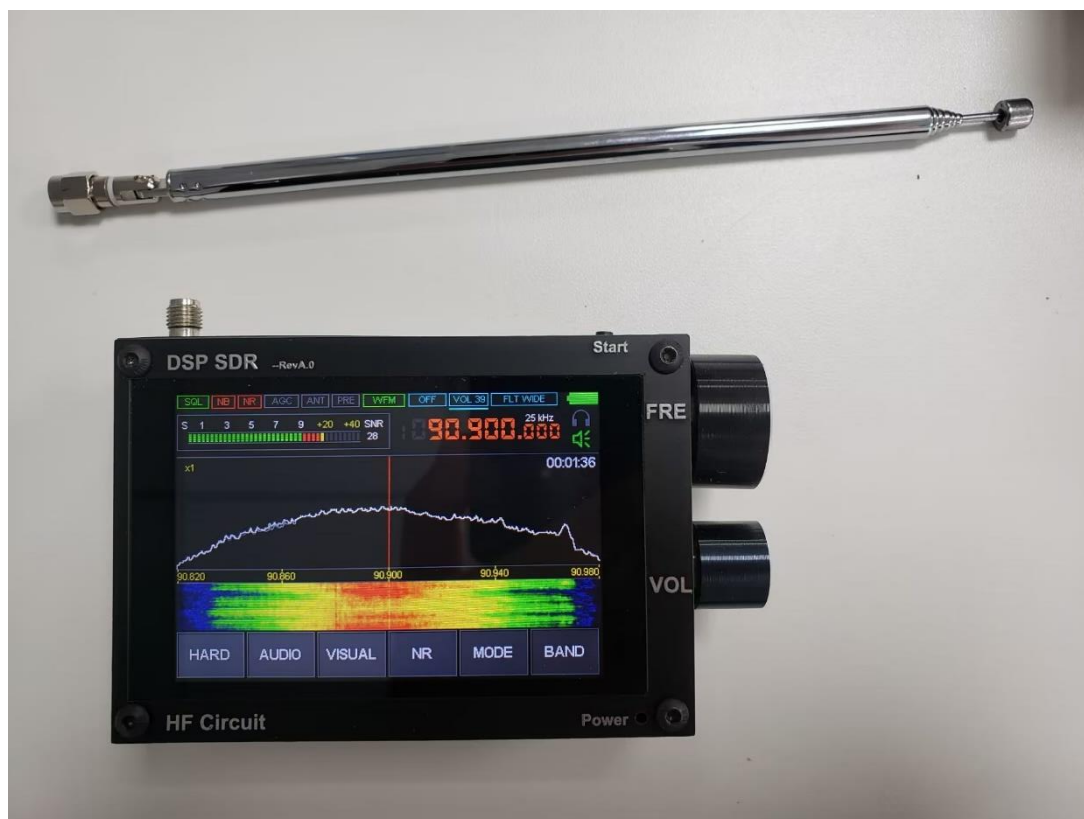


无线电接收机

«MALAHIT-DSP»



1. GENERAL INFORMATION

“MALAHITEAM-DSP” radio receiver built as SDR-type and its functionality defined by uploaded software. This manual is common for all models of radios of the Malachite family, the differences 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, equalizer;

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: Li-Ion cell(at least 3000mAh) and/ USB C(USB charging supported);

9) Power consumption: 300mA with standard headphones;

10) Radio receiver has SMA connector for use with external antennas or telescopic antennas with SMA.

To improve SB mode reception for model Malahit-DSP1 an additional board is available, sold 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 4500kHz

Installs directly into existing housing, no modifications required.

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

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)

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



Software and USB driver available to download from the web. Check the following link:

<https://drive.google.com/drive/u/1/folders/1WiQdee4R8XBenx-E7PT3dPy4iDjbuofR>

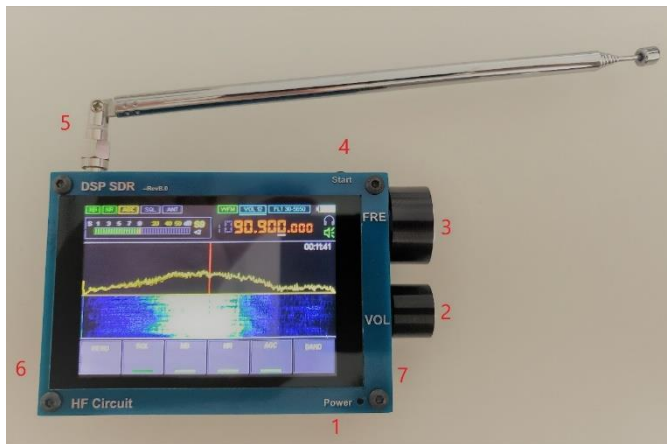
Warning! Due to the fire hazard presented by lithium batteries...

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 the same.



Front panel controls:

1 Disconnect the internal battery connection

2 Rotary knob with push button

3 Rotary knob with push button

4 Power button

5 SMA Antenna connector

6 3.5mm audio plug

7 USB C

3 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 allows you to turn on the receiver only if the power button is pressed at least three times within an interval of 5 seconds. To enable this function, you must:

- for Malachite-DSP1: it is necessary to remove the rear cover of the radio receiver and connect pin 7 of the connector (in accordance with the diagram in section 9), intended for connecting an 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 ON on the DIP SWITCH on the printed circuit board.

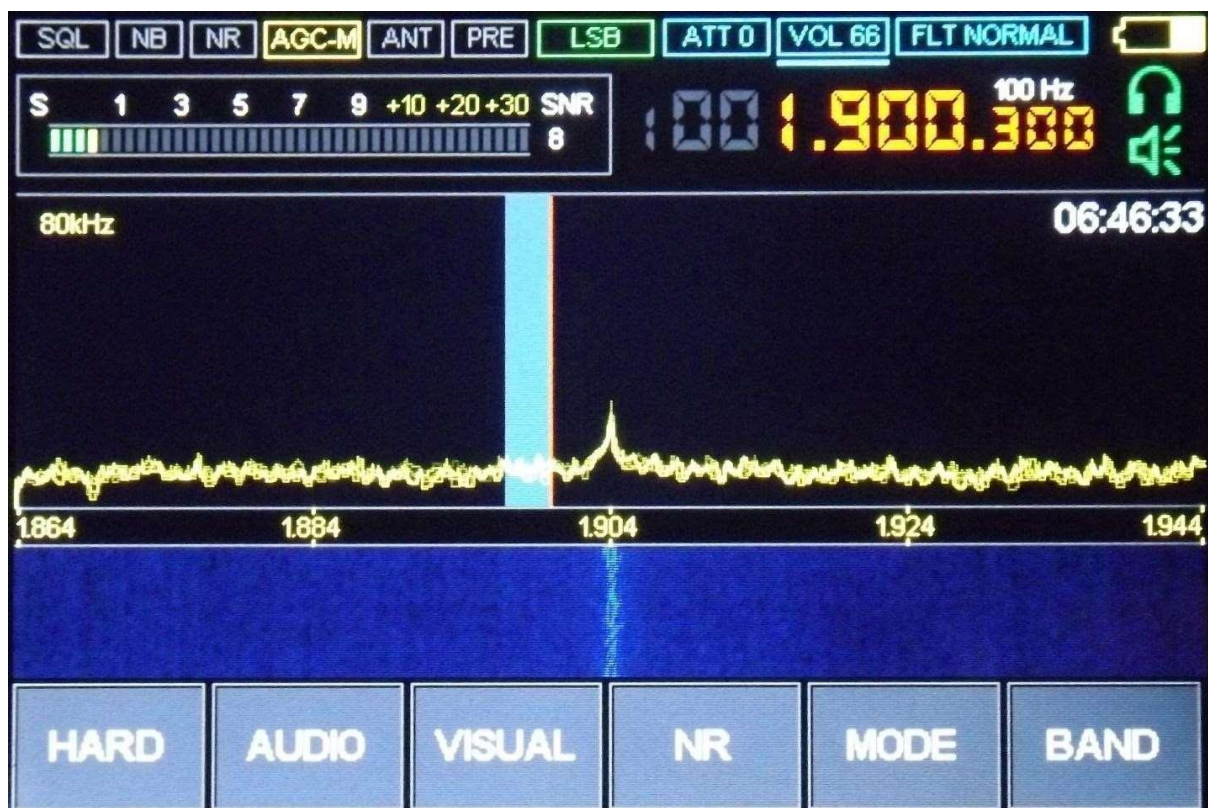
Switching off is carried out by long pressing the power control button until the display goes out and a sound signal appears (message "73" transmitted by Morse code). After the sound signal appears and the button is released, the receiver will turn off.

