

TMM1000 LINUX
Creation
of
Cross Development Environment
and
Software Development

2003/07/04



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Attention

- ◆ Sales of Red Hat (R) Linux (R) 8.0 by Red Hat have been finished already.
- ◆ Supply of Errata will be finished by December 31,2003.
- ◆ Concerning products acquired through FTP etc., Red Hat never responds to any inquiries.

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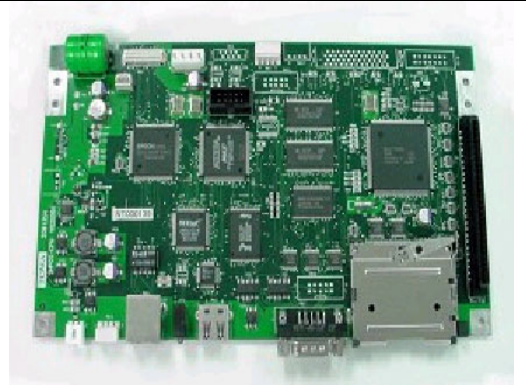
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1. Introduction

1-1 This document (Part 1)

The purpose of this document is to explain steps and descriptions to develop software on Towa LINUX board (TMM1000).

1-2 Scheme of TMM1000

SH-Linux board loading SH3(HD6417709SHF133MHz)	
Main memory: 16MbSDRAM×2pcs. (32MB)	
Ethernet 100Base-Tx/10Base-T Common use ×1CH (LAN91C111L by SMSC)	
On board Flash: ROM 4MB	
USB SL811HST	
Corresponds to SH-Linux	
SIO 3CH(ttySC0, ttySC1, ttySC2)	

1-3. Towa LINUX board (TMM 1000)

- / A high-quality built-in microcomputer board on which SuperH processor is installed.
- / A lot of free software written for Linux all over the world can be used as SuperH GNU/Linux operating system operates.
- / Developing environment is arranged on Linux. Since GNU C compiler is used, development software suite are also free.
- / Kernel software is supplied on open-source and royalty-free basis.
- / A microcomputer board best suited as built-in device or for study.

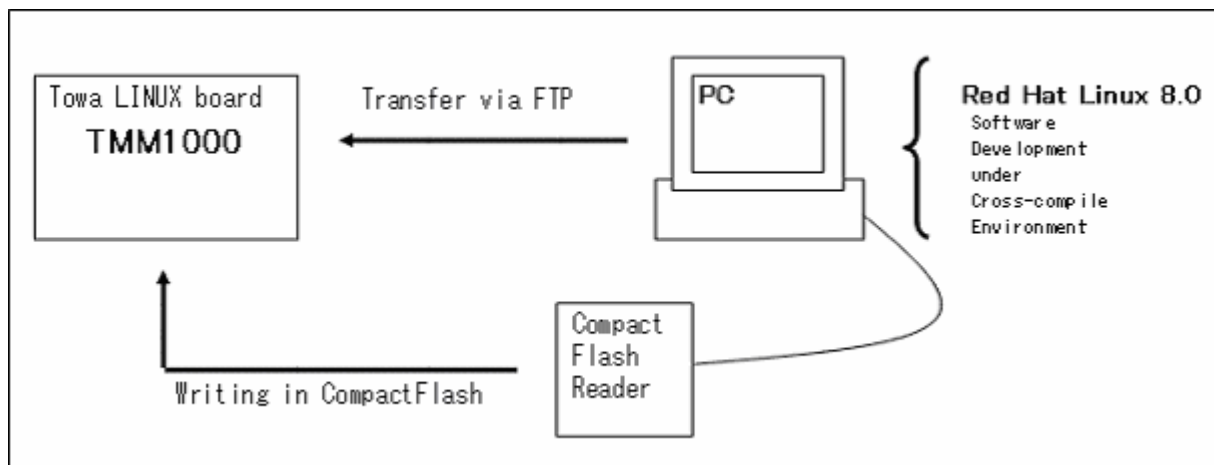
1-4 This document (Part 2)

In this document, software development steps on Towa LINUX board (TMM1000) is explained. Software on Towa LINUX board is developed under the cross-compile environment in Linux on DOS/V.

As environments easily acquired, we have Red Hat(R) Linux(R) and Turbo Linux. Accordingly, we explain here the steps of development with Red Hat Linux as it is acquired free and the developing environment of gcc etc. can easily constructed.

Development based on other Linux systems has basically same steps, but after installing by installer the lacked environments must be covered with RPM etc. And if the business version is purchased, the composition may differ a little.

1-5 Steps of software development



As above, TMM1000 software development steps are explained under Red Hat Linux 8.0 with cross-compile environment.

1-6 Basic needs

Basic needs for the development equipments are as follows:

- a) A DOS/V personal computer equipped with Red Hat Linux
- b) A CD for installing Red Hat Linux
- c) Compact flash reader (not necessary if you can read and write compact flash with your notebook or something.)

Our suggestion: Hagiwara Syscom HBC-UVL1

- d) Linux board

Things useful to have

- a) Windows PC
- b) Terminal program
- c) Cross-cable with D-SUB 9-pin

2. Red Hat Linux 8.0 Installation

2-1 Operating condition of machine to install Red Hat Linux 8.0 in (Recommended environment for Red Hat)

CPU	Pentium II/300MHz or more
Memory	64MB
Hard disc	4GB or more (+1GB)*1
CD-ROM	CD-ROM drive bootable

*1 As it is necessary to install the development environment separately, please prepare the higher spec PC than recommended environment for Red Hat. In brackets, minimum disc capacity for development is suggested.

