Giga Technology

RADIO RECEIVER

«MALAHIT-DSP»,

«MALAHIT-DSP2»

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CONTENTS

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1. GENERAL INFORMATION

“MALAHITEAM-DSP” radio receiver built as SDR-type and its functionality defined by up
software. This manual is common for all models of radios of the Malachite family, the d
depending on the specific model are specified in the text.

SPECIFICATIONS:

1) Frequency range:

   for Malahit-DSP1: from 50kHz to 250MHz, from 400MHz to 2GHz;

   for Малахит-DSP2- from 20кГц to 380МГц, from 400МГц до 2 ГГц;

2) Modulation modes: AM, SSB, DSB, CW, NFM, WFM

(RDS support with stereo);

3) Digital signal processing(DSP) functions: variable filter width, adaptive noise suppression(squelch), threshold Noise Gate(threshold squelch), Noise Blanker, AGC,
4) CPU: 32-bit Arm® Cortex®-M7 480MHz;
5) Display type: 3.5” touch-screen LCD;
6) Preamplifier: built-in;
7) Main Controls: rotary encoders with built-in buttons and capacitive touch panel;
8) Power: 18650 Li-Ion cell(at least 1500mAh) and/or micro USB (USB charging supported);
9) Power consumption: 300mA with standard headphones;
10) Radio receiver has SMA connector for use with external antennas or telescopic ante SMA.

To improve SB mode reception for model Malahit-DSP1 an additional board is avai
separately. Auxiliary board consist of:

- Source repeater with advanced controls
- Adjustable 0-30dB attenuator with 1dB step
- 4 filters: LPF 500kHz, Bandpass 500-1500kHz, Bandpass 1500-4500kHz, HFH 450

Installs directly into existing housing, no modifications required.

The Malachite-DSP2 model already includes all the components of this add-on boar

11) Computer control and display over micro USB with CAT, IQ and audio support

Spans:

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

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

12) Sensitivity: 0.3μV at 1.0GHz

13) Selectivity: 82dB

14) 3.5mm plug for audio jack, stereo

15) SMA antenna connector

16) Input impedance: 50Ω/Hi-Z (for Malahit-DSP1 only with auxiliary board)

17) Receiver body made out of extruded aluminum 120x88x39mm enclosure for Malac
140x88x39mm Malachite-DSP2

19) Battery type:18650 Li-Ion rechargeable cell

Radio Receiver developers:

- Georgy Yatsuk, RX9CIM (idea, DSP, initial circuit design),
- Vladimir Gordienko, R6DAN (GUI and control),
- Vadim Burlakov, R6DCY (final circuit design, layout and build)
- Igor Naumenko (active participant in review meetings, creator of vintage retro scale).

radio receiver, you should read this manual to be quite familiar with its operation.

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For Malahit-DSP1 activation requires after initial firmware flashing. A non-activated dev
upon power up would display unique code, this code need to be send by e-mail to:
malahit_sdr@rambler.ru .

Software and USB driver available to download from the web. Check the following link:
https://drive.google.com/drive/u/1/folders/1WiQdee4R8XBenx-E7PT3dPy4iDjbu0fR

Warning! Due to the fire hazard presented by lithium batteries, radio receivers shipped
battery. Once received, user need to remove screws and open back cover to install 186
rechargeable cell, purchased separately.

Welcome to our Telegram groups:
- for Russian-speaking users - https://t.me/MalahitReceiver
- for English-speaking users - https://t.me/MALAHITEAM_EN

2 DESIGN AND FEATURES

Malachite-DSP1 is considered below as an example. For Malachite-DSP2, everything is t

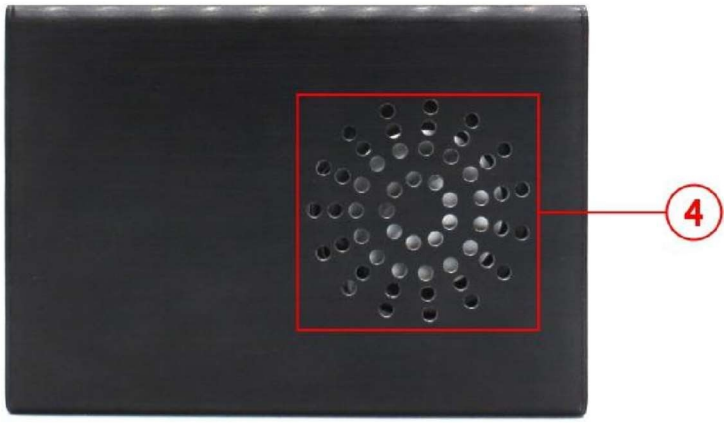
Front panel controls:

1 3.5” Touchscreen display

2 Rotary knob with push button

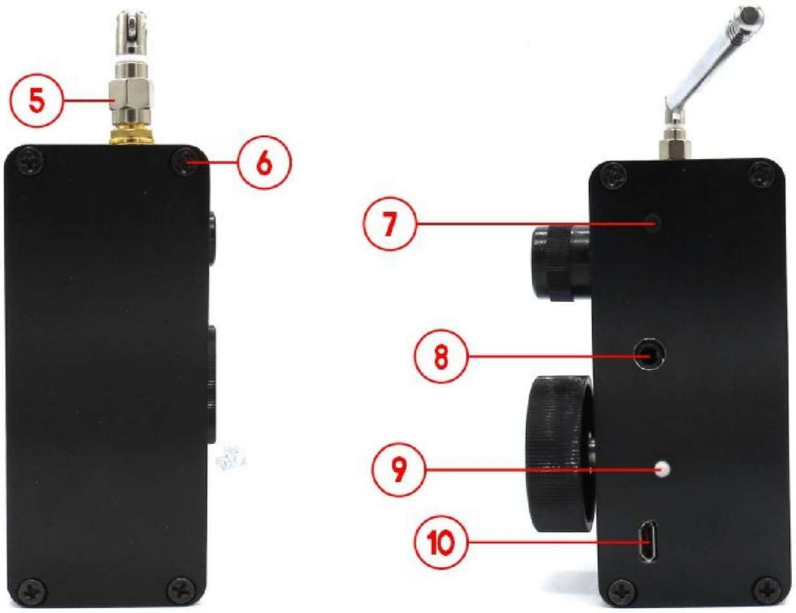
3 Rotary knob with push button

Rear side:



4 Speaker

Receiver sides:



