

# BlueCat Linux Target Support Guide

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for Hitachi EBX7709 Boards

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# *Overview*

The BlueCat Linux Target Support Guide (TSG) for the EBX7709 (SH-3) evaluation board describes the BlueCat Linux procedure and the configuration of the prebuilt BlueCat Linux kernel contained in the sh\_ebx7709 Target Support Package (TSP) distribution. It summarizes the demo systems supported in the sh\_ebx7709 TSP. Chapter 5 shows the supported device drivers. Chapter 6 provides an overview of the Automated Test System (ATS) and qualification of the EBX7709 board.



This chapter describes the BlueCat Linux boot procedure for the EBX7709 board.

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## Installing the OS Loader into Flash Using the HDI Interface

Before using the BlueCat environment, the user should read and understand the HDI documentation provided with the Hitachi EBX7709 Board.

The OS Loader must be programmed into the board's Flash memory prior to using the board's parallel port interface for booting BlueCat Linux images on to the board using the OS Loader. This operation is demonstrated in your BlueCat Linux installation. Follow the procedure below to program the OS Loader into the board's Flash.

- Install the HDI software on a machine running Windows 9x/NT/2k. This software is provided on the CD that comes with the EBX7709 board.
- Attach the EBX7709 board to the Windows machine using a serial cable.
- Set the DIP switch positions to use the HDI interface instead of the normal boot sequence (toggle DIP switch #1).
- Power on the board. Launch the HDI software on the host (`hdi.exe`). When prompted, provide the appropriate serial port parameters and the board type (SH3).

- Copy the file  
`$(BLUECAT_PREFIX)/demo/flash/flash.mot`  
on the machine running the HDI client.
- Choose the **Load Program** item from the **File** menu in the HDI client program.
- Set the load program type to **S-Record**, load offset to `0c000000`, and specify the file to load (`flash.mot`). Then click on the **Open** button to start the download process. The serial interface used by the HDI is rather slow, so file downloading may take a while.

After the download is complete, the HDI client displays a dialog box indicating a successful download. Close the box by clicking on the **OK** button and run the program by pressing the **F5** key.

- As soon as the Flash programming is complete, the board is reset. The HDI client displays another dialog box to indicate the reset.
- Turn the board power off, restore the DIP switch positions to boot the secondary OS image. (Toggle DIP switch #1 to enable normal boot sequence and select the secondary OS image using the DIP switch #7.) The board now boots the OS Loader at power on.

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**NOTE:** *You can program any BlueCat Linux embedded system into Flash using the same demonstration system by modifying the `.spec` file in the demonstration system directory. Specify the image you want to program instead of `osloader.kdi` and rebuild the demonstration system. Then follow the procedure described above to program the embedded system of your choice in the board's Flash memory.*

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## Booting BlueCat Linux on SH from ROM/Flash

Step through the following procedure to boot BlueCat Linux on the SH board from Flash:

- Boot the OS Loader on the target. The OS Loader boots on the target on a power-on/reset, provided you have installed the OS Loader into Flash as described above.
- Install your embedded BlueCat Linux system into Flash using the OS Loader.
- Refer to the section entitled “Booting BlueCat Linux from ROM/Flash” in the *BlueCat Linux User's Guide* for a detailed description of the installation procedure. It is important that the Linux kernel starts at offset 0x800000 (8 MB) from the beginning of Flash. Make sure you partition the Flash device accordingly by using the `flash_fdisk` tool. For instance, the following command will create a single partition in which you can install a BlueCat Linux image of up to 7.9 MB:

```
> exec flash_fdisk /dev/mtdchar0 32-62
```
- Refer to the user documentation for the EBX7709 board for a detailed description of the Flash layout. Specifically, make sure that you do not erase the last sector of Flash, as it contains vital board data.
- Reset the target board. Your embedded BlueCat Linux system should boot up at this time.

