MF1224-01

EPSON

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER **E0C6011**

DEVELOPMENT TOOL MANUAL

ENERGY SAVING EPSON

SEIKO EPSON CORPORATION

E0C6011 Development Tool Manual

PREFACE

This manual mainly explains the outline of the development support tool for the 4-bit Single Chip Microcomputer E0C6011.

Refer to the "E0C62 Family Development Tool Reference Manual" for the details (common to all models) of each development support tool. Manuals for hardware development tools are separate, so you should also refer to the below manuals.

Development tools	☞ E0C62 Family Development Tool Reference Manual EVA6011 Manual ICE62R (ICE6200) Hardware Manual
Development procedure	☞ E0C62 Family Technical Guide
Device (E0C6011)	☞ E0C6011 Technical Manual
Instructions	☞ E0C6200/6200A Core CPU Manual

CONTENTS

1 COMPOSITION OF DEVELOPMENT SUPPORT TOOL

Here we will explain the composition of the software for the development support tools, developmental envilonment and how to generate the execution disk.

1.1 Configuration of DEV6011

The below software are included in the product of the E0C6011 development support tool DEV6011.

1. Cross Assembler ASM6011 ..... Cross assembler for program preparation
2. Function Option Generator FOG6011 ..... Function option data preparation program
3. Segment Option Generator SOG6011 ..... Segment option data preparation program
4. ICE Control Software ICS6011 ..... ICE control program
5. Mask Data Checker MDC6011 ..... Mask data preparation program

1.2 Developmental Environment

The software product of the development support tool DEV6011 operates on the following host systems:

- IBM PC/AT (at least PC-DOS Ver. 2.0)
- NEC PC-9801 Series (at least MS-DOS Ver. 3.1)

When developing the E0C6011, the above-mentioned host computer, editor, P-ROM writer, printer, etc. must be prepared by the user in addition to the development tool which is normally supported by Seiko Epson.

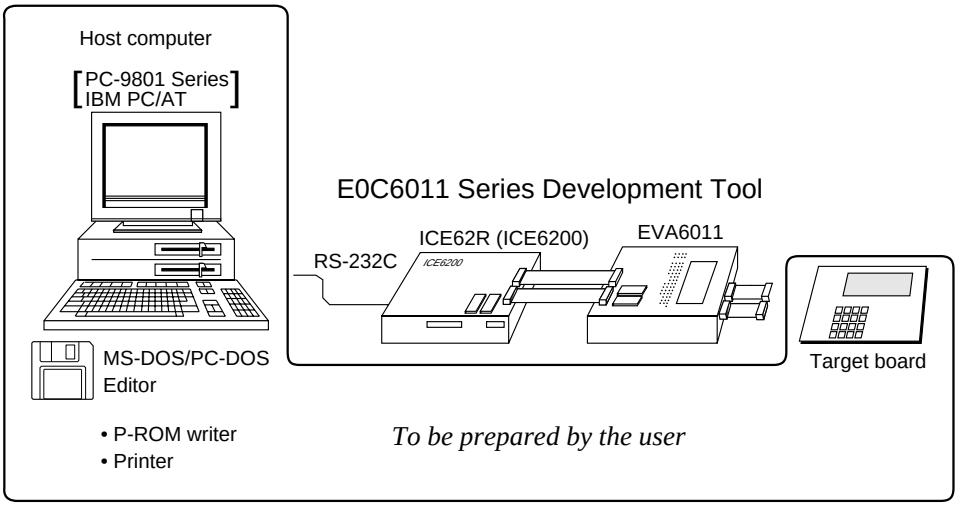

Fig. 1.2.1 System configuration

Note The DEV6011 system requires a host computer with a RAM capacity of about 140K bytes. Since the ICE62R (ICE6200) is connected to the host computer with a RS-232C serial interface, adapter board for asynchronous communication will be required depending on the host computer used.

1.3 Development Flow

Figure 1.3.1 shows the development flow through the DEV6011.

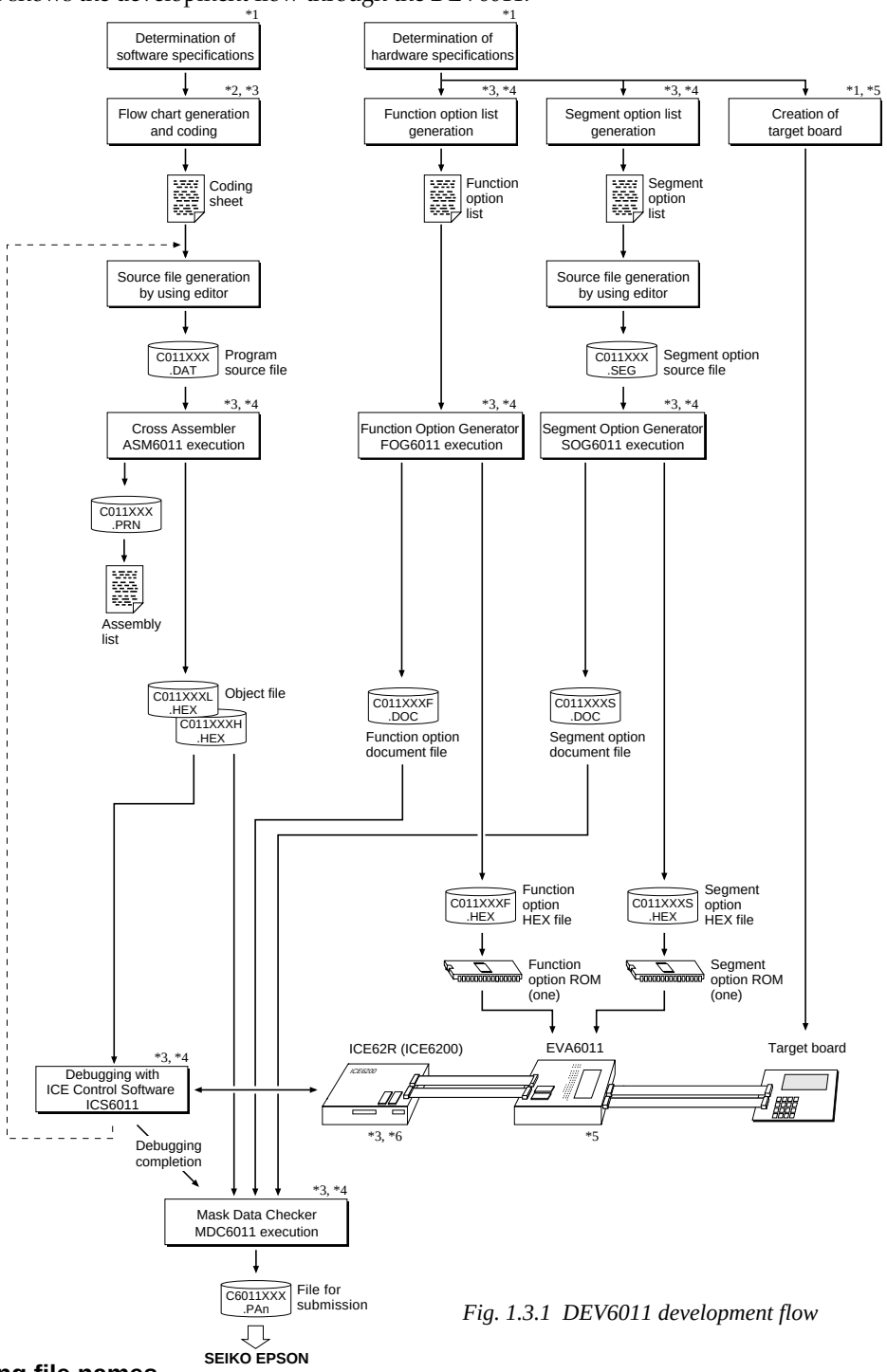

Fig. 1.3.1 DEV6011 development flow

Concerning file names

All the input-output file name for the each development support tool commonly use "C011XXX". In principle each file should be produced in this manner. Seiko Epson will designate the "XXX" for each customer.

☞ Reference Manual

*1 E0C6011 Technical Hardware Manual	*4 E0C6011 Development Tool Manual (this manual)
*2 E0C6200/6200A Core CPU Manual	*5 EVA6011 Manual
*3 E0C62 Family Development Tool Reference Manual	*6 ICE62R (ICE6200) Hardware Manual

1.4 Production of Execution Disk

Execution files for each software development support tool and batch and parameter files for the ICE62R (ICE6200) are recorded in the DEV6011 floppy disk.
The content of the files contained in the DEV6011 floppy disk are shown below.

PC-DOS version	MS-DOS version	Contents
ASM6011.EXE	ASM6011.EXE	Cross Assembler execution file
FOG6011.EXE	FOG6011.EXE	Function Option Generator execution file
ICS6011B.BAT	ICS6011.BAT	ICE Control Software batch file
ICS6011W.EXE	ICS6011J.EXE	ICE Control SoftzÀre execution file
ICS6011P.PAR	ICS6011P.PAR	ICE Control Software parameter file
MDC6011.EXE	MDC6011.EXE	Mask Data Checker execution file
SOG6011.EXE	SOG6011.EXE	Segment Option Generator execution file

- First copy the entire content of this disk using commands such as DISKCOPY then make the execution disk. Carefully conserve the original floppy disk for storage purposes.
  When copying into a hard disk, make a sub-directory with an appropriate name (DEV6011, etc.) then copy the content of the floppy disk into that subdirectory using the COPY command.

Example:

Copying into a floppy disk

Insert the original disk into the A drive and the formatted disk to be copied into B drive, then execute the DISKCOPY command.

```
A>DISKCOPY  A:  B:↵
```

Copying into a hard disk (C drive)

Make a subdirectory (DEV6011), then insert the original disk into the A drive and execute the COPY command.

```
C\>MD DEV6011↵
C\>CD DEV6011↵
C\DEV6011\>COPY A:*.*↵
```

- Next make a CONFIG.SYS file using Editor or the like.
  When a CONFIG.SYS has previously been made using a hard disk system, check the setting of the FILES within it. (If there is none add it.)
  Set the number of files to be described in CONFIG.SYS at 10 or more, so that the Mask Data Checker MDC6011 will handle many files.

Note *The driver for the RS-232C must be included in CONFIG.SYS by the host computer.*

Example:

Setting of FILES (CONFIG.SYS)

```
C\>TYPE  CONFIG.SYS↵
     :
FILES=20
     :
```

- In "ICS6011(B).BAT" the batch process is indicated such that the ICS6011J(W).EXE is executed after the execution of the command for the setting of the RS-232C communication parameters.
  The SPEED (MS-DOS) or MODE (PC-DOS) command is used for setting the RS-232C, so you should copy these commands into the disk to be executed or specify a disk or directory with the command using the PATH command.

RS-232C Setting (PC-DOS version)

```
MODE  COM1:  9600, n, 8, 1, p
```

RS-232C Setting (MS-DOS version)

```
SPEED  R0  9600  B8  PN  S1
```

2 CROSS ASSEMBLER ASM6011

2.1 ASM6011 Outline

The ASM6011 cross assembler is an assembler program for generating the machine code used by the E0C6011 4-bit, single-chip microcomputers. The Cross Assembler ASM6011 will assemble the program source files which have been input by the user's editor and will generate an object file in Intel-Hex format and assembly list file. In this assembler, program modularization has been made possible through macro definition functions and programming independent of the ROM page structure has been made possible through the auto page set function. In addition, consideration has also been given to precise error checks for program capacity (ROM capacity) overflows, undefined codes and the like, and for debugging of such things as label tables for assembly list files and cross reference table supplements.

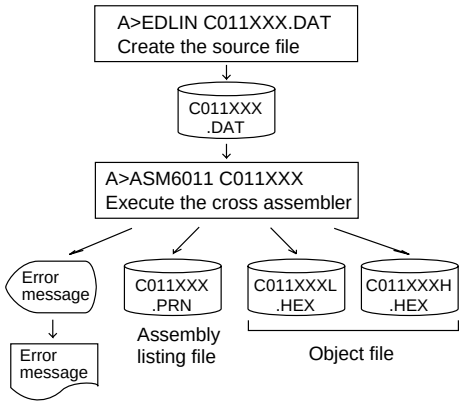

Fig. 2.1.1 ASM6011 execution flow

☞ *The format of the source file and its operating method are same as for the E0C62 Family. Refer to the "E0C62 Family Development Tool Reference Manual" for details.*

2.2 E0C6011 Restrictions

Note the following when generating a program by the E0C6011:

■ ROM area

The capacity of the E0C6011 ROM is 1,536 steps (0000H to 05FFH).
Therefore, the specification range of the memory setting pseudo-instructions and PSET instruction is restricted.

Memory configuration:

Bank: Only bank 0, Page: 6 pages (0 to 5H), each 256 steps

Significant specification range:

ORG	pseudo-instruction:	0000H to 05FFH
PAGE	pseudo-instruction:	00H to 05H
BANK	pseudo-instruction:	Only 0H
PSET	instruction:	00H to 05H

■ RAM area

The capacity of the E0C6011 RAM is 144 words (000H to 06FH, 080H to 09FH, 4 bits/word). Memory access is invalid when the unused area of the index register is specified.

Example:

```
LD    X,0A0H
```

A0H is loaded into the IX register, but an unused area has been specified so that the memory accessible with the IX register (MX) is invalid.

```
LD    Y,0B7H
```

B7H is loaded into the IY register, but an unused area has been specified so that the memory accessible with the IY register (MY) is invalid.

■ Undefined codes

The following instructions have not been defined in the E0C6011 instruction sets.

PUSH	XP	PUSH	YP
POP	XP	POP	YP
LD	XP,r	LD	YP,r
LD	r,XP	LD	r,YP

2.3 ASM6011 Quick Reference

■ Starting command and input/output files

_ indicates a blank.
↵ indicates the Return key.
A parameter enclosed by [ ] can be omitted.

Execution file: ASM6011.EXE

Starting command: **ASM6011_ [drive-name:] source-file-name [.shp]_ [-N]↵**

Option:
- .shp Specifies the file I/O drives.
  - s Specifies the drive from which the source file is to be input. (A–P, @)
  - h Specifies the drive to which the object file is to be output. (A–P, @, Z)
  - p Specifies the drive to which the assembly listing file is to be output. (A–P, @, Z)
    @: Current drive, Z: File is not generated
- -N The code (FFH) in the undefined area of program memory is not created.

