

Global Trigger Crate Manual

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<http://globaltrigger.hephy.at>

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1 Infrastructure

1.1 Fixed IP Addresses

IP Addresses	Hostnames
193.170.243.142	cmsgalaxy cmsgalaxy.hephy.at
193.170.243.97	gtcrate gtcrate.hephy.at
193.170.243.121	gttest gttest.hephy.at

cmsgalaxy is the project server and local terminal for working in the electronics laboratory.

gtcrate is the VME test PC connected with the Global Trigger crate. It also runs the local XDAQ services.

gttest is the backup VME test PC. It runs the local CMS database accessed via gtcrate.

2 Crate Setup

2.1 Using external Orbit/BC Reset

Required VME Modules

- NIM/ECL Converter (NIM Crate)
- TTCci Module
- LHC Clock Module
- TIM Module

Lemo Cabling

Connection (Cable)	Output	Input
CLK (ECL) for TTCci (6ns)	TTC CLOCK GEN, ECL_2	TTCci, Clock IN/ecl
CLK (ECL) for TIM (8ns)	TTC CLOCK GEN, ECL_1	TIM, CLK I (ECL)
ORBIT (NIM) (8ns)	TTCci, Orbit OUT/nim	NIM/ECL-CONV, NIM IN
ORBIT (ECL) for TIM (8ns)	NIM/ECL-CONV, ECL OUT (inv.)	TIM, ORB I (ECL)

Table 1: Lemo cabling

TIM Setup

- Set Jumper to External Clock [JP8]

Software Setup

See startup instructions on how to setup the modules.

- Configure TTCci Module
 - Set ORBIT_SOURCE to INTERNAL
 - Set CLOCK_SOURCE to TTC QPLLReset=YES QPLLAutoRestart=YES FreqBits=0x0
- Configure TIM Module
 - Set SEL_BCRES to ORB_I

3 Crate Startup

This manual is textbfonly for the Vienna Test Crate. Do this procedure on every Power Up or Power Cycle.

3.1 External Clock/Orbit

Using Startup Script

Use the `crate-restart` script to setup the GT crate for external Clock/Orbit usage.

This will configure the TTCci module to generate the Orbit synchronious to the external clock, setup TIM module for external Orbit and restarts the GT-Cell and GMT-Cell of the Trigger Supervisor (to re-initialize with CAEN controller).

```
$ crate-restart
```

Manual Setup

Configure TTCci Module for external clock usage and interal orbit generation. This can be done by using the web frontend <http://gtcrate:4000/urn:xdaq-application:lid=40/> and/or saving the config locally.

- Set ORBIT_SOURCE to INTERNAL
- Set CLOCK_SOURCE to TTC QPLLReset=YES QPLLAutoRestart=YES FreqBits=0x0

Make sure that ORBIT_SOURCE and CLOCK_SOURCE are setup correctly in the configuration file.

Configure TIM

Configure the TIM module for external Orbit. the SEL_BCRES bits must be set to ORB_I, otherwise the TIM will generate the Orbit/BC Reset internally from the external clock.

Manually using the GUI

Use the `timgui` to setup the BC Reset source manually.

```
$ timgui
```

Go *Test Mode* → *Select BC Reset* → *'ORB I' from front panel*

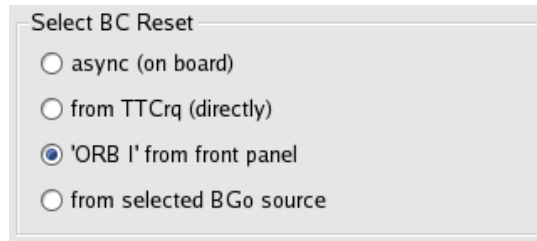


Figure 1: Select BC Reset source in TIM GUI.

Using the Trigger Supervisor

Configure with database key using the Trigger Supervisor.

4 Testing

Test procedures using the Trigger Supervisor.

4.1 Test Cell

Access the GT Test Cell using a web browser opening following URL:

<http://el1cratepc:3838/urn:xdaq-application:lid=13>

Note: `el1cratepc` must be in your `hosts` file or use the current IP address instead.

