Pixel DTB

Pixel DTB is the DAQ board used for testing the CMS pixel chips and modules for the Phase 1 upgrade. For high level testing have a look at Psi46.

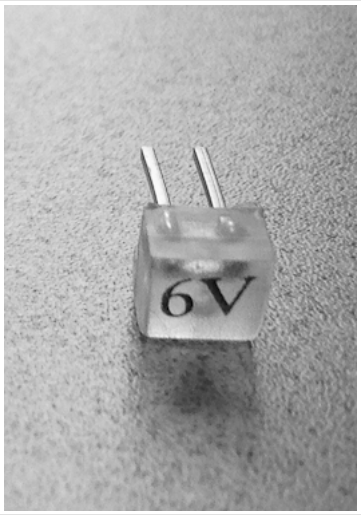
⚠ This page is incomplete. Use it at your own risk. Missing information will soon be added. Please accept that we do not yet give support beyond what is written here as this software and the new test board have not yet been released. yet.

Set up of the DTB

Power supply

The DTB requires 6V/3A. It comes with a power supply similar to one for a laptop. You will need to configure it properly:

- Take the little resistor insert marked with "6V" from the small bag, see picture ❶
- Insert it into the slot, see picture ❷
  (Do not miss the fun to read the German translation of "Output: select by a changeable slot" on the label)
- Exchange the connector for the DTB. It is the one with the largest diameter in the bag
- Make sure you put it on correctly polarised. Center pin needs to be +, sleeve –. The plug is labeled on one side with "CEN". Make sure it points to +, see picture ❸
- If you need to exchange the power cord, you will require one having a C7 connector.
  ⚠ For safety reasons, do not use an adaptor in case the plug doesn't fit to the sockets used in your country. The required cable is easy to get with your local plug and costs just a few bucks.



❶

❷

❸

Simple operations test

Connect the DTB to power. The LED marked with "PWR" shold come up and the four LED's labeled 1 through 4 show a moving pattern. If this works, the DTB should be operational.

Watch this youtube-movie in case you don't know what to look for.

Test your setup:

- Make sure you have the latest version of the psi46test software. See Psi46test for details on how to obtain and install the software.
- Connect your DTB to the computer using USB
- Power up the DTB
- Invoke the software with `bin/psi46test test.log`
- Some information about your DTB should appear (see example output below)
- Issue the command `welcome`. The LED 1-4 should show their moving pattern.

Sample output (actual values will differ on your setup):

```
Frank-Meiers-MacBook-Pro:testboard/psi46test> bin/psi46test testDTB12.log
PSI46V2 ROC/Wafer Tester V1.3 (07.08.2013)

DTB DTB_WRECOM opened
--- DTB info--------------------------------------
Board id:    26
HW version:  DTB1.2
FW version:  1.1
SW version:  1.7
USB id:      DTB_WRECOM
MAC address: 40D85511801A
Hostname:    pixelDTB026
Comment:
------------------------------------------------

+-- control commands -------------------------------------------+
| h                  display this text                          |
| exit               exit commander                             |
+-- chip test --------------------------------------------------+
| test <chip id>     run chip test                              |
+---------------------------------------------------------------+
```

Common failure modes

- **Communication seems to work but version/ID-information listed is empty or incomplete**
  This can be caused by the µSD-card no longer sitting in its correct place, especially after shipping. Open the DTB (unscrew the four screws on the side with the 68-pin connector, extract the PCB out by gently pulling on the plate you just released from the screws) and re-insert the µSD-card into its reader. Close the board and test if it works now.

More documentation: manual, tutorial, schematic etc.

There is a lot more information available:

- **Manual:** A draft version of the evolving manual is available here DTBmanual.pdf. This document is still INCOMPLETE and is only meant to show you what we are working at.
- **Testing:** You can consult the test manual. This documents all the tests performed before the DTB was shipped to you. It includes instructions to calibrate voltages, test basic I/O etc.
- **Schematic:** A schematic of the DTB can be found here: DTB_Mainboard.pdf

- **List and test results:** A list of DTB and their test results is available in this spreadsheet.
- **US inventory:** For US institutes: A list of DTB in the US and status of delivery is available here.
- **Impedance matching:** If you intend to make your own adapter cards, take a look at Module_Adapter_ImpedanceMatching.pdf. This document describes a simple circuit for doing the impedance matching of the module signals (using a micro twisted pair cable of 50 Ω impedance) to the 68-pin ribbon cable (with 115 Ω impedance). The adapter cards make use of this circuit (where needed). For other cases adjust the resistors accordingly. Signal loss may be compensated by adjusting the settings of the level translator chip (inside the DTB) via software.

Firmware upgrade

This can be done using `psi46test` and a working USB connection to your DTB:

- First check your current firmware version. This is the number listed in the item `SW version: X.Y` when you start `psi46test`
- Download the latest firmware version from the list below. Save it to a convenient place (i.e. your `psi46test` directory)
- Start `psi46test` and issue `upgrade [pathToFirmwareFile]`. This will take up to 30 seconds. Progress is printed to the console.
  ⚠ Do not interrupt the DTB power during this operation. Do also not create any unneccessary load on your computer. Unsuccessful upgrades usually lead to an inoperable DTB
- Power-cycle the DTB. Exit `psi46test` and re-invoke it. You should now see the result manifest as a `SW version` number matching your file chosen.

Notes:

- A firmware upgrade via USB using `psi46test` requires a working firmware on the DTB. If this is not the case you will need to install the firmwre using JTAG.
- Failed firmware upgrades usually manifest theselves as that you can no longer talk to the board (i.e. the DTB info section when you invoke `psi46test` is empty, missing or no communication takes place). You will need to use the JTAG approach instead
- In case you need to do an upgrade via JTAG, you will need to open the DTB (JTAG interface is inside the DTB) and will need a USB blaster. Get in touch with us for help.

