

To our customers,

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

M16C/80 Series

Converting from Binary Number to Floating-point Number

1.0 Abstract

This program converts a 32-bit signed binary number into a single-precision, floating-point number.

2.0 Introduction

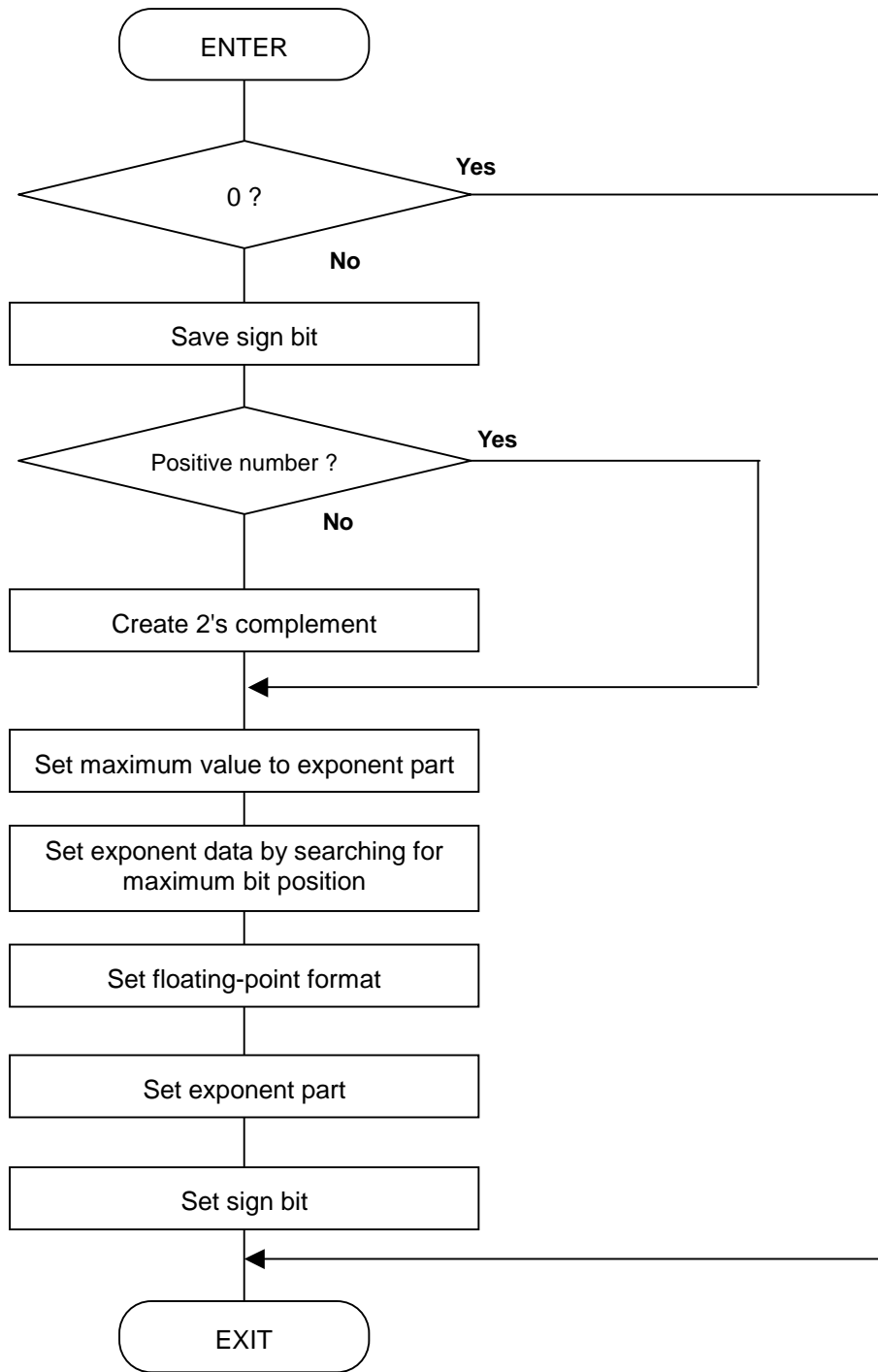
This program converts a 32-bit signed binary number into a single-precision, floating-point number. Set the 32-bit signed binary number in R2 and R0 beginning with the upper half. A single-precision, floatingpoint number is output to R2 and R0.