Function Test

In the GT Test Cell Menu select `Control Panels` → `Test Execution` panel.

- Select Test Category `GT/GMT Function Test`
- Select an given Test Specification, or create a new one in the `Test Creation` panel.
- Hit `Execute test` to run the function test, watch the `Result` output.

Interconnection Test

- Select Test Category `Interconnection Test`
- Select an given Test Specification, or create a new one in the `Test Creation` panel.
- Hit `Execute test` to run the interconnection test, watch the `Result` output.

FINOR Test

This test was never implemented, do not use this TS option.

4.2 TCS Trigger Rates

Testing `RANDOM` and `CALIBRATION` trigger rates on the TCS module. This is a quick and basic selftest often used at CMS to validate TCS functionality.

- Reset and configure modules.
- start random and calibration trigger runs
- monitor trigger rates

Access the GT Test Cell using a web browser opening following URL:

<http://el1cratepc:3228/urn:xdaq-application:lid=13>

Note: `el1cratepc` must be in your `hosts` file or use the current IP address instead.

GT Configuration Panel (Need Help?)

LOCK PANEL

Global Trigger			
State:	CONFIGURED	Physics Declared:	FALSE Set TRUE
GT key:	gt_2010_35_PixDtAutoresync	Current Prescale Index:	0
Level-1 menu key:	L1Menu_CollisionsHeavyIons2010_v2/L1T_Scales_20080926_startup/Imp0/Oxi01d 1 2	Predefined Prescale Set:	Set 0 <input type="button" value="Preview..."/> <input type="button" value="Apply"/> <input type="checkbox"/>
State Control:	<input type="button" value="Reset GT FSM"/> <input type="button" value="Cold-Reset..."/> <input type="button" value="Configure GT..."/>	Custom Prescale Set:	<input type="button" value="Edit & Apply L1 Prescale Set..."/>

GT Partition: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#)

Global Trigger - GT Partition 0			
State:	CONFIGURED	Trigger sources:	<input type="checkbox"/> PHYSICS <input type="checkbox"/> RANDOM <input type="checkbox"/> CALIBRATION <input type="checkbox"/> TEST 3 4
Partition key:	gt_partition_2009_57	Physics trigger setup:	<input type="button" value="Edit & Apply L1 Bit Selection..."/>
Run number:	0	Random trigger setup:	<input type="button" value="Random Trigger Frequency..."/> 5
State control:	<input type="button" value="Reset FSM"/> <input type="button" value="Configure..."/> <input type="button" value="Partition..."/> <input type="button" value="Start"/> 6	BGO signals:	<input type="button" value="Resync"/> <input type="button" value="Hard-Reset"/>

Database	
<input type="button" value="Clear Data Cache"/>	<input type="button" value="Clear Database Structure Cache"/>

Figure 2: GT Configuration Panel overview, (1) reconfigure FPGAs, (2) load settings from DB using a key, (3) producing random triggers, (4) producing test triggers, (5) controll random trigger frequency (use 600Hz), (6) start a run.

Cold-Reset

In the GT-Cell go Control Panels → 2 GT Configuration

This might be optional but a good choice to bring the system back into an stable state. Check the modules to be reconfigured.

Configure

In the GT-Cell go Control Panels → 2 GT Configuration

Load settings from the cms database using a valid configuraton key, for example (feb. 2011) gt_2010_35_PixDtAutoresync

Note: It might be required to unceck Require FW Versions if testing with newer firmware.

Note: In Feb. 2011 the where errors configuring the GTL, so it had to be unchecked for this key.

Monitoring

- Start an new Run with using the Start button.
- Activate the RANDOM triggers.
- In the GT Partitioning panel, check all PTC states to be ready (RDY).
- Now go Control Panels → GT Trigger Monitor and monitor the random trigger rates, it must keep at 600 Hz.