Available firmware versions

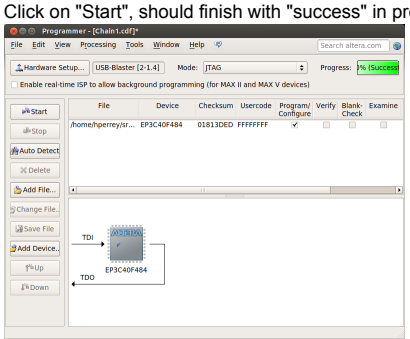
This is a list of available firmware version. Older, incompatible versions have been removed from this list.

Version	Release date	Download link	Comment
1.6	02-AUG-2013	dtb_v0106.flash	
1.7	05-AUG-2013	dtb_v0107.flash	
1.8	21-NOV-2013	dtb_v0108a.flash	beta w/DESER400)
1.8	03-DEC-2013	dtb_v0108b.flash	beta w/DESER400)
1.11	25-NOV-2013	dtb_v0111.flash	single ROC with single pixel operations on TB
1.13	06-DEC-2013	dtb_v0113a.flash	Merged FW with single pixel operations, ethernet, and DESER400
'1.9'	06-JAN-2014	dtb_v01122.flash	Merged FW for single ROC testing, TBM and module programming, but no module readout (and no tests)
1.14	15-JAN-2014	dtb_v1.14.flash	Take this for pxar
1.19	06-FEB-2014	dtb_v1.19.flash	Take this for pyXar

more recent versions are at https://github.com/psi46/pixel-dtb-firmware/tree/master/FLASH

How to recover from a failed firmware upgrade

If the DTB does not respond correctly anymore after a firmware upgrade, you can reflash the board directly e.g. via an Altera USB-Blaster download cable.

1. Checkout the pixel firmware repository: https://github.com/psi46/pixel-dtb-firmware
2. Download and install the "WebEdition" of Quartus from www.altera.com (https://www.altera.com/download/sw/dnl-sw-index.jsp)
   (Worked with 13.1.1.166 on Ubuntu 12.10 for me)
3. Download a firmware bitfile from this TWiki page.
4. Connect the USB-Blaster to the PC and the DTB, power up the DTB
5. Start Quartus (e.g. `[path to altera installation]/quartus/bin/quartus`)
6. Select "Tools->Programmer"
7. Click on "Hardware Setup", select the USBBlaster
8. Click on "Add File", select appropriate SRAM Object File `[path to pixel-dtb-firmware repository]/dtb/dtb.sof`
9. Click on "Start", should finish with "success" in progress bar as shown in the screen shot below:
   

10. Now flash the firmware file by running the following commands in the Altera base directory (e.g. `~/altera/13.1`):
    ./nios2eds/nios2_command_shell.sh
    nios2-flash-programmer --base=0x8000000 --epcs --accept-bad-sysid [flash file] --program
    (where `[flash file]` corresponds to the bitfile downloaded from this page)
11. Power cycle the DTB -> the LEDs should show their typical startup pattern!

Adapter cards

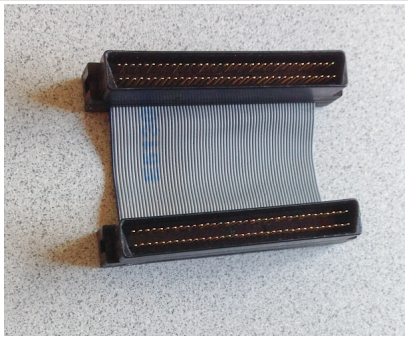
⚠ **SAFETY RECOMMENDATION**

Early April we received a note of a burnt SCSI cable used to connect a single ROC adapter to a DTB. While we still need to understand to root cause (a short on the board, inside the cable) we ask users to follow the following recommendation to prevent fire hazard:

- Operate any adapter card in a way that no shorts can be made between solder pins and leads of the SCSI connector on the board
- Check SCSI cables for shorts between the lines, especially between line 47 (3.3 V power) and neighbours

A description of the pin-out and a wiring scheme for connecting adapter cards to the DTB can be found in this excerpt from the draft manual: wiringSchemeDTB.pdf. More information is in the draft.

68-pin ribbon cable



The adapter cards make use of standard 68-pin SCSI ribbon cables. **Do not use corded cables** as the benefits of the clever wiring scheme in use will vanish and you may suffer from inferior signal quality.

Standard SCSI cables can be used, and may be obtained by your local IT supplier. Or they can be made yourself, see the information below.

A cable should meet the following specifications:

- Lenght up to 1 m. We have reports that cables up to 4 m will work, but at your own risk (needless to say: timing adjustments will be needed)
- Impedance should be 115 Ω ± 20 Ω (determined for balanced signal)
- 68 conductors with a spacing of 0.025 in (0.635 mm)
- D-Subminiature connectors with 68 pins, for use with the ribbon cable.
- The picture shows how the connectors should be attached (rule: pin 1 of both connectors need to be on the same wire).
- Test that all connections work using a meter. Badly manufactured cables can result in hard-to-debug behaviour, so better spend that time.

