QSOLink v1.4.0

HIGH-PERFORMANCE VoIP RADIO TERMINAL FOR SvxLink REFLECTOR

TECHNICAL AND OPERATING REFERENCE MANUAL

DESIGN AND DEVELOPMENT BY CÉDRIC F4JGI

SOFTWARE VERSION: 1.4.0
ARCHITECTURE: C++20 / Qt 6.10 / JNI Native Android
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PERSONAL CONFIGURATION NOTES

(This page is intentionally left blank for you to note your call signs, HMAC keys, and favorite TalkGroup configurations)

Favorite Networks:

Configured PTT Hardware Codes:

Notes on USER equalization:

LEGAL INFORMATION AND DEVELOPMENT

ABOUT QSOLink

QSOLink is the result of intensive software engineering work aimed at providing an uncompromised amateur radio experience on Android. The project focuses on three pillars: audio fidelity (16kHz DSP), network resilience (Watchdog & QoS), and graphical stability (Optimization for Xiaomi/Redmi).

INTELLECTUAL PROPERTY

- Author & Lead Developer: Cédric F4JGI
- Software Base: Inspired by Silviu YO6SAY's Latry project
- Technologies: C++20 (engine), QML (Qt Quick interface) and Java/JNI (native Android services)

LICENSE AND FREE SOFTWARE

This software is distributed under the GNU GPL license. You are encouraged to use and share it. Compliance with applicable regulations regarding transmission via reflectors is the responsibility of the user.

ACKNOWLEDGEMENTS AND CREDITS

- UDO (DO1IP): beta tester and technical support for FM-funknetz networks
- Silviu YO6SAY: original vision for the platform
- The SvxLink community: robust and open protocol
- Donors: financial support for development

RESOURCES AND OFFICIAL LINKS

- Support: cedric@f4jgi.fr
- QRZ: F4JGI

DISCLAIMER

This software is provided "AS IS" without warranty of any kind. The author is not responsible for system crashes or data loss.

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📂 CHAPTER 1 — FIRST STARTUP AND DATA ARCHITECTURE

The first launch of **QSOLink** is a crucial step. This is when the application establishes its system environment on Android to ensure total audio continuity, without interruptions or unexpected standby mode.

1. WELCOME POPUP — DECISION POINT

During the initial launch, if no configuration file is detected, QSOLink automatically displays the **First Run** window. Two choices are then offered:

🔁 Option A — Restore a backup

- The application opens the Android file explorer.
- **Expected file**: `QSOLink_Backup.json`
- **Immediate effect**:
  - Restores the **10 network slots**
  - of the **6 equalization bands**
  - **key assignments**
  - and **visual preferences**
- **Technical note**: restoration triggers a **complete reset of the network sockets** in order to instantly apply the imported settings.

🆕 Option B — New installation

- Creation of a blank configuration:
  - 10 empty network slots
  - default audio profiles: **FLAT, BASS, PUNCH, USER, CAR**

2. SYSTEM PERMISSIONS — THE BASIS FOR OPERATION

To function as a professional radio terminal, QSOLink requires three critical permissions. Denying any one of them will result in degraded performance or even the inability to transmit.

2.1 Microphone — `RECORD_AUDIO`

- **Use**: capture of native PCM audio stream at 48 kHz
- **Consequence if denied**:
  - PTT inoperative
  - Opus encoder not initialized

2.2 Nearby devices — `BLUETOOTH_CONNECT / SCAN`

- **Use**:
  - Bluetooth SCO (hands-free mode)
  - Wireless PTT buttons

- **Key function**:
  - audio routing to car stereo
  - use of remote microphones (e.g., B01)

2.3 Notifications — `POST_NOTIFICATIONS`

- **Usage**: display of foreground service notifications
- **Critical impact**:
  - prevents Android from putting QSOLink into standby mode
  - keeps the 4G/5G connection active when the screen is off

3. BATTERY OPTIMIZATION — VITAL AREA

This is the stage where most VoIP applications fail. By default, Android severely limits background network activity.

⚠️ **Mandatory setting**

1. Android settings
2. Apps → QSOLink
3. Battery / Power saver
4. Select **No restrictions**

👉 **Built-in verification**:
In `Settings → System`, the **FIX BACKGROUND ISSUES** button allows you to confirm that the Android kernel is applying this setting correctly.

4. FILE ARCHITECTURE AND BACKUPS

QSOLink uses a secure application space (`AppDataLocation`), separate from traditional user storage.

4.1 Internal files (not accessible without root)

Location:

`/data/user/0/f4jgi.latry_like/files/`

- `qsolink_config.json`
  → database of 10 slots (servers, keys, call signs, monitored TG)
- `user_profiles.json`
  → DSP and equalization settings
- `inputs_config.json`
  → assignment of physical keys and commands

4.2 User exports

Accessible via **Documents** or **Downloads**:

- `QSOLink_Backup.json`
  → full backup for migration
- `QSOLink_Log_YYYY-MM-DD.adi`
  → traffic log in ADIF format (QRZ, eQSL, CloudLog)

5. FOREGROUND SERVICE — VOIP CONTINUITY

After the first launch, a QSOLink icon appears in the notification bar.