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## Booting BlueCat Linux on SH from a Parallel Port

Use the following procedure to boot BlueCat Linux on SH from a parallel port:

- Install the OS Loader in Flash, as described above.
- Boot the OS Loader on the target.
- Boot a BlueCat Linux embedded system to SH from a parallel port using the OS Loader. A detailed description of the booting procedure is available in the *BlueCat Linux User's Guide*. Refer to the section entitled “Booting BlueCat Linux from a Network or a Parallel Port” in the “Booting BlueCat Linux” chapter.



# Default Kernel Configuration

This chapter shows the configuration of the prebuilt BlueCat Linux kernel contained in the sh\_ebx7709 TSP distribution.

**Table 3-1: BlueCat Linux Default Configuration for the sh\_ebx7709 TSP Distribution**

Parameters	Table Number
Code Maturity Level Options	Table 3-2
Loadable Module Support	Table 3-3
General Setup	Table 3-4
Block Devices	Table 3-5
Filesystems	Table 3-6
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Messenger Support	Table 3-13
Modular Advanced Power Management	Table 3-14

**Table 3-2: Code Maturity Level Options**

Option	Value	Description
CONFIG_EXPERIMENTAL	N	Prompt for development and/or incomplete code/drivers

**Table 3-3: Loadable Module Support**

Option	Value	Description
CONFIG_MODULES	Y	Enable loadable module support
CONFIG_MODVERSIONS	Y	Set version information on all symbols for modules
CONFIG_KERNEL	Y	Kernel daemon support (e.g., autoload of modules)

**Table 3-4: General Setup**

Option	Value	Description
CONFIG_SH_RAM_START	0x0C000000	RAM start address
CONFIG_SH_RAM_MB	16	RAM size in Megabytes
CONFIG_BLUECAT_INSTALL_FLASH	N	Flash installation image
CONFIG_NET	N	Networking support
CONFIG_BLUECAT_LOADER	N	BlueCat OS Loader support
CONFIG_BLUECAT_IGNORE_PRINTK	N	BlueCat ignore printk
CONFIG_BLUECAT_SMALL_FOOTPRINT	N	BlueCat small memory footprint
CONFIG_BLUECAT_MEMSIZE	N	Memory sizing benchmarks
CONFIG_SYSVIPC	Y	System V IPC
CONFIG_BINFORMAT_AOUT	N	Kernel support for a.out binaries
CONFIG_BINFORMAT_ELF	Y	Kernel support for ELF binaries
CONFIG_PARPORT	N	Parallel port support

**Table 3-5: Block Devices**

Option	Value	Description
CONFIG_BLK_DEV_FD	N	Normal PC floppy disk support
CONFIG_BLK_DEV_IDE	N	Enhanced IDE/MFM/RLL disk/cdrom/tape/floppy support
CONFIG_BLK_DEV_HD_ONLY	N	Old hard disk (MFM/RLL/IDE) driver
CONFIG_BLK_DEV_LOOP	Y	Loopback device support

**Table 3-5: Block Devices (Continued)**

Option	Value	Description
CONFIG_BLK_DEV_MD	N	Multiple devices driver support
CONFIG_BLK_DEV_RAM	Y	RAM disk support
CONFIG_BLK_DEV_INITRD	N	Initial RAM disk (initrd) support
CONFIG_BLUECAT_RFS	Y	BlueCat RFS support
CONFIG_BLK_DEV_GENERIC_FLASH_DOC	N	M-Systems DiskOnChip
CONFIG_BLK_DEV_XD	N	XT hard disk support
CONFIG_PARIDE_PARPORT	N	Parallel port IDE device support
CONFIG_BLK_CPQ_DA	N	Compaq SMART2 support

