PUNKTRACKER II
20mar2025

The firmware is a further development of @fagci 1.2.1-b5 from 1 Nov 2023
https://github.com/fagci/uv-k5-firmware-fagci-mod/commit/2535e8a1751dca2c3167eda1505284987ac9ad90

By installing this firmware you get a stable firmware tailored to scanning modes with the ability to program the desired scanning mode once and then enter it immediately after turning on the radio station.
Punktracker II contains many changes and fixes relative to fagci b5 and previous versions of Punktracker.

Many thanks to @autumn1rain (Karina) for help in development, the firmware uses his developments for the functions:
AM Fix in the spectrum, IsSignalLost (quick closing of the squelch in the spectrum), with its help some functions are implemented, such as a global blacklist, dim backlight and others.

SPECTRUM AND PAGE SPECTRAL SCANNER
This firmware allows you to scan any range by going through the spectrum pages.

Instructions for a beginner:

To start scanning you need to:
1. Enter the starting frequency of the scanning range into the VFO (for example 118.000)
[Please note that when entering the frequency, you do not need to enter the dot and zeros, just enter 118 and confirm by pressing M]
2. Enter the spectrum by pressing F+5
3. Press the * Scan button
4. Enter the final frequency of the range of interest (for example 470.000)
5. Press the M button.
Scanning of the range 118.000 - 470.000 will begin
When changing ranges, presets are used, for example, if you started scanning from Avia and crossed the 140 MHz border, the modulation will change to FM, and the step to 12.5, etc. In this way, you can scan several different ranges at once, for example 27 MHz + LowBand or Avia + VHF.
6. When you detect interference, a digital signal, or conversations that you are not interested in, press the PTT button (transmission in normal mode) and they will be added to the black list, and you will no longer encounter them until you turn off the radio/reset the black list (by pressing button 4).
7. After detecting and adding all local interference to the blacklist, press the SIDE2) button (flashlight) to turn off the backlight; when a signal is detected, the backlight will automatically turn on at low brightness.
8. When a signal is detected, the radio will automatically stop on it, you can return to the last detected signal by pressing the SIDE1 button (the spectrum will be centered on the signal frequency, scanning will pause as when the signal was detected).
9. By pressing the M button you can go into capture mode (scanning will stop, the squelch will open) and listen to all frequencies found by the spectrum (including interference).
10. In the capture mode, switching between the found frequencies is carried out by the UP and DOWN buttons. Pressing M again will transfer the selected frequency to the VFO mode.
11. Pressing EXIT will return you to the spectrum centered on the selected frequency.
12. After leaving the spectrum, you can save the found frequency to any channel using menu item 13 (see the instructions for the radio station).
13. When working with weak signals (CB ~27 MHz, SATCOM ~250 MHz) it is recommended to use button 2 to raise the RSSI time to 2000.

The spectrum scanner's range skipping is configured in the radio station menu:

You can manually configure the skipping of additional bands that you do not need using the functions in 10 MHz steps:
Menu item 047 SkipA - start of skip A
Menu item 048 EndSkA - end of skip A
Menu item 049 SkipB - start skip B
Menu item 050 EndSkB - end of skip B

Menu item 051 SkipM - start skip M
Menu item 052 EndSkM - end of skip M

Let's say you want to skip the 180 to 300 MHz and 310 to 400 MHz bands.
To program this you will need to set:
SkipA CH-018; EndSkA CH-030; SkipB CH-031; EndSkB CH-040
By setting these settings and running the spectrum scan (by * specifying the scanning limits 118-470) you will get a scan of the areas:
118-180; 300-310; 400-470, so you can turn off the sections of the spectrum that you are not interested in scanning.
SkipA and SkipB settings are stored in EEPROM, and SkipM in RAM and are reset to 018 - 022 when turned off.
87-108, 630-840, when entering such a range, the spectrum scanner will automatically skip it.

