard "K" go-ahead invitation at your configured WPM and tone. Voice-mode ghosts (LSB / USB / FM / AM / DIG) play one of 112 different text-to-speech clips when you lock on, drawn at random so the rig sim sounds alive across many sessions. The library covers CQ calls, DX contacts, contest exchanges, POTA / SOTA / WWFF activations, ragchew snippets, signal-report swaps, sign-offs, weather and ARES nets, satellite ops, antenna brags, and digital-mode chatter (FT8, PSK31, RTTY, JS8, WSPR).

The chip row above the LCD shows your Score, the Found counter (out of total ghosts on this band), and the Band edges — the absolute frequency range you can tune within on the current band.

Switching bands respawns a fresh set of ghosts. PTT does open the microphone (the rig sim transmits your voice into the smart-reply matcher, never over the air or off the device), so the first time you press PTT your phone will ask for microphone permission — deny and PTT still works as a visual-only TX indicator but no transcript or smart reply will fire.

QSO Voice Simulator

Practice the 4-step amateur-radio QSO protocol with on-device speech recognition. Each round randomly assigns you a role: either you call CQ first, or a fake station calls CQ and you respond. The top row of the screen shows four step boxes that turn green on correct execution or red on a miss / wrong order.

Steps: (1) initial contact (CQ call or response), (2) acknowledge + signal report, (3) name + QTH exchange, (4) sign off. Hold the fingerprint button while speaking; release when done. The fingerprint button blooms a soft feathered halo while you hold it so you always see at a glance that the mic is open. The fake station replies between steps via text-to-speech.

Wide accepted vocabulary — the trainer rewards real on-air idioms, not one canonical script. Step 1 accepts CQ / QRZ / your callsign / "this is" / "de" / "standing by" / "calling". Step 2 accepts 59 / "five nine" / 599 / "5 by 9" / Roger / QSL / "good copy" / "loud and clear" / "thanks for the call" / "thanks for the report". Step 3 accepts "name is" / "I am" / "I am in <city>" / "my handle is" / "QTH is" / "calling from" / "located in". Step 4 accepts 73 / "seventy-three" / "good luck" / "good DX" / clear / QRT / SK / "best regards" / cheers / bye.

The accepted variants for the current step are shown beneath the prompt card so you always know what counts. Speech-to-text is fully on-device; audio never leaves your phone.

QSO CW Simulator

Same 4-step QSO protocol as the Voice simulator, but you tap Morse code on a paddle instead of speaking. Each step accepts any of several real-world CW shorthands.

Step 1 — initial contact: CQ / CQCQ / QRZ as initiator, or K / KN / BK / R as responder. Step 2 — signal report: 5NN / 599 / 5N / R / QSL / TU. Step 3 — mid-QSO handshake: OP / NAME / QTH / FB / OM / TU / OK. Step 4 — sign off: 73 / 88 / GL / GB / SK / TU / EE.

Tap short for a dit, hold longer for a dah. The paddle button blooms a soft feathered halo on every key-press so each dit and dah leaves a visible blink — the same look and behaviour as the Morse Send game's button. Standard inter-character gap (~3 dit lengths) commits the letter you tapped; longer gap (~7 dit lengths) evaluates the whole token. The fake station replies in audible CW between steps so you hear real Morse pacing at your configured WPM.

Like its voice sibling, this simulator shows 4 progress boxes at the top: each grey by default, green on success, red on miss. The full accepted-tokens list is shown beneath the prompt card.

Pool Quiz

Random multiple-choice questions pulled from the current US FCC question pools — Technician, General, and Amateur Extra, all combined into one stream. The badge in the top-left of each question shows which pool it came from (green = Technician, amber = General, red = Extra) for learning context only; you cannot filter the source.

Four answer options per question, lettered A-D. Correct picks score +1 and bump your streak; wrong picks reset the streak. The question text scrolls if it is long (some Extra-pool questions run multiple lines).

Source: NCVEC question pools (US public domain) via russolsen/ham_radio_question_pool (Apache-2.0).