**Table 3-6: Filesystems**

Option	Value	Description
CONFIG_QUOTA	N	Quota support
CONFIG_AUTOFS_FS	N	Kernel automounter support
CONFIG_AFFS_FS	N	Amiga FFS filesystem support
CONFIG_HFS_FS	N	Apple Macintosh filesystem support (exp)
CONFIG_FAT_FS	N	DOS FAT fs support
CONFIG_ISO9660_FS	N	ISO 9660 CDROM filesystem support
CONFIG_MINIX_FS	N	Minix fs support
CONFIG_NTFS_FS	N	NTFS filesystem support (read only)
CONFIG_HPFS_FS	N	OS/2 HPFS filesystem support (read only)
CONFIG_PROC_FS	Y	/proc filesystem support
CONFIG_ROMFS_FS	N	ROM filesystem support
CONFIG_EXT2_FS	Y	Second extended fs support
CONFIG_SYSV_FS	N	System V and Coherent filesystem support
CONFIG_UFS_FS	N	UFS filesystem support
CONFIG_BLUECAT_FFS	N	BlueCat Linux Flash File System support

**Table 3-7: Partition Types**

Option	Value	Description
CONFIG_BSD_DISKLABEL	N	BSD disklabel (BSD partition tables) support
CONFIG_MAC_PARTITION	N	Macintosh partition map support
CONFIG_SMD_DISKLABEL	N	SMD disklabel (Sun partition tables) support
CONFIG_SOLARIS_X86_PARTITION	N	Solaris (x86) partition table support

**Table 3-8: Character Devices**

Option	Value	Description
CONFIG_VT	N	Virtual terminal
CONFIG_SERIAL	Y	Standard/generic (dumb) serial support
CONFIG_SERIAL_CONSOLE	Y	Support for console on serial port
CONFIG_SERIAL_EXTENDE	N	Extended dumb serial driver options
CONFIG_SERIAL_SCI	N	SCI serial support
CONFIG_SERIAL_SCIF	N	SCIF serial support
CONFIG_SERIAL_NONSTANDARD	N	Non-standard serial port support
CONFIG_UNIX98_PTYS	N	Unix98 PTY support
CONFIG_MOUSE	N	Mouse support (not serial mice)
CONFIG_QIC02_TAPE	N	QIC-02 tape support
CONFIG_WATCHDOG	N	Watchdog timer support
CONFIG_NVRAM	N	/dev/nvram support
CONFIG_RTC	N	Enhanced Real Time Clock Support
CONFIG_DTLK	N	Double Talk PC internal speech card support

**Table 3-9: Video for Linux**

Option	Value	Description
CONFIG_VIDEO_DEV	N	Video for Linux

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**Table 3-10: Joystick Support**

Option	Value	Description
CONFIG_JOYSTICK	N	Joystick support

**Table 3-11: Floppy Tape Device Driver, Ftape**

Option	Value	Description
CONFIG_FTAPE	N	Ftape (QIC-80/Travan) support
CONFIG_FT_NORMAL_DEBUG	Not Set	Debugging output
CONFIG_FT_STD_FDC	Not Set	Floppy tape controller

**Table 3-12: Kernel Hacking**

Option	Value	Description
CONFIG_PROFILE	N	Kernel profiling support
CONFIG_BLUECAT_KDBG	N	Include kdbg kernel debugger
CONFIG_BLUECAT_KDBG_TTYS0	Not Set	Serial console device

**Table 3-13: Messenger Support**

Option	Value	Description
CONFIG_BLUECAT_MSNG	N	Enable Messenger support

**Table 3-14: Modular Advanced Power Management**

Option	Value	Description
CONFIG_BLUECAT_APM	N	MAPM support



## *Supported Demo Systems*

The following table shows the demo systems supported by the sh\_ebx7709 TSP. Boot devices supported by the pre-built demo systems included in your distribution are shown.