Input file: C011XXX.DAT (Source file)

Output file: C011XXXL.HEX (Object file, low-order)
C011XXXH.HEX (Object file, high-order)
C011XXX.PRN (Assembly listing file)

■ Display example

```
          *** E0C6011 CROSS ASSEMBLER. --- Ver 1.00 ***

EEEEEEEEEE   PPPPPPPP        SSSSSSS       OOOOOOOO     NNN      NNN
EEEEEEEEEE   PPPPPPPPPP     SSS   SSSS    OOO    OOO    NNNN     NNN
EEE          PPP     PPP   SSS     SSS   OOO      OOO   NNNNN    NNN
EEE          PPP     PPP    SSS          OOO      OOO   NNNNNN   NNN
EEEEEEEEEE   PPPPPPPPPP      SSSSSS      OOO      OOO   NNN NNN NNN
EEEEEEEEEE   PPPPPPPP           SSSS     OOO      OOO   NNN  NNNNNN
EEE          PPP                 SSS    OOO      OOO   NNN   NNNNN
EEE          PPP           SSS     SSS   OOO      OOO   NNN    NNNN
EEEEEEEEEE   PPP           SSSS   SSS     OOO    OOO    NNN     NNN
EEEEEEEEEE   PPP             SSSSSSS       OOOOOOOO     NNN      NN

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          SOURCE FILE NAME IS " C011XXX.DAT "

          THIS SOFTWARE MAKES NEXT FILES.

             C011XXXH.HEX  ...  HIGH BYTE OBJECT FILE.
             C011XXXL.HEX  ...  LOW BYTE OBJECT FILE.
             C011XXX .PRN  ...  ASSEMBLY LIST FILE.

DO YOU NEED AUTO PAGE SET? (Y/N) Y                              ...(1)

DO YOU NEED CROSS REFERENCE TABLE? (Y/N) Y                      ...(2)
```

When ASM6011 is started, the start-up message is displayed.
At (1), select whether or not the auto-page-set function will be used.

Use ..... Y↵
Not use ..... N↵

If the assembly listing file output is specified, message (2) is displayed. At this stage, cross-reference table generation may be selected.

Generating ..... Y↵
Not generating ..... N↵

When the above operation is completed, ASM6011 assembles the source file.
To suspend execution, press the "CTRL" and "C" keys together at stage (1) or (2).

■ Operators

Arithmetic operators		Logical operators	
+a	Monadic positive	a_AND_b	Logical product
-a	Monadic negative	a_OR_b	Logical sum
a+b	Addition	a_XOR_b	Exclusive logical sum
a-b	Subtraction	NOT_a	Logical negation
a*b	Multiplication	Relational operators	
a/b	Division	a_EQ_b	True when a is equal to b
a_MOD_b	Remainder of a/b	a_NE_b	True when a is not equal to b
a_SHL_b	Shifts a b bits to the left	a_LT_b	True when a is less than b
a_SHR_b	Shifts a b bits to the right	a_LE_b	True when a is less than or equal to b
HIGH_a	Separates the high-order eight bits from a	a_GT_b	True when a is greater than b
LOW_a	Separates the low-order eight bits from a	a_GE_b	True when a is greater than or equal to b

■ Pseudo-instructions

Pseudo-instruction	Meaning	Example of Use
EQU (Equation)	To allocate data to label	`ABC EQU 9` `BCD EQU ABC+1`
SET (Set)	To allocate data to label (data can be changed)	`ABC SET 0001H` `ABC SET 0002H`
DW (Define Word)	To define ROM data	`ABC DW 'AB'` `BCD DW 0FFBH`
ORG (Origin)	To define location counter	`ORG 100H` `ORG 256`
PAGE (Page)	To define boundary of page	`PAGE 1H` `PAGE 3`
SECTION (Section)	To define boundary of section	`SECTION`
END (End)	To terminate assembly	`END`

MACRO (Macro)	To define macro	`CHECK MACRO DATA`
		`LOCAL LOOP`
		`LOOP CP MX,DATA`
		`JP NZ,LOOP`
		`ENDM`
		
		`CHECK 1`

LOCAL (Local)	To make local specification of label during macro definition	
ENDM (End Macro)	To end macro definition	

■ Error messages

Error message	Explanation
S (Syntax Error)	An unrecoverable syntax error was encountered.
U (Undefined Error)	The label or symbol of the operand has not been defined.
M (Missing Label)	The label field has been omitted.
O (Operand Error)	A syntax error was encountered in the operand, or the operand could not be evaluated.
P (Phase Error)	The same label or symbol was defined more than once.
R (Range Error)	• The location counter value exceeded the upper limit of the program memory, or a location exceeding the upper limit was specified. • A value greater than that which the number of significant digits of the operand will accommodate was specified.
! (Warning)	• Memory areas overlapped because of a "PAGE" or "ORG" pseudo-instruction or both.
FILE NAME ERROR	The source file name was longer than 8 characters.
FILE NOT PRESENT	The specified source file was not found.
DIRECTORY FULL	No space was left in the directory of the specified disk.
FATAL DISK WRITE ERROR	The file could not be written to the disk.
LABEL TABLE OVERFLOW	The number of defined labels and symbols exceeded the label table capacity (4000).
CROSS REFERENCE TABLE OVERFLOW	The label/symbol reference count exceeded the cross-reference table capacity (only when the cross-reference table is generated).

3 FUNCTION OPTION GENERATOR FOG6011

3.1 FOG6011 Outline

With the 4-bit single-chip E0C6011 microcomputers, the customer may select 12 hardware options. By modifying the mask patterns of the E0C6011 according to the selected options, the system can be customized to meet the specifications of the target system.
The Function Option Generator FOG6011 is a software tool for generating data files used to generate mask patterns. It enables the customer to interactively select and specify pertinent items for each hardware option. From the data file created with FOG6011, the E0C6011 mask pattern is automatically generated by a general purpose computer.
The HEX file for the evaluation board (EVA6011) hardware option ROM is simultaneously generated with the data file.

☞ *The operating method is same as for the E0C62 Family. Refer to the "E0C62 Family Development Tool Reference Manual" for details.*

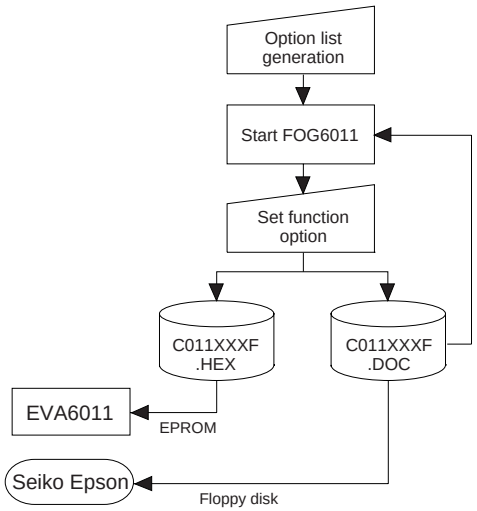


Fig. 3.1.1 FOG6011 execution flow

3.2 E0C6011 Option List

Multiple specifications are available in each option item as indicated in the Option List. Using "3.3 Option Specifications and Selection Message" as reference, select the specifications that meet the target system. Be sure to record the specifications for unused ports too, according to the instructions provided.

1. DEVICE TYPE

☐ 1. E0C6011 LCD 3 V
☐ 2. E0C6011 LCD 4.5 V

2. OSC1 SYSTEM CLOCK SELECT

☐ 1. Internal Resistor OSC1 = 65 kHz
☐ 2. Internal Resistor OSC1 = 130 kHz
☐ 3. Internal Resistor OSC1 = 195 kHz
☐ 4. Internal Resistor OSC1 = 260 kHz

3. INTERRUPT NOISE REJECTOR K00–K03

☐ 1. Use ☐ 2. Not Use

4. INPUT PORT PULL DOWN RESISTOR

- K00 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- K01 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- K02 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- K03 ..... ☐ 1. With Resistor ☐ 2. Gate Direct

5. R00 SPECIFICATION

- R00 OUTPUT SPECIFICATION ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- R00 OUTPUT TYPE ..... ☐ 1. DC Output ☐ 2. Buzzer Output

6. R01 SPECIFICATION

- R01 OUTPUT SPECIFICATION ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain

7. R02 SPECIFICATION

- R02 OUTPUT SPECIFICATION ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- R02 OUTPUT TYPE ..... ☐ 1. DC Output
  ☐ 2. FOSC/2
  ☐ 3. FOSC/4
  ☐ 4. FOSC/8
  ☐ 5. FOSC/16
  ☐ 6. FOSC/32
  ☐ 7. FOSC/64
  ☐ 8. FOSC/128
  ☐ 9. FOSC/256

8. R03 SPECIFICATION

- R03 OUTPUT SPECIFICATION ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- R03 OUTPUT TYPE ..... ☐ 1. DC Output
  ☐ 2. Buzzer Output (R00 control)
  ☐ 3. Buzzer Output (R03 control)

9. I/O PORT SPECIFICATION

- P00 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P01 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P02 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P03 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P10 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P11 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P12 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain
- P13 ..... ☐ 1. Complementary ☐ 2. Pch-OpenDrain

10. I/O PORT PULL DOWN RESISTOR

- P00 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P01 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P02 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P03 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P10 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P11 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P12 ..... ☐ 1. With Resistor ☐ 2. Gate Direct
- P13 ..... ☐ 1. With Resistor ☐ 2. Gate Direct

11. LCD COMMON DUTY AND BIAS

☐ 1. 1/4 Duty, 1/3 Bias or 1/4 Duty, 1/2 Bias
☐ 2. 1/3 Duty, 1/3 Bias or 1/3 Duty, 1/2 Bias
☐ 3. 1/2 Duty, 1/3 Bias or 1/2 Duty, 1/2 Bias

12. SEGMENT MEMORY ADDRESS

☐ 1. 40H–6FH ☐ 2. C0H–EFH

3.3 Option Specifications and Selection Message

Screen that can be selected as function options set on the E0C6011 are shown below, and their specifications are also described.

1 Device type and LCD voltage

```
*** OPTION  NO.1 ***

--- << DEVICE TYPE & LCD POWER VREG >> ---

                    1. E0C6011  LCD 3V
                    2. E0C6011  LCD 4.5V

PLEASE SELECT NO.(1) ? 1↵

                    1. E0C6011  LCD 3V SELECTED
```

Select the chip specification.
There are two models: 3-V LCD type and 4.5-V LCD type.

2 OSC1 system clock

```
*** OPTION  NO.2 ***

--- << OSC1 SYSTEM CLOCK SELECT >> ---

           1. INTERNAL RESISTOR OSC1=65KHZ
           2. INTERNAL RESISTOR OSC1=130KHZ
           3. INTERNAL RESISTOR OSC1=195KHZ
           4. INTERNAL RESISTOR OSC1=260KHZ

PLEASE SELECT NO.(1) ? 1↵

           1. INTERNAL RESISTOR OSC1=65KHZ SELECTED
```

The E0C6011 has a CR oscillation circuit with resistor and capacitor built-in. Four frequencies are available.

3 Interrupt noise rejector

```
*** OPTION  NO.3 ***

--- << INTERRUPT NOISE REJECTOR K00-K03 >> ---

                    1. USE
                    2. NOT USE

PLEASE SELECT NO.(1) ? 1↵

                    1. USE SELECTED
```

Select whether noise rejector will be supplemented to the input interruptor of K00–K03.
When "Use" is selected, the entry signal will pass the noise rejector, and occurrence of interrupt errors due to noise or chattering can be avoided. Note, however, that because the noise rejector performs entry signal sampling at 4 kHz, "Not Use" should be selected when high speed response is required.

4 Input port pull down resistor

```
*** OPTION  NO.4 ***

--- << INPUT PORT PULL DOWN RESISTOR >> ---

        K00                1. WITH RESISTOR
                           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 2↵

        K01                1. WITH RESISTOR
                           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 2↵

        K02                1. WITH RESISTOR
                           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 2↵

        K03                1. WITH RESISTOR
                           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 2↵

        K00                2. GATE DIRECT SELECTED
        K01                2. GATE DIRECT SELECTED
        K02                2. GATE DIRECT SELECTED
        K03                2. GATE DIRECT SELECTED
```

Select whether input ports (K00–K03) will each be supplemented with pull down resistors or not. When "Gate Direct" is selected, see to it that entry floating state does not occur. Select "With Resistor" for unused ports.
Moreover, the input port status is changed from high level (V_{DD}) to low (V_{SS}) with pull down resistors, a delay of approximately 1 msec in waveform rise time will occur depending on the pull down resistor and entry load time constant. Because of this, when input reading is to be conducted, ensure the appropriate wait time with the program.
The configuration of the pull down resistor circuit is shown in Figure 3.3.1.

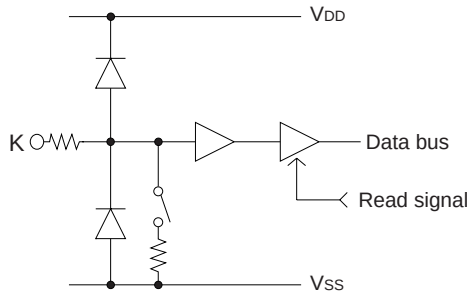


Fig. 3.3.1 Configuration of pull down resistor

5 R00 specification

```
*** OPTION  NO.5 ***

--- << R00 SPECIFICATION >> ---

 R00 OUTPUT SPECIFICATION  1. COMPLEMENTARY
                           2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

 R00 OUTPUT TYPE           1. DC
                           2. BZ OUTPUT

PLEASE SELECT NO.(1) ? 1↵

 R00 OUTPUT SPECIFICATION  1. COMPLEMENTARY SELECTED
 R00 OUTPUT TYPE           1. DC SELECTED
```

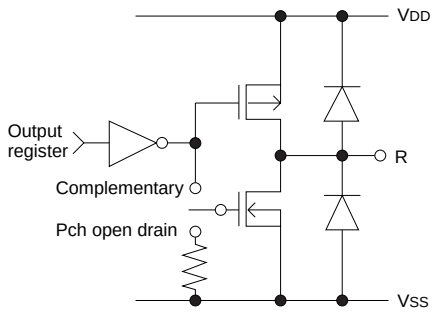


Fig. 3.3.2 Configuration of output circuit

Select the output specification and the output type for the R00 terminal.

- ***Output specification***
  Either complementary output or Pch open drain output may be selected.
  The output circuit configuration is shown in Figure 3.3.2.

- ***Output type***
  When DC output is selected, R00 becomes a regular output port. When buzzer output is selected, by writing "1" to the R00 register, buzzer drive signal is output from the R00 terminal.

  ∗ When DC output is selected, the R03 terminal output type (see Option 8, "R03 specification") selection is limited to DC output only.

Refer to Figure 3.3.5 for buzzer output waveform.

6 R01 specification

```
*** OPTION  NO.6 ***

--- << R01 SPECIFICATION >> ---

 R01 OUTPUT SPECIFICATION  1. COMPLEMENTARY
                           2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

 R01 OUTPUT SPECIFICATION  1. COMPLEMENTARY SELECTED
```

Select the output specification for the R01 terminal. Either complementary output or Pch open drain output may be selected.
The circuit configuration is the same as that of the output port R00 (Figure 3.3.2).