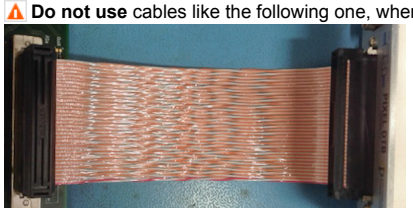
Sources for these parts are:

Part	Digi-Key	Mouser
3M 3754/68 type cable	MB68G-5-ND or MB68G-300-ND	517-3754/68-100
Connectors	A31805-ND	571-5786090-7

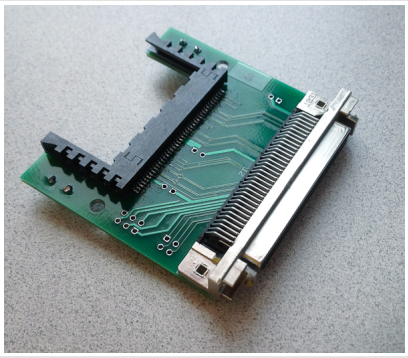
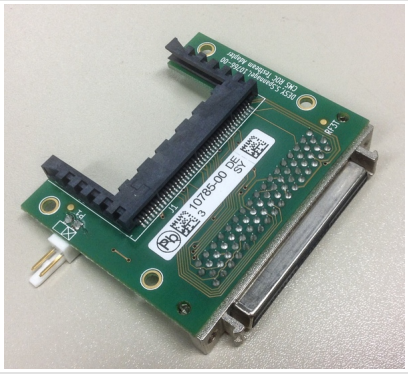
Please: Add sources in your country to help others

- 3M 3754 type spec sheet

Do not use cables like the following one, where the wires are twisted:



Single ROC adapter card

	This card has been designed by PSI and the production is carried out by UNL. It can be used to attach a single ROC on a carrier board to the DTB. You can even provide bias voltage and switch it via software using the DTB, if your ROC has a sensor. The schematic of this card can be found here: 121400C_Schema.pdf ℹ️ Out of stock, no new production foreseen so far. A list of the adapter cards manufactured at UNL so far can be found here: DTBsingleROCadaptersDB.tab.
	This card has been designed by DESY. It is a more compact rendering to fit better into test beam setups. For this, the testpoints had to be abandonned. The board features a connector for a Pt10000 themperature sensor, which is wired up in the same way like on the FPix module adapter. Readout is integrated to firmware and pXar. Contact person: Simon Spannagel

The test procedure for the adapters manufactured at UNL was:

- Hook up the card to a DTB
- Insert a carrier board having a ROC with a bump-bonded sensor
- Invoke psi46test
- Invoke the chip test *without* bias voltage on. Should run through, some pixels on the pixel map may be bad (due to lack of bias voltage)
- Turn on bias voltage (90 V), redo the test. Should run through and the pixel map looks good

~~*To place an order:*~~

- ~~One card costs USD 50 (includes material and labor)~~
- ~~Actual shipping cost will be added. To give you an estimate: FedEx economy to Europe for 5 adapters costs roughly USD 40. Cheaper and more costly options upon request.~~
- ~~You will be invoiced. Amount payable in USD to a US bank.~~
- ~~Orders should be placed with frank.meier@unlSPAMNOT.edu, subject line "Single ROC adapter order"~~
- ~~Please give us a) a delivery address, b) name and phone number of a person in charge of the order, c) email address for tracking information, d) billing information (if address differs from delivery address)~~
- ~~Status of all orders are maintained here: https://github.com/frmeier/DTBsingleROCadapters/blob/master/DTBsingleROCadaptersDB.tab~~

~~For easier shipping in Europe: A limited number is on stock with PSI, call Beat Meier.~~

~~Shipping information:~~

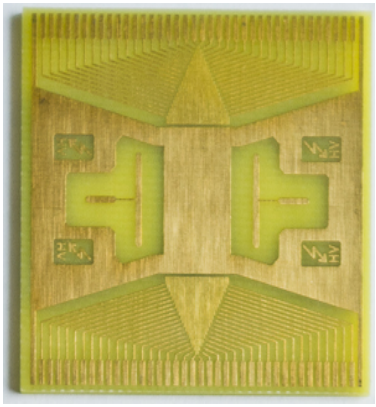
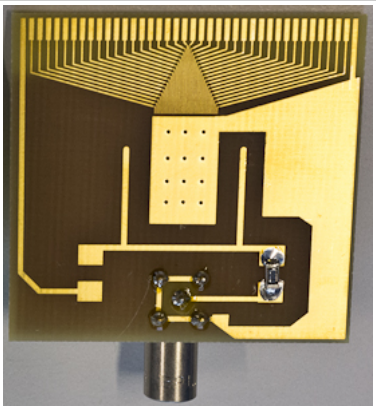
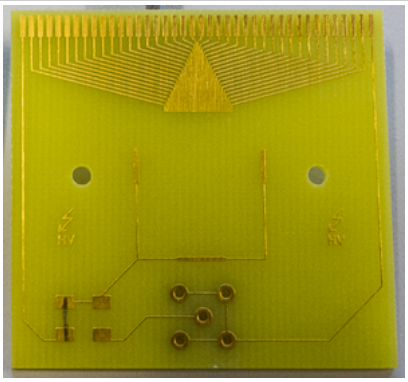
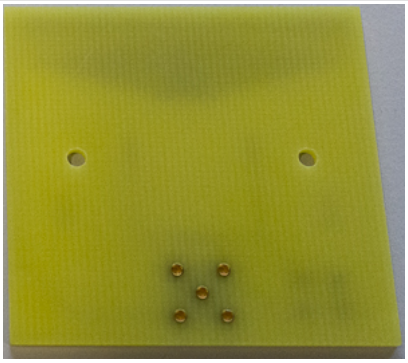
- ~~One unit weights about 31 g (=1.1 oz), which includes bubble wrap used for packaging.~~
- ~~Dimensions 64 × 64 × 15 mm^3 (unwrapped, measured at thickest point), wrapped approx. 70 × 70 × 20 mm^3~~

Carrier boards

To operate a single ROC, a carrier board is needed. Different designs have been used in the past. All designs below can have the HV supplied by the DTB. Some designs allow an optional LEMO connector on the board for separate HV supply.

