Radio Relay User Manual

Version 2.00

Application by sv3ora
http://qrp.gr

Complete feature and settings guide

Set up voice, radio messaging, navigation and shared-radio operation with explanations of every user setting, practical examples and troubleshooting.

What you will find

• Master modes, manual and automatic PTT, every audio and VOX adjustment, and fixed or variable inversion.

• Station IDs, selective communication, range checks, text delivery, mailbox recordings and SSTV photos.

• Offline locations, route recording and follow-back, persistent photo markers and their sharing rules.

• Bluetooth and Internet hosts and guests, access permissions, presets and complete setup scenarios.

Applies to the approved Radio Relay 2.00 release. Minimum Android version: Android 6.0. English interface. Prepared 27 November 2026.

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1 Using this manual

Radio Relay 2.00 turns a compatible Android phone into a voice, messaging and navigation companion for a two-way radio. It can pass live audio, record and replay calls, keep a voice mailbox, exchange text and SSTV photos, display station positions, record a return route and let other phones use a shared radio through Bluetooth or a direct Internet connection.

This manual describes the controls and behaviour of version 2.00, including settings that are available only in particular modes. It covers both everyday operation and more involved arrangements such as a radio in a backpack, an unattended mailbox and two Internet-linked radio gateways. Start with Chapters 2 to 4, then read the chapters for the features you intend to use. Chapters 17 and 18 provide complete example setups and troubleshooting.

Version scope. The application is Radio Relay, by sv3ora, at http://qrp.gr. The title bar reads “Radio Relay (sv3ora)”; About credits “Audio Relay by sv3ora”. This document describes the approved 2.00 release. Ideas discussed for future releases, and temporary audio diagnostics from other builds, are not controls in this version.

Illustrations. Screenshots show the actual 2.00 interface with example aliases, messages and positions. They illustrate controls rather than prove a live radio connection. A phone’s font scaling, Android version, permissions and current operating state can change what is visible or enabled.

What you need

The minimum Android version is **Android 6.0, API 23**. A phone needs a microphone and an available playback output for voice operation. Camera, location, compass and Bluetooth features need the corresponding hardware, Android provider and permission. An Android version meeting the minimum does not guarantee that every simultaneous input and output combination is supported by that phone.

For a physical radio, use a suitable **analog audio interface** between the radio and the phone’s microphone/headphone connections, or a Bluetooth audio interface that Android exposes appropriately. This is ordinary audio, not USB audio. Radio Relay does not program the radio’s channel, CTCSS, DCS, RF power or hardware VOX settings. Set those on the radio itself.

An on-screen PTT press controls the app’s audio transmission. To make a connected radio actually transmit, the radio needs VOX or another suitable transmit-control arrangement. A cable carrying audio alone does not make the phone electrically press the radio’s PTT switch.

Four useful roles

Role	What the phone does	Example
Local radio phone	Captures and plays radio audio through its selected routes	A phone connected to a PMR by cable
Sharing host	Owns the radio audio path and serves connected users	A radio and phone in a backpack

Role	What the phone does	Example
Bluetooth guest	Uses a nearby host through the Radio sharing connection	A second phone used as the backpack controller
Internet user or gateway	Uses or links a radio over a direct network connection	A phone in another city accessing a radio gateway

The host is the point that drives its physical radio. All its connected users share that radio's RF station identity and half-duplex airtime. They do not become additional RF stations merely by joining through Bluetooth or Internet.

Two kinds of Bluetooth. Choosing Bluetooth as an audio input/output means a headset or other supported Android audio device. Joining a Bluetooth radio means an app-to-app sharing connection between phones. These are separate functions and should not be confused.

Limits that matter in use

The offline map is a relative-position plot, without street, terrain or satellite tiles. Voice inversion disguises speech but is not strong encryption. Addressing a station filters traffic in compatible apps; it does not prevent an unrelated radio receiver from hearing the RF signal. A delivery ACK confirms the particular receipt described by that feature, not that a person read a message or that a noisy photo is visually perfect.

Audio behaviour depends on Android, the phone, the selected devices and the radio interface. In particular, simultaneous wired output and phone-speaker monitoring is available on some phones and unavailable on others. Use the replay fallback described in Chapter 14 when required. The Huawei receive-feedback investigation has not established a universal fix; version 2.00 should not be presented as guaranteeing freedom from feedback on every phone.

2 The screen and master controls

Sections and navigation

Tap a section title or its arrow to expand or contract it. Contracting a section hides its controls; it does not disable the feature. The three-dot menu offers **Expand all** and **Contract all**, as well as Audio setup info, Presets and About. Information icons explain individual controls. Reset icons return the corresponding setting to its default; there is no single reset button that silently resets the whole setup.

The screen order is Status, Radios in range, Radios map locations, Text messages, Voice mailbox and Photos send & receive. A horizontal separator then distinguishes Station ID, Bluetooth radio sharing, Internet gateway, Audio routing, Record & squelch, Playback & VOX and Voice inversion. The applications and the general settings remain in this order even when a dashboard shortcut opens a feature.

Disabled controls. A faint control is normally unavailable for the current mode, route, activation state or sharing permission. For example, stop audio before changing the physical route, and unlock host controls before changing permitted host settings as a guest. A disabled control is not automatically a phone compatibility fault. Permission failures can also prevent actions; check Android permissions before changing routing.

Status dashboard

The dashboard combines the current activation mode with the current activity, such as Listening, Recording, Sending or Playing. It also shows the station identity and destination, latest text, mailbox state, latest photo, map access and Radios heard. Tap the destination or a relevant item to open its existing selection, history, gallery or map interface. Radios heard stays immediately above the PTT and mode buttons.

The Radios heard entries use a station number, alias and time. They are observations of identified traffic, not a continuous signal-strength measurement or proof that a station remains reachable now. Deactivating audio does not intentionally clear this list. A small highlighted inversion icon beside the input-level label appears when inversion is enabled; it is a compact reminder, not a full description of the selected inversion setup.

The input meter is the measured input level after Input gain in the active capture path. The threshold indicator shows the relevant trigger level. The meter itself is not the Squelch threshold setting. Amber/CLIP indications warn about high levels or clipping. Increasing digital gain cannot repair audio that already clipped at the phone's physical input.

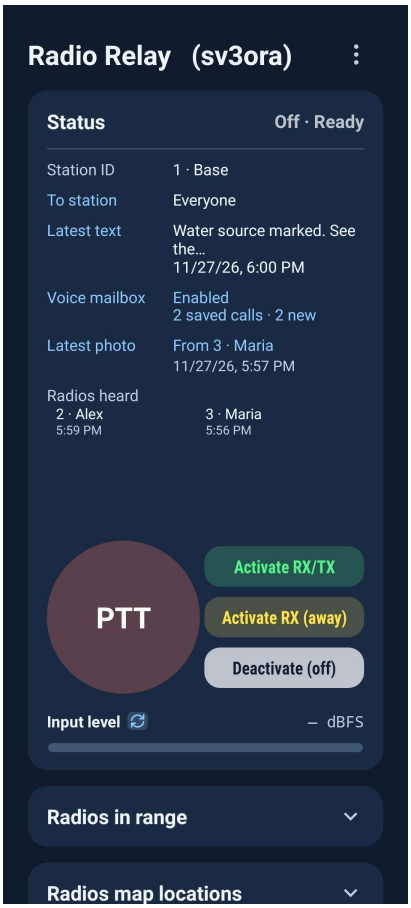

Figure 1. Dashboard shortcuts, manual PTT, three activation choices and the input meter. Example data is shown.

The three master modes

Button	Status prefix	Voice and applications
Activate RX/TX	RX/TX, green	Runs normal audio and the features enabled in your saved settings; transmission is permitted
Activate RX (away)	RX (away), yellow	Receives without sending voice, data, replies or ACKs; temporarily enables mailbox, text, photo and location reception
Deactivate (off)	Off, gray	Stops the main radio audio session; saved histories remain

Select a mode with one tap; the choices are mutually exclusive. A short vibration confirms a mode change on phones with a vibrator. Returning from RX (away) to RX/TX restores the feature-enable preferences you chose for normal use. Away mode does not overwrite those preferences. Requests and ACKs that became obsolete during a receive-only period are not transmitted later simply because you returned to RX/TX.

Away example. You normally use voice with the mailbox disabled. Before leaving, tap Activate RX (away). Incoming calls are saved and supported incoming data can be received. When you return, select Activate RX/TX; your normal mailbox-disabled preference returns. To keep recording while you are present, enable mailbox in normal RX/TX operation instead.

Main audio Off is not a global delete or a stop command for every local utility. Local map viewing, saved records and independent route recording can still be useful without radio activation. Stop the route through its own control or notification when you want to stop location tracking.

PTT and Automatic PTT

Choose **Voice trigger** under Record & squelch. With **Hold PTT**, hold the red button to speak and release it to end your outgoing voice turn. A short vibration confirms the press. In Live bridge, speech goes out live after any required lead-in. In Record & replay, the app records your turn, then sends the completed recording through the existing replay sequence.

With **Automatic**, the button remains visible as **Auto PTT** in a faint red colour. Its Triggered indication follows the automatic voice trigger. Pressing it manually does nothing and produces no PTT vibration. Automatic triggering uses the input level, threshold and confirmation rules; it does not mean that the app can safely distinguish every unwanted sound from speech.

Hold PTT governs local outgoing voice. It does not turn off incoming-radio detection, text reception, photo reception or the mailbox. In a one-way Audio jack → Phone speaker receive setup, the app still has to open the receive path automatically, even if Hold PTT is your saved outgoing preference. Connected sharing guests always use Hold PTT for their own voice.

3 First setup and a useful test order

Grant permissions and make a simple local test

Allow microphone access when requested. For a first functional test without a radio, choose Phone microphone → Phone speaker, Record & replay and Automatic. Use modest volume and no inversion. Speak briefly, pause longer than Squelch hang time and listen for replay. This tests the basic capture and playback sequence, not the cable or radio.

Use Deactivate before changing a route or audio mode. Start with Input gain and Output level at **0 dB**, not at the slider's far-left minimum. Set a threshold above idle noise but below normal speech. Avoid enabling inversion, sharing and several automatic data features while first diagnosing a physical audio path.

Connect the radio audio interface

A phone microphone input is normally the microphone contact of a compatible headset connection. A headphone-only connection may expose output but no wired input. The radio's receive audio must reach the phone's selected input at an appropriate level, and the phone output must reach the radio's microphone input through an appropriate interface. Connector contact arrangements and radio accessory wiring differ.

Connection order can matter. If Android does not recognise the route, unplug both ends and try connecting the cable to the phone first and then the radio. On other phones, the reverse order works better. Accept or adjust any media-volume prompt that appears. Recheck the actual selected input and output after reconnecting. One connection order is not universal across phones.

Test each direction separately before Auto direction. The table below assumes the radio uses VOX for phone-to-radio transmission. "Off" in the VOX column means radio VOX is unnecessary for that receive-only test.

Test	Input source	Output destination	Audio mode	Auto direction	Radio VOX
Radio receive then replay	Audio jack	Phone speaker	Record & replay	Off	Off
Radio receive live	Audio jack	Phone speaker	Live bridge	Off	Off
Phone voice then radio replay	Phone microphone	Audio jack	Record & replay	Off	On
Phone voice to radio live	Phone microphone	Audio jack	Live bridge	Off	On
Two-way live operation	Phone microphone	Audio jack	Live bridge	On	On
Two-way record and replay	Phone microphone	Audio jack	Record & replay	On	On

For receive tests, transmit from a second radio and confirm that the app hears that radio, rather than the phone's built-in microphone. For transmit tests, hold app PTT if Hold PTT is selected and listen on the second radio. A successful opening DTMF tone with no voice afterwards can mean the radio VOX opens for the tone but the voice level is too low to keep it open.

Save the known working setup

Once the two directions work, save a named preset before experimenting. A useful name is "T92 wired live" or "Backpack host". Keep normal phone volume, radio receive volume and radio VOX adjustments in your own setup notes: these physical or system controls are not all values that an app preset can restore. Chapter 16 explains exactly what presets include.