4 USER INTERFACE.

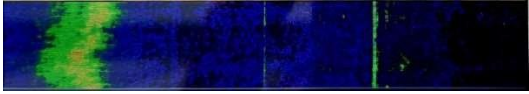
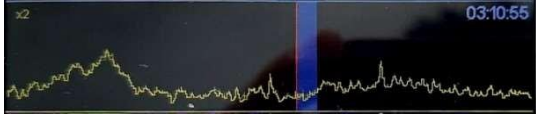
Screenshots below are for reference, type model of receivers and future software updates might add/remove/expand some functionality but in general, interface should look and feel the same. The information display logic is built taking into account the fact that the "Enabled" state corresponds to green or yellow, the "Off" state - red or gray. 以下屏幕截图仅供参考，接收器的类型型号和未来的软件更新可能添加/删除/扩展一些功能，但总的来说，界面应该看起来和感觉一样。这信息显示逻辑的构建考虑到“启用”状态对应于绿色或黄色，“关闭”状态 - 红色或灰色。

6.1 MAIN DISPLAY AND MENUS

Main display should look like attached below主显示应如下图所示:



INDICATORS指标					
FLT NORMAL	VOL 66	ATT 0	LSB	PRE	ANT
DESCRIPTION描述					
选择的过滤器类型	音量级别	衰减器数值	调制类型	高频前置放大器状态: 'Green' – 启用 'Gray' – 关闭	天线状态: '补充板 绿色 – Hi-Z 灰色 – 50Ω
AGC-M	NR	NB	SQL	100 Hz	SNR 8
AGC 状态: “黄色” – 启用“灰色” – 关闭	自适应静噪地位: “绿色” – 启用 “灰色” – 关闭	消音器状态: “红色” – 启用 “灰色” – 关闭	临界点静噪地位: “红色” – 启用 “灰色” – 关闭	当前频率步长	信噪比
80 kHz	HARD	AUDIO	VISUAL	NR	MODE
频谱跨度	HARD 菜单按钮, 触摸屏	AUDIO 菜单按钮, 触摸屏	VISUAL 菜单按钮, 触摸屏	自适应静噪开/关按钮, 触摸屏	Mode 菜单按钮, 触摸屏
BAND	06:46:33				
在选定波段中跳出 存储的频率	当前时间	Battery charge indicator	音频输出选择: -Headphones -Speaker -Both	信号电平, 屏幕 触摸 -> 进入/退出 “HARD”菜单	当前的 频率, 屏幕触摸 -> 进入 频率 编辑 模式

	
瀑布图	频谱图
	
频率刻度	解码器工作
	保存到内存指示器。当前用户时显示指示器设置与内存中的不同。 “黄色” – 将当前设置保存到内存 “绿色”——设置保存完成，自动隐藏指示器。

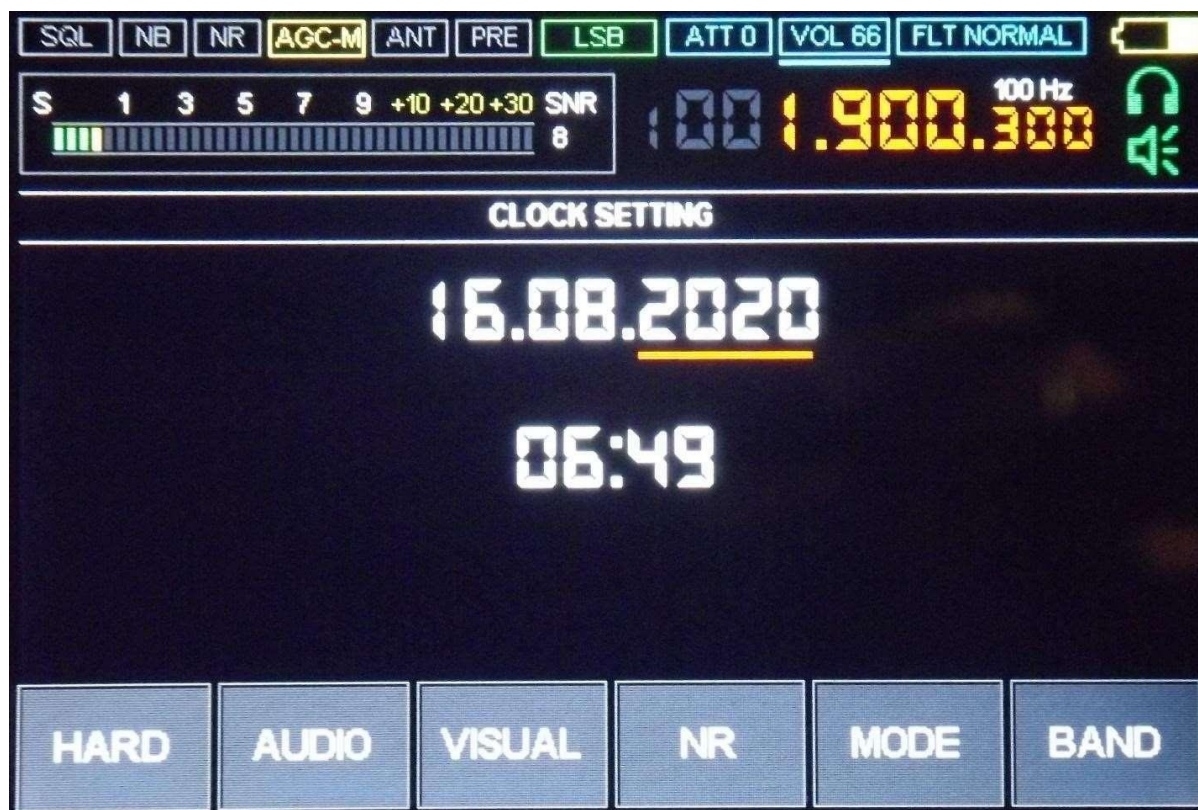
6.2 HARD Menu

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

点击触摸屏上的“HARD”按钮进入“HARD”菜单。HARD菜单子项激活触摸屏，通过“VOLUME”旋钮改变数值。“HARD”菜单可以随时通过单击“HARD”按钮或“Volume”或“Frequency”旋钮退出。



