



MASK162

User's Manual

4-Bit Microcontroller MSM64162-XXX Mask Option Support Tool

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Preface

This manual is prepared to describe the procedure for operating the mask option data file generator MASK162, which is used to create mask option data from the LCD segment data of MSM64162, a CMOS 4-bit microcontroller.

You are recommended to use this manual in conjunction with the following documents.

- : User's Manual for MSM64162
 - description of the MSM64162 hardware
 - description of the MSM64162 software
- : User's Manual for MSM64164
 - description of the MSM64164 hardware
 - description of the MSM64164 software
- : User's Manual for Cross Assembler ASM64X
 - description of operating procedure for the ASM64X assembler
 - description of the ASM64X assembly language
- : User's Manual for EASE64162/164
 - description of the program development support system for MSM64162/164

Contents

Chapter 1: General

1. Mask Option Data File Generator MASK162	1-1
2. Mask Option Data Files	1-2
3. Use of Mask Option Data Files	1-3

Chapter 2: Operating Procedure for MASK162

1. To Start MASK162	2-1
1.1 Operating Environment	2-1
1.2 To Start the Program MASK162	2-1
1.3 Chip Attributes	2-2
2. Selection on the Main Menu	2-4
2.1 Main Menu	2-4
2.2 To Create an LCD Segment Assignment Table	2-5
2.3 To Add New Data to the LCD Segment Assignment Table	2-10
2.4 To Display/Edit the LCD Segment Assignment Table	2-10
2.5 To Display/Edit the Option Data	2-12
2.6 To Print Out the LCD Segment Assignment Table	2-14
2.7 Shell Function	2-14
2.8 To Terminate MASK162	2-14

Chapter 3: Files

1. Mask Option Data Files	3-1
2. The Mask Option Data Related to the Addresses	3-3

Appendixes

Appendix-1: Data Tables	AP-1
Appendix-2: Entries in Mask Option Tables	AP-3

Chapter 1: General	1
Chapter 2: Operating Procedure for MASK162	2
Chapter 3: Files	3
Appendixes	

Chapter 1

1

General

☆ This chapter describes the general concept and use of MASK162.

Chapter 1: General

1. Mask Option Data File Generator MASK162

The mask option data file generator MASK162 is a program to generate mask option data files in INTEL HEX format according to the specification of each mask option for CMOS 4-bit microcontroller MSM64162, OKI. The mask option data to be created include:

- 1 Assignment of the LCD segment terminals (L0 to L23) to Port, Com and Seg
- 2 Assignment of the LCD segment terminals to display registers
- 3 Operating voltage
- 4 Existence of X'tal CG

The values set for the above mask option data will be recorded at the specified addresses in the INTEL HEX formatted file.

Figure 1-1 shows the operating modes of MASK162.

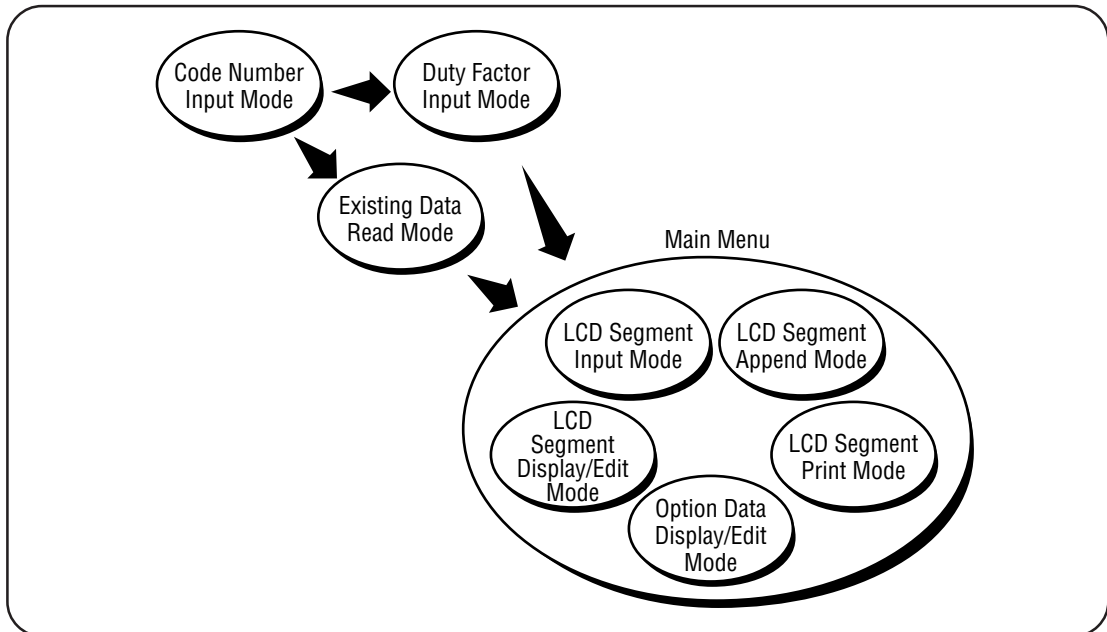


Figure 1-1 Block Diagram of MASK162

2. Mask Option Data Files

If you enter the mask option data described in Section 1., the mask option data file generator MASK162 will generate 15 data files. Figure 1-2 shows the process in which the mask option data files are generated.

