ProxyDemo v5.20
User Guide
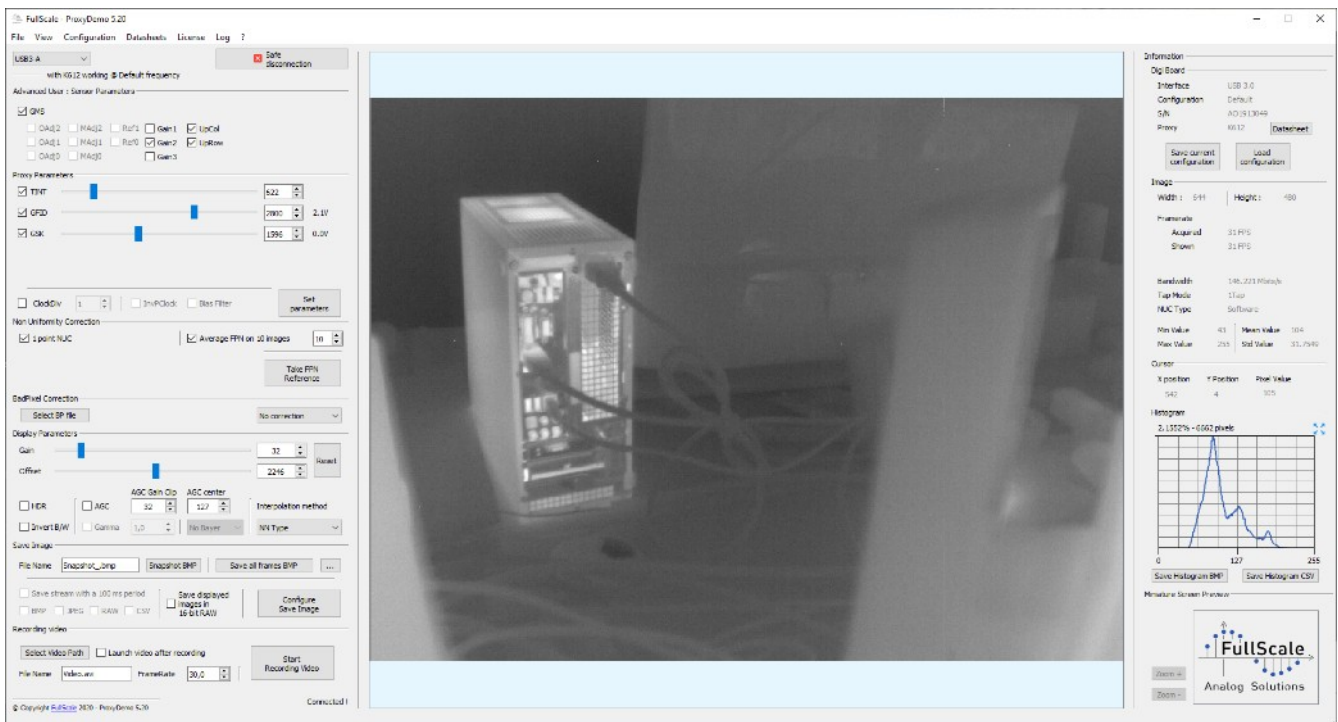
Document reference	UG_ProxyDemo5_Software
Date	14. Oct. 2020
Revision	Rev 0.10

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Abbreviation table

AGC	Automatic Gain Control
BP	BadPixel
DGO	Display Gain and Offset
FPN	Fixed-Pattern Noise
GUI	Graphical User Interface
HDR	High Dynamic Range
NUC	Non Uniformity Correction
PoCL	Power over CameraLink
USB	Universal Serial Bus
MAC	Media Access Control
DHCP	Dynamic Host Configuration Protocol
MDI-X	Medium Dependant Interface Crossover
SP	Service Pack
CL	CameraLink

1. Before starting

ProxyDemo is a portable software. Place the ProxyDemo directory anywhere on the computer. The executable is located to: "ProxyDemo/ProxyDemo.exe".

IMPORTANT: To prevent any issues, do not use any specials characters (ex: 'é', '@', '~', etc.) for the directory path.

CAREFUL: Before connecting any Proxy Board, please make sure the configuration saved in the Digi Board is correct (cf. 3.1 Digi Board and Proxy choice)

1.1. Recommended configuration

The minimum configuration to execute ProxyDemo is:

- Operating System: Microsoft Windows 7 / 8.1 / 10 (x86)

- Processor: Dual Core Intel i3 (or AMD equivalent) @2GHz

- RAM: 4GB DDR3 Single Channel

- Hard Disk Drive with 500MB free space

- Software:

  ◦ Microsoft Visual C++ 2010 Redistributable (x86) (can be downloaded here)

  ◦ Microsoft Visual C++ 2013 Redistributable (x86) – Version 12.0.30501 (can be downloaded here)

  ◦ Microsoft Visual C++ 2015 Redistributable Update 3 RC (x86) (can be downloaded here)

The recommended configuration is:

- Operating System: Microsoft Windows 8.1 / 10 (x64)

- Processor: Quad Core Intel i5 (or AMD equivalent) @3GHz

- RAM: 8GB DDR3 Dual Channel (2x4GB)

- SSD Disk Drive with 500MB free space

- Display resolution: FullHD (1920x1080)

- Software:

  ◦ Microsoft Visual C++ 2010 Redistributable (x86) (can be downloaded here)

  ◦ Microsoft Visual C++ 2013 Redistributable (x86) – Version 12.0.30501 (can be downloaded here)

  ◦ Microsoft Visual C++ 2015 Redistributable Update 3 RC (x86) (can be downloaded here)

CAREFUL: ProxyDemo may work with Microsoft Windows Seven (SP1) but not optimally. Some options may be not available and the performances with USB3-A are not guaranteed.

NB: ProxyDemo may need administrator privileges to manage files and to save some in particular folders.

1.2. … with USB3-A

The USB3-A has to be installed on your system. To proceed, plug the USB3-A without proxy on a computer USB3 port. Windows installs it automatically and recognizes it as a camera. The peripheral is called "FullScale_USB3-A".
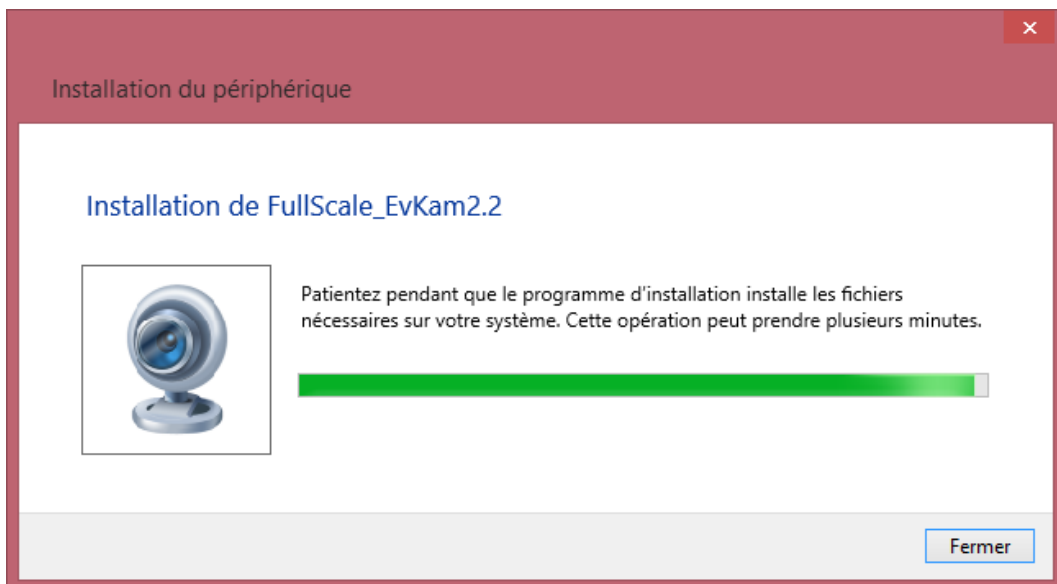
Illustration 1: USB3-A installation on Windows

Once the installation is complete, unplug the USB3-A from the computer.

ProxyDemo uses dedicated USB3-A licenses files. In the folder ProxyDemo/Licenses, please check that the license(s) of your material is available (ex: USB3-A_AO1615014.dat). If the license file of your USB3-A is not available, please copy it in this folder or contact FullScale for more information.

Plug the USB3-A to the USB port. Two LEDs are ON and one is toggling. Once the initialization is done, only one LED has to be ON.

ProxyDemo software can be launch now.

IMPORTANT: If a Processing Board is connected to the USB3-A Digi Board, then, some processing can be done directly on the board (NUC and BadPixels.) To select the processing mode, please refer to the NUC menu (cf. Chapter 5)

1.3. … with GigEV-B

The GigEV-B has to be connected to the same network as the computer is. Then, ProxyDemo is able to detect the Digi Board on the network.

MAC address of the NTX Pleora board set is written on a bonded label. FullScale recommends to use a DHCP configuration (with an address reservation for the NTX if possible).

ProxyDemo uses dedicated GigEV-B licenses files. In the directory ProxyDemo/Licenses, please check that the license(s) of your material is available (ex: GIGEV-B_AQ1601xxx.dat). If the license file of your GigEV-B is not available, please copy the corresponding license in this folder or contact FullScale for more information.

IMPORTANT: ProxyDemo is using the eBUS Runtime 4.1.7.3988. Older versions are not supported by the software. Please, use the revision 4.1.7.3988.

NB: The GigEV-B can be connected directly to the computer using a RJ45 cable. Microsoft Windows assigns an IP address automatically to the GigEV-B (if the DHCP protocol is enabled on the computer). The NTX boards supports the Auto MDI-X capability which allows to use a standard RJ45 cable instead of a RJ45 crossover cable.

Tips to improve performances of ProxyDemo with GigEV-B:

• Pleora provides specific drivers to improve performances. Please be sure the "eBUS Universal Pro For Ethernet Driver" is installed on the computer. Go to "Control Panel" → Network and Sharing Center → Change Adapter Settings → Right Click on Ethernet (or Wireless) main controller → Properties. The eBUS Universal Pro For Ethernet Driver" item has to be available and checked if it is installed.
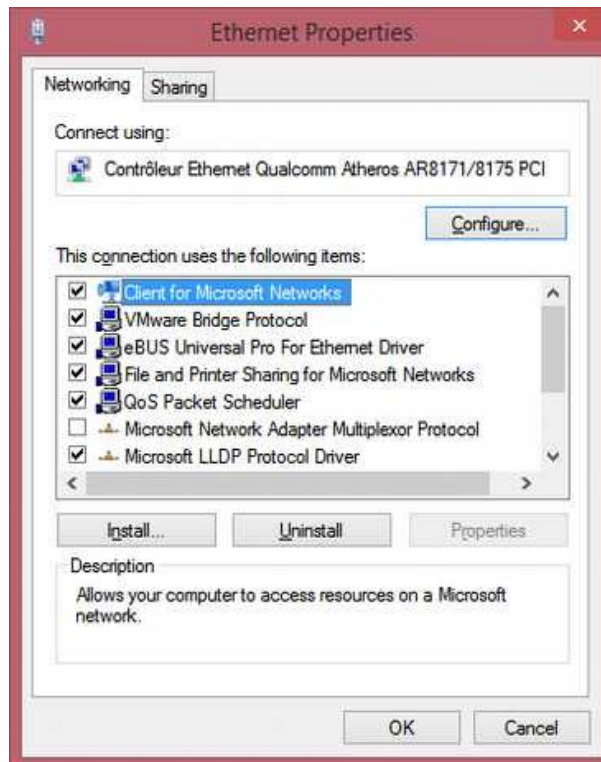

Illustration 2: eBUS Driver installed for the Ethernet

driver

• It can be possible to change the "Jumbo trame" parameter of the Network Adapter. Go to "Control Panel" → Network and Sharing Center → Change Adapter Settings → Right Click on Ethernet (or Wireless) main controller → Properties → Configure… → "Advanced" tab → Jumbo trame. Then set the value to 1KB MTU or higher.
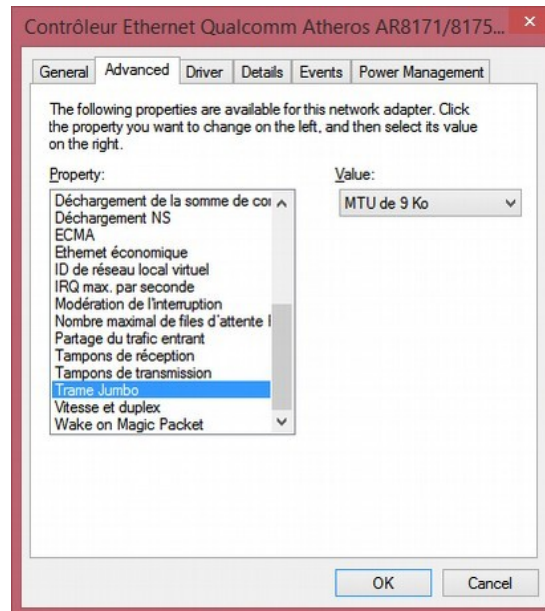

Illustration 3: Jumbo trame modification

NB: It can be necessary to exclude ProxyDemo software from the Windows firewall.

1.4. … with CLink-C+ or CLink-B+

The Clink-C+ or CLink-B+ is connected to the computer via a CameraLink cable. The computer has to integrate the PCI Euresys GrabLink Base Frame grabber. ProxyDemo is only compatible with this frame grabber model. The drivers can be find from this link: Drivers multicam 6.9 Euresys

When the Digi Board has finished to boot, two LEDs are toggling.

ProxyDemo uses dedicated licenses files. In the directory ProxyDemo/Licenses, please check that the license(s) of your material is available (ex: CLINK-C+_AN1011012.dat). If the license file of your CLink-C+ is not available, please copy it in this folder or contact FullScale for more information.

Plug the CLink-C+ to the frame grabber.

ProxyDemo can be launched now.

NB: ProxyDemo is compatible with multiple Euresys Frame Grabber. Multiple ProxyDemo instances can be executed to start multiple streams coming from different Frame Grabber. This is an automatic feature, there is no frame grabber choice. ProxyDemo establishes the link with the first CLink-C+ connected and available. This feature has not been tested with

dual Camera Link connectors available on one Frame Grabber.

Careful: Using more than one ProxyDemo instance can affect the stream and display performances.

1.5. … with CLink-C

The CLink-C is connected to the computer via a CameraLink cable. The computer has to integrate the PCI Euresys GrabLink Base Frame grabber. ProxyDemo is only compatible with this frame grabber model. The drivers can be find from this link: [Drivers multicam 6.9 Euresys](#)
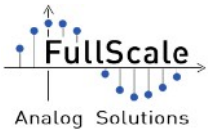
When the CLink-C has finished to boot, two LEDs are toggling.

Plug the CLink-C to the frame grabber.

ProxyDemo can be launched now.

NB: On Windows 8 and newer version, by default, the PoCL functionality is disabled. To modify this parameter, please follow the following instructions:

- *Go to the Control Panel then click on the Power Options icon.*

- *Click on the "Choose what the power buttons do" link on the left side.*

- *Click on the "Change settings that are currently unavailable" link at the top*

- *If prompted by UAC, then click on "Yes".*

- *Under Shutdown settings, uncheck the "Turn on fast startup" checkbox if it is listed, then click on the "Save changes" button.*

- *The Fast Startup feature is now disabled.*

> Source:
> *Euresys – Release Notes for MultiCam 6.9.4 – Important Notices – Multicam does not support Windows 8 Fast Startup feature – page 3*

NB: The Multicam driver 6.9.4.2368 is mandatory to work with the CameraLink Digi Boards

2. Quick start with a FullScale DemoKit

The following procedure allows the user to quickly display a perfect thermal raw image from a FullScale DemoKit. For detailed user parameters, go to paragraph 3.

