Red Hawk Linux® OS Version 2.3 Release Notes

July 2005

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concurrent

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Contents

1.0. Introduction

This document provides release information and installation instructions for Concurrent Computer Corporation's RedHawk™ Linux® operating system Version 2.3.

1.1 Product Description

RedHawk Linux is a real-time version of the open source Linux operating system. Modifications are made to standard Linux version 2.6 to support the functionality and the performance required by complex real-time applications. RedHawk uses a single kernel design to support a single programming environment that directly controls all system operation. This design allows deterministic program execution and response to interrupts while simultaneously providing high I/O throughput and deterministic file, networking, and graphics I/O operations. RedHawk is the ideal Linux environment for the deterministic applications found in simulation, data acquisition, industrial control and medical imaging systems.

Included with RedHawk is the popular Red Hat® Enterprise Linux distribution. The RedHawk installation CDs provide additional real-time kernels and libraries for accessing RedHawk specific kernel features. Optionally, the NightStar™ development tool set is available for developing real-time applications, and the Frequency-Based Scheduler and Performance Monitor can be used for monitoring performance.

The RedHawk kernel integrates both open source patches and Concurrent developed features derived from the real-time UNIX® implementations that Concurrent has supported in its over 35 years experience developing real-time operating systems.

RedHawk is included with each Concurrent iHawk™ system. iHawks are symmetric multi-processor (SMP) systems available in a variety of architectures and configurations. Either 32-bit or 64-bit versions of RedHawk and its supporting software products are installed, depending upon the iHawk architecture type and the support included in RedHawk for that architecture.

Support for SMPs is highly optimized. A unique concept known as *shielded CPUs* allows a subset of processors to be dedicated to tasks that require the most deterministic performance. Individual CPUs can be shielded from interrupt processing, kernel daemons, interrupt bottom halves, and other Linux tasks. Processor shielding provides a highly deterministic execution environment where interrupt response of less than 30 microseconds is guaranteed.

RedHawk Linux has at least the same level of POSIX® conformance as other Linux distributions based on the 2.6 series of kernels. Concurrent has added additional POSIX compliance by adding some of the POSIX real-time extensions that are not present in standard Linux. Linux on the Intel™ x86 architecture has defined a defacto binary standard of its own which allows shrink-wrapped applications that are designed to run on the Linux/Intel x86 platform to run on Concurrent's iHawk platform.

NightStar is Concurrent's powerful real-time tool set that provides a robust graphic interface for non-intrusive control, monitoring, analysis, and debugging of real-time multiprocessing applications. All tools can be run natively on the same system as the application or remotely for less intrusive application control. The NightStar tools include the following:

- NightView™ source-level debugger – allows multi-language, multi-processor, multi-program and multi-thread monitoring and debugging from a single graphical interface.
- NightTrace™ run-time analyzer – analyzes the dynamic behavior of a running application.
- NightSim™ periodic scheduler – allows the user to easily schedule applications that require periodic execution.
- NightProbe™ data monitor – used to sample, record or modify program data in multiple running programs.
- NightTune™ performance tuner – used for analyzing system and application performance.

1.2 Product Media

The tables below list the CDs that are delivered with RedHawk Linux Version 2.3 for each Concurrent system.

WARNING

While much of the software on the RedHawk CDs is licensed under the GNU GPL license, some components are not. Therefore, these CDs cannot be freely copied.

Processor Type:	**Intel® Xeon™ i386 and EM64T (32-bit)**
Model:	**iHawk 860 Series [HQ685, 680, 665, 660, 645, 460, 285, 280, 265, 260, 185, 175, 160, 075, 074, 067, 065, 060, 053, 047 045, 036, 034, 000]** **iHawk 880 Series [HQHS2]** **ImaGen [HQ0G1]**
CDs: **Red Hat Enterprise Linux 3 Update 4 (x86)** (8 discs) **Red Hat Enterprise Linux 3.0 Updates for i386 & EM64T Systems** [LXUPDATE WA9086-J/WA-IA32 Version 2.3] (2 discs) **RedHawk Linux OS for i386 & EM64T Systems** [WA9086-J/WA-IA32 Version 2.3] **RedHawk Linux Documentation CD** [LXDOCKIT i386 & EM64T WA9086-J/WA-IA32 Version 2.3]	
Optional CDs: **RedHawk NightStar Tools** [WU1220-LDV Version *x.x* (*x.x*=latest version)] **RedHawk Linux Frequency-Based Scheduler for i386 & EM64T Systems** [WU1210-JL Version 2.3] **RedHawk Linux PCI-to-VME Bridge Software Library for i386 & EM64T Systems** [WU-HS630-LIB (WCS-SBS-620)] Version 2.3	
Processor Type:	**AMD Opteron™ x86_64 (64-bit)**
Model:	**iHawk 870 Series [HR844, 430, 221, 210, 00W, 00T]** **ImaGen [HR0G1]**
CDs: **Red Hat Enterprise Linux 3 Update 4 (AMD64)** (8 discs) **Red Hat Enterprise Linux 3.0 Updates for x86_64 Systems** [LXUPDATE WA-AMD64 Version 2.3] (2 discs) **RedHawk Linux OS for x86_64 Systems** [WA-AMD64 Version 2.3] **RedHawk Linux Documentation CD** [LXDOCKIT x86_64 WA-AMD64 Version 2.3]	
Optional CDs: **RedHawk NightStar Tools** [WU1220-ADV Version *x.x* (*x.x*=latest version)] **RedHawk Linux Frequency-Based Scheduler for x86_64 Systems** [WU1210-JA Version 2.3] **RedHawk Linux PCI-to-VME Bridge Software Library for x86_64 Systems** [WU-HS630-LIB (WCS-SBS-620)] Version 2.3	

1.3 Version Numbers

All RedHawk Linux version numbers take the following form:

major.*minor*[.*update*]

where:

major	is the product's major version number
minor	is the product's minor version number
update	is the update's incremental version number

For example, 2.0 is the initial release of major version 2, and 2.1 is a subsequent release to version 2.0. Both 2.0 and 2.1 constitute complete product releases and do not require a previous release to be currently installed on the system; both are available on CD from Software Distribution.

Individual updates available via the RedHawk Updates website (see the "System Updates" section below) are not a complete product and can only be installed as an update to the matching *major*.*minor* release. For example; a 1.4.1 kernel update can only be installed on a system currently running RedHawk Linux version 1.4.

1.4 System Updates

As RedHawk Linux updates are issued, they are made available for downloading from Concurrent's RedHawk Updates website.

NOTE

Concurrent does not recommend downloading Red Hat updates.

The RedHawk Linux kernel replaces the standard Red Hat kernel and is likely to work with any version of the Red Hat distribution. However, installing upgrades, especially to **gcc** and **glibc**, from sources other than Concurrent may destabilize the system and is not recommended. Security updates from outside sources may be installed if desired.

Instructions for downloading updates from the website are included with the installation and update instructions in this Release Notes and are provided in the section "Software and Documentation Updates" on page 43.

1.5 Syntax Notation

The following notation is used throughout this document:

italic	Books, reference cards, and items that the user must specify appear in *italic* type. Special terms may also appear in *italic*.
`list bold`	User input appears in **`list bold`** type and must be entered exactly as shown. Names of directories, files, commands, options and man page references also appear in **`list bold`** type.
`list`	Operating system and program output such as prompts, messages and listings of files and programs appears in `list` type.

`[]`	Brackets enclose command options and arguments that are optional. You do not type the brackets if you choose to specify these options or arguments.
hypertext links	When viewing this document online, clicking on chapter, section, figure, table and page number references will display the corresponding text. Clicking on Internet URLs provided in ***blue*** type will launch your web browser and display the web site. Clicking on publication names and numbers in ***red*** type will display the corresponding manual PDF, if accessible.

2.0. Documentation

2.1 RedHawk Linux Documentation

Table 2-1 lists the documentation provided by Concurrent as PDF files on the RedHawk Linux documentation CD. After installing the RedHawk Linux Documentation CD, the PDF files are available for viewing by clicking on the "Documents" icon on the desktop.

Table 2-1 RedHawk Linux Documentation

RedHawk Linux Operating System Documentation	Document Number
RedHawk Linux Online Documentation Roadmap	0898002-430
RedHawk Linux OS Version 2.3 Release Notes	0898003-2.3b
RedHawk Linux User's Guide	0898004-430
Real-Time Clock & Interrupt Module (RCIM) PCI Form Factor User's Guide	0898007-300
RedHawk Linux Frequency-Based Scheduler (FBS) User's Guide	0898005-230
iHawk Optimization Guide	0898011-000
RedHawk Linux FAQ	N/A
Partner Documentation	
SBS Technologies Model 1003 Linux Support Software	85221990
SBS Technologies Model 618-3 Adapter Hardware	85851150
Guide to SNARE for Linux	N/A

RedHawk NightStar Tools documentation is included as PDF files on the RedHawk NightStar Tools CD.

Updates to Concurrent documentation as PDF files can be downloaded from the RedHawk Updates web site. Refer to "Software and Documentation Updates" on page 43 for more information. Documentation is also available from Concurrent's web site at **www.ccur.com**. Printed copies can be ordered by contacting the Concurrent Software Support Center. Refer to "Direct Software Support" on page 43 for details.

2.2 Vendor Documentation

Documentation provided by Red Hat is included as PDF files on the Red Hat CDs delivered with RedHawk Linux.

Documentation for the SBS Technologies PCI-to-VME Bridge adapter and SNARE auditing subsystem is included with the RedHawk Linux documentation.

Commercial off-the-shelf (COTS) documentation applicable to your iHawk system is included with the system. Contact the vendor's sales office to purchase additional copies.

