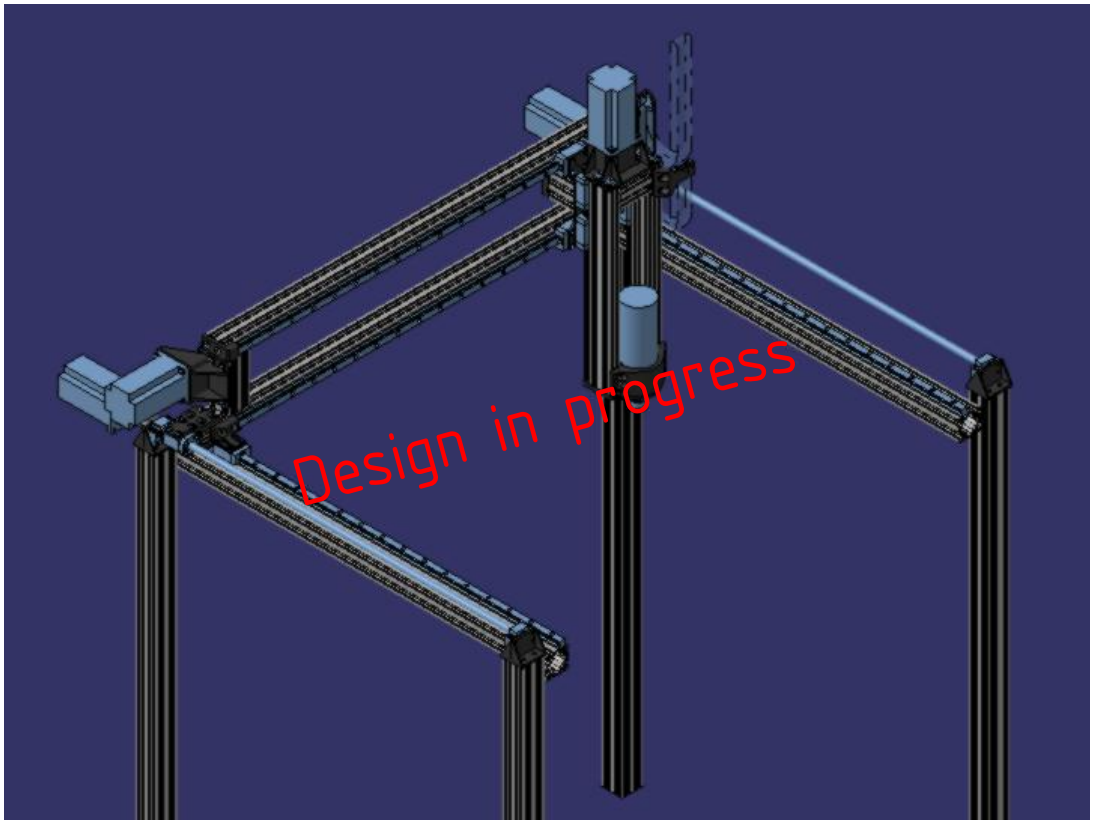


R993CNC

PC Settings

for LinuxCNC controllers

2022-09-21

Paragraph	Change	Date
-	Initial version	2022/09/21

Version notes

Table of contents

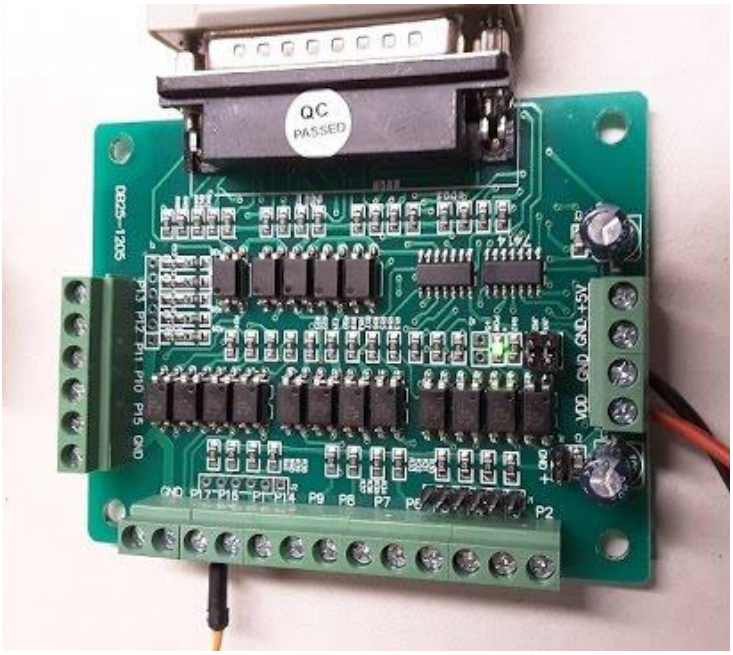
1. Hardware

The hardware set :

