

Debian 4.0, Fedora Core 7, Mandriva 2007.1 and Ubuntu 7.04 UniChrome/Chrome 9HC Integrated Graphics Console Frame Buffer x86 Display Driver Installation Guide

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1. Summary

The document describes how to install VIA's UniChrome/Chrome 9 HC Integrated Graphics Console Frame Buffer display driver for VIA's CLE266, CN400, CN700, CN800, CN896, CX700(M/M2), VN800, VN896, VX700(M/M2), PM880, PN880, PM800, PN800, P4M800CE, P4M800Pro, P4M890 and P4M900 north bridge chips. Two solutions are provided, one is to use the OS built-in console frame buffer driver, and another is to use VIA's UniChrome console frame buffer driver (built-in or module mode). The instructions to customize display resolution, color depth, and refresh rate by using the "FBSet" tool are covered. VIA's UniChrome Console Frame Buffer display driver provides additional functions including special CRT display modes, TV-Out functions with HDTV support and Single Adapter Multiple Monitor (SAMM) mode support. The information in this document is provided "AS IS," without guarantee of any kind.

2. File Descriptions

This package requires 2 files as described below:

```
06/13/2007 16:04pm      3,534,246      Linux-FBDev-kernel-bin_2.6.00.02a.tgz
                                UniChrome FB driver Binary
                                This file
README
```

User may download the VIA's UniChrome/Chrome 9 HC FB Driver Binary from VIA Arena's Web Site at <http://www.viaarena.com/default.aspx?PageID=2&Type=3>. Choose the Fedora Linux and Integrated Graphics, and then choose the Graphic chipset used to obtain it.

3. OS built-in Console Frame Buffer Driver

Those Linux distributions use VESA 2.0 driver as the default console frame buffer driver. To activate the built-in VESA frame buffer driver, follow the steps below:

- (1) View the table below to choose the resolution.

Colors	640x480	800x600	1024x768	1280x1024	1600x1200
8-bit	769	771	773	775	796
15-bit	784	787	790	793	797
16-bit	785	788	791	794	798
32-bit	786	789	792	795	799

(2) Add one line "VGA= XXX" in the GRUB boot loader file

```
# vi /boot/grub/menu.lst
```

For example, edit the file as below for the 1024x768 16-bit color depth

```
-----  
title Fedora Core (2.6.21-1.3194.fc7)  
root (hd0,0)  
kernel /boot/vmlinuz-2.6.21-1.3194.fc7 ro root=/dev/hda1 vga=791  
initrd /boot/initrd-2.6.21-1.3194.fc7.img  
-----
```

Then, reboot the system by using the command "# reboot". While rebooting, Users should be able to see a picture bar at the top of the screen.

4. UniChrome Console Frame Buffer Driver Pre-compiled Binary

VIA prepared the pre-compiled driver binary for Debian Linux 4.0, Fedora Linux Core 7, Mandriva Linux 2007.1 and Ubuntu 7.04 Distributions. Follow the steps below to install the pre-compiled binary:

```
#tar zxvf Linux-FBDev-kernel-bin_2.6.00.03a.tgz  
#cd Linux-FBDev-kernel-bin_2.6.00.03a  
#./viameu (1. Install driver or 2. Uninstall driver)
```

Note: Please uninstall the old driver (option 2. will remove the VIA VGA and FB drivers) before install this new FB driver.

After installing the driver, users will have to load the module to the system. Follow the command below to load the module with the display mode of 800x600:

```
# modprobe viafb mode=800x600 bpp=16
```

5. UniChrome/Chrome 9 HC Console Frame Buffer Driver Source Code

VIA provides the UniChrome Console Frame Buffer driver source code available at VIA Arena's web site. Users may download the driver from the website. First, go to the web site at <http://www.viaarena.com/default.aspx?PageID=2&Type=3>. Choose "Source", then "Integrated Graphics", then "UniChrome Integrated Graphics". Users will be able to download the driver's source code package "Linux-FBDev-kernel-src_2.6.00.03a.tgz". Follow the steps below to build the binary from the source code:

```
# tar zxvf Linux-FBDev-kernel-src_2.6.00.03a.tgz  
# cd Linux-FBDev-kernel-src_2.6.00.03a  
# make  
# make install
```

Refer to the "readme.txt" for more details with the source code compilation procedures.

