MF1089-01a

EPSON

CMOS 8-BIT SINGLE CHIP MICROCOMPUTER **E0C88409**

DEVELOPMENT TOOL MANUAL

ENERGY SAVING EPSON

SEIKO EPSON CORPORATION

Contents

1 OUTLINE OF PACKAGE

1.1 Preface

The "E0C88409 Development Tool" package is a software development tool package for the CMOS 8-bit single chip microcomputer E0C88 Family, and consists of software tools necessary for debugging by the ICE88R/EVA88 and mask option setting of the E0C88409. The "E0C88 Family Structured Assembler" package is also necessary for the software development.

Program unused area filling utility **fil88409**

Function option generator **fog88409**

Mask data checker **mdc88409**

Self-diagnostic program **t88409**

1.2 Provided Floppy Disks

This package includes the following floppy disks which are necessary for debugging by the ICE88R/ EVA88 and mask option setting of the IC for the E0C88409 development.

1) 3.5" floppy disk (2HD) for IBM-PC/AT 1
2) E0C88409 Development Tool Manual (this manual) ... 1

The type of the personal computer that can be used with the development system and the restrictions are described in "2.1 System Configuration", be sure to read before to use.

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

Note: Use the DISKCOPY for backup of the original disk.

The contents of the floppy disk and installation procedure of the software development tools are explained in "2.2 Installation".

1.3 Outline of Software Tool

Figure 1.3.1 shows the software development flow.
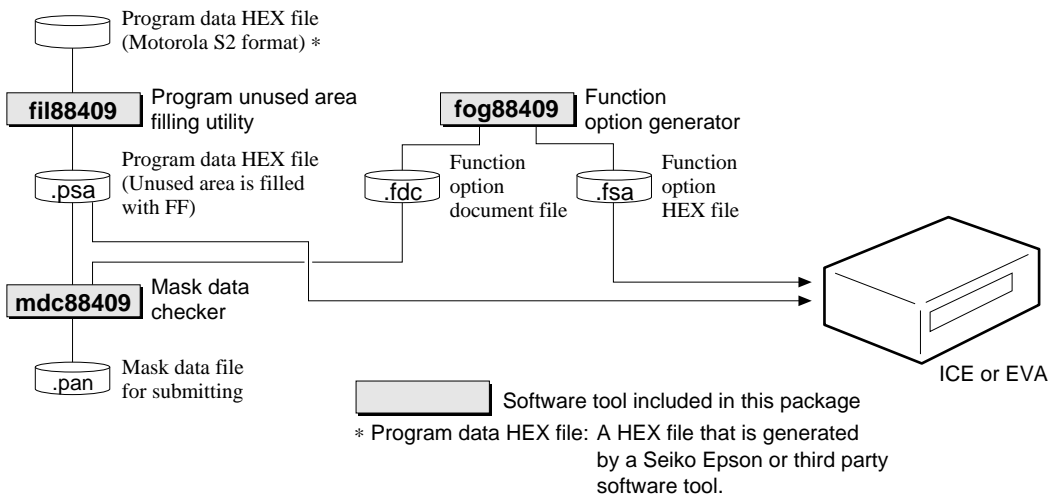
Fig. 1.3.1 Software development flow

Outline of the basic function of each program are as follows.

1.3.1 Program unused area filling utility <fil88409>

The program unused area filling utility fil88409 is a tool for filling the unused area of the E0C88409 built-in ROM with the FF and setting the system code for the system reserved area of the E0C88409 when debugging using the ICE88R or EVA88 and for submitting mask data to Seiko Epson, for E0C88409 software development.

1.3.2 Function option generator <fog88409>

In the E0C88409, 10 items such as an I/O port function can be selected as mask option. The function option generator fog88409 is a tool that can interactively select the E0C88409 mask option settings and generates the mask option setting file for the ICE88R/EVA88 and the function option document file for generating the mask pattern.

1.3.3 Mask data checker <mdc88409>

The mask data checker mdc88409 is a tool to check the format of the program data that the unused area of the built-in ROM is filled with FFH and the E0C88409 system code is set and the function option document file for generating mask pattern, and to convert data developed by the customer to the mask data for submitting to Seiko Epson. So the customer's data becomes mask IC exactly.

1.3.4 Self-diagnostic program <t88409>

This package includes the self-diagnostic program to check the ICE88R/EVA88 and the PRC88409 hardware and the function option data. Perform a self-diagnostic of the ICE88R/EVA88 and PRC88409 periodically using this program when using the ICE88R/EVA88 and the PRC88409 for debugging.

Note: When submitting mask data to Seiko Epson, you should use the mdc88409 and it must include program data in the mask data, even if you use the E0C88409 in the MPU mode that does not need to make a mask for internal ROM; it needs masking only for the mask option (I/O settings, etc.).

2 DEVELOPMENTAL ENVIRONMENT AND INSTALL

Here we will explain the configuration of the program development system and installation procedure for the software tools.

2.1 System Configuration

The system configuration that is necessary for the program development using this package is shown below.

2.1.1 Development using IBM-PC/AT

Model: IBM-PC / AT and the full compatible (∗1)
DOS: PC-DOS ver. 3.3 or higher
 MS-DOS ver. 3.3 or higher
RAM capacity:
 640K bytes (∗2)
Hard disk drive:
 Free space more than 200K bytes is
 necessary (∗3)
Floppy disk drive:
 3.5 inches, 2HD (1.44M bytes),
 1 drive or more
CRT & graphic board:
 EGA, VGA (text display only, fixed at 80
 character × 25 lines)
Printer: For listing (only character printing)
Other software:
 Editor For source file creation / modification

Restrictions:
∗1 Compatible with models that use Intel 80 × 86
 system for CPU.
 The interface board for debugging with the
 ICE88R is compatible with the ISA bus.
∗2 This system operates in the real mode and does
 not use EMS and protected memory.
∗3 Assumes to use HD basically.

2.2 Installation

Here we will explain the installing of the programs included in this package. The contents of the floppy disk supplied with this package are shown in Figure 2.2.1.
Keep the original disk in a safe place as a backup after installing.

Note: Use the DISKCOPY for backup of the original disk.

2.2.1 Installer

This package includes the exclusive installer "setup409.exe" to install the software tools on the customer's disk drive. Install the software tools in this package by starting this installer.

Path name to install is fixed at \88409 in the default, but the setting that appending the upper layered path name to \88409 is possible.
When installing other software tools of the E0C88 Family, by setting the same upper layered path name like this, file management on the disk will be easy.

Example: When setting to append "EPSON" in the upper layered path name.

3
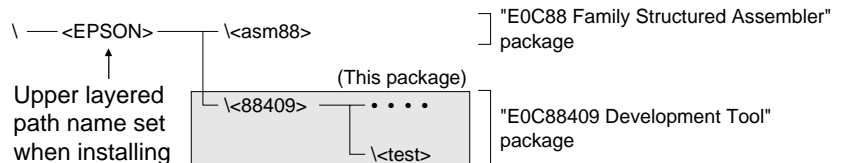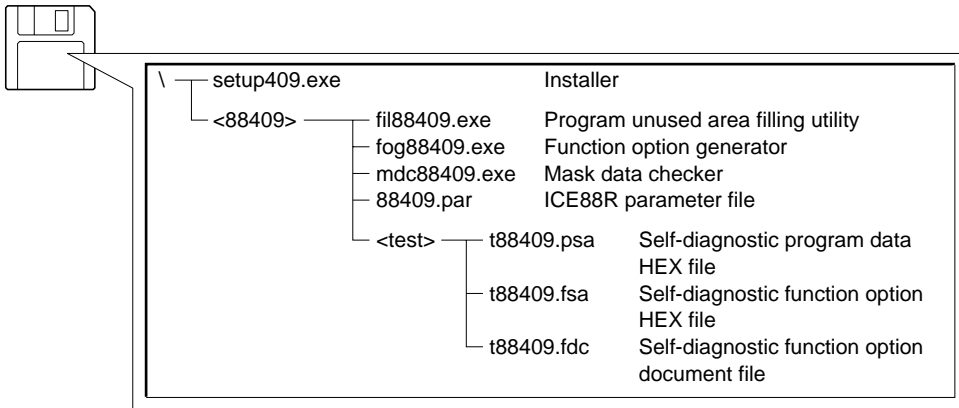
Fig. 2.2.1 Contents of floppy disk

Note: The batch file is installed in the directory ···\<88409>. Use it after copying to your work directory if necessary.

2.2.2 Installation procedure

The E0C88 Family software tools need capacity approximate 200K bytes including a work area in case of all the program is installed. Therefore, we recommend to use HD (hard disk) basically. The twin-drive FD model can be used.

The exclusive installer in this package checks the free space on the disk to be installed. If there is not enough free space on the install destination disk, reserve free space on the disk to perform file deletion and backup.

■ Operation procedure

(1) Insert the floppy disk in this package into a drive.

(2) Start the installer.
    When starting the installer, be sure to set English mode.

    A:setup409↵

Hereafter, install according to the messages displayed as below.

