GRIDDOWN

Tactical Navigation & Planning

Comprehensive User Guide

Version 6.19.9

BlackDot Technology
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1. Introduction

1.1 What is GridDown?

GridDown is a professional-grade Progressive Web Application (PWA) designed for tactical navigation and operational planning in challenging environments. Built with an offline-first philosophy, GridDown ensures that critical functionality remains available when traditional communications and mapping services are unavailable.

Whether you are a search and rescue coordinator, emergency responder, outdoor enthusiast, or tactical operator, GridDown provides the tools you need to plan, navigate, and communicate effectively when the grid goes down.

1.2 Core Philosophy

- Offline-First: Every feature works without internet after initial setup
- Paper Backup: Comprehensive print/PDF export when electronics fail
- Field-Ready: Designed for real-world tactical and emergency scenarios
- Self-Reliant: No cloud dependencies, no accounts required
- Infrastructure Independent: Works when the grid goes down

1.3 Key Capabilities

GridDown integrates multiple critical functions into a single application:

Category	Features
Navigation	Interactive maps, GPS tracking, turn-by-turn guidance, compass
Planning	Route building, logistics calculation, contingency planning
Communication	APRS, Meshtastic mesh networking, SSTV, team coordination
Detection	RadiaCode radiation, RF Sentinel aircraft/ships, SARSAT beacons
Environment	Weather forecasts, terrain analysis, sun/moon calculator
Reference	Medical protocols, field guides, radio frequencies
Export	GPX/KML, print to PDF, encrypted plan sharing

1.4 System Requirements

1.4.1 Supported Browsers

Browser	Version	Notes
Chrome	80+	Full support including Web Bluetooth
Edge	80+	Full support including Web Bluetooth

Opera	67+	Full support including Web Bluetooth
Firefox	75+	No Web Bluetooth (device connections limited)
Safari	13.1+	No Web Bluetooth (device connections limited)
Chrome Android	80+	Full support on mobile
Safari iOS	13+	Limited - no Web Bluetooth

Recommendation: Use Chrome or Edge for full functionality, especially for connecting to RadiaCode, APRS TNC, and Meshtastic devices.

1.4.2 Device Requirements

- Modern smartphone, tablet, or computer with GPS (recommended)
- Minimum 500 MB storage for offline map tiles
- Internet connection for initial setup and map downloads
- Microphone access for SSTV receive (optional)
- Camera access for SSTV transmit (optional)

2. Getting Started

2.1 Installation

2.1.1 Web Browser (Recommended)

Step 1: Navigate to the GridDown URL (e.g., app.blackdot.tech)

Step 2: When prompted, click Install or Add to Home Screen

Step 3: GridDown will install as a standalone application

Step 4: The app icon will appear on your home screen or desktop

Once installed, GridDown can be launched without an internet connection, though initial setup requires connectivity to download map tiles.

2.1.2 Running Locally

For advanced users who wish to self-host GridDown:

Step 5: Download the GridDown package from the official repository

Step 6: Extract files to a web server directory

Step 7: Serve via any static web server (Apache, Nginx, Python http.server)

Step 8: Access via http://localhost:8000 or your server address

2.2 First Launch

When you first open GridDown, an onboarding tour will guide you through the main features:

- Map navigation and controls
- Creating waypoints
- Building routes
- Downloading offline maps
- Accessing panels and settings

You can restart this tour at any time from Settings > Show Onboarding Tour.

2.3 Interface Overview

The GridDown interface consists of three main areas:

2.3.1 Map Canvas

The central map display shows your current position, waypoints, routes, and overlays. Interact with the map using:

- Pan: Click and drag (mouse) or swipe (touch)
- Zoom: Scroll wheel, pinch gesture, or +/- buttons
- Rotate: Hold Shift and drag, or two-finger rotate on touch devices
- Reset North: Press N key or click the compass indicator

2.3.2 Navigation Sidebar

The left sidebar provides access to all GridDown panels. Categories include:

- Core: Map Layers, Waypoints, Routes, Offline Maps, GPS
- Planning: Logistics, Contingency, Terrain Analysis
- Communications: Radio Reference, APRS, Meshtastic, Team, SSTV
- Sensors: RadiaCode, RF Sentinel, SARSAT
- Environment: Weather, Sun/Moon, Stream Gauges, Barometer
- Reference: Medical, Field Guides, SOS/Emergency
- System: Settings, Print/Export

