

User Manual of HamGeek 50KHz-2GHz MALAHIT

SDR Receiver



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1. Specifications:

- 1) Frequency range:
 - * Malahit-DSP1: 50kHz to 250MHz, and 400MHz to 2GHz;
 - * Malahit-DSP2: 20kHz to 380MHz, and 400MHz to 2GHz.
- 2) Modulation modes: AM, SSB, DSB, CW, NFM, WFM (with RDS support and stereo audio).
- 3) Digital Signal Processing (DSP) functions: Variable filter width, adaptive noise reduction (squellch), threshold Noise Gate (threshold squellch), Noise Blanker, AGC, and equalizer.
- 4) CPU: 32-bit Cortex-M7 for Arm, 480MHz.
- 5) Display type: 3.5-inch touchscreen LCD.
- 6) Preamplifier: Built-in.
- 7) Main controls: Rotary encoders with built-in buttons and a capacitive touch panel.
- 8) Power supply: Li-Ion battery (at least 3000mAh) and/or USB-C (USB charging supported).
- 9) Power consumption: 300mA with standard headphones.
- 10) Antenna connector: The radio receiver is equipped with an SMA connector for use with external antennas or telescopic antennas with an SMA connector.

To improve SSB mode reception for the Malahit-DSP1 model, an additional board is available and sold separately. The auxiliary board consists of:

- * Source repeater with advanced controls
- * Adjustable 0-30dB attenuator with 1 dB step adjustment
- * Four filters: LPF 500kHz, Bandpass 500-1500kHz, Bandpass 1500-4500kHz, HFH 4500kHz

The auxiliary board installs directly into the existing housing, and no modifications are required.

The Malahit-DSP2 model already includes all components of this add-on board.

- 11) Computer control and display: Supported via Micro USB with CAT, IQ, and audio support.

Bandwidths:

Malahit-DSP1: 160kHz, 80kHz, 40kHz

Malahit-DSP2: 192kHz, 96kHz, 48kHz

- 12) Sensitivity: 0.3 μ V at 1.0GHz.
- 13) Selectivity: 82dB.
- 14) Audio jack: 3.5mm stereo audio jack.
- 15) Antenna connector: SMA antenna connector.
- 16) Input impedance: 50 Ω /Hi-Z (Hi-Z available for Malahit-DSP1 only with the

auxiliary board).

Before using the radio receiver, please read this manual carefully to become familiar with its operation.

Software and USB drivers are available for download from the website. Please check the following link:

<https://drive.google.com/drive/u/1/folders/1WiQdee4R8XBenx-E7PT3dPy4iDjbu0fR>

Warning! Please be aware of the fire hazard associated with lithium batteries.

2. Design and Features:

The Malahit-DSP1 is used as an example below. The same applies to the Malahit-DSP2.





3. Power On/Off:

By default, the receiver is turned on by briefly pressing the power button.

The receiver has a protection function against accidental power-on. This function allows the receiver to be turned on only when the power button is pressed at least three times within 5 seconds.

To enable this function:

- * For Malahit-DSP1: Remove the rear cover of the radio receiver and connect pin 7 of the connector intended for connecting an additional board to the negative power supply or common wire.
- * For Malahit-DSP2: Remove the rear cover of the radio receiver and set Switch 2 on the DIP switch on the printed circuit board to ON.

To turn off the receiver, press and hold the power button until the display turns off

and a sound signal is heard (the message "73" transmitted in Morse code). After the sound signal is heard, release the button, and the receiver will turn off.

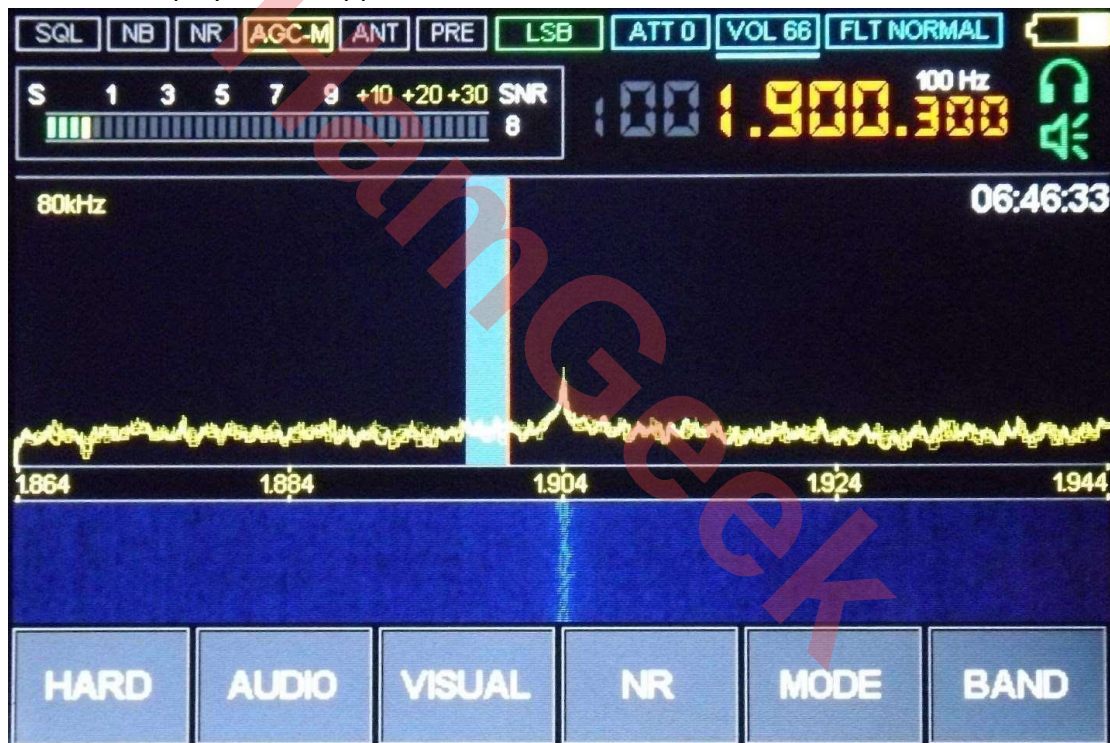
4. User Interface:

The screenshots below are for reference only. Depending on the receiver model and future software updates, some functions may be added, removed, or expanded. However, the overall appearance and operation of the interface should remain generally the same.