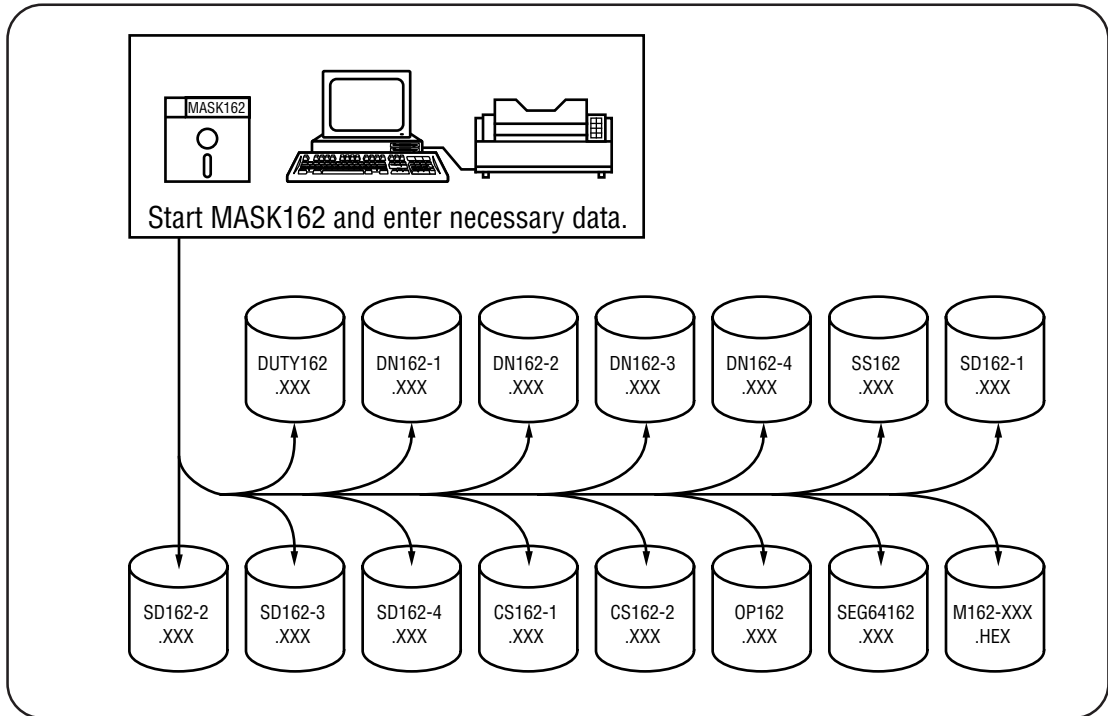



Figure 1-2 Mask Option Data File Generating Process

In Figure 1-2,  represents a data file generated by MASK162. The above mentioned INTEL HEX formatted mask option data file is represented by M162-XXX.HEX. The use of those data files is explained in the next section.



"XXX" in each file name in Figure 1-2 represents a code number. See "To Enter Chip Attributes" for details of the code numbers.

3. Use of Mask Option Data Files


The INTEL HEX formatted files generated by the mask option data file generator MASK162 (hereinafter, referred to as HEX files) are used to prepare the mask data required to manufacture MSM64162 and debug the application programs generated with the in-circuit emulator EASE 64162/164.  SEE NOTE-1

Figure 1-3 shows the successive works related to mask option data generation.