2.3.3 Status Bar

The bottom status bar displays:

- Current coordinates (multiple formats available)
- Zoom level
- GPS status and accuracy
- Connection indicators (when devices are connected)

3. Map & Navigation

3.1 Map Sources

GridDown supports 15+ map tile sources, selectable from the Map Layers panel:

Source	Type	Best For
OpenStreetMap	Street	General navigation, urban areas
USGS Topo	Topographic	Hiking, terrain analysis (US only)
USGS Imagery	Satellite	Aerial reconnaissance (US only)
USFS Topo	Forest Service	National forests, trails (US only)
Esri World Imagery	Satellite	Global satellite imagery
Esri World Topo	Topographic	Global topographic coverage
Stamen Terrain	Terrain	Hillshade visualization
OpenTopoMap	Topographic	European hiking maps

Tip: Download multiple map sources for the same region to have alternatives if one source fails.

3.2 Coordinate Formats

GridDown displays coordinates in your preferred format. Switch between formats in Settings:

- Decimal Degrees (DD): 37.7749, -122.4194
- Degrees Minutes Seconds (DMS): 37° 46' 29.6" N, 122° 25' 9.8" W
- Degrees Decimal Minutes (DDM): 37° 46.494' N, 122° 25.164' W
- UTM: 10S 551234 4182341
- MGRS: 10SEG 51234 82341

The Coordinate Converter panel allows conversion between all formats.

3.3 GPS Tracking

Enable GPS tracking to display your current position on the map:

Step 9: Open the GPS panel from the sidebar

Step 10: Click Enable GPS Tracking

Step 11: Grant location permission when prompted

Step 12: Your position appears as a blue dot with accuracy circle

GPS features include:

- Current position display with accuracy indicator
- Speed and heading (when moving)
- Altitude from GPS or barometer
- Track recording for later analysis

- Magnetic declination adjustment

3.4 Turn-by-Turn Navigation

For routes with multiple waypoints, GridDown provides voice-guided navigation:

Step 13: Create or load a route with waypoints
Step 14: Open the Navigation panel
Step 15: Select your route and tap Start Navigation
Step 16: Follow voice prompts and on-screen directions

Navigation features:

- Voice announcements for turns and waypoints
- Off-route alerts with recalculation suggestions
- Distance and ETA to next waypoint
- Breadcrumb trail showing your path
- Compass bearing to destination

4. Waypoints & Routes

4.1 Creating Waypoints

Waypoints mark important locations in your operational area. To create a waypoint:

Step 17: Long-press (touch) or right-click (mouse) on the map

Step 18: Select Add Waypoint from the context menu

Step 19: Enter waypoint details in the form

Step 20: Select the appropriate waypoint type

Step 21: Add notes, photos, or verification status as needed

4.1.1 Waypoint Types

Type	Icon	Use Case	Special Fields
Water		Water sources	Flow rate, treatment required
Fuel		Fuel caches, gas stations	Fuel type, quantity
Camp		Campsites, rest areas	Capacity, amenities
Resupply		Supply points	Operating hours, contact
Hazard		Dangers to avoid	Hazard type, severity
Bail-out		Emergency extraction points	Access method, capacity
Custom		General purpose	User-defined fields

4.1.2 Waypoint Verification

Mark waypoints as Verified after confirming their accuracy in the field. Verification includes:

- Verification status (Verified/Unverified)
- Last verification date and time
- Verification notes

Unverified waypoints display with a dotted border as a visual reminder.

4.2 Building Routes

Routes connect waypoints into navigable paths:

Step 22: Open the Routes panel from the sidebar

Step 23: Click New Route to enter route building mode

Step 24: Click on the map to add route points

Step 25: Drag points to adjust the path

Step 26: Set terrain type for each segment (road, trail, technical)

Step 27: Click Save Route when complete

4.2.1 Terrain Classifications

Terrain	Description	Speed Factor
Highway	Paved roads, high speed	1.0x
Road	Maintained roads	0.8x
Trail	Established trails	0.5x
Technical	Off-trail, difficult terrain	0.3x

Terrain classification affects logistics calculations for travel time, fuel consumption, and fatigue.

