The STAR Run Control

Operation Manual

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I. Introduction

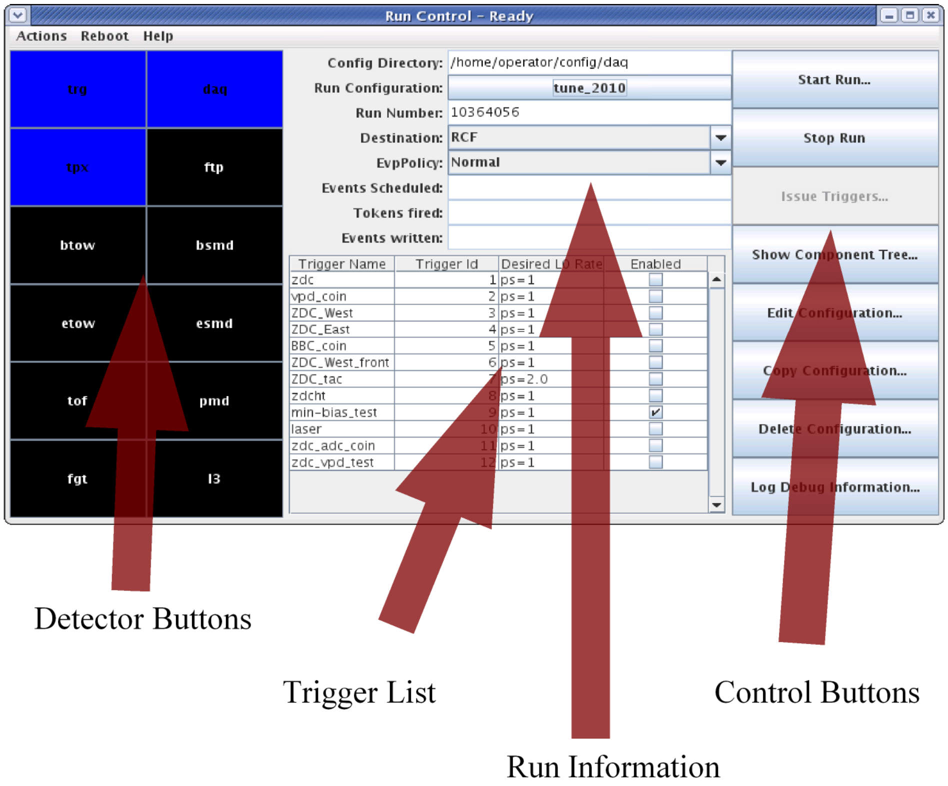
The STAR run control system configures and controls the readout components of the STAR Trigger, DAQ and detector systems.

Each detector must be turned on properly configured using the detector specific slow control systems before including it in the data taking, according to the shift leader documentation. Many detectors have specific instructions that need to be followed for certain types of runs. These functions are all part of the Detector Operator training for each detector and are separate from the Run Control. The DAQ/QA shift member must be aware of these requirements; however the Detector Operators and Shift Leaders are responsible for placing the detectors in the appropriate state.

When a detector or sub-detector is referred to in this documentation or in on the Run Control program, it refers only to the detectors readout electronics. Although many problems can be diagnosed from the Run Control program, and from the DAQ monitoring and logging systems, for the most part problems with the physical detectors can not be resolved from run control.

The Run Control system runs on the computer RTS02.

II. The Basics



Config Directory: /home/operator/config/daq
Run Configuration: tune_2010
Run Number: 10364056
Destination: RCF
EvpPolicy: Normal
Events Scheduled:
Tokens fired:
Events written:

Trigger Name	Trigger Id	Desired L0 Rate	Enabled
zdc	1	ps=1	☐
vpd_coin	2	ps=1	☐
ZDC_West	3	ps=1	☐
ZDC_East	4	ps=1	☐
BBC_coin	5	ps=1	☐
ZDC_West_front	6	ps=1	☐
ZDC_tac	7	ps=2.0	☐
zdcht	8	ps=1	☐
min-bias_test	9	ps=1	☑
laser	10	ps=1	☐
zdc_adc_coin	11	ps=1	☐
zdc_vpd_test	12	ps=1	☐

Detector Buttons

Trigger List

Control Buttons

Run Information

The main run control screen displays the state of the main subsystems at a glance, and allows quick and easy control of the STAR configuration and run state. The panel is built from 4 main sections:

- **The Detector Buttons**
  - The colors of these buttons show the state of each detector subsystem. In addition, when there is no run in progress, one can add or remove each detector system from the next run by clicking on its subsystem box. The colors consist of the following possibilities:
    - **Black –** Not in the run. Systems should not be added or removed when the run is in progress. Systems not included in the run are not under

control of the Run Control Program, so no Run Control operations, including reboot will have any effect on removed nodes.

- **Dark Grey with White Text** – In the run but not connected to Run Control. There are two main reasons a system may be disconnected:

  1. The system is in the process of being rebooted. In this case, the system should automatically reconnect in less than ~60 seconds.

  2. The system is powered off, the software is not running, or the network is disconnected. This situation can not be fixed through run control. It is the subsystem nodes which connect to the run control handler.

- **Light Grey with Black Text/Blue –** In the run and ready for run control operations. Operationally, there is no difference between these two states. A system will be Light Grey the first time it is booted, and after that will return to Blue when ready for operation.

- **Green** – This is the normal running state. The only operation that can be done in this state is to stop the run.

- **Yellow –** This is the paused state. Only the trigger system will ever be set to the paused state. Typically, trigger will be yellow while all other subsystems are green. This means that the components are running, but there are no triggers currently scheduled to be issued. During this state, the run may be stopped, or additional triggers may be issued.

- **Flashing &/or Red –** These are transitional states. Starting and stopping runs can take anything between one second and two-three minutes.

- **The Run Information**

  - This portion of the run control screen displays information about the current run, and allows one to modify the configuration for the following run. It contains the following fields:

    - **Configuration Directory –** This displays the directory for configuration files for informational purposes only.

    - **Run Configuration** – This button displays the current run configuration. Pressing this button will bring up the Run Configuration chooser.

- **Run Number –** The name of the current (or last) run number. The run number is automatically chosen by the run control system.

- **Destination –** This is the destination for data. Unless specified by a DAQ expert, the proper selection for this is "RCF". The meanings for other selections are:

  1. **RCF –** Send the data to RCF for physics analysis

  2. **RCF + DISK –** Send the data to RCF, but also keep a local copy of the data on the event builder machines

  3. **LOCAL DISK** – Only write a copy to the local event builder disks. There will be no permanent data storage.

  4. **NONE –** The data will not be saved.

- **EVP Policy –** This is the policy for sending data to the event pool. Unless specified by a DAQ expert, the proper value for this field is "NORMAL". The meaning of the values is as follows:

  1. **Normal** – Follow the policy specified by the trigger configuration for this run.

  2. **Sample** – Override the detailed event pool policy defined in the trigger configuration in favor of a simple algorithm of sampling events at 10hz, irrespective of trigger type or detector mix.

  3. **All –** Write every event to the event pool. Use extreme caution with this setting, as the event pool has a very limited throughput. If event rates are above ~20hz this can lead to very poor performance, and even crashes of the DAQ system.

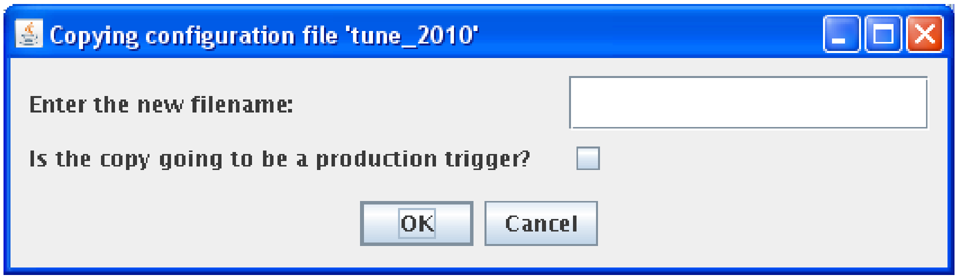
  4. **None –** Don't send any events to the event pool. If this is selected, the online histograms will not receive any data, so no QA information will be available.

- **The Trigger List**

  - The list of triggers available in the current configuration screen are defined here. The prescale's are displayed, either as straight prescales (ps=#) or as target rates (#hz). Additionally, a check-box is available for each trigger.

This check-box is used for the the shift operator to enable or disable triggers for the following run. Check a box to include a trigger in the run. Un-check the box to remove it.

- **Control Buttons**
    - The control buttons are used to preform actions.
        - **Start Run** – This starts a run. It is only available as an option when the system is in the ready state.
        - **Stop Run –** This stops a run. In addition the Stop Run button is used as the first step to solving any error state. If a run won't stop for any reason, press stop run again.
        - **Issue Triggers –** This issues more triggers. This option is only available when the system is in a paused state, and it is possible request more events.
        - **Show Component Tree –** Display the detailed states of all nodes controlled by the run control.
        - **Edit Configuration –** Display the configuration file editor for the currently selected configuration file.
        - **Copy Configuration –** This will display the configuration file chooser to allow you to select a configuration file to copy. Then it will display the following dialog box:



Copying configuration file 'tune_2010'

Enter the new filename:

Is the copy going to be a production trigger? □

Enter the filename for the new configuration file. Note the “production trigger” checkbox. This should be checked if the new configuration will be a production trigger. Typically, the reason for copying a configuration is to do perform test runs on a scratch configuration file, so this box should normally not be checked. If the box is checked, then existing production trigger id's will be carried over to the new configuration file.

- **Delete Configuration –** This will display the configuration file chooser to allow you to delete configuration files. You are restricted to deleting files that have not been designated as production triggers. Additionally you may not delete the currently selected configuration file. Typically, you should only delete test configuration files that you yourself have created.

- **Log Debug Information –** This logs debugging information about the current state of the system to the daq logs. The debugging information shows up in the file daqman:/RTS/log/handler.log

III. Starting and Stopping runs

This section describes the main operation of the run control for the shift crew – configuring and taking runs. The short checklist for starting a run is as follows:

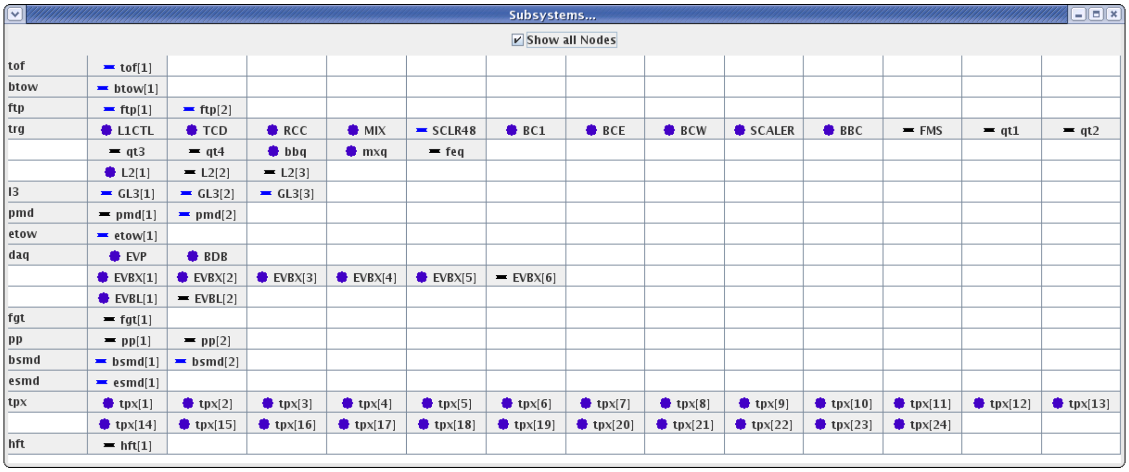
1. Set the proper detectors in the run by clicking the appropriate detector buttons.
2. Chose the proper configuration file by clicking the “Run Configuration” button and choosing from the configuration file chooser.
3. Press “Start Run”, and follow the directions on the screen.

