

Table of Contents

JRichTBTrigger.....	1
Software Installation.....	1
Hardware.....	1
Firmware.....	1
Chimaera2 PL1 2x5 pin header.....	1
LEMO connectors.....	1
PDMDB.....	2
Counters.....	2
Trigger and DB selection.....	2
Variable pulser frequency.....	2
Deadtime control.....	3
Registers.....	3
New timing trigger TB2018.....	3

JRichTBTrigger

This program is used to set up the DAQ trigger sources. It can be run standalone but it should normally be started from JRichEcControl.

Software Installation

The trigger GUI is part of the RICHECKIT package. Check the RichEcKit topic for installation details.

Using the `Main->Devices...` menu, select the ID of the connected trigger device (it is usually on a label on the underside of the board). Restart the GUI.

Hardware

The hardware consists of a Chimaera2 FPGA board, Tengja breakout/adaptor board and scintillator plug-in. The photograph shows the boards assembled in the 2017 beam test configuration which exposes the Tengja J6 connector.

The trigger board functions also as a 4-channel coincidence unit when coupled with the Tengja board and scintillator plugin module as shown. See the JCosmixerDepp topic for details. Any of the six programmable coincidences may be selected as the DAQ trigger source in the JRichTBTrigger main panel.

Firmware

The latest firmware can be downloaded [here](#).

Chimaera2 PL1 2x5 pin header

For 2017 beam tests the pin functions are assigned as follows:

Pin	Signal	Mode	Typical usage
AA8/AB8	TRGOUT+/-	LVDS toggle out	Tracker A/B
Y9/AB9	TRGOUT+/-	LVDS toggle out	Tracker A/B
AA10/AB10	TRGOUT+/-	LVDS pulse out	Telescope or miniDAQ
W12/Y12	TRGIN+/-	LVDS In	External trigger source (called LVDS on GUI)

For 2018 beam tests the pin functions are assigned as follows (miniDAQ synchronous trigger):

Pin	Signal	Mode	Typical usage
AA8/AB8	TRGOUT+/-	LVDS pulse out (delayed)	Telescope or miniDAQ
Y9/AB9	TRGOUT+/-	LVDS pulse out (prompt,synchronous to W12/Y12)	MiniDAQ trigger
AA10/AB10	TRGOUT+/-	LVDS pulse out (delayed)	Telescope or miniDAQ
W12/Y12	ExtClk+/-	LVDS In	External global clock input

LEMO connectors

Pin	Function	Mode
LEMOTOP	LASER/LED	TTL3V3 Out
LEMOBOT	AUXTRG	TTL3V3 500hm In

LEMOTOP may be used as an LVTTTL pulse to trigger an LED or LASER pulser. It is driven synchronously to the trigger outputs but can be independently enabled or disabled from the panel.

PDMDB

For the 2017 beam test configuration, the PDMDB master link I2C can be driven from the Tengja J6 connector as follows:

Pin	Signal	Mode	Typical usage
70	SDA0	I2C InOut	PDMDB0 master link configuration
69	SCL0	I2C Out	PDMDB0 master link configuration
76	SDA1	I2C InOut	PDMDB1 master link configuration
75	SCL1	I2C Out	PDMDB1 master link configuration

Counters

The trigger GUI displays a number of counters:

Counter name	Description
External Tclk	Number of rising edges on external clock input
Gated trigger	Number of triggers for currently selected gated trigger
Ungated beam	Number of ungated beam triggers after input conditioning
Gated beam	Number of gated triggers after input conditioning
Telescope	Number of trigger pulses to telescope
Gated pulser	Number of gated pulser triggers

The counters are automatically reset when the `Start` button is pressed. Additional radio buttons are provided to reset the counters. The values of the counters are stored in the elog for each recorded run.

Trigger and DB selection

Radio buttons allow to select between three trigger sources (`Pulser`, `Beam` or `FEB`) or `None`. The connected DBs should be ticked in the GUI.

DB	TB name	Tengja trigger	Tengja gate
0	JT-AB	J5(3,4)	J5(7,8)
1	JT-CD	J5(5,6)	J5(9,10)
2	ST-AB	J2(3,4)	J2(7,8)
3	ST-CD	J2(5,6)	J2(9,10)
4	SB-CD	J3(3,4)	J3(7,8)
5	SB-AB	J3(5,6)	J3(9,10)
6	JB-CD	J4(3,4)	J4(7,8)
7	JB-AB	J4(5,6)	J4(9,10)
8	Tracker-A		J6(89,90)
9	Tracker-B		J6(83,84)

Variable pulser frequency

The `Pulse delay` textfield can be used to vary the frequency of the pulser. The allowed range is from 10 to 65535. For normal operation the pulser should be set to the order of 100kHz, corresponding to setting 100. At higher frequency (lower delay), the ethernet switch discards packets and the online data processing may experience difficulties keeping up. The delay is set in steps of 100ns in the current version of the firmware.

Deadtime control

For reliable triggering it is essential to set a minimum trigger deadtime to veto triggers until the hardware is ready to respond to the next. This is especially important when several parts of the system are running synchronously (e.g. tracker, RICH and beam scintillators). For example, with the RICH upgrade readout in TAE mode sending 23 time slots, the deadtime can be used to enforce a minimum spacing between triggers of 23 times 25ns (575ns). The deadtime setting in the trigger board is an integer with each step being 100ns so in this case, a setting of at least 6 (i.e. 600ns) should be used, more to be safer. The allowed range is 1-511. The deadtime can also be used to limit the rate to reduce packet loss in the network switch.

Registers

The JRichTBTrigger register map can be viewed [here](#).

New timing trigger TB2018

GUI installed in `richtbuser` account on `lbrichtb`.

Run it with

```
cd ~richtbuser/Public/Java/Trigger2Kit
java -Djava.library.path=. -jar JRichTBTrigger.jar
```

Requires external clock (from miniDAQ/muDAQ) connected to Y12/W12.

Set pulse widths to 10 (100ns). Set deadtime to 5 (500ns) or greater.

Firmware is not loaded permanently into flash. On power cycle, reload the firmware as follows (stop the trigger GUI first):

```
cd ~richtbuser/Public/Java/JAVAKIT
java -Djava.library.path=. -jar XilinxDjtg.jar
```

- Click `OK` to connect to the trigger board.
- Click `Choose file` to select the firmware.
- Click `Load FPGA` to program the FPGA.
- Exit program when done.

Use firmware `richtbtrigger-x4-v3.bin`.

This topic: LHCb > JRichTBTrigger

Topic revision: r15 - 2018-10-24 - StephenWotton



Copyright &© 2008-2019 by the contributing authors. All material on this collaboration platform is the property of the contributing authors.

Ideas, requests, problems regarding TWiki? Send feedback