

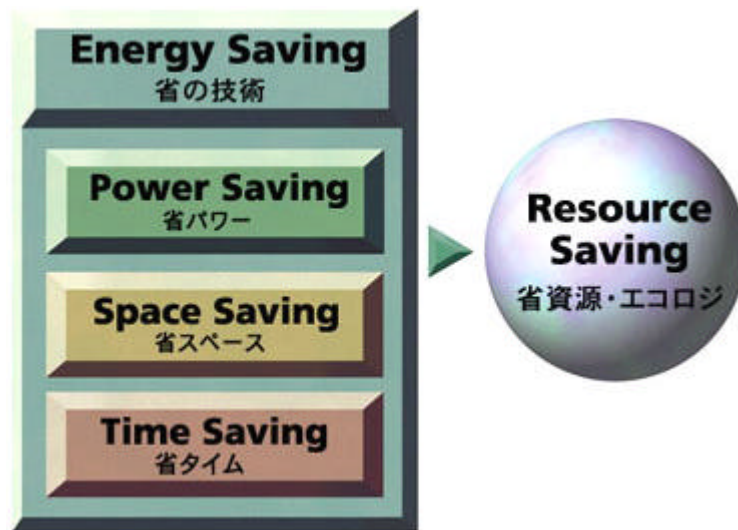
EPSON

CARD-E09A

**Evaluation Kit
Software Manual
(English)**



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•CARD-E09A Evaluation Kit Software Manual (English)

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1 INTRODUCTION

This document overviews specification of the software developed for the CARD-E09A. For further information on the specification as well as on the Windows CE, refer to the manual attached to the SH-CARD Windows CE2.11 Development Kit.

2 LOADER

The CARD-E09A loader comprises the three programs and the data file named the startup data. The three programs consist of IPL stored on the CARD-E09A flash ROM, and SBR and NKLOADS that are resident on the CompactFlash ("CF").

2.1 IPL

IPL is executed first when you turn on or reset the system. After a simple initialization, it reads SBR stored on the CF, then passes control to SBR.

When both the CF and ATA card are connected to the system and SBR is present on both of them, IPL reads SBR via the ATA card. In this document, both the CF and ATA card are referred to as "CF".

2.2 SBR

SBR is the sub-loader and being stored in an area that are not used by DOS. This area on the CF is approximately 3.5KB away from the Sub-Boot Record (sector #2). SBR analyzes the CF file system to read NKLOADS (a DOS file), then passes control to it.

2.2.1 SBR Writing Procedure

The following describes the procedure for writing SBR to the CF sector #2. It is also recommended to refer to the "SBR Command" in 5.1.2.8 of this document.

1. Format the CF in DOS style.
2. Setup the CARD-E09A Evaluation Board (see Chapter 6 in the CARD-E09A Evaluation Kit Hardware Manual).
3. Insert the ATA card (contained in the same package as that for the evaluation kit) to PCMCIA slot (CN11) A on the CARD-E09A Evaluation Board and the CF (connected to the ATA card adapter) to slot B. Refer to the figure below for the positions of slot A and B.
4. Turn power on to display the quick debugger (see 2.3.1.4 of this document) screen. When the screen appears, enter the following command from the keyboard:

```
SBR SBR.BIN B [Enter]
```
5. As the prompt "-" appears at the end of the execution, turn power off.



2.2.2 File System Format

SBR supports two file systems, FAT12 and FAT16. If the CF is formatted in any file system other than the above, SBR fails to recognize the file and, thus, the Windows CE may not be turned on.

2.3 NKLOADS

NKLOADS is used for loading the Windows CE image file (NK.BIN) being stored on the CF. It equips with all the major functions required for a loader. It is resident as a file on the root directory of the DOS-formatted CF.

2.3.1 Functions of NKLOADS

NKLOADS is recalled by SBR when the system is reset.