- **Function**: maintains a **system WakeLock**
- **Effect**:
    - CPU and network remain active
    - audio continuity guaranteed even when using other applications (GPS, navigation, etc.)

6. SPECIAL CASE — XIAOMI / REDMI / POCO

On these devices, the **Autostart** option must be enabled.

👉 Without this setting, QSOLink will not be able to restart its services after the phone is rebooted.

🌐 CHAPTER 2 — THE NETWORK EDITOR (NETWORK CONFIG)

The network editor is the heart of QSOLink's configuration. Each button on the main grid corresponds to an **independent memory slot**, comparable to a programmable channel on a transceiver. It is in this editor that you define the network parameters, authentication, and TalkGroup management logic.

1. ACCESSING THE EDITOR

To prevent accidental changes during operation, access to the editor is deliberately protected.

- **Action**: long press (approximately 2 seconds) on one of the **10 buttons** on the network grid.
- **Visual confirmation**: a modal window opens, clearly indicating the number of the slot being edited
  (e.g., **EDIT CONFIG #1**).

2. DETAILED DESCRIPTION OF FIELDS

Parameters must be entered accurately. A single character error can prevent HMAC authentication and block the connection to the server.

2.1 Visual identifiers

These fields define how the network is displayed in the interface.

- **Name (Button)**
  Short name displayed on the main grid.
  - Recommendation: **7 to 8 characters maximum**
  - Example: `RRF-NAT`, `IDRE-FR`
- **Long Name (Banner)**
  Full description displayed in the TopBar.
  - Typical use: official name of the network or salon
    (e.g., "Francophone Network – National Room"*)

2.2 Network connection settings

These fields define the communication socket with the reflector.

- **Host (Server)**
  DNS or IP address of the SvxLink server.
  - Examples:
    - `reflector.f4jgi.fr`
    - `12.34.56.78`
- **Port**
  Communication port defined by the network administrator.
  - Current value: **5300**

- **Key (Authentication key)**
  Cryptographic password used for authentication.
    - Security:
        - QSOLink generates an **HMAC-SHA1 hash**
        - the key **is never transmitted in clear text** over the network

2.3 Radio identity and default group

- **Callsign**
  Your official radio call sign.
    - ⚠️ Must be entered in **UPPERCASE**
    - Correct example: `F4JGI`
    - Some servers reject lowercase letters
- **Default TG (Home TG)**
  TalkGroup active upon connection to the server.
    - Recommended use: national group or main local group
      (e.g.: TG 208,2,...)

3. MONITORING AND SCAN LOGIC (ADVANCED)

This section determines how QSOLink monitors and prioritizes secondary groups.

3.1 Scan Trigger Options

- **Scan Auto Start**
    - **Enabled**: monitoring starts automatically upon connection
    - **Disabled**: the scan must be started manually using the **MONITOR** button
- **Scan Mode**
    - **Info Only**
        - You remain on the Home TG
        - Other groups are only visible on the Dashboard
    - **Auto-Switch (Jump)**
        - QSOLink automatically switches audio to an active priority TG

4. SLOT MANAGEMENT ACTIONS

At the bottom of the editor, three buttons allow you to manage configurations.

4.1 SAVE

- Checks the consistency of the data entered
- Writes immediately to `qsolink_config.json`
- Updates the corresponding button in the main grid

4.2 DELETE — Delete

- Completely erases the slot configuration
- The button becomes empty (gray) again

4.3 DUPLICATE — Duplicate

- Advanced function
- Copies the entire configuration to the **first available slot**
- Typical use case:
    - same server
    - multiple buttons with **different Home TGs**
      (e.g., National/Local)

📻 CHAPTER 3 — THE MAIN INTERFACE (MAIN UI)

The main page is the **central control station** for QSOLink. It has been designed to offer maximum readability on OLED screens, with ergonomics inspired by professional transceivers (Yaesu FTDX series), to enable quick and intuitive operation, even in mobile conditions. The interface is divided into **six functional areas**, each dedicated to a specific aspect of radio management.

1. THE TOPBAR — SYSTEM MONITORING

Located at the top of the screen, the TopBar is the application's **permanent dashboard**.

1.1 Connection button (left)

- Indicates the status of the network connection:
    - **Blue**: connected
    - **Gray**: disconnected
- **Short click**:
    - launches the connection for the selected slot
- **Long press**:
    - opens the forced disconnect menu

1.2 Dynamic center banner

The banner automatically alternates between three displays every 10 seconds:

1. **Active network name**
    - displays the configured long name
    - displays **NOT CONNECTED** in red offline
2. **QSOLink logo**
    - visual transition with particle effect
3. **System clock**
    - Real-time local date and time

1.3 Status icons (right)

- **Audio Out**: indicates active audio output
  (speaker, wired headphones, or Bluetooth)
- **Mute**: icon crossed out when sound is muted
- **Gear**:
    - click: settings menu
    - long press: direct access to the DSP console

2. NETWORK SLOTS

This area contains the **10** configurable **memory slots**.

