HamTab User Guide

Amateur Radio Dashboard for POTA, SOTA, DX & Propagation

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Introduction

What is HamTab?

HamTab is a real-time amateur radio dashboard designed for portable activators and DX enthusiasts. It aggregates live data from multiple sources into a single, customizable interface:

- **POTA** (Parks on the Air) spots and park information
- **SOTA** (Summits on the Air) spots and summit data
- **DX Cluster** spots from global DX networks
- **PSKReporter** digital mode reception reports
- **Space weather** and propagation forecasts
- **Satellite tracking** with pass predictions
- **Moon phase** and EME path loss calculations

Whether you're hunting activators from home or setting up a portable station, HamTab gives you the information you need at a glance.

Key Features

Feature	Description
Live Spots	Real-time POTA, SOTA, DX Cluster, and PSK spots
Interactive Map	Markers, overlays, geodesic paths, satellite footprints
Solar Data	18 configurable space weather metrics with color coding
Band Conditions	Day/night propagation forecast by band and region
HF Propagation	24-hour band reliability matrix
Live Spots Widget	See where YOUR signal is being received
Satellite Tracking	Real-time position and pass predictions
Lunar/EME	Moon phase, declination, and path loss
Filters	Band, mode, distance, age, location, and license filtering

Feature	Description
Filter Presets	Save and recall filter combinations
Customizable Layout	Drag, resize, and show/hide any widget

System Requirements

HamTab runs in any modern web browser:

- **Chrome** 90+ (recommended)
- **Firefox** 88+
- **Safari** 14+
- **Edge** 90+

JavaScript must be enabled. A screen resolution of at least 1280x720 is recommended for the best experience.

Deployment Modes

HamTab can be deployed in two ways:

Hosted Mode (hamtab.net)

- Cloud-hosted on Cloudflare
- No installation required
- Settings sync across devices via Cloudflare Access login
- Always up-to-date

LAN Mode (Self-Hosted)

- Run on your own Windows, Linux, or Raspberry Pi
- Works offline on your local network
- Full privacy — no data leaves your LAN
- Automatic HTTPS with self-signed certificates

Both modes have identical features. Choose hosted mode for convenience, or LAN mode for privacy and offline operation.

Getting Started

First-Time Setup

When you first open HamTab, you'll see the splash screen with essential configuration options. Complete these steps to get the most out of HamTab.

Setting Your Callsign

Your callsign is used for:

- Calculating distances to spots
- Live Spots widget (showing where your signal is received)
- DX Detail widget lookups

To set your callsign:

1. Click the **gear icon** in the top-right corner to open Config
2. Enter your callsign in the **Callsign** field
3. Press Enter or click outside the field to save

> Tip: Your callsign is stored locally in your browser and is never transmitted to any server.

Setting Your Location

Your location (QTH) enables distance calculations, map centering, and satellite pass predictions. You have three options:

Option 1: GPS (Automatic)

Click **Use GPS** to automatically detect your location. Your browser will ask for permission to access your location.

> Note: GPS requires HTTPS and browser permission. Some browsers block GPS on self-signed certificates.

Option 2: Grid Square

Enter your 4 or 6-character Maidenhead grid square (e.g., `FN31` or `FN31pr`). HamTab calculates the center of that grid square.

Option 3: Manual Coordinates

Enter your latitude and longitude directly:

- **Latitude**: Decimal degrees (e.g., `41.7128`)
- **Longitude**: Decimal degrees, negative for West (e.g., `-73.0060`)

Time Format

Choose your preferred time display format:

- **Local** — Times shown in your browser's timezone
- **UTC** — Times shown in Coordinated Universal Time (recommended for amateur radio)

API Keys (Optional)

Some features require free API keys:

N2YO API Key (Satellite Tracking)

1. Visit n2yo.com/api
2. Create a free account
3. Copy your API key
4. Paste it in Config → N2YO API Key

> **Tip:** Without an N2YO key, satellite tracking will be disabled but all other features work normally.

Weather Underground API Key (Weather Data)

Required only if you want local weather data from Weather Underground instead of NWS:

1. Visit wunderground.com/member/api-keys
2. Create a free account and generate an API key

3. Paste it in Config → Weather Underground API Key

Saving Your Configuration

All settings are saved automatically to your browser's localStorage. To export or import your configuration:

1. Open Config (gear icon)
2. Click **Export Config** to download a JSON file
3. Use **Import Config** to restore settings on another device

> **Important:** Exported config files contain your API keys. Keep them secure and don't share them publicly.

Quick Start Checklist

- [ ] Set your callsign
- [ ] Set your location (GPS, grid, or manual)
- [ ] Choose time format (UTC recommended)
- [ ] Add N2YO API key (if you want satellite tracking)
- [ ] Arrange widgets to your preference (drag title bars)
- [ ] Save a filter preset for your usual operating

Widgets Reference

HamTab's interface is built from configurable widgets. Each widget can be moved, resized, shown, or hidden to create your ideal layout.

Widget Management

Moving Widgets

Click and drag the **title bar** to move a widget. Widgets snap to screen edges and other widgets when you drag near them.

Resizing Widgets

Drag the edges or corners of any widget to resize it. Most widgets have minimum sizes to ensure content remains readable.

Showing/Hiding Widgets

1. Open Config (gear icon in top-right)
2. Use the checkboxes under "Visible Widgets" to show or hide each widget
3. Hidden widgets can be restored anytime

Widget Settings

Many widgets have their own settings. Click the **gear icon** in the widget's title bar to access widget-specific configuration.

Filters Widget

Filter spots by band, mode, distance, age, and location criteria.

Band Filters

Click band buttons to filter spots. Multiple bands can be selected. Active bands are highlighted.

Band	Frequency Range
160m	1.8 - 2.0 MHz
80m	3.5 - 4.0 MHz
60m	5.3 - 5.4 MHz
40m	7.0 - 7.3 MHz
30m	10.1 - 10.15 MHz
20m	14.0 - 14.35 MHz
17m	18.068 - 18.168 MHz
15m	21.0 - 21.45 MHz
12m	24.89 - 24.99 MHz
10m	28.0 - 29.7 MHz
6m	50.0 - 54.0 MHz
2m	144.0 - 148.0 MHz
70cm	420.0 - 450.0 MHz

Mode Filters

Filter by operating mode:

- **CW** — Morse code
- **Phone** — Voice (SSB, FM, AM)
- **Digital** — FT8, FT4, JS8, RTTY, PSK, etc.

Distance Filter

Filter spots within a specified distance from your QTH:

1. Enter a number in the distance field
2. Choose miles or kilometers
3. Only spots within that radius appear

> **Note:** Distance filtering requires your location to be set in Config.