Please get the information on hardware to make Red Hat Linux 8.0 work properly from the following URL:

<http://hardware.redhat.com/hcl/genpage2.cgi> (English)

Here, the explanation is described based on that the machine with TMM1000 installed has one set of HDD on. If it has two sets or more, programming of partition may be different.

2-2 Red Hat Linux 8.0 Installation items

[1] Preparation of installation	[14] Firewall Configuration
[2] Restart	[15] Additional Language Support
[3] CD-ROM check	[16] Time Zone Selection
[4] Start of preparation of installation	[17] Account Configuration
[5] Language Selection	[18] Authentication Configuration
[6] Keyboard	[19] Package Group Selection
[7] Mouse Configuration	[20] Boot Disc Creation
[8] Installation Type	[21] Graphical Interface (X) Configuration
[9] Disc Partitioning Set Up	[22] Monitor Configuration
[10] Automatic Partitioning	[23] Customize Graphical Configuration
[11] Disc Setup (Partitioning)	[24] Basic Configuration
[12] Boot Loader Configuration	[25] Login
[13] Network Configuration	

2-3 Installation of Red Hat Linux 8.0

[1] Preparation of installation

Set "CD-ROM1" on the machine to install Red Hat Linux 8.0.

Regarding obtaining Red Hat Linux 8.0, please download the network edition from <http://www.jp.redhat.com/> for free, or utilize supplement to a magazine, book etc.

[2] Restart

Please modify the boot option at BIOS, and boot up by CD-ROM boot. When you boot up with CD-ROM, as you see “boot:” at the lower left of the display, press the ‘Enter’ key.

[3] CD-ROM check

You will see “CD Found” in the center of the display. If you select “OK,” you can check the CD for installation. As it is not necessary, select “Skip” and go to [4].

[4] Start of preparation of installation

When the screen for installation is displayed, as the mouse can be used, point the mouse pointer at and click “Next” at the lower right of the display.

[5] Language Selection

Select “English” and click “Next.”

[6] Keyboard

Select your keyboard type in the list and click “Next.”

[7] Mouse Configuration

Select the mouse type connected with your PC. If you use the emulator of 3-button mouse, please check the column of “Enable 3 buttons.” After selecting, please click “Next.”

[8] Installation Type

Please select “Custom” and click “Next.”

[9] Disc Partitioning Set Up

Select “Automatically Partition” and click “Next.”

[10] Automatic Partitioning

Select “Remove all partitions on this system.” and click “Next.”

Warning displays, but click “Yes” if there is not an error.

[11] Disc Setup (Partitioning)

Click “Next” directly.

[12] Boot Loader Configuration

Click “Next” directly.

[13] Network Configuration

Please program matching to the environment of your machine. It is possible to change it later. After completion of programming, click "Next."

[14] Firewall Configuration

Select the security level that matches to the environment of your machine.

[15] Additional Language Support

If you install language(s) other than English select one in the list of "Select additional languages on this system." and click "Next." If you do not wish to add any language, click "Next" directly.

[16] Time Zone Selection

Select the time zone you are in (example: America/New York), and click "Next."

[17] Account Configuration

Input your password of 5 to 22 characters in the column for "root." Input the same password in the "Confirm" column that you have input in the "root" column.

If you wish to add the account of other user(s), click "Add," then a new screen for a new user account is displayed.

The name of user must be within 8 characters.

As the full name input is not a must, input it on a voluntary basis.

In the password column, input the additional user's password in 5 to 22 characters. Input the same password in the "Confirm" column that you have input for the additional order in the "root" column. Click "OK" in the last place. If you wish to add new user(s), click "Add" and continue to add the account(s).

NOTE 1: Please add one more user other than the above.

User's name: tmm1000

Password: tmm1000

NOTE 2: As it is necessary to input the user's name and password at login, please do not forget them. If you forget, you need to install Red Hat Linux 8.0 again.

When you finish adding the account(s), click "Next."

[18] Authentication Configuration

If it is not necessary specially, click "Next" directly.

[19] Package Group Selection

Here, needed package group is selected. Check "Everything" in the bottom of list, and click "Next."

----- Start Installation -----

As preparation of installation has been finished perfectly, click "Next." Then Installation starts.

On the way, when you are asked to change CD-ROM's, change the CD-ROM and click "OK."

NOTE: For installation, it takes about one hour or so, depending on the machine spec.

[20] Boot Disc Creation

Create the boot disc according to need. If you do not wish to create it, check "No, I do not want to create a boot disc." When the creation is finished, or when "Omit the creation of boot disc" is checked, click "Next."

[21] Graphical Interface (X) Configuration

Select the video card you use, and select RAM capacity of the video card. Do not check if you do not wish to program X. (If you check it, Xwindow cannot be used.)

Click "Next."

[22] Monitor Configuration

Select the monitor you use. Then, click "Next."

[23] Customize Graphical Configuration

Change program according to the video card you use.

As the kind of login, select "Graphical" and click "Next."

Then, "Congratulations the installation is complete." will display. If you click "Exit" then, reboot will start.

NOTE: Since the CD-ROM is automatically ejected, do not forget to take it out.

[24] Basic Configuration

After rebooting, "Welcome to Red Hat Linux!" will display. Click "Forward" and configuration the following 1 to 4:

1. Date and Time Configuration
2. Sound Card Configuration
3. Red Hat Update Agent

4. Installation of other software

When you finish configuration the above 1 to 4, click "Forward."

----- Installation has finished. -----

[25] Login

After basic configuration has been finished, the screen for login will display.

Input "tmm1000" for the user's name, and input "tmm1000" for the password, and press 'Enter'

Installation of Red Hat is now finished.

