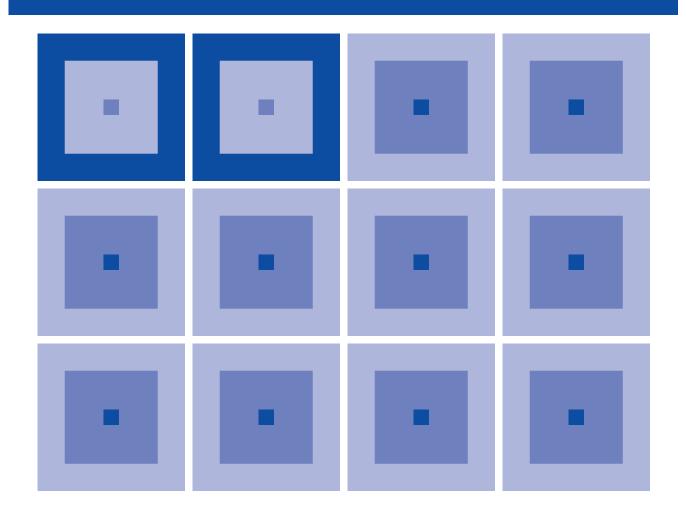


CMOS 4-BIT SINGLE CHIP MICROCOMPUTER S1C60/62 Family Development Tool Manual



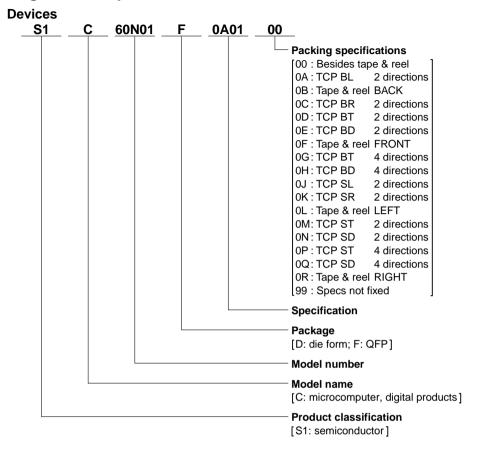
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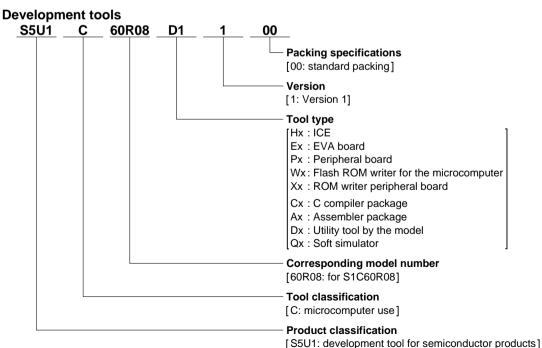
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PREFACE

This manual describes how to use the Windows version development tools for the S1C60 Family and S1C62 Family of CMOS 4-bit, single-chip microcomputers.

This manual is applicable to all types of microcomputers in the family for which the development tools are available including explanations for tools not yet prepared.

For details about option lists inherent in each type of microcomputer and other information, refer to the Technical Manual.

CAUTION

We are not responsible for any problems involving products you have manufactured using packed data created without the use of the tool contained in this package, or using packed data edited after being created using the tool contained in this package.

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1 Outline of the Package

1.1 Overview

The S1C60xxx/62xxx Development Tool for Windows is a development tool package for each type of microcomputer in the S1C60 Family and S1C62 Family of CMOS 4-bit, single-chip microcomputers. This package includes the tools to create mask option and mask data files, as well as files that contain descriptions of setup information for each type of microcomputer. The tools 1 to 5 below are Windows GUI applications that run under Windows 95, Windows 98, Windows NT 4.0 versions.

1. Function option generator <winfog.exe>

This tool creates a function option ROM HEX file to install to the evaluation board after selecting the mask options of the S1C60xxx/62xxx and the function option document file that is necessary to generate IC mask patterns. You can create function option data by selecting the appropriate item using the check boxes.

2. Segment option generator <winsog.exe>

This tool creates a segment option ROM HEX file to install to the evaluation board after selecting the segment options of the S1C60xxx/62xxx and the segment option document file that is necessary to generate IC mask patterns. You can create segment assignment data by merely clicking on the display memory map and segment decode table shown on the window.

Note: The winsog is only included in the package for microcomputers in which segment options are set.

3. Melody assembler <winmla.exe>

This tool converts the melody data created using an editor into the melody ROM and melody option data for the S1C60xxx/62xxx melody generator. The winmla is used only for the model with a melody output function.

Note: The winmla is only included in the package for microcomputers with a melody output function.

4. Mask data checker <winmdc.exe>

This tool checks the data in development-completed program ROM files and option document files to create the mask data file that will be presented to Seiko Epson.

5. EPROM data generator <winedg.exe>

This tool merges two program-ROM (high-order/low-order) files into one file for writing to an external EPROM.

Note: The winedg is only included in the package for microcomputers that support an external EPROM.

6. Device information definition file <s1c60xxx.ini/s1c62xxx.ini>

This file is used to set information, such as the configuration of options, on each type of microcomputer for the tools of 1 to 4 described above. This file must be available before each tool can be executed.

7. Parameter file <ics60xxxp.par/ics62xxxp.par>

This file is used to establish correspondence between the S1C60/62 Family common development tools and each type of microcomputer. This file is needed when executing the debugger, linker or other tools included in the S1C60/62 Family assembler package. Place this file in the directory where the S1C60/62 Family assembler package is installed.

8. Function option and LCD segment option setup HEX sample files <c60xxxf.hex/c62xxxf.hex, c60xxxs.hex/c62xxxs.hex>

These are sample HEX files necessary to set function options and LCD segment options for each type of microcomputer in the ICE or evaluation board. Although you use HEX files created by winfog and winsog during actual software development process, you can use this data to verify the operation of the ICE or evaluation board. The sample HEX file for LCD segment option setup is not included for microcomputers that have had no LCD segment options set.

- Notes: Although S1C60xxx/62xxx Development Tool for Windows is provided individually for each type of microcomputer in the S1C60/62 Family, there is no difference between each tool between the different types of microcomputers. Therefore, the explanations in this manual are for all types of microcomputers and uses "S1C60xxx/62xxx" as the representative name. The sample screens and sample files assume an S1C60xxx model. The contents of the sample screens vary according to the type of microcomputer.
 - For software development, in addition to this package, you also need to have the S1C60/62
 Family assembler package, which is compatible with all microcomputers in the S1C60/62 Family.

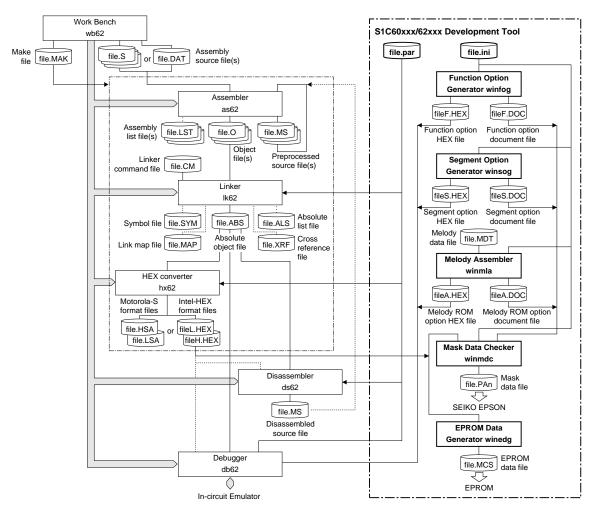


Fig. 1.1.1 Software Development Flow

1.2 Package Components

The following lists the components of the package.

- 2. S1C60/62 Family Development Tool Manual 1 pc. in Japanese and English

2 Installation

This chapter describes the operating environment required for the tools included in the package and how to install them.

2.1 Operating Environment

For each tool to be used, the following operating environment is required:

Personal computer

IBM PC/AT or fully compatibles that can run the system software listed below. A personal computer using Pentium 90 MHz or greater as the CPU and incorporating 32 MB or more of RAM is recommended.

Display

A 800×600 dots display unit or higher is required.

System software

Each tool is designed to run under Microsoft® Windows®95, Windows®98, Windows NT® 4.0 versions (in English or Japanese).

Other

The S1C60/62 Family assembler package is also required for software development.

2.2 Installation Method

To install the development tools, use the installer (Setup.exe) on the floppy disk included with the package.

To install the tools



Setup.exe

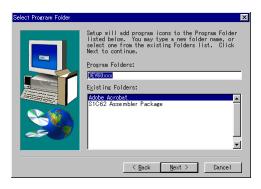


- (1) Start Windows95/98 or Windows NT 4.0. If the OS is already active, close active programs.
- (2) Insert Disk1 into the drive.
- (3) Double-click Setup.exe.

Welcome

(4) Click on the [Next>] button to proceed.





Choose Destination Location

A dialog box for specifying the directory in which to install the tools appears.

(5) If you do not wish to change the default settings, simply click the [Next>] button to execute installation.

To install in another directory

Click [Browse...] to bring up the [Choose Folder] dialog box. From this dialog box, enter the path or select the directory in which to install the tools. Click the [OK] button to finish directory selection and then click the [Next>] button.

Select Program Folder

(6) Enter the desired program folder name and click the [Next>] button. To use the default folder name, simply click the [Next>] button.

The installer will start installing the tools.





Setup Complete Setup has finished installing Development Tools on your computer.

Click Finish to complete Setup.

Setup Needs The Next Disk

When the installer finishes copying Disk1, it displays a message prompting you to change disks.

(7) After removing Disk1, insert Disk2 into the drive and click [OK].

Setup Complete

(8) Click [Finish] to terminate the installer.

Program menu

The folder of tools is registered to the program menu by the installer.

Finish

To end installation

All dialog boxes that appear during installation have a [Cancel] button. To prematurely terminate installation, click [Cancel] in the dialog box when it is displayed.

To uninstall

To uninstall the installed tools, use "Add/Remove Programs" on the Control Panel.

3 Function Option Generator <winfog>

3.1 Outline of winfog

The S1C60xxx/62xxx chip allows several hardware specifications such as I/O port functions to be selected as mask options. This helps you to configure the hardware of your product by changing the S1C60xxx/62xxx chip's mask patterns according to its specifications.

The Function Option Generator <winfog> is the software tool for creating the files necessary to generate mask patterns. Its graphical user interface (GUI) ensures easy selection mask options. From the files created by winfog, Seiko Epson produces the mask patterns for the S1C60xxx/62xxx chip.

In addition, simultaneously with this file, winfog can create a HEX file (Intel HEX format data) for a mask option ROM that is required when debugging the program with the evaluation board. By writing this data to a ROM and installing it to the evaluation board, the evaluation board is configured with the option settings and works as the actual IC.

3.2 Input/output Files

Figure 3.2.1 shows the input/output files of winfog.

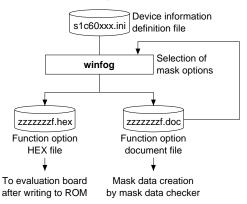


Fig. 3.2.1 Input/Output Files of winfog

Device information definition file (s1c60xxx.ini/s1c62xxx.ini)

This file contains option lists for various types of microcomputers and other information. Always be sure to use the files presented by Seiko Epson. This file is effective for only the type of microcomputer indicated by the file name. Do not modify the contents of the file or use the file in other types of microcomputers.

Function option document file (zzzzzzf.doc)

This is a text format file in which the contents of selected mask options are stored. You can read this file into winfog and correct the already selected option settings. This file is packed along with completed other program/data files into a single file by the mask data checker <winmdc>, which we would like to have presented to Seiko Epson as the mask data file. From this file, Seiko Epson will create the mask patterns for the IC.

Function option HEX file (zzzzzzf.hex)

This is the Intel HEX format file necessary to set the selected mask options in the evaluation board. When you debug programs with the evaluation board, create a ROM with this file and install the ROM to the function option ROM socket on the evaluation board, or download this file into the evaluation board through the ICE using a debugger <db62> command.

- *1 The "xxx" in the file name denotes the model name of a microcomputer. For the "zzzzzzz" part, any given file name can be specified.
- *2 For details on how to download mask options, refer to the "S5U1C62000A Manual".