Age Filter

Filter spots by how recently they were posted:

- Enter a number of minutes
- Only spots posted within that time appear

Location Filters

Filter by geographic criteria (availability varies by data source):

- **Country** — Filter by DXCC entity
- **State** — Filter by US state (POTA only)
- **Grid** — Filter by Maidenhead grid prefix
- **Continent** — Filter by continent code (DXC only)

License Privilege Filter

Filter spots based on US amateur license privileges:

- **Extra** — All frequencies
- **General** — General class privileges
- **Technician** — Technician class privileges
- **Novice** — Novice class privileges

Spots outside your selected license class are hidden.

Filter Presets

Save commonly-used filter combinations:

1. Set up your desired filters
2. Click **Save Preset**
3. Enter a name (e.g., "40m CW", "Local Parks")
4. Click preset buttons to quickly recall saved filters
5. Long-press a preset button to delete it

On the Air Widget

Displays live spots in a tabular format with source tabs for POTA, SOTA, DXC, and PSK.

Source Tabs

Click tabs to switch between data sources:

Tab	Data Source	Content
POTA	Parks on the Air API	Park activations
SOTA	SOTA Cluster	Summit activations
DXC	DX Cluster	DX spots worldwide
PSK	PSKReporter	Digital mode reports

Table Columns

Each source has different columns. Common columns include:

- **Callsign** — Activator or DX station callsign
- **Freq** — Operating frequency in kHz
- **Mode** — Operating mode
- **Reference** — Park/Summit reference (clickable link)
- **Time** — Spot timestamp
- **Age** — Time since spot was posted

Interacting with Spots

- **Click a row** to select it — shows on map and populates DX Detail
- **Click callsign** to copy to clipboard
- **Click reference link** to open park/summit page in new tab

Column Visibility

Click the gear icon to show/hide specific columns for each source.

HamMap Widget

Interactive map showing spots, your location, satellites, and propagation overlays.

Map Controls

- **Zoom** — Mouse wheel or +/- buttons
- **Pan** — Click and drag
- **Fullscreen** — Click expand button in corner

Markers

Marker Color	Meaning
Blue	Your QTH (home location)
Green	POTA activation
Orange	SOTA activation
Red	DX Cluster spot
Purple	PSK report
Yellow	Selected spot

Overlays

Click the gear icon to toggle map overlays:

- **Lat/Lon Grid** — Geographic coordinate grid
- **Maidenhead Grid** — Ham radio grid squares
- **Timezone** — World timezone boundaries
- **Gray Line** — Day/night terminator

Geodesic Paths

When you select a spot, a curved line shows the great-circle path from your QTH to the spot's location. This is the shortest path a radio signal would travel.

Satellite Footprints

If satellites are tracked, their footprints (coverage areas) appear on the map in real-time. The ISS also shows a dashed cyan orbit path line. Click a satellite marker to select it.

Solar Widget

Real-time space weather data from HamQSL.

Available Fields

Field	Description	Good Propagation
Solar Flux (SFI)	10.7cm radio flux	Higher is better (>100)
Sunspots	Visible sunspot count	Higher is better
A-Index	Daily geomagnetic activity	Lower is better (<10)
K-Index	3-hour geomagnetic activity	Lower is better (<3)
X-Ray	Solar flare intensity	Lower is better
Signal Noise	HF background noise	Lower is better
Solar Wind	Particle stream speed	Lower is better (<400)
Bz (IMF)	Interplanetary magnetic field	Positive is better
Proton Flux	High-energy protons	Lower is better
Electron Flux	High-energy electrons	Lower is better
Aurora	Auroral activity index	Higher = more aurora
Aurora Lat	Southernmost aurora	Higher latitude = less interference
He 10830A	Solar chromosphere indicator	—
Geomag Field	Geomagnetic field state	"Quiet" is best
K-Index (Night)	Nighttime K-index	Lower is better
MUF	Maximum Usable Frequency	—

Field	Description	Good Propagation
foF2	Critical frequency F2 layer	—
MUF Factor	MUF multiplication factor	—

Color Coding

Several fields are color-coded:

- Green — Good conditions
- Yellow — Fair conditions
- Red — Poor conditions

Customizing Fields

Click the gear icon to show/hide fields. Default fields: SFI, Sunspots, A-Index, K-Index, X-Ray, Signal Noise.

Band Conditions Widget

Global propagation forecast showing conditions by band and region.

Metrics

Toggle between display modes:

- **MUFD** — Maximum Usable Frequency (Day)
- **SS** — Signal Strength
- **SNR** — Signal-to-Noise Ratio

Day/Night Toggle

Switch between current conditions and 12-hour forecast.

Regions

Shows propagation for paths from your location to:

- North America

- South America
- Europe
- Africa
- Asia
- Oceania

Color Scale

- Green — Good propagation
- Yellow — Fair propagation
- Red — Poor/closed

VOACAP DE→DX Widget

A dense 24-hour propagation prediction grid showing band reliability from your station (DE) to the world (DX). This widget uses the **VOACAP** (Voice of America Coverage Analysis Program) engine — a professional ionospheric model used by international broadcasters and militaries worldwide — to predict which bands will be open and when.

Prediction Engines

HamTab uses two prediction engines, shown by the badge in the bottom-left corner of the widget:

Badge	Engine	Description
VOACAP (green)	Real VOACAP	Full ionospheric ray-tracing model via dvoacap-python. Computes multi-hop propagation paths, signal-to-noise ratios, and reliability percentages for each band/hour combination. Accounts for D-layer absorption, MUF, takeoff angle, transmit power, and operating mode.
SIM (gray)	Simplified model	A lightweight approximation based on solar flux, geomagnetic indices, and time of day. Used as a fallback when the VOACAP engine is unavailable (e.g., on self-hosted installations without Python).

The engine switches automatically — no user action needed. When VOACAP is available, predictions are significantly more accurate because they model the actual ionospheric layers and propagation geometry between your location and target regions, rather than using statistical approximations.

Reading the Grid

- **Rows** — HF bands from 10m (top) to 80m (bottom)
- **Columns** — 24 UTC hours, starting from the current hour at the left edge
- **Cell colors** — Predicted reliability percentage:

Color	Reliability
Black/dark	0–10% — Band closed
Red	10–30% — Poor
Orange/Yellow	30–60% — Fair
Green	60–100% — Good to excellent

Hover over any cell to see the exact reliability percentage, band, and UTC hour.