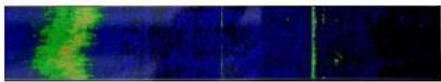
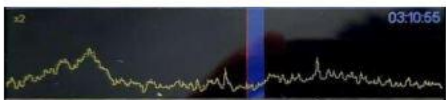
The information display logic is designed so that the enabled state is indicated by green or yellow, while the disabled state is indicated by red or gray.

4.1 Main Display And Menus

The main display should appear as shown below:



Indicators					
FLT NORMAL	VOL 66	ATT 0	LSB	PRE	ANT
Description					
Selected filter type	Volume level	Attenuator value	Modulation type	HF preamplifier status: Green – enabled; Gray – disabled	Antenna status: Auxiliary board Green – Hi-Z; Gray – 50Ω
AGC-M	NR	NB	SQL	100 Hz	SNR 8
AGC status: Yellow – enabled; Gray – disabled	Adaptive squelch status: Green – enabled; Gray – disabled	Noise Blanker status: Red – enabled; Gray – disabled	Threshold squelch status: Red – enabled; Gray – disabled	Current frequency step	Signal-to-noise ratio
80 kHz	HARD	AUDIO	VISUAL	NR	MODE
Spectrum span	HARD menu button, touchscreen	AUDIO menu button, touchscreen	VISUAL menu button, touchscreen	Adaptive squelch ON/OFF button, touchscreen	MODE menu button, touchscreen
BAND	06:46:33				
Recall stored frequencies in the selected band	Current time	Battery charge indicator	Audio output selection: Headphones, speaker, or both	Signal level, touchscreen → Enter/exit the HARD menu	Current frequency, touchscreen → Enter frequency editing mode

	
Waterfall Plot	Spectrum Plot
	
Frequency Scale	Decoder Working
	Save to memory indicator. Displayed when current user settings differ from memory. Yellow– Saving current settings to memory. Green– Settings saved successfully; indicator automatically hidden.

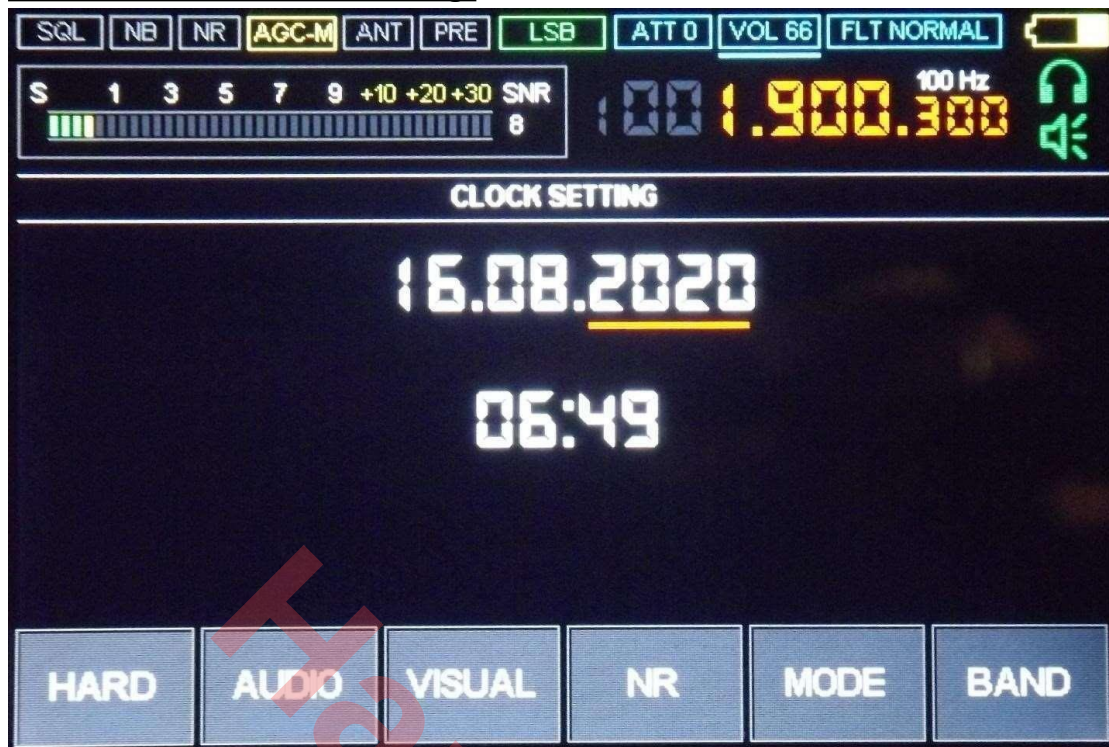
4.2 HARD Menu

Tap the "HARD" button on the touchscreen to enter the "HARD" menu. The items in the "HARD" menu are activated using the touchscreen, and their values can be changed using the "VOLUME" knob.

The "HARD" menu can be exited at any time by tapping the "HARD" button or pressing the "VOLUME" or "FREQUENCY" knob.



4.3 CLOCK Menu and Clock Settings



The "CLOCK" menu is used to set the date and time. To access this menu, press and hold the "HARD" menu button until the "CLOCK" menu is activated.

