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Renesas Electronics Corporation

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H8/300H Tiny Series

1-Byte-Hexadecimal to ASCII Code Conversion

Introduction

The software HTOA converts a 1-byte hexadecimal number to its corresponding ASCII code, '0' to '9' or 'A' to 'F'.

Target Device

H8/300H Tiny Series

Contents

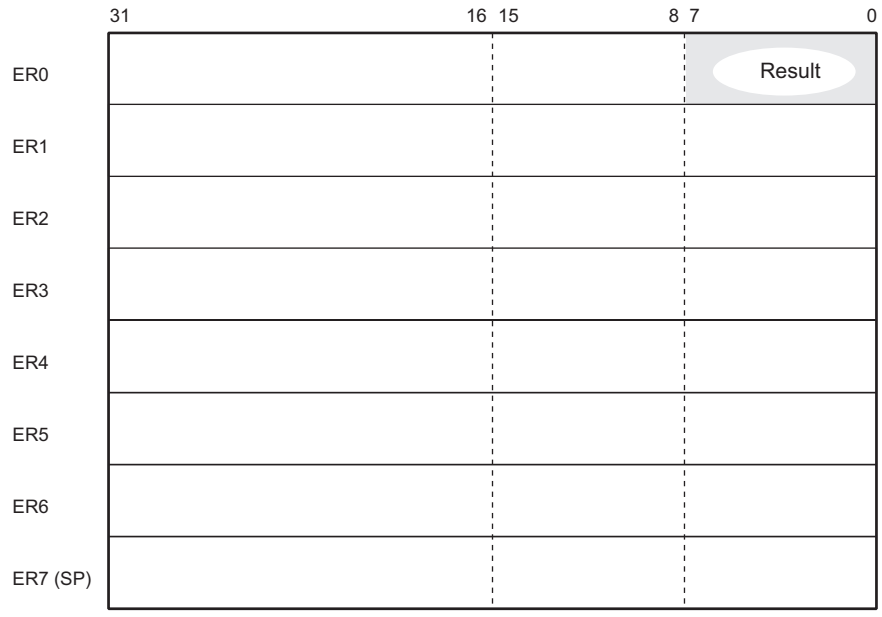
1. Functions

1. The software HTOA converts a 1-byte hexadecimal number to its corresponding ASCII code, '0' to '9' or 'A' to 'F'.
2. Unsigned integer data is used as the input argument.

2. Arguments

Contents		Storage Location	Data Length
Input	1-byte hexadecimal number	R0L	1 byte
Output	ASCII code	R0L	1 byte
	Indicator of conversion	C flag (CCR)	1 bit

3. Changes to Internal Registers and Flags



4. Programming Specifications

Program memory (bytes)
22
Data memory (bytes)
0
Stack (bytes)
0
Number of cycles
68
Re-entrant
Yes
Relocatable
Yes
Interrupts during execution
Yes

5. Description

5.1 Description of Functions

1. The arguments are as follows.
   R0L: Set a 1-byte hexadecimal number here.
   The ASCII code is placed here by execution of the HTOA subroutine.
   C flag (CCR): Indicates the status after execution of the software HTOA as the output arguments.
   C flag = 1: The input 1-byte hexadecimal number is not in the range from H'00 to H'0F.
   C flag = 0: The input 1-byte hexadecimal number is in the range from H'00 to H'0F.
2. The following figure illustrates the execution of the HTOA subroutine. When the input argument is set as shown in the figure below, the corresponding ASCII code (H'46) for 'F' is set in R0L.

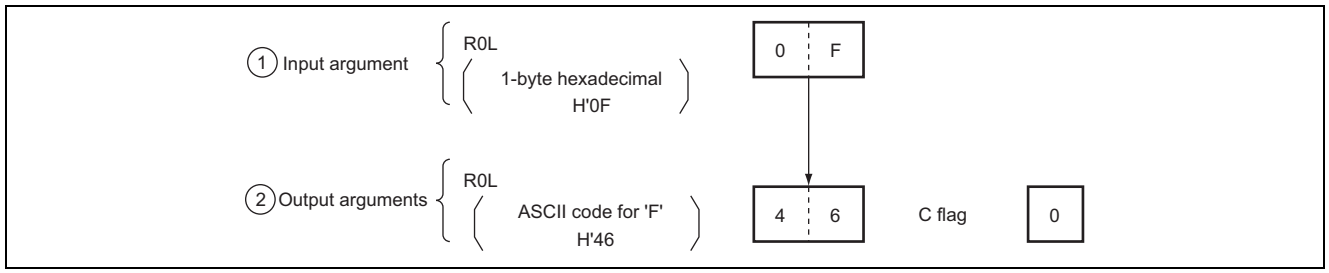


Figure 1 Example of HTOA Execution

5.2 Usage Notes

None

5.3 Description of Data Memory

No data memory is used by HTOA.