I'll now go through these elements in full detail:

1. **Selecting Detector Components:**
   - For the purposes of run control, trigger and DAQ are considered detector subsystems. For typical runs, one selects detectors by clicking the appropriate detector button on the Run Control Main Panel. This toggles a detector system in or out of the run. However, all detectors consist of multiple subsystems. For typical detectors such as the TPC, each node is a single component of the detector. (For the TPC there is a single node for each TPC sector) For trigger and DAQ, there are numerous components which each have specialized functions. Some nodes are not needed in every run. Toggling a detector system into the run using the Detector Button selects the current default list of nodes, however for many runs some components need to be

disabled. Shift crews need to be aware of this, because experts sometimes disable certain nodes without informing the crew. The simplest way to ensure that the default setup is in place is to remove and replace trigger and daq by clicking twice on their Detector Buttons. However, there will be times when you need to disable/enable specific nodes:

- **The Subsystem Tree –** Press the "Subsystem Tree" on the Main Run Control Panel. You should see the following screen:



Subsystems...

☑ Show all Nodes

tof	▬ tof[1]													
btow	▬ btow[1]													
ftp	▬ ftp[1]	▬ ftp[2]												
trg	● L1CTL	● TCD	● RCC	● MIX	▬ SCLR48	● BC1	● BCE	● BCW	● SCALER	● BBC	▬ FMS	▬ qt1	▬ qt2
	▬ qt3	▬ qt4	● bbq	● mxq	▬ feq									
	● L2[1]	▬ L2[2]	▬ L2[3]											
l3	▬ GL3[1]	▬ GL3[2]	▬ GL3[3]											
pmd	▬ pmd[1]	▬ pmd[2]												
etow	▬ etow[1]													
daq	● EVP	● BDB												
	● EVBX[1]	● EVBX[2]	● EVBX[3]	● EVBX[4]	● EVBX[5]	▬ EVBX[6]								
	● EVBL[1]	▬ EVBL[2]												
fgt	▬ fgt[1]													
pp	▬ pp[1]	▬ pp[2]												
bsmd	▬ bsmd[1]	▬ bsmd[2]												
esmd	▬ esmd[1]													
tpx	● tpx[1]	● tpx[2]	● tpx[3]	● tpx[4]	● tpx[5]	● tpx[6]	● tpx[7]	● tpx[8]	● tpx[9]	● tpx[10]	● tpx[11]	● tpx[12]	● tpx[13]
	● tpx[14]	● tpx[15]	● tpx[16]	● tpx[17]	● tpx[18]	● tpx[19]	● tpx[20]	● tpx[21]	● tpx[22]	● tpx[23]	● tpx[24]			
hft	▬ hft[1]													

Here, the detector system is listed in the leftmost column, and each node is listed in its own box. The colors correspond to the colors in the Detector Buttons (Green = running, Blue/grey = ready, Yellow = paused, Black = not connected). However, in this case nodes are displayed whether they are in the run or not. The filled in circle indicates that the node is in the run, while the flat line indicates the node is not selected for the run. Additionally, nodes that are in a transitional state are marked with the "W" rather than blinking lights.

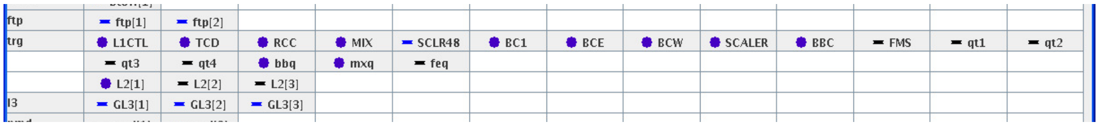
In order add or remove a node from the run, simply click on the node in question.

Trigger Modes:

There are three typical setups for the trigger system:

- **Full Trigger**: Default nodes

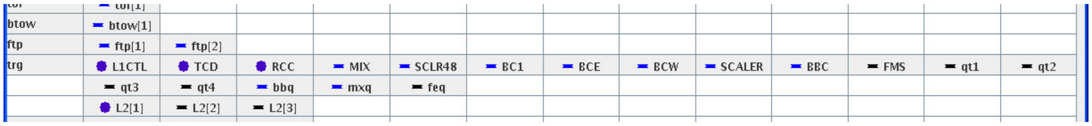
  This setup is used for normal data taking.



ftp	▬ ftp[1]	▬ ftp[2]											
trg	● L1CTL	● TCD	● RCC	● MIX	▬ SCLR48	● BC1	● BCE	● BCW	● SCALER	● BBC	▬ FMS	▬ qt1	▬ qt2
	▬ qt3	▬ qt4	● bbq	● mxq	▬ feq								
	● L2[1]	▬ L2[2]	▬ L2[3]										
l3	▬ GL3[1]	▬ GL3[2]	▬ GL3[3]										

- **Minimum Trigger Setup**: Only RCC/L1/L2/TCD

  This setup is used to simplify the trigger system, but still run using the TCU.

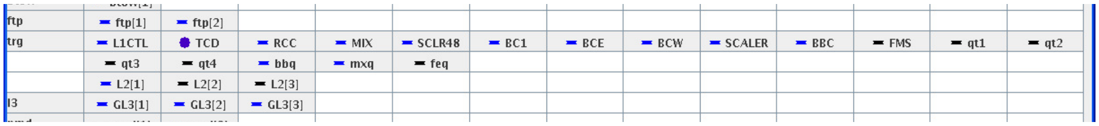


btow	▬ btow[1]												
ftp	▬ ftp[1]	▬ ftp[2]											
trg	● L1CTL	● TCD	● RCC	▬ MIX	▬ SCLR48	▬ BC1	▬ BCE	▬ BCW	▬ SCALER	▬ BBC	▬ FMS	▬ qt1	▬ qt2
	▬ qt3	▬ qt4	▬ bbq	▬ mxq	▬ feq								
	● L2[1]	▬ L2[2]	▬ L2[3]										

- **TCD Only:** Bypass trigger system entirely

  This setup is used to simulate triggers. It allows testing of detectors while bypassing trigger entirely.

  In this mode, the system will never go into the paused mode. One can issue more triggers into the system even though the run control mode is "RUNNING"



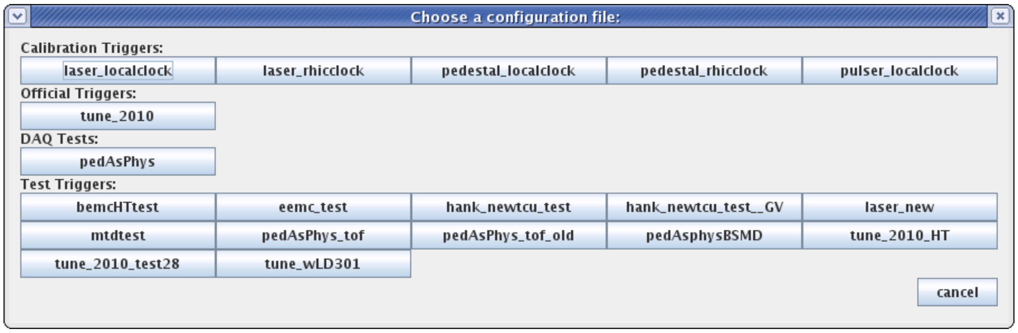
ftp	▬ ftp[1]	▬ ftp[2]											
trg	▬ L1CTL	● TCD	▬ RCC	▬ MIX	▬ SCLR48	▬ BC1	▬ BCE	▬ BCW	▬ SCALER	▬ BBC	▬ FMS	▬ qt1	▬ qt2
	▬ qt3	▬ qt4	▬ bbq	▬ mxq	▬ feq								
	▬ L2[1]	▬ L2[2]	▬ L2[3]										
l3	▬ GL3[1]	▬ GL3[2]	▬ GL3[3]										

DAQ Modes:

- At least one EVBX node is always required
- If the FTPC is in the run, then at least one EVBL node is required, as well as the BDB node.
- If one wishes to view QA data using the online histograms then the EVP node is required.
- The default selection will contain a full set of 5 EVBX nodes, 1 EVBL node as well as EVP and BDB. This should be the general setup for data taking.

2. Select Run Configuration

- To select the run configuration, find the "Run Configuration" field in the Run Information section of the main Run Control panel. Press on the button containing the name of the current configuration. The following screen will appear:



The configuration files are grouped by type.

Calibration Triggers are production triggers defined for specific purposes. Note that these triggers include the clock as part of their name. This is because when there is no beam in RHIC, the clock our trigger system uses is not defined and we need to provide our own clock. Choose “rhicclock” if there is beam in the machine or “localclock” if not.

Official Triggers are the standard production physics triggers.

Test Triggers are scratch triggers created by various detector experts to test specific issues. These triggers are not supported by the Run Control Group, and are likely to be based on obsolete capabilities. If you need a special trigger configuration to be generally available for shift operations, then contact the Run Control Group to have the trigger added to one of the official categories.

To select a run configuration, simply click on the appropriate box.

- Once the trigger configuration is selected, the “Trigger List” on the main Run Control Panel should update. This list shows each trigger configured for the run, the “Trigger ID” used to identify this trigger, the pre-scale for the trigger, and a checkbox. At this point you should check that the appropriate triggers are enabled in the run. Triggers can be enabled by selecting the checkbox and disabled by unselecting the checkbox.

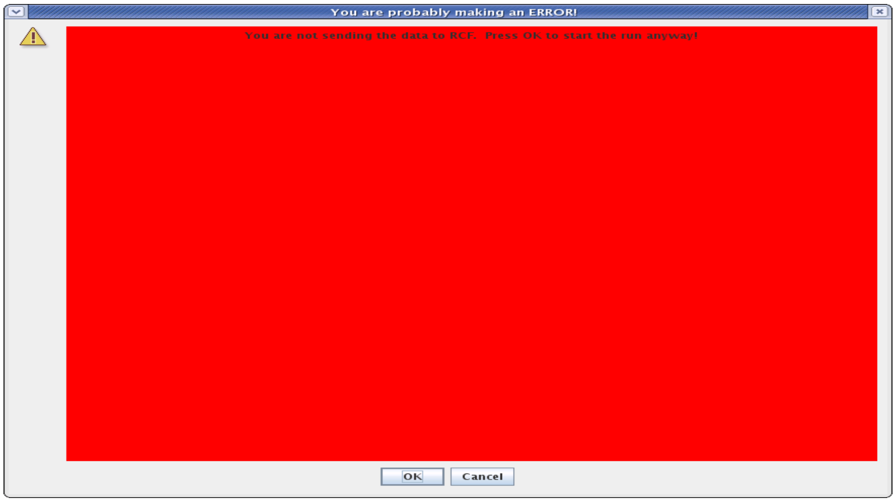
  The prescales will be listed either as a hardcoded prescale in the form of “ps=x” or as a target rate “x hz”. If the rate is listed as a target rate, the rate may not match the observed trigger rate for many reasons. First, there may not be enough luminosity to provide this rate. Second, the target rate does not account for detector deadtime. Third, the rate is based on a calculation using a model of the expected rate of the trigger. At times this model may not be correct, but the true rate configured empirically by adjusting the desired rate.