3.0. Prerequisites

3.1 Software

No previously installed software is required in order to install RedHawk Linux. The complete RedHawk Linux installation consists of the following software:

- Red Hat Enterprise Linux 3 with updates
- RedHawk Linux operating system
- RedHawk NightStar Tools (optional)
- RedHawk Linux Frequency-Based Scheduler (FBS) (optional)
- RedHawk Linux PCI-to-VME bridge software (optional)

These packages operate in either a 32-bit or 64-bit environment. The operating environment on a system depends upon the processor type and the support included in the software for that processor. Refer to “Product Media” on page 2 for details.

3.2 Hardware

- Any Concurrent iHawk or ImaGen system
- Real-Time Clock and Interrupt Module (RCIM)

4.0. Changes in this Release

This section describes enhancements and other changes introduced in Version 2.3.

4.1 Enhancements

4.1.1 Enhanced RCIM

RCIM II is a major update to Concurrent's Real-time Clock and Interrupt Module (RCIM). This new board contains the following upgrades:

- 4 additional real-time clocks (RTCs) for a total of 8 32-bit clocks
- 8 additional edge-triggered interrupt lines (ETIs) for a total of 12
- 8 additional output external interrupt lines for a total of 12
- 4 additional distributed interrupts (DIs) for a total of 12
- 8 additional programmable interrupt generators (PIGs) for a total of 12
- Optional GPS module for synchronizing the system's time to GPS time
- Optional high stability oscillator for improved time synchronization

RedHawk supports the new RCIM II board as well as the original RCIM. Note that the PCI vendor and device IDs for the RCIM II are different than those for the original RCIM board.

RedHawk Version 2.3 users who are using the original RCIM should refer to section **4.2.6** on page 11 for changes affecting original RCIM usage.

Refer to the *Real-time Clock and Interrupt Module (RCIM) PCI Form Factor User's Guide* for complete information.

4.1.2 Support for Blade Technology

The new iHawk Series 880 multiprocessing system features Intel Xeon Blade technology. The pre-built RedHawk i386 kernels are utilized on these systems and all documentation for i386 RedHawk functionality applies. Currently the default RedHawk installation does not support Blades unless they have on-board disk drives.

4.1.3 Robust Mutexes and Priority Inheritance through an Alternative glibc

Additional pthread mutex services that extend beyond POSIX 1003.1-2001 specifications are available through an alternative **`glibc`**. This support provides robust mutexes and priority inheritance and is based upon two open source patches, fusyn-2.3.1 and rtnptl-2.3. It is accessed by compiling and linking applications with **`ccur-gcc`**.

A robust mutex gives applications a chance to recover if one of the application's threads dies while holding a mutex. New services and error codes enable marking a mutex as "inconsistent" allowing the owner to identify the condition and take immediate action. An application using a priority inheritance mutex can find its priority temporarily boosted from time to time. The boosting happens to those threads that have acquired a mutex and other higher priority threads go to sleep waiting for that mutex.

Refer to Chapter 5 of the *RedHawk Linux User's Guide* for details.

4.1.4 POSIX Named Semaphores

Support for POSIX named counting semaphores is included in this release. This functionality is described in Chapter 5 of the *RedHawk Linux User's Guide* and in the **sem_open(3)**, **sem_close(3)** and **sem_unlink(3)** man pages.

4.1.5 PCI-to-VME Bridge Support on Opteron Processors

The PCI-to-VME Bridge can now be used to connect iHawk 870 Opteron-based systems to VME-based systems. Refer to Chapter 14 of the *RedHawk Linux User's Guide* for information about this support.

4.1.6 Shared Memory Bindings to VMEbus Mappings

Via the PCI-to-VME Bridge, VMEbus space mappings can be created and used with **shmbind(2)** or **shmconfig(1)** to bind the segment to a region of I/O. Two new library functions, bt_hw_map_vme() and bt_hw_unmap_vme(), and a **/proc** interface have been added to view, create and remove these mappings. Refer to Chapter 14 of the *RedHawk Linux User's Guide* for details.

4.1.7 BAR File System mmap Routines

Two new library routines are available that can be used when mmap'ing a PCI base address register (BAR) file. The **bar_mmap(3)** function is a wrapper around **mmap(2)** that aligns small BAR files at the start of the mmap'ed BAR data rather than at the beginning of the area that is mmap'ed. **bar_munmap(3)** is supplied for unmapping BAR files mapped using **bar_mmap**. Refer to the man pages and the "Device Drivers" chapter of the *RedHawk Linux User's Guide* for details.

4.1.8 kdb Support on Opteron Processors

kdb is now fully supported on iHawk 870 systems with AMD Opteron processors.

4.1.9 Full LKCD Support on Opteron Processors

Full LKCD support is now provided on iHawk 870 systems with AMD Opteron processors.

4.1.10 SNARE Auditing Subsystem

SNARE (System iNtrusion Analysis Reporting Environment), an open source system auditing and event logging facility, is included in RedHawk.

SNARE allows the security administrator to select events to be audited and filter the output to meet specific needs. The SNARE audit GUI provides a graphical user interface that allows the administrator to add, remove or modify audit objectives and change reporting options.

SNARE documentation in PDF form is included with the standard RedHawk Linux documentation. SNARE is installed by the RedHawk installation script and can be enabled by configuring the SNARE_AUDIT kernel parameter in your kernel.

Note that enabling SNARE_AUDIT causes additional processing to occur during many common system events (e.g., login, logout) which may adversely affect system performance.

4.1.11 usermap(3) Maps to I/O Page Mappings

The **usermap(3)** service now allows mapping to a target process' I/O page mappings. This service is described in the man page and in Chapter 9 of the *RedHawk Linux User's Guide*.

4.1.12 Additional Reductions of Cross Processor Interrupts on Shielded CPUs

Reduction of cross processor interrupts on shielded CPUs has been expanded to include PCI-based NVIDIA cards. In addition, measures have been taken to reduce TLB flush cross processor interrupts when the NVIDIA driver accesses Video RAM.

Refer to Appendix G in the *RedHawk Linux User's Guide* for a complete discussion of cross processor interrupts and how you can fine tune your system for maximum performance.

4.1.13 NUMA Support on Opteron Processors

Non-Uniform Memory Architecture (NUMA) is fully supported and optimized for real-time performance in the x86_64 RedHawk kernels that run on iHawk 870 systems with AMD Opteron processors.

The following are included with this support:

- NUMA enhancements to **run(1)**, **shmconfig(1)** and **mpadvise(3)**
- libnuma library (see **numa(3)**)
- **numastat** and **numactl(8)** utilities
- **mbind(2)**, **set_mempolicy(2)** and **get_mempolicy(2)** system service calls
- **kdb** support with the addition of several commands for debugging NUMA systems

Details can be found in Chapter 10 of the *RedHawk Linux User's Guide* and the man pages.

4.1.14 New Options to ccur-config

The **ccur-config** tool provides two new options that allow you to save a custom configuration file and name the resulting kernel without having to edit the Makefile. See the **ccur-config(8)** man page for details.

4.1.15 iHawk Optimization Techniques and Tools

An analysis has been performed to determine how to get the best performance from your iHawk system. PCI bus characteristics, IRQ priority management schemes and the effect of BIOS settings have been examined on each of the iHawk models. A discussion of these issues and recommendations for optimizing the

configuration of each iHawk system are provided in a new document, *iHawk Optimization Guide*, publication number 0898011. This guide is included with the standard RedHawk Linux documentation.

A new tool, **lsirq(8)**, can be used to analyze the distribution of IRQs on a system.**lsirq** lets you see when devices are sharing buses or IRQs and at what priority the devices' interrupts are being serviced. This information can help the system administrator determine where changes in system configuration can be made to improve performance. Refer to the **lsirq(8)** man page for details.

4.2 Modifications

4.2.1 Local Timer Removed from RCU Processing

The kernel read copy update (RCU) code traditionally relies on the local timer to poll for a quiescent state on each CPU to free data structures. When a CPU is shielded from local timer interrupts, that CPU can no longer perform the needed RCU processing.

A synchronization mechanism is now used that launches RCU processing at an arbitrary point and completes without waiting for a timer driven poll, eliminating the local timer's participation in RCU processing.

4.2.2 Reserving vmalloc Space

When an i386 RedHawk kernel is configured to reduce **vmalloc()** and **ioremap()** TLB flush cross processor interrupts, the virtual area is divided into two areas: one for smaller allocations and one for larger allocations.

Previously, the VMALLOC_LARGE_RESERVE kernel parameter was used to define the size of the large allocation area. Now, VMALLOC_SMALL_RESERVE is used to define the small allocation area. The large allocation area size is equal to the total vmalloc virtual space (VMALLOC_RESERVE) minus the small reserve size. At system boot, the kernel boot option **vmalloc=***size* sets the total reserved area and a new boot option, **vmalloc_sm**=*size*, sets the small reserve area. Increasing the total area also increases the large area unless the small area is also increased.

For more information about reducing TLB flush cross processor interrupts, see Appendix G of the *RedHawk Linux User's Guide*.

4.2.3 FBS Tunable for Maximum Queries

The maximum number of tasks that can be queried simultaneously by the **pmqrycpu(3)** and **pmqrylist(3)** Performance Monitor routines is now defined in a new kernel tunable, FBSQUERYMAX. If this value is exceeded, an error is returned. This tunable is designed to prevent these services from being preempted while holding the BUSY_FBS lock. The tunable is accessible under Frequency-Based Scheduling on the Kernel Configuration GUI. The default value is 100; the range is 1-1000.

4.2.4 Change to ATI Radeon Kernel Driver Support

The ATI Radeon kernel support driver is now a module instead of included directly into the RedHawk kernel. If you have Radeons and are using X, you may now need to issue a "`modprobe radeon`" command before bringing up the X server.

4.2.5 Rescheduling Variables and Forking

Changes have been made that affect multi-threaded programs using rescheduling variables (RVs) and forking. Programs using RVs that fork should be recompiled to ensure proper RV semantics during forking. Existing binaries may not be notified in a timely manner of denied preempts and deferred signals that occur while the RV is locked during the fork processing.