5.4 Example of Usage

```
WORK1   . RES. B 1          ..... Reservation of the data memory area for setting of a 1-byte hexadecimal number in the user
                                  program.
WORK2   . RES. B 1          ..... Reservation of the data memory area where the 1-digit ASCII code will be placed in the user
                                  program.
          .
          .
          .
        MOV. B @WORK1, R0L  ..... Sets, as the input argument, the 1-byte hexadecimal number specified by the the user program.
        JSR    @HTOA        ..... Subroutine call of HTOA.
        BCS    SKIP         ..... Branches to the required processing routine if the input data is other than H'00 to H'0F.
        MOV. B R0L, @WORK2  ..... Transfers the ASCII code from the output argument to the data memory area
          .                       of the user program.
          .
          .
SKIP    Processing routine for out-of-range
        1-byte hexadecimal numbers
          .
          .
          .
```

5.5 Principles of Operation

Whether or not the data set in R0L falls within the ASCII code range '0' to '9' or 'A' to 'F' (the parts enclosed by ☐ in the table below) is determined by tests of the C flag, which indicates the results of calculation in R0L.

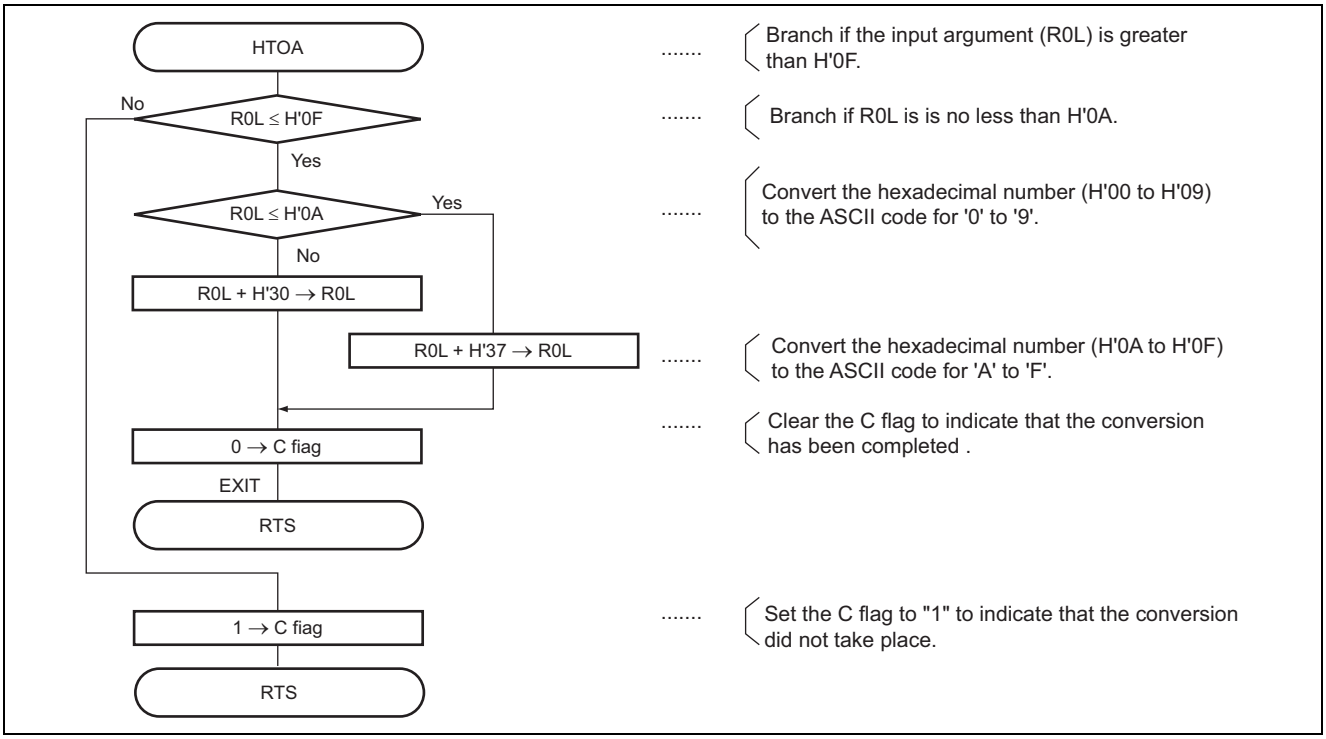
Further operation is performed to exclude codes in the range from ':' to '@' (the shaded parts of the table).