Interactive Parameters

The bottom bar shows clickable settings. Click any value to cycle through options:

Parameter	Options	Effect
Power	5W, 100W, 1kW	TX power — higher power improves reliability at margins
Mode	CW, SSB, FT8	Operating mode — FT8 shows significantly more green because of its ~40 dB SNR advantage over SSB
TOA	3°, 5°, 10°, 15°	Takeoff angle — lower angles favor long-distance DX, higher angles favor shorter paths
Path	SP, LP	Short path or long path (the "other way around" the Earth)
S=	(display only)	Current smoothed sunspot number from NOAA

Overview vs Spot Mode

Click **OVW/SPOT** in the parameter bar to toggle target mode:

- **OVW** (Overview) — Shows the best predicted reliability across representative worldwide targets (Europe, East Asia, South America, North America). This tells you "what bands are open to anywhere in the world right now."
- **SPOT** — Calculates predictions specifically to the station you've selected in the On the Air table. This tells you "when will this band open to *that particular DX station*."

> Tip: Use Overview mode for general band planning, then switch to Spot mode when you see a specific station you want to work and want to know the best time/band.

Map Overlay

Click any band row to show that band's propagation on the map. Two overlay modes are available — click the ○**/REL** toggle in the parameter bar to switch:

- ○ **(Circles)** — Draws concentric range rings from your QTH, scaled by predicted reliability. Larger circles = better propagation. A small red circle means the band is closed.
- **REL (Heatmap)** — Paints the entire map with a color gradient showing predicted reliability to every point on Earth. Green = good, yellow = fair, red = poor, dark = closed. The heatmap re-renders as you pan and zoom, with finer detail at higher zoom levels.

Click the same band again to clear the overlay.

About the Predictions

- Predictions are **monthly median values** based on the current smoothed sunspot number (SSN) from NOAA
- They represent typical conditions for this month, not real-time ionospheric state
- Use them for **planning** which bands to try at different times of day, rather than as guarantees of what's open right now
- Real-time conditions vary due to solar flares, geomagnetic storms, and local ionospheric irregularities — check the Solar widget for current space weather

> Note: VOACAP predictions work best for bands 80m–10m. They do not cover VHF/UHF propagation (6m, 2m, 70cm), which depends on different mechanisms like sporadic-E, tropospheric ducting, and meteor scatter.

Live Spots Widget

Shows where YOUR signal is being received via PSKReporter.

Requirements

- Your callsign must be set in Config
- Works best when actively transmitting on digital modes (FT8, FT4, JS8)

Band Cards

Each card represents a band where your signal has been received:

- Click a card to toggle that band's paths on the map
- Shows either station count or farthest distance

Display Mode

Click the gear icon to switch between:

- **Count** — Number of stations receiving you
- **Distance** — Distance to farthest receiver

Lunar / EME Widget

Moon phase, position, and Earth-Moon-Earth path loss calculations.

Available Fields

Field	Description
Moon Phase	Current lunar phase name
Illumination	Percentage of moon illuminated
Declination	Moon's position relative to equator
Distance	Distance to moon (km)
Path Loss	EME path loss at 144 MHz

Field	Description
Elongation	Angular separation from sun
Ecl. Longitude	Ecliptic longitude
Ecl. Latitude	Ecliptic latitude
Right Ascension	Celestial RA coordinate

EME Path Loss

Calculated for 144 MHz based on current lunar distance:

- **Perigee** (closest): ~367 dB
- **Apogee** (farthest): ~370 dB

> Tip: Lower path loss means easier EME contacts. Plan EME operations around lunar perigee.

Satellites Widget

Live tracking and pass predictions for amateur radio satellites.

ISS Tracking (No API Key Needed)

The ISS (International Space Station) is tracked automatically with no setup required. You'll see:

- **ISS marker** on the map showing its current position
- **Footprint circle** showing the area that can communicate with ISS
- **Orbit path** — a dashed cyan line showing the predicted ground track for one full orbit

The ISS has an amateur radio station onboard (ARISS) with voice repeater, APRS, and occasional SSTV transmissions.

Adding More Satellites

To track additional satellites (AO-91, SO-50, etc.), you need a free API key from N2YO.com. Enter it in Config, then click the gear icon in the Satellites widget to add satellites.

Satellite Information

For each tracked satellite:

- **Position** — Current latitude/longitude
- **Altitude** — Height above Earth (km)
- **Azimuth/Elevation** — Position in your sky
- **Footprint** — Coverage area shown on map

Pass Predictions

Click a satellite name to view upcoming passes:

- **AOS** — Acquisition of Signal (rise time)
- **TCA** — Time of Closest Approach
- **LOS** — Loss of Signal (set time)
- **Max Elevation** — Highest point in pass

Reference Widget

Quick-reference tables for common ham radio information. Use the tabs to switch between different references.

RST Tab

Readability-Strength-Tone signal reporting system:

Code	Readability	Strength	Tone (CW)
1	Unreadable	Faint	Harsh, hum
2	Barely readable	Very weak	Harsh, mod
3	Readable w/ difficulty	Weak	Rough, hum
4	Almost perfectly	Fair	Rough, mod
5	Perfectly readable	Fairly good	Wavering
6	—	Good	Wavering, mod

Code	Readability	Strength	Tone (CW)
7	—	Mod. strong	Good, slight hum
8	—	Strong	Good, slight mod
9	—	Very strong	Perfect tone

Usage: Phone reports use RS only (e.g., "59"). CW reports use RST (e.g., "599").

Phonetic Tab

NATO phonetic alphabet for clear letter pronunciation.

Morse Tab

International Morse code dit/dah patterns for each letter and number.

Q-Codes Tab

Common Q-code abbreviations used in amateur radio.

Bands Tab

US amateur band privileges by license class (Extra, General, Technician, Novice). Shows frequency ranges and allowed modes for each class.

- **My privileges only** — Check this box to filter the table to show only your license class. Requires a US callsign set in Config.
- Mode groups: **All** (any mode), **CW** (Morse only), **CW/Digital** (CW and digital modes like FT8), **Phone** (voice modes like SSB).

DX Detail Widget

Detailed information about the currently selected spot.

Information Displayed

- **Callsign** — With link to QRZ.com lookup
- **Name/Address** — From QRZ if available

- **License Class** — If available
- **Grid Square** — Maidenhead locator
- **Frequency** — Operating frequency
- **Mode** — Operating mode
- **Reference** — Park/Summit (if applicable)
- **Distance** — Great-circle distance from your QTH
- **Bearing** — Compass heading to station

Selecting a Spot

Click any spot row in On the Air, or click a map marker, to populate this widget.

Map Features

The HamMap widget is an interactive Leaflet-based map with multiple layers and overlays designed for amateur radio use.