7 R02 specification

```
*** OPTION  NO.7 ***

--- << R02 SPECIFICATION >> ---

 R02 OUTPUT SPECIFICATION  1. COMPLEMENTARY
                           2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

 R02 OUTPUT TYPE           1. DC
                           2. FOSC/2
                           3. FOSC/4
                           4. FOSC/8
                           5. FOSC/16
                           6. FOSC/32
                           7. FOSC/64
                           8. FOSC/128
                           9. FOSC/256

PLEASE SELECT NO.(1) ? 1↵

 R02 OUTPUT SPECIFICATION  1. COMPLEMENTARY SELECTED
 R02 OUTPUT TYPE           1. DC SELECTED
```

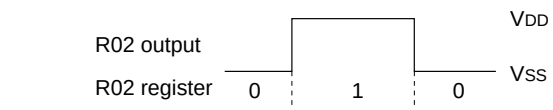


Fig. 3.3.3 Output waveform at R02 DC output selection

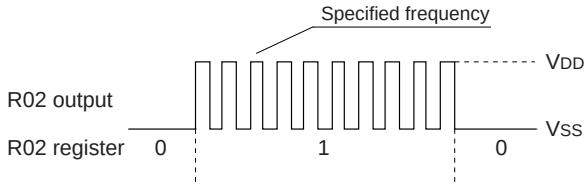


Fig. 3.3.4 Output waveform at R02 FOUT output selection

Select the output specification and the output type for the R02 terminal.

- ***Output specification***
  Either complementary output or Pch open drain output may be selected.
  The circuit configuration is the same as that of the output port R00 (Figure 3.3.2).

- ***Output type***
  Either DC output or FOUT output may be selected.
  When DC output is selected, R02 becomes a regular output port.
  When the R02 register is set to "1", the R02 terminal output goes high (V_{DD}), and goes low (V_{SS}) when set to "0".
  The output waveform is shown in Figure 3.3.3.

  When FOUT is selected, a clock with a set frequency can be output from the R02 terminal. When the FOUT bit (R02 register) is set to "1", 50% duty and V_{DD}–V_{SS} amplitude square wave is generated at the specified frequency. When set to "0", the FOUT terminal goes low (V_{SS}). A FOUT frequency may be selected from among 8 types, ranging from $f_{OSC}/256$ to $f_{OSC}/2$.
  The FOUT output is normally utilized to provide clock to other devices but since hazard occurs at the square wave breaks, great caution must be observed when using it.
  The output waveform is shown in Figure 3.3.4.

8 R03 specification

```
*** OPTION  NO.8 ***

--- << R03 SPECIFICATION >> ---

 R03 OUTPUT SPECIFICATION  1. COMPLEMENTARY
                           2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

 R03 OUTPUT TYPE           1. DC
                           2. BZ OUTPUT(R00)
                           3. BZ OUTPUT(R03)

PLEASE SELECT NO.(1) ? 1↵

 R03 OUTPUT SPECIFICATION  1. COMPLEMENTARY SELECTED
 R03 OUTPUT TYPE           1. DC SELECTED
```

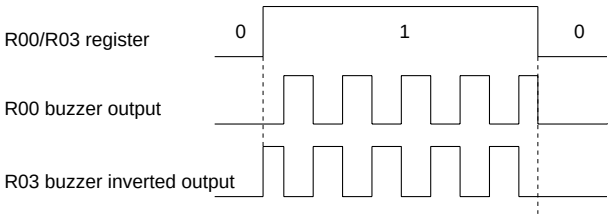


Fig. 3.3.5 Buzzer output waveform

Select the output specification and the output type for the R03 terminal.

- ***Output specification***
  Either complementary output or Pch open drain output may be selected.
  The circuit configuration is the same as that of the output port R00 (Figure 3.3.2).
- ***Output type***
  Either DC output or buzzer output (buzzer inverted output) may be selected.
  When DC output is selected, R03 becomes a regular output port.
  When buzzer output is selected, inverted waveform of R00 buzzer output is generated from the R03 terminal. When "BZ OUTPUT (R03)" is selected, the R03 outputs the buzzer inverted signal when "1" is written to the R03 register.
  When "BZ OUTPUT (R00)" is selected, the R03 buzzer output can be controlled by the R00 register as well as the R00 buzzer output.

  ∗ The buzzer output for R03 may not be selected when the output type of the R00 terminal (see Option 5, "R00 specification") is not set to buzzer output. Moreover, at this point, when the R00 output type is reselected after selecting buzzer output, the R00 output type is fixed at buzzer output.

  The buzzer output waveform is shown in Figure 3.3.5.

9 I/O port specification

```
*** OPTION  NO.9 ***

--- << I/O PORT SPECIFICATION >> ---

        P00             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P01             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P02             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P03             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P10             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P11             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵
```

Select the output specification to be used during I/O ports (P00–P03 and P10–P13) output mode selection. Either complementary output or Pch open drain output may be selected.
The circuit configuration of the output driver is the same as that of output ports (Figure 3.3.2).
Select complementary output for unused ports.

The I/O ports can control the input/output direction according to the IOC bit (07EH•D0 and 0FEH•D0); at "1" and "0" settings, it is set to output port and input port, respectively.

The pull down resistor of this port is turned on by the read signal and is normally turned off to minimize leak current.
Because of this, when the port is set for input, take care that a floating state does not occur in the terminal.
The I/O port circuit configuration is shown in Figure 3.3.6.

```
        P12             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P13             1. COMPLEMENTARY
                        2. PCH-OPENDRAIN

PLEASE SELECT NO.(1) ? 1↵

        P00             1. COMPLEMENTARY SELECTED
        P01             1. COMPLEMENTARY SELECTED
        P02             1. COMPLEMENTARY SELECTED
        P03             1. COMPLEMENTARY SELECTED
        P10             1. COMPLEMENTARY SELECTED
        P11             1. COMPLEMENTARY SELECTED
        P12             1. COMPLEMENTARY SELECTED
        P13             1. COMPLEMENTARY SELECTED
```

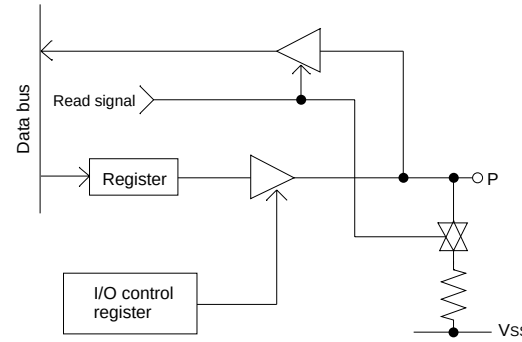


Fig. 3.3.6 Circuit configuration of I/O port

10 I/O port pull down resistor

```
*** OPTION  NO.10 ***

--- << I/O PORT PULL DOWN RESISTOR >> ---

        P00             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P01             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P02             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P03             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P10             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P11             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P12             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P13             1. WITH RESISTOR
                        2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

        P00             1. WITH RESISTOR SELECTED
        P01             1. WITH RESISTOR SELECTED
        P02             1. WITH RESISTOR SELECTED
        P03             1. WITH RESISTOR SELECTED
        P10             1. WITH RESISTOR SELECTED
        P11             1. WITH RESISTOR SELECTED
        P12             1. WITH RESISTOR SELECTED
        P13             1. WITH RESISTOR SELECTED
```

Select whether I/O ports (P00–P03, P10–P13) will each be supplemented with pull down resistors or not. When "Gate Direct" is selected, see to it that entry floating state does not occur. Select "With Resistor" for unused ports.
Moreover, when the I/O port is set to the input mode and a low-level voltage (VSS) is input, an erroneous input results if the time constant of the capacitive load of the input line and the built-in pull-down resistor load is greater than the read-out time. When the input data is being read, the time that the input line is pulled down is equivalent to 0.5 cycles of the CPU system clock. Hence, the electric potential of the terminals must settle within 0.5 cycles. If this condition cannot be met, some measure must be devised, such as arranging a pull-down resistor externally, or performing multiple read-outs.

11 LCD specification

```
*** OPTION  NO.11 ***

--- << LCD COMMON DUTY AND BIAS >> ---

                    1. 1/4 DUTY,1/2 BIAS
                    2. 1/3 DUTY,1/2 BIAS
                    3. 1/2 DUTY,1/2 BIAS

PLEASE SELECT NO.(1) ? 1↵

                    1. 1/4 DUTY,1/2 BIAS SELECTE
```

(for 3-V LCD model)

Table 3.3.1 Common duty selection standard

Number of segments	Common duty
1–76	1/2
77–114	1/3
115–152	1/4

Select the specification (drive duty) for the LCD drive circuit.

- ***Drive duty***
  Select a drive duty.
  When 1/2 duty is selected, up to 76 segments of LCD panel can be driven with 2 COM terminals and 38 SEG terminals. When 1/3 duty is selected, up to 114 segments can be driven with 3 COM terminals, and when 1/4 duty is selected, up to 152 segments with 4 COM terminals.
  When 1/2 duty is selected, the COM0 and COM1 terminals are effective for COM output and the COM2 and COM3 terminals always output an off signal.
  When 1/3 duty is selected, the COM0 to COM2 terminals are effective and the COM3 terminal always outputs an off signal. Refer to Table 3.3.1 for common duty selection.
  Figures 3.3.7 and 3.3.8 show the drive waveforms of 1/3 bias driving and 1/2 bias driving, respectively.

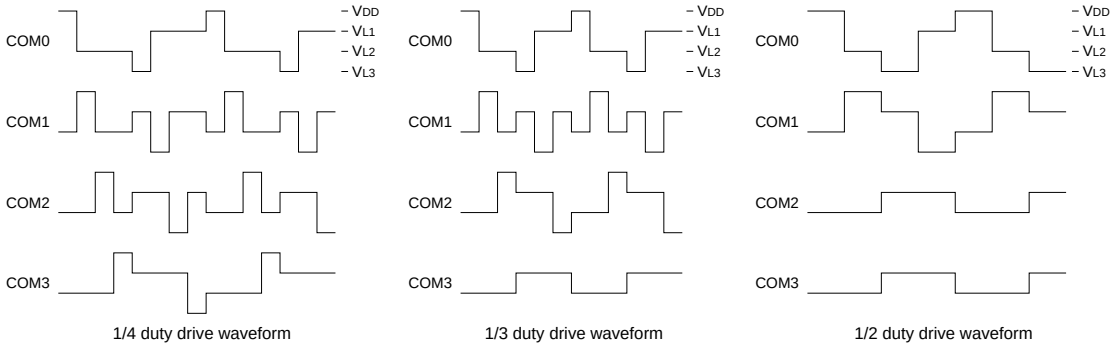


Fig. 3.3.7 Drive waveform from COM terminals (1/3 bias)

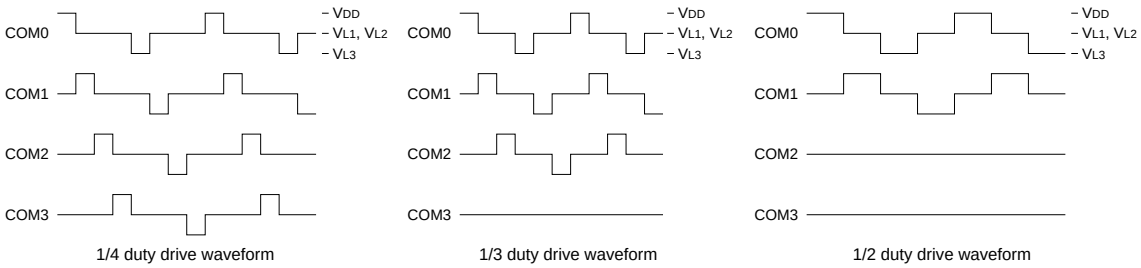


Fig. 3.3.8 Drive waveform from COM terminals (1/2 bias)

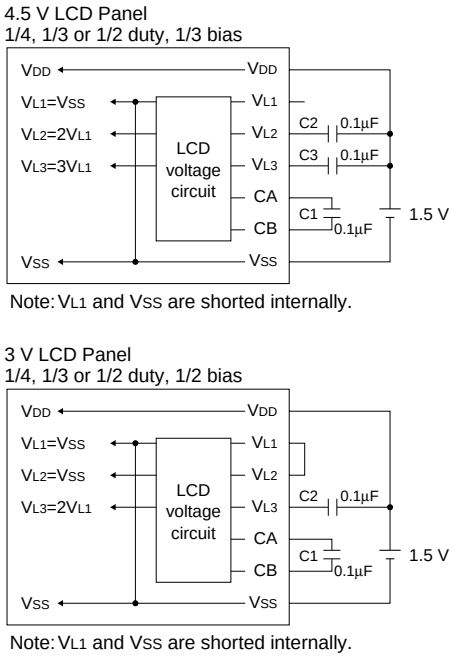


Fig. 3.3.9 External elements for LCD power supply circuit

The LCD drive bias is decided according to the LCD voltage selection of Option 1.
When 4.5 V LCD is selected, the LCD drive bias is set to 1/3 (drives LCD with 4 levels, V_{DD}, V_{L1}, V_{L2} and V_{L3}). When 3 V LCD is selected, the LCD drive bias is set to 1/2 (drives LCD with 3 levels, V_{DD}, V_{L1} = V_{L2} and V_{L3}).
Figure 3.3.9 shows the external element configuration for the LCD voltage selected by Option 1.

The LCDON register (0FFH•D0) is used for turning the LCD display ON and OFF.

12 Segment memory address

```
*** OPTION  NO.12 ***

--- << SEGMENT MEMORY ADDRESS SELECT >> ---

                      1. 40H-6FH
                      2. C0H-EFH

PLEASE SELECT NO.(1) ? 2↵

                      2. C0H-EFH SELECTED
```

Select the segment memory area.
When "40H–6FH" is selected for the segment memory area, it is possible to read and write from/to this area because a RAM is assigned to this area.
When "C0H–EFH" is selected, this segment memory area becomes a write-only area.

3.4 FOG6011 Quick Reference

■ Starting command and input/output files

Execution file: FOG6011.EXE

Starting command: **FOG6011**↵ ↵ *indicates the Return key.*

Input file: C011XXXF.DOC (Function option document file, when modifying)

Output file: C011XXXF.DOC (Function option document file)
C011XXXF.HEX (Function option HEX file)

■ Display example

```
     ***  E0C6011 FUNCTION OPTION GENERATOR. --- Ver 2.00  ***

EEEEEEEEEE   PPPPPPPP         SSSSSSS        OOOOOOOO      NNN      NNN
EEEEEEEEEE   PPPPPPPPPP     SSS    SSSS    OOO    OOO     NNNN     NNN
EEE          PPP     PPP   SSS     SSS    OOO      OOO    NNNNN    NNN
EEE          PPP     PPP    SSS           OOO      OOO    NNNNNN   NNN
EEEEEEEEEE   PPPPPPPPPP      SSSSSS       OOO      OOO    NNN NNN NNN
EEEEEEEEEE   PPPPPPPP           SSSS      OOO      OOO    NNN  NNNNNN
EEE          PPP                 SSS     OOO      OOO    NNN   NNNNN
EEE          PPP            SSS     SSS   OOO      OOO    NNN    NNNN
EEEEEEEEEE   PPP            SSSS    SSS    OOO    OOO     NNN     NNN
EEEEEEEEEE   PPP              SSSSSSS        OOOOOOOO      NNN      NN

              (C) COPYRIGHT 1994 SEIKO EPSON CORP.

         THIS SOFTWARE MAKES NEXT FILES.

            C011XXXF.HEX  ...  FUNCTION OPTION HEX FILE.
            C011XXXF.DOC  ...  FUNCTION OPTION DOCUMENT FILE.

                         STRIKE ANY KEY.
```

Start-up message
When FOG6011 is started, the start-up message is displayed.
For "STRIKE ANY KEY.", press any key to advance the program execution.