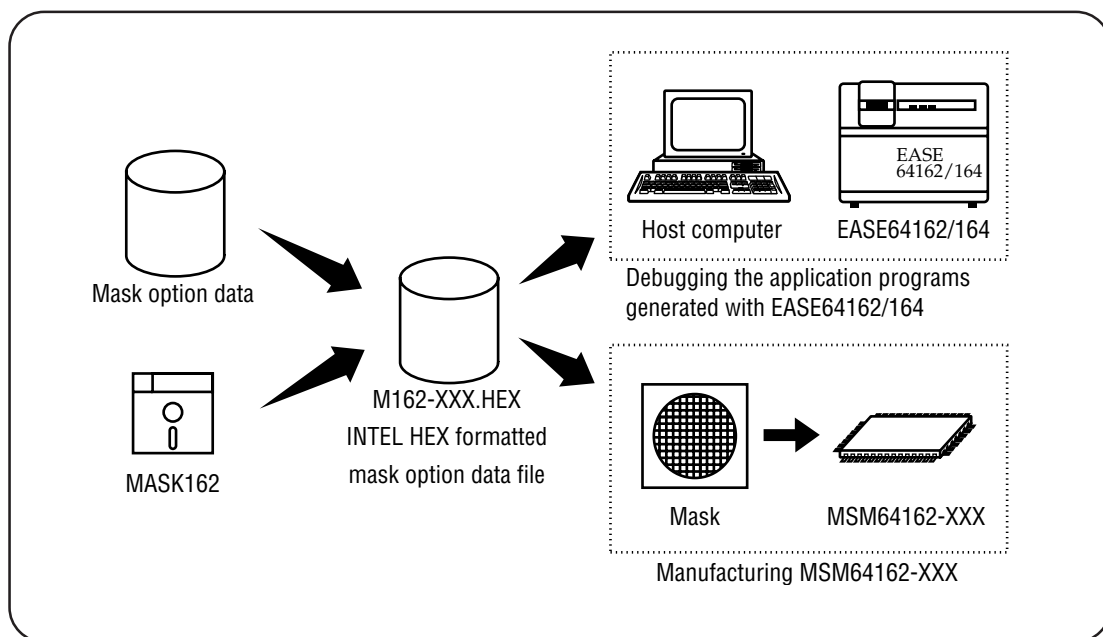


Figure 1-3 Use of Mask Option Data Files

NOTE -1 Among the information included in the INTEL HEX formatted mask option data file generated by MASK162, the information related to the assignment of segment terminals to Port, Common and Segment, and to the Display Registers, will be used for debugging the application programs generated with the in-circuit emulator EASE64162/164. Therefore, the operating voltage and the existence of X'tal CG can't be checked while debugging the application programs generated by the in-circuit emulator EASE64162/164. Use the command LODM to transfer the content of the mask option data file into EASE64162/164. See User's Manual for EASE64162/164 for details.

Chapter 2

2

Operating Procedure for MASK162



☆ This chapter minutely describes the practical procedure to operate the mask option data file generator MASK162.

Chapter 2: Operating Procedure for MASK162

1. To Start MASK162

1.1 Operating Environment

MASK162 can be started under the following condition.

MS-DOS (version 3.1 or higher) is provided as the operating system.
Free area of more than 40 Kbytes is provided.  SEE NOTE-1
The printer is available.  SEE NOTE-2



Of the "40 Kbytes", about 30 Kbytes is for the main unit of MASK162 (MASK162.EXE) and about 10Kbytes is used to record the generated files.



Make sure that the printer is ready before starting the program.

1.2 To Start the Program MASK162

Start the mask option data file generator MASK162 in the following procedures.


1. Turn on the main switch of the personal computer to start MS-DOS.
2. Start the mask option data file generator MASK162.

You can start the mask option data file generator MASK162 from the directory containing the mask option data file generator MASK162.EXE or from another directory.

- (1) To start from the directory containing MASK162.EXE,
Enter as follows in response to the DOS prompt.

```
A>MASK162 
```

- (2) To start from another directory,
Enter in the same way as in (1) if the environment variable PATH includes the directory containing MASK162.EXE. Enter as follows, if the PATH is not included.

```
A>path-name ¥ MASK162 
```

3. The following message will appear on the screen of the console and then you can enter the code number.

```
MSM64162 Mask Option Generator Version X.XX XXX XXXX  
Copyright (C) XXXX. OKI Electric Ind. Co., Ltd.  
  
[Code Number] : MSM64162-_  
_
```

MASK162 can be started with the above steps 1 to 3.



See Section 1.3 "Chip Attributes" for the code numbers to be entered in the step 3.

1.3 Chip Attributes

Once MASK162 is started, you should enter the chip attributes as mentioned in the step 3 of Section 1.2 "To Start the Program MASK162".

Enter the chip attributes as follows.


1. Enter the code number.

When MASK162 is started, the following message is displayed.

```
MSM64162 Mask Option Generator Version X.XX XXX XXXX
Copyright (C) XXXX. OKI Electric Ind. Co., Ltd.
[Code Number] : MSM64162-  
```

Enter an integer of three digits in the underlined position. The entered value will be a part of the file name or extension.

If you enter only one or two digit(s), 00 or 0 will be added before the digit(s) so that the entered value will be regarded as three-digit value.

When the  key is pressed without entering an integer, the MASK162 program will be terminated.




[Code Number] : MSM64162-123 

Entering as above, the name of the file to be generated will be as follows.

M162-123.HEX
SEG64162.123



[Code Number] : MSM64162-7 

Entering as above, the name of the file to be generated will be as follows.

M162-007.HEX
SEG64162.007





2. The following message will appear if the directory doesn't contain the file with the same code number entered in the step 1. Otherwise, proceed to the step 4.

```
SEG64162.XXX is New File
```

3. Enter the duty factor. MASK162 will ask you to enter the duty factor displaying the following message.

```
[Input Duty] : 1/2:2, 1/3:3, 1/4:4 →   
```

You can use the following combinations of keys to enter the duty factor.

2		: Sets the duty factor to 1/2.
3		: Sets the duty factor to 1/3.
4		: Sets the duty factor to 1/4.
		: Sets the duty factor to the default of 1/4.

The entered value will be stored in the file DUTY162.XXX.

4. The file SEG64162.XXX with the code number entered in the step 1 will be read from the current directory. It won't be read if the current directory contains the file from the beginning. (See Step 2)

SEG64162.XXX File Reading ...



SEG64162.XXX, OP162.XXX and DUTY162.XXX will be read in this step.

5. After the duty factor is entered or the reading of the file SEG64162.XXX is completed, the main menu page will be shown and you can select an operation mode from the menu.