4 Audio routing

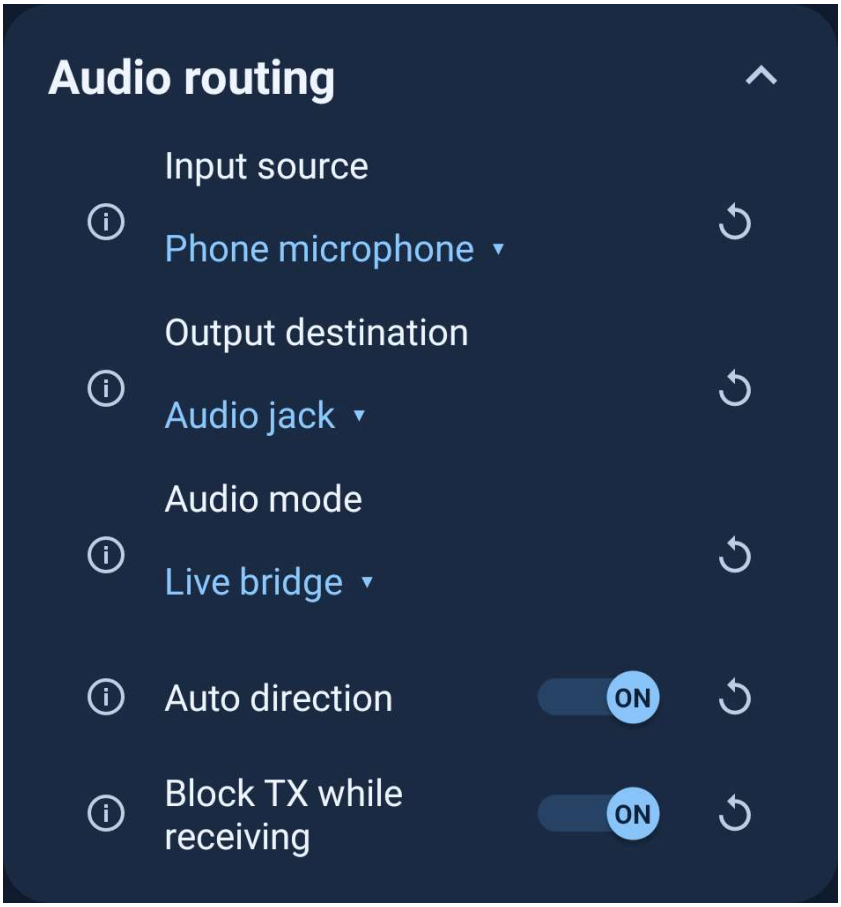

Figure 2. Audio routing selections. Some controls depend on the chosen devices and mode.

Input source and Output destination

Input source selects where the phone captures audio. Phone microphone uses the built-in microphone; Audio jack uses a detected wired microphone input; Bluetooth uses a supported Bluetooth microphone exposed to Android. **Output destination** selects Phone speaker, Audio jack or Bluetooth playback. An output-only Bluetooth speaker does not automatically provide a microphone.

Choose the endpoints while deactivated. The app requests those routes, but Android makes the final routing decision. If an endpoint disappears or Android redirects a required route, the app can stop and display an error rather than keep sending through an unintended device. A working Bluetooth music profile does not by itself prove that simultaneous Bluetooth microphone and playback work as expected.

Record and replay

Record & replay collects a voice segment, waits for its end and then plays it to the output. With Automatic, Squelch threshold and Trigger confirmation start a clip; Squelch hang time decides how much quiet remains within the same clip. Pre-roll retains opening audio. Replay delay adds an optional pause, and Receive recovery controls the return to listening after playback.

With Hold PTT, the local user defines the outgoing turn by pressing and releasing PTT. This prevents room noise from starting outgoing speech. Radio reception can still use automatic receive detection. The voice recording buffer has a three-minute per-clip limit; it is intended for calls rather than unlimited continuous recording. The mailbox is a separate recording function and does not mean that every replayed clip is a saved mailbox call.

Parrot example. Select the radio-facing input and output appropriate to your interface, Record & replay and Automatic. A received call is recorded, then replayed to the radio after its end. The radio needs VOX or suitable transmit control for the replay. Set recovery high enough to avoid recording the radio's own end-of-transmission sounds. Prevent any physical or acoustic loop from feeding the replay back into the input.

Live bridge

Live bridge passes audio through during the active voice turn instead of waiting for a whole clip. It is useful for a headset-to-radio connection, wired phone-microphone transmission and shared phone-to-phone voice. The app can buffer opening speech while it sends required identification or variable-inversion lead-in tones, so you do not have to manually wait for those tones before speaking.

Live bridge does not require every record/replay control. Replay delay, pre-roll and recovery are relevant only where the current receive, mailbox or transmission path uses them; the interface disables controls that do not apply. Keep-alive and hang-time behaviour can still apply to live voice. See Chapters 5 and 6 for the distinctions.

Same-device restriction. A local Phone microphone → Phone speaker live setup is permitted for **Hold PTT**, including phone-only sharing: your outgoing speech is streamed without being played back locally, and incoming voice uses the speaker on its turn. Automatic does not allow that same-phone live combination because it can create a feedback trigger. Same jack or same Bluetooth endpoint combinations are not a general-purpose full-duplex intercom; use the modes the interface permits.

Auto direction and Swap

For a normal wired two-way setup, select **Phone microphone → Audio jack**, enable Auto direction, and let the return route be **Audio jack → Phone speaker**. In a headset arrangement, the user-facing side can instead be a supported Bluetooth audio endpoint. Auto direction changes which side is carrying a voice turn; it does not change the radio's RF channel or override its half-duplex nature.

With Hold PTT, pressing the button selects the outgoing microphone path and holds that direction for the turn. Releasing ends the turn, after any record/replay send or output drain, then returns to reception. This avoids

repeatedly switching during syllables or voice pauses. On phones that cannot run both microphone paths at once, the wired Hold PTT path opens them one at a time.

Automatic direction uses the local trigger and radio receive threshold to decide which side is active. Where simultaneous capture is not available, supported wired automatic operation uses a sequential probing approach. Detection and switching can have a delay; test opening words and radio responses on the actual phone. Do not infer two-input hardware support simply because manual Swap works.

Swap reverses the selected route while stopped, for example between Phone microphone → Audio jack and Audio jack → Phone speaker. It is a manual configuration action, normally visible for mixed endpoints when Auto direction is off. Your tap supplies the direction decision. Auto direction has to detect or follow a PTT decision during operation and therefore does more than repeatedly tap this button.

Block TX while receiving

With Auto direction, **Block TX while receiving** prevents local voice from taking over an incoming radio call. It is useful where noise near the phone could otherwise start a local turn during reception. With it off, a confirmed local automatic voice trigger can take the transmit turn. It is not a detector of whether a distant person has finished a conversation; it follows the app's detected audio and hang rules.

This option, Auto direction and Radio receive threshold are disabled for routes that do not have a meaningful separate return path. Their disabled state for a same-device setup is intentional. Hold PTT and sharing arbitration impose their own turn rules; blocking does not grant a guest permission to transmit.

5 Record and squelch settings

The following ranges are the controls in 2.00. A default is a starting value, not a universal radio recommendation. "dBFS" measures digital signal level relative to full scale: −30 dBFS is louder than −50 dBFS. A less negative threshold requires a stronger signal.

Setting	Range and step	Default
Input gain	−24 to +24 dB, 1 dB	0 dB
Voice trigger	Automatic or Hold PTT	Automatic
Squelch threshold	−70 to −10 dBFS, 1 dB	−42 dBFS
Squelch threshold mode	Fixed or Auto	Fixed
Radio receive threshold	−70 to −10 dBFS, 1 dB	−42 dBFS
Trigger confirmation	20 to 1000 ms, 20 ms	80 ms
Squelch hang time	0 to 5000 ms, 50 ms	650 ms
Pre-roll	0 to 500 ms, 20 ms	200 ms

Input gain

Input gain digitally raises or lowers the selected input before the meter, trigger processing and downstream audio. Increase it only enough to make useful audio clear and reliably detectable. It also raises noise and any unwanted returned signal. Lowering it can help with overdriven digital processing, but cannot undo clipping in the phone's analog input.

Example. A weak source reaches −55 dBFS during speech and the threshold is −42 dBFS. A moderate gain increase may bring speech above the threshold. First confirm that the source really is weak; an absent wired microphone or a wrong route will not be repaired by adding +24 dB. For distorted or pulsing idle input, reduce gain and check the source rather than raising thresholds indiscriminately.

Voice trigger

Automatic is hands-free: a sustained signal above the trigger level starts a voice turn. Hold PTT lets the user explicitly control outgoing speech. The app disables automatic outgoing trigger controls where they do not apply, but it retains controls needed to detect incoming radio audio or record mailbox calls. The label can become Squelch threshold (receive) to make that purpose clear.

For a phone in a noisy environment, Hold PTT is usually easier to predict. For an unattended parrot, Automatic is required to react without a finger press. Sharing guests use Hold PTT regardless of the host's local choice. The host can keep Automatic or Record & replay for its own local voice without imposing those modes on a guest's microphone.

Fixed threshold and Auto Squelch Set

With **Fixed**, move Squelch threshold above idle noise and below useful speech. If noise opens the input, make it less negative. If quiet speech is missed, make it more negative or correct the input level. Do not confuse this software threshold with the radio's RF squelch or CTCSS/DCS decoder.

The small **Fixed/Auto** control beside the title chooses between the manual value and a separately stored measured value. **Auto Squelch Set** measures the selected background for **three seconds**. **Do not speak during those three seconds.** Use a representative idle condition. The app takes the median measured background level and sets the Auto threshold **14 dB above it**, within the control's allowed limits.

Auto is a saved calibration, not a continuously changing noise detector. It stays until you measure again. Switching to Fixed restores use of your fixed slider value; it does not delete the saved Auto value. Returning to Auto reuses the measurement. Before the first successful calibration, Auto uses the Fixed value. An unusably silent input, excessive background level or an interrupted calibration can leave the previous value in place rather than save a misleading result.

Radio example. With the radio's own squelch closed, the phone may receive near silence. That does not reveal the noise inside a future weak radio call. Calibrate only for the idle audio actually reaching the phone and verify with real calls afterwards. Calibration cannot learn sounds the radio does not pass.

Radio receive threshold

Auto direction uses Radio receive threshold for audio arriving from the radio-facing side, separately from the user's local microphone threshold. The mailbox uses it when recording that receive input. Place it above idle radio/interface noise but below received speech and data as appropriate.

Hold PTT does not make the radio channel permanently “clear”. Data transmissions still need receive activity detection and channel access. If a photo reports Channel busy while the room is quiet, examine the radio-facing input, gain and threshold. A disabled local voice threshold does not mean that SSTV ignores all received audio.

Trigger confirmation

Audio must remain above the relevant threshold for this duration before a recording or automatic route opens. Increase it to reject brief clicks, contact noise or short bursts. A very long value makes opening detection slower and may miss short words or signals. Pre-roll can retain some opening audio in paths that use recording, but is not an excuse to use an excessive confirmation time.

Example. At 80 ms, a 20 ms click should not form a confirmed call. At 500 ms, a short “yes” may be largely over before confirmation. Choose the shortest value that reliably rejects your setup’s unwanted impulses.

Squelch hang time

In Record & replay, hang time is how long quiet can remain before the clip ends. At **2500 ms**, a two-second pause stays within one recording. The full range is zero to five seconds. With a short value, pauses split speech into several clips; with a long value, replay starts later after you finish.

In Live bridge, hang time also bounds how long VOX keep-alive can fill a voice pause. In Auto direction it helps hold the chosen path through pauses. It does not change the physical radio’s VOX hold time. If the radio drops transmit after half a second of quiet, a 2500 ms recording hang setting alone cannot keep that radio keyed during replay.

Pre roll

Pre-roll is a short history from before the confirmed trigger. With a 200 ms value, replay can include sound immediately before the app decided the signal was valid, reducing clipped word beginnings. It is relevant to recording and mailbox capture, rather than a delay you must wait before speaking.

Pre-roll differs from the VOX lead-in tone: pre-roll preserves earlier **input**, while the lead-in is generated **output** that gives the radio or receiver time to open. Increasing one does not replace the other.