To suspend execution, press the "CTRL" and "C" keys together: the sequence returns to the DOS command level.

```
*** E0C6011 USER'S OPTION SETTING. --- Ver 2.00 ***

CURRENT DATE IS  99/01/22
PLEASE INPUT NEW DATE  :  ↵
```

Date input
Enter the 2-digit year, month, and day of the month by delimiting them with a slash ("/"). When not modifying the date, press the RETURN key "↵" to continue.

```
*** OPERATION SELECT MENU ***

       1. INPUT NEW FILE
       2. EDIT FILE
       3. RETURN TO DOS

PLEASE SELECT NO.?
```

Operation selection menu
Enter a number from 1 to 3 to select a subsequent operation.
1. To set new function options.
2. To modify the document file.
3. To terminate FOG6011.

```
*** OPERATION SELECT MENU ***

       1. INPUT NEW FILE
       2. EDIT FILE
       3. RETURN TO DOS

PLEASE SELECT NO.? 1↵
PLEASE INPUT FILE NAME? C0110A0↵                              ..(1)
PLEASE INPUT USER'S NAME? SEIKO EPSON CORP.↵                  ..(2)
PLEASE INPUT ANY COMMENT
(ONE LINE IS 50 CHR)? FUJIMI PLANT↵                           ..(3)
                    ? 281 FUJIMI SUWA-GUN NAGANO-KEN 399-0293 JAPAN↵
                    ? TEL 0266-61-1211↵
                    ? FAX 0266-61-1273↵
                    ? ↵
```

Setting new function options
Select "1" on the operation selection menu.
(1) Enter the file name.
(2) Enter the customer's company name.
(3) Enter any comment.
(Within 50 characters x 10 lines)
Next, start function option setting from option No. 1.

```
PLEASE INPUT FILE NAME? C0110A0↵
EXISTS OVERWRITE(Y/N)? N↵
PLEASE INPUT FILE NAME? C0110B0↵
PLEASE INPUT USER'S NAME?
```

In case a function option document file with the same name as the file name specified in the current drive exists, the user is asked whether overwriting is desired. Enter "Y" or "N" accordingly.

```
*** OPERATION SELECT MENU ***

        1. INPUT NEW FILE
        2. EDIT FILE
        3. RETURN TO DOS

PLEASE SELECT NO.? 2↵

*** SOURCE FILE(S) ***

C0110A0         C0110B0         C0110C0                 ..(1)

PLEASE INPUT FILE NAME? C0110A0↵                        ..(2)
PLEASE INPUT USER'S NAME? ↵                             ..(3)
PLEASE INPUT ANY COMMENT
(ONE LINE IS 50 CHR)? ↵                                 ..(4)
PLEASE INPUT EDIT NO.? 4↵                               ..(5)
            :
(Modifying function option settings)
            :
PLEASE INPUT EDIT NO.? E↵
```

In step (1), if no modifiable source exists, the following message is displayed and the sequence returns to the operation selection menu.

```
*** SOURCE FILE(S) ***

FUNCTION OPTION DOCUMENT FILE IS NOT FOUND.
```

In step (2), if the function option document file is not in the current drive, the following message is displayed, prompting entry of other file name.

```
PLEASE INPUT FILE NAME? C0110N0↵
FUNCTION OPTION DOCUMENT FILE IS NOT FOUND.
PLEASE INPUT FILE NAME?
```

Modifying function option settings

Select "2" on the operation selection menu.

(1) Will display the files on the current drive.
(2) Enter the file name.
(3) Enter the customer's company name.
(4) Enter any comment.
    Previously entered data can be used by pressing the RETURN key "↵" at (3) and (4).
(5) Enter the number of the function option to be modified. When selection of one option is complete, the system prompts entry of another function option number. Repeat selection until all options to be modified are selected.
    Enter "E↵" to end option setting. Then, move to the confirmation procedure for HEX file generation.

```
*** OPTION  NO.3 ***

--- << INTERRUPT NOISE REJECTOR K00-K03 >> ---

                    1. USE
                    2. NOT USE

PLEASE SELECT NO.(1) ? 2↵

                    2. USE SELECTED
```

Option selection

The selections for each option correspond one to one to the option list. Enter the selection number. The value in parentheses ( ) indicates the default value, and is set when only the RETURN key "↵" is pressed.
In return, the confirmation is displayed.
When you wish to modify previously set function options in the new setting process, enter "B↵" to return 1 step back to the previous function option setting operation.

```
END OF OPTION SETTING.
DO YOU MAKE HEX FILE (Y/N) ? Y↵                         ..(1)

*** OPTION EPROM SELECT MENU ***

        1. 27C64
        2. 27C128
        3. 27C256
        4. 27C512

PLEASE SELECT NO.? 2↵                                   ..(2)

        2. 27C128   SELECTED

MAKING FILE(S) IS COMPLETED.

*** OPERATION SELECT MENU ***

        1. INPUT NEW FILE
        2. EDIT FILE
        3. RETURN TO DOS

PLEASE SELECT NO.?
```

EPROM selection

When setting function options setting is completed, the following message is output to ask the operator whether to generate the HEX file.

(1) When debugging the program with EVA6011, HEX file is needed, so enter "Y↵". If "N↵" is entered, no HEX file is generated and only document file is generated.
(2) For the option ROM selection menu displayed when "Y↵" is entered in Step (1), select the EPROM to be used for setting EVA6011 options.

When a series of operations are complete, the sequence returns to the operation selection menu.

3.5 Sample File

■ Example of function option document file

```
* E0C6011 FUNCTION OPTION DOCUMENT  V 2.00
*
* FILE NAME    C0110A0F.DOC
* USER'S NAME  SEIKO EPSON CORP.
* INPUT DATE   1999/01/22
*
*
*
* OPTION NO.1
* < << DEVICE TYPE & LCD POWER VREG >> >
*                              E0C6011 LCD  3V  -----------  SELECTED
 OPT0101 01
*
* OPTION NO.2
* < << OSC1 SYSTEM CLOCK SELECT >> >
*                              INTERNAL RESISTOR OSC1=65KHZ  SELECTED
 OPT0201 01
*
* OPTION NO.3
* < << INTERRUPT NOISE REJECTOR K00-K03 >> >
*                              USE  ----------------------  SELECTED
 OPT0301 01
*
* OPTION NO.4
* < << INPUT PORT PULL DOWN RESISTOR >> >
*     K00                      WITH RESISTOR  -------------  SELECTED
*     K01                      WITH RESISTOR  -------------  SELECTED
*     K02                      WITH RESISTOR  -------------  SELECTED
*     K03                      WITH RESISTOR  -------------  SELECTED
 OPT0401 01
 OPT0402 01
 OPT0403 01
 OPT0404 01
*
* OPTION NO.5
* < << R00 SPECIFICATION >> >
*     R00 OUTPUT SPECIFICATION COMPLEMENTARY  -------------  SELECTED
*     R00 OUTPUT TYPE          DC  ------------------------  SELECTED
 OPT0501 01
 OPT0502 01
*
* OPTION NO.6
* < << R01 SPECIFICATION >> >
*     R01 OUTPUT SPECIFICATION COMPLEMENTARY  -------------  SELECTED
 OPT0601 01
*
* OPTION NO.7
* < << R02 SPECIFICATION >> >
*     R02 OUTPUT SPECIFICATION COMPLEMENTARY  -------------  SELECTED
*     R02 OUTPUT TYPE          DC  ------------------------  SELECTED
 OPT0701 01
 OPT0702 01
*
* OPTION NO.8
* < << R03 SPECIFICATION >> >
*     R03 OUTPUT SPECIFICATION COMPLEMENTARY  -------------  SELECTED
*     R03 OUTPUT TYPE          DC  ------------------------  SELECTED
 OPT0801 01
 OPT0802 01
*
```

```
* OPTION NO.9
* < << I/O PORT SPECIFICATION >> >
*     P00                       COMPLEMENTARY  -------------  SELECTED
*     P01                       COMPLEMENTARY  -------------  SELECTED
*     P02                       COMPLEMENTARY  -------------  SELECTED
*     P03                       COMPLEMENTARY  -------------  SELECTED
*     P10                       COMPLEMENTARY  -------------  SELECTED
*     P11                       COMPLEMENTARY  -------------  SELECTED
*     P12                       COMPLEMENTARY  -------------  SELECTED
*     P13                       COMPLEMENTARY  -------------  SELECTED
 OPT0901 01
 OPT0902 01
 OPT0903 01
 OPT0904 01
 OPT0905 01
 OPT0906 01
 OPT0907 01
 OPT0908 01
*
* OPTION NO.10
* < << I/O PORT PULL DOWN RESISTOR >> >
*     P00                       WITH RESISTOR  -------------  SELECTED
*     P01                       WITH RESISTOR  -------------  SELECTED
*     P02                       WITH RESISTOR  -------------  SELECTED
*     P03                       WITH RESISTOR  -------------  SELECTED
*     P10                       WITH RESISTOR  -------------  SELECTED
*     P11                       WITH RESISTOR  -------------  SELECTED
*     P12                       WITH RESISTOR  -------------  SELECTED
*     P13                       WITH RESISTOR  -------------  SELECTED
 OPT1001 01
 OPT1002 01
 OPT1003 01
 OPT1004 01
 OPT1005 01
 OPT1006 01
 OPT1007 01
 OPT1008 01
*
* OPTION NO.11
* < << LCD COMMON DUTY AND BIAS >> >
*                               1/4 DUTY,1/2 BIAS  ---------  SELECTED
 OPT1101 01
*
* OPTION NO.12
* < << SEGMENT MEMORY ADDRESS SELECT >> >
*                               C0H-EFH  -------------------  SELECTED
 OPT1201 02
*
*
*
* SEIKO EPSON'S AREA
*
*
*
* OPTION NO.13
 OPT1301 01
 *
* OPTION NO.14
 OPT1401 01
\\END
```

Note End mark "¥¥END" may be used instead of "\\END" depending on the PC used. (The code of \ and ¥ is 5CH.)

4 SEGMENT OPTION GENERATOR SOG6011

4.1 SOG6011 Outline

With the 4-bit single-chip E0C6011 microcomputers, the customer may select the LCD segment options. By modifying the mask patterns of the E0C6011 according to the selected options, the system can be customized to meet the specifications of the target system.
The Segment Option Generator SOG6011 is a software tool for generating data file used to generate mask patterns. From the data file created with SOG6011, the E0C6011 mask pattern is automatically generated by a general purpose computer. The HEX file for the evaluation board (EVA6011) segment option ROM is simultaneously generated with the data file.

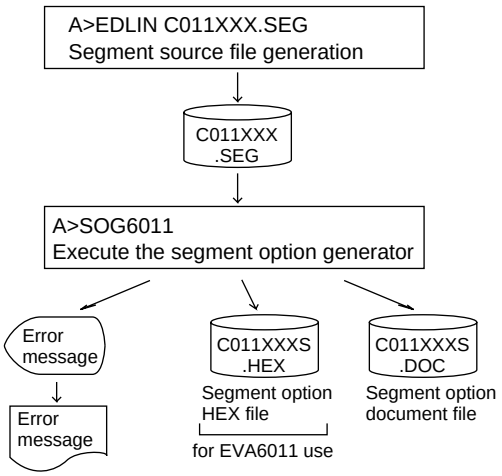


Fig. 4.1.1 SOG6011 execution flow

☞ *The operating method is same as for the E0C62 Family. Refer to the "E0C62 Family Development Tool Reference Manual" for details.*

4.2 Option List

TERMINAL NAME	ADDRESS												OUTPUT SPECIFICATION
	COM0			COM1			COM2			COM3			
	H	L	D	H	L	D	H	L	D	H	L	D	
SEG0													SEG output
SEG1													DC output ☐ C ☐ P
SEG2													SEG output
SEG3													DC output ☐ C ☐ P
SEG4													SEG output
SEG5													DC output ☐ C ☐ P
SEG6													SEG output
SEG7													DC output ☐ C ☐ P
SEG8													SEG output
SEG9													DC output ☐ C ☐ P
SEG10													SEG output
SEG11													DC output ☐ C ☐ P
SEG12													SEG output
SEG13													DC output ☐ C ☐ P
SEG14													SEG output
SEG15													DC output ☐ C ☐ P
SEG16													SEG output
SEG17													DC output ☐ C ☐ P
SEG18													SEG output
SEG19													DC output ☐ C ☐ P
SEG20													SEG output
SEG21													DC output ☐ C ☐ P
SEG22													SEG output
SEG23													DC output ☐ C ☐ P
SEG24													SEG output
SEG25													DC output ☐ C ☐ P
SEG26													SEG output
SEG27													DC output ☐ C ☐ P
SEG28													SEG output
SEG29													DC output ☐ C ☐ P
SEG30													SEG output
SEG31													DC output ☐ C ☐ P
SEG32													SEG output
SEG33													DC output ☐ C ☐ P
SEG34													SEG output
SEG35													DC output ☐ C ☐ P
SEG36													SEG output
SEG37													DC output ☐ C ☐ P

Legend: <ADDRESS>
H: High order address, L: Low order address
D: Data bit

<OUTPUT SPECIFICATION>
C: Complementary output
P: Pch open drain output

Note: 1. Even if there are unused areas, set "---" (hyphens) such that there are no blank columns.
2. When DC output is selected, the display memory of the COM0 column becomes effective.

4.3 Segment Ports Output Specifications

For the output specification of the segment output ports SEG0–SEG37, segment output and DC output can be selected in units of two terminals. When used for liquid crystal panel drives, select segment output; when used as regular output port, select DC output. When DC output is selected, either complementary output or Pch open drain output may further be selected.
However, for segment output ports that will not be used, select segment output.
Refer to the "E0C62 Family Development Tool Reference Manual" for the segment option source file creation.

■ When segment output is selected

The segment output port has a segment decoder built-in, and the data bit of the optional address in the segment memory area (040H–06FH or 0C0H–0EFH) can be allocated to the optional segment. With this, up to 152 segments (114 segments when 1/3 duty is selected or 76 segments when 1/2 duty is selected) of liquid crystal panel could be driven.
The segment memory may be allocated only one segment and multiple setting is not possible.
The allocated segment displays when the bit for this segment memory is set to "1", and goes out when bit is set to "0".
Segment allocation is set to H for high address (4–6 or C–E), to L for low address (0–F), and to D for data bit (0–3) and are recorded in their respective column in the option list. For segment ports that will not be used, write "---" (hyphen) in the H, L, and D columns of COM0–COM3.