- ASRock J3355B-mTX motherboard.
- Zifei (Aliexpress.com) 8GB 18666MHz 1,35V DDR3L PC3L-14900 CL12 memory module. One module sets in slot A.
- Storage Crucial MX500 250Go SSD drive.

Machine link :

- Parallel isolated breakout board (Aliexpress.com) for stepping, limit switches and emergency stop.



Breakout board

- USB to RS485 converter board (GoTronic.fr) for spindle inverter communication.

USB-RS485 board

User interface :

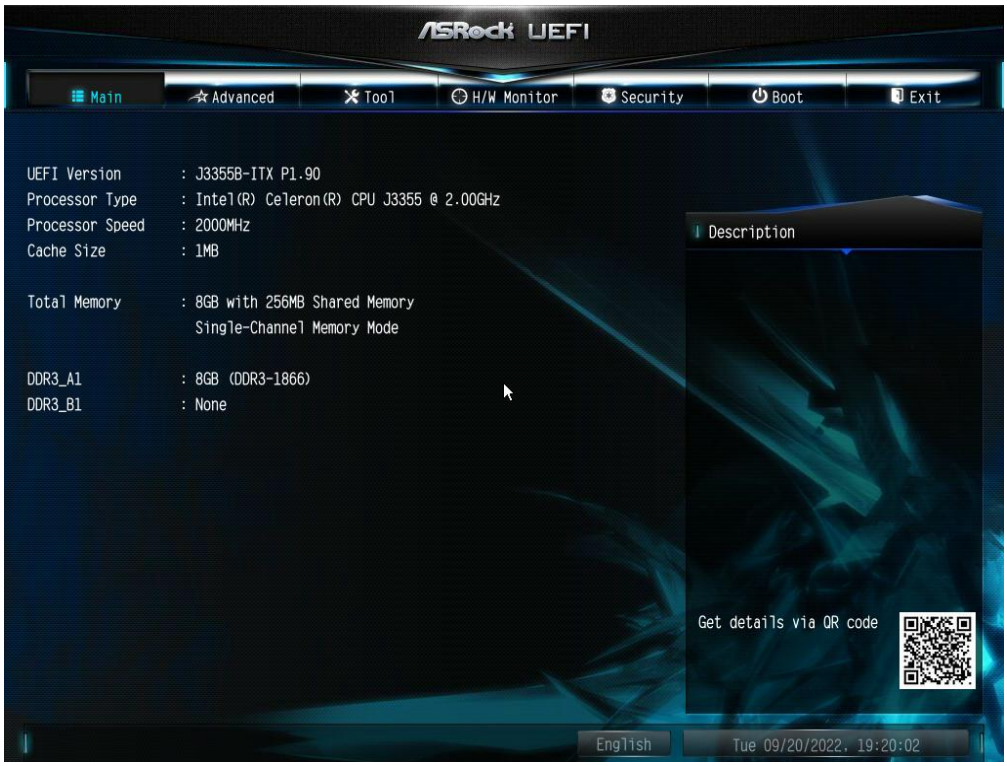
- Mouse and keyboard : Logitech MK120 (french layout)

- Philips 18,5'' 193V5LSB2 (VGA) display.
  This display not accommodate very well LinuxCNC GEMOCCAPI interface. Choose 4/3 display or one with more lines.

Other :

- 19'' 1U IPC-C125B Rack case (25cm depth). Fans are not connected.
- FPS250-50GUB 80+ Bronze power supply.