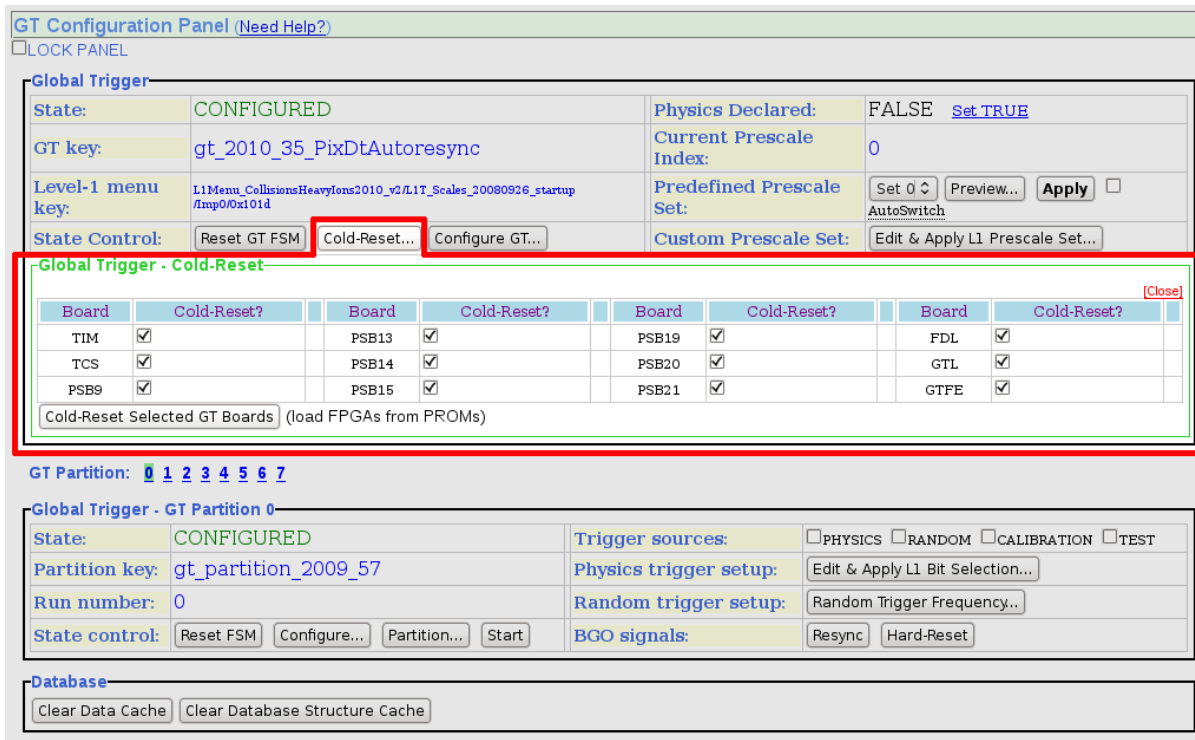


Figure 3: Cold-Reset Modules (load PROM into FPGA, set Cold-Reset flags).