Examples

• When 1/4 duty is selected

```
0  C00  C01  C02  C03  S
1  C10  C11  C12  C13  S
```

• When 1/3 duty is selected

```
0  C00  C01  C02  ---  S
1  C10  C11  C12  ---  S
```

• When 1/2 duty is selected

```
0  C00  C01  ---  ---  S
1  C10  C11  ---  ---  S
```

■ When DC output is selected

The DC output can be selected in units of two terminals and up to 38 terminals may be allocated for DC output. Also, either complementary output or Pch open drain output is likewise selected in units of two terminals. When the bit for the selected segment memory is set to "1", the segment output port goes high (V_{DD}), and goes low (V_{SS}) when set to "0". Segment allocation is the same as when segment output is selected but for the while the segment memory allocated to COM1–COM3 becomes ineffective. Write three hyphens ("---") in the COM1–COM3 columns in the option list.

Example

• When complementary output is set to SEG34 and SEG35, and Pch open drain output is set to SEG36 and SEG37.

```
34  E00  ---  ---  ---  C
35  E10  ---  ---  ---  C
36  E20  ---  ---  ---  P
37  E30  ---  ---  ---  P
```

4.4 SOG6011 Quick Reference

■ Starting command and input/output files

_ indicates a blank.
↵ indicates the Return key.
A parameter enclosed by [ ] can be omitted.

Execution file: SOG6011.EXE

Starting command: **SOG6011_ [-H]↵**

Option: -H: Specifies the segment option document file for input file of SOG6011.

Input file: C011XXX.SEG (Segment option source file)
C011XXXS.DOC (Segment option document file, when -H option use)

Output file: C011XXXS.DOC (Segment option document file)
C011XXXS.HEX (Segment option HEX file)

■ Display example

```
     ***  E0C6011 SEGMENT OPTION GENERATOR. --- Ver 2.00  ***

EEEEEEEEEE   PPPPPPPP        SSSSSSS       OOOOOOOO     NNN      NNN
EEEEEEEEEE   PPPPPPPPPP     SSS    SSSS    OOO    OOO    NNNN     NNN
EEE          PPP     PPP   SSS     SSS   OOO      OOO   NNNNN    NNN
EEE          PPP     PPP    SSS          OOO      OOO   NNNNNN   NNN
EEEEEEEEEE   PPPPPPPPPP      SSSSSS      OOO      OOO   NNN NNN  NNN
EEEEEEEEEE   PPPPPPPP           SSSS     OOO      OOO   NNN  NNNNNN
EEE          PPP                SSS     OOO      OOO   NNN   NNNNN
EEE          PPP           SSS    SSS   OOO      OOO   NNN    NNNN
EEEEEEEEEE   PPP           SSSS    SSS    OOO    OOO    NNN     NNN
EEEEEEEEEE   PPP             SSSSSSS       OOOOOOOO     NNN      NN

             (C) COPYRIGHT 1999 SEIKO EPSON CORP.

         SEGMENT OPTION SOURCE FILE NAME IS " C011XXX.SEG "

         THIS SOFTWARE MAKES NEXT FILES.

            C011XXXS.HEX  ...  SEGMENT OPTION HEX FILE.
            C011XXXS.DOC  ...  SEGMENT OPTION DOCUMENT FILE.

                        STRIKE ANY KEY.
```

Start-up message
When SOG6011 is started, the start-up message is displayed.
For "STRIKE ANY KEY.", press any key to advance the program execution.

To suspend execution, press the "CTRL" and "C" keys together: the sequence returns to the DOS command level.

```
*** E0C6011 USER'S OPTION SETTING. --- Ver 2.00 ***

CURRENT DATE IS  99/01/14
PLEASE INPUT NEW DATE  :  ↵
```

Date input
Enter the 2-digit year, month, and day of the month by delimiting them with a slash ("/"). When not modifying the date, press the RETURN key "↵" to continue.

```
*** SOURCE FILE(S) ***

C0110A0         C0110B0         C0110C0                              ..(1)

PLEASE INPUT SEGMENT OPTION FILE NAME? C0110A0↵                      ..(2)
PLEASE INPUT USER'S NAME? SEIKO EPSON CORP.↵                         ..(3)
PLEASE INPUT ANY COMMENT
(ONE LINE IS 50 CHR)? FUJIMI PLANT↵                                  ..(4)
                    ? 281 FUJIMI SUWA-GUN NAGANO-KEN 399-0293 JAPAN↵
                    ? TEL 0266-61-1211↵
                    ? FAX 0266-61-1273↵
                    ? ↵
```

Input file selection
(1) Will display the files on the current drive.
(2) Enter the file name.
(3) Enter the customer's company name.
(4) Enter any comment.
(Within 50 characters x 10 lines)
Then, move to the confirmation procedure for HEX file generation.

```
*** SOURCE FILE(S) ***

SEGMENT OPTION SOURCE FILE IS NOT FOUND.       ..(5) -H option not use

*** SOURCE FILE(S) ***

SEGMENT OPTION DOCUMENT FILE IS NOT FOUND.     ..(6) -H option use
```

```
PLEASE INPUT SEGMENT OPTION SOURCE FILE NAME? C0110N0↵
SEGMENT OPTION SOURCE FILE IS NOT FOUND.       ..(7) -H option not use

PLEASE INPUT SEGMENT OPTION DOCUMENT FILE NAME? C0110N0↵
SEGMENT OPTION DOCUMENT FILE IS NOT FOUND.     ..(8) -H option use
```

In step (1), if no modifiable source exists, an error message (5) or (6) will be displayed and the program will be terminated.
In step (2), if the specified file name is not found in the current drive, an error message (7) or (8) is displayed, prompting entry of other file name.

```
END OF OPTION SETTING.
DO YOU MAKE HEX FILE (Y/N) ? Y↵                          ..(1)

*** OPTION EPROM SELECT MENU ***

        1. 27C64
        2. 27C128
        3. 27C256
        4. 27C512

PLEASE SELECT NO.? 2↵                                    ..(2)

        2. 27C128   SELECTED

MAKING FILE IS COMPLETED.
```

EPROM selection

When selecting file is completed, the following message is output to ask the operator whether to generate the HEX file.

(1) When debugging the program with EVA6011, HEX file is needed, so enter "Y↵". If "N↵" is entered, no HEX file is generated and only document file is generated.

(2) For the option ROM selection menu displayed when "Y↵" is entered in Step (1), select the EPROM to be used for setting EVA6011 options.

When a series of operations are complete, the SOG6011 generates files. If no error is committed while setting segment options, "MAKING FILE IS COMPLETED" will be displayed and the SOG6011 program will be terminated.

■ Error messages

Error message	Explanation
S (Syntax Error)	The data was written in an invalid format.
N (Segment No. Select Error)	The segment number outside the specificable range was specified.
R (RAM Address Select Error)	The segment memory address or data bit outside the specificable range was specified.
D (Duprication Error)	The same data (SEG port No., segment memory address, or data bit) was specified more then once.
Out Port Set Error	The output specifications were not set in units of two ports.

4.5 Sample Files

■ Example of segment option source file

```
; C0110A0.SEG, VER.2.00
; EVA6011 LCD SEGMENT DECODE TABLE
 0    C00  C01  C02  C03 S
 1    C10  C11  C12  C13 S
 2    C20  C21  C22  C23 S
 3    C30  C31  C32  C33 S
 4    C40  C41  C42  C43 S
 5    C50  C51  C52  C53 S
 6    C60  C61  C62  C63 S
 7    C70  C71  C72  C73 S
 8    C80  C81  C82  C83 S
 9    C90  C91  C92  C93 S
10    CA0  CA1  CA2  CA3 S
11    CB0  CB1  CB2  CB3 S
12    CC0  CC1  CC2  CC3 S
13    CD0  CD1  CD2  CD3 S
14    CE0  CE1  CE2  CE3 S
15    CF0  CF1  CF2  CF3 S
16    D00  D01  D02  D03 S
17    D10  D11  D12  D13 S
18    D20  D21  D22  D23 S
19    D30  D31  D32  D33 S
20    D40  D41  D42  D43 S
21    D50  D51  D52  D53 S
22    D60  D61  D62  D63 S
23    D70  D71  D72  D73 S
24    D80  D81  D82  D83 S
25    D90  D91  D92  D93 S
26    DA0  DA1  DA2  DA3 S
27    DB0  DB1  DB2  DB3 S
28    DC0  DC1  DC2  DC3 S
29    DD0  DD1  DD2  DD3 S
30    DE0  DE1  DE2  DE3 S
31    DF0  DF1  DF2  DF3 S
32    E00  E01  E02  E03 S
33    E10  E11  E12  E13 S
34    E20  E21  E22  E23 S
35    E30  E31  E32  E33 S
36    E40  ---  ---  --- C
37    E50  ---  ---  --- C
```

■ Example of segment option document file

```
* E0C6011 SEGMENT OPTION DOCUMENT  V 2.00
*
* FILE NAME    C0110A0S.DOC
* USER'S NAME  SEIKO EPSON CORP.
* INPUT DATE   99/01/14
*
*
* OPTION NO.13
*
* < LCD SEGMENT DECODE TABLE >
*
* SEG COM0 COM1 COM2 COM3 SPEC
*
   0  C00  C01  C02  C03  S
   1  C10  C11  C12  C13  S
   2  C20  C21  C22  C23  S
   3  C30  C31  C32  C33  S
   4  C40  C41  C42  C43  S
   5  C50  C51  C52  C53  S
   6  C60  C61  C62  C63  S
   7  C70  C71  C72  C73  S
   8  C80  C81  C82  C83  S
   9  C90  C91  C92  C93  S
  10  CA0  CA1  CA2  CA3  S
  11  CB0  CB1  CB2  CB3  S
  12  CC0  CC1  CC2  CC3  S
  13  CD0  CD1  CD2  CD3  S
  14  CE0  CE1  CE2  CE3  S
  15  CF0  CF1  CF2  CF3  S
  16  D00  D01  D02  D03  S
  17  D10  D11  D12  D13  S
  18  D20  D21  D22  D23  S
  19  D30  D31  D32  D33  S
  20  D40  D41  D42  D43  S
  21  D50  D51  D52  D53  S
  22  D60  D61  D62  D63  S
  23  D70  D71  D72  D73  S
  24  D80  D81  D82  D83  S
  25  D90  D91  D92  D93  S
  26  DA0  DA1  DA2  DA3  S
  27  DB0  DB1  DB2  DB3  S
  28  DC0  DC1  DC2  DC3  S
  29  DD0  DD1  DD2  DD3  S
  30  DE0  DE1  DE2  DE3  S
  31  DF0  DF1  DF2  DF3  S
  32  E00  E01  E02  E03  S
  33  E10  E11  E12  E13  S
  34  E20  E21  E22  E23  S
  35  E30  E31  E32  E33  S
  36  E40  E41  E42  E43  C
  37  E50  E51  E52  E53  C
\\END
```

Note End mark "¥¥END" may be used instead of "\\END" depending on the PC used. (The code of \ and ¥ is 5CH.)

5 ICE CONTROL SOFTWARE ICS6011

5.1 ICS6011 Outline

The In-circuit Emulator ICE62R (ICE6200) connects the target board produced by the user via the EVA6011 and performs real time target system evaluation and debugging by passing through the RS-232C from the host computer and controlling it. The operation on the host computer side and ICE62R (ICE6200) control is done through the ICE Control Software ICS6011.
The ICS6011 has a set of numerous and highly functional emulation commands which provide sophisticated break function, on-the-fly data display, history display, etc., and so perform a higher level of debugging.

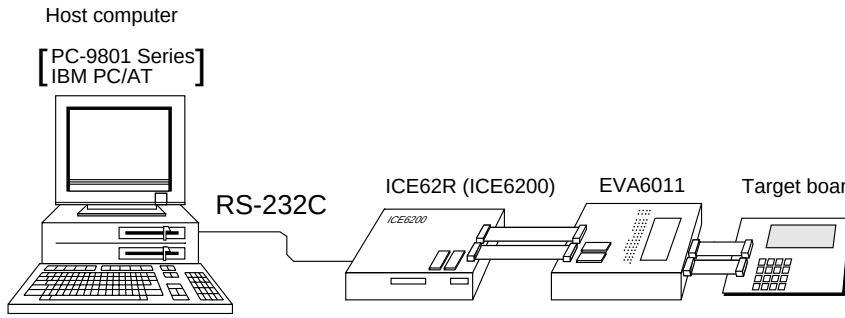


Fig. 5.1.1 Debugging system using ICE62R (ICE6200)

☞ *The functions of the ICE62R (ICE6200) and commands are same as for the E0C62 Family. Refer to the "E0C62 Family Development Tool Reference Manual" for details.*

5.2 ICS6011 Restrictions

Take the following precautions when using the ICS6011.

■ ROM Area

The ROM area is limited to a maximum address of 5FFH. Assigning data above the 5FFH address causes an error.

■ RAM Area

The RAM area is limited to a maximum address of 0FFH. Assigning data above the 0FFH address causes an error. Furthermore, as the following addresses are in the unused area, designation of this area with the ICE commands produces an error.

Unused area: 0A0H to 0EFH (When segment memory is assigned from 040H to 06FH)
0A0H to 0BFH (When segment memory is assigned from 0C0H to 0EFH)
071H, 072H, 074H, 076H, 077H, 07BH, 07FH, 0F0H to 0F5H, 0F7H to 0FCH

Refer to the "E0C6011 Technical Manual" for details.

■ Undefined Code

The instructions below are not specified for the E0C6011 and so cannot be used.

PUSH	XP	POP	XP	LD	XP,r	LD	r,XP
PUSH	YP	POP	YP	LD	YP,r	LD	r,YP

■ OPTLD Command

In the ICS6011, OPTLD command can be used.
This command is used to load HEX files (function option data and segment option data for LCD) in the EVA6011 memory with the ICE62R (ICE6200).

Load of function option data: `#OPTLD,1,C011XXX`↵
Load of segment option data: `#OPTLD,2,C011XXX`↵

OPTLD *READ HEXA DATA FILE*

Format

#OPTLD,1,<*file name*>↵ ...(1)
#OPTLD,2,<*file name*>↵ ...(2)

Function

(1) Load function option HEX file in the EVA6011 function option data memory.
It is HEX file output by the function option generator and has intel HEX format.

(2) Load segment option HEX file in the EVA6011 segment option data memory.
It is HEX file output by the segment option generator and has intel HEX format.

Examples

#OPTLD,1,C011XXX↵ ..... C011XXXF.HEX file is loaded in the function option data memory.

#OPTLD,2,C011XXX↵ ..... C011XXXS.HEX file is loaded in the segment option data memory.