2. UEFI settings

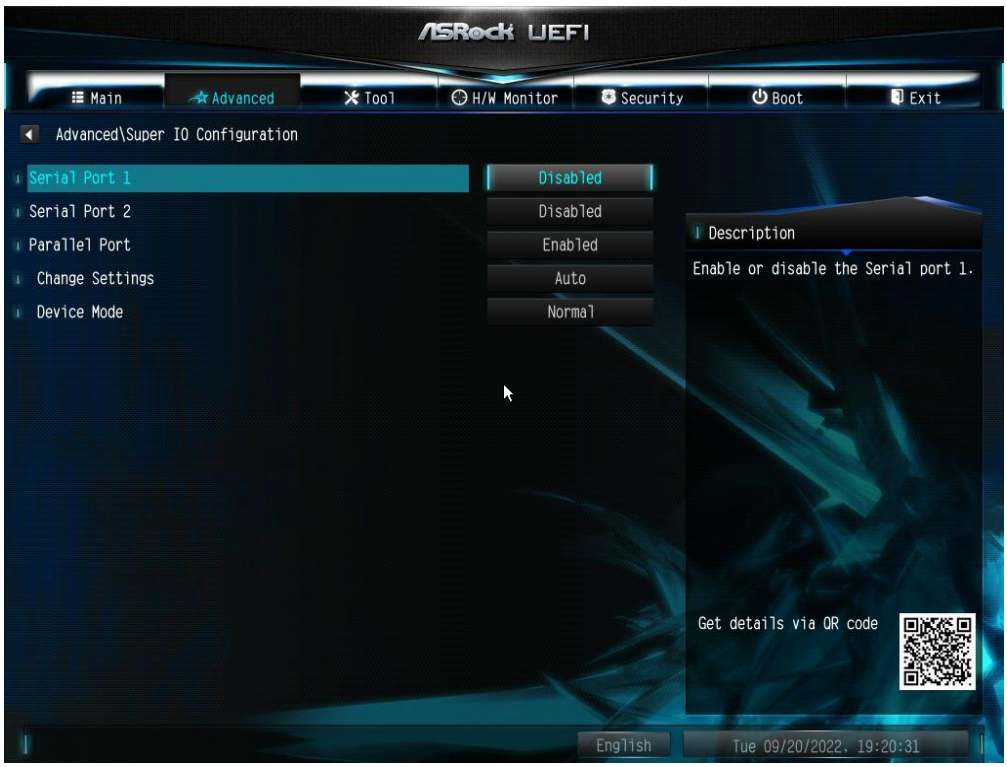


Main page

CPU settings

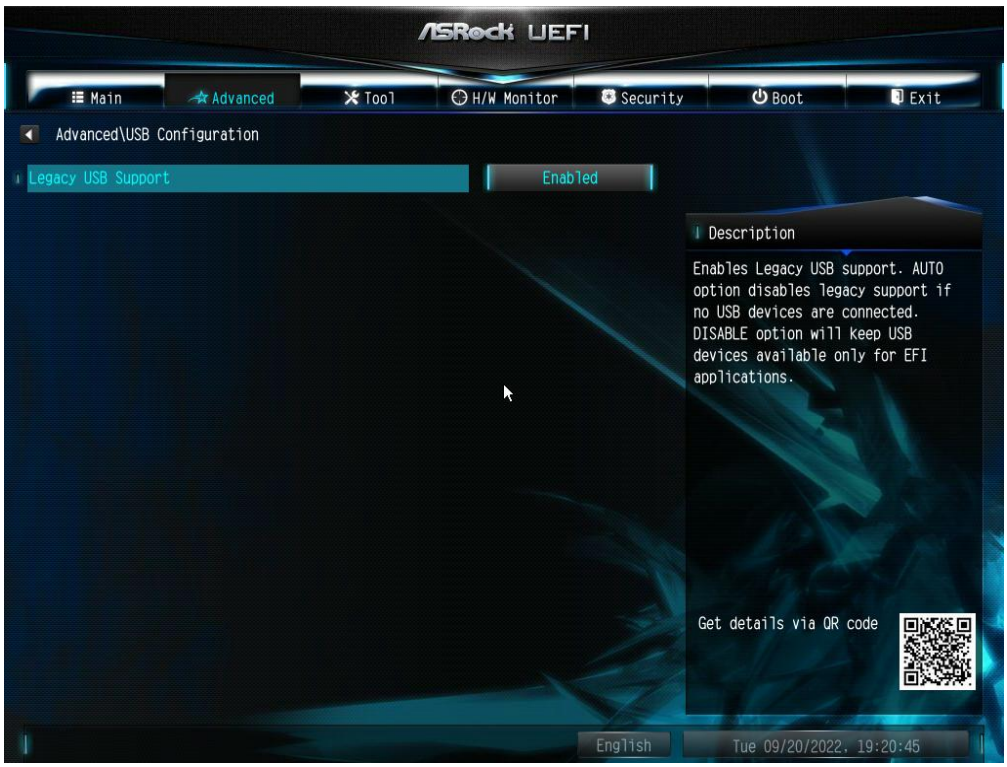
Chipset settings

Storage settings

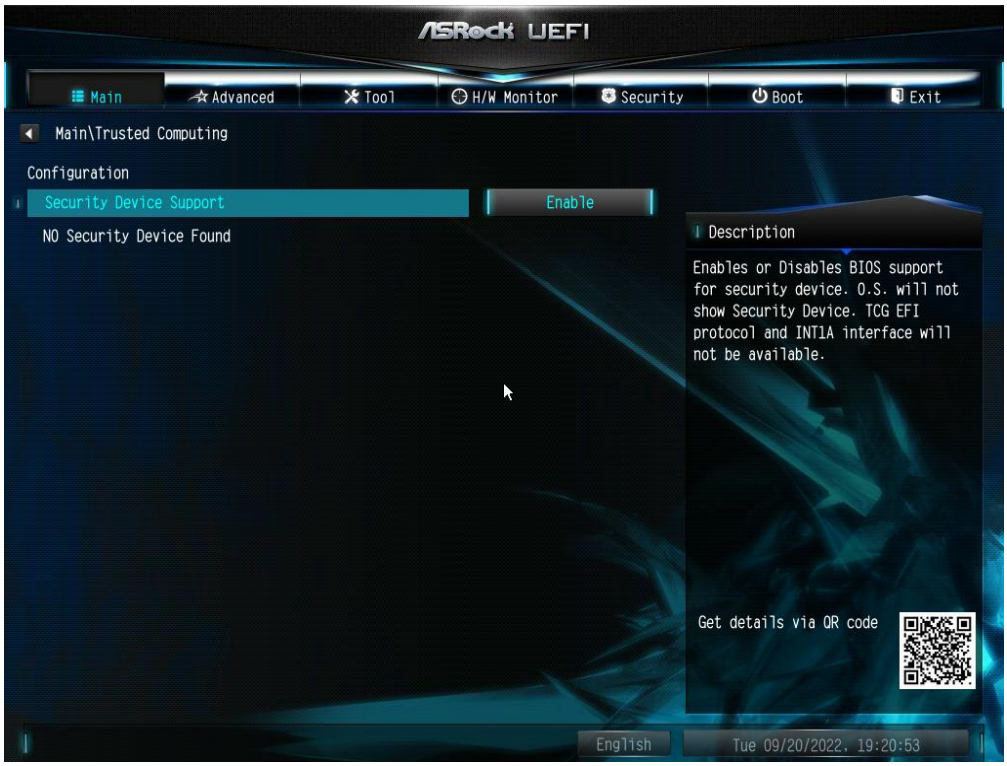


IO settings

APCI settings



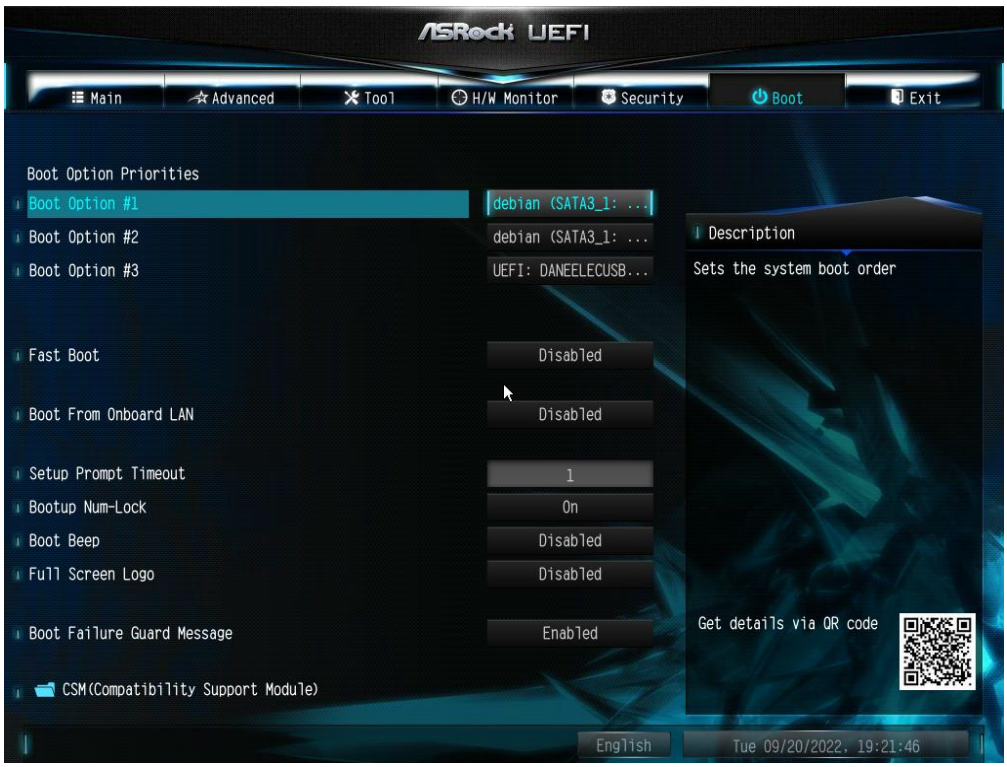
USB settings



Trusted settings

H/W settings

Security settings



Boot settings

3. Debian Buster and LinuxCNC installation

References :

http://linuxcnc.org/docs/stable/html/getting-started/getting-linuxcnc.html#_normal_download

Download :

http://www.linuxcnc.org/iso/linuxcnc-2.8.2-buster.iso

Make bootable USB key ISO image (linux command line) :

```
$ dd if='~/Downloads/linuxcnc-2.8.2-buster.iso' of=/dev/[l'identifiant de la clé USB]
```

See manual pages :

```
$ man dd
```

Make a standard installation using full disk with all datas in one partition.

Install LinuxCNC with RTAI.

References :

http://linuxcnc.org/docs/stable/html/getting-started/getting-linuxcnc.html#cha:Installing-RTAI

Add the packets signing key :

```