If the data is in neither of the ranges '0' to '9' and 'A' to 'F', the C flag is set to '1' during the processing of steps (1) and (2).

Table 1 ASCII Coding

LSD \ MSD		0 000	1 001	2 010	3 011	4 100	5 101	6 110	7 111
0	0000	NUL	DLE	SP	0	@	P	`	p
1	0001	SOH	DC_1	!	1	A	Q	a	q
2	0010	STX	DC_2	“	2	B	R	b	r
3	0011	ETX	DC_3	#	3	C	S	c	s
4	0100	EOT	DC_4	$	4	D	T	d	t
5	0101	ENG	NAK	%	5	E	U	e	u
6	0110	ACK	SYN	&	6	F	V	f	v
7	0111	BEL	ETB	'	7	G	W	g	w
8	1000	BS	CAN	(	8	H	X	h	x
9	1001	HT	EM	)	9	I	Y	i	y
A	1010	LF	SUB	*	:	J	Z	j	z
B	1011	VT	ESC	+	;	K	[	k	{
C	1100	FF	FS	,	<	L	\	l	|
D	1101	CR	GS	-	=	M	]	m	}
E	1110	SO	RS	.	>	N	↑	n	~
F	1111	SI	VS	/	?	O	←	o	DEL

6. Flowchart


HTOA
No
R0L ≤ H'0F
Yes
R0L ≤ H'0A
Yes
No
R0L + H'30 → R0L
R0L + H'37 → R0L
0 → C fiag
EXIT
RTS
1 → C fiag
RTS
Branch if the input argument (R0L) is greater than H'0F.
Branch if R0L is is no less than H'0A.
Convert the hexadecimal number (H'00 to H'09) to the ASCII code for '0' to '9'.
Convert the hexadecimal number (H'0A to H'0F) to the ASCII code for 'A' to 'F'.
Clear the C flag to indicate that the conversion has been completed .
Set the C flag to "1" to indicate that the conversion did not take place.

7. Program Listing

```
  1                1  ;*************************************************************************
  2                2  ;*                                                                       *
  3                3  ;*                                                                       *
  4                4  ;*         NAME   :   CHANGE 1 BYTE ASCII CODE                           *
  5                5  ;*                    TO 4 BIT HEXAGON (NIBBLE)                          *
  6                6  ;*                                                                       *
  7                7  ;*************************************************************************
  8                8  ;*                                                                       *
  9                   ;*         ENTRY  :   R0L                    (1 BYTE ASCII CODE)       *
 10               10  ;*                                                                       *
 11               11  ;*         RETURN :   R0L                    (4 BIT HEXADECIMAL)       *
 12               12  ;*                    C flag of CCR          (C=0:FALSE,  C=1:TRUE)    *
 13               13  ;*                                                                       *
 14               14  ;*************************************************************************
 15               15  ;
 16               16             .CPU             300HN
 17 0000          17             .SECTION                       HTOA_code,CODE,ALIGN=2
 18               18             .EXPORT                        HTOA
 19               19  ;
 20       00000000  20  HTOA       .EQU             $             ;Entry point
 21 0000    A80F    21             CMP.B            #H'0F,R0L
 22 0002    420E    22             BHI              EXIT2         ;Branch if R0L =< H'0F
 23 0004    A80A    23             CMP.B            #H'0A,R0L
 24 0006    4404    24             BCC              HTOA10        ;Branch if R0L =< H'0F
 25                25
 26 0008    8830    26             ADD.B            #H'30,R0L     ;
 27 000A    4002    27             BRA              EXIT1         ;Branch if R0L > 'F'
 28                28
 29 000C    8837    29  HTOA10     ADD.B            #H'37,R0L     ;
 30                30  ;
 31 000E    06FE    31  EXIT1      ANDC             #H'FE,CCR     ;
 32 0010    5470    32             RTS
 33                33  ;
 34 0012    0401    34  EXIT2      ORC              #H'01,CCR     ;
 35 0014    5470    35             RTS
 36                36  ;
 37                37             .END
*****TOTAL ERRORS   0
*****TOTAL WARNINGS    0
```

Revision Record

Rev.	Date	Description	
		Page	Summary
2.00	Feb.28.06	—	Format has been changed from Hitachi version to Renesas version.

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