6.3 时钟菜单。时钟设置



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

"CLOCK" 菜单需要计时。要访问此菜单，请按住 "HARD" 菜单按钮直到 "CLOCK" 菜单激活。要设置日期和时间，请使用 "VOLUME" 旋钮设置数值并按下按钮前进到下一个。要应用当前日期和时间，请按住 "VOLUME" 旋钮按钮直到听到滴声，退出菜单 - 按 "HARD" 菜单

6.4 VISUAL 菜单



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

点击触摸屏上的 "VISUAL" 按钮进入 "VISUAL" 菜单。此菜单中的设置是用于更改信息显示和显示操作的设置。从菜单退出单击 "VISUAL" 按钮或 "VOLUME" 旋钮。

6.5 AUDIO Menu

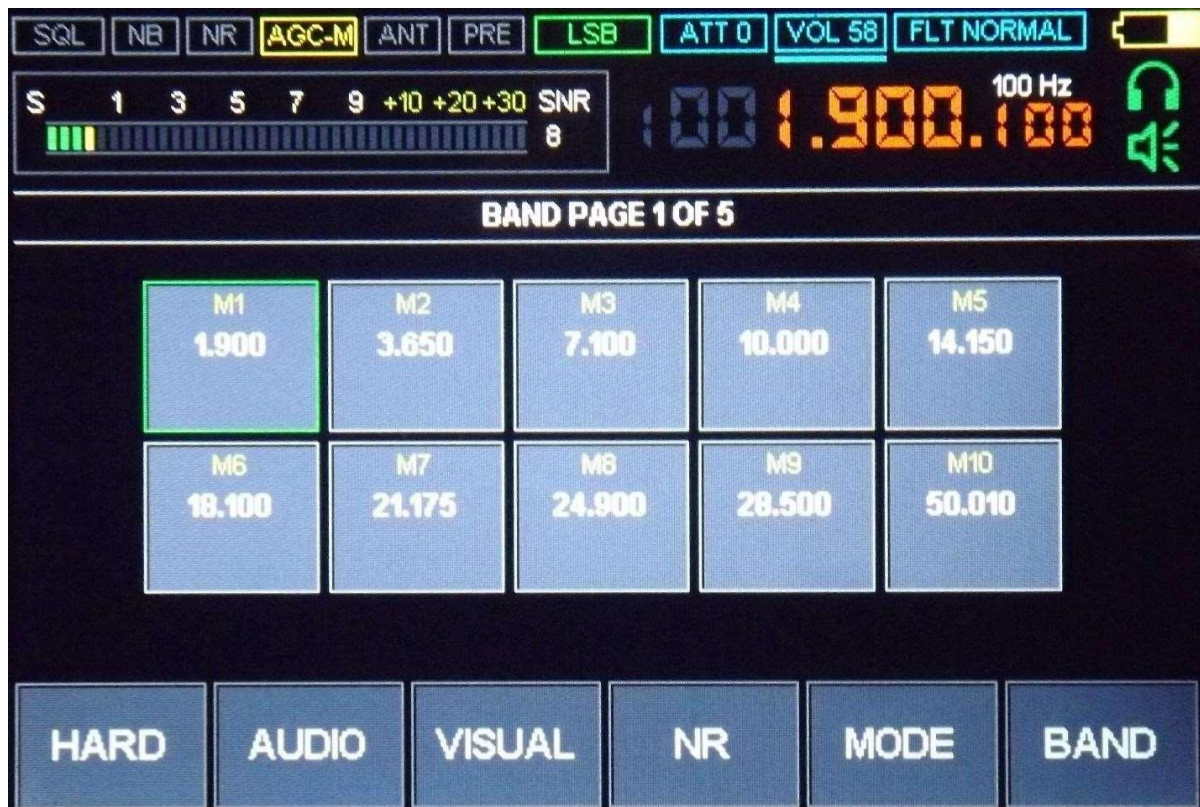


Menu to select digital signal processing applied to audio output.

Exit from menu by clicking "MENU" button or "Volume" knob.

选择应用于音频输出的数字信号处理的菜单。单击 "MENU" 按钮或 "VOLUME" 旋钮退出菜单

6.6 BAND Menu



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

Menu navigation done with "Frequency" rotary knob.

Exit from menu by clicking "BAND" button or "Volume" knob.

此菜单调用存储频率或将当前频率保存到特定地址。

使用 "Frequency" 旋钮进行菜单导航。单击 "BAND" 按钮或 "Volume" 旋钮退出菜单

6.7 MODE Menu



This menu selects modulation type and decoder activation.

Exit from menu by clicking "MODE" button or "Volume" knob.

此菜单选择调制类型和解码器激活。

单击 "MODE" 按钮或 "Volume" 旋钮退出菜单

5 MAIN FUNCTIONS AND COMMON USE 主要功能及常规使用方法

7.1 重置为默认值

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

此功能将当前用户设置重置为出厂默认值。要激活此功能 - 关闭所有菜单，并在显示主屏幕的设备上，同时按住“音量”和“频率”旋钮的直到滴声响起。**所有用户设置、当前和内存位置都将丢失。**

7.2 CONTROL KNOB’S REVERSING 控制旋钮的反转

This function allows changing encoder increments direction from CW to CCW. To activate control knobs reverse mode, enter “HARD” menu and activate “EN1 reverse” for “Frequency” and “EN2 reverse” for “Volume”. Clicking on given button enable/disable knob’s reverse mode.

此功能允许将编码器旋钮增量方向从 CW 更改为 CCW。激活控制旋钮反转模式，进入“HARD”菜单并为“Frequency”和“EN2”激活“EN1 reverse”反转为“音量”。单击给定按钮启用/禁用旋钮的反向模式。

7.3 BATTERY MONITOR MODES 电池监控模式

This function turns radio receiver off if battery voltage drops below 3.3V. Function implemented to 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 cut off when the voltage reaches 3.1V.

如果电池电压低于 3.3V，此功能将关闭无线电接收器。实现的功能延长电池寿命并避免电池完全放电。要启用此功能，请进入“HARD”菜单并选择“Vbat control”：

——Standard – 功能激活，截止设置为 3.3V

——Low – 功能禁用，设备将运行电池低至 2.7V对于 Malachite-DSP2，截止电压由硬件控制，当电压达到3.1V。

7.4 ANTENNA TYPE SELECTION 天线类型选择

This function works only at frequencies up to 50MHz. In Malachite-DSP₁, the function works only if there is an additional board in the receiver. To select the type of antenna input, go to the HARD menu, click on the "SW antenna" parameter. - Hi-Z – high impedance input, for short telescopic antennas

- 50 Ω- 50Ω impedance input, recommended for use with long antennas with ~50Ω wave impedance

此功能仅适用于 50MHz 以上频率。在 Malachite-DSP₁ 中，该功能仅适合装有补充板的接收器（比如飞鱼的双天线版本）。要选择天线输入类型，请转到 HARD菜单，单击“SW antenna”参数。

- Hi-Z – 高阻抗输入，用于拉杆天线

- 50 Ω- 50Ω 阻抗输入，推荐用于~50Ω 阻抗的外接长天线

7.5 BUILT-IN HF PREAMP CONTROL 内置高频前置放大器控制

This function enables/disables built-in preamplifier. To enable, activate "HARD" menu and select

此功能启用/禁用内置前置放大器。要启用，请进入“HARD”菜单并选择

"PREAMP":

- Enabled
- Disabled

7.6 ATTENUATOR CONTROL 衰减器控制

This function only applies to units with auxiliary board installed. To change attenuator settings enter "HARD" menu select "ATT" option, using "VOLUME" rotary knob select attenuator dB value from 0 to 30dB (maximum attenuation) in 1 dB increments.