2. Selection on the Main Menu

2.1 Main Menu

After the chip attributes are defined, the mask option data file generator MASK162 will display the main menu page as shown below, enabling you to select the operation mode.

```


<<MSM64162 Mask Option Generator>>
      - MENU -
      1 : Create LCD Segment
      2 : Append LCD Segment
      3 : Display and Edit LCD Segment
      4 : Display and Edit Option Data
      5 : Print LCD Segment
      6 : MS-DOS
      7 : Exit

      Select (1-7) → _
```

You can select the operation mode by entering the desired number from 1 to 7 in the underlined area.

MASK162 will act as follows according to the entered number.

```

      1 : Creates the LCD segment mask option data table.
      2 : Adds new data to an existing LCD segment mask option data table.
      3 : Displays/edits the LCD segment mask option data table.
      4 : Displays/edits the option data.  SEE NOTE-1
      5 : Prints out the LCD segment mask option data table.
      6 : Starts the command processor COMMAND.COM.
      7 : Terminates the program MASK162.
```

See the description on the next page for details of each operation mode.

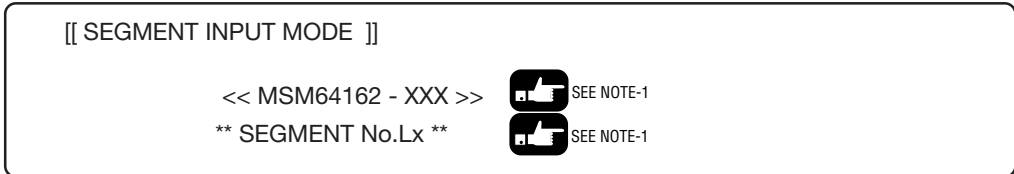


Option data includes the operating voltage and the existence of X'tal CG.

2.2 To Create an LCD Segment Assignment Table

In this mode, you can enter the segment data for each segment number in the LCD mask option data table.

Select "1" in the main menu page. The following message will be displayed.

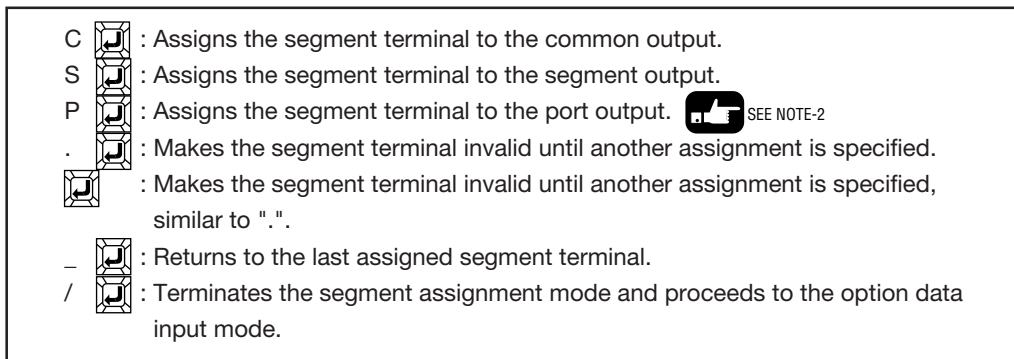


Now enter the necessary data according to the following procedures.

1. Select Com, Seg or Port.



You can enter one of the above three in the underlined position. The following combinations of keys can be used for the entry.

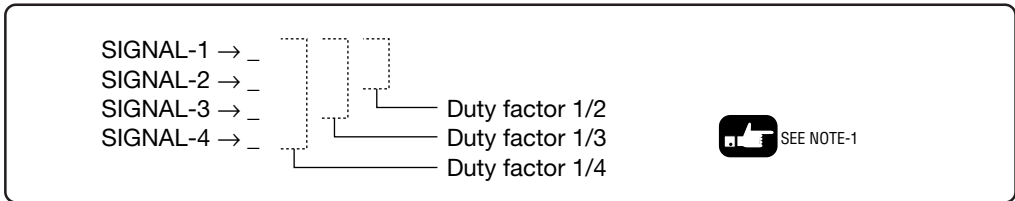


"XXX." will be replaced by the code number entered in the step 1 in Section 1.3. "No.Lx" will be replaced by the current segment number. The segment number must be equivalent to or smaller than 23.



You can enter "P", i.e. assign the segment terminal to the port output, only when the segment number is equivalent to or larger than 16.

2. Enter the LCD segment name (SIGNAL).



You can enter the segment name in the underlined position. Each segment name shall consist of up to 6 alphanumericals.

In addition to the alphanumeric keys, you can use the following combinations of keys.

- : Makes the segment invalid.
- : You can jump to the next segment terminal, omitting the successive segment name entries.
- : You can go back to the segment assignment mode (selection of Com, Seg or Port) for the same segment terminal.
- : Terminates the segment name input mode and proceeds to the option data input mode.



If you select "C" in the step 1, i.e. the segment terminal is assigned to the common output, the segment names shall be as follows.

