

## Detailed Solution for Stratix III Error Detection (ED) CRC MLAB Issue

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### Introduction

This document provides details on how to determine if your design is affected by the Stratix III ED CRC MLAB issue and how to work around the problem, including using the Quartus II patch to automatically convert from MLAB RAM type to other memory types. Refer to the Solutions web page for the recommended flow as well as the script and Quartus II patches.

### Determining if your design is affected

To determine if the ED CRC feature and MLAB RAMs are used in your design, download the script `mlab_with_crc.tcl` (refer back to the Solutions web page) and run it from the command line. Make sure to use the version of the Quartus `quartus_cdb` command that the design was compiled with. The script automatically detects if the ED CRC feature and MLAB RAMs are used. MLAB ROMs are not affected, so they are ignored by the script.

Usage: `quartus_cdb -t mlab_with_crc.tcl <project name> -c <revision name>`

Sample output:

#### Design 1 (no MLAB RAM or ED CRC disabled)

Info: Your design does not contain MLAB RAM blocks, or Error Detection CRC is disabled.

#### Design 2 (MLAB RAM and ED CRC enabled)

Warning: Your design contains MLAB RAM blocks, and Error Detection CRC is enabled. The Error Detection CRC feature may cause MLAB RAM blocks to operate incorrectly in Stratix III devices. Refer to the submessages for the list of MLAB RAMs.

Info:

```
altshift_taps0:inst_shiftreg|altshift_taps:altshift_taps_component|shift_taps_q1s:aut  
o_generated|dpram_1ee1:dpram2|ALTDPRAM_INSTANCE
```

Alternatively, you can perform a quick manual check instead of using the script to determine if both the ED CRC feature and MLABs are used in the design. Note this manual check does not distinguish between MLAB RAMs or ROMs.

To check if the ED CRC feature is enabled, in the Quartus II software menu, go to the **Assignments, Settings, Device and Pin Options**, and **Error Detection CRC** tab. If the **Enable error detection CRC** box is checked, then ED CRC is used in the design (Figure 1).

