EPSON

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER **E0C63B07**

DEVELOPMENT TOOL MANUAL

ENERGY
SAVING
EPSON

SEIKO EPSON CORPORATION

CONTENTS

CHAPTER 1   OUTLINE OF PACKAGE

1.1   Preface

The "E0C63B07 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 E0C63B07. 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 **hex63b07**
2) Function option generator **fog63b07**
3) Melody assembler **mla63b07**
4) Segment option generator **sog63b07**
5) Mask data checker **mdc63b07**
6) Parameter file for ICE63 .... **par63b07.par**
7) HEX sample file for function option setting **c3b07xxx.fsa**
8) HEX sample file for segment option setting **c3b07xxx.ssa**

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 E0C63B07 development.

1) 3.5" floppy disk for NEC PC9801 1
2) 3.5" floppy disk for IBM-PC/AT 1
3) E0C63B07 Development Tool Manual (English) 1
4) E0C63B07 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 halftone) on the whole software development.
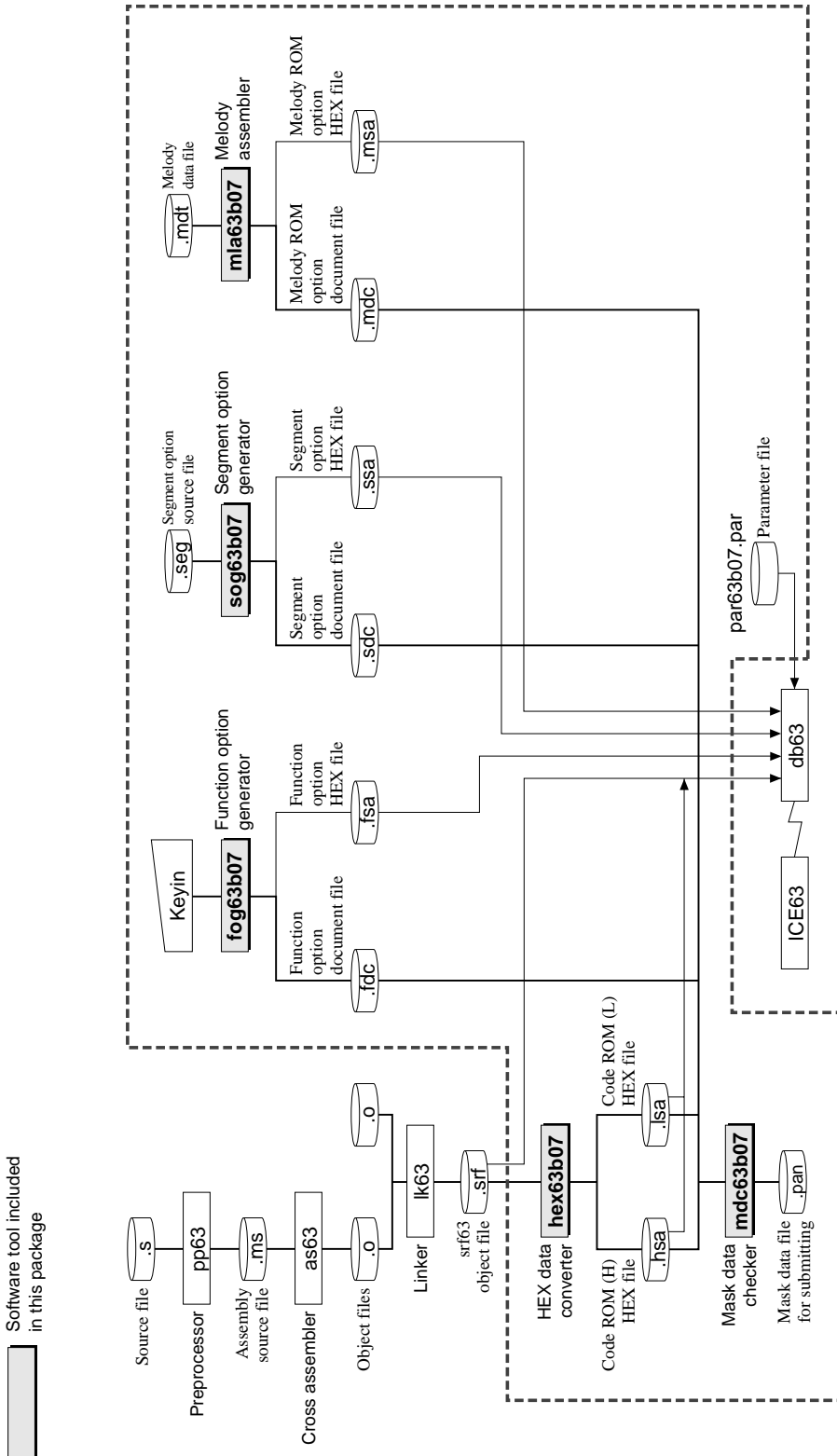
Fig. 1.3.1 Software development flow

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

1.3.1 HEX data converter <hex63b07>

The HEX data converter hex63b07 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 <fog63b07>

In the E0C63B07, some hardware specifications such as an I/O port function can be selected as mask option. The function option generator fog63b07 is a tool that can interactively select the E0C63B07 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 Melody assembler <mla63b07>

The melody assembler mla63b07 is a software tool for setting the melody ROM data and the melody option of the E0C63B07.

1.3.4 Segment option generator <sog63b07>

The E0C63B07 also provides hardware options for setting the output specifications of the LCD segment terminals and for allocating the display memory to the segments.
The segment option generator sog63b07 converts the segment option source file, and generates the mask option setting file for the ICE63 and the segment option document file for generating the IC mask pattern. This file must be loaded to the ICE63 at the beginning of debugging using the "lo" command.

1.3.5 Mask data checker <mdc63b07>

The mask data checker mdc63b07 is a software tool that checks the ROM data and option data developed and generates a file for submitting to Seiko Epson.

1.3.6 Parameter file for ICE63 <par63b07.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.

1.3.7 HEX file for function option setting <c3b07xxx.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 fog63b07.

1.3.8 HEX file for segment option setting <c3b07xxx.ssa>

This file is used to define the segment 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 segment option generator sog63b07.

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 (*hex63b07*)

2.1   Outline of hex63b07

The HEX data converter utility hex63b07 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 (mdc63b07).

2.2   Execution Flow and Input/Output Files

Figure 2.2.1 shows the hex63b07 execution flow .

c3b07xxx.hsa: Code ROM high-order data HEX file
c3b07xxx.lsa: Code ROM low-order data HEX file
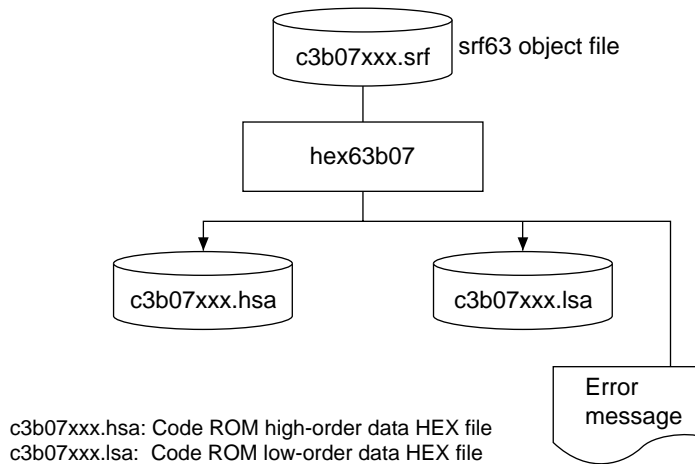
Fig. 2.2.1 hex63b07 execution flow

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

The hex63b07 inputs an object file (srf63 format) and generates two 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 "c3b070a0.srf", the hex63b07 outputs two files as below:

    1) c3b070a0.hsa   2) c3b070a0.lsa

(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 hex63b07 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 hex63b07 outputs this file in Motorola S2 format. This file contains low-order 8 bits of the codes (13 bits each) 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).

> **hex63b07 <Object file name[.srf]> ↵**

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

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

(2) Start-up message

When the hex63b07 starts up, the following message is displayed.

Example: File name: c3b070a0.srf

```
A>hex63b07 c3b070a0.srf↵
E0C63B07 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 hex63b07 displays the following message and returns to the DOS command level.

(1) When terminated normally

The hex63b07 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 hex63b07 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 hex63b07 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 hex63b07 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: "xxxxxxxx.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 hex63b07 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 erorr.	The file cannot be written.
Error: File read error.	The file cannot be read.
Error: Memory allocate error.	Memory is insufficient.

2.5 hex63b07 Execution Example

The following shows an example of when an srf63 format file ("c3b070a0.srf") is converted into a Motorola S2 format file ("c3b070a0.hsa", "c3b070a0.lsa").

```
A>hex63b07 c3b070a0.srf↵
```

■ **Example of input file**

```
<c3b070a0.srf>
     Hex dump output
     00000000  00 0A 00 00 01 10 63 00 00 00 00 10 00 00 00 90        c
     00000010  00 00 00 3C 00 01 00 00 00 02 00 00 01 10 00 00     <
     00000020  00 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 00 06 00 00 00 00 00 00
     00000040  00 02 00 00 00 02 00 00 80 00 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 00
     00000070  00 00 00 02 02 4C 31 00 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 00
     000000D0  06 00 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 00 02 00
     000000F0  00 FF FE 00 00 00 00 00 00 00 00 00 00 00 00 00
     00000100  00 00 02 00 00 00 00 00 00 02 4C 31 00 00 00 01          L1
     00000110  00 02 00 00 00 00 00 01 02 4C 32                        L2
```

■ **Example of output file**

```
<c3b070a0.hsa>
     S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
     S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
     S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
     S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
     S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
     S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
     S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
     S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
     S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1E1918FFFFFFFFFFFFFFFFFFFFFFFFFFA8
     S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
     S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
          :       :       :       :       :       :       :       :       :
     S224001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1C
     S224001FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC
     S804000000FB