In this program, after confirming whether the input data is "0" and adjusting the data by the sign, a maximum value is set to the exponent part that can be represented by a 32-bit signed binary number. Next, the input data is shifted left while calculating (subtracting) the exponent part to create mantissa data. Finally, the resulting data is adjusted to suit the format of single-precision, floating-point numbers.

Subroutine name : BINtoFLOATING	ROM capacity : 60byte
Interrupt during execution:Accepted	Number of stacks used : None

Register/memory	Input	Output	Usage condition
R0	Lower half of signed binary	Mid and lower parts of mantissa	←
R1	-	Indeterminate	Used for format conversion
R2	Upper half of signed binary	Exponent, upper part of mantissa	←
R3	-	-	Unused
A0	-	Indeterminate	Used to save sign bit
A1	-	-	Unused
Usage precautions			

3.0 Flowchart



4.0 Programming Code

```

*****
;
;   M16C Program Collection
;   CPU : M16C/80 series
*****
VromTOP      .EQU          0FE0000H          ; Declares start address of ROM
;=====
;   Title: Converting from binary number to single-precision, floating-point number
;   Outline: Converts 32-bit signed binary number into single-precision, floating-point number
;   Input:  ----->                Output:
;   R0(Lower half of signed binary)      R0(Mid and lower parts of mantissa)
;   R1()                                R1(Indeterminate)
;   R2(Upper half of signed binary)      R2(Exponent, upper part of mantissa)
;   R3()                                R3(Unused)
;   A0()                                A0(Indeterminate)
;   A1()                                A1(Unused)
;   Stack amount used: None
;   Notes:
;=====
;
;           .SECTION      PROGRAM, CODE
;           .ORG          VromTOP          ; ROM area
BINtoFLOATING:
;
;   XCHG.W      R2,R0          ; Changes data
;   CMP.L       #0,R2R0       ;
;   JEQ         BINtoFLOATING_EXIT ; --> ZERO
BINtoFLOATING_10:
;
;   MOV.B       R0H,A0        ; Saves sign bit
;   BTST        7,R0H         ; Checks sign
;   JEQ         BINtoFLOATING_20 ; --> Positive number
;   NOT.W       R2            ; Takes 2's complement
;   NOT.W       R0
;   ADD.W       #1,R2
;   ADCF.W      R0
BINtoFLOATING_20:
;
;   MOV.B       #9DH+1,R1L    ; Sets maximum value to exponent part
BINtoFLOATING_30:
;
;   BTST        7,R0H         ; Search of maximum bit position
;   JNE         BINtoFLOATING_40 ; --> Finds maximum bit
;   SHL.W       #1,R2         ; Pushes for search of maximum bit position
;   ROLC.W      R0
;   SUB.B       #1,R1L        ; Counts down exponent
;   JMP         BINtoFLOATING_30
BINtoFLOATING_40:
;
;   MOV.B       #7,R1H        ; Number of shifts to adjust mantissa position
BINtoFLOATING_50:
;
;   SHL.W       #-1,R0        ; Adjusts mantissa position
;   RORC.W      R2
;   ADJNZ.B     #-1,R1H,BINtoFLOATING_50 ; --> Adjustment not completed
;   MOV.B       R1L,R0H       ; Sets exponent
;   SHL.W       #-1,R0        ; Adjusts format
;   RORC.W      R2
;   BTST        7,A0          ; Sets sign bit
;   BMC         7,R0H
BINtoFLOATING_EXIT:
;
;   XCHG.W      R2,R0          ; Changes data
;   RTS
;
;           .END ;

```

5.0 Reference

MCU Technical Information Homepage

<http://www.infocom.maec.co.jp/indexe.htm>

(or <http://www.mdece.com/> , <http://www.mitsubishichips.com/products/mcu/index.html> or your local Web Site.)

Technical Support

E-mail: support@apl.maec.co.jp

(or your local support E-mail address. A private e-mail address should NOT be used.)

Data Sheet

M16C/80 group

(Use the latest version on the Homepage: <http://www.infocom.maec.co.jp/indexe.htm>)

User's Manual

M16C/80 group

(Use the latest version on the Homepage: <http://www.infocom.maec.co.jp/indexe.htm>)

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