To set the date and time, use the "VOLUME" knob to adjust the value, then press the knob to move to the next item. To apply the current date and time, press and hold the "VOLUME" knob until a beep is heard.

To exit the menu, press the "HARD" menu button.

4.4 VISUAL Menu



Tap the "VISUAL" button on the touchscreen to enter the "VISUAL" menu. The settings in this menu are used to change the information display and display operation.

To exit the menu, tap the "VISUAL" button or press the "VOLUME" knob.

4.5 AUDIO Menu



This menu contains settings for digital signal processing applied to the audio output.

To exit the menu, press the "MENU" button or the "VOLUME" knob.

4.6 BAND Menu



This menu is used to recall stored frequencies or save the current frequency to a specific memory location.

Use the "FREQUENCY" knob to navigate through the menu.

To exit the menu, press the "BAND" button or the "VOLUME" knob.

4.7 MODE Menu



This menu is used to select the modulation type and activate the decoder.

To exit the menu, press the "MODE" button or the "VOLUME" knob.

5. Main Functions and General Operation:

5.1 Reset to Default Settings

This function resets the current user settings to the factory default values.

To activate this function, close all menus and display the main screen. Then press and hold the "VOLUME" and "FREQUENCY" knobs simultaneously until a beep is heard.

All user settings, including the current frequency and memory locations, will be lost.

5.2 Reverse Control Knob Direction

This function allows the encoder knob rotation direction to be changed from CW to CCW.

To activate the control knob reverse mode, enter the "HARD" menu and enable "EN1 reverse" for "Frequency" and "EN2 reverse" for "Volume".

Tap the corresponding button to enable or disable the reverse mode for the knob.

5.3 Battery Monitoring Mode

This function turns off the HamGeek radio receiver when the battery voltage falls

below 3.3V. This function extends battery life and prevents complete battery discharge.

To enable this function, enter the "HARD" menu and select "Vbat control":

- * Standard – Function enabled; cutoff voltage set to 3.3V
- * Low – Function disabled; the device can operate with a battery voltage as low as 2.7V

For the Malahit-DSP2, the cutoff voltage is controlled by hardware and is set to 3.1V.

5.4 Antenna Type Selection

This function is available only for frequencies above 50MHz.

For the Malahit-DSP1, this function is available only on receivers equipped with the auxiliary board, such as the dual-antenna version.

To select the antenna input type, go to the "HARD" menu and tap the "SW antenna" parameter.

- * Hi-Z – High-impedance input for telescopic antennas
- * 50Ω – 50Ω impedance input, recommended for external antennas with an impedance of approximately 50Ω

5.5 Built-in HF Preamplifier Control

This function enables or disables the built-in HF preamplifier.

To enable or disable the preamplifier, enter the "HARD" menu and select "PREAMP":

- * Enabled
- * Disabled

5.6 Attenuator Control

This function is available only on receivers equipped with the auxiliary board.

To change the attenuator setting, enter the "HARD" menu and select "ATT". Use the "VOLUME" knob to select the desired attenuation value from 0 to 30dB, in 1dB increments.

5.7 Gain Control

The receiver's front-end IC provides gain control for the signal mixers and UHF.

To adjust the gain, enter the "HARD" menu and adjust the following parameters:

- * "RF GAIN" – RF gain
- * Gain factor for the wideband mixer
- * "LNA/MIX UP GR" – attenuation control (On/Off), applicable to the built-in

preamplifier in HF mode and the first mixer in SB mode

- * "MIX GR" – attenuation control (On/Off), applicable to the built-in preamplifier in HF mode and the second mixer in SB mode

Use the "VOLUME" knob to navigate through the menu and press the knob to activate the selected option.

For the "LNA/MIX UP GR" and "MIX GR" options:

- * Enabled – attenuator enabled
- * Disabled – attenuator disabled

Recommendations:

- * The "LNA/MIX UP GR" and "MIX GR" options are signal attenuators. They can be used with external long antennas or when the receiver is overloaded by overlapping signals.
- * For "RF GAIN", a value of no more than 40dB is recommended when using a short telescopic antenna, and no more than 20dB when using a long antenna.

This function is available only on receivers equipped with the auxiliary board. To change the attenuator setting, enter the "HARD" menu and select "ATT". Use the "VOLUME" knob to select the desired value.

5.8 Frequency Display Error Correction

This function provides display error correction.

To adjust the display correction, enter the "HARD" menu and select "F correct". Use the "VOLUME" knob to set the appropriate value.

5.9 Audio Output Selection

This function sets the type of audio output device: headphones, the built-in speaker, or both. The audio output can be selected by tapping the audio icon on the main screen. Alternatively, enter the "HARD" menu and press the "Audio out" button to select the desired audio output type.

5.10 Noise Blanker (NB)

This function provides broadband attenuation. The function settings are available under the "NB" option in the "AUDIO" menu.

- * Threshold – removes or reduces interference. Adjust manually using the "VOLUME" control. Values below 3 are not recommended.
- * Config – NB configuration. Adjust manually using the "VOLUME" control to remove or reduce interference.
- * NB – enables or disables the Noise Blanker. Experiment with this setting based on the audio feedback.

5.11 AGC

This function maintains an optimal audio output level. The settings are available under the "AGC" option in the "AUDIO" menu:

- * AGC LIM – maximum output level
- * AGC GAIN – AGC gain
- * MANUAL GAIN – manual gain control, available when AGC is disabled
- * AGC MODE – AGC response mode

AGC mode options:

- * FAST – short time constant (fast response)
- * MIDDLE – medium time constant
- * SLOW – long time constant
- * LONG – extra-long time constant
- * OFF – AGC disabled

To change the AGC settings, enter the "AUDIO" menu, select the desired parameter, and use the "VOLUME" knob to adjust it.