<c3b070a0.lsa>
     S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
     S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
     S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
     S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
     S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
     S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
     S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
     S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
     S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF27272FFFFFFFFFFFFFFFFFFFFFFFFFFFF21
     S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
     S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
          :       :       :       :       :       :       :       :       :
     S224001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1C
     S224001FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC
     S804000000FB
```

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CHAPTER 3 FUNCTION OPTION GENERATOR (*fog63b07*)

3.1 Outline of fog63b07

The E0C63B07 4-bit single ship microcomputer has 9 mask options to select hardware specifications such as I/O port functions. By modifying the IC mask patterns of the E0C63B07 according to the options selected, the system can be customized to meet the specifications of the target system.

The function option generator fog63b07 is a software tool for generating the document file used to generate IC mask patterns. The mask options for the E0C63B07 can be interactively selected. From the data file created with fog63b07, the E0C63B07 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 fog63b07 execution flow .
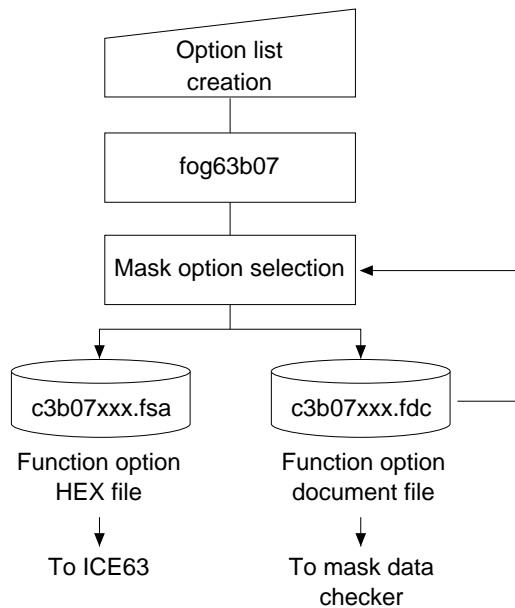
Fig. 3.2.1 fog63b07 execution flow

(1) Option list creation

Select the E0C63B07 mask options that meet the target system and record them in the option list (see Section 3.3).

(2) fog63b07 execution

Start the fog63b07 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 fog63b07.
As a result, the fog63b07 outputs the following two files.

- **Function option document file (c3b07xxx.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 fog63b07. This file should be packed with the completed program files for submitting to Seiko Epson.

- **Function option HEX file (c3b07xxx.fsa)**

  This file is a Motorola S2 format data file for setting the E0C63B07 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 E0C63B07.
Multiple selections are available in each option item as indicated in the Option List. Using "E0C63B07 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 fog63b07 execution, using this option list as reference.

1 MULTIPLE KEY ENTRY RESET COMBINATION

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

2 MULTIPLE KEY ENTRY RESET TIME AUTHORIZE

☐ 1. Not Use
☐ 2. Use

3 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

4   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

5   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

6   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

7   LCD DRIVING POWER

☐ 1. Internal Power V3V (3.0V)
☐ 2. External Power V3V $V_{DD}=V_{C1}$ (4.5V)
☐ 3. External Power V3V $V_{DD}=V_{C2}$ (4.5V)
☐ 4. External Power V3V $V_{DD}=V_{C3}$ (3.0V)
☐ 5. External Power V2V $V_{DD}=V_{C1}=V_{C2}$ (3.0V)
☐ 6. External Power V2V $V_{DD}=V_{C3}$, $V_{C1}=V_{C2}$ (3.0V)

8   SERIAL INTERFACE POLARITY

☐ 1. Positive
☐ 2. Negative

9   OSC1 SYSTEM CLOCK

☐ 1. 32.768kHz
☐ 2. 76.8kHz
☐ 3. 153.6kHz

3.4 Operation Procedure

3.4.1 Starting procedure

(1) Starting command

> **fog63b07** ⏎

⏎ indicates the Return key.

To start fog63b07, enter "fog63b07" at the DOS command level (a state in which a prompt such as A> is displayed). The "fog63b07.exe" program should be previously copied into the working directory.

(2) Start-up message

```
A>fog63b07
E0C63B07 Function Option Generator Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x

This software makes the following files.

c3b07xxx.fsa ... function option HEX file.
c3b07xxx.fdc ... function option document file.
```

When the fog63b07 starts up, the start-up message is displayed.

The following explains the actual operation method of the fog63b07 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 "ST OP" key depending on the PC used.

(3) Date input

```
Current data is '97/01/30
Please input new data :  97/01/30⏎
```

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 (c3b07xxx.fdc) generated by "1. Input new file".

3. Return to DOS: Used to terminate the fog63b07 and return to the DOS command level.

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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 ? c3b07xxx⏎                              ...(2)
Please input user's name ? SEIKO EPSON CORP.⏎                   ...(3)
Please input any comment
(one line is 50 chr) ? TOKYO DESIGN CENTER⏎                     ...(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 ? c3b07xxx⏎
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 E0C63B07. For new settings, select options Option No. 1 to No. 9 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) ***

C3b070A0      C3b070B0      C3b070C0        ...(2)

Please input file name ? c3b070A0⏎         ...(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 (c3b07xxx.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 ? c3b070a0⏎
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 (1–9) 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⏎
```

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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. 10 sequentially; to modify settings (Edit file), the specified option number may be set directly

(1) Example of option selection

```
*** Option No.1 ***
--- 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 ***
--- Input port pull up resistor ---

    K00:  1. With resistor
          2. Gate direct

Please select No.(1) ? B⏎

*** Option No.2 ***
--- Multiple key entry time authorize ---

          1. Not use
          2. Use

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 (c3b07xxx.fsa). If "N" is entered, no HEX file is generated and only document file (c3b07xxx.fdc) is generated.

Since the function option HEX file (c3b07xxx.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 fog63b07 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 fog63b07 can be terminated by selecting "3. Return to DOS" on this menu.

The fog63b07 can be forcibly terminated by pressing the "CTRL" and "C" keys together during this software execution. (It is possible by pressing "ST OP" 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 fog63b07 error messages.

Table 3.5.1 fog63b07 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 E0C63B07 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 : finename	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

```
* E0C63B07 FUNCTION OPTION DOCUMENT V 1.00
*
* FILE NAME    C3B070A0.FDC
* USER'S NAME  SEIKO EPSON CORP.
* INPUT DATE   '97/01/30
* COMMENT      TOKYO DESIGN CENTER
*              421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN
*              TEL 042-587-5816
*              FAX 042-587-5624
*
* *** OPTION NO.1 ***
* --- MULTIPLE KEY ENTRY RESET COMBINATION ---
*     NOT USE  ------------------------------------------------- SELECTED
 OPT0101 01
*
* *** OPTION NO.2 ***
* --- MULTIPLE KEY ENTRY RESET TIME AUTHORIZE ---
*     NOT USE  ------------------------------------------------- SELECTED
 OPT0201 01
*
* *** OPTION NO.3 ***
* --- 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
 OPT0301 01
 OPT0302 01
 OPT0303 01
 OPT0304 01
 OPT0305 01
 OPT0306 01
 OPT0307 01
 OPT0308 01
*
* *** OPTION NO.4 ***
* --- OUTPUT PORT OUTPUT SPECIFICATION ---
*     R00              COMPLEMENTARY  ---------------------- SELECTED
*     R01              COMPLEMENTARY  ---------------------- SELECTED
*     R02              COMPLEMENTARY  ---------------------- SELECTED
*     R03              COMPLEMENTARY  ---------------------- SELECTED
*     R1X              COMPLEMENTARY  ---------------------- SELECTED
 OPT0401 01
 OPT0402 01
 OPT0403 01
 OPT0404 01
 OPT0405 01
*
* *** OPTION NO.5 ***
* --- I/O PORT OUTPUT SPECIFICATION ---
*     P0X              COMPLEMENTARY  ---------------------- SELECTED
*     P1X              COMPLEMENTARY  ---------------------- SELECTED
*     P20              COMPLEMENTARY  ---------------------- SELECTED
*     P21              COMPLEMENTARY  ---------------------- SELECTED
*     P22              COMPLEMENTARY  ---------------------- SELECTED
*     P23              COMPLEMENTARY  ---------------------- SELECTED
```

```
 OPT0501 01
 OPT0502 01
 OPT0503 01
 OPT0504 01
 OPT0505 01
 OPT0506 01
*
* *** OPTION NO.6 ***
* --- 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
 OPT0601 01
 OPT0602 01
 OPT0603 01
 OPT0604 01
 OPT0605 01
 OPT0606 01
*
* *** OPTION NO.7 ***
* --- LCD DRIVING POWER ---
*     INTERNAL POWER V3V(3.0V)  --------------------------------  SELECTED
 OPT0701 01
*
* *** OPTION NO.8 ***
* --- SERIAL INTERFACE POLARITY ---
*     POSITIVE  -------------------------------------------  SELECTED
 OPT0801 01
*
* *** OPTION NO.9 ***
* --- OSC1 SYSTEM CLOCK ---
*     32.768KHZ  ------------------------------------------  SELECTED
 OPT0901 01
*EOF
```

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