5.3 ICS6011 Quick Reference

■ Starting command and input/output files

↵ *indicates the Return key.*

Execution file:
ICS6011.BAT (ICS6011J.EXE) . . . for MS-DOS
ICS6011B.BAT (ICS6011W.EXE) . . . for PC-DOS

Starting command:
ICS6011 (ICS6011J)↵ . . . for MS-DOS
ICS6011B (ICS6011W)↵ . . . for PC-DOS

Input file:
C011XXXL.HEX (Object file, low-order)
C011XXXH.HEX (Object file, high-order)
C011XXXD.HEX (Data RAM file)
C011XXXC.HEX (Control file)

Output file:
C011XXXL.HEX (Object file, low-order)
C011XXXH.HEX (Object file, high-order)
C011XXXD.HEX (Data RAM file)
C011XXXC.HEX (Control file)

■ Display example

```
          *** E0C6011 ICE CONTROL SOFTWARE. --- Ver 3.01 ***

EEEEEEEEEE   PPPPPPPP        SSSSSSS       OOOOOOOO     NNN      NNN
EEEEEEEEEE   PPPPPPPPPP     SSS    SSSS    OOO    OOO    NNNN     NNN
EEE          PPP     PPP   SSS      SSS   OOO      OOO   NNNNN    NNN
EEE          PPP     PPP    SSS           OOO      OOO   NNNNNN   NNN
EEEEEEEEEE   PPPPPPPPPP      SSSSSS       OOO      OOO   NNN NNN  NNN
EEEEEEEEEE   PPPPPPPP           SSSS     OOO      OOO   NNN  NNNNNN
EEE          PPP                SSS     OOO      OOO   NNN   NNNNN
EEE          PPP           SSS    SSS   OOO      OOO   NNN    NNNN
EEEEEEEEEE   PPP           SSSS   SSS     OOO    OOO    NNN     NNN
EEEEEEEEEE   PPP             SSSSSSS       OOOOOOOO     NNN      NN

             (C) COPYRIGHT 1991 SEIKO EPSON CORP.

* ICE POWER ON RESET *
* DIAGNOSTIC TEST OK *
#
```

Start-up message
When ICS6011 is started, the start-up message is displayed, and a self-test is automatically performed. ICS6011 commands are awaited when the program is properly loaded and the # mark is displayed.
Debugging can be done by entering command after the # mark.
The ICS6011 program is terminated by entering the Q (Quit) command.

Note *Confirm that the cables connected properly, then operate the ICS6011.*

■ Error messages

Error message	Meaning	Recover procedure
* COMMUNICATION ERROR OR ICE NOT READY *	ICE62R (ICE6200) is disconnected or power is OFF.	Switch OFF the host power supply, connect cable, and reapply power. Or switch ON power to ICE62R (ICE6200).
* TARGET DOWN (1) *	Evaluation board is disconnected. (Check at power ON)	Switch OFF power to ICE, and connect the evaluation board. Then, apply power to ICE62R (ICE6200).
* TARGET DOWN (2) *	Evaluation board is disconnected. (Check at command execution)	Switch OFF power to ICE, and connect the evaluation board. Then, apply power to ICE62R (ICE6200).
* UNDEFINED PROGRAM CODE EXIST *	Undefined code is detected in the program loaded from ROM or FD.	Convert ROM and FD data with the cross assembler, then restart the ICE62R (ICE6200).
* COMMAND ERROR *	A miss occurs by command input.	Reenter the proper command.
(No response after power on)	The ICE-to-HOST cable is disconnected on the host side.	Switch OFF the host power supply, connect cable, and reapply power.

■ Command list

Item No.	Function	Command Format	Outline of Operation
1	Assemble	#A,a ↵	Assemble command mnemonic code and store at address "a"
2	Disassemble	#L,a1,a2 ↵	Contents of addresses a1 to a2 are disassembled and displayed
3	Dump	#DP,a1,a2 ↵	Contents of program area a1 to a2 are displayed
		#DD,a1,a2 ↵	Content of data area a1 to a2 are displayed
4	Fill	#FP,a1,a2,d ↵	Data d is set in addresses a1 to a2 (program area)
		#FD,a1,a2,d ↵	Data d is set in addresses a1 to a2 (data area)
5	Set Run Mode	#G,a ↵	Program is executed from the "a" address
		#TIM ↵	Execution time and step counter selection
		#OTF ↵	On-the-fly display selection
6	Trace	#T,a,n ↵	Executes program while displaying results of step instruction from "a" address
		#U,a,n ↵	Displays only the final step of #T,a,n
7	Break	#BA,a ↵	Sets Break at program address "a"
		#BAR,a ↵	Breakpoint is canceled
		#BD ↵	Break condition is set for data RAM
		#BDR ↵	Breakpoint is canceled
		#BR ↵	Break condition is set for EVA6011 CPU internal registers
		#BRR ↵	Breakpoint is canceled
		#BM ↵	Combined break conditions set for program data RAM address and registers
		#BMR ↵	Cancel combined break conditions for program data ROM address and registers
		#BRES ↵	All break conditions canceled
		#BC ↵	Break condition displayed
		#BE ↵	Enter break enable mode
		#BSYN ↵	Enter break disable mode
		#BT ↵	Set break stop/trace modes
		#BRKSEL,REM ↵	Set BA condition clear/remain modes
8	Move	#MP,a1,a2,a3 ↵	Contents of program area addresses a1 to a2 are moved to addresses a3 and after
		#MD,a1,a2,a3 ↵	Contents of data area addresses a1 to a2 are moved to addresses a3 and after
9	Data Set	#SP,a ↵	Data from program area address "a" are written to memory
		#SD,a ↵	Data from data area address "a" are written to memory
10	Change CPU Internal Registers	#DR ↵	Display EVA6011 CPU internal registers
		#SR ↵	Set EVA6011 CPU internal registers
		#I ↵	Reset EVA6011 CPU
		#DXY ↵	Display X, Y, MX and MY
		#SXY ↵	Set data for X and Y display and MX, MY

Item No.	Function	Command Format	Outline of Operation
11	History	#H,p1,p2 ↵	Display history data for pointer 1 and pointer 2
		#HB ↵	Display upstream history data
		#HG ↵	Display 21 line history data
		#HP ↵	Display history pointer
		#HPS,a ↵	Set history pointer
		#HC,S/C/E ↵	Sets up the history information acquisition before (S), before/after (C) and after (E)
		#HA,a1,a2 ↵	Sets up the history information acquisition from program area a1 to a2
		#HAR,a1,a2 ↵	Sets up the prohibition of the history information acquisition from program area a1 to a2
		#HAD ↵	Indicates history acquisition program area
		#HS,a ↵	Retrieves and indicates the history information which executed a program address "a"
		#HSW,a ↵ #HSR,a ↵	Retrieves and indicates the history information which wrote or read the data area address "a"
12	File	#RF,file ↵	Move program file to memory
		#RFD,file ↵	Move data file to memory
		#VF,file ↵	Compare program file and contents of memory
		#VFD,file ↵	Compare data file and contents of memory
		#WF,file ↵	Save contents of memory to program file
		#WFD,file ↵	Save contents of memory to data file
		#CL,file ↵	Load ICE62R (ICE6200) set condition from file
		#CS,file ↵	Save ICE62R (ICE6200) set condition to file
		#OPTLD,1,file ↵ #OPTLD,2,file ↵	Load function option data from file Load segment option data from file
13	Coverage	#CVD ↵	Indicates coverage information
		#CVR ↵	Clears coverage information
14	ROM Access	#RP ↵	Move contents of ROM to program memory
		#VP ↵	Compare contents of ROM with contents of program memory
		#ROM ↵	Set ROM type
15	Terminate ICE	#Q ↵	Terminate ICE and return to operating system control
16	Command Display	#HELP ↵	Display ICE62R (ICE6200) instruction
17	Self Diagnosis	#CHK ↵	Report results of ICE62R (ICE6200) self diagnostic test

↵ means press the RETURN key.

6 MASK DATA CHECKER MDC6011

6.1 MDC6011 Outline

The Mask Data Checker MDC6011 is a software tool which checks the program data (C011XXXH.HEX and C011XXXL.HEX) and option data (C011XXXF.DOC and C011XXXS.DOC) created by the user and creates the data file (C6011XXX.PAn) for generating mask patterns. The user must send the file generated through this software tool to Seiko Epson.

Moreover, MDC6011 has the capability to restore the generated data file (C6011XXX.PA0) to the original file format.

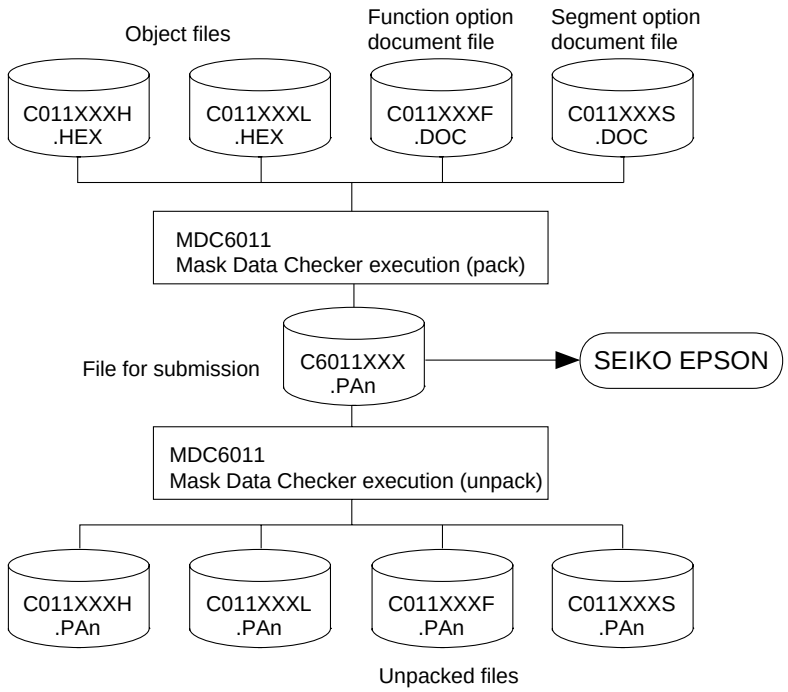


Fig. 6.1.1 MDC6011 execution flow

☞ *The operating method is same as for the E0C62 Family. Refer to the "E0C62 Family Development Tool Reference Manual" for details.*

6.2 MDC6011 Quick Reference

■ Starting command and input/output files

Execution file: MDC6011.EXE

Starting command: **MDC6011**↵ ↵ *indicates the Return key.*

Input file:

C011XXXL.HEX	(Object file, low-order)	When packing
C011XXXH.HEX	(Object file, high-order)	
C011XXXF.DOC	(Function option document file)	
C011XXXS.DOC	(Segment option document file)	
C6011XXX.PAn	(Packed file)	When unpacking

Output file:

C6011XXX.PAn	(Packed file)	When packing
C011XXXL.PAn	(Object file, low-order)	When unpacking
C011XXXH.PAn	(Object file, high-order)	
C011XXXF.PAn	(Function option document file)	
C011XXXS.PAn	(Segment option document file)	

■ Display examples

```
          *** E0C6011 PACK / UNPACK PROGRAM Ver 2.00 ***

EEEEEEEEEE   PPPPPPPP        SSSSSSS       OOOOOOOO      NNN      NNN
EEEEEEEEEE   PPPPPPPPPP     SSS   SSSS    OOO    OOO     NNNN     NNN
EEE          PPP     PPP   SSS     SSS   OOO      OOO    NNNNN    NNN
EEE          PPP     PPP    SSS          OOO      OOO    NNNNNN   NNN
EEEEEEEEEE   PPPPPPPPPP      SSSSSS      OOO      OOO    NNN NNN  NNN
EEEEEEEEEE   PPPPPPPP           SSSS     OOO      OOO    NNN  NNNNNN
EEE          PPP                 SSS    OOO      OOO    NNN   NNNNN
EEE          PPP           SSS     SSS   OOO      OOO    NNN    NNNN
EEEEEEEEEE   PPP           SSSS   SSS     OOO    OOO     NNN     NNN
EEEEEEEEEE   PPP             SSSSSSS       OOOOOOOO      NNN      NN

             (C) COPYRIGHT 1993 SEIKO EPSON CORP.

                   --- OPERATION MENU ---

                          1. PACK
                          2. UNPACK

                   PLEASE SELECT NO.?
```

Start-up message

When MDC6011 is started, the start-up message and operation menu are displayed. Here, the user is prompted to select operation options.

```
                   --- OPERATION MENU ---

                          1. PACK
                          2. UNPACK

                   PLEASE SELECT NO.? 1↵                          ...(1)

       C011XXXH.HEX --------+
                            |
       C011XXXL.HEX --------+
                            |-------- C6011XXX.PAn (PACK FILE)
       C011XXXF.DOC --------+
                            |
       C011XXXS.DOC --------+

 PLEASE INPUT PACK FILE NAME (C6011XXX.PAn) ?  C60110A0.PA0↵   ...(2)

       C0110A0H.HEX --------+
                            |
       C0110A0L.HEX --------+
                            |-------- C60110A0.PA0
       C0110A0F.DOC --------+
                            |
       C0110A0S.DOC --------+
```

Packing of data

(1) Select "1.PACK" in the operation menu.
(2) Enter the file name.
After submitting the data to Seiko Epson and there is a need to re-submit the data, increase the numeric value of "n" by one when the input is made.
(Example: When re-submitting data after "C6011XXX.PA0" has been submitted, the pack file name should be entered as "C6011XXX.PA1".)

With this, the mask file (C6011XXX.PAn) is generated, and the MDC6011 program will be terminated.
Submit this file to Seiko Epson.

Note Don't use the data generated with the -N option of the Cross Assembler (ASM6011) as program data. If the program data generated with the -N option of the Cross Assembler is packed, undefined program area is filled with FFH code. In this case, following message is displayed.

```
WARNING: FILLED <file_name> FILE WITH FFH.
```

```
                   --- OPERATION MENU ---

                          1. PACK
                          2. UNPACK

                   PLEASE SELECT NO.? 2↵                          ...(1)

 PLEASE INPUT PACKED FILE NAME (C6011XXX.PAn) ?  C60110A0.PA0↵  ...(2)

                            +-------- C0110A0H.PA0
                            |
                            +-------- C0110A0L.PA0
       C60110A0.PA0 --------|
                            +-------- C0110A0F.PA0
                            |
                            +-------- C0110A0S.PA0
```

Unpacking of data

(1) Select "2.UNPACK" in the operation menu.
(2) Enter the packed file name.

With this, the mask data file (C6011XXX.PAn) is restored to the original file format, and the MDC6011 program will be terminated.

Since the extension of the file name remains as "PAn", it must be renamed back to its original form ("HEX" and "DOC") in order to re-debug or modify the restored file.

