To our customers,

Old Company Name in Catalogs and Other Documents

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GRADE A

MSC TECHNICAL NEWS

No.M16C-02-9607

Note on using the JMP.A/JSR.A instruction of the M16C/60 series (Rev.B)

1. Related devices

M16C/60 series

2. Symptoms

- Immediately after executing a write instruction by word to an odd address in an area inserted software wait, then executing the JMP.A or JSR.A instruction, the written data may not be written to the correct address. Note that one wait is always inserted in SFR area.
- Immediately after executing a write instruction by word to an odd address in an external area inserted software wait with the external data bus width = 8 bits(BYTE pin is "H") , then executing the JMP.A or JSR.A instruction, the written data may not be written to the correct address.

3. Example

When executing this program, the MOV.W instruction writes the lower 8 bits of R0 to address 00501_{16}, and writes the upper 8 bits of R0 to address 00502_{16}. The program is then jumped by the JMP.A instruction to sub.

However, when address 00501_{16} is in an area inserted software wait, the upper 8 bits of R0 may be written to an address but not address 00502_{16}.

Example:

```
MOV.W   R0 , 501H
JMP.A   sub
  •
  •
sub :
```

4. Cause

M16C/60 series uses pipeline process. Writing with the MOV.W instruction in example 3 processes parallel with the address calculation by the JMP.A instruction. This time, the process of "internal PC change" at the 2nd cycle of the JMP.A instruction affects the writing address calculation by the MOV.W instruction (see figure 1). (This is not caused by other instructions but by the JMP.A or JSR.A instruction.) When not inserting a software wait, since the 00502_{16} address calculation is completed before "internal PC change" (see figure 2), the problem does not happen.

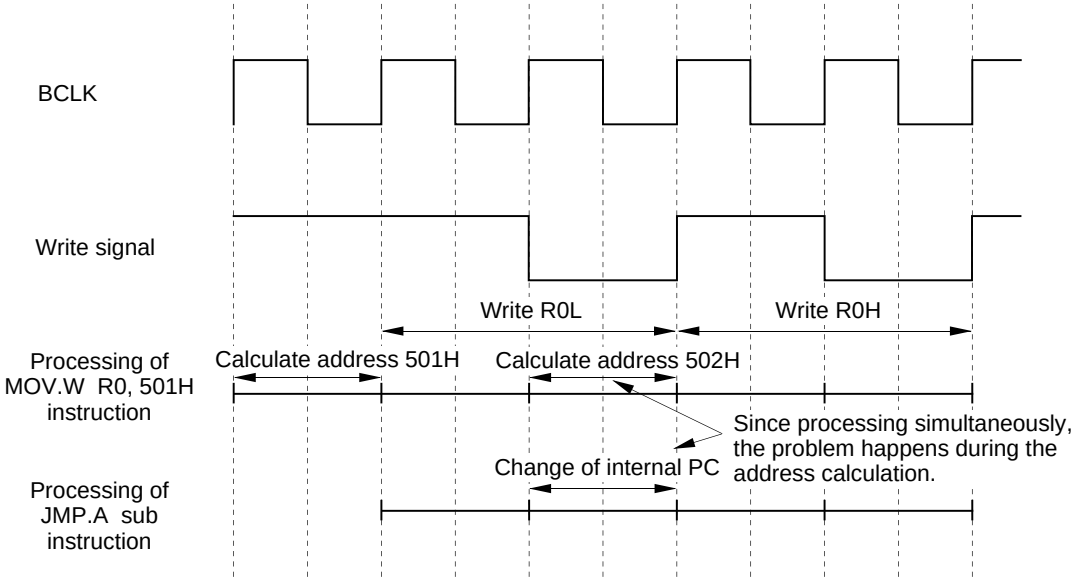

Figure 1 One wait

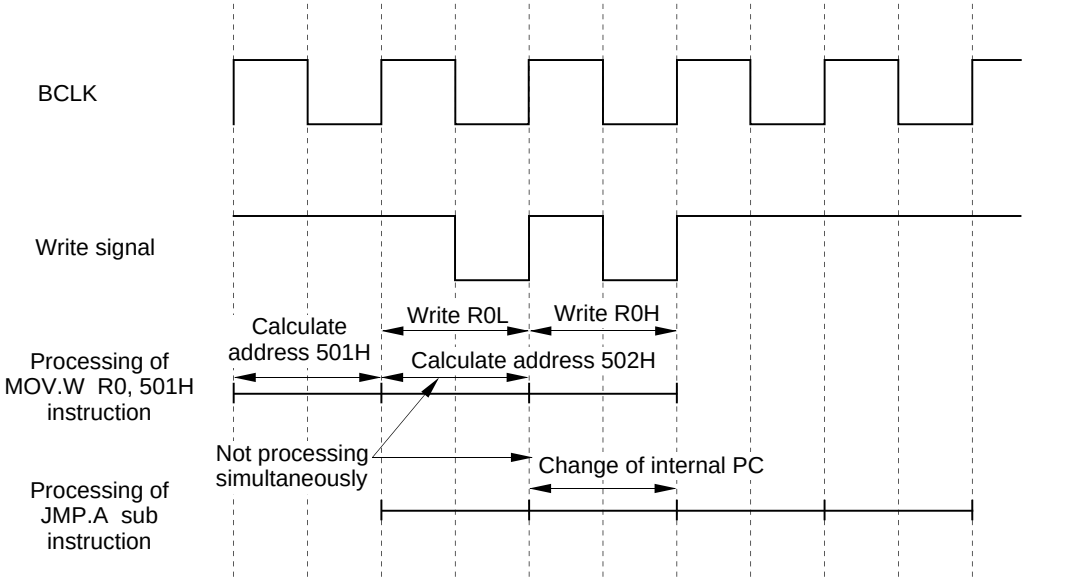

Figure 2 No wait

When accessing 16-bit data which begins at an odd address, or accessing 16-bit data using the 8-bit bus, the 16-bit data is accessed separately in 2 operations, 8 bits at a time. When accessing write, since the 2nd address calculation processes in parallel with the next instruction, this problem occurs. When accessing a 8-bit data or a 16-bit data which begins at an even address by 16-bit bus, this problem do not happen.

5. Solution

Insert the JMP.B instruction for jumping to the JMP.A or JSR.A instructions before the JMP.A or JSR.A instructions.

Example:

```
        MOV.W   R0,501H
        JMP.B   PTCH
PTCH:   JMP.A   sub
  •
  •
sub :
```

6. Reference

The JMP.A and JSR.A instructions are used when branch distance is over 32 K bytes. Use the JMP.S, JMP.B or JMP.W instructions for unconditional branch instruction distances under 32 K bytes. Use the JSR.W instruction for subroutine call distances under 32 K bytes.