$ sudo apt-key adv --keyserver hkp://keys.openpgp.org --recv-key 3cb9fd148f374fef
```

Add deposits :

```
$ echo deb http://linuxcnc.org/ buster base 2.8-rt | sudo tee
/etc/apt/Referencess.list.d/linuxcnc.list
$ echo deb-src http://linuxcnc.org/ buster base 2.8-rt | sudo tee -a
/etc/apt/Referencess.list.d/linuxcnc.list
```

Update the packets list :

```
$ sudo apt-get update
```

Install linuxCNC :

```
$ sudo apt-get install linuxcnc
```

Update to the last official revision (2022/20/09).

References :

https://forum.linuxcnc.org/9-installing-linuxcnc/37684-building-rtai-5-2-packages-some-questions#252386

Download :

https://www.linuxcnc.org/dists/buster/2.8-rtpreempt/binary-amd64/linuxcnc-uspace-rtai_2.8.4_amd64.deb

Remove previous revision of LinuxCNC :

```
$ sudo apt-get remove LinuxCNC
```

Install new revision :

```
$ sudo dpkg -i ~/Downloads/linuxcnc-uspace-rtai_2.8.4_amd64.deb
```

4. Adding UEFI Setup menu entry to Grub menu

During first Grub update, the UEFI subnemu will be removed. Add it now to keep the option during updates.

Open /etc/grub.d/40_custom file :

```
$ sudo nano /etc/grub.d/40_custom
```

Add this to the end of the file :

```
menuentry "UEFI setup" {
        fwsetup
}
```

5. Kernel parameters modifications

References :

https://forum.linuxcnc.org/38-general-linuxcnc-questions/46663-cannot-seem-to-get-good-latency-numbers#249850

Edit /etc/default/grub file :

```
$ sudo nano /etc/default/grub
```

Add option to line GRUB_CMD_LINUX_DEFAULT :

```
GRUB_CMDLINE_LINUX_DEFAULT="quiet nosmt intel_idle.max_cstate=0 pocessor.max_cstate=0 idle=pool cpufreq.off=1 acpi_irq_nobalance isolcpus=0"
```

Some explanations :

- nosmt : deactivate symmetric multi-threading.
- *.max_cstate=0 : processor power management. 0 = no power management.
- idle=pool : While processor is waiting for command, it leave active.
- cpufreq.off=1 : remove frequency adaptation to processor load.
- acpi_irq_nobalance : lock interrupts to the stated core.
- isolcpus=0 : Core 0 will not be used for no real time tasks. Use core 1 for RT-Preempt.

