

CMOS 4-BIT SINGLE CHIP MICROCOMPUTER **E0C63A08**

***DEVELOPMENT TOOL MANUAL***



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# CHAPTER 1 OUTLINE OF PACKAGE

## 1.1 Preface

---

The "E0C63A08 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 E0C63A08. 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 .....                          | <b>hex63a08</b>     |
| 2) Function option generator .....                   | <b>fog63a08</b>     |
| 3) Melody assembler .....                            | <b>mla63a08</b>     |
| 4) Mask data checker .....                           | <b>mdc63a08</b>     |
| 5) Parameter file for ICE63 .....                    | <b>par63a08.par</b> |
| 6) HEX file for LCD drive terminal setting .....     | <b>e0c63a08.ssa</b> |
| 7) HEX sample file for function option setting ..... | <b>c3a08xxx.fsa</b> |

## 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 E0C63A08 development.

- |                                                      |   |
|------------------------------------------------------|---|
| 1) 3.5" floppy disk for NEC PC9801 .....             | 1 |
| 2) 3.5" floppy disk for IBM-PC/AT .....              | 1 |
| 3) E0C63A08 Development Tool Manual (English) .....  | 1 |
| 4) E0C63A08 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) <b>Model:</b>              | IBM-PC/AT or compatible model<br>NEC PC9801 Series or compatible model                           |
| 2) <b>OS:</b>                 | MS-DOS or PC-DOS, ver. 3.3 or higher                                                             |
| 3) <b>RAM capacity:</b>       | 640K bytes                                                                                       |
| 4) <b>Disk drive:</b>         | 3.5 inches (1.2M: PC9801 and the compatible)<br>3.5 inches (1.44M: IBM-PC/AT and the compatible) |
| 5) <b>Necessary software:</b> | General purpose editor                                                                           |