When AGC is disabled, the "AGC GAIN" parameter is replaced by "MANUAL GAIN". The AGC function is not supported in WFM mode.

5.12 Equalizer

This option enables or disables the equalizer. In the "EQ" option under the "AUDIO" menu, use the "VOLUME" knob to select the desired setting.

- * EQ-OFF – disabled
- * SOFT/LIVE/CLUB/ROCK/BASS/JAZZ/POP/VOICE – popular EQ presets

5.13 WFM Stereo Mode

The receiver supports stereo reception in FM mode. To enable FM stereo, enter the "AUDIO" menu and toggle the "WFM Stereo" button.

The "WFM Stereo" option has two settings: Enable and Disable.

Stereo mode supports strong-signal stations only. You must select either headphone output or simultaneous headphone and speaker output. Speaker-only output is not supported.

"WFM-ST" indicates stereo reception.

5.14 Adaptive Squelch

To improve reception and selectivity, the receiver is equipped with an adaptive squelch function. This function uses different bandpass filtering algorithms:

- * Span > 1kHz "speech" – optimized filter for speech
- * Span ≤ 1kHz "tone" – optimized filter for tone

The algorithm is selected automatically based on the span value.

The noise reduction level for voice signals can be adjusted manually. To enable or disable noise reduction, toggle the "NR" button.

To set the voice noise reduction level, enter the "AUDIO" menu, select "Threshold" under the "NR" group, and use the "VOLUME" control to set the desired value. The "Threshold" setting does not apply to spans ≤ 1kHz.

5.15 Threshold Squelch

This function blocks audio content below a preset signal level (threshold).

To enable "Threshold Squelch", enter the "AUDIO" menu, select the "SQL" option, and use the "VOLUME" control.

"SQL" options:

- * Enabled
- * Disabled

To set the threshold level, enter the "AUDIO" menu, select the "Threshold" option, and adjust it using the "VOLUME" control.

For speech-type signals, set the threshold using the "Threshold" option under the "NR" menu.

5.16 Backlight Control

This function adjusts the backlight brightness of the LCD display.

- * Backlight level – minimum/maximum brightness
- * Timeout – switches from the current backlight level to the minimum backlight level
- * Timeout – turns the backlight off

To adjust the backlight settings, enter the "VISUAL" menu and use the "VOLUME" control to select "BRIGHTMAX" to set the maximum brightness, or "BRIGHT MIN" to set the minimum brightness (battery-saving mode).

To adjust the timeout settings, enter the "VISUAL" menu and use the "VOLUME" control to select the "REDUCT TIME" group. Select "SLEEP TIME" to set the timeout before entering battery-saving mode, and "LCD SLEEP" to set the timeout before turning off the display. The "LCD SLEEP" option must be enabled.

5.17 Setting Spectrum Rate

This function changes the spectrum update rate on the main display.

To adjust the update rate, enter the "VISUAL" menu and use the "VOLUME" control to select "FFT ave" and set the desired value. Higher values correspond to a slower update rate.

5.18 Setting Spectrum Range

This function changes the SNR amplitude scale of the spectrum.

To adjust the scale, enter the "VISUAL" menu, select "FFT scale", and use the "VOLUME" control to set the desired SNR scale value (dB). Lower values provide more detail but result in more noise.

5.19 Setting Spectrum Color

This function changes the color table used for the spectrum display.

To change the color table, enter the "VISUAL" menu, select "FFT color", and use the "VOLUME" control to select the desired color setting.

5.20 Setting Spectrum and Waterfall Ratio

This function changes the display ratio between the spectrum and waterfall.

To adjust the ratio, enter the "VISUAL" menu, select "Pan percent", and use the "VOLUME" control to set the desired ratio (%).

5.21 Setting Waterfall Rate

This function changes the waterfall filling rate.

To adjust the filling rate, enter the "VISUAL" menu, select "WTF delay", and use the "VOLUME" control to set the desired value. Lower values result in faster filling.

5.22 Setting Waterfall Highlight

This function changes the waterfall brightness relative to the signal level.

To adjust the highlight level, enter the "VISUAL" menu, select "WTF Gain", and use the "VOLUME" knob to set the desired value. Lower values result in lower brightness.

5.23 Setting Spectrum Scale and Type

This function changes the spectrum span and type. Different spectrum types are supported in WFM mode. The current spectrum scale is displayed in the left corner of the spectrum. Higher scale values correspond to a narrower span with greater detail.

For SSB, CW, DSB, AM, and NFM modes, the supported options are 1, 2, and 4.

For WFM mode, the supported options are 1 and MPX, where MPX represents the mixed-signal spectrum.

To change the spectrum span or type, tap the desired area of the spectrum.

5.24 Clock Setup

See Section 4.3 for details.

5.25 Save To And Load From Device Flash Memory

This function allows the user to save the current settings to the device flash memory or load settings from the flash memory.

To select a memory location, enter the "BAND" menu and navigate to the desired memory cell by tapping it. Use the "FREQUENCY" control to move forward or backward through the memory locations and navigate to the desired location.

To save the current settings, select the desired memory cell and press and hold the corresponding button until an audio signal is heard or the selected button is highlighted in red.

5.26 CW Decoder

This function decodes Baudot signals and displays the decoded text on the main screen.

To enable the decoder, enter the "MODE" menu, select "Decoder", and enable it. The "CW" text on the decoder button indicates that the decoder is active.

For proper operation, use the "VOLUME" control to set the optimal "Min SNR" value in the corresponding group and save the setting.

The "Min SNR" setting determines the trigger threshold for decoder activation. Setting it too low or too high may result in decoding failure.