- Next, ensure that the “Data Destination” field is set to the proper value. Unless explicitly told otherwise, the “Data Destination” should be set to “RCF”.

- Finally, ensure that the “EVP Policy” field is set to the proper value. Unless explicitly told otherwise, the “EVP Policy” should be set to “Normal”.

3. **Ensure that the system state is consistent**
   - At this point, the “Detector Buttons” for all detectors in the run should be solid BLUE, and the “Start Run...” button should be enabled. If so the run may be started.
   - If not, press “Stop Run”. This is the generic first step for any debugging. In a few seconds, the “Detector Buttons” should turn solid blue, and the “Start Run...” Button should be enabled.
   - If the “Start Run” button is still not enabled, determine which systems are in error. These are the systems for which the “Detector Button” is either (1) flashing, or (2) a color other than BLUE. For each of these systems, go to the reboot menu and select the appropriate system.

4. **Read Warning Boxes**



You are probably making an ERROR!

You are not sending the data to RCF. Press OK to start the run anyway!

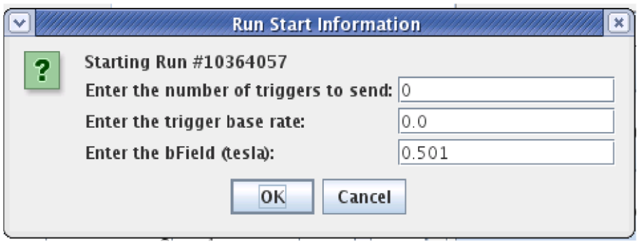
   - At this point, you may see large red warning boxes. Read the warning.
   - Currently, these warnings indicate one of two things:
     - “You are not sending the data to RCF” - This means that the data destination is not “RCF”. It is an indication that the destination is not the standard approved setting for physics running. Note that if you have been told to take a run using the setting “RCF + disk”, this warning will appear even though a copy of the data will be sent to RCF.
     - “You are not running with the RHIC Clock” - This means that the local clock has been set. If you are running a physics run, this is an error and

should be fixed, however calibration runs are frequently run using the local oscillator.

- Press OK to continue the start run despite any warnings, or else press cancel to abort the run start and re-edit the configuration.

5. **Start The Run**

   - Press “Start Run...” The following screen should appear:



Run Start Information

Starting Run #10364057

Enter the number of triggers to send: 0

Enter the trigger base rate: 0.0

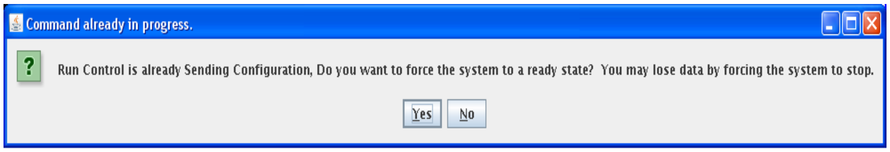
Enter the bField (tesla): 0.501

   - Enter the number of triggers to schedule for the run in the first box.
   - The second box should display the trigger base rate. This number is typically the bare ZDC rate, but the scaler used may change from run to run. However, its value will automatically update.

     However, for the specific case of “TCD” only runs, which do not include trigger, the initial value here will be “1000000”. TCD runs emulate the trigger, so for these runs you may explicitly control the emulation rate by adjusting this field.
   - The third box contains the main magnetic field. It should always be automatically set.
   - Press OK to start the run.
   - At this point, the detector buttons will flash while the subsystems configure. This can take up to 2 minutes so be patient. Eventually the subsystem buttons will all turn green. This indicates that the run has successfully started.

6. **Stopping the Run**

   - Press “Stop Run”
   - Wait for the run to stop. Runs should stop within about 2 minutes. (Usually much sooner)
   - If the run does not stop within this time, press “Stop Run” again. You will see the following message:



Command already in progress.

Run Control is already Sending Configuration, Do you want to force the system to a ready state? You may lose data by forcing the system to stop.

The warning is only relevant for pedestal runs. If you are must force a pedestal run to stop, then probably the pedestals are not valid, and should be retaken, otherwise, the run should be valid. The system should return to the ready state after a few moments. If not, then refer to the debugging section of this document.

IV. Editing Configuration Files

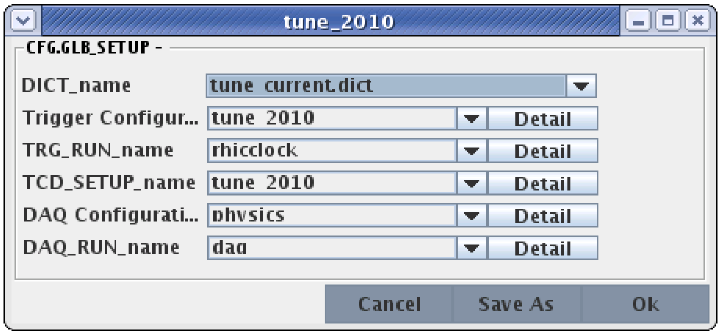
To edit the run configuration press “Edit Configuration” from the Main Run Control Panel. This allows you to edit the currently selected run configuration file.

Effectively, the run control application and the configuration editors are separate programs. The only point at which they interact is at the time a run is started. And even then, the run control configures the system using the current configuration as it exists on the disk. Therefore, changes to configurations must be saved before runs are started.

However, some aspects of the trigger configuration screens are kept statically in memory, in particular some of the dictionaries that define various configurable parameters. This means that it is quite dangerous to edit one configuration, and then change to a different configuration and edit the new one... leaving both editors on the screen at one time. It is possible to do this, but not recommended. Instead, edit the file and close all editors before changing to a different run configuration.

1. Run Configuration Screen:

After pressing “Edit Configuration”, the following screen will appear:



tune_2010

CFG.GLB_SETUP

DICT_name: tune_current.dict

Trigger Configur...: tune_2010

TRG_RUN_name: rhicclock

TCD_SETUP_name: tune_2010

DAQ Configurati...: physics

DAQ_RUN_name: daq

The STAR configuration is made up from 7 files. The first file is displayed on the main “Edit Configuration” panel shown here. It simply consists of 6 filenames which can be selected from the dropdown menus. Each of these files, in turn, can be edited by selecting the appropriate “Details...” button.

The main reason for segmenting the configuration into multiple files is because certain information is typically common to all run configurations, whereas other information is typically highly specific to each run configuration. The six files and their behaviour are described here:

Dict_Name: This field shows the “Dictionary File Name” which is very dangerous to modify. Please use caution, and make sure you understand all of the following explanations before doing so:

The dictionary file is used to define configurable aspects of the trigger. Each implementation of the trigger QT and DSM firmware has a set of “registers” each of which have different meanings depending on the current programming. For convenience, the run control groups all of the various firmware versions needed to run the trigger into a single “file” called the Tier1 file. For each Tier1 file, there is a corresponding “Dictionary file” with the same name.

To run properly, the “Dictionary File” and the “Tier1 File” need to be consistent. In order to do this, any time the “DICT_name” field is updated the “Trigger Configuration” file is automatically modified to use the compatible Tier1 file.

In addition to this, the “Dictionary File” defines the which registers are enabled. So, modifying the dictionary file also automatically updates the “Trigger Configuration” file to define the appropriate registers. If a register does not exist in the new dictionary its value is lost. If a register exists in the new dictionary that wasn't in the previous dictionary its value is set to the default value (-1). This means, if you change the dictionary to an invalid one, and then change it back, you will lose register settings. Furthermore, the register value copies are done according to the names of the registers, so even if the registers are shared in the new dictionary, if the spelling is different, the register value will be lost.

Unfortunately, during trigger commissioning Tier1 files and Dictionary files must be frequently modified. However, the typical changes are modifications to algorithms and additional registers. In order to simply the version control we always keep links to the production dictionary files of each type. These files are called:

trg_current.dict - used for production triggers *tune_current.dict* - used for tuning triggers

ped_current.dict - pedestal files

If the dictionary name contains the string "current", then the tier1 file set in the "Trigger Configuration" file will be set to the actual implemented file. (ie. trg_xxxxxx.bin, where xxxxxx contains the date the tier1 file was created).

The end result is that for production triggers, using the "xxx_current.dict" dictionary ensures that the dictionary and tier1 file are consistent, and that the version is always the most recent blessed version. This should always be the case for production triggers.

However, for testing new tier1 file, the specific tier1 file must be selected in this field.

Trigger Configuration:

The trigger configuration defines the suite of triggers available for the run. As this is the heart of the configuration, nearly every Run Configuration has its own "Trigger Configuration". The only exceptions are that "pedestal_localclock / pedestal_rhicclock" and "laser_rhicclock / laser_localclock" share the same Trigger Configurations, as they differ only in the setting of the clock source.

TRG_RUN_name:

TRG_RUN defines the trigger parameters that are typically shared among different triggers. The main field which might be different for different configurations is the clock source. Therefor, there are typically 2 TRG_RUN files: "rhicclock" and "localclock". All production files should use one of these two settings.

TCD_SETUP_name:

The only reason to change the TCD setup is to run timing scans for specific detectors. The TCD_SETUP_name should always be "TCD"

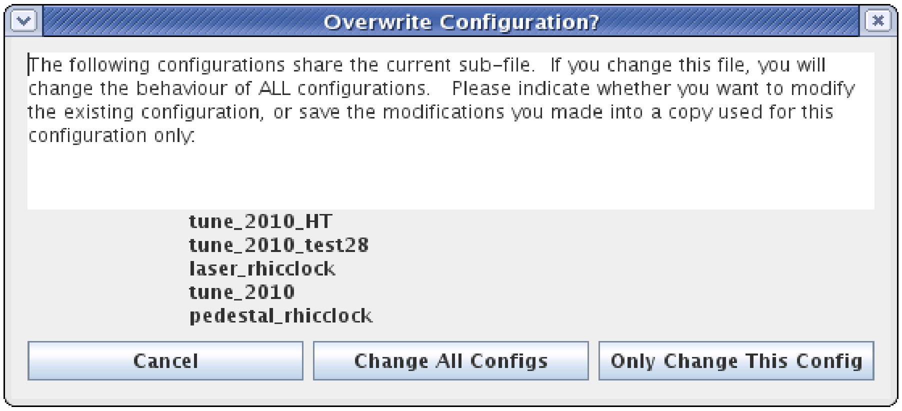
DAQ_Configuration:

The DAQ_Configuration setup falls into catagories based on the run type. Therefore there are three different commonly used files: "pedestal", "pulser", and "physics". All production physics configurations should use the "physics" setting.

DAQ_RUN_name:

This should be shared among every configuration file. Always use the file named: "daq".

