

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER **E0C63404**

DEVELOPMENT TOOL MANUAL



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CHAPTER 1 OUTLINE OF PACKAGE

1.1 Preface

The "E0C63404 Development Tool" package is a software development tool package for the CMOS 4-bit single chip microcomputer E0C63 Family, and consists of software tools necessary for debugging by the ICE63 and mask option setting for the E0C63404. The "E0C63 Family Assembler" package common to all the family models is also necessary for the software development in addition to this package.

- | | |
|------------------------------------------------------|---------------------|
| 1) HEX data converter | hex63404 |
| 2) Function option generator | fog63404 |
| 3) Mask data checker | mdc63404 |
| 4) Parameter file for ICE63 | par63404.par |
| 5) HEX file for LCD drive terminal setting | e0c63404.ssa |
| 6) HEX sample file for function option setting | c3404xxx.fsa |

1.2 Provided Floppy Disks

This package includes the following floppy disks which are necessary for debugging by the ICE63 and mask option setting of the IC for the E0C63404 development.

- | | |
|------------------------------------------------------|---|
| 1) 3.5" floppy disk for NEC PC9801 | 1 |
| 2) 3.5" floppy disk for IBM-PC/AT | 1 |
| 3) E0C63404 Development Tool Manual (English) | 1 |
| 4) E0C63404 Development Tool Manual (Japanese) | 1 |

The type of the personal computer that can be used with the development system and the restrictions are as follows:

- | | |
|-------------------------------|--------------------------------------------------------------------------------------------------|
| 1) Model: | IBM-PC/AT or compatible model
NEC PC9801 Series or compatible model |
| 2) OS: | MS-DOS or PC-DOS, ver. 3.3 or higher |
| 3) RAM capacity: | 640K bytes |
| 4) Disk drive: | 3.5 inches (1.2M: PC9801 and the compatible)
3.5 inches (1.44M: IBM-PC/AT and the compatible) |
| 5) Necessary software: | General purpose editor |

* This software operates in the real mode and does not use EMS and protected memory.

Keep the original disk in a safe place as a backup after copying the contents to hard disk or other floppy disk.

1.3 Outline of Software Tool

The software tools included in this package take position indicated in the following Figure 1.3.1 (parts with a half-tone) on the whole software development.

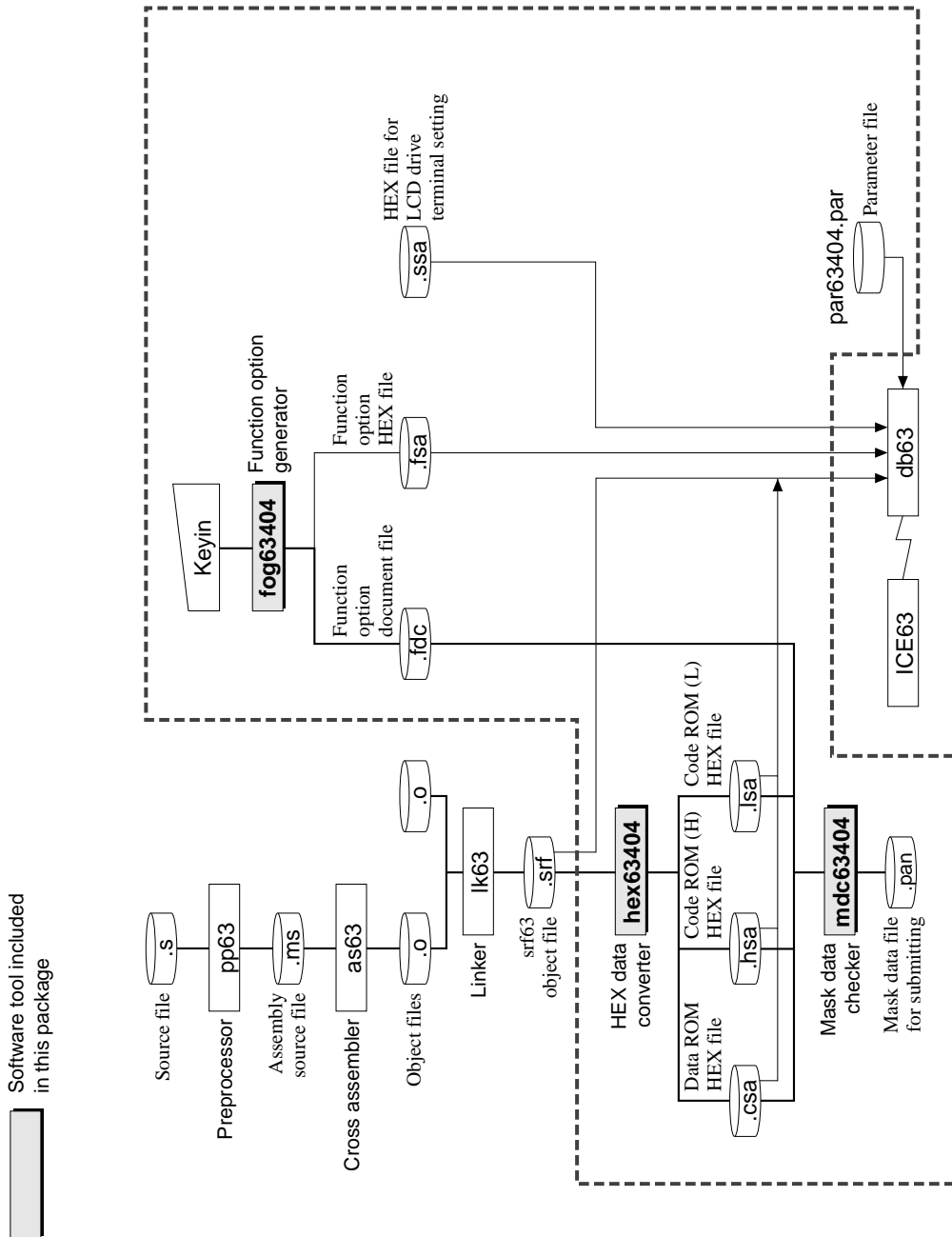


Fig. 1.3.1 Software development flow

The following shows the outline of the basic function of each software.

1.3.1 HEX data converter <hex63404>

The HEX data converter hex63404 converts the file output by the linker (lk63) for the E0C63 Family into a HEX file (Motorola S2 format). At the same time, it fills unused ROM space with FFH data. The completed program should be finally verified by loading the HEX file output from this tool to the ICE63.

1.3.2 Function option generator <fog63404>

In the E0C63404, some hardware specifications such as an I/O port function can be selected as mask option. The function option generator fog63404 is a tool that can interactively select the E0C63404 mask option settings and generates the mask option setting file for the ICE63 and the function option document file for generating the IC mask pattern.