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

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

### 1.3 Outline of Software Tool

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

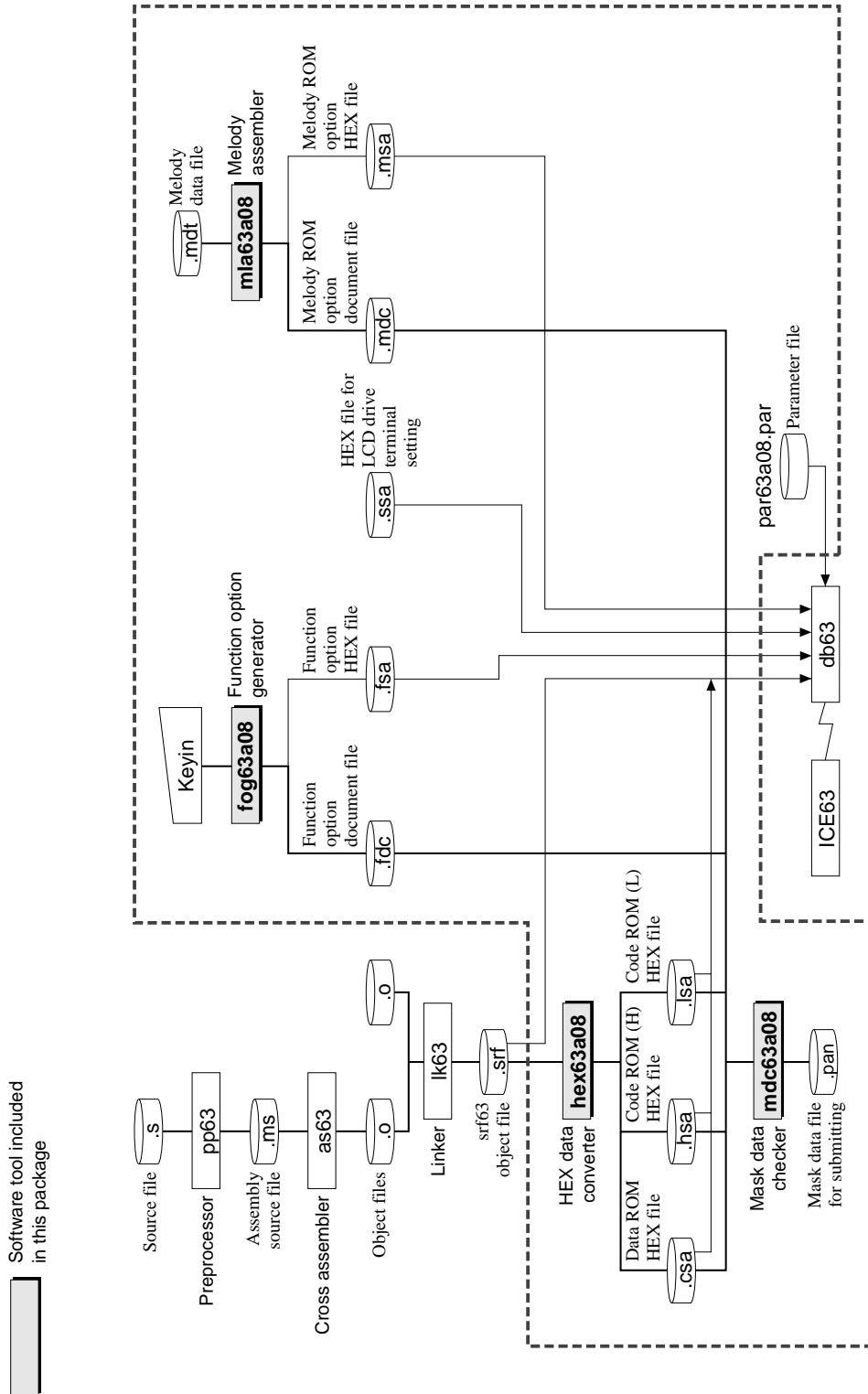


Fig. 1.3.1 Software development flow

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

### ***1.3.1 HEX data converter <hex63a08>***

The HEX data converter hex63a08 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 <fog63a08>***

In the E0C63A08, some hardware specifications such as an I/O port function can be selected as mask option. The function option generator fog63a08 is a tool that can interactively select the E0C63A08 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 <m1a63a08>***

The melody assembler m1a63a08 is a software tool for setting the melody ROM data and the melody option of the E0C63A08.

### ***1.3.4 Mask data checker <mdc63a08>***

The mask data checker mdc63a08 is a software tool that checks the ROM data and option data developed and generates a file for submitting to Seiko Epson.

### ***1.3.5 Parameter file for ICE63 <par63a08.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.

### ***1.3.6 HEX file for LCD drive terminal setting <e0c63a08.ssa>***

The ICE63 has 80 SEG terminals built-in for driving the LCD, however, the E0C63A08 can use 40 of them. This file is used to set the SEG terminal configuration in the ICE63 to correspond with the E0C63A08. This file must be loaded to the ICE63 at the beginning of debugging using the "lo" command.

### ***1.3.7 HEX file for function option setting <c3a08xxx.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 fog63a08.

## ***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 (hex63a08)*

## 2.1 *Outline of hex63a08*

The HEX data converter utility hex63a08 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 (mdc63a08).

## 2.2 *Execution Flow and Input/Output Files*

Figure 2.2.1 shows the hex63a08 execution flow.

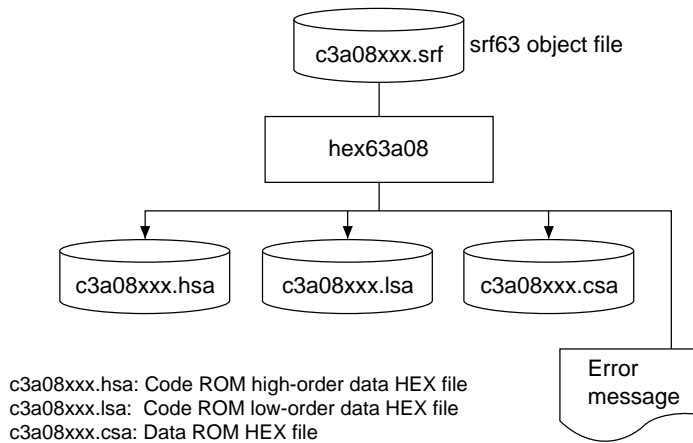


Fig. 2.2.1 *hex63a08 execution flow*

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

The hex63a08 inputs an object file (srf63 format) and generates three HEX files (Motorola S2 format). The object file name is used as the output file name except for the extension. For example, if the object file name is "c3a080a0.srf", the hex63a08 outputs three files as below:

- 1) c3a080a0.hsa      2) c3a080a0.lsa      3) c3a080a0.csa

### (1) **Input file**

- **Object file (~.srf)**

This is an srf63 format object file output from the linker lk63.

### (2) **Output files**

- **Code ROM high-order data HEX file (~.hsa)**

The hex63a08 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 hex63a08 outputs this file in Motorola S2 format. This file contains low-order 8 bits of the codes (13 bits each) in the object file.

- **Data ROM HEX file (~.csa)**

The hex63a08 outputs this file in Motorola S2 format. This file contains the data (4 bits) in the object file.



## 2.3 Operation Procedure

---

### 2.3.1 Starting procedure

#### (1) Starting command

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

```
hex63a08 <Object file name[.srf]> 
```

indicates the Return key.

A parameter enclosed by [ ] can be omitted.

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

#### (2) Start-up message

When the hex63a08 starts up, the following message is displayed.