Base Map

The default base map uses OpenStreetMap tiles. The map supports standard interactions:

- **Zoom** — Mouse wheel, pinch gesture, or +/- buttons
- **Pan** — Click and drag
- **Double-click** — Zoom in on clicked location

Marker Types

Your QTH (Home Location)

- **Color**: Blue
- **Shape**: Circle marker
- **Label**: Your callsign (if set)
- Shows your configured location from Config

POTA Activations

- **Color**: Green
- **Shape**: Circle marker
- Click to select and view park details

SOTA Activations

- **Color**: Orange
- **Shape**: Circle marker
- Click to select and view summit details

DX Cluster Spots

- **Color**: Red

- **Shape**: Circle marker
- Click to select and view DX station details

PSKReporter Spots

- **Color**: Purple
- **Shape**: Circle marker
- Click to select and view digital mode report details

Selected Spot

- **Color**: Yellow/Gold highlight
- Currently selected spot is highlighted
- Geodesic path drawn from your QTH

Satellite Positions

- **Shape**: Satellite icon
- Shows real-time position of tracked satellites
- Click to select and view pass information

Map Overlays

Access overlay controls via the gear icon in the HamMap widget title bar.

Latitude/Longitude Grid

Displays geographic coordinate lines at regular intervals. Useful for referencing positions by decimal degrees.

Maidenhead Grid

Displays the amateur radio grid square overlay. Grid squares are labeled with their 2 or 4-character designators (e.g., FN31).

> Tip: Maidenhead grid squares are essential for VHF/UHF contesting and grid chasing.

Timezone Overlay

Shows world timezone boundaries. Helpful for determining local time at DX stations.

Gray Line (Day/Night Terminator)

Shows the current position of the day/night boundary on Earth. The gray line is the region transitioning between day and night.

> **Tip:** Gray line propagation can enable long-distance contacts on lower HF bands as signals follow the terminator around the Earth.

Geodesic Paths

When you select a spot, HamTab draws a **geodesic path** (great-circle line) from your QTH to the spot's location.

What is a Geodesic Path?

A geodesic path is the shortest distance between two points on a sphere. On a flat map projection, this appears as a curved line, but it represents the actual shortest path a radio signal travels.

Path Information

The path color matches the spot source (green for POTA, orange for SOTA, etc.). The DX Detail widget shows:

- **Distance** — Great-circle distance in miles or kilometers
- **Bearing** — Initial compass heading from your QTH

Satellite Features

Real-Time Position

Tracked satellites show their current position updated every few seconds. The satellite icon moves across the map in real-time.

Footprint Circles

Each satellite displays its "footprint" — the circular area on Earth that can currently see (and potentially communicate with) the satellite. If you're inside the footprint circle, the satellite is above your horizon.

ISS Orbit Path

The ISS displays a dashed cyan line showing its predicted ground track for one full orbit (~92 minutes). The line starts slightly behind the ISS's current position (showing where it just was) and extends forward through the rest of the orbit. The path updates every 10 seconds and wraps correctly across the international date line.

Live Spots Paths

When you enable a band in the Live Spots widget, the map displays geodesic paths from your QTH to each station receiving your signal on that band.

Band Colors

Each band uses a distinct color for its paths, making it easy to see propagation patterns across multiple bands simultaneously.

HF Propagation Circles

When you click a band row in the HF Propagation widget, the map displays estimated propagation range circles centered on your QTH.

These circles represent:

- **Inner circle** — Near skip zone (signals skip over this area)
- **Outer circle** — Maximum estimated range based on current conditions

> Note: Propagation circles are estimates based on general conditions. Actual propagation varies with solar activity, time of day, and path geometry.

Map Center Modes

Configure how the map centers via Config:

QTH Mode

Map centers on your home location. Best for:

- Monitoring nearby activations
- Planning which spots are in easy reach
- Seeing your local propagation environment

Spot Mode

Map centers on the currently selected spot. Best for:

- Examining spot details
- Seeing the spot's geographic context
- Planning antenna headings

Performance Tips

- **Reduce overlays** — Disable unused overlays for smoother performance
- **Limit satellites** — Track only satellites you're actively interested in
- **Filter spots** — Use filters to reduce marker count on busy bands
- **Zoom appropriately** — Very wide zoom with many markers can slow rendering

Data Sources

HamTab aggregates data from multiple amateur radio services. All external API calls are proxied through the HamTab server to protect your privacy and comply with Content Security Policy.

POTA (Parks on the Air)

What is POTA?

Parks on the Air is an amateur radio program that encourages portable operation from parks and protected natural areas worldwide. Activators set up stations in parks; hunters contact them for park-to-park and park-to-home QSOs.

Data Provided

- **Activator callsign** — Station operating in the park
- **Frequency** — Operating frequency in kHz
- **Mode** — CW, SSB, FT8, etc.
- **Park reference** — Unique park identifier (e.g., K-0001)
- **Park name** — Full name of the park
- **Spot time** — When the spot was posted

Filtering Options

- Band, Mode, Distance, Age
- Country (DXCC entity)
- US State
- Grid square prefix
- License privilege

Links

- Park references link to pota.app with full park details
- Includes activation history, park location, and contact requirements

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SOTA (Summits on the Air)

What is SOTA?

Summits on the Air is an award program for amateur radio operators who operate from mountain summits. Activators hike to summits and make contacts; chasers work them from home or portable locations.

Data Provided

- **Activator callsign** — Station operating on the summit
- **Frequency** — Operating frequency in kHz
- **Mode** — Operating mode
- **Summit reference** — Unique summit identifier (e.g., W7W/KG-001)
- **Summit details** — Name, elevation, points
- **Spot time** — When the spot was posted

Filtering Options

- Band, Mode, Distance, Age

Links

- Summit references link to sotadata.org.uk with full summit information
- Includes summit location, elevation, activation history, and point values

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DX Cluster (DXC)

What is DX Cluster?

DX Cluster is a worldwide network where amateur radio operators post "spots" of interesting DX (long-distance) stations they've heard or worked. It's the primary real-time source for DX activity.

Data Provided

- **DX callsign** — The DX station being spotted
- **Frequency** — Operating frequency in kHz
- **Mode** — Operating mode (may be inferred from frequency)
- **Spotter** — Callsign of the station posting the spot
- **Country** — DXCC entity of the DX station

- **Continent** — Continent code (NA, SA, EU, AF, AS, OC)
- **Spot time** — When the spot was posted

Filtering Options

- Band, Mode, Distance, Age
- Continent

Notes

- DX Cluster spots come from multiple cluster nodes worldwide
- Spot quality varies — some spots may be inaccurate or outdated
- High-demand DX may generate many duplicate spots

PSKReporter

What is PSKReporter?