The difficulty with this kind of hierarchy of shared files is that it is easy to modify a file which affects other configuration files, sometimes blindly. For this reason, the run control editor senses this situation. If you edit some configuration and the edit will affect another Run Configuration you will see the following message:



The following configurations share the current sub-file. If you change this file, you will change the behaviour of ALL configurations. Please indicate whether you want to modify the existing configuration, or save the modifications you made into a copy used for this configuration only.

tune_2010_HT
tune_2010_test28
laser_rhicclock
tune_2010
pedestal_rhicclock

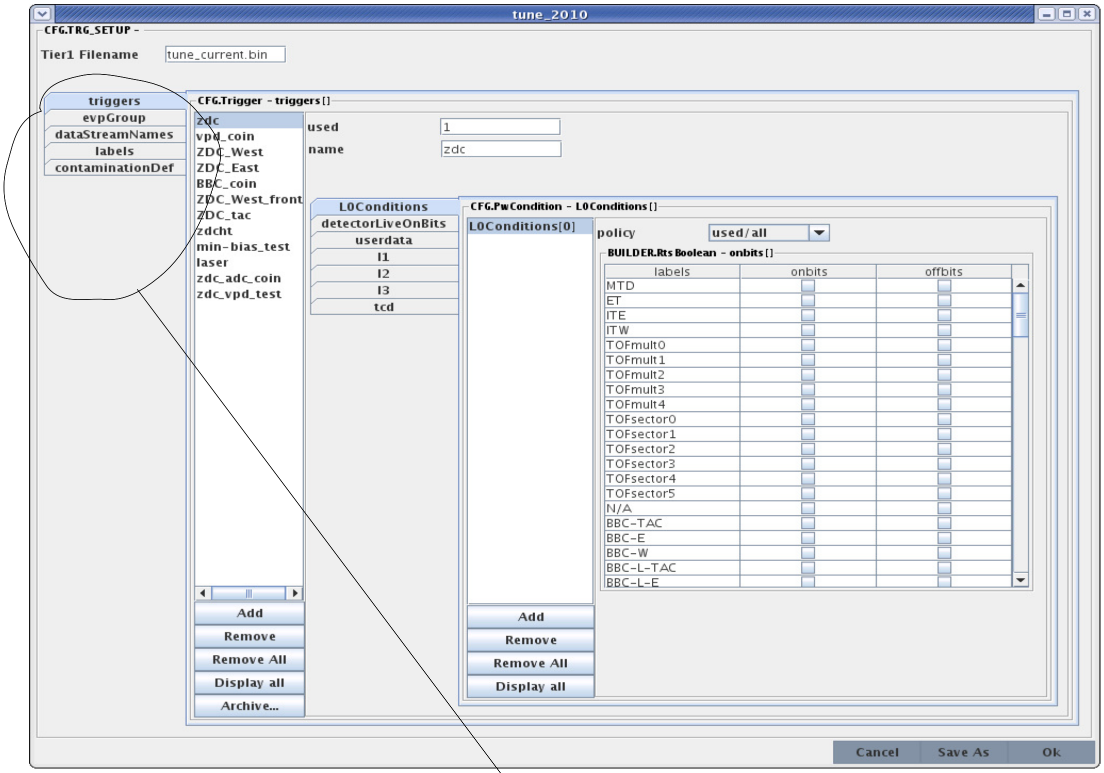
Typically you will want to select "Change All Configs". This will save the file as is, and modify the parameters for all configurations. Typically this is the proper choice. For example, if you mask out a TPC receiver board, the reason is that the board is broken. It doesn't matter which trigger you run, the board is broken for all configurations.

However, in some cases you will not want to change the other configuration files. Perhaps you are taking a timing scan within a test trigger configuration. In this case select "Only change this config". The result is that the modified file will be saved with a different name. Then the "Run Configuration File" will be updated to use the new version of the file. If you are dealing with a production file, this is nearly always the incorrect choice.

2. **The Trigger Configuration:**

The trigger configuration is the most complex part of the entire run control system.

The first field: "Tier1 Filename" does not need to be set. This field is automatically modified whenever the "DICT_name" field in the run configuration is changed so that the dictionary file always stays consistent with the tier1 file. However, for specialized testing, this field may be modified. The only reason for doing this is to test tier1files.



Tier1 Filename: tune_current.bin

used: 1

name: zdc

policy: used/all

labels	onbits	offbits
MTD	□	□
ET	□	□
ITE	□	□
ITW	□	□
TOFmult0	□	□
TOFmult1	□	□
TOFmult2	□	□
TOFmult3	□	□
TOFmult4	□	□
TOFsector0	□	□
TOFsector1	□	□
TOFsector2	□	□
TOFsector3	□	□
TOFsector4	□	□
TOFsector5	□	□
N/A	□	□
BBC-TAC	□	□
BBC-E	□	□
BBC-W	□	□
BBC-L-TAC	□	□
BBC-L-E	□	□

Main Tabs

The first set of tabs (located at the upper left portion of the screen) selects between the main objects one can configure:

- **triggers:**

  This tab is used to set up the suite of triggers to be fired.

- **evpGroup:**

This tab is used to configuration how events are sent to the event pool for QA monitoring.

- **dataStreamNames:**

  This tab gives the names for express streams

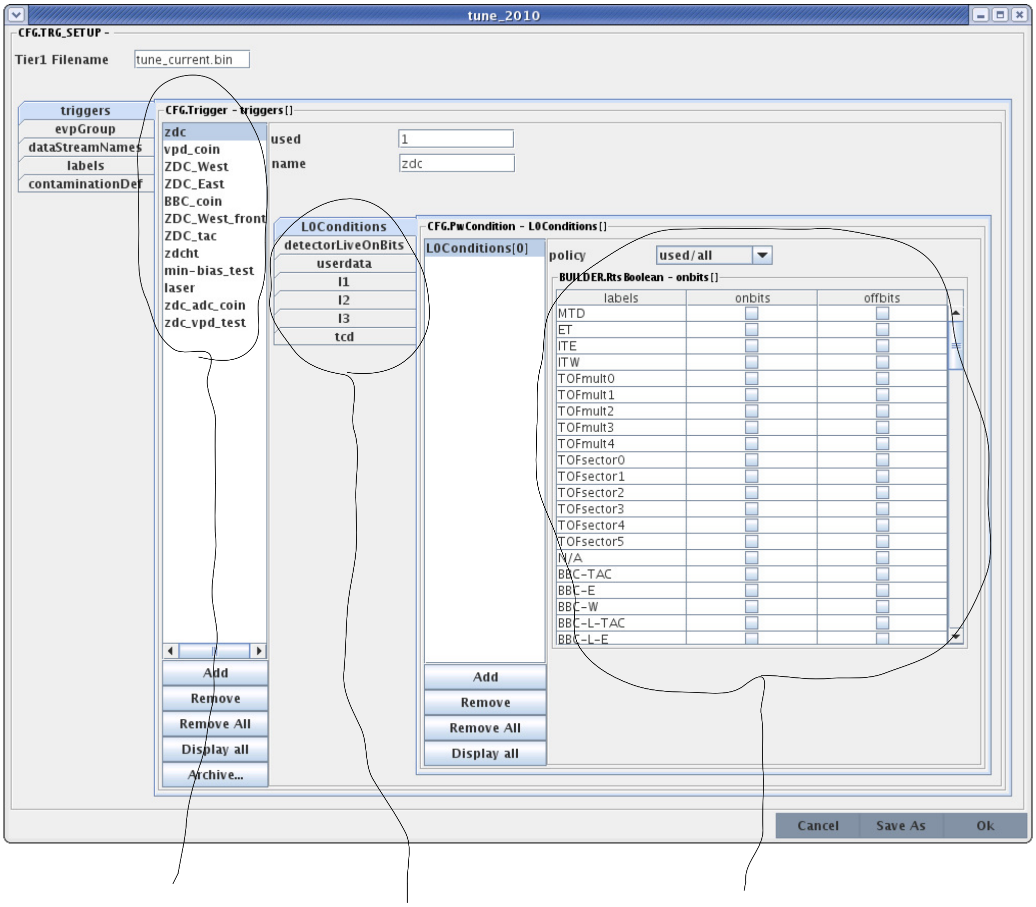
- **labels:**

  This tab is used to set up the configurable parameters of the DSM and QT trees.

- **contaminationDef:**

  This tab is completely mislabeled. The information within this tab is ignored except for a single field which is used along with the evpGroup tab to set up which events are sent to the event pool for QA monitoring.

- **The "Triggers" Tab**



Tier1 Filename tune_current.bin

zdc
vpd_coin
ZDC_West
ZDC_East
BBC_coin
ZDC_West_front
ZDC_tac
zdcht
min-bias_test
laser
zdc_adc_coin
zdc_vpd_test

used 1
name zdc

policy used/all

labels	onbits	offbits
MTD	☐	☐
ET	☐	☐
ITE	☐	☐
ITW	☐	☐
TOFmult0	☐	☐
TOFmult1	☐	☐
TOFmult2	☐	☐
TOFmult3	☐	☐
TOFmult4	☐	☐
TOFsector0	☐	☐
TOFsector1	☐	☐
TOFsector2	☐	☐
TOFsector3	☐	☐
TOFsector4	☐	☐
TOFsector5	☐	☐
N/A	☐	☐
BBC-TAC	☐	☐
BBC-E	☐	☐
BBC-W	☐	☐
BBC-L-TAC	☐	☐
BBC-L-E	☐	☐

Selected Trigger Trigger Definition Tab Physics Requirements

This tab allows one to setup the trigger mix. The left hand column displays the selected triggers. To select a trigger, simply click on the trigger name with the mouse and the selected trigger will be highlighted in blue. Only one trigger may be selected at a time.

To add or remove triggers use the buttons below the trigger name list.

Please note that most operations on triggers reselect the first trigger in the list. One should be careful to ensure that the currently selected trigger is the appropriate one.

Once a trigger has been selected, all of the information to the right of the trigger list box applies only to the selected trigger. The various information for the definition of each trigger is arranged on seven panels available from the "Trigger Definition Tab

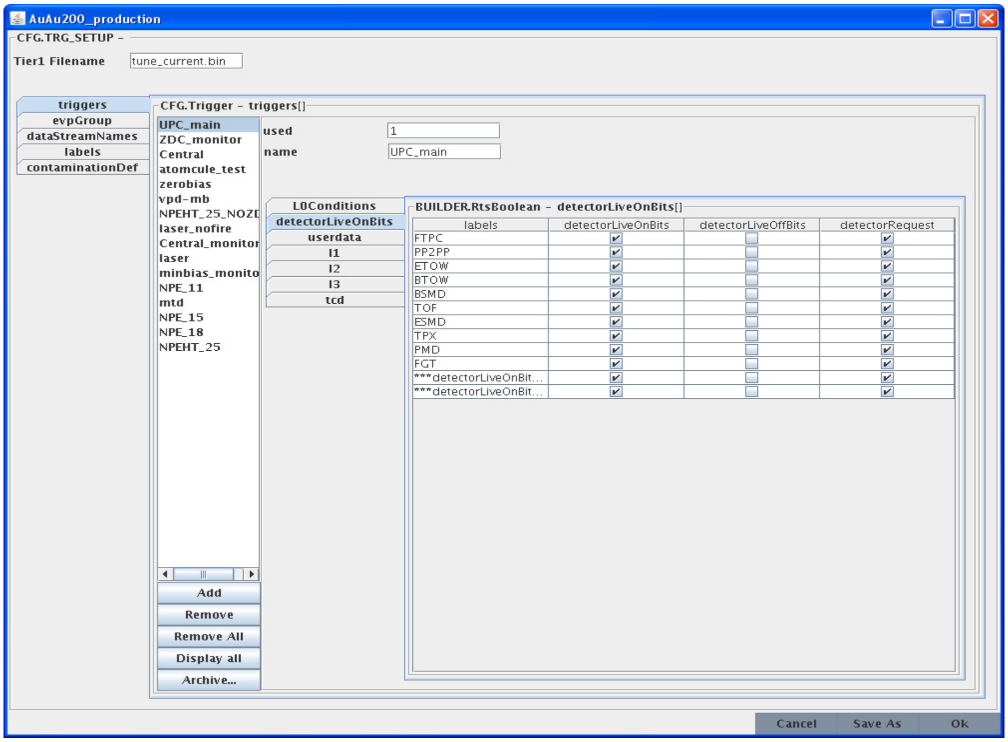
- **L0Conditions Tab:**

  The L0 conditions represent masks of physics bits that are required to be on or off for a given trigger. There are 128 physics bits available for each condition in the "Physics Requirements" screen. Each bit corresponds to a row of the table. Select the appropriate checkbox to ensure that a bit is required to be on or off. If multiple bits are checked they are applied as a logical "AND", meaning every bit checked must be satisfied for the trigger to fire.