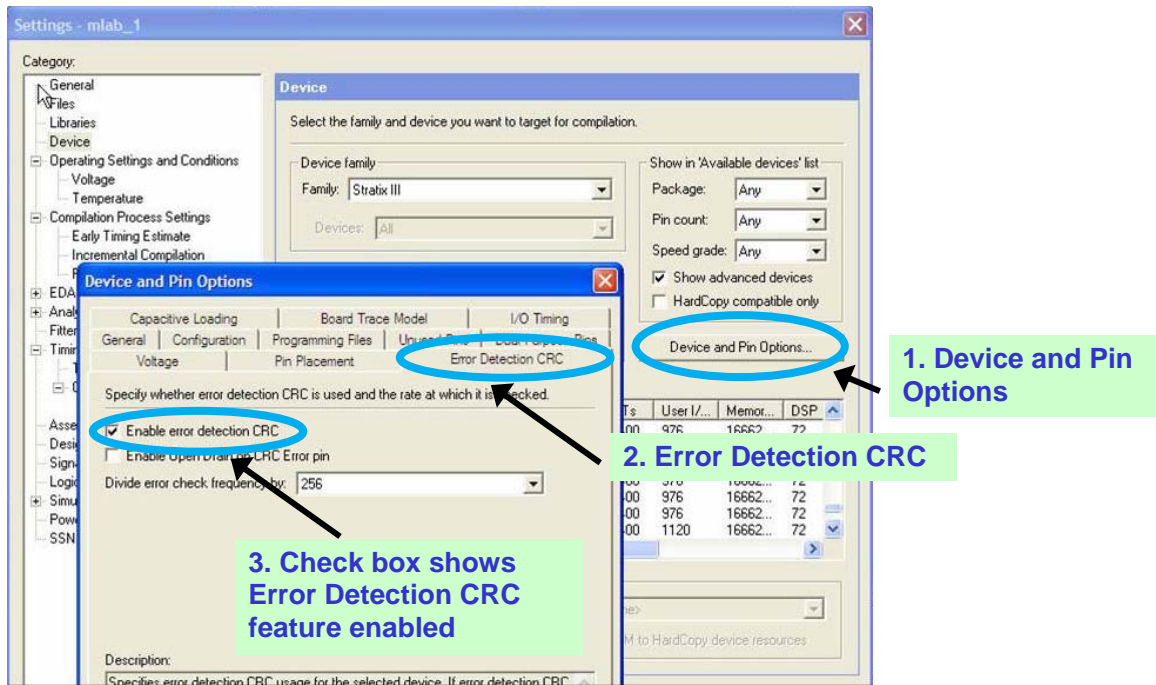


Figure 1. Checking the Quartus setting for ED CRC usage.

To check if MLABs are used in the design, go to the **Compilation Report** and look under the **Fitter** section. Under **Resource Section** and **Resource Usage Summary**, if **Memory ALUTs** is non-zero, then MLAB RAMs and ROMs are used in the design. Also, check under **RAM Summary**, all instances of MLAB RAMs and ROMs are listed. See Figure 2.

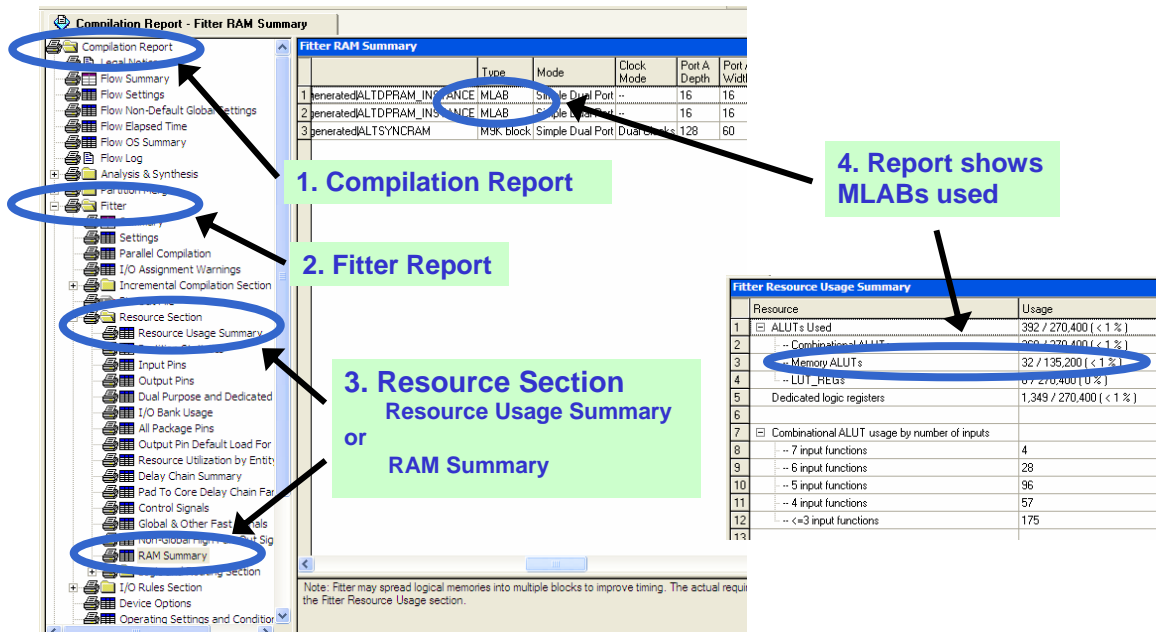


Figure 2. Checking Fitter Report for MLAB usage.

To be certain if your design is affected by the ED CRC MLAB problem, run the script described above.