- **Display**:
    - each button has a cyan LED at the top
    - LED lit = slot active
- **Interactions**:
    - **Short click**: immediate connection or switch to the network
    - **Long press**: opens the configuration editor
- **Screen adaptation**:
    - **landscape**: 5 columns × 2 rows
    - **portrait**: scrolling horizontal row

3. THE STATUS BAR — RADIO TELEMETRY

Central area of the screen, dedicated to real-time technical information.

3.1 High-precision S-meter (FTDX style)

- Measurement:
    - **RX**: received signal level
    - **TX**: transmission power
- Scale:
    - S0 to S9 +60 dB
- Dynamic digital display
  (e.g., -45 dB or S9)

3.2 Central TalkGroup indicator

- Displays the **active TG** in large characters
- Color code:
    - **Cyan**: receive/standby
    - **Red**: transmission
- Central radio navigation element

3.3 Status indicators (9 indicators)

- **NET/UDP**: active network sockets
- **LOSS**: packet loss rate (red > 1%)
- **GATE**: Noise Gate active
- **EQ**: current audio profile
- **A.TX / A.RX**: AGC transmission / reception
- **DSP**: active noise reduction
- **AUD**: incoming audio stream detection

4. CONTROL PANEL — DSP LIVE

Eight buttons provide immediate access to essential audio functions without leaving the main screen.

- **NR RX**: OFF / LOW / HIGH (noise reduction)
- **AGC RX**: automatic leveling of received volume
- **PROFILE**: FLAT / BASS / PUNCH / USER
- **AGC TX**: voice compression
- **GATE**: microphone mute (AUTO in car mode)
- **BOOST**: forced gain +20 dB
- **TOT / VOX**: safety delay or voice trigger status
- **EXT PTT**: Bluetooth button behavior

5. THE LOGFRAME — HISTORY AND DASHBOARD

Lower area scrolling horizontally, offering three distinct views:

5.1 LOG view — Traffic log

- Chronological list of stations received
- Access to details of each QSO
- Network errors appear in **red** for diagnosis

5.2 DASH View — Network Activity

- Real-time display of active stations on the server
- **QSY button**:
    - Instant switch to the TG of a selected station

5.3 INFO view — Diagnostics

- System information:
    - phone model
    - CPU
    - Connection duration
    - Network statistics

6. VU METER AND PTT BUTTON

Main action area located at the bottom of the screen.

6.1 Horizontal VU meter

- Instantaneous modulation level
- **Yellow line**: Noise Gate threshold
- **Purple line**: measured ambient noise

6.2 Main PTT button

- **Safety**:
    - Automatic lock after inactivity
    - unlocked by long press (2 sec)
- **Pre-TX**:
    - yellow status for 500 ms
    - prevents accidental triggering
- **TX active**:
    - red button during transmission

📊 CHAPTER 4 — STATUS BAR AND TALKGROUP MANAGEMENT

The **StatusBar** is the nerve center of QSOLink. It brings together all network and audio telemetry information, while serving as an advanced touch interface for dynamic TalkGroup (TG) management. Its operation is directly inspired by the dashboards of modern high-end transceivers.

1. HIGH-PRECISION S-METER (FTDX STYLE)

Located to the left of the StatusBar, the S-meter provides an instant reading of radio quality.

- **Reception (RX)**
  - Scale: S0 to S9, then +20 to +60 dB
  - Reflects the strength of the incoming signal
- **Transmission (TX)**
  - Indicates output power
  - Calculated from the RMS level of voice modulation
- **Digital display**
  - Raw value in dB (e.g., -42 dB)
  - Or equivalent in S units (e.g., S9+10)

2. STATUS BOXES

Nine visual indicators allow you to assess the status of the terminal at a glance.

Indicator	Color	Meaning
NET	Green	TCP connection established with the server
UDP	Cyan	UDP audio port open
LOSS	Red	Packet loss > 1%
GATE	Yellow	Noise Gate active
EQ	Red	Current audio profile
A.TX	Yellow	AGC transmission active
A.RX	Green	AGC active reception
DSP	Cyan	RX noise reduction active
AUD	Green	Incoming audio stream detected

📌 These indicators are the main diagnostic tool for mobile communications (4G/H+).

3. CENTRAL TALKGROUP INDICATOR

The central and most visible element of the StatusBar.

- **Main display**: active TalkGroup number (e.g., TG 208)

- **Color code**:
    - **Dark gray**: disconnected
    - **Cyan**: connected/standby/receiving
    - **Flashing red**: transmitting
- **Network label**:
    - displayed under the TG
    - confirms the active server (e.g., RRF NATIONAL)

4. DYNAMIC INTERACTIONS — TG MANAGEMENT

The StatusBar is fully interactive and allows you to navigate the network without leaving the main screen.

4.1 Manual TalkGroup change (QSY)

- **Action**: single click on the TG number
- **Effect**:
    - opens the **TG popup**
    - direct entry of a number
    - or selection of a recently active TG

4.2 Monitoring and scanner configuration

- **Action**: long press (≈ 2 seconds) on the TG number
- **Effect**:
    - opens the **Monitor popup**
    - manage automatic scanning
    - priority setting (see Chapter 5)

5. TIME AND SCANNER STATUS INDICATORS

To the right of the StatusBar are the radio activity timers.

