

PicoDigitizer125

Quick Start Guide

Version 1.5 – October 2015 – Updated for Software Tools Release 7.0

Congratulations on the purchase of your new PicoDigitizer125!

Box Contents

In the PicoDigitizer125 box, you will find:

- **The PicoDigitizer125 enclosure**
- **A universal power supply with a power cord.**
 - Maximum output power: 150 Watts
 - Output voltage: 12 VDC
 - Input voltage: 100 to 240 VAC
 - Frequency: 50 to 60 Hz
 - Operation temperature: 0 to 40°C
- **The BAS Software tools USB dongle**
 - Windows 7 Installer (Host and FPGA development).
 - Ubuntu 12.04 LTS Installer (Host development).
- **The PicoDigitizer125 Quick Start Guide**
- **An Ethernet cable**
- **A mini-USB cable**
- **Other documents** (Terms of use and product policies)

Enclosure Contents

PicoDigitizer125/16(E)

- A **Perseus601x** carrier board equipped with a Virtex6 FPGA.
- A **MI125** FMC (16 ADC channels).
- A **back plane** board ensuring the Perseus and MI125 operation.
- A **SAMC-514** embedded CPU in the PicoDigitizer125/16E.

PicoDigitizer125/32(E)

- A **Perseus601x** carrier board equipped with a Virtex6 FPGA.
- A **MI125** FMC stack (32 ADC channels).
- A **back plane** board ensuring the Perseus and MI125 operation.
- A **SAMC-514** embedded CPU in the PicoDigitizer125/32E.

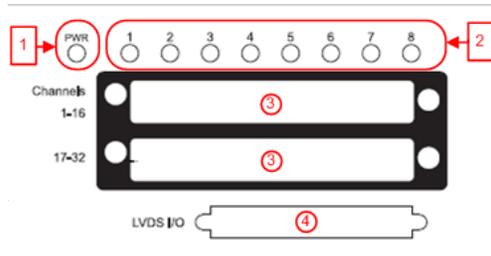
PicoDigitizer125/64

- Two **Perseus601x** carrier board each equipped with a Virtex6 FPGA.
- Two **MI125** FMC stacks (64 ADC channels).
- A **back plane** board ensuring the Perseus and MI125 operation.

SAMC-514 Linux passwords			
User	nutaq	admin (sudo)	superuser (su)
Password	nutaq	nutaq	nutaqrd

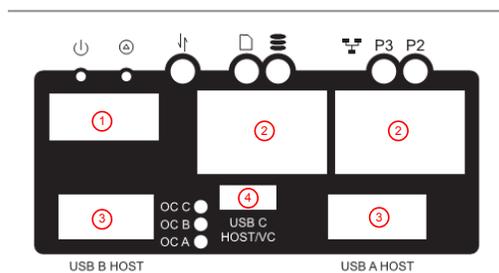
PicoDigitizer125 Front Panel

Depending on your PicoDigitizer125/X models, the front panel gives access to 1, 2 or 4 MI125. The following diagram lists the important connectors and indicators.



1. Perseus Power-On LED
2. Perseus User LED
3. MI125 Connector
4. Mestor LVDS Connector

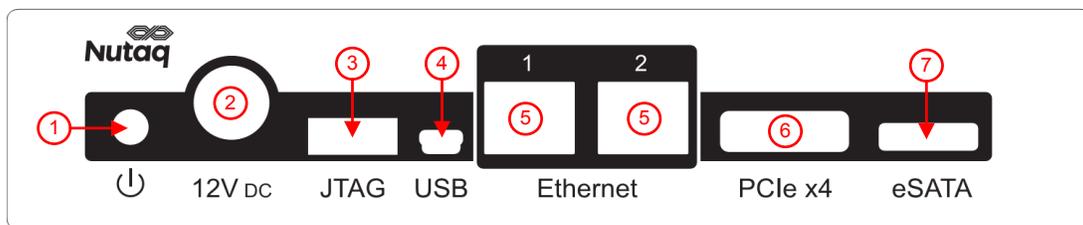
On the PicoDigitizer125/16E, PicoDigitizer125/32E models, the front panel gives access to the embedded CPU. The following diagram lists the important connectors and indicators.