4.2.2 Elevation Profiles

View elevation changes along your route:

- Open any saved route
- Click View Elevation Profile
- Profile shows elevation gain/loss, grade percentages, and difficulty
- Hover over the profile to highlight the corresponding map location

4.3 Import & Export

GridDown supports standard GPS data formats:

4.3.1 GPX (GPS Exchange Format)

- Import waypoints, routes, and tracks from GPS devices
- Export your data for use in other applications
- Preserves waypoint types, notes, and timestamps

4.3.2 KML/KMZ (Google Earth)

- Import placemarks and paths from Google Earth
- Export for visualization in Google Earth
- Supports styled placemarks with descriptions

5. Offline Maps

5.1 Why Download Maps?

Downloading maps for offline use is critical for GridDown's core mission:

- Ensures map availability when internet is unavailable
- Faster map loading (no network latency)
- Reduced data usage in the field
- True infrastructure independence

5.2 Downloading Map Regions

Step 28: Open the Offline Maps panel

Step 29: Click Draw Region

Step 30: Draw a polygon on the map covering your area of operations

Step 31: Select zoom levels to download (10-17 recommended)

Step 32: Choose map sources to download

Step 33: Click Download and wait for completion

Storage Estimate: A 50 km × 50 km area at zoom levels 10-16 requires approximately 200-400 MB of storage.

5.3 Managing Offline Storage

The Offline Maps panel shows:

- Total tiles downloaded
- Storage space used
- Downloaded regions (can be deleted individually)
- Cache health and statistics

To free up space, delete regions you no longer need or clear the entire cache.

5.4 Storage Warnings

GridDown monitors available storage and alerts you at:

- 80% capacity: Informational warning
- 90% capacity: Moderate warning
- 95% capacity: Critical warning with action required

Access storage management from Settings > Storage or click the warning banner.

6. Communications

6.1 Radio Frequency Reference

The Radio Reference panel provides quick access to common frequencies:

6.1.1 FRS (Family Radio Service)

License-free, short-range communication:

- 22 channels, 462/467 MHz
- Range: 0.5-2 miles typical
- 2 watts maximum power

6.1.2 GMRS (General Mobile Radio Service)

Higher power with FCC license required:

- 30 channels, 462/467 MHz
- Range: 5-25 miles with good conditions
- 50 watts maximum, repeater capable

6.1.3 MURS (Multi-Use Radio Service)

License-free business band:

- 5 channels, 151/154 MHz
- Better building penetration than FRS/GMRS
- 2 watts maximum power

6.1.4 Marine VHF

Maritime communication channels:

- Channel 16: Distress and calling
- Channel 9: Secondary calling
- Weather channels: WX1-WX7

6.2 APRS Integration

Automatic Packet Reporting System provides real-time position tracking over amateur radio.

6.2.1 Connecting a TNC

Step 34: Connect your APRS TNC (Mobilinkd, etc.) via Bluetooth

Step 35: Open the APRS panel in GridDown

Step 36: Click Connect and select your device

Step 37: Configure your callsign and SSID

Step 38: Enable position beaconing if desired

6.2.2 APRS Features

- Real-time station tracking on map
- Distance and bearing to each station
- Station list sorted by proximity
- Message sending (where supported)
- Weather station data display

Requirement: Valid amateur radio license required for transmitting on APRS frequencies.

6.3 Meshtastic Integration

Meshtastic provides off-grid mesh networking without amateur radio licensing.

6.3.1 Connecting a Meshtastic Device

Step 39: Power on your Meshtastic device

Step 40: Open the Meshtastic panel in GridDown

Step 41: Click Connect via Bluetooth or Serial

Step 42: Select your device from the list

Step 43: Configure channel and encryption settings

6.3.2 Meshtastic Features

- Text messaging across mesh network
- Position sharing with all nodes
- Node discovery and signal quality
- Range testing tools
- Channel management

6.4 Team Management

Coordinate team members with the Team panel:

- Create team roster with roles (Leader, Navigator, Medic, etc.)
- Track member status (Active/Stale/Offline)
- View distance and bearing to each member
- Set rally points with proximity alerts
- Configure check-in schedules
- Emergency code words

6.5 SSTV (Slow Scan Television)

Transmit and receive images over amateur radio using SSTV modes.