- **TX Time (Red)**
    - current transmission time
    - Automatic shutdown if the **Time-Out Timer (TOT)** is exceeded
- **RX Time (Cyan)**
    - Duration of the correspondent's transmission
- **Scanner status** (text below the timers):
    - **AUTO-SCAN**: active standby
    - **REVERT 30s / 60s**: timed return to Home TG
    - **MANUAL HOLD**: manually forced group

6. LOSS INDICATOR — ADVANCED NETWORK DIAGNOSTICS

The **LOSS** indicator is the key indicator for assessing the quality of the internet connection.

- **0.0 to 0.5% (Cyan)**
    - Excellent connection
    - perfectly smooth audio
- **0.6 to 2.0% (Cyan)**
    - micro-cuts possible
    - Opus encoder compensates
- **> 2.0% (Red)**
    - choppy or metallic audio
    - saturation or network instability

👉 **Recommendation**:
If the light remains red, change location or switch to a more stable network.

🎚️ CHAPTER 5 — DSP AUDIO CONSOLE (SIGNAL PROCESSING)

The **DSP console** is the audio heart of QSOLink. It allows the voice processing chain to be precisely adapted to operating conditions: heavy traffic, mobile, noisy environment, or fixed station. All settings are applied **in real time**, without interrupting the flow.

1. GENERAL DSP ARCHITECTURE

The audio chain is entirely software-based and optimized for Android devices.

Signal processing order (TX):

```
Microphone → Noise Gate → EQ → AGC TX → Compressor → Opus Encoder → Network
```

Signal processing order (RX):

```
Network → Opus Decoder → NR → AGC RX → EQ → Audio Output
```

📌 Each module is independent and can be enabled or disabled without affecting the others.

2. NOISE GATE — AMBIENT NOISE CONTROL

The Noise Gate automatically mutes the microphone below a defined threshold.

- **OFF**
  - Microphone always open
  - use in very quiet fixed stations
- **AUTO**
  - Adaptive threshold
  - recommended for mobile or vehicle use
- **MANUAL**
  - precise threshold adjustment via slider
  - eliminates background noise, wind, or engine noise

🔎 **Visual indicator**:

- Yellow line on the VU meter = trigger threshold
- Purple line = measured ambient noise

3. EQUALIZER (EQ) — VOICE SHAPING

QSOLink offers a multiband equalizer optimized for spoken voice.

3.1 Preset profiles

- **FLAT**: neutral, reference
- **BASS**: boosts low frequencies (deep voice)
- **PUNCH**: accentuates midrange (heavy traffic)
- **CAR**: specific vehicle filtering

3.2 USER profile

- 6 adjustable bands:
    - 120 Hz
    - 240 Hz
    - 500 Hz
    - 1 kHz
    - 2.5 kHz
    - 4.5 kHz
- Adjustment range: ±12 dB

📌 Settings are stored in `user_profiles.json`.

4. AGC — AUTOMATIC GAIN CONTROL

4.1 AGC TX (Transmission)

- Stabilizes the modulation level
- Prevents saturation during microphone distance variations
- **Modes**:
    - OFF
    - SOFT (recommended)
    - HARD (in noisy environments)

4.2 AGC RX (Receive)

- Maintains a constant volume between correspondents
- Reduces listening fatigue during long listening sessions

5. COMPRESSOR / BOOST TX

- **BOOST +20 dB**
    - Increases the perceived level
    - useful with low-sensitivity Bluetooth microphones

⚠️ Use sparingly: may accentuate background noise.

6. NOISE REDUCTION RX (NR)

- **OFF**: raw audio
- **LOW**: light filtering (recommended)
- **HIGH**: aggressive filtering (voice may sound artificial)

📌 The **DSP** indicator lights up when noise reduction is active.

7. VOX AND TIME-OUT TIMER (TOT)

7.1 VOX

- Automatic voice activation
- Configurable threshold
- Recommended for use with wired microphone

7.2 TOT — Time-Out Timer

- Limits the maximum transmission time
- Typical values:
  - 60 s
  - 120 s
- Protects the network against blocked transmissions

8. BACKUP AND AUDIO PROFILES

- Every change is applied immediately
- Profiles are persistent:
  - per device
  - per user
- Exportable via QSOLink global backup

9. RECOMMENDED SETTINGS (BEST PRACTICES)

Context	Noise Gate	EQ	AGC TX	NR RX
Fixed Station	OFF / MANUAL	FLAT	SOFT	LOW
Mobile car	AUTO	CAR	HARD	HIGH
Micro BT	AUTO	PUNCH	HARD + BOOST	LOW

🔄 CHAPTER 6 — AUTOMATIC SCANNING AND MULTI-TALKGROUP MONITORING

The **QSOLink scanner** allows you to monitor several TalkGroups simultaneously while maintaining a main group (Home TG). It is an **intelligent** scanner, focused on network traffic rather than simple sequential scanning, ensuring maximum responsiveness without audio loss.

1. CONCEPT OF HOME TG AND MONITORED TGs

Each network slot is based on two fundamental concepts:

- **Home TG (Default TG)**
  - Main group
  - Active upon connection
  - Priority reception and transmission
- **Monitor TGs**
  - Secondary groups monitored continuously
  - Defined in the network editor (see Chapter 2)

📌 The scanner **does not query** the TGs: it passively listens to the flows announced by the server.