PSKReporter is an automatic propagation reporting network. Digital mode software (WSJT-X, JS8Call, etc.) automatically uploads reception reports to PSKReporter, creating a real-time map of worldwide propagation.

Data Provided

- **TX callsign** — Station being received
- **Frequency** — Operating frequency in Hz
- **Mode** — Digital mode (FT8, FT4, JS8, etc.)
- **RX callsign** — Station receiving the signal
- **SNR** — Signal-to-noise ratio in dB
- **TX grid** — Transmitting station's grid square
- **RX grid** — Receiving station's grid square
- **Spot time** — When the reception occurred

Filtering Options

- Band, Mode, Distance, Age

Use Cases

- See who's active on digital modes
- Monitor real-time propagation
- Find active stations to call

Space Weather (HamQSL)

What is HamQSL Space Weather?

HamQSL provides real-time space weather data relevant to HF propagation. Solar activity directly affects ionospheric conditions and thus radio propagation.

Data Provided

Metric	Source	Relevance
Solar Flux Index	NOAA	Higher = better HF propagation
Sunspot Number	SILSO	Correlates with SFI
A-Index	NOAA	Geomagnetic disturbance (lower = better)
K-Index	NOAA	Short-term geomagnetic activity
X-Ray Flux	GOES satellite	Solar flare intensity
Solar Wind	ACE satellite	Particle stream speed
Bz (IMF)	ACE satellite	Interplanetary magnetic field
Proton Flux	GOES satellite	High-energy particle flux
Aurora Activity	NOAA	Northern/Southern lights

Update Frequency

Space weather data updates every few minutes. The Solar widget shows the timestamp of the last update.

Satellite Data (N2YO)

What is N2YO?

N2YO is a satellite tracking service that provides real-time positions and pass predictions for thousands of satellites, including amateur radio satellites.

Data Provided

- **Real-time position** — Latitude, longitude, altitude
- **Azimuth/Elevation** — Position in observer's sky
- **Pass predictions** — Upcoming visible passes
- **Orbital parameters** — TLE data

API Key Required

N2YO requires a free API key. Without it, satellite tracking is disabled.

Supported Satellites

HamTab includes frequency information for popular amateur satellites:

- ISS (ZARYA) — Voice, SSTV, APRS
- AO-91 (RadFxSat) — FM repeater
- AO-92 (Fox-1D) — FM repeater
- SO-50 — FM repeater
- CAS-4A/4B — Linear transponder
- RS-44 — Linear transponder
- TEVEL-1/2 — FM transponder

Weather Data

National Weather Service (NWS)

Default weather provider for US locations. No API key required.

- Current conditions
- Forecast data

- Alerts and warnings

Weather Underground

Alternative weather provider. Requires free API key.

- Current conditions from personal weather stations
- Useful for non-US locations or more local data

Data Refresh Rates

Data Source	Refresh Interval
POTA spots	60 seconds
SOTA spots	60 seconds
DX Cluster	60 seconds
PSKReporter	60 seconds
Space weather	5 minutes
Satellite positions	5 seconds
Live Spots (your TX)	60 seconds

> **Tip:** Data refresh happens automatically. There's no need to manually refresh the page.

Privacy

All external API requests are proxied through the HamTab server:

- Your IP address is not exposed to external services
- Your location is not transmitted to data providers
- Distance calculations happen client-side using locally-stored coordinates

Filter System

The Filters widget provides powerful filtering capabilities to help you find the spots you're looking for.

How Filters Work

Filters are **AND** logic — a spot must match ALL active filters to appear. For example, if you select 20m band AND CW mode, only spots on 20m CW will show.

Within filter categories (like bands), selection is **OR** logic — selecting both 20m and 40m shows spots on either band.

Band Filters

Selecting Bands

Click any band button to toggle it:

- **Highlighted** = Active (spots on this band shown)
- **Dimmed** = Inactive (spots on this band hidden)

If NO bands are selected, ALL bands are shown (no band filtering).

HF Bands

Band	Frequency	Typical Use
160m	1.8-2.0 MHz	Nighttime DX, regional
80m	3.5-4.0 MHz	Regional, some DX at night
60m	5.3-5.4 MHz	Channelized, emergency
40m	7.0-7.3 MHz	All-around band, day & night
30m	10.1-10.15 MHz	CW/Digital only, quiet band
20m	14.0-14.35 MHz	Primary DX band, daytime
17m	18.068-18.168 MHz	DX, follows 15m propagation

Band	Frequency	Typical Use
15m	21.0-21.45 MHz	DX during solar maximum
12m	24.89-24.99 MHz	DX, sporadic propagation
10m	28.0-29.7 MHz	Local/DX, cycle dependent

VHF/UHF Bands

Band	Frequency	Typical Use
6m	50-54 MHz	"Magic band", sporadic E
2m	144-148 MHz	Local, satellite, EME
70cm	420-450 MHz	Local, satellite, repeaters

Mode Filters

Mode Categories

Mode	Includes
CW	Morse code (all speeds)
Phone	SSB, FM, AM voice
Digital	FT8, FT4, JS8, PSK, RTTY, etc.

Selecting Modes

Same as bands — click to toggle. If no modes selected, all modes shown.

Distance Filter

Filter spots within a radius of your QTH.

Setting Distance

1. Enter a number in the distance field
2. Choose units: **mi** (miles) or **km** (kilometers)
3. Only spots within that distance appear

Examples

- `100 mi` — Local parks/summits within easy drive
- `500 mi` — Regional, one-hop propagation
- `3000 mi` — Typical 20m single-hop range
- `6000 mi` — Multi-hop DX paths

> **Important:** Distance filtering requires your location to be set. If no location is configured, the distance filter has no effect.

Age Filter

Filter spots by recency.

Setting Age

Enter the maximum age in minutes. Only spots posted within that time appear.

Recommended Settings

- `15 min` — Very fresh spots, likely still active
- `30 min` — Standard, most activators still QRV
- `60 min` — Includes recent activity, some may have QRT
- `120 min` — Historical view, many inactive

> **Tip:** Shorter age filters help you focus on currently-active stations. Longer filters give you a broader picture of activity patterns.

Location Filters

Country Filter

Filter by DXCC entity (country). Enter the country name or prefix.

- Available for: POTA, SOTA

State Filter

Filter by US state abbreviation (e.g., `NY`, `CA`).

- Available for: POTA only

Grid Filter

Filter by Maidenhead grid prefix (2 or 4 characters).

- Example: `FN` shows all FN grids (Northeast US)
- Example: `FN31` shows only FN31 grid square

Continent Filter

Filter by continent code.