1. Initial screen

```
┌────── E0C88 Family Development Tool Install Utility Ver. X.XX ──────┐
│                                                                       │
│              Copyright(C) SEIKO EPSON CORP. 199x                      │
│                                                                       │
│         ******** E0C88409 Development Tool ********                   │
│                                                                       │
│ Enter install drive from   [ A ]    ◄────── Transfer source drive (original disk)
│                                                                       │
│ Enter copy drive & path to [ C:\88409\                            ]   │
│                              ▲                                        │
│                              └──── Transfer destination drive         │
│                                    and path (default setting)         │
│                                                                       │
│                                      (Quit :  Ctrl + C )              │
│                                                                       │
│ ************************  Message Window  ************************    │
│ *  OK : Enter                                               *         │
│ *  Caution : Install and copy drive must be set different name   *    │
│ *                                                           *         │
│ ****************************************************************       │
└───────────────────────────────────────────────────────────────────┘
```

2. Changing transfer destination drive and path

```
┌──────── E0C88 Family Development Tool Install Utility Ver. X.XX ────────┐
│                                                                          │
│              Copyright(C) SEIKO EPSON CORP. 199x                         │
│                                                                          │
│           ******** E0C88409 Development Tool ********                    │
│                                                                          │
│  Enter install drive from   [ A ] ◄────────  The transfer source drive can also be changed by
│                                              return the cursor to this position.
│  Enter copy drive & path to [ C:\88409\                              ]   │
│                               ▲   └──────── The appending path of the transfer destination disk can
│                               │             be set by setting the cursor to this position.
│                               └──────────── The transfer destination drive can also be changed by
│                                             setting the cursor to this position.
│                                                                          │
│                                        (Quit :  Ctrl + C )               │
│                                                                          │
│  ************************  Message Window  ************************       │
│  *  Enter appends a path from default setting (max 40 char)      *       │
│  *                                                               *       │
│  *                                                               *       │
│  ****************************************************************        │
└──────────────────────────────────────────────────────────────────────┘
```

3. Registration of appending path of transfer destination

```
┌──────── E0C88 Family Development Tool Install Utility Ver. X.XX ────────┐
│                                                                          │
│              Copyright(C) SEIKO EPSON CORP. 199x                         │
│                                                                          │
│           ******** E0C88409 Development Tool ********                    │
│                                                                          │
│  Enter install drive from   [ A ]                                        │
│                                                                          │
│  Enter copy drive & path to [ C:\EPSON\88409\                        ]   │
│                                      └──────── Set appending path to transfer destination disk.
│                                                                          │
│                                        (Quit :  Ctrl + C )               │
│                                                                          │
│  ************************  Message Window  ************************       │
│  *  Enter appends a path from default setting (max 40 char)      *       │
│  *                                                               *       │
│  *                                                               *       │
│  ****************************************************************        │
└──────────────────────────────────────────────────────────────────────┘
```

4. Confirmation of transfer source disk (original) insertion

```
┌────────── E0C88 Family Development Tool Install Utility Ver. X.XX ──────────┐
│                                                                            │
│                  Copyright(C) SEIKO EPSON CORP. 199x                       │
│                                                                            │
│              ******** E0C88409 Development Tool ********                   │
│                                                                            │
│  Install drive from : A:\              ◄──────── Confirm setting by Enter key
│                                                                            │
│  Copy drive to      : C:\EPSON\88409\  ◄──────── Confirm setting by Enter key
│                                                                            │
│                                                                            │
│                          ┌──── Volume name of original disk                │
│                          │                                                 │
│                          │                                                 │
│                          ▼                      (Quit :  Ctrl + C )        │
│  ************************  Message Window  ************************         │
│  *  Insert install disk [ 88409_DISK1 ] to specified drive       *        │
│  *                                                               *        │
│  *                    Press any key to continue_                  *        │
│  ***************************************************************            │
└────────────────────────────────────────────────────────────────────────────┘
```

After setting the transfer source drive and transfer destination drive by Enter key respectively, the installer waits for confirmation of the transfer source disk (original) insertion.

⇩

Installation starts by inputting any key in this status.

The file name to be transferred is displayed in the "Message Window" during installing. When the installation is completed normally, an end message is displayed in the "Message Window".

5. Error

```
┌────────── E0C88 Family Development Tool Install Utility Ver. X.XX ──────────┐
│                                                                            │
│                  Copyright(C) SEIKO EPSON CORP. 199x                       │
│                                                                            │
│              ******** E0C88409 Development Tool ********                   │
│                                                                            │
│  Install drive from : A:\                                                  │
│                                                                            │
│  Copy drive to      : C:\EPSON\88409\                                      │
│                                                                            │
│                                                                            │
│                                                                            │
│                                                 (Quit :  Ctrl + C )        │
│  ************************  Message Window  ************************         │
│  *  Insufficient disk space  ◄── If an error has occurred during installing, an error  *
│  *                              message is displayed in the "Message Window".   *        │
│  *                    Press any key to continue_                  *        │
│  ***************************************************************            │
└────────────────────────────────────────────────────────────────────────────┘
```

Note: When an error which is not fatal is generated in the installing stage, the installer returns to the initial screen and the operation can be continued. However, when "Quit" or a fatal error is generated, the installer is forcibly terminated. (In this case, delete all the file which are installed incompletely.)

\<Messages of installer\>

1. Start-up message

```
E0C88 Family Development Tool Install Utility Ver. X.XX
Copyright (C) SEIKO EPSON CORP. 199x
```

2. Setting, confirmation and operating messages

Message	Explanation
Enter install drive from	Transfer source drive name
Enter copy drive & path to	Transfer destination drive name
Caution : Install and copy drive must be set different name	Transfer source drive name and transfer destination drive name must be set to different names.
Insert install disk [volume name] to specified drive	Insert the transfer source disk [volume name] into the specified drive.
Copy drive and path is [drive and path name]	Transfer destination drive and path is [drive name and path name].
Enter appends a path from default setting (max 40 char)	Input path name appending to the default setting.
Install drive from : [Install drive and path name]	Transfer source drive is [drive name and path name].
Copy drive to : [Copy drive and path name]	Transfer destination drive is [drive name and path name].
Copying [reading file]	Reading transfer source file [file name].
to [writing file]	Writing transfer destination file [file name].
Press any key to continue	Press any key to continue the installer.
Press any key to exit	Press any key to terminate the installer.
E0C88 Family Dev. Tools install utility has been successfully	Installation of the E0C88 Family software tools has been succeeded.
Good-bye from E0C88 Family Dev. Tools install utility	Terminates installation of the E0C88 Family software tools.

3. Error messages

Error message	Explanation
Incorrect DOS Version use DOS 3.X or later	DOS version is incorrect.
Write protect error	Transfer destination disk has been protected from writing.
Unit No. is not exist	There is no unit number.
Drive not ready	The drive is not ready.
Install disk is different	Disk to be installed is different.
Seek error	Seek error has been generated.
Media type is different	Disk is different.
Sector not found	Sector cannot be detected.
Write error	Write error has been generated.
Read error	Read error has been generated.
Other error	Other error has been generated.
Disk error on [drive]	Disk error has been generated on [drive].
Cannot create the path	Path cannot be created.
Setting path already exists enter another drive and path	Since the set path already exists, set another drive and path.
Insufficient disk space	Disk space is insufficient.
Insufficient disk space, insert other disk	Since the disk space is insufficient, insert another disk.
Bad select the install drive	Drive specification for transfer source disk is wrong.
Bad select the copy drive	Drive specification for transfer destination disk is wrong.
Error : [Reading file] Cannot open source file	Transfer source file cannot be read.
Error : [Writing file] Cannot open out file	Transfer destination file cannot be written.
E0C88 Family Dev. Tools install utility has been terminated	Installation of the E0C88 Family software tools has been terminated.
Caution : Delete temporary installed and files	Since the installation of the E0C88 Family software tools has been terminated, delete all the file which are installed incompletely.

3   DETAILED EXPLANATION OF TOOLS

3.1   Program Unused Area Filling Utility (fil88409)

3.1.1 Outline of fil88409

The fil88409 is a tool for filling the unused area of the E0C88409 built-in ROM (000000H–001FFFH) with the FF and setting the system code for the system reserved area of the E0C88409 when debugging using the ICE88R or EVA88 and for submitting mask data to Seiko Epson, for E0C88409 software development.

It serves to enhance the compatibility between the data debugged by the customer using the ICE88R or EVA88 and the mask data for submission to Seiko Epson.

After downloading an fil88409 output file to the ICE88R or writing into EPROM and debugging using the ICE88R or EVA88, use the mask data checker (mdc88409) to convert it into mask data for submission to Seiko Epson.
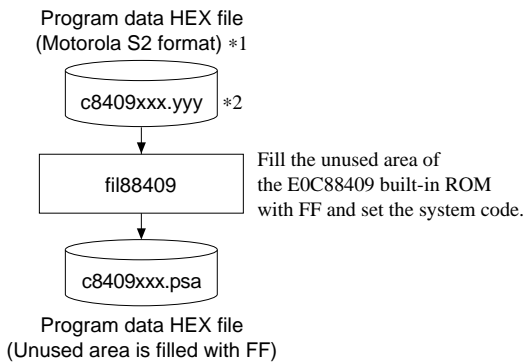
Program data HEX file
(Motorola S2 format) *1

c8409xxx.yyy   *2

fil88409

Fill the unused area of
the E0C88409 built-in ROM
with FF and set the system code.

c8409xxx.psa

Program data HEX file
(Unused area is filled with FF)

Fig. 3.1.2.1 fil88409 execution flow

*1   A HEX file that is generated by a Seiko Epson or third party software tool.

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

Replace the yyy with an extension of the HEX file generated by a Seiko Epson or third party software tool.

3.1.2 Execution flow and input/output files

Figure 3.1.2.1 shows the fil88409 execution flow.

(1) Preparation of program data HEX file

Prepare a Hex file (Motorola S2 format) generated by a Seiko Epson or third party software tool.

(2) fil88409 execution

A file (c8409xxx.psa) in the format where the unused area of the E0C88409 built-in ROM has been filled by the FFH, for debugging the above mentioned program data HEX file on the ICE88R or EVA88, and of the type (mdc88409) for submission of mask data to Seiko Epson is generated by execution of the program unused area filling utility (fil88409). At this time, the system codes F1H and FFH are also set to the system reserved areas (addresses 000032H and 000033H) of the E0C88409.

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

3.1.3 Operation procedure

To start fil88409, insert the work disk into the current drive at the DOS command level (state in which a prompt such as A> is displayed) and then enter the command as following format.

```
fil88409 <file> ⏎
```

⏎ indicates the Return key.

■ Input file name (c8409xxx.yyy)

Specify the program data HEX file name to fill the unused area of the built-in ROM.
The fil88409 accepts only Hex files (Motorola S2 format) generated by a Seiko Epson or third party software tool.
When a file for other than the current drive is specified, the path name (drive/directory) must be specified in front of the file name.

Example: A>fil88409 b:\test\c84090a0.sa

■ Start-up message

When fil88409 is started, the following message is displayed.
Example: File name: c84090a0.sa

```
A>fil88409 c84090a0.sa⏎
FIL88409 Unused Area Filling Utility Version X.XX
Copyright (C) SEIKO EPSON CORP. 199x
```

■ End message

When a series of operation are complete, the fil88409 displays the following message and returns to DOS command level.