5 SMA Antenna connector

6 Body panels screws

7 Power button

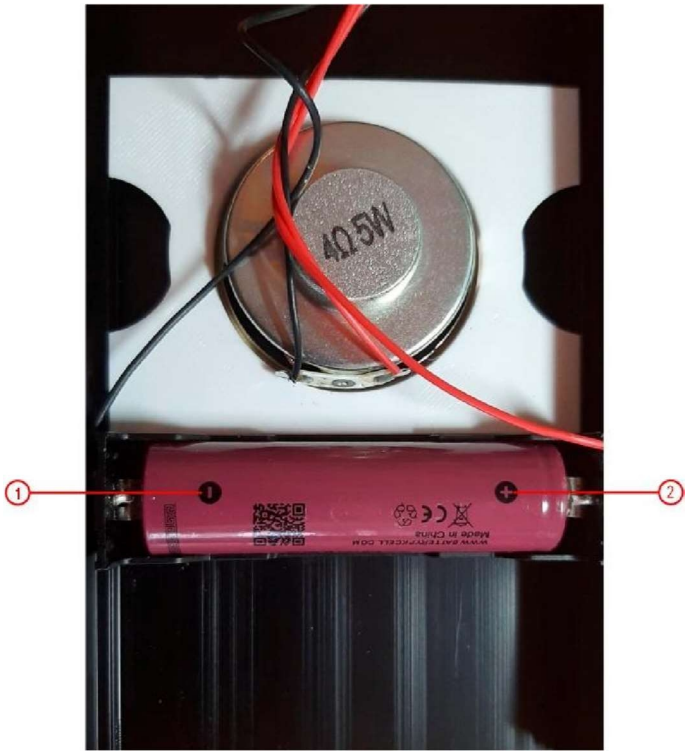
8 3.5mm audio plug

9 Battery state LED

10 micro USB

3 GETTING STARTED.

Before using radio receiver, read this manual to avoid complications and get the most f
product. Radio receiver shipped without battery (18650 Li-Ion rechargeable cell) in orc
battery, user must remove screws holding rear panel and insert rechargeable cell into
(check polarity!).



Warning! Observe polarity when inserting batte
into battery holder, red wire goes to ‘POS’ black
wire to ‘NEG’. Failure to observer polarity would
damage radio receiver and void warranty. Chec
image below for proper installation, check
battery polarity with multimeter if polarity is no
clear from cell’s labels:

1 Negative side “-“

2 Positive side “+”

Once battery installed, re-assemble radio receiver and secure with screws.

4 POWER UP/POWER DOWN.

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

The receiver has a function of protection against false switching on - this function allow
on the receiver only if the power button is pressed at least three times within an interv
seconds. To enable this function, you must:

- for Malachite-DSP1: it is necessary to remove the rear cover of the radio receiver and of the connector (in accordance with the diagram in section 9), intended for connecting additional board, with a negative power supply or a common wire.
- for Malachite-DSP2: remove the rear cover of the radio receiver and set switch 2 to O SWITCH on the printed circuit board.

Switching off is carried out by long pressing the power control button until the display g a sound signal appears (message "73" transmitted by Morse code). After the sound sig and the button is released, the receiver will turn off.

5 FIRMWARE ACTIVATION.

This action is need only for Malahit-DSP1.

Radio receiver successfully flashed with firmware (except testing image) would display screen as shown below:

For device activation user must supply unique activation key. To obtain activation key e code from seen on device screen to: malahit_sdr@rambler.ru . Once activation code re

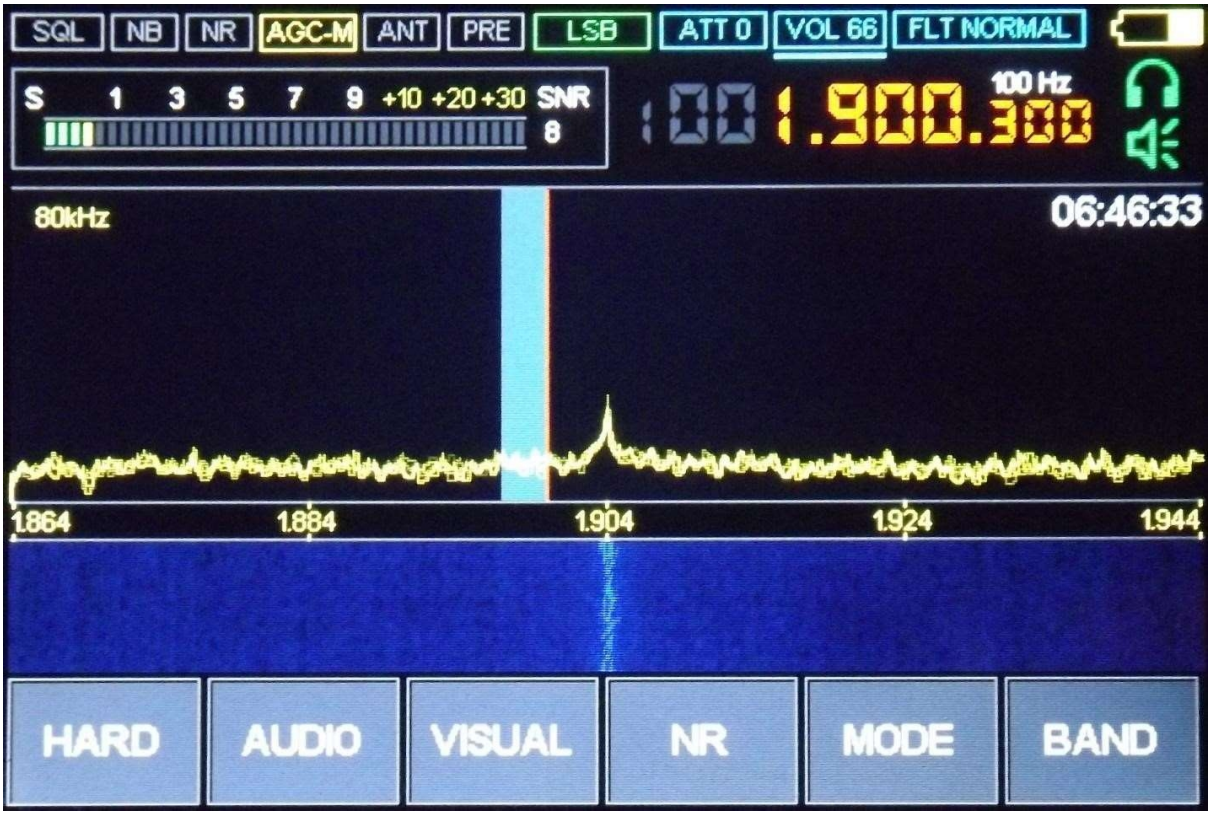
it with volume rotary knob (top knob), use rotary function for char selection and button advancing next, use frequency knob(bottom knob) to enter activation code. Activation require for future upgrades.

6 USER INTERFACE.

Screenshots below are for reference, type model of receivers and future software upda add/remove/expand some functionality but in general, interface should look and feel th information display logic is built taking into account the fact that the "Enabled" state co green or yellow, the "Off" state - red or gray.