3.3 Using winfog

3.3.1 Starting Up

Startup from Explorer



Double-click on the winfog.exe icon or select winfog from the start menu.

If the device information definition file (s1c60xxx.ini/s1c62xxx.ini) was loaded into your computer during previous execution, winfog automatically reads the same file as it starts. Alternatively, drag the Device information definition file icon into the winfog, exe icon to start winfog, which will then read the Device information definition file.

Startup by command input

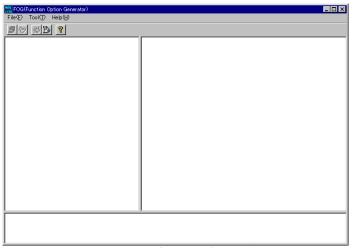
You can also start winfog from the MS-DOS prompt by entering the command shown below.

>winfog [s1c60xxx.ini/s1c62xxx.ini] 🗔

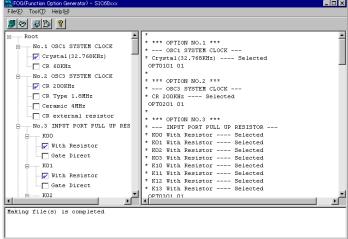
denotes entering the return key.

You can specify the device information definition file (s1c60xxx.ini/s1c62xxx.ini) as a command option. (You can also specify a path.) When you specify the device information definition file here, winfog reads it as it starts. This specification can be omitted.

When winfog starts, it displays the [FOG] window. The following diagrams show a [FOG] window when the device information definition file has been loaded and when it has not.

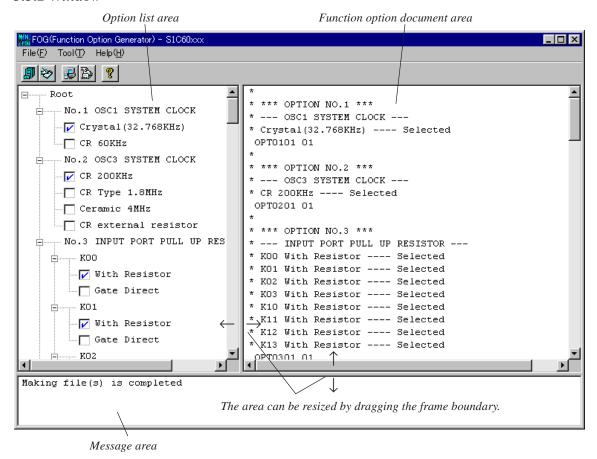


[FOG] Window (initial screen)



[FOG] Window (after reading the device information definition file)

3.3.2 Window



- * The microcomputer model name on the title bar is the file name (not including the path and extension) of the device information definition file that has been read.
- * The option list and the function option document vary with each type of microcomputer.

Fig. 3.3.2.1 Window Configuration

The [FOG] window is divided into three areas as shown above.

Option list area

Lists mask options set in the device information definition file (s1c60xxx.ini/s1c62xxx.ini). Use the check boxes in this area to select each option. A selected option has its check box marked by \checkmark .

Function option document area

Displays the contents of selected options in the function option document format. The contents displayed in this area are output to the function option document file. When you change any selected item in the option list area, the display in this area is immediately updated.

Message area

When you create a file by selecting [Generate] from the [Tool] menu or clicking the [Generate] button, this area displays a message showing the result of the selected operation.

3.3.3 Menus and Toolbar Buttons

This section explains each menu item and toolbar button.

[File] menu



Open

Opens a function option document file. Use this menu command when correcting an existing file. The [Open] button has the same function.

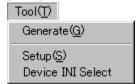


[Open] button

End

Terminates winfog.

[Tool] menu



Generate

Creates a file according to the selected contents of the option list. The [Generate] button has the same function.



[Generate] button

Setup

Sets the date of creation, output file name and a comment included in the function option document file. The [Setup] button has the same function.



[Setup] button

Device INI Select

Loads the device information definition file <s1c60xxx.ini/s1c62xxx.ini>. The [Device INI Select] button has the same function. This file must be loaded first before performing any operation with winfog.



[Device INI Select] button

[Help] menu



Version

Displays the version of winfog. The [Help] button has the same function.



[Help] button

The dialog box shown below appears. Click [OK] to close this dialog box.



3.3.4 Operation Procedure

The following shows the basic operation procedure.

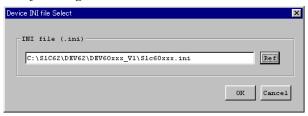
(1) Loading the device information definition file

First, select a device information definition file <s1c60xxx.ini/s1c62xxx.ini> and load it. Select [Device INI Select] from the [Tool] menu or click the [Device INI Select] button.



[Device INI Select] button

The dialog box shown below appears. Enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the option list and the function option document, which have both been set by default, are displayed in each area.

To stop loading the file, click [Cancel].

Once a device information definition file is selected, the same file is automatically loaded the next time you start winfog.

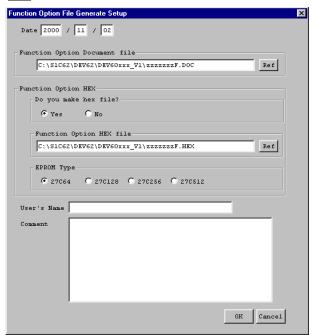
Note: When you load a device information definition file after setting up options, all settings are reset to the default state.

(2) Setup

Select [Setup] from the [Tool] menu or click the [Setup] button to bring up the [Setup] dialog box. From this dialog box, select items and enter data.



[Setup] button



Displays the current date. Change it as necessary.

Function Option Document file

Specify the function option document file name you want to create. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

Function Option HEX Do you make hex file?

Select whether to create a function option HEX file. You need to create one when you use the evaluation board to debug programs.

Function Option HEX file

When you create a function option HEX file, specify its file name here. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

EPROM Type

Select a ROM type to be used when installing the ROM in which the generated HEX data is written to the evaluation board. The data start address is decided according to the selected ROM type as shown below.

27C64 = 0000H 27C128 = 0000H 27C256 = 4000H 27C512 = C000H

When downloading the file via the ICE using the debugger, select 27C64 (default).

User's Name

Enter your company name. Up to 40 characters can be entered. You can use English letters, numbers, symbols, and spaces. The content entered here is recorded in the USER'S NAME field of the function option document file.

Comment

Enter a comment. Up to 50 characters can be entered in one line. You can enter up to 10 lines. You can use English letters, numbers, symbols, and spaces. Use the [Enter] key to create a new line. All comments should include the following information:

- Place of business, your department or section
- · Address, telephone number, and facsimile number
- Other: Technical information, etc.

The content entered here is recorded in the COMMENT field of the function option document file. When you have finished entering the above necessary items, click [OK]. The setup contents are saved, and the dialog box is closed. The setup contents take effect immediately. If you click [Cancel], current settings will not be changed and the dialog box is closed.

Notes: • File name specification is subject to the following limitations:

- 1. The number of characters that can be used to specify a file name including the path is 2,048.
- 2. The file name itself (not including the extension) can be up to 15 characters, and the extension up to three characters.
- 3. The file name cannot begin with a hyphen (-), nor can the following symbols be used as part of directory names (folder names), file names, and extensions: /:,;*?"<>|
- The symbols shown below cannot be used in the User's Name and Comment: \$\|`

(3) Selecting options

Select necessary options by clicking the corresponding check boxes in the option list. When you change any selection item in the option list area, the display in the function option document area is updated. Note that when you have loaded the device information definition file, the option list is placed in its default selection state.

For details about option specifications, refer to the Technical Manual available for each type of microcomputer.

(4) Creating files

After selecting options, select [Generate] from the [Tool] menu or click the [Generate] button to create the files.



[Generate] button

The function option document file you specified from the [Setup] dialog box and the function option HEX file (if specified) are created. When winfog has finished creating the files normally, it displays the message "Making file(s) is completed" in the message area. If an error occurs, an error message is displayed.

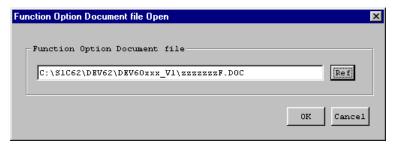
(5) Correcting an existing document file

You can read an existing function option document file into winfog and correct it as necessary. To read a file, select [Open] from the [File] menu or click the [Open] button.



[Open] button

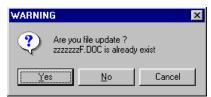
The dialog box shown below appears, so enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the option list and the function option document areas are updated according to the contents of the file. To stop loading the file, click [Cancel].

Perform steps (3) and (4) to update the file.

If you select [Generate] without changing the file name, the message shown below is displayed asking you whether or not to overwrite the file. Click [Yes] to overwrite or [No] or [Cancel] to stop overwriting. Use the [Setup] dialog box to change the file name.



Note: The function option document file can be read only when the device information definition file has been loaded.

(6) Quitting

To terminate winfog, select [End] from the [File] menu.

3.4 Error Messages

The error messages of winfog are listed below. The "Dialog" in the Display column means that messages are displayed in the dialog box, and "Message" means that messages are displayed in the [FOG] window message area.

Table 3.4.1 List of winfog Error Messages

Message	Description	Display	
File name error	Number of characters in the file name or extension exceeds the limit.	Dialog	
Illegal character	Prohibited characters have been entered.	Dialog	
Please input file name	File name has not been entered.	Dialog	
Can't open File: xxxx	File (xxxx) cannot be opened.	Dialog	
INI file is not found	Specified device information definition file (.ini) does not exist.	Dialog	
INI file does not include FOG information	Specified device information definition file (.ini) does not contain	Dialog	
	function option information.		
Function Option document file is not found	Specified function option document file does not exist.	Dialog	
Function Option document file does not	Contents of the specified function option document file do not match	Dialog	
match INI file	device information definition file (.ini).		
A lot of parameter	Too many command line parameters are specified.	Dialog	
Making file(s) is completed	Finished creating the file, but the created file (xxxx) does not contain	Message	
[xxxx is no data exist]	any data.		
Can't open File: xxxx	File (xxxx) cannot be opened when executing Generate.	Message	
Making file(s) is not completed			
Can't write File: xxxx	File (xxxx) cannot be written when executing Generate.	Message	
Making file(s) is not completed			

Table 3.4.2 winfog Warning Messages

Message	Description	Display
Are you file update?	Overwrite confirmation message	Dialog
xxxx is already exist	(Specified file already exists.)	

3.5 Example Output Files

Note: Option and other configurations vary with each type of microcomputer.

Example of a function option document file

```
* S1C60xxx FUNCTION OPTION DOCUMENT Vx.xx
                                                 \leftarrow Version
* FILE NAME
               zzzzzzF.DOC
                                                 ← File name (specified by [Setup])
* USER'S NAME SEIKO EPSON CORPORATION
                                                 ← User name (specified by [Setup])
               yyyy/mm/dd
* INPUT DATE
                                                 ← Date of creation (specified by [Setup])
               SAMPLE DATA
                                                 ← Comment (specified by [Setup])
* *** OPTION NO.1 ***
                                                 ← Option number
* --- OSC1 SYSTEM CLOCK ---
                                                 ← Option name
* Crystal(32.768KHz) ---- Selected
                                                 ← Selected specification
OPT0101 01
                                                 \leftarrow Mask data
* *** OPTION NO.2 ***
* --- OSC3 SYSTEM CLOCK ---
* CR 200KHz ---- 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
OPT0401 01
OPT0402 01
OPT0403 01
OPT0404 01
* *** OPTION NO.8 ***
* --- SOUND GENERATOR POLARITY ---
* NEGATIVE ---- Selected
OPT0801 01
                                                 ← End mark
```

Example of a function option HEX file (Intel HEX format)

For details about the Intel HEX format, refer to the Appendix.

4 Segment Option Generator <winsog>

4.1 Outline of winsog

Some types of microcomputers in the S1C60/62 Family allow the LCD output pin output specifications and LCD output pin assignments to be set with hardware options, so that mask patterns for the IC are generated according to option settings. The Segment Option Generator <winsog> is the software tool for creating the files required to generate mask patterns. Its graphical user interface (GUI) ensures simple mask option setting.