1.3.3 Mask data checker <mdc63404>

The mask data checker mdc63404 is a software tool that checks the ROM data and option data developed and generates a file for submitting to Seiko Epson.

1.3.4 Parameter file for ICE63 <par63404.par>

This is a parameter file for setting the ICE63 so that the ICE63 will be compatible with each model. Place this file in the directory where the tools for the "E0C63 Family Assembler" package are installed.

1.3.5 HEX file for LCD drive terminal setting <e0c63404.ssa>

The ICE63 has 80 SEG terminals built-in for driving the LCD, however, the E0C63404 can use 40 of them. This file is used to set the SEG terminal configuration in the ICE63 to correspond with the E0C63404. This file must be loaded to the ICE63 at the beginning of debugging using the "lo" command.

1.3.6 HEX file for function option setting <c3404xxx.fsa>

This file is used to define the function option and other settings of each model into the ICE63. This file is included in the package as a sample.

Create an actual use file using the function option generator fog63404.

1.4 Installation Procedure

This package does not include an installer program. Please copy the all files to the working directory.

CHAPTER 2 HEX DATA CONVERTER (hex63404)

2.1 Outline of hex63404

The HEX data converter utility hex63404 converts the file (~.srf) output by the linker (lk63) for the E0C63 Family into a HEX file (Motorola S2 format). At the same time, it fills unused ROM space with FFH data. The completed program should be finally verified by loading the HEX files output from this tool to the ICE63. Then create data for submitting to Seiko Epson from the HEX files using the mask data checker (mdc63404).

2.2 Execution Flow and Input/Output Files

Figure 2.2.1 shows the hex63404 execution flow.

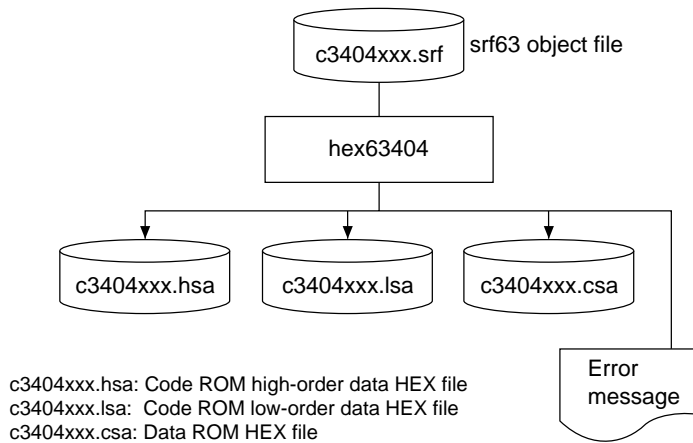


Fig. 2.2.1 hex63404 execution flow

Note: Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.

The hex63404 inputs an object file (srf63 format) and generates three HEX files (Motorola S2 format). The object file name is used as the output file name except for the extension. For example, if the object file name is "c34040a0.srf", the hex63404 outputs three files as below:

- 1) c34040a0.hsa 2) c34040a0.lsa 3) c34040a0.csa

(1) Input file

- **Object file (~.srf)**
This is an srf63 format object file output from the linker lk63.

(2) Output files

- **Code ROM high-order data HEX file (~.hsa)**
The hex63404 outputs this file in Motorola S2 format. This file contains high-order 5 bits of the codes (13 bits each) in the object file.
- **Code ROM low-order data HEX file (~.lsa)**
The hex63404 outputs this file in Motorola S2 format. This file contains low-order 8 bits of the codes (13 bits each) in the object file.
- **Data ROM HEX file (~.csa)**
The hex63404 outputs this file in Motorola S2 format. This file contains the data (4 bits) in the object file.

2.3 Operation Procedure

2.3.1 Starting procedure

(1) Starting command

Enter the command as following format at the DOS command level (state in which a prompt such as A> is displayed).

```
hex63404 <Object file name[.srf]> 
```

indicates the Return key.

A parameter enclosed by [] can be omitted.

The input file should be placed in the current directory. The output files are also generated in the current directory.

(2) Start-up message

When the hex63404 starts up, the following message is displayed.

Example: File name: c34040a0.srf

```
A>hex63404 c34040a0.srf 
E0C63404 HEX Data Converter Ver.x.xx
Copyright (C) SEIKO EPSON CORP. 199x
Now checking the SROFF file ...
```

2.3.2 End procedure

When a series of operations is completed, the hex63404 displays the following message and returns to the DOS command level.

(1) When terminated normally

The hex63404 displays the following message after generating the output files and returns to the DOS command level.

```
.....
Now checking the SROFF file ...
OK.
A>
```

(2) When an error occurs

The hex63404 displays an error message and returns to the DOS command level. The output file is not generated.

```
.....
Now checking the SROFF file ...
Error:<Error message>
A>
```

(3) When a warning occurs

The hex63404 displays a warning message, but continues the processing. It returns to the DOS command level after generating the output files.

```
.....
Now checking the SROFF file ...
Warnig:<Warning message>
OK.
A>
```

2.4 Error and Warning Messages

The hex63404 error messages and warning message are listed below.

2.4.1 Start-up error

Message	Explanation
Usage: hex63 <file name>	The start-up parameter is incorrect.
Error: "xxxxxxx.xxx" file is not found.	The specified object file is not found.

2.4.2 Input file format error (1)

Message	Explanation
Error: The start address is out of range.	The start address is out of the ROM capacity range.
Error: The end address is out of range.	The end address is out of the ROM capacity range.
Error: Input file is not E0C63 Sroff file.	The object file specified is not an srf63 file for the E0C63 Family.

2.4.3 Input file format error (2)

When an error message as shown below appears, try to execute the hex63404 again after re-creating the srf63 file. If a similar error still results, please notify Seiko Epson of the situation and the error message displayed.

Message	Explanation
Error: The start address offset error.	The start address is incorrect.
Error: Code conflicted at XXXXH.	A conflict occurred at address XXXXH in the code ROM.
Error: Data conflicted at XXXXH.	A conflict occurred at address XXXXH in the data ROM.
Error: Information chain empty.	The information is empty.
Error: Chain information size is greater than file size.	The chain information size is greater than the file size.
Error: Chain seek address is greater than file size.	The chain seek address is greater than the file size.
Error: File control flag error.	The file control flag in the link format is incorrect.
Error: Entry address error.	The entry address is not 0x00000110.
Error: Section address error.	The section address is out of the 0x00000000 to 0x0000ffff range.
Error: Section ID error.	The section ID is out of the 0x0000 to 0x00ff range.
Warnig: Section information chain is not found.	There is no section information chain.