More informations :

https://www.kernel.org/doc/html/v4.19/admin-guide/kernel-parameters.html

Update Grub :

```
$ sudo update-grub
```

Reboot :

```
$ sudo reboot
```

6. Core isolating addons (smp_affinity)

References :

https://forum.linuxcnc.org/38-general-linuxcnc-questions/46663-cannot-seem-to-get-good-latency-numbers#249850

Isolating cores is not enough. We have to force interrupts to run on the non isolated core.

If it not exists, create /etc/rc.local files :

```
$ sudo touch /etc/rc.local
```

Edit /etc/rc.local file :

```
$ sudo nano /etc/rc.local
```

Append following lines :

```
#!/bin/sh -e
for i in /proc/irq/*; do
	if [ -d $i ]; then
		/bin/echo 2 > $i/smp_affinity || true
	else
		/bin/echo 2 > $i || true
	fi
done
```

```
exit 0
```

2 if binary mask binary 0b10 (bit 2 = core 2).

Make it executable :

```
$ sudo chmod +x /etc/rc.local
```

Lauch the daemon :

```
$ sudo systemctl daemon-reload
$ sudo systemctl start rc-local
```

or relauch it :

```
$ sudo systemctl restart rc-local
```

Chek the interrups running state :

```
$ watch -n 1 -d cat /proc/interrupts
```

Effect is more visible using RT-Preempt than using RTAI.

7. Removing braille extension (brltty)

Brltty use same port as USB-RS485 link for spindle. It must be removed.

Run command :

```
$ sudo apt-get remove brltty
```

8. Deactivating (or removing) PulseAudio

References in french :

https://doc.ubuntu-fr.org/pulseaudio#a_essayer_en_premier

Create ~/.pulse folder :

```
$ mkdir ~/.pulse
```

Copy /etc/pulse/client.conf file to this new folder :

```
$ cp /etc/pulse/client.conf ~/.pulse/
```

Edit ~/.pulse/client.conf file :

```
$ nano ~/.pulse/client.conf
```

Replace the line :

```
; autospawn = yes
```

with :

```
autospawn = no
```

Stop PulseAudio :

```
$ pulseaudio -k
```

Lock restart :

```
$ touch ~/.pulse_a11y_nostart
```

If it not works remove packets :

```
$ sudo apt-get remove gstreamer1.0-pulseaudio libpulsedsp pavucontrol pulseaudio pulseaudio-utils
```

9. Installing compressing tool

Run command :

```
$ sudo apt-get install ark
```

10. Deactivating sound modules

Download lcnc-hw latency test script :

https://forum.linuxcnc.org/media/kunena/attachments/17274/lcnc-hw_2020-09-30_2020-10-02.zip

Unzip file using graphic tools.

The unzipped folder is placed in ~/linuxcnc :

```
$ mkdir ~/linuxcnc
$ mv -r ~/Downloads/lcnc-hw ~/linuxcnc/
```

Run the script :

```
$ cd ~/linuxcnc/lcnc-hw/
$ sudo ./lcnc-hw
```

When latency datas appears, stop the script :

```
crtl+c
```

Latency module add block-snd-modules file. Run this script :

```
$ sudo ~/linuxcnc/lcnc-hw/block-snd-modules
```

11. Deactivating monitor blanking (DPMS)

References :

https://forum.linuxcnc.org/38-general-linuxcnc-questions/46847-screen-saver-function-on-buster#251505

This is the official Debian proposal.