6. Building viafb as a built-in kernel driver on Fedora Linux Core 7 or Kernel 2.6.22-rc3

Built-in driver will be load at kernel booting, and you can parse argument to viafb driver through kernel parameters.

(1) Get kernel source and put them under /usr/src/linux

(2) Copy Linux-FBDev-kernel-src_2.6.00.03a source to proper location.

```
# cp -a Linux-FBDev-kernel-src_2.6.00.03a
/usr/src/linux/drivers/video/via
```

(3) Replace "Makefile"

```
# cd /usr/src/linux/drivers/video/via
# mv -f Makefile_26.kernel Makefile
```

(4) Modify "Makefile" and "Kconfig" under /usr/src/linux/drivers/video: add line "obj-\$(CONFIG_FB_VIA) += via/" to proper position of "Makefile"; add below lines to "Kconfig" (Kernel 2.6.22-rc3/Fedora Linux Core 7).

```
config FB_VIA
```

```
tristate "VIA UniChrome/Chrome 9 HC display support"
depends on FB && PCI
select FB_CFB_FILLRECT
select FB_CFB_COPYAREA
select FB_CFB_IMAGEBLIT
select FRAMEBUFFER_CONSOLE
help
```

```
This is the frame buffer device driver for the VIA CLE266, CN400,
CN700, CN800, CN896, CX700, PMN800, PMN880, P4M800CE-Pro, P4M890,
P4M900, VN800, VN896 and VX700 chipsets.
```

(5) Select device drivers

```
# make menuconfig
```

Enable **Device Drivers -> Graphics support -> VIA UniChrome/Chrome 9 HC display support*

Disable **VESA driver at Drivers -> Graphics support -> VESA VGA graphics*

(6) Make kernel image and initrd

```
# make
# mv arch/i386/boot/bzImage /boot/vmlinuz-viafb
# cp .config /boot/config-viafb
# cp System.map /boot/System.map-viafb
```

```
# cd /boot
# mkiinitrd -i ini-trd-viafb.img 2.6.[version you used] (for Fedora
Core 7 and Mandriva 2007.1)
# mkiinitramfs -o ini-trd-viafb.img 2.6.[version you used] (for
Debian 4.0 and Ubuntu 7.04 Desktop)
```

(7) Test and using built-in viafb driver

Modify /boot/grub/menu.lst, let new kernel "vmlinuz-viafb" be the boot image.

```
...
title Linux.viafb /*new VIA FB kernel */
kernel (hd0,0)/boot/vmlinuz-viafb ro root=/dev/hdc1 vi deo=vi afb: <opti ons>
ini trd (hd0,0)/boot/i ni trd-vi afb. i mg
...
```

Some parameters can be parsed to viafb through kernel parameters at booting: vi deo=vi afb: <opti ons>, For example, if users want to set the CRT + HDTV(YCbCr 720P) console with 1280x720, 32bpp color depth, 60 refresh rate. Use the command below:

```
vi deo=vi afb: mode=1280x720, bpp=32, acti ve_dev=CRT+TV, tv_out_si gnal =9,
tv_system=5, accel =1
```

Another sample, if users want to set the SMM mode console HDTV(YCbCr 720P) with 1280x720, 32bpp color depth, 60 refresh rate and CRT with 800x600, 16 bpp colordepth, 60 refresh rate. Use the command below:

```
vi deo=vi afb: mode=1280x720, bpp=32, acti ve_dev=TV+CRT, SMM: ON, tv_out_si gnal =9
, tv_system=5, mode1=800x600, bpp1=16
```

More detail, please refer to the "readme.txt" document.

7. Configure display mode by the "FBSet" tool

Some Linux distributions offer the built-in "FBSet" tool, which allows users to change the display resolution, color depth, and the vertical sync of the console driver. However, it is important to note that the tool doesn't work when using the OS built-in "vesa" driver. Some special display mode offered by UniChrome driver will not be able to be shown by using this tool. It is important to note a known issue that the FBSet tool may work abnormally in 2.6.x kernel Linux distributions.