The optimal "Min SNR" value can be determined based on the following conditions:

- * When there is no incoming Baudot transmission, the decoder activity indicator should remain off.
- * The decoder activity indicator ("heart-beat") should be synchronized with the incoming Baudot transmission.

The decoded signal is displayed as text on the main screen. Tap the "S-meter" to clear the text window.

5.27 Setting Tuning Step Resolution

This function changes the tuning step resolution.

To change the tuning step, press the "FREQUENCY" knob and use the rotary encoder to increase or decrease the step size to the desired value. The selected step is displayed in white on the frequency display. Press the "FREQUENCY" knob to confirm the selection.

The tuning step is paired with the modulation type, so each mode can have a unique step setting stored in memory.

5.28 HF Preamplifier Gain Compensation In S-Meter Mode

This function changes the gain factor of the HF preamplifier in S-meter mode.

To set the HF preamplifier gain factor, enter the "HARD" menu, select "PRE Gain", and use the "VOLUME" control to set the actual preamplifier gain.

Set the gain value to zero to bypass gain compensation. The default value is 14dB.

5.29 Tone Signal Volume Control

This function changes the volume of the tone signal.

To change the tone signal volume, enter the "HARD" menu, select "BEEP LVL", and use the "VOLUME" control to set the desired level.

5.30 Changing S-Meter Scale Display

This function changes the S-meter display scale.

To change the scale, enter the "HARD" menu, select "Ind type", and use the "VOLUME" control to set the desired value.

The SNR value corresponds to the scaled signal-to-noise ratio in dBm.

5.31 S-Meter Corrections

This function changes the S-meter calibration coefficient.

To change the S-meter calibration coefficient, enter the "HARD" menu, select "Sm Correct", and use the "VOLUME" control to set the desired value.

For proper calibration, input a signal with a known signal level and accuracy into the receiver. Use the "VOLUME" control to adjust the correction value until the displayed S-meter level matches the input signal level. The S-meter scale must be set to dBm.

5.32 Idle Timer

This function sets a timeout for user inactivity. When the timeout expires, the device automatically turns off.

To enable this function, enter the "HARD" menu, select "Activity timer", and use the "VOLUME" control to set the timeout in minutes.

Set the value to zero to disable this function.

5.33 Spectrum Fill

This function changes the spectrum fill type. Two options are available:

- * Line-only, no-fill
- * Line and fill

To select the fill type, enter the "VISUAL" menu, select "FFT fill", and toggle between "Disabled" and "Enabled" for no-fill and fill, respectively.

5.34 DC Offset Compensation

This function enables DC offset compensation for the receiver front-end DAC.

To enable DC offset compensation, enter the "VISUAL" menu, select "DC reject", and use the "VOLUME" control to select the DC value to be subtracted.

This function must be used appropriately to make full use of the DAC. The real-time DC offset is displayed at 0Hz on the spectrum and represents the DC value calculated by the FFT.

DC offset compensation does not affect receiver reception. For the best spectrum display, set the DC offset value within the range from zero to the actual DC value displayed on the spectrum when the offset is set to "zero". Setting a higher value may excessively suppress lower-frequency components of the displayed spectrum.

5.35 Disabling Spectrum And Waterfall

This function disables the spectrum and waterfall displays to reduce interference. When the spectrum and waterfall displays are disabled, the LCD is updated only when the GUI changes, reducing interference caused by high-frequency switching associated with image rendering.

To disable the spectrum and waterfall displays, enter the "VISUAL" menu, select "View Pan&Wtf", and toggle between "Enable" and "Disable".

- * Enabled – Spectrum and waterfall displays enabled
- * Disabled – Spectrum and waterfall displays disabled

Changing this setting also changes the S-meter display.

5.36 Bandpass Filter Settings

This function sets the bandpass filters and their parameters. Three predefined bandpass filters are available:

- * Narrow – narrow bandwidth
- * Normal – normal bandwidth
- * Wide – wide bandwidth

To select a filter, press the "VOLUME" control button, select "FLT", and use the "VOLUME" rotary encoder to select the desired filter.

The filter can also be configured from the "AUDIO" menu by selecting "Filter" and using the "VOLUME" control.

For each filter, the span and frequency cutoff values can be adjusted in the "AUDIO" menu under "Low freq" and "High freq", respectively. Use the "VOLUME" control to adjust the values.

In CW mode, the three filters use different parameters:

- * Pitch – center frequency, calculated as the mean of f1 and f2
- * Width – passband width

To set the CW-mode filter parameters, enter the "AUDIO" menu, select "Pitch" or "Width", and use the "VOLUME" control to set the desired value.

5.37 Setting Mode And Detection Types

The receiver supports the following modulation types:

- * SSB (USB/LSB)
- * CW telegraphy in USB and LSB
- * DSB
- * NFM
- * WFM

To select SSB mode, enter the "MODE" menu, select "USB" or "LSB", and set the desired type.

To select CW mode, enter the "MODE" menu, select "CW", and use "USB" or "LSB" to select the desired type.

To select DSB mode, enter the "MODE" menu, select "DSB", and use "USB" or "LSB" to select the desired type.

To select AM mode, enter the "MODE" menu and select "AM". Then use "MAG"

(classic amplitude detector), "SAM" (synchronous amplitude detector), "SAMU" (synchronous amplitude detector with upper side-band), or "SAML" (synchronous amplitude detector with lower side-band) to select the desired detector type.

To select the demodulator type, enter the "MODE" menu and select "AM det".

To select NFM mode, enter the "MODE" menu and select "NFM".

To select WFM mode, enter the "MODE" menu and select "WFM".

