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April 1\textsuperscript{st}, 2010
Renesas Electronics Corporation

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1. **Abstract**
   
   This document describes the protect operation.

2. **Introduction**
   
   The application described in this document applies to the following MCU:
   
   - MCU: R32C/118 Group

   This program can be used with other R32C/100 Series MCUs which have the same special function registers (SFRs) as the R32C/118 Group. Check the manual for any additions or modifications to functions. Careful evaluation is recommended before using this application note.
3. **Explanation of the Application Example**

The protect function protects important registers from being unintentionally rewritten due to a program runaway. After deasserting the protect, protected registers can be rewritten.

After setting the PRC2 bit in the PRCR register to 1 (write enabled), when writing to an arbitrary address, the bit becomes 0 (write disabled). Rewrite registers PLC0, PLC1, PD9, and P9_iS (i = 0 to 7) with the instruction immediately after setting the PRC2 bit to 1. Do not generate an interrupt or perform DMA transfer in between setting the PRC2 bit to 1 and the next instruction. Regardless of writing to arbitrary addresses, bits PRC0, PRC1, PRC27, and PRC31 will not become 0, and must be set to 0 by the user.

When data does not need to be written to registers protected by the PRR register, in order to protect registers from being unintentionally written to, write a value other than AAh to the PRR register.

<table>
<thead>
<tr>
<th>Table 3.1 The Protect Register and Protected Registers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect Register</td>
</tr>
<tr>
<td>PRCR</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>PRCR2</td>
</tr>
<tr>
<td>PRCR3</td>
</tr>
<tr>
<td>PRR</td>
</tr>
</tbody>
</table>
4. Setting

This section shows the procedures and values to set the example in chapter 3, “Explanation of the Application Example”. Refer to individual MCU hardware manuals for details on individual registers.

4.1 Using the PRC0 bit to change the protected registers

(1) Protect deasserted (write enabled).

<table>
<thead>
<tr>
<th>Protect Register (PRCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b7 b6 b5 b4 b3 b2 b1 b0</td>
</tr>
<tr>
<td>1 1 1 1 1 1 1 1</td>
</tr>
</tbody>
</table>

PRC0 Protect Bit 0 (Write Enabled for Registers CM0, CM1, CM2, and PM3)
1: Write enabled

(2) Set the CM0, CM1, CM2, and CM3 registers.

(3) Set the protect (write disabled).

<table>
<thead>
<tr>
<th>Protect Register (PRCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b7 b6 b5 b4 b3 b2 b1 b0</td>
</tr>
<tr>
<td>1 1 1 1 1 1 1 0</td>
</tr>
</tbody>
</table>

PRC0 Protect Bit 0 (Write Enabled for Registers CM0, CM1, CM2, and PM3)
0: Write disabled

4.2 Using the PRC2 bit to change the protected registers

(1) Protect deasserted (write enabled).

<table>
<thead>
<tr>
<th>Protect Register (PRCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b7 b6 b5 b4 b3 b2 b1 b0</td>
</tr>
<tr>
<td>1 1 1 1 1 0 0 0</td>
</tr>
</tbody>
</table>

PRC2 Protect Bit 2 (Write Enabled for Registers PLC0, PLC1, PD9, and P9_iS (i = 0 to 7))
1: Write enabled

Do not generate an interrupt or perform DMA transfer in-between setting the PRC2 bit to 1 and the next instruction.

(2) Set the PLC0, PLC1, PD9, and P9_iS (i = 0 to 7) registers.

After setting the PRC2 bit to 0, by writing to an arbitrary register, the bit becomes 0.
4.3 Using the PRR register to change the protected registers

(1) Protect deasserted (write enabled).

<table>
<thead>
<tr>
<th>b7</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAh</td>
<td></td>
</tr>
</tbody>
</table>

Protect Deassert Register (PRR)

--- b7 to b0 Control protection for registers CCR, FMCR, PBC, FEBC0, FEBC3, EBC0 to EBC3, CB01, CB12, and CB23. AAh: Write enabled

(2) Set the CCR, FMCR, PBC, FEBC0, FEBC3, EBC0 to EBC3, CB01, CB12, and CB23 registers.

(3) Enable the protect function (write disabled).

<table>
<thead>
<tr>
<th>b7</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>00h</td>
<td></td>
</tr>
</tbody>
</table>

Protect Deassert Register (PRR)

--- b7 to b0 Control protection for registers CCR, FMCR, PBC, FEBC0, FEBC3, EBC0 to EBC3, CB01, CB12, and CB23. Value other than AAh: Write disabled
5. **Sample Program**

A sample program can be downloaded from the Renesas Technology website.

6. **Reference Documents**

- **Hardware Manual**
  R32C/118 Group Hardware Manual Rev.1.00
  The latest version can be downloaded from the Renesas Technology website.

- **Technical Update/Technical News**
  The latest information can be downloaded from the Renesas Technology website.

- **C Compiler Manual**
  R32C/100 Series C Compiler Package Ver. 1.02 Compiler User’s Manual Rev. 1.00
  The latest version can be downloaded from the Renesas Technology website.
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Renesas Technology Website
http://www.renesas.com/

Inquiries
http://www.renesas.com/inquiry
csc@renesas.com

<table>
<thead>
<tr>
<th>REVISION HISTORY</th>
<th>Protect Operation</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Date</td>
</tr>
<tr>
<td>Page</td>
<td>Summary</td>
</tr>
<tr>
<td>1.00</td>
<td>Mar. 5, 2010</td>
</tr>
</tbody>
</table>

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