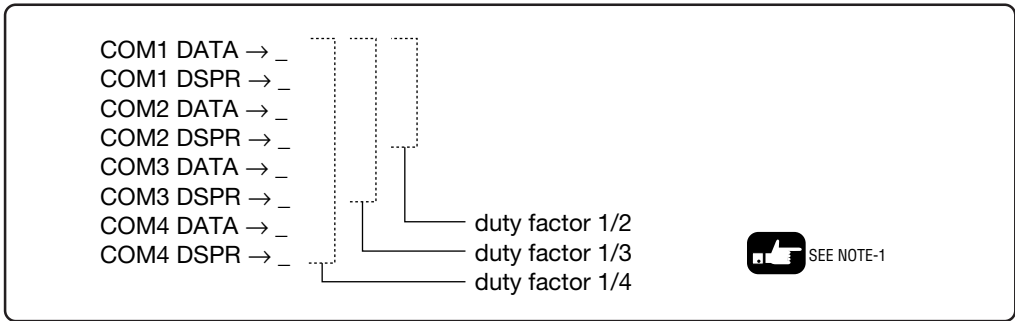
SIGNAL-1 : "COM1"
 SIGNAL-2 : "COM2"
 SIGNAL-3 : "COM3"
 SIGNAL-4 : "COM4"

If you select "P" in the step 1, i.e. the segment terminal is assigned to the port output, you need to enter only for SIGNAL-1.



The number of the signals to be entered depends on the duty factor. With the duty factor 1/2 for example, two signals of SIGNAL-1 and SIGNAL-2 will be available.

3. Define the registers for the data to be indicated (enter DATA and DSPR).



You can enter the segment data in each underlined position following DATA and the display register number following DSPR.

The segment data shall be a lower case alphabet from "a" to "d".

The display register number shall be a number from 0 to 20 (decimal notation).

In addition to the above characters, you can use the following combinations of keys.

- : : Makes the indication data register invalid.
- : : You can jump to the next segment terminal, omitting the successive entries.
- : : You can go back to the segment assignment mode (selection of Com, Seg or Port) for the same segment terminal.
- / : Terminates the indication data register input mode and proceeds to the option data input mode.



If you select "C" in the step 1, MASK162 will skip this step.
 If you select "P" in the step 1, you need to enter only for COM1DATA and COM1DSPR.
 In this case, the display register number shall be 0 or 1.



The number of the data registers to be entered depends on the duty factor. With the duty factor 1/2 for example, two registers for COM1 and COM2 will be available.

4. Determine the operating voltage.

After entering all the necessary data for segment terminals in the steps 1 to 3 or terminating with "/", you are required to determine the operating voltage and the existence of X'tal CG.


[[SEGMENT INPUT MODE]]


<< MSM64162 - XXX >>


Voltage of Power Supply (1.5v : 0 / 3v : 1)


Input → _

You can use one of the following key entries to determine the operating voltage.

0  : Sets the operating voltage to 1.5 V.

1  : Sets the operating voltage to 3 V.

 : You can jump to the X'tal CG existence determination mode.
The operating voltage will be set to the default of 1.5 V.


/  : Terminates the operating voltage determination mode.


5. Determine whether the X'tal CG exists or not.


X'tal CG Existence (Nonexist : 0 / Exist : 1)


Input → _


You can use one of the key entries shown on the next page to determine the X'tal CG existence.

0  : Sets internal X'tal CG to nonexist. (requires external CG)


1  : Sets internal X'tal CG to exist.

 : Terminates the X'tal CG definition mode, setting internal X'tal CG to nonexist.

-  : You can go back to the operating voltage input mode.



/  : Terminates the X'tal CG definition mode.

6. Save the file.

When all the necessary data in the steps 1 to 5 are entered, the following message is displayed asking whether you will create the file or not.  SEE NOTE-1

File Create? (Y/N) → _

You can use the following combinations of keys.

"Y" : You will create the file.
"N" : You won't create the file.

If you key in "Y", the following message is displayed and the saving starts.

File Creating...

When the file is completely saved, the following message is displayed followed by the main menu page.

HEX.file M162_XXX.HEX Created



This procedure is used not only in file create mode to create a new LCD segments assignment table but also in Append and Display/Edit mode to add to or display/edit an existing one.

2.3 To Add New Data to the LCD Segment Assignment Table

Adding procedure is essentially the same as the creating procedure described in Section 2.2 except that it is used to enter additional data after reading out the segment data already saved in a file. If you select "2" in the main menu page, the following message is displayed.

```

[[ SEGMENT APPEND MODE ]]

<< MSM64162 - XXX >>
** SEGMENT No.Lx **
    
```

"SEGMENT No.Lx" represents the next number of the last entered segment terminal number. If you enter all the segments before the file is saved, you will begin with the maximum segment number 23.

See Section 2.2 "To Create an LCD Segment Assignment Table".

2.4 To Display/Edit the LCD Segment Assignment Table

The entered or read segment data will be displayed in units of 10 in a table format. If any data is to be edited, you must specify the segment terminal number of that data. If you select "3" in the main menu page, the following screen page will displayed.

```

[[ DISPLAY & EDIT MODE ]]


<<MSM64162 - XXX>>          - Segment Data -          Page 1
    
```


SEG	SIGNAL	C/S/P	COM1		COM2		COM3	
			DATA	DSPR	DATA	DSPR	DATA	DSPR
L0	XXX/ XXX/ XXX	S	a	12	b	12	c	17
L1	/ / .	.	.	.	.	.	.	.
L2	/ / .	.	.	.	.	.	.	.
L3	/ / .	.	.	.	.	.	.	.
L4	/ / .	.	.	.	.	.	.	.
L5	/ / .	.	.	.	.	.	.	.
L6	/ / .	.	.	.	.	.	.	.
L7	/ / .	.	.	.	.	.	.	.
L8	/ / .	.	.	.	.	.	.	.
L9	/ / .	.	.	.	.	.	.	.


```


Edit Number (Next : CR, Back : -, To Menu : /) → _
    
```


You can use the following combinations of keys in this mode.

numeric  : Displays the segment data corresponding to the entered segment terminal number. You can enter any number from 0 to 9 in this case.