2.4.4 System error

Message	Explanation
Error: File open error.	The file cannot be opened.
Error: File write error.	The file cannot be written.
Error: File read error.	The file cannot be read.
Error: Memory allocate error.	Memory is insufficient.

2.5 hex63404 Execution Example

The following shows an example of when an srf63 format file ("c34040a0.srf") is converted into a Motorola S2 format file ("c34040a0.hsa", "c34040a0.lsa", "c34040a0.csa").

A>hex63404 c34040a0.srf []

■ Example of input file

```
<c34040a0.srf>
Hex dump output
00000000  00 0A 00 00 01 10 63 00 00 00 10 00 00 00 90          c
00000010  00 00 00 3C 00 01 00 00 02 00 00 01 10 00 00        <
00000020  00 00 00 00 00 00 00 00 68 00 00 00 10 00 00          h
00000030  00 01 00 00 00 88 00 00 06 00 00 00 00 00 00
00000040  00 02 00 00 00 02 00 00 80 00 00 00 00 00 00
00000050  00 00 00 00 00 78 00 00 00 10 00 00 00 01 00 00    x
00000060  00 8E 00 00 00 02 00 01 00 00 00 00 00 00 00
00000070  00 00 00 02 02 4C 31 00 00 00 00 00 00 00 00    L1
00000080  00 00 00 02 02 4C 32 00 1E F2 19 72 18 72 0A 0F    L2  r r
00000090  00 00 00 00 00 00 00 B4 00 00 00 0D 00 00 00 01
000000A0  00 00 00 C1 00 00 00 3C 00 00 00 FD 00 00 00 20    <
000000B0  00 00 00 02 00 00 00 08 73 61 6D 70 6C 65 2E 73    sample.s
000000C0  00 FF FF 00 00 00 00 00 00 00 00 00 00 00 00
000000D0  06 00 00 00 00 00 00 00 00 00 00 07 00 00 00
000000E0  00 00 01 00 00 00 00 00 08 00 00 00 00 02 00
000000F0  00 FF FE 00 00 00 00 00 00 00 00 00 00 00 00
00000100  00 00 02 00 00 00 00 00 02 4C 31 00 00 00 01    L1
00000110  00 02 00 00 00 00 01 02 4C 32                      L2
```

■ Example of output file

```
<c34040a0.csa>
S224000000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFA
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:       :       :       :       :       :       :       :
S2240007C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF34
S2240007E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF14
S804000000FB

<c34040a0.hsa>
S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFA8
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:       :       :       :       :       :       :       :
S224000FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2C
S224000FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0C
S804000000FB
```

CHAPTER 2: HEX DATA CONVERTER (hex63404)

<c34040a0.lsa>

```
S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2727FFFFFFFFFFFFFFFFFFFF21
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:           :           :           :           :           :           :           :
S224000FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2C
S224000FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0C
S804000000FB
```

CHAPTER 3 FUNCTION OPTION GENERATOR (fog63404)

3.1 Outline of fog63404

The E0C63404 4-bit single chip microcomputer has 12 mask options to select hardware specifications such as I/O port functions. By modifying the IC mask patterns of the E0C63404 according to the options selected, the system can be customized to meet the specifications of the target system.

The function option generator fog63404 is a software tool for generating the document file used to generate IC mask patterns. The mask options for the E0C63404 can be interactively selected. From the data file created with fog63404, the E0C63404 mask pattern is automatically generated by a CAD machine at Seiko Epson.

In addition, HEX data in the Motorola S2 format necessary for debugging using the ICE63 can be created. By downloading this data file from the host machine when debugging with the ICE63, the same option functions as the actual IC can be realized on the ICE63.

3.2 Execution Flow and Input/Output Files

Figure 3.2.1 shows the fog63404 execution flow.

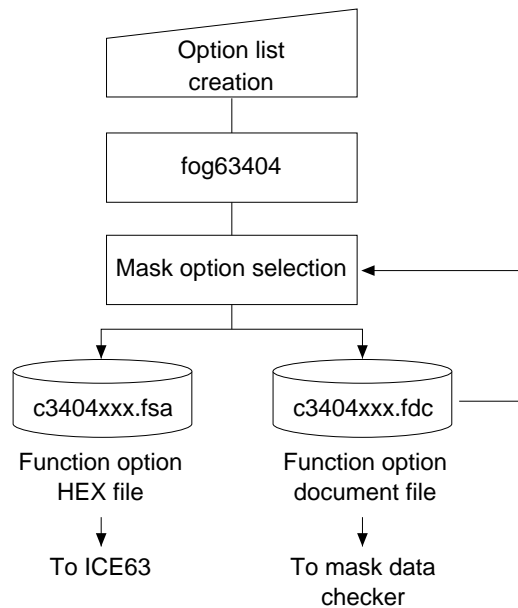


Fig. 3.2.1 fog63404 execution flow

(1) Option list creation

Select the E0C63404 mask options that meet the target system and record them in the option list (see Section 3.3).

(2) fog63404 execution

Start the fog63404 and select the mask options according to the display on screen. Since options can be selected using the interactive format, a device such as a source file is not necessary.

In addition, when correcting the contents, once it has been set, the necessary points alone can be corrected by inputting the file that was output by the fog63404.

As a result, the fog63404 outputs the following two files.

• **Function option document file (c3404xxx.fdc)**

This file contains the mask option setting data and is used for generating a mask pattern of the IC at Seiko Epson. The option setting data in this file can be modified by loading it to the fog63404. This file should be packed with the completed program files for submitting to Seiko Epson.

• **Function option HEX file (c3404xxx.fsa)**

This file is a Motorola S2 format data file for setting the E0C63404 mask options to the ICE63. When debugging programs with the ICE63, this file should be loaded into the ICE63 using a command from the db63 debugger for the ICE63.

- *1 Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.
- *2 Pack the document file and the program files using the mask data checker and submit it to Seiko Epson.
- *3 Refer to the "E0C63 Family Assembler Package Manual" for the method of downloading the mask options into the ICE63.

3.3 Option List

The following options can be set for the E0C63404.

Multiple selections are available in each option item as indicated in the Option List. Using "E0C63404 Technical Manual" as reference, select the specifications that meet the target system and check the appropriate box. Be sure to record the specifications for unused functions too, according to the instructions provided.

The option selection is done interactively on the screen during the fog63404 execution, using this option list as reference.