## Resolving the problem and using the patch

To resolve the problem, the simplest workaround is to disable the ED CRC feature and recompile the design. Go to the **Assignments, Settings, Device and Pin Options**, and **Error Detection CRC** tab. Uncheck the **Enable error detection CRC** box and recompile your design (Figure 3). If recompilation is not possible, you may request a script from Altera to disable the ED CRC feature.

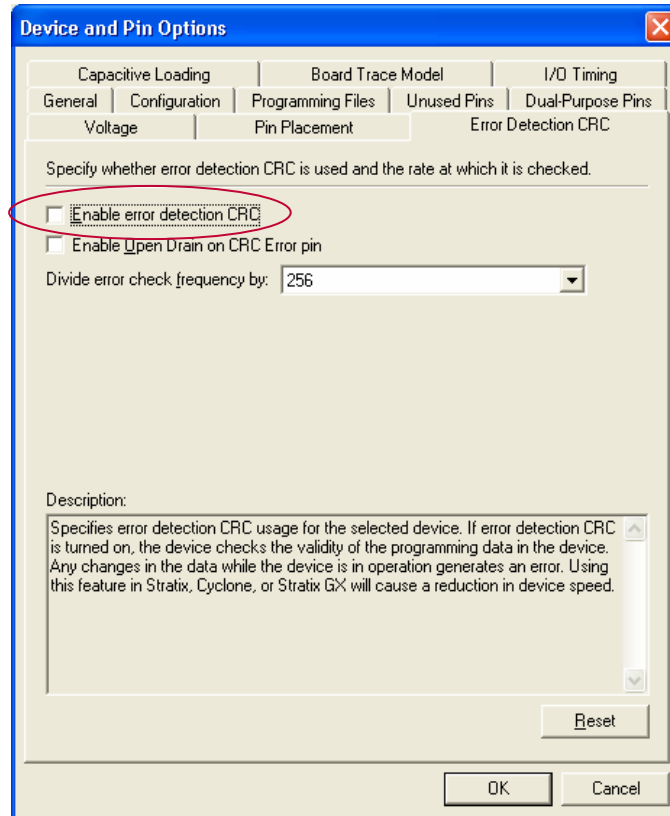


Figure 3. Disabling the ED CRC feature.

If the ED CRC feature is required, then the MLABs need to be converted to other memory types. Altera strongly recommends that you directly update the MLAB to other memory types in the megafunctions, IPs, and MegaCores if possible and recompile your design. In the MegaWizard or IP where the megafunction is generated, select the M9K, M144K, or Logic Cells (LCs) memory block type (Figure 4). This step ensures that the design will be implemented more efficiently.