6.1 MAIN DISPLAY AND MENUS

Main display should look like attached below:



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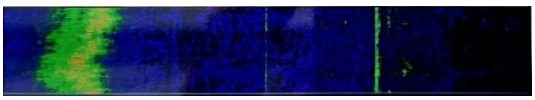
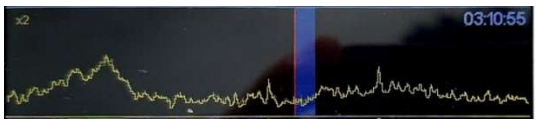
INDICATORS					
FLT NORMAL	VOL 66	ATT 0	LSB	PRE	ANT
DESCRIPTION					
Filter type selected	Volume level	Attenuator value	Modulation type	HF preamplifier status: 'Green' – active 'Gray' - Off	Antenna status: 'auxiliary board' 'Green' – Hi-Z 'Gray' - 50Ω
AGC-M	NR	NB	SQL	100 Hz	SNR 8
AGC status: "Yellow" – Active "Gray" – Off	Adaptive squelch status: "Green" – active "Gray" – Off	Noise Blanker status: "Red" – Active "Gray" – Off	Threshold squelch status: "Red" – Active "Gray" – Off	Current frequency step size	SNR value
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				
Button to recall memory settings for selected frequency band	Current time	Battery charge indicator	Audio output selected: -Headphones -Speaker -Both	Signal level, screen touch -> enters/exits 'HARD' menu	Current frequency, screen touch -> enters frequency editing mode

	
Waterfall indicator	Spectrum plot
	
Frequency scale	Decoder workload
	Saving to memory indicator. Indicator shows up when current settings are different from the one in memory. “yellow” – saving current settings to memory “Green” – settings save complete, hiding indicator automatically.

6.2 HARD Menu

Click “HARD” button on the touchscreen to enter “HARD” menu. Hard-menu sub item a touchscreen, value change by “Volume” rotary knob. “HARD” menu can exited at any t by clicking “HARD” button or ether “Volume” or “Frequency” knobs.

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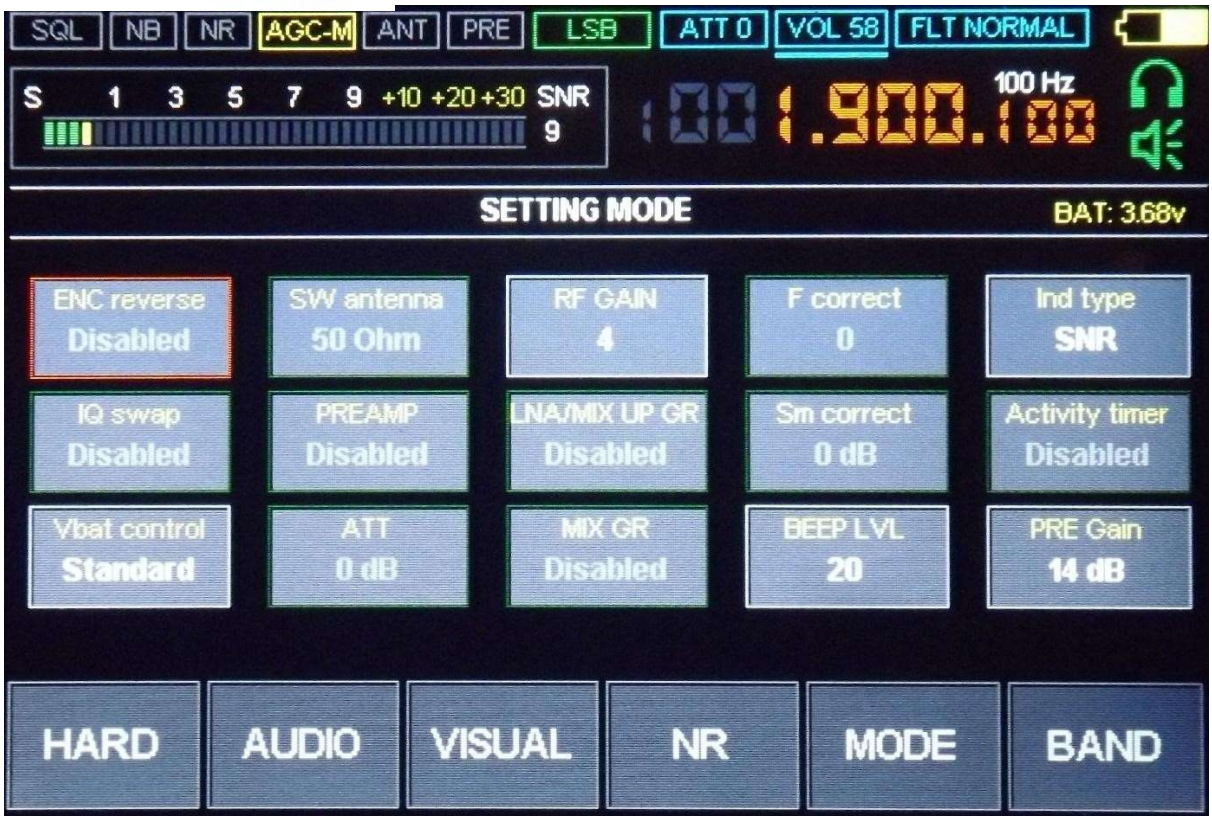
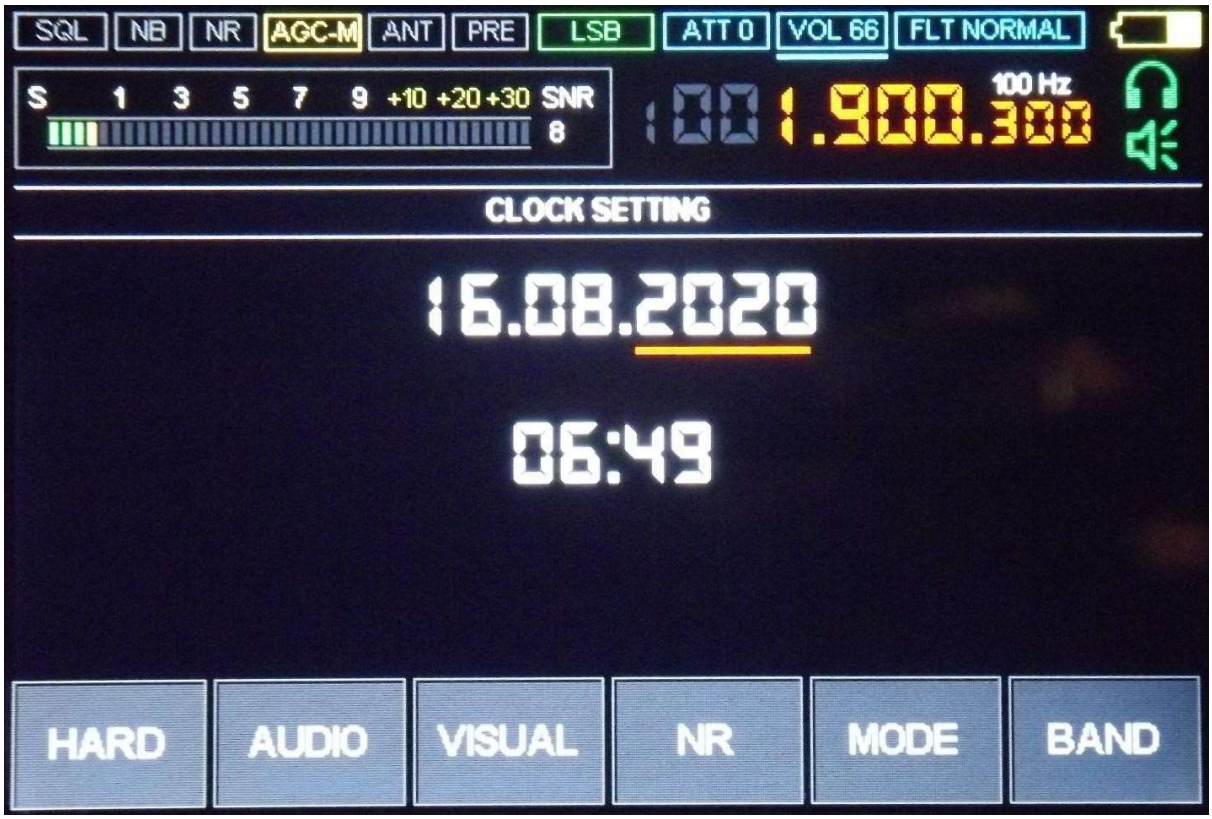