此功能仅适用于安装了补充板的接收器。要更改衰减器设置，请进入 "HARD" 菜单选择 "ATT" 选项，使用 "VOLUME" 旋钮选择衰减器dB值从0到 30dB（最大衰减），增量为 1dB。

7.7 GAIN CONTROL 增益控制

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

For gain, control enter "HARD" menu and adjust the following

接收器的前端 IC 允许对信号混频器和 UHF 进行增益控制。

对于增益，控制进入 "HARD" 菜单并调整以下内容:

-- "RF GAIN" 射频增益

--gain factor for wideband mixer 宽带混频器的增益系数;

"LNA/MIX UP GR" – attenuation control (On/Off), applies to built-in preamplifier in HF-mode and 1st mixer in SB-mode 衰减控制（开/关），适用于内置前置放大器HF模式和SB模式中的第一个混频器

- ;

"MIX GR" – attenuation control (On/Off), applies to built-in preamplifier in HF- mode and

2nd mixer in SB-Mode; 衰减控制（开/关），适用于内置前置放大器HF模式和SB 模式中的第二个混频器

-

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

使用 "VOLUME" 旋钮进行菜单导航并使用按钮进行激活

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 antennas and over 20 dB with long antennas.

建议：

- 1) LNA/MIX UP GR и MIX GR 选项是信号衰减器，用于外置长天线，或用于过载接收 - 重叠电台。
- 2) RF GAIN 建议值，使用短拉杆天线不超过 40dB，长天线不超过超过 20 dB。

This function only applies to receivers with auxiliary board installed. To change attenuator settings enter "HARD" menu select "ATT" option, using "VOLUME" rotary knob select desired value. 此功能仅适用于安装了补充板的接收器。更改衰减器设置请进入 "HARD" 菜单选择 "ATT" 选项, 使用 "VOLUME" 旋钮选择需要的值

7.8 FREQUENCY DISPLAY ERROR CORRECTION 频率显示误差修正

This function provide display error correction.

To set display correction enter "HARD" menu select "F correct" option, using "VOLUME" rotary knob set proper value.

此功能提供显示错误校正。

设置显示校正进入 "HARD" 菜单选择 "F correct" 选项, 使用 "VOLUME" 旋钮设置适当的值

7.9 AUDIO OUTPUT SELECT 音频输出选择

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



Output selection done by clicking on audio icon located on main screen. Another way to select is to go to the HARD menu and by pressing the Audio out button select the desired type of audio output.

此功能设置音频输出设备类型: 耳机、内置扬声器或**同时输出**。通过单击主屏幕上的音频图标完成输出选择。另一种选择方式是进入 HARD 菜单并通过按下 Audio out 按钮选择所需的类型音频输出。

7.10 NOISE BLANKER (NB) 噪声屏蔽器 NB

This function performs wide-band attenuation. Function settings are under "AUDIO" menu and grouped under "NB" option: 此功能执行宽带衰减。功能设置在 "AUDIO" 菜单下的

"NB" 选项里

- Threshold临界点 – to remove/reduce interference adjust manually with “VOLUME” control, values below 3 not recommended;
- 使用 “VOLUME” 控制手动消除/减少干扰调整, 不推荐低于 3 的数值;
- Config配置 – NB configuration, controls manually with “VOLUME” to remove/reduce interference; NB 配置, 使用 “VOLUME” 手动控制删除/减少干涉
- NB – enable/disable NB, 基于音频反馈进行试验设置.
-

7.11 AGC

- This function maintains optimal audio output level. Settings located under “AUDIO” menu and grouped in “AGC” block
- 此功能可保持最佳音频输出水平。位于“音频”菜单下的“AGC”选项:
- AGC LIM – maximum output level最大输出电平;
- AGC GAIN – AGC 增益;
- MANUAL GAIN –手动控制, AGC 关闭时可用;
- AGC MODE – AGC 响应模式
- ; AGC 模式 选项:
- FAST – short time integral(response time);
- MIDDLE – medium time integral;
- SLOW – long time integral;
- LONG – extra-long time integral;
- OFF – AGC – off;

要更改 AGC 设置, 请进入 “AUDIO” 菜单选择所需参数并使用 “VOLUME” 进行设置.

当 AGC 禁用时, AGC GAIN 参数替换为 MANUAL GAIN。AGC 功能不支持 WFM

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7.12 EQUALIZER 均衡器

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

此选项启用/禁用均衡器显示。在 “AUDIO” 菜单的EQ中, 通过 “VOLUME” 旋钮选择。

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

7.13 WFM STEREO MODE 调频立体声模式

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

Stereo supported with strong signal and on headphones or headphones with speaker only, "WFM- ST" indicates stereo reception.

此接收器支持 FM 模式下的立体声接收。要启用调频立体声，请进入 "AUDIO" 菜单并切换 "WFM 立体声" 按钮。"WFM 立体声" 有 2 个选项——Enable/Disable。

立体声模式仅支持强信号电台，需要选择耳机输出或耳机和扬声器同时输出，**单扬声器输出不支持**，"WFM-ST" 表示立体声接收。

7.14 ADAPTIVE SQUELCH 自适应静噪

For improved reception and selectivity, receiver equipped with adaptive squelch function. This function employs various band-pass filtering algorithms:

为了提高接收和选择性，接收器配备了自适应静噪功能。此功能采用多种带通滤波算法

- Span 跨度 >1 kHz "speech" – optimized filter 优化过滤器
- Span 跨度 ≤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 toggle "NR" button. To set voice cancelling level enter "AUDIO" select "Threshold" under "NR" group use "VOLUME" control to set desired value. "Threshold" settings do not apply to spans ≤1kHz.

根据跨度值自动完成算法选择。

可以手动设置语音的降噪级别。启用/禁用降噪切换 "NR"

按钮。要设置语音消除级别，请输入 "AUDIO" 选择 "NR" 组下的 "Threshold" 使用 "VOLUME" 控制设置所需的值。"阈值" 设置不适用于 ≤1kHz 的跨度

7.15 THRESHOLD SQUELCH 阈值静噪

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

To enable "Threshold squelch" enter "AUDIO" menu select "SQL" option with "VOLUME" control.