(1) When terminated normally

```
A>fil88409 c84090a0.sa⏎
FIL88409 Unused Area Filling Utility Version X.XX
Copyright (C) SEIKO EPSON CORP. 199x
 ...........................................
Unused Area Filling Completed
System Area Data Set Completed
A>
```

In this case, since the PATH name of the drive/directory will not be set upon start-up, the post conversion program HEX file (c84090a0.psa) with the built-in ROM unused area filled and the E0C88409 system code set is generated in the directory.
The proceeding status is indicated by a period (.) during fil88409 execution.

(2) When an error has been occurred

```
A>fil88409 c84090a0.sa⏎
FIL88409 Unused Area Filling Utility Version X.XX
Copyright (C) SEIKO EPSON CORP. 199x


      C84090A0.SA 5:        File Format Error              ...Example of error message
A>
```

If an error is generated during fil88409 execution, it displays the file name producing the error, the line number and an error message, then terminates the fil88409.
Also, when an error has been generated, a post-conversion program data HEX file (c8409xxx.psa) is not generated. (In the event of a warning message, a post-conversion program data HEX file is generated.)

(3) In the event of forced termination

To forcibly terminate the execution of the fil88409, enter "CTRL" + "C". (This can also be done by pressing the "STOP" key on the host machine you are using.)

3.1.4 Error messages and warning message

fil88409 error messages and warning message are listed below.

Table 3.1.4.1 Error message

Error message	Explanation
Can't Find File	The specified input file does not exist.
Syntax Error: Input File	An input file name has not been specified.
File Format Error	The input file format is wrong. (∗1)
Can't Open File	The input file cannot be opened.
Not S Record	The input file is not S record format.
Data Length	The data length of 1 line is too short.
Too Many Data In One Line	The data length of 1 line is too long.
Not 3Byte Address	The address length is not 3 bytes (including S1, S3, S7 and S9 record).
Check Sum Error	The check sum does not match.
Duplicate Error	There is a duplicate definition of data in the same address.
Can't Use Vector 32H System Reserve	The physical addresses 000032H and 000033H cannot be used as
Can't Use Vector 33H System Reserve	a vector because they are reserved as a system area for the E0C88409.
Insufficient disk space	There is no disk space.
Write Error	An error has occurred while writing data.

∗1 A file format error will occur under the following conditions:
- Another record has followed the S8 record.
- Something other than a hexadecimal number is included in the file.
- There is a line that consists of less than 12 characters.
- There is an S8 record that has more or less than 12 characters or of which the byte count is not 04.
- There is an S4, S5 or S6 record included in the file.
- There is no S8 record.

Table 3.1.4.2 Warning message

Warning message	Explanation
Warning: No 00H Address	There is no data in the physical address 000000H.

Note: When there is no data in the physical address 000000H, it will output a warning message and filled the data FFH.

3.1.5 fil88409 execution example

■ Input file example (c84090a0.sa)

```
S2240000000001BE01BD01C001C101C201C301BF01C401C501C601C701C801C901CA01CB014F
S224000020D301D401D201CC01CD01CC01CC01CC017E
S224000100CF6EFFFEB4FFB000DD5380DD53009FC0DD0031DD0100DDD500DDD600DDD700DD1C
S224000120D800DDD900DDD000DDD100DDD200DDD300DDD400DD210CDD2540DD50039F00B0F6
S22400014000B10041220F3200E62B3201E63E3202E63F3203E6403204E6413205E642320635
S224000160E6433207E6443208E6453209E646320AE647F1CCDD8000DDE900DD5400DD560075
S224000180DD0100DD6100DDA000F1B9DD8028F1B4DDE9C0F1AFDDA040F1AADDA020F1A5DD5F
S2240001A05401F1A0DD5601F19BDD0102F196DD0103F191DD6109F18CDD0107F187F9F9F9BE
S2240001C0F9F9F9F9F9F9F9F9F9F9F9F9F9F981DD29FCF9F9F9F919
S804000000FB
```

■ Output file example (c84090a0.psa)

> F1H and FFH are set in the system reserved area (addresses 000032H and 000033H) for E0C88409.

```
S2240000000001BE01BD01C001C101C201C301BF01C401C501C601C701C801C901CA01CB014F
S224000020D301D401D201CC01CD01CC01CC01CC01F1FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF8C
S224000040FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFBB
S224000060FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9B
S224000080FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF7B
S2240000A0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF5B
S2240000C0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3B
S2240000E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1B
S224000100CF6EFFFEB4FFB000DD5380DD53009FC0DD0031DD0100DDD500DDD600DDD700DD1C
S224000120D800DDD900DDD000DDD100DDD200DDD300DDD400DD210CDD2540DD50039F00B0F6
S22400014000B10041220F3200E62B3201E63E3202E63F3203E6403204E6413205E642320635
S224000160E6433207E6443208E6453209E646320AE647F1CCDD8000DDE900DD5400DD560075
S224000180DD0100DD6100DDA000F1B9DD8028F1B4DDE9C0F1AFDDA040F1AADDA020F1A5DD5F
S2240001A05401F1A0DD5601F19BDD0102F196DD0103F191DD6109F18CDD0107F187F9F9F9BE
S2240001C0F9F9F9F9F9F9F9F9F9F9F9F9F9F981DD29FCF9F9F9FFFFFFFFFFFFFFFFFFFFFF19
S2240001E0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1A
S224000200FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF9
```

```
:      :      :      :      :      :      :      :      :      :
```

```
S224001FA0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF3C
S224001FC0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF1C
S224001FE0FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFC
S804000000FB
```

3.2   Function Option Generator (fog88409)

3.2.1 Outline of fog88409

With the 8-bit single chip E0C88409 microcomputer, the customer may select 10 mask options. By modifying the mask patterns of the E0C88409 according to the options selected by the customer, the system can be customized to meet the specifications of the target system.

The fog88409 function option generator is a software tool for generating the document file used to generate mask patterns. It lets the customer interactively select the mask option for the E0C88409. From the data file created with fog88409, the E0C88409 mask pattern is automatically generated by a CAD machine at Seiko Epson. In addition, HEX data in the Motorola S2 format necessary for debugging using the ICE88R or EVA88 can be created. By downloading this data file from the host machine when debugging with the ICE88R or EVA88, and by writing the contents of this data file into the EPROM and mounting it on the EVA88, the same option functions as the actual IC can be executed on the ICE88R or EVA88.

3.2.2 Execution flow and input/output files
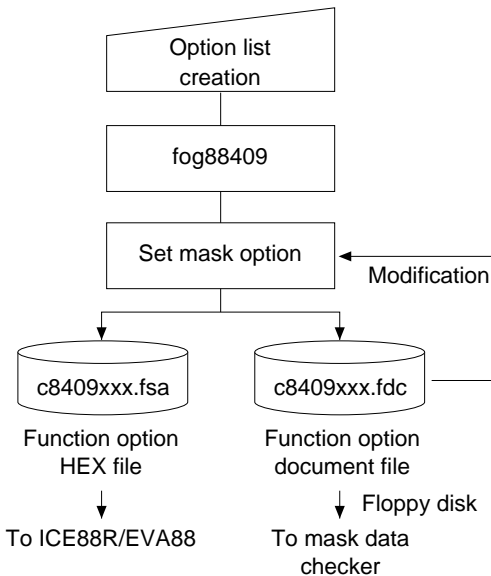
Figure 3.2.2.1 shows the fog88409 execution flow.

Fig. 3.2.2.1 fog88409 execution flow

(1) Option list creation

Select the E0C88409 mask options that meet the specifications of the customer's target system and record them in the option list (paper for recording items in preparation for input operation; explained later). At this time, decide the option for the ICE88R and EVA88 use.

(2) fog88409 execution

Start fog88409 and select the mask options for the E0C88409 according to the display on screen. Since options can be selected using the interactive format, a device such as a source file is not necessary when creating data.
In addition, when correcting the contents, once it has been set, the necessary points alone can be corrected by inputting the document file that was output by fog88409.
As a result, fog88409 generates the following two files by option settings.

- *Function option document file (c8409xxx.fdc)*
  This is a document file in which the selected mask option items for the E0C88409 have been recorded, used to generate mask patterns at Seiko Epson. You can correct part of this file by inputting it using the fog88409.
  This file must be run through the mdc88409 mask data checker with the completed program file, and be submitted to Seiko Epson.

- *Function option HEX file (c8409xxx.fsa)*
  This is a data file for setting the E0C88409 mask options when debugging by the ICE88R or EVA88. This file is generated by a Motorola S2 type format.
  When debugging is done using the ICE88R, download this file into the ICE88R by the ICE command. When debugging is done using the EVA88, create a function option ROM by writing this file into the EPROM and mount it to the EVA88.

Remarks

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

* Copy the document file and the program file (c8409xxx.psa) in a batch to another floppy disk and submit it to Seiko Epson.

* Refer to the "E0C88 Family Evaluation Board Manual" for the function option ROM installation location on the EVA88.

* Refer to the ICE88R help file for the method of downloading the mask options into the ICE88R.

3.2.3 Option list

The following options can be set for the E0C88409 and ICE88R/EVA88.
Multiple specifications are available in each option item as indicated in the Option List. Using "3.2.7 Option selection and option specification" as reference, select the specifications that meet the target system and check the appropriate box. Be sure to record the specifications for unused functions too, according to the instructions provided.
The option selection is done interactively on the screen during fog88409 execution, using this option list as reference.