In addition, simultaneously with this file, winsog can create a HEX file (Intel HEX format data) for a mask option ROM that is required when debugging the program with the evaluation board. By writing this data to a ROM and installing it to the evaluation board, the Evaluation board is configured with the option settings and works as the actual IC.

Note: The Segment Option Generator <winsog> is provided for only certain types of microcomputers that have set segment options.

4.2 Input/output Files

Figure 4.2.1 shows the input/output files of winsog.

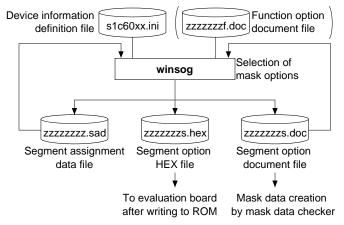


Fig. 4.2.1 Input/Output Files of winsog

Device information definition file (s1c60xxx.ini/s1c62xxx.ini)

This file contains option lists for various types of microcomputers and other information. Always be sure to use the files presented by Seiko Epson. This file is effective for only the type of microcomputer indicated by the file name. Do not modify the contents of the file or use the file in other types of microcomputers.

Function option document file (zzzzzzf.doc)

This is the text format file generated by winfog and contains the selected mask options. This file is required only when the segment option setup condition depends on the mask option selected with winfog.

Segment option document file (zzzzzzs.doc)

This is a text format file in which setup contents of segment options are stored. You can read this file into winsog and correct the option settings. This file is packed along with completed other program/data files into a single file by the mask data checker <winmdc>, which will be presented to Seiko Epson as the mask data file. From this file, Seiko Epson will create the mask patterns for the IC.

Segment option HEX file (zzzzzzs.hex)

This is the Intel HEX format file necessary to set the selected mask options in the evaluation board. When you debug programs with the evaluation board, create a ROM with this file and install the ROM to the segment option ROM socket on the evaluation board, or download this file into the evaluation board through the ICE using a debugger <db62> command.

Segment assignment data file (zzzzzzzzsad)

This is a text format file in which segment assignment data is stored. Create this file when terminating winsog before finishing segment assignment. You can continue option setting next time by loading this file to winsog.

- *1 The "xxx" in the file name denotes the model name of a microcomputer. For the "zzzzzzz" part, any given file name can be specified.
- *2 For details on how to download mask options, refer to the "S5U1C62000A Manual".

4.3 Using winsog

4.3.1 Starting Up

Startup from Explorer



 $Double\text{-}click\ on\ the\ winsog.exe\ icon\ or\ select\ winsog\ from\ the\ start\ menu.$

If the device information definition file (s1c60xxx.ini/s1c62xxx.ini) was loaded into your computer during previous execution, winsog automatically reads the same file as it starts. Alternatively, drag the device information definition file icon into the winsog.exe icon to start winsog, which will then read the device information definition file. If a function option document file is required for setting the segment option, a dialog box will appear to allow file selection. In this case enter the file name including the path in the text box or choose the file from the dialog box that appears by clicking on the [Ref] button.

Startup by command input

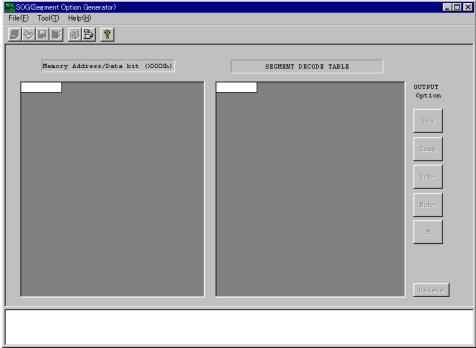
You can also start winsog from the MS-DOS prompt by entering the command shown below.

>winsog [s1c60xxx.ini/s1c62xxx.ini] 🗓

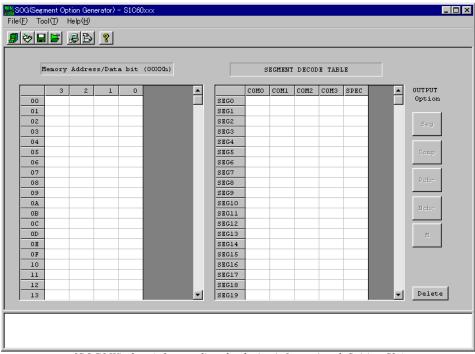
denotes entering the return key.

You can specify the device information definition file (s1c60xxx.ini/s1c62xxx.ini) as a command option. (You can also specify a path.) When you specify the device information definition file here, winsog reads it as it starts. If a function option document file is required for setting the segment option, the file (zzzzzzzf.doc) must be prepared in the directory in which s1c60xxx.ini/s1c62xxx.ini and winsog.exe exist before entering the command. When the command is entered, a dialog box will appear to allow file selection. Enter the file name including the path in the text box or choose the file from the dialog box that appears by clicking on the [Ref] button. This specification can be omitted.

When winsog starts, it displays the [SOG] window. The following diagrams show a [SOG] window when the device information definition file has been loaded and when it has not.

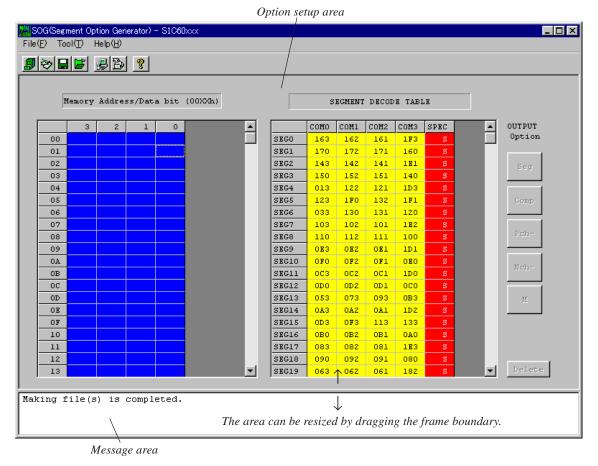


[SOG] Window (initial screen)



[SOG] Window (after reading the device information definition file)

4.3.2 Window



- * The microcomputer model name on the title bar is the file name (not including the path and extension) of the device information definition file that has been read.
- * The display memory addresses and segment configuration vary with each type of microcomputer.

Fig. 4.3.2.1 Window Configuration

The [SOG] window is divided into two areas as shown above.

Option setup area

Comprised of a display memory map, a segment decode table, and buttons to select pin specifications. By clicking on cells in the display memory map and segment decode table, you can assign display memory addresses and bits.

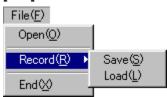
Message area

When you create a file by selecting [Generate] from the [Tool] menu or clicking the [Generate] button, this area displays a message showing the result of the selected operation.

4.3.3 Menus and Toolbar Buttons

This section explains each menu item and toolbar button.

[File] menu



Open

Opens a segment option document file. Use this menu command when correcting an existing file. The [Open] button has the same function.



[Open] button

Record - Save

Saves the current option settings to a file (segment assignment data file). The [Save] button has the same function.



[Save] button

Record - Load

Loads a segment assignment data file. The [Load] button has the same function.



[Load] button

End

Terminates winsog.

[Tool] menu



Generate

Creates a file according to the contents of segment options set. The [Generate] button has the same function.



[Generate] button

Setup

Sets the date of creation or output file name or a comment included in the segment option document file. The [Setup] button has the same function.



[Setup] button

Device INI Select

Loads the device information definition file <s1c60xxx.ini/s1c62xxx.ini>. The [Device INI Select] button has the same function. This file must be loaded first before performing any operation with winsog.



[Device INI Select] button

[Help] menu



Version

Displays the version of winsog. The [Help] button has the same function.



[Help] button

The dialog box shown below appears. Click [OK] to close this dialog box.

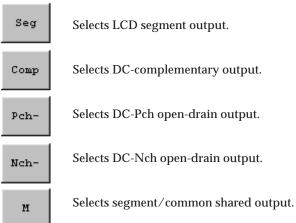


4.3.4 Option Selection Buttons

The following buttons are available in the option setup area.

OUTPUT Option buttons

These buttons select SEG pin output modes. These buttons are enabled when you click a SPEC cell in [SEGMENT DECODE TABLE].



[Delete] button

Delete Clears selected segment assignments. The [Delete] key has the same function.

4.3.5 Operation Procedure

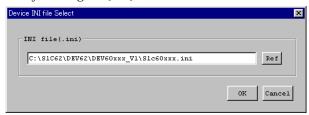
The following shows the basic operation procedure.

(1) Loading the device information definition file

First, select a device information definition file <s1c60xxx.ini/s1c62xxx.ini> and load it. Select [Device INI Select] from the [Tool] menu or click the [Device INI Select] button.



The dialog box shown below appears. Enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the set-up items in winsog are initialized with the loaded device information.

To stop loading the file, click [Cancel].

Once a device information definition file is selected, the same file is automatically loaded the next time you start winfog.

If a function option document file is required for setting the segment option, the dialog box shown below will appear to allow file selection. In this case enter the file name including the path in the text box or choose the file from the dialog box that appears by clicking on the [Ref] button.

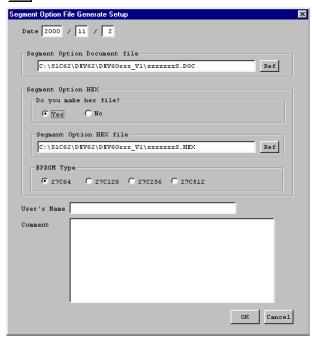


Note: When you load a device information definition file after setting up options, all settings are reset to the default state.

(2) Setup

Select [Setup] from the [Tool] menu or click the [Setup] button to bring up the [Setup] dialog box. From this dialog box, select items and enter data.





Date

Displays the current date. Change it as necessary.

Segment Option Document file

Specify the segment option document file name you want to create. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

Segment Option HEX Do you make hex file?

Select whether to create a segment option HEX file. You need to create one when you use the evaluation board to debug programs.

Segment Options HEX file

When you create a segment option HEX file, specify its file name here. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

EPROM Type

Select a ROM type to be used when installing the ROM in which the generated HEX data is written to the evaluation board. The data start address is decided according to the selected ROM type as shown below.

27C64 = 0000H 27C128 = 0000H 27C256 = 4000H 27C512 = C000H

When downloading the file via the ICE using the debugger, select 27C64 (default).

User's Name

Enter your company name. Up to 40 characters can be entered. You can use English letters, numbers, symbols, and spaces. The content entered here is recorded in the USER'S NAME field of the segment option document file.

Comment

Enter a comment. Up to 50 characters can be entered in one line. You can enter up to 10 lines. You can use English letters, numbers, symbols, and spaces. Use the [Enter] key to create a new line. All comments should include the following information:

- · Place of business, your department or section
- Address, telephone number, and facsimile number
- Other: Technical information, etc.

The content entered here is recorded in the COMMENT field of the segment option document file. When you have finished entering the above necessary items, click [OK]. The setup contents are saved, and the dialog box is closed. The setup contents take effect immediately. If you click [Cancel], current settings will not be changed and the dialog box is closed.

Notes: • File name specification is subject to the following limitations:

- 1. The number of characters that can be used to specify a file name including the path is 2,048.
- 2. The file name itself (not including the extension) can be up to 15 characters, and the extension up to three characters.
- 3. The file name cannot begin with a hyphen (-), nor can the following symbols be used as part of directory names (folder names), file names, and extensions: /:,;*?"<> |
- The symbols shown below cannot be used in the User's Name and Comment: \$ \ | `

(3) Setting segment outputs

The LCD drive circuit of a S1C60/62 Family chip that has had segment options set normally allows selecting the segment output and DC output for every two pins (in certain types of microcomputers, individually for each pin). Segment output should be specified when using the pins for driving an LCD panel.

Segment output ports have a built-in segment decoder allowing any address and data bit in the display memory area to be assigned to any segment. When the segment memory bit is set to 1, the assigned segment lights up; when the bit is set to 0, the segment dims. Segments and display memory bits correspond individually, so that you cannot assign one display memory bit to multiple segments. Therefore, all segments must be assigned different addresses and data bits.

For details about the display memory map and segment assignment, refer to the Technical Manual for each type of microcomputer.