Example: File name: c3a080a0.srf

```
A>hex63a08 c3a080a0.srf   
E0C63A08 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 hex63a08 displays the following message and returns to the DOS command level.

#### (1) When terminated normally

The hex63a08 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 hex63a08 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 hex63a08 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 hex63a08 error messages and warning message are listed below.

### 2.4.1 Start-up error

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

### 2.4.2 Input file format error (1)

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

### 2.4.3 Input file format error (2)

When an error message as shown below appears, try to execute the hex63a08 again after re-creating the srf63 file. If a similar error still results, please notify Seiko Epson of the situation and the error message displayed.

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

### 2.4.4 System error

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

## 2.5 hex63a08 Execution Example

The following shows an example of when an srf63 format file ("c3a080a0.srf") is converted into a Motorola S2 format file ("c3a080a0.hsa", "c3a080a0.lsa", "c3a080a0.csa").

A>hex63a08 c3a080a0.srf

### ■ Example of input file

<c3a080a0.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 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

<c3a080a0.csa>

```

S224000000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFA
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:           :           :           :           :           :           :
S2240001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF2C
S224000FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF0C
S804000000FB

```

<c3a080a0.hsa>

```

S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFB
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFA8
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:           :           :           :           :           :           :
S224001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1C
S224001FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC
S804000000FB

```

**hex63a08**

<c3a080a0.lsa>

```
S224000000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
S224000020FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDB
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF27272FFFFFFFFFFFFFFFFFFFF21
S224000120FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFDA
S224000140FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBA
:           :           :           :           :           :           :           :
S224001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1C
S224001FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC
S804000000FB
```

# CHAPTER 3 FUNCTION OPTION GENERATOR (fog63a08)

## 3.1 Outline of fog63a08

The E0C63A08 4-bit single ship microcomputer has 10 mask options to select hardware specifications such as I/O port functions. By modifying the IC mask patterns of the E0C63A08 according to the options selected, the system can be customized to meet the specifications of the target system.

The function option generator fog63a08 is a software tool for generating the document file used to generate IC mask patterns. The mask options for the E0C63A08 can be interactively selected. From the data file created with fog63a08, the E0C63A08 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 fog63a08 execution flow.

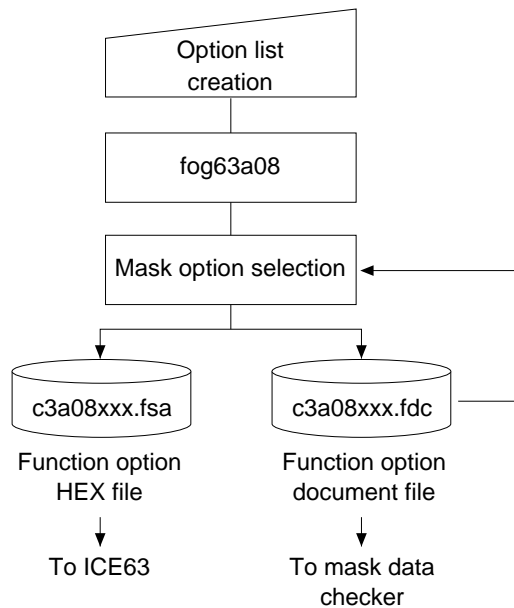


Fig. 3.2.1 fog63a08 execution flow

**fog63a08**

**(1) Option list creation**

Select the E0C63A08 mask options that meet the target system and record them in the option list (see Section 3.3).

**(2) fog63a08 execution**

Start the fog63a08 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 fog63a08.

As a result, the fog63a08 outputs the following two files.

• **Function option document file (c3a08xxx.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 fog63a08. This file should be packed with the completed program files for submitting to Seiko Epson.

• **Function option HEX file (c3a08xxx.fsa)**

This file is a Motorola S2 format data file for setting the E0C63A08 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 E0C63A08.

Multiple selections are available in each option item as indicated in the Option List. Using "E0C63A08 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 fog63a08 execution, using this option list as reference.

**1 OSC3 SYSTEM CLOCK**

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

**2 MULTIPLE KEY ENTRY RESET COMBINATION**

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

**3 MULTIPLE KEY ENTRY RESET TIME AUTHORIZE**

- 1. Not Use
- 2. Use

**4 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

**5 OUTPUT PORT OUTPUT SPECIFICATION**

- R00 .....  1. Complementary                       2. Nch Open Drain
- R01 .....  1. Complementary                       2. Nch Open Drain
- R02 .....  1. Complementary                       2. Nch Open Drain
- R03 .....  1. Complementary                       2. Nch Open Drain
- R1x .....  1. Complementary                       2. Nch Open Drain
- R2x .....  1. Complementary                       2. Nch Open Drain
- R3x .....  1. Complementary                       2. Nch Open Drain
- R4x .....  1. Complementary                       2. Nch Open Drain

**6 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
- P3x .....  1. Complementary                       2. Nch Open Drain
- P4x .....  1. Complementary                       2. Nch Open Drain

**7 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
- P3x .....  1. With Resistor                       2. Gate Direct
- P4x .....  1. With Resistor                       2. Gate Direct

**8 LCD DRIVING POWER**

- 1. Internal
- 2. External

**9 SERIAL PORT INTERFACE POLARITY**

- 1. Positive
- 2. Negative

**10 OSC1 SYSTEM CLOCK**

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

### 3.4 Operation Procedure

#### 3.4.1 Starting procedure

##### (1) Starting command

```
fog63a08 ↵
```

↵ indicates the Return key.

To start fog63a08, enter "fog63a08" at the DOS command level (a state in which a prompt such as A> is displayed). The "fog63a08.exe" program should be previously copied into the working directory.

##### (2) Start-up message

```
A>fog63a08
E0C63A08 Function Option Generator Version x.xx
Copyright (C) SEIKO EPSON CORP. 199x

This software makes the following files.

c3a08xxx.fsa ... function option HEX file.
c3a08xxx.fdc ... function option document file.
```

When the fog63a08 starts up, the start-up message is displayed.

The following explains the actual operation method of the fog63a08 according to the screen displayed.

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

##### (3) Date input

```
Current data is '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 (c3a08xxx.fdc) generated by "1. Input new file".
- 3. Return to DOS:** Used to terminate the fog63a08 and return to the DOS command level.