■ Error messages

Program data error

Error Message	Explanation
1. HEX DATA ERROR : NOT COLON.	There is no colon.
2. HEX DATA ERROR : DATA LENGTH. (NOT 00-20h)	The data length of 1 line is not in the 00–20H range.
3. HEX DATA ERROR : ADDRESS.	The address is beyond the valid range of the program ROM.
4. HEX DATA ERROR : RECORD TYPE. (NOT 00)	The record type of 1 line is not 00.
5. HEX DATA ERROR : DATA. (NOT 00-FFh)	The data is not in the range between 00H and 0FFH.
6. HEX DATA ERROR : TOO MANY DATA IN ONE LINE.	There are too many data in 1 line.
7. HEX DATA ERROR : CHECK SUM.	The checksum is not correct.
8. HEX DATA ERROR : END MARK.	The end mark is not : 00000001FF.
9. HEX DATA ERROR : DUPLICATE.	There is duplicate definition of data in the same address.

Function option data error

Error Message	Explanation
1. OPTION DATA ERROR : START MARK.	The start mark is not "\OPTION". (during unpacking) *
2. OPTION DATA ERROR : OPTION NUMBER.	The option number is not correct.
3. OPTION DATA ERROR : SELECT NUMBER.	The option selection number is not correct.
4. OPTION DATA ERROR : END MARK.	The end mark is not "\\END" (packing) or "\END" (unpacking).*

Segment option data error

Error Message	Explanation
1. SEGMENT DATA ERROR : START MARK.	The start mark is not "\SEGMENT". (during unpacking) *
2. SEGMENT DATA ERROR : DATA.	The segment data is not correct.
3. SEGMENT DATA ERROR : SEGMENT NUMBER.	The SEG No. is not correct.
4. SEGMENT DATA ERROR : SPEC.	The output specification of the SEG terminal is not correct.
5. SEGMENT DATA ERROR : END MARK.	The end mark is not "\\END" (packing) or "\END" (unpacking).*

File error

Error Message	Explanation
1. <File_name> FILE IS NOT FOUND.	The file is not found or the file number set in CONFIG.SYS is less than 10.
2. PACK FILE NAME (File_name) ERROR.	The packed input format for the file name is wrong.
3. PACKED FILE NAME (File_name) ERROR.	The unpacked input format for the file name is wrong.

System error

Error Message	Explanation
1. DIRECTORY FULL.	The directory is full.
2. DISK WRITE ERROR.	Writing on the disk is failed.

** \ sometimes appears as ¥, depending on the personal computer being used.*

APPENDIX A. E0C6011 INSTRUCTION SET

Classification	Mnemonic	Operand	Operation Code												Flag				Clock	Operation
			B	A	9	8	7	6	5	4	3	2	1	0	I	D	Z	C		
Branch instructions	PSET	p	1	1	1	0	0	1	0	p4	p3	p2	p1	p0					5	NBP ← p4, NPP ← p3~p0
	JP	s	0	0	0	0	s7	s6	s5	s4	s3	s2	s1	s0					5	PCB ← NBP, PCP ← NPP, PCS ← s7~s0
		C, s	0	0	1	0	s7	s6	s5	s4	s3	s2	s1	s0					5	PCB ← NBP, PCP ← NPP, PCS ← s7~s0 if C=1
		NC, s	0	0	1	1	s7	s6	s5	s4	s3	s2	s1	s0					5	PCB ← NBP, PCP ← NPP, PCS ← s7~s0 if C=0
		Z, s	0	1	1	0	s7	s6	s5	s4	s3	s2	s1	s0					5	PCB ← NBP, PCP ← NPP, PCS ← s7~s0 if Z=1
		NZ, s	0	1	1	1	s7	s6	s5	s4	s3	s2	s1	s0					5	PCB ← NBP, PCP ← NPP, PCS ← s7~s0 if Z=0
	JPBA		1	1	1	1	1	1	1	0	1	0	0	0					5	PCB ← NBP, PCP ← NPP, PCSH ← B, PCSL ← A
	CALL	s	0	1	0	0	s7	s6	s5	s4	s3	s2	s1	s0					7	M(SP-1) ← PCP, M(SP-2) ← PCSH, M(SP-3) ← PCSL+1 SP ← SP-3, PCP ← NPP, PCS ← s7~s0
	CALZ	s	0	1	0	1	s7	s6	s5	s4	s3	s2	s1	s0					7	M(SP-1) ← PCP, M(SP-2) ← PCSH, M(SP-3) ← PCSL+1 SP ← SP-3, PCP ← 0, PCS ← s7~s0
	RET		1	1	1	1	1	1	0	1	1	1	1	1					7	PCSL ← M(SP), PCSH ← M(SP+1), PCP ← M(SP+2) SP ← SP+3
	RETS		1	1	1	1	1	1	0	1	1	1	1	0					12	PCSL ← M(SP), PCSH ← M(SP+1), PCP ← M(SP+2) SP ← SP+3, PC ← PC+1
	RETD	*l*	0	0	0	1	*l*7	*l*6	*l*5	*l*4	*l*3	*l*2	*l*1	*l*0					12	PCSL ← M(SP), PCSH ← M(SP+1), PCP ← M(SP+2) SP ← SP+3, M(X) ← *l*3~*l*0, M(X+1) ← *l*7~*l*4, X ← X+2
System control instructions	NOP5		1	1	1	1	1	1	1	1	1	0	1	1					5	No operation (5 clock cycles)
	NOP7		1	1	1	1	1	1	1	1	1	1	1	1					7	No operation (7 clock cycles)
	HALT		1	1	1	1	1	1	1	1	1	0	0	0					5	Halt (stop clock)
	SLP		1	1	1	1	1	1	1	1	1	0	0	1					5	Sleep (stop oscillation)
Index operation instructions	INC	X	1	1	1	0	1	1	1	0	0	0	0	0					5	X ← X+1
		Y	1	1	1	0	1	1	1	1	0	0	0	0					5	Y ← Y+1
	LD	X, x	1	0	1	1	x7	x6	x5	x4	x3	x2	x1	x0					5	XH ← x7~x4, XL ← x3~x0
		Y, y	1	0	0	0	y7	y6	y5	y4	y3	y2	y1	y0					5	YH ← y7~y4, YL ← y3~y0
		XH, r	1	1	1	0	1	0	0	0	0	1	r1	r0					5	XH ← r
		XL, r	1	1	1	0	1	0	0	0	1	0	r1	r0					5	XL ← r
		YH, r	1	1	1	0	1	0	0	1	0	1	r1	r0					5	YH ← r
		YL, r	1	1	1	0	1	0	0	1	1	0	r1	r0					5	YL ←
		r, XH	1	1	1	0	1	0	1	0	0	1	r1	r0					5	r ← XH
		r, XL	1	1	1	0	1	0	1	0	1	0	r1	r0					5	r ← XL
		r, YH	1	1	1	0	1	0	1	1	0	1	r1	r0					5	r ← YH
		r, YL	1	1	1	0	1	0	1	1	1	0	r1	r0					5	r ← YL
	ADC	XH, i	1	0	1	0	0	0	0	0	i3	i2	i1	i0			↕	↕	7	XH ← XH+i3~i0+C
		XL, i	1	0	1	0	0	0	0	1	i3	i2	i1	i0			↕	↕	7	XL ← XL+i3~i0+C
		YH, i	1	0	1	0	0	0	1	0	i3	i2	i1	i0			↕	↕	7	YH ← YH+i3~i0+C
		YL, i	1	0	1	0	0	0	1	1	i3	i2	i1	i0			↕	↕	7	YL ← YL+i3~i0+C

Classification	Mnemonic	Operand	Operation Code												Flag				Clock	Operation
			B	A	9	8	7	6	5	4	3	2	1	0	I	D	Z	C		
Index operation instructions	CP	XH, i	1	0	1	0	0	1	0	0	i3	i2	i1	i0			↕	↕	7	XH-i3~i0
		XL, i	1	0	1	0	0	1	0	1	i3	i2	i1	i0			↕	↕	7	XL-i3~i0
		YH, i	1	0	1	0	0	1	1	0	i3	i2	i1	i0			↕	↕	7	YH-i3~i0
		YL, i	1	0	1	0	0	1	1	1	i3	i2	i1	i0			↕	↕	7	YL-i3~i0
Data transfer instructions	LD	r, i	1	1	1	0	0	0	r1	r0	i3	i2	i1	i0					5	r←i3~i0
		r, q	1	1	1	0	1	1	0	0	r1	r0	q1	q0					5	r←q
		A, Mn	1	1	1	1	1	0	1	0	n3	n2	n1	n0					5	A←M(n3~n0)
		B, Mn	1	1	1	1	1	0	1	1	n3	n2	n1	n0					5	B←M(n3~n0)
		Mn, A	1	1	1	1	1	0	0	0	n3	n2	n1	n0					5	M(n3~n0)←A
		Mn, B	1	1	1	1	1	0	0	1	n3	n2	n1	n0					5	M(n3~n0)←B
	LDPX	MX, i	1	1	1	0	0	1	1	0	i3	i2	i1	i0					5	M(X)←i3~i0, X←X+1
		r, q	1	1	1	0	1	1	1	0	r1	r0	q1	q0					5	r←q, X←X+1
	LDPY	MY, i	1	1	1	0	0	1	1	1	i3	i2	i1	i0					5	M(Y)←i3~i0, Y←Y+1
		r, q	1	1	1	0	1	1	1	1	r1	r0	q1	q0					5	r←q, Y←Y+1
	LBPX	MX, *l*	1	0	0	1	*l*7	*l*6	*l*5	*l*4	*l*3	*l*2	*l*1	*l*0					5	M(X)←*l*3~*l*0, M(X+1)←*l*7~*l*4, X←X+2
Flag operation instructions	SET	F, i	1	1	1	1	0	1	0	0	i3	i2	i1	i0	↑	↑	↑	↑	7	F←F∨i3~i0
	RST	F, i	1	1	1	1	0	1	0	1	i3	i2	i1	i0	↓	↓	↓	↓	7	F←F∧i3~i0
	SCF		1	1	1	1	0	1	0	0	0	0	0	1				↑	7	C←1
	RCF		1	1	1	1	0	1	0	1	1	1	1	0				↓	7	C←0
	SZF		1	1	1	1	0	1	0	0	0	0	1	0			↑		7	Z←1
	RZF		1	1	1	1	0	1	0	1	1	1	0	1			↓		7	Z←0
	SDF		1	1	1	1	0	1	0	0	0	1	0	0		↑			7	D←1 (Decimal Adjuster ON)
	RDF		1	1	1	1	0	1	0	1	1	0	1	1		↓			7	D←0 (Decimal Adjuster OFF)
	EI		1	1	1	1	0	1	0	0	1	0	0	0	↑				7	I ←1 (Enables Interrupt)
	DI		1	1	1	1	0	1	0	1	0	1	1	1	↓				7	I ←0 (Disables Interrupt)
Stack operation instructions	INC	SP	1	1	1	1	1	1	0	1	1	0	1	1					5	SP←SP+1
	DEC	SP	1	1	1	1	1	1	0	0	1	0	1	1					5	SP←SP-1
	PUSH	r	1	1	1	1	1	1	0	0	0	0	r1	r0					5	SP←SP-1, M(SP)←r
		XH	1	1	1	1	1	1	0	0	0	1	0	1					5	SP←SP-1, M(SP)←XH
		XL	1	1	1	1	1	1	0	0	0	1	1	0					5	SP←SP-1, M(SP)←XL
		YH	1	1	1	1	1	1	0	0	1	0	0	0					5	SP←SP-1, M(SP)←YH
		YL	1	1	1	1	1	1	0	0	1	0	0	1					5	SP←SP-1, M(SP)←YL
		F	1	1	1	1	1	1	0	0	1	0	1	0					5	SP←SP-1, M(SP)←F
	POP	r	1	1	1	1	1	1	0	1	0	0	r1	r0					5	r←M(SP), SP←SP+1
		XH	1	1	1	1	1	1	0	1	0	1	0	1					5	XH←M(SP), SP←SP+1
		XL	1	1	1	1	1	1	0	1	0	1	1	0					5	XL←M(SP), SP←SP+1

Classification	Mnemonic	Operand	Operation Code												Flag				Clock	Operation
			B	A	9	8	7	6	5	4	3	2	1	0	I	D	Z	C		
Stack operation instructions	POP	YH	1	1	1	1	1	1	0	1	1	0	0	0					5	YH← M(SP), SP ← SP+1
		YL	1	1	1	1	1	1	0	1	1	0	0	1					5	YL ← M(SP), SP ← SP+1
		F	1	1	1	1	1	1	0	1	1	0	1	0	↕	↕	↕	↕	5	F ← M(SP), SP ← SP+1
	LD	SPH, r	1	1	1	1	1	1	1	0	0	0	r1	r0					5	SPH ← r
		SPL, r	1	1	1	1	1	1	1	1	0	0	r1	r0					5	SPL ← r
		r, SPH	1	1	1	1	1	1	1	0	0	1	r1	r0					5	r ← SPH
		r, SPL	1	1	1	1	1	1	1	1	0	1	r1	r0					5	r ← SPL
Arithmetic instructions	ADD	r, i	1	1	0	0	0	0	r1	r0	i3	i2	i1	i0	★	↕	↕		7	r ← r+i3~i0
		r, q	1	0	1	0	1	0	0	0	r1	r0	q1	q0	★	↕	↕		7	r ← r+q
	ADC	r, i	1	1	0	0	0	1	r1	r0	i3	i2	i1	i0	★	↕	↕		7	r ← r+i3~i0+C
		r, q	1	0	1	0	1	0	0	1	r1	r0	q1	q0	★	↕	↕		7	r ← r+q+C
	SUB	r, q	1	0	1	0	1	0	1	0	r1	r0	q1	q0	★	↕	↕		7	r ← r-q
	SBC	r, i	1	1	0	1	0	1	r1	r0	i3	i2	i1	i0	★	↕	↕		7	r ← r-i3~i0-C
		r, q	1	0	1	0	1	0	1	1	r1	r0	q1	q0	★	↕	↕		7	r ← r-q-C
	AND	r, i	1	1	0	0	1	0	r1	r0	i3	i2	i1	i0		↕			7	r ← r∧i3~i0
		r, q	1	0	1	0	1	1	0	0	r1	r0	q1	q0		↕			7	r ← r∧q
	OR	r, i	1	1	0	0	1	1	r1	r0	i3	i2	i1	i0		↕			7	r ← r∨i3~i0
		r, q	1	0	1	0	1	1	0	1	r1	r0	q1	q0		↕			7	r ← r∨q
	XOR	r, i	1	1	0	1	0	0	r1	r0	i3	i2	i1	i0		↕			7	r ← r∀i3~i0
		r, q	1	0	1	0	1	1	1	0	r1	r0	q1	q0		↕			7	r ← r∀q
	CP	r, i	1	1	0	1	1	1	r1	r0	i3	i2	i1	i0		↕	↕		7	r-i3~i0
		r, q	1	1	1	1	0	0	0	0	r1	r0	q1	q0		↕	↕		7	r-q
	FAN	r, i	1	1	0	1	1	0	r1	r0	i3	i2	i1	i0		↕			7	r∧i3~i0
		r, q	1	1	1	1	0	0	0	1	r1	r0	q1	q0		↕			7	r∧q
	RLC	r	1	0	1	0	1	1	1	1	r1	r0	r1	r0		↕	↕		7	d3 ← d2, d2 ← d1, d1 ← d0, d0 ← C, C ← d3
	RRC	r	1	1	1	0	1	0	0	0	1	1	r1	r0		↕	↕		5	d3 ← C, d2 ← d3, d1 ← d2, d0 ← d1, C ← d0
	INC	Mn	1	1	1	1	0	1	1	0	n3	n2	n1	n0		↕	↕		7	M(n3~n0) ← M(n3~n0)+1
	DEC	Mn	1	1	1	1	0	1	1	1	n3	n2	n1	n0		↕	↕		7	M(n3~n0) ← M(n3~n0)-1
	ACPX	MX, r	1	1	1	1	0	0	1	0	1	0	r1	r0	★	↕	↕		7	M(X) ← M(X)+r+C, X ← X+1
	ACPY	MY, r	1	1	1	1	0	0	1	0	1	1	r1	r0	★	↕	↕		7	M(Y) ← M(Y)+r+C, Y ← Y+1
	SCPX	MX, r	1	1	1	1	0	0	1	1	1	0	r1	r0	★	↕	↕		7	M(X) ← M(X)-r-C, X ← X+1
	SCPY	MY, r	1	1	1	1	0	0	1	1	1	1	r1	r0	★	↕	↕		7	M(Y) ← M(Y)-r-C, Y ← Y+1
	NOT	r	1	1	0	1	0	0	r1	r0	1	1	1	1		↕			7	r ← $\overline{r}$

Abbreviations used in the explanations have the following meanings.