2. AVAILABLE SCAN MODES

QSOLink offers two distinct operating modes, adapted to different styles of operation.

2.1 INFO ONLY mode

- The terminal remains locked on the **Home TG**
- Activities on the monitored TGs:
  - appear in the Dashboard
  - **never interrupt the audio**

✅ Recommended for:

- priority local traffic
- mobile stations
- ambient listening

2.2 AUTO-SWITCH (JUMP) mode

- When a monitored TG becomes active:
  - QSOLink automatically switches the audio to that TG
- The active TG temporarily becomes the priority

⚠️ Transmission is then made on the currently selected TG.

3. TALKGROUP PRIORITY LOGIC

When simultaneous traffic is detected:

1. **Manual active TG** (selected by the user)
2. **Home TG**
3. **Monitored TGs**, in the order of the list

📌 The first valid stream detected locks the audio until the end of the transmission.

4. SMART REVERT (AUTOMATIC RETURN)

Revert defines the delay for returning to the Home TG after the end of secondary traffic.

- Current values:
    - **REVERT 30 s**
    - **REVERT 60 s**
    - **REVERT 90 s**
    - **REVERT 120 s**
    - **OFF** (maintains current TG)
- Display:
    - visible in the StatusBar
    - Implicit countdown

5. STARTING AND STOPPING THE SCANNER

5.1 Automatic start

- **Scan Auto Start** option enabled:
    - the scanner starts as soon as the network connection is established

5.2 Manual start

- **MONITOR** button
- Visual indication:
    - **AUTO-SCAN** text in the status bar

5.3 Temporary stop (HOLD)

- Long press on the active TG number
- Status displayed: **MANUAL HOLD**
- No automatic change as long as the status is maintained

6. TRANSMISSION BEHAVIOR (TX)

QSOLink adopts a strict safety logic:

- Any transmission:
    - **immediately suspends the scanner**
    - prevents untimely switches
- After TX:
    - automatically resumes scanning
    - complies with the configured Revert delay

7. CONFLICT MANAGEMENT AND SPECIAL CASES

- Two TGs active simultaneously:
    - priority given to the first detected
- Temporary network loss:
    - scanner frozen
    - automatic resumption after reconnection
- Manual TG change:
    - temporarily disables auto-switch

8. BEST PRACTICES FOR USE

- Limit monitored TGs to **a maximum of 5**
- Always define a **clear Home TG**
- Disable AUTO-SWITCH during heavy traffic
- Use INFO ONLY in mobile mode

🎧 CHAPTER 7 — AUDIO DEVICES, BLUETOOTH, AND EXTERNAL PTT

QSOLink is designed to integrate with **external audio chains** (car radio, headphones, remote microphone, physical PTT buttons). This chapter describes audio routing, Bluetooth management, and the use of external PTT controls, which are essential for mobility.

1. GENERAL AUDIO ARCHITECTURE

QSOLink uses the native Android audio engine with full support for:

- **Audio outputs**:
  - internal speaker
  - wired headphones (jack/USB-C) (not yet)
  - Bluetooth A2DP/SCO
- **Audio inputs**:
  - internal microphone
  - wired microphone (not yet)
  - Bluetooth microphone (SCO mode)

📌 Routing is **automatic**, but can be forced manually if necessary.

2. AUDIO OUTPUTS — ROUTING AND PRIORITIES

2.1 Internal speaker

- Default output
- Good quality in quiet environments
- Automatically muted when headphones or Bluetooth are activated

2.2 Wired headphones

- Immediate connection priority
- Maximum audio quality (minimum latency)
- Recommended for fixed stations

2.3 Bluetooth — A2DP vs. SCO

Mode	Usage	Advantages	Limitations
A2DP	Listening only	HD audio	No microphone
SCO	Two-way voice	Microphone + audio	Reduced bandwidth

📌 QSOLink automatically switches to **SCO** as soon as PTT or VOX is active.

3. BLUETOOTH MICROPHONES

- Compatible:
  - Bluetooth PTT buttons
  - remote microphones (e.g., B01, B02)
- Activation:
  - requires authorization **Nearby devices**
- Indication:
  - Bluetooth icon active in the TopBar

⚠️ Some microphones impose a latency > 100 ms, compensated by **Pre-TX**.

4. EXTERNAL PTT CONTROLS

QSOLink supports several types of PTT triggering.

4.1 Bluetooth PTT button

- Operation:
  - Press = TX
  - release = RX
- Advantage:
  - hands-free
  - Ideal for use in vehicles

4.2 Wired buttons (GPIO / USB)

- Detection via:
  - audio jack
  - USB HID interface
- Customizable assignment in:
  - `Settings → Inputs`

4.3 Physical phone keys

- Volume +
- Volume −
- Camera button (depending on model)

📌 Each button can be assigned independently.

5. INPUT CONFIGURATION (INPUTS CONFIG)

In the **Settings → Inputs** menu, each action can be associated with a physical command.

Available actions:

- PTT
- QSY
- AUDIO PROFILE

The settings are stored in `inputs_config.json`.