Antenna Math

Random metric-length antenna math across the full band catalogue (160 m – 23 cm). Variants: full wavelength λ , half-wave dipole total length ($\lambda/2 \times$ velocity factor 0.95), quarter-wave vertical element ($\lambda/4 \times 0.95$), 5/8 lambda vertical ($\lambda \times 0.625 \times 0.95$), full-wave loop perimeter, and three Yagi-Uda element lengths (reflector $\approx 0.51 \lambda$, driven $\approx 0.475 \lambda$, director $\approx 0.45 \lambda$).

Four answer choices per question — each one is a real length that another formula or a ± 10 –40% perturbation would produce, so the wrong answers look plausible and you cannot simply spot the outlier.

Answers are shown in metres (or centimetres for sub-1 m values like 70 cm Yagi elements).

Repeater Setup

A virtual handheld radio (HT) face. Each round presents a real repeater listing — callsign, output frequency, offset rule (-600 kHz for 2 m, +5 MHz for 70 cm, or simplex for 146.520 MHz), and CTCSS tone. You dial in the right TX shift direction and the matching tone from a 19-entry CTCSS chart.

The HT LCD updates live as you make selections: RX freq is fixed (it is the repeater output), TX freq is computed from RX + your chosen offset. Confirm when both shift and tone are set.

Correct = score +1; wrong = the listing card shows the correct values for a couple of seconds before the next round.

Credits

Built solo by A46UNX (unixeer). Open-source thanks to flutter, audioplayers, speech_to_text, flutter_tts, vibration, flutter_pdfview, get, shared_preferences, sensors_plus, and flutter_compass.

Appendix — May 13 2026 Updates

New game families on the home screen

Games are now organised into four named families on the home page: Field Ops, Voice Lab, CW Arcade, and Tech Bench. Each family is a two- or three-column section header followed by its games, kept to a multiple of 3 so no row is half-empty.

Field Ops covers on-air operational games (Follow Sat, Repeater Setup, Pile-Up Master, Repeater Detective, Doppler Sat, Grid Locator, Contest Manager, DXpedition Planner, Field Day Strategist, EmComm Net, ADIF Logger and more).

Voice Lab is the voice-trainer family (Phonetic, Q-code, QSO Voice, First QSO Walkthrough, Bands by Ear).

CW Arcade collects the CW practice games (Morse Listen / Send / Mania / Shower / Speed Drill / QSO CW Sim).

Tech Bench groups theory, workbench and signal-identification tools (Engineer's Bench with 6 tabs, NanoVNA Quest, Yagi Designer, Schematic Builder, Decoder Lab, Waveform Lab, Mode by Ear, Symbol Quiz, Resistor + Capacitor Codes, Restoration Bench).

Mascot character + scout on Follow Sat

Every page now has an on-screen mascot peeking from the bottom-right corner. It cycles between waiting, happy, surprised and not-proud expressions in sync with the encouragement audio.

Follow That Satellite features a scout illustration holding the rotating Yagi. The rotation pivot is glued to the scout's fist so the boom flips around the hand regardless of which direction the satellite is in the sky.

Decoder Lab: real SSTV VIS audio + spectrogram waterfall

Decoder Lab now covers 12 SSTV modes (Robot 36/72, Martin M1/M2, Scottie 1/2/DX, PD-50/90/120/180/240). Each round's audio synthesises the real VIS code framing — 1900 Hz leader, 1200 Hz break + start/stop, 1100 Hz / 1300 Hz data bits — so a real SSTV decoder would identify the clip correctly.

The visual scope is a spectrogram-style heatmap (blue → green → yellow → red intensity) plus a side panel that progressively fills with a procedural test pattern as the transmission progresses. Tapping Hear sync runs both audio + image build-up together for one combined receive experience.

Waveform Lab + Mode by Ear: identify modulations by sight + sound

Waveform Lab renders a live oscilloscope trace for thirteen modulations (CW, AM, DSB-SC, NFM, MFM, WFM, USB, LSB, RTTY, PSK31, FT4, FT8, Digital Voice). The trace drifts continuously so the scope feels like a real instrument.

Mode by Ear is the audio counterpart — listen to a synthesised clip of one modulation and pick it from four choices.