- Available for: DX Cluster only

Code	Continent
NA	North America
SA	South America
EU	Europe
AF	Africa
AS	Asia
OC	Oceania

License Privilege Filter

Filter spots based on what frequencies you can legally transmit on.

How It Works

Select your US license class. Spots on frequencies outside your privileges are hidden.

License Classes

Class	HF Privileges
Extra	All amateur frequencies
General	Most HF with some restrictions
Technician	Limited HF (CW portions, 10m)
Novice	Very limited HF (CW portions)

Mode Considerations

Privileges vary by mode:

- **CW/Digital** portions are often available to lower classes
- **Phone** portions are more restricted

> Note: This filter uses FCC Part 97 rules for US amateurs. Non-US operators should verify their own regulations.

Filter Presets

Save and recall filter combinations for quick switching.

Saving a Preset

1. Configure your filters as desired
2. Click **Save Preset** in the Filters widget

3. Enter a descriptive name
4. Click Save

Loading a Preset

Click any preset button to instantly apply those filter settings.

Deleting a Preset

Long-press (click and hold) a preset button to delete it.

Preset Ideas

Preset Name	Filters	Use Case
"40m CW"	40m band, CW mode	CW hunters
"Local Parks"	100mi distance	Finding nearby activations
"FT8 DX"	20m+17m+15m, Digital	Hunting digital DX
"Tech HF"	Technician privilege	Tech operators
"Fresh Spots"	15min age	Only current activity
"Weekend"	20m+40m, Phone	Casual SSB operating

Filter Combinations

Example: POTA Hunting on 40m CW within 500 miles

1. Select **POTA** tab in On the Air
2. Click **40m** band button
3. Click **CW** mode button
4. Enter `500` in distance, select `mi`
5. Save as preset: "Local 40m CW Parks"

Example: All DX on 20m and up

1. Select **DXC** tab
2. Click **20m, 17m, 15m, 12m, 10m** bands
3. Leave mode empty (all modes)
4. Set age to `30` minutes
5. Save as preset: "20m+ DX"

Example: Digital modes from Europe

1. Select **PSK** tab
2. Click **Digital** mode
3. Set continent filter to `EU`
4. Save as preset: "EU Digital"

Clearing Filters

Clear Individual Filters

- Click active band/mode buttons to deselect
- Clear text from distance/age fields
- Clear location filter text

Clear All Filters

Click **Clear** or **Reset** if available, or reload the page. All filters return to defaults (no filtering).

> Tip: If you're not seeing expected spots, clear all filters first, then add filters one at a time to identify which filter is excluding them.

Configuration

All HamTab settings are accessed via the Config panel (gear icon in the top-right corner).

Personal Information

Callsign

Your amateur radio callsign. Used for:

- Live Spots widget (showing who receives your signal)
- DX Detail distance/bearing calculations
- Map marker label at your QTH

> Tip: Your callsign is stored locally and never transmitted to HamTab servers.

Location (QTH)

GPS

Click "Use GPS" to automatically detect your location.

- Requires HTTPS and browser permission
- Most accurate option
- May not work with self-signed certificates

Grid Square

Enter your 4 or 6-character Maidenhead grid (e.g., `FN31` or `FN31pr`).

- Good balance of accuracy and privacy
- Standard for amateur radio location sharing

Manual Coordinates

Enter decimal degrees:

- **Latitude**: Positive = North, Negative = South

- **Longitude**: Positive = East, Negative = West
- Example: `41.7128, -73.0060`

Time Format

- **Local** — Times in your browser's timezone
- **UTC** — Times in Coordinated Universal Time

> Tip: UTC is standard in amateur radio. Using UTC eliminates confusion when logging contacts with stations in different timezones.

API Keys

N2YO API Key

Required for satellite tracking.

1. Visit n2yo.com/api
2. Create a free account
3. Generate an API key
4. Paste into Config

Without this key, the Satellites widget is disabled.

Weather Underground API Key

Optional, for enhanced weather data.

1. Visit wunderground.com/member/api-keys
2. Create account and generate key
3. Paste into Config

If not provided, weather data comes from National Weather Service (US only).

Display Preferences

Units

- **Distance**: Miles or Kilometers
- **Temperature**: Fahrenheit or Celsius

Map Center Mode

- **QTH** — Map stays centered on your location
- **Spot** — Map centers on selected spot

Widget Visibility

Check or uncheck widgets to show or hide them:

- ☐ Filters
- ☐ On the Air
- ☐ HamMap
- ☐ Solar
- ☐ Band Conditions
- ☐ HF Propagation
- ☐ Live Spots
- ☐ Lunar / EME
- ☐ Satellites
- ☐ Reference
- ☐ DX Detail

Hidden widgets can be re-enabled anytime.

Widget-Specific Settings

Many widgets have their own configuration. Access via the gear icon in each widget's title bar.

Solar Widget Settings

Show/hide individual fields:

- Solar Flux, Sunspots, A-Index, K-Index (default: shown)

- X-Ray, Signal Noise (default: shown)
- Solar Wind, Bz, Proton Flux, etc. (default: hidden)

Lunar Widget Settings

Show/hide individual fields:

- Phase, Illumination, Declination, Distance, Path Loss (default: shown)
- Elongation, Ecliptic coordinates, Right Ascension (default: hidden)

On the Air Column Settings

Per-source column visibility for POTA, SOTA, DXC, PSK tables.

Live Spots Display Mode

- **Count** — Show number of stations receiving you
- **Distance** — Show distance to farthest receiver

Satellite Selection

Add or remove satellites from tracking.

Layout Management

Automatic Layout Save

Widget positions and sizes are automatically saved to localStorage. When you reload, your layout is restored.

Reset Layout

To reset to default layout:

1. Open browser developer tools (F12)
2. Go to Application → Local Storage
3. Delete keys starting with `hamtab_`
4. Reload the page

Config Export/Import

Exporting Configuration

1. Open Config
2. Click **Export Config**
3. Save the JSON file

Exported data includes:

- Callsign and location
- API keys
- All preferences
- Filter presets
- Widget visibility
- Layout positions

Importing Configuration

1. Open Config
2. Click **Import Config**
3. Select a previously exported JSON file
4. Settings are applied immediately

> **Important:** Exported configs contain your API keys. Store them securely and don't share publicly.

---

localStorage Keys

HamTab stores all data in browser localStorage with the `hamtab_` prefix:

Key	Content
`hamtab_callsign`	Your callsign
`hamtab_lat`	Latitude

Key	Content
`hamtab_lon`	Longitude
`hamtab_grid`	Grid square
`hamtab_utc`	Time format preference
`hamtab_n2yo_key`	N2YO API key
`hamtab_wu_key`	Weather Underground key
`hamtab_widgets`	Widget visibility
`hamtab_widgets_user`	Widget positions/sizes
`hamtab_filter_presets`	Saved filter presets
`hamtab_solar_fields`	Solar field visibility
`hamtab_lunar_fields`	Lunar field visibility
`hamtab_tracked_sats`	Tracked satellite IDs

Clearing All Data

To completely reset HamTab:

1. Open browser developer tools
2. Console: `localStorage.clear()`
3. Reload the page

Or use your browser's "Clear site data" feature.