6.3 CLOCK Menu: "CLOCK SETUP



"CLOCK" menu requires for time keeping. To access this menu press and hold "HARD" until "CLOCK" menu activates. To set date and time use "Volume" rotary knob for valu button for advancing to next. To apply current date and time press and hold "Volume" button until audio signal, exit from menu – by pressing "HARD" menu.

6.4 VISUAL Menu

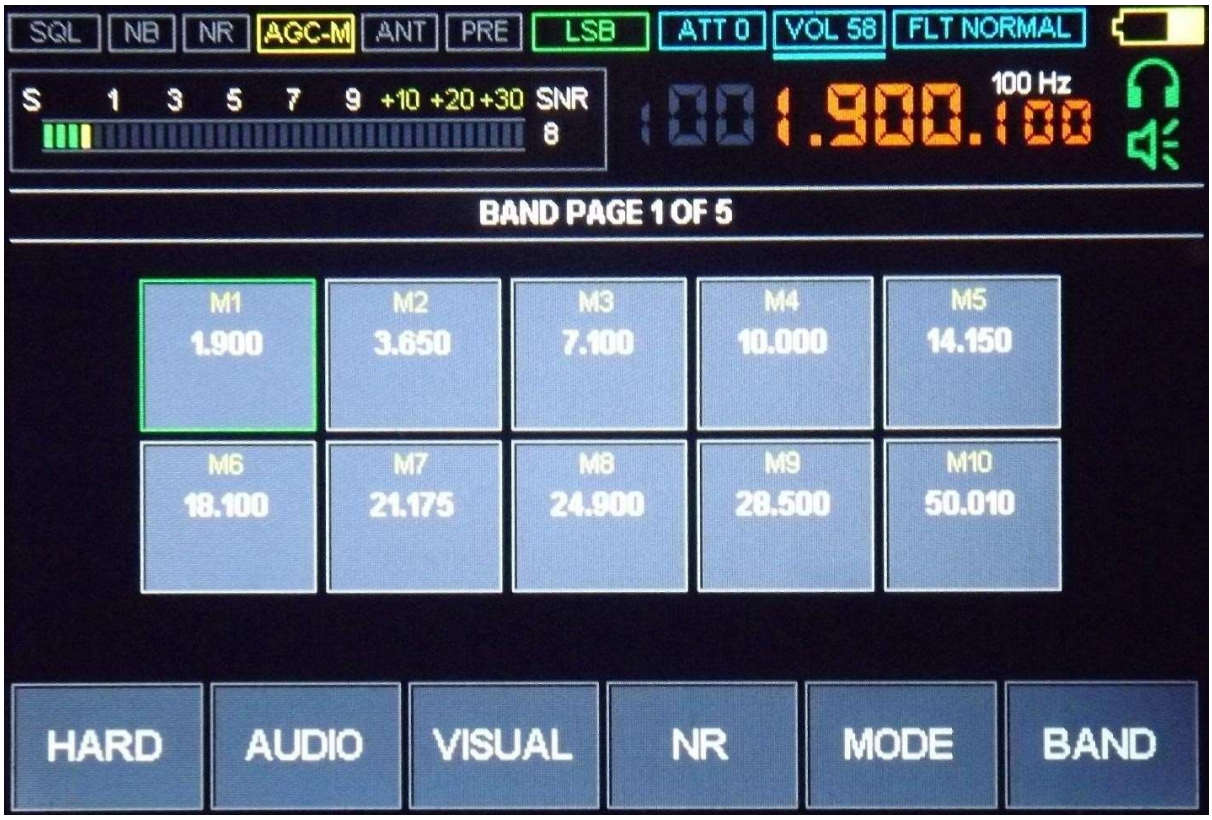
Click “VISUAL” button on the touchscreen to enter “VISUAL” menu. The settings in this
used to change the settings for information display and display operation. Exit from me
clicking “VISUAL” button or “Volume” knob.

6.5 AUDIO Menu

Menu to select digital signal processing applied to audio output.

Exit from menu by clicking “MENU” button or “Volume” knob.

6.6 BAND Menu



This menu recalls memory settings for given BAND or saves current frequency to speci location.

Menu navigation done with “Frequency” rotary knob.

Exit from menu by clicking “BAND” button or “Volume” knob.

6.7 MODE Menu

This menu selects modulation type and decoder activation.

Exit from menu by clicking “MODE” button or “Volume” knob.

7 MAIN FUNCTIONS AND COMMON USE

7.1 RESET TO DEFAULT

This function reset current user settings to factory defaults. To activate this function – c
menus, and on device displaying main screen, press and hold both “Volume” and “Freq
until audio signal. All user settings, current and in memory locations will be lost.

7.2 CONTROL KNOB’s REVERSING

This function allows changing encoder increments direction from CW to CCW. To activa
knobs reverse mode, enter “HARD” menu and activate “EN1 reverse” for “Frequency”
reverse” for “Volume”. Clicking on given button enable/disable knob’s reverse mode.

7.3 BATTERY MONITOR MODES

This function turns radio receiver off if battery voltage drops below 3.3V. Function impl
extend battery life and to avoid complete battery discharge.
To enable this function, enter “HARD” menu and select “Vbat control”:

- Standard – function activated, cut off set to 3.3V
- Low – function disabled, device would run battery down as low as 2.7V

For Malachite-DSP2, the cut-off voltage is controlled by hardware and is automatically c
the voltage reaches 3.1V.