2.1. Opening the video stream

Once all the drivers are installed and the ProxyDemo software copied on the computer, execute the program ProxyDemo.exe. The program can be found at the following path: "FullScale_GUI-x.xx/ProxyDemo/ProxyDemo.exe".
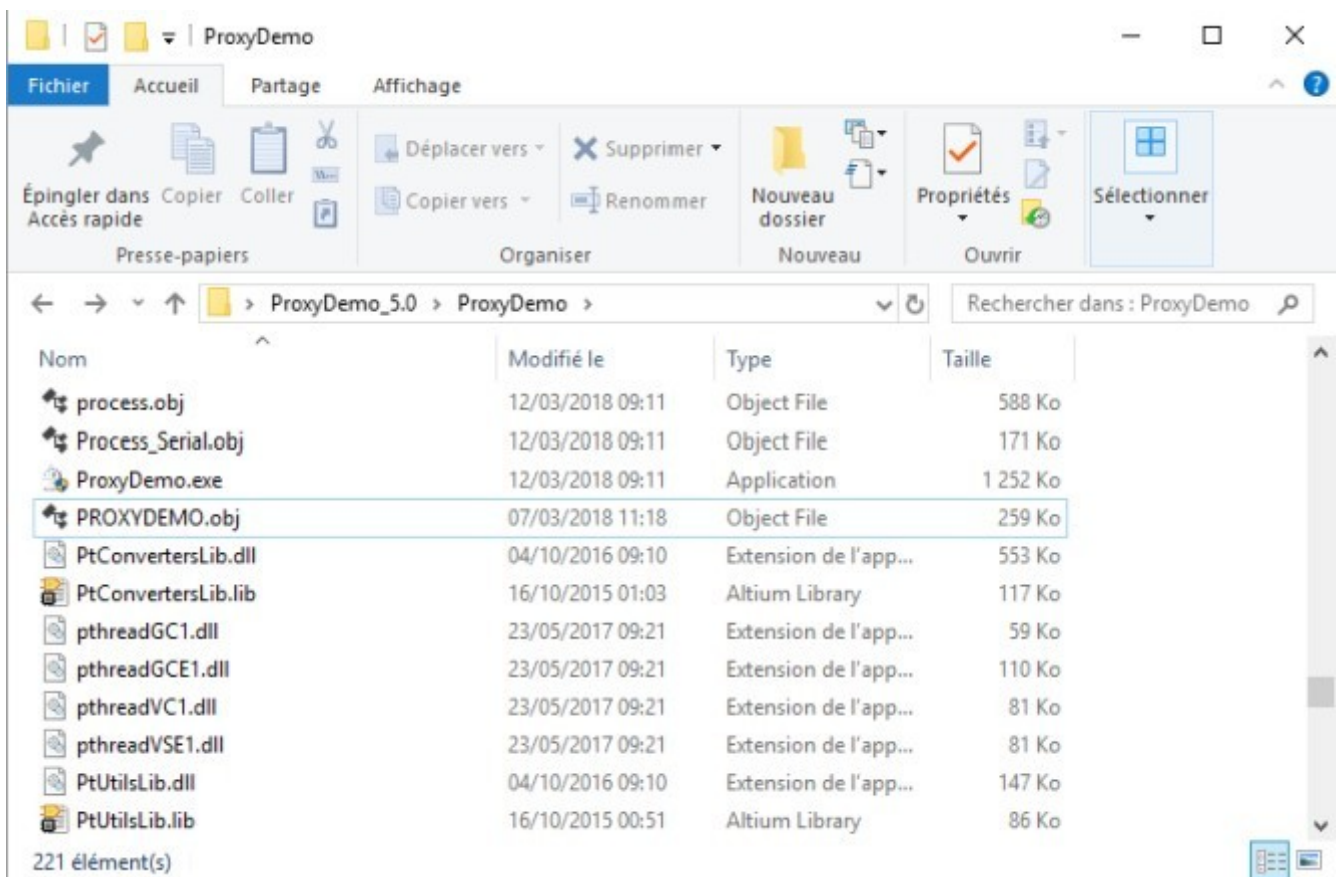
Illustration 4: Location of ProxyDemo executable file

NB: If no license is detected by the ProxyDemo, ProxyDemo warns that without a correct license file, the connection to a FullScale Digi Board cannot be possible. ProxyDemo gives the possibility to select one license file. Selecting it, ProxyDemo will automatically copy this file to the ProxyDemo License directory.

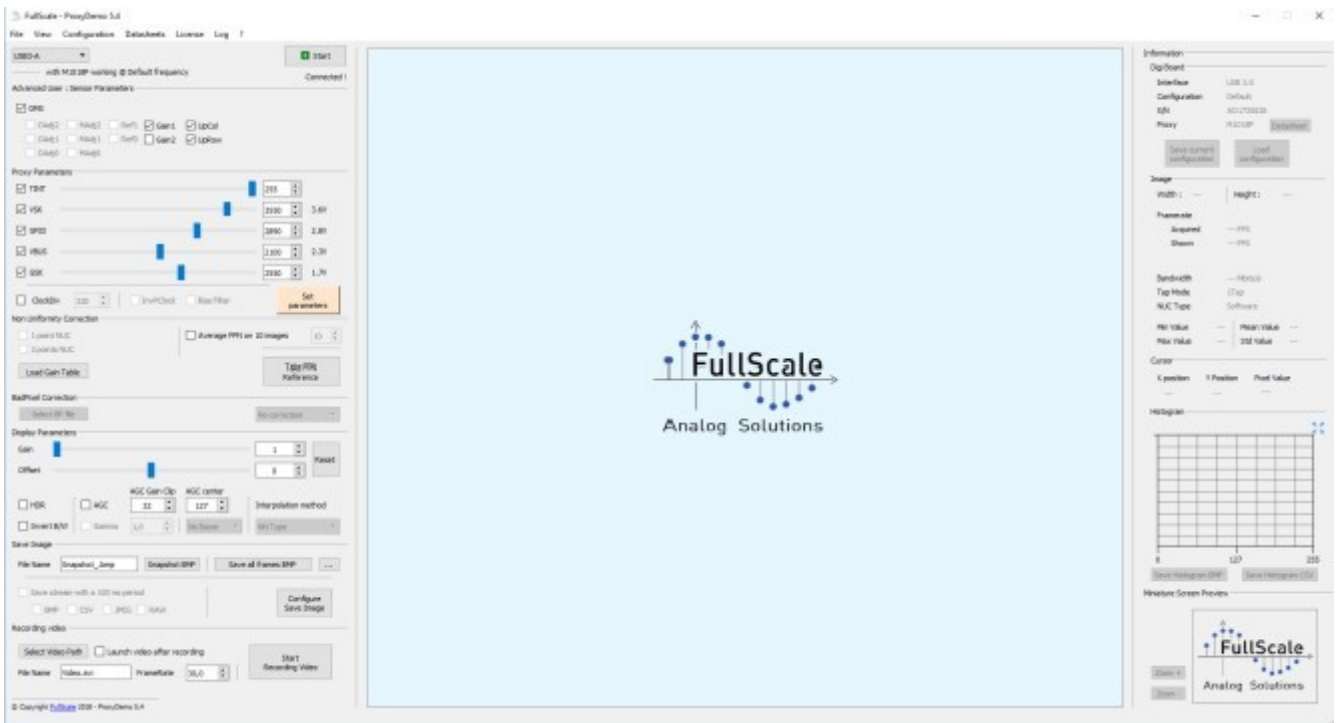A window appears with the FullScale logo in the center of the blue area.

Illustration 5: ProxyDemo 5 interface

Be sure the DemoKit is connected and powered. If so, ProxyDemo is ready to use.

On the top of the software, the FullScale Digi Board is shown. Be sure the displayed Digi Board name corresponds to the Digi Board embedded into the FullScale DemoKit.

Then, click on the "Connect" button on the right.
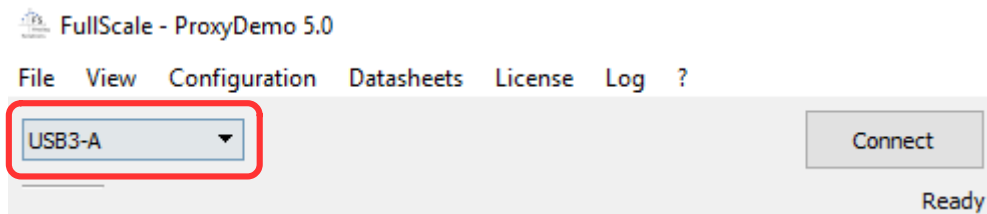
Illustration 6: Digi Board choice

After a few seconds ProxyDemo establishes the connection between the Digi Board and the computer. On the left of the Digi Board, the Digi Board configuration is shown with the Proxy Board and the frequency configuration (by default: "@ Default frequency").

The button "Connect" changed and became "Start".

If an error occurred, be sure the FullScale DemoKit is correctly powered and connected to the computer. If a license error is displayed, please contact FullScale for more information.

Illustration 7: Connection established between the Digi Board and ProxyDemo

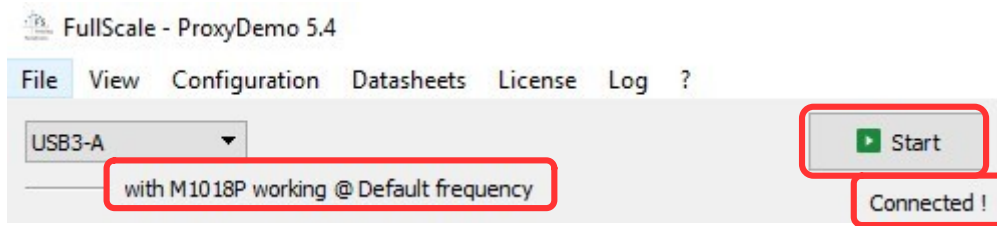ProxyDemo is now ready to display the video stream. Click on "Start" button to grab the stream. ProxyDemo can take up to 5 seconds to start the display (according to the hardware computer configuration).

The interface becomes active and RAW images are displayed on the software.
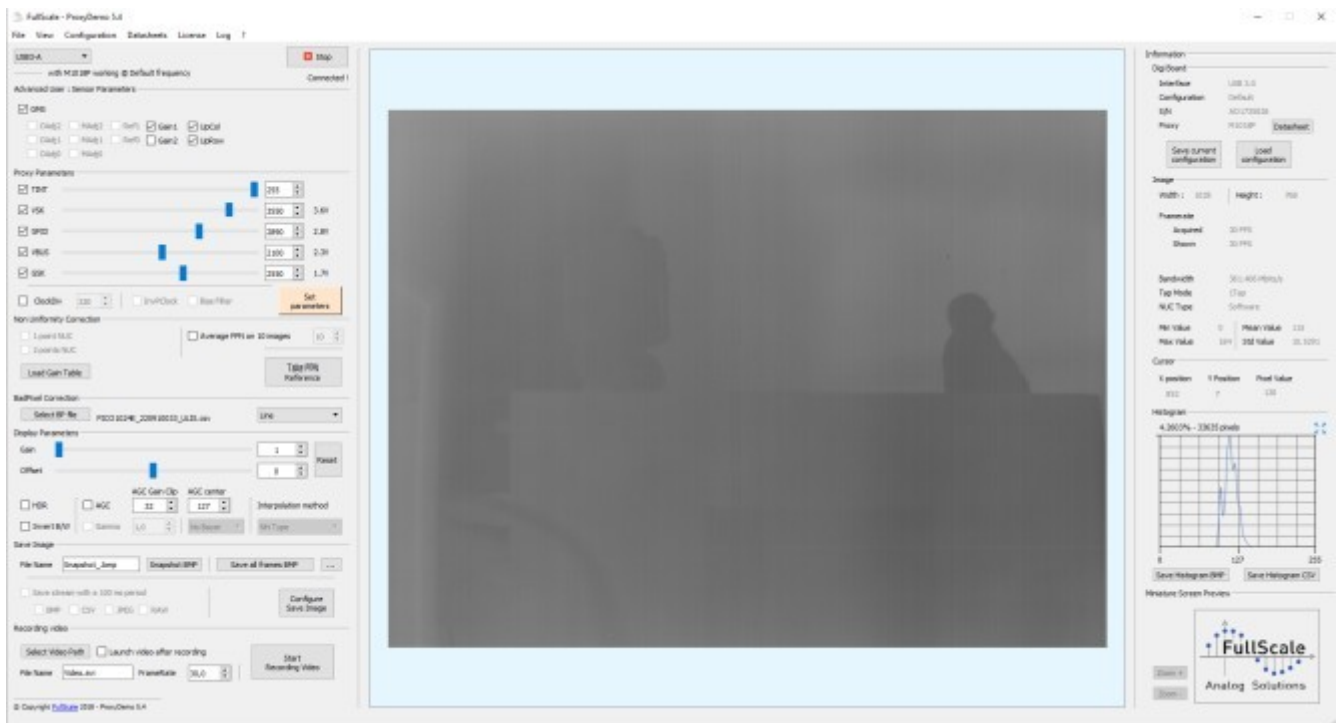

Illustration 8: Starting video stream acquisition

NB: If the DemoKit embeds a CLink-C+ Digi Board, the display can be "noisy". By default, the NUC operation is processed into the Digi Board and uses a reference image stored into the embedded RAM. The reference image contains random values and explains the displayed images.

2.2. Non Uniformity Correction on stream

ProxyDemo can process the images to apply a 1 point NUC correction.

Please place a shutter in front of the lens and click on "Take FPN Reference" button. The "1 point NUC" box is automatically checked. The display becomes dark. Then, remove the shutter to see the scene.
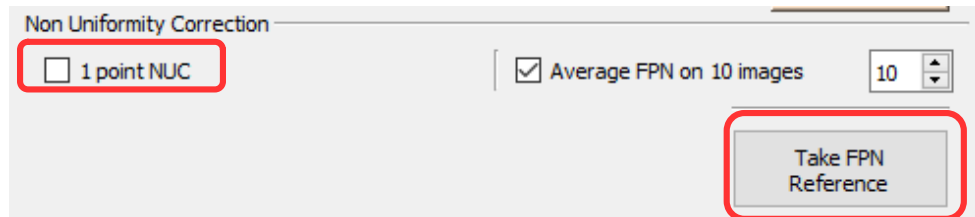
Illustration 9: How to apply NUC...
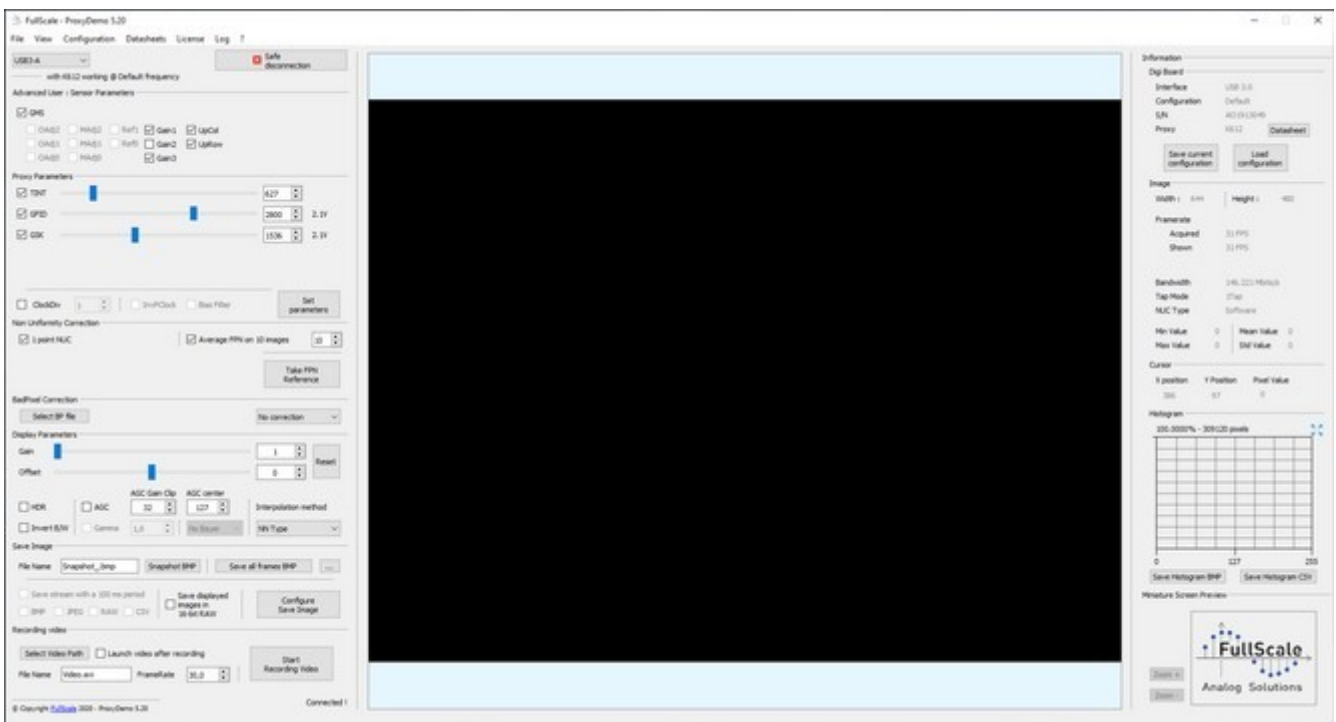
Illustration 10: 1 point NUC applied without Gain nor Offset with the shutter in front of the lens

The image needs to have gain and offset on the image. Move gently the sliders gain and offset to get a correct image.
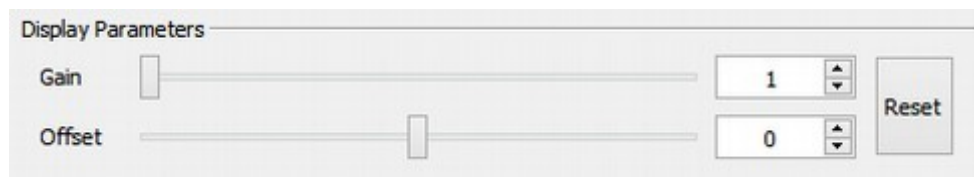
Illustration 11: Gain and Offset sliders