The recalled NKLOADS functions in the following sequences:

1. Initializes hardware so that NKLOADS may operate correctly.
2. Reads the startup data.
3. Initializes the video.
4. Calls the quick debugger (only when so specified in the startup data).
5. Displays the logo screen.
6. Loads the FrzDri data (when so specified in the startup data).
7. Loads Windows CE from the CF, then starts its execution.
8. End.

Windows CE, startup data, quick debugger and logo images are placed on the CF in the form of a file. NKLOADS reads these files from the CF as necessary.

2.3.1.1 Initialization of Hardware

In order to ensure correct operation, NKLOADS initializes hardware. Specifically, target hardware of the initialization are CPU, bus controller, SH3's built-in timer, PCMCIA controller, video controller and debug serial being built in the companion chip. Other devices are not initialized.

2.3.1.2 Startup Data

Startup data denotes the text file having the predetermined format. They are written to the CF as a file. When turned on, NKLOADS reads the startup data and then operates according to the data contained in it. The startup data is passed to the Windows CE, too, and part of the devices change their action according to the information contained in it.

The startup data contains the following information:

- Video initialize parameters to be used by the loaders.
- File names of the logo images (256 colors in BMP format).
- Data used for specifying the logo image display position.
- Name of the quick debugger (to be specified only when the quick debugger is executed).
- File names containing the FrzDri data.

NKLOADS reads the startup data whenever it is turned on. Thus, dynamic change of NKLOADS operations becomes available by modifying contents of the data before turning power off or calling the FrzDri.

2.3.1.3 Initialize of the Video

The video is initialized by parameters' instructions in the startup data for display the logo Screen.

2.3.1.4 Executing the Quick Debugger

The quick debugger is the hardware debug program prepared for the CARD-E09A equipped systems. It allows you to read or write data to the system memory as well as to select and check parameters when connecting the LCD. It can also be used for writing SBR.

When the file name is specified in the startup data, the quick debugger will be loaded to memory for the execution.

The quick debugger is installed on the ATA card contained in the same package as that for this evaluation kit. The startup data also stored on the ATA card are being set up in such that they can turn on the quick debugger. You can start the quick debugger operation by attaching the ATA card to the PCMCIA slot A on the CARD-E09A Evaluation Board. Refer to later Chapter 4 for the detailed procedure.

2.3.1.5 Displaying the Logo Screen

The logo screen is used for displaying the image file having the BMP 256-color format. The format is specified in the startup data immediately after initialization of the video. Display positions are also specified in the startup data.

Image size cannot exceed the screen size.

Logo images appear in approximately 2 second from powering on and remains on the screen until control is passed to the Windows CE.

2.3.1.6 Loading the FrzDri Data

When the FrzDri data file name is specified in the startup data, NKLOADS loads contents of the file to RAM. Refer to Chapter 2 for description of FrzDri.

2.3.1.7 Loading the Windows CE

NKLOADS locates the file named NK.BIN among the files stored on the CF, loads it to RAM and then passes control to the entry point.

2.3.2 File System Format

NKLOADS supports the file systems FAT12 and FAT16. If the CF is formatted in any form other than the above, NKLOADS fails to read the file and, thus, the Windows CE may not be turned on.

2.4 Operational Flow Up To Turning Windows CE On

The following summarizes flow of the operations starting with the system reset up until control is passed to the Windows CE.

```

Reset:
//---IPL ---
IPL starts
loads the SBR from ATA card or CF
jump to SBR
//--- SBR ---

```

```

//— SBR —
SBR loads the NKLOADS
jump to NKLOADS
//— NKLOADS —
NKLOADS starts
read startup data from CF
initialize video by startup data
if debugger program is specified in startup data
    load debugger program to RAM from CF
    call debugger program
endif
if logo is specified by startup data
    read logo data from CF
    display logo on video
endif
if FrzDri data file is specified by startup data
    load FrzDri data to RAM from CF
endif
load nk.bin to RAM from CF
jump to entry address of nk.bin

```

3 FrzDri

3.1 Description of FrzDri

The Windows CE is an OS which assumes that the memory data are constantly maintained. The registry and files are stored on RAM. Thus, if you turn the system power off, setup data or other information on RAM will be lost. Seiko Epson now offers a function that allows you to store the RAM data as files and restore them when re-starting the system. It is named the FrzDri function. This function enables to maintain the setup data and files on RAM after the system power is turned off.