3. Creation of Cross Development Environment on Red Hat Linux 8.0

Environment: Red Hat Linux 8.0 (AT compatible machine)

Target machine: TMM-1000

3-1 Introduction

The compiler, sh-linux-gcc used this time, corresponds to Red Hat Linux 8.0 only as of January 2003.

In attached CD-ROM's, sh-linux.devel.tar.gz is used for installation.

3-2 version

binutils - 2.13.1

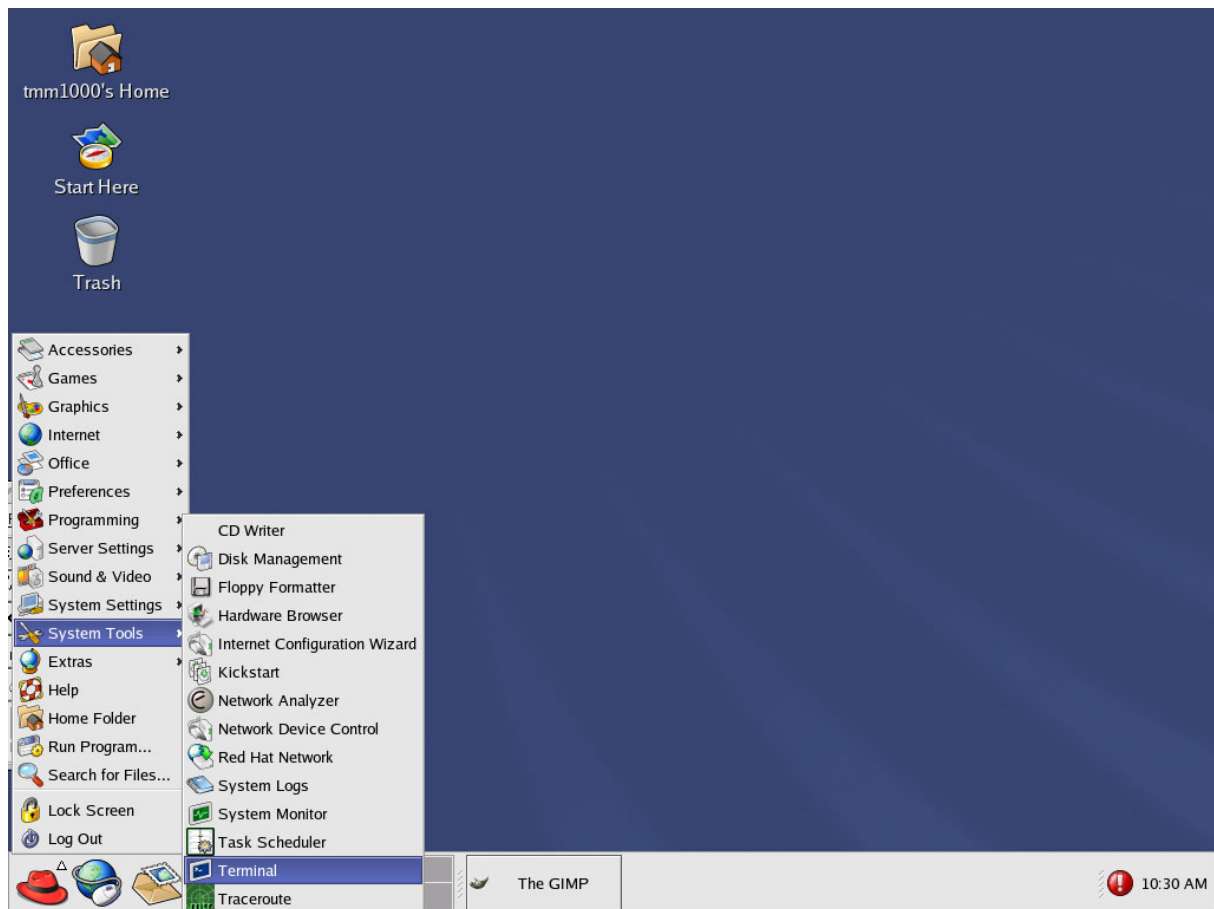
gcc - 3.2.1

glibc - 2.2.4

linux kernel 2.4.18

3-3 Installation of cross development environment

Assume to login by the user tmm1000 that has been made in 2.3 Red Hat Linux 8.0.



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In the menu, select the system tool and boot up Terminal.

[1] Programming path to sh-linux-gcc

Set the path of tmm1000 user. At Terminal, in the list after inputting 'ls -al' please confirm the existence of the file of ".bashrc."

```
File Edit View Terminal Go Help
[tmm1000@linux05 tmm1000]$ ls -al
合計 75556
drwx----- 18 tmm1000 tmm1000 4096 1月 20 14:39 .
drwxr-xr-x 5 root root 4096 1月 17 13:14 ..
-rw----- 1 tmm1000 tmm1000 161 1月 20 13:58 .ICEauthority
-rw----- 1 tmm1000 tmm1000 101 1月 20 13:58 .Xauthority
-rw----- 1 tmm1000 tmm1000 421 1月 17 21:05 .bash_history
-rw-r--r-- 1 tmm1000 tmm1000 24 1月 17 13:14 .bash_logout
-rw-r--r-- 1 tmm1000 tmm1000 191 1月 17 13:14 .bash_profile
-rw-r--r-- 1 tmm1000 tmm1000 166 1月 17 14:12 .bashrc
-rw-r--r-- 1 tmm1000 tmm1000 5531 1月 17 13:14 .canna
-rw-r--r-- 1 tmm1000 tmm1000 854 1月 17 13:14 .emacs
drwxrwxr-x 3 tmm1000 tmm1000 4096 1月 17 14:10 .emacs.d
-rw----- 1 tmm1000 tmm1000 16 1月 17 20:07 .esd_auth
drwx----- 2 tmm1000 tmm1000 4096 1月 17 14:07 .file-roller
-rw-rw-r-- 1 tmm1000 tmm1000 111362 1月 17 13:17 .fonts.cache-1
drwx----- 5 tmm1000 tmm1000 4096 1月 20 13:58 .gconf
drwx----- 3 tmm1000 tmm1000 4096 1月 20 14:00 .gconfd
drwxrwxr-x 17 tmm1000 tmm1000 4096 1月 20 14:00 .gimp-1.2
drwx----- 5 tmm1000 tmm1000 4096 1月 17 13:17 .gnome
drwxr-xr-x 2 tmm1000 tmm1000 4096 1月 17 13:17 .gnome-desktop
drwx----- 6 tmm1000 tmm1000 4096 1月 17 20:07 .gnome2
drwx----- 2 tmm1000 tmm1000 4096 1月 17 13:16 .gnome2_private
-rw-r--r-- 1 tmm1000 tmm1000 120 1月 17 13:14 .gtkrc
```