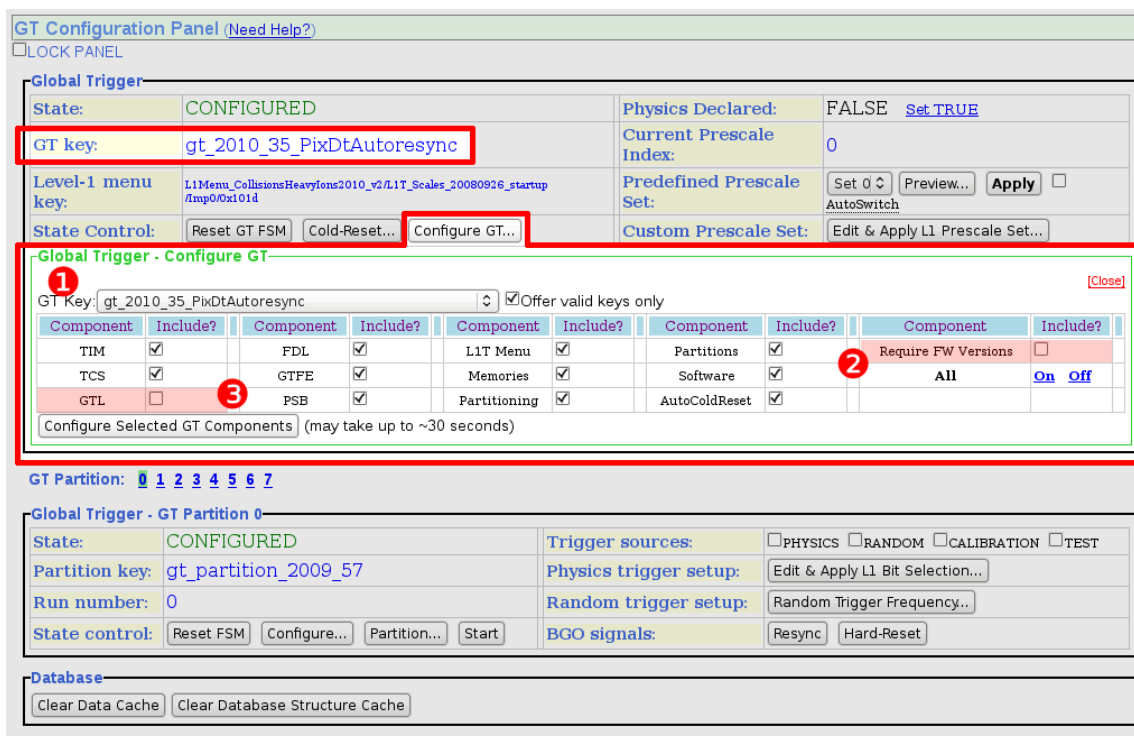


Figure 4: Configure from DB (load settings into FPGAs), (1) select DB key, (2) skip firmware version check, (3) disable GTL configuration due to an error in (occured feb. 2011).

