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How the ROMON Bit Behaves on the E Series HC11 MCUs

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Introduction

The functionality and differences in the functionality of the ROMON bit in the HC711E9 and HC711E20 microcontrollers (MCU) are discussed in this engineering bulletin. Although all 68HC11 Family parts are designed with full code compatibility in mind, bits may vary slightly due to customer-specific requirements in the CONFIG register. As a rule of thumb, however, the configuration bits should be similar from series to series within the family, having only slight differences.

General Information

The ROMON bit is responsible for mapping the on-board ROM or EPROM into the standard 64-K addressing range.

When set to a 1, this bit causes the ROM/EPROM to be present in the memory map, and when cleared to a 0, ROMON causes the ROM/EPROM to be removed from the memory map.

In single-chip mode, internal logic on the HC711E20 (mask set D43R) and the HC711E9 is responsible for forcing the bit to a 1 and mapping the ROM/EPROM into the memory map. For the HC711E20 mask set 3G59F, however, a 1 must be programmed.

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Verification

To verify the operation of the ROMON bit, a 4-step process, which is outlined at the end of this section, can be used. To perform the verification, either the SPGMR11 (a Motorola serial programmer which runs PROG11) or the M68HC711PGMR board running PCBUG11 can be used. Both of these methods allow the user to program the MCU's OTP or EPROM. This step is required to place a small program inside the OTP and to show proper fetching of the reset vector. After program storage, a reset is initiated. If the proper reset vector contains the correct starting address of the OTP, PORTB will toggle. But if the mapping was done incorrectly, the processor will be lost and will never toggle the port.

For step-by-step instructions on programming the E series of MCUs with the M68HC711E9PGMR, refer to *Simplify MC68HC711E9EPROM Programming with PCBUG11 and the M68HC711E9PGMR Board,* Engineering Bulletin185, Motorola document order number EB185/D.

The CONFIG register on the 68HC11 is an EEPROM-based cell. Once programmed, this value will be latched into the CONFIG register and used for operation during reset. To verify the ROMON bit's functionality, the ROMON bit must be cleared and the MCU placed in single-chip mode.

For a step-by-step procedure for programming the CONFIG register, refer to steps 2 through 7 in the Engineering Bulletin titled *Enabling the Security Feature on MC68HC811E2 Devices with PCbug11 on the M68HC711E9PGMR,* Motorola document order number EB188/D.

Step 1

Program the EPROM with the Toggle.asm program shown here. The reset vector should point to the program's starting address. The ROMON bit should be set to a 1, and the MCU must be in single-chip mode. This step can be accomplished by programming the CONFIG register with hexadecimal value $0F in bootstrap mode with this code.

```
Toggle.asm
       org    $D000    ;/* start s record at D000*/
Start  lds    #$1ff    ;/* set stack pointer to top of RAM*/
       ldaa   #$ff     ;/* load accumulator A with $ff*/
again  staa   portb    ;/* turn on all ports*/
```

```
clr     portb    ;/* turn off all ports*/
bra     again
org     $FFFE    ;/* load reset vector at FFFE*/
fdb     Start    ;/* with D000*/
```

Step 2 After the CONFIG register is programmed, MODA must be pulled high through a 4.7-KΩ resistor, and MODB must be pulled directly to ground for the part to come up in single-chip mode after reset. If PORTB is toggling after reset, proceed to step No. 3. But if there is no toggling, make sure the CONFIG register or the EPROM has been programmed properly.

Step 3 Now the ROMON bit will be programmed to a logic level 0, and the CONFIG value can be a hexadecimal $0B. This step must be performed while the part is in bootstrap mode.

Step 4 After the CONFIG register is programmed, MODA must be pulled high through a 4.7-KΩ resistor, and MODB must be pulled directly to ground for the part to come up in single-chip mode after reset. If PORTB is toggling after reset, the part is forcing the ROMON bit to a logic level 1 when placed in single-chip mode.

Summary

On the HC711E9, the ROMON bit is forced to a logic level 1 in single-chip mode.

The HC711E20 with mask set D43R will exhibit the same behavior; however, mask set 3G59F for that device does not force the ROMON bit to logic 1 in single-chip mode. The only work around for this problem is to have the ROMON bit programmed to a 1 for every 3G59F device used in single-chip mode.

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