-  : You can go back to the previous page.

 : Displays the next 10 segment data.

/  : You can go back to the main menu page.

If you enter a number and , the segment data corresponding to the entered segment terminal number is displayed, where you are required to select Com, Seg or Port as shown in the next page.

NOTE


The page shown above is an example of 1/3 duty mode.



[[DISPLAY & EDIT MODE]]

<<MSM64162 - XXX>>


SEG	SIGNAL	C/S/P	COM1	COM2	COM3
			DATA DSPR	DATA DSPR	DATA DSPR
LX	XXX/ XXX/ XXX	S	a 12	b 12	c 17

Com / Seg / Port → _

 SEE NOTE-1

The procedure used in this mode is almost the same as the one shown in Section 2.2 "To Create an LCD Segment Assignment Table" except that you can skip the current entry to the next one by entering  (space) .

EXAMPLE

Enter  in this position.

Com / Seg / Port → ___ NOT CHANGE

SIGNAL-1 → ← Enter the next entry.

When you reach the last page or terminate the input mode by entering "/", MASK162 will ask whether you will update the file or not, using the same prompt shown in the step 6 in Section 2.2 if the content of the file data has any change.

NOTE
-1

"LX" represents the entered segment number. If the segment number 10 is entered for example, "L10" will be indicated at this position.

2.5 To Display/Edit the Option Data

In this mode, the entered or read option data can be displayed on the screen. If you select "4" in the main menu page, the following screen page is displayed.


[[OPTION DATA EDIT MODE]]


<<MSM64162 - XXX>> - Option Data -


Voltage of Power Supply	X'tal CG Existence
(0 : 1.5v / 1: 3.0v)	(0 : Nonexist / 1 : Exist)
X	X

Edit Option Data? (Y/N) → _

You can use one of the following combinations of keys.

"Y"  : You can go into the option data input mode.

"N"  : You can escape from the option data input mode.


If you key in "Y" , the following screen page is displayed to determine the operating voltage.

[[OPTION DATA EDIT MODE]]


<< MSM64162 - XXX >>

Voltage of Power Supply (1.5v : 0 / 3v : 1)

Input → _

See the step 4 in Section 2.2 "To Create an LCD Segment Assignment Table" for the keys to be used in this mode. Note that keying in  in this mode will not change the operating voltage, while it will set the voltage to 1.5 V (default) in the step 4 in Section 2.2. In the following screen page, you are required to define the X'tal CG existence.



X'tal CG Existence (Nonexist : 0 / Exist : 1)
Input → _

See the step 5 in Section 2.2 "To Create an LCD Segment Assignment Table" for the keys to be used in this mode. Note that keying in  in this mode will not change the state of X'tal CG existence, while it will set the state to "nonexist" in the step 4 in Section 2.2.

If there is any change in the data, the following message is displayed to determine whether you will create a file or not.

File Create? (Y/N) → _

You can use one of the following combinations of keys.

"Y"  : You will create a file.
"N"  : You won't create a file.

2.6 To Print Out the LCD Segment Assignment Table

In this mode, you can print out the already entered or read LCD mask option data. If you select "5" in the main menu page, the following message is displayed.

*** Setup Printer & Hit Anykey !! ***

Making sure that the printer is ready, press any one key to print the mask option table.



If the printer is not ready, the key entry may be rejected. Therefore, make sure that the printer is ready before starting the print out operation.

2.7 Shell Function

Select "6" in the main menu page to start the command processor COMMAND.COM. The system needs to have sufficient free RAM area for the program to be executed, in order to activate this shell function. Resident part of MASK162.XXX requires RAM area of about 30 Kbytes. Therefore, the total RAM area required for the shell function will be:

30 Kbytes + RAM area required by COMMAND.COM

Enter as follows to terminate the COMMAND.COM program.

A > EXIT

2.8 To Terminate MASK162

Select "7" in the main menu page to terminate MASK162.



Be sure to check the data you have entered or updated is successfully saved before terminating the program.

Chapter 3

Files

☆ This chapter describes the mask option data files to be generated by MASK162.

Chapter 3: Files

1. Mask Option Data Files

The mask option data file generator MASK162 generates 15 data files as shown below. "XXX" in the file name represents the code number entered in the step 1 in Section 1.3, Chapter2.

SEG64162.XXX	SD162_1.XXX
DUTY162.XXX	SD162_2.XXX
OP162.XXX	SD162_3.XXX
DN162_1.XXX	SD162_4.XXX
DN162_2.XXX	SS162.XXX
DN162_3.XXX	CS162_1.XXX
DN162_4.XXX	CS162_2.XXX
SEG162_XXX.HEX	

Following are the detailed descriptions of each file.