E0C88409 mask option list

1 OSC1 SYSTEM CLOCK
  ☐ 1. Crystal
  ☐ 2. External Clock
  ☐ 3. CR
  ☐ 4. Crystal (with Gate Capacity)

2 OSC3 SYSTEM CLOCK
  ☐ 1. Crystal
  ☐ 2. Ceramic
  ☐ 3. CR
  ☐ 4. External Clock

3 MULTIPLE KEY ENTRY RESET
  ☐ 1. Not Use
  ☐ 2. Use K00, K01
  ☐ 3. Use K00, K01, K02
  ☐ 4. Use K00, K01, K02, K03

4 MPU MODE INITIAL SET
  ☐ 1. 4M MAXIMUM
  ☐ 2. 4M MINIMUM
  ☐ 3. 64K

5 INPUT PORT PULL UP RESISTOR
- K00 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K01 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K02 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K03 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K04 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K05 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K06 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K07 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K10 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K11 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K12 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- K13 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- $\overline{\text{RESET}}$ .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- MCU/$\overline{\text{MPU}}$ ..... ☐ 1. With Resistor   ☐ 2. Gate Direct

6 I/O PORT PULL UP RESISTOR
- P00 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P01 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P02 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P03 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P04 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P05 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P06 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P07 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P10 .... ☐ 1. With Resistor   ☐ 2. Gate Direct
- P11 .... ☐ 1. With Resistor   ☐ 2. Gate Direct

- P12 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P13 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P14 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P15 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P16 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P17 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P20 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P21 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P22 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P23 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P30 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P31 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P32 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P33 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P34 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P35 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P36 ....☐ 1. With Resistor   ☐ 2. Gate Direct
- P37 ....☐ 1. With Resistor   ☐ 2. Gate Direct

7 RAM OPTION

☐ 1. LCD RAM 2K Byte
☐ 2. LCD RAM 2.25K Byte
☐ 3. LCD RAM 2.5K Byte
☐ 4. LCD RAM 2.75K Byte
☐ 5. LCD RAM 3K Byte
☐ 6. LCD RAM 3.25K Byte
☐ 7. LCD RAM 3.5K Byte

8 TOUCH PANEL CONTROLLER DRIVE PORT

☐ 1. Use
☐ 2. Not Use

9 TPC INPUT PORT

- P30 ....☐ 1. Use   ☐ 2. Not Use
- P31 ....☐ 1. Use   ☐ 2. Not Use
- P32 ....☐ 1. Use   ☐ 2. Not Use
- P33 ....☐ 1. Use   ☐ 2. Not Use
- P34 ....☐ 1. Use   ☐ 2. Not Use
- P35 ....☐ 1. Use   ☐ 2. Not Use

10 TPC INPUT PORT TYPE

- P30 ....☐ 1. Y Input   ☐ 2. X Input   ☐ 3. Not Use
- P31 ....☐ 1. X Input   ☐ 2. Y Input   ☐ 3. Not Use
- P32 ....☐ 1. Not Use   ☐ 2. X Input   ☐ 3. Y Input
- P33 ....☐ 1. Not Use   ☐ 2. X Input   ☐ 3. Y Input
- P34 ....☐ 1. Not Use   ☐ 2. X Input   ☐ 3. Y Input
- P35 ....☐ 1. Not Use   ☐ 2. X Input   ☐ 3. Y Input

3.2.4 Starting procedure

■ Starting command

```
fog88409 ↵
```

> ↵ indicates the Return key.

To start fog88409, insert the work disk into the current drive at the DOS command level (state in which a prompt such as A> is displayed), then enter the program name.

■ Start-up message

```
A>fog88409
E0C88409 Function Option Generator Version X.XX
Copyright (C) SEIKO EPSON CORP. 199x

THIS SOFTWARE MAKES THE FOLLOWING FILES

    C8409XXX.FSA . . . FUNCTION OPTION HEX FILE.
    C8409XXX.FDC . . . FUNCTION OPTION DOCUMENT FILE.
```

When fog88409 is started, the start-up message is displayed.

Here we will explain the actual operation method of fog88409 according to the screen displayed.
To suspend execution, press the "CTRL" and "C" keys together; the sequence returns to the DOS command level. (It is possible by pressing "STOP" key depending on the PC used.)

■ Date input

```
CURRENT DATE IS 'xx/xx/xx
PLEASE INPUT NEW DATE :   ↵
```

Following the start-up message, the date currently set in the host computer is displayed, prompting entry of a new date. When modifying the date, enter the 2-digit year, month, and day of the month by delimiting them with a slash ("/"). When not modifying the date, press the Return key to continue.

■ Operation selection menu

```
*** OPERATION SELECT MENU ***

        1. INPUT NEW FILE
        2. EDIT FILE
        3. RETURN TO DOS

PLEASE SELECT NO. ?
```

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

The items indicate the following.

1. **INPUT NEW FILE:**
   Used to set new function option file.

2. **EDIT FILE:**
   Used to read the already-generated function option document file and set or modify the option contents. In this case, the current drive must contain the function option document file (c8409xxx.fdc) generated by "1. INPUT NEW FILE".

3. **RETURN TO DOS:**
   Used to terminate fog88409 and return to the DOS command level.

3.2.5 Setting new function options (INPUT NEW FILE)

This section explains how to set new function option file.

* In the examples, ↵ indicates the Return key.

```
*** OPERATION SELECT MENU ***

        1. INPUT NEW FILE
        2. EDIT FILE
        3. RETURN TO DOS

PLEASE SELECT NO.? 1↵                                         .. (1)

PLEASE INPUT FILE NAME ? c8409xxx↵                           .. (2)
PLEASE INPUT USER'S NAME ? SEIKO EPSON CORP.↵                .. (3)
PLEASE INPUT ANY COMMENT
(ONE LINE IS 50 CHR)  ? TOKYO DESIGN CENTER↵                 .. (4)
                      ? 421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN↵
                      ? ↵
```

(1) PLEASE SELECT NO.?

Select "1. INPUT NEW FILE" on the operation selection menu.

(2) PLEASE INPUT FILE NAME?

Enter the function option document (and HEX) file name to be generated. Do not enter the extension of the file name. A small letter is converted to a capital letter and outputs to the document file. Alphabetic characters and "0" to "9" can be used.

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

```
    PLEASE INPUT FILE NAME? c8409xxx↵
    EXISTS OVERWRITE(Y/N)?
```

(3) PLEASE INPUT USER'S NAME?

Enter the customer's company name.
Up to 40 characters may be entered. If 41 or more characters are entered, they are ignored.
"[" and "]" is displayed by conversion to "(" and ")".

(4) PLEASE INPUT ANY COMMENT

Enter any comment. Up to 50 characters may be entered in one line. If 51 or more characters are entered in one line, they are ignored. Up to 10 comment lines may be entered. To end entry of comments, press the Return key.
A small letter is displayed by conversion to a capital letter.
Include the following in comment lines:

• Company, department, division, and section names
• Company address, phone number, and FAX number
• Other information, including technical information

The below symbols for the inputting of (3) and (4) cannot be used. When those symbols are input, it displays an "ILLEGAL CHARACTER" error message, then again returns to the input status for that line.
"$", "\"("¥"), "|", back-quote ... input disable

Next, start mask option setting for E0C88409. For new settings, select options OPTION No. 1 to No. 10 sequentially and interactively.
See "3.2.7 Option selection and option specification" for the selection procedure of each function option.

3.2.6 Modifying function option settings (EDIT FILE)

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

* In the examples, ⏎ indicates the Return key.

```
*** OPERATION SELECT MENU ***

        1. INPUT NEW FILE
        2. EDIT FILE
        3. RETURN TO DOS

PLEASE SELECT NO.? 2⏎                              .. (1)

*** SOURCE FILE(S) ***

C84090A0        C84090B0        C84090C0          .. (2)

PLEASE INPUT FILE NAME ? c84090a0⏎               .. (3)
PLEASE INPUT USER'S NAME ? ⏎                      .. (4)
PLEASE INPUT ANY COMMENT
(ONE LINE IS 50 CHR)  ? ⏎                         .. (5)
PLEASE INPUT EDIT NO. ? 4⏎                        .. (6)
```

(1) PLEASE SELECT NO.?

Select "2. EDIT FILE" on the operation selection menu.

(2) *** SOURCE FILE(S) ***

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

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

```
FUNCTION OPTION DOCUMENT …
        … FILE IS NOT FOUND.
```

(3) PLEASE INPUT FILE NAME?

Enter a file name. Do not enter the extension of the file name. If the function option document file (c8409xxx.fdc) is not in the current drive, an error message like the one below is output, prompting entry of other file name.

```
PLEASE INPUT FILE NAME? c84090n0⏎
FUNCTION OPTION DOCUMENT …
        … FILE IS NOT FOUND.
```

(4) PLEASE INPUT USER'S NAME?

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

(5) PLEASE INPUT ANY COMMENT

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

(6) PLEASE INPUT EDIT NO.?

Enter the number (1–10) of the option to be modified, then start setting the option contents (See "3.2.7 Option selection and option specification").

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

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

Enter "E⏎" to end option setting. Then, move to the confirmation procedure for the function option HEX file generation (See "3.2.8 HEX file generation").

Example:
• When modifying the settings of the option of No. 9
```
PLEASE INPUT EDIT NO.? 9⏎
```
• When ending setting
```
PLEASE INPUT EDIT NO.? E⏎
```

3.2.7 Option selection and option specification

Selection procedure for function options are described below.

* Option selection is done interactively. For new settings (INPUT NEW FILE), set all options OPTION No. 1 to No. 10 sequentially; to modify settings (EDIT FILE), the specified option number may be set directly.

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

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

* In the selection examples, "⏎" indicates the Return key input.

• **Example of option selection**

```
*** OPTION NO.3 ***
--- MULTIPLE KEY ENTRY RESET ---

        1. NOT USE
        2. USE K00,K01
        3. USE K00,K01,K02
        4. USE K00,K01,K02,K03

PLEASE SELECT NO.(1) ? 2⏎

        2. USE K00,K01          SELECTED
```

• **Modifying procedure when wrong number is selected in new setting (INPUT NEW FILE)**
When you wish to modify previously set option in the new setting process (INPUT NEW FILE), enter "B⏎" to return 1 step back to the previous function option setting operation.

```
*** OPTION NO.3 ***
--- MULTIPLE KEY ENTRY RESET ---

        1. NOT USE
        2. USE K00,K01
        3. USE K00,K01,K02
        4. USE K00,K01,K02,K03

PLEASE SELECT NO.(1) ? B⏎

*** OPTION NO.2 ***
--- OSC3 SYSTEM CLOCK ---

        1. CRYSTAL
        2. CERAMIC
        3. CR
        4. EXTERNAL CLOCK

PLEASE SELECT NO.(1) ?
```

When all of option settings are completed in new settings, move to the confirmation procedure for the function option HEX file generation (See "3.2.8 HEX file generation").
When modify settings are completed, move to the confirmation procedure for the function option HEX file generation (See "3.2.8 HEX file generation") by entering "E⏎".

Screen that can be selected as function options set on the E0C88409 are shown below.
Please refer to the "E0C88409 Technical Manual" for detailed specification of the E0C88409.