4.2.6 RCIM Modifications

Support for the new RCIM II board brought about changes to basic RCIM usage as noted here:

- **`rcimconfig(1)`** is no longer available. Instead, use **`/proc/driver/rcim/config`**.
- The way in which a distributed interrupt (DI) is driven has changed when using an RCIM II. Originally, the source of the DI was the output of the local interrupt pending register bit corresponding to the requested source. For example, if eti0 was configured to drive di0, the interrupt being used to drive a DI had to be enabled and serviced locally to be driven as a distributed interrupt. This is still true when using the original RCIM board.

  On RCIM II, the local interrupt does not drive the configured DI. An ETI_REQUEST ioctl will cause a local interrupt but will not affect the DI associated with the ETI. If eti0 is configured to drive di0 on an RCIM II, it will connect the external ETI input to di0 directly without passing through the local eti0 interrupt control logic.

  A benefit of this is that a local interrupt is not issued for every distributed PIG and ETI. A PIG should be used for a programmable software controlled interrupt and an ETI should be used for an external interrupt output.
- Specifying aliases to "none" as a source for a distributed interrupt is no longer supported. Previously, "(rtc0)|di0" could be used as an alias for "none|di0", perhaps to indicate that rtc0 on a remote source was driving di0. As it erroneously implied that one is actually changing a configuration remotely, these aliases are no longer supported.
- A 32-bit interface to the RTCs is provided through two new **`ioctl`**s, RTCIOCSETL and RTCIOCGETL. These can be used with the original RCIM as well as RCIM II. The original 16-bit interface is still supported through RTCIOCSET and RTCIOCGET. With the 32-bit interface, a repeat counter can be specified with an initial counter value different from the reload value when used with RCIM II; with the original RCIM board, the two values must be the same.

5.0. Installation Procedures

Use the installation procedures provided here under the following circumstances:

- generating or regenerating a system
- upgrading a system currently running Version 1.x to Version 2.3. Refer to “File System Backup Recommendations” on page 37 before starting the installation.

If upgrading from Version 2.x to Version 2.3, follow the steps in “Upgrade Procedures” on page 26.

Review the following points before installing the software:

- Read through the entire installation procedure once before actually performing the installation.
- It is **strongly recommended** that installation and updates of software be performed in single-user mode to guard against the possibility of corrupting a running application.
- Concurrent recommends these procedures be followed as documented here; however, advanced users may decide to make other choices based on onsite requirements.
- The installation media in use is accessed at various times and must be kept in the drive during the installation until you are instructed to install different media.
- Prior to installation, remove any floppy media that may have been left in the machine.

Before you start:

- **Main Memory Size** — You need to know the system’s main memory size in order to properly set up the file system swap size. If you are not sure of the main memory size, access the system’s BIOS to ascertain this information.
- **Network Addresses** — If you plan to configure networking using fixed numbers (recommended), you will need to have the following information for your system before beginning the installation:
  - IP address
  - netmask address
  - gateway address
  - primary and secondary DNS addresses
- **BIOS Settings** — BIOS settings should be reviewed before installation and whenever problems involving non-working devices are encountered. Exercise caution before changing default settings. Concurrent makes the following recommendations:
  - “Linux” should be specified for the “Installed OS” setting (or its equivalent) if it is an available option. If not, use the default “other.”
  - Only the default settings for memory functions and PCI timing functions are supported.
  - ACPI support should be enabled, but care should be taken before changing other ACPI options from their defaults. ACPI sleep states should ***not*** be enabled in the BIOS or in any custom kernel build.

5.1 Installing Red Hat Software

The version of Red Hat Enterprise Linux that is appropriate to your system's architecture must be installed on the system first by completing the steps below. (If you are uncertain which version is applicable, refer to the "Product Media" section on page 2.) During installation, refer to Red Hat's online help if needed.

1. Power on the system, if needed, to open the CD-ROM drawer.
2. Insert Red Hat Enterprise Linux Installation Disc 1 of 4 in the CD-ROM drive and power down the system.
3. Power on the system with the installation disc installed to boot from the disc. After a short delay, a screen containing the `boot:` prompt should appear.
4. If you wish to check the Red Hat media, type `linux mediacheck` at the `boot:` prompt (optional). Otherwise, press Enter (or allow this screen to timeout after a minute) to start the installation program using the GUI installation interface.

NOTES

If your system contains disk drives or devices that are not supported by the Red Hat installation program, you will need to obtain the necessary driver(s) in order to install Red Hat Enterprise Linux. A diskette containing the driver may be included with your system, it may be available on the Red Hat installation CD, or it may be available for download from the RedHawk Updates web site. If you need to download the driver image file from the RedHawk Updates web site, refer to section "Creating a Driver Disk for Red Hat Installation" on page 39.

For this type of installation, type `linux dd` at the `boot:` prompt. Insert the diskette in the drive when instructed to do so.

If your hard drive is not recognized and no driver diskette is supplied, a screen appears stating that no hard drives are found, would you like to select drivers. The installation CD contains a number of device drivers. Select Yes, then Add Device to display a list of drivers. Select the desired driver and proceed through the screens, completing this action by selecting Done.

If your system has a graphics card that is not recognized by the Red Hat installation program, the installation GUI will not appear and you will have to install Red Hat Enterprise Linux in **text mode**. Aids at the bottom of the screen describe how to navigate through the text mode screens and make selections. The instructions given below can be applied to both GUI and text mode installation; however, the number and order of the configuration screens differ slightly between the two modes. During RedHawk installation, your graphics card will be configured properly.

5. At the Welcome screen, no action is needed. Proceed to the next screen.

   - For language selection, choose English language. Proceed to the next screen.
   - When using the GUI interface:
     - For keyboard configuration, accept keyboard defaults. Proceed to the next screen.
     - For mouse configuration, select the appropriate mouse model. **NOTE**: Click the "Emulate 3 buttons" box at bottom of page if using a 2 button mouse. Proceed to the next screen.
   - For disk partitioning, choose "Manually Partition with Disk Druid" and proceed to the next screen to partition the disk manually and create the partition sizes as shown in Table 5-1 below. Note that this table shows recommended partition sizes for a 36 GB disk or larger.

NOTES

All partitions on SCSI drives must be placed on **/dev/sda**; all partitions on IDE drives must be placed on **/dev/hda**.

If the system has multiple drives, you must deselect all other drives.

Standard RedHawk does not support software RAID and Concurrent does not recommend its use.

   - At the Partitioning screen, first delete all existing partitions by highlighting each line and selecting DELETE. This must be done one partition at a time.

     To add partitions, highlight the disk drive and select NEW. Provide the mount point, filesystem type and size. Select the Force to be primary partition box at the bottom of each partition setup page. Select OK to continue to set up the next partition. **Note:** If the system has multiple drives, the additional drives listed under Allowable Drives must be unchecked each time a new partition is added.

Table 5-1 Recommended Disk Partition Sizes

Mount Point	Type	Filesystem Type	Partition Size
/boot	primary	ext3	500 MB
/	primary	ext3	16384 MB (16 GB)
swap (See Note below)	primary	swap	Size of system's main memory **plus** 5 percent additional. (See Table 8-2 on page 38 for suggested swap sizes)
/home	primary	ext3	Select "Fill to maximum allowable size."
Note: Select the **swap** file system from the list of filesystems.			

- Proceed to the next screen when finished with partitioning.
- For configuring the Boot Loader, accept GRUB boot loader defaults. Enter a GRUB password if desired (not recommended). Proceed to the next screen.
- For Network configuration, configure networking as appropriate (fixed network numbers are recommended - you will need address information if using fixed numbers). Select the network device if necessary, select Edit, and supply the appropriate addresses. Proceed to the next screen after completion.
- For Hostname specification, select manual configuration and proceed to the next screen. Supply the hostname for your system. Proceed to the next screen.
- For Firewall configuration, choose "No firewall", then proceed to the next screen.
- For Additional Language Support, choose any additional languages as necessary. Proceed to the next screen.
- For Time Zone Selection, select the appropriate time zone, then proceed to the next screen.
- To set the Root Password, enter the root password and confirmation, then proceed to the next screen.
- For selecting Packages to be installed, select "Customize the set of packages to be installed", then proceed to the next screen.
- At the list of Package Groups to install, scroll down to the bottom of the list and select "Everything." Proceed to the next screen.
- A screen preparing you for the installation of Red Hat Enterprise Linux now appears.

  At this point in the installation, the disk will format and packages on Red Hat Installation disc 1 will be installed. When disc 1 is completed, you will be prompted to insert disc 2. Remove disc 1 and insert disc 2, then click OK. Take the same action when prompted for discs 3 and 4 and finally disc 1 again.

- When using the GUI interface:
  - at the Graphical Interface (X) Configuration screen, accept defaults. Proceed to the next screen.
  - At the Monitor Configuration screen, accept monitor defaults. Proceed to the next screen.
  - At the Customize Graphical Configuration screen, provide the Color Depth and Screen Resolution values for your monitor. Proceed to the next screen.
- Remove all media from the drives and store appropriately.

6. Make the selection to reboot the system. Verify that Red Hat boots up properly.

7. When using the GUI installation interface, once the system boots up successfully, proceed as follows:

   - At the Welcome screen:
     Click Next to continue.
   - At the License Agreement screen:
     Click "Yes, I agree to the License Agreement", then click Next.
   - At the Date and Time screen:
     Set the appropriate date and time. Enable NTP if desired. Click Next to continue.
   - At the Red Hat Login screen:
     Select "Tell me why I need to register and provide a Red Hat login." and click Next. At the Why Register? screen, select "I cannot complete registration at this time. Remind me later." and click Next.
   - At the System User screen:
     Enter a username and password for each account you wish to set up at this time (this can be done after the full installation). Click Next to continue.
   - If your system has a sound card installed, the Sound Card screen will appear. At the Sound Card screen:
     Click Play test sound if desired. Click Next.
   - At the Install Additional CDs screen:
     Three choices appear for installing additional Red Hat CDs. If you wish to install any of them now, click on the Install button for the desired CD and follow the instructions that display. Click Next to continue.
   - At the Finished Setup! screen:
     Click Next to continue.