!IF YOU DON'T KNOW WHAT TO SCAN, START SCANNING WITH THE SETTINGS SPECIFIED, IN THE 118-180 AND 400-470 RANGES, YOU CAN DETECT A SIGNIFICANT PART OF ANALOG RADIO EXCHANGE NOW.

Automatic scanning starts upon power-on is configured by menu item 42 (PonScn):
VFO - Normal VFO mode.
SCN - Channel scanning mode, or frequency scanning between frequencies VFO A / VFO B (turn off the radio on VFO A for correct operation of scanning between frequencies).
SPE - Spectral scanning mode between VFO A / VFO B frequencies (after loading into the spectrum the backlight will turn off).

Scanning the spectrum in range less than 128 channels:
Let's say you want to scan the LPD range with a step of 25 kHz, by opening the spectrum from the frequency 433.075 and by pressing button 1 setting the step to 25 kHz you will find that the end frequency of the spectrum has become 436.275.
To set the end scanning frequency to 434.775, press *, enter 434.775 and press M. Spectral scanning will not start, but frequencies above 434.775 will be added to the temporary blacklist of the page, and you will be able to monitor only the specified range.
Scanning less than 33 channels (400 kHz with a spectrum step of 1600 kHz, 800 kHz with a spectrum step of 3200 kHz) is not allowed. To scan such a section, set the spectrum step smaller so that more channels in the same range fit into it (using button 7), or use the frequency scanning mode in VFO.

Spectrum control:
1 7 - Scanning step and width of the scanned range.
2 8 - - RSSI scan time.
3 9 - Adjusting the level of the SQL.
* - Enter the final scanning frequency, the current initial frequency is selected as the initial frequency, after confirmation the scanning will begin by going through the pages in the specified range.
4 - Clear the general blacklist.
5 - Direct frequency input
6 - Bandwidth
0 - Modulation
- Enable/disable auto-apply presets. (A/M symbol in the top line).
UP - Next page of spectrum/skip page in spectrum scanner.
DOWN - Previous spectrum page/stops the spectrum scanner
PTT - Add the last frequency where a signal was detected (displayed at the top of the spectrum) to the general blacklist.
SIDE1 (MONI) - Makes the last frequency where the signal was detected central and pauses scanning (similar to pausing when a signal is detected).
SIDE2 - Turn on/off the backlight.
MENU - Frequency capture mode, opens at the last frequency on which a signal was detected, in this mode squelch is open by default.

In frequency capture mode:
M - Copy the current frequency to the VFO and exit the spectrum.
EXIT - Exit to the spectrum and set the selected/entered frequency as the center frequency.
UP DOWN - Switching between frequencies found by the spectrum. Loot is sorted in the order of frequency detection, the number of frequencies in loot is up to 99.
SIDE1 (MONI) - Turn squelch on/off.
SIDE2 - Turn on/off the backlight.
1 7 - Fine tuning of frequency

5 - Entering frequency
3 9 - Adjusting the level of the SQL (only if it is enabled).
6 - Bandwidth
0 - Modulation
- Register setting mode (only for FM and SSB, in AM mode the radio automatically controls the registers).

Key functions in VFO mode:
Copy Channel to VFO, triggered by long hold of M
Changing VFO by pressing EXIT button
Changing the deviation by F+2 in VFO
F+7 - Switches AM/FM/SSB. BYP and RAW are cut.

FREQUENCY AND CHANNEL SCANNER:
You can set the scanning limit of the frequency scanner by entering it into the lower VFO (you can also select a channel with a suitable frequency) and starting scanning in the upper VFO, when the scanner reaches the final frequency, it will return to the one from which scanning began.
- Example of using the function: save the first channel with the range with the correct step (re-save via the radio menu) and the last channel of the range, then in the first VFO set the first channel and copy the channel to the VFO by holding M, in the second VFO set the last channel and start scanning in the first VFO.