1. HDMI connector for video monitor
2. Ethernet connectors
3. USB connectors (mouse and keyboard)
4. Mini-USB connector

PicoDigitizer125 Back Panel

On all PicoDigitizer models, the back pane gives access to the Perseus debug, control and data streaming ports.



1. Power button.
Power up: When the power cable has been connected or the PicoDigitizer is in shutdown, press once to power up the unit.
Power cycle: When the PicoDigitizer is running, press once to power cycle slot B, and press twice to power cycle slots A and B.
Shutdown: When the PicoDigitizer is running, press and hold the button for three seconds to shutdown the unit.
 For full power button operation details, please consult the PicoDigitizer User's Guide.
2. 12V DC power supply connector.
3. FPGA JTAG connector for the Perseus Virtex-6 FPGA.
4. Mini-USB connector. Access the Perseus embedded Linux console.
5. Gigabit Ethernet connectors.
6. PCI Express x4 connector (optional).
7. External HDD eSATA connector (Present on PicoDigitizer125/16E, PicoDigitizer125/32E)

Setting Up the PicoDigitizer125

The following procedure will guide you through the PicoDigitizer125 setup to run the Record example.

Requirements

- PicoDigitizer box content
- A PC with Windows 7 64-bits and 10 GB of RAM.
 - Gigabit Ethernet network card with jumbo frame capability
- Visual Studio 2012
- An Ethernet cable
- A 10-MHz signal generator
- At least 1 Edge Rate Contact™ breakout SMA cables purchased from Nutaq or a custom cable to input a signal on the PicoDigitizer125

Procedure

This procedure briefly describes how to run the PicoDigitizer125 example design. For more details, please refer to document *MI125 Examples Guide.pdf* in folder `%BASROOT%/doc/fmc/MI125`.

1. Install the BAS Software tools on the Windows PC. Follow the instructions available in the *Board & Systems Software Tools - Installation Guide.pdf* document in the `doc/release` folder of the USB dongle.
2. Connect the PC to the PicoDigitizer125 with the Ethernet cable. Use the Ethernet port 1 on the PicoDigitizer125 backplane.
3. Connect the Edge Rate Contact breakout SMA cable(s) to the PicoDigitizer125 front panel connector(s) labeled 1 to16 and 17 to 32.
4. Connect a 1-Vpp (4 dBm) sine at 10 MHz to each channels.