8. Initial Red Hat installation is now complete. The login window should appear at this point. Remove any media from respective drives. Continue with the steps in section **5.2** to install Red Hat software updates.

5.2 Installing Red Hat Software Updates

The discs labeled "Red Hat Enterprise Linux 3.0 Updates Version 2.3" contain the latest updates released by Red Hat and validated against RedHawk Linux. These updates are important to the proper operation of RedHawk Linux.

To install the Red Hat software updates, perform the following steps.

1. Log in as root and take the system down to single-user mode:
   a. If in GUI mode, right click on the desktop and select New Terminal.
   b. At the system prompt, type **`init 1`**.
2. **If you used a driver diskette to install Red Hat Enterprise Linux,** type **`export NO_KERNEL_UPDATE=1`**. If you did not use a driver diskette during installation, skip to the next step.

3. Locate the disc labeled “Red Hat Enterprise Linux 3.0 Updates (Disc 1 of 2)” appropriate to your system’s architecture and insert it into the CD-ROM drive.

4. If the cdrom device does not mount automatically, execute the following command:

   ```
   mount /mnt/cdrom
   ```

5. Execute the following commands to install the update software on disc 1:

   ```
   cd /mnt/cdrom
   ./install-updates
   ```

   Follow the on-screen instructions until the installation script completes.

   NOTE: This process may take some time to complete.

6. When disc 1 is completed, you will be prompted to unmount disc 1, insert disc 2 and run the install script again. Perform the following:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

   Remove disc 1 and insert disc 2.

   ```
   mount /mnt/cdrom
   cd /mnt/cdrom
   ./install-updates
   ```

7. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

8. Remove disc 2 from the CD-ROM drive and store the discs.

9. **Perform this step ONLY if you are installing on a single processor system.** If installing on a multiprocessor system or on a system with one physical CPU that supports hyper-threading, skip to the next step.

   On a single processor system, execute the following:

   ```
   rpm -e kernel-smp
   ```

NOTE: It is possible that some warning messages may display at this time. These can be ignored and will be resolved when the system is rebooted.

10. Type “reboot” at the system prompt and verify that the new Red Hat kernel boots.

11. Continue with the steps in the next section to install RedHawk Linux.

5.3 Installing RedHawk Linux

After installing Red Hat and its updates, perform the following steps to install RedHawk Linux:

1. Log in as root and take the system down to single-user mode:

   a. If in GUI mode, right click on the desktop and select New Terminal.

b. At the system prompt, type **`init 1`**.

2. Locate the disc labeled “RedHawk Linux OS Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive.
3. If the cdrom device does not mount automatically, execute the following command:

   ```
   mount /mnt/cdrom
   ```

4. Execute the following commands to install RedHawk Linux:

   ```
   cd /mnt/cdrom
   ./install-redhawk
   ```

   NOTE: Special instructions are displayed during the installation that may require appropriate action, such as video card installation and configuration. Follow the on-screen instructions until the installation script completes.

5. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

6. Remove the disc from the CD-ROM drive and store.
7. Locate the disc labeled “RedHawk Linux Documentation CD Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive. Use **`mount`** as described above if needed to mount the cdrom device.
8. Execute the following commands to install RedHawk Linux documentation:

   ```
   cd /mnt/cdrom
   ./install-docs
   ```

   Follow the on-screen instructions until the installation script completes.

9. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

10. Remove the disc from the CD-ROM drive and store.
11. Exit single-user mode (Ctrl-D).
12. If you installed in text mode because full support for the video card was not present during Red Hat installation, you need to complete this configuration now. Type `init 5` at the system prompt. Proceed through the windows that display to configure screen resolution and color depth for your system. When you exit this session, the RedHawk Linux desktop should appear.
13. Check for RedHawk updates as outlined in the following section.

5.4 Installing RedHawk Linux Updates

If there are any updates to this release available from the RedHawk Updates web site, they should be downloaded and installed now. Follow these steps:

1. In multi-user mode, access the **redhawk.ccur.com** web site using your browser or by clicking on the "Updates" desktop icon.
2. Log onto the site using the login and password provided by Concurrent.
3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **`/root/updates`**).
4. Return to single-user mode as root.
5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

   To install the updates, issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   Installation time will vary depending on the number of updates being installed.
6. When complete, reboot the system (see **NOTES** below) choosing the new RedHawk kernel and verify that the system boots properly.

   NOTES If this system is a model 868 8-way iHawk, disable hyper-threading through the BIOS before booting (refer to the hardware documentation for the appropriate BIOS setting).

   On an i386 system with greater than 4 GB of memory installed, support must be configured into the kernel. Refer to section **8.1.3** on page 38 for details.

   Continue with section **5.5** if an RCIM is to be installed or section **5.6** to install FBS.

5.5 Installing the RCIM

The following serves as an installation checklist for installing a PCI RCIM in an iHawk system. If an RCIM is not installed in your iHawk system, it should be installed now. See the *Real-Time Clock and Interrupt Module (RCIM) PCI Form Factor User's Guide* for complete details. The PDF file for this manual is available for viewing by clicking on the "Documents" icon on the desktop.

5.5.1 Quick Hardware Installation Checklist

1. Before installing the RCIM, determine if you will be using the RCIM to accept or deliver external interrupts and the mode in which the RCIM will run (see "RCIM Connection Modes" on page 38).
2. Verify that the **`ccur-rcim`** RPM has been installed by executing the command **`rpm -q ccur-rcim`**. The system will inform you if it is not installed. It is a standard package in the RedHawk installation.

3. Power down the system and remove all power cords.

NOTE

Concurrent Computer Corporation strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing and removing printed circuit boards.

4. Open the case of your system and identify the PCI slot where you want the RCIM to reside. In general, it is best for the RCIM to be configured in a slot where minimal or no contention with other devices occurs and at the highest IRQ priority possible. For more information, refer to the *iHawk Optimization Guide*, publication number 0898011. The PDF file for this manual is available for viewing by clicking on the "Documents" icon on the desktop.
5. Insert the RCIM into the selected PCI slot and lock it down.
6. If this is to be part of an RCIM chain, attach the synchronization cable as required (see the RCIM manual for complete details).
7. If you have the optional GPS module, attach the antenna lead and mount the antenna. The antenna should be mounted on the rooftop or in an open area.
8. Close the case and reconnect all power cords.
9. Power up the system and verify the system boots up properly. Refer to the *Real-Time Clock and Interrupt Module (RCIM) PCI Form Factor User's Guide* for configuration options.

5.5.2 Verifying RCIM Operation

1. To check that the RCIM is operating correctly, perform the following:

```
cat /proc/driver/rcim/status
```

You should see an output similar to that shown below:

```
RCIM-I board 0 is at revision 1 eeprom 1.0.
This is a standalone (isolated) rcim.
Has IRQ 17 and major number 252
System time synchronized to RCIM.
```

2. To view the current RCIM configuration, issue the following command:

```
cat /proc/driver/rcim/config
```

You should see output similar to the following:

```
h/Not_Configured,sync,pig0|out0,pig1|out1,pig2|
out2,pig3|out3,none|di0,none|di1,none|di2,none|
di3,none|di4,none|di5,none|di6,none|di7,di0/f,
i1/f,di2/f,di3/f,di4/f,di5/f,di6/f,di7/f,eti0/f,
eti1/f,eti2/f,eti3/f
```

5.5.3 Downloading NTP Updates for RCIM II with GPS Module

If you installed the RCIM II model equipped with the optional GPS module, access the RedHawk Updates web site to download the ccur-ntp update required for its use if it has not already been downloaded. If you do not have the RCIM II board with GPS module, skip to section **5.6**.

To download and install the ccur-ntp update, follow these steps:

1. In multi-user mode, access the **redhawk.ccur.com** web site.
2. Log onto the site using the login and password provided by Concurrent.
3. A list of updates that you have not yet downloaded will display. Click on the **ccur-ntp-4.2.0.a.20040617-4*** update to download it and save it in a suitable location. (***** is the architecture type, **i386** or **x86_64**.)
4. To install the package:
   a. Change directory to the location of the update and unpack the tarball.

      ```
      # tar -xvf ccur-ntp-4.2.0.a.20040617-4.*.tar
      ```

   b. Determine if ntp or ccur-ntp is already installed:

      ```
      # rpm -q ntp
      ntp-4.1.2-4.EL3.1
      ```

   c. Remove (erase) the existing ntp. Because there are some rpms which are normally installed which depend on ntp, use the **--nodeps** option to bypass the dependency test. This will save the existing **/etc/ntp.conf** file as **/etc/ntp.conf.rpmsave**.

      ```
      # rpm --nodeps -e ntp
      ```

   d. Install the ccur-ntp update:

      ```
      # rpm -ivh ccur-ntp-4.2.0.a.20040617-4.*.rpm
      ```

5. After your system is completely installed, refer to the document *Installing RCIM II on an iHawk System* (publication number 0898006-000) included in this update for instructions for configuring ntp.

5.6 Installing Frequency-Based Scheduler (FBS) Software

FBS is an optional package to RedHawk Linux. If you will be using FBS, install it at this time by performing the following steps:

1. With RedHawk Linux Version 2.3 running, log in as root and take the system down to single-user mode:
   a. Right click on the desktop and select New Terminal.
   b. At the system prompt, type **init 1**.
2. Locate the disc labeled “RedHawk Linux Frequency-Based Scheduler Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive.

3. To mount the cdrom device, execute the following command:

   ```
   mount /mnt/cdrom
   ```

4. To install, execute the following commands:

   ```
   cd /mnt/cdrom
   ./install-fbs
   ```

   Follow the on-screen instructions until the installation script completes.

5. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

6. Remove the disc from the CD-ROM drive and store. Exit single-user mode (Ctrl-D). Check for FBS updates as outlined in the following section.