In the explanation below, the chip is assumed to have four common pins, COM0 to COM3. Follow the procedure below to assign segments:

From the [Memory Address/Data bit] table, select the memory address/data bit you want to
assign by clicking the appropriate cell. The cell changes color to blue.
If you select an incorrect cell, select a correct cell.
The horizontal rows of the table correspond to display memory addresses. The hexadecimal
number shown to the right of the "Memory Address/Data bit" title is the base address of display
memory, with only the lower byte of address being displayed in each row of the table. The vertical
columns of the table correspond to data bits.

2. From [SEGMENT DECODE TABLE], select the SEG pin/COM pin to which you want to assign the memory address/data bit selected in 1 by clicking the appropriate cell. A 3-digit numeric value is displayed in the cell, showing the selected address (2 high-order digits) and data bit (1 low-order digit), and the cell changes color to yellow.



If you select an incorrect cell, click the [Delete] button to clear its assignment and reselect from 1. Two or more cells selected by dragging an area can also be deleted using the [Delete] button. Before selecting a cell in [SEGMENT DECODE TABLE], always select a cell in [Memory Address/Data bit].

3. Click the SPEC cell for the segment selected in 2 and then the [Seg] button. The cell shows the letter S and changes color to red. This means that the segment has been set for a LCD segment output pin.

If your chip requires selecting segment output and DC output every two pins, the other pin that comprises a pair is set in the same way.



Repeat steps 1 to 2 for all segments used for LCD output. Specification selection in 3 may be performed later.

If any COM cell in one SEG pin is unused, leave it blank.



(4) Setting DC outputs

When using SEG pins for general-purpose DC output, assign segments according to steps 1 and 2 described in Item (3), "Setting segment outputs". However, output control works in such a way that the display memory assigned to COM0 is enabled while the display memory assigned to COM1 through COM3 are disabled. Therefore, set a memory address/data bit for only COM0 cell and leave memory address/data bits for COM1 through COM3 cells blank.

For DC output, you may select an output mode between complementary output and Nch (or Pch) open-drain output. Select your desired output in SPEC cell using the buttons listed below:

[Comp] button: Complementary output (C)

[Nch-] button: N-channel open-drain output (N)

[Pch-] button: P-channel open-drain output (P)

If your chip requires selecting an output mode every two pins, the other pin that comprises a pair is set in the same way.



(5) Setting SEG/COM shared pins

Whether the SEG/COM shared pins output segment signals or common signals is determined by selecting the function option.

When using the shared pins as SEG pins, allocate display memory addresses/bits as shown above and leave unused COM cells blank. When using the shared pins as COM pins, select segment/common shared output ([M] button) as the output specification and do not allocate memory.

Note: This setting is required only for microcomputers that have SEG/COM shared pins.

(6) Setting unused SEG pins

For SEG pins that are used for neither LCD output nor DC output, leave COM0 through COM3 cells in [SEGMENT DECODE TABLE] blank. However, SPEC cells cannot be left blank, so select segment output (S) for the corresponding SPEC cells.

Selection example: SEG6

(7) Creating files

After selecting options, select [Generate] from the [Tool] menu or click the [Generate] button to create the files.



[Generate] button

The segment option document file you specified from the [Setup] dialog box and the segment option HEX file (if specified) are created. When winsog has finished creating the files normally, it displays the message "Making file(s) is completed" in the message area. If an error occurs, an error message is displayed.

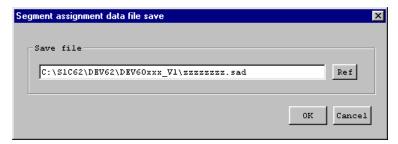
(8) Saving uncompleted segment option data

You can save the segment option settings that have not been completed as a segment assignment data file. To save data, select [Record - Save] from the [File] menu or click the [Save] button.



[Save] button

The dialog box shown below appears, so enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Clicking [OK] saves the current assignment data to the specified file. To stop saving, click [Cancel].

You can read an existing segment option document file into winsog and correct it as necessary. To load a segment assignment data file, select [Record - Load] from the [File] menu or click the [Load] button.



[Load] button

The dialog box shown below appears, so enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the option setup area is updated according to the segment assignment data saved in the file. You can continue segment assignment from the previous set state. To stop loading the file, click [Cancel].

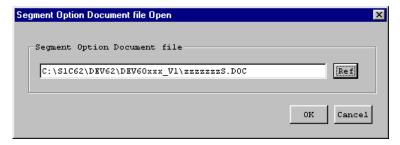
- Notes: The segment assignment data file can be read only when the device information definition file has been loaded.
 - Some models need a function option document file to be loaded at the start of winsog, and the
 contents of the file affect the segment option setup condition. Therefore, the segment assignment data file in which the settings do not match the function option cannot be read.

(9) Correcting an existing document file

You can read an existing segment option document file into winsog and correct it as necessary. To read a file, select [Open] from the [File] menu or click the [Open] button.



The dialog box shown below appears, so enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, [Memory Address/Data bit] and [SEGMENT DECODE TABLE] are updated according to the contents of the file. To stop loading the file, click [Cancel].

If you want to change an assigned address, clear its cell assignment using the [Delete] button first and then reassign a new address. If you want to change a selected output mode too, select the corresponding SPEC cell and clear its selected output mode with the [Delete] button before reselecting a new output mode. Two or more cells selected by dragging an area can also be deleted using the [Delete] button.

If you select [Generate] without changing the file name, the dialog box asking you whether to overwrite the file is displayed. Click [Yes] to overwrite or [No] or [Cancel] to stop overwriting. Use the [Setup] dialog box to change the file name.

- Notes: The segment option document file can be read only when the device information definition file has been loaded.
 - Some models need a function option document file to be loaded at the start of winsog, and the
 contents of the file affect the segment option setup condition. Therefore, the segment option
 document file in which the settings do not match the function option cannot be read.

(9) Quitting

To terminate winsog, select [End] from the [File] menu.

4.4 Error Messages

The error messages of winsog are listed below. The "Dialog" in the Display column means that messages are displayed in the dialog box, and "Message" means that messages are displayed in the [SOG] window message area.

Table 4.4.1 List of winsog Error Messages

Message	Description	Display
File name error	Number of characters in the file name or extension exceeds the limit.	Dialog
Illegal character	Prohibited characters have been entered.	Dialog
Please input file name	File name has not been entered.	Dialog
Can't open File: xxxx	File (xxxx) cannot be opened.	Dialog
INI file is not found	Specified device information definition file (.ini) does not exist.	Dialog
INI file does not include SOG information	Specified device information definition file (.ini) does not contain	Dialog
	segment option information.	
Function Option document file is not found	Specified function option document file does not exist.	Dialog
Function Option document file does not	Contents of the specified function option document file do not match	Dialog
match INI file	device information definition file (.ini).	
Segment Option document file is not found	Specified segment option document file does not exist.	Dialog
Segment Option document file does not	Contents of the specified segment option document file do not match	Dialog
match INI file	device information definition file (.ini).	
Segment assignment data file is not found	Specified segment assignment data file does not exist.	Dialog
Segment assignment data file does not	Contents of the specified segment assignment data file do not match	Dialog
match INI file	device information definition file (.ini).	
Can't open File: xxxx	File (xxxx) cannot be opened when executing Generate.	Message
Making file(s) is not completed		
Can't write File: xxxx	File (xxxx) cannot be written when executing Generate.	Message
Making file(s) is not completed		
ERROR: SPEC is not set	One or more SPEC cells are left blank when executing Generate.	Message
Making file(s) is not completed		
ERROR: SEGMENT DECODE TABLE is	Selected memory address/data bit have not been assigned to	Message
not set.	SEG/COM terminal cells when executing Generate.	
Making file(s) is not completed		

Table 4.4.2 winsog Warning Messages

Message	Description	Display
Are you file update?	Overwrite confirmation message	Dialog
xxxx is already exist	(Specified file already exists.)	

4.5 Example Output Files

Note: The display memory addresses, the number of SEG/COM pins, and output specification vary with each type of microcomputer.

Example of a segment option document file

```
* S1C60xxx SEGMENT OPTION DOCUMENT Vx.xx
                                                 ← Version
* FILE NAME
               ZZZZZZZS DOC
                                                 ← File name (specified by [Setup])
* USER'S NAME SEIKO EPSON CORPORATION
                                                 ← User name (specified by [Setup])
* INPUT DATE yyyy/mm/dd
                                                 ← Date of creation (specified by [Setup])
* COMMENT
               SAMPLE DATA
                                                 ← Comment (specified by [Setup])
* OPTION NO.xx
                                                 ← Option number (varies with type of microcomputer)
 < LCD SEGMENT DECODE TABLE >
 SEG COMO COM1 COM2 COM3 SPEC
   0 163
           162
                161 1F3
                                                 ← Segment decode table
     170
           172
                171
                     1,60 S
   2 143 142 141 1E1 S
   3 150 152 151 140 S
 xx 3B0 3B1 3B2 3B3 S
                                                 ← End mark
```

Example of a segment assignment data file

```
* S1C60xxx SEGMENT OPTION DOCUMENT Vx.xx
                                                    ← Version
                                                    ← File name (specified by [Setup])
* FILE NAME
                 zzzzzzs.DOC
* USER'S NAME
                                                    ← User name (specified by [Setup])
* INPUT DATE
                                                    ← Date of creation (specified by [Setup])
                yyyy/mm/dd
* COMMENT
                                                    ← Comment (specified by [Setup])
 OPTION NO.xx
                                                    ← Option number (varies with type of microcomputer)
 < LCD SEGMENT DECODE TABLE >
  SEG COM0 COM1 COM2 COM3 SPEC
   0 163 162 161 1F3 S
                                                    ← Segment data has been assigned
                 171
                       160 S
      170
            172
   1
                  141
      143 142
                       1E1
  mm FRE FRE
                                                    ← FRE: Segment address and data bit have not been assigned.
                 FRE FRE X
  nn FRE FRE
                FRE FRE X
                                                    ← X: Output specification has not been set.
  oo FRE FRE FRE X
                                                    \leftarrow End mark
*EOF
```

Example of a segment option HEX file (Intel HEX format)

For details about the Intel HEX format, refer to Appendix.

5 Melody Assembler <winmla>

5.1 Outline of winmla

Some models in the S1C60/62 Family have a built-in melody generator that outputs the sound converted from the melody ROM data. The Melody Assembler <winmla> is the software tool for converting the melody data created using an editor into the melody ROM data and melody option setup data. From the file created by winmla, Seiko Epson produces the mask patterns for the S1C60xxx/S1C62xxx chip. In addition, simultaneously with this file, winmla can create the required HEX file when debugging programs with the evaluation board.

5.2 Input/output Files

Figure 5.2.1 shows the input/output files of winmla.

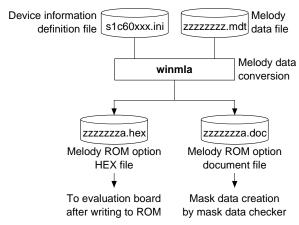


Fig. 5.2.1 Input/Output Files of winmla

Device information definition file (s1c60xxx.ini/s1c62xxx.ini)

This file contains option lists for various types of microcomputers and other information. Always be sure to use the files presented by Seiko Epson. This file is effective for only the type of microcomputer indicated by the file name. Do not modify the contents of the file or use the file in other types of microcomputers.

Melody data file (zzzzzzz.mdt)

This is a test format file in which the score data is written. Use an editor to create this file. Refer to Section 5.4, "Melody Data", for details.

Melody ROM option document file (zzzzzzza.doc)

This is a text format file in which the contents of selected mask options and the mask data created from the melody data are stored. This file is packed along with completed other program/data files into a single file by the mask data checker <winmdc>, which we would like to have presented to Seiko Epson as the mask data file. From this file, Seiko Epson will create the mask patterns for the IC.

Melody ROM option HEX file (zzzzzzza.hex)

This is the Intel HEX format file necessary to set the selected mask options in the evaluation board. When you debug programs with the evaluation board, create a ROM with this file and install the ROM to the melody option ROM socket on the evaluation board, or download this file into the evaluation board through the ICE using a debugger <db62> command.

*1 The "xxx" in the file name denotes the model name of a microcomputer. For the "zzzzzzzz" part, any given file name can be specified.