Common specs:

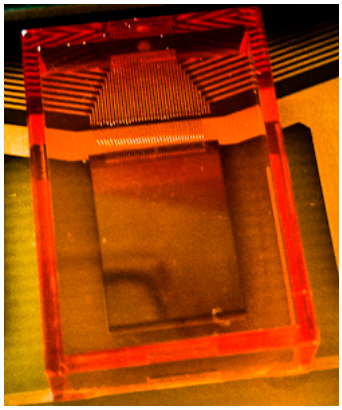
- Dimensions 41.75 x 39.9 x 1.6 mm^3. The 41.75 mm edge should not be changed as this is where the contacts to the edge connector are.
- Glasepoxy FR-4
- Traces plated with Ni/Au (to make them wire-bondable)
- Pitch for wirebonds is 200 µm, thickness of traces for wirebonding: 100 µm

	Carrier 1	Carrier 2	Carrier 3	Carrier 4
front				
back				
Use case	General testing, single ROC with or without sensor bump bonded	Has metal on both sides for better cooling.	Reduced amount of metal, especially no metal under the ROC area. Suitable for irradiation studies to reduce activation.	
Comment		Shown with LEMO connector, but can be used without it and HV provided by DTB		Board similar to typ
Gerber files			carrier3_GERBER.zip	

The pinout of these cards follows the single ROC adapter card, link to schematic given above. The idea is here (assuming the pins on the card on top):

- Leftmost pin: HV
- Rightmost pin: HV GND
- Other pins match the ROC pads. The three last pins remain unused.
- Some cards have HV and HV GND connected by default. This is ok for testing ROC without sensor. With scratching away the connection at the appropriate spot the HV can be separated from HV GND and the board is ready for accepting ROC with sensors.
- Recall: The DTB has a 100 kΩ resistor to limit the HV current.
- Wirebond schema for single ROC carriers: wirebondSchemaSingleROC.pdf and CarrierBoardPinout.pdf

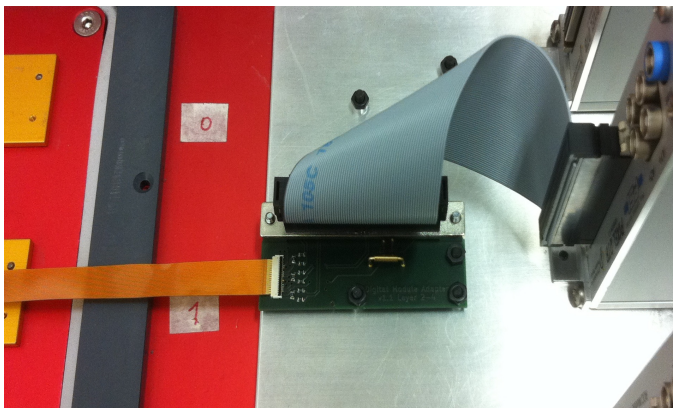
The following picture shows a single ROC adapter and the wirebonds:



Module adapter cards

BPix adapter card

A prototype card exists at ETH/PSI. It has a similar design as the FPix one, see below.



FPix adapter card

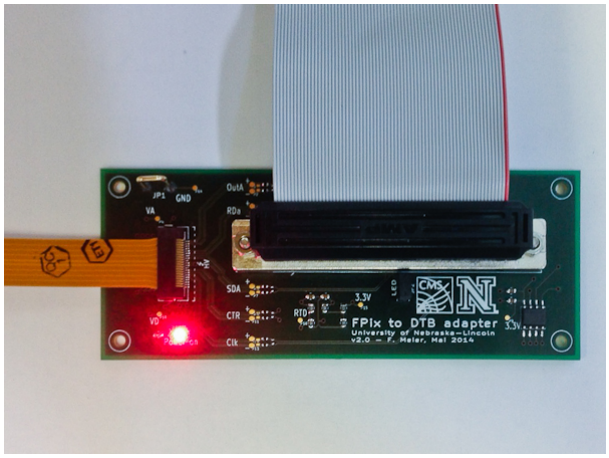
A prototype card has been designed at UNL.

All available documentation for this board can be found in DocDB (docid 12208)

Board version	no. manufactured	Notes	Documentation	Gerber files	KiCAD sources
v1.0	2	Requires a kludge on the connector to work. Do not use.			
v1.1	4	Compatible with first version of FPix HDI, provides additional clock signals to DTB	adapterFpix2DTB.pdf v1	FPix2DTB2013-11-16-21h05.tar.bz2	github tag v1.1
v2.0	2	New version currently under development. **Incompatible to v1.1.**	adapterFpix2DTB-V1.0.pdf		

v2.0 is foreseen to become the production version of this board.

v2.0

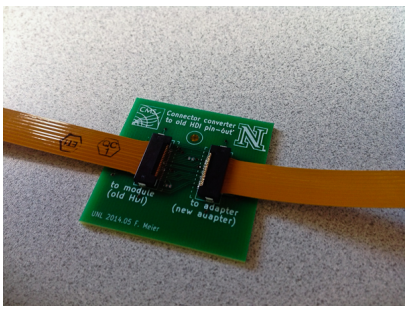


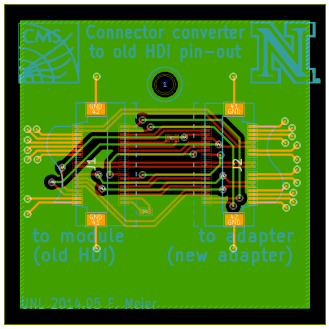
This is the adapter compatible with the *new* version of the HDI. Note: You will need a converter to operate modules with old HDI. ⚠ NOTE: This adapter is not compatible to the old HDI. Use of it may cause damage to modules and/or DTB as it shorts power and signal lines to ground.

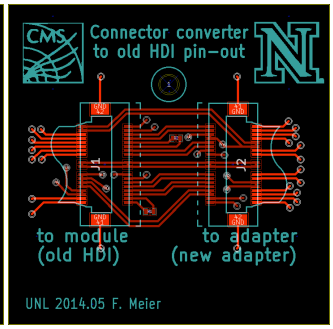
- Adjust impedance matching of signals from module to DTB to reduce attenuation
- Drop signal networks for `RClk` and `160MHz_Out` (not needed or no longer existing)
- Reshuffle signals to match them to the new HDI.
- Add LED to signal power state
- Add a fuse for 3.3 V network
- Swap inner two layer (minor change)
- Smaller form factor: 40 × 100 mm^2

Status: Prototype boards received. One copy with Fermilab for testing. Bulk order will be placed after tests give green light. Order expected to be placed early June, deliveries will start second half of June.