```
S22400000070291000000000000000000000000000000000000AA0B00000000000000000000007D
S804000000FB
```

CHAPTER 4   MELODY ASSEMBLER (*mla63b07*)

4.1   Outline of mla63b07

The melody assembler mla63b07 is a software tool for setting the melody ROM data and the melody option of the E0C63B07. It assembles a melody data file and generates the melody ROM/option document file for creating the E0C63B07 mask pattern and the melody ROM/option HEX file (Motorola S2 format) for debugging with the ICE63.

4.2   Execution Flow and Input/Output Files

Figure 4.2.1 shows the mla63b07 execution flow .
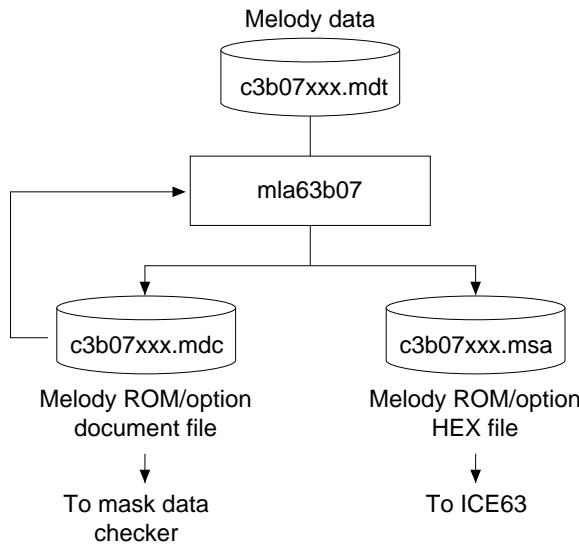
Fig. 4.2.1   mla63b07 execution flow

(1) Melody data (c3b07xxx.mdt)

Details of melody data and hoe to create data will be explained in the next section.

(2) mla63b07 execution

Start up the mla63b07 using melody data (1) as the input file to execute melody data assembly . The mla63b07 generates the following two data files.

(3) Melody ROM/option document file (c3b07xxx.mdc)

This file is used for generating the mask pattern of the IC at Seiko Epson. It contains the HEX data for playing melodies and the selected contents of the melody mask option.

(4) Melody ROM/option HEX file (c3b07xxx.msa)

This file is used for debugging melody play with the ICE63.

∗1 The "xxx" part of the file name is the customer code field. Enter the code designated by Seiko Epson.

∗2 The melody ROM/option document file that is generated by the mla63b07 should be packed with the program and other option files and submitted to Seiko Epson.

∗3 Refer to the "E0C63 Family Assembler Package Manual" for debugging melody data with the ICE63.

4.3   Melody Data

4.3.1 Outline of melody data

To produce music or sound effects with the melody generator of the E0C63B07, the following four data must be created:

(1) Tempo data

Two types of tempo settings are available for a piece of music. They can be selected from 16 types of tempos.

(2) Main data

a) Control bits   Attack (for separating notes), rest and the end of melody are specified.
b) Note data   Seven types of notes are available.
c) Interval data   The range differs according to the reference frequency (38.4 kHz or 32.768 kHz).
d) Jump bit   Used to repeat a phrase and to change the flow .
e) Tempo   Either one of the tempo data (1) can be selected.

(3) Control data

The jump destinations (main data numbers) from the main data in which the jump bit is set are described here.

(4) Option data

The hardware option specifications for melody output are set.

4.3.2 Melody data creation procedure

The following flowchart shows the melody data creation procedure.
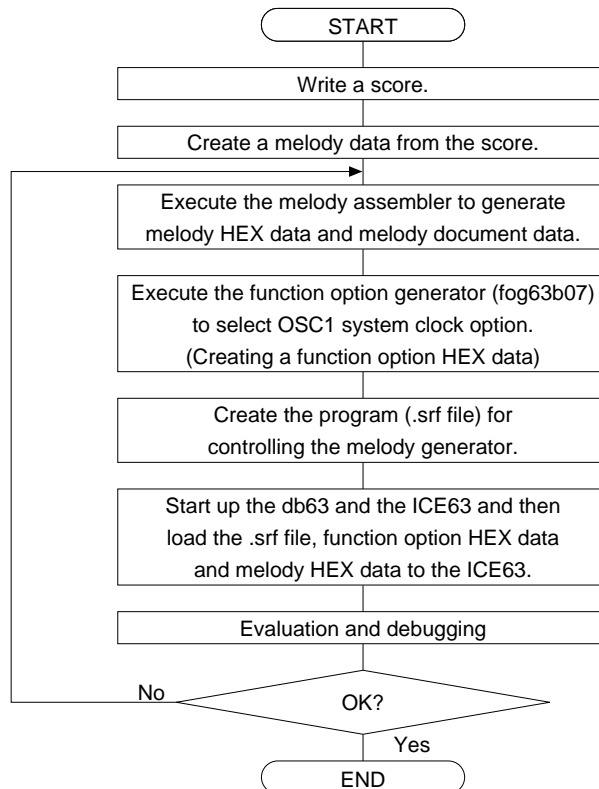
4.3.3 Method of creating melody data

The following shows the method of creating melody data according to the creation procedure.

(1) Writing score

Describe music to be played with the E0C63B07 in the form of a score as shown below .

Example of score

(2) Creating melody data

Create a melody data based on the score using a general-purpose editor .

Example of melody data

Code	Description
`; mla63b07 sample file`	Description from ";" to the end of the line is skipped as it is regarding as a comment.
`TEMPO`	Start mark of tempo data (It cannot be omitted.)
`; m0-tempo 0, 1`	
`TEMPO 0 0 = 4  TEMPO 0 1 = 10`	<1> Tempo 0 of the melody No.0 (m0) = 4 <2> Tempo 1 of the m0 = 10
`END`	End mark of tempo data (It cannot be omitted.)
`MAIN`	Start mark of main data (It cannot be omitted.)
`; no. cntl note pitch jump tempo`	The data order is melody data No., control bit, note data,
`; m0 test`	pitch data, jump bit and tempo No. from the left.
` 0 1 7 G5  0 0`	<3>
` 1 1 6 F5  0 0`	<4>
` 2 1 5 D5# 0 0`	<5>
` 3 2 4 RR  1 0`	<6>
` 4 0 3 E5  0 1`	<7>
` 5 1 2 E5  0 1`	<8>
` 6 1 1 D5  0 1`	<9>
` 7 1 0 C5  0 1`	<10>
` 8 3 0 RR  1 1`	<11> The jump bit in the last data of a melody should be set to "1" if data is a rest.
`END`	End mark of main data (It cannot be omitted.)
`CONTROL`	Start mark of control data (It cannot be omitted.)
`m0`	Melody number (m0–m15)
`    0`	This means that the m0 begins from 0 <3> in the main data.
`    0`	
`    4`	
`END`	End mark of control data (It cannot be omitted.)
`OPTION`	Start mark of option data (It cannot be omitted.)
`change`	Enables music change during play. (Use "nochange" if music change is to be disabled.)
`positive`	Sets the melody output waveform to positive polarity. (Use "negative" if negative polarity is set.)
`END`	End mark of option data (It cannot be omitted.)

∗ Either capital letters or small letters can be used for describing melody data.

∗ The "nochange" option must be described in one word without any space. "no change" is not regarded as an option.

Description of melody data

(1) Tempo data

16 types of tempo data (0 to 15) are available. 2 types of tempo data from them can be selected for each melody.

Tempo data should be described as follows:

```
TEMPO                              Start mark of tempo data (It cannot be omitted.)
    :
TEMPO x 0 = 3   TEMPO x 1 = 9
    :
    :                              Tempo data (0 to 15)
    :                              Tempo No. (0, 1)
    :                              Melody No. (0 to 15)
    :
END                                End mark (It cannot be omitted.)
```

- The start mark "TEMPO" and the end mark "END" must be placed at the beginning and the end of the setting, respectively.
- Tempo data for each melody should be described in one line for easy reading.
- Tempo No. should be ordered 0 and 1 as above.
- Tempo No. 1 can be omitted if only one tempo is used. In this case, tempo No. 1 will be set to tempo data 0.

Example:
```
TEMPO 0 0 = 3
TEMPO 1 0 = 7   TEMPO 1 1 = 5
```

- Separate "TEMPO" and tempo No. and between tempo No. and melody No. with one or more spaces or tabs (return can also be used).
- Either capital letters or small letters can be used for the start mark, end mark and "TEMPO" in data.

Table 4.3.3.1 shows the available tempo data. For example, 60.0 means $\downarrow \fallingdotseq$ 60.0, the playing of 60 crotchets per minute.

Table 4.3.3.1 Tempo data

Tempo data	Tempo	Tempo data	Tempo
0	30.0	8	60.0
1	32.0	9	68.6
2	34.0	10	80.0
3	36.9	11	96.0
4	40.0	12	120.0
5	43.6	13	160.0
6	48.0	14	240.0
7	53.3	15	480.0

(2) Main data

For the main part of the score such as pitches and the duration should be described in the main data field as follows:

```
MAIN                          Start mark of main data (It cannot be omitted.)
  :
; mX data                     A comment should be described for easy reading.
0 1 7 G6  0 0
1 1 6 F5  0 0
2 1 5 D5# 0 0
3 2 4 RR  1 0
4 0 3 E5  0 1
5 1 2 E5  0 1
6 1 1 D5  0 1
7 1 0 C5  0 1
8 3 0 RR  1 1
```

```
                                    Tempo No.
                                    Jump bit
                                    Pitch data
                                    Note data
                                    Control bit
                                    Main data No.
END                           End mark (It cannot be omitted.)
```

(2-1) Main data No.

Assign numbers of main data sequentially from 0 regardless of the melody number Data can be set from 0 to 511.

(2-2) Control bit

The control bit specifies attack (separating notes), rest or the end of melody . The control bit values (0 to 3) mean as below .

0	Attack is disabled. When the next note has the same pitch, the current note and the next one will be played as tied notes. In the above main data example, two E5 at the main data No. 4 and 5 will be played as one note.
1	Attack is enabled. Notes will be played independently even if the next note has the same pitch.
2	Indicates a rest. When the control bit is set to 2, the melody data in the line is regarded as a rest even if a pitch is specified. When the control bit is set to 0 or 1 for a rest, an error will occur even if the pitch is set to "RR" (rest).
3	Indicates the end of a melody. The control bit in the last data of each melody must be set to 3. When two or more control bits that are set to 3 are described, the first control bit is effective and the melody ends at that point.

(2-3) Note data

Note data sets duration of notes or rests. Eight types of notes or rests are available as shown in   Table 4.3.3.2. To specify a note that is not available, tie two or more available notes by setting the control bit to 0. For a rest, tie two or more rests by setting control bit to 2.

Table 4.3.3.2 Notes

Note data	0	1	2	3	4	5	6	7
Note								
Rest								

22

(2-4) Pitch data

The range for selecting pitches differs according to the reference frequency that can be selected at the start-up of the melody assembler. The frequency should be selected according to the selection of the OSC1 oscillation circuit in the function option generator (fog63b07).

Table 4.3.3.3 shows the correspondence between pitches and HEX codes for each reference frequency .
In melody data, pitch data should be described.

Table 4.3.3.3 Pitch data

Reference frequenc: 38.4 kHz

Pitch data	HEX data	Pitch data	HEX data
D4	04	A5	B1
D4#	12	A5#	B5
E4	20	B5	B8
F4	2F	C6	BC
F4#	3B	C6#	C0
G4	44	D6	C4
G4#	51	D6#	C8
A4	5B	E6	CD
A4#	65	F6	CE
B4	6C	F6#	D3
C5	74	G6	D4
C5#	7C	G6#	D9
D5	84	A6	DB
D5#	8D	A6#	DC
E5	92	B6	DE
F5	98	C7	E0
F5#	9E	C7#	E2
G5	A4	D7	E4
G5#	AB	D7#	E6

Reference frequenc: 32.768 kHz

Pitch data	HEX data	Pitch data	HEX data
C4	0A	E5	A3
C4#	18	F5	A6
D4	27	F5#	AD
D4#	33	G5	B0
E4	3F	G5#	B7
F4	48	A5	BA
F4#	55	A5#	BE
G4	5F	B5	C2
G4#	66	C6	C7
A4	71	C6#	CB
A4#	79	D6	CC
B4	81	D6#	D1
C5	89	E6	D2
C5#	8E	F6	D7
D5	94	F6#	D8
D5#	9D	G6	DA

∗   All of the half tones should be described using pitches with a #.
∗   The pitch data consists of a letter that indicates a scale code and a number that indicates an octave number.
∗   "RR" should be described for rests. When specifying "RR", the control bit must be set to 2 for the middle of the melody or 3 for the end of the melody

(2-5) Jump bit

The jump bit controls the melody flow It should be set to 1 to repeat a phrase or to jump to another part of the same melody or another melody. It must be set to 1 at the end of a melody if a rest is set there.

0	Not jumped.
1	Jump is enabled. Set also when changing tempo and specifying a rest at the end of a melody.

(2-6) Tempo No.

Tempo can be selected by a number (0 or 1) from two types set at the tempo data field. However , set tempo No. 0 at the beginning of a melody. Furthermore, it is necessary to set the jump bit to 1 when changing tempo in the middle of the melody

(3) Control data

In the control data field, the jump destinations (main data numbers) from the main data in which the jump bit is set are described here. The control data should be described after the main data field. The following shows the control data corresponding to the main data.