1 OSC1 SYSTEM CLOCK

- 1. Crystal (32.768 kHz)
- 2. CR

2 OSC3 SYSTEM CLOCK

- 1. Use <Ceramic> or Not Use
- 2. Use <CR>

3 MULTIPLE KEY ENTRY RESET COMBINATION

- 1. Not Use
- 2. Use <K00, K01, K02, K03>
- 3. Use <K00, K01, K02>
- 4. Use <K00, K01>

4 MULTIPLE KEY ENTRY RESET TIME AUTHORIZE

- 1. Not Use
- 2. Use

5 INPUT PORT PULL UP 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
- K10 1. With Resistor 2. Gate Direct
- K11 1. With Resistor 2. Gate Direct
- K12 1. With Resistor 2. Gate Direct
- K13 1. With Resistor 2. Gate Direct

6 OUTPUT PORT OUTPUT SPECIFICATION

- R00 1. Complementary 2. Nch Open Drain
- R01 1. Complementary 2. Nch Open Drain
- R02 1. Complementary 2. Nch Open Drain
- R03 1. Complementary 2. Nch Open Drain
- R1x 1. Complementary 2. Nch Open Drain
- R2x 1. Complementary 2. Nch Open Drain

7 I/O PORT OUTPUT SPECIFICATION

- P0x 1. Complementary 2. Nch Open Drain
- P1x 1. Complementary 2. Nch Open Drain
- P20 1. Complementary 2. Nch Open Drain
- P21 1. Complementary 2. Nch Open Drain
- P22 1. Complementary 2. Nch Open Drain
- P23 1. Complementary 2. Nch Open Drain

8 I/O PORT PULL UP RESISTOR

- P0x 1. With Resistor 2. Gate Direct
- P1x 1. With Resistor 2. Gate Direct
- P20 1. With Resistor 2. Gate Direct
- P21 1. With Resistor 2. Gate Direct
- P22 1. With Resistor 2. Gate Direct
- P23 1. With Resistor 2. Gate Direct

9 LCD DRIVING POWER

- 1. Internal
- 2. External

10 SERIAL PORT INTERFACE POLARITY

- 1. Positive
- 2. Negative

11 SVD EXTERNAL VOLTAGE DETECTION

- 1. Not Use
- 2. Use

12 SOUND GENERATOR POLARITY FOR OUTPUT

- 1. Positive
- 2. Negative

3.4 Operation Procedure

3.4.1 Starting procedure

(1) Starting command

```
fog63404 ↵
```

↵ indicates the Return key.

To start fog63404, enter "fog63404" at the DOS command level (a state in which a prompt such as A> is displayed). The "fog63404.exe" program should be previously copied into the working directory.

(2) Start-up message

```
A>fog63404
E0C63404 Function Option Generator Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x

This software makes the following files.

c3404xxx.fsa ... function option HEX file.
c3404xxx.fdc ... function option document file.
```

When the fog63404 starts up, the start-up message is displayed.

The following explains the actual operation method of the fog63404 according to the screen displayed.

To suspend execution, press the "CTRL" and "C" keys together; the sequence returns to the DOS command level. It is possible by pressing "STOP" key depending on the PC used.

(3) Date input

```
Current data is '95/09/11
Please input new data : 95/09/11 ↵
```

Following the start-up message, the date currently set in the host computer is displayed, prompting entry of a new date. When modifying the date, 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.

(4) Operation selection menu

```
*** Operation select menu ***

    1. Input new file
    2. Edit file
    3. Return to dos

Please select No. ?
```

When the date is set, the operation selection menu is displayed on the screen. Enter a number from 1 to 3 to select a subsequent operation.

The items indicate the following.

- 1. Input new file:** Used to set new function option file.
- 2. Edit file:** Used to read the already-generated function option document file and set or modify the option contents. In this case, the current directory must contain the function option document file (c3404xxx.fdc) generated by "1. Input new file".
- 3. Return to DOS:** Used to terminate the fog63404 and return to the DOS command level.

3.4.2 Setting new function options (Input new file)

This section explains how to set new function option file.

* In the examples, indicates the Return key.

```

*** Operation select menu ***

      1. Input new file
      2. Edit file
      3. Return to dos

Please select No. ? 1                                     ...(1)

Please input file name ? c3404xxx                               ...(2)
Please input user's name ? SEIKO EPSON CORP.                         ...(3)
Please input any comment
(one line is 50 chr) ? ED MARKETING DEPARTMENT                               ...(4)
                        ? 421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN
                        ? TEL 042-587-5816
                        ? FAX 042-587-5624
                        ? 

```

(1) Please select No. ?

Select "1. Input new file" on the operation selection menu.

(2) Please input file name ?

Enter the function option document (and HEX) file name to be generated. Do not enter the extension of the file name.

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

```

Please input file name ? c3404xxx
File exists. Overwrite (y/n) ?

```

(3) Please input user's name ?

Enter your company name.

Up to 40 characters may be entered. If 41 or more characters are entered, they are ignored.

"[" and "]" are converted into "(" and ")" to record in the document file.

(4) Please input any comment

Enter any comment. Up to 50 characters may be entered in one line. If 51 or more characters are entered in one line, they are ignored. Up to 10 comment lines may be entered. To end entry of comments, press the Return key at the beginning of the line. Small letters entered are converted into capital letters to record in the document file.

Furthermore, include the following in comment lines:

- Department, division, and section names
- Company address, phone number, and FAX number
- Other information, including technical information

Moreover, the below symbols for the inputting of (3) and (4) cannot be used. When those symbols are input, it displays an "Illegal character" error message, then again returns to the input status for that line.

```

"$", "\", "(", ")", "|", "\ (back-quote)"      ... input disabled

```

Next, start mask option setting for the E0C63404. For new settings, select options Option No. 1 to No. 12 sequentially and interactively.

See "3.4.4 Option selection" for the selection procedure of each function option.

3.4.3 Modifying function option settings (Edit file)

This section explains how to modify the settings in the function option file.

* In the examples, indicates the Return key.

```

*** Operation select menu ***

    1. Input new file
    2. Edit file
    3. Return to dos

Please select No. ? 2                ... (1)

*** Source file(s) ***

C34040A0      C34040B0      C34040C0      ... (2)

Please input file name ? c34040A0    ... (3)
Please input user's name ?                 ... (4)
Please input any comment
(one line is 50 chr) ?                 ... (5)
Please input edit no.(End=e) ? 2    ... (6)
    
```

(1) Please select No. ?

Select "2. Edit file" on the operation selection menu.

(2) * Source file(s) *****

Will display the function option document files on the current drive.

If no modifiable source exists, the following message is displayed and the program is terminated.

Function option document file is not found.

(3) Please input file name ?

Enter a file name. Do not enter the extension of the file name. If the specified function option document file (c3404xxx.fdc) is not in the current directory, an error message like the one below is output, prompting entry of other file name.

Please input file name ? c34040a0
 Function option document file is not found.

(4) Please input user's name ?