5.3 Using winmla

5.3.1 Starting Up

Startup from Explorer



 $\label{lem:condition} Double-click on the winmla. exe icon or select winmla from the start menu.$

If the device information definition file (s1c60xxx.ini/s1c62xxx.ini) was loaded into your computer during previous execution, winmla automatically reads the same file as it starts. Alternatively, drag the Device information definition file icon into the winmla.exe icon to start winmla, which will then read the Device information definition file.

Startup by command input

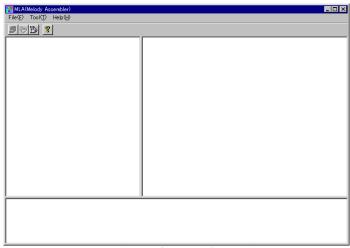
You can also start winmla from the MS-DOS prompt by entering the command shown below.

>winmla [s1c60xxx.ini/s1c62xxx.ini] 🗓

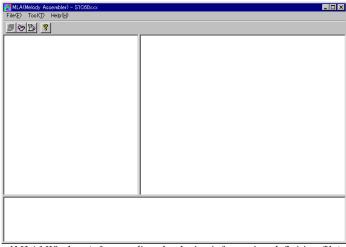
denotes entering the return key.

You can specify the device information definition file (s1c60xxx.ini/s1c62xxx.ini) as a command option. (You can also specify a path.) When you specify the device information definition file here, winmla reads it as it starts. This specification can be omitted.

When winmla starts, it displays the [MLA] window. The following diagrams show a [MLA] window when the device information definition file has been loaded and when it has not.

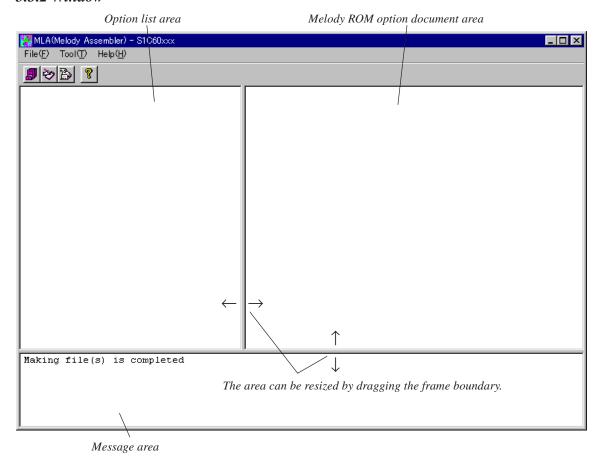


[MLA] Window (initial screen)



[MLA] Window (after reading the device information definition file)

5.3.2 Window



* The microcomputer model name on the title bar is the file name (not including the path and extension) of the device information definition file that has been read.

Fig. 5.3.2.1 Window Configuration

The [MLA] window is divided into three areas as shown above.

Option list area

This area is used to list and select melody generator mask options in another S1C Family. This area is always left blank since it is not used in the S1C60/62 Family.

Melody ROM option document area

This area is used to display the selected melody options in another S1C Family. This area is always left blank since it is not used in the S1C60/62 Family.

Message area

When you create a file by selecting [Generate] from the [Tool] menu or clicking the [Generate] button, this area displays a message showing the result of the selected operation.

5.3.3 Menus and Toolbar Buttons

This section explains each menu item and toolbar button.

[File] menu



Open

Not available for S1C60/62 Family microcomputers.

Exit

Terminates winmla.

[Tool] menu



Generate

Sets the date of creation, output file name and a comment included in the melody ROM option document file, and creates the specified files. The [Generate] button has the same function.



[Generate] button

Device INI Select

Loads the device information definition file (s1c60xxx.ini/s1c62xxx.ini). The [Device INI Select] button has the same function. This file must be loaded first before performing any operation with winmla.



[Device INI Select] button

[Help] menu



Version

Displays the version of winmla. The [Help] button has the same function.



[Help] button

The dialog box shown below appears. Click [OK] to close this dialog box.



5.3.4 Operation Procedure

The following shows the basic operation procedure.

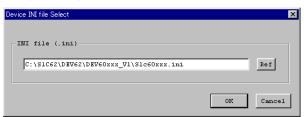
(1) Loading the device information definition file

First, select a device information definition file (s1c60xxx.ini/s1c62xxx.ini) and load it. Select [Device INI Select] from the [Tool] menu or click the [Device INI Select] button.



[Device INI Select] button

The dialog box shown below appears. Enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the option list and the melody ROM option document, which have both been set by default, are displayed in each area.

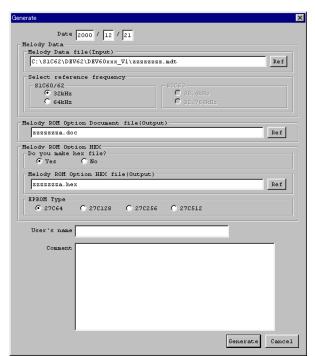
To stop loading the file, click [Cancel].

Once a device information definition file is selected, the same file is automatically loaded the next time you start winmla.

(2) Setup and creating files

Select [Generate] from the [Tool] menu or click the [Generate] button to bring up the [Generate] dialog box. From this dialog box, select items and enter data.





Date

Displays the current date. Change it as necessary.

Melody Data file

Specify the melody data file to be assembled. You can use the [Ref] button to look at other folders.

Select reference frequency

Select the reference frequency.

Melody ROM Option Document file

Specify the melody ROM option document file name you want to create. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

Melody ROM Option HEX

Do you make hex file?

Select whether to create a melody ROM option HEX file. You need to create one when you use the evaluation board to debug programs.

Melody ROM Option HEX file

When you create a melody ROM option HEX file, specify its file name here. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

EPROM Type

Select a ROM type to be used when installing the ROM in which the generated HEX data is written to the evaluation board.

User's Name

Enter your company name. Up to 40 characters can be entered. You can use English letters, numbers, symbols, and spaces. The content entered here is recorded in the USER'S NAME field of the melody ROM option document file.

Comment

Enter a comment. Up to 50 characters can be entered in one line. You can enter up to 10 lines. You can use English letters, numbers, symbols, and spaces. Use the [Enter] key to create a new line. All comments should include the following information:

- · Place of business, your department or section
- Address, telephone number, and facsimile number
- Other: Technical information, etc.

The content entered here is recorded in the COMMENT field of the melody ROM option document file.

When you have finished entering the above necessary items, click [Generate]. The melody ROM option document file you specified and the melody ROM option HEX file (if specified) are created, and the dialog box is closed.

When winmla has finished creating the files normally, it displays the message "Making file(s) is completed" in the message area. If an error occurs, an error message is displayed.

If you click [Cancel], current settings will not be changed and the dialog box is closed.

Notes: • File name specification is subject to the following limitations:

- 1. The number of characters that can be used to specify a file name including the path is 2,048.
- 2. The file name itself (not including the extension) can be up to 15 characters, and the extension up to three characters.
- 3. The file name cannot begin with a hyphen (-), nor can the following symbols be used as part of directory names (folder names), file names, and extensions:

 | : , ; * ? " < > |
- The symbols shown below cannot be used in the User's Name and Comment: \$\|`

(3) Quitting

To terminate winmla, select [Exit] from the [File] menu.

5.4 Melody Data

5.4.1 Outline of Melody Data

To produce music or sound effects with the melody generator of the S1C60xxx/S1C62xxx, the following four data must be created:

1) Melody ROM data

2) Melody option data

a) Octave selection (.OCTAVE = m) The normal range (C3–C6#) or the range one octave higher (C4–C7#) is selected.

and envelope.

b) Tempo selection (.TEMPC0 = n / .TEMPC1 = n) Two types are selected from the sixteen types of tempos.

5.4.2 Melody Data Generation Procedure

The following flowchart shows the melody data generation procedure.

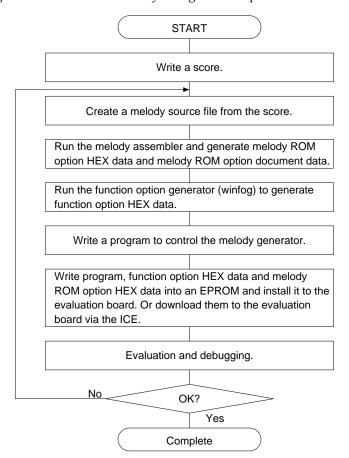


Fig. 5.4.2.1 Melody Data Generation Procedure

5.4.3 Method of Generating Melody Data

The method of generating melody data is given according to the generation procedure.

(1) Writing score

Describe music to be output from the S1C60xxx/62xxx in the form of a score as follows.

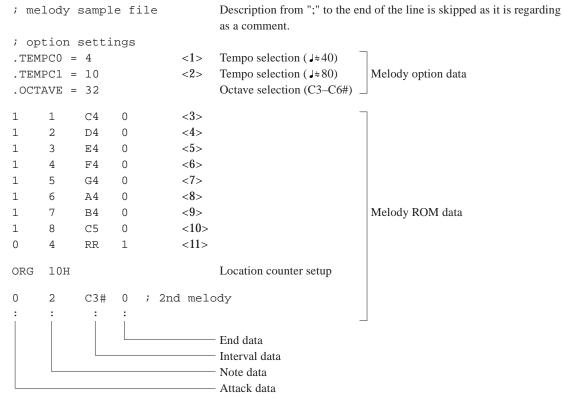
<Score>



(2) Creating melody source file

Create a melody source file based on the above score data.

<Example of melody data>



- Up to 80 characters can be described in one line including a comment and delimiters (space and TAB). winmla allows blank lines in the source file except for the last line.
- Data parameters must be separated with one or more spaces or tabs (eg., 1 1 C4 0).
- The pseudo-instructions and data must be described from the beginning of each line without a space.

5.4.4 Melody Option Data

Octave selection and tempo selection are possible with the melody option data.

(1) Tempo selection

There are 16 tempos available. Two tempos can be selected from them. The tempo setting pseudo-instructions (.TEMPC0 = n and .TEMPC1 = n) are used for selection.

The following table shows the relationship between tempo codes (J = k), and tempo setting pseudo-instructions. Two tempos can be selected by specifying n. Which of the two selected tempos is used is decided by the program.

Tempo Option-setting Tempo Option-setting symbol pseudo-instruction symbol pseudo-instruction = 30.TEMPC0 = 0d = 60 .TEMPC0 = 8.TEMPC1 = 0.TEMPC1 = 8.TEMPC0 = 1.TEMPC0 = 9= 32= 68.6.TEMPC1 = 1.TEMPC1 = 9= 34.3.TEMPC0 = 2.TEMPC0 = 10**」**≒ 80 .TEMPC1 = 2.TEMPC1 = 10= 36.9.TEMPC0 = 3= 96 .TEMPC0 = 11.TEMPC1 = 3.TEMPC1 = 11 $\rfloor = 40$.TEMPC0 = 4= 120.TEMPC0 = 12.TEMPC1 = 4.TEMPC1 = 12= 43.6.TEMPC0 = 5.TEMPC0 = 13 $\rfloor = 160$.TEMPC1 = 5.TEMPC1 = 13= 48.TEMPC0 = 6= 240.TEMPC0 = 14.TEMPC1 = 6.TEMPC1 = 14」 ≒ 53.3 .TEMPC0 = 7J = 480.TEMPC0 = 15.TEMPC1 = 7.TEMPC1 = 15

Table 5.4.4 Tempo Selection

(2) Octave selection

The octave selection pseudo-instructions ($.OCTAVE = 32 \mid 64$) selects the scale range as follows:

.OCTAVE = 32: C3-C6#.OCTAVE = 64: C4-C7#

When ".OCTAVE = 64" is described, the range one octave higher (C4–C7#) is generated without changing the description of the C3–C6# interval data (mentioned later) . For example, the C5 is generated from C4.

5.4.5 Melody ROM Data

Melody ROM data is consists of interval data, note data, end data and attack data.

(1) Interval data

Interval data sets the sound pitch (frequency).