1　OSC1 system clock

```
*** OPTION NO.1 ***
--- OSC1 SYSTEM CLOCK ---

        1. CRYSTAL
        2. EXTERNAL CLOCK
        3. CR
        4. CRYSTAL (WITH GATE CAPACITY)

PLEASE SELECT NO.(1) ? 1↵

        1. CRYSTAL          SELECTED
```

2　OSC3 system clock

```
*** OPTION NO.2 ***
--- OSC3 SYSTEM CLOCK ---

        1. CRYSTAL
        2. CERAMIC
        3. CR
        4. EXTERNAL CLOCK

PLEASE SELECT NO.(1) ? 1↵

        1. CRYSTAL          SELECTED
```

3　Multiple key entry reset

```
*** OPTION NO.3 ***
--- MULTIPLE KEY ENTRY RESET ---

        1. NOT USE
        2. USE K00,K01
        3. USE K00,K01,K02
        4. USE K00,K01,K02,K03

PLEASE SELECT NO.(1) ? 1↵

        1. NOT USE          SELECTED
```

4　MPU mode initial set

```
*** OPTION NO.4 ***
--- MPU MODE INITIAL SET ---

        1. 4M MAXIMUM
        2. 4M MINIMUM
        3. 64K

PLEASE SELECT NO.(3) ? 1↵

        1. 4M MAXIMUM       SELECTED
```

5　Input port pull up resistor

```
*** OPTION NO.5 ***
--- INPUT PORT PULL UP RESISTOR ---

     K00:  1. WITH RESISTOR
           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

     K01:  1. WITH RESISTOR
           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵


                  :
         (Selection for K02–K07, K10–K12)
                  :

PLEASE SELECT NO.(1) ? 1↵

     K13:  1. WITH RESISTOR
           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

   XRESET:  1. WITH RESISTOR
            2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

    XMPU:  1. WITH RESISTOR
           2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

     K00:  1. WITH RESISTOR     SELECTED
     K01:  1. WITH RESISTOR     SELECTED
     K02:  1. WITH RESISTOR     SELECTED
     K03:  1. WITH RESISTOR     SELECTED
     K04:  1. WITH RESISTOR     SELECTED
     K05:  1. WITH RESISTOR     SELECTED
     K06:  1. WITH RESISTOR     SELECTED
     K07:  1. WITH RESISTOR     SELECTED
     K10:  1. WITH RESISTOR     SELECTED
     K11:  1. WITH RESISTOR     SELECTED
     K12:  1. WITH RESISTOR     SELECTED
     K13:  1. WITH RESISTOR     SELECTED
   XRESET:  1. WITH RESISTOR    SELECTED
    XMPU:  1. WITH RESISTOR     SELECTED
```

6 I/O port pull up resistor

```
*** OPTION NO.6 ***
--- I/O PORT PULL UP RESISTOR ---

      P00:  1. WITH RESISTOR
            2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

                :
        (Selection for P01–P07 and P10–P17)
                :

PLEASE SELECT NO.(1) ? 1↵

      P20:  1. WITH RESISTOR
            2. GATE DIRECT

PLEASE SELECT NO.(2) ? 2↵

                :
        (Selection for P21–P23, P30 and P31)
                :

PLEASE SELECT NO.(2) ? 2↵

      P32:  1. WITH RESISTOR
            2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

                :
          (Selection for P33–P36)
                :

PLEASE SELECT NO.(1) ? 1↵

      P37:  1. WITH RESISTOR
            2. GATE DIRECT

PLEASE SELECT NO.(1) ? 1↵

      P00:  1. WITH RESISTOR     SELECTED
      P01:  1. WITH RESISTOR     SELECTED
      P02:  1. WITH RESISTOR     SELECTED
      P03:  1. WITH RESISTOR     SELECTED
      P04:  1. WITH RESISTOR     SELECTED
      P05:  1. WITH RESISTOR     SELECTED
      P06:  1. WITH RESISTOR     SELECTED
      P07:  1. WITH RESISTOR     SELECTED
      P10:  1. WITH RESISTOR     SELECTED
      P11:  1. WITH RESISTOR     SELECTED
      P12:  1. WITH RESISTOR     SELECTED
      P13:  1. WITH RESISTOR     SELECTED
      P14:  1. WITH RESISTOR     SELECTED
```

```
      P15:  1. WITH RESISTOR     SELECTED
      P16:  1. WITH RESISTOR     SELECTED
      P17:  1. WITH RESISTOR     SELECTED
      P20:  2. GATE DIRECT       SELECTED
      P21:  2. GATE DIRECT       SELECTED
      P22:  2. GATE DIRECT       SELECTED
      P23:  2. GATE DIRECT       SELECTED
      P30:  2. GATE DIRECT       SELECTED
      P31:  2. GATE DIRECT       SELECTED
      P32:  1. WITH RESISTOR     SELECTED
      P33:  1. WITH RESISTOR     SELECTED
      P34:  1. WITH RESISTOR     SELECTED
      P35:  1. WITH RESISTOR     SELECTED
      P36:  1. WITH RESISTOR     SELECTED
      P37:  1. WITH RESISTOR     SELECTED
```

7 RAM option

```
*** OPTION NO.7 ***
--- RAM OPTION ---

            1. LCD RAM USE 2K
            2. LCD RAM USE 2.25K
            3. LCD RAM USE 2.5K
            4. LCD RAM USE 2.75K
            5. LCD RAM USE 3K
            6. LCD RAM USE 3.25K
            7. LCD RAM USE 3.5K

PLEASE SELECT NO.(7) ? 7↵

            7. LCD RAM USE 3.5K  SELECTED
```

8 Touch panel controller drive port

```
*** OPTION NO.8 ***
--- TOUCH PANEL CONTROLLER DRIVE PORT ---

            1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 1↵

            1. USE              SELECTED
```

9 TPC input port

```
*** OPTION NO.9 ***
--- TPC INPUT PORT ---

      P30:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 1⏎

      P31:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 1⏎

      P32:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 2⏎

      P33:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 2⏎

      P34:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 2⏎

      P35:  1. USE
            2. NOT USE

PLEASE SELECT NO.(1) ? 2⏎

      P30:  1. USE           SELECTED
      P31:  1. USE           SELECTED
      P32:  2. NOT USE       SELECTED
      P33:  2. NOT USE       SELECTED
      P34:  2. NOT USE       SELECTED
      P35:  2. NOT USE       SELECTED
```

10 TPC input port type

```
*** OPTION NO.9 ***
--- TPC INPUT PORT TYPE ---

      P30:  1. Y INPUT
            2. X INPUT
            3. NOT USE

PLEASE SELECT NO.(1) ? 1⏎

      P31:  1. X INPUT
            2. Y INPUT
            3. NOT USE

PLEASE SELECT NO.(1) ? 1⏎

      P32:  1. NOT USE
            2. X INPUT
            3. Y INPUT

PLEASE SELECT NO.(1) ? 1⏎

      P33:  1. NOT USE
            2. X INPUT
            3. Y INPUT

PLEASE SELECT NO.(1) ? 1⏎

      P34:  1. NOT USE
            2. X INPUT
            3. Y INPUT

PLEASE SELECT NO.(1) ? 1⏎

      P35:  1. NOT USE
            2. X INPUT
            3. Y INPUT

PLEASE SELECT NO.(1) ? 1⏎

      P30:  1. Y INPUT       SELECTED
      P31:  1. X INPUT       SELECTED
      P32:  1. NOT USE       SELECTED
      P33:  1. NOT USE       SELECTED
      P34:  1. NOT USE       SELECTED
      P35:  1. NOT USE       SELECTED
```

3.2.8 HEX file generation

When function options setting is completed, the following message is output to ask the operator whether to generate the function option HEX file.

```
END OF OPTION SETTING.
DO YOU MAKE HEX FILE (Y/N) ? y⏎
```

DO YOU MAKE HEX FILE (Y/N) ?

Enter "Y" to generate the HEX file (c8409xxx.fsa). If "N" is entered, no HEX file is generated and only document file (c8409xxx.fdc) is generated.
Since the function option HEX file (c8409xxx.fsa) is needed when debugging the program with the ICE88R or EVA88, normally set "Y".

When debugging with the ICE88R, download the generated HEX file into the ICE88R.
When debugging with the EVA88, one EPROM is required for setting function options. Use EPROM with following specifications: 27C256, 250 nsec or less access time.

When the above operation is completed, fog88409 generates the function option HEX file and function option document file. And then the following message is output and the sequence returns to the operation selection menu. However, when "N" is input in the above selection for the function option HEX file, the end message shown below is not displayed.

```
MAKING FILE(S) IS COMPLETED.
```

3.2.9 End procedure

```
*** OPERATION SELECT MENU ***

        1.  INPUT NEW FILE
        2.  EDIT FILE
        3.  RETURN TO DOS

PLEASE SELECT NO.? 3⏎
```

When a series of operations are complete, the sequence returns to the operation selection menu. Execution of fog88409 can be ended by selecting "3. RETURN TO DOS" on this menu. If "1. INPUT NEW FILE" or "2. EDIT FILE" is selected, setting function options can be performed again.

fog88409 can be forcibly terminated by pressing the "CTRL" and "C" keys together during program execution. (It is possible by pressing "STOP" key depending on the PC used.) However, in this case, the correct function option HEX file and function option document file are not generated.

3.2.10 Error message

Here following is a list of the fog88409 error messages.

Table 3.2.10.1 fog88409 error message list

Error message	Explanation
ILLEGAL CHARACTER!!	There is an input character error.
	An input disable character has been input.
FUNCTION OPTION DOCUMENT FILE IS NOT FOUND.	There is no document file at the time of the setting modification (EDIT FILE).
	There is no document file with the input file name at the time of the setting modification (EDIT FILE).
FILE NAME ERROR	9 characters or more have been input for the file name input.
BAD FUNCTION OPTION DOCUMENT FILE. - file name -	A function option document file other than for the E0C88409 is specified during modification (EDIT FILE).