When modifying the company name, enter a new name. The previously entered name may be used by pressing the Return key.

(5) Please input any comment

When modifying a comment, enter all the comment lines anew, beginning with the first line; comment data cannot be partially modified. Previously entered comment data can be used by pressing the Return key. The input conditions are the same as for new settings.

(6) Please input edit No. (End = e) ?

Enter the number (1–12) of the option to be modified, then start setting the option contents (See "3.4.4 Option selection").

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.

If the Return key is pressed without entering a number, the option of the subsequent number can be selected.

Enter "E" to end option selection. Then, move to generate for the function option HEX file.

Example: • When modifying the settings of the option of No. 2

Please input edit No.(End=e) ? 2

• When ending setting

Please input edit No.(End=e) ? E

3.4.4 Option selection

Selection procedure for function options are described below.

Option selection is done interactively. For new settings (Input new file), set all options Option No. 1 to No. 12 sequentially; to modify settings (Edit file), the specified option number may be set directly.

(1) Example of option selection

```
*** Option No.3 ***
--- Multiple key entry reset combination ---

    1. Not use
    2. Use K00,K01,K02,K03
    3. Use K00,K01,K02
    4. Use K00,K01

Please select No.(1) ? 1↵
    1. Not use                               selected
```

The selections for each option correspond one to one to the option list. While referring to the contents recorded in the option list, enter the selection number.

In the message that prompts entry, the value in parentheses () indicates the default value in case of new settings, or the previously set value in case of setting modification. This value is set when only the Return key is pressed.

Furthermore, in the selection examples, "[↵]" indicates the Return key input.

When all of option settings are completed in new settings, move to the generate for the function option HEX file.

When modify settings are completed, move to generate for the function option HEX file by entering "E[↵]".

(2) Modifying procedure when wrong number is selected in new setting (Input new file)

```
*** Option No.3 ***
--- Multiple key entry reset combination ---

    1. Not use
    2. Use K00,K01,K02,K03
    3. Use K00,K01,K02
    4. Use K00,K01

Please select No.(1) ? B↵

*** Option No.2 ***
--- OSC3 system clock ---

    1. Not use/Use Ceramic
    2. Use CR

Please select No.(1) ?
```

To modify previously set option in the new setting process (Input new file), enter "B[↵]" to return 1 step back to the previous function option setting operation.

3.4.5 HEX file generation

When function option settings are completed, the following message is output to ask the user whether to generate the function option HEX file.

```
End of option setting.
Do you make HEX file (y/n) ? y
```

Enter "Y" to generate the HEX file (c3404xxx.fsa). If "N" is entered, no HEX file is generated and only document file (c3404xxx.fdc) is generated.

Since the function option HEX file (c3404xxx.fsa) is needed when debugging the target program with the ICE63, normally set "Y".

Furthermore, when debugging with the ICE63, download the generated HEX file into the ICE63.

When the above operation is completed, the fog63404 generates the function option HEX file and function option document file. And then the following message is output and the sequence returns to the operation selection menu. However, when "N" is input in the above selection for the function option HEX file, the end message shown below is not displayed.

```
Making file(s) is completed.
```

3.4.6 End procedure

```
*** Operation select menu ***

    1. Input new file
    2. Edit file
    3. Return to dos
```

When a series of operations are completed, the sequence returns to the operation selection menu. Execution of the fog63404 can be terminated by selecting "3. Return to DOS" on this menu.

The fog63404 can be forcibly terminated by pressing the "CTRL" and "C" keys together during this software execution. (It is possible by pressing "STOP" key depending on the PC used.) However, in this case, the correct function option HEX file and function option document file are not generated.

3.5 Error Message

Table 3.5.1 lists the fog63404 error messages.

Table 3.5.1 fog63404 error message list

Message	Explanation
Illegal character!!	There is an input character error. An input disable character has been input.
Function option document file is not found.	There is no document file at the time of the setting modification (Edit file). There is no document file with the input file name at the time of the setting modification (Edit file).
File name error.	9 characters or more have been input for the file name input.
Bad function option document file.-filename-	A function option document file other than for the E0C63404 is specified during modification (Edit file).
Error: File write error.	The function option document file or function option HEX file cannot be created. This error may occur if there is no disk space.
Can't open file : filename	The file cannot be opened. This error may occur when too many files exist in the current directory.

3.6 Sample Files

■ Example of function option document file

```

* E0C63404 FUNCTION OPTION DOCUMENT V x.xx
*
* FILE NAME      C34040A0.FDC
* USER'S NAME   SEIKO EPSON CORP.
* INPUT DATE    '96/02/19
* COMMENT       ED MARKETING DEPARTMENT
*              421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN
*              TEL 042-587-5816
*              FAX 042-587-5624
*
* *** OPTION NO.1 ***
* --- OSC1 SYSTEM CLOCK ---
*   CRYSTAL(32.768KHZ) ----- SELECTED
OPT0101 01
*
* *** OPTION NO.2 ***
* --- OSC3 SYSTEM CLOCK ---
*   NOT USE/USE CERAMIC ----- SELECTED
OPT0201 01
*
* *** OPTION NO.3 ***
* --- MULTIPLE KEY ENTRY RESET COMBINATION ---
*   NOT USE ----- SELECTED
OPT0301 01
*
* *** OPTION NO.4 ***
* --- MULTIPLE KEY ENTRY RESET TIME AUTHORIZE ---
*   NOT USE ----- SELECTED
OPT0401 01
*
* *** OPTION NO.5 ***
* --- INPUT PORT PULL UP RESISTOR ---
*   K00           WITH RESISTOR ----- SELECTED
*   K01           WITH RESISTOR ----- SELECTED
*   K02           WITH RESISTOR ----- SELECTED
*   K03           WITH RESISTOR ----- SELECTED
*   K10           WITH RESISTOR ----- SELECTED
*   K11           WITH RESISTOR ----- SELECTED
*   K12           WITH RESISTOR ----- SELECTED
*   K13           WITH RESISTOR ----- SELECTED
OPT0501 01
OPT0502 01
OPT0503 01
OPT0504 01
OPT0505 01
OPT0506 01
OPT0507 01
OPT0508 01
*
* *** OPTION NO.6 ***
* --- OUTPUT PORT OUTPUT SPECIFICATION ---
*   R00           COMPLEMENTARY ----- SELECTED
*   R01           COMPLEMENTARY ----- SELECTED
*   R02           COMPLEMENTARY ----- SELECTED
*   R03           COMPLEMENTARY ----- SELECTED
*   R1X           COMPLEMENTARY ----- SELECTED
*   R2X           COMPLEMENTARY ----- SELECTED
OPT0601 01
OPT0602 01
OPT0603 01