The displayed image is modified live with the gain and offset values set.
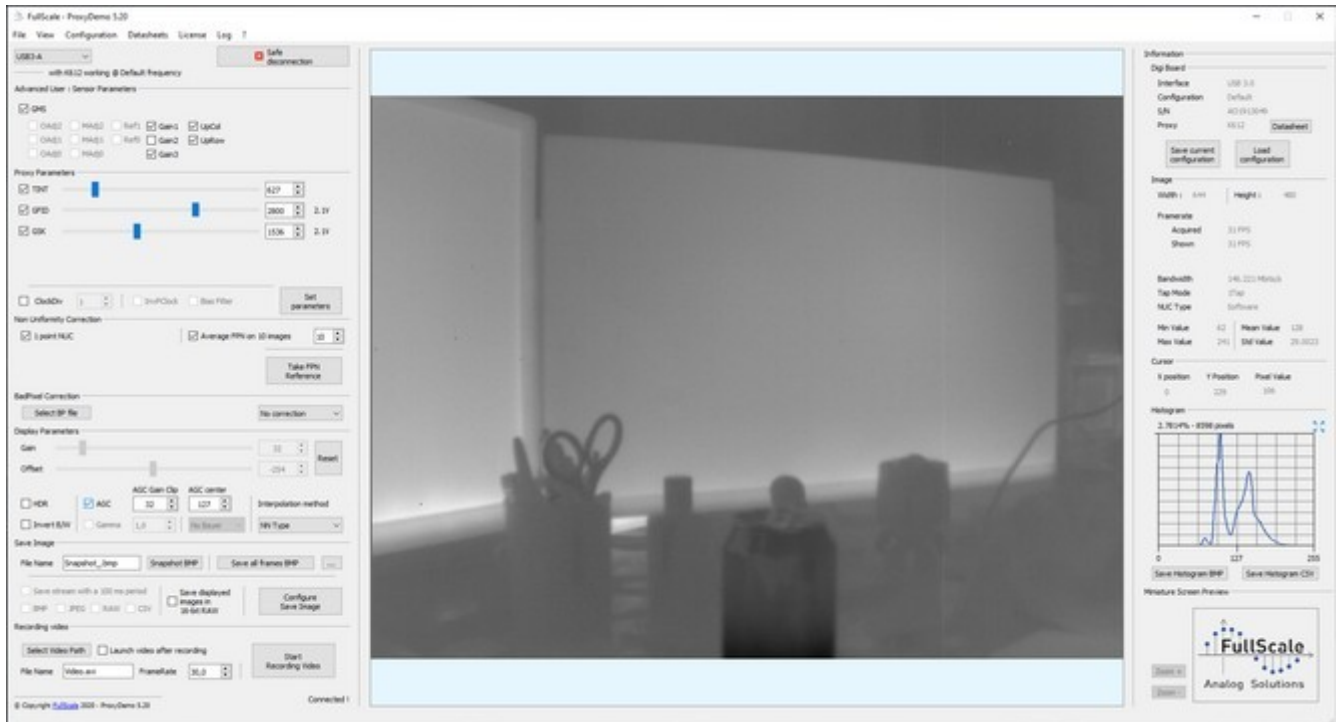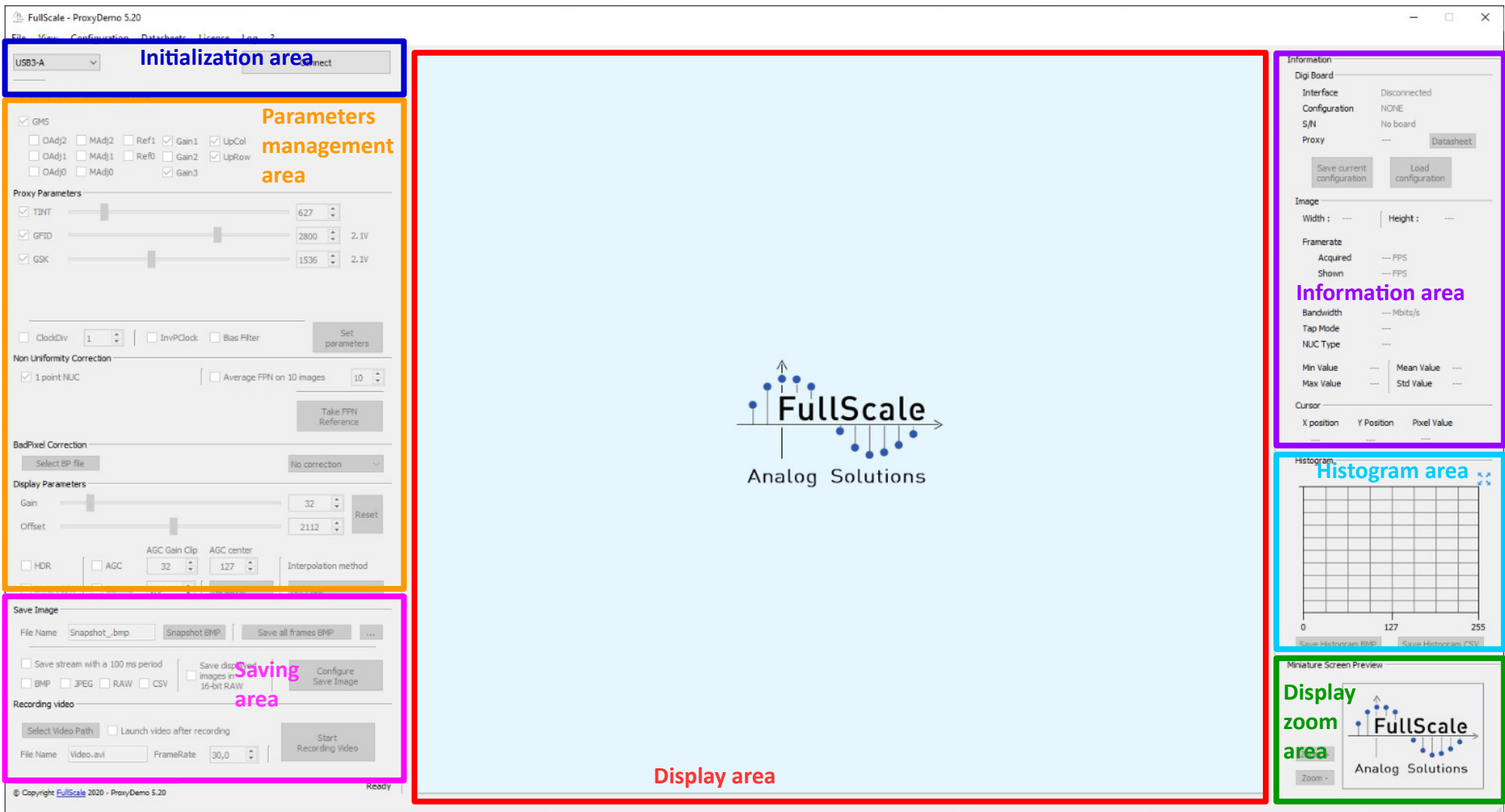
Illustration 12: Displayed images with adequate Gain and Offset

Displayed images look better!

FullScale - ProxyDemo5_Software

3. ProxyDemo's GUI

ProxyDemo's GUI is composed of 7 parts:

- Initialization area: Digi Board choice before starting stream.

- Parameters management area: Parameters of the Proxy Board and the sensor can be changed.

- Image display area.

- Saving area: Where images can be saved or video recorded.

- Display zoom area: Miniature stream is displayed (only when click zoom is enabled).

- Histogram area: Little histogram of the image is display

- Information area: Some information about the stream and the Digi Board are displayed

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Initialization area

Parameters management area

Information area

Histogram area

Saving area

Display zoom area

Display area

3.1. Digi Board and Proxy choice

The first step before displaying video stream on ProxyDemo is to select the Digi Board. Six choices are available: CLink-B+, CLink-C, CLink-C+, GigEV-B, RSB1-Z and USB3-A.

Illustration 13 : Board selection

Once the Digi Board is selected, "Connect" button becomes clickable. Clicking on it, the connection with the Digi Board is established.

When the connection is established, then the "Connect" button becomes a "Start" button. More information appears on the right of the Digi Board label (proxy board and frequency configuration of the Digi Board are displayed).

Illustration 14: Connection established
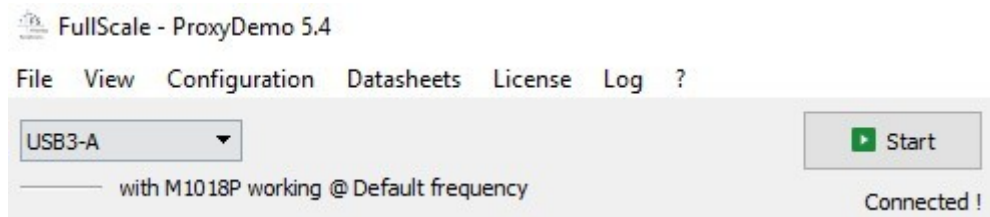
NB: After the first use of ProxyDemo, the last Digi Board used to open the stream is saved. When the software will be execute in the future, it will load this information and update the GUI.

3.1.1 With USB3-A

With USB3-A, the protocol to open the stream is the following:

- Launch ProxyDemo with the USB3-A plugs and NO Proxy Board nor sensor connected.

- Select USB3-A as Digi Board and click on "Connect" button.

- Take a look at the USB3-A configuration.

- If the displayed configuration is not the requested configuration, it is necessary to modify it. Please follow the procedure on the 3.2. Proxy board and frequency configuration.

- Unplug the USB3-A.

- Re-plug the USB3-A with the right connected Proxy Board and sensor and wait for the complete initialization of the USB3-A.

- Then on ProxyDemo, click again on the "Connect" button and check if the displayed configuration has been properly updated.

- Press "Start" button to start the display,

3.1.2 With GigEV-B

With GigEV-B, the protocol to open the stream is the following:

- Launch ProxyDemo with the GigEV-B plugs and NO Proxy Board nor sensor connected on it.

- Select GigEV-B as Digi Board and click on "Connect" button. ProxyDemo uses Pleora's libraries to establish a connection and to get an image with the GigEV-B. When the "Connect" button is pressed, then a Pleora window is shown. On the following window, it is possible to select any GigEV-B connected to the network.
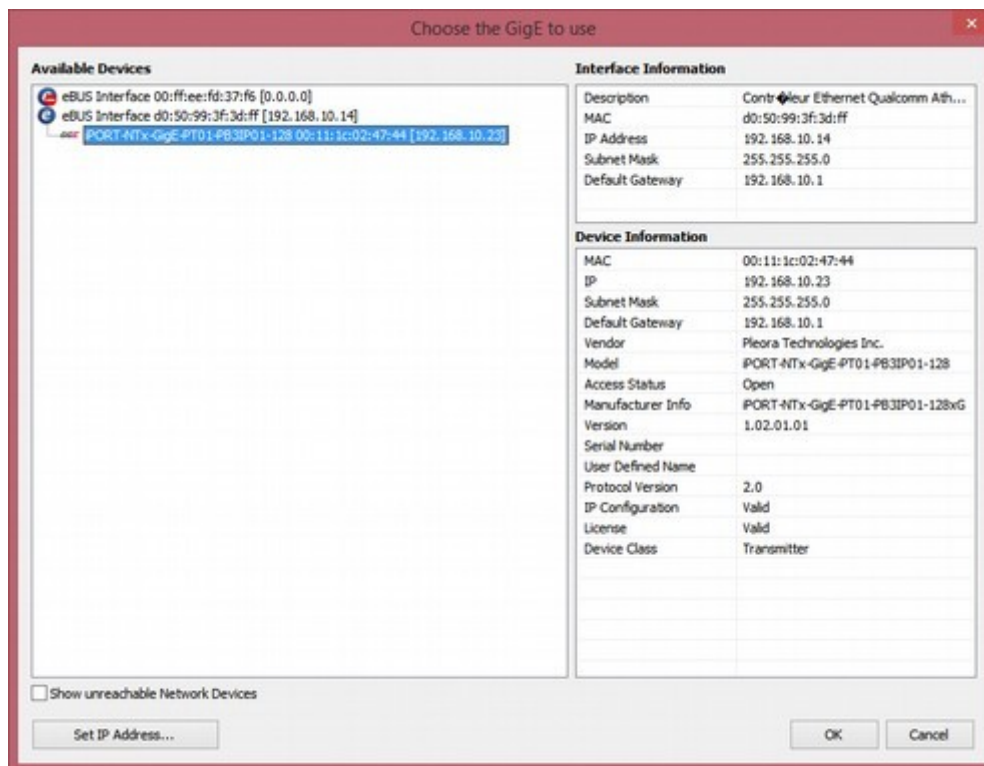
Illustration 15: Pleora window for GigEV-B selection

NB: The GigEV-B may need time to initialize the Pleora NTX network interface. Depending on the network configuration (static IP, DHCP, etc) the initialization may take up to 30 seconds.

- Take a look at the GigEV-B configuration.

- If the displayed configuration is not the requested configuration, it is necessary to modify it. Please follow the procedure on the 3.2. Proxy board and frequency configuration.

- Power off the GigEV-B.

- Re-power on the GigEV-B with the right connected Proxy Board and sensor then wait for the complete initialization of the GigEV-B.

- Then on ProxyDemo, click again on the "Connect" button and check if the displayed configuration has been properly updated.

- Press "Start" button to start the display

3.1.3 With CLink-C+ or CLink-B+

With CLink-C+ or CLink-B+, if the switches configuration is set to an operating configuration then, when the connection is established, dedicated Proxy Board and "@ Default frequency" are displayed.

Otherwise, if "Personal" switches configuration is selected, it is necessary to configure correctly the Digi Board using the "Setup DigiBoard" window. In that case, please follow the procedure on the 3.2. Proxy board and frequency configuration.

CAREFUL: Using "Personal" configuration, the Digi board configuration has to be performed without proxy nor sensor connected to the digi board.

Once the configuration written on ProxyDemo is correct, the stream can be displayed.

Camera Link protocol can work with different modes: 1Tap, 2Tap. CLink-C+ can work with two different modes: 1Tap 16bits and 2Tap 12bits. CLink-B+ can only work on 1Tap mode.
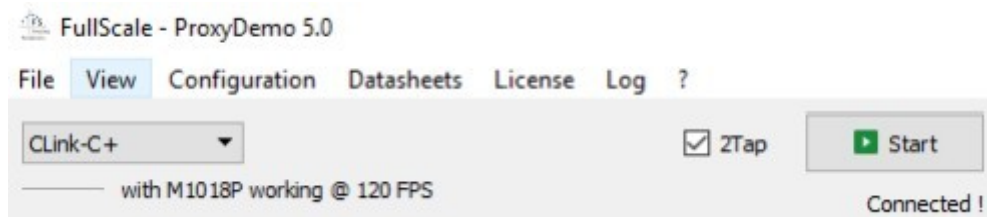
Illustration 16: Tick box "2Tap" present with M1018P

NB: On ProxyDemo, some proxy has to work with particular modes depending on the framerate, resolution, etc. A "2Tap" tick appears once the proxy is selected to choose the mode. When enable, it means the CLink-C+ is in 2Tap 12bits mode, otherwise, it is 1Tap 16bits mode (default mode). For example, 2Tap configuration is mandatory with M1018P @120FPS.

3.1.4 With CLink-C

With the Clink-C, only the default configurations are available. When the "Connect" button is pressed, a new window appears to choose the Proxy board connected to the Digi Board. Then a password is required to open a connection with the CLink-C. Once the password entered, press "Start" to initiate the connection.
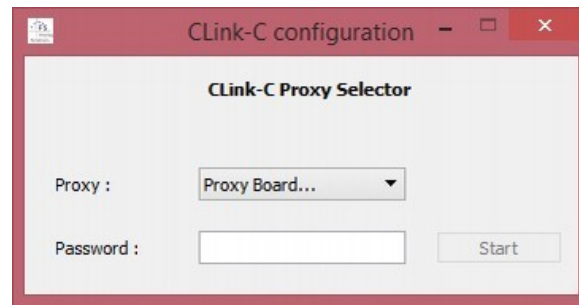
Illustration 17: CLink-C configuration window

Then press the "Start" button to start the stream.

3.1.5 With RSB1-Z

With the RSB1-Z Digi Board, once the button "Connect" is pressed, the image is displayed from the K035 Proxy Board,

NB: The RSB1-Z is only compatible with the FullScale K035 Proxy Board.

3.2. Proxy board and frequency configuration

ProxyDemo allows the dynamic reconfiguration of frequency on the USB3-A, GigEV-B, CLink-B+ or CLink-C+ Digi Board to obtain a custom frame rate.

The "Setup DigiBoard" window is accessible using "File" menu, then "Setup DigiBoard" (or using the F6 shortcut).

Firstly, select the Proxy Board. Then choose the frequency. Frequency values depend on the selected proxy.

The "Custom" frequency configuration allows to program any Proxy Board MasterClock (up to the Digi Board limit).

This feature shall be used with caution. This frequency has to be in the range indicated in the Proxy Board datasheet. The sensor may not accept the associated clock and can be damaged. Please be very careful using it and prefer the preloaded configurations. **FullScale can not be responsible for any damage that may be caused to the sensor using this feature**.

The following window is opening:
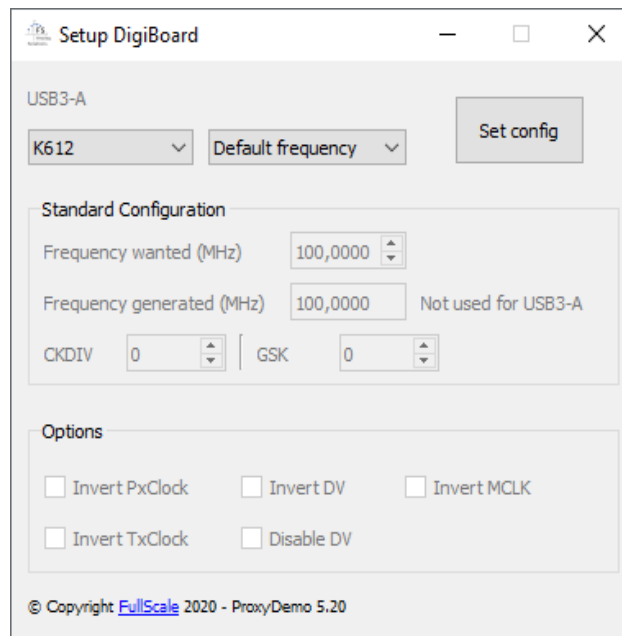
Illustration 18: Setup Digi Board window

When both parameters are selected, click on "Set Config" button. The new configuration is uploaded in the Digi Board.

Then, restart the Digi Board to apply the new configuration. (For USB3-A, unplug then re-plug the USB3 cable, on CLink-B+, CLink-C+ or GigEV-B, power down the Digi Board then re-power on)

NB: The Digi Board has to be connected to use this functionality.

CAREFUL: Please refer to the Digi Board datasheet for more information.

3.3. Start acquisition

Once the Digi Board is connected on ProxyDemo, press the Start button to display the image from the sensor. (cf. Illustration 13 : Board selection)

The image can take up to 5 seconds to appear depending on the proxy and the platform.

The RAW image is shown. To have a correct image, place a "shutter" in front of the sensor and press the "Take FPN Reference" button then click on "Apply NUC". Remove the shutter then adjust gain and offset.

NB: The shutter can be activated pressing the 's' key (depends on the CLink-C+ firmware, please contact FullScale for more information).