6.5.1 Supported Modes

Mode	Resolution	Time	Use Case
Robot 36	320×240	36 sec	Fast transmission
Robot 72	320×240	72 sec	Better quality
Martin M1	320×256	114 sec	Standard quality
Scottie S1	320×256	110 sec	Alternative to Martin
PD-90	320×256	90 sec	Moderate speed
PD-120	640×496	126 sec	High resolution
PD-180	640×496	180 sec	Higher quality
PD-290	800×616	290 sec	Maximum resolution

6.5.2 Receiving SSTV

Step 44: Connect your radio's audio output to your device

Step 45: Open the SSTV panel and select the Receive tab

Step 46: Click Start Receiving

Step 47: Tune your radio to an SSTV frequency (e.g., 14.230 MHz)

Step 48: GridDown automatically detects mode and decodes the image

Features: Auto mode detection, waterfall display, signal quality meter, image history.

6.5.3 Transmitting SSTV

Step 49: Enter your callsign in SSTV settings

Step 50: Load an image (camera, gallery, or map capture)

Step 51: Add annotations if desired (draw, text, arrows)

Step 52: Select transmission mode

Step 53: Click Transmit and key your radio

Legal Requirement: Valid amateur radio license required. Callsign is automatically overlaid on transmitted images.

6.5.4 AI Enhancement

Enhance received SSTV images with AI-powered tools:

- 2× and 4× upscaling using neural networks
- Noise reduction for radio interference
- OCR to extract callsigns and grid squares

7. Sensors & Detection

7.1 RadiaCode Gamma Spectrometer

Connect RadiaCode 101/102/103/110 devices for radiation monitoring.

7.1.1 Connecting RadiaCode

Step 54: Power on your RadiaCode device

Step 55: Open the RadiaCode panel in GridDown

Step 56: Click Connect via Bluetooth

Step 57: Select your device from the list

Step 58: Wait for connection and initial data

7.1.2 RadiaCode Features

- Real-time dose rate display (µSv/h)
- Count rate monitoring (CPS)
- 1024-channel gamma spectrum analysis
- Isotope identification (Cs-137, K-40, Co-60, etc.)
- GPS-tagged radiation mapping
- Threshold-based alerts

7.1.3 Alert Thresholds

Level	Threshold	Indicator	Action
Normal	< 0.3 µSv/h	Green	Normal background
Elevated	0.3 - 1.0 µSv/h	Yellow	Investigate source
Warning	1.0 - 10 µSv/h	Orange	Limit exposure time
Alarm	> 10 µSv/h	Red	Evacuate area

7.1.4 Demo Mode

Test RadiaCode features without hardware by enabling Demo Mode in the RadiaCode panel. This simulates realistic readings for training and familiarization.

7.2 RF Sentinel

Connect to an RF Sentinel SDR receiver for multi-protocol RF detection.

7.2.1 Detection Types

Type	Frequency	Symbol	Description
Aircraft (ADS-B)	1090 MHz	 Blue	Commercial and GA aircraft
Ships (AIS)	162 MHz	 Cyan	Maritime vessels

Drones (Remote ID)	2.4 GHz	Amber	UAVs with Remote ID
Radiosondes	400 MHz	Purple	Weather balloons
APRS	144.39 MHz	Green	Amateur radio stations

7.2.2 Connection Methods

- WebSocket: Real-time push updates (recommended)
- MQTT: Pub/sub via MQTT broker
- REST Polling: Periodic fetch every 5 seconds

All methods connect over your network (WiFi or Ethernet) to the RF Sentinel hardware.

7.2.3 Emergency Detection

RF Sentinel alerts on emergency conditions:

- Aircraft Squawk 7500: Hijacking
- Aircraft Squawk 7600: Radio failure
- Aircraft Squawk 7700: General emergency
- AIS SART: Search and rescue transponder
- AIS MOB: Man overboard
- AIS EPIRB: Emergency beacon

7.2.4 FIS-B Weather

RF Sentinel can receive aviation weather via FIS-B (978 MHz UAT):

- METARs: Current airport conditions
- TAFs: Terminal forecasts
- SIGMETs: Significant weather
- PIREPs: Pilot reports
- TFRs: Temporary flight restrictions

Enable FIS-B Weather Source in RF Sentinel settings for true infrastructure-independent weather.