Create /etc/X11/xorg.conf.d folder :

```
$ sudo mkdir /etc/X11/xorg.conf.d
```

Create /etc/X11/xorg.conf.d/10-noblanking.conf configuration file :

```
$ sudo touch /etc/X11/xorg.conf.d/10-noblanking.conf
```

Edit this file :

```
$ sudo nano /etc/X11/xorg.conf.d/10-noblanking.conf
```

Write the following lines :

```
Section "ServerFlags"
        Option "BlankTime" "0"
        Option "StandbyTime" "0"
        Option "SuspendTime" "0"
        Option "OffTime" "0"
EndSection

Section "Extensions"
        Option "DPMS" "Disable"
EndSection
```

Reboot :

```
$ sudo reboot
```

Check DPMS state :

```
$ xset -q
```

12. Automatic login

Edit /etc/lightdm/lightdm.conf file :

```
$ sudo nano /etc/lightdm/lightdm.conf
```

Under [seat:*] section, remplace line :

```
#autologin-user=
```

by :

```
autologin-user=username
```

13. Installing some useful tools

Screen recorder :

```
$ sudo apt-get install simplescreenrecoder
```

Screen capture :

```
$ sudo apt-get install xfce4-screenshooter
```

14. Latency test

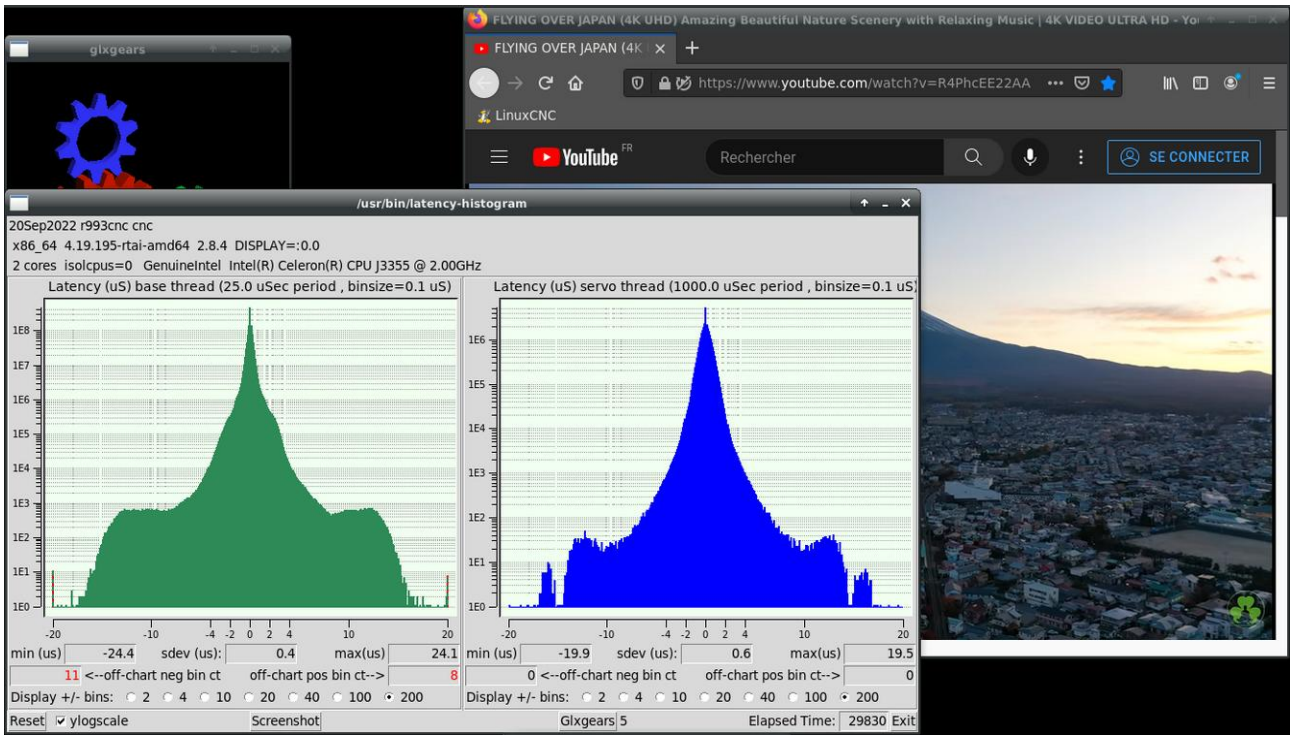
use lcnc-hw :

```
$ cd ~/linuxcnc/lcnc-hw
```

```
$ sudo ./lcnc-hw
```

Or, Run latency-histogram with 5 glxgears and one HD video (youtube).

The result must be similar to this :



Latency-histogram results

15. Some accessories

Limit switches and emergency stop test box

USB-RS485 box