Illustration 19: Raw image
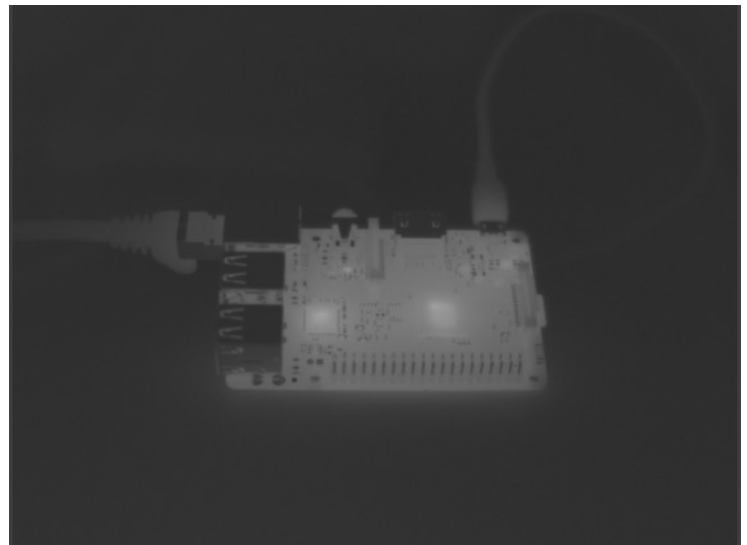
Illustration 20: Image after the NUC subtraction

ProxyDemo receives and processes 16 bits data. Only 8 bits data's MSB are displayed (values range 0 to 255).

3.4. Stop acquisition

Some sensors require a particular stop sequence, To respect this procedure and avoid any damage on the sensor, please use the "Disconnect" button. Once pressed, ProxyDemo will set the TINT and the GFID to the minimum value and the GSK to the maximum value.

A popup message is displayed as long as the disconnecting procedure is in progress. When the popup disappear, then, you can power off or disconnect the DigiBoard.

3.5. Sensor parameters

Now the image is displayed in the software, it is possible to communicate with the sensor in order to apply different parameters on the image.

The parameters you can change are:

> ➢ Gain bits on the sensor (2 or 3 bits depending on the sensor)
> ➢ UpCol: Horizontal flip
> ➢ UpRow: Vertical flip
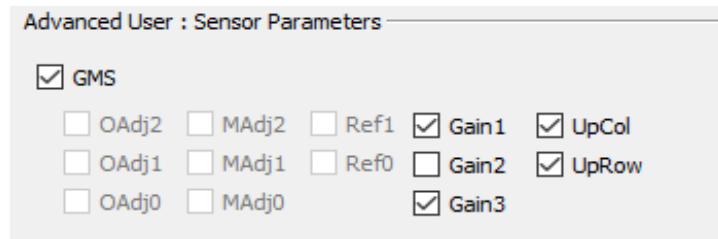
Illustration 21 : Sensor parameters

NB: Please note, Gain Bits, UpCol / UpRow can be updated only if the box GMS is checked.

3.5.1 Sensor gain bits

Gain bits change the values of capacitance in the sensor. The image becomes more or less sensitive depending on the gain set.

On the following illustrations, the gain bits on a Pico640Gen2 with a K618P are changed.

Illustration 22: ULIS PICO640Gen2 Raw Image

(Gain 1 and 3 checked)

Illustration 23: ULIS PICO640Gen2 Raw Image

(Only Gain 3 checked)

The RAW image is different on the Illustration 23 because the gain is more important (no other parameter was changed).

Relative Gain on Illustration 22: x1

Relative Gain on Illustration 23: x1.18

Source: ULIS UserGuide PICO640Gen2 – Figure 3.11 Gain (Integration capacitor CINT) – page 29

3.5.2 Image orientation

UpCol and UpRow change the initial coordinates of the image.

Illustration 24: UpRow enabled with NUC Applied

Illustration 25: UpRow disabled without new FPN Ref

Illustration 26: UpRow disabled with new FPN Ref and NUC applied

3.6. Proxy parameters

The sensor BIAS voltages can be adjusted directly from ProxyDemo. Two or four sliders are available to calibrate them and one more to adjust the integration time (or exposition time) of the sensor.

To send BIAS voltage values, move the sliders or change the numeric value and press "Set

parameters" button. Following parameters are sent: BIAS Voltages, integration time, gain bits, UpCol, UpRow and if available, ClockDiv, InvPClock and Bias Filter.

BIAS adjustment has to be done with a RAW image. (cf. 3.7 FPN Reference and 1 point NUC)

NB: Indicated BIAS voltages are not the real values applied. It corresponds to the calculated theorical value according to the embedded hardware components.

ClockDiv values has to be in accordance to the datasheet of the proxy to have the best sampling data.

Pressing one time "Set parameter" button enables the BadPixel Correction.

NB: Only checked box(es) values are sent (all DAC, Integration Time and GMS).

CAUTION: Modifying integration time when windowing is progressing may damage the sensor, please refer to the proxy and sensor datasheets.

- **Change BIAS voltage values**
- **Change Int Time if necessary (be careful if windowing)**
- **Change ClockDiv if necessary (use with caution)**
- **Click on "Set parameters" button**
- Changing BIAS values has to be done with a RAW image

Illustration 27 : Proxy parameters

- **Check boxes to send requested parameters when "Set Parameter" button is pressed.**
- **The GMS tick in "Advanced User : Sensor Parameters" has to be checked to send the GMS value to the proxy / sensor.**

- **Use "Set parameters" button to configure Sensor registers (gain, flip).**
- The displayed raw image changes following new parameters.
NB : If a parameter is changed, then the button becomes orange. When pressed, it returns grey

NB: On some Proxy Boards, TINT (Integration Time) is replaced by TEXP (Exposition Time).

In order to get the best result on the stream, FullScale advises that the RAW image has a medium gray scale (values around 127-128). When the sensor is heating, some area can be saturated (black or white areas depending on the sensor). To correct it, FullScale

recommends to adjust the GSK BIAS (step of 20) until the RAW image is correct.

Illustration 29: RAW Image with saturation (with pixels equals to 0)
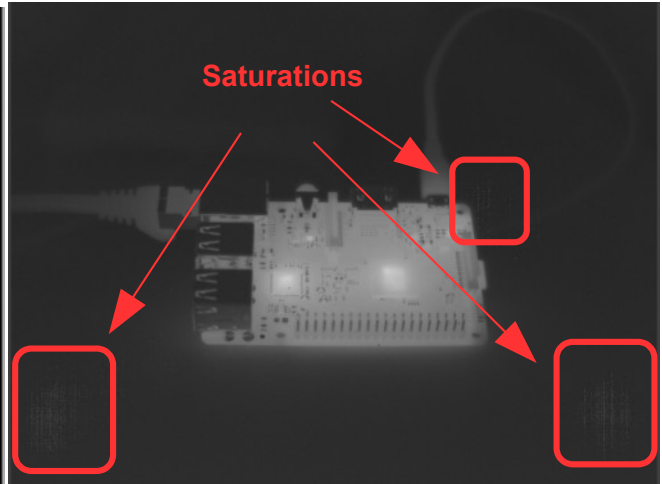
Illustration 28: Image with NUC with saturation areas

3.7. FPN Reference and 1 point NUC

3.7.1 With CLink-C, GigEV-B and USB3-A (without Processing Board)

The CLink-C, GigEV-B and USB3-A Digi Boards do not include an embedded NUC, The NUC feature is made by ProxyDemo. a reference image has to be taken with ProxyDemo, to subtract this reference image from the acquired image.

- If "Average FPN" is checked, then the software will make a Reference Image using the N images wanted

To apply the correction, click on "1 point NUC" tick.

The "Take FPN Reference" button take a reference image.

Illustration 30 : FPN Correction on USB3-A and GigEV-B

A "shutter" should be placed in front of the lens, then press "Take FPN Reference" button. Now, the tick "1 point NUC" is enabled. Check the "1 point NUC" box to apply the NUC, the image will become gray.

Gain and Offset sliders have to be adjusted to get the best image.

Here is the formula ProxyDemo applies to calculate the 1 point NUC:

$$NUCed\,image(x,y) = (RAW\,Image(x,y) - Reference\,image(x,y) + \overline{Reference\,image} + Offset) \times Gain$$
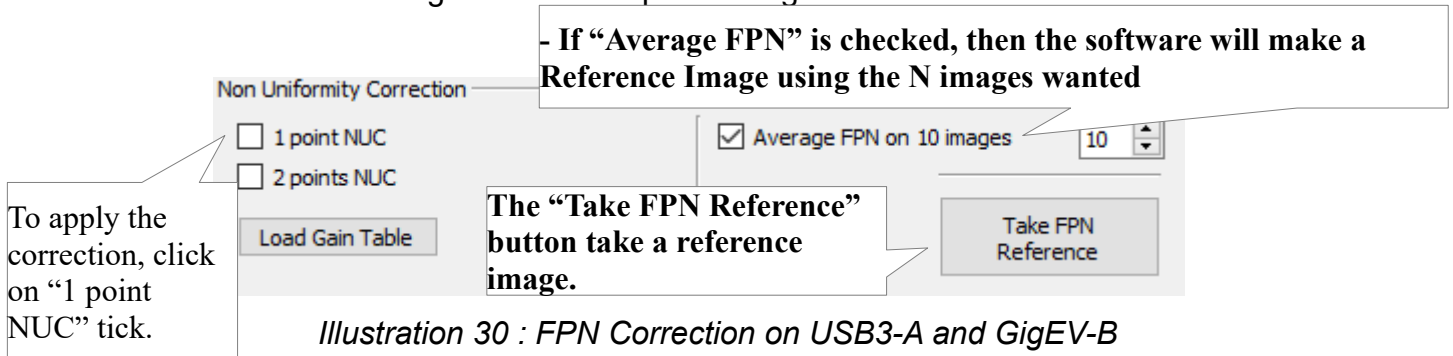
NB: The FPN Reference image can be taken by pressing the 's' key.

3.7.2 On CLink-C+ and CLink-B+ and USB3-A (with Processing Board)

3.7.2.1 Embedded NUC

The CLink-C+, CLink-B+ and USB3-A (with Processing Board) integrate an embedded NUC. Embedded NUC can be controlled by pressing the SW1 button on the board. Then, CLink-C+ takes the current acquired image as a reference and subtracts this reference from all following images once the button is released.

On ProxyDemo, "Take FPN Reference" button sends a particular command to the CLink-C+ and CLink-B+ to activate the shutter. The "Apply Embedded NUC" tick allows to enable or not the NUC inside the CLink-C+ or CLink-B+.

By default, on the CLink-C+ and CLink-B+, the NUC is enabled, the images got when it is powered up (before taking first reference image) depends on the data stored into the CLink-C+ RAM.

"Average FPN" is disabled with Embedded NUC

"1 Point NUC Embedded" ask the Digi board to bypass the NUC correction (or not)

"Take FPN Reference" button send a command to the CLink to control the shutter

Non Uniformity Correction

- [ ] 1 point NUC Embedded
- [ ] 2 points NUC

Load Gain Table

- [ ] Average FPN on 10 images   10

Take FPN Reference
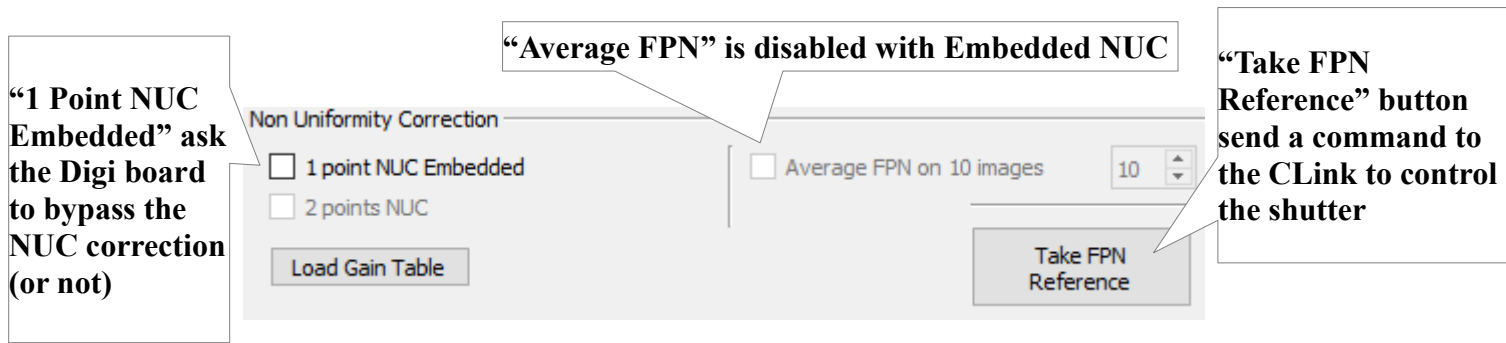
Illustration 31 : NUC Embedded parameter on CLink-C+ and CLink-B+

3.7.2.2   Software NUC

Using the CLink-C+, CLink-B+ or the USB3-A, the NUC processing can be done on ProxyDemo. To enable this functionality, on the "Configuration" menu, select "NUC" and then click on "Software". To redo the NUC embedded, click on "Hardware". Please notice that the "Average FPN" option is enabled only when Software NUC is active.

NB: With the boards, the shutter can be activated pressing the 's' key (For the CLink-C+ it depends on the firmware, please contact FullScale for more information).

NB: When "Apply Embedded NUC" is not checked, then the Gain and Offset are not supported.

If the AGC feature is enabled, disabling the 1 point NUC will also disable the AGC.

3.8. Automatic BadPixel detection

ProxyDemo embeds a feature that allows to detect the BadPixel automatically. Once detected a csv file with the coordinates are generated in order to correct the BadPixel.

This feature can be found under "Configuration" menu → "Auto Detect BadPixel".

A new window pop-up.
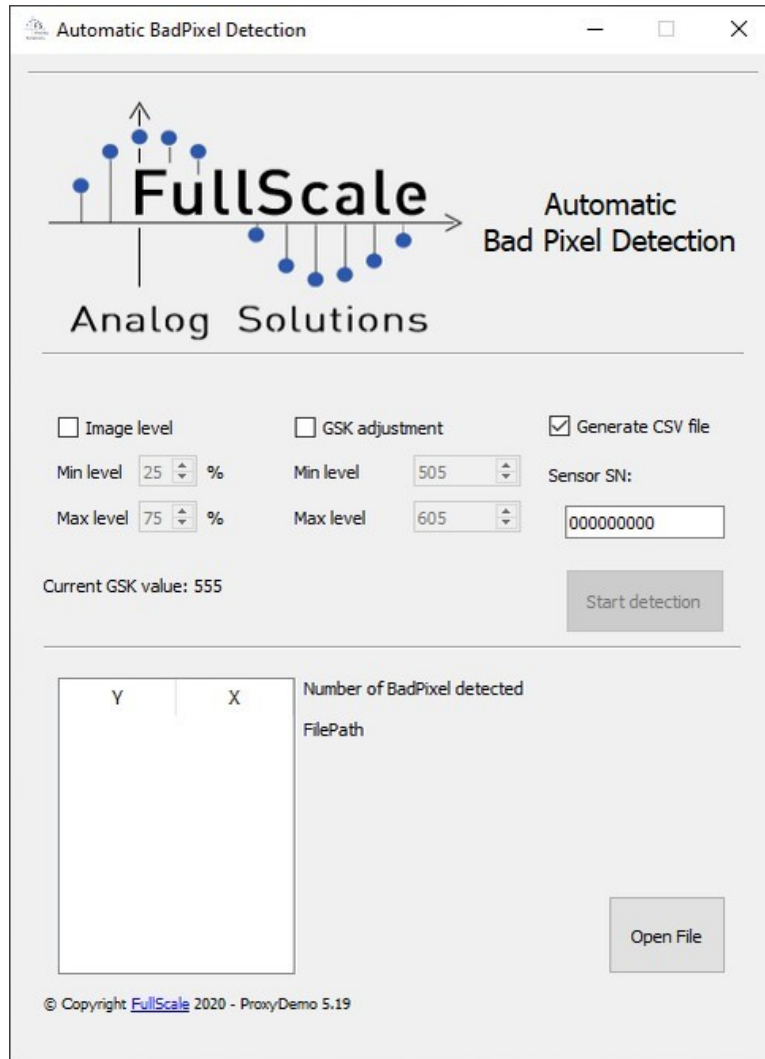
To detect the Bad Pixels, ProxyDemo will change the GSK BIAS voltage to adjust the greyscale of the image. Using two different images, ProxyDemo will analyze each pixel and compare each pixel variation to the average value variation.

$$Pix(x,y) = Pix_{(GSK\,HIGH)}(x,y) - Pix_{(GSK\,LOW)}(x,y)$$

$$IF\ Pix(x,y)<0,75*(\frac{\sum\limits_{(x,y=0)}^{x=XLength;\ y=YLength}(Pix(x,y))}{(XLength\times YLength)})THEN\ Pix(x,y)\ is\ detected\ as\ a\ Bad\ Pixel$$

$$ELSE\ IF\ Pix(x,y)>1,25*(\frac{\sum\limits_{(x,y=0)}^{x=XLength;\ y=YLength}(Pix(x,y))}{(XLength\times YLength)})THEN\ Pix(x,y)\ is\ detected\ as\ a\ Bad\ Pixel$$

$$ELSE\ Pix(x,y)\ is\ detected\ as\ a\ Good\ Pixel$$

It is recommended to place a shutter in front of the lens for the detection.

Two detection modes are possible:

- Image Level: ProxyDemo will change the GSK value to get a greyscale level around N % for the minimum value (by default 25% = 64 greyscale level) and then it will increase the GSK in order to get a M% greyscale level (by default 75% = 192 greyscale level), This test can be long depending of the number of GSK value to test.

- GSK adjustment: Proxy Demo will change the GSK according to the value defined. This is a quick test but if the defined values are not correct and a saturation happens, the result won't be correct.

Once the operating mode is selected, please be sure the "Generate CSV file" box is checked and the sensor serial number is correctly filled.

Then, press "Start detection" button and wait for the Bad Pixel to be detected.

Once done, the array will contain the Bad Pixels coordinates and the Bad Pixels generated file path will be displayed. This file can be loaded by Proxy Demo to correct the Bad Pixels.