Table 4-1: Demo Systems Supported by the sh\_ebx7709 TSP

Demo	Boot Devices Supported by Default	ROM Requirements	RAM Requirements
caffeine	Flash Parallel port using the OS Loader	2656 KB	17000 KB
default	Flash Parallel port using the OS Loader	1289 KB	8000 KB
ffs	Flash Parallel port using the OS Loader	1197 KB	8000 KB
gdb	Flash Parallel port using the OS Loader	1124 KB	7500 KB
hello	Flash Parallel port using the OS Loader	351 KB	4000 KB
kdbg	Flash Parallel port using the OS Loader	1202 KB	8000 KB
loadkeys	Flash Parallel port using the OS Loader	1549 KB	9000 KB
mapm	Flash Parallel port using the OS Loader	1118 KB	7500 KB
memsize	Flash Parallel port using the OS Loader	1215 KB	8000 KB

Table 4-1: Demo Systems Supported by the sh\_ebx7709 TSP

Demo	Boot Devices Supported by Default	ROM Requirements	RAM Requirements
modular	Flash Parallel port using the OS Loader	1198 KB	8000 KB
msgng_exmpl	Flash Parallel port using the OS Loader	1153 KB	8500 KB
multi_user	Flash Parallel port using the OS Loader	2180 KB	11500 KB
osloader	Flash Parallel port using the OS Loader	464 KB	7000 KB
shell	Flash Parallel port using the OS Loader	1269 KB	8000 KB
tcl	Flash Parallel port using the OS Loader	1470 KB	9000 KB
tutorial	Flash Parallel port using the OS Loader	1234 KB	8000 KB
xclock	Flash Parallel port using the OS Loader	3211 KB	17500 KB
xdemo1	Flash Parallel port using the OS Loader	3165 KB	17500 KB
xdemo2	Flash Parallel port using the OS Loader	3829 KB	20500 KB

## Supported Device Drivers

The following table shows the device drivers supported by the sh\_ebx7709 TSP.

Table 5-1: The Device Drivers Supported by the sh\_ebx7709 TSP

Hardware Device	Device Drivers	Location in Source Tree	Kernel Configuration Options	Notes
<b>Serial Ports</b> Two 16550-compatible async serial ports with RS-232 interface.	Standard serial driver	drivers/char/serial.c	CONFIG_SERIAL	
<b>On-chip Serial Interfaces</b> Three 2-wire serial ports on SH7709 (SCI, SCIF)		drivers/char/sh3sci.c drivers/char/sh3scif.c	CONFIG_SERIAL_SCI CONFIG_SERIAL_SCIF	
<b>Parallel Ports</b>	parport_pc.c	drivers/misc/parport_pc.c	CONFIG_PARPORT	
<b>Video</b> HD64461		drivers/video/vgacon.c	CONFIG_VGA_CONSOLE	Graphic modes supported by X Windows.
<b>Keyboard/Mouse</b> PS/2	pc_keyb.c	drivers/char/pc_keyb.c	CONFIG_PSMOUSE	



# *Target Testing and Qualification*

This chapter shows the results of the ATS testing and qualification of BlueCat Linux for the EBX7709 board. For a detailed description of the BlueCat Linux Test Suite and Automated Test System (ATS) refer to the *BlueCat Linux User's Guide*.

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## ATS Suites Test Results

All supported ATS Suites run on EBX7709 board. Test results are as shown in Chapter 5 of *BlueCat Linux User's Guide*.

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## Real-Time Performance

This section summarizes the results of the *BlueCat Linux User's Guide* real-time performance test suite, which simulates a real-world system environment and measures the Interrupt Response and Task Response times.

The following table summarize the actual results of real-time performance measurements for EBX7709 board. The results were obtained on the following hardware system:

- CPU SH7709, at 75 MHz
- L1 Cache – 8 KB
- L2 Cache – None
- RAM – 16 MB
- Ethernet – None

**Table 6-1: Real-Time Performance - Configuration 1**

<b>Configuration</b> schedule policy: fifo schedule priority: 99 background load: none	
<b>Interrupt Response:</b> Best Measured: Average: Worst Measured:	22 us 33 us 420 us
<b>Task Response:</b> Best Measured: Average: Worst Measured:	124 us 442 us 48126 us