3.2.11 Sample files

■ Example of function option document file

```
* E0C88409 FUNCTION OPTION DOCUMENT  V X.XX
*
* FILE NAME    C84090A0.FDC
* USER'S NAME  SEIKO EPSON CORP.
* INPUT DATE   'xx/xx/xx
* COMMENT      TOKYO DESIGN CENTER
*              421-8 HINO HINO-SHI TOKYO 191-8501 JAPAN
*
* #E0C88409 OPTION
* *** OPTION NO.1 ***
* --- OSC1 SYSTEM CLOCK ---
*     CRYSTAL  ---------------------------------------  SELECTED
 OPT0101 01
*
* *** OPTION NO.2 ***
* --- OSC3 SYSTEM CLOCK ---
*     CRYSTAL  ---------------------------------------  SELECTED
 OPT0201 01
*
* *** OPTION NO.3 ***
* --- MULTIPLE KEY ENTRY RESET ---
*     NOT USE  ---------------------------------------  SELECTED
 OPT0301 01
*
* *** OPTION NO.4 ***
* --- MPU MODE INITIAL SET ---
*     4M MAXIMUM  ------------------------------------  SELECTED
 OPT0401 01
*
* *** OPTION NO.5 ***
* --- INPUT PORT PULL UP RESISTOR ---
*     K00              WITH RESISTOR ---------------  SELECTED
*     K01              WITH RESISTOR ---------------  SELECTED
*     K02              WITH RESISTOR ---------------  SELECTED
*     K03              WITH RESISTOR ---------------  SELECTED
*     K04              WITH RESISTOR ---------------  SELECTED
*     K05              WITH RESISTOR ---------------  SELECTED
*     K06              WITH RESISTOR ---------------  SELECTED
*     K07              WITH RESISTOR ---------------  SELECTED
*     K10              WITH RESISTOR ---------------  SELECTED
*     K11              WITH RESISTOR ---------------  SELECTED
*     K12              WITH RESISTOR ---------------  SELECTED
*     K13              WITH RESISTOR ---------------  SELECTED
*     XRESET           WITH RESISTOR ---------------  SELECTED
*     XMPU             WITH RESISTOR ---------------  SELECTED
 OPT0501 01
 OPT0502 01
 OPT0503 01
 OPT0504 01
 OPT0505 01
 OPT0506 01
 OPT0507 01
 OPT0508 01
 OPT0509 01
 OPT0510 01
 OPT0511 01
 OPT0512 01
 OPT0513 01
 OPT0514 01
```

```
*
* *** OPTION NO.6 ***
* --- I/O PORT PULL UP RESISTOR ---
*      P00                    WITH RESISTOR  ----------------  SELECTED
*      P01                    WITH RESISTOR  ---------------   SELECTED
*      P02                    WITH RESISTOR  ---------------   SELECTED
*      P03                    WITH RESISTOR  ---------------   SELECTED
*      P04                    WITH RESISTOR  ---------------   SELECTED
*      P05                    WITH RESISTOR  ---------------   SELECTED
*      P06                    WITH RESISTOR  ---------------   SELECTED
*      P07                    WITH RESISTOR  ---------------   SELECTED
*      P10                    WITH RESISTOR  ---------------   SELECTED
*      P11                    WITH RESISTOR  ---------------   SELECTED
*      P12                    WITH RESISTOR  ---------------   SELECTED
*      P13                    WITH RESISTOR  ---------------   SELECTED
*      P14                    WITH RESISTOR  ---------------   SELECTED
*      P15                    WITH RESISTOR  ---------------   SELECTED
*      P16                    WITH RESISTOR  ---------------   SELECTED
*      P17                    WITH RESISTOR  ---------------   SELECTED
*      P20                    GATE DIRECT    -----------------  SELECTED
*      P21                    GATE DIRECT    -----------------  SELECTED
*      P22                    GATE DIRECT    -----------------  SELECTED
*      P23                    GATE DIRECT    -----------------  SELECTED
*      P30                    GATE DIRECT    -----------------  SELECTED
*      P31                    GATE DIRECT    -----------------  SELECTED
*      P32                    WITH RESISTOR  ---------------   SELECTED
*      P33                    WITH RESISTOR  ---------------   SELECTED
*      P34                    WITH RESISTOR  ---------------   SELECTED
*      P35                    WITH RESISTOR  ---------------   SELECTED
*      P36                    WITH RESISTOR  ---------------   SELECTED
*      P37                    WITH RESISTOR  ---------------   SELECTED
 OPT0601 01
 OPT0602 01
 OPT0603 01
 OPT0604 01
 OPT0605 01
 OPT0606 01
 OPT0607 01
 OPT0608 01
 OPT0609 01
 OPT0610 01
 OPT0611 01
 OPT0612 01
 OPT0613 01
 OPT0614 01
 OPT0615 01
 OPT0616 01
 OPT0617 02
 OPT0618 02
 OPT0619 02
 OPT0620 02
 OPT0621 02
 OPT0622 02
 OPT0623 01
 OPT0624 01
 OPT0625 01
 OPT0626 01
 OPT0627 01
 OPT0628 01
```

```
*
* *** OPTION NO.7 ***
* --- RAM OPTION ---
*     LCD RAM USE 3.5K  ----------------------------------  SELECTED
 OPT0701 07
 OPT0702 07
 OPT0703 07
 OPT0704 07
 OPT0705 07
*
* *** OPTION NO.8 ***
* --- TOUCH PANEL CONTROLLER DRIVE PORT ---
*     USE  ---------------------------------------------  SELECTED
 OPT0801 01
*
* *** OPTION NO.9 ***
* --- TPC INPUT PORT ---
*     P30                 USE  ------------------------  SELECTED
*     P31                 USE  ------------------------  SELECTED
*     P32                 NOT USE  --------------------  SELECTED
*     P33                 NOT USE  --------------------  SELECTED
*     P34                 NOT USE  --------------------  SELECTED
*     P35                 NOT USE  --------------------  SELECTED
 OPT0901 01
 OPT0902 01
 OPT0903 02
 OPT0904 02
 OPT0905 02
 OPT0906 02
*
* *** OPTION NO.10 ***
* --- TPC INPUT PORT TYPE ---
*     P30                 Y INPUT  ---------------------  SELECTED
*     P31                 X INPUT  ---------------------  SELECTED
*     P32                 NOT USE  ---------------------  SELECTED
*     P33                 NOT USE  ---------------------  SELECTED
*     P34                 NOT USE  ---------------------  SELECTED
*     P35                 NOT USE  ---------------------  SELECTED
 OPT1001 01
 OPT1002 01
 OPT1003 01
 OPT1004 01
 OPT1005 01
 OPT1006 01
*
*
* SEIKO EPSON'S AREA
*
*
 OPT1101 01
*
 OPT1201 01
*
 OPT1301 01
*
 OPT1401 01
*
 OPT1501 01
*
 OPT1601 01
```

```
*
 OPT1701 01
*
 OPT1801 01
*
 OPT1901 01
*
 OPT2001 01
\\END
```

Note: *End mark "\\END" may be used instead of "¥¥END" depending on the PC used. (The code of \ and ¥ is 5CH.)*

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

```
S2140020000000000000F03000E00002000000021006A
S804000000FB
```

3.3   Mask Data Checker (mdc88409)

3.3.1 Outline of mdc88409

The mdc88409 mask data checker is a software tool that checks the format of the program data (c8409xxx.psa) that the unused area of the built-in ROM is filled with FFH by fil88409 and option data (c8409xxx.fdc) created by the user and creates the data file (c8409xxx.pan) for generating mask patterns. The user must send the file generated through this software tool to Seiko Epson. Moreover, mdc88409 has the capability to restore the generated data file (c8409xxx.pan) to the original file format (c8409xxx.usa and c8409xxx.ufd).

Fig. 3.3.2.1 mdc88409 execution flow

3.3.2 Execution flow and input/output files

Figure 3.3.2.1 shows the mdc88409 execution flow.

(1) Preparation of program data file (c8409xxx.psa)

Prepare the program data HEX file generated from the program unused area filling utility (fil88409).

(2) Preparation of function option data file (c8409xxx.fdc)

Prepare the function option data file generated from the function option generator (fog88409).

(3) Packing of data

Using the mask data checker (mdc88409), compile the program data HEX file and function option document file in one data file for masking (c8409xxx.pan). This file must be sent to Seiko Epson.

(4) Unpacking of data

The data file for masking (c8409xxx.pan) generated by packing processing can be restored to the original program data HEX file and function option document file using the mask data checker (mdc88409).

Note: Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.
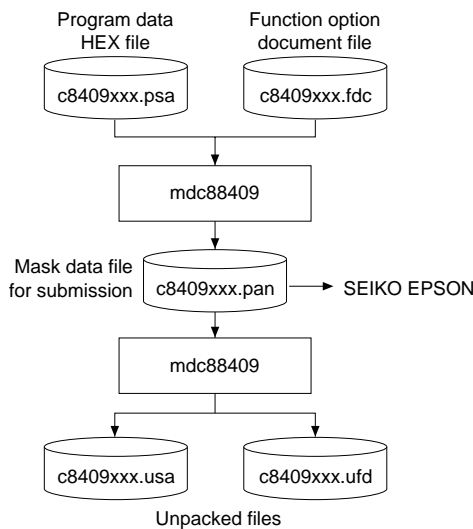
> **NOTE:** **Program data HEX file to be packed/unpacked**
>
> mdc88409 executes the following processing for the program data file generated by the user.
>
> Since the built-in ROM capacity of the E0C88409 is 8K bytes (000000H–001FFFH), the packing/unpacking processing by the mdc88409 is done for only the 8K bytes area from the top of program data that can be masked into ROM.
>
> When packing, the mdc88409 extracts the part (8K bytes) to be masked into the E0C88409 built-in ROM and generates the pack data for generating the mask. When restoring the program data by unpacking, only 8K bytes of program data generated as the pack data is restored. Be careful: the program data exceeding 8K bytes becomes invalid in the mdc88409 if the program data created by the user exceeds 8K bytes.
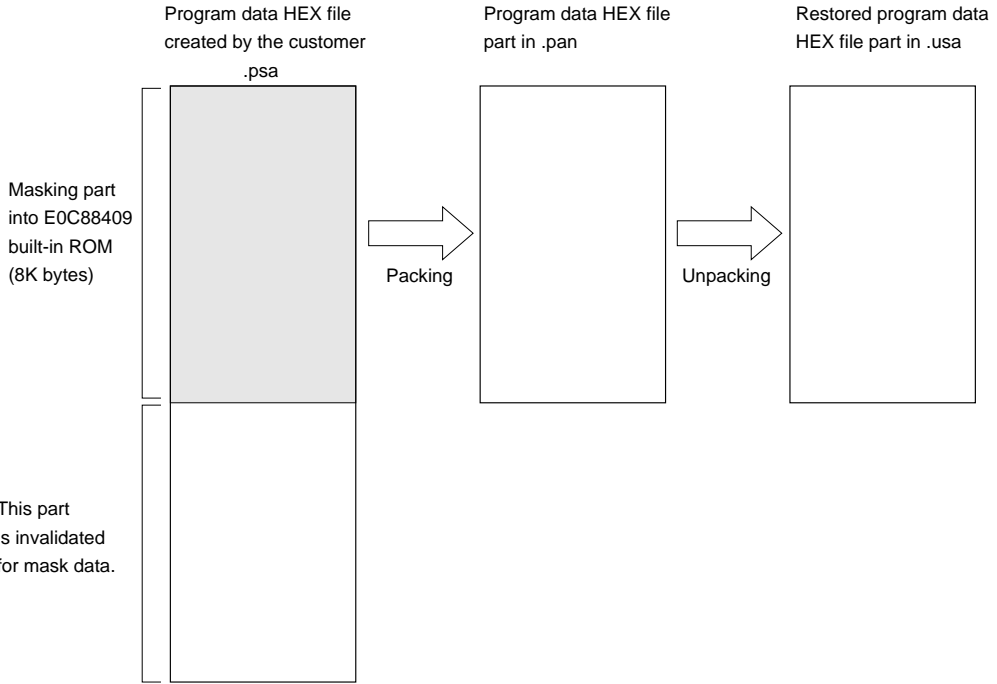
Program data HEX file created by the customer .psa