This function supports the following operations:

- On a system in which power is turned off every time the daily operation is over, you can start the system again in the same setting as that specified before powering off.
- Building a single NK.BIN (Windows CE program) allows to support two or more systems each operating under a different setup.
- When re-starting the system, you can select either the "setup specified prior to powering off" or the "constantly used predetermined setup".

The following summarizes two major functions of the FrzDri:

- When ending the Windows CE, RAM area data can be backed up in the form of a file.
- When starting the system, RAM area data being saved as the file can be restored in RAM area again.

3.2 Preparations Required before Turning On FrzDri

RAM data are stored in the FrzDri data file being specified in the startup data. The FrzDri data file is not automatically created. You need to prepare the file beforehand using BLDFZE utility. The FrzDri data file created will be named NK.FZD. You can, however, rename the file and specify it in the startup data using that name.

You must place the FrzDri data files in the root directory of the start DISK just like you do for NK.BIN. BLDFZD utility is attached to the SH-CARD Windows CE2.11 Development Kit.

3.3 Turning System Power Off After Using FrzDri Function

RAM data is backed up by the sample shell included in the SH-CARD Windows CE2.11 Development Kit.

The sample shell executes necessary processing for ending the Windows CE and saves RAM data to the FrzDri data file. When the data save is successfully ended, the system turns off the display or indicates any message to that sense. Now, you can turn the system power off. If the saving ended unsuccessfully, re-boot the system to turn on the Windows CE again.

When the data save is ended normally, the CARD-E09A drives PWOFF# signal line to active "L". It is strongly recommended for the customers to design a hardware configuration (with the software switch being installed external to the CARD-E09A) so that the system power may be automatically turned off utilizing this signal.

3.4 Restoring the Previous FrzDri Data

Specify the FrzDri data file in the startup data. The loader will load the FrzDri data to RAM prior to start of the Windows CE. Then the Windows CE turns on without initializing the file system or registry on RAM. As the result, data being saved on the FrzDri data file are used by the Windows CE without any modification.

The startup data allows you to specify a data file having a specified default value in it, too.

3.5 Shrinking the FrzDri Data File

FZDPREP creates FrzDri data file named NK.FZD within the range of RAM size that the Windows CE can handle. When you want to constantly turn on the system with the original setup being specified when the system is delivered, data on the FrzDri data file are fixed. Thus, in such case, you can shrink the FrzDri data file by cutting the unnecessary area. FZDCUT utility is used for the shrink. By shrinking the file, you can not only save the disk area but also cut the starting up time because the restoring size is reduced. Before executing the shrink, you need to set up the file and registry on the Windows CE, then run the FrzDri once in order to select the delivery-time-setup for your FrzDri data file setting.

When the FrzDri data file named NK.FZD is shrunk with FZDCUT utility, the shrunk file will be named a NF0.FZD. This file can be used as the default setup file so that the system may be defaulted to the delivery-time-setup.

FZDPREP and FZDCUT utilities are attached to the SH-CARD Windows CE2.11 Development Kit.

3.6 Precautions on Use of FrzDri

Don't try to use an obsolete FrzDri data file.

When NK.BIN (image file executable on Windows CE) is updated, usage of RAM changes accordingly. Thus, the loader may fail to load the FrzDri data file being specified in the startup data. Whenever updating the NK.BIN, make sure to update the FrzDri data file, too.

Don't try to dismount the CF

If you dismount the CF while it is in operation, hardware failure can result. Thus, you should not try to remove the CF.

When you have booted the system using the ATA card, you can remove the ATA card. However, if you remove the ATA card, there is no place to accommodate the FrzDri data file, resulting in malfunctioning of the FrzDri. Thus, as long as the

FrzDri is used, you should not remove the ATA card.

4 DRIVERS FROM EPSON

The following describes function of the drivers from Seiko Epson.