7.3 SARSAT Beacon Receiver

Monitor COSPAS-SARSAT 406 MHz emergency beacons with external SDR hardware.

7.3.1 Beacon Types

Type	Name	Use Case	Icon
PLB	Personal Locator Beacon	Hikers, adventurers	
ELT	Emergency Locator Transmitter	Aviation emergencies	

EPIRB	Emergency Position-Indicating Radio Beacon	Maritime distress	
SSAS	Ship Security Alert System	Ship security threats	

7.3.2 Hardware Requirements

SARSAT reception requires external hardware:

- Raspberry Pi 4 or 5
- RTL-SDR Blog V4 (or compatible SDR)
- 406 MHz antenna (quarter-wave whip, ~18.5 cm)
- Optional: 406 MHz bandpass filter and LNA

Run the included Python receiver software on the Raspberry Pi and connect via WebSocket.

7.3.3 Legal Notice

Important: SARSAT reception is for supplementary monitoring only. This system does not replace official search and rescue services. Always contact emergency services (911/112/999) in actual emergencies. Receiving 406 MHz signals is legal; transmitting is strictly prohibited.

7.4 Multi-Device Operation

GridDown can connect to all three sensor systems simultaneously:

Device	Connection	Module
RadiaCode	Bluetooth (BLE)	RadiaCodeModule
RF Sentinel	WebSocket/MQTT/REST over network	RFSentinelModule
SARSAT Receiver	WebSocket or Serial	SarsatModule

Each system operates independently with its own connection, data processing, and map overlay rendering.

8. Planning Tools

8.1 Logistics Calculator

Calculate resource requirements for your mission based on personnel, vehicles, terrain, and duration.

8.1.1 Vehicle Profiles

Profile	Base MPG	Terrain Factor	Typical Capacity
4×4 Truck	15 mpg	0.7-1.0×	100 gal fuel, 50 gal water
Jeep/SUV	18 mpg	0.6-1.0×	25 gal fuel, 20 gal water
ATV/UTV	25 mpg	0.5-0.9×	10 gal fuel, 5 gal water
Motorcycle	45 mpg	0.7-1.0×	5 gal fuel, 2 gal water

8.1.2 Personnel Profiles

Profile	Water/Day	Calories/Day	Terrain Factor
Fit Adult	3 liters	3,000 kcal	1.0×
Average Adult	2.5 liters	2,500 kcal	0.8×
Child	1.5 liters	1,800 kcal	0.6×
Elderly	2 liters	2,000 kcal	0.5×

8.1.3 Logistics Output

The calculator provides:

- Total fuel required with safety margin
- Water requirements adjusted for temperature
- Food/calorie requirements
- Critical resupply points along route
- What-if analysis (e.g., What if this cache is empty?)

8.2 Contingency Planning

Prepare for the unexpected with contingency planning tools.

8.2.1 Bail-Out Analysis

For each point along your route, GridDown calculates:

- Nearest bail-out points
- Distance and bearing to each
- Terrain difficulty to reach
- Estimated travel time

8.2.2 Checkpoint Generation

Automatically generate checkpoints along routes:

- Set checkpoint interval (e.g., every 5 km)
- Checkpoints include coordinates in all formats
- Useful for scheduled position reports
- Exportable for radio communication plans

8.2.3 Alternative Routes

Create and compare multiple route options:

- Primary and alternate routes
- Compare distance, elevation, and terrain
- Identify common vs. unique segments

8.3 Terrain Analysis

Analyze terrain for tactical planning.

8.3.1 Slope Analysis

Evaluate terrain trafficability:

- < 10°: Easy vehicle/foot travel
- 10-20°: Moderate difficulty
- 20-30°: Difficult, foot traffic only
- > 30°: Very difficult, technical terrain

8.3.2 Viewshed Analysis

Calculate what can be seen from a given point:

- Select observation point
- Set observer height and max range
- View visible/hidden areas on map
- Useful for OP placement, communication planning

8.3.3 RF Line-of-Sight

Analyze radio propagation between two points:

- Select transmitter and receiver locations
- Set antenna heights
- View terrain profile with Fresnel zone
- Indicates clear, marginal, or blocked path

9. Environmental Data

9.1 Weather

GridDown integrates weather data for planning and situational awareness.