  There is also the capability to setup multiple bit mask conditions for the same trigger, applied with the logic of a logical "OR". To do this, select "Display All" on the L0 condition list box. You should see 4 triggers conditions displayed. The unused conditions will be marked on each side by asterixes. To add a condition, select one of the unused conditions and press the "Add" button. Then select the "Suppressed Unused" to display only the conditions applied to the given trigger. Note that this feature, though available in the run control is not supported by the trigger system for the 2010 run.

  Finally, there is one special trigger situation. A trigger can be constructed from "All Configured Triggers". To do this, select both "onbits" and "offbits" for the first 8 trigger bits. This is a special cased handled by the configuration software to be satisfied by every event read into DAQ. It's main purpose is to feed L2 or L3 trigger algorithms.

- **The detectoLiveOnBits tab:**



Tier1 Filename tune_current.bin

used 1

name UPC_main

labels	detectorLiveOnBits	detectorLiveOffBits	detectorRequest
FTPC	☑	□	☑
PP2PP	☑	□	☑
ETOW	☑	□	☑
BTOW	☑	□	☑
BSMD	☑	□	☑
TOF	☑	□	☑
ESMD	☑	□	☑
TPX	☑	□	☑
PMD	☑	□	☑
FGT	☑	□	☑
***detectorLiveOnBit...	☑	□	☑
***detectorLiveOnBit...	☑	□	☑

This tab is used to define the detector readout characteristics for each trigger.

detectorLiveOnBits: select the detectors that need to be live to read out the selected trigger

detectorLiveOffBits: select the detectors that need to be dead in order to read out this trigger

detectorsRequest: select the detectors that need to be fired for this trigger.

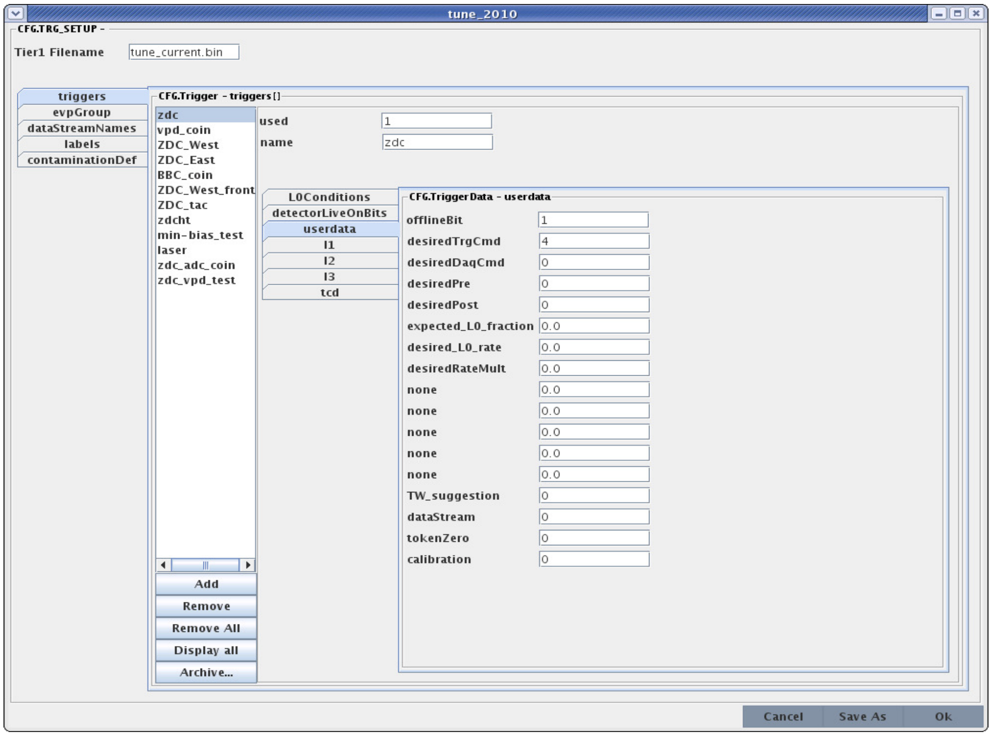
There are several behaviors to be aware of relating to the setup of this page.

- The setup within this tab only applies to detectors that are in the actually in the run. All bits for detectors not in the run are masked out. It is impossible to fire a detector that is not in the run. It is also impossible to select events based on the busy characteristics of a detector not in the run.

- There are always several bits that do not correspond to any active detectors. These are automatically masked out of the run.

- An unchecked detectorRequest means “don't care”. If an event satisfies multiple triggers, a detector may be present even though it was not required by some trigger requested.

- **The userdata tab:**



Tier1 Filename	tune_current.bin
used	1
name	zdc
offlineBit	1
desiredTrgCmd	4
desiredDaqCmd	0
desiredPre	0
desiredPost	0
expected_L0_fraction	0.0
desired_L0_rate	0.0
desiredRateMult	0.0
none	0.0
none	0.0
none	0.0
none	0.0
none	0.0
TW_suggestion	0
dataStream	0
tokenZero	0
calibration	0

The user data tab contains miscellaneous information about each trigger. The parameters in this tab need to be set carefully as they determine what actions the trigger system takes upon trigger the event:

- **offlineBit**: this field sets the ID that offline uses to identify the trigger for analysis. There is a general scheme for this ID:

  0-1000 - test id's, these are not production triggers. A trigger is a production trigger if it's id is > 1000.

  900x - pedestal triggers

910x - pulser triggers

920x - laser triggers

930x - zero bias triggers

xxyyyy - xx is the run period. Typically this is incremented each time the species or energy changes, so there are several values for xx each year.

xx00zz – minbias like triggers

xx01zz – central like triggers

xx05zz – emc based triggers

xx07zz – uncatagorized triggers. (mtd, upc...)

xx08zz - fast detector only triggers

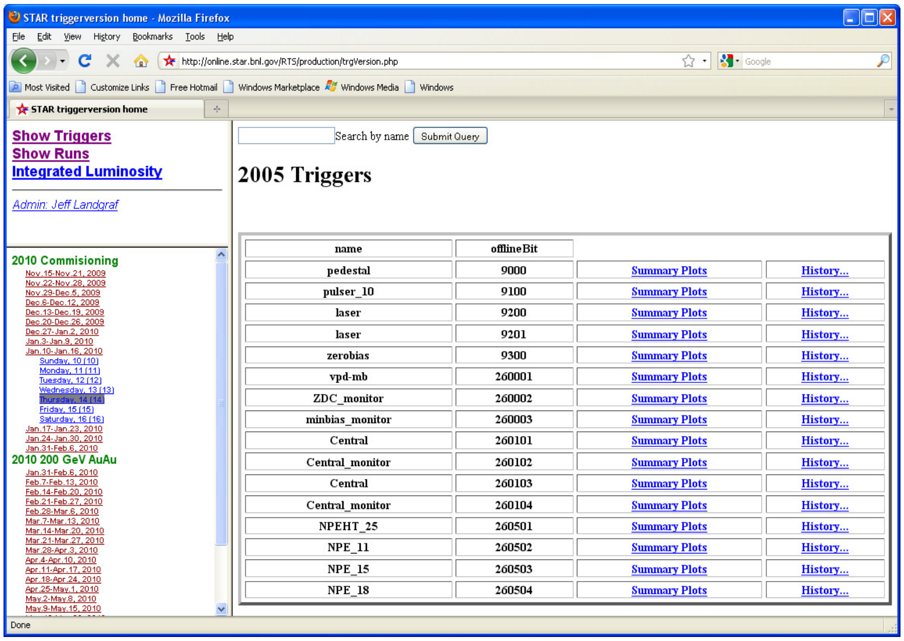
xx09zz – fms based triggers

Note that the triggers id scheme is necessarily fluid. Many triggers don't fall squarely into a single category, and thus this scheme is only the most course method of identifying a trigger.

The main difficulty in assigning trigger ids is to ensure that the trigger id's are unique. The simplest way to do this is to use the triggerVersioning web page which displays all sorts of information about run configurations. To view this page go to

http://online.star.bnl.gov/RTS/production/trgVersion.php

Then select “Show Triggers”. This should show the following page, which gives a list of all the production triggers for the year and gives links to see the history of each trigger.


STAR triggerversion home - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://online.star.bnl.gov/RTS/production/trgVersion.php
Google
Most Visited Customize Links Free Hotmail Windows Marketplace Windows Media Windows
STAR triggerversion home
Search by name
Submit Query
Done

Show Triggers
Show Runs
Integrated Luminosity

Admin: Jeff Landgraf

2010 Commisioning
Nov.15-Nov.21, 2009
Nov.22-Nov.28, 2009
Nov.29-Dec.5, 2009
Dec.6-Dec.12, 2009
Dec.13-Dec.19, 2009
Dec.20-Dec.26, 2009
Dec.27-Jan.2, 2010
Jan.3-Jan.9, 2010
Jan.10-Jan.16, 2010
Sunday, 10 (10)
Monday, 11 (11)
Tuesday, 12 (12)
Wednesday, 13 (13)
Thursday, 14 (14)
Friday, 15 (15)
Saturday, 16 (16)
Jan.17-Jan.23, 2010
Jan.24-Jan.30, 2010
Jan.31-Feb.6, 2010
2010 200 GeV AuAu
Jan.31-Feb.6, 2010
Feb.7-Feb.13, 2010
Feb.14-Feb.20, 2010
Feb.21-Feb.27, 2010
Feb.28-Mar.6, 2010
Mar.7-Mar.13, 2010
Mar.14-Mar.20, 2010
Mar.21-Mar.27, 2010
Mar.28-Apr.3, 2010
Apr.4-Apr.10, 2010
Apr.11-Apr.17, 2010
Apr.18-Apr.24, 2010
Apr.25-May.1, 2010
May.2-May.8, 2010
May.9-May.15, 2010

2005 Triggers

name	offlineBit		
pedestal	9000	Summary Plots	History...
pulser_10	9100	Summary Plots	History...
laser	9200	Summary Plots	History...
laser	9201	Summary Plots	History...
zerobias	9300	Summary Plots	History...
vpd-mb	260001	Summary Plots	History...
ZDC_monitor	260002	Summary Plots	History...
minbias_monitor	260003	Summary Plots	History...
Central	260101	Summary Plots	History...
Central_monitor	260102	Summary Plots	History...
Central	260103	Summary Plots	History...
Central_monitor	260104	Summary Plots	History...
NPEHT_25	260501	Summary Plots	History...
NPE_11	260502	Summary Plots	History...
NPE_15	260503	Summary Plots	History...
NPE_18	260504	Summary Plots	History...