4.1 Display

The display driver supports the video controller SED1355 being built in the CARD-E09A.

4.1.1 Display Units Completed with Performance

The following lists the resolution and number of colors being completed with the function check. Certain types of LCDs, however, have not been checked for their performance. Refer the "CARD-E09A Application Note" when you evaluate an LCD.

- | | | |
|-----------|---------|-----------------------------|
| ● CRT | 640×480 | 256 colors. / 65536 colors. |
| ● CRT | 800×600 | 256 colors. / 65536 colors. |
| ● TFT LCD | 640×480 | 256 colors. / 65536 colors. |
| ● TFT LCD | 800×600 | 256 colors. / 65536 colors. |
| ● STN LCD | 640×480 | 256 colors. / 65536 colors. |

4.1.2 Tuning

The following arrangements are employed so that different types of display units may be supported.

- SED1355 parameters are provided from the startup data.
- Operation clock for the SED1355 can be entered external to the CARD-E09A.

Modifying the parameters allows you to change the current resolution or use a different type of LCD.

4.1.3 Precautions on Use of LCD

Certain LCD models require a special sequence or timing for the powering on or initialization. In such case, your operation must meet with the required sequence or timing.

4.2 Keyboard

The keyboard driver supports the keyboard connected to the CARD-E09A PS/2 port. Unlike IBM compatible machines, however, some keys are ignored.

LEDs for NumLock, CapsLock and ScrollLock do not come on.

4.3 Mouse

The mouse driver supports the mouse connected to the CARD-E09A PS/2 port. The wheel is not supported.

4.4 PCMCIA

The PCMCIA driver supports PCMCIA Slot-A and PCMCIA Slot-B on the CARD-E09A. The plug-and-play is also supported.

4.5 Serial

The serial driver supports the following 4 channels; serial port 2 channels attached with the SH3 FIFO and serial port 2 channels for 16550 contained in the companion chip.

Every serial port supports up to 115200 bps. With certain port, however, significant error can result if it is used up to the upper limit. The error will be 1% maximum when the ports are used on 110, 150, 600, 1200, 2400, 4800, 9600, 19200, 31250, 38400 or 56000 bps.

Note that the serial port attached with the SH3-contained FIFO is not an UART for 16550.

4.6 Parallel

The parallel driver supports the printer being designed in compliance with the Centronics.

4.7 Touch Panel

The touch panel driver supports the 4-wire resistance film type touch panel.

4.8 Audio

The audio driver plays back the saved data by use of the SH3-contained DAC.

5 DEBUG TOOL

5.1 Quick Debugger (DEBUGS)

The ATA card (provided in this evaluation kit package) contains the startup data that specifies execution of the quick debugger. Thus, you need not modify the startup data when running the quick debugger.

5.1.1 Starting the Quick Debugger

When so specified in the startup data, the quick debugger is started instead of the Windows CE. You can specify other program files for debugging than the quick debugger attached to this evaluation kit. For the detail, refer to the manual attached to the SH-CARD Windows CE2.11 Development Kit.

The following describes the quick debugger starting procedure:

1. Setup the CARD-E09A Evaluation Board. (For the procedure, refer to Chapter 6 of the CARD-E09A Evaluation Kit Hardware Manual.)
2. Insert the ATA card to the PCMCIA slot (CN11) A (the card is contained in the same package as that for this evaluation kit.)
3. Turn power on to display copyright message of the quick debugger on the CRT, being followed by the prompt "-".
4. The above completes the starting up procedure.

5.1.2 Command

The following describes the commands used for the quick debugger. Commands are entered from the keyboard and results of the execution are

displayed on the CRT.

5.1.2.1 RB/RW/RL Commands

They are used for reading the system memory.

[Format] Reading of address "aaaaaaa"h

RB aaaaaaa

RW aaaaaaa

RL aaaaaaa

[Operation]

RB command: 8 bits (Byte) long data is read in one time.

RW command: 16 bits (Word) long data is read in one time.

RL command: 32 bits (Long Word) long data is read in one time.