### 3.4.2 Setting new function options (Input new file)

This section explains how to set new function option file.

\* In the examples,  indicates the Return key.

```

*** Operation select menu ***

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

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

Please input file name ? c3a08xxx ... (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 ? c3a08xxx
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 E0C63A08. For new settings, select options Option No. 1 to No. 10 sequentially and interactively.

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

**fog63a08****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) ***

C3a080A0      C3a080B0      C3a080C0      ... (2)

Please input file name ? c3a080A0    ... (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 (c3a08xxx.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 ? c3a080a0

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 (1–10) of the option to be modified, then start setting the option contents (See "3.4.4 Option selection").

When selection of one option is complete, the system prompts entry of another function option number. Repeat selection until all options to be modified are selected.

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

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

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

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

• When ending setting

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

### 3.4.4 Option selection

Selection procedure for function options are described below.

Option selection is done interactively. For new settings (Input new file), set all options Option No. 1 to No. 10 sequentially; to modify settings (Edit file), the specified option number may be set directly.

#### (1) Example of option selection

```
*** Option No.2 ***
--- 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, "<sup>␣</sup>" 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<sup>␣</sup>".

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

```
*** Option No.2 ***
--- Multiple key entry reset combination ---

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

Please select No.(1) ? B␣

*** Option No.1 ***
--- OSC3 system clock ---

    1. Use CR
    2. Use Ceramic/Not use

Please select No.(1) ?
```

To modify previously set option in the new setting process (Input new file), enter "B<sup>␣</sup>" to return 1 step back to the previous function option setting operation.

**fog63a08**

**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 (c3a08xxx.fsa). If "N" is entered, no HEX file is generated and only document file (c3a08xxx.fdc) is generated.

Since the function option HEX file (c3a08xxx.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 fog63a08 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 fog63a08 can be terminated by selecting "3. Return to DOS" on this menu.

The fog63a08 can be forcibly terminated by pressing the "CTRL" and "C" keys together during this software execution. (It is possible by pressing "STOP" key depending on the PC used.) However, in this case, the correct function option HEX file and function option document file are not generated.

**3.5 Error Message**

Table 3.5.1 lists the fog63a08 error messages.

*Table 3.5.1 fog63a08 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 E0C63A08 is specified during modification (Edit file).
Error: File write error.	The function option document file or function option HEX file cannot be created. This error may occur if there is no disk space.
Can't open file : filename	The file cannot be opened. This error may occur when too many files exist in the current directory.

## 3.6 Sample Files

### ■ Example of function option document file

```

* E0C63A08 FUNCTION OPTION DOCUMENT V 1.20
*
* FILE NAME      C3A080A0.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 ***
* --- OSC3 SYSTEM CLOCK ---
* USE CR ----- SELECTED
OPT0101 02
*
* *** OPTION NO.2 ***
* --- MULTIPLE KEY ENTRY RESET COMBINATION ---
* NOT USE ----- SELECTED
OPT0201 01
*
* *** OPTION NO.3 ***
* --- MULTIPLE KEY ENTRY RESET TIME AUTHORIZE ---
* NOT USE ----- SELECTED
OPT0301 01
*
* *** OPTION NO.4 ***
* --- 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
OPT0401 01
OPT0402 01
OPT0403 01
OPT0404 01
OPT0405 01
OPT0406 01
OPT0407 01
OPT0408 01
*
* *** OPTION NO.5 ***
* --- OUTPUT PORT OUTPUT SPECIFICATION ---
* R00           COMPLEMENTARY ----- SELECTED
* R01           COMPLEMENTARY ----- SELECTED
* R02           COMPLEMENTARY ----- SELECTED
* R03           COMPLEMENTARY ----- SELECTED
* R1X           COMPLEMENTARY ----- SELECTED
* R2X           COMPLEMENTARY ----- SELECTED
* R3X           COMPLEMENTARY ----- SELECTED
* R4X           COMPLEMENTARY ----- SELECTED
OPT0501 01
OPT0502 01
OPT0503 01
OPT0504 01
OPT0505 01
OPT0506 01

```



# CHAPTER 4 MELODY ASSEMBLER (*mla63a08*)

## 4.1 Outline of *mla63a08*

The melody assembler *mla63a08* is a software tool for setting the melody ROM data and the melody option of the E0C63A08. It assembles a melody data file and generates the melody ROM/option document file for creating the E0C63A08 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 *mla63a08* execution flow.