- **desiredTrgCommand:** this field sets the desired trigger command for the trigger. The trigger command determines what action is performed by the detectors when the trigger is fired:

Trigger Command	Action
4	Read out the detector for physics
8	Fire an interspersed laser event. Here the special TCD handling for lasers is disabled (see trgcmd 9). For this trigger to work, the “laserProtection” and “laserFired” bits from the TCU must be enabled for the trigger as well as the trigger command 8
9	Fire a laser event. This is used for stand-alone laser runs. The laser is fired, and the tcd holds on to the trigger (and the busy) until it receives a signal from the laser diode indicating the laser has fired.
10	Fire the TPC padplane pulser

- **desiredDaqCmd**: This is use to indicate trigger by trigger special processing by the DAQ system. The DAQ front ends receive only a limited amount of information about the type of event fired, and in particular have no knowledge of the actual trigger. Therefor the daq command is the only trigger dependent routing information available to it. These values are actually a bit mask, so to enable more than one at the same time, add the daq commands together. Here are the possible values:

DAQ command	Action
2	The TPC should run tracking on this event.
4	Force RAW data for detectors (typically we write out only hits) This is used, for example, in zero bias triggers for eventual use in embedding studies.
8	For detectors that need pretriggers (pmd), fake a pretrigger. This is used for pedestal events on pretrigger based detectors.
15	Ignore the event. Treated as an abort.

- **desiredPre, desiredPost:** These fields set the number of pre-crossings and post-crossings read out each event for this trigger. The pre-post data is only sent to the local trigger data on the trigger computers.

- **ExpectedL0Fraction, desiredL0Rate, desiredRateMult:** These fields combine together, along with the "baseRate" (the trigger rate displayed while starting the run – typically the zdc coincidence rate) to calculate the prescale according to the following rules:

  - if desiredL0Rate < 0, the prescale = abs(desiredL0Rate)

  - if desiredRate = 0, the prescale is 1

  - Otherwise:

*ps = baseRate*expectedL0Fraction / (desiredL0Rate+desiredRateMult*baseRate)*

subject to: ps is always rounded up to nearest integer.

- If the run is TCD only, then there is no prescale. However events will be simulated for each trigger at the desiredL0Rate, or the baseRate whichever is lower.

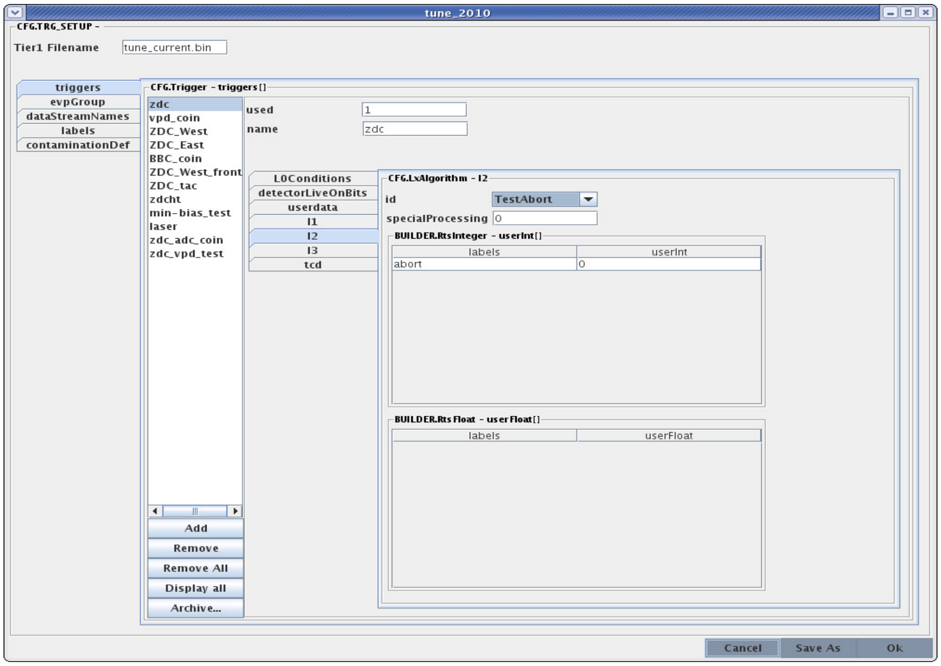
The proper setup of these fields is to set the “expectedL0Fraction” to the ratio of the L0 triggerrate to the trigger base rate for this trigger. The desiredL0Rate should be set to the desired rate, adjusted slightly higher to account for deadtimes.

- **dataStream:** This field is used in conjunction with the dataStreamNames tab. The number indicates the name of the data stream this trigger is assigned to. Typically the standard physics data stream has the index “0”, and express streams have index > 0. If an event satisfies more than one trigger, it is copied to the data stream of each trigger satisfied.

- **tokenZero:** Set this value to 1 if the trigger should be satisfied by token 0.

- **TriggerWordSuggestion / calibrationTrigger:** both of these fields are obsolete.

- **The L1 / L2 / L3 tabs:**



tune_2010

CFG.TRG_SETUP

Tier1 Filename: tune_current.bin

CFG.Trigger - triggers[]

zdc
vpd_coin
ZDC_West
ZDC_East
BBC_coin
ZDC_West_front
ZDC_tac
zdcht
min-bias_test
laser
zdc_adc_coin
zdc_vpd_test

used: 1
name: zdc

CFG.LxAlgorithm - l2

id: TestAbort
specialProcessing: 0

BUILDER.RtsInteger - userInt[]

labels	userInt
abort	0

BUILDER.Rts Float - userFloat[]

labels	userFloat

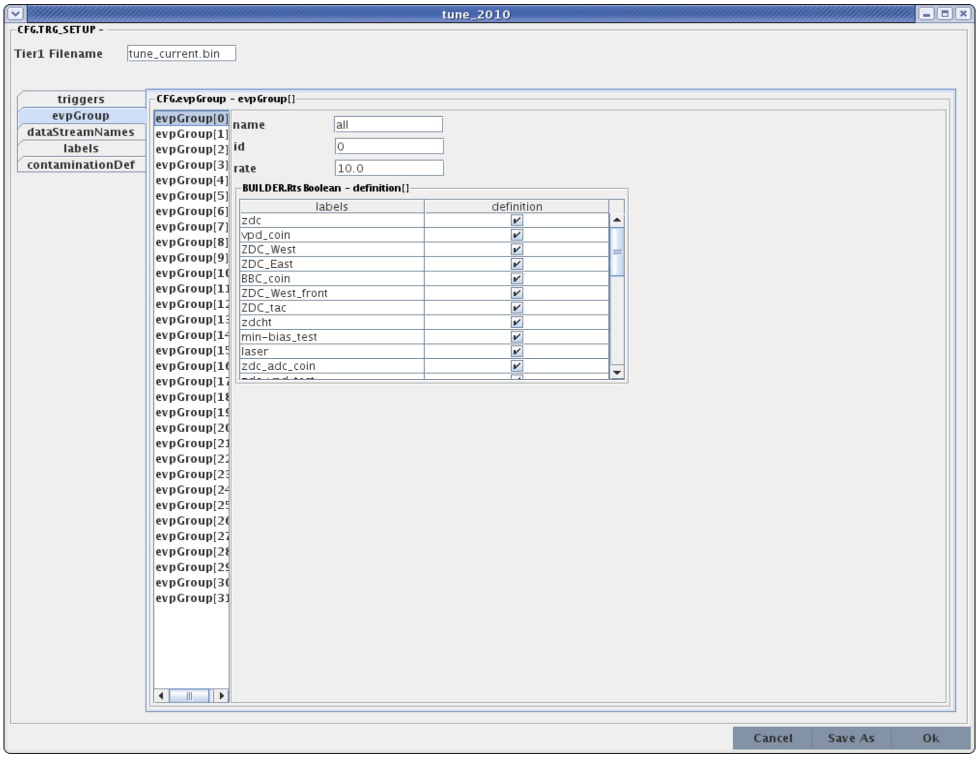
These tabs set up the L1/L2 & L3 algorithms for this trigger. The high level algorithm is chosen from the drop down box. For each algorithm, a different set of parameters may be configured. The meanings of these parameters must be documented by the maintainers of the L2 algorithms.

- **The TCD Tab:**

  The TCD tab gives the capability for the TCD to generate special triggers on a time schedule. This feature has not been used in STAR.

This concludes the description of the "triggers" tab which sets up the suite of triggers. I'll now continue to the description of the other main tabs of the Trigger Configuration screen.

- **The EvpGroup Tab**:



Tier1 Filename tune_current.bin

name all

id 0

rate 10.0

labels	definition
zdc	☑
vpd_coin	☑
ZDC_West	☑
ZDC_East	☑
BBC_coin	☑
ZDC_West_front	☑
ZDC_tac	☑
zdcht	☑
min-bias_test	☑
laser	☑
zdc_adc_coin	☑

The tab is used to setup the rates and trigger mix sent to the event pool. This list box contains 32 possible "evpGroups". Each one of these groups is defined in terms of a set of triggers. The logic is that you select the triggers to be considered within the group with the check boxes. Then you select the rate for the group of triggers by entering the value in hz into the box labeled “rate”.

Within each group, triggers are randomly sent to the event pool at the rate set for the group. This means that the fraction of events arriving at the event pool in each group reflects the relative rates of the triggers belonging to that group.

One important note is that this configuration works in conjunction with the tab labeled “contaminationDef” as well as the field on the run control main screen labeled “evpPolicy”. The “contaminationDef” tab contains a field called “policy”. There are several possible values for the policy field:

- sample – Ignore evp groups, take a random sample at 10hz

- none – Do not send data to the event pool

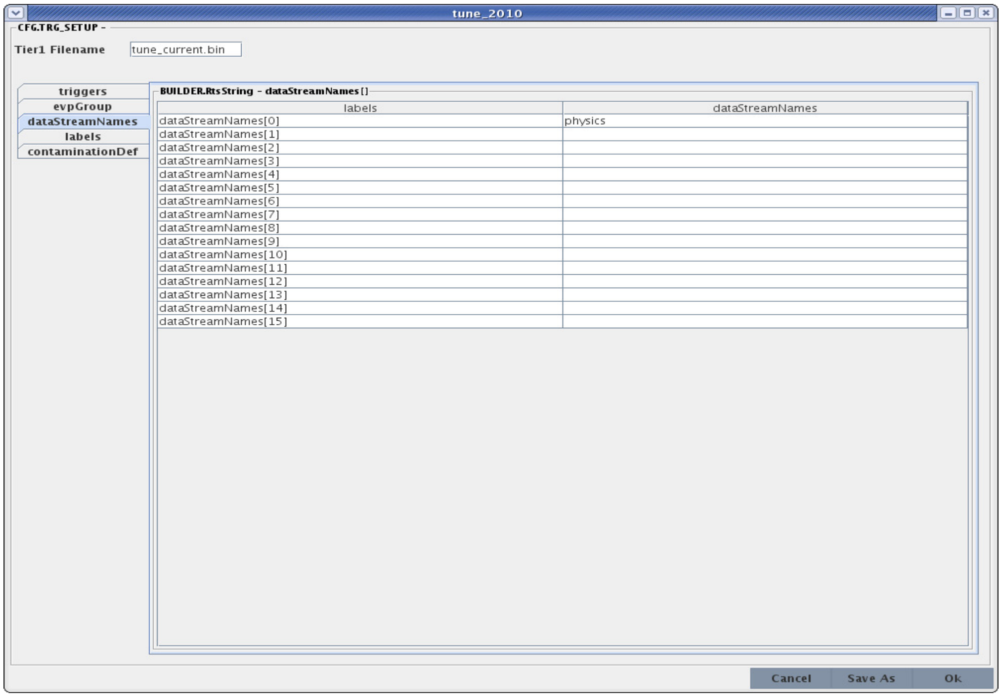
- all – Send all data to the event pool. (Dangerous because the event pool can not handle more than about 30MB/sec)

- normal – Use the “evpGroup configuration” to determine which events are sent to the event pool

Furthermore, the logic is that the value set on the main screen takes precedence over the value on the “contaminationDef” tab, unless the main screen evpPolicy has the value “normal”. If the main screen evpPolicy is “normal”, then the “contaminationDef” policy is used.