IncrementSlider + RotaryKnob shared widgets

Every slider in the app now sports compact +/- buttons on either side so values can be stepped precisely. Morse Settings: tone Hz steps by 10, sensitivity by 5%, WPM and Farnsworth by 1.

Doppler Sat Sim uses a new pan-around-centre rotary knob for doppler trim. The trim range, step size and lock window scale automatically per band (2 m SSB, 70 cm SSB, 23 cm, 10 GHz).

Accessibility + theming polish

Knobs, paddles, and PTT buttons announce themselves to screen readers via Semantics labels and values.

All disabled-state buttons, mid-state SWR amber, and solder-iron blue temperature indicators now use theme tokens so dark mode renders correctly.

Pop-up dialogs (info icon, tip of the week) now use the sibling Ham Setting visual: transparent Dialog with a gradient-filled Container and accent border. Normal-theme dialogs match the blue family of the rest of the app.

Appendix — May 13, 2026 Update

This appendix lists the changes that shipped on May 13, 2026. Earlier chapters remain accurate for the unchanged features; this section documents the new + reworked surfaces only.

Three new component games

Three new games join the Tech Bench family:

- Fault Lab — read a real-world symptom (120 Hz hum bar, S 9 with no antenna, FT8 not decoding, weak audio, high SWR) and pick the failed component from a 4-choice list. Covers PSU, audio, RF, antenna, digital + mechanical failure modes.
- Cap Picker — for each circuit role (PSU smoothing, RF coupling, snubber, IC decoupling, 555 timing, LC tank, Y-cap line filter, etc.), pick the right capacitor type + value + dielectric from 4

options. Teaches WHICH cap a real circuit needs by role, distinct from Capacitor Codes which decodes the markings.

- Transistor Match — match a real-world part number (2N3904, IRF610, MRF150, BLF188XR, NE555, LM358, Si5351, AD9850, and many more) to its function. Covers BJTs, MOSFETs, JFETs, op-amps, comparators, regulators, timers, DDS chips, motor drivers, opto-couplers.

Yagi Designer — full physics rewrite

The Yagi Designer is now a true antenna simulator. Element count is dynamic (2–8 elements), and sliders interact physically — boom length × element ratios × spacing jointly drive gain, beamwidth, F/B, and the pattern's lobe count. The polar pattern is computed by summing each element's induced current with the correct geometric phase, so the pattern shape responds in real time to every slider. A "Snap NBS" button drops the design to canonical proportions.

NanoVNA Quest — full physics rewrite

The NanoVNA Quest is now built around a complex-impedance core. The SWR sweep axis is correctly inverted (1.0 at the bottom, like a real NanoVNA — the dip points down toward resonance). A live readings strip shows R, X, |Z|, return loss, | Γ |, and phase $\angle\Gamma$ at the target frequency. Height above ground now ripples the feedpoint resistance per image theory, radial count adds counterpoise loss, and a ground-quality picker (salt water through desert) scales earth losses.

Doppler Sat — V/U and U/V cross-band modes

The Doppler Sat sim now models real cross-band linear-transponder operating. V/U mode (VHF up, UHF down — FO-29, RS-44, JO-97, FO-118) tracks doppler on the RX (UHF) leg. U/V mode (UHF up, VHF down — AO-7 Mode B, AO-73, AO-95) tracks doppler on the TX (UHF) leg. A QO-100-style 23 cm up / 10 GHz down option illustrates microwave-scale doppler. TX is shown at the top of the rig LCD, RX below; the doppler indicator follows the UHF leg. All frequencies are displayed with MHz units.

Audio fixes across 4 games

Band by Ear, Mode by Ear, Decoder Lab, and Repeater Setup are now reliably audible. The audio playback service now subscribes to the completion stream before play() so short clips don't race the listener attachment. A global AudioPlayer session is initialised at app boot so the first playback on iOS doesn't hit a cold AVAudioSession. The Repeater Setup CW success/fail tone is now awaited before the encouragement TTS so the two don't preempt each other.