```
MAIN
; no. cntl note pitch jump tempo
; m0 test
 0 1 7 G5  0 0     <1> <5>  ←Data flow
 1 1 6 F5  0 0     <2> <6>
 2 1 5 D5# 0 0     <3> <7>
 3 2 4 RR  1 0     <4> <8>
 4 0 3 E5  0 1         <9>
 5 1 2 E5  0 1         <10>
 6 1 1 D5  0 1         <11>
 7 1 0 C5  0 1         <12>
 8 3 0 RR  1 1         <13>
END
```

CONTROL	Start mark of control data (It cannot be omitted.)	
m0	Melody number (m0–m15)	
0	<1>–<4>	Indicates that the m0 begins from the melody data No.0
0	<5>–<8>	Indicates that the music flow jumps from the melody data No.3 (<4>) to the melody data No.0.
4	<9>–<13>	Indicates that the second play jumps from the melody data No.3 (<8>) to the melody data No.4.
END	End mark (It cannot be omitted.)	

(4) Option data

The following two options are selectable for the melody generator The option numbers are assigned to numbers following the last function option number set in the function option generator (fog63b07) for each model.

Option 10: Enables or Disables music change while playing.

Keyword	
change	Enables change while playing.
nochange	Disables music change music while playing.

∗ Do not enter any space in "nochange".

Option 11: Sets the polarity of the waveform on the melody output terminal.

Keyword		
positive	Sets the output waveform to positive polarity.	⊓⊔⊓⊔⊓⊔⊓⊔
negative	Sets the output waveform to negative polarity.	⊔⊓⊔⊓⊔⊓⊔

∗ Refer to the "E0C63B07   Technical Manual" for details of the melody options.

Notes:

- *Create scores before inputting melody data because the melody data No. may change later when inserting data in the main data.*

- *The data fields can be described in any order. However, control data must be placed after main data (it is not necessary to continue).*

- *Data parameters must be separated with one or more spaces or tabs.*

4.4 Starting Procedure

(1) Starting command

To start the mla63b07, enter the command above at the DOS command level (a state in which a prompt such as A> is displayed).

---

mla63b07 {-h} <file name> ⏎

⏎ indicates the Return key.
The option enclosed with { } can be omitted.

(2) Option

The -h option is available in the mla63b07 starting command.

-h

When the -h option is specified, the mla63b07 generates a melody ROM/option HEX data (.msa) from a melody ROM/option document data (.mdc) already generated.
Example: `mla63b07 c3b07xxx.mdc`⏎

Input file:	c3b07xxx.mdc	Melody ROM/option document data
Output file:	c3b07xxx.msa	Melody ROM/option HEX file

Default (When option has not been specified)

When the option is not specified, the mla63b07 generates a melody ROM/option document data (.mdc) and a melody ROM/option HEX data (.msa) from a melody data (.mdt).
Example: `mla63b07 c3b07xxx.mdt`⏎

Input file:	c3b07xxx.mdt	Melody data
Output files:	c3b07xxx.mdc	Melody ROM/option document data
	c3b07xxx.msa	Melody ROM/option HEX file

(3) Message displayed

Example: when the option is not specified

```
A>mla63b07 c3b07xxx.mdt⏎
E0C63B07 Melody Assembler Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x

Select reference frequency
     1. 38.4 KHz
     2. 32.768 KHz
select no. : 1⏎

USER'S NAME : SEIKO EPSON CORP.⏎
COMMENT : TOKYO DESIGN CENTER⏎
        : 421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN⏎
        : TEL 042-587-5816⏎
        : FAX 042-587-5624⏎
        : ⏎

MLA Completed
```

Start-up message

Select reference frequency
The frequency to be selected here must be the same as the oscillation frequency selection when the fog63b07 creates the function option HEX data.

USER'S NAME
Up to 40 characters can be entered. Just press the Return key when not entering a character.

COMMENT
Up to 10 lines and 50 characters per line can be entered. Just press the Return key when not entering a character.

∗ When the mla63b07 starts with the -h option, only the start-up message is displayed.

4.5 Error Messages

The following lists the error messages of the mla63b07.

Message	Explanation
Usage: MLA63B07 [filename]	Message when the mla63b07 is started without any command line parameters.
"file name" file is not found.	The input file name is not "c3b07xxx.mdt" or ".mdc".
malloc fault	There is not enough memory. At least 640KB of memory is necessary.
MDT file error : No start mark.	There is no start mark at the beginning of the data field in the input file.
Tempo data error : Illegal melody number. (0–15)	The melody No. in the tempo data field is out of the range (0–15).
Tempo data error : Illegal tempo number. (0,1)	The tempo No. in the tempo data field is out of the range (0, 1).
Tempo data error : Illegal tempo data. (0–15)	The tempo data in the tempo data field is out of the range (0–15).
Main data error : Illegal data number.	The main data No. is not described in ascending order (0–511).
Main data error : Illegal control bit. (0–3)	The control bit in the main data field is out of the range (0–3).
Main data error : Illegal note data. (0–7)	The note data in the main data field is out of the range (0–7).
Main data error : Illegal jump bit. (0,1)	The jump bit in the melody data field is out of the range (0, 1).
Main data error : Illegal tempo number. (0,1)	The tempo No. in the main data field is out of the range (0, 1).
Main data error : Usable scales are 16.	17 or more types of pitch data are used in the main data field.
Main data error : Illegal scale data. (38.4KHz:D4–D7#)	A pitch that is out of the range (D4–D7#) in the reference frequency 38.4 kHz is specified.
Main data error : Illegal scale data. (32.768KHz:C4–G6)	A pitch that is out of the range (C4–G6) in the reference frequency 32.768 kHz is specified.
Main data error : Too many data. (0–511)	Main data exceeds the range (0–511).
Main data error : RR -> control bit = 2 or 3	The control bit in the main data in which a rest is specified is not 2 or 3.
Main data error : no end mark.	The control bit in the last data of a melody is not 3.
Control data error : Illegal data.	There is data not available in the control data field (except for melody No. m0–m15 or jump destination melody data No.).
Control data error : Melody no. is not sequential.	The melody No. in the control field is not described in ascending order (m0, m1...m15).
Control data error : Usable melodies are 16.	The melody No. is out of the range (m0–m15).
Control data error : Too many data. (0–95)	96 or more control data are described.
Option data error : Illegal key word. (change/nochange)	An illegal keyword is used for music change selection.
Option data error : Illegal key word. (positive/negative)	An illegal keyword is used for waveform polarity selection.
Option data error : Too many data.	3 or more option data are described.
MDC file error : Not motorola S2 format.	The input file (.mdc) is not a Motorola S2 format file (when -h option is specified).
MDC file error : Illegal data.	The input file (.mdc) contains a data other than HEX data (when -h option is specified).
MDC file error : Check sum error.	The check sum in the input file (.mdc) is not correct (when -h option is specified).
Disk Write Error.	Writing file has failed (not enough disk space, etc.).
MDC making error.	An error occurred while the .mdc file was being created.
Check sum calculation error.	An error occurred while a check sum was being calculated.

4.6 Sample Files

For Elize

Original title: For Elize

Composer: Beethoven

Score:

■ **Example of input file (Melody data)**

```
C3B07ELZ.MDT

TEMPO
; m0-tempo 0,1
TEMPO  0 0 = 8
END

MAIN
;adr cntl note scale jump tempo
;m0 For Elize
   0 1 7 E5  0 0
   1 1 7 D5# 0 0
   2 1 7 E5  0 0
   3 1 7 D5# 0 0
   4 1 7 E5  0 0
   5 1 7 B4  0 0
   6 1 7 D5  0 0
   7 1 7 C5  0 0
   8 1 5 A4  0 0
   9 1 7 C4  0 0
  10 1 7 E4  0 0
  11 1 7 A4  0 0
  12 1 5 B4  0 0
  13 1 7 E4  0 0
  14 1 7 G4# 0 0
  15 1 7 B4  0 0
  16 1 5 C5  0 0
  17 1 7 E4  0 0
```

```
 18 1 7 E5   0 0
 19 1 7 D5#  0 0
 20 1 7 E5   0 0
 21 1 7 D5#  0 0
 22 1 7 E5   0 0
 23 1 7 B4   0 0
 24 1 7 D5   0 0
 25 1 7 C5   0 0
 26 1 5 A4   0 0
 27 1 7 C4   0 0
 28 1 7 E4   0 0
 29 1 7 A4   0 0
 30 1 5 B4   0 0
 31 1 7 E4   0 0
 32 1 7 C5   0 0
 33 1 7 B4   0 0
 34 1 6 A4   0 0
 35 2 7 RR   1 0  ;FINE
 36 1 7 B4   0 0
 37 1 7 C5   0 0
 38 1 7 D5   0 0
 39 1 5 E5   0 0
 40 1 7 G4   0 0
 41 1 7 F5   0 0
 42 1 7 E5   0 0
 43 1 5 D5   0 0
 44 1 7 F4   0 0
 45 1 7 E5   0 0
 46 1 7 D5   0 0
 47 1 5 C5   0 0
 48 1 7 E4   0 0
 49 1 7 D5   0 0
 50 1 7 C5   0 0
 51 1 7 B4   0 0
 52 1 7 E4   0 0
 53 1 7 E4   0 0
 54 1 7 E4   0 0
 55 1 7 E4   0 0
 56 1 7 E4   0 0
 57 1 7 E4   0 0
 58 1 7 E5   0 0
 59 1 7 E5   0 0
 60 1 7 D5#  0 0
 61 1 7 E5   0 0
 62 1 7 D5#  0 0
 63 1 7 E5   0 0
 64 1 7 D5#  0 0
 65 1 7 E5   0 0
 66 1 7 D5#  1 0  ;D.C.
 67 3 7 RR   1 0  ;Data for ending the melody
END

CONTROL
m0
    0
    36
    0
    67
END

OPTION
 change
 positive
END
```

■ Example of output file (Melody ROM/option document file)