6 Playback and VOX settings

Setting	Range and step	Default
Output level	−30 to +6 dB, 1 dB	0 dB
Replay delay	0 to 3000 ms, 50 ms	0 ms
VOX lead-in tone	Stored Off or 25 to 3000 ms, 25 ms	Off for plain voice; automatic 500 ms when an identification lead is needed

Setting	Range and step	Default
VOX tone volume	1 to 100 percent, 1 percent	25 percent
VOX keep-alive	Off or On	Off
VOX beep interval	100 to 2000 ms, 20 ms	500 ms
VOX beep length	20 to 80 ms, 20 ms	60 ms
VOX quiet threshold	−70 to −10 dBFS, 1 dB	−45 dBFS
Receive recovery	0 to 3000 ms, 50 ms	500 ms

Output level and phone volume

Output level scales voice sent to the selected output. The phone's side volume controls also affect the active Android output stream, so both settings matter. Start at 0 dB and increase carefully; excess level can distort a radio microphone input or create feedback. The far-left slider position is −30 dB, not 0 dB.

The opening/keep-alive tones have their own VOX tone volume. A loud, successful DTMF opening therefore does not prove that speech has a suitable output level. Conversely, very loud speech is not a reason to make identification tones needlessly loud. A phone may expose different media and call volume controls while a communication speaker path is active; adjust the control corresponding to the path currently playing.

Replay delay

Replay delay adds a pause after a recording closes and before the app starts replay. This can give the source radio time to return to receive. If another confirmed signal arrives during this waiting period, the app can resume recording instead of sending prematurely.

Use zero for the quickest replay, or add a modest delay if your radios need turnaround time. This setting is not an Internet jitter buffer and is not the interval between keep-alive beeps. Ordinary live bridging does not wait for a whole clip and therefore does not use this replay-only pause.

VOX lead in tone

A lead-in gives a VOX-controlled radio and the remote receiver time to open before speech. Plain voice can use an optional opening tone. With Station ID enabled, the lead carries the clear station digit; with variable output inversion, the leading clear DTMF digit identifies the inversion slot. These headers are meaningful control signals, not merely decorative beeps.

The stored default zero means Off for an optional plain tone. When a required DTMF lead is used, zero selects its **500 ms automatic default**. The variable-inversion lead has a minimum of **125 ms** even if a shorter nonzero duration is selected. The setting can be increased up to three seconds. Additional short station/destination digits can follow a variable slot lead; the duration setting does not turn all those header parts into one long digit.

For slow VOX or squelch opening, increase this duration before assuming DTMF decoding is faulty. A receiver must hear enough of the clear digit to decode it. Keeping a long lead on every call improves opening margin at the cost of delay and audible tones.

VOX tone volume

This percentage is shared by the lead-in tone and keep-alive beeps. Changing it changes both; there is no separate keep-alive volume to maintain. Use enough level to trigger and sustain the radio VOX, while avoiding clipping or uncomfortable tones.

Hardware VOX sensitivity is still set on the radio. The app's PTT, input squelch, output voice level and tone level are four different controls. Set and test them in that order rather than treating every "PTT" or "VOX" label as the same mechanism.

Keep alive and its three adjustments

Enable **VOX keep-alive** to insert short tones into quiet portions of outgoing speech. The app evaluates audio level in 20 ms blocks. **VOX quiet threshold** determines what counts as quiet; **VOX beep interval** determines the wait to the first beep and the repetition interval; **VOX beep length** determines each tone's duration. The tone volume is the common VOX tone volume above.

If speech resumes, the app stops the beep and resets the quiet timer. A later pause starts the timer again. With keep-alive off, these beeps are not added. In record/replay they help bridge pauses inside the recorded clip; in live voice they apply within the active turn and its applicable hang window. They are not an instruction to transmit forever after a conversation ends.

Example. Set hang time to 2500 ms, interval to 500 ms and beep length to 60 ms. You speak, then pause for two seconds. The recording remains one clip. During its replay, after roughly half a second of sufficiently quiet audio, beeps recur to keep the physical VOX open. When the next words start, the beeps cease. Choose an interval shorter than the radio's own VOX timeout.

Raise the quiet threshold if background noise prevents beeps; lower it if soft speech is incorrectly treated as quiet. If the radio drops TX between beeps, shorten the interval or adjust hardware VOX. If beeps are missed, a slightly longer beep or more tone volume can help. These adjustments do not replace input trigger confirmation.

Receive recovery

Receive recovery is the delay after playback before listening is rearmed for another record/replay cycle. It prevents a radio's release noise, return-to-receive sound or a short residual signal from immediately creating another clip.

Increase it if a completed replay triggers itself again through end sounds. Excess recovery can miss a quick reply. It is not a general echo canceller, and it cannot cure a continuous live audio loop during an actual received call.

7 Station identity and selective communication

Enable station ID and edit aliases

Enable Station ID to identify transmissions and use the app's station-based functions. The group has **eight RF stations, numbered 1 to 8**. Give each radio phone a different number. Under **Edit station aliases**, enter a short name for each number, up to 16 characters per alias. The same agreed alias list on the group's phones makes received calls easier to recognise.

My station chooses this phone's RF station number and displays its alias. For example, 1 · Alex and 4 · Maria identify two radio endpoints. An alias is a local name associated with a number; sending the station digit does not distribute a new alias list to every unrelated radio. Configure or import the agreed list on each phone.

Bluetooth and Internet guests use the host's station number when they send through its radio. A remote RF station sees the host identity, not a separately numbered guest inside that host. The shared chat can still label a local origin as Guest BT or Guest Internet so the host and connected users understand who submitted it.

To station

Tap **To station** in Station ID or the dashboard, then tap Everyone or a station's number and alias. It is a list of destinations, without a radio button you must confirm separately. Everyone is the normal default. You cannot meaningfully address your own RF station through this selection; choose another group station.

For identified voice, the sender digit comes first, followed by an optional destination digit for an addressed call. If variable inversion is used, its slot digit precedes those identity digits. For example, Alex at 1 sends to Maria at 4 using slot 2: the clear header carries **#**, then **1**, then **4**, followed by the voice. Each symbol has a distinct role and position.

Messages and photo sends present a destination choice as part of sending. Text addressing is carried in its FSK packet; it is not simply "play Maria's DTMF digit instead of the sender ID". Photo transfer combines its station/address lead and transfer metadata. Range checks and public location checks remain group operations.

A guest's destination applies to that guest's outgoing turn or item. It does not overwrite the host's saved To station choice. Everyone connected to a sharing host sees traffic that the host accepts for its radio, including an item addressed to the host from a distant station. There is no separate private Bluetooth sub-recipient behind the host.

Receiving addressed traffic

A compatible station-ID receiver can distinguish a sender from a destination and reject voice addressed to another number. Unknown or non-identified incoming radio audio can still be received in ordinary receiving use. Without station IDs, the app cannot attribute an ordinary call to a named group member merely from the sound of their voice.

Mailbox detail. Mailbox storage follows the incoming audio supplied to the app's receive path. With station-ID destination filtering active, a call addressed to a different station can be excluded before mailbox capture. Do not treat the mailbox as a guaranteed bypass that records every other station's selectively addressed call. For general activity recording without group identification/filtering, use the appropriate ordinary receive setup with Station ID disabled. Clear incoming calls from outside the group do not require a recognised sender to be recorded.

Addressing provides convenient selective reception in the app. It does not stop other radios hearing the transmitted audio, and it is not an access-control or encryption system for the RF channel.

Lock station IDs setup

The station setup lock is **Off by default** and is optional even when IDs are enabled. To lock, deactivate audio, tap **Lock station IDs setup**, enter a **4 to 12 digit PIN**, repeat it and confirm. The PIN fields disappear while the app works, and a Please wait indicator remains so the administrator can tell that the operation is in progress.

The lock protects Enable station ID, My station and **all eight aliases**. It does not lock the entire application or prevent ordinary preset creation. To edit the protected setup or remove the lock, use **Unlock station IDs setup** and the correct PIN. Starting audio does not request the PIN; it uses the identity already protected on that device.

Presets can still be saved, exported, imported and loaded normally. On a locked phone, the protected identity fields remain the phone's own values while other settings can change. On an unlocked phone, imported station settings can be applied. For example, Maria's locked station 4 can load Alex's squelch and routing preset without becoming station 1 or changing any of the eight aliases.

The lock PIN is local and is not a transferable preset credential. After five failed attempts, a 30-second waiting period limits further guesses; follow the displayed waiting message. There is no forgotten-PIN recovery inside the app. Clearing app data or uninstalling resets the lock by erasing the app's local data and settings. This is an administrative convenience, not protection against someone who controls the phone and can erase the application.

8 Radios in range

Enable and run a manual check

Enable **Range checks** while deactivated, enable Station ID and activate RX/TX. Tap **Manually check range now** to ask nearby compatible stations to announce themselves. The request uses clear DTMF **9**, followed by the caller's own station ID. The 9 tone lasts **500 ms by default**, or longer if the configured VOX lead-in requires it.

Each receiving station knows who started the check and updates that caller in its heard list. Other stations reply with their own ID in assigned **four-second slots**. There are seven reply positions for the other stations, so a complete response window is about **28 seconds**, plus turnaround time. The visible countdown shows that observation period; it is not an instruction to keep a radio transmitting for the whole period.

The caller and other listening participants learn from any recognised reply. Ordinary identified voice transmissions also refresh Radios heard. A station does not have to initiate its own 9 call to learn about stations it hears during somebody else's check.

Example. Station 1 starts a check. Stations 2 and 4 are present. Station 2 replies in its slot, the slot corresponding to station 3 is quiet, and station 4 replies in its slot. All nearby compatible listeners can update their lists from those IDs. Missing stations retain their last-heard information rather than being proven permanently out of range.

Automatic range checks and interval

Automatic range checks runs the same check on a timer while the appropriate RX/TX session is active. **Automatic check interval** accepts whole minutes, from 1 to 2,147,483,647; the default is **60 minutes**. For a day use 1440 minutes, or for a week 10080. A manual check restarts the interval.

A due check waits for an available channel and the current voice/data turn to finish. Replies also respect their slot and channel rules; a busy channel can cause a reply opportunity to be missed. The app does not send a stale reply after its usable window has passed. RX (away) can listen to ID traffic but does not transmit checks or ACK replies.

Interpreting the results

The expanded section contains station identities and timestamps; the dashboard gives a compact Radios heard list. A timestamp means “this app recognised this station at this time”. It is not a continuously measured radio range, an RF strength value, or a guarantee that a future message will arrive.

No reply can have several causes: the other app is off, its IDs or range feature are disabled, its radio cannot key automatically, another transmission occupies the slot, or the station really is out of reach. For unattended answers, the radio requires VOX or another transmit arrangement. Use text or photo delivery status for confirmation of those particular items.

9 Text messages

Enable text and choose a speed

Turn on **Enable text messages** while deactivated. Station ID identifies the sender. Activate RX/TX to send and receive normally. RX (away) receives texts without sending ACKs. With mixed audio endpoints, enable Auto direction so the app has both the radio receive and transmit paths required for two-way data.

Text speed offers **50, 100 or 200 bits/s**, default **100**. The receiver reads the speed from the packet, so participants need not manually match a receive-speed switch. Lower speed gives each bit more time and costs more airtime; it cannot guarantee recovery from clipping, severe distortion or a wrong audio route.

Messages are deliberately short. The maximum is **120 UTF-8 bytes**: roughly 120 plain English letters, spaces and punctuation, usually around 15 to 20 short words. Many non-Latin characters use more than one byte, so a message with Greek text can reach the limit with fewer characters. The app asks you to shorten content that exceeds the encoded limit.

Airtime example. A ten-word English instruction might contain about 60 characters. Its text alone takes about five seconds at 100 bits/s, about ten at 50, or about two and a half at 200. The actual send is longer because of framing, identification, opening and possible ACK traffic. These are examples, not a fixed words-per-second promise.

Send message and read the chat

Type in **Write a message**, tap **Send message**, choose Everyone or a station and let the host/app send when the channel allows it. For example, “Meet at the north gate in ten minutes” is easier to act on later than a long spoken instruction. The chat shows sender or outgoing origin, destination where relevant, timestamp and delivery state.