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And the .bashrc file is edited with editor. (home/tmm1000/.bashrc)

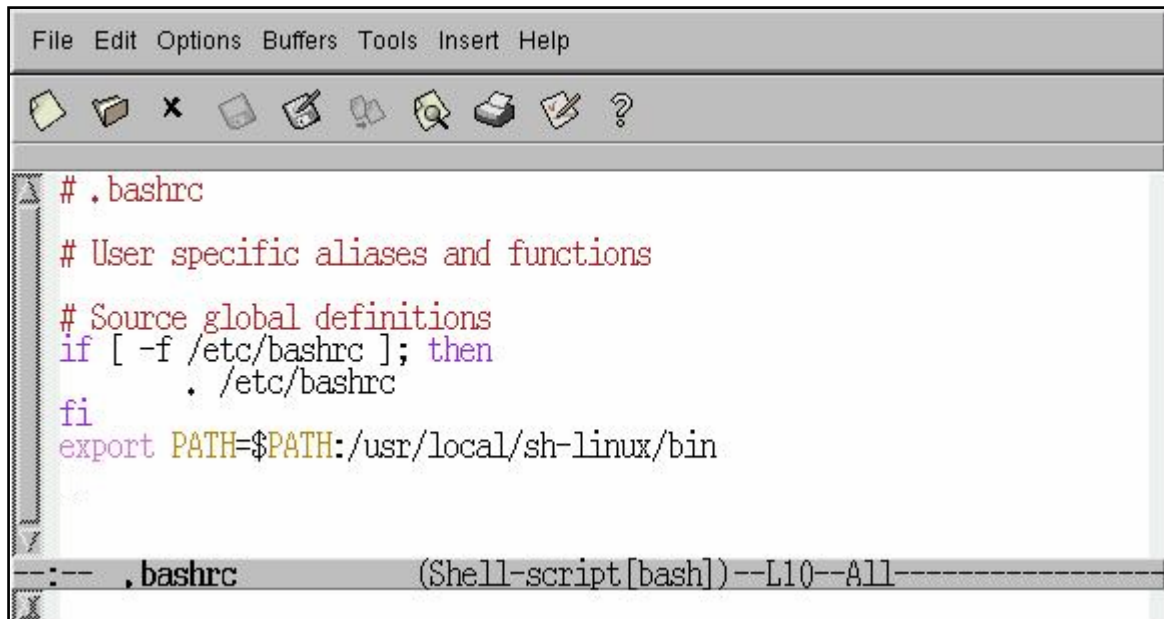
At Terminal, Emacs editor will boot up when 'emacs .bashrc' is input and 'Enter' is pressed.

```
File Edit View Terminal Go Help
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$ emacs .bashrc
```

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Other than that, there are 'vi' editor and 'gedit' editor.

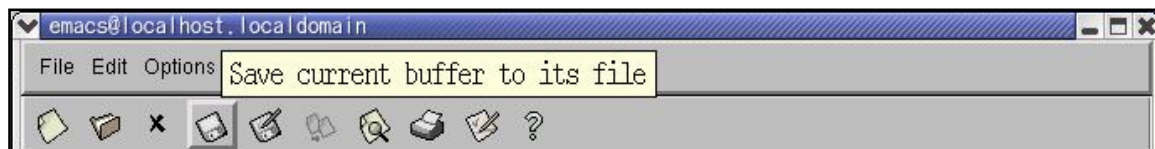
When Editor boots up, add the phrase of “export PATH=\$PATH:/usr/local/sh-linux/bin” as below:



```
File Edit Options Buffers Tools Insert Help
# .bashrc
# User specific aliases and functions
# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi
export PATH=$PATH:/usr/local/sh-linux/bin
:-- .bashrc (Shell-script[bash])--L10--All-----
```

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When the phrase of “export PATH=\$PATH:/usr/local/sh-linux/bin” is added, click ‘Save’ to save the data. And when the save is finished, close Editor.