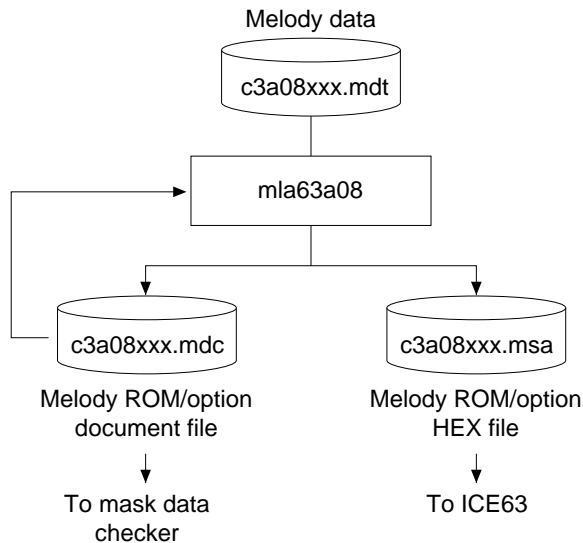


Fig. 4.2.1 *mla63a08* execution flow

### (1) Melody data (c3a08xxx.mdt)

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

### (2) *mla63a08* execution

Start up the *mla63a08* using melody data (1) as the input file to execute melody data assembly. The *mla63a08* generates the following two data files.

### (3) Melody ROM/option document file (c3a08xxx.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 (c3a08xxx.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 *mla63a08* 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 E0C63A08, 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

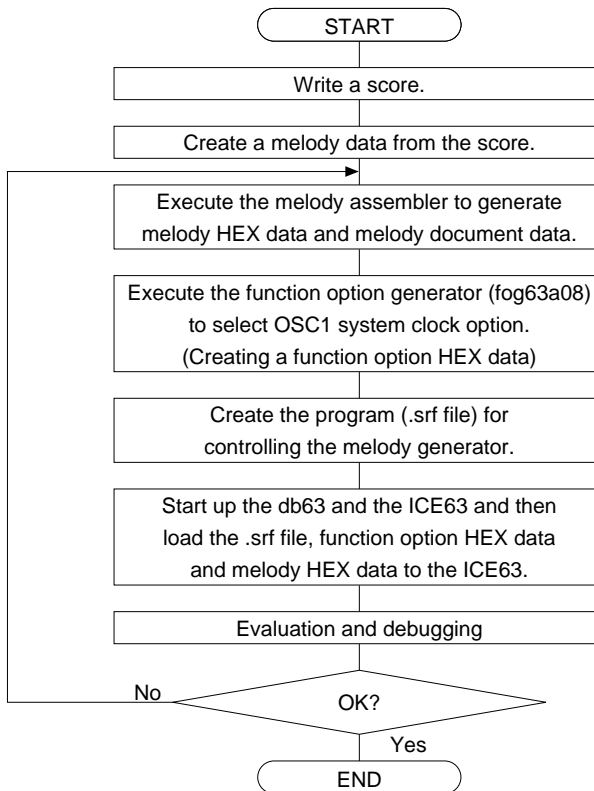
The jump destinations (main data numbers) from the main data in which the jump bit is set are described here.

##### (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.





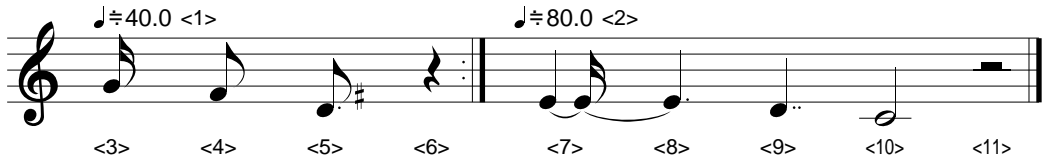
### 4.3.3 Method of creating melody data

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

#### (1) Writing score

Describe music to be played with the E0C63A08 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

```

; mla63a08 sample file           Description from ";" to the end of the line is skipped as it is
                                   regarding as a comment.
TEMP0                             Start mark of tempo data (It cannot be omitted.)
; m0-tempo 0, 1
TEMP0 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 ♩ = 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								

**mla63a08**

**(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 (fog63a08).

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				Reference frequenc: 32.768 kHz			
Pitch data	HEX data	Pitch data	HEX data	Pitch data	HEX data	Pitch data	HEX data
D4	04	A5	B1	C4	0A	E5	A3
D4#	12	A5#	B5	C4#	18	F5	A6
E4	20	B5	B8	D4	27	F5#	AD
F4	2F	C6	BC	D4#	33	G5	B0
F4#	3B	C6#	C0	E4	3F	G5#	B7
G4	44	D6	C4	F4	48	A5	BA
G4#	51	D6#	C8	F4#	55	A5#	BE
A4	5B	E6	CD	G4	5F	B5	C2
A4#	65	F6	CE	G4#	66	C6	C7
B4	6C	F6#	D3	A4	71	C6#	CB
C5	74	G6	D4	A4#	79	D6	CC
C5#	7C	G6#	D9	B4	81	D6#	D1
D5	84	A6	DB	C5	89	E6	D2
D5#	8D	A6#	DC	C5#	8E	F6	D7
E5	92	B6	DE	D5	94	F6#	D8
F5	98	C7	E0	D5#	9D	G6	DA
F5#	9E	C7#	E2				
G5	A4	D7	E4				
G5#	AB	D7#	E6				

- \* 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 (fog63a08) for each model.

**Option 11: 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 12: 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 "E0C63A08 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 mla63a08, enter the command above at the DOS command level (a state in which a prompt such as A> is displayed).