Host-authored outgoing items use You on the host. A guest submission has a guest-origin label rather than making every participant appear to be the same local author. The RF identity remains the host's station ID. Shared users see host and guest submitted messages through the host's common chat path.

Use the dashboard's Latest text shortcut to read the conversation without expanding this section. The local chat retains up to **100 entries**. It is a working conversation history rather than an unlimited archival log. **Clear chat** asks for confirmation; on a guest it clears that handset's shared chat view, not every other phone's history.

Delivery ACK and retry

An addressed message carries a message identifier. A recipient in RX/TX that correctly receives and saves it returns a short FSK ACK identifying that message. This means **saved by the addressed app**, not read by Maria. A message to Everyone has no group ACK exchange, avoiding several recipients replying at once.

After transmission the sender normally waits up to **six seconds** for its text ACK. If no confirmation arrives, it makes **one automatic retry**, keeping the same message ID. That retry waits for a clear channel and does not deliberately interrupt voice. A bounded clear-channel wait can expire; a permanently busy channel does not create an endless automatic retry loop.

If the ACK was lost but the message was saved, duplicate handling lets the receiver confirm the same ID again without adding the same addressed message repeatedly. After the automatic attempt is exhausted, the entry shows no confirmation and **Retry** offers a manual resend of a selected eligible message. It is not an unqualified "resend every unconfirmed message" command. Several drafts/submissions can be queued, but one shared radio still sends one transmission at a time.

Example. Alex sends "Bring the first aid bag" to 4 · Maria. Maria saves it and sends an ACK. If Alex misses the ACK, his retry uses the same identifier; Maria can acknowledge it again. If Maria is in RX (away), she may save the text but send no ACK, so Alex must not interpret No confirmation as proof that the text was never received.

Damaged messages

Hide damaged messages is **Off by default**. When a packet can be sufficiently recovered but fails verification, the app can show it in the same chat in amber with a Damaged label. Unreadable characters can appear as replacement symbols. Even apparently readable characters in a damaged entry may be wrong, including numbers or instructions.

Turning Hide damaged messages on hides damaged history and discards newly damaged messages. A severely damaged header or missing synchronisation can prevent any recoverable message from being produced at all; the app cannot display text it never identified. Damaged content is not treated as a verified delivery deserving a normal successful-message ACK.

For a gate code, coordinate or important instruction, ask for a resend if Damaged appears. Adjust levels and test at 100 or 50 bits/s before assuming a slower rate alone fixes every problem. Text decoding follows the selected input-descrambling path when experimental data inversion is used; both endpoints must agree on that setup.

10 Voice mailbox

What the mailbox records

The mailbox is an **incoming-call recorder**, separate from the record/replay audio-mode buffer. Enable **Enable mailbox** to add it to normal RX/TX listening. RX (away) temporarily enables mailbox recording automatically. Deactivate stops incoming capture and keeps the calls already saved.

It uses the existing input gain, applicable threshold, confirmation, hang time and pre-roll rather than duplicating those settings. With Auto direction, it records the radio receive side. It can keep a call whether or not you later answer by voice; it does not attempt to infer that your reply answered a particular recording, and it does not automatically delete that call.

Calls have a time, duration and sender ID/alias if a recognisable header was present. Unidentified ordinary audio can be saved too. The mailbox has no speech recognition, caller voice identification or automatic "someone replied" detector. Destination filtering, when active, follows the rules described in Chapter 7.

Inversion and stored audio

If **Descramble input** is selected and the incoming call uses the matching fixed or variable inversion, the mailbox receives the descrambled audio before storage. **Scramble output** is a separate outgoing setting and does not scramble the saved mailbox file again.

If you feed clear microphone speech into an enabled descrambler, that operation will make it sound inverted; the app cannot know that you intended a clear test. For a useful mailbox test, send actually scrambled audio with the correct frequency or a valid variable slot lead, or turn input descrambling off for a clear call.

Saved calls and Play all

Saved calls opens the timestamped list. Select a call to open its player. The player has Play/Pause, a seek bar, elapsed/total time and sender information. Close returns to the list so you can select another call. On a local radio phone, **deactivate main audio before playing saved calls**; the player does not quietly compete with the active radio capture/playback session.

Play all plays saved calls sequentially and marks them heard as each one plays. It does not mark the entire list read before playback reaches it. Pause or close if you want to stop. Playback uses a suitable phone-speaker or Bluetooth media output, with the phone's playback volume controls.

The dashboard shows new-call counts, allowing you to notice a recording without expanding the section. It need not show "No saved calls" when the feature is off. A connected guest can have its own heard/unheard state for a shared recording; listening on that guest is not a reliable indication that the host owner has listened.

Export and delete

An individual call's **Export** opens Android's file picker to create a WAV file. Select a writable destination and confirm the filename. The suggested filename contains the call time. Export creates a separate copy you can keep outside the app; a preset does not include the WAV audio.

Use **Delete** in the individual player to remove one saved call after confirmation, or **Empty mailbox** to remove all saved calls after confirmation. On a shared guest, deletion/emptying removes those calls from that

handset's shared list rather than silently erasing the host's entire archive. Clearing app data or uninstalling can remove private recordings; export anything you need to keep first.

Unattended example. At an event, select RX (away) before leaving the desk. When you return, deactivate to listen to Saved calls or Play all. There is no mailbox ACK mechanism in 2.00; an unanswered spoken call is not automatically acknowledged as a delivered voicemail.

11 Photos send and receive

Choose a photo

Turn on **Enable SSTV** under Photos send & receive while stopped, then activate RX/TX for sending. **Choose photo** lets you take a camera picture or select an existing image from the phone. The draft is adapted to the **320 by 240 pixel Robot 36** transmission format and shown before sending. Fine print or a large landscape with tiny subjects will not retain the detail of the original phone photograph.

Select the destination and use **Transmit photo** to send. One Robot 36 picture takes approximately **36 to 37 seconds**, with extra time for identification and metadata. Keep the channel available for the full transfer. A guest requires Talk and data permission and an active host data path.

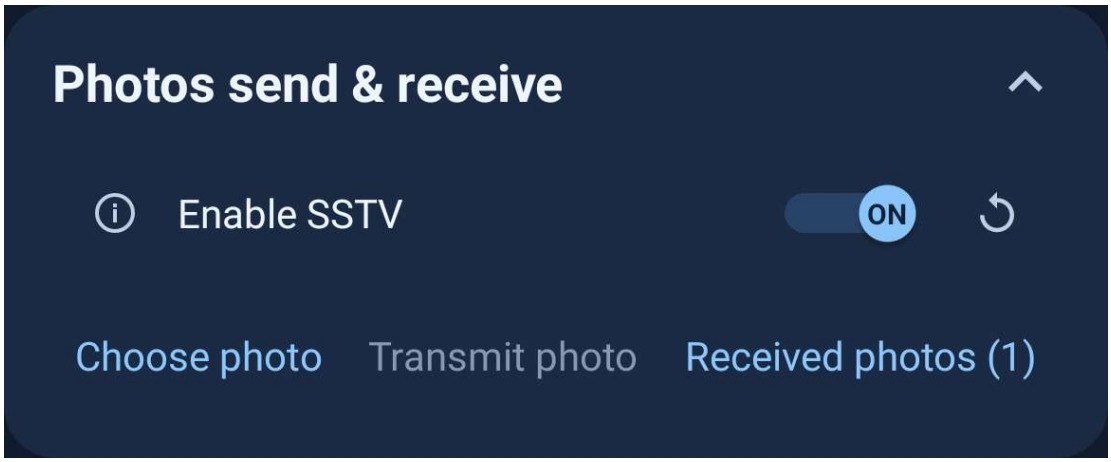

Figure 3. Choosing, transmitting and reviewing photos from the same section.

Sending progress and Cancel

The photo section shows transmission progress and offers cancellation once sending begins. A marker-image send started from the map also exposes sending percentage and Cancel, using the same photo transmission path. Cancel ends the current send; it does not make a partial image complete at a receiver.

The app waits for a suitable channel opportunity. Channel busy means the receive/traffic checks did not permit the send; it is not necessarily a failed image file. Examine the input meter, actual radio activity and receive threshold if it stays busy in apparent silence. Do not simply turn off receive detection to force simultaneous voice and data.

Receiving and viewing photos

A compatible receive session recognises Robot 36 signalling and displays receiving progress. A recognisable station lead provides sender identity. A standard Robot 36 source without the app's leading station ID can still be detected, but the sender may be unknown. You do not need to insert a fake ID merely to make an ordinary external Robot 36 frame exist.

During a damaged or interrupted picture, the decoder can keep collecting scan data rather than abandon it on a brief quiet patch. Use **Cancel receiving** if you want to stop a reception that is no longer useful. A received file can contain noisy, missing or corrupted lines; saving it is not a guarantee of image quality.

Open **Received photos** or the latest-photo dashboard shortcut for the list. Tap a photo for a larger preview, its sender, timestamp and available filename/marker information. **Done** returns to the list. Delete one photo from its preview, or use **Delete all photos** in the photo list; both destructive actions ask for confirmation.

Photo saved ACK and manual retry

An addressed photo uses a short FSK transfer header carrying a photo ID before the usual image. After the intended recipient finishes receiving and saves the image, it can return a matching **Photo saved** ACK when RX/TX and the channel permit. The normal station-identification control digits remain clear.

The photo ACK waiting period is about **12 seconds** after sending. If confirmation does not arrive, the app shows **No confirmation** and lets the user retry. **Photos have no automatic retry.** A manual retry uses the same transfer identity so a receiver that already saved it can confirm again without keeping needless duplicate copies. Everyone sends remain one-way with no group of competing photo ACKs.

Photo saved confirms that the app stored a file. Robot 36 image pixels do not have a text-like guarantee that every detail is correct. Open the image to assess its usefulness. In RX (away), a recipient can receive without transmitting the save ACK, just as with addressed text.

Sharing and inversion

Host-originated photos are distributed to connected sharing users as well as taking the selected radio path. A photo submitted by a guest is also stored/distributed through the host. Shared receive progress updates on the guest while it is receiving; opening the gallery is not meant to be required just to refresh the percentage.

Text and photo data can use the selected inversion path experimentally. Clear station and inversion-slot signalling is kept separate from inverted payload audio. For an initial SSTV test, use inversion off at both ends, moderate clean levels and a direct setup. Once that works, test inversion separately; a voice-inversion setting that sounds intelligible for speech does not prove reliable modem decoding.

12 Radios map locations

Enable locations and choose the source

Enable locations offers Off, GPS, Wi-Fi & cellular and Manual. Off stops this radio's location sharing/replies. Selecting a source does not make missing hardware or permissions available: the app checks provider availability and asks for the necessary access. A phone without usable GPS can use Android's network location provider if available, or fixed manual coordinates.

Source	Meaning	Suitable use
Off	No active location sharing from this feature	Avoid publishing your position
GPS	Satellite-derived phone location	Outdoor movement and offline routes
Wi-Fi & cellular	Android network-provider estimate	Approximate position when network location is available
Manual	Stored decimal-degree position that does not move	A stationary base or known fixed radio site

Wi-Fi & cellular does not mean the app independently calculates coordinates from any cell tower without assistance. It depends on Android's provider and may need connectivity. Its accuracy can be hundreds or thousands of metres. GPS can work without Internet, but needs a usable satellite fix and may be poor indoors.

The Manual choice warns **only while you are stationary**. Enter latitude and longitude as decimal degrees, for example latitude **37.983810** and longitude **23.727539**. Use a decimal point, not degrees/minutes/seconds notation. Latitude is −90 to +90; longitude is −180 to +180. Negative values mean south or west. Save the two fields in the manual-coordinate dialog.

Manual coordinates remain stored when you choose another source, select Off, or close and reopen the app. Re-selecting Manual reuses the stored values. They do not follow you if you start walking. Local route recording therefore requires GPS or Wi-Fi & cellular, not a manual starting marker.

The inline map

Expand Radios map locations to use the map directly inside the section. A dashboard shortcut takes you there; there is no need for a separate map window to see normal updates. Your current position and radio positions share the same plot as your route and saved markers.