IMPORTANT:

The detected Bad Pixels list generated by ProxyDemo does not replace the Bad Pixels list that Lynred provides with their detector.

Due to the algorithm used by this feature, it is possible that some Bad Pixels won't be detected. It is recommended to use the provided Lynred detector Bad Pixels list.

During sensor life, some extra bad pixels could appear. ProxyDemo Bad Pixels Detection feature has to be run again to detect these new bad pixels.

3.9. BadPixels correction

According to a BadPixels file, ProxyDemo replaces BadPixels depending on the chosen mode.

Ilustration 32 : BadPixels Correction

It is possible to choose between 5 modes of replacement:

- Previous Pixel Correction: Replace the BP with the last good one.
- Display Black BP: Replace the BP with the 0 value.
- Display White BP: Replace the BP with the 255 value.
- Display Blink BP: Replace the BP with a value range 0 to 255.
- Line: Replace the BP with the mean value of the pixels above and below it.

3.9.1 On CLink-C, GigEV-B and USB3-A(without Processing Board)

When the "Enable" tick is checked on the GUI, then, ProxyDemo is waiting for the BadPixel file (*.csv) which contains the coordinates of the BP.

3.9.2 On CLink-C+ and CLink-B+ (with Processing Board)

With the USB3A, the CLink-C+ or the CLink-B+, the BadPixels are sent to the Digi Board. The replacement is done directly on the board. No data processing is made on the software.

When the "Enable" tick is checked on the GUI, then, ProxyDemo is waiting for the BadPixels file (*.csv) which contains the coordinates of the BP.

The csv file has to start with the following line: "Ligne, Colonne". Then, each coordinates has to be placed separated with a Line Return. To separate the Y and X coordinates, comma or semi-column car be used.

Coordinates order is important. Y coordinates has to be increasing. Then X coordinates has to be incresing if 2 Bad Pixels are present in a single line.

For example:

NOT VALID		VALID	
Y coordinates	X coordinates	Y coordinates	X coordinates
4	52	4	15
4	15	4	52
8	12	8	12
16	47	12	11
12	11	16	47
20	78	20	78

Here is the corresponding BadPixel csv file:

```
1    Ligne,Colonne
2    4,15
3    4,52
4    8,12
5    12,11
6    16,47
7    20,78
```

NB: BadPixels csv files provided by Lynred do not included the temperature columns displayed by ProxyDemo. It is possible to shift the coordinates of the BadPixel manually (editing the file) or using the "Adjust Offset BadPixel" feature (please refer to the chapter 5.5. Adjust BadPixel offset).

CAREFUL: The line correction is only available on a software correction. It is not implemented on the embedded firmwares.

NB: Using the CLink-B+ or the USB3-A with Processing Board, while the BadPixels are sent to the Board, a new window with progress bar is displayed.

3.10. Gain and Offset

The gain and offset on the image displayed can be adjusted using the two sliders shown below.
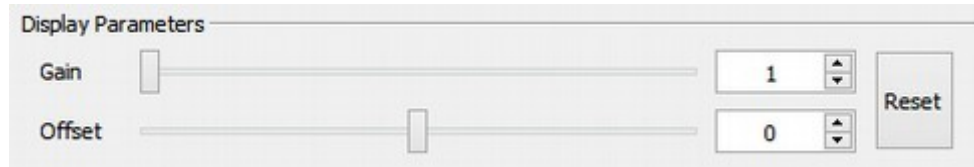

Illustration 33: Gain and offset sliders

Gain is range 0 to 255 and Offset is range -65536 to 65535.

Clicking on "Reset" button will reset the values to Gain = 1 and Offset = 0. It also disables the AGC feature (if enabled).

3.10.1 On CLink-C, GigEV-B and USB3-A (without Processing Board)

On these Digi Boards, the Gain and Offset are applied directly on the image displayed. All the process is done on the computer. These two sliders impact neither the RAW image nor the value of the FPN reference image.

By default, they are set with a gain equals to 1 and an offset equals to 0.

3.10.2 On CLink-C+, CLink-B+ and USB3-A (with Processing Board)

The Gain and Offset are applied after the subtraction by the reference image (during the NUC). These values are updated each 200ms when one of them is modified.

Gain and Offset can bypass the NUC and can be used on the RAW image. To do this, the "Configuration → NUC-→ Software" option has to be enabled. When enabled, the gain and offset are not sent to the CLink-C+ nor the CLink-B+ but directly apply on the displayed image.

3.11. Configure displayed image

ProxyDemo allows to apply HDR correction (High Dynamic Range) and an inversion of black and white values on the image.

On the CLink-C, GigEV-B and USB3-A, these processes are made on the software. The CLink-C+ and CLink-B+ execute all these processes embedded on board.

Illustration 34: Image saturated

Illustration 35: HDR Enabled

Illustration 36: Image saturated with Invert B/W enabled

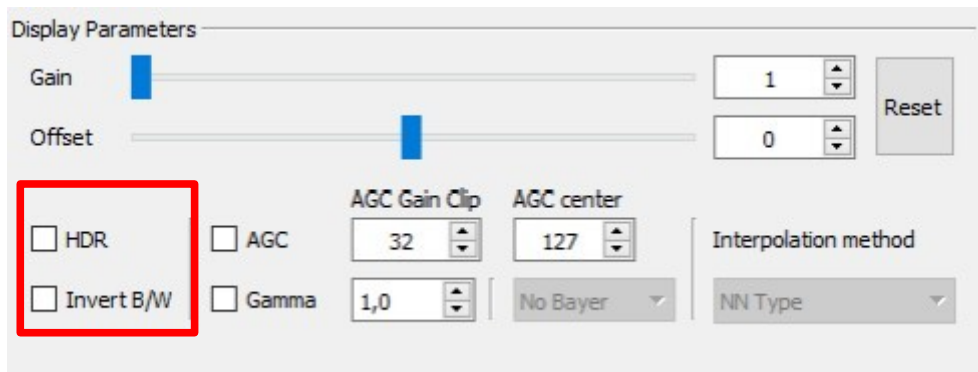*Illustration 37: Invert B/W and HDR enabled*

Illustration 38: HDR and Invert B/W checkbox

3.12. AGC Correction

The AGC Correction (Automatic Gain Control) is available on CLink-C, GigEV-B and USB3-A (without Processing Board). This function adjusts automatically the Gain and Offset to have the mean value of every pixel in the image equals to the "AGC center" value. The "AGC Gain Clip" value corresponds to the maximum Gain that ProxyDemo can apply on the image during AGC operation.

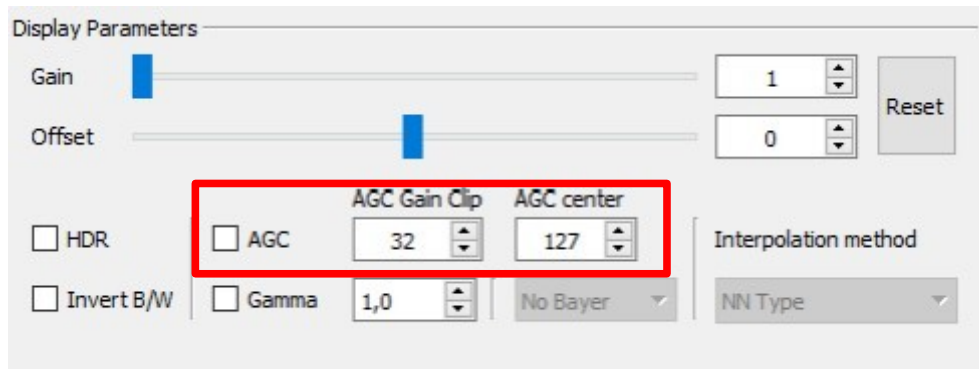The calculated values by the AGC are updated every 50ms.

Illustration 39 : AGC Parameters

NB: The AGC processing can decrease the framerate.
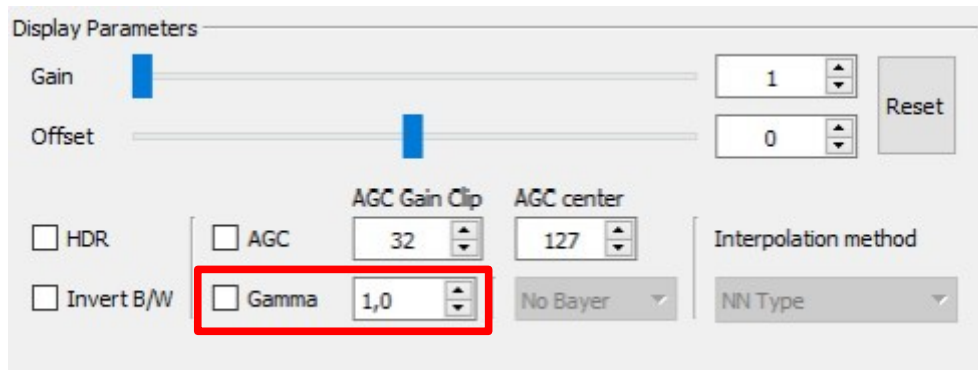
3.13. Gamma Correction

Illustration 40 : AGC Parameters

The Gamma correction is available on CLink-C, GigEV-B and USB3-A and only for the V1330 Proxy Board. This function will change the display by making dark darker or light lighter.

NB: The Gamma processing can highly decrease the framerate.

3.14. Histogram

ProxyDemo can calculate the histogram of the pixel values in the images. On the right of the GUI, an area is dedicated to the histogram. Clicking on the little icon "Size Up" on the top of the Histogram, a new window will appear.
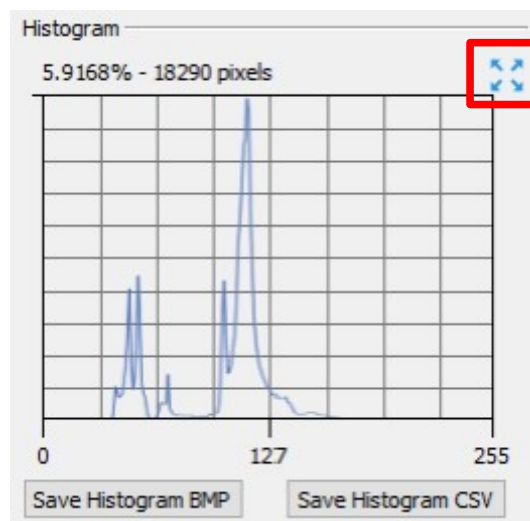

Illustration 41 : Histogram

The window shows a bigger histogram with more information shown. It is possible to display the histogram for each color (useful for the V1330 Proxy Board), or to save the current histogram in a bmp or png file.
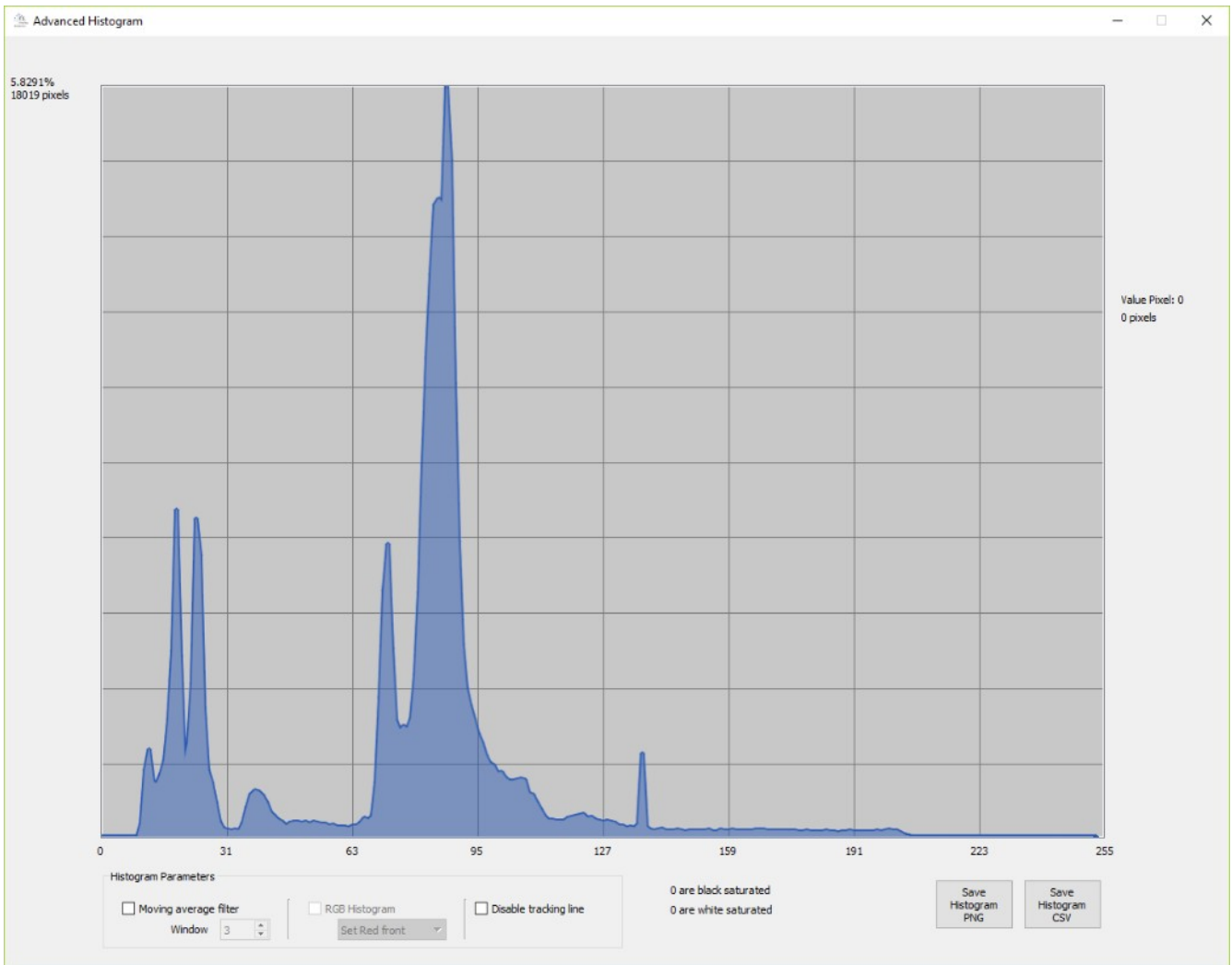
Illustration 42: Advanced histogram window

The number of pixel in the image for a specific value can be know by clicking in the histogram (if the tracking line is active).
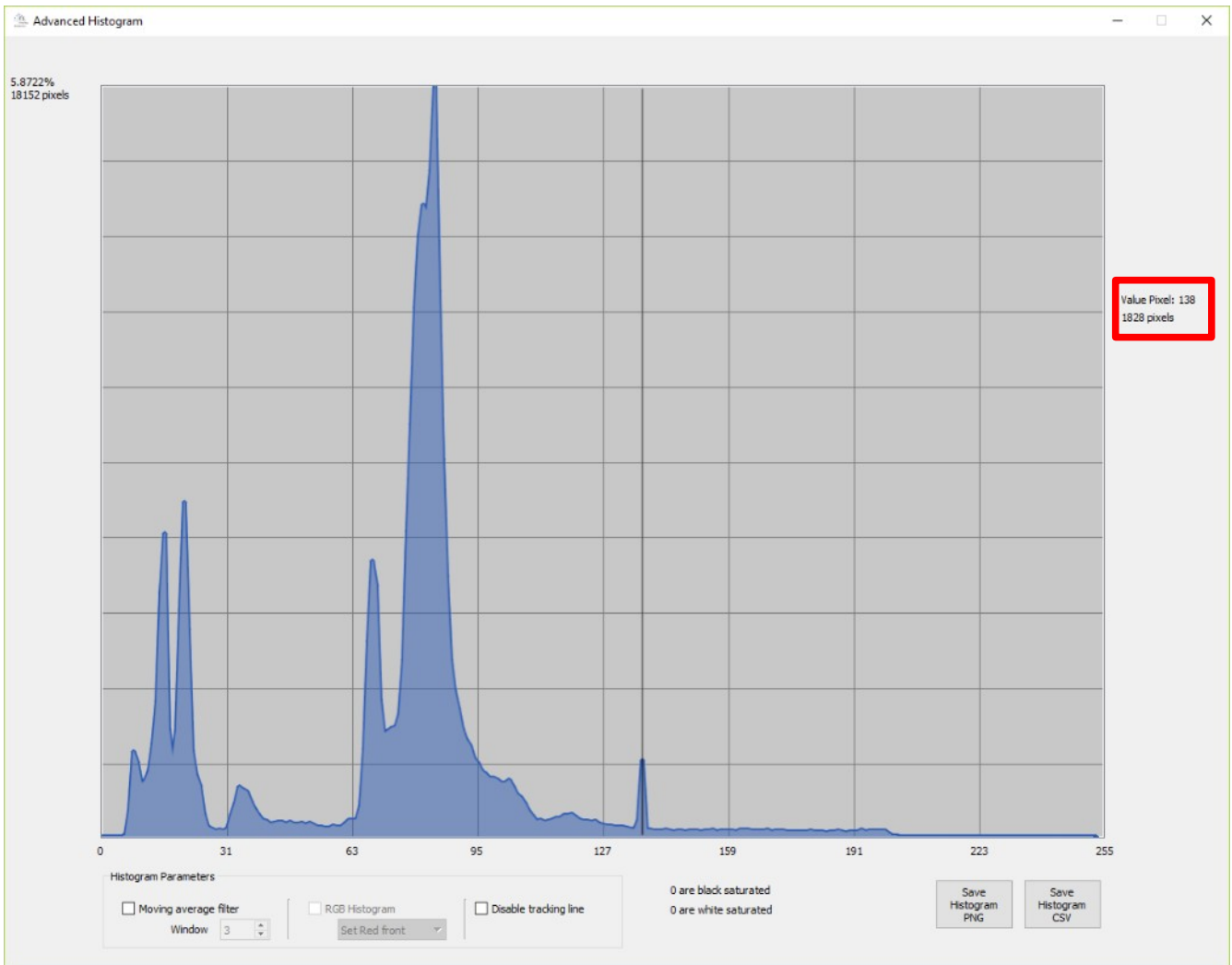
Illustration 43: Tracking line with number of pixels with this value

The histogram is updated every second.