To overcome the incompatibility with the old HDI, a simple little adapter card has been designed:







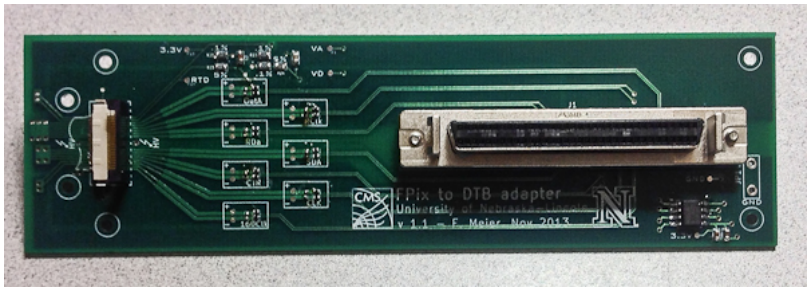
In addition to these images a schematic (CableAdapter.pdf) and a zip file with Gerber files (CableAdapter.zip) is available.

Specifications:

- 2 layer board
- has two SMK connectors on it
- size 40 × 40 cm^2
- has a hole for a 2M screw for convenience
- The unused signals from the old HDI (TBM07...TBM08) can be terminated with resistors.
- Signals were routed as short as possible. But don't expect wonders about the signal quality. This card just connects two flex cables together and does not enhance the signal quality.

An order of 10 PCB has been received. They will be assembled upon need with a initial round of 5 cards. NOTE: With the advent of the new HDI, this adapter will soon be obsolete. In order to save connectors, think twice if you really need one.

v1.1



⚠ **NOTE: This adapter is not compatible to the new HDI.** Use of it may cause damage to modules and/or DTB as it shorts power and signal lines to ground. The converter card described above does not work for this card. You will need a new adapter for use with new HDI.

A prototype card has been designed at UNL (labeled as version v1.1) and 4 of them were manufactured. It is specific to FPix and has the following features:

- Uses the FPix connector, for use with the flex cable.
- Does the impedance matching between the flex cable (60 Ω) and the SCSI cable to the DTB (115 Ω).
- Can be used with an HDI having a TBM07a or TBM08. The signals `RCl` and `160 MHz` (TBM07a only) are routed to `SDATA3` and `SDATA4`.
- The RTD can be read out by the ADC using channels `AIN0` and `AIN1` for the RTD and the reference voltage, respectively.
- Has a 2 kbit EEPROM memory connected to the I^2C bus, to be used for identifying it as an FPix adapter. This is optional, can stay without it.

⚠ Do not power the adapter card without a module attached to the connector. Without a flex cable inserted, the connector shorts the signals with the power pins and the connector gets hot. If for any reason you want to operate an adapter board without a module, insert a flex cable as a minimum.

This adapter now features a form factor suitable for mounting on a PSI cold box. This version v1.1 should act as an intermediate solution until a final decision on the adapter cards will be made. The specifications are in this file: adapterFpix2DTB.pdf and the Gerber files are in this tarball: FPix2DTB2013-11-16-21h05.tar.bz2.

How to solder the SMK connector to the board by hand:

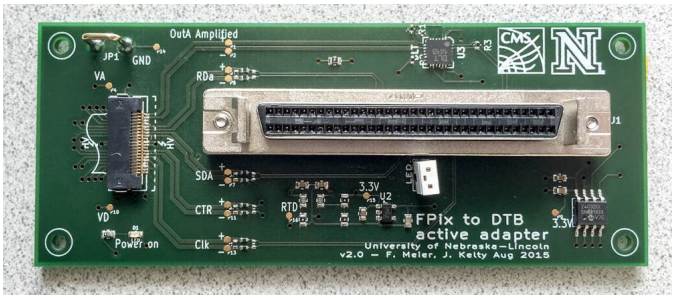
- You need: a fine tipped soldering iron, a loupe or a microscope, solder, flux, a Ohm meter, a board, and a connector.
- Reminder: Flux is your friend. We at Nebraska made good experience with flux that comes on pens.
- Apply flux to all pads on the board.
- Put solder on every pad, not to much but sufficient to make contact with the pad later on. You will not apply more solder later on, so make sure it is sufficient (a little 'hill' covering the pad is good).
- EXCEPTION: No flux to the pads neighbouring the HV, i.e. the ones that are not connected to anything on the board.
- Apply flux to all the little pins of the connector, on both sides (top and bottom).
- Place the connector.
- Solder it on, pin by pin. Just place the tip of your soldering iron on top of a pin and press it down softly. After removing the tip, the pin should stay down (indicates the solder reflowed).
- Add some solder to the large two GND pins.
- Check all connections with the Ohm meter. You can access the pads on the connector with a fine tip. All signals are available on the board as spy pads. The values you should see are:
  - ~ 0 Ω for every signal between pin of connector and corresponding spy pad on the board
  - ~ 91 Ω for differential pairs, probed at the + and - pads on the board and at the pins of the connector
  - ∞ Ω for signals not connected
  - > 10 kΩ between RTD and 3.3V
  - Power can be tested between the spy pads (VA, VD) and the GND-loop (some boards have a problem with the GND spy pad, don't use it). Check that resistance is ∞ between GND, VA and VD on the spy pads. Check all combinations. The power connections are (left side of connector, from top to bottom as viewed as in the picture): 2×—VA, 6×—GND, empty, 2×—HV, empty, 4×—VD, 2×—VA, 2×—GND.