You represents an available local position, or the shared host position in a mirrored map. The ± accuracy value comes from the location source. ±5 m and ±2000 m describe very different uncertainties, not two different zoom settings. If a fresh position is unavailable, the app must not invent a reliable You position. Stored station positions can still remain visible.

Radio labels show their number/alias, distance from your current position and compact update age, such as **240 m · 8 min ago** or **1:12 hours ago**. Distances update as your own location changes. The other station is represented at its last reported position; the app does not know that it moved until another update arrives. Radio points do not require straight connector lines from your position.

Use **Stations list** to inspect stations, or **tap a station for details**. The detail view provides more exact location/time information. A recent marker does not mean a continuous live tracking feed. A station that did not respond to the latest check remains visible in a gray/subdued style with its original timestamp, so new replies are easy to distinguish.

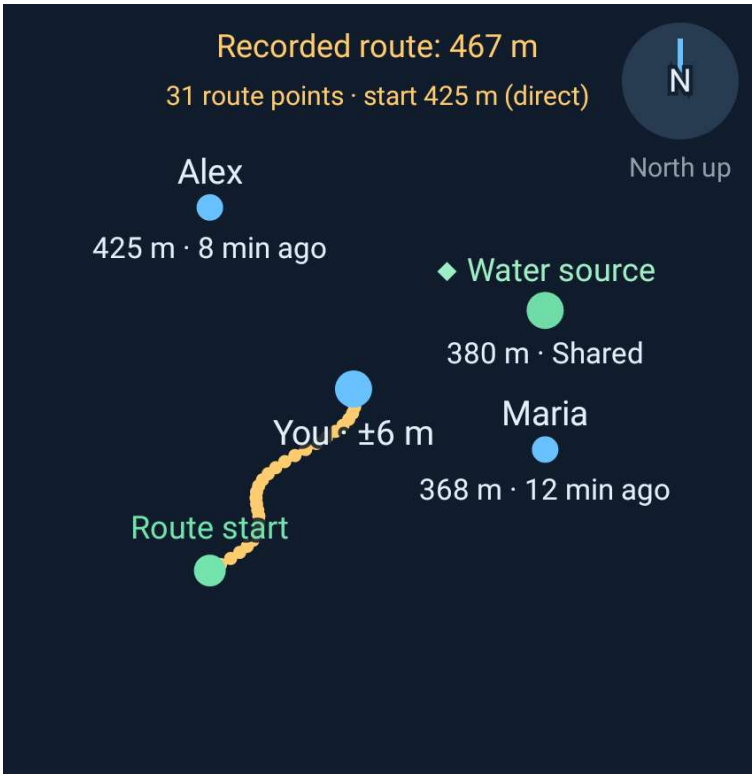

Figure 4. Radio positions, distance labels, a saved marker and the route share one plot. Example data is shown.

Map movement and compass

Drag to pan; use **+** and **–** to zoom. **Center on me** or Center on host returns to the relevant current position. **Fit map** adjusts the view so available items fit. Panning changes your view, not any stored coordinates or the radio destination.

Rotate with phone uses a usable rotation-vector or compass sensor, with magnetic/acceleration information where appropriate. Gravity alone cannot determine north. If the phone lacks a usable compass, the option is unavailable or the view falls back to North up. A magnetic or unreliable heading is not a precision navigation bearing; nearby radios, metal and phone cases can disturb it.

A Bluetooth or Internet guest uses its own phone's sensors for view rotation while displaying the shared map. Turning the guest does not rotate the host's saved route or change the coordinates. North-up viewing, zoom, distance labels and markers remain useful without a compass.

Share and check locations

With a source, Station ID and the appropriate active transmit/receive session, **Share & check locations** first broadcasts your current position, then invites the other stations to reply. It is a combined public location exchange, not two separate "send my position" and "probe" commands.

The seven other station positions use assigned **10-second reply slots**, with a turnaround guard and a visible waiting countdown. A full window is approximately **70 seconds plus the guard**. A reply carries position data over FSK. Stations with locations disabled do not announce their position merely because another radio requested it.

Other listeners can update their station positions from the public location traffic they hear, even when they did not start the check. A manual check waits for a clear channel. During replies, voice traffic can delay a reply within its slot or prevent it before the slot expires; the app does not deliberately force it over an active voice turn or send it much later as an obsolete response.

Select Off under Enable locations to stop an ongoing check/sharing. A missing new response leaves the older position and its timestamp; it does not erase the station. A dynamic fix used for sending must be current enough; a configured Manual position is explicitly treated as fixed instead of ageing like a live GPS fix.

Automatic locations

Enable **Automatic locations** for timed Share & check locations exchanges. **Location check interval** is in whole minutes, default **15**, using the same positive-integer minute input as automatic range checks. A manual exchange restarts this timer. Automatic exchanges are to Everyone, so participants can update a common picture instead of maintaining private polling cycles.

Automatic sending waits for the channel and does not operate as transmit service in RX (away). Replies to other stations' checks can work even with your automatic timer off, provided locations and the normal TX session are enabled. No location should be sent by a feature that is Off. Merely viewing a locally recorded route does not publish that route over PMR.

Record and follow your route back

This is a local navigation utility. It works without a radio and with the main radio audio deactivated. Choose GPS or Wi-Fi & cellular, obtain a fresh position, and tap **Start recording route** before walking away from camp. The phone saves breadcrumbs approximately **20 metres apart**, with location updates requested about every two seconds. This spacing is built in; there is no user checkpoint-interval setting.

At a dead end or when you want to return, use **Stop recording route & follow route back**. The saved outward route stops growing, the current endpoint is retained, and your live position continues to update against the existing route. Returning does not draw a new line over your way back. Start recording again when you want to resume adding points. After reopening the app, **Follow saved route back** lets you resume navigation on an existing saved route.

The route display distinguishes the **recorded route distance**, calculated by adding saved line segments, from the direct distance to its start. It is not just a straight line from camp to your present position. Gaps in location coverage are not counted as a known walked straight-line segment. Point spacing, location error and missed bends affect the estimate, so it is not a survey-grade distance measurement.

The map updates while you look at it. You do not have to return to the main screen and reopen the map to see the new position. Your position also updates during follow-back. You may leave the saved line and rejoin it further along; the app assesses proximity to the route, not whether you stepped on every breadcrumb in reverse order.

Off route warning distance

The default is **50 metres**, with a selectable range **10 to 10000 metres**. While following back, two fresh positions beyond the allowed distance, with reported location accuracy taken into account, trigger a small warning and vibration. The alert is not repeatedly vibrated for every point while you remain outside; returning sufficiently near the route resets it.

For example, if you bypass fallen trees and rejoin the trail 100 metres farther down, the warning can clear when you are back near that saved line. A very inaccurate cellular position can delay a reliable off-route warning or make a small warning distance impractical. Use the visible accuracy figure when interpreting it.

Missing location and stopping the route

The service considers the freshness of location fixes, rather than assuming that an enabled location switch means continuous tracking. A disabled provider or a missing fresh fix pauses recording, shows a warning and vibrates. The normal freshness window is about **30 seconds**. When good fixes resume, recording resumes with a gap instead of pretending to know the missing path.

Recording/following can continue with the screen off through the route foreground service, subject to Android's permissions and power management. **Stop route** in the route notification stops updates while keeping the saved route. Turning tracking off also stops the relevant location work. **Clear route** asks for confirmation, stops tracking and deletes the route only; it does not delete radio positions or saved map markers.

Shared route

Bluetooth guests and Internet viewers can see the host's route, markers and station positions. On reconnection, they catch up with the complete saved state, including route points missed during the disconnection; large backfills wait for voice/data opportunities. A password-authorised **Bluetooth** guest can record, follow, clear and adjust permitted host route controls. **Internet** viewers cannot start, stop or edit that host route, even with the settings password.

This makes the backpack setup useful without a physical radio: the host can record the walk while the Bluetooth controller displays it. It also lets a remote Internet viewer observe a route without being allowed to erase or modify it. Sharing a route through a phone connection is different from transmitting that breadcrumb history over PMR; the latter is not what this feature does.

Persistent map markers

Use **Add marker** to mark your current location, enter manual decimal coordinates, or long-press a place on the map. Enter a description such as "Water tap beside stone shelter" or "Blocked path fallen tree". The chosen position is captured for that marker and does not drift while you type or use the camera. Route recording or follow-back continues during marker creation.

A marker can have a camera photo. If it has no photo, transmitting it can use a simple location card. Saved markers remain on the map until you delete them individually or use **Clear markers**. Clear route does not remove them. The **Saved markers** list is a quick way to find a pin that is outside the present view.

Filename and photo storage

The marker image filename carries its creation date/time, latitude, longitude and description. For example: **RR-marker_20261127T120000000Z_37.983810_23.727539_Water tap.jpg**. The Z timestamp is UTC; it can differ from the phone's local displayed time. Coordinates use six decimal places in the filename. The complete name is limited to **250 UTF-8 bytes**, including the fixed fields and .jpg extension.

The remaining description budget therefore depends on the fixed fields and character encoding. Accented or non-Latin letters may consume more space than plain English. The editor limits the final name; reserved filename characters are converted to safe underscores. This preserves useful information when you browse or copy the image outside Radio Relay without a separate notes database.

Marker images are automatically copied to **Pictures/Radio Relay/Markers** when Android storage access permits it. On older Android releases, grant the requested storage permission for that public copy. If the public save fails, read the warning rather than assume a gallery copy exists. Private app storage and a public Pictures copy are distinct; removing a marker does not erase copies already kept in Pictures.

View and edit a marker

Tap a marker to open its preview, description, coordinates, creation time and distance from your currently available position. The popup presents its actions in a vertical list, including the photo transmit action, Edit marker, Delete marker, Saved markers and Done. Distances change with your position; the saved marker itself remains fixed.

Edit marker can change its description or coordinates while retaining its original creation time. The private and public photo names are updated automatically so the filename continues to describe the edited marker. Editing clears the previous SSTV Shared indication: other radios have not necessarily received the changed information. Delete marker and Clear markers ask for confirmation; clearing markers keeps routes, radio positions and already exported Pictures copies.

Send a marker through SSTV

From the marker popup, use the transmit action to send its photo/card through Photos send & receive. Enable that feature, activate RX/TX and choose a destination. Percentage and Cancel send are available from the marker workflow as well as the photo section. The existing FSK photo-control header carries the filename, allowing a compatible recipient to recognise the marker's time, coordinates and description and add a pin.

The filename header remains **clear**, even when image audio uses inversion. A damaged filename header may prevent pin creation even if a picture is saved. A long description also adds header airtime: at 100 bits/s, the filename costs approximately 0.08 seconds per encoded byte, in addition to the image and other signalling. Use a concise useful label rather than fill every possible filename character automatically.

Orange pins have not completed an SSTV send from this host. Green pins labelled **Shared** have completed at least one such send; marker details show destinations and last-send time. This means **transmission completed**, not that every radio received it. Bluetooth/Internet synchronisation does not set Shared, because those users receive host markers automatically and this indicator is about radio sharing.

Marker permissions on shared phones

Both Bluetooth and Internet users see host markers and preview photos, with full catch-up after reconnection. Bluetooth guests can add a marker to the host, which distributes it to connected viewers. Editing/deleting host markers or clearing them requires the existing host-settings authorisation, like host route controls.

Internet users are viewers for host markers. They cannot add, edit or delete them, even after unlocking other host settings. A marker-named photo submitted by an Internet user is handled as an ordinary photo rather than granting permission to create a host pin. Leaving a shared radio restores the handset's own local markers; joining does not automatically upload every old private marker to the host.

13 Voice inversion

Mode and direction

Inversion mode is Off, Fixed or Variable. Only one scrambler mode can be selected at a time. **Descramble input** and **Scramble output** independently choose the processing direction within that mode. Change the mode and those direction choices while audio is deactivated.

Descramble input operates on incoming audio before mailbox storage and supported data decoding. Scramble output operates on outgoing content. For a clear local test, enabling input descrambling alone makes your clear test voice sound inverted; that is expected mathematical processing, not a sign that output scrambling secretly turned on. Both directions must match the actual signals you send and receive.

Voice inversion is a reversible analog transformation. It is useful for compatibility experiments and casual speech obfuscation, but a person with suitable equipment can recover it. Neither a variable sequence nor selective station IDs makes it strong cryptographic voice protection.

