## Specific Configuration of the control_set_opt_threshold and Other Comprehensive Parameters Resulted in Inversion Operation Error

I encountered an inconsistency while using Vivado in non-project mode. Here are the details:

My system is Linux, and I'm using Vivado version 2023.1. While working in non-project mode, during synthesis, I opted for a non-default synthesis flow and adjusted various synthesis settings. Specifically, I used the following synthesis command:“synth_design -top top -flatten_hierarchy none -gated_clock_conversion on -bufg 14 -directive AreaMapLargeShiftRegToBRAM -fsm_extraction gray -resource_sharing off -control_set_opt_threshold 12 -shreg_min_size 6 -max_bram 6 -cascade_dsp tree -incremental_mode quick -no_srlextract -no_lc -assert”.

The intention was to enhance synthesis efficiency by utilizing the quick incremental mode. However, these changes should not affect code consistency. Nevertheless, after synthesis, an error occurred in the inversion operation, impacting the assignment of reg41 (line 566 in the attached rtl.v file). This issue subsequently led to signal inconsistencies observed during simulation.

To accurately reproduce and pinpoint the root cause of this problem, I decided to provide a more detailed description of the steps I executed:

1.The files vivado.tcl and new_vivado.tcl are scripts used for synthesis and simulation with default and modified synthesis parameters, respectively.

2.The testbench.v file references files like cells_cmos.v and cells_cyclone_v.v, which I have attached.

3.I opened a terminal on the Linux system and executed the commands "vivado -mode batch -source vivado.tcl" and "vivado -mode batch -source new_vivado.tcl".

By executing the above commands directly in the terminal, it's evident that there's a discrepancy in the middle portion of the simulation result's fourth line, with "0100" and "0000" appearing differently. The terminal output is shown in the screenshot below:

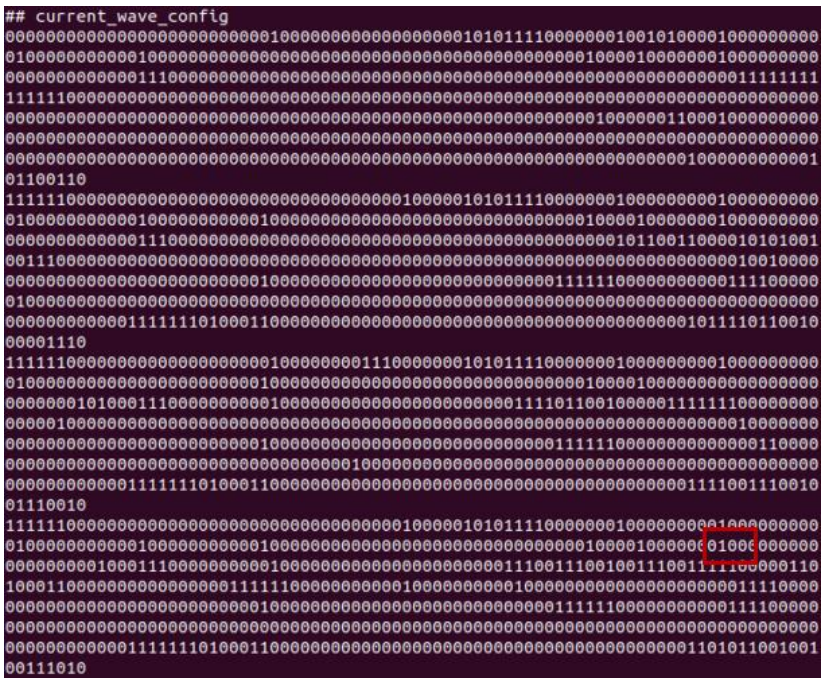


Figure 1: Before Modification

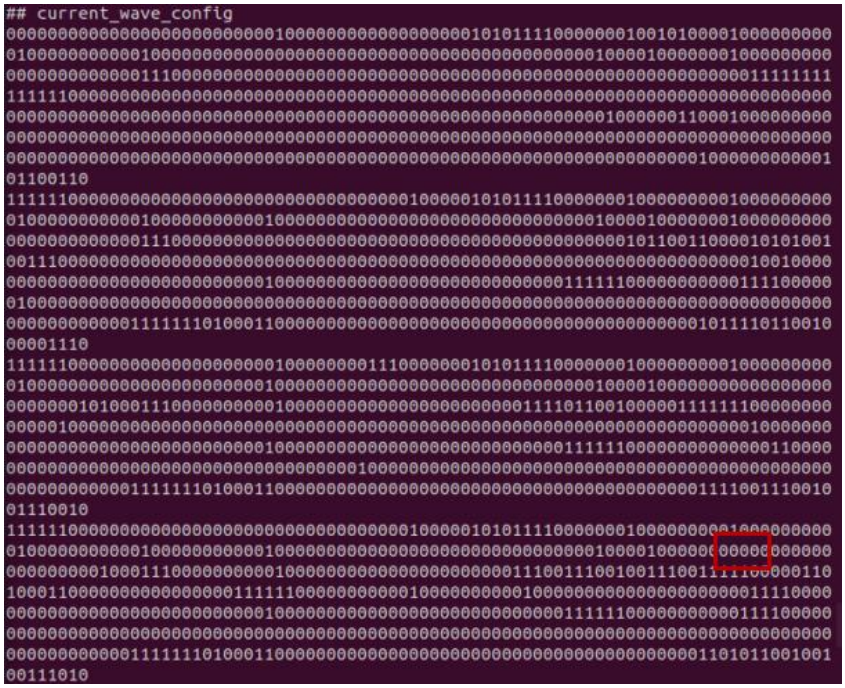


Figure 2: After Modification