The channel inputs must be less than 2 Vpp in amplitude to avoid the risk of damaging the hardware. If you are unable to connect a signal to all the channels, connect signals to as many as possible, and then change the connections to test all the channels. If you have only one Edge Rate Contact breakout SMA cables, start testing channels 1 to 16 and then connect it to channels 17 to 32.
5. Power up the PicoDigitizer125 by plugging in the power supply and by clicking once on the backplane reset button.
6. The Perseus will boot and configure itself with the MI125 Record example bitstream previously written in Flash memory.
7. The PicoDigitizer125 Perseus is configured to use a static IP upon startup. The Perseus default IP address is 192.168.0.101
8. On the host PC, browse to `%BASROOT%/examples/mi125/host/scripts`.
9. In this folder is a batch file (or shell script, if you use Linux) demonstrating MI125 configuration and data record.
10. Double-click the file to launch the demo. The demo then starts automatically.
11. The following demonstrates a successful MI125-Record test on a PicoDigitizer125.

```
----- MI125 Init -----  
  
Parsing MI125_Init.ini file for needed parameters...Done!  
  
Configuring the Perseus at IP = 192.168.0.101, please wait.  
MI125 Init...  
  - Board number : 1  
    - Sampling clock source : 0  
    - Trigger output IO : OFF  
    - Is a clock master : Yes.  
    - Core Version: 0x0201  
    - Driver Version: 0x0023  
    - PCB temp: 48.5C  
  - Board number : 2  
    - Sampling clock source : 2  
    - Trigger output IO : OFF  
    - Is a clock master : No.  
    - Core Version: 0x0201  
    - Driver Version: 0x0023  
    - PCB temp: 45.5C  
  
Done!  
  
----- CustomRegister_Write -----  
  
Configuring the Perseus at IP = 192.168.0.101, please wait.  
CustomRegister Write...  
  - Custom Register ID : 13  
  - Value to write : 4  
  
Done!  
  
----- CustomRegister_Write -----  
  
Configuring the Perseus at IP = 192.168.0.101, please wait.  
CustomRegister Write...  
  - Custom Register ID : 14  
  - Value to write : 0  
  
Done!
```

```

----- CustomRegister_Write -----
Configuring the Perseus at IP = 192.168.0.101, please wait.
CustomRegister Write...
  - Custom Register ID : 15
  - Value to write : 0
Done!

----- RecordData -----
  - Trigger source : 0
  - Record size : 65600 bytes
  - Start address : 0 bytes
  - Trigger delay : 0 bytes

Connecting to the platform at IP address : 192.168.0.101 ...
Resetting Record Playback module...
Setting the Record trigger in external mode...
Start recording...

----- CustomRegister_Write -----
Configuring the Perseus at IP = 192.168.0.101, please wait.
CustomRegister Write...
  - Custom Register ID : 15
  - Value to write : 1
Done!

----- RetrieveRecordedData -----
  - RTDEx channel : 0
  - Frame size : 8192 bytes
  - Record size : 65536 bytes
  - Start address : trigger
  - Record timeout : 1000 ms
  - Filename : ..\bin\record.bin

Connecting to the platform at IP address : 192.168.0.101 ...
Trigger position: 81604064
The data will be transferred through RTDEx Gigabit Ethernet
MAC Address of Perseus is: '00:D0:CC:0A:01:5F'
MAC Address of Host is: '10:60:4B:79:68:3C'

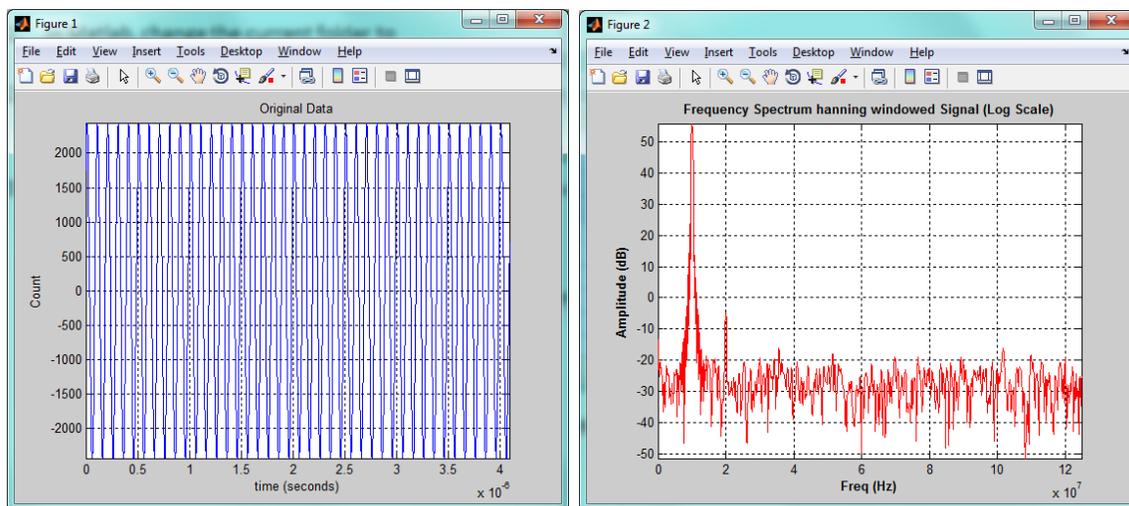
Setting the Record Playback module in memory to host transfer mode...
0.070 MB received.
Done.

```

12. The demo generates a record.bin file in %BASROOT%/examples/mi125/host/bin.

13. Plot the recorded data using Matlab

- In Matlab, change the current folder to %BASROOT%/examples/mi125/host/bin.
- Run this command: `bintofft('filename', num_of_channels_to_plot, 'int16', number_of_samples, acquisition_frequency);`
For example: `bintofft('record.bin', 32, 'int16', inf, 125e6);`
- Matlab will plot the received data and the FFT for each channel.



In the figures above, we clearly see the 10MHz tone in the time spectrum plot and the frequency spectrum FFT plot.