(1) Use command "# fbset -i "

This is to view the current framebuffer driver information. For example users would see the below message for resolution 800x600-16bpp-75Hz:

```
mode "800x600-75"
# D: 48.001 MHz, H: 46.876 kHz, V: 75.121 Hz
geometry 800 600 800 600 16
```

```

timings 20833 96 32 16 4 96 4
rgba 8/16, 8/8, 8/0, 0/0

endmode

Frame buffer device information:
Name       : VESA VGA
Address    : 0xe1800000
Size       : 8388608
Type       : PACKED PIXELS
Visual     : TRUECOLOR
XPanStep   : 0
YPanStep   : 0
YWrapStep  : 0
LineLength : 800
Accelerator : No

```

Note: If using the 2D accelerator feature with "accel=1" parameter, the "fbset -i" command will show the "Accelerator : Unknown (50)" message.

(2) Use command '# fbset "resolution-vertical_sync"'

This is to change the display resolution and vertical sync. View the file "/etc/fb.modes" to see available resolutions. It is noted that any resolution and vertical sync that is not listed in the "/etc/fb.modes" file will not be able to be configured. For example, to configure the display resolution to 1024x768 with the vertical sync 75, type '# fbset "1024x768-75"'.

(3) Use command "# fbset -depth <value>"

This is to set the color depth. For example, to configure color depth 16 bpp, type "# fbset -depth 16".

8. Display Modes supported

The UniChrome console frame buffer driver supports a wide range of display resolutions, color depth and refresh rates. Users are allowed to set their own display mode, color depth and refresh rates. For example, if users want to set the console in 1024x768 mode, with 32 bpp color depth and 75 refresh rate. Use the command below:

```
# modprobe viafb mode=1024x768 bpp=32 refresh=75 accel=1
```

Use the command above to set other modes, color depths, and refresh rates. Refer to the "readme.txt" file in the package for the modes available. It is important to note that the refresh rates (/Hz) 75, 85, 100 are only available in 640x480, 800x600, and 1024x768 modes and the refresh rate 120 is only available in 640x480 and 800x600

modes. Other display modes work fine with refresh rate 60. If users do not specify the refresh rate while loading module, the default refresh rate 60 will be used. Below is the summary for the CRT display modes for the Samsung 17" test configuration. The display mode support is highly depending on the monitor itself.

Resolution	Color Depth	Refresh Rate (Hz)
640x480	8, 16, 32	60,75,85,100,120
720x480	8, 16, 32	60
720x576	8, 16, 32	60
800x480	8, 16, 32	60
800x600	8, 16, 32	60,75,85,100,120
848x480	8, 16, 32	60
856x480	8, 16, 32	60
1024x512	8, 16, 32	60
1024x768	8, 16, 32	60,75,85,100
1152x864	8, 16, 32	70,75
1280x720	8, 16, 32	60
1280x768	8, 16, 32	60
1280x800	8, 16, 32	60
1280x960	8, 16, 32	60
1280x1024	8, 16, 32	60,75,85
1366x768	8, 16, 32	60
1400x1050	8, 16, 32	60
1440x1050	8, 16, 32	60
1600x1200	8, 16, 32	60,75
1920x1080	8, 16, 32	60

9. TV-Out Function

The UniChrome console frame buffer driver supports TV-Out function for VIA's VT1622A/VT1623/VT1625 TV encoders. The driver supports various TV Out functions, including different TV Output types, TV types, TV overscan, 2D hardware accelerator, and SAMM mode. VIA CLE266 north bridge chip supports VT1622A/1623 TV encoders and VIA CN400/CN700/CN800/CN896/CX700(M/M2)/PM880/P4M800CE-Pro/P4M900/VX700(M/M2) north bridges support VT1622A/1623/VT1625(M) TV encoders. To enable TV out, users will have to enable this function by using the "active_dev=CRT+TV" parameter. Also, users are allowed to set the TV output's brightness, contrast, saturation, and tint level. It is noted that different TV encoders

have different default values of TV color features including brightness, contrast, saturation, and the tint level. The "accel" parameter provides the 2D Hardware acceleration.

```
# modprobe viafb mode=800x600 bpp=16 active_dev=CRT+TV
```

The following table summarizes the resolutions and the TV Signal modes supported in VIA VT1622M, and VT1625/M TV encoder:

TV Encoder	Function	640x480	800x600	720x480	720x576	1024x768	1280x720	1920x1080
VT1625+CN700 (Y/Cb/Cr)	TV-Out	Pass	Pass	Pass	Pass	Pass	N/A	N/A
	SAMM	Pass	Pass	Pass	Pass	Pass	N/A	N/A
VT1625M+CN800 (Y/Cb/Cr)	TV-Out	Pass	Pass	Pass	Pass	Pass	Pass	Pass
	SAMM	Pass	Pass	Pass	Pass	Pass	Pass	Pass
VT1625M+CX700M (Y/Cb/Cr)	TV-Out	Pass	Pass	Pass	Pass	Pass	Pass	Pass
	SAMM	Pass	Pass	Pass	Pass	Pass	Pass	Pass
VT1625M+CN896 (Y/Cb/Cr)	TV-Out	Pass	Pass	Pass	Pass	Pass	Pass	Pass
	SAMM	Pass	Pass	Pass	Pass	Pass	Pass	Pass

- (1) The 1280x720 and 1920x1080 resolutions have been tested with Y/Cb/Cr cable, other resolutions use the composite or S-video cable.

The VT1625 TV encoder supports HDTV output type, however, users must make sure the BIOS supports the HDTV. Follow the step below to load the module with "HDTV_YPBPR (720P)" TV out signal: e.g. (CRT:1280x720/32 + HDTV-TCbCr-720P:1280x720/32)

```
# modprobe viafb mode=1280x720 bpp=32 active_dev=CRT+TV tv_out_signal=9
tv_system=5
```

Additionally, the UniChrome console frame buffer driver supports Single Adapter Multiple Monitors (SAMM) mode, which allows the console to be displayed in two different devices such as CRT and TV. Users can drag the video output window from one device to another. However, it is important to note that the application playing the video output must support the SAMM mode to be able to drag the output window back and forth. To enable SAMM mode, follow the step below: e.g. SAMM mode console (HDTV-YCbCr-1080I:1920x1080/32 + CRT:1024x768/16)

```
# modprobe viafb mode=1920x1080 bpp=32 active_dev=TV+CRT
tv_out_signal=4 tv_system=6 SAMM_ON=1 mode1=1024x768 bpp=16
```

Refer to the "readme.txt" file in the package for further TV related settings.

10.LCD Function

The UniChrome console frame buffer driver supports LCD-Out function for VIA's VT1631L/VT1632A/CX700 Multi-configuration LVDS transmitters (up to UXGA). To enable LCD out, users will have to enable this function by using the

"LCD_ON=1" parameter. Also, users are allowed to use some different LCD output's channel (signal or dual) resolution and dithering. Refer to the "readme.txt" file in the package for more details.

```
# modprobe viafb lcd_panel_id=14 active_dev=CRT+LCD
```

LVDS transmitter	Function	640x480	800x600	1024x768	1280x768	1280x1024	1400x1050	1600x1200
CX700	LVDS-Out	Pass	Pass	Pass	Pass	Pass	Pass	Pass

11. Test Configuration

The following table summarizes the system configurations used for test.

CPU	VIA C3 Nehemiah 1 GHz	VIA C7 2 GHz
Mainboard	VIA EPIA M10000 (CLE266+VT8235+VT1622)	VT8454C (CX700M+VT1625)
DRAM	512 MB DDR SDRAM	512 MB DDRII 533
HDD	Maxtor 5T030H3 7200RPM 30GB	
Monitor	Samsung 17" SyncMaster. HorizSync: 30.0-50.0 KHz, VertRefresh: 50.0-80.0 Hz, Max resolution: 1280x1024	

CPU	VIA C7 1.5 GHz	VIA C7-D 2.0 GHz
Mainboard	VIA EPIA-EN (CN700+VT8237R-Plus+VT1625)	VT5935C-4 (CN896+VT8237A+VT1625)
DRAM	512 MB DDRII 533	512 MB DDRII 667
HDD	Seagate ST3120026A 120GB	
Monitor	Samsung 17" SyncMaster. HorizSync: 30.0-50.0 KHz, VertRefresh: 50.0-80.0 Hz, Max resolution: 1280x1024	

CPU	VIA Eden ULV 1.5 GHz	
Mainboard	VT5935C (CN800+VT8237R+VT1625)	
DRAM	512 MB DDRII 533	
HDD	Maxtor 6Y080L0 7200RPM 80GB	
Monitor	Samsung 17" SyncMaster. HorizSync: 30.0-50.0 KHz, VertRefresh: 50.0-80.0 Hz, Max resolution: 1280x1024	