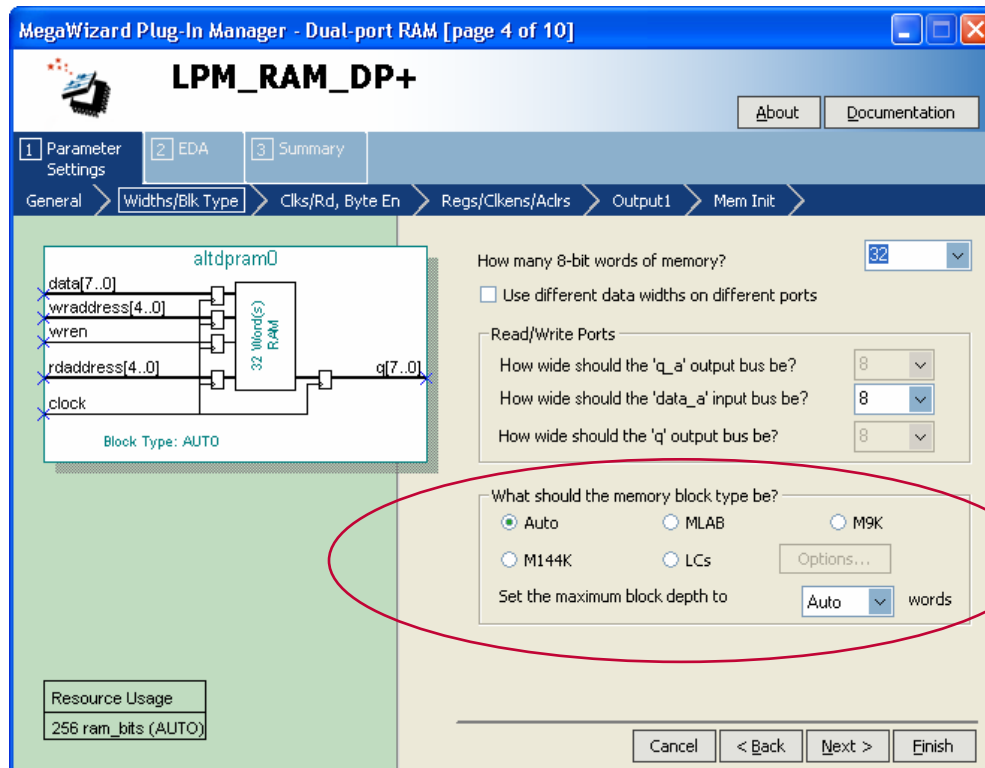


Figure 4. Selecting other memory block types instead of MLAB

If manual update is not possible, download and install the Quartus II 8.1 or Quartus II 9.0SP1 patch (refer back to the Solutions web page). A patch installation is not required for later versions of the Quartus II software, but a QSF assignment is still required to apply the patch. During compilation the patch automatically converts all MLAB RAM usage to M9K, M144K, or LCs. Note the patch will not convert MLAB ROM instances.

To apply the patch, add the following assignment to the QSF file:

```
set_global_assignment -name DISABLE_MLAB_RAM_USE ON
```

The following additional settings help in the MLAB conversion process:

a) Fitter setting

From the Quartus II menu, click on **Assignments, Settings, Fitter Settings, and More Settings**. In the **More Fitter Settings** dialog box, set the following:

Set "Auto RAM to MLAB Conversion" to "Off" (Figure 5).

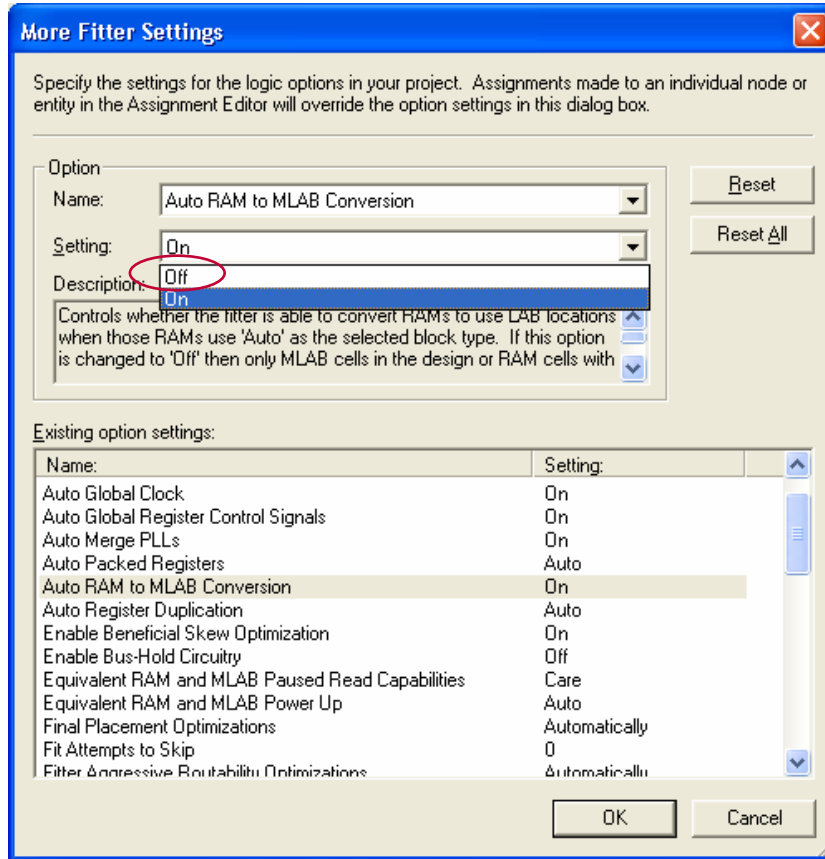


Figure 5

Set "Equivalent RAM and MLAB Paused Read Capabilities" to "Don't Care" (Figure 6).