Impedance matching

The signal attenuation induced by the passive impedance matching grid is too large for some read-back channels. In order to correct this, do the following in the `OutA` circuit:

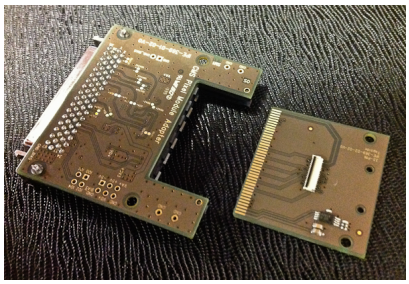
- Replace the both 39 Ω with 0 Ω (if not at hand, a blob of solder will do).
- Replace the 91 Ω resistor with 120 Ω.
- This adjustment guarantees no reflections created but works in one direction only. The old setup would work in both directions, but is not needed.
- This modification was tested successfully and presented at the FPix upgrade meeting of Jan 22, 2014

Active adapter



This is a version of the v1.x board that comes with a DLT chip in the SDATA signal line. Impedance is matched to 30 Ω, suitable for the aluminium flex cable. The design is based on the similar card of the BPix group. KiCAD files are available in this repository on GitHub.

Universal BPix adapter card



Such a card is currently under design at KIT. For more information have a look at these slides presented at the Catania workshop on Sep 30, 2013.

Current status of this card (as of May 2014): FPix decided to use their own design (see above) and the universal adapter card will therefore only support (all kinds of) BPix modules. The electrical design of the card was verified already in January 2014 at DESY (see slides). The mechanical redesign which is needed to be compatible with the existing ETH cooling boxes was finished in April 2014 and three prototypes were delivered in May 2014.

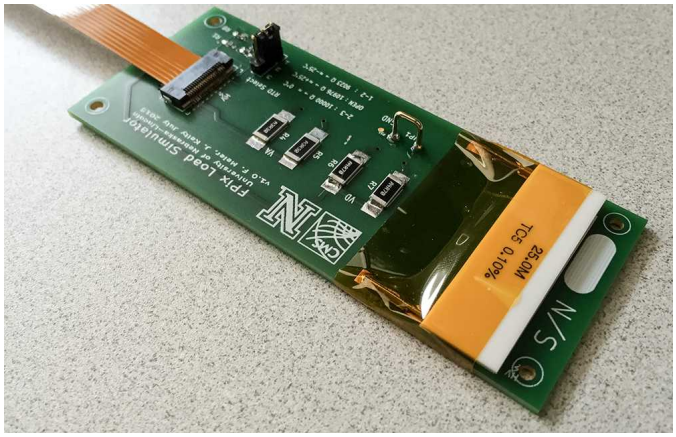
After successful testing the production of a preseries will start. There will be enough preseries adapters to supply every BPix production center with at least one adapter and multiple inserts (to ensure availability for preseries module production and testing). Mass production will start after the evaluation of the preseries production.

Preliminary order numbers were collected in April 2014. They will be used to calculate the final offer. Currently it is planned to only have one single production run for both adapters and inserts. Contact person at KIT: stefan.heindl@kitSPAMNOT.edu

The proposed solution consists of

- **Adapter card:** The card has the following features:
  - Connection to the DTB via 68 pin SCSI connector.
  - Uses double-sided Samtec connector (with coding notch) for the insert. This makes a mix-up with single chip adapters impossible.
  - All impedance matching could be done on this card (pads exist). Currently no impedance matching is foreseen due to test results reported by ETH in January 2014.
  - Multiplexer chip to handle data from BPix layer 1 modules with two TBMs.
- **Inserts:** Handles the abstraction of different Molex cable connectors.
  - Reasonably cheap design (target: few Euros each). Intended to stay with the module during whole manufacturing and testing lifecycle, therefore provides connector saver features.
  - 2 kbit EEPROM memory chip to store ID/serial number of module connected, type of insert and module.
  - Comes in flavours for BPix layer 1 (with 39-pin Molex connector) and BPix layer 2–4 (with 33-pin Molex connector).

FPix DTB tester board



The FPix project designed a small board that connects like a regular module to a DTB plus adapter board and allows to quickly test the current measurements done inside the DTB. It is intended for quality control use at test centers.

The board is resonably simple. It had four circuits:

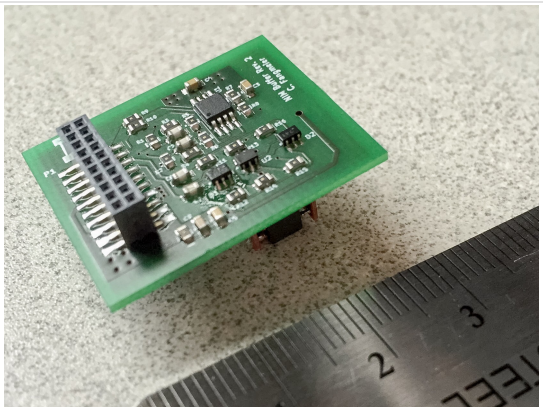
- VA: Two high-power resistors to provide a ohmic load
- VD: Same as for VA
- HV: One high-precision (0.10%) high-voltage resistor
- RTD: A net of three precision resistors. Using a jumper, resitances can be selected mimicking –25°C, 0°C, and +25°C using a jumper

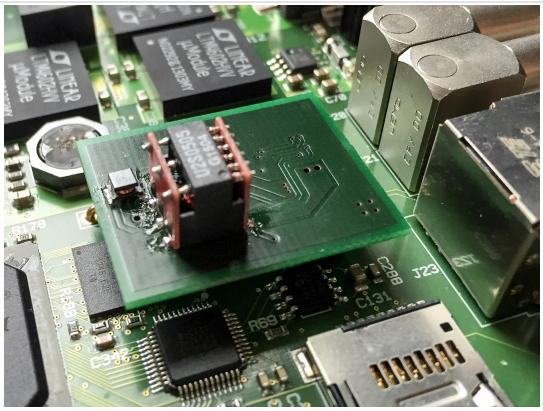
The board designs can be found in this github repository. A PDF of the schematic can be found here: FPixDTBtestload.pdf

Digital signal levels: TTL and NIM

In a standard configuration, the digitial inputs (CLK, TRG) and outputs (D1, D2) understand TTL levels. This is defined by a small mezzanine board inside the DTB. The manufacturing standard comes with a simple buffer board that supports TTL.