7.4 ANTENNA TYPE SELECTION

This function works only at frequencies up to 50MHz. In Malachite-DSP1, the function w
there is an additional board in the receiver. To select the type of antenna input, go to t
menu, click on the "SW antenna" parameter.- Hi-Z – high impedance input, for short tel
antennas
- 50 Ω- 50Ω impedance input, recommended for use with long antennas with ~50Ω wav

7.5 BUILT-IN HF PREAMP CONTROL

This function enables/disables built-in preamplifier. To enable, activate “HARD” menu a
“PREAMP”:

- Enabled
- Disabled

7.6 ATTENUATOR CONTROL

This function only applies to units with auxiliary board installed. To change attenuator s
“HARD” menu select “ATT” option, using “VOLUME” rotary knob select attenuator dB v
to 30dB (maximum attenuation) in 1 dB increments.

7.7 GAIN CONTROL

Receiver’s front end IC allows gain control for signal mixers and UHF.

For gain, control enter “HARD” menu and adjust the following:

- “RF GAIN” – gain factor for wideband mixer;
- “LNA/MIX UP GR” – attenuation control (On/Off), applies to built-in preamplifier in mode and 1st mixer in SB-mode;
- “MIX GR” – attenuation control (On/Off), applies to built-in preamplifier in mode and 2nd mixer in SB-Mode;

Use “VOLUME” rotary knob for menu navigation and push button for activation.

LNA/MIX UP GR and MIX GR options:

- Enabled - attenuator enabled;
- Disabled - attenuator disabled;

Recommendations:

1) LNA/MIX UP GR и MIX GR options are signal attenuators and are for use with long antennas, or for overloaded reception – overlapping stations.
2) No recommended to set RF GAIN over 40dB working with short telescopic antenna over 20 dB with long antennas.

This function only applies to receivers with auxiliary board installed. To change attenua
enter “HARD” menu select “ATT” option, using “VOLUME” rotary knob select desired va

7.8 FREQUENCY DISPLAY ERROR CORRECTION

This function provide display error correction.

To set display correction enter “HARD” menu select “F correct” option, using “VOLUME
set proper value.

7.9 AUDIO OUTPUT SELECT

This function sets audio output device type: headphones, built-in speaker or both.

Output selection done by clicking on au tor located on main screen. Another way to
select is to go to the HARD menu and by pressing the Audio out button select the desir
audio output.

7.10 NOISE BLANKER (NB)

This function performs wide-band attenuation. Function settings are under “AUDIO” me
grouped under “NB” option:

- Threshold – to remove/reduce interference adjust manually with “VOLUME” con
values below 3 not recommended;
- Config – NB configuration, controls manually with “VOLUME” to remove/redu
interference;
- NB – enable/disable NB, sets experimentally based on audio feedback.
-

7.11 AGC

This function maintains optimal audio output level. Settings located under “AUDIO” me
grouped in “AGC” block:

- AGC LIM – maximum output level;

- AGC GAIN – AGC gain;
- MANUAL GAIN – manual control, available when AGC is off;
- AGC MODE – AGC response mode;

AGC MODE options:

- FAST – short time integral(response time);
- MIDDLE – medium time integral;
- SLOW – long time integral;
- LONG – extra-long time integral;
- OFF – AGC – off;

To change AGC settings enter “AUDIO” menu select required parameter and set with “V control.

When AGC disabled, AGC GAIN parameter replaced with MANUAL GAIN. AGC functionali supported for WFM.

7.12 EQUALIZER

This option enables/disables equalizer display. Use “VOLUME” control in “AUDIO” menu TYPE” option:

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

7.13 WFM STEREO MODE

This receiver supports stereo reception in FM-mode. To enable stereo enter “AUDIO” m toggle “WFM stereo” button. “WFM stereo” has 2 options – Enable/Disable.

Stereo supported with strong signal and on headphones or headphones with speaker or ST” indicates stereo reception.

7.14 ADAPTIVE SQUELCH

For improved reception and selectivity, receiver equipped with adaptive squelch functio function employs various band-pass filtering algorisms:

- Span >1 kHz “speech” –optimized filter
- Span ≤1 kHz “tone” – optimized filter

Algorithms selection done automatically based on span value.

Noise cancelling level for voice can be set manually. To enable/disable noise cancelling button. To set voice cancelling level enter “AUDIO” select “Threshold” under “NR” gro “VOLUME” control to set desired value. “Threshold” settings do not apply to spans ≤1k

7.15 THRESHOLD SQUELCH

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

To enable “Threshold squelch” enter “AUDIO” menu select “SQL” option with “VOLUME “SQL” options:

- Enabled;
- Disabled;

To setup threshold level navigate to “AUDIO” menu select “Threshold” option and set v “VOLUME” control.

To setup threshold for speech-type signal set “Threshold” option under “NR” menu.

7.16 BACKLIGHT CONTROL

This function sets LCD display backlight intensity:

- Backlight level – min/max;
- Timeout, switching from current to minimum backlight level;
- Timeout, turning backlight off;

To edit backlight settings enter “VISUAL” menu, using “VOLUME” control select “BRIGH set maximum brightness, select “BRIGHT MIN” for minimum (battery saving mode).

To edit timeout settings enter “VISUAL” menu, using “VOLUME” control select “REDUCT group, navigate to “SLEEP TIME” to set timeout for entering into battery saving mode a SLEEP” to set timeout for turning display off, “LCD SLEEP” option must be enabled.

7.17 SETTING SPECTRUM RATE

This function changes spectrum update rate on main display. To edit rate enter “VISUA
select “FFT ave” using “VOLUME” control set desired value for update rate, higher valu
corresponds to slower rate.

7.18 SETTING SPECTRUM RANGE

This function changes spectrum’s SNR amplitude scale. To edit scale enter “VISUAL” m
“FFT scale” using “VOLUME” control set desired SNR scale value (dB), lower value for g
but more noise.

7.19 SETTING SPECTRUM COLOR

This function changes color table for spectrum display. To edit color table enter “VISUA
select “FFT color” and using “VOLUME” control set colors to desired values.

7.20 SETTING SPECRUM AND WATERFALL RATIO

This function changes spectrum vs waterfall displays scale ratio. To change scale ratio
“VISUAL” menu select “Pan percent” and using “VOLUME” control set desired scale val
(%).

7.21 SETTING WATERFALL RATE

This function changes waterfall fill rate. To change fill rate enter “VISUAL” menu select
and using “VOLUME” control set desired fill rate, lower value for faster fill.

7.22 SETTING WATERFALL HIGHLIGHT

This function changes waterfall brightness to signal level ratio. To change highlight rat
“VISUAL” menu select “WTF Gain” and using “VOLUME” control set desired highlight ra
value for less highlight.

7.23SETTING SPECTRUM SCALE AND TYPE

This function changes spectrum's span. Spectrum types supported in WFM mode. Curre
scale displayed in left spectrum's corner. Higher scale value correspond to narrow spar
detail. For SSB, CW, DSB, AM, NFM modulations supported options are: 1, 2, 4. For WFM
options: 1 and MPX, where MPX – mixed signal spectrum. To change spectrum span or
desired spectrum area.