5.7 Installing FBS Updates

If there are any updates to this FBS release available from the RedHawk Updates web site that have not already been downloaded, download and install them now by following these steps. If no updates are available, skip to step 6 (reboot the system).

1. In multi-user mode, access the **redhawk.ccur.com** web site.
2. Log onto the site using the login and password provided by Concurrent.
3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **`/root/updates`**).
4. Return to single-user mode as root.
5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

   To install the updates, issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   Installation time will vary depending on the number of updates being installed.

6. When complete, reboot the system choosing the new RedHawk kernel and verify that the system boots properly.

5.8 Installing the PCI-to-VME Bridge

If you are using the PCI-to-VME bridge supplied by Concurrent to connect your iHawk system with a VME system, it can be installed at this time. If you are not installing this feature, skip to section **5.10**.

5.8.1 Installing the Hardware

The hardware consists of a PCI adapter, a VMEbus adapter and a fiber optic cable.

NOTE: Concurrent Computer Corporation strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing and removing printed circuit boards.

1. To configure the jumpers on the VMEbus adapter card correctly, refer to Chapter 10 of the *SBS Technologies Model 618-3 Hardware Manual* included with the RedHawk Linux documentation. The PDF file for this manual is available for viewing by clicking on the "Documents" icon on the desktop.
2. To install the PCI adapter in your iHawk system:
    a. Power down the system.
    b. Locate a vacant PCI card slot in the chassis that supports a bus master.
    c. Remove the metal plate that covers the cable exit at the rear of the chassis.
    d. Insert the PCI adapter card into the connector.
    e. Fasten the adapter card in place with the mounting screw.
    f. Replace the cover.
3. To install the VMEbus adapter card:
    a. Ensure that the VMEbus chassis is powered down.
    b. Decide whether the VMEbus adapter card is the system controller. If so, it must be installed in slot 1. If not, locate an unoccupied 6U slot in the card cage for the adapter.
    c. Insert the card into the connector of the selected slot.
4. To install the fiber optic cable:
    a. Ensure that both systems are powered down.
    b. Remove the rubber boots on the fiber-optic transceivers as well as the ones on the fiber-optic cables. Be sure to replace these boots when cables are not in use.
    c. Plug one end of the fiber-optic cable into the PCI adapter card's transceiver.
    d. Plug the other end of the cable into the VMEbus adapter card's transceiver.
    e. Power on both systems.
    f. Ensure that the READY LEDs on both adapter cards are lit.

5.8.2 Installing the Software

1. With RedHawk Linux Version 2.1 or later running on the iHawk system, log in as root and take the system down to single-user mode:

   a. Right click on the desktop and select New Terminal.
   b. At the system prompt, type **`init 1`**.

2. Locate the disc labeled "RedHawk Linux PCI-to-VME Bridge Library Version 2.3" appropriate to your system's architecture and insert it into the CD-ROM drive.

3. To mount the cdrom device, execute the following command:

   ```
   mount /mnt/cdrom
   ```

4. To install, execute the following commands:

   ```
   cd /mnt/cdrom
   ./install-sbsvme
   ```

   Follow the on-screen instructions until the installation script completes.

5. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

6. Remove the disc from the CD-ROM drive and store. Exit single-user mode (Ctrl-D).

Refer to the "PCI-to-VME Support" chapter of the *RedHawk Linux User's Guide* for configuration and usage information. The PDF file for this manual is available for viewing by clicking on the "Documents" icon on the desktop.

5.9 Installing PCI-to-VME Updates

If there are any updates to this PCI-to-VME release available from the RedHawk Updates web site that have not already been downloaded, download and install them now by following these steps. If no updates are available, skip to step 6 (reboot the system).

1. In multi-user mode, access the **redhawk.ccur.com** web site.

2. Log onto the site using the login and password provided by Concurrent.

3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **`/root/updates`**).

4. Return to single-user mode as root.

5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

To install the updates, issue the following command:

```
rpm -Fvh *.rpm
```

Installation time will vary depending on the number of updates being installed.

6. Reboot the system choosing the new RedHawk kernel and verify that the system boots properly.

5.10 Installing NightStar Tools

If you will be installing the NightStar toolset, do so now. Refer to the *RedHawk NightStar Tools Release Notes* for installation instructions.

6.0. Upgrade Procedures

Use the upgrade procedures provided here only under the following circumstances:

- upgrading from Version 2.x to Version 2.3

If generating or regenerating a system or upgrading a system currently running Version 1.x to Version 2.3, follow the steps in “Installation Procedures” on page 12.

Review the following points before upgrading the software:

- It is recommended that the installer first read through the entire procedure once before actually performing the upgrade.
- It is **strongly recommended** that installation and updates of software be performed in single-user mode to guard against the possibility of corrupting a running application.
- Install all available upgrades. No quality claims are made by Concurrent unless all appropriate version levels of all RedHawk Linux software are installed.
- The media in use is accessed at various times and must be kept in the drive during the installation until you are instructed to install different media.
- Prior to upgrade, remove any floppy media that may have been left in the machine.
- The Red Hat kernel should be running when upgrading to RedHawk Linux Version 2.3.

6.1 Updating Red Hat Software

The discs labeled “Red Hat Enterprise Linux 3.0 Updates Version 2.3” contain the latest updates released by Red Hat and validated against RedHawk Linux. These updates are important to the proper operation of RedHawk Linux.

To update the installed Red Hat software, perform the following steps.

1. If not already running **Red Hat Enterprise Linux**, boot the system with the Red Hat kernel.
2. Log in as root and take the system down to single-user mode:
   a. Right click on the desktop and select New Terminal.
   b. At the system prompt, type **`init 1`**.
3. Locate the disc labeled “Red Hat Enterprise Linux 3.0 Updates Version 2.3 Disc 1 of 2” appropriate to your system’s architecture and insert it into the CD-ROM drive.
4. If the cdrom device does not mount automatically, execute the following:

   `mount /mnt/cdrom`

5. Execute the following commands to install the update software on disc 1:

   ```
   cd /mnt/cdrom
   ./install-updates
   ```

   Follow the on-screen instructions until the installation script completes.

   NOTE: This process may take some time to complete.

6. When disc 1 is completed, you will be prompted to unmount disc 1, insert disc 2 and run the install script again. Perform the following:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

   Remove disc 1 and insert disc 2.

   ```
   mount /mnt/cdrom
   cd /mnt/cdrom
   ./install-updates
   ```

   NOTE: This process may take some time to complete.

7. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

8. Remove disc 2 from the CD-ROM drive and store the discs.

9. **Perform this step ONLY if you are installing on a single processor system.** If installing on a multiprocessor system, skip to the next step.

   Execute the following:

   ```
   rpm -e kernel-smp
   ```

NOTE: It is possible that some warning messages may display at this time. These can be ignored and will be resolved when the system is rebooted.

10. Type “reboot” at the system prompt, then select the updated Red Hat Enterprise Linux kernel and verify that the updated kernel boots. Continue with the steps in the following section.

6.2 Upgrading to RedHawk Linux Version 2.3

To upgrade to RedHawk Linux Version 2.3, perform the following steps:

1. With the Red Hat Enterprise Linux kernel updated in the previous step running on the system, log in as root and take the system down to single-user mode:

   a. Right click on the desktop and select New Terminal.

   b. At the system prompt, type **`init 1`**.

2. Locate the disc labeled “RedHawk Linux OS Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive.

3. If the cdrom device does not mount automatically, execute the following command:

   ```
   mount /mnt/cdrom
   ```

4. Execute the following commands to install RedHawk Linux Version 2.3 upgrade software:

   ```
   cd /mnt/cdrom
   ./install-redhawk
   ```

   NOTE: Special instructions are displayed during the installation that may require appropriate action, such as video card installation and configuration. Follow the on-screen instructions until the installation script completes.

5. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

6. Remove the disc from the CD-ROM drive and store.

7. Locate the disc labeled “RedHawk Linux Documentation CD Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive. Use **mount** as described above if needed to mount the cdrom device.

8. Execute the following commands to install RedHawk Linux documentation:

   ```
   cd /mnt/cdrom
   ./install-docs
   ```

   Follow the on-screen instructions until the installation script completes.

9. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

10. Remove the disc from the CD-ROM drive and store.

11. Exit single-user mode (Ctrl-D). Check for RedHawk updates as outlined in the following section.

6.3 Applying RedHawk Updates

If there are any updates to this release available from the RedHawk Updates web site, they should be downloaded and installed now by following these steps:

1. In multi-user mode, access the **redhawk.ccur.com** web site using your browser or by clicking on the “Updates” desktop icon.

2. Log onto the site using the login and password provided by Concurrent.

3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **/root/updates**).

4. Return to single-user mode as root.
5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

   To install the updates, issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   Installation time will vary depending on the number of updates being installed.
6. When complete, reboot the system (see **NOTES** below) choosing the new RedHawk kernel and verify that the system boots properly. Continue to the next section.

   NOTES: If this system is a model 868 8-way iHawk, disable hyper-threading through the BIOS (refer to the hardware documentation for the appropriate BIOS setting).

   On an i386 system with greater than 4 GB of memory installed, support must be configured into the kernel. Refer to section **8.1.3** on page 38 for details.

6.4 Upgrading to Frequency-Based Scheduler (FBS) Version 2.3

If you are using FBS, upgrade to FBS Version 2.3 at this time by performing the following steps. If you are not using FBS, proceed to “Upgrading to PCI-to-VME Bridge Version 2.3” on page 30.

1. With RedHawk Linux Version 2.3 running, log in as root and take the system down to single-user mode.
2. Locate the disc labeled “RedHawk Linux Frequency-Based Scheduler Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive.
3. To mount the cdrom device, execute the following command:

   ```
   mount /mnt/cdrom
   ```
4. Execute the following commands to install the FBS software:

   ```
   cd /mnt/cdrom
   ./install-fbs
   ```

   Follow the on-screen instructions until the installation script completes.
5. When the installation completes, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```
6. Remove the disc from the CD-ROM drive and store. Exit single-user mode (Ctrl-D). Check for FBS updates as outlined in the following section.