```
C3B07ELZ.MDT

S21400000000000000000000000000000000000000000000EB
S804000000FB
S21400000008000000000000000000000000000000000000E3
S21400000100000000000000000000000000000000000000DB
S804000000FB
S214000000A39D819489710A3F665FA64800000000000A0
S804000000FB
S21400000000000000000000000000000000000000000000EB
        :        :        :        :
S21400005000000000000000000000000000000000000000009B
S804000000FB
S2140000000024004300000000000000000000000000000084
        :        :        :        :
S21400005000000000000000000000000000000000000000009B
S804000000FB
S214000000010101010101010101010101010101010101DB
S214000010010101010101010101010101010101010101CB
S214000020010101020101010101010101010101010101BA
S214000030010101010101010101010101010101010101AB
S214000040010101030000000000000000000000000000A5
        :        :        :        :
        :        :        :        :
S2140001F00000000000000000000000000000000000000FA
S804000000FB
S214000000E0E2E0E2E0E4E6E8AAECEEEAA4EEF0E401
S214000010A8EEE0E2E0E2E0E4E6E8AAECEEEAA4EE2F
S214000020E8E4CAF1E4E8E6A0F2F4E0A6F6E0E6A822
S214000030EEE6E8E4EEEEEEEEEEEEEE0E0E2E0E2E043
S214000040E2E0E3F700000000000000000000000000F
        :        :        :        :
        :        :        :        :
S2140001F00000000000000000000000000000000000000FA
S804000000FB
* E0C63B07 MELODY OPTION DOCUMENT V x.xx
*
* FILE NAME    C3B07ELZ.MDC
* USER'S NAME  SEIKO EPSON
* INPUT DATE   97/01/30
* COMMENT      For Elize
*
* *** OPTION NO.10 ***
* --- CHANGE MELODY IN OPERATION MODE ---
*     CHANGE ------------------------------------------ SELECTED
 OPT1001 01
*
* *** OPTION NO.11 ***
* --- POLARITY FOR PLAY OUTPUT ---
*     POSITIVE ---------------------------------------- SELECTED
 OPT1101 01
*
*EOF
```

■ Example of output file (Melody ROM/option HEX file)

```
C3B07ELZ.MSA

S21400000000000000000000000000000000000000000EB
S214000010080000000000000000000000000000000D3
S21400002000000000000000000000000000000000000CB
S214000030A39D819489710A3F665FA6480000000070
S2140000400000000000000000000000000000000000AB
S214000050000000000000000000000000000000000009B
S2140000600000000000000000000000000000000000008B
S2140000700000000000000000000000000000000000007B
S2140000800000000000000000000000000000000000006B
S2140000900000000000000000000000000000000000005B
S2140000A00024004300000000000000000000000000E4
S2140000B000000000000000000000000000000000003B
S2140000C000000000000000000000000000000000002B
S2140000D000000000000000000000000000000000001B
S2140000E00000000000000000000000000000000000B
S2140000F0000000000000000000000000000000000FB
S214000100010101010101010101010101010101DA
S214000110010101010101010101010101010101CA
S214000120010101020101010101010101010101B9
S214000130010101010101010101010101010101AA
S2140001400010101030000000000000000000000A4
S214000150000000000000000000000000000000009A
         :         :         :         :
         :         :         :         :
S2140002F000000000000000000000000000000000F9
S214000300E0E2E0E2E0E4E6E8AAECEEEAA4EEF0E4FE
S214000310A8EEE0E2E0E2E0E4E6E8AAECEEEAA4EE2C
S214000320E8E4CAF1E4E8E6A0F2F4E0A6F6E0E6A81F
S214000330EEE6E8E4EEEEEEEEEEEEEE0E0E2E0E2E040
S214000340E2E0E3F700000000000000000000000C
         :         :         :         :
         :         :         :         :
S2140004F000000000000000000000000000000000F7
S2140005000101FFFFFFFFFFFFFFFFFFFFFFFFFFFFF2
S804000000FB
```

CHAPTER 5 SEGMENT OPTION GENERATOR (sog63b07)

5.1 Outline of sog63b07

The E0C63B07 provides hardware options for setting the output specifications of the LCD segment terminals and for allocating the display memory to the segments. By modifying the IC mask patterns of the E0C63B07 according to the options selected, the system can be customized to meet the specifications of the target system.

The segment option generator (hereinafter called sog63b07) is a software tool that inputs a source file in which the segment option settings are described, and generates data files for generating mask patterns. 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.

5.2 Execution Flow and Input/Output Files
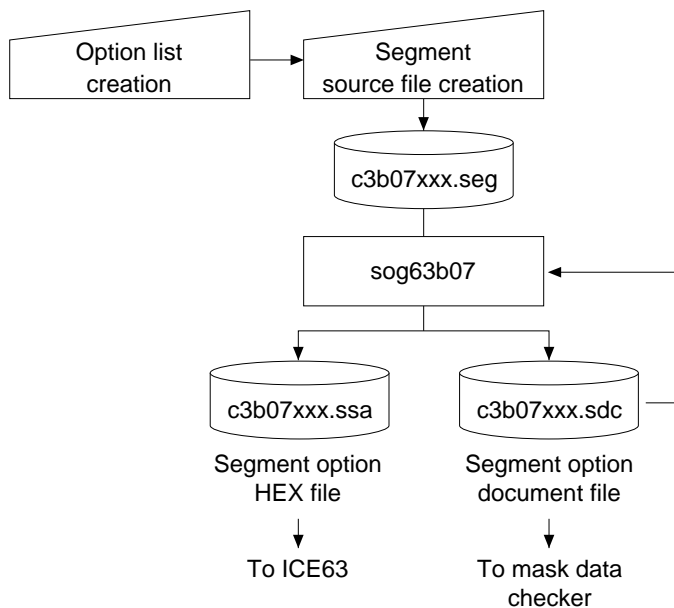
Figure 5.2.1 shows the sog63b07 execution flow .

Fig. 5.2.1 sog63b07 execution flow

(1) Segment option source file creation

Decide the output specifications of the LCD segment terminals and the display memory allocation, then record them in the option list (see Section 5.3).

Next create the segment source file (c3b07xxx.seg) using an editor while referencing the option list.

(2) sog63b07 execution

The sog63b07 reads a source file containing segment port specification, and output following files.

- **Segment option document file (c3b07xxx.sdc)**
  This is a data file used to generate the mask patterns of the segment decoder and segment output port.

- **Segment option HEX file (c3b07xxx.ssa)**
  This file is a Motorola S2 format data file for setting the E0C63B07 segment 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.

5.3   Option List

The option list has columns for writing display memory addresses to be allocated to the segments and check boxes for selecting the output specifications. Using the next section as a reference, select the specifications that meet the target system and check the appropriate box.

Furthermore, write the display memory addresses as well as the selected output specifications.

Create a segment option source file by using the option list as reference.

TERMINAL NAME	ADDRESS (F0xx)												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	☐ N
SEG2													SEG output	☐	
SEG3													DC output	☐ C	☐ N
SEG4													SEG output	☐	
SEG5													DC output	☐ C	☐ N
SEG6													SEG output	☐	
SEG7													DC output	☐ C	☐ N
SEG8													SEG output	☐	
SEG9													DC output	☐ C	☐ N
SEG10													SEG output	☐	
SEG11													DC output	☐ C	☐ N
SEG12													SEG output	☐	
SEG13													DC output	☐ C	☐ N
SEG14													SEG output	☐	
SEG15													DC output	☐ C	☐ N
SEG16													SEG output	☐	
SEG17													DC output	☐ C	☐ N
SEG18													SEG output	☐	
SEG19													DC output	☐ C	☐ N
SEG20													SEG output	☐	
SEG21													DC output	☐ C	☐ N
SEG22													SEG output	☐	
SEG23													DC output	☐ C	☐ N
SEG24													SEG output	☐	
SEG25													DC output	☐ C	☐ N
SEG26													SEG output	☐	
SEG27													DC output	☐ C	☐ N
SEG28													SEG output	☐	
SEG29													DC output	☐ C	☐ N
SEG30													SEG output	☐	
SEG31													DC output	☐ C	☐ N
SEG32													SEG output	☐	
SEG33													DC output	☐ C	☐ N
SEG34													SEG output	☐	
SEG35													DC output	☐ C	☐ N
SEG36													SEG output	☐	
SEG37													DC output	☐ C	☐ N
SEG38													SEG output	☐	
SEG39													DC output	☐ C	☐ N
SEG40													SEG output	☐	
SEG41													DC output	☐ C	☐ N
SEG42													SEG output	☐	
SEG43													DC output	☐ C	☐ N
SEG44													SEG output	☐	
SEG45													DC output	☐ C	☐ N
SEG46													SEG output	☐	
SEG47													DC output	☐ C	☐ N
SEG48													SEG output	☐	
SEG49													DC output	☐ C	☐ N
SEG50													SEG output	☐	
SEG51													DC output	☐ C	☐ N
SEG52													SEG output	☐	
SEG53													DC output	☐ C	☐ N
SEG54													SEG output	☐	
SEG55													DC output	☐ C	☐ N
SEG56													SEG output	☐	
SEG57													DC output	☐ C	☐ N
SEG58													SEG output	☐	
SEG59													DC output	☐ C	☐ N

<ADDRESS> H: RAM data high order address (0–3)   <OUTPUT SPECIFICATION> S: Segment output
L: RAM data low order address (0–F)   C: Complementary output
D: Data bit (0–3)   N: Nch 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.

5.4 Segment Ports Output Specifications

For the output specification of the segment output ports SEG0–SEG59, 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 Nch open drain may further be selected.

However, for segment output ports that will not be used, select segment output.

(1) 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 display memory area (F000H–F03FH) can be allocated to the optional segment. W ith this, up to 240 segments (180 segments when 1/3 duty is selected or 120 segments when 1/2 duty is selected) of liquid crystal panel could be driven.

The display memory may be allocated only one segment and multiple setting is not possible. Separate the segment allocation data (low-order byte of the display memory address and the data bit number) into 3 parts and write them in the corresponding columns.

H column: Upper nibble of low-order byte (0 to 3)
L column: Lower nibble of low-order byte (0 to F)
D column: Data bit (0 to 3)

For segment ports that will not be used, write "---" (hyphen) in the H, L, and D columns of COM0–COM3.

The allocated segment displays when the bit for this display memory is set to "1", and goes out when bit is set to "0".

(2) When DC output is selected

The DC output can be selected in units of two terminals and up to 60 terminals may be allocated for DC output. Also, either complementary output or Nch open drain output is likewise selected in units of two terminals. When the bit for the selected display 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 display memory allocated to COM1–COM3 becomes ineffective. Write three hyphens ("---") in the COM1–COM3 columns in the option list.

5.5 Creating Segment Option Source File

The sog63b07 needs, as an input file, a segment option source file containing the specifications for the segment output ports. Using an editor, create this source file by referencing the contents of the option list. Use the following file name. For "xxx", enter the string distributed by Seiko Epson.

c3b07xxx.seg

Write the output specifications (SEG output, DC complementary output, or DC Nch open drain output) and the display memory-SEG ports correspondence data (data that associates display memory addresses to SEG ports) in the file. Comments may also be written in the file.

The description procedure is explained by using a sample segment option source file.