5.38 Retro Scale

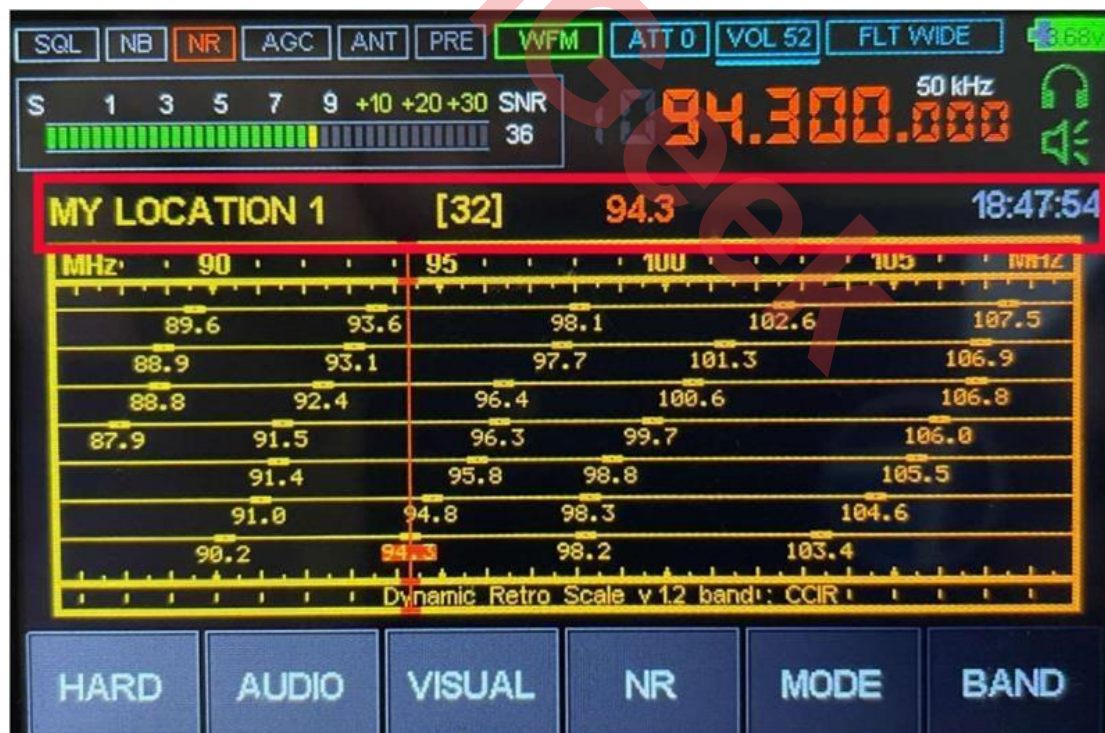
The HamGeek receiver features a custom retro interface for WFM reception as a tribute to classic tube and transistor radios. The retro scale is available only in WFM mode.

Note: This mode is activated only when the current frequency is within the local FM broadcast range:

* Europe: 87.5-108MHz

* Japan: 75.1-94.9MHz

To activate the retro scale from the main screen, tap and hold the center of the display above the menu buttons until the retro scale appears.





Retro Scale Features:

- * Retro-style display
- * Add radio stations with custom names that can be edited by the user
- * Custom scale colors
- * Recall stations from memory
- * Edit, save, and load custom station lists
- * Two user-customizable station lists
- * Automatic station search

To enter retro scale editing mode, tap the center of the screen where the frequency is displayed.

The retro scale menu provides the following options:

5.38.1 ADD/EDIT STATION

Adds a new station to the list, edits an existing station name, or deletes a station from the list.

After opening this function, a new menu allows the user to:

- * Adjust the frequency in either direction.
- * Use the "VOLUME" control to select characters when entering a custom station name.

Once the station name entry screen is opened, you cannot return to the frequency adjustment screen. You can either save and edit the station, or delete it and start again.

After entering the station name:

- * "SAVE AND EXIT" – Save the new station name and exit
- * "SAVE AND CONTINUE" – Save the station and continue searching or editing
- * "DELETE STATION" – Delete the station
- * "CANCEL" – Exit the current retro scale menu

A station can also be added without manually entering its name. Simply adjust the frequency and select "SAVE AND CONTINUE" or "SAVE AND EXIT".

After a search is completed, stations are displayed using their frequency in MHz. For example, "87.5" represents 87.5MHz, making stations easy to identify and search. This provides an alternative to the mode described in Section 5.40.

5.38.2 RENAME SCALE

Enter or edit the current scale name associated with the loaded station list.

When this option is selected, additional menu items allow the user to:

- * Enter or edit the scale name using the "FREQUENCY" encoder to select characters
- * Clear the entered scale name using "CLEAR NAME"

5.38.3 CLEAR SCALE

Clears the Retro Scale data from memory. Tapping this button opens a warning message with two buttons, "CLEAR" and "CANCEL".

The "CLEAR" button clears the Retro Scale data from memory and returns to the Retro Scale main menu. The cleared scale is displayed with the name "Empty".

The current scale and default station name are saved as "My Location 1" or "My Location 2", depending on the source.

The "CANCEL" button returns to the Retro Scale main menu without deleting any data.

5.38.4 SWITCH USER SCALE

Switches between two user scale lists.

Tap this button to switch from one list to the other. This function can be used to quickly switch between different station lists, such as "Home Office" and "Home Travel".

5.38.5 LOAD PRESET

Load the desired preset.

Clicking this button opens a warning that the current retro scale data will be lost and replaced with the preset data stored in memory.

5.38.6 CHANGE COLOR

Selects the scale color.

Each custom station list can have its own scale color. Tap this button to open a new menu with a color selection box, a "CANCEL" button, and a "SAVE COLOR AND EXIT" button.

Select the desired color and tap "SAVE COLOR AND EXIT" to save the custom color.