1.1 File SEG64162.XXX

This file stores the segment data related to all the segment terminals. It will be read by MASK162.

1.2 File DUTY162.XXX

This file stores the duty factors entered as a part chip attributes. It will be read by MASK162.

1.3 File OP162.XXX

This file stores the option data (the operating voltage and the existence of the X'tal CG). It will be read by MASK162.

1.4 File DN162_1.XXX

This file stores the display register numbers for COM1.

1.5 File DN162_2.XXX

This file stores the display register numbers for COM2.

1.6 File DN162_3.XXX

This file stores the display register numbers for COM3.

1.7 File DN162_4.XXX

This file stores the display register numbers for COM4.

1.8 File SD162_1.XXX

This file stores the segment data for COM1.

1.9 File SD162_2.XXX

This file stores the segment data for COM2.

1.10 File SD162_3.XXX

This file stores the segment data for COM3.

1.11 File SD162_4.XXX

This file stores the segment data for COM4.

1.12 File SS162.XXX

This file stores the segment attributes data.

1.13 File CS162_1.XXX

This file stores the common select data for VDD, VPC, VPS, VNC, VNS and VSS. These symbols represent the voltage level at specified points on the MSM64162 chip.

1.14 File CS162_2.XXX

This file stores the common select data for CON, COF, POLS, POLC, TDC1, PON and POF. These symbols represent the LCD display control signals for the MSM64162 chip.

1.15 File SEG162_XXX.HEX

This is a HEX file generated from the above files (1.3 to 1.14). The file will be loaded on EASE64162/164.

2. The Mask Option Data Related to the Addresses

Table 3-1 shows the addresses of the HEX file assigned to the MASK OPTION data.

Table 3-1 The mask Option Data Related to the Addresses

3

Address	Data Stored
0H to 021H	Display register number for COM1
100H to 121H	Display register number for COM2
200H to 221H	Display register number for COM3
300H to 321H	Display register number for COM4
400H to 421H	Segment data for COM1
500H to 521H	Segment data for COM2
600H to 621H	Segment data for COM3
700H to 721H	Segment data for COM4
800H to 821H	Segment attributes data
900H to 921H	High order 6 bits of the common select data
A00H to A21H	Low order 7 bits of the common select data
B00H	Option data

Appendixes

Appendixes

Appendix-1: Data Tables

Table AP-1 Display Register Number Data Table

DSPR	AD4	AD3	AD2	AD1	AD0	DSPR	AD4	AD3	AD2	AD1	AD0
00	01	01	01	01	01	11	01	10	01	10	10
01	01	01	01	01	10	12	01	10	10	01	01
02	01	01	01	10	01	13	01	10	10	10	10
03	01	01	01	10	10	14	01	10	10	01	01
04	01	01	10	01	01	15	01	10	10	10	10
05	01	01	10	01	10	16	10	01	01	01	01
06	01	01	10	10	01	17	10	01	01	10	10
07	01	01	10	10	10	18	10	01	01	01	01
08	01	10	01	01	01	19	10	01	01	10	10
09	01	10	01	01	10	20	10	01	10	01	01
10	01	10	01	10	01						

This table is used to create the files DN162_1.XXX, DN162_2.XXX, DN162_3.XXX and DN162_4.XXX. The display register number data are associated with the HEX file data at the addresses from 0H to 321H.

Table AP-2 Segment Data Table

	DATA	D7	D6	D5	D4	D3	D2	D1	D0
DSPR even number	a	0	0	0	0	0	0	0	1
	b	0	0	0	0	0	0	1	0
	c	0	0	0	0	0	1	0	0
	d	0	0	0	0	1	0	0	0
DSPR odd number	a	0	0	0	1	0	0	0	0
	b	0	0	1	0	0	0	0	0
	c	0	1	0	0	0	0	0	0
	d	1	0	0	0	0	0	0	0

This table is used to create the files SD162_1.XXX, SD162_2.XXX, SD162_3.XXX and SD162_4.XXX. The segment data are associated with the HEX file data at the addresses from 400H to 721H.

Table AP-3 Segment Attributes Data Table

Attributes of segment terminals	S4	$\overline{S4}$	S3	$\overline{S3}$	S2	$\overline{S2}$	S1	$\overline{S1}$
Used as COM1	0	1	0	1	0	1	1	0
Used as COM2	0	1	0	1	1	0	0	1
Used as COM3	0	1	1	0	0	1	0	1
Used as COM4	1	0	0	1	0	1	0	1
Used as 1/4 duty segment	0	0	0	0	0	0	0	0
Used as 1/3 duty segment	0	1	0	0	0	0	0	0
Used as 1/2 duty segment	0	1	0	1	0	0	0	0
Used as PORT	0	1	0	1	0	1	0	0
Not used	0	1	0	1	0	1	0	1

This table is used to create the file SS162.XXX.

The segment attributes data are associated with the HEX file data at the addresses from 800H to 821H.