```
; C3B07xxx.SEG
; LCD SEGMENT DECODE TABLE              Comment
;
0      001 000 032 120 S              ;1st DIGIT
1      012 011 010 023 S
2      013 020 021 022 S
3      100 002 030 031 S
4      1E0 --- --- --- C              ;DC OUTPUT
5      1F0 --- --- --- C
:       :   :   :   :  :

Display memory-SEG ports     Output              Comment
correspondence data          specification data
```
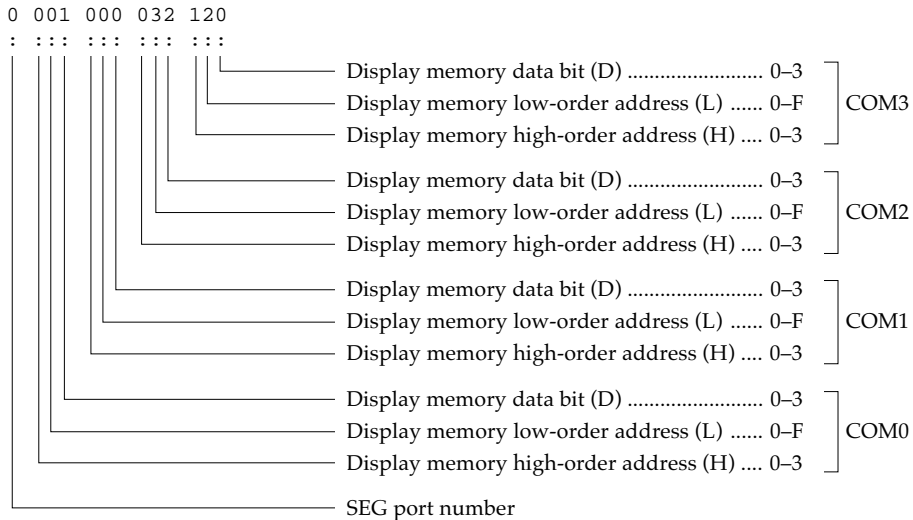
(1) Comment

A statement beginning with a semicolon (";") is considered a comment. Such items as date, summary , and version may be written in such a line.

(2) Display memory-SEG ports correspondence data

This data indicates correspondence between display memory addresses and segment ports.   The arrangement is the same as that of the option list, so write the data in the following format while referencing the option list.

```
0 001 000 032 120
: ::: ::: ::: :::
```

Display memory data bit (D) 0–3	
Display memory low-order address (L) 0–F	COM3
Display memory high-order address (H) 0–3	
Display memory data bit (D) 0–3	
Display memory low-order address (L) 0–F	COM2
Display memory high-order address (H) 0–3	
Display memory data bit (D) 0–3	
Display memory low-order address (L) 0–F	COM1
Display memory high-order address (H) 0–3	
Display memory data bit (D) 0–3	
Display memory low-order address (L) 0–F	COM0
Display memory high-order address (H) 0–3	
SEG port number	

- Low-order addresses correspond to bits 0 through 3 of the display memory address. High-order addresses correspond to bits 4 through 7.

- Each SEG port number corresponds to an actual device, so it must be unique. Moreorve, data descriptions in accordance with the following format are required for all segment terminals.

- Off areas COM0 to COM3, write three successive "---" (3 hyphens) as data for unused areas. SEG port numbers are needed even if the ports themselves will not be used, so write "---" (3 hyphens) for all areas COM0 to COM3.

  Example: When not using COM2 in SEG8
  ```
  8 081 080 --- 122
  ```

  Example: When not using SEG12
  ```
  12 --- --- --- ---
  ```

- When "DC output" is selected, write the display memory-SEG ports correspondence data for COM0; "---" (hyphens) for COM1 to COM3.

  Example: When setting SEG20 and SEG21 as DC output
  ```
  20 033 --- --- ---
  21 043 --- --- ---
  ```

- Be sure to write one or more blanks or a tab between the SEG port number , COM0, COM1, COM2, and COM3.

(3) Output specification selection data

This data is used to specify whether the SEG port will be used as a segment output port, a DC complementary output port, or a DC Nch open drain output port.
Write data after inserting one or more blanks or a tab after the display memory-SEG ports correspondence data.

S: Segment output
C: DC complementary output
N: DC Nch open drain output

- The SEG port output specifications must be selected in units of two ports, so write the selection data carefully while referencing the option list.

  Example: When setting SEG22 and SEG23 as DC complementary output

  ```
  22 1E0 --- --- --- C
  23 1F0 --- --- --- C
  ```

- Select "SEG output" for the segment ports that will not be used.

  Example: When not using SEG18

  ```
  18 --- --- --- --- S
  ```

Create the segment option source file according to the formats and restrictions above.

5.6   Operation Procedure

5.6.1 Starting procedure

(1) Starting command

To start sog63b07, enter the following at the DOS command level (state in which a prompt such as A> is displayed).
The current drive must contain the segment option source file (c3b07xxx.seg).

> **sog63b07 [-H]⏎**

⏎ indicates the Return key.
A parameter enclosed by [ ] can be omitted.

-H: Specifies the segment option document file (c3b07xxx.sdc) for input file of the sog63b07.

(2) Start-up message

When the sog63b07 starts up, the start-up message is displayed.

```
A>sog63b07
E0C63B07 Segment Option Generator Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x


Segment option source file name is "c3b07xxx.seg".


This software makes following file(s).
    c3b07xxx.ssa ... segment option HEX file.
    c3b07xxx.sdc ... segment option document file.
```

The following explains the actual operation method of the sog63b07 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.

5.6.2 Input operation

```
*** E0C63B07 user's option setting --- Ver. x.xx  ***
Current date is 97/01/30
Please input new date: ↵                                        ...(1)


*** E0C63B07 source file(s) ***


C3B070A0                                                        ...(2)


Please input segment source file name? c3b070A0↵               ...(3)
Please input user's name? SEIKO EPSON CORP.↵                   ...(4)
Please input any comment
 ( One line is 50 chr ) ? TOKYO DESIGN CENTER↵                 ...(5)
                        ? 421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN↵
                        ? ↵
```

↵ indicates the Return key.

(1) Date input

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.

(2) *** E0C63B07 source file(s) ***

Will display readable files on the current drive.

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

```
Segment option file is not found.
```

(3) Please input segment source file name ?

Enter a segment option source file name (-H option use: segment option document file name). Do not enter the extension of the file name. If the specified file is not in the current directory an error message like the one below is output, prompting entry of other file name.

```
Please input segment source file name ? c3b070b0↵
Segment option source file is not found.
```

(4) 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.

(5) 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 (4) and (5) 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.

"\"("¥"), "[", "]", "|"   ... input disabled

When the above operations are complete, move to the confirmation procedure for HEX file generation.

5.6.3 HEX file generation

When input operatin is completed, the following message is output to ask the user whether to generate the segment option HEX file.

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

Enter "Y" to generate the HEX file (c3b07xxx.ssa). If "N" is entered, no HEX file is generated and only document file (c3b07xxx.sdc) is generated.
Since the segment option HEX file (c3b07xxx.ssa) is needed when debugging the target program with the ICE63, normally set "Y".

However, when -H option is used, HEX file is generated without any conditions. Therefore, this message is not displayed.

When the above operation is completed, the sog63b07 generates the segment option HEX file and segment option document file (-H option use: HEX file only). And then the following message is output and the sog63b07 program will be terminated.

```
Making file is completed.
```

If an error occurs during execution, an error message like the one below appears and the sequence prompts entry of another file name.

```
Do you need HEX file (y/n)? y⏎
R 7     6 004 --- --- --- N

 1 error(s).

Strike any key.

Making file is not completed by source file error(s).

*** E0C63B07 source file(s) ***

C3B070A0
```

5.6.4 End procedure

When a series of operations are completed, the sog63b07 program will be terminated.

The sog63b07 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 segment option HEX file and segment option document file are not generated.

5.7 Error Message

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 (Duplicate 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. Data other than "---" was recorded as the COM1–COM3 data of the segment for DC output.

5.8 Sample Files

■ Example of input file

```
C3B070A0.SEG

 0   000   001   002   003   S
 1   010   011   012   013   S
 2   020   021   022   023   S
 3   030   031   032   033   S
 4   040   041   042   043   S
 5   050   051   052   053   S
 6   060   061   062   063   S
 7   070   071   072   073   S
 8   080   081   082   083   S
 9   090   091   092   093   S
10   0A0   0A1   0A2   0A3   S
11   0B0   0B1   0B2   0B3   S
12   0C0   0C1   0C2   0C3   S
13   0D0   0D1   0D2   0D3   S
14   0E0   0E1   0E2   0E3   S
15   0F0   0F1   0F2   0F3   S
16   100   101   102   103   S
17   110   111   112   113   S
18   120   121   122   123   S
19   130   131   132   133   S
20   140   141   142   143   S
21   150   151   152   153   S
22   160   161   162   163   S
23   170   171   172   173   S
24   180   181   182   183   S
25   190   191   192   193   S
26   1A0   1A1   1A2   1A3   S
27   1B0   1B1   1B2   1B3   S
28   1C0   1C1   1C2   1C3   S
29   1D0   1D1   1D2   1D3   S
30   1E0   1E1   1E2   1E3   S
31   1F0   1F1   1F2   1F3   S
32   200   201   202   203   S
33   210   211   212   213   S
34   220   221   222   223   S
35   230   231   232   233   S
36   240   241   242   243   S
37   250   251   252   253   S
38   260   261   262   263   S
39   270   271   272   273   S
40   280   281   282   283   S
41   290   291   292   293   S
42   2A0   2A1   2A2   2A3   S
43   2B0   2B1   2B2   2B3   S
44   2C0   ---   ---   ---   N
45   2D0   ---   ---   ---   N
46   2E0   2E1   2E2   2E3   S
47   2F0   2F1   2F2   2F3   S
48   300   301   302   303   S
49   310   311   312   313   S
50   320   321   322   323   S
51   330   331   332   333   S
52   340   341   342   343   S
53   350   351   352   353   S
54   360   361   362   363   S
55   370   371   372   373   S
56   380   ---   ---   ---   C
57   390   ---   ---   ---   C
58   3A0   3A1   3A2   3A3   S
59   3B0   3B1   3B2   3B3   S
```

■ Example of output file (Segment option document file)

