*digi*NICAM V2.03

Transmit and receive NICAM-728 and PzN with the 7020, without a PC · control in the web browser · FPGA and software PE1PzN · manual for digiNICAM V2.03 (2 November 2026)

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1. What is digiNICAM V2.03

With digiNICAM V2.03 the 7020 works as a **NICAM transmitter and receiver without a PC**. You control it in a web browser: on the PC, a tablet or the phone. You see the rack, the meters, the receiver and the log, with the same meters as digiNICAM for Windows. New: a fast input spectrum (up to 25 times per second).

Everything is on the SD card. Put the card in, switch on, and after about a minute the page is ready. There is nothing to install.

> **It does not matter whether you use the web version or the Windows program.** If you start digiNICAM for Windows, the web version steps aside by itself. If you close it, the web version takes over again. See chapter 8.

> **Only for radio amateurs and radio research, not for commercial use.** The software, the files for the SD card and this manual are given free, as they are, without any warranty. Use is at your own risk: PE1PzN is not liable for damage to equipment or other results of use. Only transmit on frequencies you are licensed for.

2. What you need

- A **Zynq 7020 SDR with AD9363** (Pluto clone with four SMA connectors) and an empty micro SD card.
- The 7020 connected with a **network cable** to your router or switch.
- A device with a **web browser** on the same network: Chrome, Edge, Firefox or Safari.
- For sound from outside: an I2S ADC on the 7020. Without it you can transmit the test tone.
- For sound out of the 7020: an I2S DAC board (PCM5102A), or listen in the browser.

3. Making the SD card and starting up

1. Take an empty micro SD card, formatted FAT32 (up to 32 GB is easiest).
2. Put **everything** from the folder *SD-kaartje digiNICAM V2.03* directly on the card, so not in a folder. At the top of the card you then see, among others, BOOT.bin, uImage, uramdisk.image.gz and the folders *bootbin* and *pzn*.

3. Eject the card properly and put it in the 7020 (power off).
4. Switch the 7020 on and wait about a minute.
5. Open **http://IP-address/** in the browser, for example http://192.168.0.173/. You go to port 8080 by itself. The IP address is in your router (the list of devices).

From now on everything starts **by itself** when the 7020 is switched on, with the last settings. The transmitter is then as you left it: on or off.

> **Everything is on the card, your settings too** (in the folder *pzn*). Nothing is added to or removed from the memory of the 7020 (the flash). To remove it again: take the card out and switch the 7020 on again. The IP address does not change.

Updating

You put a new version on the card in the same way, over the old files. Your settings are in *pzn/instellingen.txt*; that file stays, so your settings are kept.

Not working?

What you see	What you do
In Windows the 7020 is called "ADALM-PLUTO" or "PlutoSDR"	That is normal: the USB device always has that name.
The page does not open	Wait another half minute. Are you on the same network as the 7020? Are the files at the top of the card and not in a folder?
At the top it says "NO CONNECTION WITH THE 7020"	The browser no longer hears from the 7020. Is it off, or is the network cable out?
Old page after a new version	Press F5 once (refresh).
Still nothing	Run `Controle.bat` (in the folder *Hulp*): it makes a report of the 7020 without changing anything. Send the folder it makes to PE1PzN.

4. The rack



digiNICAM V2.03 in the browser on the PC: the rack at the top, below it the tab Modulation monitor. The page is in English and looks like digiNICAM for Windows.

The rack is at the top, just like in the Windows program.