6.5 Applying FBS Updates

If there are any updates to this FBS release available from the RedHawk Updates web site that have not already been downloaded, download and install them now by following these steps. If no updates are available, skip to step 6 (reboot the system).

1. In multi-user mode, access the **redhawk.ccur.com** web site.
2. Log onto the site using the login and password provided by Concurrent.
3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **/root/updates**).
4. Return to single-user mode as root.
5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

   To install the updates, issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   Installation time will vary depending on the number of updates being installed.
6. When complete, reboot the system choosing the new RedHawk kernel and verify that the system boots properly.

6.6 Upgrading to PCI-to-VME Bridge Version 2.3

If you are using the PCI-to-VME bridge supplied by Concurrent to connect your iHawk system with a VME system, upgrade the software to Version 2.3 at this time by performing the following steps. If you are not using this bridge, proceed to “Additional Requirements” on page 31.

1. With RedHawk Linux Version 2.3 running, log in as root and take the system down to single-user mode.
2. Locate the disc labeled “RedHawk Linux PCI-to-VME Bridge Library Version 2.3” appropriate to your system’s architecture and insert it into the CD-ROM drive.
3. To mount the cdrom device, execute the following command:

   ```
   mount /mnt/cdrom
   ```
4. Execute the following commands to install the PCI-to-VME software:

   ```
   cd /mnt/cdrom
   ./install-sbsvme
   ```

   Follow the on-screen instructions until the installation script completes.
5. Upon completion, execute the following commands:

   ```
   cd /
   umount /mnt/cdrom
   eject
   ```

6. Remove the disc from the CD-ROM drive and store. Exit single-user mode (Ctrl-D). Check for updates as outlined in the following section.

6.7 Applying PCI-to-VME Updates

If there are any updates to this PCI-to-VME release available from the RedHawk Updates web site that have not already been downloaded, download and install them now by following these steps. If no updates are available, skip to step 6 (reboot the system).

1. In multi-user mode, access the **redhawk.ccur.com** web site.
2. Log onto the site using the login and password provided by Concurrent.
3. A list of updates that you have not yet downloaded will display. These may be individual packages or related updates packaged into a tarball. Click on the updates to download them and save them in a suitable location (e.g. **`/root/updates`**).
4. Return to single-user mode as root.
5. To install the newly downloaded packages, change directory to the location of the updates.

   If the update is in a tarball, unpack it:

   ```
   tar xzf *.tar.gz
   ```

   To install the updates, issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   Installation time will vary depending on the number of updates being installed.
6. Reboot the system choosing the new RedHawk kernel and verify that the system boots properly.

6.8 Additional Requirements

If you are using custom drivers with a pre-defined RedHawk Linux kernel, it will be necessary to run **`ccur-config`** after upgrading to a new release of RedHawk in order to configure the kernel source tree to match the currently running kernel. Follow these steps:

1. Change directory (**`cd`**) to **`/usr/src/`***redhawk-release-directory.*
2. Run the **`ccur-config(8)`** tool as follows:

   ```
   ./ccur-config -n -c
   ```

   Wait for on-screen messages to complete.

If you are building additional modules out of the kernel source tree, it will be necessary to run **`ccur-config`** after upgrading to a new release of RedHawk in order to configure the drivers in the kernel. Follow these steps:

1. Change directory (**`cd`**) to **`/usr/src/`***redhawk-release-directory.*
2. Run the **`ccur-config(8)`** tool as follows:

   ```
   ./ccur-config -c
   ```

Refer to the man page or *RedHawk Linux User's Guide* for more details, if needed.

7.0. NVIDIA Graphics Configuration

The NVIDIA Linux Display Driver (version 1.0-6629) is included in the RedHawk Linux installation and built automatically for all pre-built and custom RedHawk Linux kernels. The RedHawk installer identifies the type and model of the video adapter present in the system. If you wish to configure for a multiple display mode, refer to the sections below.

Note that if you install an NVIDIA graphics card into your system after RedHawk Linux has been installed, you may need to install the user module, **`ccur-nvidia-glx`**, at that time. The RPM for this module can be found on the RedHawk Linux installation CD in the **`nvidia`** directory.

7.1 Configuring Multiple Display Capability

There are several options for configuring two or more displays. The upper limit on the number of displays that can be driven effectively is application dependent. Theoretically, you can configure as many displays as you have video adapters.

There is only one high performance AGP slot in an iHawk graphics system, so the maximum number of displays that can run off AGP depends on the number of heads on the installed card. It should be possible to mix and match as many PCI cards as there are PCI slots, and PCI cards with AGP. Systems designed with AGP are usually limited to two physical CPUs. If more than two physical processors are needed in your system, utilize PCI adapters. To maximize throughput, place the cards in PCI slots that are not shared by other devices.

For configuring multiple adapters, execute the command **`lsirq -c 0300`** for a listing of all VGA compatible adapters. This will list the IRQ asignments for all VGA cards along with the busID (logical slot number) of each adapter. See **`lsirq(8)`** for more details about this command.

The following multiple display modes are available:

- One desktop spanned across two monitors.
  NVIDIA calls this TwinView. In this mode, the workspace size is twice as large as with a single monitor display. Windows can be dragged across displays, which can be positioned either vertically or horizontally. Switching between workspaces affects both displays simultaneously so it's easy to switch between data views that are linked together, for example, during demos and presentations. Multiple workspaces can be configured. See section **7.1.1** to configure this display mode.

- Separate desktops.
  This mode provides two or more separate desktops that act independently, for example a NightView debugger running on one monitor and an application running on another. Because the monitors work independently, displays are not synchronized as in TwinView mode and you cannot drag windows across monitors; however, it allows you more combinations for viewing data. See section **7.1.2** to configure this display mode.

The mode in use depends upon the settings in the X server configuration file when the X server is booted. You can easily switch between modes by maintaining more than one configuration file and copying the one you want to use to **`/etc/X11/XF86Config`** before starting the X server.

Along with the original **`XF86Config`** configuration file located in **`/etc/X11`**, there are additional sample configuration files. These samples illustrate configurations for TwinView, dual desktop and quad desktop. Use these as a reference when creating configuration files for use at your site.

NOTE

Parameters required for the multiple display modes are discussed below, but other fields in the configuration file may need to be modified depending upon other factors at your site. For complete information about the **XF86Config** file, see the **XF86Config(5x)** man page. Additionally, you can download the README file from the **www.nvidia.com** web site.

You will need to know the following information for each monitor (consult the documentation provided with the monitors):

- the range of possible refresh rates
- supported resolutions
- supported color depths

Note that entries for the "Driver" field in the "Device" section of the **XF86Config** file have the following meanings:

"vesa" This is a generic Linux VGA adapter driver that will run any VGA compatible adapter. It is a rudimentary driver capable of running only low resolutions, color depths and refresh rates. It is most useful as a troubleshooting tool, providing some display capability when no other driver works.

"nv" This is the name of the generic NVIDIA driver supplied with the standard Red Hat X server. It runs any NVIDIA VGA adapter but does not drive a high performance NVIDIA graphics card to its full capabilities.

"nvidia" This tells the kernel to use the high performance NVIDIA driver installed by the **ccur-nvidia-glx** rpm. It must be entered manually in the "Driver" field of the **XF86Config** file. This selection includes the NVIDIA X Server Settings tool that allows you to configure settings for special capabilities enabled on the adapter by the NVIDIA rpm and can be run under X by executing the following command: **/usr/bin/nvidia-settings &**.

7.1.1 Configuring One Desktop Across Two Monitors

To create a virtual desktop that displays across two monitors (for example, NVIDIA's TwinView), follow these steps:

1. Provide appropriate settings in the "Screen" section of the configuration file as shown below. The display mode and monitor characteristics are defined as "Options." Refresh rates and resolutions for each monitor and the location (orientation) of the second monitor used as the extended desktop are supplied. "TwinViewOrientation" can be "LeftOf", "RightOf", "Above" or "Below" to represent where the second monitor will be positioned relative to the first.

   Following is an example of the "Screen" section of the configuration file with possible settings for TwinView mode.

```
Section   "Screen"
          Identifier    "Screen0"
          Device        "Videocard0"
          Monitor       "Monitor0"
          DefaultDepth     24
```

```
            Option       "TwinView"
            Option       "SecondMonitorHorizSync" "30-97"
            Option       "SecondMonitorVertRefresh" "50-180"
            Option       "MetaModes" "1280x1024,1280x1024"
            Option       "TwinViewOrientation" "LeftOf"
            SubSection   "Display"
                   Depth    16
                   Modes "1280x1024" "1024x768" "800x600" "640x480"
            EndSubSection
            SubSection   "Display"
                   Depth    24
                   Modes "1280x1024" "1024x768" "800x600" "640x480"
            EndSubSection
EndSection
```

2. Verify that “nvidia” is specified for the “Driver” entry in the Device section.

7.1.2 Configuring Separate Desktops

For this mode, the Device, Screen, Monitor and ServerLayout sections in the configuration file are utilized. The number of displays available is limited only by hardware constraints. The examples below are for a dual display. For additional displays, add additional sections with appropriate designations (see **`XF86Config.quaddesktop`** for examples). Follow the steps below to modify the configuration file.

1. First, update the ServerLayout section to reflect the multiple display configuration. Each screen to be used will be listed here and defined in Screen sections later in the file.

```
Section  "ServerLayout"
         Identifier   "nvidia dualdesktop"
         Screen  0    "Screen0" 0 0
         Screen  1    "Screen1" LeftOf "Screen0"
         InputDevice  "Mouse0" "CorePointer"
         InputDevice  "Mouse1" "SendCoreEvents"
         InputDevice  "Keyboard0" "CoreKeyboard"
EndSection
```

2. Then, create separate Device sections. In each section, provide the BusID (*bus*:*device*:*function*) of the graphics card associated with each display. This information displays when you use “**`lsirq -c 0300`**” or “**`cat /proc/pci`**”. In the case of a dual head adapter, specify separate sections (one for each head) using the same BusID. **Caution:** BusIDs can change when PCI cards are added or removed.