```
mla63a08 {-h} <file name> ↵
```

↵ indicates the Return key.

The option enclosed with { } can be omitted.

### (2) Option

The -h option is available in the mla63a08 starting command.

#### -h

When the -h option is specified, the mla63a08 generates a melody ROM/option HEX data (.msa) from a melody ROM/option document data (.mdc) already generated.

Example: mla63a08 c3a08xxx.mdc ↵

Input file: c3a08xxx.mdc Melody ROM/option document data  
Output file: c3a08xxx.msa Melody ROM/option HEX file

#### Default (When option has not been specified)

When the option is not specified, the mla63a08 generates a melody ROM/option document data (.mdc) and a melody ROM/option HEX data (.msa) from a melody data (.mdt).

Example: mla63a08 c3a08xxx.mdt ↵

Input file: c3a08xxx.mdt Melody data  
Output files: c3a08xxx.mdc Melody ROM/option document data  
c3a08xxx.msa Melody ROM/option HEX file

### (3) Message displayed

Example: when the option is not specified

```
A>mla63a08 c3a08xxx.mdt ↵
E0C63A08 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 fog63a08 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 mla63a08 starts with the -h option, only the start-up message is displayed.

## 4.5 Error Messages

The following lists the error messages of the mla63a08.

Message	Explanation
Usage: MLA63A08 [filename]	Message when the mla63a08 is started without any command line parameters.
"file name" file is not found.	The input file name is not "c3a08xxx.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:

TEMPO ♩=80

*8va*

*Fine*

*D.C.*

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

C3A08ELZ.MDT

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

```
MAIN
;adr cnt1 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





# CHAPTER 5 MASK DATA CHECKER (*mdc63a08*)

## 5.1 Outline of *mdc63a08*

The mask data checker *mdc63a08* is a software tool that checks the format of the input files, code ROM files (*c3a08xxx.hsa*, *c3a08xxx.lsa*), data ROM file (*c3a08xxx.csa*) generated by the *hex63a08*, the function option document file (*c3a08xxx.fdc*) generated by the *fog63a08* and the melody ROM/option document file (*c3a08xxx.mdc*) generated by the *m1a63a08*, and generates a data file (*c3a08xxx.pan*) for generating mask patterns. Submit the file generated through this software tool to Seiko Epson. Moreover, the *mdc63a08* has a function to restore the generated data file (*c3a080a0.pan*) to the original file format.

## 5.2 Execution Flow and Input/Output Files

Figure 5.2.1 shows the *mdc63a08* execution flow.

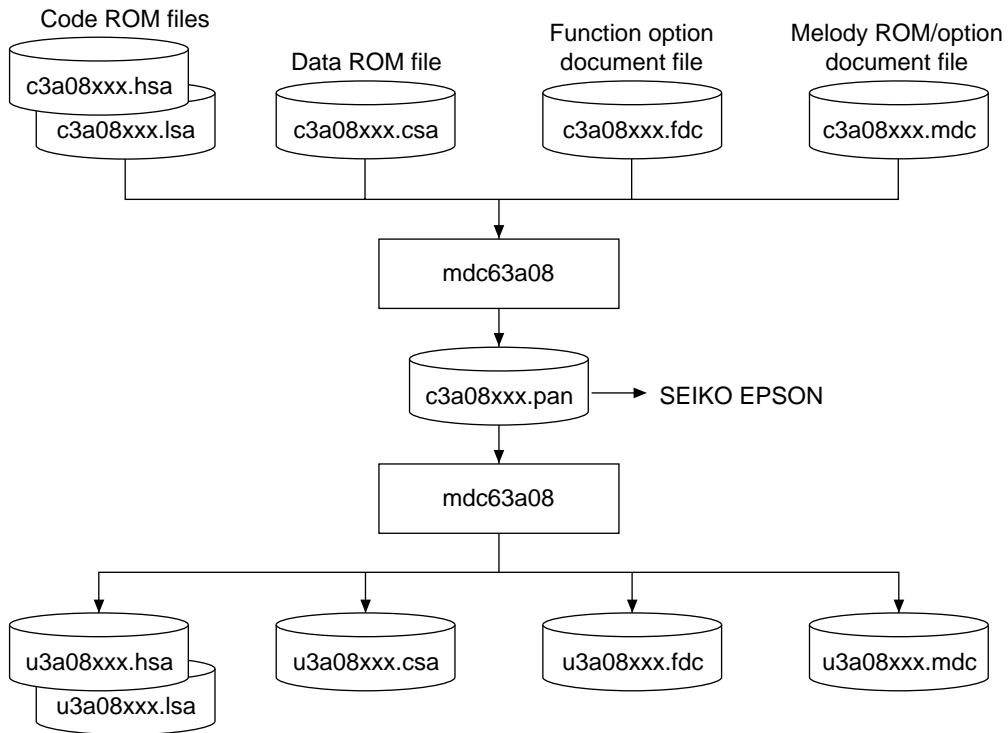


Fig. 5.2.1 *mdc63a08* execution flow

**(1) Preparation of code ROM files (c3a08xxx.hsa, c3a08xxx.lsa) and data ROM file (c3a08xxx.csa)**

Prepare the code ROM and data ROM HEX files output from the HEX data converter (hex63a08).

**(2) Preparation of function option data file (c3a08xxx.fdc)**

Prepare the function option document file output from the function option generator (fog63a08).

**(3) Preparation of melody ROM/option file (c3a08xxx.mdc)**

Prepare the melody ROM/option document file output from the melody assembler (mla63a08).

**(4) Packing of data**

Using the mask data checker (mdc63a08), compile the code/ data ROM files and function option document file in one data file for masking (c3a08xxx.pan). This packing file should be sent to Seiko Epson.

**(5) Unpacking of data**

The data file for masking (c3a08xxx.pan) generated by packing process can be restored to the original file using the mask data checker (mdc63a08).

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

## **5.3 Operation Procedure**

---

### **5.3.1 Copying each data files**

When submitting data to Seiko Epson, copy on the work disk the data generated from the HEX converter (hex63a08), the function option generator (fog63a08) and the melody assembler (mla63a08).

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:                  | c3a08xxx.hsa<br>c3a08xxx.lsa |
| 2) Data ROM file:                   | c3a08xxx.csa                 |
| 3) Function option document file:   | c3a08xxx.fdc                 |
| 4) Melody ROM/option document file: | c3a08xxx.mdc                 |

### **5.3.2 Starting procedure**

**(1) Starting command**

To start mdc63a08, enter the command as following format at the DOS command level (state in which a prompt such as A> is displayed).