[Output]

Specified address and read data are displayed.

5.1.2.2 WB/WW/WL Commands

They are used for writing data to the system memory.

[Format] Writing data "dd"h to address "aaaaaaa"h

WB aaaaaaa dd

WW aaaaaaa dddd

WL aaaaaaa dddddddd

[Operation]

WB command: 8 bits (Byte) long data is written in one time.

WW command: 16 bits (Word) long data is written in one time.

WL command: 32 bits (Long Word) long data is written in one time.

[Output]

Specified address and written data are displayed.

5.1.2.3 D/DW/DL Commands

They are used for dumping 256 bytes long data to the system memory in one time.

[Format] Dumping 256 bytes data from the address "aaaaaaa"h

D aaaaaaa

DW aaaaaaa

DL aaaaaaa

[Operation]

D command: 8 bits (Byte) long data is dumped in one time.

DW command: 16 bits (Word) long data is dumped in one time.

DL command: 32 bits (Long Word) long data is dumped in one time.

[Output]

Specified address and read data are displayed.

5.1.2.4 E Command

It is used for editing the system memory data.

[Format] Displaying and editing 256 bytes long data in address "aaaaaaaa"h

E aaaaaaaaa

[Operation]

1. Displays 256 bytes long data in address "aaaaaaaa"h.
2. Edits displayed data from the keyboard.

[Keyboard operation for editing]

- ↑↓←→ : They are used for moving the cursor.
- 0 to 9 and A to F keys: They are used for entering data.
- Enter: It is used for recording entered data into the memory.
- Esc: It is used for ending the edit.

5.1.2.5 REG Command

It is used for editing data on the CARD-E09A register.

[Format]

REG

[Operation]

1. Displays the CARD-E09A register setup.
2. Allows editing of the displayed data from the keyboard.

[Keyboard operation for editing]

- ↑↓←→ : They are used for moving the cursor.
- 0 to 9 and A to F keys: They are used for entering data.
- Enter: It is used for recording the entered data into memory.
- Page Up/Page Down: They are used for scrolling display pages.
- F5: It is used for reading entire register contents.
- Esc: It is used for ending the edit.

5.1.2.6 CLS Command

It is used for initializing the display screen (Clear Screen).

[Format]

CLS

[Operation]

- Deletes numbers and characters being displayed on the screen.
- Moves the cursor to the top position.

5.1.2.7 H Command

It is used for display help menu.

[Format]

H

[Operation]

Display command and format list.

5.1.2.8 SBR Command

It is used for recording the sub-boot loader to the ATA card or CF sector #2.

[Format]

SBR SBR.BIN [drive_name]

[Specifying the drive_name]

Select the drive_name = B when the ATA card containing the quick debugger is loaded to the PCMCIA slot A and the sub-boot loader is written to the CF or ATA card in the slot A.

- Select the drive_name = A when the CF containing the quick debugger is mounted on the CARD-E09A and the sub-boot loader is written to the ATA card or CF in the slot A.
- Select the drive_name = B when the CF containing the quick debugger is mounted on the CARD-E09A and the sub-boot loader is written to the ATA card or CF in the slot A.

[Operation]

The sub-boot loader (SBR.BIN) is written to the ATA card or CF sector #2.

[Output]

- Result of the SBR.BIN loading is displayed.
- Result of the SBR.BIN writing is displayed.
- Result of the SBR.BIN verification is displayed.

5.1.2.9 LCD Command

It is used for checking the parameter setup when the LCD is connected. If the checked parameter setup is satisfactory, it will be written into the startup data by editing startup data (startup.dat). This command cannot be used for modifying the powering on sequence. If you try to change the powering on sequence using the LCD command, the system can be damaged. (See the "CARD-E09A Application Note".)

[Format]

LCD

[Operation]

- It allows you to change setup of the video controller "SED1355F0A" register on the CARD-E09A.
- It also allows you to set up or edit the resister parameters from the parameter buffer and then display the test pattern.