Tap "CANCEL" to return to the Retro Scale main menu without saving the custom color.

Tap "CANCEL" to exit the Retro Scale menu and return to the receiver main menu.

5.38.7 AUTO SEARCHING

Automatically search for and save radio stations. **See Section 5.39** for details.

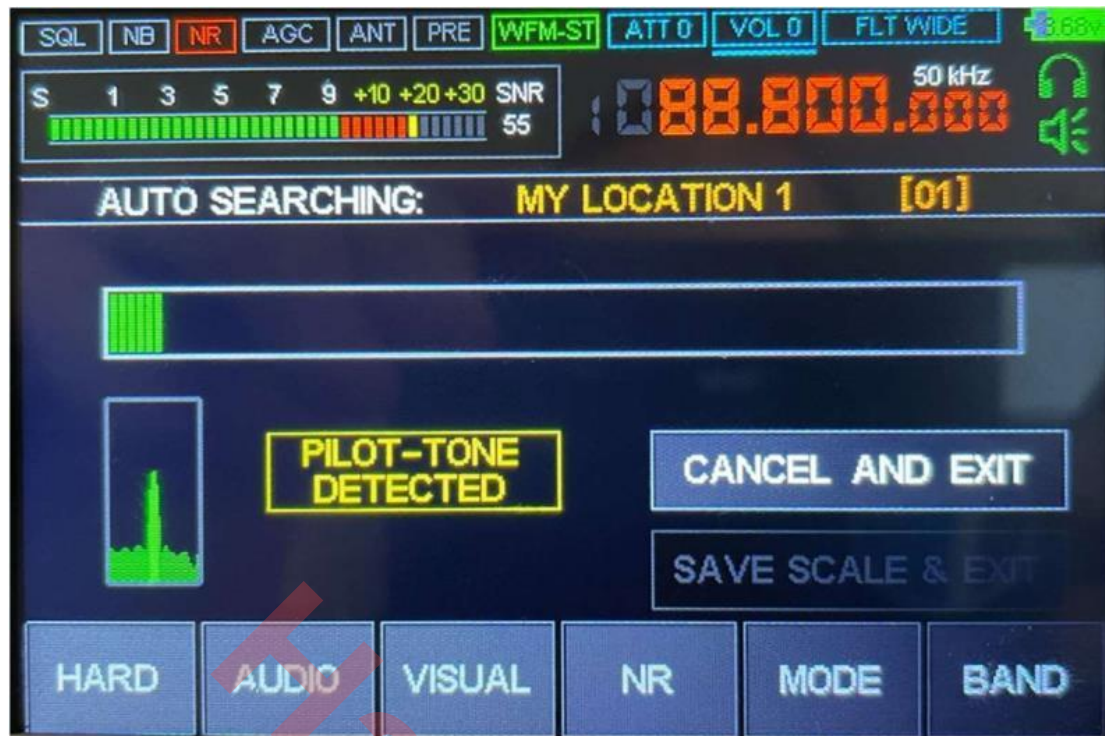
While in retro scale mode, the user can advance the tuner frequency in 50kHz steps or jump from one station to the next.

To jump from one station to the next, use the "FREQUENCY" encoder until "NEXT" appears in place of the tuning step value.

5.39 FM Station Scan Mode

This function scans for radio stations in FM mode.

To start the scan, open the Retro Scale menu and select "AUTO SEARCHING". Tap this button to start the automatic station search.



When the automatic search is complete, a new window will appear with the following buttons:

- * CANCEL AND EXIT: Discards the automatic search results and returns to the Retro Scale menu.
- * SAVE SCALE & EXIT: Saves the automatic search results and returns to the Retro Scale menu.

Note: Only strong FM stereo signals are detected and added to the station list during the automatic search. For the automatic search to work properly, the headphones must be selected as the audio output, and WFM Stereo must be enabled in the AUDIO menu.

In areas with poor reception, use the "ADD/EDIT STATION" function (see Section 5.38.1) to manually tune to the desired frequency. Tap "SAVE AND CONTINUE" to add the selected station to the list and continue the automatic search.

Stations can be added to or deleted from the list after the search is complete, and the Retro Scale can then be saved.

Both automatic and manual searches are equally effective and easy to use. Neither method has an absolute advantage over the other.

5.40 Manual Frequency Setting

The receiver allows you to set the frequency manually.

To set the desired frequency:

- * Tap the frequency display in the upper-right corner.
- * Enter the desired frequency in Hz, kHz, or MHz.

To exit the frequency editing menu, tap the frequency display again.

5.41 Auto Notch Filter

This function removes interfering tone signals from the received signal.

The function is available only when receiving in USB or LSB mode.

To enable this function, open the AUDIO menu and tap the ANF button.

5.42 PseudoStereo

This function creates a pseudo-surround sound effect.

It is available in all modes except WFM and can only be used when listening through headphones.

5.43 PGA BST Function

This function may help when receiving very strong signals. An excessively strong input signal may overload the receiver.

To adjust this function, open the "HARD" menu and tap the PGA BST button.

The ENABLED state provides maximum gain. If the input signal causes the receiver to overload, set PGA BST to Disabled.

5.44 Changing the Display Frequency

This experimental function is available only on the Malachite-DSP2 and affects only the frequency display in WFM mode.

To use this function, remove the rear cover of the receiver and set DIP switch 3 on the printed circuit board to:

- * OFF: Decreases the displayed frequency.
- * ON: Increases the displayed frequency.

5.45 User Equipment Management

This function is currently available only on the Malachite-DSP1. It allows you to control additional equipment that uses a logic-level signal, such as a Bluetooth module.