3.15. Interpolation method

The image can be filtered with four algorithms:

- ➢ NN (Non correction);
- ➢ Linear (Bilinear interpolation);
- ➢ Cubic (cubic interpolation over 4x4 pixels neighborhood);
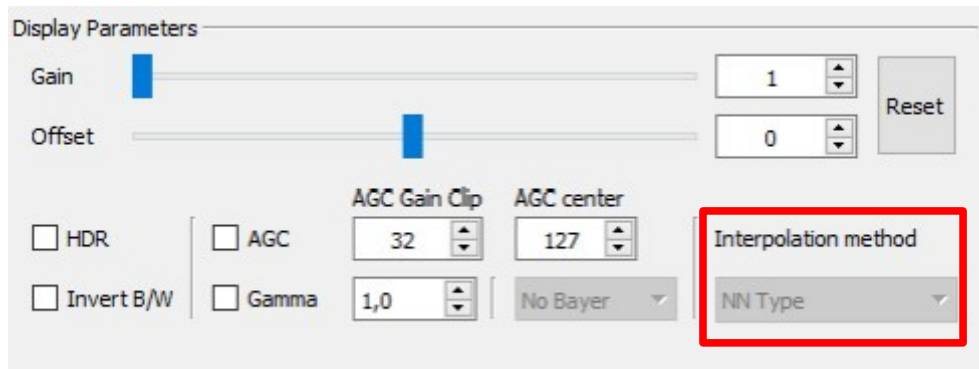- ➢ Lanczos4 (Lanczos interpolation over 8x8 pixels neighborhood).

Illustration 44 : List of interpolation method
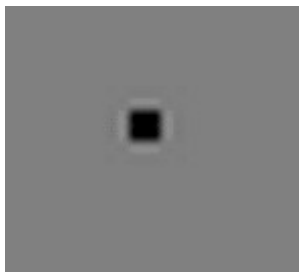

Illustration 45 : Pixel without correction (with Zoom applied)
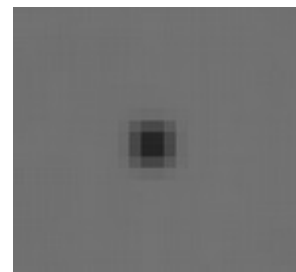

Illustration 46 : Pixel with Linear correction (with Zoom applied)
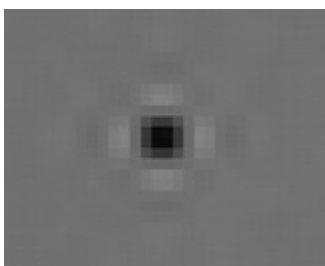
Illustration 47 : Pixel with Lanczos correction (with Zoom applied)
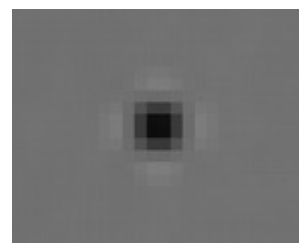
Illustration 48 : Pixel with Cubic correction (with Zoom applied)

3.16. Bayer Correction

This feature is only useful with a V1330 Proxy Board (with the NIT NSC1003C sensor). Using it, the display will show the colors of the image (with the right bayer selected).

INFORMATION: The image colorized is only available when the Demo Mode is enabled.

Four bayers are available:

- ➢ RG2RGB
- ➢ BG2RGB
- ➢ GB2RGB
- ➢ GR2RGB

Illustration 49: Showing colors using bayer

3.17. Save images

ProxyDemo can save the acquired images. 4 functions exists:

• Snapshot: Save one image in the format wanted with the name indicates (the incrementing is automatic if the file already exists)

• Save all frames: Save all acquired images in BMP or BIN format. The displayed stream video is slower when activated. To start or stop the saving, press the "Save all frames" button.
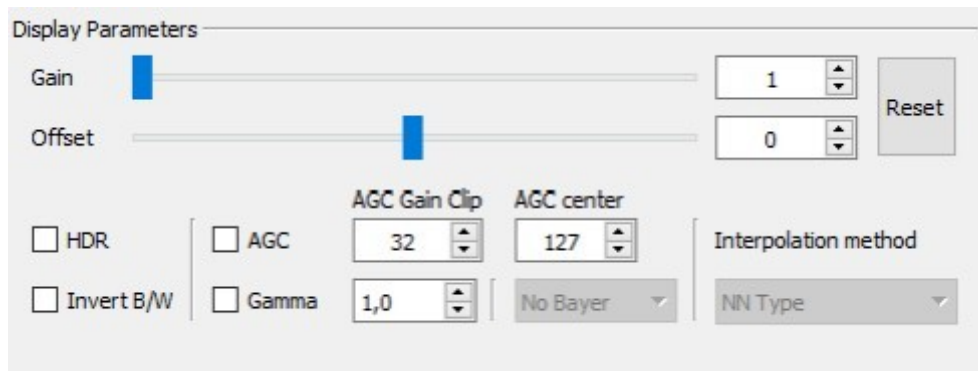
• Save N frames: Save a number N of images in BMP or BIN format. The displayed stream video is slower when activated. To start or stop the saving, press the "Save all frames" button.

• Save stream: Save images in different format (CSV, JPEG, RAW or BMP) with a period which can be choose. Several formats can be activated in the same time. To use it, select the format(s) wanted, adjust the period (in milliseconds) and click on "Enable Save Stream" tick. To stop the saving, uncheck the "Enable Save Stream" box. Using Save stream, it is possible to choose the data length of the displayed images saved (8-bit and/or 16-bit). Please notice that when 16-bit data are saved in a .raw file, data are placed in little endian mode (LSB first).

• Saved all displayed images in 16-bit RAW file: Save all displayed images in RAW format until the tick is unchecked. Files will be saved as "ImageDisplayedxx,raw" (with xx the image number). Number incrementing between two images is automatic, if the file already exists, it is automatically replaced with the new one.

The file format of "Save all frames" and "Snapshot" function can be changed. In "Configuration" menu, select "Setup Saving File". A new window appears to configure these options.
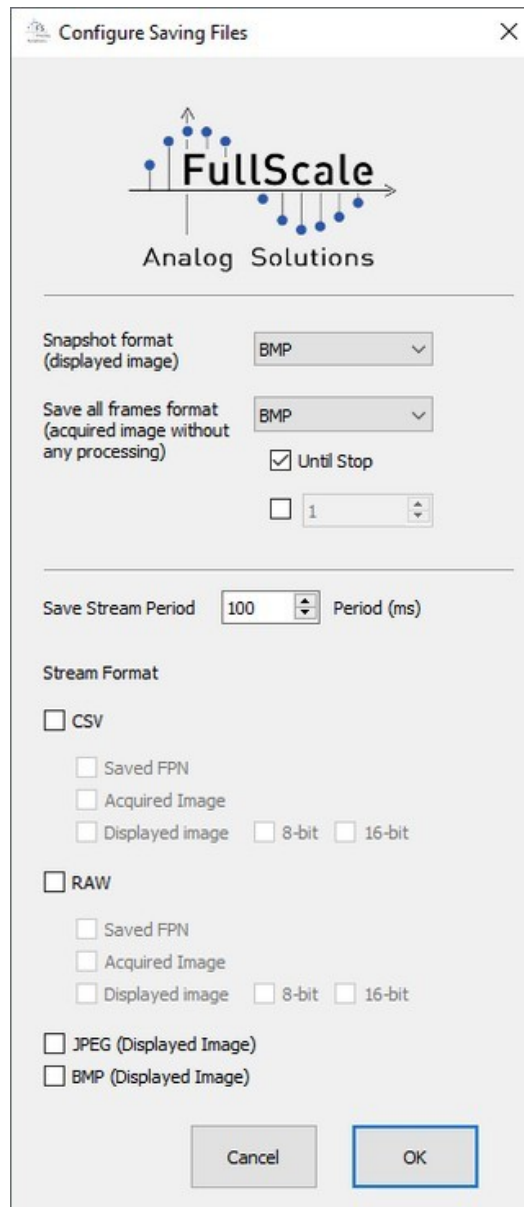
Illustration 50: Changing the format of "Save

all frames"

NB: Performances of "Save All Frames" can vary depending on the hardware configuration. Save performances can be improved with the check box "Full Performances" (described on the next part).
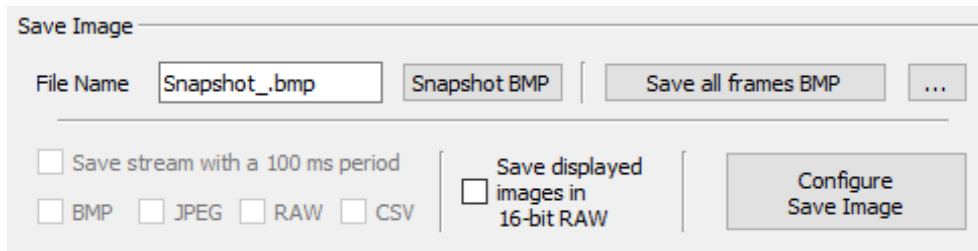*A SSD and min 8Go of Dual Channel RAM are highly recommended.*

Illustration 51 : Snapshot and Save Stream

When Save stream feature is used, some files are saved:

- RAW:

When RAW file are saved, binary data are saved in little endian mode (LSB are first), There is no separator for each pixel.

➢ Acquired file: Contains 16-bit binary data of the acquired image (without any process).

➢ FPN file: Contains 16-bit data of the Fix Pattern Reference image taken.

➢ Displayed file : Contains 16-bit or 8-bit data of the currently displayed image.

- CSV:

➢ Displayed file: Contains integer (16-bit or 8-bit) data of the currently displayed image.

➢ FPN file: Contains integer (16-bit) data of the Fix Pattern Reference image taken.

➢ Acquired file: Contains integer (16-bit) data of the acquired image (without any process).

- BMP: The displayed image is saved into a BMP file

- JPEG: The displayed image is saved into a JPEG file.

NB: Depending on the amount of data to save, the defined period may be not respected.

The tick "Saved displayed image in 16-bit raw" will save every images displayed in .raw files. Please notice that this feature may affect the display framerate.

3.18. Video recorder

ProxyDemo is able to save video using the images displayed.

Pressing the "Select Video Path" button, it is necessary to indicates a valid path to save the video.

It is possible to change the file name replacing it directly on the field "File Name".

The tick "Launch video after recording" will start automatically the video on the default video player once the video finish to be recorded.

FullScale recommends to install VLC Media Player to read the saved videos. Microsoft Windows Media Player can't open the saved videos.

The "Framerate" value is important to indicated the framerate of the video recorded in order to read the video later.
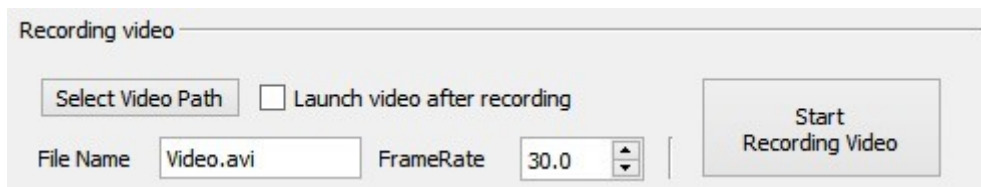

Illustration 52: Video recording

Once the video is recording, a "REC" icon is toggling next to the button.

Important: The video recorder feature uses uncompressed images. The video file can take a huge size on the Hard Disk Drive

CAREFUL: Saving video disables the zoom in the display and might decrease the performances of the video stream displayed.

4. ProxyDemo's display area

4.1. Information shown

ProxyDemo displays some information about the stream and the images. On the right of the display, the number of frames acquired on the peripheral (Ethernet, USB or Frame Grabber) and displayed,. the targeted coordinates by the mouse's cursor and the value of the corresponding pixel are shown. The resolution of the image is displayed too.
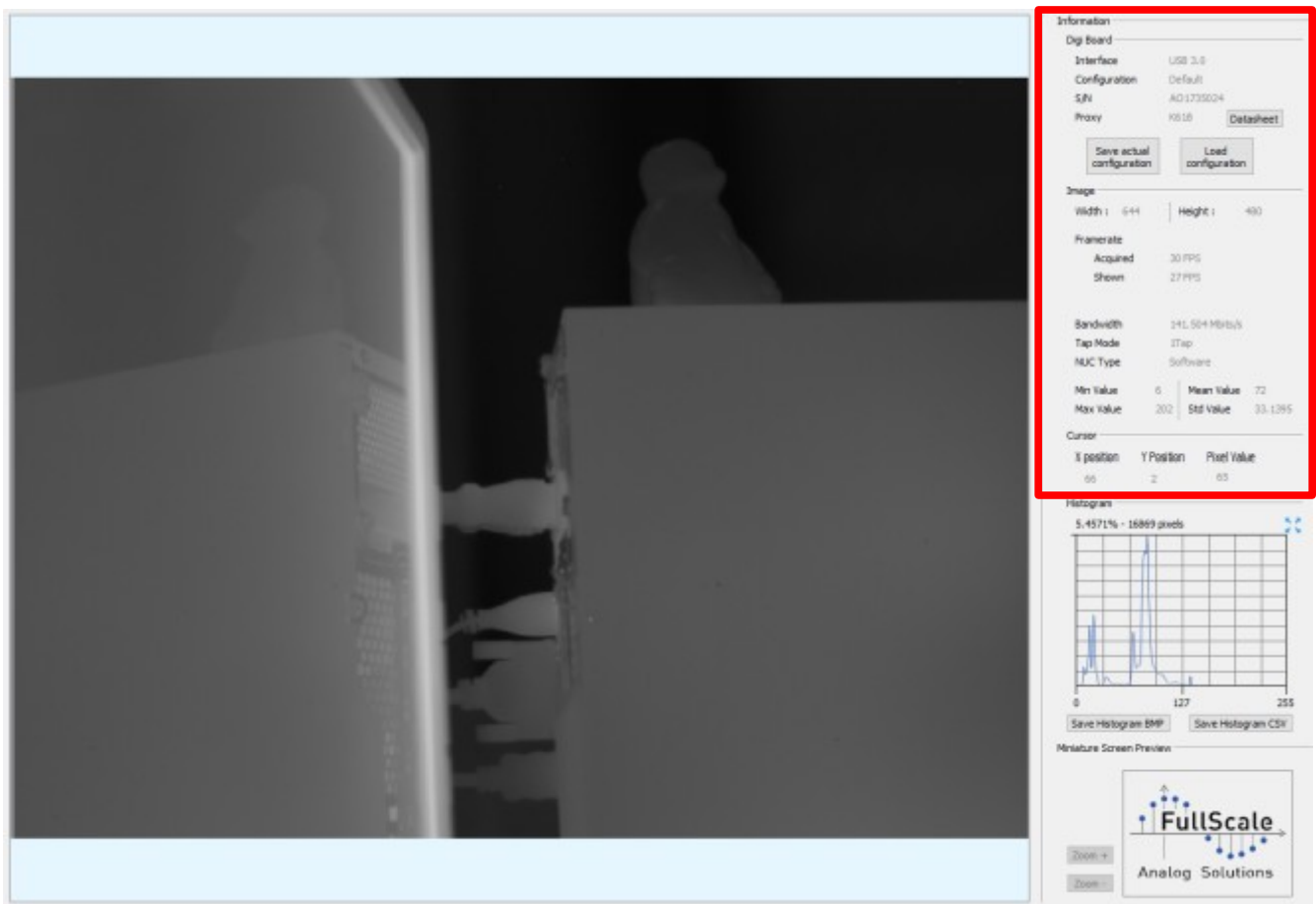

Illustration 53 : Image displayed and information

4.2. Zoom

Two zooms are available clicking on the image directly (with the left click). The first one, adapts the display to the window area. The second one is a click zoom. Click zoom applies a zoom around the click position.

To zoom in or zoom out, use the mouse's wheel or the two buttons "Zoom +" and "Zoom -".