```

CHAPTER 3: FUNCTION OPTION GENERATOR (fog63404)

```

OPT0604 01
OPT0605 01
OPT0606 01
*
* *** OPTION NO.7 ***
* --- I/O PORT OUTPUT SPECIFICATION ---
* P0X COMPLEMENTARY ----- SELECTED
* P1X COMPLEMENTARY ----- SELECTED
* P20 COMPLEMENTARY ----- SELECTED
* P21 COMPLEMENTARY ----- SELECTED
* P22 COMPLEMENTARY ----- SELECTED
* P23 COMPLEMENTARY ----- SELECTED
OPT0701 01
OPT0702 01
OPT0703 01
OPT0704 01
OPT0705 01
OPT0706 01
*
* *** OPTION NO.8 ***
* --- I/O PORT PULL UP RESISTOR ---
* P0X WITH RESISTOR ----- SELECTED
* P1X WITH RESISTOR ----- SELECTED
* P20 WITH RESISTOR ----- SELECTED
* P21 WITH RESISTOR ----- SELECTED
* P22 WITH RESISTOR ----- SELECTED
* P23 WITH RESISTOR ----- SELECTED
OPT0801 01
OPT0802 01
OPT0803 01
OPT0804 01
OPT0805 01
OPT0806 01
*
* *** OPTION NO.9 ***
* --- LCD DRIVING POWER ---
* INTERNAL POWER ----- SELECTED
OPT0901 01
*
* *** OPTION NO.10 ***
* --- SERIAL INTERFACE POLARITY ---
* POSITIVE ----- SELECTED
OPT1001 01
*
* *** OPTION NO.11 ***
* --- SVD EXTERNAL VOLTAGE DETECTION ---
* NOT USE ----- SELECTED
OPT1101 01
*
* *** OPTION NO.12 ***
* --- SOUND GENERATOR POLARITY FOR OUTPUT ---
* POSITIVE ----- SELECTED
OPT1201 01
* EOF

```

■ Example of function option HEX file (Motorola S2 format)

```

S2240000002200000000000000000000000000000000000000000000000000000480B0000000000000000000000000066
S804000000FB

```

CHAPTER 4 MASK DATA CHECKER (mdc63404)

4.1 Outline of mdc63404

The mask data checker mdc63404 is a software tool that checks the format of the input files, code ROM files (c3404xxx.hsa, c3404xxx.lsa), data ROM file (c3404xxx.csa) generated by the hex63404 and the function option document file (c3404xxx.fdc) generated by the fog63404, and generates a data file (c3404xxx.pan) for generating mask patterns. Submit the file generated through this software tool to Seiko Epson.

Moreover, the mdc63404 has a function to restore the generated data file (c3404a0.pan) to the original file format.

4.2 Execution Flow and Input/Output Files

Figure 4.2.1 shows the mdc63404 execution flow.

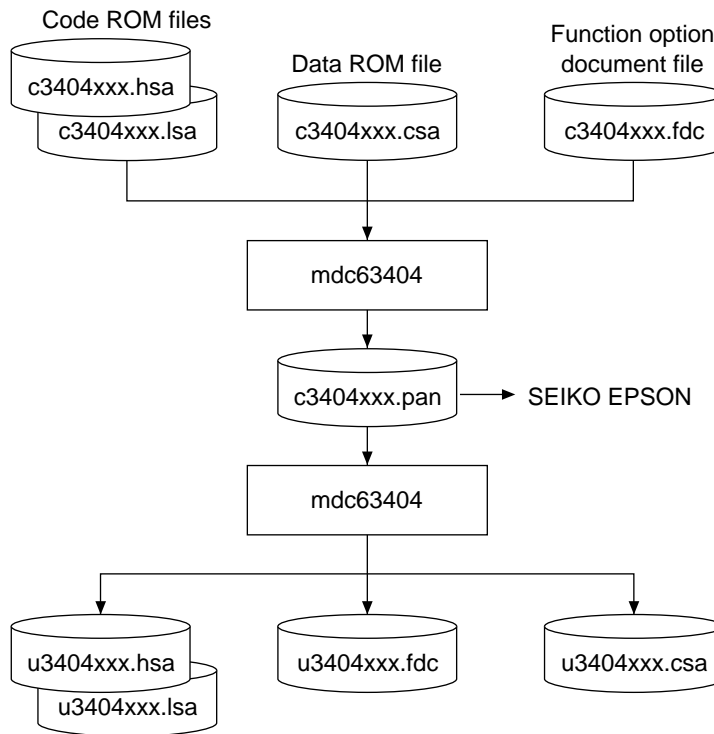


Fig. 4.2.1 mdc63404 execution flow

(1) Preparation of code ROM files (c3404xxx.hsa, c3404xxx.lsa) and data ROM file (c3404xxx.csa)

Prepare the code ROM and data ROM HEX files output from the HEX data converter (hex63404).

(2) Preparation of function option data file (c3404xxx.fdc)

Prepare the function option document file output from the function option generator (fog63404).

(3) Packing of data

Using the mask data checker (mdc63404), compile the code/data ROM files and function option document file in one data file for masking (c3404xxx.pan). This packing file should be sent to Seiko Epson.

(4) Unpacking of data

The data file for masking (c3404xxx.pan) generated by packing process can be restored to the original file using the mask data checker (mdc63404).

Note: Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.

4.3 Operation Procedure

4.3.1 Copying each data files

When submitting data to Seiko Epson, copy on the work disk the data generated from the HEX converter (hex63404) and the function option generator (fog63404).

Be sure to assign the following file names. Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.

- 1) Code ROM files: c3404xxx.hsa
 c3404xxx.lsa
- 2) Data ROM file: c3404xxx.csa
- 3) Function option document file: c3404xxx.fdc

4.3.2 Starting procedure

(1) Starting command

To start mdc63404, enter the command as following format at the DOS command level (state in which a prompt such as A> is displayed).

```
mdc63404 {-p | -u} <file name> [ ]
```

[] indicates the Return key.

{-p | -u} indicates either one can be specified.

(2) Option

The options below have been set for the start-up command of the mdc63404.

-p

Specification of packing. When specifying this option, **an output file name must also be specified**. In this case, the code/data ROM files (~.hsa, ~.lsa, ~.csa) and function option document file (~.fdc) must have the same name (excluding the extension) as the specified output file name.

Furthermore, generation of the output file and reading of the input files are done only for the current directory.

Example: mdc63404 -p c34040a0.pa0

-u

Specification of unpacking. When specifying this option, **an input file name must also be specified**. Furthermore, reading of the input file and generation of the output files are done only for the current directory.