Content enrichment

Each randomised-scenario game grew its content library:

- First QSO — 50 scenarios across 11 categories (HF DX, HF rag-chew, HF contest, HF CW, VHF repeater, VHF simplex, satellite, POTA/SOTA, digital, net check-in, etiquette).
- EmComm Net — 105 scenarios across 11 categories (ARES check-in, NTS traffic, SKYWARN, hospital/agency liaison, SAR tactical, Field Day, DX nets, marine, MARS, procedural, vocabulary).

- Schematic Builder — 25 circuits across 7 workshops with context-aware part palettes.
- Restoration Bench — 30 parts across 5 radio eras (1950s tube AM-FM, 1970s transistor pocket, classic tube transceiver, modern HF transceiver, SDR dongle) with an interactive alignment-tool pick step.
- Antenna Math — 17 question kinds (added J-pole, EFHW, square loop, delta loop, inverted-V leg, 3/8 vertical, Hentenna, plus coax matching stubs at VF 0.66 and 0.80).
- Resistor Codes — 7 formats: 3-band, 4-band, 5-band, 6-band (with temp coefficient), SMD 3-digit, SMD 4-digit, and EIA-96 SMD codes.
- Morse Mania — switched to any-order letter matching: keying L on "HELLO" highlights both Ls. Word list shifted to 100+ four-to-eight-letter words biased toward ham + common-English shapes.
- CW Shower — falling-letter speed reduced 30% with tighter per-tier variance for friendlier beginner pacing.

Voice + UI polish

The encouragement mascot's voice pitch dropped from 1.00 to 0.80 for a more masculine adult timbre, with a best-effort `setVoice()` pass over each locale's known male TTS voices. The First QSO step header was restyled from a filled accent chip to a flat ribbon so it no longer reads as a tappable button. Dialog OK buttons in light theme now contrast properly (dark accent text on solid white).

Appendix — May 13 2026 Updates (Round 2, post-playtest)

Morse Mania bug fix — level 1 crash

An earlier build crashed when Morse Mania was opened because the level-1 word pool was filtered down to words of two letters or less, but the dictionary only contained four-letter and longer words. The level ladder is now re-balanced so every level has a non-empty pool: level 1 = four-letter words, level 2 = five letters, level 3 = six letters, level 4 = seven-plus letters, and level 5 = multi-word combinations.

Decoder Lab — sync audio auto-plays on first load + after each round

Decoder Lab now plays the SSTV VIS sync tones automatically the moment the page opens (no more silent first round) and again between rounds, as soon as the new mode appears. The manual Hear Sync button still works for replays.

Fake-button category chips converted to plain labels

Four games (First QSO, Capacitor Picker, Fault Lab, EmComm Net) previously rendered the round's category as a blue rounded pill that looked like a tappable button but did nothing. The pills are now thin outlined uppercase tags that read clearly as metadata labels — no more confusion about what is tappable.

NanoVNA Quest — six antenna families + new tuning factors

The antenna picker grew from four families (1/4-wave Vertical, Half-wave Dipole, End-Fed Half-Wave, Full-wave Loop) to six, laid out as a fixed two-row three-column grid: now also Yagi-Uda and Magnetic Loop.

Yagi-Uda exposes an Elements slider (2–8) that drives both the feedpoint impedance and the bandwidth — more elements means narrower bandwidth and a sharper SWR dip, mirroring the real antenna's Q.

Magnetic Loop exposes a Loop Diameter slider (0.3 m – 3.0 m). Small loops resonate higher and present an extremely narrow, deep dip; larger loops broaden a touch.

Three new factor sliders apply to every antenna family where they make physical sense: Wire Gauge (14–22 AWG, thicker wire widens and shallows the dip, thinner wire sharpens it), Radial Droop Angle (0–90°, sloping radials raise feedpoint impedance toward 50 Ω) for vertical and end-fed antennas, and a Matching Network picker (None / L-match / Pi-network) that pulls the feedpoint impedance toward 50 Ω and re-shapes the dip's width.

Yagi Designer — every slider visibly affects the polar pattern

Audit pass: the Driven Length slider previously only updated the gain readout, leaving the polar pattern unchanged. Now the driven element's current magnitude follows a bell curve around 0.95 of the half-wave dipole length, so detuning the driven visibly shrinks the radiation pattern in addition to changing the gain number. Reflector, director, spacing, and element-count sliders all still produce visible pattern changes as before.

