Digitizer's Manual

Step-by-step procedure(s) to programme IP's, to download bitstream to digitizer card(s), and to run the internal noise test

General operations:

- Change IP if required
- Run FPGA to program CORE and SEGMENTS using XPORTs
- Test internal noise of individual CORE and SEGMENTS submit the report

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A. To program digitizers IPs:

 Firmware is available at <u>http://ltxfaq.custhelp.com/app/answers/detail/a_id/644</u> NB: Download "stand alone DeviceInstaller". This can be installed on a window computer. System requirements – Windows XP or Windows7, Java JRE version 1.6 or later (available at <u>Java web site</u>, please select Java Runtime Environment JRE1.6), Screen resolution 1024x768, at least 1 GB of RAM, Microsoft .NET Framework 4

Product	Download via FTP	Download via HTTP	Comment
Stand-alone DeviceInstaller Setup application for Windows (70 MB)	<u>FTP</u>	HTTP	No internet access required to install

- 2. After installation change the machine to the local network (i.e., 10.10.30.250 core card, and/or 10.10.31.250 segment card (NB– this operation should be performed on local network only) details of local network at GSI are following;
 Local network IP 10.10.30.250
 Subset mask 255.0.0.0
 Default gateway 0.0.0.0
- 3. Plug the network cable in the CORE of digitizer.
- 4. Run the DeviceInstaller as administrator it should show a window as given below

22 Lantronix DeviceInstaller 4.3.0.3	Carl Meterical - Hart	to be access to operate	-				x
File Edit View Device Tools Help							
🔎 Search 🛛 🤤 Exclude 🛛 🔇 Assign IP							
E- altronix Devices - 57 device(s)	Туре	Name	Group	IP Address	Hardware Address	Status	*
Encal Area Connection (140.181.70.129) ⊕- □ UDS ↓ □ VPort	2 XPort-03/04			140.181.73.125	00-20-4A-B1-5B-54	Online	
	2 XPort-03/04			140.181.73.81	00-20-4A-B1-5B-29	Online	
	XPort-03/04			140.181.73.83	00-20-4A-B1-5B-24	Online	
	2 XPort-03/04			140.181.73.85	00-20-4A-A7-36-BE	Online	
	2 XPort-03/04			140.181.73.87	00-20-4A-B1-5B-3C	Online	
	ธีเสีย∨⊓-⊥ กา /ก∦			140 101 70 00	00 00 44 D1 ED 04	0-t	*
🗹 Ready							

- Click on SEARCH on Lantronix device installer it shows the IP address of core (e.g., 10.0.1.14 (here – 14 is digitizer's id) and MAC address (it's better to note MAC addresses of CORE and SEGMENTS).
- open XPORT menu (click on +) click on IP address (i.e., 10.0.1.14) click on assign IP click on assign a specific IP address click NEXT (it opens IP settings).

- 7. Now change IP from 10.0.1.14 to 10.10.30.14 (as mentioned above, 14 is the digitizer's id, 30 is the CORE device id) click **NEXT**.
- 8. Click Assign progress of task finish successfully change the IP

Same operation should be performed to change the IP of SEGMENTS. However, following changes are must;

- Plug the network cable into the SEGMENTS
- Change the SEGMENT device id as 31 (for example 10.10.31.14, for the segments of digitizer 14)

B.Test of internal noise of Digitizers: (*i*) Download Bitstream to Digitiser Card

- 1. You will need Xilinx Impact software tool and the Xilinx USB programmer. (Download from: <u>http://www.xilinx.com/support/download/index.htm</u>)
- 2. Connect Xilinx USB programmer to the JTAG connector of one of the digitiser cards (at the back of the digitiser).
- 3. Run Impact, choose "create new project" and click ok:

🐉 iMPACT Project		
l want to		
O load most recent project	Bro	iwse
	Load most recent project file when iMPACT starts	5
⊙ create a new project (.ipf)	default.ipf Bro	wse
	<u>OK</u>	

4. Leave setting as "Configure devices using Boundary-Scan (JTAG) – Automatically connect to a cable and identify Boundary-Scan chain" and click Finish.

🏶 iMPACT - Welcome to iMPACT	
Please select an action from the list below	
 Configure devices using Boundary-Scan (JTAG) 	
Automatically connect to a cable and identify Boundary-Scan chain 😒	
O Prepare a PROM File	
O Prepare a System ACE File	
O Prepare a Boundary-Scan File	
SVF 💌	
Configure devices	
using Slave Serial mode	
< <u>B</u> ack <u>Einish</u>	Cancel

5. Bypass first 3 chips (platform flashes) in the JTAG chain. On the 4th one (the FPGA itself), choose the appropriate file (i.e DIGI_SAM_CORE_v5_optionCCLK.bit for the CORE card and DIGI_SAM_SEG_v16_optionCCLK.bit for all the SEGMENTS cards).