6. VOX WITH EXTERNAL DEVICES

- Compatible with:
    - Bluetooth SCO microphone
- Settings:
    - trigger threshold
    - release delay
- Automatically disabled:
    - if a hardware PTT is detected

7. COMMON PROBLEMS AND SOLUTIONS

Problem	Probable cause	Solution
No BT microphone	SCO not active	Force TX
Choppy sound	A2DP active	Switch to SCO
TX latency	BT microphone	Enable Pre-TX
PTT inactive	BT Permission	Check Permissions

8. BEST PRACTICES FOR MOBILITY

- Limit the number of simultaneous BT devices
- Test latency before actual traffic
- Avoid aggressive power saving

⚙️ CHAPTER 8 — SYSTEM SETTINGS, BACKUPS, AND MAINTENANCE

This chapter covers the essential functions that ensure the **stability**, **durability of settings**, and **operational reliability** of QSOLink, particularly during updates, phone changes, or intensive use.

1. SETTINGS MENU — GENERAL ORGANIZATION

The **Settings** menu centralizes all global settings for the application.

Main sections:

- **System**
- **Audio**
- **Inputs**
- **Network**
- **About**

📌 Changes are applied **immediately**, without restarting the application.

2. SYSTEM SETTINGS

2.1 Foreground Service

- Indicator:
    - Persistent notification QSOLink
- Role:
    - CPU WakeLock maintenance
    - Prevents network standby

⚠️ Manually removing the notification will cause the audio service to stop.

2.2 FIX BACKGROUND ISSUES

- Automated diagnostic tool
- Checks:
    - battery restrictions
    - critical permissions
    - foreground service status
- Offers:
    - direct shortcuts to relevant Android settings

2.3 System volume management

- Option:

        - **Link volume to media**
- Allows:
    - Synchronization of QSOLink volume with Android media volume

3. GLOBAL AUDIO SETTINGS

3.1 Sample rate

- Fixed value:
    - **48 kHz**
- Optimized for:
    - Opus encoder
    - wideband voice quality

3.2 Audio latency

- Setting:
    - LOW / NORMAL / HIGH
- Impact:
    - LOW → minimum latency (stable network)
    - HIGH → better tolerance to network variations

4. BACKUPS AND RESTORATION

4.1 Full backup

- Menu:
    - `Settings → System → Export Backup`
- Generated file:
    - `QSOLink_Backup.json`
- Content:
    - networks
    - audio profiles
    - key assignments
    - UI preferences
    -

📌 Compatible between major versions.

4.2 Restore

- Possible:
    - on first launch
    - at any time via Settings

- Effect:
    - controlled restart of network sockets

5. LOGS

5.1 ADIF logs

- Format:
    - `QSOLink_Log_YYYY-MM-DD.adi`
- Content:
    - call sign
    - TG
    - date/time
    - RX/TX duration
- Compatible:
    - QRZ
    - eQSL
    - CloudLog

5.2 System logs

- Usage:
    - advanced diagnostics
- Access:
    - `Settings → About → Debug`

6. UPDATES AND COMPATIBILITY

6.1 Application update

- Recommendation:
    - Back up before updating
- User settings are automatically saved

6.2 Android compatibility

- Minimum recommended version:
    - **Android 10**
- Optimized for:
    - Android 12 to 14

⚠️ Some manufacturers (Xiaomi, Huawei) require additional settings (see Chapter 1).

7. RESET (FACTORY RESET)

- Option:
  - `Settings → System → Factory Reset`
- Effect:
  - complete deletion of local data
  - return to default settings

⚠️ Irreversible action without prior backup.

8. BEST MAINTENANCE PRACTICES

- Back up after each major change
- Test updates in real conditions
- Regularly check the **LOSS** indicator
- Restart the application after a long uptime (> 72 hours)

⌨️ CHAPTER 9 — POPUP INPUT CONFIG (KEY MAPPING)

The **Popup Input Config** allows you to associate **physical keys** (phone, steering wheel, Bluetooth microphone, HID controls) with **advanced radio actions** in QSOLink. This mechanism transforms your smartphone into **a** true **programmable radio terminal**, comparable to professional hardware control panels.

1. ACCESS AND LEARNING MODE

Accessing the menu

`Settings → System → Button Mapping (Config)`

When the popup opens, the native C++ engine automatically switches to **learning mode** (`startInputLearning`).

- All hardware events are intercepted
- Standard Android keys (volume, camera, side buttons)
- External devices:
    - steering wheel controls
    - Bluetooth PTT buttons
    - HID microphones

📌 As long as this popup is open, **the keys no longer trigger their original functions**.

2. DETECTION AREA — THE SNIFFER

The upper part of the popup is dedicated to raw detection of hardware inputs.

- **Visual appearance**:
    - large dark rectangle (`detectRect`)
    - positioned at the top of the window

2.1 Pending status

- Display:

`PRESS A BUTTON...`

QSOLink is waiting for a valid hardware event.

2.2 Key detection

- **User action**:
    - Press a key on the phone
    - or an external button (steering wheel, PTT, BT microphone)
- **Immediate reaction**:

- green flash **(#30D158)**
- display of detected hardware code
  (e.g.: `CODE DETECTED:` 24*)

📌 This code is the low-level identifier used by Android (KeyCode).