   The driver in each section in the example below is identified as "nvidia.” A separate screen is assigned in each section.

```
Section  "Device"
         Identifier   "nvidia0"
         Driver       "nvidia"
         BusID        "PCI:1:0:0"
         Screen       0
EndSection

Section  "Device"
         Identifier   "nvidia1"
         Driver       "nvidia"
```

```
        BusID        "PCI:1:0:0"
        Screen       1
EndSection
```

3. Next, create separate Screen sections, each using one of the devices identified in the Device sections; for example:

```
Section  "Screen"
        Identifier   "Screen0"
        Device       "nvidia0"
        Monitor      "Monitor0"
        DefaultDepth     24
        Subsection   "Display"
               Depth     24
               Modes "1600x1200" "1024x768" "800x600" "640x480"
        EndSubsection
EndSection

Section  "Screen"
        Identifier   "Screen1"
        Device       "nvidia1"
        Monitor      "Monitor1"
        DefaultDepth       24
        Subsection   "Display"
               Depth      24
               Modes "1600x1200" "1024x768" "800x600" "640x480"
        EndSubsection
EndSection
```

4. Finally, create separate Monitor sections, each describing the characteristics of one of the monitors to be used; for example:

```
Section  "Monitor"
        Identifier   "Monitor0"
        VendorName   "Viewsonic"
        ModelName    "G90f"
        DisplaySize  370   270
        HorizSync    30.0 - 97.0
        VertRefresh  50.0 - 180.0
        Option       "dpms"
EndSection
```

7.2 Connecting the Monitors and Booting the System

The graphics adapter card identifies multiple outputs as head 1, head 2, etc. With multiple monitors, the console output goes to head 1 during boot or when X is not running. The monitors on subsequent heads only display when X is running.

1. Connect monitor 1 to head 1 of the adapter, monitor 2 to head 2 of the adapter, etc.
2. To allow a recovery if there is a problem during the installation, set the system's default run level to enable the system to boot to console instead of starting up X.
   a. Edit **/etc/inittab**:

      vi /etc/inittab

   b. Locate the following line:

      `id:5:initdefault`

c. Change the `5` to `3`, save and exit.

d. Reboot the system with **`init 3`**.

3. If you will be using separate desktops and wish to use **`gnome`**, edit **`/etc/X11/gdm/gdm.conf`** and uncomment the following line:

   ```
   1=Standard
   ```

   Note that **`kde`** works without modifications.

4. Make a backup copy of the original configuration file, then copy the file you wish to use to **`/etc/X11/XF86Config`**; for example:

   ```
   cp XF86Config XF86Config.orig
   cp XF86Config.mydual XF86Config
   ```

5. Startup X with **`init 5`**.

6. To test the success of the installation, run the following command:

   `startx`

   If successful, you will see the NVIDIA logo and then the desktop appears. Reset the system's default run level back to run level 5 (X11 startup mode).

   a. Using **`vi`** to edit **`/etc/inittab`**, locate the line reading:
   `id:3:initdefault`
   Change the `3` to `5`, save and exit.

   b. Execute the command **`init 6`**.

   If unsuccessful, the problem may be due to a misconfigured **`XF86Config`** file. Review the **`/var/log/XFree86*.log`** files along with the NVIDIA README document to debug your **`/etc/X11/XF86Config`** file.

7. If you want to test the 3D performance of your card, perform the following:

   `glxgears`

   This should bring up three gears rotating at high speed with frames per second displayed in the associated window.

   If the setup is incorrect, you may get the following on-screen messages:

   ```
   Xlib: extension "GLX" missing on display ":0.0".
   Error: couldn't get an RGB, Double-buffered visual
   ```

   Refer to the NVIDIA README document for troubleshooting tips.

8.0. Additional Information

This section contains helpful information about issues that may be applicable at your site.

8.1 Installation/Configuration Issues

8.1.1 File System Backup Recommendations

All file systems should be archived or preserved prior to commencing a re-installation. This can be accomplished using normal backup methods. Concurrent recommends obtaining a new disk while keeping the original disk to ensure minimal data loss.

Table 8-1 contains a list of configuration files that may be useful in configuring a newly installed RedHawk system to match an existing configuration.

Table 8-1 Files Recommended for Backup

NOTE: This is not an all inclusive list and not all files are meant to be copied intact to a new system.

Path	Comments
/etc/hosts	To preserve hostnames on file.
/etc/fstab	To maintain existing mounts. Will not preserve mount points.
/etc/sysconfig/network	Network information.
/etc/sysconfig/network-scripts/ifcfg-*	Network device configuration.
/etc/resolv.conf	DNS configuration info.
/etc/nsswitch.conf	NIS/DNS configuration info.
/etc/ntp.conf /etc/ntp/step-tickers	NTP configuration. See ntpd(1).
/etc/rc.local /etc/rhosts	Startup info.
/etc/X11/XF86Config	X11 server/device/screen configuration data.
/etc/modules.conf	For reference and comparison.
/etc/security/capability.conf	PAM configuration.
/etc/ssh/*	To preserve host keys.
/etc/inittab	For reference and comparison.
/etc/xinetd.d/	For reference and comparison. Capture any file customizations.
/var/spool/cron/	To preserve user crontab entries.
/sbin/chkconfig --list > <***save_file_name***>	For reference to configure new system.
/etc/*.conf	Customized configuration files.
/etc/sysconf/*	Customized configuration files.
/etc/pam.d/*	Customized PAM files.
rpm files	Those installed after previous system installation that need to be moved forward to the new system. Use **/bin/rpm -qal --last | more** to view.

8.1.1 File System Swap Size Guidelines

Table 8-2 supplies the recommended swap partition sizes for various sizes of main memory. The swap partition size is based on the size of the system's main memory plus an additional 5 percent. This swap space allocation should be adequate to accommodate system crash dumps.

Table 8-2 Swap Partition Size Guidelines

Main Memory Size (MB)	Recommended Swap Partition Size (MB)
256	269
1024	1075
2048	2150
3072	3225
4096	4300
5120	5376
6144	6451
7168	7526
8192	8601

8.1.3 Configuring Greater Than 4 GB of Memory on i386 Systems

If memory is added to an iHawk i386 system increasing the total physical memory to greater than 4 GB, the kernel configuration options that support large memory systems must be enabled in the kernel. Select the following options from the Processor Type and Features -> High Memory Support (4GB) submenu of the kernel Configuration GUI:

- 64GB
- Allocate 3rd-level pagetables from highmem

8.1.4 RCIM Connection Modes

Before installing an RCIM on an iHawk system, determine the connection mode. It is easier to connect the synchronization cable to the input connector before the RCIM is installed. An RCIM can be connected in one of the following four modes:

Isolated mode — Neither the input nor output connector is used. There is no connection between this RCIM and other RCIMs.

Master mode — The RCIM is connected to one or more other RCIMs and is at the head of the chain. There is an output cable connection from a master RCIM but there is no input cable connection into it. The RCIM master is unique in that it controls the synchronized clocks. See Chapter 3 of the *Real-Time Clock and Interrupt Module (RCIM) PCI Form Factor User's Guide* for a discussion of synchronized clocks.

Pass-through Slave mode — The RCIM is connected to one or more other RCIMs but not at the head of the chain. There is an input cable connection into a pass-through slave RCIM and an output cable connection to another slave.

Final Slave mode	The RCIM is connected to one or more other RCIMs at the end of the chain. There is an input cable connection into a final slave RCIM but no output cable connection.

8.1.5 Creating a Driver Disk for Red Hat Installation

If your system contains disk drivers or devices that are not supported by the Red Hat installation program, you will need to use a driver diskette with the needed driver image file to install Red Hat Enterprise Linux. If this diskette is not supplied with your system, it can be created by copying the driver image file to a floppy.

Look for the file on the RedHawk Updates web site (**redhawk.ccur.com**). It will have the suffix "**.img**." Follow the instructions in the section "Software and Documentation Updates" on page 43 to download the file. On any working system, copy this file to a formatted floppy disk.

To copy the file to disk on a Linux system, use the following command line as root, where `fd0` is the system's floppy drive.

dd if=*imagefilename* **of=/dev/fd0**

If working on a Windows system, use the DOS **rawrite** command. Note that the **rawrite** utility only accepts filenames having eight characters, a period, and a three-character filename extension. Therefore, you may need to rename this file to meet that convention before running **rawrite**.

In DOS, from the same directory containing the driver diskette image, type the following, where **d** is the cdrom drive letter and **a** is the floppy drive:

d:\dosutils\rawrite *imagefilename* **a:**

Use this diskette as you follow the instructions under "Installation Procedures."

8.2 Considerations

8.2.1 Compiler Requirements

If you plan to build a kernel from source residing on your iHawk system on a different system, that system must be using **gcc-2.96-98** or later.

8.2.2 NightView Accessibility

A possible result of upgrading Red Hat software during a RedHawk Linux upgrade is a break in the symbolic link for the NightView debugger (**nview**) making it unavailable. The RedHawk Linux install script will re-establish this link and no further action should be necessary. If you encounter a problem accessing **nview**, ensure that a symbolic link is established linking **/usr/bin/nview** to the current NightView installation; e.g, **/usr/opt/ccur-NightView-5.6-913/usr/bin/nview**.

8.2.3 Hyper-thread Activation

Hyper-threading is configured by default in each of the standard RedHawk Linux kernels running on iHawk Series 860 systems. It can be disabled on a per-CPU basis using the **cpu(1)** command. However, hyper-threading is also defined in

the system BIOS. The setting in the BIOS will supersede any configuration of this feature in the kernel. Therefore, if hyper-threading is turned off in the BIOS, it will not be available on your system even if it is configured in the kernel.