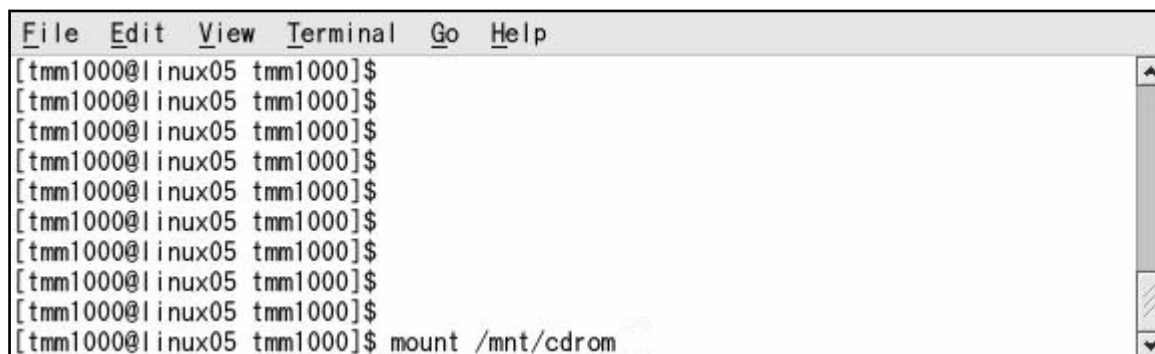
```
emacs@localhost.localdomain
File Edit Options Save current buffer to its file
```

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NOTE: If necessary, take the same steps for other users.

[2] Copy the ‘sh-linux.devel.tar.gz’ file in work directory (current directory /home/tmm1000).

Set the attached CD-ROM, input mount/mnt/cdrom and press ‘Enter.’



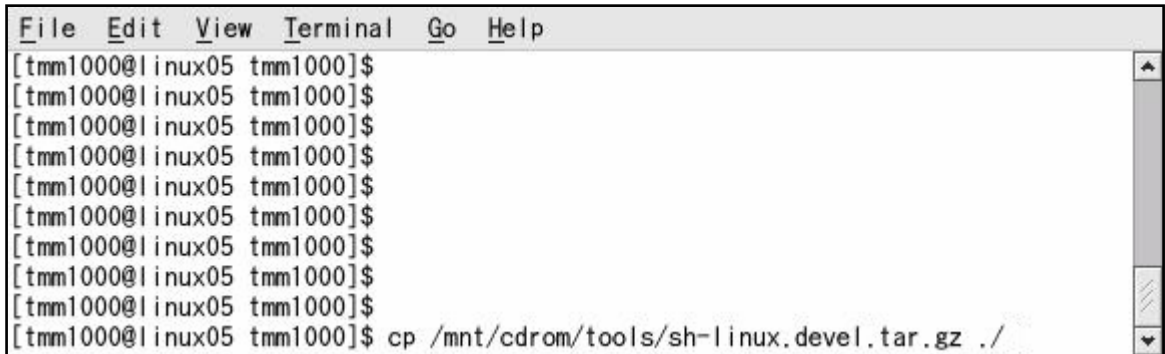
```
File Edit View Terminal Go Help
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$ mount /mnt/cdrom
```

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In Terminal, if the following messages are displayed, go on next because auto-mount has worked:
“mount: /dev/cdrom is already mounted or /mnt/cdrom is in use.”

“According to mount : mtab, /dev/cdrom is already mounted on /mnt/cdrom.”

In Terminal, input “cp /mnt/cdrom/tools/sh-linux.devel.tar.gz ./” and press ‘Enter’ and copy ‘sh-linux.devel.tar.gz’ in the attached CD-ROM.



```
File Edit View Terminal Go Help
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$ cp /mnt/cdrom/tools/sh-linux.devel.tar.gz ./
```

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When the prompt returns, the copy has finished.

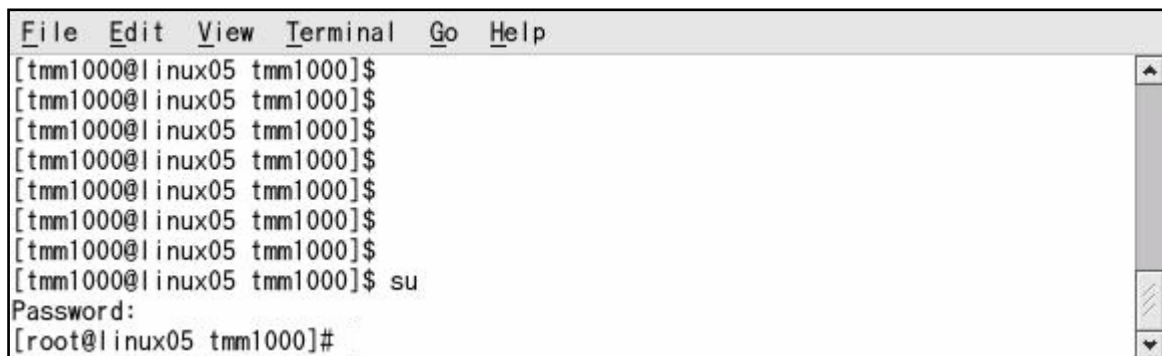
```
[tmm1000@linux05 tmm1000]$ cp /mnt/cdrom/tools/sh-linux.devel.tar.gz ./
```

```
[tmm1000@linux05 tmm1000]$
```

 When the prompt returns, it displays.

[3] Installation (deployment) of ‘sh-linux.devel.tar.gz’ by the root user (superuser)

Input “su” in Terminal, and you are qualified as the superuser.



```
File Edit View Terminal Go Help
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$
[tmm1000@linux05 tmm1000]$ su
Password:
[root@linux05 tmm1000]#
```

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When “Password” is displayed, input the password of root user (superuser), and press ‘Enter.’

Then, as you are qualified as the superuser, install (deploy) ‘sh-linux.devel.tar.gz’. In Terminal, input ‘cd /usr/local’ and then input ‘tar -xzvf ~tmm1000/sh-linux.devel.tar.gz’ and press ‘Enter.’

```
File Edit View Terminal Go Help
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$
[tmm1000@linux01 tmm1000]$ which sh-linux-gcc
/usr/local/sh-linux/bin/sh-linux-gcc
[tmm1000@linux01 tmm1000]$
```

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When the prompt returns, the installation (deployment) has finished.