Program data HEX file part in .pan

Restored program data HEX file part in .usa

Masking part into E0C88409 built-in ROM (8K bytes)

Packing

Unpacking

This part is invalidated for mask data.

Fig. 3.3.2.2 Program data HEX file to be packed/unpacked

When submitting mask data to Seiko Epson, you should use the mdc88409 and it must include program data in the mask data, even if you use the E0C88409 in the MPU mode that does not need to make a mask for internal ROM; it needs masking only for the mask option (I/O settings, etc.).

3.3.3 Creating work disk

In order to prevent accidents due to misoperations such as program erasures, place a write protection tab on the mask data checker system disk and keep it as master disk; actual operation should be conducted on other disks.
Create a work disk and copy "mdc88409.exe" on it.

3.3.4 Copying data files

When submitting data to Seiko Epson, copy on the work disk the data generated from the program unused area filling utility (fil88409) and the function option generator (fog88409).
Be sure to assign the following file names. (Since the customer code is entered in the xxx part of the file name, it should be as designated by Seiko Epson.)
• *Program data c8409xxx.psa*
• *Function option data c8409xxx.fdc*

3.3.5 Starting procedure

To start mdc88409, insert the work disk into the current drive at the DOS command level (state in which a prompt such as A> is displayed) and then enter the command as following format.

■ Start-up command

```
mdc88409 -[p u] <file>      ↵
```

↵ indicates the Return key.

■ Option

The below options have been set for the start-up command of the mdc88409.

1) *-p*
Specification of packing. When this option has been specified, the output file name must also be specified. In this case, the program data HEX file (.psa) and function option document file (.fdc) must have the same name (excluding the extension) as the specified output file name. Furthermore, generation of the output file and reading of the input files are done only for the current drive.
Example: A>mdc88409 -p c84090a0.pa0↵

2) *-u*
Specification of unpacking. When this option has been specified, an input file name must also be specified.
Furthermore, reading of the input file and generation of the output files are done only for the current drive.
Example: A>mdc88409 -u c84090a0.pa0↵

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

■ Start-up message

When mdc88409 is started, the following message is displayed.

```
┌─ Display 1 ─────────────────────────────┐
 Example: When option has not been specified.

 A>mdc88409
 E0C88409 Mask Data Checker Version X.XX
 Copyright (C) SEIKO EPSON CORP. 199x


       --- OPERATION MENU ---


             1. PACK
             2. UNPACK


        PLEASE SELECT NO.?

└─────────────────────────────────────────┘
```

When an option has not been specified at the time the start-up command is input, the operation menu is displayed and the user is prompted to select operation. When creating masking data for submission to Seiko Epson, select "1"; when the masking data is to be split and restored to the original format (c8409xxx.psa and c8409xxx.fdc), select "2". When an option has been specified at the time of start-up of the mdc88409, it executes directly the selected packing or unpacking processing without displaying this operation menu.

Note: *In OS environment setup file "CONFIG.SYS", the number of files that can be opened at the same time must be set at least 10.*
Example: *FILES = 20*

3.3.6 Packing of data

When generating data for submission to Seiko Epson, specify -p option at the time of start-up of the mdc88409 (see "1)" in "3.3.5 Starting procedure") or select "1. PACK" in the operation menu (see "3)" in "3.3.5 Starting procedure").

When "1. PACK" is selected in the operation menu, the user is prompted for the name of the file to be generated. (See Display 2.)

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

Moreover, after submitting the masking data to Seiko Epson and there is need to re-submit the masking data for reasons such as faulty programs, etc., increase the numeric value of "n" by one when the input is made. (Example: When re-submitting data after "c8409xxx.pa0" has been submitted, the pack file name should be entered as "c8409xxx.pa1".)

In addition, access to the input files when packing data is done only for program data HEX file (.psa) and function option document file (.fdc) that have the same name (excluding the extension) as the specified output file name on the current drive.

When the -p option has been specified at mdc88409 start-up, it executes directly the packing processing without displaying the operation menu and confirmation message of the file name to be generated.

If there is no problem in inputting of the file name and the content of the input file, it generates the packed data for masking and displays the generated file name. (See Display 3.)

With this, the data file for masking (c8409xxx.pan) is generated. Submit this file to Seiko Epson.

Display 2

```
      C8409XXX.PSA --------+
                           +-------- C8409XXX.PA0 (PACK FILE)
      C8409XXX.FDC --------+

PLEASE INPUT PACK FILE NAME (C8409XXX.PAn) ? c84090a0.pa0↵
```

Display 3

Example: In case of the output file name is "c84090a0.psa".

```
      C84090A0.PSA --------+
                           +-------- C84090A0.PA0
      C84090A0.FDC --------+
```

3.3.7 Unpacking data

When restoring the packed data to original file format, specify -u option at the time of start-up of the mdc88409 (see "2)" in "3.3.5 Starting procedure") or select "2. UNPACK" in the operation menu (see "3)" in "3.3.5 Starting procedure").

When "2. UNPACK" is selected in the operation menu, the user is prompted for the input file name. (See Display 4.)

When the -u option has been specified at mdc88409 start-up, it executes directly the unpacking processing without displaying the operation menu and confirmation message of the input file name (packed data) to be input.

If there is no problem in the file name and the content of the input file, it executes the unpacking processing and displays the generated file name. (See Display 5.)

With this, the data file for masking (c8409xxx.pan) is restored to the original file format, making it possible to male comparison with the original data. The restored data file names will be as follows:
• *Program data c8409xxx.usa*
• *Function option data c8409xxx.ufd*

Display 4
```
PLEASE INPUT PACKED FILE NAME (C8409XXX.PAn) ? c84090a0.pa0⏎
```

Display 5
```
Example: In case of the input file name is "c84090a0.pa0"

                     +-------- C84090A0.USA
C84090A0.PA0 --------+
                     +-------- C84090A0.UFD
```

3.3.8 End procedure

When a series of operations are complete, the mdc88409 displays the following message and returns to the DOS command level.

When terminated normally

Display 6
```
PACK/UNPACK COMPLETED
A>
```

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

When an error has been occurred

Display 7
```
HEX DATA ERROR : NOT S RECORD   ...Example of error message
A>
```

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

3.3.9 Error message

In the packing operation, program data HEX file and function option data file are checked; in the unpacking operation, the packed file is checked. If there is any abnormal format, the message below is displayed. The mdc88409 error message lists are indicated below.

Table 3.3.9.1 Program data error message list

Message	Explanation
MESSAGE : SEPARATED DATA WITH 8K AS MASK DATA	When data in ".psa" exceeds 8K bytes (built-in ROM capacity of the E0C88409), it packs the 0000H to 1FFFH data as mask data.

Error message	Explanation
HEX DATA ERROR : NOT S RECORD.	There is no S record.
HEX DATA ERROR : DATA LENGTH.(NOT 24H)	The data length of 1 line is not 24H.
HEX DATA ERROR : ADDRESS.	The address length is not 3 bytes.
HEX DATA ERROR : TOO MANY DATA IN ONE LINE.	There are too many data in 1 line.
HEX DATA ERROR : CHECK SUM.	The checksum is not correct.
HEX DATA ERROR : DUPLICATE.	There is duplicate definition of data in the same address.
HEX DATA ERROR : NO 00H ADDRESS	There is no data in the physical address 00H.
HEX DATA ERROR : NO FILLED FILE WITH FFH	The data of the unused area are not FFH.

Table 3.3.9.2 Function option data error message list

Error message	Explanation
OPTION DATA ERROR : START MARK.	The start mark is not "\OPTION". (during unpacking) *
OPTION DATA ERROR : OPTION NUMBER.	The option number is not correct.
OPTION DATA ERROR : SELECT NUMBER.	The option selection number is not correct.
OPTION DATA ERROR : END MARK.	The end mark is not "\\END" (packing) or "\END" (unpacking). *

Table 3.3.9.3 File error message list

Error message	Explanation
<file name> FILE IS NOT FOUND.	The file is not found or the file number set in CONFIG.SYS is less.
PACK FILE NAME (file name) ERROR.	The packed input format for the file name is wrong.
PACKED FILE NAME (file name) ERROR.	The unpacked input format for the file name is wrong.

Table 3.3.9.4 System error message list

Error message	Explanation
Directory Full	The directory is full.
Disk Write Error	Writing on the disk is failed.