```
C3B070A0.SDC

* E0C63B07 SEGMENT OPTION DOCUMENT V 1.00
*
* FILE NAME    C3B070A0.SDC
* USER'S NAME  SEIKO EPSON
* INPUT DATE   97/01/30
* COMMENT      TEST
*
*
* OPTION NO.12
*
* < LCD SEGMENT DECODE TABLE >
*
* SEG COM0 COM1 COM2 COM3 SPEC
*
   0  000  001  002  003  S
   1  010  011  012  013  S
   2  020  021  022  023  S
   3  030  031  032  033  S
   4  040  041  042  043  S
   5  050  051  052  053  S
   6  060  061  062  063  S
   7  070  071  072  073  S
   8  080  081  082  083  S
   9  090  091  092  093  S
  10  0A0  0A1  0A2  0A3  S
  11  0B0  0B1  0B2  0B3  S
  12  0C0  0C1  0C2  0C3  S
  13  0D0  0D1  0D2  0D3  S
  14  0E0  0E1  0E2  0E3  S
  15  0F0  0F1  0F2  0F3  S
  16  100  101  102  103  S
  17  110  111  112  113  S
  18  120  121  122  123  S
  19  130  131  132  133  S
  20  140  141  142  143  S
  21  150  151  152  153  S
  22  160  161  162  163  S
  23  170  171  172  173  S
  24  180  181  182  183  S
  25  190  191  192  193  S
  26  1A0  1A1  1A2  1A3  S
  27  1B0  1B1  1B2  1B3  S
  28  1C0  1C1  1C2  1C3  S
  29  1D0  1D1  1D2  1D3  S
  30  1E0  1E1  1E2  1E3  S
  31  1F0  1F1  1F2  1F3  S
  32  200  201  202  203  S
  33  210  211  212  213  S
  34  220  221  222  223  S
  35  230  231  232  233  S
  36  240  241  242  243  S
  37  250  251  252  253  S
  38  260  261  262  263  S
  39  270  271  272  273  S
  40  280  281  282  283  S
  41  290  291  292  293  S
  42  2A0  2A1  2A2  2A3  S
  43  2B0  2B1  2B2  2B3  S
  44  2C0  2C1  2C2  2C3  N
  45  2D0  2D1  2D2  2D3  N
  46  2E0  2E1  2E2  2E3  S
  47  2F0  2F1  2F2  2F3  S
  48  300  301  302  303  S
```

```
49   310   311   312   313   S
50   320   321   322   323   S
51   330   331   332   333   S
52   340   341   342   343   S
53   350   351   352   353   S
54   360   361   362   363   S
55   370   371   372   373   S
56   380   381   382   383   C
57   390   391   392   393   C
58   3A0   3A1   3A2   3A3   S
59   3B0   3B1   3B2   3B3   S
*EOF
```

■ Example of output file (Segment option HEX file)

```
C3B070A0.SSA

S2240000000000000000100020003FFFFFFFFFFFFFFFF0100010101020103FFFFFFFFFFFFFFFFDB
S2240000200020002010202020203FFFFFFFFFFFFFFFF0300030103020303FFFFFFFFFFFFFFFFAB
S2240000400040004010402040203FFFFFFFFFFFFFFFF0500050105020503FFFFFFFFFFFFFFFF7B
S2240000600060006010602060203FFFFFFFFFFFFFFFF0700070107020703FFFFFFFFFFFFFFFF4B
S2240000800080008010802080203FFFFFFFFFFFFFFFF0900090109020903FFFFFFFFFFFFFFFF1B
S2240000A00A000A010A020A03FFFFFFFFFFFFFFFF0B000B010B020B03FFFFFFFFFFFFFFFFEB
S2240000C00C000C010C020C03FFFFFFFFFFFFFFFF0D000D010D020D03FFFFFFFFFFFFFFFFBB
S2240000E00E000E010E020E03FFFFFFFFFFFFFFFF0F000F010F020F03FFFFFFFFFFFFFFFF8B
S2240001001000100110021003FFFFFFFFFFFFFFFF1100110111021103FFFFFFFFFFFFFFFF5A
S2240001201200120112021203FFFFFFFFFFFFFFFF1300130113021303FFFFFFFFFFFFFFFF2A
S2240001401400140114021403FFFFFFFFFFFFFFFF1500150115021503FFFFFFFFFFFFFFFFFA
S2240001601600160116021603FFFFFFFFFFFFFFFF1700170117021703FFFFFFFFFFFFFFFFCA
S2240001801800180118021803FFFFFFFFFFFFFFFF1900190119021903FFFFFFFFFFFFFFFF9A
S2240001A01A001A011A021A03FFFFFFFFFFFFFFFF1B001B011B021B03FFFFFFFFFFFFFFFF6A
S2240001C01C001C011C021C03FFFFFFFFFFFFFFFF1D001D011D021D03FFFFFFFFFFFFFFFF3A
S2240001E01E001E011E021E03FFFFFFFFFFFFFFFF1F001F011F021F03FFFFFFFFFFFFFFFF0A
S2240002002000200120022003FFFFFFFFFFFFFFFF2100210121022103FFFFFFFFFFFFFFFFD9
S2240002202200220122022203FFFFFFFFFFFFFFFF2300230123022303FFFFFFFFFFFFFFFFA9
S2240002402400240124022403FFFFFFFFFFFFFFFF2500250125022503FFFFFFFFFFFFFFFF79
S2240002602600260126022603FFFFFFFFFFFFFFFF2700270127022703FFFFFFFFFFFFFFFF49
S2240002802800280128022803FFFFFFFFFFFFFFFF2900290129022903FFFFFFFFFFFFFFFF19
S2240002A02A002A012A022A03FFFFFFFFFFFFFFFF2B002B012B022B03FFFFFFFFFFFFFFFFE9
S2240002C02C002C012C022C03FFFFFFFFFFFFFFFF2D002D012D022D03FFFFFFFFFFFFFFFFB9
S2240002E02E002E012E022E03FFFFFFFFFFFFFFFF2F002F012F022F03FFFFFFFFFFFFFFFF89
S2240003003000300130023003FFFFFFFFFFFFFFFF3100310131023103FFFFFFFFFFFFFFFF58
S2240003203200320132023203FFFFFFFFFFFFFFFF3300330133023303FFFFFFFFFFFFFFFF28
S2240003403400340134023403FFFFFFFFFFFFFFFF3500350135023503FFFFFFFFFFFFFFFFF8
S2240003603600360136023603FFFFFFFFFFFFFFFF3700370137023703FFFFFFFFFFFFFFFFC8
S2240003803800380138023803FFFFFFFFFFFFFFFF3900390139023903FFFFFFFFFFFFFFFF98
S2240003A03A003A013A023A03FFFFFFFFFFFFFFFF3B003B013B023B03FFFFFFFFFFFFFFFF68
S2240003C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF38
S2240003E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF18

                              :

S224000FA0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF4C
S224000FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2C
S224000FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0C
S2240010000000000000000000000000000000000000000000000000000000000000000000CB
S2240010200000000000000000000000050500000000000000000001010000FFFFFFFFA3
S22400104FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFAB
S22400106FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF8B
S22400108FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF6B
S2240010A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF4B
S2240010C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2B
S2240010E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0B
S804000000FB
```

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CHAPTER 6   MASK DATA CHECKER (*mdc63b07*)

6.1   Outline of mdc63b07

The mask data checker mdc63b07 is a software tool that checks the format of the input files, code ROM files (c3b07xxx.hsa, c3b07xxx.lsa) generated by the hex63b07, the function option document file (c3b07xxx.fdc) generated by the fog63b07, the melody ROM/option document file (c3b07xxx.mdc) generated by the mla63b07 and the segment option document file (c3b07xxx.sdc) generated by the sog63b07, and generates a data file (c3b07xxx.pan) for generating mask patterns. Submit the file generated through this software tool to Seiko Epson.
Moreover, the mdc63b07 has a function to restore the generated data file (c3b070a0.pan) to the original file format.

6.2   Execution Flow and Input/Output Files

Figure 6.2.1 shows the mdc63b07 execution flow .
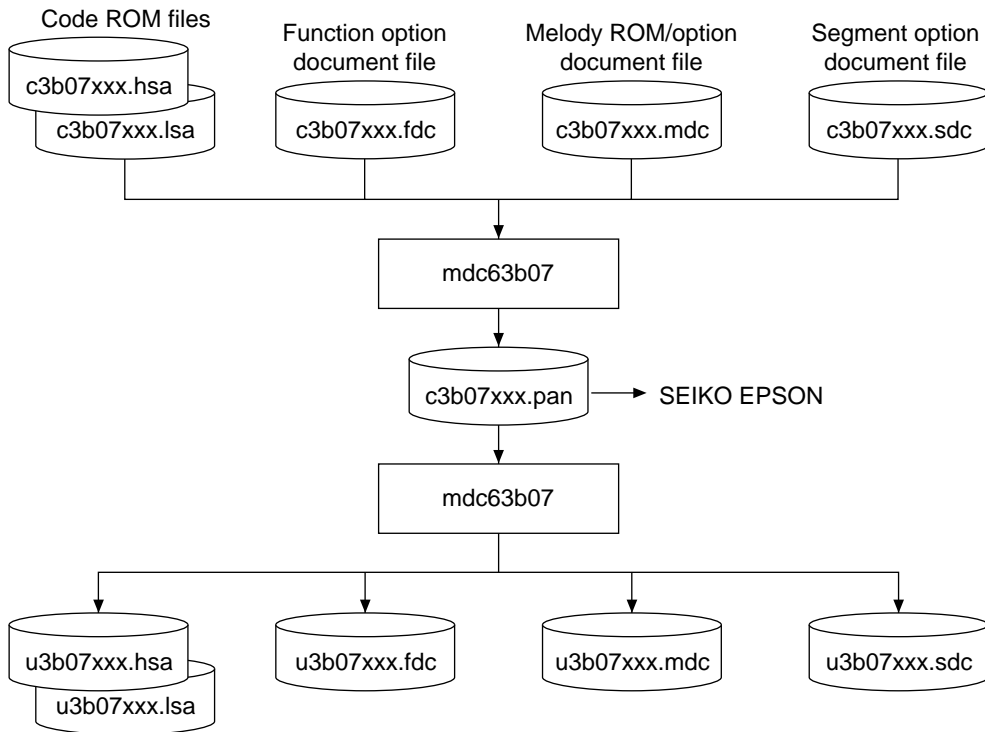
Fig. 6.2.1 mdc63b07 execution flow

(1) Preparation of code ROM files (c3b07xxx.hsa, c3b07xxx.lsa)

Prepare the code ROM HEX files output from the HEX data converter (hex63b07).

(2) Preparation of function option data file (c3b07xxx.fdc)

Prepare the function option document file output from the function option generator (fog63b07).

(3) Preparation of melody ROM/option file (c3b07xxx.mdc)

Prepare the melody ROM/option document file output from the melody assembler (mla63b07).

(4) Preparation of segment option data file (c3b07xxx.sdc)

Prepare the segment option document file output from the segment option generator (sog63b07).

(5) Packing of data

Using the mask data checker (mdc63b07), compile the code ROM files, function option document file and segment option document file in one data file for masking (c3b07xxx.pan). This packing file should be sent to Seiko Epson.

(6) Unpacking of data

The data file for masking (c3b07xxx.pan) generated by packing process can be restored to the original file using the mask data checker (mdc63b07).

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

6.3   Operation Procedure

6.3.1 Copying each data files

When submitting data to Seiko Epson, copy on the work disk the data generated from the HEX converter (hex63b07), the function option generator (fog63b07), the melody assembler (mla63b07) and the segment option generator (sog63b07).
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: c3b07xxx.hsa
                                          c3b07xxx.lsa

    2) Function option document file: c3b07xxx.fdc

    3) Melody ROM/option document file: c3b07xxx.mdc

    4) Segment option document file: c3b07xxx.sdc

6.3.2 Starting procedure

(1) Starting command

To start mdc63b07, enter the command as following format at the DOS command level (state in which a prompt such as A> is displayed).

> **mdc63b07 {-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 mdc63b07.

-p

Specification of packing. When specifying this option, **an output file name must also be specified**. In this case, the code ROM files (~.hsa, ~.lsa), function option document file (~.fdc), melody ROM/ option document file (~.mdc) and segment option document file (~.sdc) 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: `mdc63b07 -p c3b070a0.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: `mdc63b07 -u c3b070a0.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 mdc63b07 starts up, the following message is displayed.

Example: When option has not been specified.