3. CONFIGURATION FORM

As soon as a code is detected, the configuration form appears automatically.

It contains **three interactive elements**.

3.1 Name — Name of the key

- **Usage**:
  - Human identification of the button
- **Examples**:
  - `PTT wheel`
  - `Volume Up button`
  - `PTT Micro BT`
- **Default behavior**:
  - if left blank → `Button [Code]`

📌 The name is purely descriptive and does not affect operation.

3.2 Action — Function selector

The drop-down menu offers **8 possible actions**:

1. **PTT (Standard Hold)**
   - transmission as long as the button is held down
   - standard radio behavior
   - ⭐ *recommended mode*
2. **PTT (Toggle ON/OFF)**
   - First press: TX ON
   - Second press: TX OFF
3. **Network Next (>>)**
   - toggle to the next network slot
   - Quick navigation between networks
4. **Network Prev (<<)**
   - return to previous network slot
5. **Audio Toggle**

    - alternate:
        - speaker phone
        - headphones/Bluetooth
6. **Force TX ON**
    - Forcibly opens the microphone
    - ⚠️ requires **Force TX OFF** or active **TOT**
7. **Force TX OFF**
    - immediately cuts off any ongoing transmission
    - recommended safety button
8. **OPEN CAR SCREEN**
    - opens the **full-screen Car Mode** interface
    - without changing the TX/RX status

3.3 Option — Open Car Screen Automatically

Comfort option specially designed for automotive use.

- **If enabled**:
    - pressing this button:
        - executes the assigned action
        - **automatically switches the interface to Car Mode**
- **Typical example**:
    - `Volume +` button → PTT (Standard Hold)
    - Upon transmission:
        - automatic display of the giant car interface

4. LIST OF CONFIGURED BUTTONS

The lower part of the popup displays all active mappings in the form of **horizontal cards**.

Each card indicates:

- **Identifier**:
    - custom name
    - numeric key code
- **Tag [AUTO-SCREEN] (Cyan)**
    - visible if automatic opening of Car Mode is enabled
- **Assigned action**:
    - displayed in green
      (e.g.: `PTT (Standard Hold)*`)

- **Delete**:
    - **red X** button
    - immediate effect:
        - mapping deleted
        - restoration of the original Android function

5. SAVING AND CLOSING

5.1 SAVE MAPPING

- Action:
    - writes data to `inputs_config.json`
    - Notifies the C++ engine
- Effect:
    - exits learning mode
    - mapping ready for use

5.2 CLOSE

- Closes the popup
- Stops detection mode

⚠️ **Important**:
The buttons **only become functional after closing the popup**.

6. TECHNICAL SPECIFICATIONS AND COMPATIBILITY

6.1 Bluetooth buttons

- Compatible with:
    - 99% of PTT rings
    - HID microphones (B01, Talkpod, Abbree)
- Behave like **standard HID keyboards**

6.2 Android Auto

- Some dashboard buttons (Play/Pause, Next) are sometimes **intercepted by Android**
- If not detected:
    - use the Android Auto touch interface

6.3 Xiaomi/Redmi security

- Use `Accessible.ignored: true`
- Guarantees:

- safe green flash
- no OpenGL crash / Signal 6

CHAPTER 10 : APRS SYSTEM & MESSAGING (EXPERIMENTAL FEATURE)

This version introduces advanced integration of the **APRS-IS** protocol. It allows you to not only be visible on global tracking maps (such as aprs.fi) but also to exchange live text messages with other ham radio stations, while enriching the SvxLink Dashboard with your real-time position.

1. Activation and Button Statuses

Control is handled via the **GPS/APRS** button in the function panel. To avoid confusion during connection phases, the button displays its status in real-time:

- **OFF**: The module is completely stopped. No GPS data is read, and the network connection is closed.
- **STARTING... (Blinking)**: Initializing the C++ module.
- **NET CONNECT... (Blinking)**: Attempting to connect to the rotate.aprs2.net server.
- **WAIT GPS... (Blinking)**: Network connection established; the app is waiting for the phone to acquire a valid satellite "fix."
- **LOCATOR (e.g., IN94sp)**: Module fully operational. Your position is being sent and received.

Note: The pulsing (blinking) animation stops automatically as soon as your precise position is locked.

2. The "APRS MESSENGER" Popup (Long Press)

By performing a **long press** on the GPS/APRS button, you open the control and messaging center. This popup is designed to move and remain accessible even when the Android keyboard is open.

A. Beacon Configuration (Settings)

- **Log Filter**:
  - *Around me*: Receives traffic from all stations within the chosen radius.
  - *My callsign only*: Private mode, ideal for receiving only your personal messages.
- **Radius**: Adjusts the reception distance (from 10 to 500 km).
- **Send Interval**: Sets the frequency of your beacons (from 1 to 15 minutes). Increase this delay to save battery when stationary.
- **Comment & Icon**: Personalize your status text and your symbol on the map (House, Car, Jogger, etc.).
- **My Call**: **Crucial.** This is where you define your APRS identity (e.g., F4JGI-9). This setting is independent of your voice network connection.