Table AP-4 Common Select Data Table

C/S/P	VDD	VPC	VPS	VNC	VNS	VSS	CON	COF	POLS	POLC	TDC1	PON	POF
C	0	1	0	1	0	0	1	0	0	1	0	0	1
P	0	0	1	0	1	0	0	1	1	0	0	0	1
P	1	0	0	0	0	1	0	1	0	0	1	1	0
Not used	0	1	0	1	0	0	1	0	0	1	0	0	1

CS162_1.XXX data

CS162_2.XXX data

This table is used to create the file CS162_1.XXX and CS162_2.XXX.

The common select data are associated with the HEX file data at the addresses from 900H to A21H.

Table AP-5 Option Data Table

Operating voltage	VS	X'tal CG	CG
1.5 V	0	nonexist	0
3.0 V	1	exist	1

This table is used to create the file OP162.XXX.

The option data is associated with the HEX file data at the address of B00H.

Appendix-2: Entries in Mask Option Tables

-1/3 duty-

SEG	SIGNAL			C/S/P	COM1		COM2		COM3	
					DATA	DSPR	DATA	DSPR	DATA	DSPR
L0	L1/	9A/	1C	S	a	10	a	08	c	00
L1	L2/	1B/	1G	S	b	10	b	00	c	01
L2	1A/	1F/	1E	S	a	00	b	01	a	01
L3	2B/	2C/	L10	S	b	02	c	02	b	09
L4	2A/	2G/	2D	S	a	02	c	03	d	02
L5	2F/	2E/	.	S	b	03	a	03	.	00
L6	3B/	3C/	L11	S	b	04	c	04	c	09
L7	3A/	3G/	3D	S	a	04	c	05	d	04
L8	L3/	3F/	3E	S	c	10	b	05	a	05
L9	L4/	4B/	.	S	d	10	b	06	.	00
L10	4A/	4G/	4C	S	a	06	c	07	c	06
L11	4F/	4E/	4D	S	b	07	a	07	d	06
L12	L5/	L6/	L7	S	a	12	b	12	c	12
L13	./	./	COM3	C	.	00	.	00	.	00
L14	./	./	.	.	.	00	.	00	.	00
L15	./	./	.	.	.	00	.	00	.	00
L16	./	./	.	.	.	00	.	00	.	00
L17	./	./	.	.	.	00	.	00	.	00
L18	./	./	.	.	.	00	.	00	.	00
L19	./	COM2/	.	C	.	00	.	00	.	00
L20	COM1/	./	.	C	.	00	.	00	.	00
L21	L8/	8E/	8F	S	d	12	a	17	b	17
L22	8D/	8G/	8A	S	d	16	c	17	a	16
L23	8C/	8B/	7A	S	c	16	b	16	a	14

Voltage of Power Supply	X'tal CG Existence
(0 : 1.5v / 1 : 3.0v)	(0 : Nonexist / 1 : Exist)
0	0

Appendix-2: Entries in Mask Option Tables

-1/4 DUTY-

SEG	SIGNAL				C/S/P	COM1		COM2		COM3		COM4	
						DATA	DSPR	DATA	DSPR	DATA	DSPR	DATA	DSPR
L0	COM1/	./	./	.	C	.	00	.	00	.	00	.	00
L1	8A/	8B/	10B/	10A	S	a	10	b	10	b	14	a	14
L2	8F/	8G/	10F/	8C	S	b	11	c	11	b	15	c	10
L3	8E/	8D/	9C/	9B	S	a	11	d	10	c	12	b	12
L4	DEGREE/	19/	9G/	9A	S	d	09	d	11	c	13	a	12
L5	7B/	7C/	9F/	9H	S	b	08	c	08	b	13	d	13
L6	7A/	7G/	9J/	7D	S	a	08	c	09	b	16	d	08
L7	7F/	6B/	14B/	14C	S	b	09	b	06	b	14	c	14
L8	6A/	6G/	6D/	RECALL	S	a	06	c	07	d	06	a	15
L9	4A/	4G/	4D/	SPL	S	a	04	c	05	d	04	d	15
L10	4F/	4E/	HAND/	20	S	b	05	a	05	d	17	c	18
L11	3B/	3C/	BUZZER/	TMR	S	b	02	c	02	c	16	d	15
L12	3A/	3G/	3D/	12B	S	a	02	c	03	d	02	b	10
L13	3F/	3E/	BELL/	STW	S	b	03	a	03	d	16	b	16
L14	17/	18/	2C/	RPT	S	b	18	a	18	c	00	d	19
L15	2A/	2B/	2G/	2D	S	a	00	b	00	c	01	d	00
L16	1B/	2F/	2E/	12A	S	b	12	b	01	a	01	a	10
L17	./	COM2/	./	.	C	.	00	.	00	.	00	.	00
L18	./	./	COM3/	.	C	.	00	.	00	.	00	.	00
L19	1ADEG/	24/	11ADEG/	11C	S	a	12	d	14	a	14	c	14
L20	12D/	1C/	11B/	12E	S	d	10	c	12	b	14	a	11
L21	12C/	P/	12F/	12G	S	c	10	d	12	b	11	c	11
L22	13E/	4C/	ALM/	13F	S	a	13	c	04	c	15	b	13
L23	13D/	4B/	13A/	13G	S	d	12	b	04	a	12	c	13

Voltage of Power Supply	X'tal CG Existence
(0 : 1.5v / 1 : 3.0v)	(0 : Nonexist / 1 : Exist)
1	1