Chapter 16

Motorola MC68HC11 Family MCU Architecture

Lesson 6

Using System Timing Devices for PWM outputs

Pulse Width Modulation by Using OCs

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- **Free running counter TCNT 16-bits**

- **A PWM action is obtained by writing 0 at a preset time and then rewrite 1 at an OCx pin and repeatedly cycle 0 and 1 for the preset periods**

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Start Cycle

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Define OCx pins for 2, 3, 4, or 5 as PWM and set output level and action-mask bits for OC2 to OC5

By a write OL-OM operation, define the level (0) and mask output pin action are defined for timer reading out compare output action (s) on selected pin(s) between OC2 to IC5
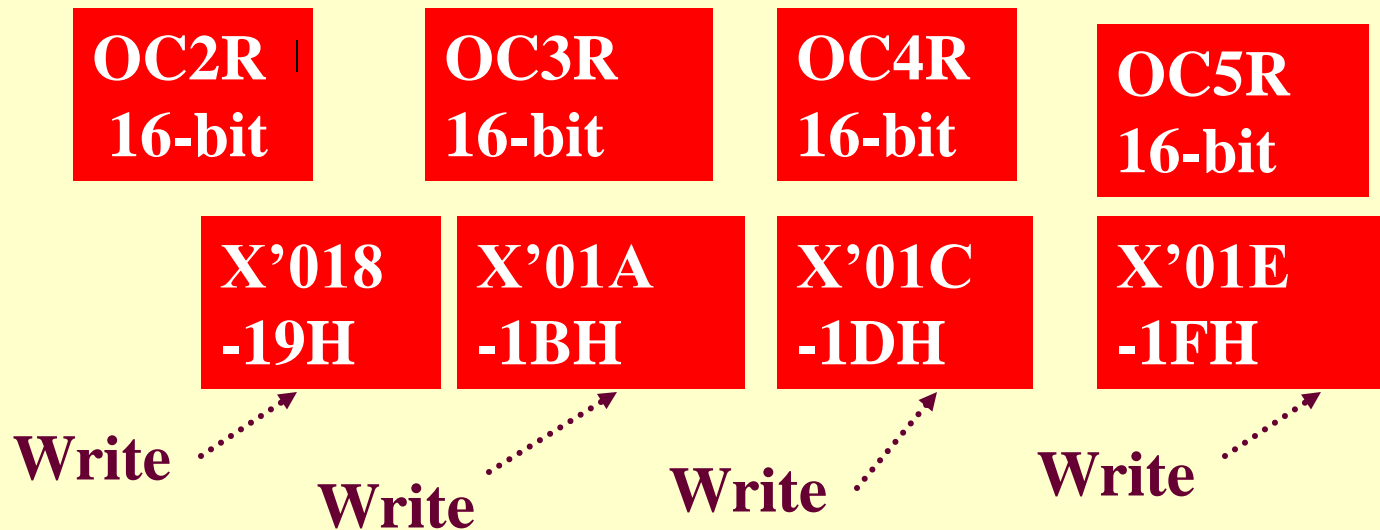
Write

TCTL1 8-bits
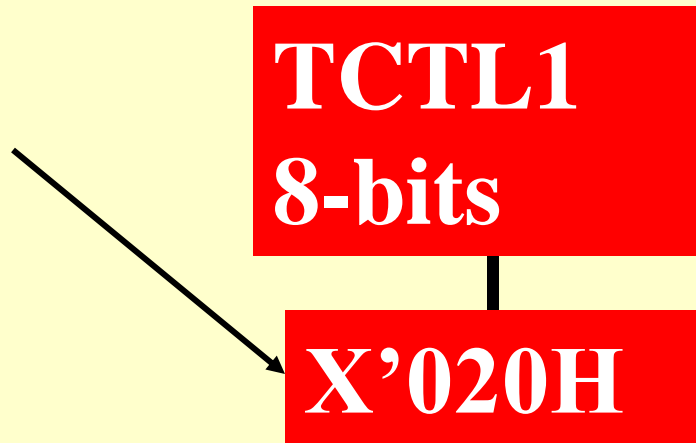
X'020H

OL5-OM5, OL4-OM4 OL3-OM3 OL2-OM1, bits at TCTL1 at x'020H

Write Registers for preset Time TCNT instance (s) on an Out-Compare (s) output = 0 at pin between OC2 to OC5 pins

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OC2R 16-bit	OC3R 16-bit	OC4R 16-bit	OC5R 16-bit
X'018 -19H	X'01A -1BH	X'01C -1DH	X'01E -1FH

Write   **Write**   **Write**   **Write**

An output OC pin (s) action and (or) interrupt (s) when timer 16-bit reading compares equal with the an out-compare register 16-bits on an Interrupt
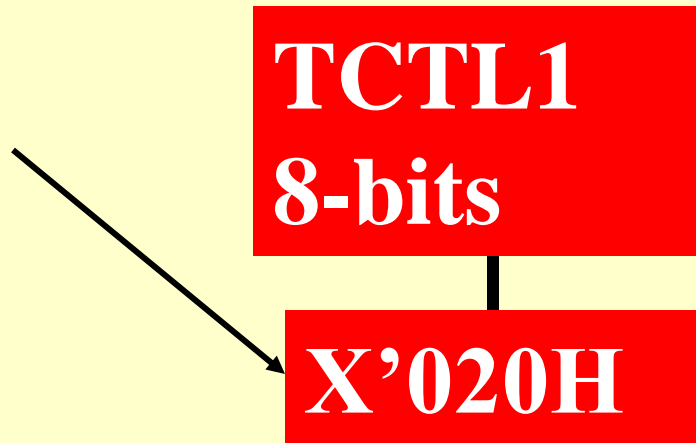
X' four bits are as per init register