```
mdc63a08 {-p | -u} <file name> 
```

indicates the Return key.

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

**mdc63a08**

**(2) Option**

The options below have been set for the start-up command of the mdc63a08.

**-p**

Specification of packing. When specifying this option, **an output file name must also be specified**. In this case, the code/ data ROM files (~.hsa, ~.lsa, ~.csa), function option document file (~.fdc) and melody ROM/option document file (~.mdc) 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: mdc63a08 -p c3a080a0.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: mdc63a08 -u c3a080a0.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 mdc63a08 starts up, the following message is displayed.

Example: When option has not been specified.

```

E0C63A08 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 mdc63a08, 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

### 5.3.3 Packing of data

When generating data for submission to Seiko Epson, select packing option at the time of start-up of the mdc63a08 (see "5.3.2 Starting procedure").

#### (1) Input file name

When the operation menu item 1, "Pack", is selected after starting up the mdc63a08 in default (without option specification), the mdc63a08 prompts to enter **a file name to be generated**.

Moreover, when the -p option has been specified at the mdc63a08 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: C3A08xxx.HSA
                 C3A08xxx.LSA
                 C3A08xxx.CSA
                 C3A08xxx.FDC
                 C3A08xxx.MDC
Output file is : C3A08xxx.PAn

Please input pack file name(C3A08xxx.PAn) ? c3a080a0.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 "c3a08xxx.pa0" has been submitted, the pack file name should be entered as "c3a08xxx.pa1".

#### (2) Packing process

Access to the input files when packing data is done only for code ROM files (~.hsa, ~.lsa), data ROM file (.csa), function option document file (.fdc) and melody ROM/option document file (~.mdc) 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: C3A080A0.HSA
                 C3A080A0.LSA
                 C3A080A0.CSA
                 C3A080A0.FDC
                 C3A080A0.MDC
Output file is : C3A080A0.PA0
```

**mdc63a08**

**5.3.4 Unpacking data**

When restoring the packed data to original file format, select unpacking option at the time of start-up of the mdc63a08 (see "5.3.2 Starting procedure").

**(1) Input file name**

When the operation menu item 2, "Unpack", is selected after starting up the mdc63a08 in default (without option specification), the mdc63a08 prompts to enter **a file name to be unpacked**.

When the -u option has been specified at mdc63a08 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 : C3A08xxx.PAn
Output files are: U3A08xxx.HSA
                  U3A08xxx.LSA
                  U3A08xxx.CSA
                  U3A08xxx.FDC
                  U3A08xxx.MDC

Please input pack file name(C3A08xxx.PAn) ? c3a080a0.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 mdc63a08 finds the specified file from the current directory and loads it for unpacking.