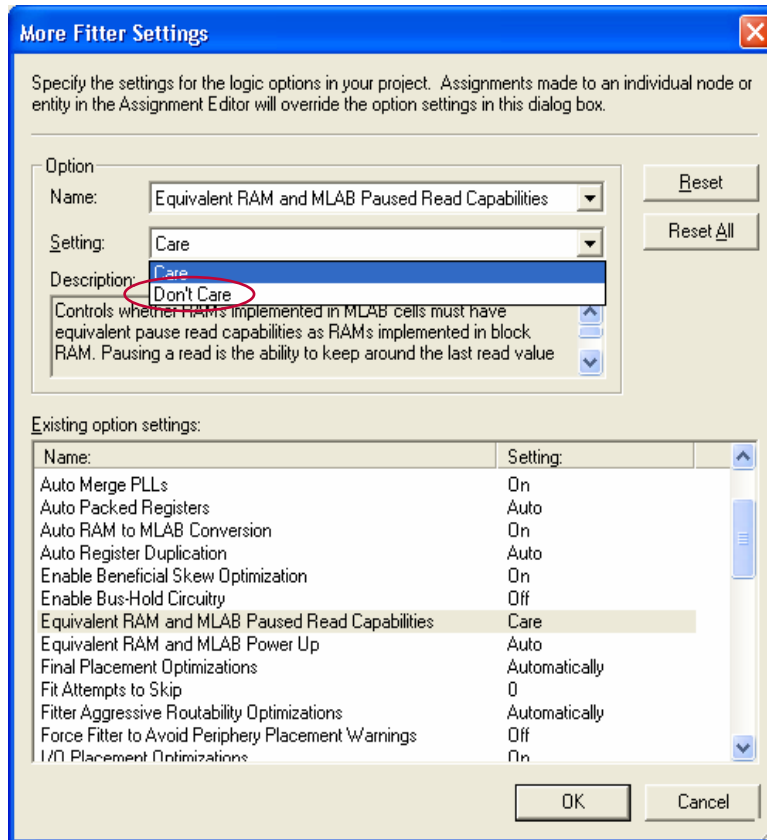


Figure 6

Set "Equivalent RAM and MLAB Power Up" to "Don't Care" (Figure 7).