To quit the zoom mode, press right click of the mouse anywhere in the display area.
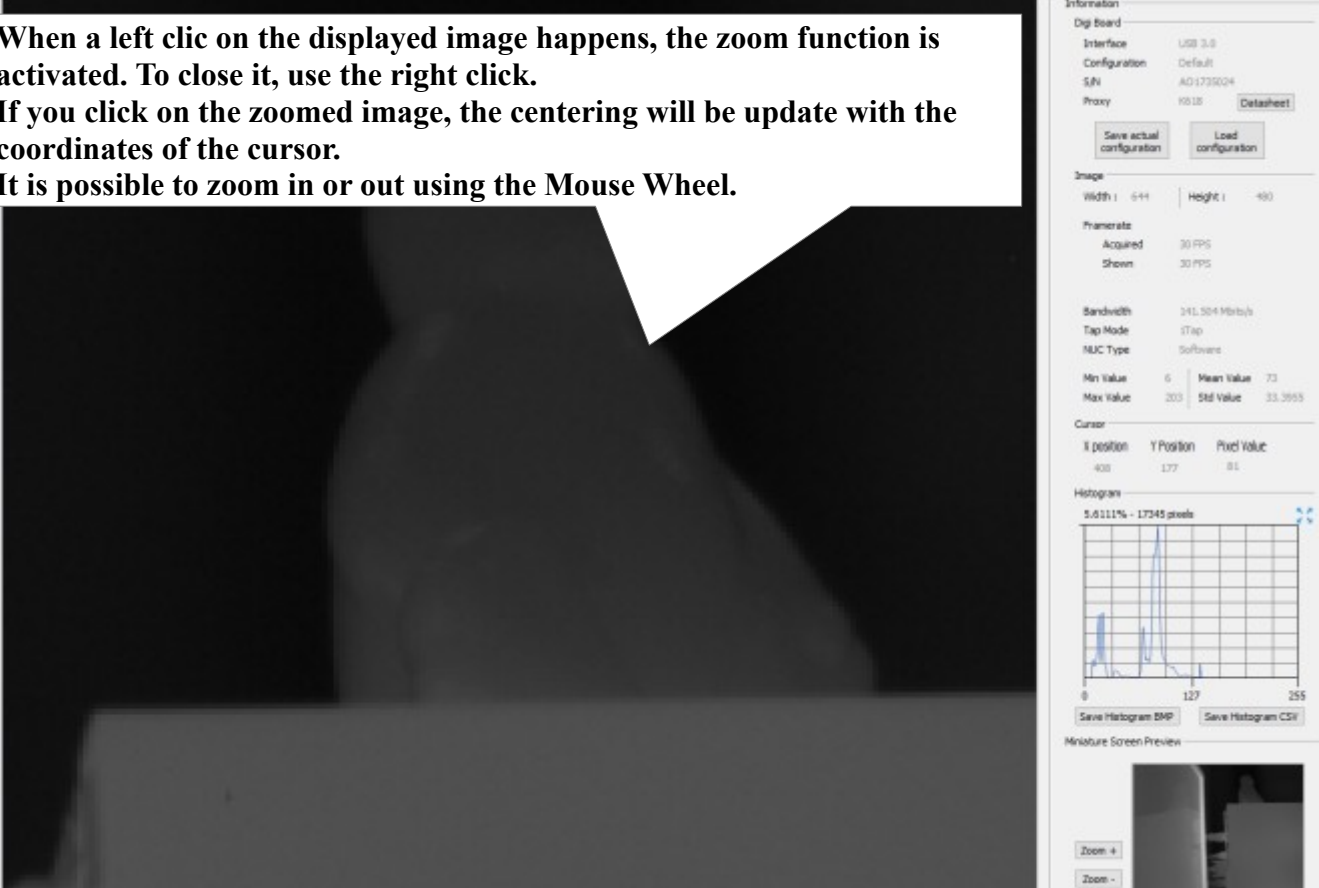

Illustration 54 : Zoom

When the zoom is the higher, the displayed image size is 11*11 pixels.

5. ProxyDemo's menus

The ProxyDemo menus allows to have access to different options.

• In the "File" menu, are available the following options:

➢ "Demo Mode Options" can be used to enable the Demo Mode feature. This feature disables the display into Proxy Demo and opens a new window with a size adapted to the maximum definition of the display. The Dual View can be activated by clicking on the "Dual View" option. When the ProxyDemo GUI window is active, the mode can be switched (Normal or Demo Mode) pressing "F10" key.

➢ While the OpenCV window is active, pressing 'ESC' key will return the software into "Normal Mode". Pressing '+' or '-' key will change the offset. Pressing 's' will activate the shutter.

➢ "Main Display" allows to select the definition wanted to adapt the "Demo Mode" window definition. This menu will analyze the two first displays.

➢ "Save all frames in RAW" modify the format of all saved frames. This options feature allows to switch between RAW and BMP format.

➢ "Auto Start" changes the starting behavior. When checked, once the Connect Button is pressed, the stream is automatically started. When unchecked, the Connect Button allows to reconfigure the DigiBoard before starting stream.

➢ "Auto 1-pt NUC" automatically enables the 1-pt NUC when a Fix Pattern Noise is taken (using the button).

• In the "View" menu, are available the following options:

➢ "Commands" opens a new window to send custom parameter to the Digi Board.

➢ "Terminal" opens a new window and which one it is possible to send commands to the CLink-C / Clink-C+ / CLink-B+. (Press F12 as shortcut)

➢ "Advanced Histogram" opens the histogram window with advanced configurations and options (tracking bar, saving files, etc.).

➢ "Calibration window" opens a new window that allows to create calibration table and BadPixel file.

• In the "Configuration" menu, are available the following options:

➢ "Reset parameters" which reset all the parameters with default values for the Proxy Board actually selected.

➢ "Send I2C Configuration File" which load a configuration file to configure the sensor according to custom sensor parameters (according to the sensor Datasheet)

➢ "Adjust Offset BadPixel" which be use to move the origin point of the image according to the BasPixel file selected. This can be use only when the BadPixel correction is made on the software.

➢ "NUC" allows to choose where the NUC operation has to be done using a CLink-C+ or Clink B+ or USB3-A Digi Board (NUC Hardware (= Embedded) or Software). Doing it, every processing is made on the DigiBoard (NUC, Invert BW, HDR, etc)

➢ "Setup Digi Board" allows to modify the current configuration of the Digi Board. The MasterClock can be changed as the default ClockDiv or the GSK Bias voltages, USE THIS FEATURE WITH CAUTION.

➢ "Setup Saving Files" to change the image format to save and/or the period when automatic saving is used.

➢ "BP Correction Software" to change the type or correction (process done in embedded hardware or in the software) Used for CLink-C+, Clink-B+ and USB3-A with Processing Board.

➢ "LUT" to change the display. 2 default Look Up Tables are available (Fire and Cool) and can be loaded to display color on the display according to the pixel values.

➢ "Windowing configuration" to apply a custom windowing on the image. This feature is only enabled for CLink-C+ and CLink-B+ Digi Boards.

• In the "Datasheets" menu, are accessible the datasheets of the proxy and the user guide of ProxyDemo and the Digi Board.

• In the "License" menu, the License currently used can be display. Or a wizard to select the license can be used. This feature will copy the license in the correct folder,

• In the "Log" menu, the log file can be shown, rename or delete.

CAREFUL: Sending parameters with Advanced Commands window can affect the image and the sensor. For more information, please contact FullScale.

5.1. Terminal window

The Terminal can be used to send commands to the Digi Board using serial communication. This window is not refreshed automatically. The received data are only the one sent by the Digi Board after sending a command using the terminal.

CAREFUL: All the commands sent using the terminal bypass all securities implemented in ProxyDemo. Please use this functionality with caution. FullScale can not be responsible for any damage that may be caused to the sensor using this feature.
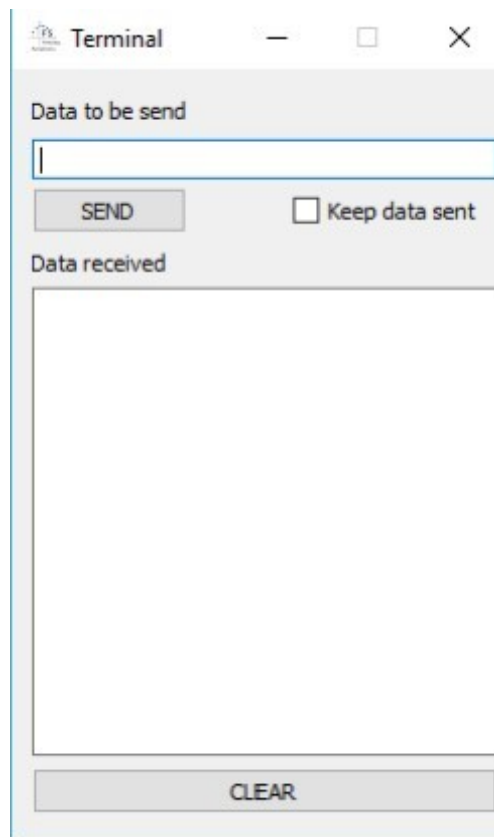

Illustration 55: Terminal Window

5.2. Advanced Commands window

This window allows to set a particular configuration of the Digi Board depending on the parameter which can be changed.

Some Proxy Board parameters can also be changed (ex: Interframe).

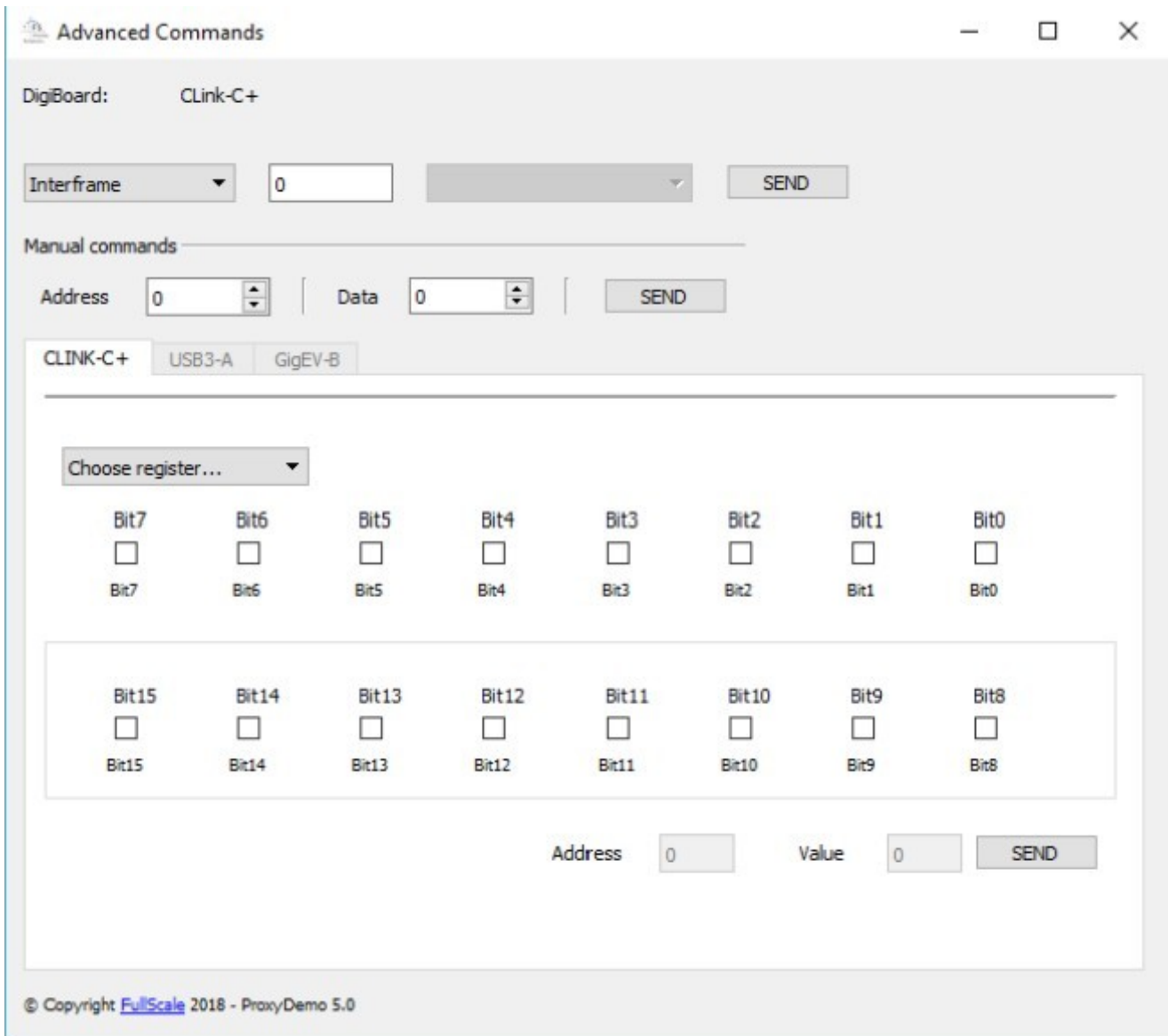With the CLink-C+, every FPGA register can be updated.

Illustration 56: CLink-C+ Advanced Commands

With the GigEV-B, some NTX parameters can be uploaded quickly or it is possible to use the Pleora's windows (the same as available in Pleora eBus software). Also, you can have access to shortcut to open the "Windows Device Manager" and "Windows Network Connections" to manage your network card.
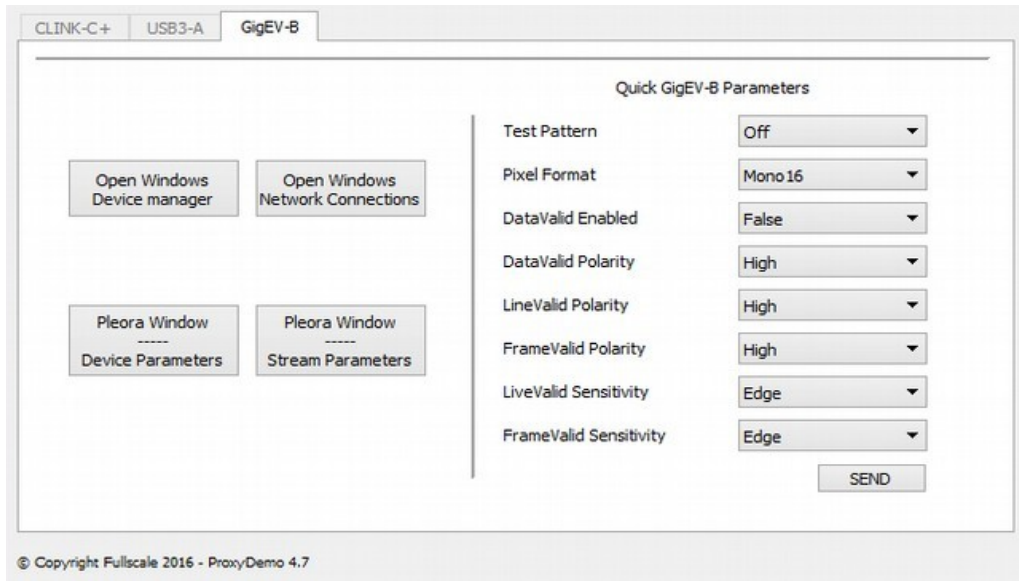
Illustration 57: GigEV-B Advanced Commands

NB: The Table is updating automatically when the Digi Board is connected to ProxyDemo.

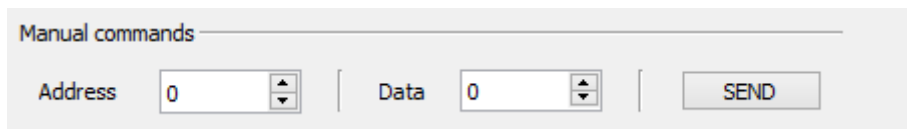# 5.3. Manual Digi Board configuration

Illustration 58: Manual digi board configuration

The image above shows how to set a manual configuration by setting the address and the value of one parameter (or register). When the address and the value are set, click on SEND button to apply it.

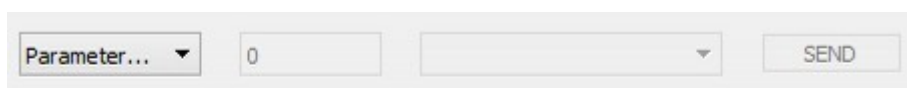# 5.4. Proxy Board configuration

Illustration 59: Proxy parameters configuration

With the tools shown above, it is possible to change some proxy parameters as the Interframe, the Configuration Mode, etc. Some of them are depending on the Proxy Board

used. For example the "Configuration Mode" is only available for V1330.

5.5. Adjust BadPixel offset

In this window, the Offset can be adjust for X and Y axes. The modification is made in live and can be observed in live.
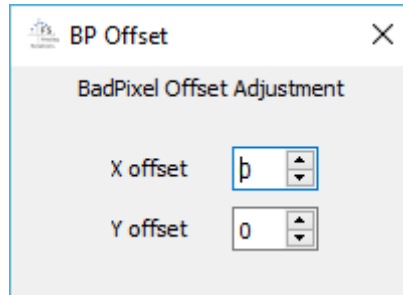
Illustration 60: Adjust BP

Offset window

5.6. I2C Configuration File

CAREFUL: This feature is still under test. Please use it with caution!

In this window, it is possible to load a csv file with the Register Name, the memory type, the I2C Address and I2C Value to send..

The first line of the file has to be:

 "TYPE_MEM;NOM;ADRESSE;VALEUR"

The values has to be separated with the ';' character. Each I2C command has to be separated this a Line feed,

Addresses and values has to be in hexadecimal starting with a 'h' character.

```
 1    TYPE_MEM;NOM;ADRESSE;VALEUR
 2    RAM;GAIN_IMAGE;h40;hd3
 3    RAM;ADC;h41;h00
 4    RAM;YMIN_A;h43;h00
 5    RAM;YMIN_B;h44;h00
 6    RAM;YMAX_A;h45;h00
 7    RAM;YMAX_B;h46;h00
 8    RAM;XMIN_A;h47;h00
 9    RAM;XMIN_B;h48;h00
10    RAM;XMAX_A;h49;h00
11    RAM;XMAX_B;h4a;h00
12
13
```

Illustration 61: Example of a I2C
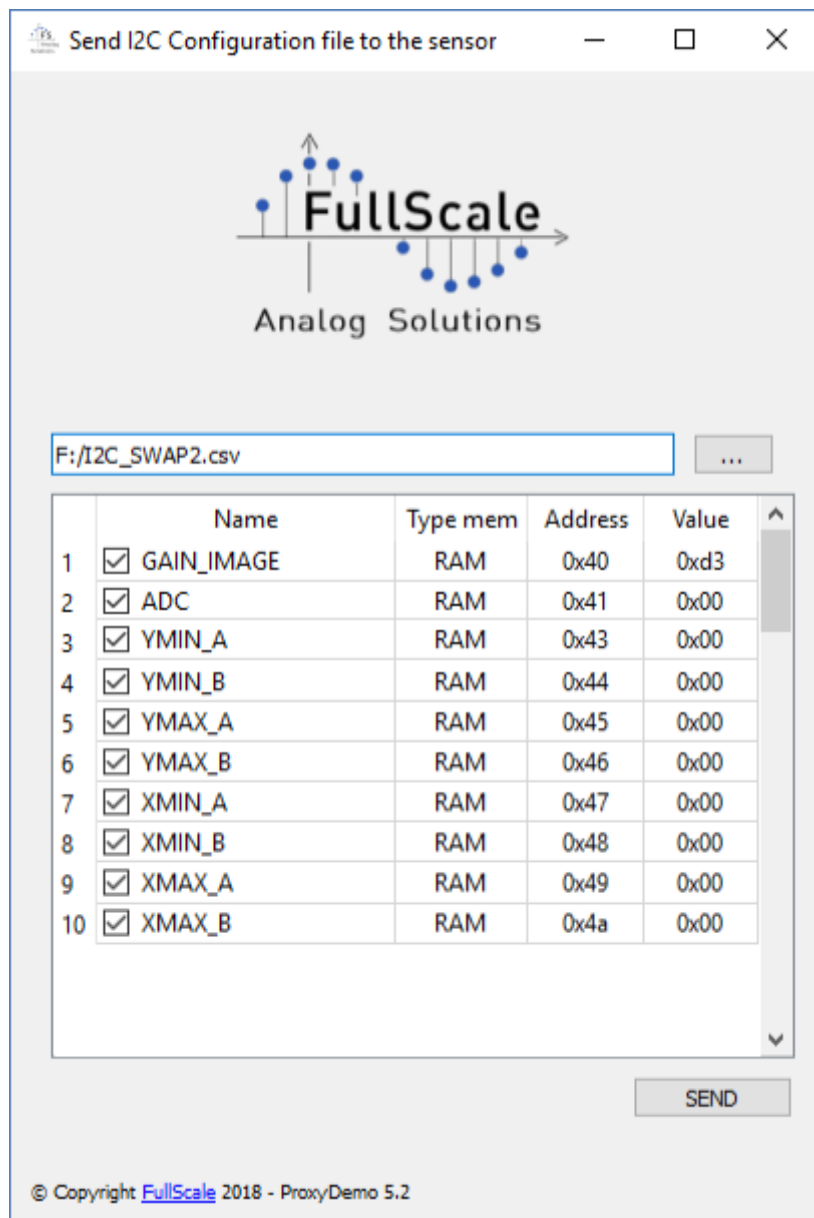
configuration csv file

Illustration 62: I2C Configuration to sensor

The command that should not been sent can be disabled by unchecking the box in the left of the command name.