7.24 CLOCK SETUP

Check section 5 for details.

7.25 SAVING TO DEVICE FLASH, READING FROM FLASH

This function let user save current settings into device flash or recall settings from flash
To select memory location enter "BAND" menu navigate to desired memory cell and se
clicking. Using "FREQUENCY" control, you can advance back and force navigation. To s
settings (active) select desired cell press and hold button until audio signal or selected
highlights with red boarder.

7.26 CW DECODER

This function decodes and displays baudot signal on main screen
To enable baudot decoder enter "MODE" menu select "Decoder" and activate it. "CW"
the decoder button would signal activation. For correct operation user must set "Min SN
corresponding group using "VOLUME" control set optimal value and save. "Min SNR" se
threshold for decoder's start trigger, setting too low or too high would fail decoding.
Optimal value for "Min SNR" based on the following:
- Decoder activity indicator should be off if there is no incoming baudot transmission;
- Decoder activity indicator "heart-beat" should be synced with incoming baudot transm
Decoded signal displays as text on main screen, clicking on "S-meter" display – clears t

7.27 SETTING TUNING STEP RESOLUTION

This function changes tuning step size resolution. To change tuning step press “FREQU and using rotary encoder step up or down to desired step size, step size displays in whi frequency display. Selecting done by clicking “FREQUENCY” knob push button. Tuning s paired with modulation type, i.e. each mode’s step can be unique (stored in memory).

7.28 HF PREAMPLIFIER GAIN COMPENSATION IN S-METER MODE

This function changes gain coefficient for HF preamplifier in S-meter mode. To set HF p gain coefficient enter “HARD” menu select “PRE Gain” and using “VOLUME” control set preamplifier, setting gain value to “zero” bypasses gain compensation (default value: 1

7.29 TONE SIGNAL VOLUME CONTROL

This function changes audio tone volume. To change audio tone volume enter “HARD” “BEEP LVL” and using “VOLUME” control set desired level.

7.30CHANGING S-METER SCALE DISPLAY

This function changes S-meter display scale. To change scale enter “HARD” menu selec and using “VOLUME” control set desired value, SNR value corresponds to signal to nois in dBm.

7.31 S-METER CORRECTIONS

This function changes correction factor for S-meter. To change S-meter correction facto “HARD” menu and select “Sm correct” and using “VOLUME” control set to desired valu setup, provide signal with known precision level to receiver input and with “VOLUME” c correction value to match signal level, S-meter scale must be in dBm.

7.32 IDLE TIMER

This function sets timeout for user inactivity, once expired device turns itself off. To ena function enter “HARD” menu select “Activity timer” and using “VOLUME” control set tir parameter in minutes, “zero” disables function

7.33 SPECTRUM FILL

This function changes spectrum fill type, two options available:

- Line-only, no-fill;
- Line and fill;

To select fill type enter “VISUAL” menu select “FFT fill” and toggle between “Disabled” “Enabled”, no-fill/ fill respectively.

7.34 DC OFFSET COMPENSATION

This function enables DC-offset compensation for receiver front-end DAC. To enable DC compensation enter “VISUAL” menu select “DC reject” and using “VOLUME” control sel to subtract. This function requires for proper full-scale utilization of DAC. Real-time DC- displayed at 0Hz on spectrum graph, DC-value from FFT calculation. DC-offset compens not affect receiver reception.

DC-offset value sets from optimal spectrum looks, value should be in range from zero u DC value on spectrum (with offset at “zero”), setting higher values excessively trims lo frequencies on displayed spectrum.

7.35 DISABLING SPECTRUM AND WATERFALL

This function disables spectrum and waterfall display to reduce interference. When spe waterfall display disabled LCD displays updates only when there is a change of GUI, thu interference from high frequency switching associated with image rendering.

To disable spectrum and waterfall display enter “VISUAL” menu select “View Pan&Wtf” Enable/Disable. Enabled – spectrum and waterfall enabled; Disabled- spectrum and wat disabled; this function also changes S-meter display, updates on settings change only.

7.36 BANDPASS FILTER SETTINGS

This function sets bandpass filter and filter parameters. There are three predefined spa filters:

- Narrow;
- Normal;
- Wide;

This function sets by clicking “VOLUME” control’s push button and selecting “FLT” optic
rotary encoder (“VOLUME”) to select desired filter. Function also sets from “AUDIO” me
“Filter” option using “VOLUME” control.
Span value and frequency cutoff values edited over “AUDIO” menu under “Low freq” a
freq” respectfully for each filter with “VOLUME” control.
In CW-mode same three filters parameters are as different:

- Pitch – center frequency (mean(f1, f2));
- Width -pass band;

To set CW-mode filter parameters enter “AUDIO” menu select “Pitch” or “Width” optio
“VOLUME” control set desired value.

7.37 SELECTING MODE AND DETECTION TYPES

Receiver supports the following modulation types:

- SSB(USB/LSB);
- CW telegraph manipulation in USB and LSB;
- DSB;
- NFM;
- WFM;

To select SSB type, enter “MODE” menu select “USB” or “LSB” and set desired type.
To select CW type, enter “MODE” menu select “CW” option and using “USB” or “LSB” s
type.
To select DSB type, enter “MODE” menu select “DSB” option and using “USB” or “LSB”
type.
To select AM type, enter “MODE” select “AM” option and using “MAG” (classic amplitud
“SAM” (synchronized amplitude detector), “SAMU” (synchronized amplitude detector w

side band) or "SAML" (synchronized amplitude detector with lower side band) select detector type. To select demodulator type, enter “MODE” menu select “AM det”.

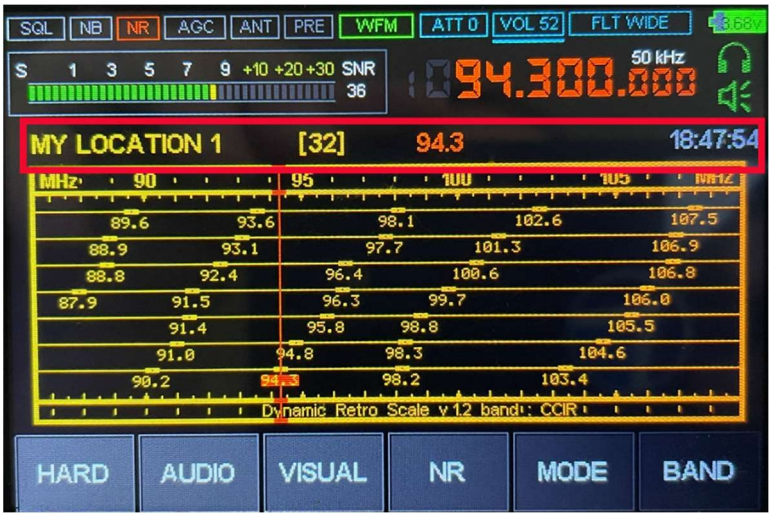
To select NFM type, enter “MODE” menu click on NFM type.