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

3.3.10 Packed file

■ **Configuration of packed file**
The packed file is configured according to the following format:

```
                              *
                              *   E0C88409 MASK DATA VER X.XX
                              *
Program data header   ─\ROM
Model name            ─E0C88409XXX PROGRAM ROM
Program data          ┌S224000000...........................................
(Motorola S2 format)  │S224000020...........................................
                      │  :         :        :        :        :        :        :
                      └S804000000FB
End mark              ─\END
Function option header ─\OPTION
                      ┌* E0C88409 FUNCTION OPTION DOCUMENT  V X.XX
                      │*
                      │* FILE NAME    C8409XXX.FDC
                      │* USER'S NAME  SEIKO EPSON CORP.
                      │* INPUT DATE   'xx/xx/xx
                      │*
Function option data  │* #E0C88409 OPTION
                      │* *** OPTION NO.1 ***
                      │* --- OSC1 SYSTEM CLOCK ---
                      │*    CRYSTAL  ----------------------------    SELECTED
                      │ OPT0101 01
                      │  :         :        :        :        :        :        :
                      └ OPT2001 01
End mark              ─\END
```
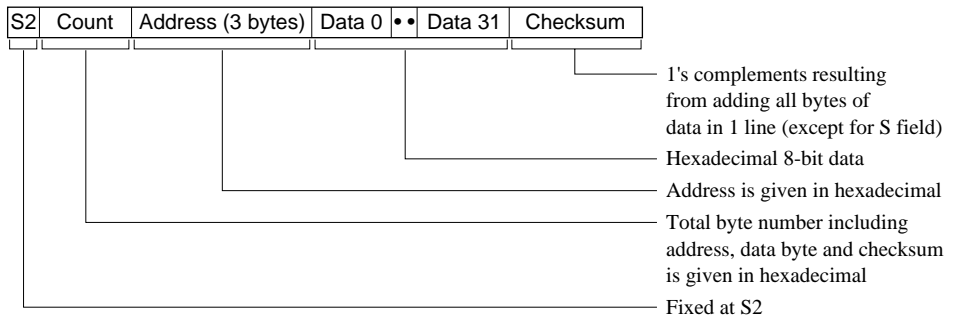
        * \ sometimes appears as ¥, depending on the personal computer being used.

■ **Program data**

(1) Data line
The program data is configured as follows, using Motorola S2 format:

S2	Count	Address (3 bytes)	Data 0	••	Data 31	Checksum

        1's complements resulting from adding all bytes of data in 1 line (except for S field)

        Hexadecimal 8-bit data

        Address is given in hexadecimal

        Total byte number including address, data byte and checksum is given in hexadecimal

        Fixed at S2

(2) End mark

S804000000FB

3.4 Self-diagnostic Program (t88409)

3.4.1 Outline of t88409

t88409 is a self-diagnostic program to check the operation of the hardware tool ICE88R/EVA88 that is used for program debugging of the E0C88 Family.

Perform a self-diagnostic of the ICE88R/EVA88 and PRC88409 periodically using this program when using the ICE88R/EVA88 and the PRC88409 for debugging.

3.4.2 File configuration

(1) Program data HEX file (t88409.psa)

This is the main unit of the self-diagnostic program generated by the fil88409 and in which FFH is filled in the unused area of the internal ROM and the system code is set to the system reserved area of the E0C88409.

(2) Function option HEX file (t88409.fsa)

This is the file generated by the fog88409 to set the mask option into the ICE88R/EVA88 and the PRC88409, and is used at self-diagnosis.

(3) Function option document file (t88409.fdc)

This is the document file generated by the fog88409 and the setting contents of the function option HEX file mentioned above are described.

3.4.3 Operation procedure

After installing the PRC88409 into the ICE88R or the EVA88, self-diagnosis of the ICE88R/EVA88 and the PRC88409 can be done by the following operating test.

For the following operating test, the self-diagnostic program (t88409.psa) and the function option HEX data (t88409.fsa) in this package are used. Perform the below operations respectively for the ICE88R and EVA88.

■ **Operation Check on ICE88R**
Execute by reading the self-diagnostic program (t88409.psa) and the function option HEX data (t88409.fsa) into the ICE88R.
Please refer the ICE88R help file for loading, execution.

■ **Operation Check on EVA88**
Write the self-diagnostic program (t88409.psa) and function option HEX data (t88409.fsa) to EPROM (27C256) to install it into the EVA88. Turn the power ON and execute by pressing the RESET switch when the "EMU" LED goes on.

Diagnostic procedure

Check using the DONE, OSCC, LCDON, VD1C0–1, SVDON, HVLD, TPC, PDC, DAON and IVREF LEDs on the PRC88409. If the below light statuses are verified following system reset, it is normal. The cycle count indicates a 1 second interval and the light status of the below LED changes every second. When it returns to 1 after 10, it then repeats the cycle again.

Cycle count	1	2	3	4	5	6	7	8	9	10	1	2	3
DONE	●	●	●	●	●	●	●	●	●	●	●	●	●
OSCC	○	○	○	○	○	○	○	○	○	●	○	○	○
LCDON	○	○	○	○	○	○	○	○	●	●	○	○	○
VD1C0	○	○	○	○	○	○	○	●	●	●	○	○	○
VD1C1	○	○	○	○	○	○	●	●	●	●	○	○	○
SVDON	○	○	○	○	○	●	●	●	●	●	○	○	○
HVLD	○	○	○	○	●	●	●	●	●	●	○	○	○
TPC	○	○	○	●	●	●	●	●	●	●	○	○	○
PDC	○	○	●	○	○	○	○	○	○	○	○	○	●
DAON	○	●	●	●	●	●	●	●	●	●	○	●	●
IVREF	○	○	○	○	○	○	○	○	○	○	○	○	○

●: ON (lit)
○: OFF (not lit)

---

4 88409.par FILE

The 88409.par file is a macro file that contains the information for the E0C88409. The ICE88R sets its operating environment by loading this parameter file. Therefore, the ICE88R cannot start up if this parameter file does not exist.

4.1 Contents of 88409.par File

The supplied 88409.par file contains the following information.

```
[Options]
Prcclksel=0                ...(1)
Vdddown=0                  ...(2)
CC=0                       ...(3)
DIAG=0                     ...(4)


[MAP Config]
;E0C88409 MAP Configuration Setting
;   000000-00FFFF:Define 1 byte unit
;   010000-FFFFFF:Define 256 bytes unit
;
;syntax:<Start address> <End address> [E][I][U][S][W]
;        E:Emulation memory
;        I:I/O (PRC Board) memory
;        U:User memory
;        S:Stack area
;        W:Write protect (Default does not protect)

;Internal ROM
Map0=000000 001FFF E W     ...(5)

;Internal RAM
;Map1=00F800 00FEFF E
;Map1=00F900 00FEFF E
;Map1=00FA00 00FEFF E
;Map1=00FB00 00FEFF E
;Map1=00FC00 00FEFF E
;Map1=00FD00 00FEFF E
Map1=00FE00 00FEFF E

;Stack area
;Map2=00F800 00FEFF E S
;Map2=00F900 00FEFF E S
;Map2=00FA00 00FEFF E S
;Map2=00FB00 00FEFF E S
;Map2=00FC00 00FEFF E S
;Map2=00FD00 00FEFF E S
Map2=00FE00 00FEFF E S

;Display memory
;Map3=00F000 00F7FF E
;Map3=00F000 00F8FF E
;Map3=00F000 00F9FF E
;Map3=00F000 00FAFF E
;Map3=00F000 00FBFF E
;Map3=00F000 00FCFF E
Map3=00F000 00FDFF E

;I/O memory
Map4=00FF00 00FF01 I
Map5=00FF10 00FF16 I
Map6=00FF20 00FF2A I
```

```
Map7=00FF30 00FF35 I
Map8=00FF36 00FF37 I W
Map9=00FF38 00FF39 I
Map10=00FF3A 00FF3A I W
Map11=00FF40 00FF43 I
Map12=00FF50 00FF50 I
Map13=00FF51 00FF51 I W
Map14=00FF52 00FF56 I
Map15=00FF60 00FF6A I
Map16=00FF80 00FF80 I
Map17=00FF81 00FF82 I W
Map18=00FF90 00FF91 I
Map19=00FFA0 00FFA6 I
Map20=00FFA7 00FFAB I W
Map21=00FFC0 00FFC2 I
Map22=00FFC3 00FFC4 I W
Map23=00FFD0 00FFD9 I
Map24=00FFE0 00FFE9 I
```

4.2 Description of the Parameters

The parameters (1) to (4) are fixed items, so do not modify their settings. Parameter (5) and the following parameters are used to set the memory allocations and memory conditions.

General format:
Map<Serial number>
        = <Start address> <End address> <Switch>

■ Serial number

The Map parameter must have a serial number within the range from 0 to 1023.
The serial numbers must not be specified in a special order.
If a number is duplicated, the parameter set first is enabled and the others are disabled.

■ Address settings

Addresses can be set in byte units for the range from 000000 to 00FFFF. Areas exceeding 010000 should be done using 265 byte units. (****00–****FF).

■ Switch

The following five letters are available for specifying <Switch>: E, I, U, S and W.

- ***Switches for allocating memories (E, I, U switches)***
  The I switch allocates the specified address area to the memory on the PRC board.
  The E switch allocates the specified area to the emulation memory on the ICE88R.
  The U switch allocates the specified area to the user's memory on the target board.

- ***Switch for setting a stack area (S switch)***
  The S switch sets the specified area as a stack area.

- ***Switch for disabling writing in certain areas***
  The W switch sets the specified area as a ROM area that cannot be written on. When an area is specified without the W switch, the ICE88R will regard it as a RAM area.

■ Comments

The ICE88R identifies a line that begins with a semicolon (;) as a comment line. Comments cannot be placed following parameters (e.g., `Map0=000000 001FFF E W ;internal ROM`).

4.3 Emulation Memory

The ICE88R has built-in a 64KB emulation memory for the memory space from 000000 to 00FFFF and a 256KB emulation memory that can be used as an expanded memory area exceeding address 010000. The emulation memory allows the user to use it as a memory that will be connected externally in the actual product. Thus it is not necessary to mount the external memory on the target board to develop the program. However, prepare the external memory on the target board when developing a product that needs a larger memory than 256KB at a location exceeding address 010000.

■ Notes

- ICE88R for Windows gets the path information for loading the parameter file from the ICE88R.INI file.
  Installation of ICE88R for Windows makes the DEFAULT.PAR file in the same directory as the ICE88R.EXE file installed and sets the path information in the ICE88R.INI file so that the debugger will refer to the DEFAULT.PAR file. It is therefore necessary to edit the path description in the \WINDOWS\ICE88R.INI file. When the 88409.par file exists in the directory the same as the ICE88R.EXE file, only the file name part should be modified.

- The parameters (1) to (4) must be described in the part that begins with an [Options] line and the parameters following (5) must be described after the [MAP Config] line. Do not delete [Options] and [MAP Config].

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