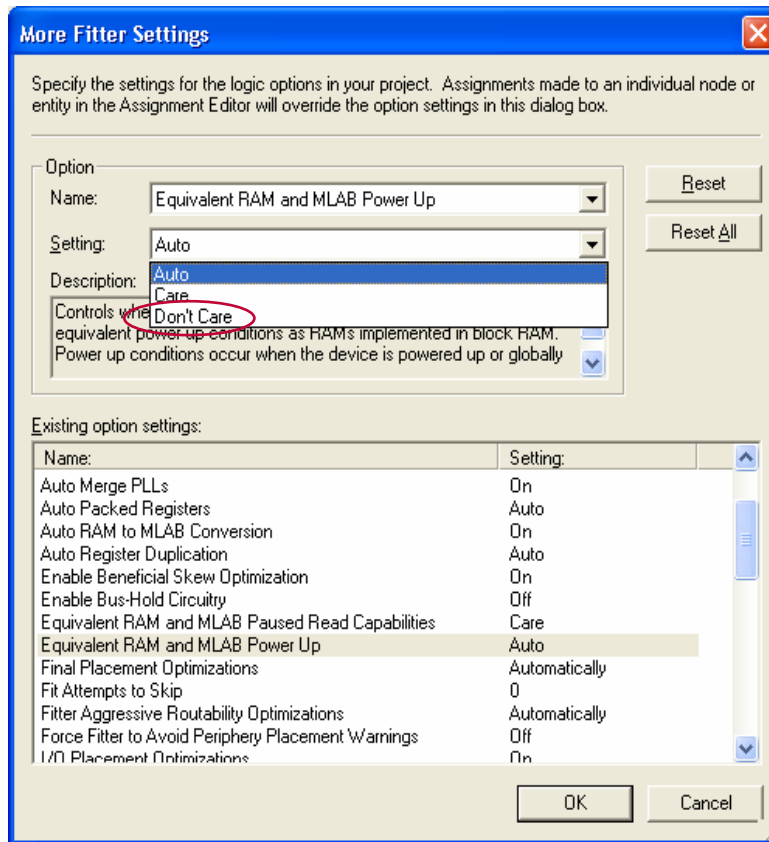


Figure 7

## b) Analysis and synthesis setting

From the Quartus II menu, click on **Assignments, Settings, Analysis & Synthesis Settings**, and **More Settings**. In the **More Analysis & Synthesis Settings** dialog box, set the following:

Set “Auto RAM to Logic Cell Conversion” to “On” to prevent M9K/M144K overuse in order to fit design (Figure 8).

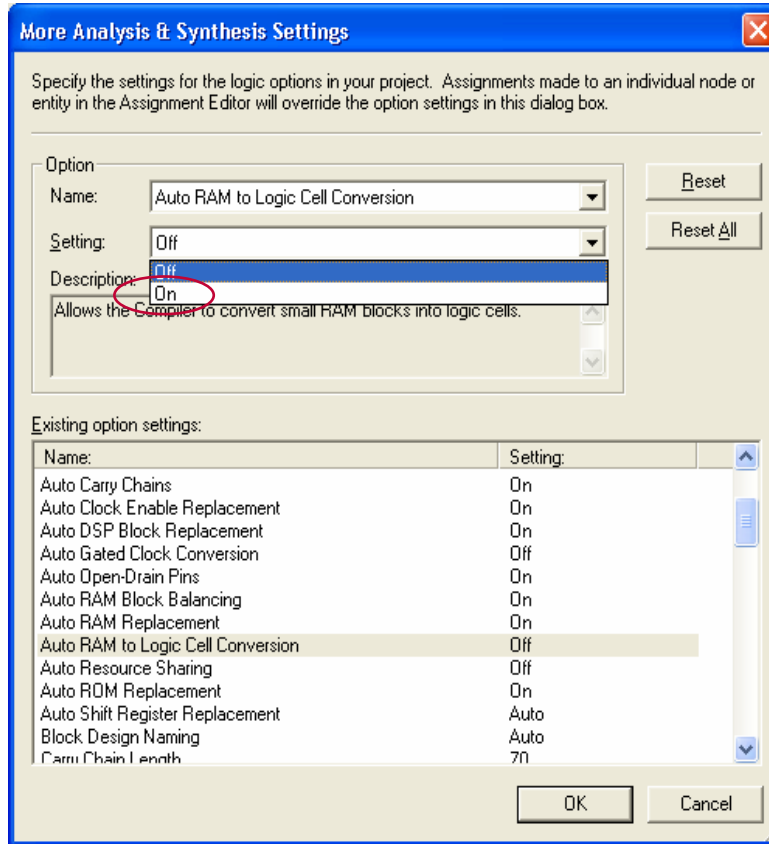


Figure 8

In rare cases, a compilation error may occur if the automatic conversion cannot be done because the MLAB memory type is hard-coded. If you encounter this situation, avoid hard-coding the memory type in the design.

In the case where there are not enough memory resources available to convert from MLAB to other memory types, please contact Altera for further support.