Schematic Builder — slot row layout fix

Long slot labels paired with longer picked-part names ("Smooth C" + "Polar cap") used to clip on narrow phones. The slot row now uses a balanced flex layout, smaller fonts (slot label 12 pt, picked part 11 pt), and wraps to two lines with an ellipsis when content overflows.

Doppler Sat — bigger rotary knob + twinkling stars

The Doppler Trim knob grew from 110 px to 150 px so the rotation indicator is clearly visible while spinning. The sky horizon strip now also includes 70 procedurally-placed twinkling stars seeded once per build so the constellation stays stable across repaints while individual stars gently modulate brightness with the pass clock.

Homepage — bigger game-title font

Game cell labels jumped from 8 pt to 11 pt for readability without changing the icon circle size, vertical gap, or row spacing. Every existing layout proportion is preserved.

Voice strategy — teenage-scout encouragement + male/female ghost mix

Encouragement audio (the cheering / supportive lines triggered between game rounds) is now tuned to a teenage-male scout voice that matches the mascot illustration. Pitch lowered to 0.90 and the engine searches a wider list of male-voice candidates (Daniel, Aaron, Alex, Fred, Arthur,

Rishi, Reed, Albert and platform-specific Siri voices) before falling back to a deeper pitch of 0.70 to push the default voice into a masculine register when no male voice is installed.

Rig Simulator ghost-station QSOs now alternate between a male-leaning operator (pitch 0.65 – 0.85) and a female-leaning operator (pitch 1.10 – 1.30) per conversation, so the two voices sit on opposite sides of the natural human voice band. Lock-in greetings randomly pick which operator speaks first. Push-to-talk replies use the male-leaning pitch so the locked station's response feels consistent with one of the operators.

Appendix — May 20, 2026 Updates (Version History)

Version History (About → Version History)

Ham Gaming now ships a dedicated Version History page that surfaces every release's What's New notes from inside the app. The page lives under the About tab — tap the new "Version History" link in the header row, next to User Manual and Support.

Each release renders as a collapsible card. The most recent release is expanded by default; older entries stay collapsed and you can tap to expand any of them. Inside the expanded card you see the full What's New text with selectable copy so you can paste into a forum post, group chat, or email.

Release notes are bundled in the app (`assets/release_notes.json`) so the page works fully offline — no network call, no waiting. New releases simply prepend a new entry to that file before each build.

Like the developer signature and copyright watermark, the Version History page is English-only and left-to-right regardless of any other language toggles. Release-note prose is a wire-format-style artifact (consumed by humans across forums + email) so translation would create more drift than it would solve.

Notes for operators

If the Version History page shows "No release history available" the app couldn't read `assets/release_notes.json` — reinstall is the safest fix. The page never deletes or overwrites any of your progress or settings; it's a read-only view of the bundled release notes.

Appendix — May 30, 2026 Updates

Diagnostic log (new)

Ham Gaming now ships the same diagnostic-log pipeline as Ham Logging, Ham Setting, and Ham Learning. If the app hits an unexpected error, a one-tap "EMAIL" prompt appears so you can mail the captured event details to `A46UNX@GMAIL.COM`. The log buffers up to fifty events in memory (no disk persistence, no third-party reporter) and includes app version, captured-event count, and per-event timestamp + source + truncated stack trace.

Background network noise — offline retries, transient timeouts — is filtered out so the email only contains real app errors. Framework warnings in debug builds are also suppressed at the snackbar layer so they stop popping during development; release builds are unaffected.

About page

Footer copyright is now centered to match the rest of the Unixeer family. Developer signature line above the copyright remains left-anchored as before.

Appendix — May 30, 2026 PM Updates

No code changes in round two

Ham Gaming did not receive code changes in the May 30 PM round. The new diagnostic-log handler and the About-page footer standardization documented in the AM appendix remain the full extent of the v1.0.0+1 round-two delta. This entry exists for cohort symmetry with the sibling apps.