此功能阻止低于预设信号电平（阈值）的音频内容。

要启用“阈值静噪”，请进入“AUDIO”菜单选择“SQL”选项，通过“VOLUME”控制。

“SQL” options:

- Enabled;
- Disabled;

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

要设置阈值级别，请导航到“AUDIO”菜单选择“Threshold”选项并设置“VOLUME”

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

要设置语音类型信号的阈值，请设置“NR”菜单下的“阈值”选项

7.16 BACKLIGHT CONTROL 背光控制

This function sets LCD display backlight intensity: 此功能设置 LCD 显示屏背光强度

- Backlight level – min/max; 背光水平 - 最小/最大
- Timeout, switching from current to minimum backlight level; 超时，从当前切换到最小背光级别
- Timeout, turning backlight off; 超时，关闭背光

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

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

编辑背光设置请进入“VISUAL”菜单，使用“VOLUME”控制选择“BRIGHTMIN”设置最大亮度，最小选择“BRIGHT MIN”（省电模式）。编辑超时设置进入“VISUAL”菜单，使用“VOLUME”控制选择“REDUCT TIME”组，导航到“睡眠时间”设置进入省电模式的超时时间和“LCDSLEEP”设置关闭显示器的超时时间，必须启用“LCD SLEEP”选项。

7.17 SETTING SPECTRUM RATE 设置频谱速率

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

此功能可更改主显示屏上的频谱更新率。编辑比率进入 "VISUAL" 菜单使用 "VOLUME" 控制选择 "FFT ave" 设置更新率所需的数值，更高的数值对应于较慢的速率。

7.18 SETTING SPECTRUM RANGE 设置频谱范围

This function changes spectrum's SNR amplitude scale. To edit scale enter "VISUAL" menu select "FFT scale" using "VOLUME" control set desired SNR scale value (dB), lower value for greater detail but more noise.

此功能会更改频谱的 SNR 幅度标度。要编辑比例进入 "VISUAL" 菜单选择 "FFT 标度" 使用 "VOLUME" 控制设置所需的 SNR 标度值 (dB)，较低的数值可获得更多细节但噪音更大。

7.19 SETTING SPECTRUM COLOR 设置光谱颜色

This function changes color table for spectrum display. To edit color table enter "VISUAL" menu select "FFT color" and using "VOLUME" control set colors to desired values.

此功能更改光谱显示的颜色表。编辑颜色表进入 "VISUAL" 菜单选择 "FFT 颜色" 并使用 "VOLUME" 控件将颜色设置为所需的值

7.20 SETTING SPECTRUM AND WATERFALL RATIO 设置光谱和瀑布比

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

此功能更改频谱与瀑布显示比例。要更改缩放比例，请输入 "VISUAL" 菜单选择

“Pan percent” 并使用 “VOLUME” 控件设置所需的比值(%)。

7.21 SETTING WATERFALL RATE 设置瀑布率

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

此功能更改瀑布填充率。要更改填充率，请进入 “VISUAL” 菜单选择 “WTF delay” 并使用 “VOLUME” 控件设置所需的填充率，较低的值可加快填充

7.22 SETTING WATERFALL HIGHLIGHT 设置瀑布高光

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

此功能将瀑布亮度更改为信号电平比率。要更改高光比，请进入 “VISUAL” 菜单选择 “WTF Gain” 并使用 “VOLUME” 旋钮设置所需的高光比，数值越低亮度越低。

7.23 SETTING SPECTRUM SCALE AND TYPE 设置频谱规模和类型

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

此功能改变频谱的跨度。WFM 模式支持的频谱类型。电流谱标度显示在左侧频谱的角落。较高的标度值对应于较窄的跨度，但较高细节。对于 SSB、CW、DSB、AM、NFM 调制支持的选项是：1、2、4。对于 WFM 支持选项：1 和 MPX，其中 MPX – 混合信号频谱。要更改频谱跨度或键入单击所需的频谱区域。

7.24 CLOCK SETUP

Check section 5 for details.

7.25 SAVING TO DEVICE FLASH, READING FROM FLASH 保存到设备闪存，从闪存读取

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 select it by clicking. Using "FREQUENCY" control, you can advance back and force navigation. To save current settings (active) select desired cell press and hold button until audio signal or selected button highlights with red boarder.

此功能可让用户将当前设置保存到设备闪存中或从闪存中调用设置。要选择内存位置，请进入 "BAND" 菜单导航到所需的内存单元并通过点击。使用 "FREQUENCY" 控制，您可以前进后退和强制导航。保存当前设置（活动）选择所需的单元格按住按钮直到音频信号或选定的按钮与红色寄宿生的亮点。

7.26 CW DECODER 连续波解码器

This function decodes and displays baudot signal on main screen

To enable baudot decoder enter "MODE" menu select "Decoder" and activate it. "CW" text over the decoder button would signal activation. For correct operation user must set "Min SNR" in

corresponding group using "VOLUME" control set optimal value and save. "Min SNR" sets 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 transmission.

Decoded signal displays as text on main screen, clicking on "S-meter" display – clears text window.

此功能解码baudot信号并显示在主屏幕上，请进入“MODE”菜单选择“Decoder”并启用它。“CW”文本结束解码器按钮将发出激活信号。为了正确操作，用户必须在相应组使用“VOLUME”控件设置“Min SNR”最佳值并保存。“Min SNR”设置解码器启动触发阈值，设置过低或过高都会导致解码失败。“Min SNR”的最佳值基于以下因素：- 如果没有传入的baudot传输，解码器活动指示灯应关闭；- 解码器活动指示器“heart-beat”应与传入的baudot传输同步。解码后的信号在主屏幕上显示为文本，单击“S-meter”显示 - 清除文本窗口。

7.27 SETTING TUNING STEP RESOLUTION 设置调谐步进分辨率

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

此功能可更改调谐步长分辨率。要改变调谐步长，按下 "FREQUENCY" 旋钮并使用旋转编码器步进或降低到所需的步长，步长显示为白色频率显示。单击 "FREQUENCY" 旋钮按钮完成选择。调整步长与调制类型配对，即每个模式的步骤可以是唯一的（存储在内存中）。

7.28 HF PREAMPLIFIER GAIN COMPENSATION IN S-METER MODE HF 前置放大器增益补偿

This function changes gain coefficient for HF preamplifier in S-meter mode. To set HF preamplifier gain coefficient enter "HARD" menu select "PRE Gain" and using "VOLUME" control set real gain for preamplifier, setting gain value to "zero" bypasses gain compensation (default value: 14dB).

此功能在 S-meter 模式下更改 HF 前置放大器的增益系数。设置 HF 前置放大器增益系数 进入 "HARD" 菜单选择 "PRE Gain" 并使用 "VOLUME" 控制设置实际增益为前置放大器，将增益值设置为 "零" 绕过增益补偿（默认值：14dB）。

7.29 TONE SIGNAL VOLUME CONTROL 音频信号音量控制

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

此功能改变提示音音量。要更改提示音音量，请进入 "HARD" 菜单选择 "BEEP LVL" 并使用 "VOLUME" 控制设置所需的电平。

7.30 CHANGING S-METER SCALE DISPLAY 改变 S-Meter 比例显示

This function changes S-meter display scale. To change scale enter "HARD" menu select "Ind type" and using "VOLUME" control set desired value, SNR value corresponds to signal to noise ratio scaled in dBm.

此功能更改 S-meter 显示比例。要改变比例进入 "HARD" 菜单选择 "Ind type" 并使用

“VOLUME” 控制设置期望值，SNR值对应缩放的信噪比以 dBm 为单位。

7.31 S-METER CORRECTIONS S-Meter 校正 (SM)

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

此功能可更改S-meter的校正系数。要更改 S-meter 校正系数，请输入 “HARD” 菜单并选择 “Sm Correct” 并使用 “VOLUME” 控件设置为所需值。对于适当的设置，向接收器输入提供具有已知精度电平的信号并带有 “VOLUME” 控制设置与信号电平匹配的校正值，S-meter刻度必须以 dBm 为单位。

7.32 IDLE TIMER空闲定时器

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

此功能为用户不活动设置超时，一旦过期设备将自行关闭。要启用此功能进入 “HARD” 菜单选择 “Activity timer” 并使用 “VOLUME” 控制设置超时以分钟为单位的参数，“零” 禁用功能

7.33 SPECTRUM FILL 频谱填充

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" and "Enabled", no-fill/ fill respectively.