A logic signal is generated on pin 8 of the connector. This signal is intended for connecting an additional board. Logic 0 corresponds to 0V. Logic 1 corresponds to

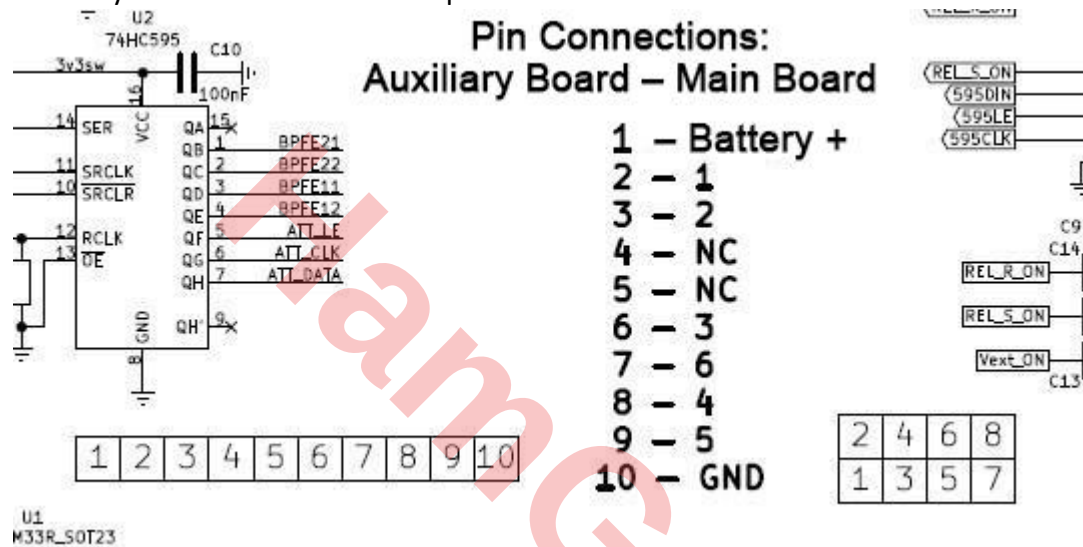
3.3V.

To control the logic signal, open the "HARD" menu and tap the User function button. The Enabled state corresponds to Logic 1, while the Disabled state corresponds to Logic 0.

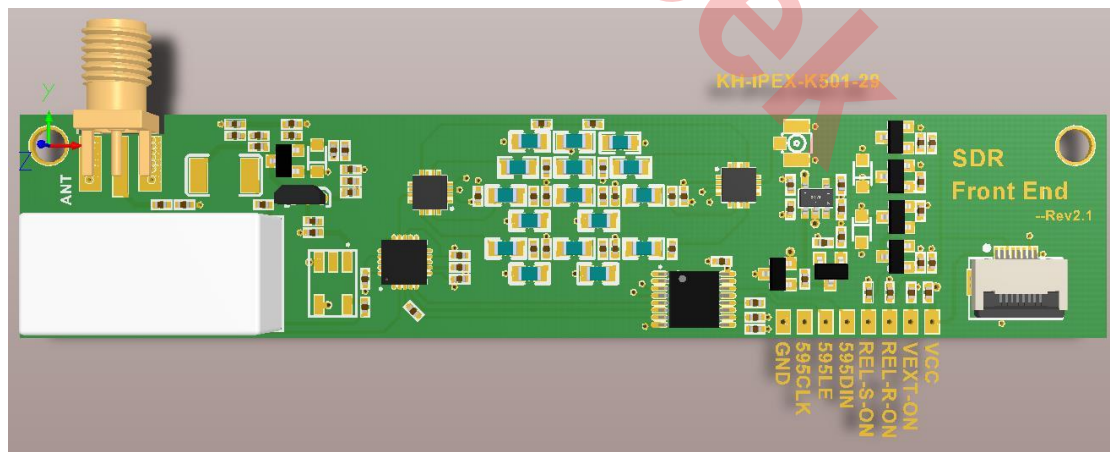
6. Auxiliary Board Installation:

This section applies only to the Malachite-DSP1.

Auxiliary Board Pinout and Description:



The pin numbering corresponds to the PCB layout inside the receiver enclosure, as shown below.



7. Measured Radio Receiver Sensitivity:

Sensitivity, dBm, SSB, dF=300-800Hz, S/N=10dB, Input 50 Ohm, optional board is present, display is OFF

frequency	RF GAIN=0	RF GAIN=20	RFGAIN=0, PRE=EN	RF GAIN=10, PRE=EN	RF GAIN=20, PRE=EN
100000	-97	-96	-92	-92	-94
1000000	-109	-111	-121	-120	-120
5000000	-109	-114	-121	-127	-128
10000000	-110	-120	-123	-125	-125
15000000	-115	-121	-121	-121	-121
20000000	-117	-121	-123	-125	-124
30000000	-111	-113	-115	-116	-117
50000000	-115	-112	-109	-107	-115
70000000	-122	-121	-127	-125	-127
90000000	-120	-125	-128	-128	-127
100000000	-119	-123	-124	-127	-126
120000000	-118	-113	-117	-116	-113
140000000	-108	-124	-130	-128	-130
145000000	-110	-125	-130	-130	-130
150000000	-104	-122	-130	-130	-127
170000000	-112	-124	-126	-130	-129
200000000	-120	-121	-127	-128	-127
240000000	-105	-108	-117	-117	-114
410000000	-106	-109	-109	-109	-109
430000000	-116	-116	-118	-118	-117
440000000	-117	-114	-115	-116	-115
500000000	-96.5	-108	-111	-114	-112
600000000	-117	-119	-124	-126	-124
800000000	-114	-121	-123	-126	-122
1100000000	-98	-105	-109	-113	-111
1200000000	-103	-106	-110	-112	-112
1500000000	-108	-114	-113	-116	-117
1900000000	-101	-106	-98	-103	-104