9.1.1 Internet Weather

When connected, receive forecasts from Open-Meteo:

- Current conditions (temperature, wind, humidity)
- 7-day forecast
- Weather alerts and warnings
- Precipitation probability

9.1.2 FIS-B Weather (RF Sentinel)

When offline, receive aviation weather via RF Sentinel:

- METARs from nearby airports
- TAFs for terminal forecasts
- SIGMETs for significant weather

Enable in RF Sentinel settings > Weather Source > RF Sentinel FIS-B.

9.2 Sun/Moon Calculator

Plan activities around daylight and lunar cycles:

- Sunrise and sunset times
- Golden hour and blue hour
- Civil, nautical, and astronomical twilight
- Moonrise and moonset
- Moon phase and illumination percentage
- Lunar calendar for mission planning

9.3 Magnetic Declination

Accurate compass navigation requires declination adjustment:

- Automatic calculation for current position
- Displays true vs. magnetic bearing
- Annual change rate
- Used in all bearing calculations

9.4 Stream Gauges

Monitor water levels at USGS gauge stations (US only):

- Real-time flow rate (cubic feet/second)
- Current gauge height
- Flood stage indicators
- Historical trends

Useful for crossing planning, water source assessment, and flood awareness.

9.5 Barometric Altimeter

Use device pressure sensor for altitude (Android Chrome required):

- Current altitude from barometer
- Calibrate to known elevation or GPS
- Pressure trend monitoring
- More accurate than GPS altitude when calibrated

10. Reference Materials

10.1 Medical Reference

Access critical medical information offline.

10.1.1 Protocol Categories

- Trauma: Hemorrhage, fractures, burns, head injury
- Medical: Cardiac, respiratory, diabetic emergencies
- Environmental: Heat/cold injuries, altitude sickness, drowning
- Toxicology: Poisoning, envenomation, overdose

10.1.2 Quick Reference

- Vital signs by age
- CPR guidelines (adult/child/infant)
- Rule of 9s for burns
- Glasgow Coma Scale
- Hemorrhage classification

10.1.3 Medication Database

- Common field medications
- Dosing by age/weight
- Contraindications and warnings

Disclaimer: Medical reference is for trained personnel. Always follow your training and local protocols.

10.2 Field Guides

Comprehensive offline reference library with 600+ entries.

10.2.1 Categories

- Foraging: 150+ edible plants, mushrooms, wild foods
- Medicinal Plants: 100+ species with preparation
- Wildlife: Mammals, birds, reptiles, insects
- Hazards: Dangerous plants, animals, environmental
- Survival Skills: Fire, shelter, water, navigation
- Knots & Lashing: 50+ knot tutorials

10.2.2 Features

- Full-text search across all guides
- Favorites for quick access
- Regional filtering

- Seasonal availability indicators
- Nutritional and toxicity information

10.3 SOS/Emergency

Quick access to emergency resources:

- Emergency contact management
- Quick-dial emergency numbers
- International distress signals
- Signal mirror sun angle calculator
- Emergency frequencies reference

11. Export & Printing

11.1 Print Documents

Generate paper backups for when electronics fail.

11.1.1 Document Types

- Full Operational Plan: Complete mission package
- Route Cards: Turn-by-turn directions for each leg
- Waypoint Lists: Grouped by type with coordinates
- Communication Plan: Frequencies, call signs, schedule
- Quick Reference Card: Pocket-sized essential info

11.1.2 Printing

Step 59: Open the Print/Export panel

Step 60: Select document type

Step 61: Configure options (format, detail level)

Step 62: Click Generate PDF

Step 63: Print or save the PDF

11.2 Data Export

11.2.1 Standard Formats

- GPX: Universal GPS exchange format
- KML/KMZ: Google Earth compatible
- GeoJSON: Radiation tracks and analysis data

11.2.2 Encrypted Plans

Share complete plans securely:

Step 64: Open Plan Sharing from Export panel

Step 65: Select data to include

Step 66: Enter encryption passphrase

Step 67: Export .gdplan file

Step 68: Share file via secure channel

Recipients import the .gdplan file and enter the passphrase to decrypt.