If your system is not behaving as expected in regards to hyper-threading based on the kernel configuration, check the BIOS setting and modify it as needed. Refer to your hardware documentation to determine which BIOS setting is involved.

Note that hyper-threading is not supported for the model 868 8-way iHawk system and should be disabled in the BIOS prior to booting a Version 2.3 RedHawk Linux kernel on this type of system.

8.2.4 Binary Compatibility Between Versions 1.4 and 2.x

Programs that are dynamically linked to the **`ccur_rt`** and **`ccur_fbsched`** libraries on RedHawk 1.4 systems will not be binary compatible with RedHawk 2.x.

If having a single application binary that will run on RedHawk 1.4 and 2.x systems is required, download the RedHawk 1.4.1 update from the RedHawk Updates web site and relink the applications to the new **`ccur_rt`** library (and **`ccur_fbsched`** if applicable) included with the update. The resulting binaries will run on both systems. See “Software Updates and Support” on page 43 for instructions for downloading the update.

In addition to the above, programs that are statically linked to the **`ccur_fbsched`** library on RedHawk 1.x systems will not be binary compatible with RedHawk 2.x. Programs statically linked on 1.x systems must be relinked on 2.x systems to retain binary compatibility across both systems.

If binary compatibility between these two systems is not required, no special action is needed. Applications linked to the 1.4 libraries will continue to run on 1.4 systems, and applications compiled on 2.x will run on 2.x systems.

8.2.5 NFS Compatibility

The version of nfs-utils (1.0.6-31EL) supplied by Red Hat Enterprise Linux Version 3 Update 3 is not compatible with RedHawk Linux Version 2.2. Concurrent supplies a compatible version of this package (1.0.6-7EL) on the “Red Hat Enterprise Linux 3.0 Updates” CD delivered with RedHawk. To prevent incompatibility between NFS and RedHawk, it is recommended that the supplied nfs-utils package be used, not updates acquired from outside sources.

9.0. Known Issues

Special consideration should be given to the following areas.

Networking Issues

- There are sporadic problems with password files that are distributed to multiple systems via NIS. This can prevent valid users from logging into the system when their accounts are made known to that system via NIS.
- NFS mounts of large partitions will sporadically have problems in seeing all of the files that should be mounted in the partition.
- An incompatibility exists between various versions of the nfs-utils package and RedHawk Linux. Concurrent strongly discourages installing separate updates to this package.

Linux Test Project

When running the Linux Test Project test suite LTP-2002(*), the user must remove the **Fork07** test case prior to building the test suite to prevent a system hang on RedHawk systems with greater than 1GB of memory. This is a known bug in the official Linux kernel. For more information, refer to the Linux Test Project web site at **http://ltp.sourceforge.net/**

BIOS “Console Redirection”

The “Console Redirection” BIOS feature, when enabled, has been observed to interfere with the proper operation of the integrated VGA video and the XFree86 X server with some iHawk platforms, such as the Dell PowerEdge™ 6650 (iHawk Model HQ665).

NMI Button

Using the NMI button on the processor enters **kdb** on the console when configured. It cannot be used, however, to step repeatedly through an error condition.

kdb and USB Keyboards

There is no USB keyboard support for the **kdb** kernel debugger. However, **kdb** can be used on a system with a USB keyboard by configuring a serial console. Refer to Apepndix H of the *RedHawk Linux User’s Guide* for instructions for setting up a serial console.

PAM Capabilities

- Note that in order to use the **`pam_capability(8)`** feature with **`ssh`**, the **`/etc/ssh/sshd_config`** file must have the following option set:

  ```
  UsePrivilegeSeparation no
  ```

- Currently, commands run with **`rexec(1)`** on a RedHawk target fail to inherit capabilities even when the appropriate **`pam_capability.so`** entry is made in the **`/etc/pam.d/rexec`** file. Use the **`rsh`** facility instead.
- Using Kerberos telnet services with PAM is not recommended. If krb5-telnet is on and Kerberos is not properly configured, the following error will occur upon logging in via telnet:

  ```
  login: Cannot resolve network address for KDC in requested realm
  while getting initial credentials
  ```

  The krb5-telnet xinetd service should be disabled:

  ```
  chkconfig krb5-telnet off
  ```

sadc(8) Issue

When a system configuration change is made that affects the number of CPUs (for example when booting with a uniprocessor kernel or changing hyper-threading configuration), the **sadc(8)** (sar data collector) program cannot successfully write data in the daily data file **/var/log/sa/sa**?? (?? is the day of the month). This results in **crond** sending an email every ten minutes to root@localhost with the following message:

```
Cannot append data to that file
```

To eliminate the email, remove or move the **/var/log/sa/sa**?? file for the current date.

Model 868 8-way iHawk Restrictions

Kernel crash dumps and hyper-threading are not currently supported on a model 868 8-way iHawk system. Hyper-threading should be disabled in the BIOS before booting RedHawk Linux on this system. Refer to the hardware documentation for the appropriate BIOS setting.

lspci(8) Output

Under earlier versions of RedHawk Linux, output from **lspci(8)** displays the RCIM peripheral as "PLX Technology, Inc.: Unknown device." To correct this so that the RCIM is correctly identified, update **/usr/share/hwdata/pci.ids** with the version of this file supplied in the RedHawk kernel tree. Contact Concurrent Software Support (see page 43 for details) if you require assistance.

irqbalance

The **irqbalance** feature is disabled on RedHawk Linux. This Red Hat feature is meant to distribute interrupts equally across CPUs. It does not honor the IRQ affinity masks set up in **/proc/irq/***irq#***/smp_affinity** and therefore will cause interrupts to be routed to shielded CPUs.

This feature can be enabled/disabled at boot time with:

chkconfig irqbalance {**on**|**off**}

as well as started/stopped while the system is running with:

service irqbalance {**start**|**stop**}

Performance Issue on Opteron iHawks

On Opteron systems, having the HPET timer enabled results in intermittent RTC interrupt errors and a corresponding increase in process dispatch latency of applications that wait on the RTC interrupt. It is recommended that the HPET timer functionality be disabled in the BIOS on these systems. Refer to your hardware documentation to determine which BIOS setting is involved.

Periodic Interrupts on IBM Blade System

It has been observed that the IBM HS20 Blade system experiences periodic SMI hardware interrupts. These interrupts last approximately 6 microseconds and appear to occur with a very regular frequency of nearly exactly one hour intervals.

Concurrent is working with IBM to determine the cause of this potential source of non-determinism, and it is hoped that the issue will be addressed in a future BIOS revision which can be installed at the customer site.

Additional information and BIOS upgrade instructions will be announced and made available as soon as a resolution to the issue is available from IBM.

10.0. Software Updates and Support

10.1 Direct Software Support

For answers to basic RedHawk Linux questions, check out the **FAQ** included with the RedHawk Linux documentation. Updates to the FAQ can be downloaded from the RedHawk Updates web site by clicking on the FAQ button (see "Software and Documentation Updates" below) or at **www.ccur.com/isdfaq/redhawk-faq.pdf**.

Software support is available from a central source. If you need assistance or information about your system, please contact the Concurrent Software Support Center at our toll free number 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822. The Software Support Center operates Monday through Friday from 8 a.m. to 5 p.m., Eastern Standard Time.

Calling the Software Support Center gives you immediate access to a broad range of skilled personnel and guarantees you a prompt response from the person most qualified to assist you. If you have a question requiring on-site assistance or consultation, the Software Support Center staff will arrange for a field analyst to return your call and schedule a visit.

You may also submit a request for assistance at any time by using the Concurrent Computer Corporation web site at **http:// www.ccur.com/isd_support_contact.asp** or by sending an email to **support@ccur.com**.

10.2 Software and Documentation Updates

Updates to RedHawk Linux software and documentation can be downloaded from the RedHawk Updates web site as they become available.

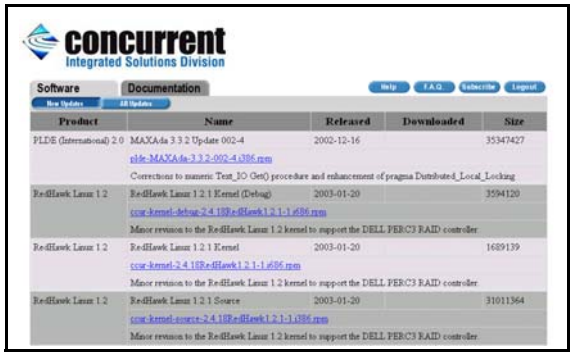
Follow these steps to download RedHawk Linux updates:

1. Access the RedHawk Updates web site, **redhawk.ccur.com**. This site can be accessed by clicking on the "Updates" icon on the desktop once the RedHawk Linux Documentation CD has been installed. Accessing this web site displays the following screen:

2. Click on the Login button to display the login screen below.

3. Fill in your login ID and password, then click on the Login button. The login ID and password can be found in the shipping documents accompanying your system.

4. A list of software packages that you have not yet downloaded will display. Click on the packages to download them and save them in a suitable location (e.g. **`/root/updates`**).



5. Updates to RedHawk documentation are included in the kernel update packages. If you would like to download individual documentation PDF files, select the Documentation tab. Click on the names to download PDFs and save in a suitable location. The latest RedHawk FAQ can be accessed by clicking on the FAQ button.

6. If you would like to be notified of new RedHawk Linux releases, click on the Subscribe button and supply an email address where notifications can be sent.

7. When done, click on the Logout button.

8. To install the newly downloaded packages, log in as root and take the system down to single-user mode:

   a. Right click on the desktop and select New Terminal.

   b. At the system prompt, type **`init 1`**.

9. Change directory to the location of the updates and issue the following command:

   ```
   rpm -Fvh *.rpm
   ```

   The time it takes to install will vary depending on the number of updates being installed.

10. When complete, exit single-user mode (Ctrl-D).

If you have problems, please contact the Concurrent Software Support Center (see “Direct Software Support” on page 43 for further information).