Fixed inversion frequency

The **Inversion frequency** range is **1000 to 4500 Hz**, with 1 Hz adjustment and a default of **3350 Hz**. Move the slider or tap its value to enter an exact frequency. Set the receiving descrambler to the same frequency used by the transmitted inverted voice. Reset affects this control alone.

For example, if a compatible radio uses fixed 3350 Hz inversion, select Fixed, 3350 Hz and Descramble input for reception. Select Scramble output too if your outgoing clear voice must be inverted for the other end. Frequencies at the low end can remove or poorly place parts of the speech band; the setting range is not a guarantee of equal audio quality at every value or compatibility with every radio’s processing.

Variable inversion setup

Variable mode has **six different frequency slots**, each from 1000 to 4500 Hz, and a repeating sequence of slot numbers. The default sequence is **123456**. The default frequencies are shown below. These slot numbers are not RF station numbers even though both are displayed as ordinary digits in configuration.

Inversion slot	Clear DTMF symbol	Default inversion frequency
1	*	2450 Hz
2	#	2650 Hz
3	A	2850 Hz
4	B	3050 Hz
5	C	3250 Hz
6	D	3450 Hz

Open the variable setup to edit the six frequencies and sequence, generate a sequence, copy the complete setup text or paste a shared setup. All six frequencies must be different. A valid sequence contains at least two different digits from 1 to 6 and can contain up to **16384 digits**. The generator accepts a length from 2 to 16384 and avoids neighbouring identical choices, including the cycle boundary for longer generated sequences.

The complete transferable setup has the sequence followed by a vertical bar and the six comma-separated frequencies, for example **123456|2450,2650,2850,3050,3250,3450**. Share the whole setup, not only the digit string, so the other phone knows what frequency each slot means. Save the setup after editing; Cancel leaves it unchanged.

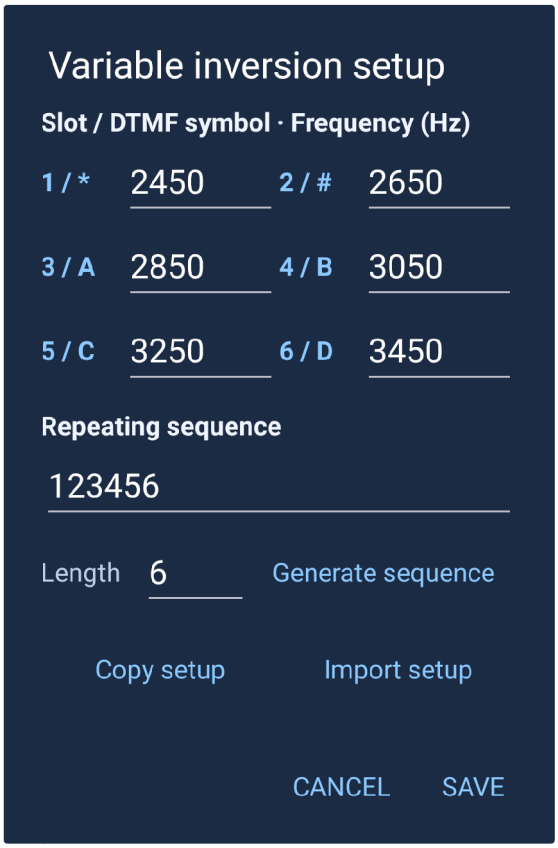

Figure 5. Six frequencies and the repeating sequence are configured together.

Synchronisation and voice buffering

Each new outgoing voice session selects the next slot from the sequence, sends the corresponding clear DTMF symbol, then sends the voice using that inversion frequency. After the last sequence entry, it wraps to the first. With station identification, the sender and optional destination digits follow the slot lead. Those control tones are **not scrambled**.

The receiver reads the explicit slot symbol, so it does not have to count every previous call or ask both users to press Resync. It needs the correct slot-frequency mapping and a decodable opening lead. Avoiding repeated adjacent slots makes successive calls change frequency more often; it is not the mechanism that restores synchronisation.

If no valid slot lead is received, the fallback is the **first slot named in the configured sequence**, not necessarily slot 1. That supports clear-microphone local tests, but a lost radio header can still give the wrong frequency. A real sender's opening tone is the reliable way to identify the current slot. In live mode the app buffers opening voice while the lead is sent, preventing the header from simply overwriting the first words.

Text and photo inversion limits

Experimental data inversion is available within the existing output inversion choices. For data, the usable inversion frequency range is **2800 to 4500 Hz**, rather than the full voice range. A fixed frequency below 2800 causes a message asking you to use 2800–4500 Hz or turn off Scramble output. In variable data sending, the app chooses supported entries from the sequence and skips unsupported low-frequency slots; at least one used entry must be suitable.

The ordinary voice range remains 1000–4500 Hz. Do not raise every voice slot solely because one data send needs a supported slot unless that matches your intended group setup. Station IDs, variable slot digits and range-check 9 stay clear; relevant photo filename/control metadata also remains clear. The receiver's input descrambling must match the payload path before modem decoding can work.

14 Bluetooth radio sharing

Start a host and join a guest

Set up and activate the host's working radio audio first. Pair the phones in Android Bluetooth settings. On the host, open **Bluetooth radio sharing**, select **Share radio via Bluetooth**, then **Add Bluetooth guest**. The host displays a **six-digit join code**, valid for **two minutes**. This is an app invitation code, not a station number, station PIN or Internet password.

On the guest, choose **Join Bluetooth radio**, select the paired host and enter its current join code. The host approves the request and assigns access. If the host remembers that user, later out-of-range/re-entry reconnects do not require a new code and approval every time. A lost link releases PTT; after reconnection, talking requires a fresh press rather than resuming a possibly forgotten transmit turn.

Stop Bluetooth sharing ends that service. **Reconnect Bluetooth** offers a manual reconnect when appropriate, in addition to automatic recovery. **Leave Bluetooth radio** or the dashboard leave control exits the guest role. A guest joined through Internet cannot simultaneously join another host through Bluetooth; the panel says Bluetooth sharing is unavailable while connected via Internet.

Access levels and management

Access	Voice reception	Hold PTT voice	Submit text photos or other permitted radio data
Listen only	Yes	No	No
Talk	Yes	Yes	No
Talk and data	Yes	Yes	Yes

Use **Bluetooth guest approval** for pending requests and **Manage Bluetooth guests** for connected or remembered users. Select a guest to change access, save a PTT timeout or remove access. Permission and the host's current activation mode both matter: Talk permission does not permit transmitting through a host in RX (away) or Off.

PTT timeout is optional and defaults to no timeout. Enable it and enter **1 to 3600 seconds** to limit that user's continuous PTT turn. The editor offers 30 seconds as an initial value when you turn it on. This can limit an accidentally held guest button without changing the local host's own voice trigger settings.

Release Bluetooth guest PTT lets the host stop a current Bluetooth guest turn. **Kick for this session** disconnects that user for the current sharing session; **Revoke access** removes the approval so future access requires authorisation again. No four-user artificial cap is imposed, but actual simultaneous capacity depends on Android Bluetooth, memory, bandwidth and the host phone. "No fixed app cap" does not mean unlimited working Bluetooth links.

Voice turns and what everyone hears

Guests use **Hold PTT only**. Their microphone opens after the host grants the turn, and voice goes out live until release or timeout. Guests do not run their own automatic voice trigger or record/replay in front of the host. The host retains its existing local audio mode for its own microphone. A shared radio carries only one permitted transmit turn at a time.

Incoming radio voice is distributed to the host and connected users. Host speech is also copied to guests while the radio transmits. Guest speech goes through the host to the radio and the other connected listeners, rather than directly between two guest phones. For the host itself to hear that guest live, the phone must maintain both the radio output and a local speaker monitor; the next subsection explains its fallback.

The host is busy during guest voice or guest data transfer and cannot start an overlapping local PTT turn. Status messages indicate who is talking or sending. Text, photos, range checks, mailbox and map access use the usual sections on the guest through the host instead of a second duplicated collection of applications inside the sharing panel.

Mute host speaker and Replay guest voice

Mute host speaker, default Off, silences the host's local speaker copy. It does **not** mute useful input to decoders, mailbox capture, connected listeners or the radio transmit output. This is the backpack control: the radio/host can stay quiet while a Bluetooth controller hears calls. The same setting is displayed in Internet gateway; the two panels change one shared value, not contradictory independent mutes.

For an attended host, leave the mute off. The host attempts a supported live guest-speaker monitor. Some Android phones can keep that speaker and wired radio output together, while others redirect one of them. If live monitoring is unavailable, **Replay guest voice**, default Off, lets the host hear a local recording **after** the guest's live radio transmission has ended. The actual radio send is not delayed into this replay.

During replay, the host and guest show a countdown and transmission is restricted so people know to wait. A new received radio call takes priority and interrupts the local replay. With replay disabled on a phone lacking live monitoring, the host does not hear that guest locally, although the guest can still transmit to the radio. Mute host speaker applies to the local monitoring/replay copy too.

Host settings password

The optional **Host settings password** is separate from normal guest access and is Off by default. Set and confirm **6 to 64 characters** on the host. A connected user enters it under **Unlock host controls** to obtain the permitted remote controls. Password checks and updates display a waiting indicator; wait for the result rather than tapping again because the phone appears busy.

Authorisation enables the shared feature controls: range enable/timer/interval, mailbox enable, text enable/speed/damaged-message preference, photo enable, location source/manual coordinates/timer/interval, and mute/replay settings. It also permits host activation controls on the guest dashboard: **Activate host (RX/TX)**, **Activate host RX (away)** and **Deactivate host (off)**, beside the leave action. This is useful when a feature must be changed while the host is deactivated inside a backpack.

Authorisation does not turn every phone setting into a remote slider. Physical audio routing, local gain/VOX tuning, the host's station identity and voice inversion remain protected/read-only from the guest interface. A guest's own To station remains its own per-send destination. Bluetooth route/marker controls have the specific rules in Chapter 12; Internet viewers retain their view-only route/marker restrictions even after unlocking other host controls.

The host can remove the host-settings password when it no longer wants remote administration. The normal sharing access levels still apply. The Station ID PIN remains a different local protection; knowing the host-settings password does not unlock the station identity lock.

Histories and presets while joined

Connected users receive common voice/data activity and host map state. Host photos and guest photos use the shared path, and host chat status reflects guest sends. Saved mailbox calls can be downloaded for playback. The guest's read state or locally cleared history is not a command to declare that every host user read or deleted the original content.

While joined, physical audio controls remain visible but disabled where the host owns them. To manage **this handset's own named presets**, leave the shared radio first. The preset manager explicitly requests this; it is not a way to overwrite the host's routing by importing a local guest preset. On leaving, the phone returns to its own saved local configuration and local map content.

15 Internet gateway

Two independent role choices

The Internet gateway connects phones directly using an address, TCP port and password. It does not require an account, a PC relay server, a central room directory or a third-party forwarding service. One side must still be reachable over the network. There are two different roles to choose, and neither means "audio travels only one way".

Choice	Options	What it decides
Radio role	Radio gateway or Internet user	Whether this phone provides the radio/audio gateway or uses the other phone's radio
Network role	Server or Client	Whether this phone waits for a connection or opens the connection to the other phone

Usually the attached-radio phone is Radio gateway + Server, and the other phone is Internet user + Client. The reverse network arrangement is also supported: a radio gateway can be Client and connect to an Internet user acting as Server. Once connected, audio and data travel both ways; reversing network roles does not move the cable or radio to the other phone.

Two Radio gateway phones can link radio areas, for example city A and city B. Internet users and Bluetooth guests can also share a gateway subject to the same transmit-turn rules. This does not implement arbitrary Bluetooth-to-Internet-client multi-hop forwarding: an ordinary joined client is not automatically another sharing gateway for a chain of phones.

Connection settings

Remote address is entered on the Client and identifies the Server. Use an IP address or domain, for example 192.168.1.20, radio.example.org or 2001:db8::20. Do not include http://, https://, a path or a port. The port has its own field. On the Server, the remote-address field is unnecessary and disabled.