Part	What it does
Lights	CONNECTED (the browser hears the 7020), ON AIR (green) or OFF AIR (yellow), NICAM SYNC and STEREO (the receiver has the signal), 7020 SDR, ALARM. With an alarm the reason is shown below it, for example *temperature above 75 °C* or *bit errors*. An alarm stays on for at least 2 seconds.
Temperatures	FPGA and AD9363. Green below 70 °C, yellow up to 80 °C, above that red.
`FREQ`	Type in the transmit frequency (70 to 6000 MHz).
`PRESET`	The window with presets: a table with name and frequency. Double-click a name or frequency to change it. `Tune` tunes, `Add current frequency` adds the current frequency, `Delete` removes one, ▲ ▼ sets the order. At the bottom you choose the step size of ▲ ▼ on the front.
`POWER`	A slider for the transmit power (TX ATT), from -89.75 dB to 0 dB, in steps of 0.25 dB. Mouse wheel: 0.25 dB per click, with Shift 1 dB. The power is remembered per frequency: another frequency within 5 MHz gets the same power; further away or never set: -10 dB.
`SETUP`	Jumps to the transmitter settings (tab Modulation monitor). Once more: back.
Display	Transmit frequency, ON AIR or OFF AIR, station ID, system, TX ATT, pre-emphasis, source (I2S LOCKED or TEST TONE), BER and SNR of the receiver and the temperatures. `DISP` switches between status and the received spectrum.
Frequency with the mouse	Put the mouse on a digit and turn the wheel: that digit goes up or down, down to 1 Hz. Turning next to the digits: one step of ▲ ▼.
▲ ▼	Transmit frequency one step up or down. **Right mouse button:** choose the step size, from 1 kHz to 1 GHz.
TRANSMITTER	The transmitter on (I ON, green) or off (OFF O). Below the switch are the sample rate and the IP address.

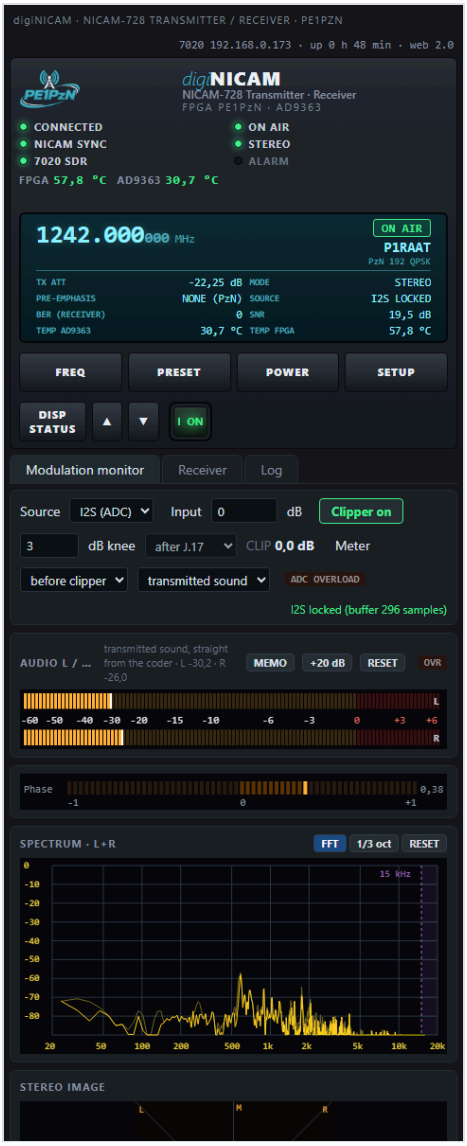
Double-click an empty spot (for example on the rack): the whole page goes full screen, just like F11. Double-click again or Esc: back.

5. Modulation monitor

Here you see the sound the transmitter sends, straight from the coder in the FPGA.

- **Source:** test tone (-20 dBFS) or I2S (the ADC). On the right it shows whether I2S is locked, with the buffer in samples.
- **Input:** gain of the input, -20 to +12 dB. The light **ADC OVERLOAD** is on when the ADC is overdriven.
- **Clipper:** on or off, with the knee in dB and the position: after the J.17 or before the J.17. CLIP shows how much is clipped. With PzN the clipper is always before the codec and there is no J.17.
- **Meter:** *before clipper* (the programme as it comes in) or *after clipper* (as it goes into the 14 bits, 0 = -12 dBFS, with the J.17 taken off again). *After clipper* only works with the clipper on.
- **transmitted sound / received sound:** what the meters show.

- **PPM:** L and R, 0 on the meter = -12 dBFS. `MEMO` holds the peaks, `+20 dB` shifts the bars up for quiet signals, `RESET` resets the peaks and OVR.
- **Phase:** correlation between L and R, from -1 to +1.
- **Spectrum:** `FFT` or `1/3 oct`. With NICAM there should be nothing above 15 kHz.
- **Stereo image:** vertical = mono, slanted = L or R.
- **Scale factor:** how often each coding range is used, 1 = loud, 5 = quiet. Below it the C bits of the frame.
- **At the bottom:** IQ normal or swapped, J.17 pre-emphasis, station ID (8 characters) and the system of the transmitter.