NOTE: To reflect environment path, close Terminal treated by the superuser.


```
File Edit View Terminal Go Help
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$
[tnm1000@linux05 sample]$ cd disp
[tnm1000@linux05 disp]$ make clean
[tnm1000@linux05 disp]$ make -f Makefile.sh3
```

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When the prompt returns, installation of sample.tar.gz is finished.

3) Compile the drawing program.

In Terminal, input 'cd disp' to move the current directory.

Then, input 'make clean' and press 'Enter.'

Consecutively, input 'make -f Makefile.sh3' to start compiling.

```
File Edit View Terminal Go Help
[tnm1000@linux01 disp]$
[tnm1000@linux01 disp]$
[tnm1000@linux01 disp]$
[tnm1000@linux01 disp]$
[tnm1000@linux01 disp]$
[tnm1000@linux01 disp]$ ls
A16X32.FNT  K32X32.FNT  disp.c  euc2sjis.c  pposmain  sample01.bmp  tmmdisp.h
A8X16.FNT  Makefile    disp.h  euc2sjis.h  sample.c  sample02.bmp
K16X16.FNT  Makefile.sh3 disp.o  euc2sjis.o  sample.o  sampledisp
[tnm1000@linux01 disp]$
```

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When compiling is finished, the binary file of testsh is created.

To confirm it, please input 'ls'.

Regarding the others, move the directory for work and "make."

Respectively, testsh , testprintsh , testdevice will be made.

4) Please confirm on the target machine. NOTE: Confirm on castam.txt in detail.

Copy testsh , testprintsh , testdevice into the target machine.

Other than these, copy fonts and the bmp file for drawing on the display.

Copy A16X32.FNT , A8X16.FNT , K16X16.FNT , K32X32.FNT sample01.bmp in disp to the same directory that the binary file is in. Please execute and confirm by the root user. (To open device, the root authority is needed.)

In the copied directory, input './testsh' and execute it.

Displays and sounds from the speaker.

In the same manner, input './testprintsh' and execute it.

If a printer is connected with, the characters will be output.

Consecutively, input './testdevice' and execute it.

The characters will display on the connected device.

NOTE:

In case the sample program does not boot up on the target machine, it is probable to exist no permission to execute it. (In FTP etc., the execution bit may be erased during data transfer.)

When you cannot execute, input 'ls -al test*'.
ls -al test*

```
ls -al test*
```

```
-r--r--r--      testsh
```

```
-r-xr-xr-x testprintsh
```

```
-r-xr-xr-x testdevice
```

They are displayed as above. (Some displays are left out.)

Then, if 3 pieces of 'x' in '-r-xr-xr-x' is displayed, it must be executed. ('x' stands for execution authority.)

If they are not displayed, input 'chmod 555 testsh'.

(Regarding other binary files, in the same manner, use chmod and stand the execution bit On.)

After inputting it, use 'ls' command again.

'-r-xr-xr-x testsh' must be displayed.

If you cannot execute it in spite of the execution bit On, the font may not exist in the same directory or the device name may be wrong.

Or the cause may exist in the binary file for X86. It can be confirmed by inputting 'file testsh'.

That is the end of 'sh-linux-gcc' installation and its confirmation.

4. Mount Information

It is assumed that compact flash composition (3 partitions) and mount point are used as follows:

	File system	Capacity	Application	Mount point
1	DOS(FAT12)	10M	Kernel*1 RW	/dos
2	EXT 3	34M	System RO	/
3	EXT 3	Rest	User RW	/home/tmm

File system	Capacity	Application
1:DOS(FAT12)	Partition 10M-byte	Kernel for boot
2:EXT3	Partition 34M-byte	Read on system
3:EXT3	Partition Rest	Data partition

The basic system of LINUX is deployed in 2nd partition, and after RAM-DISK is created, devs,etcs,vars are deployed on RAM-DISK and linked. This is described in /etc/initd/rcs.

*1 If Kernel vmlinux does not exist, OS will boot up by Kernel in inner ROM.

(Refer to boot sequence.)

System partition is read only mount.

To rewrite under /etc, on the cross environment (PC), mount 2nd partition and delete "ro" of mounted part in the file of '/etc/fstab,/etc/init.d/rcS'.

NOTE: But when you use like this, please do not forget to shut-down the system at power Off. If you don't, the file system may be broken.

3rd partition is RW-mount.

It is always synchronized (SYNC), and writing may cause lowering the processing speed. Therefore, use lower level function for writing.

When using in CF construction in the sample, it is not necessary to shut-down. But to write in the file may cause the delay. Please validate the evidence enough. Especially, in case using USB device, write expressly and doing SYNC is recommended.

5. Writing (COPY) to Compact flash Reader on Red Hat Linux 8.0

Making partition in compact flash (hereinafter referred to as CF card)

The CF card purchased just now has different composition of partition from the one to be used on our board. By the following steps, the partition needs to be modified.

To treat the CF card, we need both of a Windows machine such as Windows98 etc. and a Linux machine.

If you wish to treat CF cards not with notebooks, we recommend the following CF card adaptor:

Hagiwara System HBC-UCF1

It is possible to use CF card adaptors other than the one recommended by us if Linux end recognizes. Most adaptors of Red Hat family cannot be used. Some adaptors of Turbo family may be used.

NOTE: CF cards manufactured by HAGIWARA SYS-COM cannot be used.

Use the cards manufactured by SUN-DISK, Hitachi or TDK.

And the cards that need large current such as micro-drive etc. do not operate.

