



NIKA2 System Recovery for software version **V2_IRAM**

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Abstract

The present document summarizes the main thing that must be checked to be sure that the NIKA2 acquisition is running smoothly at the 30m telescope, and the steps to follow in order to perform a system recovery in case of need. Procedures to connect (remotely or locally), start, check, and reboot the system if necessary are described. Some of the procedures listed below involving reboots of the electronics should be taken with caution and are not recommended for non-experienced observers. In case of doubt, please contact the IRAM staff or a NIKA2 instrument expert for assistance.

1 Connection to Work on NIKA2

1.1 Local connection

If you are at the Pico Veleta site, you don't need to open tunnels: you can directly work on the NIKA2 desk (at the center of the control room), which has two Mac: Mac8 (on the left) and Mac12 (on the right, **but see note above..**). The steps to follow are in this case the following:

1. **On Mac8**, double-click on the shortcut called “**ssh nika2 V2_IRAM**”. This opens a ssh terminal on nika2-a, already in the *appli* folder of software version 'V2_IRAM'. We will refer to this terminal as the *appli terminal*. It's from here that all the main script can be launched, so it's always good to have such an ssh connection to the appli folder of nika2 available.
2. Still **On Mac8**, double-click on the shortcut called “**fenetres_nika**”. It will open three VNC windows connected to nika2-a, respectively on port 5901 (named 'nika2-a:1'), on port 5902 (named 'nika2-a:2'), and on port 5903 (named 'nika2-a:3'). If this does not work, from the appli terminal launch the script:

- `./vnc_reset.pl`

Now you should be able to connect to the nika2-a vnc terminals using the “fenetres_nika” shortcut. If not, try a second time the previous command. The windows that are opened by “fenetres_nika” are:

- **nika2-a:1** : first window open on the nika2-a machine, used to launch the acquisition and lecture programs
- **nika2-a:2** : second window open on the nika2-a machine, used to run the monitor and trace programs
- **nika2-a:3** : a third window that can be used if one wants to launch extra copies of the trace program. It can otherwise be ignored.

3. **On Mac12**, from a shell window, open a VNC connection to the PC31 (or 38) to check the cryostat status:

- **open vnc://192.168.1.38** (or .31)

1.2 Remote connection

Follow these steps if you are not currently at the Pico Veleta site.

1. Open the tunnel to various NIKA2 machines, in particular nika2-a , Mac8, Mac12, PC31 and PC38:
 - **For Mac:** go in `./NIKA/Processing/NIKA_lib.V2_IRAM/Acquisition/appli/` and launch the script **tunnel.command**.
 - **For Linux:**
`ssh -L 2222:nika2-a.iram.es:22 -L 5901:nika2-a.iram.es:5901 -L 5902:nika2-a.iram.es:5902 -L 5908:150.214.224.24:5908 -L 5912:150.214.224.24:5912 -L 5936:mrt-nika1.iram.es:5901 -L 5931:150.214.224.24:5931 -L 5938:150.214.224.24:5938 t22@mrt-lx2.iram.es`
2. Open a ssh window on nika2:
 - `ssh -X -p 2222 -t localhost -l nika2`
 - `cd ./NIKA/Processing/NIKA_lib.V2_IRAM/Acquisition/Appli`
 - `bash`

In the following we will refer to this terminal as the *appli terminal*.

3. Open a series of VNC windows: 2 on nika2-a, one on Mac 12, as well as one on either the PC31 or the PC38 for the cryostat control:
 - **open vnc://localhost:5901** : first window open on the nika2-a machine, used to launch the acquisition and lecture programs
 - **open vnc://localhost:5902** : second window open on the nika2-a machine, used to run the monitor and trace programs
 - **open vnc://localhost:5903** : a third window that can be used if one wants to launch extra copies of the trace program. It can otherwise be ignored.
 - **open vnc://localhost:5912** : a data acquisition Mac used for an overview of the KIDs status. It typically runs an extra copy of lecture, plus the 'trace' program to check the time traces of the NIKA2 detectors and their level of noise. **As of Oct 2018, this option is not really valid due to the slow communication between the Mac12 and the acquisition machine. Work is ongoing to solve the problem**
 - **open vnc://localhost:5931 (or :5938)** : a NIKA2 PC to control the cryostat status.