😵 Add Virtex-/II Pro/Virtex4 Object Files 🔀
Virtex-II Pro/Virtex4 File
Virtex-II Pro/Virtex4 Configuration File
DIGI_SAM_SEG_v16_optionCCLK.bit
Add Remove
BMM File
Add Remove
Power PC Software Files
Add Remove
Associate ELF Tags
<u>D</u> K <u>C</u> ancel

6. Then right click on the FPGA icon on the chain and select program.

👺 BAPACT - Z:\default.ipf - [Bos	andary Scan]	
File Edit View Operations Output	: Debug Window Help	
Bonday Scan StreteMAP Destay Scan StreteMAP Destay Configuration SystemACE PROM File Formater	Image: Second	
Modes Available Operations are: ⇒Program ⇒Gre Device D ⇒Gre Device Signature/Usecode ⇒Devick Idoode ⇒Read Status Register	Set Dase Properties	
Operations	Boundary Scan	

7. Make sure that Device 4 (FPGA,) is selected and click apply /ok.

Device Programming Properties	- Device 4 Programming Properties		
ategory			
Device 1 (PROM, xcf04s)			
- Device 2 (PROM, xcf04s)	Property Name	Value	
- Device 3 (PROM, xcf04s)	Verify		
Device 4 (FPGA, xc2vp30)	FPGA Device Specific Programming Properties		
	Pulse PROG		
	Assert Cable INIT during programming		
		OK Cancel Apply	Help

8. If successful - you will get the following (and the LEDs at the back of the card will toggle in an even-odd pattern);

00	1 //			
😵 iMPACT - Z:\default.ipf - [Bou	ndary Scan]			
Be Edit Yew Operations Output	Debug Window Help			
2 🗟 🖌 🖓 🖓 🗶 😫 💥 🕻		1 20 12		
Flows	K			
⊕ Boundary Scan				
- BayeSerial				
- BBSelectMAP			E NUME	
- Bo Desktop Configuration	101 KUNF	- 2.0.W	V	
- BoDirect SPI Configuration				
- D SystemACE	xcf04s	xct04s xct04s	xc2vp30	
PROM File Formatter	bypass	bypass bypass	digi_sam_seg	
	100			
Modes				
MPACT Processes				
Available Operations are:				
-Program				
Get Device ID				
Get Device Signature/Usercode				
Check Idcode				
Pread Status Register		Program	Succeeded	
		Trogram	baccectaca	
Onerations				
a per a verte	Boundary Scan			

- Repeat the procedure for the rest of the digitiser cards. (Make sure to download DIGI_SAM_CORE_v5_optionCCLK.bit for the CORE card and DIGI_SAM_SEG_v16_optionCCLK.bit for all the SEGMENT cards)
- 10. Another way to check that the correct bitstreams are loaded in the FPGA's is to check the SAMWISE once you have connected. In the snapshot below, left handside, samwise reports the type and version of the bitstreams found in the FPGA's.



Now the Digitizers are ready to run noise test - follow the forth given steps to run internal noise test

- (ii) *Steps to run internal noise test.*
 - Firmware is available at <u>http://www.iphc.cnrs.fr/article/samwise.html</u> System requirements – Windows 2000 or Windows XP, Windows7 (not tested on other platforms), Java JRE version 1.5 or 1.6 (available at <u>Java web site</u>, please select Java Runtime Environment JRE1.6), Screen resolution 1024x768, minimum 1 GB of RAM, Microsoft .NET Framework 4 If some abnormal termination (crash), any further startup can block showing some error message. In this case, it is necessary to remove/delete the whole "samwise" directory.
 - 2. Run SAMWISE as administrator, it should show the "Startup Window" as given below

🐽 Startup Win	dow ×							
List of reference	ed digitizer module	es. You can add,	, remove, enable/d	lisable any modul	le on the following ta	able.		
Name	IP Address	Туре	Digitizer	Ping	Connect	Consider	Remove	Add new module
Core05	10:10:30:05	Core	DIGO	?	?			Save modules
Segment05	10:10:31:05	Segment	DIG0	?	?			
								Ping all
								Connect all
								Load modules

- 3. Edit the IP address (if not the same as assigned by 'DeviceInstaller'), i.e., 10.10.30.14 (CORE) and 10.10.31.14 (SEGMENTS) (here, unit id 14 is used as an example)
- 4. Click 'Ping' one by one for both CORE and SEGMENTS it should show 'success' in the same column for both CORE and SEGMENTS
- 5. Click 'Save modules' Click 'Connect all' it should show up 'success' in 'Connect' column and also in 'HierarchyModuleWindow'.
- 6. Click 'green tab to open' in 'HierarchyModuleWindow' Right click on 'Digi0' click show histograms Click 'Test View' from different view tabs.
- 7. Select histogram type 'ADC'
- 8. Select the 'dir' location to save the noise report (e.g., E://(int_noise_digitizers)
- 9. Set the channel number one by one from the 'Channel' menu NB: *it's better not to run noise test for all CORE and SEGMENTS at a time – select upto four channels in one go.*
- 10. Click 'Run' for the selected CORE and SEGMENTS

NB: spectrum viewer gives the freedom to zoom or un-zoom the spectrum – right click and select around the peaks to zoom

11. Repeat the same procedure for all channels

Each unit has a spare channel, it's important to make noise test for spare channel too - this can be a life saver if some channel is not working properly

The acceptable signal-to-noise ratio of a digitizer is more than 70, if less – the unit need to be replaced.

Desired statistics for reliable signal-to-noise ratio is more than 300 events, which may need to run the test for almost 10 minutes.

(iii) To run the noise test for SPARE channel:

For CORE module

- 12. Right click on 'DIG0' in 'HierarchyModuleWindow'
- 13. Click 'Refresh all' wait for few seconds to execute the command
- 14. In 'CORE module' menu select edited board 'SEGMENT1'
- 15. Select 'spare channel 1'
- 16. Click 'send to card'
- 17. Repeat the same for all Segments and send to card

For SEGMENTS modules

- 18. Do the same operation for segments in 'SEGMENT module menu' and send to card NB: above operations are to modify the card to run noise test of spare channel
- 19. Now go back to 'DIG0 Histograms menu'
- 20. To run noise test for the spare channel, select 'channel 1' in the channel menu run the noise test same as before
- 21. Now submit the noise test report click 'Submit Noise Report' (must do)