In scanning mode, PTT is equivalent to pressing the UP button, skips the channel.
Automatic skipping of all affected frequencies multiple of 13 MHz in any scanning mode.

Air band 118-137
Accelerated channel and frequency scanner (16 channels per second instead of the standard 5).
TO = 45 seconds (now this mode makes sense)
CO = 10 seconds
!The priority channel function 1-CALL (menu item 30) is always a priority channel, the radio checks it every second of channel scanning.
Priority channels defined in CPS are no longer used.
The feature does not slow down the scanner, while you can stay connected on the selected channel.
In scanning mode, the FN2 button is unlocked, which allows you to control the backlight and flashlight without turning off the scanner.

FM range 87.5-108
The scanning mode with saving to channels has been removed from FM radio; now you can only save to channels manually.

Radio beacon, to activate, select the channel on which you want to turn on the beacon in the upper VFO and hold down the TX1750 activation button (by default, long hold MONI), when you press PTT, the radio beacon will turn off. Be careful with this function, because the transmission does not start immediately, but at random timing after activating the beacon.

The backlight (menu item 16) now has the following modes:
MAN - manual control of the flashlight button (dim)
3 seconds (dim)
7 seconds (dim)
10 seconds (bright)
15 seconds (bright)
30 seconds (dim)
1 minute (dim)

In F-LOCK GB mode the radio transmits in 144-146, 290-320, 430-470
In F-LOCK CE 144-146, 151-156, 430-470 mode (mode for railway workers)

Other changes compared to fagci-b5 and previous versions of Punktracker:
Instead of battery indicator, voltage is displayed.
The sound signal when the battery is low is disabled.
Removed ROGER MDC (frog sound).

The boot screen has been redesigned, a greeting is displayed (2 lines set in CPS), voltage and firmware name, after booting the radio beeps twice.
DTMF calls work as stock.
Fixed "flat spectrum" now when entering the spectrum there are always normal signal levels.
Fixed a freeze when re-entering the spectrum scanner.
Fixed freezing after pressing button 5 while the spectrum scanner is running.
Fixed a hang when entering a final frequency lower than the initial one into the spectrum scanner.
AM FIX in Spectrum now allows you to receive AM signals in the spectrum without any problems.
Fixed problems with some menu items (2 settings were available instead of the required 3).
A new squelch algorithm is used, based on adjusting the squelch based on the average noise level. This algorithm allows not to adjust the squelch when changing ranges.
Added algorithm for adjusting RSSI time depending on range.
Added algorithm for fast closing of squelch when signal is lost in spectrum by @autumn1rain
Added delay when exiting the spectrum (fixes the problem with changing VFO when exiting).
The ability to repeatedly add the same frequency to the loot/blacklist has been blocked.
Scanning speed in spectrum scanner mode up to 108 channels per second.

Known issues:

1. The most popular function when scanning is adding a frequency to the black list in the spectrum scanner/skipping a frequency in channel scanning. Therefore, this function is assigned to the PTT button, you can skip frequencies both with the button on the radio and with the button on the headset (I recommend connecting the headset to extend the life of the button on the radio).
However, when using a headset, the pass can only be done after the signal has disappeared; when receiving a signal from the quan-sheng to the headset speaker, the PTT button on it is inactive; this is a feature of the quan-sheng circuitry and it cannot be changed at the firmware level.

2. In case of spectrum scanning 27 MHz + low-band, to set the correct step on low-band always start scanning from frequency 26.800.

3. If the frequency is the first on the spectrum page and you added it to the blacklist, the squelch may still open briefly when you open the page. To avoid this, start scanning from a different frequency (for example, not 118.000 but 117.950).

4. If there is a lot of interference on the range and the black list does not cope, reduce the RSSI time with button 8 and/or raise the squelch with button 3, this way you can roughen the sensitivity of the radio and continue scanning. If this does not help, skip the range using the Skip functions. Using an external antenna (for example, on the roof of a car or a windowsill of a house) can also help with such problems.