2 Start the Acquisition software on the nika2-a machine via Mac8

It is now time to launch the acquisition software, that communicates with all the electronics boards and the various data acquisition subsystems. Do this on the Mac8 if you are at the telescope.

1. Start the acquisition software '**acqui**' on nika2-a:
 - From the appli terminal type `./reset_nika.pl`. This resets all the nika2 acquisition software processes that could still be running. Sometimes it does not work at once, so better to launch this command twice.

- In the window **nika2's X desktop (nika2-a:1)** double-click on the “**LAUNCH ACQ LECT V2 IRAM**” icon. This starts all the applications necessary for the acquisition: elvin, antenna, control, plus acqui and lecture. Wait until 2 grey rectangular windows open on the screen, one labelled 'acqui' and the second labelled 'lecture'.
 - The 'acqui' window will have a series of small rectangles ('Aamc', 'Bamc', ...), that should all be blinking. Also, it should write the name of the current run (eg: run36) in a small rectangle on the top left part. Check that this name correspond to the name of the current run. If not, contact the Grenoble support team.
 - The 'lecture' window should have a rectangle saying **SYNCHRO OK** in green. Again, you should see the name of the run on the top left part of it, and on the right, a series of lines with a format like '[number] : Ag Bg Cg ...' should be scrolling by.
- If everything is OK go to next point . If on the other hand one card does not respond or a card is stuck, there should be message. In this case, go to the Section 6 ('Verification of Amc Card Crates'), follow the steps therein, and finish by restarting the acquisition (./reset_nika.pl and so on).

3 Resonances Control via nika2's X desktop (nika2-a:2)

1. In the vnc connected to nika2-a port 5902 (nika2-a:2), double-click on the “**LAUNCH MON TRACE V2 IRAM**” icon. It will open one large grey window labelled “**monitor**” and a small orange one labelled “**trace**”.
2. If you just relaunched the acquisition, you'll have to recenter all the resonances. To do this, inside the 'monitor' window, click on the tab labelled **Recover lost pixel**. Then, in the window that appears, do the following:
 - Click on “**load freq.**”
 - Set the width of the scan: **150 points on a cold sky, 250 points if one is open on 300K or a bad sky.**
 - Click on “**measure**” and wait until the end of the measurement and the display of the curves in the graph. They should look like some gaussians (or.. kind of!). If not, repeat the 'load freq/measure' procedure.
 - Click on “**apply shift (man)**”.
 - Click on “**full tuning (man)**”. The program should now recenter the resonances.
 - Click on the tab 'main control' to go back to the main interface.

After this, and always in the 'monitor' window, you have a series of graphs allowing a general check of the system status:

- The histograms on the left indicate whether the tuning is of good quality. If all KIDs are well tuned, the histograms should look almost like a 'delta' distribution, with all KIDs placed around 0.
- All the arrows that can be seen on the top part of the 'monitor' window should point more or less upwards, and the circle should be green or yellow. The same circles with arrows can be seen also in the 'acqui' window on screen 5901. **Note:** if a scan is ongoing, the system will not tune the detectors, so if the weather is not really very good, the resonances might drift around and the arrow start to point away from the center. This is fine, provided that at the end of the scan the auto-tune correctly puts the KIDs back in place and the arrows go back to pointing upwards.
- The sliders on the right of the histograms indicate the number of usable KIDs, so all the sliders should be quite high (say above approx. 80% of full scale).

- The histograms on the right give an idea of the noise on the measurement.
 - In theory, by clicking on “**mise a jour des bons kid**” (update the good KIDs) so that the noise is calculated on the good KIDs alone. But this procedure is not commonly used so better to avoid it to prevent problems.
3. **If the above mentioned checks are all ok, tick the small box saying “Auto_tune”** (top left part of the ‘monitor’ window) so that the system starts to tuning automatically: the Elvin commands will trigger the tuning when needed. The system is now ready for observations: **YOU CAN START THE SCANS!**

4 Checking the KID traces and noise using ‘trace’

The connection of Mac12 to the nika2-a acquisition system is very slow as of Oct 2018, so Mac12 is almost useless. **As long as the problem of communication between Mac12 and nika2-a is not solved**, here are two options that still allow you to do checks on the detectors traces, acquire noise spectra etc:

- In the VNC connection to port 5902 (‘nika2-a:2’), you have a copy of the ‘trace’ program running. On its small orange window, click on the drop-down menu which says ‘nouvelle fenetre’ and click on ‘trace_tout’. For the instructions for using this window, refer to the document ‘Checking noise traces for NIKA2’. The only limit of this solution is that *only one ‘trace_tout’ window can be opened!* If you try to open a second one, the program will crash!
- If you want to open multiple ‘trace_tout’ windows, the best solution is to use the vnc connection to the third screen on nika2-a, nika2-a:3. In this window, launch as many copies of the ‘trace’ program using the icon ‘launch trace V2 IRAM’ as you want, and with each copy open *one single* trace_tout window (otherwise, it will crash!). To open it, from the orange ‘trace’ window, drop-down menu ‘nouvelle fenetre’, and choose ‘trace_tout’.

Once the communication problem of Mac12 is solved, you can follow the procedure below to launch the data reading on Mac12, as well as the ‘trace’ program to look at the KIDs time traces:

- If the **lecture** program is not already running, click, on the left, on the icon representing a small green frog with big eyes to start it. If on the other hand it is already running and you have just re-launched ‘acqui’ on nika2-a, click on the “**reconnect**” button of ‘lecture’. Check that the messages are scrolling in the right part of the green ‘lecture’ window.
- If “**trace**” is not already running, click on the icon representing an orange elephant to start it. A small orange window should appear: it is the ‘trace’ main window.
- In the “trace” main window, in the drop down menu, choose ‘trace_tout’ to open a window from which you’ll be able to plot the KIDs time traces.

For more details on the steps to take on trace_tout for plotting data/checking data quality, refer to the document ‘CheckingNoiseSpectra’

5 Check-list for Running Processes

On Mac 8 (or more in general in the nika2-a VNC windows):

1. On the **nika2’s X desktop (nika2-a:1)** grey window **acqui**:
 - All the LEDs blink correctly. If a LED does not blink, then restart (“**stop**” and “**start**”).

- All the needles are facing upwards (and green).
 - The intermediate files are well recorded (**filename is blinking**).
2. Still on the **nika2's X desktop (nika2-a:1)**, but on the grey window labelled textbflecture:
 - The data scroll regularly in the table on the right.
 - **The sync indicator is green and does not blink.**
 - The file name is displayed correctly and flashes (blinks)
 - The option 'comprime' is ticked, the 'mini' and 'normal' are not ticked
 3. In the **nika2's X desktop (nika2-a:2)**, in the grey window **monitor**:
 - **The 'auto_tune' option is ticked**
 - The text at the top left, next to Auto_tune, blinks.
 - **The histograms of the KIDs must be rather sharp and near to zero.** Notice that they can drift during long scans (no tunings are performed while scanning) but should recover a 'delta-like' shape at the end of a scan.
 - The scrollbars must be fairly high (high number of good kids)
 4. On the monitoring Mac (Mac12, nika2-a::5903, or nika2-a::5902 depending on which solution you chose):
 - On the orange window (trace and trace_tout): if you have opened the KID traces, they should be scrolling by. You can check also the noise level. Refer to the dedicated document, 'CheckingNoiseSpectra'
 5. On Mac12:
 - On the VNC connection to PC31 or PC38:
 - The temperature of the mixing box (MC) is ~ 170 mK (190 mK if considering the temperature sensor nearer to the detectors).
 - The level of the cryostat. Check that it is stable.
 - Check that the **duoPOMP**, the **COMP**, and the **HP400** turbo are on.

6 Verification of Amc Card Crates

- Go to the *appli terminal* in which the ssh connection to nika2-a is active. Normally you are in the *appli* folder. If not do:
`cd ~/NIKA/Processing/NIKA_lib_V2_IRAM/Acquisition/appli/`
- Send the command `./control.py nika`. It indicates the state of the 3 Crates as well as of all 20 boards. Verify that the 20 boards are present.