The fact that this is handled by a mezzanine board allows to support other signal standards. Board for NIM has been designed at UNL and is shown in the following pictures:





This Rev2 board has superb signal performance on the inputs and provides a reasonable quality on the output. A possible future revision may improve on that. KiCAD schematics and layouts can be found here.

The board is currently on short supply and made to order at a cost of around $60. Allow a few weeks for processing.

Questions & Answers

- **Does the DTB support the old analog chip?**
  Yes.
- **Can I talk to modules?**
  Yes.
- **Can I use the DTB in a test beam setup?**
  Yes, you can. But be aware of some current limitations: First, make sure you have a DTB equiped with a CMOS buffer PCB, see chapter 9 of this document if you are unsure. TBM emulation and external triggers are available in the firmware
- **I have version X.Y of the test board. Do I need a specific one?**
  No. DTB V1.1 is the prototype series and fully compatible to the final series, DTB V1.2. You can distinguish them by the front plate and internally: V1.1 has some red wires on the board to fix under-dimensioned power lines, fixed in V1.2. `psi46test` tells you at startup what version of the board you have, listed after `HW version`.
- **How can I check the firmware version installed on my DTB?**
  The simplest way is to use `psi46test`. When it starts up it tells you the version. A firmware flash file contains the images for both FW and SW of the firmware. The meanings of the three version numbers are:
  - `HW version` The *real* hardware version of the PCB. Currently V1.1 (prototype) and V1.2 (final production series). Will likely never change for your board.
  - `FW version` The hardware description part in the FPGA. May change for a major revision of the firmware.
  - `SW version` The software running on the NIOS processor, written in C++. This number changes more often. It contains all the routines used to communicate to and read-back from the DTB.
- **Where do I get support?**
  First: Before you get in touch with us, check all available information on this page and make sure your problem isn't already solved or covered. Make sure you have the latest recommended firmware version and you use a matching software on your computer. If your problem is related to software, go to their TWiki pages or read their README files. If nothing helps, get in touch with us. Contact information is given at the bottom of this page. Please give us the following information:
  - Id of the board
  - Firmware version in use
  - Software you are using (`psi46test` or `pxAr`) and version. Mention any local modifications to what is in the official repositories. **Note:** `psi46expert` is no longer supported.
  - Description of your problem. Give a *minimal working example* that reproduces your problem. Add any relevant output (console, logfiles etc.).
  - Describe any attempts you did to solve the problem on your own.
- **I have to import/export DTB. What is the *harmonized customs code* for the DTB?**
  The *harmonized customs code* for the DTB is 9030.8200 (http://hts.usitc.gov/) and is valid for most countries.
  The wight per unit is 350 g and the dimensions are 3.4 × 10.3 × 13 cm^3.

Contact

Questions regarding this TWiki page direct to frank.meier@unlSPAMNOT.edu.

Responsible: FrankMeier
-- FrankMeier - 21-Jul-2014

I	Attachment	History	Action	Size	Date	Who	Comment
	0506-c54b-1a5b-1faea.jpg	r1	manage	85.6 K	2015-09-16 - 20:45	FrankMeier	FPix active adapter board
	121400C_Schema.pdf	r1	manage	97.7 K	2013-08-24 - 00:19	FrankMeier	Schematic of the