TCP port is **1 to 65535**, default **8443**, and must match on both phones. Start with 8443 for a local Wi-Fi test. Choosing 80 or 443 does not make a mobile provider or router allow incoming traffic, and Android can restrict listening on low-numbered ports. This is a network connection number, not a PMR channel.

Connection password is **6 to 64 characters**, the same on both phones. It is used for the encrypted Internet connection. It does not automatically grant Talk or Talk and data permission, and it is not the host-settings password. Presets and their exported text include this connection password; share those exports only with people who should know it.

Automatic reconnect, default **On**, makes the Client try again after a lost connection. The Server continues listening irrespective of this option. A reconnect restores the session/listening state, not an old held PTT. The user must press PTT again for a new voice turn.

Local network addresses shows addresses of this phone's interfaces after starting the network service. These are not necessarily the router's public Internet address. The app does not contact an external public-IP discovery service or automatically configure port forwarding.

Start and stop

For **Radio gateway**, configure the physical audio route and activate RX/TX first, or RX (away) for a receive-only gateway. For an **Internet user**, stop its independent local audio operation before joining the other radio. Select the roles, address as needed, matching port/password, then tap **Start Internet connection**. The app explains unmet activation or configuration requirements if it cannot start.

The button becomes **Stop Internet connection** while running. Role, address, port and connection-password changes are disabled until the connection is stopped. A Client waiting to connect shows progress. A repeated

error deserves a check of the configuration and Server status rather than repeatedly changing unrelated radio controls.

Manage Internet users on the gateway assigns Listen only, Talk or Talk and data. New Internet users start with **Listen only**; this is a common reason a connected user's PTT cannot be pressed. Select that user, allow Talk or Talk and data and Save. The host also needs RX/TX activation for an outgoing turn.

The same optional **Host settings password** and **Unlock host controls** workflow provides the permitted remote settings and activation actions. Mute host speaker and Replay guest voice have the same meanings as in Bluetooth sharing and update the same shared settings. A Bluetooth host service must be started separately if you also want nearby Bluetooth users; Internet service does not replace Bluetooth pairing or its join code.

Network requirements

For the first test, put both phones on the same Wi-Fi. Use the Server's local Wi-Fi address on the Client, matching port 8443 and password. If connection succeeds but PTT is disabled, check user access before investigating routing. If it fails, confirm that the Server is actually running and that the Wi-Fi network allows devices to contact one another.

Across different networks, the Server needs a reachable public address or suitable IPv6 connectivity and firewall access. A home router may need port forwarding. A mobile provider can place a phone behind carrier NAT, preventing unsolicited inbound connections. Outgoing web browsing on port 80 does not prove that another phone can open an incoming server connection to yours.

Reversing Client/Server can help when only one of the phones is reachable. If neither can accept a connection, simply trying more common ports does not remove that obstacle. Version 2.00 supplies direct connections; it does not add a relay service or a reverse tunnel through somebody else's server. Changing the Server address requires updating the Client or using a domain you maintain.

Echo and gateway placement

The Internet path is bidirectional, but the radio and shared PTT remain half duplex. Keep a receiving client's loudspeaker away from the microphone of a nearby transmitting radio or gateway. Otherwise a delayed received copy can be recaptured, sent again and build into repeated words or a loop.

For a controlled test, separate the radios/phones acoustically, use Hold PTT, verify the actual radio-facing input and keep levels moderate. Mute host speaker can remove an unnecessary local speaker copy for a backpack or unattended gateway. That does not prove that all echoes are acoustic; Android/OEM and interface-dependent returned audio can also need investigation. Do not alter a known working non-sharing route merely because a network role was misconfigured.

16 Saved settings presets and Android operation

Automatic saving and named presets

Ordinary setting changes are saved for reopening the app; you do not have to create a named preset just to remember your latest tuning. A named preset is an additional snapshot you can return to or copy to another phone. It includes feature On/Off preferences as well as numerical tuning.

On a fresh setup, the input and output selections default to Audio jack, the audio mode to Record & replay, the voice trigger to Automatic, and Auto direction and Block TX while receiving to Off. Station ID starts disabled with number 1 and To station set to Everyone. Range checks, their automatic timer, text, mailbox, SSTV, automatic locations, map rotation and keep-alive start Off. Locations and inversion start Off, with their values retained for later selection. Mute host speaker and Replay guest voice start Off. Named presets can restore a different deliberate starting configuration; the numerical defaults are listed in their individual chapters.

Open **three dots → Presets → Save current settings**, enter a name of up to **48 characters**, and Save. If the name already exists, confirm overwrite. Tap a saved name to **Load preset**, **Overwrite with current settings**, **Delete preset** or **Export preset text**. Deleting a preset does not delete your mailbox audio, photos or route history.

Stop the Internet connection and use Deactivate before loading a preset. Leave a shared radio before changing this handset's presets. A preset is not a live route switch that should interrupt a currently held PTT. After loading, check provider availability and activate the mode you want.

What the snapshot includes

Settings group	Saved in named preset and text export
Audio routing	Input, output, audio mode, Auto direction and Block TX while receiving
Voice triggering	Hold PTT/Automatic, Fixed/Auto squelch selection, saved Auto threshold and all input/squelch sliders
Playback and inversion	All playback/VOX values, keep-alive, inversion mode/directions, fixed frequency and complete variable setup
Station setup	Enable ID, own number, all eight aliases and To station, subject to a local station lock on restore
Radio applications	Range, text, mailbox and SSTV enable preferences; automatic range/location choices and intervals; text speed and damaged-message choice
Map preferences	Location source, saved manual coordinates, phone rotation choice and off-route warning distance
Sharing preferences	Mute host speaker, Replay guest voice and saved timeout values for existing approvals
Internet configuration	Radio/network role, address, port, connection password and automatic reconnect

The snapshot is **settings**, not an archive of content. It does not contain recorded calls, chat history, photo pixels, saved routes, markers or received station positions. It does not clone Android Bluetooth pairing, guest approvals, an administrator's local PIN, an unlocked host-control session or active sockets. It does not press PTT or activate RX/TX simply because you loaded it.

RX (away)'s temporary forced receive features are not replacements for the normal saved On/Off preferences. Returning to RX/TX or loading the normal setup uses the chosen preferences, not an accidental permanent "everything enabled" state. A phone's side-button volume, radio VOX/channel settings and OS permission grants remain external to these app snapshots.

Export and import text

Choose **Export preset text** for a saved named preset. The app copies formatted text to the clipboard. Save or send that entire text to the other phone through your preferred method. On the other phone, open Presets → Import preset, paste the full text and optionally enter a new name. Import adds a named preset; **load it** to apply its settings.

Do not remove the format/version wrapper or paste just a few individual values. The import limit is **65536 characters**. Current readers preserve supported older preset fields and use appropriate defaults for absent newer settings. A supported old preset is not a promise that an arbitrary future export format will be readable by every older app version.

When the local station setup is locked, import/load does not change Enable station ID, My station or the alias list. Other settings can be applied normally, and exporting the preset is still allowed. For a device clone, import the administrator's preset while the destination phone is unlocked, assign its correct station number, then lock if desired.

Menu and per setting help

Audio setup info explains basic cable/audio arrangements and radio VOX considerations. The small information icons are the place to read setting-specific instructions without adding permanent explanatory paragraphs to the main screen. The circular reset control resets that one option to its default, subject to the same active-session and identity-lock restrictions as editing it.

Expand all and **Contract all** control section visibility, not feature activation. **About** shows the installed version with the sv3ora credit and qrp.gr. Version 2.00 has no temporary Audio diagnostic or Routing details export menu. Help text should be read in the context of the installed version, rather than instructions for a later experiment.

Permissions and background use

Microphone permission is needed for audio capture, including a sharing user's speech. Location permission and an enabled Android provider are needed for live map/route positions. Bluetooth permissions vary by Android version; newer releases ask for nearby-device access, while older discovery paths can also require location access. A successful system pairing does not grant every app runtime permission automatically.

Camera selection uses the available camera/photo-picker workflow. On older Android versions, public Pictures copies can require storage permission; an app-private photo and a gallery copy are different stores. Notification permission on newer Android versions affects visible app notifications. Internet access uses the configured network connection; it is not a GPS permission.

Active audio and route services use foreground operation so they can continue when the screen is dark, subject to Android and manufacturer power management. Test screen-off operation on the actual phone before relying on it for a long outing. Battery optimisation, an app kill, missing permissions or a disconnected device can interrupt it. No side-button PTT assignment or custom lock-screen-only interface is included in 2.00.

Recovery after another app uses audio

If a phone call, music player or another app takes audio focus, Radio Relay pauses the interrupted audio session. It remembers whether the user had selected RX/TX or RX (away). When Android returns focus, or a conservative idle check after a permanent loss establishes availability, it attempts to restore that interrupted mode.

The recovery checks about every **two seconds** and requires a short idle period of about **two seconds**. It is not an immediate guarantee that every notification interruption will be followed by audible routing at exactly two seconds; Android must release the competing audio activity and the required devices must be usable. Explicit Deactivate cancels the pending recovery.

This recovery is for an audio-focus interruption of an activated session. It is not a promise to reopen a missing cable indefinitely or automatically transmit an old PTT turn after a call. Stale data replies are not meant to be released merely because the app comes back from an interruption.

17 Complete operating examples

These examples build on a known working audio interface. They describe settings rather than guarantee that every handset supports a particular device combination. Keep a known working preset before changing a setup.

Use a phone as the controls for a wired radio

1. Set the radio to the agreed channel and tones. Enable its VOX for app-driven transmission and select a sensible VOX sensitivity.
2. Deactivate Radio Relay. Select Phone microphone → Audio jack, Live bridge, Auto direction On and Hold PTT. Start with Input gain and Output level at 0 dB.
3. Enable Block TX while receiving if you want incoming calls protected from automatic local interruptions. Configure Station ID only if the group uses it.
4. Activate RX/TX. Receive a short call, then hold app PTT and answer. Confirm both paths with another radio, including opening words and return to listening.
5. If the opening digit works but speech drops the radio VOX, tune output speech level and hardware VOX. Use keep-alive for quiet pauses if needed, rather than making hang time alone extremely long.

For record-and-replay operation, change the audio mode while deactivated. Hold PTT records your outgoing turn; releasing ends the clip and sends it. Expect the recipient to hear you after recording rather than while you speak. Keep the existing routing choices and tune replay delay/recovery if turnaround needs it.

A parrot repeater experiment

1. Connect the radio receive audio to the phone input and phone output to the radio transmit audio input through a suitable interface. Test each direction separately.
2. Choose the radio-facing input/output, Record & replay, Automatic and an idle-noise threshold that recognises received calls. Set confirmation and pre-roll to preserve speech openings.

3. Set hang time to keep normal pauses within one clip, for example 2500 ms for two-second pauses. Add replay delay if the source needs turnaround time.
4. Enable radio VOX. If its TX drops during replayed quiet portions, enable keep-alive and use an interval shorter than hardware VOX timeout.
5. Receive a short call and verify one replay only. If release sounds create another recording, adjust recovery and remove any audio return loop before unattended use.

The app records and plays audio; this example does not imply that it remotely controls an RF repeater's hardware. Check that the setup is suitable for the radio and the way you intend to operate it.

Leave a mailbox while away

Configure a working receive path first. Use normal RX/TX with Enable mailbox if you want to talk and save incoming calls together. Before leaving, select RX (away) for receive-only operation with mailbox and supported data reception automatically available. The phone will not answer range/location requests or send delivery ACKs from Away mode.

On returning, select Deactivate to review Saved calls or Play all, or go back to RX/TX for normal voice. Saved audio remains until deleted. An outside-group call can be recorded without a known alias, but deliberately addressed calls follow active station filtering. Do not assume every other user's selectively addressed message is necessarily present in your mailbox.

A silent backpack host

Put the radio and host phone in the backpack with their working two-way route. Activate the host RX/TX and start Bluetooth sharing. Join from the controller phone and approve Talk and data. Enable **Mute host speaker** so the bag does not play local copies of received voice; guests and decoders still receive.

Set a Host settings password and unlock it from your controller if you need to change permitted feature switches or switch the host between RX/TX, Away and Off without opening the bag. Host audio routes and inversion are not changed from guest controls. Your controller's PTT remains Hold PTT and its destination can change independently of the host's saved To station.