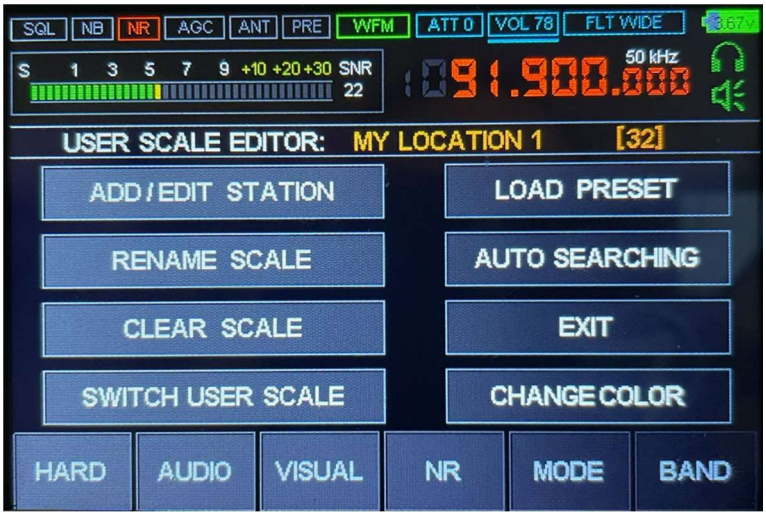
To select WFM type, enter “MODE” menu click on WFM type.

7.38 VINTAGE RETRO SCALE

Receiver comes with custom retro interface for WFM-mode, a reminder from old days o tubes/transistors radios from the past. Retro scales supported for FM mode only. Note: only activates if current frequency is within localized FM-range, European (87.5-108 MH (75.1-94.9MHz).

To activate vintage retro scale to main screen, click and hold in display center above m until retro scale shows up.





Retro scale interface features:

Retro style display:

Add radio stations with custom names, user editable:

Customize scale color:

Recall stations from memory;

Edit, save and load custom lists, two user customizable lists;

Station’s auto search;

To enter retro scale editing mode, click in the middle of the screen and frequency displ

Retro scale menu has the following options:

ADD/EDIT STATION - add new station to the list, edit new name, remove from list; Once menu items let user: adjust frequency, both ways; enter custom name using “VOLUME chars, cannot go back to frequency tuning from here(only save and edit, or delete and save new name and exit upon clicking “SAVE AND EXIT”; save station and continue sea upon clicking “SAVE AND CONTINUE”; delete station – “DELETE STATION”; exit current menu – “CANCEL”; adding stations without manually typing, just tune up and add by cl “SAVE AND CONTINUE” or “SAVE AND EXIT”; if search complete, in both cases station’ abbreviated as number and MHz, i.e.”87.5” for 87.5MHz, makes it’s simple and easy to identify/search(alternative to mode described in 7.40);

RENAME SCALE - enter/edit current scale name, associated with loaded station list; On new menu items let user: enter or edit scale name using “FREQUENCY” encoder for cha clear entered scale name – “CLEAR NAME”;

CLEAR SCALE - delete retro scale data from memory; Clicking on this button o warning message with two buttons “CLEAR” and “CANCEL”; “CLEAR” button erases ret from memory and returns to retro scale top menu, setting current scale with “empty” n default station name as “MY LOCATION” 1 or 2 based on origin ; “CANCEL” button retu retro scale top menu, data preserved;

SWITCH USER SCALE - to switch between 2 user lists; clicking this button switches fro list to another; This function can be useful to quickly change one radio stations list to a “home-office”, “home-travel…);

LOAD PRESET - to load desirable preset; Clicking this button opens up warning that c retro scale data will be lost and replaced with one from memory;

CHANGE COLOR - to select scale color; each of custom stations lists can be colored ind Clicking this button opens new menu items: Color box, Cancel button, SAVE COLOR AN Select desired color and “SAVE COLOR AND EXIT”; CANCEL to return to retro scale top custom color saved;

CANCEL - to exit retro scale menu to receiver top menu;

AUTOSEARCHING- to automatically search and save radio stations. Check for function d 7.40;

While in retro scale mode, user can advance tuner frequency by 50 kHz or jump from s To jump from one station to next use “FREQUENCY” encoder until text “NEXT” appears step size.

7.39 FM-STATIONS SCAN MODE

This function performs radio stations scan in FM mode. To initiate scan mode, enter vin scale menu select “AUTO SEARCHING” -> pressing this button starts retro scale menu.

When the auto search is finished, a new window will open containing the buttons:

- CANCEL AND EXIT - to cancel the autosearch results and exit to the retro scale menu;
- SAVE SCALE & EXIT - to save the results of autosearch and exit to the retro scale men

Only FM-stations with strong signal for stereo decoding appended to the list by auto se function. For the auto search to work, you must turn on the headphones as an audio o the WFM stereo parameter in the AUDIO menu.

In areas with poor reception, use option ‘ADD/EDIT STATION’ p.7.39.1, and use manual tuning for selecting and adding station to the list with ‘SAVE SND CONTINUE’ button an with auto search. New station appended to the list with new name based on frequency ‘MHz’ abbreviation. Adding and deleting stations from the list, done after search compl saved. Both auto search and manual are equally effective and easy to use, no real adv versus another.

7.40 SETTING FREQUENCY MANUALLY

Radio receiver allows setting frequency manually.

To set desired frequency:

- Tap on frequency’s digital display, top right corner;
- Enter desired value in Hz, kHz or MHz;

To exit frequency-editing menu, tap on frequency’s digital display again.

7.41 Auto NOTCH FILTER

This function allows you to remove an interfering tone-type signal from the received sig
function can only be used when receiving in USB, LSB mode. To enable the function, go
AUDIO menu and press the ANF button.

7.42 Pseudostereo

This function allows you to create a surround sound effect. The use of this function is p
using all types of modulation, except for WFM, and only when listening to headphones.

7.43 Function PGA BST

This function allows you to create a surround sound effect. The use of this function is p
using all types of modulation, except for WFM, and only when listening to headphones.

7.44 Changing frequency of display

This function is available only in Malachite-DSP2, is experimental and affects only the fr
the display in WFM mode. To work with this function, you need to remove the rear cove
receiver and set switch 3 on the DIP SWITCH on the printed circuit board to position:
- OFF - for reduced frequency;
- ON - for increased frequency.

7.44 Management of users equipment

This function is currently only available in Malachite-DSP1, it allows you to control addit
equipment (for example, a Bluetooth module) using a logic discrete signal. A logic sign
generated on pin number 8 of the connector (in accordance with the diagram in section
for connecting an additional board. Logic 0 corresponds to voltage 0V, logical 1 corresp
voltage 3.3V.
To control logic signals, go to the HARD menu and press the User funct button. Enabled
corresponds to logical 1, Disabled state corresponds to logical 0.