- C3–C6# scale codes are used to enter interval data as scales. Even when the upper octave is set by ".OCTAVE = 64", C3–C6# scale codes are used. Scales higher than C6# are as errors by the melody assembler.
- The amount of interval data that can be entered is limited according to the model.
- RR is entered by rests.
- Only # is valid to enter semitones. Enter B4b as A4#.
- It is possible to enter intervals directly with hexadecimal codes regardless of scales. Prefix each hexadecimal code with \$ when entering it. The valid code range is \$00 to \$FD. Table 5.4.5.1 lists the relationship between intervals and hexadecimal codes.

						iuo	<i>i</i> C .	<i>/</i> . <i>/</i> .	J.1	merv		Jui	и						
Coolo			lr	nter	val	dat	a			Coolo	Interval data								
Scale	S7	S6	S5	S4	S3	S2	S1	S0	Hex.	Scale	S7	S6	S5	S4	S3	S2	S1	S0	Hex.
C3	0	0	0	0	0	1	0	0	04	G4	1	0	1	1	0	0	0	1	В1
C3#	0	0	0	1	0	0	1	0	12	G4#	1	0	1	1	0	1	0	1	B5
D3	0	0	1	0	0	0	0	0	20	A4	1	0	1	1	1	0	0	0	B8
D3#	0	0	1	0	1	1	1	1	2F	A4#	1	0	1	1	1	1	0	0	вс
E3	0	0	1	1	1	0	1	1	3B	B4	1	1	0	0	0	0	0	0	C0
F3	0	1	0	0	0	1	0	0	44	C5	1	1	0	0	0	1	0	0	C4
F3#	0	1	0	1	0	0	0	1	51	C5#	1	1	0	0	1	0	0	0	C8
G3	0	1	0	1	1	0	1	1	5B	D5	1	1	0	0	1	1	0	1	CD
G3#	0	1	1	0	0	1	0	1	65	D5#	1	1	0	0	1	1	1	0	CE
А3	0	1	1	0	1	1	0	0	6C	E5	1	1	0	1	0	0	1	1	D3
A3#	0	1	1	1	0	1	0	0	74	F5	1	1	0	1	0	1	0	0	D4
В3	0	1	1	1	1	1	0	0	7C	F5#	1	1	0	1	1	0	0	1	D9
C4	1	0	0	0	0	1	0	0	84	G5	1	1	0	1	1	0	1	1	DΒ
C4#	1	0	0	0	1	1	0	1	8D	G5#	1	1	0	1	1	1	0	0	DC
D4	1	0	0	1	0	0	1	0	92	A5	1	1	0	1	1	1	1	0	DE
D4#	1	0	0	1	1	0	0	0	98	A5#	1	1	1	0	0	0	0	0	E0
E4	1	0	0	1	1	1	1	0	9E	B5	1	1	1	0	0	0	1	0	E2
F4	1	0	1	0	0	1	0	0	A4	C6	1	1	1	0	0	1	0	0	E4
F4#	1	0	1	0	1	0	1	1	ΑB	C6#	1	1	1	0	0	1	1	0	E6

Table 5.4.5.1 Interval Data

For example, scale C4 becomes \$84 when entered as a hexadecimal code.

(2) Note data

Note data sets the length of notes or rests. Eight types of notes (sixteenth note to half note) or rests are available. Each note or rest is express by a number as shown in Table 5.4.5.2.

 Table 5.4.5.2 Note Data

 No.
 1
 2
 3
 4
 5
 6
 7
 8

 Note
 1
 2
 3
 4
 5
 6
 7
 8

 Rest
 7
 7
 7
 2
 3
 4
 5
 6
 7
 8

(3) End data

End data indicates the end of a melody. Place "1" as the end data at the last data line of a melody, otherwise place "0". The end data "0" can be omitted.

(4) Attack data

Attack data performs the following two special operations:

a) Function to tie or separate notes

If the envelope function is not in use, the attack data ties or separates notes. For example, with consecutive same-pitch scales, if the attack data is set to "1", each note is sounded individually. If the attack data is set to "0", the notes are tied.

To separate note

1	1	G4	0	
1	1	G4	0	
1	1	G4	0	
1	1	C1	1	

• To tie notes

1	1	G4	0	
0	1	G4	0	
0	1	G4	0	
0	1	G4	1	

b) Envelope function

The envelope function add resonances to the sound as follows:

Discharge occurs after the external capacitor for the envelope has been charged, and sound is output using the enveloped waveforms during discharge as the envelope. The attack data controls the charging of the external capacitor.

If "1" is entered as the attack data, resonances can be added, since the capacitor is automatically charged just before sound is generated, and then starts to discharge immediately. If "0" is entered, the capacitor is not charged, and sound is output using the enveloped waveforms previously output as the envelope. It is impossible to sound the piezo electric buzzer or output sound through the speaker in a completely discharged condition. So, "1" needs to be entered as the attack data, taking the discharge time into consideration. Refer to the Technical Manual for details of the envelope function.

5.4.6 Pseudo-instructions

The pseudo-instruction is used for controlling winmla, and cannot be executed when the S1C60xxx/S1C62xxx plays the melody. In the explanations below, _ indicates one or more spaces or tabs. <expression> indicates a symbol, constant and arithmetic expression (< and > are not actually written).

Address setup pseudo-instruction

```
ORG (Location counter setup)
Format: ORG_<expression>
```

The ORG instruction sets the value of <expression> to the location counter (melody ROM address). Data described after this instruction is mapped sequentially from the specified address. If the ORG instruction does not exist at the beginning of the melody data file, the location counter is set to 0 before assembling. The ORG instruction can be used twice or more in a melody data file. However, if an ORG instruction specifies an address in which data exists, a warning occurs ("W" is displayed) and the statements from the ORG instruction are invalidated until a valid ORG instruction appears. When the specified address exceeds the ROM capacity, an R error occurs.

Option setup instructions

```
.TEMPC0/.TEMPC1 (Tempo selection)
```

```
Format: .TEMPC0=n (setting TEMPC0, n = 0 to 15)
.TEMPC1=n (setting TEMPC1, n = 0 to 15)
```

These instructions select TEMPC0 and TEMPC1 options. Select a tempo number from 16 types listed in Table 5.4.4.1 and write it as n. This setting cannot be omitted. ".TEMPCx", "=" and n must be separated with a space, tab or return.

```
.OCTAVE (Octave selection)

Format: .OCTAVE = m (m = 32 or 64)
```

The .OCTAVE instruction configures the melody multiplier circuit to set the scale range. When 32 is written as m, the melody multiplier circuit is configured with 32 kHz and the scale range becomes C3–C6#. When 64 is written, the circuit is configured with 64 kHz and the scale range becomes C4–C7#, one octave higher than the 32 kHz configuration. In this case, C5 in the melody data file will be output as C6. This setting can be omitted in the melody data file (can be selected by the [select reference frequency] buttons in the [Generate] dialog box).

5.5 Error Messages

The error messages of winmla are listed below. The "Dialog" in the Display column means that messages are displayed in the dialog box, and "Message" means that messages are displayed in the [MLA] window message area.

Table 5.5.1 List of winmla Error Messages

Message	Description	Display
File name error	Number of characters in the file name or extension exceeds the limit.	Dialog
Illegal character	Prohibited characters have been entered.	Dialog
Please input file name	File name has not been entered.	Dialog
Can't open File: xxxx	File (xxxx) cannot be opened.	Dialog
INI file is not found	Specified device information definition file (.ini) does not exist.	Dialog
INI file does not include MLA information	Specified device information definition file (.ini) does not contain	Dialog
	melody ROM option information.	
Melody Data file is not found	Specified melody data file does not exist.	Dialog
A lot of parameter	Too many command line parameters are specified.	Dialog
MDT file error	Contents of the read melody data is incorrect.	Message
	(Details are saved with error symbols in the ELG file)	
Can't open File: xxxx	File (xxxx) cannot be opened when executing Generate.	Message
Making file(s) is not completed		
Can't write File: xxxx	File (xxxx) cannot be written when executing Generate.	Message
Making file(s) is not completed		

Table 5.5.2 winmla Warning Messages

Message	Description	Display
Are you file update?	Overwrite confirmation message	Dialog
xxxx is already exist	(Specified file already exists.)	

5.6 Error Symbols

When an error occurs during assembling, the error symbols listed below or an error message is output to the assembly list file (ELG file).

The error symbol is placed at the beginning of the statement in which an error occurred. If two or more errors occur, all the error statements have an error symbol.

Example: S (Syntax Error)

The following lists the error symbols in the order of descending priorities.

C	(Syntax Error)	There is a fatal syntax error
	(Symax fiftor)	There is a fafal syntax error.

.TEMPC0/1 error: The tempo number is out of the range (0–15).

OCTAVE error: The octave specification is not 32 or 64.

The scale data is out of the range (C3–C6#).

The note data is out of the range (1–8).

Attack data error: The attack data is not 0 or 1.

Attack data error: The attack data is not 0 or 1. End data error: The attack data is not 0 or 1.

O (Scale ROM Overflow) The definition exceeded the scale ROM capacity.

R (Range Error) The location counter value or the specified location exceeded the upper limit

of the melody ROM capacity.

W (Warning) Warning

5.7 Sample Files

For Elize

Original title: For Elize Composer: Beethoven

Score



Example of input file (Melody data)

```
;* FOR ELIZE *
.TEMPC0 = 9
. TEMPC1 = 9
.OCTAVE = 64
1
1
1
1
1
1
1
    1
                E5
    1
1
1
1
1
1
                D5#
                E5
                D5#
                E5
                В4
                D5
                C5
111111111111111
    3
1
1
                Α4
                C4
                E4
                Α4
    1
3
1
                В4
                E4
    1
1
3
                G4#
                В4
                C5
    1
1
1
                E4
                E5
                D5#
                E5
                D5#
1
1
1
1
1
    1
1
1
                E5
                В4
                D5
    1
                C5
    3
                A4
                C4
                E4
1
    1
                Α4
                В4
1
    1
```

5 MELODY ASSEMBLER <winmla>

	1 3 1 1 1 3 1 1 1 3 1 1 1 1 1 1 1 1 1 1	B4 A4 B4 C5 D5 E5 G4 F5 D5 F4 E5 C5 C5	1	;FINE
1	1	C5		
1	1	В4		
1	1	E4		
1	1	E4 E4		
1	1	E4		
ī	1	E4		
1	1 1 1 1 1	E4		
1	1	E5		
1	1	E5		
1	1	D5#		
1	1 1 1	E5		
1	1	D5# E5		
1	1	D5#		
1	1	E5		
1 1 1	1	D5#	1	;D.C.

Example of output file (Melody ROM option document file)

```
:0000001FF
                                     Melody ROM HEX data
:10000000E0E2E0E2E0E4E6E8AAECEEEAA4EEF0E406
:10001000A8EEE0E2E0E2E0E4E6E8AAECEEEAA4EE34
:10002000E8E4ABE4E8E6A0F2F4E0A6F6E0E6A8EE49
:10003000E6E8E4EEEEEEEEEEEE0E0E2E0E2E0E254
:0000001FF
:100000009E987C92846C043B655BA444FFFFFFC414
                                     Melody scale ROM HEX data
:0000001FF
                                     \leftarrow Version
* S1C60XXX Ver x.xx
* FILE NAME
            zzzzzzza.doc
                                     ← File name (specified by [Generate])
* USER'S NAME SEIKO EPSON CORPORATION
                                     ← User name (specified by [Generate])
* INPUT DATE yyyy/mm/dd
                                     ← Date of creation (specified by [Generate])
            For Elize
                                     ← Comment (specified by [Generate])
* COMMENT
* OCTAVE CIRCUIT
                                     \leftarrow Option name
                                     ← Selected specification
 64kHz ----- Selected
OPT2001 02
                                     \leftarrow Mask data
* TEMPOCO TEMPO 9 ----- Selected
* TEMPOC1 TEMPO 9 ----- Selected
OPT2101 01
OPT2102 02
OPT2103 02
OPT2104 01
*EOF
```

Example of output file (Melody ROM option HEX file)

:0000001FF

6 Mask Data Checker <winmdc>

6.1 Outline of winmdc

The Mask Data Checker <winmdc> is the software tool for checking the format of each generated file and creating the file necessary to generate mask patterns. winmdc checks the HEX files of the program ROM generated by HEX converter <hx62>, the function option document file generated by function option generator <winfog>, and the segment option document file generated by segment option generator <winsog>.

winmdc also has a function for restoring the created mask data file into the original file format.