In case of using a 64MCF card and using attached dd image data used in (dd command), the following steps are not necessary if you use tmm64M.img.

1) 1st partition is made by FAT.

On Windows, make about 1st partition of 10M-byte.

Do a format after 1st partition is made.

With fdisk.exe, make 10M-byte of basic DOS partition

> fdisk

/ Deleting data partition

Deleting primary DOS partition

Confirmation prompt

/ Making data partition

Making primary DOS partition

Are all partition allocated? > Input N.

Size of partition? > Input 10.

Then, pull out the card once, insert again, and format the increased drive.

> format e: (Assume e drive is for a CF card.)

NOTE: Be careful not to format other than CF card partition.

2) Make 2nd and 3rd partitions on Linux.

Connect a compact flash reader/Writer with the Linux machine, and set a CF card.

3) Boot up Terminal and become a superuser.

Terminal exists in [menu] – [System Tool] – [Terminal].

Example:

```
[tmm1000@linux tmm1000]$ su                To work as the superuser (root)
```

```
[tmm1000@linux tmm1000]$ Password:XXXXXX
```

To input the password for root. (XXXXXX means the password.)

```
[root@linux tmm1000]#
```

4) Boot up fdisk.

```
[root@linux tmm1000]# /sbin/fdisk /dev/sda
```

Cannot read /dev/sda. < An error may occur once.

(massages may be different due to the machines.)

If you find the above error message, try to execute fdisk again.

By 2nd trial, the message in the following 5) will be displayed without fail, and fdisk can be executed.

If the message differs from the above error message, the drive may not be 'sda.' In that case, please connect the cable with another USB port (if your PC has 2 or more USB ports), and execute the above command.

Command (m for help)

5) Make partitions for a CF card.

```
Command (m for help): n                <    To input n
Command action
  e   extended
  p   primary partition (1-4)
p                <    To input p
```

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```
Partition number (1-4): 2                <    To input 2
First cylinder (81-490, default 81) <    To press 'Enter' directly.
Using default value 81
Last cylinder or +size or +sizeM or +sizeK (81-490, default 490): +34M
                                                <    To input +34M
```

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```

Command (m for help): n          <      To input n
Command action
  e  extended
  p  primary partition (1-4)     <      To input p
p
Partition number (1-4): 3        <      To input 3
First cylinder (354-490, default 354): <      To press 'Enter' directly
Using default value 354
Last cylinder or +size or +sizeM or +sizeK (354-490, default 490):
Using default value 490          <      To press 'Enter' directly

```

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```

Command (m for help): p          <      To input p

Disk /dev/sda: 8 heads, 32 sectors, 490 cylinders
Units = cylinders of 256 * 512 bytes

```

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Following is the list on partitions correctly divided

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1		1	80	10224	1	FAT12
/dev/sda2		81	353	34944	83	Linux

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```

Command (m for help): w          <      To input w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
[root@localhost tmm1000]#        <      The prompt returns.

```

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When the prompt returns, close Terminal.

NOTE: Never close Terminal before return of the prompt.

As above, a blank CF card is completed.

6. Format of CF Card and Writing Route Image (in case of not using dd command)

Format 2nd and 3rd partitions by EXT3.

[tmm1000@linux tmm1000]\$ su < To work as the superuser (root)

[tmm1000@linux tmm1000]\$ Password:XXXXXX

To input the password (XXXXXX is the password.)

[root@linux tmm1000]#

As the superuser, insert the CF card to the slot of CF card reader and operate as follows:

Format 2nd partition by EXT3.

[root@linux tmm1000]# /sbin/mkfs -t ext3 /dev/sda2

When the prompt returns, format 3rd partition by EXT3.

[root@linux tmm1000]# /sbin/mkfs -t ext3 /dev/sda3

When the prompt returns, write root.tar.gz.

Move the current directory according to the following steps:

[root@linux tmm1000]# cd /mnt To move the current directory

[root@linux tmm1000]# mkdir cf To make the mount pointer

[root@linux tmm1000]# mount /dev/sda2 /mnt/cf To mount 2nd partition

[root@linux tmm1000]# tar -xzf /cdrom/tools/root.tar.gz ./ To deploy root.tar.gz

[root@linux tmm1000]#

When the prompt returns, unmount 2nd partition.

[root@linux tmm1000]# umount /mnt/cf To unmount 2nd partition

That is the end.

NOTE: When the article is purchased, 2nd partition is a Read Only file.

When the article is purchased, 3rd partition is a Read Write file.

7. Format of CF Card and Writing Route Image (In case of using dd command)

In case of using 64M Compact flash image with dd command, it is possible to deploy by dd if=tmm64m.img of=/dev/sda after moving to the directory (or designating the absolute path) which has tmm64m.img on dos/v Linux. In this case, it is not necessary to re-allocate partitions.

Write the whole of image.

(In case of compact flash existing in image file /dev/sda: tmm64m.img)

8. Boot Sequence

The booting steps on this board are as follows:

Booting up of boot loader by inner ROM

Compact flash In case 1st partition is FAT16 and kernel.sh3 exists, this is read into 0x0c000000 and jumps to starting address.

Utilize this function if an OS except Linux or no OS is used.

If vmlinux exists, this is read into 0x0c000000, booting-up parameter is set in 0x0c001000, booting-up letter string is set in 0x0c001100, and jumps to 0x0c002000.