On the phone everything is shown one below the other.

6. Receiver



The tab Receiver: controls on the left, in the middle the input spectrum, the errors over time and the constellation, the meters on the right.

Controls on the left

- **RX1 / RX2:** the input of the 7020. `STOP` / `START` switches the receiver off or on.
- **Gain:** gain of the receiver, 0 to 73 dB.
- **follows transmitter:** receive on the transmit frequency. **own frequency:** tune yourself. Then you see ▼ ▲, the step size, `FREQ` (type in) and `MEM` (memories of the receiver). The mouse wheel on the digits works here too.
- **System:** *automatic* searches by itself, first for the system of your own transmitter. You can also choose a fixed system: NICAM I or B/G (also swapped), PzN QPSK or PzN DX (4GFSK). `RESTART` restarts the receiver and searches again.
- **Listen in:** the received sound in the browser, with volume. See also chapter 9.
- **DAC:** what the DAC on the 7020 plays: silence, test tone, the transmit sound or what the 7020 receives.
- **Mute above:** above this error rate the sound fades out (1 in 100,000 to 1 in 100, or never). It opens again when it stays below half of that for half a second.

Below the controls is a status line: SYNC, station ID, MER, BER, offset and I2S. If transmitter and receiver do not match (other sample rate or other modulation), it says so here.

Input spectrum

In dBµV from the noise floor (noise floor = -14 dBµV, S1). The teal area is the channel filter, the orange lines are the edges of the channel. Put the mouse in the spectrum for a reading: kHz, dBµV and dB above the noise.

If the signal is too weak to search automatically, the spectrum says so: then choose the system by hand.

Errors, SNR and constellation

Yellow: the bit errors, teal: the SNR, up to 10 minutes back. The red dotted line is the limit of *Mute above*. On the right the constellation.

Meters and tiles

- **C/N and MER:** red below 10 dB, yellow below 15 dB. The white line at MER is at 20 dB. L and R: the received sound.
- **Tiles:** BER now and average (with PzN: frames in error in %), offset, signal (line) in dBµV, frames, parity errors (with PzN: frames in error), concealed samples, input (peak in dBFS, red above -1) and the station ID.
- `Counters to zero`: start the counters and the average again.
- `Calibrate noise floor`: switch the transmitter off first. The noise floor in the channel then becomes 0 dB for the C/N meter. Press again: automatic again.

7. Log and settings

The tab **Log** shows what the 7020 does: transmitter on and off, frequency, power, receiver found, sync lost and back.

All settings are saved **on the SD card**, not in the browser. If you change something on the PC, you see it right away on your phone. Several browsers can watch at the same time.

On the right of the tab Log:

- `Name of this 7020`: the name at the top of the page.
- `Save settings (backup)`: all settings as a file on your PC.
- `Restore settings from a backup`: puts such a file back.

8. Web version and Windows program side by side

It does not matter which one you use. Use what is handiest: the browser on the phone, or digiNICAM for Windows at the workbench. You do not need to switch anything.

- **If you connect digiNICAM for Windows** to the 7020, the web version steps aside by itself. At the top of the page it then says *Busy: the digiNICAM Windows program is connected*. You can still watch, but not change settings.
- **If you close digiNICAM for Windows**, the web version takes over again within a few seconds, with its own settings. The transmitter stays as Windows left it: on or off.
- The two keep their settings separately: the Windows program on the PC, the web version on the SD card.

9. Known limitations

- The input spectrum and the constellation come from the same capture memory. They are updated in turn, a few times per second.
- Transmitter and receiver use one sample rate. When the transmitter is on, the 7020 only receives systems with the same sample rate as the transmitter. *automatic* takes this into account.
- The receiver in the 7020 searches with a fixed width around the tuning. What the Windows program does only on the PC (filtering out interference spikes, light mode, choosing a sound card) is not in the web version.
- Do not use other programs with the 7020 at the same time, such as digiATV or digiZATV. The web version and digiNICAM for Windows do take turns neatly (chapter 8).

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