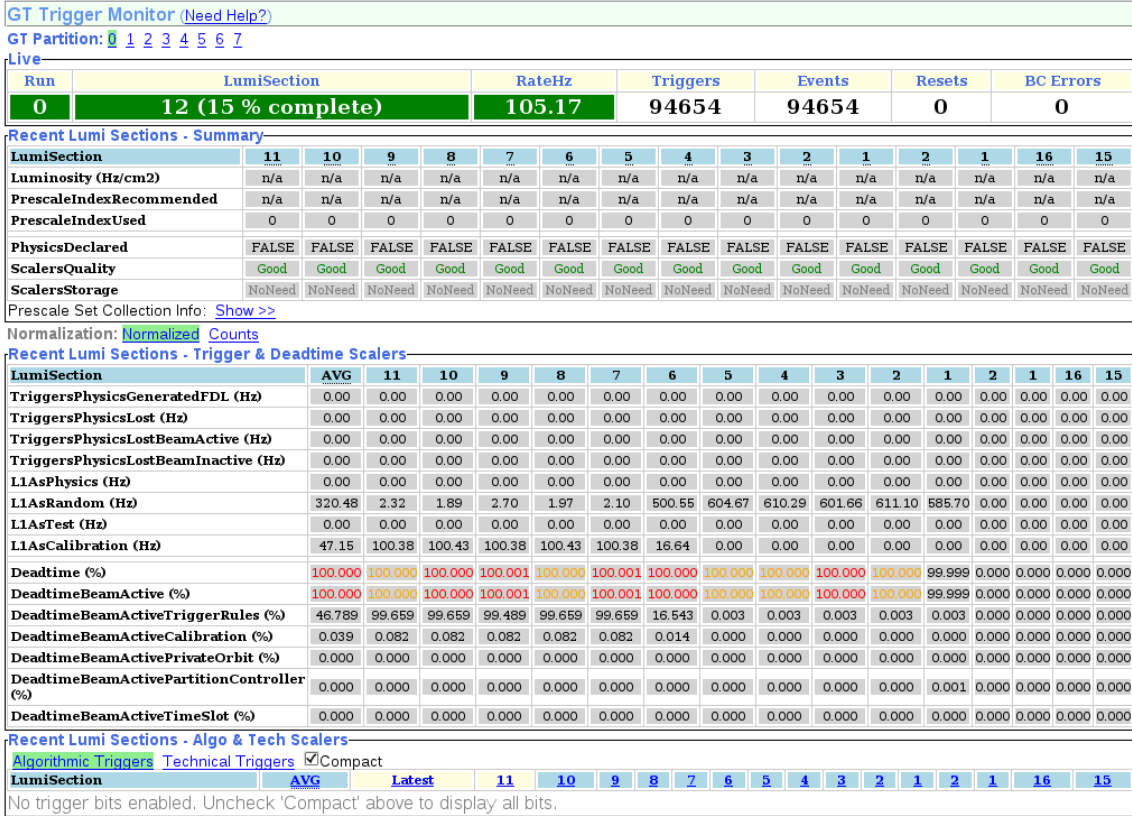


Figure 5: Monitor RANDOM and CALIBRATION trigger rates.

- Second stage is to activate the calibration triggers in the GT Configuration panel.
- In the GT Partitioning panel, check all PTC states to be ready (RDY).
- Back in the GT Trigger Monitor panel, the calibration trigger rate must keep at 100 Hz and the random trigger rate must keep at 600 Hz.

GT TTC Partition Monitor (Need Help?)							
	<input checked="" type="checkbox"/> Auto-Refresh	<input checked="" type="checkbox"/> Compact View	Force READY for None	Force READY for All			
Apply Changes							
FMM Status		PTC:	0	FMM Status			
00	EB+	<input checked="" type="checkbox"/> force	RDY	16	CSC+	<input checked="" type="checkbox"/> force	RDY
01	EB-	<input checked="" type="checkbox"/> force	RDY	17	CSC-	<input checked="" type="checkbox"/> force	RDY
02	EE+	<input checked="" type="checkbox"/> force	RDY	18	DTIF	<input checked="" type="checkbox"/> force	RDY
03	EE-	<input checked="" type="checkbox"/> force	RDY	19	CSCTF	<input checked="" type="checkbox"/> force	RDY
04	RETRI	<input checked="" type="checkbox"/> force	RDY	20	Castor	<input checked="" type="checkbox"/> force	RDY
05	HBHEa	<input checked="" type="checkbox"/> force	RDY	21	TOTEM	<input checked="" type="checkbox"/> force	RDY
06	HBHEb	<input checked="" type="checkbox"/> force	RDY	22	ZDC	<input checked="" type="checkbox"/> force	RDY
07	HBHEc	<input checked="" type="checkbox"/> force	RDY	23	SCAL	<input checked="" type="checkbox"/> force	RDY
08	HF	<input checked="" type="checkbox"/> force	RDY	24	TIBD	<input checked="" type="checkbox"/> force	RDY
09	HO	<input checked="" type="checkbox"/> force	RDY	25	TOB	<input checked="" type="checkbox"/> force	RDY
10	RCT	<input checked="" type="checkbox"/> force	RDY	26	TEC+	<input checked="" type="checkbox"/> force	RDY
11	GCT	<input checked="" type="checkbox"/> force	RDY	27	TEC-	<input checked="" type="checkbox"/> force	RDY
12	RPC	<input checked="" type="checkbox"/> force	RDY	28	BPIX	<input checked="" type="checkbox"/> force	RDY
13	DT0	<input checked="" type="checkbox"/> force	RDY	29	FPIX	<input checked="" type="checkbox"/> force	RDY
14	DT+	<input checked="" type="checkbox"/> force	RDY	30	ES+	<input checked="" type="checkbox"/> force	RDY
15	DT-	<input checked="" type="checkbox"/> force	RDY	31	ES-	<input checked="" type="checkbox"/> force	RDY
GT Status		PTC:	0	DAQ Status		PTC:	0
GT	<input type="checkbox"/> force		RDY	Input		status:	RDY
GTFE	<input type="checkbox"/> force		RDY			force?	<input checked="" type="checkbox"/>
PTC Status		PTC:	0	Time Slots		PTC:	0
Input		status:	RDY	absolute		in 10 orbits:	<input type="text" value="255"/>
Output		status:	RDY	relative		in %:	<input type="text" value="100"/>

Figure 6: Check PTC states, must be ready (RDY).