Privacy

Data Stored Locally

All personal data stays in your browser:

- Callsign

- Location
- API keys
- Preferences

Data Never Transmitted

HamTab never sends your personal information to its servers. External API calls are proxied, protecting your IP address.

GDPR Compliance

- No tracking or analytics
- No cookies (localStorage only)
- You control all your data
- Export/delete anytime

Reference Tables

Quick reference information for amateur radio operating.

RST Signal Reporting

The RST system is the standard method for reporting signal quality in amateur radio.

Readability (R)

Code	Meaning
1	Unreadable
2	Barely readable, occasional words distinguishable
3	Readable with considerable difficulty
4	Readable with practically no difficulty
5	Perfectly readable

Strength (S)

Code	Meaning	Approximate S-Meter
1	Faint, barely perceptible	S0
2	Very weak	S1
3	Weak	S2-S3
4	Fair	S4
5	Fairly good	S5
6	Good	S6
7	Moderately strong	S7
8	Strong	S8

Code	Meaning	Approximate S-Meter
9	Very strong	S9 or above

Tone (T) - CW Only

Code	Meaning
1	Extremely rough, hissing note
2	Very rough AC note, no trace of musicality
3	Rough AC note, slightly musical
4	Rough note, trace of musicality
5	Musically modulated note
6	Modulated note, slight trace of whistle
7	Near DC note, smooth ripple
8	Near perfect DC note, slight trace of ripple
9	Perfect DC note

Usage Examples

Mode	Format	Example	Meaning
Phone (SSB/FM)	RS	59	Perfectly readable, very strong
CW	RST	599	Perfect readability, strength, tone
CW	RST	579	Readable, moderately strong, perfect tone

> **Tip:** In contests, 599 or 59 is almost always given regardless of actual signal quality to speed up exchanges.

NATO Phonetic Alphabet

Standard phonetics for clear letter pronunciation over radio.

Letter	Phonetic	Letter	Phonetic
A	Alpha	N	November
B	Bravo	O	Oscar
C	Charlie	P	Papa
D	Delta	Q	Quebec
E	Echo	R	Romeo
F	Foxtrot	S	Sierra
G	Golf	T	Tango
H	Hotel	U	Uniform
I	India	V	Victor
J	Juliet	W	Whiskey
K	Kilo	X	X-ray
L	Lima	Y	Yankee
M	Mike	Z	Zulu

Numbers

Number	Phonetic
0	Zero
1	One
2	Two
3	Three

Number	Phonetic
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Niner

> **Tip:** "Niner" is used instead of "nine" to avoid confusion with German "nein" (no).

HF Band Chart

US Amateur HF Allocations

Band	Frequency (MHz)	Wavelength	Primary Use
160m	1.800 - 2.000	160 meters	Nighttime, regional to DX
80m	3.500 - 4.000	80 meters	Night regional, some DX
60m	5.330 - 5.410	60 meters	Channelized, emergency
40m	7.000 - 7.300	40 meters	Day & night, reliable DX
30m	10.100 - 10.150	30 meters	CW/Digital only
20m	14.000 - 14.350	20 meters	Primary DX band
17m	18.068 - 18.168	17 meters	DX, WARC band
15m	21.000 - 21.450	15 meters	DX during high solar
12m	24.890 - 24.990	12 meters	DX, WARC band

Band	Frequency (MHz)	Wavelength	Primary Use
10m	28.000 - 29.700	10 meters	DX & local

Band Plan Segments (General Guidelines)

Segment	Typical Use
Bottom of band	CW
Lower portion	CW, RTTY, Digital
Middle	Digital, Packet
Upper portion	Phone (SSB)

US License Class Privileges

Extra Class

Full privileges on all amateur bands.

General Class

Band	CW/Digital	Phone
160m	1.800-2.000	1.800-2.000
80m	3.525-3.600	3.800-4.000
40m	7.025-7.125	7.175-7.300
30m	10.100-10.150	—
20m	14.025-14.150	14.225-14.350
17m	18.068-18.110	18.110-18.168
15m	21.025-21.200	21.275-21.450

Band	CW/Digital	Phone
12m	24.890-24.930	24.930-24.990
10m	28.000-28.300	28.300-29.700

Technician Class

Band	CW/Digital	Phone
80m	3.525-3.600	—
40m	7.025-7.125	—
15m	21.025-21.200	—
10m	28.000-28.300	28.300-28.500
6m+	All	All

> **Note:** This is a simplified reference. See FCC Part 97 for complete and current regulations.

Q Signals

Common Q signals used in amateur radio.

Q Signal	Question	Answer/Statement
QRL?	Is this frequency in use?	This frequency is in use
QRM	Are you being interfered with?	I am being interfered with
QRN	Are you troubled by static?	I am troubled by static
QRO	Shall I increase power?	Increase power
QRP	Shall I decrease power?	Decrease power
QRS	Shall I send more slowly?	Send more slowly

Q Signal	Question	Answer/Statement
QRT	Shall I stop sending?	Stop sending
QRV	Are you ready?	I am ready
QRZ?	Who is calling me?	You are being called by...
QSB	Are my signals fading?	Your signals are fading
QSL	Can you acknowledge receipt?	I acknowledge receipt
QSO	Can you communicate with...?	I can communicate with...
QSY	Shall I change frequency?	Change frequency to...
QTH	What is your location?	My location is...

Maidenhead Grid System

The Maidenhead Locator System divides the world into grid squares for location reference.

Grid Square Format

Characters	Name	Size	Example
2 (AA-RR)	Field	20° × 10°	FN
4 (AA00-RR99)	Square	2° × 1°	FN31
6 (AA00aa-RR99xx)	Subsquare	5' × 2.5'	FN31pr

Example Locations

Location	4-char	6-char
New York City	FN30	FN30as
Los Angeles	DM04	DM04wd
London	IO91	IO91wm

Location	4-char	6-char
Tokyo	PM95	PM95vq
Sydney	QF56	QF56od

> **Tip:** 6-character grid squares are standard for VHF+ work and provide accuracy to about 3 × 4 miles.

Continent Codes

Standard abbreviations used in DX logging and awards.