Example: mdc63404 -u c34040a0.pa0

Default (When option has not been specified)

When an option has not been specified, it is designed such that pack/unpack processing can be selected from the operation menu displayed, following start-up. It is set-up such that the packing file name to be output or input can also be specified according to the message displayed.

(3) Start-up message

When the mdc63404 starts up, the following message is displayed.

Example: When option has not been specified.

```
E0C63404 Mask Data Checker Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x

---<< Operation menu >>---

    1. Pack
    2. Unpack

Please select No.? 1
```

When an option is not specified at the time the start-up command is input, the operation menu is displayed and the user is prompted to select operation. When creating a mask data for submission to Seiko Epson, select "1"; when the mask data is to be split and restored to the original format, select "2". When an option has been specified at the time of start-up of the mdc63404, it executes directly the selected packing or unpacking process without displaying this operation menu.

Note: In the OS environment setup file "CONFIG.SYS", the number of files that can be opened at the same time must be set at least 10.

Example: FILES = 20

4.3.3 Packing of data

When generating data for submission to Seiko Epson, select packing option at the time of start-up of the mdc63404 (see "4.3.2 Starting procedure").

(1) Input file name

When the operation menu item 1, "Pack", is selected after starting up the mdc63404 in default (without option specification), the mdc63404 prompts to enter a **file name to be generated**.

Moreover, when the -p option has been specified at the mdc63404 start-up, it executes directly the packing process without displaying the operation menu and confirmation message of the file name to be generated.

```
Input files are: C3404xxx.HSA
                 C3404xxx.LSA
                 C3404xxx.CSA
                 C3404xxx.FDC
Output file is : C3404xxx.PAn

Please input pack file name(C3404xxx.PAn) ? c34040a0.pa0
```

Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.

Moreover, after submitting the masking data to Seiko Epson and there is need to re-submit the mask data for reasons such as faulty programs, etc., increase the numeric value of "n" by one when the input is made. For example, when re-submitting data after "c3404xxx.pa0" has been submitted, the pack file name should be entered as "c3404xxx.pa1".

(2) Packing process

Access to the input files when packing data is done only for code ROM files (~.hsa, ~.lsa), data ROM file (.csa) and function option document file (.fdc) that have the same name (excluding the extension) as the specified output file name on the current directory.

If there is no problem in inputting of the file name and the contents of the input files, the input data are packed to generate the mask data and displays the generated file name.

With this, the data file for masking is generated. Submit this file to Seiko Epson.

```
Input files are: C34040A0.HSA
                 C34040A0.LSA
                 C34040A0.CSA
                 C34040A0.FDC
Output file is : C34040A0.PA0
```

4.3.4 Unpacking data

When restoring the packed data to original file format, select unpacking option at the time of start-up of the mdc63404 (see "4.3.2 Starting procedure").

(1) Input file name

When the operation menu item 2, "Unpack", is selected after starting up the mdc63404 in default (without option specification), the mdc63404 prompts to enter a **file name to be unpacked**.

When the -u option has been specified at mdc63404 start-up, it executes directly the unpacking processing without displaying the operation menu and confirmation message of the unpacking file name to be input.

```
Input file is : C3404xxx.PAn
Output files are: U3404xxx.HSA
                  U3404xxx.LSA
                  U3404xxx.CSA
                  U3404xxx.FDC

Please input pack file name(C3404xxx.PAn) ? c34040a0.pa0
```

Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.

(2) Unpacking process

The mdc63404 finds the specified file from the current directory and loads it for unpacking.

```
Input file is : C34040A0.PA0
Output files are: U34040A0.HSA
                  U34040A0.LSA
                  U34040A0.CSA
                  U34040A0.FDC
```

If there is no problem in the entering of the file name and the input file, the mdc63404 unpacks the file to restore it to the original format files.

The first character of the unpacked file names are replaced with "U".

4.3.5 End procedure

When a series of operations is completed, the mdc63404 displays the following message and returns to the DOS command level.

(1) When terminated normally

```
Pack/Unpack Completed
A>
```

The output file is generated in the same directory as the input file.

(2) When an error occurs

```
Pack file name (C34040K0) error.
A>
```

When an error has occurred, the file is not generated.

4.4 Error Messages

In the packing operation, each ROM data file and option file are checked; in the unpacking operation, the packed file is checked. If there is any abnormal each format, the message below is displayed.

The mdc63404 error message lists are indicated below.

4.4.1 Start-up error

Message	Explanation
Usage: mdcxxxx [-p,-u] [filename]	The start-up parameter is incorrect.
"xxxxxxx.xxx" file is not found.	The specified file is not found.
Pack file name (xxxxxxx.xxx) error.	A wrong pack file name is specified for packing.
Packed file name (xxxxxxx.xxx) error.	A wrong pack file name is specified for unpacking.

4.4.2 ROM data error

When an error message as shown below appears, try to execute the mdc63404 again after checking and re-creating each file. If a similar error still results, please notify Seiko Epson of the situation and the error message displayed.

Message	Explanation
Hex data error : Not S record.	The data does not begin with "S".
Hex data error : Data is not sequential.	The data is not described in the ascending order.
Hex data error : Illegal data.	There is an illegal character.
Hex data error : Too many data in one line.	There are too many data in 1 line.
Hex data error : Check sum error.	The checksum is not correct.
Hex data error : ROM capacity over.	The data capacity is too large.
Hex data error : Not enough the ROM data.	The data capacity is too small.
Hex data error : Illegal start mark.	The start mark is incorrect. (during unpacking)
Hex data error : Illegal end mark.	The end mark is incorrect. (during unpacking)
Hex data error : Illegal comment.	The model name at the beginning of the data is incorrect. (during unpacking)

4.4.3 Function option data error

When an error message as shown below appears, try to execute the mdc63404 again after checking and re-creating the file. If a similar error still results, please notify Seiko Epson of the situation and the error message displayed.

Message	Explanation
Option data error : Illegal option number.	The option number is incorrect.
Option data error : Illegal select number.	The option select number is incorrect.
Option data error : Data is not enough.	There is not enough option data.
Option data error : Illegal start mark.	The start mark is incorrect. (during unpacking)
Option data error : Illegal end mark.	The end mark of the option data is incorrect. (during unpacking)
Option data error : Illegal comment.	The model name at the beginning of the option data is incorrect. (during unpacking)

4.4.4 File access error

Message	Explanation
Directory Full.	The directory is full.
Disk Write Error.	Writing on the file is failed. This error may occur if there is no disk space.

