Programming information for the STAR Trigger RCC board

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BOOT CONFIGURATION

RCC boots with:

- -local oscillator clock is passed to strobes
- -local oscillator led is red
- -FPGA_CONFIG led is green
- -delay lines boot with unknown and probably non-zero delay.

DELAY LINE ADDRESS MAPS

The following address map is used to set delay line values via VME reads/writes.

RS Output #	Board address (assuming board base address is 0x1a000000)
1	0x1a000004
2	0x1a000008
3	0x1a00000c
4	0x1a000010
5	0x1a000014
6	0x1a000018
7	0x1a00001c
8	0x1a000020
9	0x1a000024
10	0x1a000028
11	0x1a00002c
12	0x1a000030

The value is selectable from 0 to 255 (0x0 to 0xff) corresponding to a minimum of zero and a maximum of 127.5nS respectively. The delay increments are 0.50nS +/-0.25nS. For example;
To ensure a minimum delay on RS Output # 2, write the value 0x0 to board address 0x1a000008. The data, once written to the address, is readable BUT if no value has been previously written, zero is (incorrectly) returned. This is because the delay lines boot on power-up or reset with a non-zero value but the code initializes to zero.

SWITCHING CLOCKS

There are three possible clock sources for the RCC.
1. RHIC Strobe input (front panel input)
2. Fixed RHIC Strobe input (front panel input)
3. Local Oscillator (Crystal oscillator on the board)

If the selected input of the two front panel inputs has no signal present or if it misses two consecutive ticks, the RCC will automatically switch to the local oscillator and pass that output to the RCF system.

To switch to a specific clock WITH automatic switching on two-tick errors (see ERRORS below) use the following procedure:
1) Write one of the following three (hex) values to address 0x1a000040 (board base address + 0x40):

address	value

0x1a000040	0x0100	for local oscillator, ~9.216 MHz
0x1a000040	0x0200	for fixed RHIC clock
0x1a000040	0x0300	for RHIC clock.

2) After a minimum of 1uS, reset corresponding error flag by writing one of the following (hex) values:

address	value	
0x1a000044	0x0100	to reset RHIC fatal error and LED
0x1a000044	0x0200	to reset RHIC warning error and LED
0x1a000044	0x0300	to reset fixed RHIC fatal error
0x1a000044	0x0400	to reset fixed RHIC warning error
0x1a000044	0x0500	to reset both clock errors and LEDs (equivalent to all of the above)

3) Write any value to the board address 0x1a00004c to reset the board clocks to the correct phase.

DO NOT PUT THE TRIGGER SYSTEM INTO RUN MODE UNTIL ALL THREE OF THESE STEPS HAVE BEEN COMPLETED.

The three top front panel LEDs indicate which clock is currently driving the strobes. From top to bottom they are RHIC, fixed RHIC and local oscillator respectively. The two RHIC clocks' LEDs are green when on and the local oscillator LED is red. Error LEDs are lighted on an error.

To switch to a specific clock WITHOUT automatic switching on two-tick errors (see ERRORS below) use the following procedure:
1) Write one of the following three commands:

address	value	
0x1a000040	0x0100	for local oscillator, ~9.216 MHz (as above)
0x1a000040	0x0500	for fixed RHIC clock
0x1a000040	0x0400	for RHIC clock.

This override option allows the RHIC or fixed RHIC clock to be selected even though errors may be present or if no clock exists at all. One should be careful using this mode since if one switches to a source with no clock present and without automatic switching on errors, a possibly erratic signal with indeterminate frequency could be passed to the outputs

ERRORS

On a RHIC clock or fixed-RHIC-clock fatal error, defined as the loss of two clock ticks, the board automatically switches to the local oscillator. It will remain on local oscillator even if the clock is restored. In addition, the fatal error LED is illuminated.

To switch back to the appropriate clock, reset error flag per step 2 in the SWITCHING CLOCKS section above. Doing so will automatically switch to the selected clock, making step 1 in the SWITCHING CLOCKS section unnecessary. If you do not wish to auto switch, command a switch to another (say local oscillator) clock before resetting error. (Do this even if already in local oscillator mode) AFTER ANY SWITCHING OF CLOCKS ONE MUST RESET THE BOARD CLOCKS BY WRITING ANY VALUE TO BOARD ADDRESS 0x1a00004c.

--When overriding automatic switching, errors and error LEDS are ignored.

STATUS REGISTER

To read the status register, read board address 0x1a000048. The error status is valid ONLY FOR THE SELECTED CLOCK. That is, if you have selected the RHIC clock as the clock passed by the RCC, bits 4 and 5 of the status register are valid, but bits 6 and 7 are NOT. When reading the status register the board is outputting the local oscillator WHENEVER bit 1 = 1, regardless of the status of bit 0.

status register bit	indicates
0	0 if RHIC clock selected or =1 if fixed RHIC clock selected, and bit 1=0.
1	1 if local oscillator selected, =0 if RHIC or fixed RHIC clock is selected.
2	not used
3	not used
4	1 on RHIC clock (two tick) fatal error
5	1 on one (tick) RHIC clock error
6	1 on fixed RHIC clock (two tick) fatal error
7	1 on one (tick) fixed RHIC clock error
8-15	not used

Address Halt Out

add_halt_out is clocked by selected_clk (the selected board clock) and equals add_halt_in (from the TCUI). It retains its value until overwritten.
Read address 0x1a000034 for current value. Bit 0=1 when add_halt_in=1 and =0 when add_halt_in=0.
The default is 1.

Address latch

--Write to bit 0 of board address 0x1a000038.
--Default is 1.
--The pulse lasts 3 clock ticks or about 330nS.

Run/Stop

To read or write to run_stop, use board address 0x1a00003c. Bit 0 reads 0 when run_stop=0 and 1 when run_stop=1.
run_stop is clocked by (and therefore synchronous with) the same signal that drives board_clk. Of course, the board_clk(s) are subsequently routed through delay lines whereas run_stop is not. The run/stop is latched on the RCF to be distributed synchronously with the RHIC strobe.
It retains its value until overwritten.
The default is l.