For walking, choose the host's GPS source, begin route recording through authorised Bluetooth controls and view the mirrored route on the controller. Bluetooth loss does not turn the controller into an independent radio: it must rejoin the host. After rejoining, route and marker state catches up.

An attended host with nearby teammates

Leave Mute host speaker Off. Approve each guest's appropriate access and an optional PTT timeout. Incoming radio calls reach the host and connected listeners. A guest takes a turn with Hold PTT, while other users observe the busy/transmit status. Their voice is carried through the host to the radio and connected listeners.

If this phone supports dual output, the host hears that guest live. If it reports live speaker unavailable, choose Replay guest voice if hearing the guest after release is acceptable. Everyone waits through the indicated local replay period, which yields to a new radio reception. Do not "fix" this by redirecting the working radio output to the speaker and losing the actual transmission.

An elevated shared radio

Place the host and radio at a useful high point, such as an attic, and join from a nearby Bluetooth phone downstairs while in Bluetooth range. Use the same sharing and mute controls as the backpack example. This arrangement changes where the radio operates; it does not extend Bluetooth indefinitely or create automatic phone-to-phone multi-hop relays.

For a more distant controller, use the direct Internet gateway instead and configure reachable network access. The physical radio still belongs to the host. A user behind that gateway sends under its RF identity, regardless of which room or city the controller occupies.

Internet user to a radio gateway

1. On the attached-radio phone, set Radio role to Radio gateway and Network role to Server. Choose port 8443 and a connection password. Activate its working RX/TX route and start Internet connection.
2. On the other phone, choose Internet user and Client. Enter the gateway's reachable address, the same port and password; stop independent local radio audio before connecting.
3. Start the Client. On the gateway, open Manage Internet users and grant Talk or Talk and data; the initial Listen only state deliberately prevents PTT.
4. Test reception, then a short held PTT turn. Keep the client speaker away from any microphone that could recapture it.
5. Only after a local Wi-Fi test succeeds, arrange public reachability for different networks. If required, reverse Client/Server while keeping the radio roles the same.

For two radio areas, use Radio gateway on both attached-radio phones, one Server and one Client. For phone-only communication without attached radios, a host can use Phone microphone → Phone speaker, Live bridge and Hold PTT. Automatic does not permit this same-phone live configuration.

A hiker marking a blocked path

Choose GPS, obtain a fix and start recording the route at camp. At the blocked path, Add marker at your current coordinates and write a short description. Take a photo; recording continues while the marker editor is open. Save it, then choose Stop recording route & follow route back if you are returning.

Use the marker transmit action when you want other radio stations to receive the photo and its filename metadata. Allow time for the header and roughly 37-second image. A green Shared pin means the send completed; it is not a guarantee that everybody saw it. Nearby Bluetooth or Internet viewers of your host receive markers automatically and do not cause this RF Shared colour change.

Selective coordination at an event

Assign distinct station numbers and matching aliases before the event. Set To station to the intended person for voice, or select the intended destination when sending text or photos. Use Everyone for a group announcement. Guests of a shared radio use that host's number; they are not eight extra selectively addressable radios behind it.

For a short instruction, use text and check the delivery state. For a picture of an entrance or damaged item, send a photo and use manual retry only if necessary. A voice conversation has no automatic delivery ACK; the

person's spoken reply is separate from message/photo confirmation. A mailbox can retain incoming calls without trying to judge whether the recipient answered them.

18 Troubleshooting by symptom

PTT is disabled or says Auto PTT

Auto PTT is intentional when Voice trigger is Automatic. Select Hold PTT while stopped if you want a manual button. On an Internet or Bluetooth guest, check the host's access level, link status, current busy turn and RX/TX activation. Listen only, host RX (away), host Off or another ongoing transmission can disable outgoing PTT.

If many controls on a newly installed phone cannot be used, verify microphone, Bluetooth/nearby-device and location permissions as applicable. A connected sharing guest also intentionally has disabled local audio settings. Unlocking host settings does not enable every physical routing slider remotely.

Audio jack missing or route lost

Stop audio and reconnect using either cable insertion order, accepting any Android volume prompt. Confirm that Android exposes a microphone-capable wired device, not merely wired headphones. Re-test one-way Audio jack → Phone speaker before Auto direction. A working manual route does not prove simultaneous recording of both sources is available.

A regular headset with an inline microphone can help distinguish Android recognition from radio-interface behaviour, but do not assume the app can force a nonexistent hardware input into existence. When an error names a lost input/output, verify that path rather than only the direction that still works. Different phones can recognise or route the same interface differently.

DTMF works but voice does not key the radio

The generated lead and your voice have different level controls. Check radio VOX is enabled, then adjust speech output and radio sensitivity without clipping. Confirm the chosen microphone is actually capturing your voice. A very short hardware VOX timeout can drop TX through pauses; keep-alive can help if its interval is short enough.

At the other extreme, an over-sensitive radio VOX may remain keyed by noise or continuous unwanted output. App Hold PTT does not directly force a radio's VOX switch off if some other signal still reaches its input. Diagnose the real audio path rather than assuming every RF TX light was caused by an on-screen PTT press.

Calls split or opening words disappear

Increase Squelch hang time if normal one- or two-second pauses split a recording. Reduce excessive trigger confirmation and use pre-roll for recording openings. For live opening losses, verify lead-in buffering, route stability and the receiver's squelch/VOX timing. Radio VOX hold and app recording hang are different limits.

If receive noise or a short click creates false calls, raise the threshold, use a suitable confirmation value or run Auto Squelch Set while quiet. Recalibrate after a meaningful background change. Auto remains the saved value between calibrations; it does not keep adapting while you talk.

Channel busy or data not decoded

Check whether the radio-facing input is actually quiet and below the relevant receive threshold. High Input gain raises idle noise too. Hold PTT disables automatic local speech initiation, not the receiver's channel-busy logic. Adjusting an irrelevant local voice threshold may not alter the busy detector you are seeing.

For text, start at 100 bits/s, no inversion and clean levels; then try 50 if necessary. Check complete signalling reaches the receiver and avoid clipping, automatic sound processing in a recording/playback chain, or a loud nearby speaker feeding a microphone. A changed or distorted recording of modem tones is not equivalent to the original transmitted file.

For SSTV, verify Robot 36 reception with moderate clean audio and allow the complete frame. A picture can be detected but show errors if the waveform is distorted or noisy. Increasing gain beyond a usable level will not recover lost information. If data scrambling is enabled, use supported 2800–4500 Hz data frequencies and matching input processing, or disable scrambling for the test.

No ACK or an unexpected retry

Check that the item is addressed to a single station, that the recipient saves valid content and that its app is in RX/TX rather than Away. Its radio must be able to transmit the ACK and the channel must permit a reply. Losing only the ACK can still cause a retry even though the remote user already has the item; stable transfer IDs avoid treating that as a new item.

Everyone messages/photos do not gather delivery ACKs. Text has one automatic retry; photos only manual retry. Range and map reply lists are different mechanisms and are not confirmation that a particular text or photo was saved. "No confirmation" is therefore more precise than "definitely not received".

Echo repetition or severe feedback

First distinguish delayed repeated copies, acoustic howl and distorted clipping. Separate playing radios/phones acoustically. Use moderate gain/output and verify the selected input by speaking near the phone while no radio audio is arriving. If Mute host speaker stops the problem, it demonstrates that the local playback participates; it does not identify the entire mechanism.

Some phone/interface combinations can return playback into captured audio even when no distant radio is transmitting. A silent room, Hold PTT or a high receive threshold does not prove that capture contains no returned signal. Do not treat a continually repeating last phrase as useful incoming voice. Lower volume or mute the local copy for a controlled test, and keep a working setup/preset for comparison.

There is no confirmed universal Huawei feedback fix in this release and no diagnostic/suppression menu in 2.00. Avoid assuming that success on one phone proves the same route on another. The application's own PTT indication, a radio's VOX TX lamp and detected receive activity describe different stages of the system.

Missing or inaccurate map position

Check Enable locations, Android location access, source availability and fix age. Wi-Fi & cellular can legitimately report ±2000 m; it is not precise GPS. Go outdoors and choose GPS when accuracy matters. Manual is fixed and must be updated deliberately if you move; it cannot record a moving route.

Stored radio positions are last reports and may be stale. A gray station after a check did not produce a fresh response to that check. If route recording pauses for missing location, wait for a fresh fix and note the resulting gap. Do not read the gap as a safely known route segment or a precise distance travelled.

Internet or Bluetooth reconnects repeatedly

Confirm both phones run the intended compatible release and inspect the host's status as well as the guest's. For Bluetooth, ensure the sharing service is running, the guest is approved, permissions are granted and the invitation is not expired for a new join. Automatic rejoin uses remembered access; it cannot replace a revoked approval.

For Internet, verify one Server and one Client, correct address, matching port/password and server reachability. A TLS/handshake error differs from a reachable connection with Listen only permission. Test on the same Wi-Fi first; router isolation, firewall and carrier NAT are networking issues rather than radio squelch values.

Another application opens or takes audio

If plugging in the cable causes an OEM music player to open, check that player's headset-button/control-from-headphones option or its Android defaults. Such an app can take audio focus independently of Radio Relay. The recovery mechanism can resume after the competing activity releases audio, but cannot make another app stop requesting it forever.

For an interruption that does not recover, check whether a call, recorder, player or Bluetooth route is still active, whether the required input disappeared and whether you explicitly deactivated. Do not use continuous rapid Activate taps while Android is still changing routes; first let the interruption end and inspect the status.

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Activation and permissions matrix

Operation	Local RX/TX	Local RX away	Main audio Off	Connected sharing user
Receive enabled radio apps	Yes	Mailbox text photo location reception forced on	No main audio capture	Through host and its state
Send voice	Trigger/PTT rules	No	No	Talk permission and granted turn
Send text photo or location check	Feature route and channel rules	No	No	Talk and data plus host capability
Transmit ACK or slot reply	Feature and channel rules	No	No	Host handles radio transmission

Operation	Local RX/TX	Local RX away	Main audio Off	Connected sharing user
View stored content	Yes where available	Yes where available	Yes	Shared content; some actions local
Play local saved mailbox calls	Deactivate first	Deactivate first	Yes	Download/play shared calls
Record a local route	Independent service	Independent service	Yes with live location	Host mirror/control rules apply
Change physical audio route	Deactivate first	Deactivate first	Yes	Host-owned controls disabled

No table cell overrides the required Android permission, actual device availability or current busy state. RX (away) does not temporarily grant transmit access. A guest settings password authorises specified settings; it is not a substitute for a working transport and radio route.

Signal and acknowledgement glossary

PTT means push to talk. In this app, Hold PTT defines an outgoing user turn; it is separate from a radio's electrical PTT contact. **VOX** is a radio's voice-operated transmit detector. The lead and keep-alive tones help feed it suitable audio.

RX is reception; **TX** is transmission. **Half duplex** means taking turns rather than both sides speaking through the same radio simultaneously. **Squelch** is the app's audio-level gate or the radio's own receive gate, depending on context; they are different controls.

dB is a relative gain setting here. **dBFS** is digital signal level relative to full scale, with more negative values quieter. **RMS** is the level measure used to decide whether audio blocks are quiet. **Clipping** occurs when the signal exceeds an available level and its peaks are truncated.

DTMF is a pair of simultaneous audio tones representing a symbol. Radio Relay uses 1–8 for station identities, 9 for a range request, * # A B C D for the six variable inversion slots, and leaves 0 reserved. These are symbols, not sixteen independently selectable single frequencies.

FSK is frequency-shift signalling used for text and control/location data. **ACK** is an acknowledgement tied to a particular operation or item. A text ACK confirms verified saved text; a photo ACK confirms a saved photo file. Neither confirms a human read it.

SSTV is slow-scan television, used here for one Robot 36 still image at a time. It is not live camera video. A **marker** is a persistent labelled place; a **radio position** is a station's last location report; a **route** is the saved series of your movement points. Clearing one category does not mean clearing the other two.

Host is the phone providing the shared radio/audio path. **Guest** or **Internet user** accesses that path. **Server** accepts the initial network connection and **Client** initiates it; either radio role can be on either network role. **UTC** is the common time reference used in marker filenames; local displayed times can differ.