8 SOFTWARE UPDATE

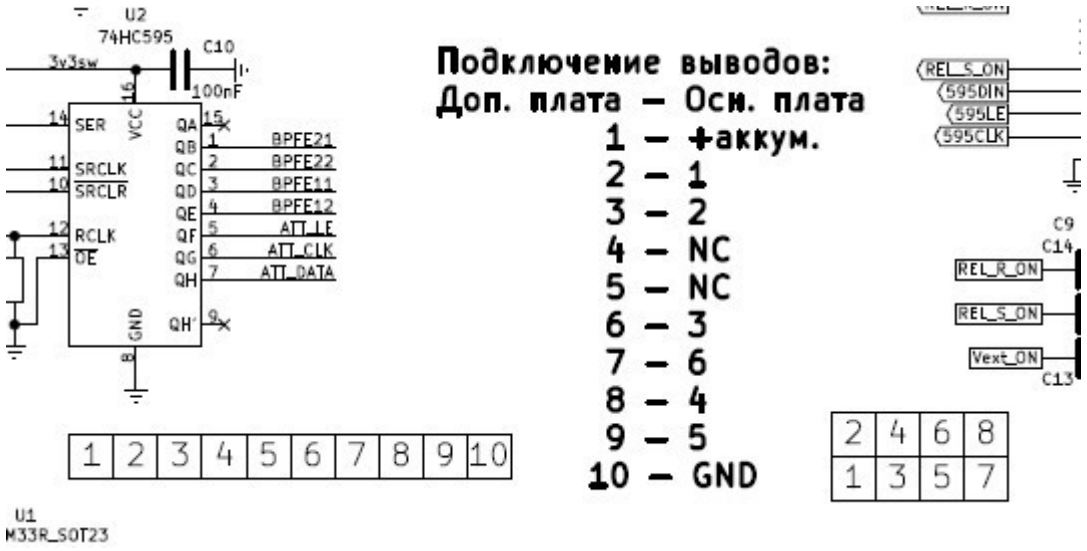
The firmware of the receivers is carried out in accordance with the video instructions:

- for Malachite-DSP1 - https://www.youtube.com/watch?v=4SF-XynJvMs
- for Malachite-DSP2 - https://www.youtube.com/watch?v=3RMuSRu4kuA

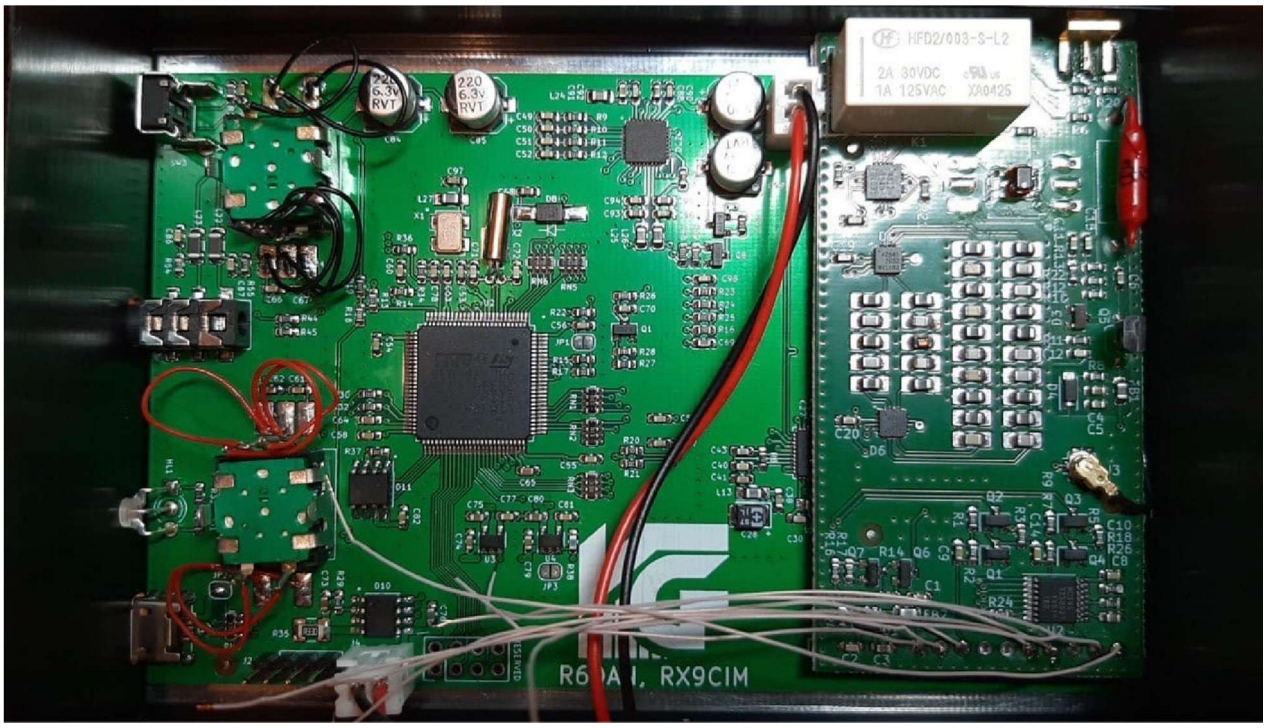
9 ACCESSORY BOARD INSTALLATION

This section is relevant only for Malachite-DSP1.

Accessory board pinout and description:



Pin designation follows the PCB placement inside radio receiver enclosure, check pictur



Board power supply can be provided from battery directly or from pcb's power pl
example power, can be sourced from capacitor C76 located close to battery connector
side is ground ('GND'), bottom is positive ('+').

10 MEASURED RADIO RECEIVER SENSITIVITY

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

	RF GAIN=20	RF PRE=EN	RF GAIN=0, PRE=EN	RF GAIN=10, PRE=EN	RF GAIN=20, PRE=EN	frequency	GAIN=0
100000	-97	-96	-92	-92	-94		
1000000	-109	-111	-121	-120	-120	5000000	-109
-114	-121	-127	-128	10000000	-110		
-123	-125	-125	15000000	-115	-121	-121	-121
-121	20000000	-117	-121	-123	-125	-12	
30000000	-111	-113	-115	-116	-117	50000000	-115
-112	-109	-107	-115	70000000	-12		
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 20000000 -120 -121 -127 -128 -127 24000000 -108 -117 -117 -114

410000000 -106 -109 -109 -109 -109

43000000 -116 -116 -118 -118 -117 44000000 -117 -114 -115 -116 -115

50000000 -96,5 -108 -111 -114 -112 60000000 -117 -119 -124 -126 -124 80000000 -114 -121 -123 -126 -122

110000000 -98 -105 -109 -113 -111 120000000 -103 -106 -110 -112 -112

150000000 -108 -114 -113 -116 -117

19000000 -101 -106 -98 -103 -104

With Regards,
team MALAHITEAM.