此功能更改频谱填充类型，提供两个选项：

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

选择填充类型进入"VISUAL"菜单选择"FFT fill"并在"Disabled"和"Disabled"之间切换"已启用"，分别为no-fill/ fill。

7.34 DC OFFSET COMPENSATION 直流偏移补偿

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

DC-offset value sets from optimal spectrum looks, value should be in range from zero up to actual DC value on spectrum (with offset at "zero"), setting higher values excessively trims lower frequencies on displayed spectrum.

此功能为接收器前端 DAC 启用 DC 偏移补偿。启用直流偏移补偿进入 "VISUAL" 菜单选择 "DC拒绝" 并使用 "VOLUME" 控制选择DC值减去。此功能需要适当地充分利用 DAC。实时直流偏移在频谱图上显示为 0Hz，来自 FFT 计算的 DC 值。直流偏移补偿不影响接收器接收。从最佳频谱外观设置的直流偏移值，值应在从零到实际的范围内频谱上的 DC 值（偏移为 "零" ），设置较高的值会过度修剪较低显示频谱上的频率。

7.35 DISABLING SPECTRUM AND WATERFALL禁用频谱和瀑布

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

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

此功能可禁用频谱和瀑布显示以减少干扰。当频谱和瀑布显示禁用 LCD 仅在 GUI 更改时才显示更新，从而减少来自与图像渲染相关的高频开关的干扰。要禁用频谱和瀑布显示，请进入 "VISUAL" 菜单选择 "View Pan&Wtf" 并切换Enable/Disable。

Enabled - 频谱和瀑布启用；

Disable - 频谱和瀑布禁用；

此功能设置更新时还会更改 S-meter 显示。

7.36 BANDPASS FILTER SETTINGS带通滤波器设置

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

该功能设置带通滤波器和滤波器参数。有三个预定义的跨度带通过滤器：

- Narrow; 窄带
- Normal; 正常
- Wide; 宽带

This function sets by clicking "VOLUME" control's push button and selecting "FLT" option and using rotary encoder ("VOLUME") to select desired filter. Function also sets from "AUDIO" menu, over "Filter" option using "VOLUME" control.

此功能通过单击 "VOLUME" 控件的按钮并选择 "FLT" 选项并使用旋转编码器 ("VOLUME") 选择所需的滤波器。功能也可以从 "AUDIO" 菜单中设置, 通过使用 "VOLUME" 调节 "Filter" 选项。

Span value and frequency cutoff values edited over "AUDIO" menu under "Low freq" and "High freq" respectfully for each filter with "VOLUME" control.

In CW-mode same three filters parameters are as different:

- Pitch – center frequency (mean(f_1 , f_2));
- Width -pass band;

To set CW-mode filter parameters enter "AUDIO" menu select "Pitch" or "Width" option and using "VOLUME" control set desired value.

7.37 SELECTING MODE AND DETECTION TYPES 选择模式和检测类型

Receiver supports the following modulation types 接收器支持以下调制类型:

- 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" set desired type.

To select DSB type, enter "MODE" menu select "DSB" option and using "USB" or "LSB" set desired type.



To select AM type, enter "MODE" select "AM" option and using "MAG" (classic amplitude detector), "SAM" (synchronized amplitude detector), "SAMU" (synchronized amplitude detector with upper
要选择 AM 类型，请进入 "MODE" 选择 "AM" 选项并使用 "MAG"（经典幅度检测器），"SAM"（同步检波器）、"SAMU"（带上限的同步检波器）

side band) or "SAML" (synchronized amplitude detector with lower side band) select desired 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.

单边带) 或 "SAML" (具有较低边带的同步检波) 选择所需的探测器类型。选择解调器类型, 进入 "MODE" 菜单选择 "AM det"。要选择 NFM 类型, 请进入 "模式" 菜单, 单击 NFM 类型。要选择 WFM 类型, 请进入 "MODE" 菜单, 单击 WFM 类型。

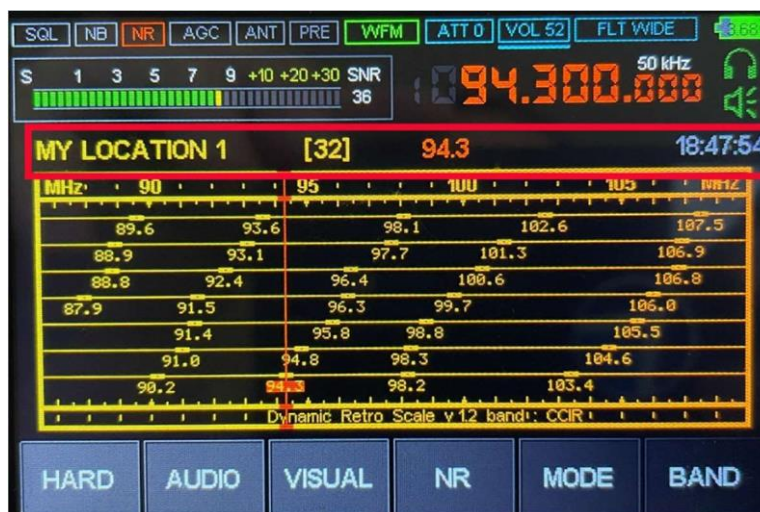
7.38 VINTAGE RETRO SCALE 复古刻度盘

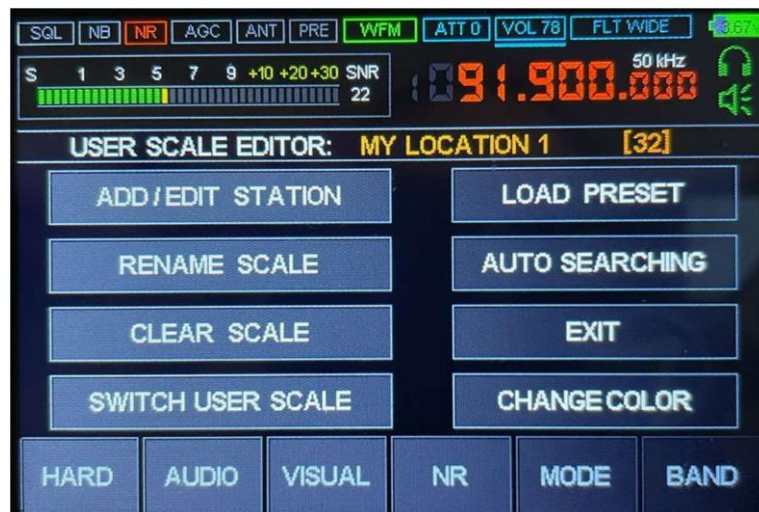
Receiver comes with custom retro interface for WFM-mode, a reminder from old days of classic tubes/transistors radios from the past. Retro scales supported for FM mode only. Note: this mode only activates if current frequency is within localized FM-range, European (87.5-108 MHz)/Japanese (75.1-94.9MHz).