							single ROC adapter card
	13_08_28_DTBtesting.pdf	r1	manage	799.5 K	2013-09-02 - 09:28	JanHoss	DTB testing (Tracker week presentation)
	31e0-1bd3-3c0a-3dfc.jpg	r1	manage	523.7 K	2015-07-06 - 20:30	FrankMeier	TTL-NIM level translator board
	CableAdapter.pdf	r1	manage	42.7 K	2014-05-07 - 23:05	FrankMeier	Cable adapter to use old HDI with new v2.0 adapter card
	CableAdapter.zip	r1	manage	14.5 K	2014-05-07 - 23:05	FrankMeier	Cable adapter to use old HDI with new v2.0 adapter card
	CarrierBoardPinout.pdf	r1	manage	35.9 K	2013-10-26 - 01:13	FrankMeier	Pinout and wirebond instructions for single ROC mounted on carrier board
	DTB-Testing-Spreadsheet-2013-09-02.xlsm	r1	manage	46.1 K	2013-09-02 - 09:26	JanHoss	DTB test results
	DTB_Mainboard.pdf	r1	manage	1436.4 K	2013-09-26 - 17:52	FrankMeier	Schematic of the DTB
	DTB_Testing.pdf	r2 r1	manage	5675.7 K	2013-08-30 - 12:04	JanHoss	Howto DTB testing by J. Hoss with input of S. Spannagel
	DTB_Testing.tar.gz	r1	manage	10908.2 K	2013-08-30 - 12:06	JanHoss	DTB_Testing Howto source files
	DTB_front.jpg	r1	manage	164.3 K	2013-08-23 - 20:40	FrankMeier	DTB
	DTBmanual.pdf	r1	manage	1540.1 K	2013-11-06 - 01:59	FrankMeier	Draft manual (preview)
	FPix2DTB2013-11-16-21h05.tar.bz2	r1	manage	570.0 K	2013-11-17 - 16:50	FrankMeier	Gerber files for proposed FPix to DTB adapter
	FPixCableAdapterBoard.png	r1	manage	46.5 K	2014-05-07 - 23:05	FrankMeier	Cable adapter to use old HDI with new v2.0 adapter card
	FPixCableAdapterBoardGNDplane.png	r1	manage	55.8 K	2014-05-07 - 23:05	FrankMeier	Cable adapter to use old HDI with new v2.0 adapter card
	FPixDTBtestload.pdf	r1	manage	41.3 K	2015-09-15 - 23:23	FrankMeier	DTB tester schematic
	Foto-3.jpg	r1	manage	159.6 K	2014-07-21 - 12:46	FrankMeier	Incompatible SCSI cable example
	FotoDTBStecker.jpg	r1	manage	207.7 K	2013-08-23 - 20:41	FrankMeier	Picture to set up the power supply
	FotoDTBpowervoltage.jpg	r1	manage	143.9 K	2013-08-23 - 20:41	FrankMeier	Picture to set up the power supply
	FotoDTBpowervoltage2.jpg	r1	manage	98.4 K	2013-08-23 - 20:41	FrankMeier	Picture to set up the power supply
	FotoDTBsingleROCadapter.jpg	r1	manage	318.2 K	2013-08-24 - 00:12	FrankMeier	Image of a single ROC adapter card
	FotoSCSIcable.jpg	r1	manage	311.6 K	2013-08-24 - 00:41	FrankMeier	Picture of a SCSI ribbon cabel used for adapter cards
	FpixAdapter.jpg	r1	manage	307.8 K	2013-11-05 - 23:04	FrankMeier	
	ModuleAdapter.jpg	r1	manage	329.9 K	2013-10-02 - 09:23	FrankMeier	
	Module_Adapter_ImpedanceMatching.pdf	r1	manage	91.9 K	2013-09-26 - 17:56	FrankMeier	Impedance matching
	Quartus_programmer_finished.png	r1	manage	82.6 K	2014-01-20 - 16:02	HannoPerrey	Quartus Programmer Screenshot after successful completion
	a039-c226-2a71-79e5.jpg	r1	manage	81.8 K	2015-09-15 - 19:08	FrankMeier	FPix DTB tester board
	adapter.jpg	r1	manage	1433.1 K	2014-01-06 - 10:20	PhilippEller	
	adapterFpix2DTB-V1.0.pdf	r1	manage	325.0 K	2014-05-05 - 21:08	FrankMeier	Specification for a FPix to DTB adapter V 1.0, describing version 2.0 of adapter
	adapterFpix2DTB.pdf	r5 r4 r3 r2 r1	manage	292.1 K	2013-11-17 - 16:49	FrankMeier	Specification for a proposed FPix to DTB adapter V 0.0, describing version 1.1 of adapter
	adapterMitLED-2.jpg	r1	manage	218.3 K	2014-05-31 - 14:13	FrankMeier	
	adapter_v11.jpg	r1	manage	150.0 K	2013-12-03 - 01:21	FrankMeier	FPix adapter v1.1

	adapteradapter-2.jpg	r1	manage	276.9 K	2014-05-31 - 14:13	FrankMeier	
	carrier1_front.jpg	r2 r1	manage	109.2 K	2013-10-10 - 19:42	FrankMeier	Carrier plates for single ROC adapter
	carrier2_back.jpg	r2 r1	manage	84.4 K	2013-10-10 - 19:43	FrankMeier	Carrier plates for single ROC adapter
	carrier2_front.jpg	r2 r1	manage	125.2 K	2013-10-10 - 19:43	FrankMeier	Carrier plates for single ROC adapter
	carrier3_GERBER.zip	r1	manage	236.9 K	2013-11-14 - 21:59	FrankMeier	Gerber files for carrier board type 3
	carrier3_back.jpg	r1	manage	79.0 K	2013-10-10 - 15:37	FrankMeier	Carrier plates for single ROC adapter
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	carrier4bot.jpg	r1	manage	83.4 K	2013-10-29 - 18:17	FrankMeier	
	carrier4top.jpg	r1	manage	110.6 K	2013-10-29 - 18:17	FrankMeier	
	d8d7-1f7a-613c-54f6.jpg	r1	manage	684.4 K	2015-07-06 - 20:30	FrankMeier	TTL-NIM level translator board
	dtb_v0106.flash	r1	manage	1818.4 K	2013-08-24 - 14:48	FrankMeier	Firmware flash file
	dtb_v0107.flash	r1	manage	1817.1 K	2013-08-24 - 14:48	FrankMeier	Firmware flash file
	dtb_v0108a.flash	r1	manage	1821.9 K	2013-11-22 - 02:44	RobertStringer	Firmware flash file with DESER400
	dtb_v0108b.flash	r1	manage	1826.5 K	2013-12-04 - 03:03	RobertStringer	Beta w/DESER400
	dtb_v0111.flash	r1	manage	1869.1 K	2013-11-25 - 17:33	NiklasMohr	
	dtb_v01122.flash	r1	manage	1896.6 K	2014-01-16 - 09:05	UrsLangenegger	
	dtb_v0113a.flash	r1	manage	1865.9 K	2013-12-06 - 23:26	RobertStringer	DTB Firmware with PixelThreshold, Ethernet, and DESER400
	dtb_v1.14.flash	r1	manage	2066.4 K	2014-01-16 - 13:13	UrsLangenegger	
	dtb_v1.19.flash	r1	manage	2080.7 K	2014-02-06 - 14:15	PhilippEller	Firmware version 1.19
	singleRocAdapterDESYk.jpg	r1	manage	157.8 K	2015-01-24 - 12:29	FrankMeier	DESY single ROC adapter
	wirebondSchemaSingleROC.pdf	r1	manage	93.7 K	2013-11-14 - 22:13	FrankMeier	Wirebond schema for single ROC carriers
	wirebondSingleROC.jpg	r1	manage	146.6 K	2013-10-10 - 20:03	FrankMeier	Wirebonds on single ROC adapter
	wiringSchemeDTB.pdf	r1	manage	36.9 K	2013-08-24 - 00:52	FrankMeier	Wiring scheme of DTB (excerpt from the manual draft)

Topic revision: r71 - 2015-10-10 - SimonSpannagel