```
E0C63B07 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 mdc63b07, 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

6.3.3 Packing of data

When generating data for submission to Seiko Epson, select packing option at the time of start-up of the mdc63b07 (see "6.3.2 Starting procedure").

(1) Input file name

When the operation menu item 1, "Pack", is selected after starting up the mdc63b07 in default (without option specification), the mdc63b07 prompts to enter **a file name to be generated**.

Moreover, when the -p option has been specified at the mdc63b07 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: C3B07xxx.HSA
                 C3B07xxx.LSA
                 C3B07xxx.FDC
                 C3B07xxx.MDC
                 C3B07xxx.SDC
Output file is : C3B07xxx.PAn

Please input pack file name(C3B07xxx.PAn) ? c3b070a0.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 "c3b07xxx.pa0" has been submitted, the pack file name should be entered as "c3b07xxx.pa1".

(2) Packing process

Access to the input files when packing data is done only for code ROM files (~.hsa, ~.lsa), function option document file (.fdc), melody ROM/option document file (.mdc) and segment option document file (.sdc) 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: C3B070A0.HSA
                 C3B070A0.LSA
                 C3B070A0.FDC
                 C3B070A0.MDC
                 C3B070A0.SDC
Output file is : C3B070A0.PA0
```

6.3.4 Unpacking data

When restoring the packed data to original file format, select unpacking option at the time of start-up of the mdc63b07 (see "6.3.2 Starting procedure").

(1) Input file name

When the operation menu item 2, "Unpack", is selected after starting up the mdc63b07 in default (without option specification), the mdc63b07 prompts to enter **a file name to be unpacked**.

When the -u option has been specified at mdc63b07 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  : C3B07xxx.PAn
Output files are: U3B07xxx.HSA
                  U3B07xxx.LSA
                  U3B07xxx.FDC
                  U3B07xxx.MDC
                  U3B07xxx.SDC

Please input pack file name(C3B07xxx.PAn) ? c3b070a0.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 mdc63b07 finds the specified file from the current directory and loads it for unpacking.

```
Input  file is  : C3B070A0.PA0
Output files are: U3B070A0.HSA
                  U3B070A0.LSA
                  U3B070A0.FDC
                  U3B070A0.MDC
                  U3B070A0.SDC
```

If there is no problem in the entering of the file name and the input file, the mdc63b07 unpacks the file to restore it to the original format files.

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

6.3.5 End procedure

When a series of operations is completed, the mdc63b07 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 (C3b070K0) error.
A>
```

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

6.4   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 mdc63b07 error message lists are indicated below .

6.4.1 Start-up error

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

6.4.2 ROM data error

When an error message as shown below appears, try to execute the mdc63b07 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)

6.4.3 Function option data error

When an error message as shown below appears, try to execute the mdc63b07 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)

6.4.4 Segment option data error

When an error message as shown below appears, try to execute the mdc63b07 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
LCD segment data error : Illegal segment No.	The segment number is incorrect.
LCD segment data error : Illegal segment area.	The display memory address is out of the range.
LCD segment data error : Illegal segment output specification.	The output specification is incorrect.
LCD segment data error : Illegal data in this line.	There is an illegal description other than hexadecimal numbers and an output specification symbol in the line.
LCD segment data error : Data is not enough.	There is not enough segment data.
LCD segment data error : Illegal start mark.	The start mark is incorrect. (during unpacking)
LCD segment data error : Illegal end mark.	The end mark is incorrect. (during unpacking)
LCD segment data error : Illegal comment.	The model name at the beginning of the data is incorrect. (during unpacking)

6.4.5 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.

6.5 Packed File

6.5.1 Configuration of packed file

The packed file is configured according to the following format:

```
Model name                      ┌ *
                                │ * E0C63B07 MASK DATA VER x.xx
                                └ *
Code ROM start mark             ─ \PROM
Master slice model name         ─ E0C63B07xxx PROGRAM ROM
                                ┌ S224000000.......................................
                                │        :       :       :       :       :       :
                                │ S804000000FB
Code ROM                        │ S224000000.......................................
                                │        :       :       :       :       :       :
                                └ S804000000FB
End mark                        ─ \END
Function option start mark      ─ \FOPTION
                                ┌ * E0C63B07 FUNCTION OPTION DOCUMENT V x.xx
                                │ *
                                │ * FILE NAME    C3B07xxx.FDC
                                │ * USER'S NAME  SEIKO EPSON
                                │ * INPUT DATE   '97/01/30
                                │ * COMMENT      FOR SAMPLE
                                │ *
Function option                 │ * *** OPTION NO.1 ***
                                │ * --- MULTIPLE KEY ENTRY RESET COMBINATION ---
                                │ *     NOT USE  ------------------------   SELECTED
                                │  OPT0101 01
                                │        :       :       :       :       :       :
                                │  OPT0901 01
                                └ *EOF
End mark                        ─ \END
Melody address ROM start mark   ─ \AROM
Master slice model name         ─ E0C63B07xxx MELODY ADDRESS ROM
                                ┌ S214000000.......................................
Melody address ROM              └ S804000000FB
End mark                        ─ \END
Melody tempo ROM start mark     ─ \TROM
Master slice model name         ─ E0C63B07xxx MELODY TEMPO ROM
                                ┌ S214000000.......................................
Melody tempo ROM                │ S214000010.......................................
                                └ S804000000FB
End mark                        ─ \END
Melody scale ROM start mark     ─ \SROM
Master slice model name         ─ E0C63B07xxx MELODY SCALE ROM
                                ┌ S214000000.......................................
Melody scale ROM                └ S804000000FB
End mark                        ─ \END
Melody contol ROM start mark    ─ \CROM
Master slice model name         ─ E0C63B07xxx MELODY CONTROL ROM
                                ┌ S214000000.......................................
                                │        :       :       :       :       :
                                │ S804000000FB
Melody contol ROM               │ S214000000.......................................
                                │        :       :       :       :       :
                                └ S804000000FB
End mark                        ─ \END
```

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Melody main ROM start mark	– \MROM
Master slice model name	– E0C63B07xxx MELODY MAIN ROM

```
┌ S214000000........................................
│       :       :       :       :       :
│ S804000000FB
Melody main ROM   S214000000........................................
│       :       :       :       :       :
└ S804000000FB
```

End mark	– \END
Melody option start mark	– \MOPTION

```
┌ * E0C63B07 MELODY OPTION DOCUMENT V x.xx
│ *
│ * FILE NAME    C3B07xxx.MDC
│ * USER'S NAME  SEIKO EPSON
│ * INPUT DATE   '97/01/30
│ * COMMENT
│ *
│ * *** OPTION NO.10 ***
│ * --- CHANGE MELODY IN OPERATION MODE ---
Melody option   *     CHANGE  --------------------------  SELECTED
│  OPT1001 01
│ *
│ * *** OPTION NO.11 ***
│ * --- POLARITY FOR PLAY OUTPUT ---
│ *     POSITIVE  ------------------------  SELECTED
│  OPT1101 01
│ *
└ *EOF
```

End mark	– \END
Segment option start mark	– \SEGMENT

```
┌ * E0C63B07 SEGMENT OPTION DOCUMENT V x.xx
│ *
│ * FILE NAME    C3B07000.SDC
│ * USER'S NAME  SEIKO EPSON
│ * INPUT DATE   '97/01/30
│ *
│ *
│ * OPTION NO.12
Segment option   *
│ * < LCD SEGMENT DACODE TABLE >
│ *
│ * SEG COM COM1 COM2 COM3 SPEC
│    0  163  162  161  1D0  S
│    1  170  172  171  160  S
│       :        :       :
│   59  1D3  1E3  1F2  1F3  S
└ *EOF
```

End mark	– \END

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

6.5.2 ROM data format

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

Sx	Count	Address (3 bytes)	Data	• •	Data	Checksum	CR, LF

ASCII codes 0DH and 0AH

1's complements resulting from adding all bytes of data in 1 line (Hex number)

8-bit data (Hex number)

Address is given (Hex number)

Total byte number including address, data byte and checksum (Hex number)

Data record: "S2",
End record: "S8"
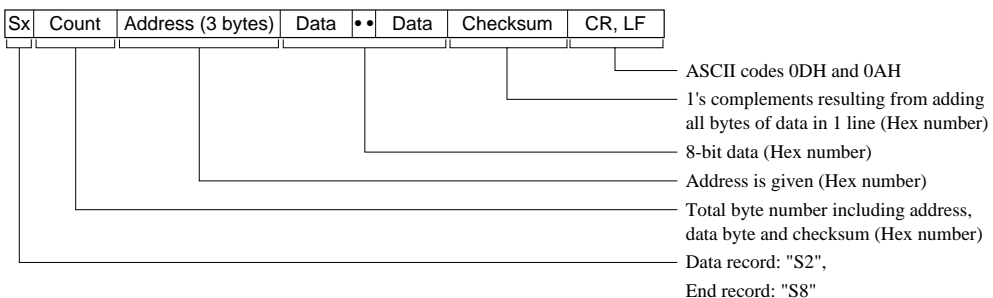
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