Code	Continent	DXCC Entities
NA	North America	USA, Canada, Mexico, Caribbean
SA	South America	Brazil, Argentina, Chile, etc.
EU	Europe	UK, Germany, France, etc.
AF	Africa	South Africa, Morocco, etc.
AS	Asia	Japan, China, India, etc.
OC	Oceania	Australia, New Zealand, Pacific Islands
AN	Antarctica	Antarctic bases

Troubleshooting

Common issues and their solutions.

Location / GPS Issues

GPS Button Does Nothing

Possible causes:

- Browser doesn't support Geolocation API
- Page not served over HTTPS
- Browser permission denied

Solutions:

1. Ensure you're using HTTPS (check URL bar for lock icon)
2. Check browser permissions: Settings → Privacy → Location
3. Try a different browser (Chrome recommended)
4. Use Grid Square or Manual coordinates instead

GPS Permission Denied

Solution:

1. Click the lock/info icon in the address bar
2. Find Location permission
3. Change from "Block" to "Allow"
4. Reload the page

Location Not Accurate

Solutions:

- Use 6-character grid square for better precision
- Enter manual coordinates from a GPS app or Google Maps
- GPS accuracy varies by device and environment

Data Loading Issues

Spots Not Loading

Possible causes:

- Network connectivity issue
- Server temporarily unavailable
- Browser cache issue

Solutions:

1. Check your internet connection
2. Wait a minute and spots will auto-refresh
3. Hard refresh: Ctrl+Shift+R (Windows) or Cmd+Shift+R (Mac)
4. Clear browser cache and reload

"No spots found" Message

This is normal when:

- No activations match your current filters
- Time of day has low activity
- Band conditions are poor

Try:

- Clear all filters to see if spots exist
- Check different source tabs (POTA, SOTA, DXC, PSK)
- Widen your distance filter
- Increase age filter

Stale Data

If data seems outdated:

1. Check the timestamp in the widget (if shown)
2. Hard refresh the page
3. Check if the data source itself is down (visit pota.app, sotawatch, etc.)

Satellite Tracking Issues

"API Key Required" Message

Solution:

1. Get a free API key from n2yo.com/api
2. Open Config (gear icon)
3. Paste the key in the N2YO API Key field
4. Wait a few seconds for data to load

Satellites Not Showing

Possible causes:

- Invalid API key
- N2YO service temporarily down
- No satellites tracked

Solutions:

1. Verify your API key is correct (no extra spaces)
2. Open satellite settings (gear icon) and ensure satellites are selected
3. Check n2yo.com to verify service is working

Pass Times Seem Wrong

Check:

- Your location is set correctly
- Your timezone setting matches your expectation
- Pass times are shown in your selected format (Local or UTC)

Weather Data Issues

Weather Not Displaying

For US locations:

- NWS data should load automatically
- Check that your location is within the United States

For non-US locations:

- Weather Underground API key required
- Enter your WU API key in Config

Weather Underground Not Working

Solutions:

1. Verify your API key is valid
2. Check that your WU account is active
3. WU free tier has daily request limits — may be exhausted

Map Issues

Map Not Loading

Possible causes:

- JavaScript error
- Network blocking tile servers
- Browser extension interference

Solutions:

1. Open browser console (F12) and check for errors
2. Disable ad blockers temporarily
3. Try incognito/private mode
4. Try a different browser

Markers Not Appearing

Check:

- Widget visibility (HamMap must be checked in Config)
- Filters aren't excluding all spots

- Zoom level (zoom in if markers seem missing)

Map Tiles Missing

Solutions:

- Check internet connection
- OpenStreetMap tile servers may be temporarily slow
- Wait and tiles will load as bandwidth allows

Filter Issues

Filters Not Working

Symptoms: Changing filters has no effect

Solutions:

1. Clear all filters and start fresh
2. Check if you're on the correct source tab
3. Some filters only apply to certain sources (e.g., State filter is POTA-only)

Privilege Filter Hiding Everything

Cause: Selected license class has no privileges on active bands

Solution:

- Select a higher license class
- Or disable the privilege filter entirely

Presets Not Saving

Possible causes:

- localStorage is full or disabled
- Private/incognito browsing mode

Solutions:

1. Close other tabs to free localStorage space

2. Exit private browsing mode
3. Clear old HamTab data and try again

Display Issues

Widgets Overlapping

Solutions:

1. Drag widgets to rearrange
2. Resize widgets by dragging edges
3. Reset layout by clearing localStorage (see Configuration chapter)

Text Too Small/Large

Solutions:

- Use browser zoom: Ctrl/Cmd + Plus/Minus
- Check your browser's minimum font size setting
- HamTab is designed for 100% browser zoom

Dark Theme Issues

Note: HamTab uses a dark theme by default. If colors appear wrong:

1. Disable browser extensions that modify page colors
2. Check for high contrast mode in OS accessibility settings

Performance Issues

Page Loading Slowly

Solutions:

1. Reduce number of tracked satellites
2. Disable unused overlays (grid, timezone, gray line)
3. Close other browser tabs
4. Use fewer filter presets

High CPU/Memory Usage

Possible causes:

- Many satellites tracked
- Many overlays enabled
- Browser memory leak (rare)

Solutions:

1. Reduce tracked satellites to 1-2
2. Disable map overlays
3. Restart browser if issue persists

LAN Mode Specific Issues

Certificate Warning

This is expected. LAN mode uses self-signed certificates.

Solutions:

- Click "Advanced" and "Proceed anyway"
- Add certificate exception in browser
- This warning appears once per browser/device

Can't Access from Other Devices

Check:

1. Both devices on same network
2. Firewall allows port 3000 (HTTP) and 3443 (HTTPS)
3. Use the correct IP address (check with `ipconfig` or `ifconfig`)

Update Checker Not Working

Solutions:

1. Ensure internet connection
2. GitHub API may be rate-limited — try again later

3. Check that you're running from a proper release, not development

---

Getting Help

Check GitHub Issues

Visit github.com/your-repo/issues to:

- Search for known issues
- Report new bugs
- Request features

Provide Debug Information

When reporting issues, include:

- Browser name and version
- Operating system
- Steps to reproduce
- Console errors (F12 → Console tab)
- Screenshots if applicable

Feedback

Use the in-app feedback form (if available) to report issues or suggestions. Your email is encrypted for privacy.

Quick Fixes Summary

Problem	Quick Fix
Data not loading	Hard refresh (Ctrl+Shift+R)
GPS not working	Use Grid Square instead
Satellites disabled	Add N2YO API key
No spots visible	Clear all filters

Problem	Quick Fix
Layout messed up	Clear localStorage
Page slow	Reduce satellites, disable overlays
Certificate warning	Accept/proceed (LAN mode only)