Encryption: AES-256-GCM with passphrase-derived key. Passphrase is never stored or transmitted.

12. Settings & Customization

12.1 Display Settings

- Coordinate format (DD, DMS, DDM, UTM, MGRS)
- Distance units (miles, kilometers, nautical miles)
- Map rotation behavior
- Label visibility at zoom levels

12.2 Night Modes

Preserve night vision with display modes:

- Standard Dark: Normal dark theme
- Red Light: Red-tinted display for night vision preservation
- Blackout: Minimal screen glow for light discipline

12.3 Accessibility

GridDown includes comprehensive accessibility features:

- WCAG 2.1 compliant
- Screen reader compatible (417 ARIA attributes)
- Keyboard navigation support
- Reduced motion option
- Skip-to-content navigation

12.4 Data Management

- Clear cached map tiles
- Export all user data
- Import from backup
- Reset to defaults

12.5 Keyboard Shortcuts

Key	Action
Ctrl+Z	Undo last action
Ctrl+Shift+Z	Redo
Escape	Close modal or panel
+/-	Zoom in/out
N	Reset map to north

Ctrl+K	Open search

13. Troubleshooting

13.1 Connection Issues

13.1.1 Bluetooth Devices Not Found

- Ensure device is powered on and in pairing mode
- Use Chrome or Edge (Firefox/Safari lack Web Bluetooth)
- Check that Bluetooth is enabled on your device
- Try restarting both the device and browser
- Ensure no other app is connected to the device

13.1.2 WebSocket Connection Failed

- Verify the server address and port are correct
- Ensure the server is running and accessible
- Check firewall settings
- Try the REST polling fallback option

13.2 Map Issues

13.2.1 Maps Not Loading

- Check internet connection (for online tiles)
- Verify offline tiles are downloaded for the area
- Try a different map source
- Clear browser cache and reload

13.2.2 GPS Not Working

- Ensure location permission is granted
- Check that GPS is enabled on device
- Move outdoors for better signal
- Wait 30-60 seconds for initial fix

13.3 Audio Issues (SSTV)

13.3.1 No Audio Detected

- Ensure microphone permission is granted
- Check that the correct input device is selected
- Verify audio levels are adequate (check waterfall)
- Confirm radio is tuned to SSTV frequency

13.3.2 Poor Decode Quality

- Adjust audio input level (avoid clipping)

- Reduce background noise
- Check radio squelch settings
- Enable auto-slant correction in DSP settings

13.4 Storage Issues

13.4.1 Storage Full

- Delete unused offline map regions
- Clear SSTV image history
- Export and delete old radiation tracks
- Use the storage management tool in Settings

13.5 Getting Help

If problems persist:

- Check the browser console (F12) for error messages
- Try a different browser
- Clear all site data and reload
- Contact support with console logs and device info

Appendix A: Quick Reference Card

A.1 Emergency Frequencies

Service	Frequency	Notes
Marine Distress	156.8 MHz (Ch 16)	International distress
Air Distress	121.5 MHz	Guard frequency
APRS	144.39 MHz	NA APRS frequency
FRS Ch 1	462.5625 MHz	Common meeting channel
GMRS Ch 1	462.5625 MHz	Shared with FRS
CB Ch 9	27.065 MHz	Emergency channel
CB Ch 19	27.185 MHz	Highway channel
MURS Ch 1	151.82 MHz	License-free

A.2 Coordinate Quick Reference

Format	Example	Common Use
DD	37.7749, -122.4194	GPS devices, digital
DMS	37°46'29.6"N 122°25'9.8"W	Traditional maps
DDM	37°46.494'N 122°25.164'W	Marine navigation
UTM	10S 551234 4182341	Military, hiking
MGRS	10SEG 51234 82341	Military grid

A.3 Signal Reference

Signal	Meaning
Three of anything	Distress signal (3 shots, 3 fires, 3 whistles)
SOS (... --- ...)	International distress
MAYDAY	Voice distress call
PAN-PAN	Urgency call (not life-threatening)
One long whistle	Recall/assembly
Orange smoke	Visual distress signal
Mirror flash	Attract attention

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When the grid goes down, you don't.