The intention here is that the main screen typically will use the evpPolicy “normal”, to defer to the configuration file. However, the user can override this by modifying the policy on the main run control screen.

- **The dataStreamNames tab:**



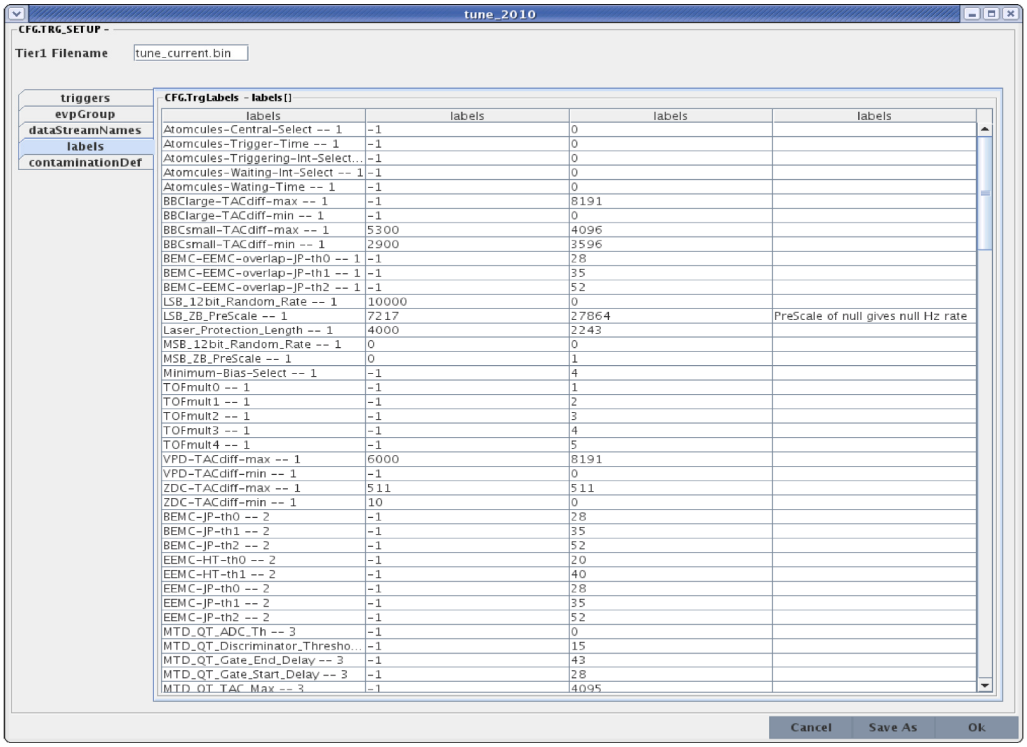
Tier1 Filename: tune_current.bin

BUILDER.RtsString - dataStreamNames[]

labels	dataStreamNames
dataStreamNames[0]	physics
dataStreamNames[1]	
dataStreamNames[2]	
dataStreamNames[3]	
dataStreamNames[4]	
dataStreamNames[5]	
dataStreamNames[6]	
dataStreamNames[7]	
dataStreamNames[8]	
dataStreamNames[9]	
dataStreamNames[10]	
dataStreamNames[11]	
dataStreamNames[12]	
dataStreamNames[13]	
dataStreamNames[14]	
dataStreamNames[15]	

Enter the names for the data streams on this panel. The index in the left column is the index one uses in the “userdata” tab of the trigger configuration to set up an express stream on some trigger.

- **The labels tab:**



Tier1 Filename: tune_current.bin

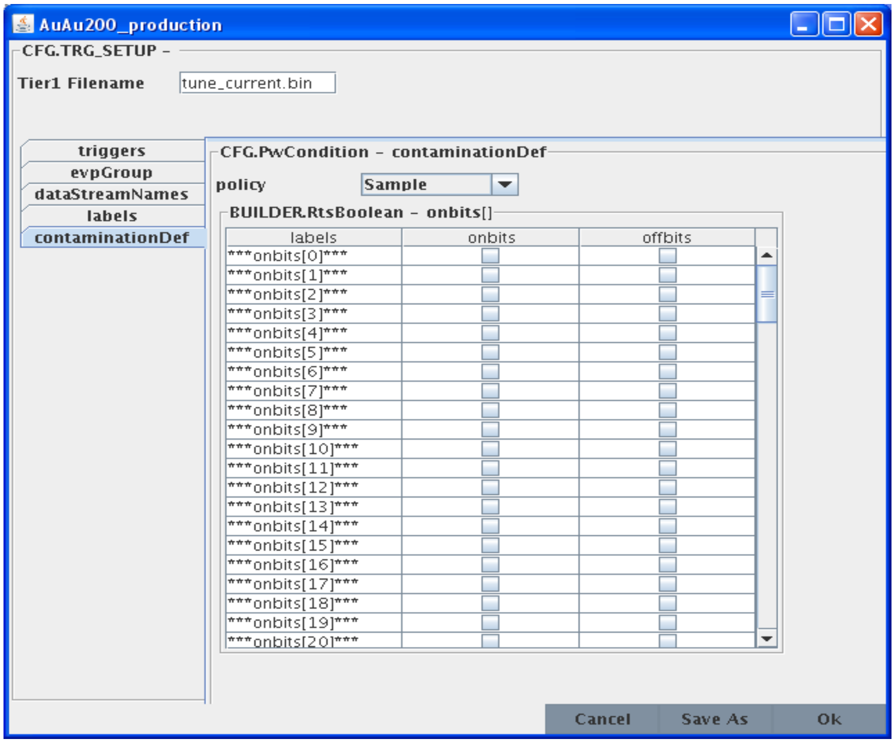
CFG.TrgLabels - labels[]

labels	labels	labels	labels
Atomcules-Central-Select -- 1	-1	0	
Atomcules-Trigger-Time -- 1	-1	0	
Atomcules-Triggering-Int-Select...	-1	0	
Atomcules-Waiting-Int-Select -- 1	-1	0	
Atomcules-Wating-Time -- 1	-1	0	
BBClarge-TACdiff-max -- 1	-1	8191	
BBClarge-TACdiff-min -- 1	-1	0	
BBCsmall-TACdiff-max -- 1	5300	4096	
BBCsmall-TACdiff-min -- 1	2900	3596	
BEMC-EEMC-overlap-JP-th0 -- 1	-1	28	
BEMC-EEMC-overlap-JP-th1 -- 1	-1	35	
BEMC-EEMC-overlap-JP-th2 -- 1	-1	52	
LSB_12bit_Random_Rate -- 1	10000	0	
LSB_ZB_PreScale -- 1	7217	27864	PreScale of null gives null Hz rate
Laser_Protection_Length -- 1	4000	2243	
MSB_12bit_Random_Rate -- 1	0	0	
MSB_ZB_PreScale -- 1	0	1	
Minimum-Bias-Select -- 1	-1	4	
TOFmult0 -- 1	-1	1	
TOFmult1 -- 1	-1	2	
TOFmult2 -- 1	-1	3	
TOFmult3 -- 1	-1	4	
TOFmult4 -- 1	-1	5	
VPD-TACdiff-max -- 1	6000	8191	
VPD-TACdiff-min -- 1	-1	0	
ZDC-TACdiff-max -- 1	511	511	
ZDC-TACdiff-min -- 1	10	0	
BEMC-JP-th0 -- 2	-1	28	
BEMC-JP-th1 -- 2	-1	35	
BEMC-JP-th2 -- 2	-1	52	
EEMC-HT-th0 -- 2	-1	20	
EEMC-HT-th1 -- 2	-1	40	
EEMC-JP-th0 -- 2	-1	28	
EEMC-JP-th1 -- 2	-1	35	
EEMC-JP-th2 -- 2	-1	52	
MTD_QT_ADC_Th -- 3	-1	0	
MTD_QT_Discriminator_Thresho...	-1	15	
MTD_QT_Gate_End_Delay -- 3	-1	43	
MTD_QT_Gate_Start_Delay -- 3	-1	28	
MTD_QT_TAC_Max -- 3	-1	4095	

The labels screen is used to set the trigger parameters for the DSM and QT tree. The first column is the name of the register. The second column is the only column that can be modified, and it corresponds to the value of the register. If this value is "-1" it means to take the default value from the tier1 file. The third column is the default value from the tier1 file. The fourth column is potentially a comment explaining the meaning of the field, or else giving a key to the possible values allowed.

The specific meaning of each register varies with different tier1 files, so see the trigger documentation for the definitions of the registers.

- **The contaminationDef tab:**



Tier1 Filename: tune_current.bin

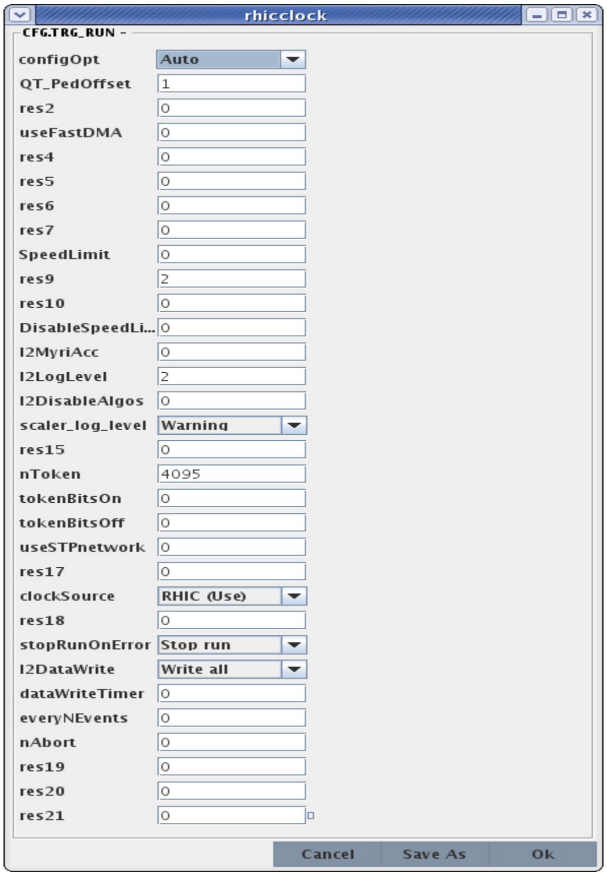
policy: Sample

labels	onbits	offbits
onbits[0]	□	□
onbits[1]	□	□
onbits[2]	□	□
onbits[3]	□	□
onbits[4]	□	□
onbits[5]	□	□
onbits[6]	□	□
onbits[7]	□	□
onbits[8]	□	□
onbits[9]	□	□
onbits[10]	□	□
onbits[11]	□	□
onbits[12]	□	□
onbits[13]	□	□
onbits[14]	□	□
onbits[15]	□	□
onbits[16]	□	□
onbits[17]	□	□
onbits[18]	□	□
onbits[19]	□	□
onbits[20]	□	□

This tab is entirely misleading. The only field that has any effect here is the "policy" field. This the evpPolicy, and is described in the discussion of the "evpGroups" tab.