Then, click on SEND button to configure the sensor.

*NB: This feature shall be used with caution. The commands sent has to be checked. The sensor may not accept the command and can be damaged. Please be very careful using it. **FullScale can not be responsible for any damage that may be caused to the sensor using this feature**.*

Important: All Proxy Boards are not compatible with this feature, please contact FullScale to get more information about this feature.

5.7. Look Up Table

CAREFUL: This feature is still under test. Please use it with caution!

ProxyDemo can change the color of the current displayed video stream. Instead of showing Black and white image, it is possible to load Look Up Table (LUT) as csv file and apply them.

2 default LUTs are available on the LUT directory. You can take them as example.

The first line has to be "Red;Green;Blue", Then on the 256 next lines, the corresponding values, separated by ';'.

Illustration 63: Example

of the first lines of a

LUT csv file

The two default LUT can be selected using the "Configuration → LUT" menu.

Custom LUT will ask to select the LUT wanted. Please select the correct csv file.
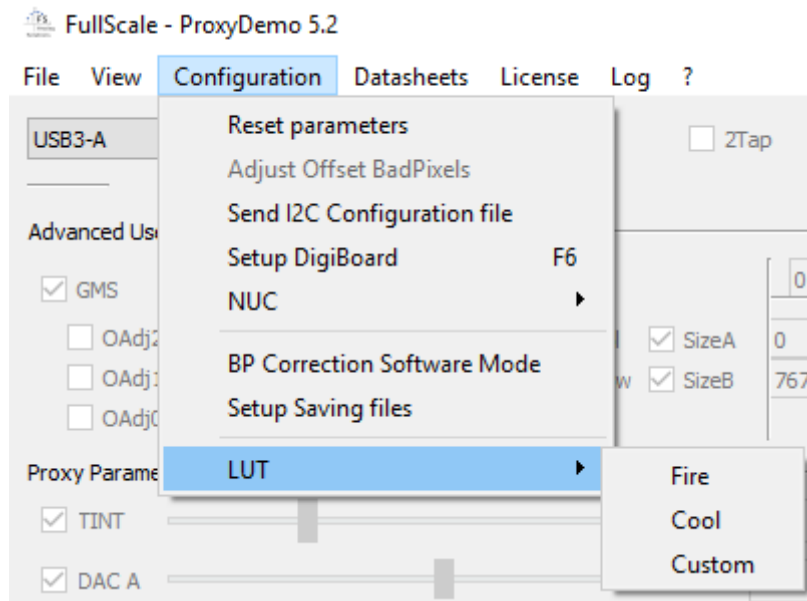
Illustration 64: How to select LUT configuration
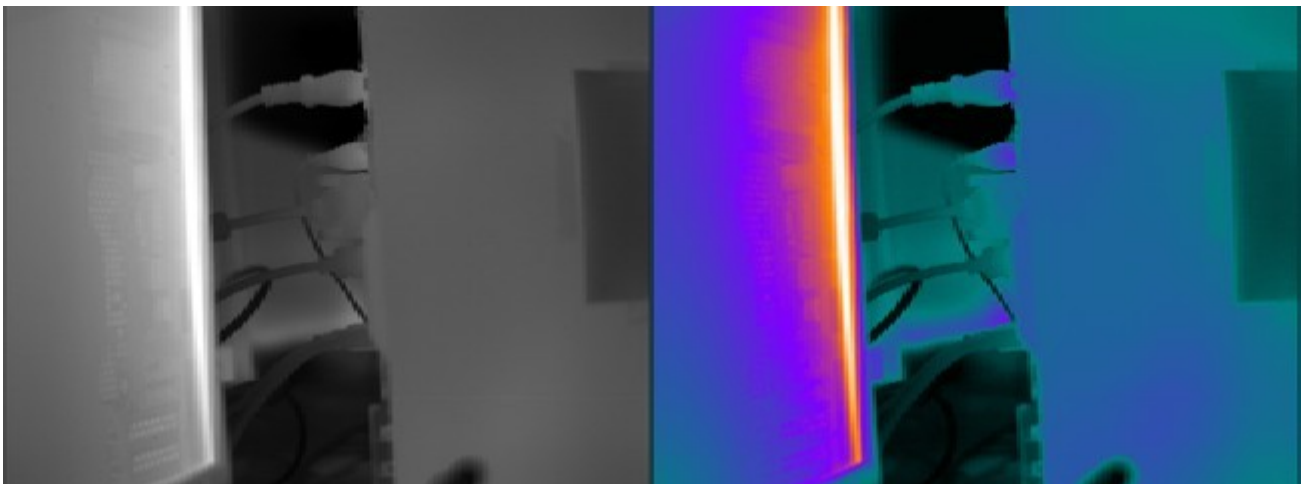
Here is an example using the "Cool.csv" LUT:

Illustration 65: Example of the Black and White image with "Cool.csv" LUT

5.8. Windowing configuration

If a FullScale CLink-C+ or CLink-B+ is used with ProxyDemo, it is possible to apply a windowing on the video stream.

Two predefined configurations are embed on ProxyDemo (QVGA centered and VGA centered). Those configurations adapt itself to the default image size.

A "User-defined" mode is available to send a custom image size, Using it, the Xfirst, Xlast, Yfirst and Ylast values may be customized.

NB: The minimum image size is 160*120.

Once the wanted size is defined, if "Set Window" button is enabled, click on it. The windowing will be automatically applied.

IMPORTANT: If a Windowing is enabled and ProxyDemo is restart, the image may seems incorrect. Just retake a new reference image to update the NUC, please be sure the checkbox Windowing Enabled is checked before start the video stream.
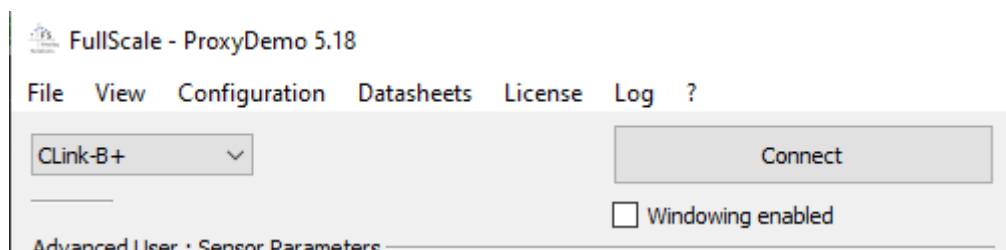

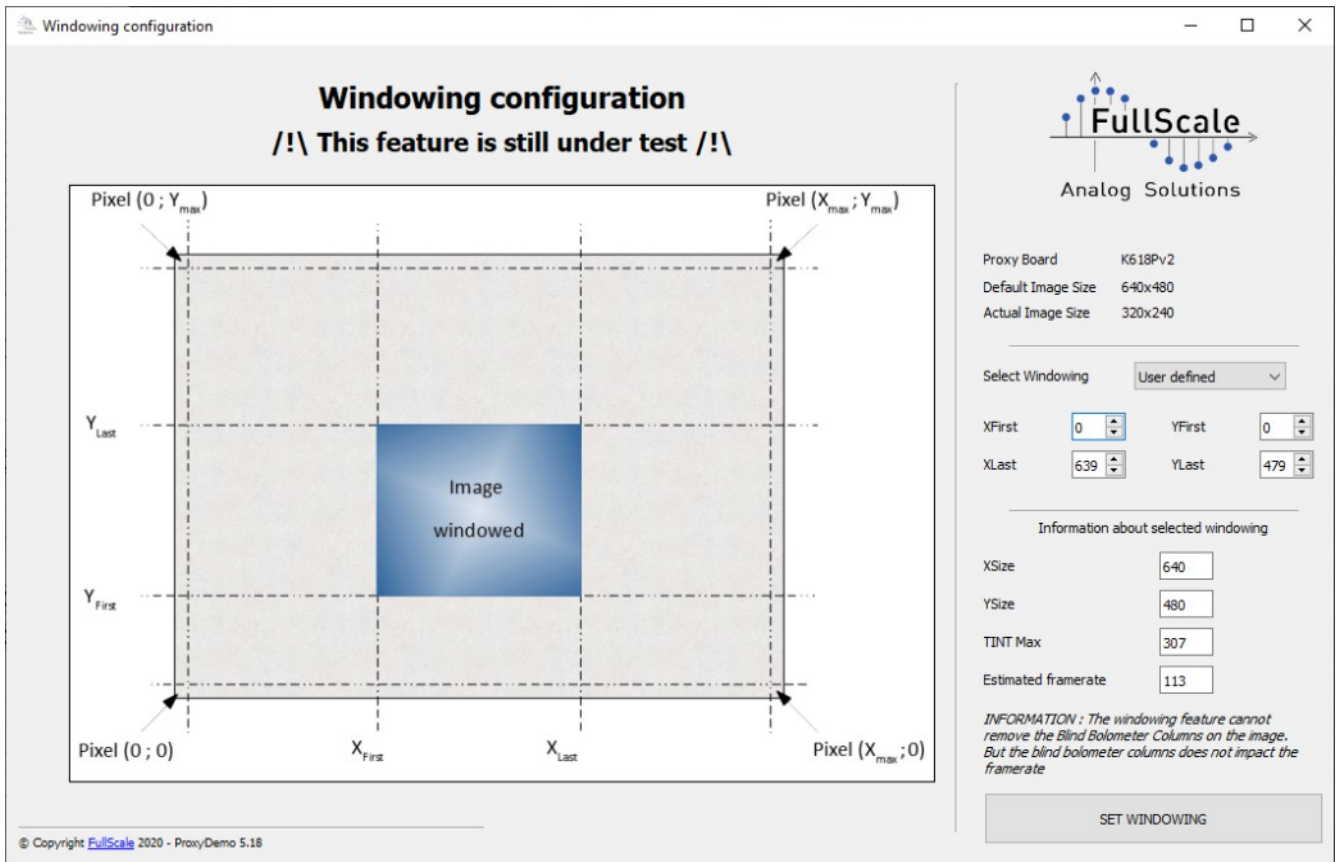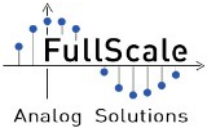*Illustration 66: Checkbox "Windowing Enabled"*

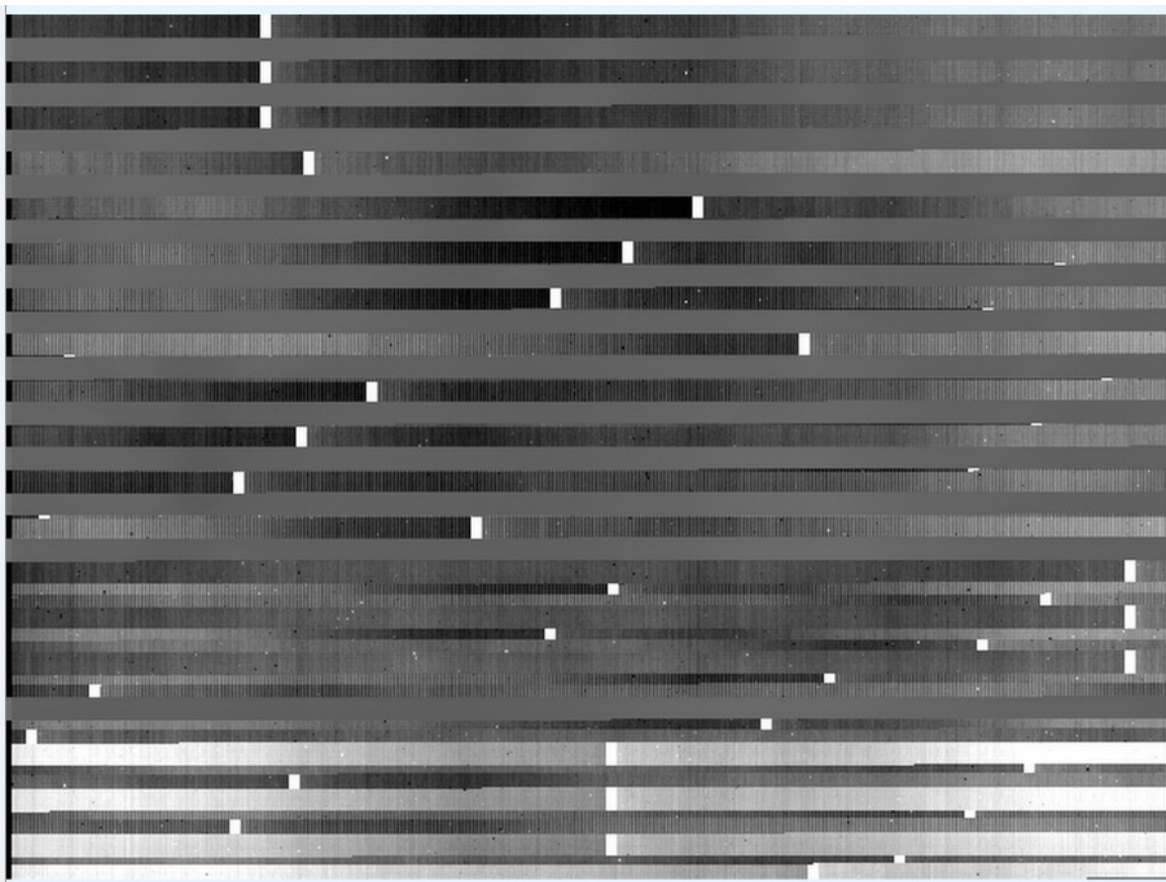*Illustration 67: Windowing configuration window*

6. Known issues

Bad Synchronisation with USB3-A DigiBoard

Issue:

ProxyDemo displays a video stream that is not correctly synchronized. Some bands may appear on the displayed image. Bands can be fixed or can moved on the image.

Example of the effect:

How to solve it:

1. The computer performances does not meet the minimum configuration required to execute correctly ProxyDemo. Please upgrade your computer

2. The Operating System used is not fully compatible with ProxyDemo and particularly with the USB3-A (Microsoft Windows 7). Please upgrade the OS to Windows 8.1 or Windows 10.

3. The installed anti-virus analyzes ProxyDemo and/or the USB3 data flow. Please add ProxyDemo in the anti-virus "Safe" list and disable the USB data flow analysis.

Note: ProxyDemo may have some issues with the following anti-virus:

- ➢ Symantec
- ➢ Norton (by Symantec)

FullScale has tested ProxyDemo with the following anti-virus:

- ➢ Bit Defender Total Security 2019
- ➢ ESET NOD32
- ➢ Microsoft Windows Defender

ProxyDemo may need to be restart to take in charge the changes.

ProxyDemo succeeded to connect to the DigiBoard but can't open a video stream.

Issue:

ProxyDemo is correctly connected to the DigiBoard but when opening the video stream, no image are displayed and a message pop-up that indicates the DigiBoard is disconnecting and the DigiBoard is disconnected.

How to solve it:

1. Please check the anti-virus software allows ProxyDemo to have access to a camera device. For example, BitDefender software need to authorize ProxyDemo to have access to the camera. Once authorized, restart ProxyDemo.

2. Please check the DigiBoard is correctly connected to the computer.

3. Please check a detector is correctly plugged on the ProxyBoard.

Failed to check the DigiBoard Licenses.

Issue:

ProxyDemo fails to check the DigiBoard license. An error pop-up message is displayed.

How to solve it:

1. Please check the DigiBoard is properly connected to the computer (using CameraLink, USB3 or RJ45 cable depending on the DigiBoard used)

2. Please check the DigiBoard is correctly powered

3. Please check the license corresponding to the DigiBoard is placed in the ProxyDemo "Licenses" folder. If the license is not available, copy the corresponding license in this folder or contact your FullScale representative to get this license file.

4. ProxyDemo should not been launch from a network drive. If so, please copy ProxyDemo software directly to the computer (SSD / HDD root or on Windows Desktop)

5. ProxyDemo software only accepts paths using UTF-8 characters. Accents and specials characters are not allowed.

Failed to reconnect to the USB3-A

Issue:

ProxyDemo fails to reconnect after a disconnection or a dynamic reconfiguration.

How to solve it:

The only way to solve this issue is to restart ProxyDemo.

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