4.5 Packed File

4.5.1 Configuration of packed file

The packed file is configured according to the following format:

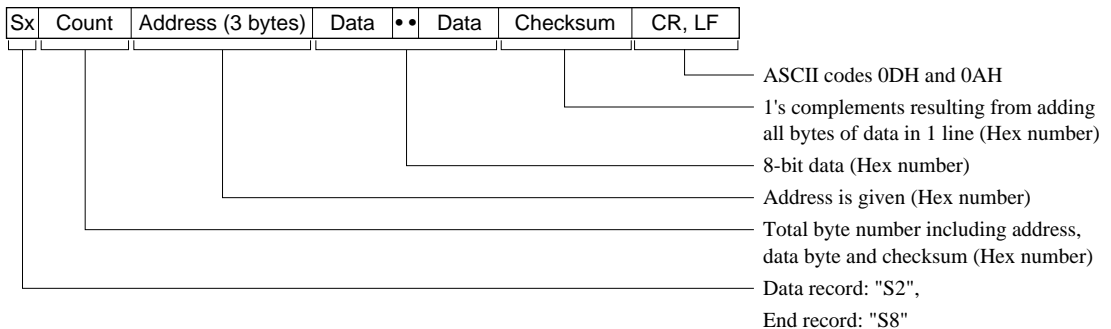
```

Model name      *
                * E0C63404 MASK DATA VER x.xx
                *
Code ROM start mark  — \PROM
Master slice model name — E0C63404xxx PROGRAM ROM
Code ROM          S224000000.....
                  :           :           :           :           :           :
                  S804000000FB
Code ROM          S224000000.....
                  :           :           :           :           :           :
                  S804000000FB
End mark          — \END
Data ROM start mark — \CHROM
Master slice model name — E0C63404xxx CHARACTER ROM
Data ROM          S224000000.....
                  :           :           :           :           :           :
                  S804000000FB
End mark          — \END
Function option start mark — \FOPTION
Function option    * E0C63404 FUNCTION OPTION DOCUMENT V x.xx
                  *
                  * FILE NAME      C3404xxx.FDC
                  * USER'S NAME    SEIKO EPSON
                  * INPUT DATE     '95/09/04
                  * COMMENT        FOR SAMPLE
                  * *** OPTION NO.1 ***
                  * --- OSC1 SYSTEM CLOCK ---
                  *   CRYSTAL(32.768KHZ) ----- SELECTED
                  OPT0101 02
                  :           :           :           :           :           :
                  OPT1201 01
                  *EOF
End mark          — \END
  
```

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

4.5.2 ROM data format

Each ROM data is configured as follows, using Motorola S2 format:



EPSON International Sales Operations

AMERICA

EPSON ELECTRONICS AMERICA, INC.

- HEADQUARTERS -

1960 E. Grand Avenue
El Segundo, CA 90245, U.S.A.
Phone: +1-310-955-5300 Fax: +1-310-955-5400

- SALES OFFICES -

West

150 River Oaks Parkway
San Jose, CA 95134, U.S.A.
Phone: +1-408-922-0200 Fax: +1-408-922-0238

Central

101 Virginia Street, Suite 290
Crystal Lake, IL 60014, U.S.A.
Phone: +1-815-455-7630 Fax: +1-815-455-7633

Northeast

301 Edgewater Place, Suite 120
Wakefield, MA 01880, U.S.A.
Phone: +1-781-246-3600 Fax: +1-781-246-5443

Southeast

3010 Royal Blvd. South, Suite 170
Alpharetta, GA 30005, U.S.A.
Phone: +1-877-EEA-0020 Fax: +1-770-777-2637

EUROPE

EPSON EUROPE ELECTRONICS GmbH

- HEADQUARTERS -

Riesstrasse 15
80992 Muenchen, GERMANY
Phone: +49-(0)89-14005-0 Fax: +49-(0)89-14005-110

- GERMANY -

SALES OFFICE

Altstadtstrasse 176
51379 Leverkusen, GERMANY
Phone: +49-(0)217-15045-0 Fax: +49-(0)217-15045-10

- UNITED KINGDOM -

UK BRANCH OFFICE

2.4 Doncastle House, Doncastle Road
Bracknell, Berkshire RG12 8PE, ENGLAND
Phone: +44-(0)1344-381700 Fax: +44-(0)1344-381701

- FRANCE -

FRENCH BRANCH OFFICE

1 Avenue de l'Atlantique, LP 915 Les Conquerants
Z.A. de Courtaboeuf 2, F-91976 Les Ulis Cedex, FRANCE
Phone: +33-(0)1-64862350 Fax: +33-(0)1-64862355

ASIA

- CHINA -

EPSON (CHINA) CO., LTD.

28F, Beijing Silver Tower 2# North RD DongSanHuan
ChaoYang District, Beijing, CHINA
Phone: 64106655 Fax: 64107320

SHANGHAI BRANCH

4F, Bldg., 27, No. 69, Gui Jing Road
Caohejing, Shanghai, CHINA
Phone: 21-6485-5552 Fax: 21-6485-0775

- HONG KONG, CHINA -

EPSON HONG KONG LTD.

20/F., Harbour Centre, 25 Harbour Road
Wanchai, HONG KONG
Phone: +852-2585-4600 Fax: +852-2827-4346
Telex: 65542 EPSCO HX

- TAIWAN, R.O.C. -

EPSON TAIWAN TECHNOLOGY & TRADING LTD.

10F, No. 287, Nanking East Road, Sec. 3
Taipei, TAIWAN, R.O.C.
Phone: 02-2717-7360 Fax: 02-2712-9164
Telex: 24444 EPSONTB

HSINCHU OFFICE

13F-3, No. 295, Kuang-Fu Road, Sec. 2
HsinChu 300, TAIWAN, R.O.C.
Phone: 03-573-9900 Fax: 03-573-9169

- SINGAPORE -

EPSON SINGAPORE PTE., LTD.

No. 1 Temasek Avenue, #36-00
Millenia Tower, SINGAPORE 039192
Phone: +65-337-7911 Fax: +65-334-2716

- KOREA -

SEIKO EPSON CORPORATION KOREA OFFICE

50F, KLI 63 Bldg., 60 Yoido-Dong
Youngdeungpo-Ku, Seoul, 150-010, KOREA
Phone: 02-784-6027 Fax: 02-767-3677

- JAPAN -

SEIKO EPSON CORPORATION

ELECTRONIC DEVICES MARKETING DIVISION

Electronic Device Marketing Department

IC Marketing & Engineering Group

421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN
Phone: +81-(0)42-587-5816 Fax: +81-(0)42-587-5624

ED International Marketing Department I (Europe & U.S.A.)

421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN
Phone: +81-(0)42-587-5812 Fax: +81-(0)42-587-5564

ED International Marketing Department II (Asia)

421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN
Phone: +81-(0)42-587-5814 Fax: +81-(0)42-587-5110



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