6.2 Input/Output Files

Figure 6.2.1 shows the input/output files of winmdc.

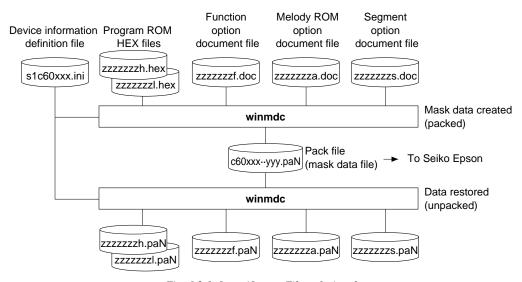


Fig. 6.2.1 Input/Output Files of winmdc

Device information definition file (s1c60xxx.ini/s1c62xxx.ini)

This file contains option lists for various types of microcomputers and other information. Always be sure to use the files presented by Seiko Epson. This file is effective for only the type of microcomputer indicated by the file name. Do not modify the contents of the file or use the file in other types of microcomputers.

Program ROM HEX files (zzzzzzh.hex, zzzzzzl.hex)

Both these files are Intel HEX format files, with the 4 high-order bits of object code (12 bits) stored in "h.hex" and the 8 low-order bits of object code stored in "l.hex". These files are created from the object files output by linker <lk62> by converting them into HEX format using HEX converter <hx62>. For details about hx62, refer to the "S5U1C62000A Manual".

Function option document file (zzzzzzf.doc)

This is a text format file in which the contents of selected function options are stored. This file is created by function option generator <winfog>.

Segment option document file (zzzzzzzs.doc)

This is a text format file in which the contents of segment options set are stored. It is created by segment option generator <winsog>. This file is available for only microcomputers with set segment options.

Melody ROM option document file (zzzzzzza.doc)

This is a text format file in which the contents of melody ROM options set are stored. It is created by melody assembler <winmla>. This file is available for only microcomputers with set melody options.

Pack file (c60xxx-yyy.paN/c62xxx-yyy.paN, N = 0 and over)

This is a text format file which contains the above data files combined into one. We would like to have this file presented to Seiko Epson as the mask data file. Seiko Epson will create the mask patterns for the IC from this mask data file.

* The "xxx··" in the file name denotes the model name of a microcomputer. The "yyy" part of the file name represents the custom code of each customer. Enter the code from Seiko Epson here. For the "zzzzzzz" part, any given file name can be specified.

6.3 Using winmdc

6.3.1 Starting Up

Startup from Explorer



Double-click on the winmdc.exe icon or select winmdc from the start menu. If the device information definition file (s1c60xxx.ini/s1c62xxx.ini) was loaded into your computer during a previous execution, winmdc automatically reads the same file as it starts. Alternatively, drag the device information definition file icon into the winmdc.exe icon to start winmdc, which will then read the device information definition file.

Startup by command input

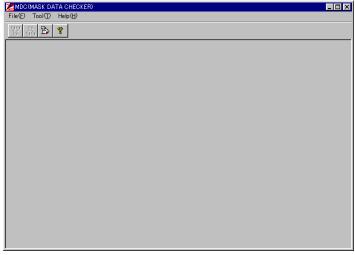
You can also start winmdc from the MS-DOS prompt by entering the command shown below.

>winmdc [s1c60xxx.ini/s1c62xxx.ini] [J

denotes entering the return key.

You can specify the device information definition file (s1c60xxx.ini/s1c62xxx.ini) as a command option. (You can also specify a path.) When you specify the Device information definition file here, winmdc reads it as it starts. This specification can be omitted.

When winmdc starts, it displays the [MDC] window.



[MDC] Window (initial screen)

- * The microcomputer model name on the title bar is the file name (not including the path and extension) of the device information definition file that has been read.
- * The [Pack] and [Unpack] buttons on the tool bar are enabled when the device information definition file is read.

6.3.2 Menus and Toolbar Buttons

This section explains each menu item and toolbar button.

[File] menu



End

Terminates winmdc.

[Tool] menu



Pack

Packs the ROM data file and option document file to create a mask data file for presentation to Seiko Epson. The [Pack] button has the same function.



[Pack] button

Unpack

Restores files in the original format from a packed file. The [Unpack] button has the same function.



[Unpack] button

Device INI Select

Loads the device information definition file <s1c60xxx.ini/s1c62xxx.ini>. The [Device INI Select] button has the same function. This file must be loaded first before performing any operation with winmdc.



[Device INI Select] button

[Help] menu



Version

Displays the version of winmdc. The [Help] button has the same function.



[Help] button

The dialog box shown below appears. Click [OK] to close this dialog box.



6.3.3 Operation Procedure

The following shows the basic operation procedure.

(1) Loading the Device information definition file

First, select a device information definition file <s1c60xxx.ini/s1c62xxx.ini> and load it. Select [Device INI Select] from the [Tool] menu or click the [Device INI Select] button.



[Device INI Select] button

The dialog box shown below appears. Enter a file name including the path in the text box or select a file by clicking the [Ref] button.



Click [OK], and the file is loaded. If the specified file exists and there is no problem with its contents, the set-up items in winmdc are initialized with the loaded device information.

To stop loading the file, click [Cancel].

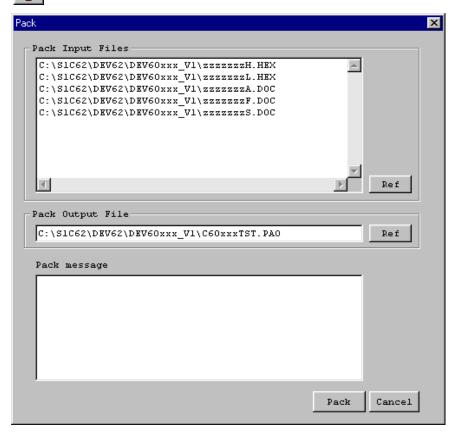
Once a device information definition file is selected, the same file is automatically loaded the next time you start winmdc.

(2) Packing

1. Select [Pack] from the [Tool] menu or click the [Pack] button on the tool bar to bring up the [Pack] dialog box.



[Pack] button



2. Select the files to be entered.

[Pack Input Files] lists the files of the type specified in the device information definition file by their default file names. If the data files to be entered are represented by different names in this list, replace the file names following the procedure below.

- a. Select a file name to be changed by clicking on it from the list box.
- b. Click the [Ref] button and select the data file to be entered.

Do this for all files listed.

When replacing files, take care not to mistake one file for another. If the input file is erroneous, an error will result during file packing.

3. Setting output file names

In the [Pack Output File] text box, specify a pack file name in which you want the mask data to be output. The file name displayed by default can be modified. You can use the [Ref] button to look at other folders.

Make sure the extension of the output file name is ".pa0". If after presenting data to Seiko Epson, you present new data due to program bugs or any other reason, increase the number in the last digit of the extension in increments of one. For example, the extension of the second file presented should be "c60xxx·yyy.pa1".

Note: File name specification is subject to the following limitations:

- 1. The number of characters that can be used to specify a file name including the path is 2,048.
- 2. The file name itself (not including the extension) can be up to 15 characters, and the extension up to three characters.
- 3. The file name cannot begin with a hyphen (-), nor can the following symbols be used as part of directory names (folder names), file names, and extensions:

4. Click the [Pack] button to execute packing.

When winmdc has completed packing, it dsiplays a message "Packing completed!" in the [Pack message] text box. If an error has occurred, an error message is displayed.

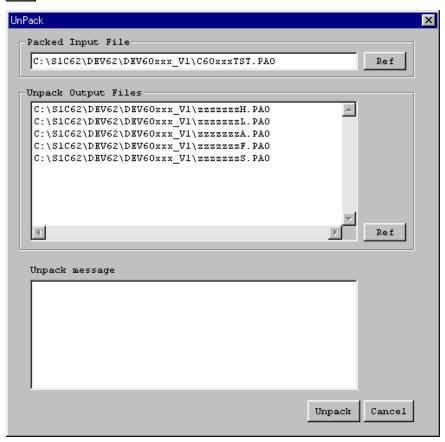
5. Click the [Cancel] button to close the dialog box.

Alternatively, you can click the [Cancel] button to quit winmdc before it executes packing.

(3) Unpacking

1. Select [Unpack] from the [Tool] menu or click the [Unpack] button on the tool bar to bring up the [Unpack] dialog box.





2. Select the file you want to unpack.

In the [Packed Input File] text box, specify the pack file name you want to enter. Use the names displayed by default to specify this file name after changing one, or select another file using the [Ref] button.

- 3. Set the output file name.
 - [Unpack Output Files] lists the files of the type specified in the device information definition file by their default file names. Modify the file name displayed by the following procedure.
 - a. Click in the list box to select the file name to be modified.
 - b. Click the [Ref] button to select another folder, and then enter a file name. Modify all the listed file names. The extensions cannot be changed.
- 4. Click the [Unpack] button to execute unpacking.

 When winmdc has completed unpacking, it displays a message "Unpacking completed!" in the [Unpack message] text box. If an error has occurred, an error message is displayed.
- Click the [Cancel] button to close the dialog box.
 Alternatively, you can click the [Cancel] button to quit winmdc before it executes unpacking.

(4) Quitting

To terminate winmdc, select [End] from the [File] menu.

6.4 Error Messages

The error messages of winmdc are listed below. The "Dialog" in the Display column means that messages are displayed in the dialog box, and "Message" means that messages are displayed in the message area of the [Pack] or [Unpack] dialog box.

Table 6.4.1 List of I/O Error Messages

	· ·	
Message	Description	Display
File name error	Number of characters in the file name or extension exceeds the limit.	Dialog
Illegal character	Prohibited characters have been entered.	Dialog
Please input file name	File name has not been entered.	Dialog
INI file is not found	Specified device information definition file (.ini) does not exist.	Dialog
INI file does not include MDC information	Specified device information definition file (.ini) does not contain	Dialog
	MDC information.	
Can't open file : xxxx	File (xxxx) cannot be opened.	Dialog
Can't write file: xxxx	File (xxxx) cannot be written.	Dialog

Table 6.4.2 List of ROM Data Error Messages

Message	Description	Display
Hex data error: Not S record.	Data does not begin with "S."	Message
Hex data error: Data is not sequential.	Data is not listed in ascending order.	Message
Hex data error: Illegal data.	Invalid character is included.	Message
Hex data error: Too many data in one line.	Too many data entries exist in one line.	Message
Hex data error: Check sum error.	Checksum does not match.	Message
Hex data error: ROM capacity over.	Data is large. (Greater than ROM size)	Message
Hex data error: Not enough the ROM data.	Data is small. (Smaller than ROM size)	Message
Hex data error: Illegal start mark.	Start mark is incorrect.	Message
Hex data error: Illegal end mark.	End mark is incorrect.	Message
Hex data error: Illegal comment.	Model name shown at the beginning of data is incorrect.	Message

Table 6.4.3 List of Function Option Data Error Messages

Message	Description	Display
Option data error : Illegal model name.	Model name is incorrect.	Message
Option data error : Illegal version.	Version is incorrect.	Message
Option data error : Illegal option number.	Option No. is incorrect.	Message
Option data error : Illegal select number.	Selected option number is incorrect.	Message
Option data error : Mask data is not enough.	Mask data is insufficient.	Message
Option data error : Illegal start mark.	Start mark is incorrect.	Message
Option data error : Illegal end mark.	End mark is incorrect.	Message

Table 6.4.4 List of Segment Option Data Error Messages

Message	Description	Display
LCD segment data error : Illegal model name.	Model name is incorrect.	Message
LCD segment data error : Illegal version.	Version is incorrect.	Message
LCD segment data error : Illegal segment No.	Segment No. is incorrect.	Message
LCD segment data error : Illegal segment area.	Display memory address is out of range.	Message
LCD segment data error : Illegal segment output	Specified output mode is incorrect.	Message
specification.		
LCD segment data error : Illegal data in this line.	Data written here is not hex number or output mode.	Message
LCD segment data error : Data is not enough.	Segment data is insufficient.	Message
LCD segment data error : Illegal start mark.	Start mark is incorrect.	Message
LCD segment data error : Illegal end mark.	End mark is incorrect.	Message

6.5 Example Output File

Note: The configuration and contents of data vary with each type of microcomputer.