本接收器带有 WFM 模式的自定义复古界面, 聊以怀念经典的电子管/晶体管收音机。仅 FM 模式支持复古刻度盘。注意: 此模式仅当当前频率在本地FM范围内时激活, 欧洲 (87.5-108 MHz)/日本(75.1-94.9MHz)。

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

要在主屏幕上激活复古刻度盘, 请单击并按住菜单按钮上方的显示中心直到复古刻度盘出现。





Retro scale interface features 复古刻度盘特点:

Retro style display 复古风格展示:

Add radio stations with custom names, user editable 添加具有自定义名称的广播电台，用户可编辑:

Customize scale color 自定义刻度颜色:

Recall stations from memory 从存储中调出电台;

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

编辑、保存和加载自定义列表，两个用户自定义列表;

Station's auto search 自动搜台;

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

Retro scale menu has the following options 要进入复古音阶编辑模式，请单击屏幕中

间的 和频率显示。复古比例菜单有以下选项:

ADD/EDIT STATION - add new station to the list, edit new name, remove from list; Once open, new menu items let user: adjust frequency, both ways; enter custom name using "VOLUME" to select chars, cannot go back to frequency tuning from here(only save and edit, or delete and start over);

save new name and exit upon clicking "SAVE AND EXIT"; save station and continue search/editing upon clicking "SAVE AND CONTINUE"; delete station – "DELETE STATION"; exit current into retro menu – "CANCEL"; adding stations without manually typing, just tune up and add by clicking on "SAVE AND CONTINUE" or "SAVE AND EXIT"; if search complete, in both cases station's 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);

添加/编辑电台 - 将新电台添加到列表中，编辑新名称，从列表中删除；打开后，新的菜单项让用户：调整频率，双向；使用 "VOLUME" 输入自定义名称以选择字符，不能从这里返回频率调整（只能保存和编辑，或删除并重新开始）；

单击"SAVE AND EXIT"后保存新名称并退出；

保存电台并继续搜索/编辑点击"SAVE AND CONTINUE"；

删除电台——"DELETE STATION"；

退出当前进入复古菜单——"CANCEL"；

无需手动输入即可添加电台，只需单击即可调整和添加"SAVE AND CONTINUE"或"SAVE AND EXIT"；

如果搜索完成，在这两种情况下站的缩写为 number 和 MHz，即 "87.5" 代表 87.5MHz，使其简单易行识别/搜索（替代 7.40 中描述的模式）；

RENAME SCALE重命名刻度 - enter/edit current scale name, associated with loaded station list;

Once open, new menu items let user: enter or edit scale name using "FREQUENCY" encoder for char selection; clear entered scale name – "CLEAR NAME";

输入/编辑当前比例名称，与加载的电台列表相关联；一旦打开，新的菜单项让用户：使用 "FREQUENCY" 编码器输入或编辑刻度名称以进行字符选择；

清除输入的刻度名称 - "CLEAR NAME" ；

CLEAR SCALE清除刻度 - delete retro scale data from memory; Clicking on this button opens up warning message with two buttons "CLEAR" and "CANCEL"; "CLEAR" button erases retro scale data from memory and returns to retro scale top menu, setting current scale with "empty" name and default station name as "MY LOCATION" 1 or 2 based on origin; "CANCEL" button returns back to retro scale top menu, data preserved;

从内存中删除复古刻度数据；单击此按钮会打开带有"CLEAR"和"CANCEL"两个按钮的警告消息；

"CLEAR" 按钮清除复古刻度数据从内存中返回到retro scale 顶部菜单，用 "empty" 名称设置当前的比例和默认站名作为 "我的位置" 1 或 2 基于来源；

"CANCEL"按钮返回到复古上层菜单，数据保留

SWITCH USER SCALE切换用户刻度 - to switch between 2 user lists; clicking this button switches from one list to another; This function can be useful to quickly change one radio stations list to another, i.e. "home-office", "home-travel...);

在 2 个用户列表之间切换；单击此按钮从一个切换列到另一个；此功能可用于快速将一个电台列表更改为另一个列表，即 "家庭办公室" ， "家庭旅行.....)

LOAD PRESET加载预设 - to load desirable preset; Clicking this button opens up warning that current retro scale data will be lost and replaced with one from memory; 加载所需的预设；单击此按钮会打开警告，当前复古比例数据将丢失并替换为内存中的数据

CHANGE COLOR选择刻度盘颜色 - to select scale color; each of custom stations lists can be colored individually; Clicking this button opens new menu items: Color box, Cancel button, SAVE COLOR AND EXIT; Select desired color and "SAVE COLOR AND EXIT"; CANCEL to return to retro scale top menu, no custom color saved每个自定义电台列表都可以单独着色；单击此按钮将打开新菜单项：颜色框、取消按钮、保存颜色并退出；选择所需的颜色并"SAVE COLOR AND

EXIT"; CANCEL 返回到retro scale 顶部菜单，不保存自定义颜色;

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

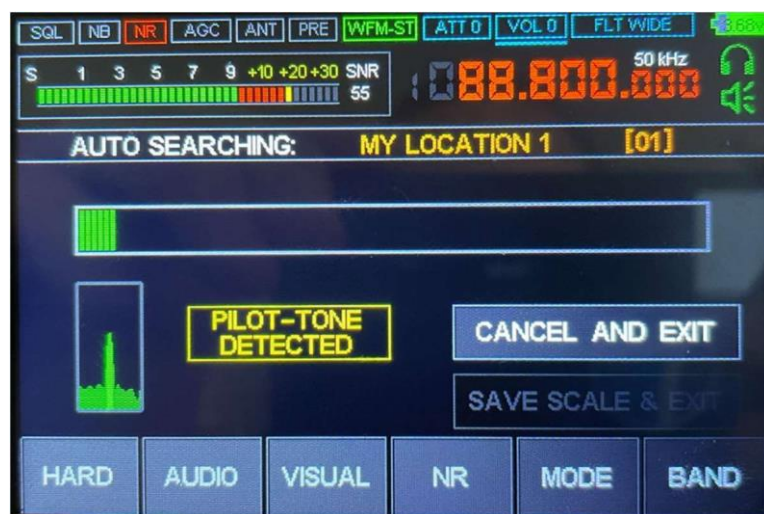
AUTOSEARCHING 自动搜索 - to automatically search and save radio stations. Check for function details in 7.40;

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

To jump from one station to next use "FREQUENCY" encoder until text "NEXT" appears in place of step size. 自动搜索和保存电台。在 7.40 中查看功能详细信息; 在复古模式下，用户可以将调谐器频率按 50 kHz步进或逐台选择。要逐台选择，请按住 "FREQUENCY" 旋钮，直到 "NEXT"字样出现以代替步进值。

7.39 FM-STATIONS SCAN MODE FM 电台扫描模式

This function performs radio stations scan in FM mode. To initiate scan mode, enter vintage retro scale menu select "AUTO SEARCHING" -> pressing this button starts retro scale menu. 此功能在 FM 模式下执行无线电台扫描。要启动扫描模式，请输入复古菜单选择"AUTO SEARCHING"-> 按此按钮启动复古菜单。



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 menu. **Attention!** Only FM-stations with strong signal for stereo decoding appended to the list by auto search function. For the auto search to work, you must turn on the headphones as an audio output, turn on 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 frequency tuning for selecting and adding station to the list with 'SAVE SND CONTINUE' button and continue with auto search. New station appended to the list with new name based on frequency value and 'MHz' abbreviation. Adding and deleting stations from the list, done after search complete and scale saved. Both auto search and manual are equally effective and easy to use, no real advantage one versus another.