Set parameters so far is as follows:

```
prn = (char*)0x0c001000;
*(long*)(prn+0) = 1;
*(long*)(prn+4) = 0;
*(long*)(prn+8) = 0x0301;
*(long*)(prn+12) = 1;
*(long*)(prn+16) = 0;
*(long*)(prn+20) = 0;
*(long*)(prn+24) = 0;
prn = (char*)0x0c001100;
strcpy( prn,"mem=32M sh_mv=tmm1000 console=ttySC1,19200 root=/dev/hda2");
('/dev/ttySC1' is DSUB 9-pin connector PN17 next to CF card on CPU board>)
```

In case vmlinux or kernel.sh3 cannot be found on 1st partition, built-in Linux kernel boots up. In the case, as the console device faces to NULL on booting-up parameter, nothing is output on /dev/ttySC1.

In productization, utilize like this. Time for booting-up will shorten to 40 seconds.

After loading kernel, mount 2nd partition of Compact flash as READ-ONLY according to program of /etc/fstab,/etc/init.d/rcS.

According to program of /etc/init.d/rcS, make RAM-DISK partition on RAM

(ram0~ram3)

```
ram0:    /var    ← Deploy tar -xzvf /vars
ram1:    /tmp     ← Deploy tar -xzvf /etc_1
ram2:    /dev    ← Deploy tar -xzvf /devs
```

(This partition becomes readable and writable, but when rebooting, it revert back to the first.)

Mount 3rd partition of Compact flash on /home/tmm as READ-WRITE.

And device drivers made uniquely are loaded here.

(/etc/init.d/mountall.sh)

```
/sbin/insmod /usr/local/mod/lpt0.o
/sbin/insmod /usr/local/mod/lpt1.o
/sbin/insmod /usr/local/mod/sci2.o
/sbin/insmod /usr/local/mod/esed.o
/sbin/insmod /usr/local/mod/da0.o
/sbin/insmod /usr/local/mod/ad0.o
/sbin/insmod /usr/local/mod/smc91111.o
/sbin/insmod /usr/local/mod/tmmrom.o
/sbin/ifconfig eth0 up
/sbin/ifconfig eth0 192.168.1.1 netmask 255.255.255.0 broadcast 192.168.1.255
```

IP address of Ether net is /etc/init.d/mountall.sh. Accordingly, reprogram from application end is necessary after booting-up of the application.

Example: Booting-up the following by shell command:

```
/sbin/ifconfig eth0 192.168.100.100 netmask 255.255.255.0 broadcast 192.168.100.255
```

In this connection, when executing by automatic booting, do execute by root authority.

In this case, tmm user is an expedient user for getting home directory.

In sample CF, telnetd ftpd is made to move. But in commercialization of product, we recommend you to stop it due to security.

In the sample CF image, root does not have its own password.

The password of tmm is tmm.

When you login this board via telnet, FTP, use the tmm user.

The new user cannot be made because /etc is 'read only mount.'

If you make a new user by all means, refer to mount information.

9. Customization

Basic of customizing is same as that of general Linux.

Let us show examples of customizing as follows:

Examples in commercialization of product:

a) To delete console output (/dev/ttySC1)

Delete vmlinux in 1st partition.

Standard console becomes NULL device, and nothing will be output.

b) To delete login prompt only

Open inittab in etc in 2nd partition in Compact flash by Editor, and modify 52nd line as follows:

```
51 #1:2345:respawn:/sbin/getty 9600 ttySC0
```

```
52 #1:2345:respawn:/sbin/getty 19200 ttySC1<-----Modify here, and add #.
```

```
53 #1:2345:respawn:/sbin/getty 19200 ttySC2
```

c) To get higher security level (1)

Stop booting-up of ftpd,telnetd.

Comment (Make it ineffective) on corresponding section in telnetd,Proftpd of etc/inetd.conf in 2nd partition.

d) To get higher security level (2)

Take out Comment at the mount point of /etc/pam.d/login #auth requisite pam_securetty.so.

Make RootLogin off at the mount point of /user/local/etc/proftpd.conf.

In case of irregular operation, the user authorized as root cannot login.

Then, make a user with proper authority, and operate.

e) To create a new user

SH-LINUX does not have a command for creating a user or a command for creating a group. A group and a user can be created by the following steps:

At first, add the following line to create a group to mountpoint, /etc/group. The last figures, "1000" means the group ID.

```
tmm1000*:1000:
```

Next, add the following line to mountpoint, /etc/passwd to create a user.

Two 1000's in "1000:1000" are the user ID and the group ID respectively. The letter string, "/home/tmm1000" is of home directory. This must be created in advance.

```
tmm1000::1000:1000:tmm1000:/home/tmm1000:bin/sh
```

The created user, tmm1000 does not have a password. Therefore, once on the machine, create the password with passwd command after modifying 2nd partition to RW mount type

In general, the consecutive number of user ID and group ID is started at 1000.

10. Tree Structure in CD-ROM

```
CD-ROM ----- Doc----- src_doc      (explaining sample source)
|           |           |----- tmm_sample01.html
|           |           |----- tmm_sample02.html
|           |           |----- tmm_sample01.txt   Same as tmm_sample01.html
|           |           |----- tmm_sample02.txt   Same as tmm_sample02.html
|           |
|           |----HWmanual.doc   Towa Linux board hardware manual
|           |----SWmanual.doc   Towa Linux board software manual
|           |----Supplementary.txt  Other explanations
|
|----- sample
|           |----sample.tar.gz   Sample source
|
|----- tools
|           |----root.tar.gz     Root (tree) image
|           |   (Compact flash 2nd partition image)
|           |----sh-linux.devel.tar.gz  sh-gcc tool
|           |----sh-linux.kernel-2.4.1.8.tar.gz  a kernel source
|           |----tmm64m.img     64M compact flash image
|
|ReadMe.txt   Latest development
```

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■ SH Board TMM1000

http://www.towanet.com/seihin/sh_board/index.html

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