3. **The TRG_RUN screen**:

Select details for the “TRG_RUN” field on the Run Configuration screen and the following window will appear:



configOpt	Auto
QT_PedOffset	1
res2	0
useFastDMA	0
res4	0
res5	0
res6	0
res7	0
SpeedLimit	0
res9	2
res10	0
DisableSpeedLi...	0
l2MyriAcc	0
l2LogLevel	2
l2DisableAlgos	0
scaler_log_level	Warning
res15	0
nToken	4095
tokenBitsOn	0
tokenBitsOff	0
useSTPnetwork	0
res17	0
clockSource	RHIC (Use)
res18	0
stopRunOnError	Stop run
l2DataWrite	Write all
dataWriteTimer	0
everyNEvents	0
nAbort	0
res19	0
res20	0
res21	0

This screen is used to set up global aspects of the trigger system that have nothing to do with the actual triggers themselves. The meanings of the parameters is as follows:

- **configOpts:** this field determines when DSM/QT code is loaded. The code takes ~>1min to load on startrun, so the best option is “Auto” which loads the code only if the tier1 file changes.

- **speed_limit:** This is the TPC speed limit. If the value is “0”, the speed limit is 750hz. Otherwise the speed limit is taken from this field.

- **disable_speed_limit:** Set this field to disable the TPC speed limit

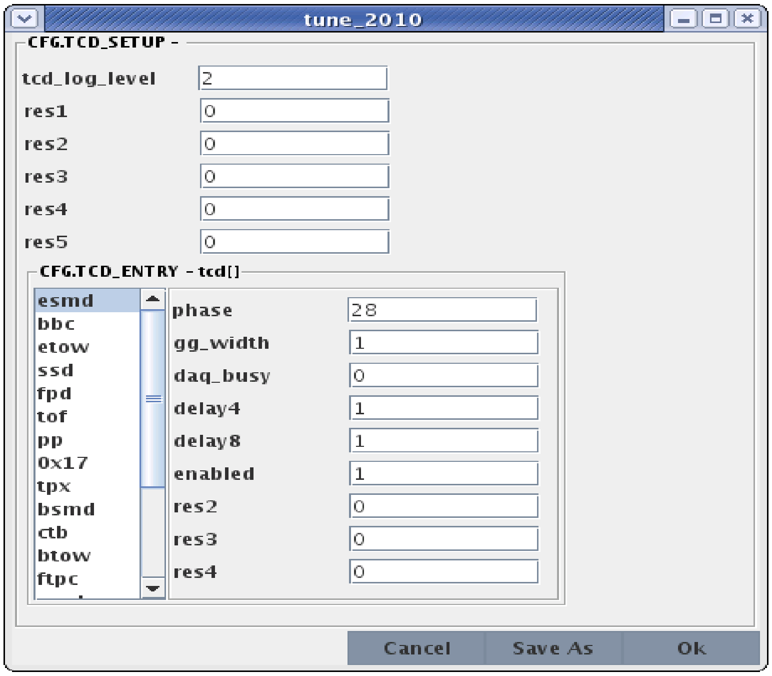
- **nToken:** Sets the number of tokens available to the system (max 4095)

- **tokenBitsOn/tokenBitsOff:** These parameters are bit masks, which allow one to force certain token bits off or on. For example tokenBitsOn=1 → only odd tokens. TokenBitsOff=1 → only even tokens. This has been used in the past to get around hardware cross-talk between token bits.

- **Clock Source:** select whether this configuration should use the RHIC clock or the trigger local oscillator.

4. TCD Setup Screen:

To get the TCD setup screen, press "details" for the TCD_SETUP_name field on the main Run Configuration screen. You should see the following window:



CFG.TCD_SETUP -

tcd_log_level	2
res1	0
res2	0
res3	0
res4	0
res5	0

CFG.TCD_ENTRY - tcd[]

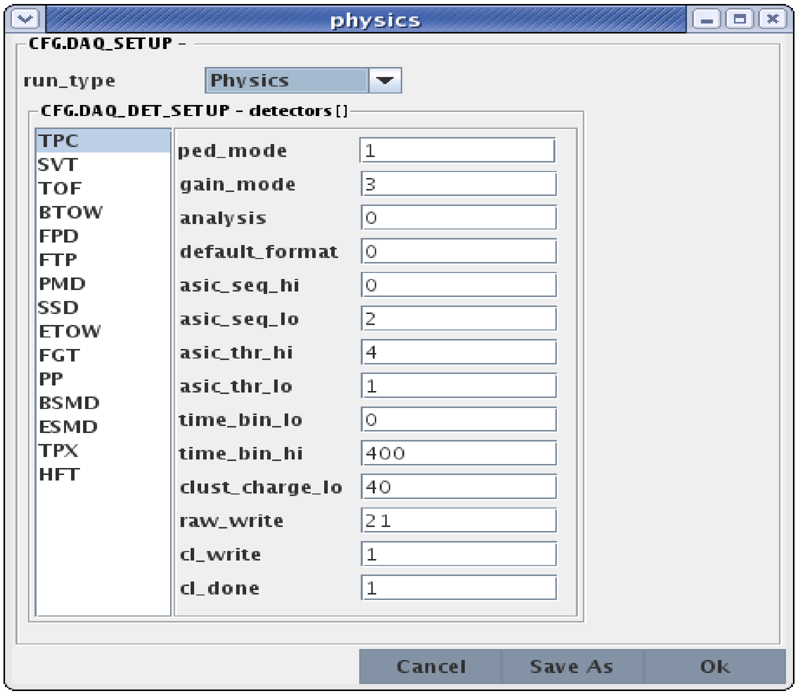
esmd
bbc
etow
ssd
fpd
tof
pp
0x17
tpx
bsmd
ctb
btow
ftpc

phase	28
gg_width	1
daq_busy	0
delay4	1
delay8	1
enabled	1
res2	0
res3	0
res4	0

Here you can select a detector's TCD and set the appropriate TCD parameters. If you change parameters on this screen and intend them to be global remember to select "Change for all configurations" on the confirmation screen.

5. DAQ Configuration Screen:

To get to the DAQ Configuration screen press “details” on the main Run Configuration screen for the “DAQ Configuration” field.



CFG.DAQ_SETUP -

run_type: Physics

CFG.DAQ_DET_SETUP - detectors []

TPC
SVT
TOF
BTOW
FPD
FTP
PMD
SSD
ETOW
FGT
PP
BSMD
ESMD
TPX
HFT

ped_mode	1
gain_mode	3
analysis	0
default_format	0
asic_seq_hi	0
asic_seq_lo	2
asic_thr_hi	4
asic_thr_lo	1
time_bin_lo	0
time_bin_hi	400
clust_charge_lo	40
raw_write	21
cl_write	1
cl_done	1

Here one sets up the daq for each detector. Select on the detector in the list box on the left side. That detectors parameters will appear on the right.

- **run_type:** This parameter describes the general run type. This sets the general actions that DAQ will take.

Run Type	Actions
Pedestal	Do not write out events, only write out a summary at the end. Calculate pedestal values
Pulser	Perform gain calculations
Configuration	Do not read out data. Instead read out pad plane id's for testing
Physics, Laser	Read out data and perform cluster finding
Others	Not used

- **ped_mode**: Set if pedestals should be subtracted

- **gain_mode:** Determines the gain table used.

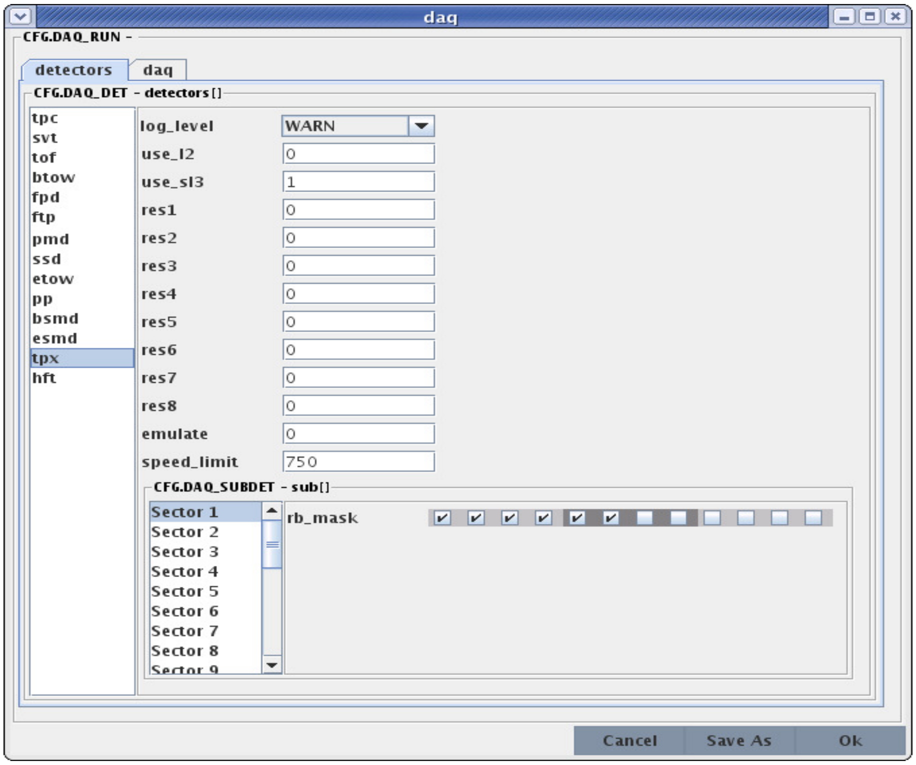
Gain Mode	Action
0	Pedestal: linear gain, above 255 stays 255
1	Seesaw: linear gain, truncate at 8 bits
2	Log: logarithmic gain
3	Corrected: logarithmic gain with gain corrections applied
4	SVT: Svt gains
5	SVT_CORRECTED: Svt gain corrected

- **raw_write:** 1 every “raw_write” events will be written out with full raw data, rather than just clusters.

- **Other:** Additional fields we be available for certain detectors, and have detector dependent meaning.

6. DAQ_RUN screen

To get to the DAQ_RUN screen select “details” for the “DAQ_RUN_name” parameter on the main Run Configuration screen.



log_level	WARN
use_l2	0
use_sl3	1
res1	0
res2	0
res3	0
res4	0
res5	0
res6	0
res7	0
res8	0
emulate	0
speed_limit	750

rb_mask ☑ ☑ ☑ ☑ ☑ ☑ □ □ □ □ □ □

The main parameters to be changed on this screen are the receiver board masks. To modify the receiver board mask, select the detector on from the left list box, then select the appropriate sector (or component) from the bottom list box. The simply click the appropriate RB's in or out of the run.

note If you mask a TPC receiver board, you also need to turn off the power for the TPC RDO. Otherwise, the TPC will read 100% dead.

Note that there are always 12 check boxes, however many RB's a detector may have. They are always counted from the left hand side.

Additionally, there may be other detector specific parameters listed in the fields above the RB masks.