After this, different cases may arise:

- The 3 Crates are not presents: it is necessary to **restart everything (power cycle them)**. Go to $\rightarrow 1$.
- The 3 Crates are present but there are some missing boards in the list: reboot the Crate in which boards are missing. Go to $\rightarrow 2$)
- The 20 boards are present but some are marked **KO instead of OK**: restart the doubtful boards. Go to $\rightarrow 3$.

- Everything seems OK but the acquisition refuses to start a precise board: **restart the board indicated by the acquisition**. Go to → 3.
- If you already tried the above steps but this did not solve the problem and one crate still refuses to start or to work properly, you have a final 'hardware' option that you can try. Go to → 4.

1. Complete restart of the Crates (power cycle):

- Connect with firefox or safari from the Mac 8 or Mac 12 on the PSE538 switch: IP-address: **192.168.1.58**, user: **admin**, pass: **admin**
- Each Crate is powered separately by the **220V P1 (for Array 1)**, **220V P2 (for Array 2)**, and **220V P3 (for Array 3)** power supplies.
- Click off 220V Px and wait 20 seconds.
- Click on 220V Px and wait 40 seconds. **WARNING: only touch the P1, P2, or P3 power supplies, nothing else.**
- Check with `./control.py nika` that the Crates are present. If they are, restart the acquisition (`./reset_nika.pl` and so on, as described in section 2).

2. Rebooting a Crate: if there are missing boards in the Crate (there must be $8(A1) + 4(A2) + 8(A3)$): `./control.py 192.168.1.xxx crateColdReboot`, where xxx is the IP-Address of the Crate: array1 = 150, array2 = 160, array3 = 170. Wait some seconds then check with `./control.py nika`.

3. Restart an individual board:

- To restart a board, you must know the IP-Address of the crate and the slot number of the board. Everything is indicated after a `./control.py nika`.
- Nonetheless, it could happen that on the `./control.py nika` command output, all boards are shown with OK status but on the Acqui or kid_monitoring windows, a board shows a problem (e.g. blinking in different colors or arrow not vertical on the Acqui display, or board level drop in the kid_monitoring display). In this case, to reboot the board it is necessary to identify its IP-Address to find its slot number and Crate IP in the `./control.py nika` output. For this, check the corresponding RunXX.ini file to relate the NICKEL Board name, to the corresponding IP-Address shown by the `./control.py nika` command.
- To restart a board, stop it and then restart it with the following commands: `./control.py 192.168.1.xxx deactivate n`, where xxx is the IP-Address of the Crate: array1 = 150, array2 = 160, array3 = 170, and where n is the number of the slot (read the slot number with the command `control.py nika`). Wait some seconds and then: `./control.py 192.168.1.xxx activate n`. Wait some seconds then check with `./control.py nika`.

4. Complete hardware restart of one Crate, with capacitors discharging:

- Note which crate is refusing to work.
- Go to the telescope cabin, as the operation is carried out working directly on the crates.
- Identify the problematic crate. The crates are located just above the stairs that give access to the telescope cabin. Crate1 is on the left, Crate2 is the central one, and Crate3 is on the right.
- On the crate, find the power supply card: it's the first from the left and has the power supply cord plugged onto it.
- Pull down the small metallic lever on the power supply card, marked by the label 'on/off' near to it.
- Unplug the power cord from the power supply card.

- With the cord unplugged, pull back up the metallic lever. The crate will try to start up, thus using the residual charge accumulated in the capacitors and fully emptying them.
- Once all the LEDs of the crate turn off because it's completely powerless, pull down again the metallic lever.
- Wait one minute (or more, if you already did this test and one minute was not enough..)
- Plug back in place the power cord, and pull up the metallic lever to restart the crate after the 'total reboot'.
- Check with `./control.py nika` that the Crates are present. If they are, restart the acquisition (`./reset_nika.pl` and so on, as described in section 2).

7 Log Information in Case of a System Crash

In case of a system crash, it is important to properly record the information of the errors showed by the system so it can be further investigated. Therefore, if a crash happens, please record the following information:

- Time of the crash.
- Kind of problem: board crash?, crate crash?, synchro lost?, etc.
- Error message if available: check in the nika2-a:1 VNC the blue output window of **ACQUI**.

And please inform O. Bourrion, M. Calvo, A. Benoit, A. Ritacco, B. Ladjelate or S. Sánchez about the problem.