Example of a pack file (mask data file)

```
* S1C60xxx MASK DATA VER x.xx
                                                \leftarrow Version
                                                ← Program ROM HEX data start mark
\ROM1
S1C60xxxyyy PROGRAM ROM
                                                ← Master slice model name
:10000000.....
:0000001FF
                                                 "zzzzzzh.hex", "zzzzzzzl.hex"
:10000000.....
:0000001FF
\END
                                                ← Program ROM HEX data end mark
                                                ← Melody ROM HEX data start mark
\ROM2
S1C60xxxyyy MELODY ROM
                                                ← Master slice model name
:10000000.....
:0000001FF
                                                 "zzzzzzza.doc"
:10000000......
:0000001FF
\ END
                                                ← Melody ROM HEX data end mark
                                                ← Melody scale ROM HEX data start mark
\ROM3
S1C60xxxyyy SCALE ROM
                                                ← Master slice model name
:10000000....
                                                "zzzzzzza.doc"
:0000001FF
                                                ← Melody scale ROM HEX data end mark
\OPTION1
                                                ← Melody option start mark
 S1C60xxx Ver x.xx
                                                ← Model name/version
* FILE NAME
               zzzzzzA.DOC
* USER'S NAME
* INPUT DATE
               2000/12/14
* COMMENT
                                                 "zzzzzza.doc"
      OCTAVE CIRCUIT
       32kHz ----- SELECTED
OPTii01 01
OPTjj04 04
*EOF
\END
                                                ← Melody option end mark
\OPTION2
                                                ← Function option start mark
 S1C60xxx FUNCTION OPTION DOCUMENT Vx.xx
                                                ← Model name/version
* FILE NAME
              zzzzzzF.DOC
* USER'S NAME
* INPUT DATE
               2000/12/14
* COMMENT
                                                 "zzzzzzf.doc"
* *** OPTION NO.1 ***
* --- OSC1 SYSTEM CLOCK ---
* CR 60KHz(Special Reset) ---- Selected
 OPT0101 03
 OPTkk01 02
*EOF
\END
                                                ← Function option end mark
\SEGMENT1
                                                 ← Segment option start mark
 S1C60xxx SEGMENT OPTION DOCUMENT Vx.xx
                                                ← Model name/version
* FILE NAME
               zzzzzzs.DOC
* USER'S NAME
* INPUT DATE
               2000/12/14
* COMMENT
* OPTION NO.mm
                                                 "zzzzzzs doc'
 < LCD SEGMENT DECODE TABLE >
  SEG COMO COM1 COM2 COM3 SPEC
      000 001 002
                     003
      010 011 012
                     013
  1
                          S
      3B0 3B1 3B2 3B3
 nn
*EOF
\END
                                                ← Segment option end mark
```

7 EPROM Data Generator <winedg>

7.1 Outline of winedg

The EPROM Data Generator <winedg> merges two program-ROM HEX files generated by the HEX converter <hx62> (4 high-order bit file: h.hex, 8 low-order bit file: l.hex) into one 12-bit instruction code file for writing to an EPROM.

Note: The EPROM Data Generator <winedg> is available only for microcomputers that support an external EPROM.

7.2 Input/Output Files

Figure 7.2.1 shows the input/output files of winedg.

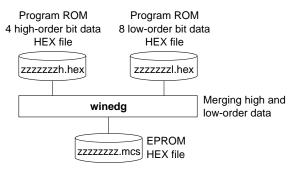


Fig. 7.2.1 Input/Output Files of winedg

Program ROM HEX files (zzzzzzh.hex, zzzzzzl.hex)

Both these files are Intel HEX format files, with the 4 high-order bits of object code (12 bits) stored in "h.hex" and the 8 low-order bits of object code stored in "l.hex". These files are created from the object files output by linker <lk62> by converting them into HEX format using HEX converter <hx62>. For details about hx62, refer to the "S5U1C62000A Manual".

EPROM HEX file (zzzzzzzz.mcs)

Two HEX data "l.hex" and "h.hex" are merged into one 12-bit object data and output to this file. The unused area is filled with FFH. Furthermore, 12 low-order bits of the sum total of the merged data is written to the address following the ROM area end address.

Write the contents of this file to an EPROM to make the external ROM for executing the program.

7.3 Using winedg

7.3.1 Starting Up

Startup from Explorer



Double-click on the winedg.exe icon or select winedg from the start menu.

Winedg.exe

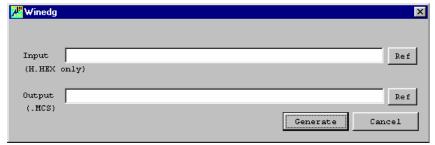
Startup by command input

It is also possible to start winedg from the MS-DOS prompt by entering the command shown below.

>winedg ⊒

denotes entering the return key.

When winedg starts, it displays the [Winedg] dialog box.



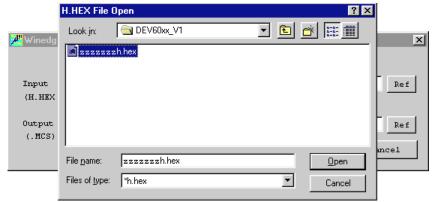
[Winedg] Dialog Box

7.3.2 Operation Procedure

The following shows the operation procedure.

(1) Selecting input files

First, select the high-order 4-bit program data HEX file (h.hex) to be merged. Enter the file name including the path in the [Input] text box or choose the file from the dialog box that appears by clicking on the [Ref] button.



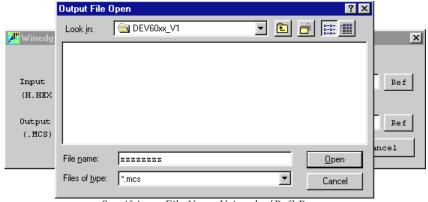
Selection Using the [Ref] Button

In this dialog, the high-order 4-bit HEX file (h.hex) must be selected. The low-order 8-bit HEX file (l.hex) with the same name as the selected HEX file will be automatically loaded during the merge operation. Note that both the high-order 4-bit and low-order 8-bit HEX files must be located in the same folder.

(2) Specifying the output file name

Next, specify an output file name.

Enter the file name including the path in the [Output] text box or choose the folder/file from the dialog box that appears by clicking on the [Ref] button. The text box in the dialog box that appears by clicking on [Ref] shows the input file name by default. When entering a file name, do not type the file extension (.mcs).



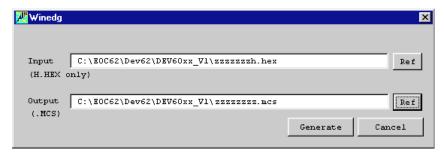
Specifying a File Name Using the [Ref] Button

Note: File name specification is subject to the following limitations:

- 1. The number of characters that can be used to specify a file name including the path is 2,048.
- 2. The file name itself (not including the extension) can be up to 15 characters, and the extension up to three characters.
- 3. The file name cannot begin with a hyphen (-), nor can the following symbols be used as part of directory names (folder names), file names, and extensions:

(3) Generating the file

Verify the input and output file names and then click on the [Generate] button.



The dialog box shown below appears when the file is generated properly.



Click on the [OK] button.

(4) Canceling execution and quitting

Click on the [Cancel] button to cancel generation of the file or to terminate winedg. The dialog box closes and winedg terminates.

7.4 Error Messages

The error messages of winedg are listed below.

Table 7.4.1 List of Error Messages

Message	Description	Display
Can not Open File: XXXX	File cannot be opened.	Dialog
Can not Create File: XXXX	Input file is invalid or prohibited characters have been entered.	Dialog
Please input the H.HEX file name!	File name is not H.HEX.	Dialog
Error: Not Intel Hex Format!	Input file is not Intel HEX format.	Dialog
Error: Each HEX data size not agree!	H.HEX and L.HEX file sizes are not the same.	Dialog
Error: Invalid data length!	Illegal record with a length not 10 is included.	Dialog

Table 7.4.2 List of Warning Messages

Message	Description	Display
Warning: Exceeded ROM Address area!	Data exceeds the ROM capacity.	Dialog

7.5 Example Input/Output Files

Input files

h.hex

:1000000050B0E050E050E050E0E0E0A020F0E0E46 :100010000A070A070E0F0E0E0B0E0A070F050B0E2E :10002000050E050E050E0E0F070E0A070F0E0F0721 :100030000A070A060E000E0F0B0F070E0A070F0E17 :100040000E0E0E0E0E0E0E0B0E0E0E040E0E040EE7 :100050000E040E0E0E0405000E0E0E0B0A0E020EFE :10006000000E0E040A060E000F0B0E0F0E0E0B0EE6 :100070000B0C0F050E0E0B0D060F0B0C0F0E0B0CC1 :100080000B0E050B0D0C070F0B0C0E0C070C0F0EB7 :100090000E0B0E0A070FFFFFFFFFFFFFFFFFFFF23 :1000A000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF :1000B000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF :1000D000FFFFFFFFFFFFFFFFFFFFFFFFFFFFF :100110000B0E050B0D0000E0F0E0F0F0E0E0E0B0E1D :100120000E05050B0E0E0E0B0E0E0E0F0F0F0F0F02

Output file

:0000001FF

.mcs

:10000000569B80E1050EE1150EE1350EE12E81EEE5 :100010008A4420AFDFE81EE8A4F70FA5F70FEE8FA4 :10002000DFE10E81B00EE8A48719FDF569B80E1066 :1000300052DE1152DE1352DE12E81F0273FEE0A4FC :100040004727FDFE81F0273FA5F734A4F636EE00E2 :100050002EEE0FDFB00F0873FEE0A48739FDFEA07F :10006000E90EA4E94EA8E98E02E80B4AE10EB0E4DD :100070004412EB4E44412EB8E44412E00E11E44425 :1000800012569056E12E81E10B40AF0E98261E00CD :10009000062E01E44412A58668EB805CFDFBEFE2CE :1000A0008FDFE02E80B03E21BE8CE4F48569E02E27 :1000B00080B03DE1673F57BE8CA8FDFE18BEECE85E :1000C000BEBEC856CBEBD2FC1F782FDFBFECE2E1FF :1000D0000C1F78BCE4FDFE12E81B40EE8A47792F26 :1000E000DFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF40 :101800004B5FFFFFFFFFFFFFFFFFFFFFFFFFFFFF

I.hex

:0000001FF

:100000006980100E110E130E1281E8440ADF81E898 :100010004F0F5F0FE8DF108100E84819DF6980109B :100020002D112D132D1281023FE04427DF81023F65 :100030005F344F36E02EE0DF00083FE04839DFA0B4 :1000400090A494A89802804A10B04412B44412B804 :10005000441200114412695612811040F098610058 :10006000620144125868B85CDFEF28DF0280032188 :10007000E8E44869028003E17357E8A8DF18EEE876 :10008000EBC86CEB2F1F82DFFEE2101F8BE4DF1248 :100090008140E84792DFFFFFFFFFFFFFFFFF99 :1000A000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF :1000B000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF :1000D000FFFFFFFFFFFFFFFFFFFFFFFFFFFFF :1001000016CC2C10A1101010501010101010101040 :10011000EB2569EB2F1200F008E050028090EB2FE6 :1001200000008FEB200280F4C21042E8C1C0C4C5B9

←Low-order 12 bits of the sum total (Address 1800H is example of S1C60R08)

:0000001FF

APPENDIX INTEL HEX FORMAT

Function option HEX files, segment option HEX files, and the program ROM HEX files packed by winmdc are created in Intel HEX format.

An example of data in Intel HEX format is shown below.

data volume (1 byte): Indicates the data length of each record. The maximum length of a data record is

0x10, while the end record is fixed at 0x00.

address (2 bytes): Indicates the address where the head data in a record is placed. type (1 byte): Indicates the type of hexadecimal format, currently only "00".

data (16 bytes max.): The object codes are placed here. This is not included in the end record. sum (1 byte):

This is a checksum (2's complement) from "Data volume" to the last data.

The end records are always "00000001FF".

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