Symbols associated with registers and memory

A A register
B B register
X XHL register
(low order eight bits of index register IX)
Y YHL register
(low order eight bits of index register IY)
XH XH register
(high order four bits of XHL register)
XL XL register
(low order four bits of XHL register)
YH YH register
(high order four bits of YHL register)
YL YL register
(low order four bits of YHL register)
SP Stack pointer SP
SPH High-order four bits of stack pointer SP
SPL Low-order four bits of stack pointer SP
MX, M(X) Data memory whose address is specified with index register IX
MY, M(Y) Data memory whose address is specified with index register IY
Mn, M(n) Data memory address 000H–00FH (address specified with immediate data n of 00H–0FH)
M(SP) Data memory whose address is specified with stack pointer SP
r, q Two-bit register code
r, q is two-bit immediate data; according to the contents of these bits, they indicate registers A, B, and MX and MY (data memory whose addresses are specified with index registers IX and IY)

r		q		Register
r1	r0	q1	q0	specified
0	0	0	0	A
0	1	0	1	B
1	0	1	0	MX
1	1	1	1	MY

Symbols associated with program counter

NBP New bank pointer
NPP New page pointer
PCB Program counter bank
PCP Program counter page
PCS Program counter step
PCSH Four high order bits of PCS
PCSL Four low order bits of PCS

Symbols associated with flags

F Flag register (I, D, Z, C)
C Carry flag
Z Zero flag
D Decimal flag
I Interrupt flag
↓ Flag reset
↑ Flag set
↕ Flag set or reset

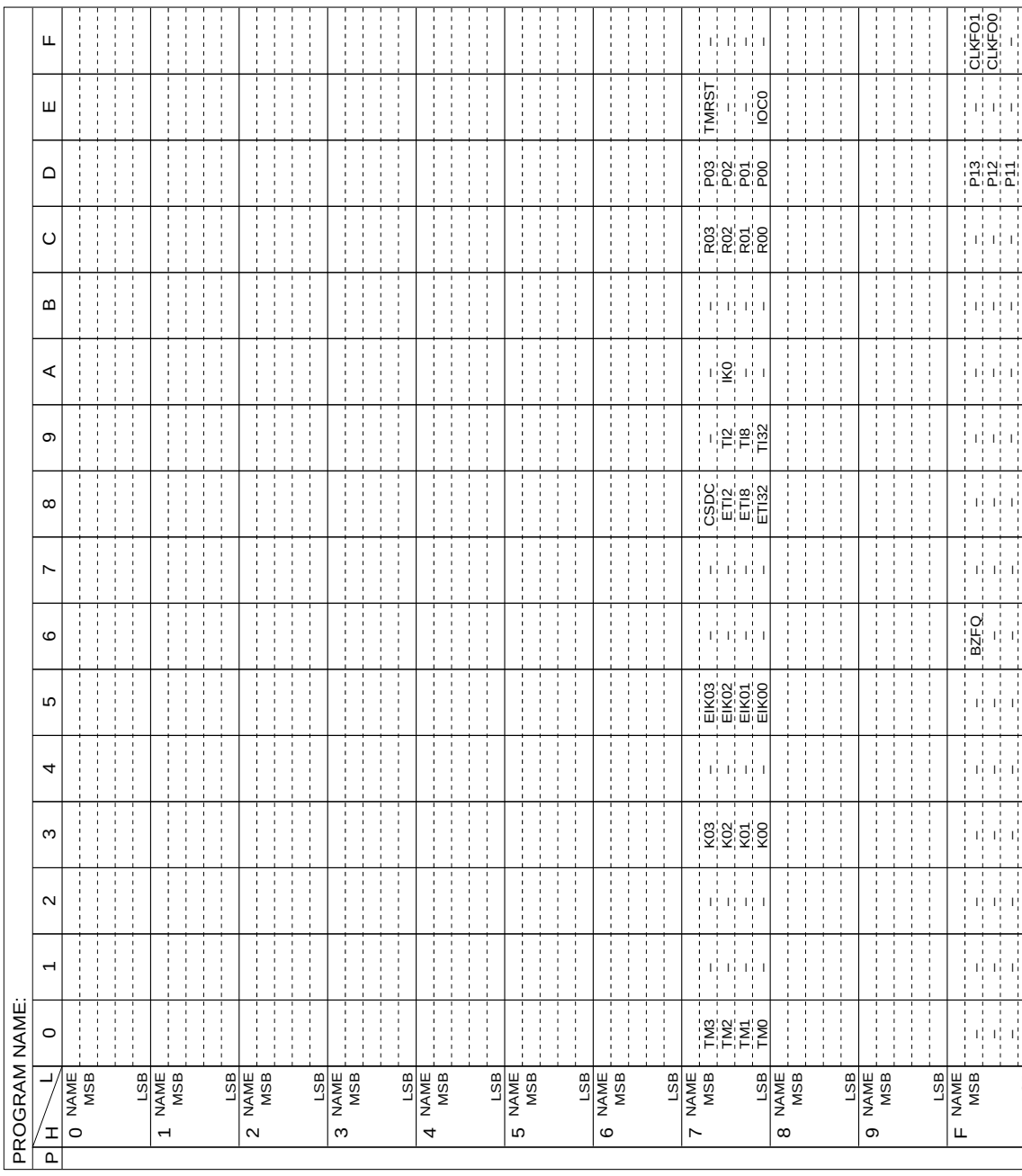
Associated with immediate data

p Five-bit immediate data or label 00H–1FH
s Eight-bit immediate data or label 00H–0FFH
l Eight-bit immediate data 00H–0FFH
i Four-bit immediate data 00H–0FH

Associated with arithmetic and other operations

+ Add
- Subtract
∧ Logical AND
∨ Logical OR
∀ Exclusive-OR
★ Add-subtract instruction for decimal operation when the D flag is set

APPENDIX B. E0C6011 RAM MAP



APPENDIX C. E0C6011 I/O MEMORY MAP

Address	Register D3	D2	D1	D0	Name	Init *1	1	0	Comment
070H	TM3	TM2	TM1	TM0	TM3	0			Clock timer data (2 Hz)
					TM2	0			Clock timer data (4 Hz)
					TM1	0			Clock timer data (8 Hz)
	R				TM0	0			Clock timer data (16 Hz) — When f_{CLK} = 65,536 Hz
073H	K03	K02	K01	K00	K03	– *2	High	Low	Input port data (K00–K03)
					K02	– *2	High	Low	
					K01	– *2	High	Low	
	R				K00	– *2	High	Low	
075H	EIK03	EIK02	EIK01	EIK00	EIK03	0	Enable	Mask	Interrupt mask register (K00–K03)
					EIK02	0	Enable	Mask	
					EIK01	0	Enable	Mask	
	R/W				EIK00	0	Enable	Mask	
078H	CSDC	EIT2	EIT8	EIT32	CSDC	0	Static	Dynamic	LCD drive switch
					EIT2	0	Enable	Mask	Interrupt mask register (clock timer 2 Hz) — When f_{CLK} = 65,536 Hz
					EIT8	0	Enable	Mask	Interrupt mask register (clock timer 8 Hz)
	R/W				EIT32	0	Enable	Mask	Interrupt mask register (clock timer 32 Hz)
079H	0	IT2	IT8	IT32	0 *3	– *2	–	–	Unused
					IT2 *4	0	Yes	No	Interrupt factor flag (clock timer 2 Hz) — When f_{CLK} = 65,536 Hz
					IT8 *4	0	Yes	No	Interrupt factor flag (clock timer 8 Hz)
	R				IT32 *4	0	Yes	No	Interrupt factor flag (clock timer 32 Hz)
07AH	0	IK0	0	0	0 *3	– *2	–	–	Unused
					IK0 *4	0	Yes	No	Interrupt factor flag (K00–K03)
	R				0 *3	– *2	–	–	Unused
					0 *3	– *2	–	–	Unused
07CH	R03	R02	R01	R00	R03	0	High	Low	Output port (R03, $\overline{BZ}$)
					R02	0	High	Low	Output port (R02, FOUT)
	R/W				R01	0	High	Low	Output port (R01)
					R00	0	High	Low	Output port (R00, BZ)
07DH	P03	P02	P01	P00	P03	– *2	High	Low	I/O port data (P00–P03)
					P02	– *2	High	Low	Output latch is reset at initial reset
	R/W				P01	– *2	High	Low	
					P00	– *2	High	Low	
07EH	TMRST	0	0	IOC0	TMRST	Reset	Reset	–	Clock timer reset
					0 *3	– *2	–	–	Unused
	W	R		R/W	0 *3	– *2	–	–	Unused
					IOC0	0	Output	Input	I/O control register 0 (P00–P03)
0F6H	BZFQ	0	0	0	BZFQ	0	f_{CLK}/32	f_{CLK}/16	Buzzer frequency selection *5
					0 *3	– *2	–	–	Unused
	R/W	R			0 *3	– *2	–	–	Unused
					0 *3	– *2	–	–	Unused
0FDH	P13	P12	P11	P10	P13	– *2	High	Low	I/O port data (P10–P13)
					P12	– *2	High	Low	Output latch is reset at initial reset
	R/W				P11	– *2	High	Low	
					P10	– *2	High	Low	
0FEH	0	0	0	IOC1	0 *3	– *2	–	–	Unused
					0 *3	– *2	–	–	Unused
	R			R/W	0 *3	– *2	–	–	Unused
					IOC1	0	Output	Input	I/O control register 1 (P10–P13)
0FFH	CLKFQ1	CLKFQ0	0	LCDON	CLKFQ1	0			Peripheral system clock selection [CLKFQ1, 0]: 00 01 10 11 (f_{CLK}: f_{OSC} f_{OSC}/2 f_{OSC}/3 f_{OSC}/4)
					CLKFQ0	0			
	R/W		R	R/W	0 *3	– *2	–	–	Unused
					LCDON	1	On	Off	LCD display On/Off conrol

*1 Initial value at initial reset

*2 Not set in the circuit

*3 Always "0" being read

*4 Reset (0) immediately after being read

*5 f_{CLK} is selectable from f_{OSC}, f_{OSC}/2, f_{OSC}/3 and f_{OSC}/4 using the CLKFQ1–CLKFQ0 register.

APPENDIX D. TROUBLESHOOTING

Tool	Problem	Remedy measures
ICE62R (ICE6200)	Nothing appears on the screen, or nothing works, after activation.	Check the following and remedy if necessary: • Is the RS-232C cable connected correctly? • Is the RS-232C driver installed? • Is SPEED.COM or MODE.COM on the disk? • Is the execution file correct? MS-DOS ICS6011J.EXE PC-DOS ICS6011W.EXE • Is the DOS version correct? MS-DOS Ver. 3.1 or later PC-DOS Ver. 2.1 or later • Is the DIP switches that set the baud rate of the main ICE62R (ICE6200) unit set correctly? • Is the breaker of the ICE62R (ICE6200) set to ON?
	The ICE6200 breaker tripped or the ICE62R fuse cut immediately after activation.	Check the following and remedy if necessary: • Are connectors F1 and F5 connected to the EVA6011 correctly? • Is the target board power short-circuiting?
	<ILLEGAL VERSION ICE6200> appears on the screen immediately after activation.	The wrong version of ICE is being used. Use the latest version.
	<ILLEGAL VERSION PARAMETER FILE> appears on the screen immediately after activation.	The wrong version of ICS6011P.PAR is being used. Use the latest version.
	Immediate values A (10) and B (11) cannot be entered correctly with the A command.	The A and B registers are reserved for the entry of A and B. Write 0A and 0B when entering A (10) and B (11). *Example:* `LD A, B` Data in the B register is loaded into the A register. `LD B, 0A` Immediate value A is loaded into the B register.
	<UNUSED AREA> is displayed by the SD command.	This message is output when the address following one in which data is written is unused. It does not indicates problem. Data is correctly set in areas other than the read-only area.
	You can not do a real-time run in break-trace mode.	Since the CPU stops temporarily when breaking conditions are met, executing in a real-time is not performed.
	Output from the EVA is impossible when data is written to the I/O memory for Buzzer and Fout output with the ICE command.	Output is possible only in the real-time run mode.
SOG6011	An R error occurs although the address is correctly set in the segment source file.	Check the following and remedy if necessary: • Does the address symbol use capital letters? • Are the output ports set for every two terminals?

Tool	Problem	Remedy measures
ASM6011	An R error occurs although the final page is passed.	The cross assembler is designed to output "R error" every time the page is changed. Use a pseudo-instruction to set the memory, such as ORG or PAGE, to change the page. See "Memory setting pseudo-instructions" in the cross assembler manual.
MDC6011	Activation is impossible.	Check the following and remedy if necessary: • Is the number of files set at ten or more in OS environment file CONFIG.SYS?
EVA6011	The EVA6011 does not work when it is used independently.	Check the following and remedy if necessary: • Has the EPROM for F.HEX and S.HEX been replaced by the EPROM for the target? • Is the EPROM for F.HEX and S.HEX installed correctly? • Is the appropriate voltage being supplied? (5V DC, 3A, or more) • Are the program ROMs (H and L) installed correctly? • Is data written from address 4000H? (When the 27C256 is used as the program ROM) • Is the EN/DIS switch on the EVA6011 set to EN?
	Target segment does not light.	Check the following and remedy if necessary: • Is an EPROM with an access time of 250 ns or less being used for S.HEX. • Has the VADJ VR inside the EVA6011 top cover been turned to a lower setting?

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