5.1.2.8.1 Menu

Executing the LCD command displays the following menu.

```
LCD Display Test
1. Edit parameters
2. Display
3. Video Test
A. Set default parameter (CRT, 16bpp)
B. Set default parameter (CRT, 15bpp)
C. Set default parameter (CRT, 8bpp)
D. Set default parameter (CRT, 4bpp)
E. Set default parameter (CRT, 2bpp)
F. Set default parameter (CRT, 1bpp)
G. Set default parameter (CRT, 800x600,8bpp)
Q. Quit
H. Show help
```

Select the test menu, then enter "1", for instance, to execute the "Edit parameters" option.

5.1.2.9.2 Edit parameters

It is used for editing the parameter buffer for the SED1355F0A register. The quick debugger occupies any area in the system memory for the parameter buffer. Executing the "Edit parameters" displays the following screen.

Edit SED1355 Prameters

ad: +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F
 00: 03 30 14 00 4F 1E 01 07 - DF 01 13 00 02 0C FF 03
 10: 00 00 00 00 00 08 40 01 - 00 00 00 00 50 F5 00 00
 20: 00 00 24 00

00h: Revision Code (RO)
 7:2 Product Code/ 1:0 Revision Code

Display Size = 640 x 480 ;8BPP

Horizontal Non-Display (pixels)
 +----- 248 pixels -----+
 +-- 14 --+ +----- 170 -----+
 +- 64 -+

Vertical Non-Display (line)
 +----- 20 lines -----+
 +-- 1 --+ +----- 16 -----+
 +- 3 -+

For passive LCD, FPLINE & FPFRAME is automatically created & no effect

HRTC is active low, FPLINE is active low
 VRTC is active low, FPFRAME is active high
 8-bit width, Format 1, Color passive, Single, Passive

α {

β {

(1)Parameter adjustment

- Upper side of the screen (indicated with @) is used for adjusting the parameters.
- The screen defaults to the "640 x 480 pixels 8BPP-Mode CRT Display".
- The port address is specified in the line headed by "ad". For example, "Column 10/Line +D" represents the register in the port "1D"h. Its default value is "F5"h.
- For the keyboard operation, refer to the below.
 - 0 to 9 and A to F: Used for entering data.
 - ↑ ↓ ← → : Used for moving the cursor.
 - Page Up/Page Down: Moves the cursor register by register.
 - END: Moves the cursor to the port "23"h.
 - ESC: Ends the setup and restores the start menu.
- For the register adjustment, refer to the "SED1355F0A Technical Manual".

(2) Display of adjustment result

- Adjustment result is displayed lower side of the screen (indicated with -B@) .

5.1.2.8.3 Display

It is used for writing the parameters being setup from the "Edit parameters" option to the SED1355F0A and then displaying the test pattern.

- Effective display area will be enclosed within a square drawn by a white line.
- Press the Esc to end the operation and return to the start menu.

5.1.2.8.4 Video Test

Just like the "Display", it is used for writing the parameters being setup from the "Edit parameters" option to the SED1355F0A and then displaying the test pattern. In this mode, the test pattern appears both on the screens 1 and 2.

5.1.2.8.5 Set default parameter

It is used for setting standard parameters on the parameter buffer. When nothing is selected from this screen, it will default to the menu C "640 x 480 pixel 8BPP-Mode CRT Display".

5.1.2.8.6 Quit

It ends the LCD command, then return to the initial screen of the quick debugger.

5.1.2.8.7 Show help

It displays the message describing how to use the keyboard.

5.2 LED

The ISH board equips with the LED that comes on or goes off according to the data bit written in the port address 80h/81h being prepared for debugging. It is helpful in executing the software debugging.

5.2.1 Initialization

NKLOADS stores the following initializing code. Make access using Word (16 bits).

```
*((short*)0xB1000780) |= 0x0080;
```

5.2.2 Blinking the LED

Make access using Byte (8 bits).

```
*((char*)0xBBC00080) = Data; /* D1 to D8 operations */
```

```
*((char*)0xBBC00081) = Data; /* D9 to D17 operations */
```

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