Define PWMx interrupt-mask bits for OC2 to OC5 Pins for PWM output 2 to 5

By a write operation, <u>mask or unmask interrupt</u> action (s) for a compare for the OC2 to OC5

OC5I,OC4I, OC3I, OC2I, bits at TMSK1

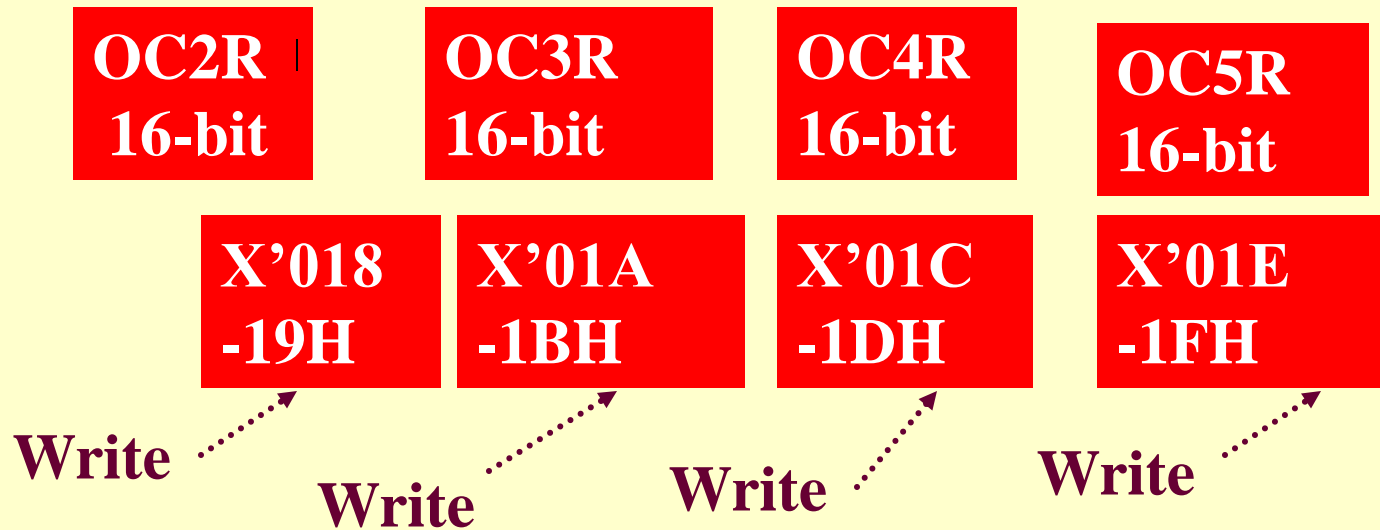**TMSK1 4-bit**

Write

X'022H

By a write OL-OM operation,   define the level (0) and mask output pin action are defined for timer reading out compare output action (s) on selected pin(s) between OC2 to IC5

Write

TCTL1 8-bits

X'020H

OL5-OM5, OL4-OM4 OL3-OM3 OL2-OM1, bits at TCTL1 at x'020H

Rewrite Registers for preset Timing Instance (s) at TCNT on an Out-Compare (s) output = 1 at pin between OC1 to OC5 pins

OC2R 16-bit	OC3R 16-bit	OC4R 16-bit	OC5R 16-bit
X'018 -19H	X'01A -1BH	X'01C -1DH	X'01E -1FH

Write Write Write Write

An output OC pin (s) action and (or) interrupt (s) when timer 16-bit reading compares equal with the an out-compare register 16-bits on an Interrupt
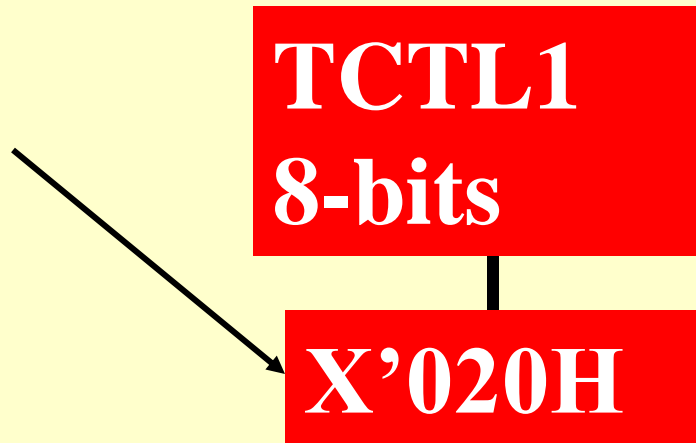
X' four bits are as per init register

Same <u>mask or unmask interrupt</u> action (s) for a compare for the OC2 to OC5

OC5I,OC4I, OC3I, OC2I, bits at TMSK1

TMSK1 4-bit

Write

X'022H

By a write OL-OM operation,   define the level (1) and mask output pin action are defined for timer reading out compare output action (s) on selected pin(s) between OC2 to IC5

Write

TCTL1 8-bits

X'020H

OL5-OM5, OL4-OM4 OL3-OM3 OL2-OM1, bits at TCTL1 at x'020H

Repeat the cycle

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Summary

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We learnt

- TOC1 to TOC5

- PWM actions using OC2 to OC5

- **A PWM action is obtained by writing level 0 at a preset time and then rewrite 1 at an OCx pin and repeatedly cycle 0 and 1 for the preset periods**

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End of Lesson 6 on
Using System Timing Devices
for
PWM outputs