自动搜索完成后，将打开一个包含按钮的新窗口：

- CANCEL AND EXIT - 取消自动搜索结果并退出到复古菜单；
- SAVE SCALE & EXIT - 保存自动搜索的结果并退出到复古菜单。 **注意！** 仅有立体声格式的强信号FM电台会通过自动搜索附加到电台列表中。要使自动搜索工作，您必须打开耳机作为音频输出，并打开AUDIO 菜单中的 WFM 立体声选项。

在接收较差的地区，使用选项“添加/编辑站” p.7.39.1，并使用手动频率使用“SAVE SND CONTINUE”按钮选择电台并将其添加到列表中并继续带有自动搜索功能。根据频率值和新名称附加到列表中的新电台“MHz”的缩写。在列表中添加和删除电台，在搜索完成和缩放后完成保存。自动搜索和手动搜索同样有效且易于使用，互相并没有绝对的优势。

7.40 SETTING FREQUENCY MANUALLY手动设置频率

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.

本接收器允许手动设置频率。

设置所需频率：

——点击右上角的频率数字显示；

——以 Hz、kHz 或 MHz 为单位输入所需值；

要退出频率编辑菜单，再次点击频率数字显示。

7.41 Auto NOTCH FILTER自动陷波滤波器

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

此功能允许您从接收到的信号中去除干扰音类信号。这个功能只能在 USB、LSB 模式下接收时使用。要启用该功能，请转到AUDIO 菜单，然后按 ANF 按钮。

7.42 Pseudostereo伪立体声

This function allows you to create a surround sound effect. The use of this function is possible when using all types of modulation, except for WFM, and only when listening to headphones. 此功能允许您创建环绕声效果。可以在除WFM之外的所有模式下使用此功能，并且仅在听耳机时使用。

7.43 Function PGA BST

Данная функция может оказаться полезной при приеме очень сильных сигналов, приводящих

к перегрузке приемника. Для управления данной функцией необходимо зайти в меню HARD и

нажать кнопку PGA BST. Состояние Enabled соответствует максимальному усилению. В случае

перегрузки приемника входными сигналами необходимо установить PGA BST в состояние Disabled.

此功能可能有助于接收非常强的信号，过强信号会导致接收器过载。要调节此功能，请进入“HARD”菜单点按PGA BST按钮。状态ENABLED为最大增益。若输入信号使接收器过载，必须将BST PGA设置为Disabled。

7.44 Changing frequency of display改变显示频率

This function is available only in Malachite-DSP2, is experimental and affects only the frequency of the display in WFM mode. To work with this function, you need to remove the rear cover of the radio receiver and set switch 3 on the DIP SWITCH on the printed circuit board to position:

- OFF - for reduced frequency;
- ON - for increased frequency.

此功能仅在 Malachite-DSP2 中可用，是实验性的，仅影响WFM 模式下的显示。要使用此功能，您需要卸下收音机的后盖接收器并将印刷电路板上 DIP 开关上的开关 3 设置到：

- OFF - 降低频率；
- ON - 用于增加频率。

7.44 Management of users equipment用户设备管理

This function is currently only available in Malachite-DSP1, it allows you to control additional equipment (for example, a Bluetooth module) using a logic discrete signal. A logic signal is generated on pin number 8 of the connector (in accordance with the diagram in section 9), intended for connecting an additional board. Logic 0 corresponds to voltage 0V, logical 1 corresponds to voltage 3.3V.

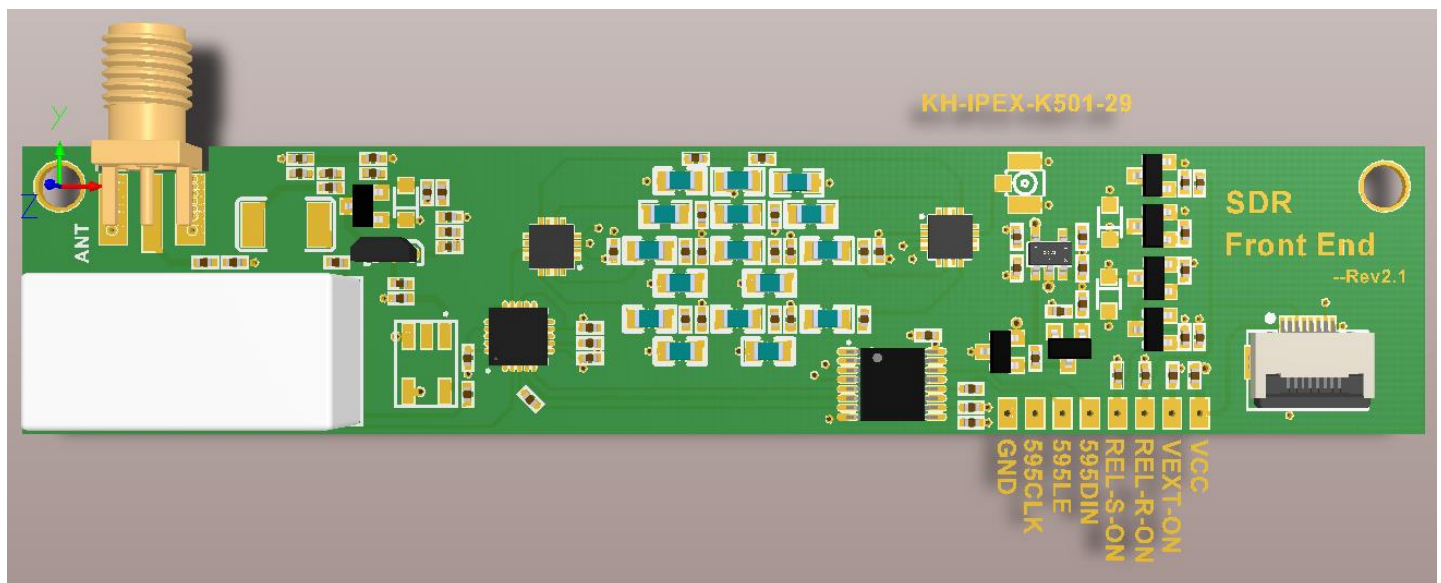
To control logic signals, go to the HARD menu and press the User funct button. Enabled state corresponds to logical 1, Disabled state corresponds to logical 0.

此功能目前仅在 Malachite-DSP1 中可用，它允许您控制额外的使用逻辑离散信号的设备（例如，蓝牙模块）。一个逻辑信号是在连接器的第 8 针脚上生成（根据第 9 节中的图表），预期用于连接附加板。逻辑0对应电压0V，逻辑1对应电压3.3V。要控制逻辑信号，请进入 HARD 菜单并按下 User 功能按钮。启用状态对应逻辑1，禁用状态对应逻辑0。

6 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 picture 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

	RF	RF	RF GAIN=0,	RF GAIN=10,	RF GAIN=20, frequency	GAIN=0
	GAIN=20	PRE=EN	PRE=EN	PRE=EN		
100000	-97	-96	-92	-92		-94
1000000	-109	-111	-121	-120	5000000	-109
	-114	-121	-127	-128	10000000	-110
	-120	-123	-125	-125	15000000	-115
	-121	-121	-121	-121	20000000	-117
	-121	-121	-121	-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
190000000 -101 -106 -98 -103 -104

With Regards,
team MALAHITEAM.