B. Keyboard-to-Keyboard Messaging

- **"TO" Field**: Enter the callsign of the target station.
- **Chat Zone**: History of messages received and sent during the session. Received messages are gray, while yours are blue.
- **SEND Button**: Instantly transmits your text via the APRS-IS network with automatic acknowledgment (ACK) management in the background.

3. SvxLink Dashboard Integration

The major innovation of this experimental feature is the direct link with the Dashboard:

- As soon as your APRS module obtains a position, your **Maidenhead Locator** (e.g., JN33pp) is displayed in cyan blue under your name in the active stations list.
- If you receive an APRS beacon from another user present on the Dashboard, their locator will also automatically appear under their name.

4. Usage Tips and Limitations

- **Battery**: Continuous GPS usage consumes power. The module uses an Android **Foreground Service** (persistent notification) to ensure the GPS is not killed by the system, even when the screen is off.
- **Accuracy**: The locator calculation is performed in real-time. When moving quickly (e.g., in a car), the Dashboard updates dynamically as you change grid squares.
- **Network**: In case of 4G/LTE signal loss, the APRS module will attempt to reconnect silently without interrupting your SvxLink audio stream.

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*This module is currently in **Beta**. For any bug reports regarding position calculation or message reception, please use the "Generate Bug Report" function in the INFO tab.*

🛠️ CHAPTER 11 — TROUBLESHOOTING, DIAGNOSTICS, AND ADVANCED FAQ

This chapter is designed as an **operational troubleshooting guide**. It allows you to quickly identify a malfunction, understand its cause, and apply the appropriate solution without unnecessarily interrupting radio operations.

1. DIAGNOSTIC METHODOLOGY

Before taking any corrective action, follow this sequence:

1. Observe the **StatusBar**
2. Check the **NET / UDP / LOSS** indicators
3. Identify:
    - network problem
    - audio problem
    - input problem (PTT/microphone)

📌 In 90% of cases, the cause is visible directly on the screen.

2. NETWORK CONNECTION PROBLEMS

2.1 Unable to connect to the server

Symptoms

- NET off
- *NOT CONNECTED* message

Possible causes

- Incorrect host or port
- Incorrect authentication key
- Unstable mobile network

Solutions

- Check Host / Port / Key (Chapter 2)
- Test using Wi-Fi
- Temporarily change network slot

2.2 Connection established but no audio

Symptoms

- NET green
- UDP off
- AUD inactive

Causes

- TG inactive
- No traffic on the network
- Monitor misconfigured

Solutions

- QSY to an active TG
- Check the `[Monitor TGs]` list
- Temporarily disable the scanner

3. RX AUDIO PROBLEMS

3.1 Choppy or metallic audio

Symptoms

- Red LOSS indicator
- Regular dropouts

Causes

- High packet loss
- Unstable network latency

Solutions

- Set audio latency to **HIGH**
- Disable NR HIGH
- Change location (mobile)

3.2 Very low or uneven volume

Causes

- AGC RX disabled
- EQ poorly adjusted

Solutions

- Enable AGC RX
- Temporarily switch to EQ FLAT

4. TX AUDIO PROBLEMS

4.1 Correspondents report saturated voice

Causes

- BOOST active
- AGC TX too aggressive

Solutions

- Disable BOOST

- Switch AGC TX to SOFT
- Move the microphone away

4.2 Voice cut off or choppy

Causes

- Noise Gate set too high
- VOX incorrectly adjusted

Solutions

- Set Noise Gate to AUTO
- Lower the VOX threshold

5. PTT PROBLEMS

5.1 PTT button inactive

Causes

- Bluetooth permission missing
- Incorrect assignment

Solutions

- Check Android permissions
- Reconfigure in `Settings → Inputs`

5.2 TX blocked

Causes

- VOX active in noisy environment
- Defective hardware PTT

Solutions

- Disable VOX
- Enable **TOT**
- Restart the application

6. SCANNER-RELATED PROBLEMS

6.1 Unexpected switching

Causes

- Too many TG monitored
- AUTO-SWITCH active

Solutions

- Reduce to 3–5 TG
- Switch to INFO ONLY

6.2 Scanner inactive

Causes

- Scan Auto Start disabled
- MANUAL HOLD active

Solutions

- Press **MONITOR**
- Check the status displayed in the StatusBar

7. SPECIAL CASES ANDROID

7.1 Application put on standby

Symptoms

- Disconnection with screen off

Solutions

- Check **No battery restrictions**
- Use **FIX BACKGROUND ISSUES**
- Enable Autostart (Xiaomi/Poco)

7.2 Unstable Bluetooth

Solutions

- Disable unnecessary A2DP
- Limit to one BT device
- Test with a wired microphone

8. QUICK FAQ

Q: Can I use multiple TGs for transmission?
A: No. Transmission is always done on **a single active TG**.

Q: Does QSOLink work without the screen turned on?
A: Yes, thanks to the foreground service.

Q: Can I migrate to another phone?
A: Yes, via `QSOLink_Backup.json`.

9. WHEN SHOULD I PERFORM A FULL RESET?

Only if:

- persistent inconsistent behavior
- restoration failed
- major Android version change
-

👉 Always back up first.