```

Input file is : C3A080A0.PA0
Output files are: U3A080A0.HSA
                  U3A080A0.LSA
                  U3A080A0.CSA
                  U3A080A0.FDC
                  U3A080A0.MDC

```

If there is no problem in the entering of the file name and the input file, the mdc63a08 unpacks the file to restore it to the original format files.

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

**5.3.5 End procedure**

When a series of operations is completed, the mdc63a08 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 (C3a080K0) error.
A>

```

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



## 5.4 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 mdc63a08 error message lists are indicated below.

### 5.4.1 Start-up error

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

### 5.4.2 ROM data error

When an error message as shown below appears, try to execute the mdc63a08 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)

### 5.4.3 Function option data error

When an error message as shown below appears, try to execute the mdc63a08 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)

### 5.4.4 File access error

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

## 5.5 Packed File

### 5.5.1 Configuration of packed file

The packed file is configured according to the following format:

```

Model name          [ *
                    * E0C63A08 MASK DATA VER x.xx
                    *
Code ROM start mark - \PROM
Master slice model name - E0C63A08xxx PROGRAM ROM
                    S224000000.....
                    :           :           :           :
Code ROM            S804000000FB
                    S224000000.....
                    :           :           :           :
                    S804000000FB
End mark           - \END
Data ROM start mark - \CHROM
Master slice model name - E0C63A08xxx CHARACTER ROM
Data ROM           [ S224000000.....
                    :           :           :           :
                    S804000000FB
End mark           - \END
Function option start mark - \FOPTION
Function option     [ * E0C63A08 FUNCTION OPTION DOCUMENT V x.xx
                    *
                    * FILE NAME      C3A08xxx.FDC
                    * USER'S NAME    SEIKO EPSON
                    * INPUT DATE      '97/01/30
                    * COMMENT         FOR SAMPLE
                    * *** OPTION NO.1 ***
                    * --- OSC3 SYSTEM CLOCK ---
                    *   USE CR  ----- SELECTED
                    OPT0101 01
                    :           :           :           :
                    OPT1001 01
                    *EOF
End mark           - \END
Melody address ROM start mark - \AROM
Master slice model name - E0C63A08xxx MELODY ADDRESS ROM
Melody address ROM  [ S214000000.....
                    S804000000FB
End mark           - \END
Melody tempo ROM start mark - \TROM
Master slice model name - E0C63A08xxx MELODY TEMPO ROM
Melody tempo ROM   [ S214000000.....
                    S214000010.....
                    S804000000FB
End mark           - \END
Melody scale ROM start mark - \SROM
Master slice model name - E0C63A08xxx MELODY SCALE ROM
Melody scale ROM   [ S214000000.....
                    S804000000FB
End mark           - \END
Melody contol ROM start mark - \CROM
Master slice model name - E0C63A08xxx MELODY CONTROL ROM
Melody contol ROM  [ S214000000.....
                    :           :           :           :
                    S804000000FB
                    S214000000.....
                    :           :           :           :
                    S804000000FB
End mark           - \END
    
```

```

Melody main ROM start mark - \MROM
Master slice model name - E0C63A08xxx MELODY MAIN ROM
Melody main ROM
End mark - \END
Melody option start mark - \MOPTION
Melody option
End mark - \END

```

```

S214000000.....
:           :           :           :
S804000000FB
S214000000.....
:           :           :           :
S804000000FB

```

```

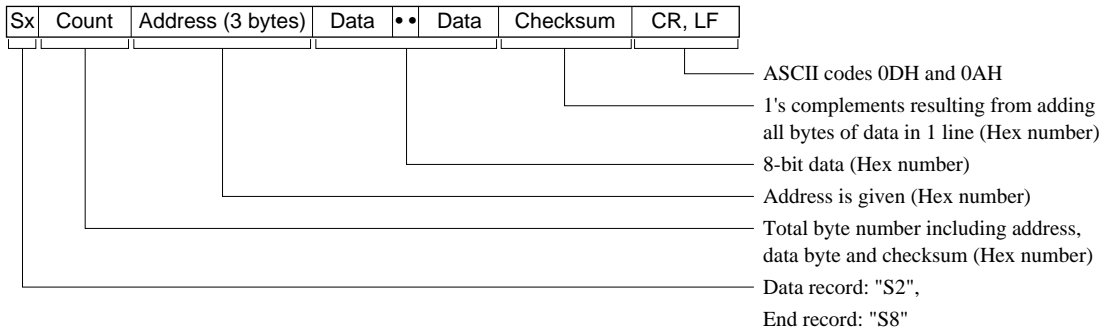
* E0C63A08 MELODY OPTION DOCUMENT V x.xx
*
* FILE NAME      C3A08xxx.MDC
* USER'S NAME   SEIKO EPSON
* INPUT DATE    '97/01/30
* COMMENT
*
* *** OPTION NO.11 ***
* --- CHANGE MELODY IN OPERATION MODE ---
*   CHANGE ----- SELECTED
OPT1101 01
*
* *** OPTION NO.12 ***
* --- POLARITY FOR PLAY OUTPUT ---
*   POSITIVE ----- SELECTED
OPT1201 01
*
*EOF

```

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

### 5.5.2 ROM data format

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



# EPSON International Sales Operations

---

## AMERICA

---

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---

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---

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Caohejing, Shanghai, CHINA  
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Telex: 65542 EPSCO HX

#### - TAIWAN, R.O.C. -

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Taipei, TAIWAN, R.O.C.  
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Telex: 24444 EPSONTB

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