

SPARCbook™ 3000 Series

Technical White paper

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1. Introduction

This document describes the design of the SPARCbook 3000 Portable Workstation. The SPARCbook 3000 packages all the power of a desktop SPARCstation 20 into a mobile package measuring 11.8 x 10.27 x 2.0 inches (300 x 261 x 51 mm) and weighing 8.0 lb (3.62 kg). Support for the Solaris™ 2 operating environment allows the SPARCbook 3000 to run all major SPARCstation applications.

1.1 Target Applications and Market Sectors

TARGET APPLICATIONS	MARKET SECTOR
Demonstration/ Presentation	Software Developers, General
Mapping and Analysis	GIS, Medical, Biotechnical
Equipment Maintenance	Communications, Aerospace, Utilities
Technical Support	Technical and Commercial
Software Development	Technical and Commercial
Engineering	Technical, Auto, CAD/CAM
Remote Trading	Banking, Insurance, Brokerage
Disaster Recovery	Banking, Trading, Communications
Mobile Training Centers	Workstation and Software suppliers

The SPARCbook 3000 Series of notebook workstations currently consists of two models:

- SPARCbook 3000XT
- SPARCbook 3000ST

The SPARCbook 3000 utilizes a 170MHz TurboSPARC processor, a Weitek P9100 Graphics Accelerator chip for high-speed graphics, a 2MB frame buffer, 16-bit audio, external display resolution to 1280x1024, a high-resolution 800 x 600 or 1024 x 768 12.1 inch active matrix TFT display, and a 1.5 hour internal battery.

1.2 Hardware Overview

The SPARCbook 3000 features include the following:

- TurboSPARC processor
- Up to 256MB SIMM main memory
- A removable hard disk drive of up to 5GB (larger capacities when available)
- PCMCIA Type I/II/III support

System upgradability is achieved through a unique modular design that allows the system board, disk drives and system memory to be easily exchanged. All SPARCbook products are designed to be used as stand-alone systems, networked workstations, X-terminals or as general-purpose portable workstations.

1.3 Operating System Support

SPARCbook 3000 products are shipped pre-loaded with SunSoft's Solaris 2 operating environment and Version 2.0 of Tadpole-Cycle's Notebook Computing Environment (NCE). SPARCbook 3000 conforms to the SPARC™ International Compliance Definition (SCD) and runs the standard Solaris operating environment.

Tadpole-Cycle's NCE software provides an easy to use graphical user interface and power management system to support mobile UNIX® computing. It provides extensive facilities for portable users of the SPARCbook product range.

For PC application compatibility the SPARCbook 3000 supports SunSoft's Wabi (Windows application binary interface), and Insignia Solutions' SoftWindows, capable of running Windows software at performance levels that exceed high-end 486 processors.

2. System Design

At the heart of the SPARCbook 3000 design concept is the Tadpole-Cycle Advanced Notebook Architecture (ANA). This defines a set of goals and guidelines to which the SPARCbook 3000 family is designed. It is a modular architecture that results in a system that utilizes highly integrated components and provides the performance and I/O facilities normally only associated with desktop workstations. It also results in a system that can be readily upgraded by the user with larger memory (up to 128MB) or disk capacities or returned to the factory for upgrades with the 256MB memory option.

The base unit of the SPARCbook 3000 contains three printed circuit boards and a removable hard disk drive module. The three boards are the Base board, CPU board, and Microcontroller board. In addition, the lid contains the system's built-in flat panel display.

2.1 Base board

The Base board carries all of the I/O components. These include the SCSI-2, Ethernet, IDE and PCMCIA interfaces; the display controller, RAMDAC and 2MB of Video RAM; and power management hardware. The board is populated on both sides using mainly surface mount devices in order to keep its physical dimensions to a minimum. The Base board also carries two PCMCIA sockets and an I/O panel which are visible from the exterior of the assembled system.

2.2 CPU board

The CPU board carries the TurboSPARC CPU and is extended to carry the main memory SIMMS. This physical arrangement has the advantage of making the SIMMs very easy to fit to or remove from a fully assembled system through the battery compartment without the use of tools.

The CPU board is mounted onto the base board in such a way that the CPU itself is sandwiched between the CPU board and Base board. An interesting feature of the Base board is a large hole through which a heatsink fitted to the CPU is allowed to protrude when the two boards are fixed together.

This brings the CPU heatsink into contact with the system's magnesium base casting to provide effective heat dissipation.

2.3 Microcontroller board

The microcontroller board is a small board which carries an Hitachi H8 microcontroller, the status display, which is visible from the outside of the assembled system, and a number of programmable memory devices. It provides connections for the keyboard, pointing stick and for the Base board. The microcontroller manages keyboard and pointing stick operation and provides system control and status monitoring functions.

2.4 Main display

The main display is housed within the system's lid along with an inverter board required to drive the display's backlight. A 12.1 inch color active matrix TFT display is used to provide a sharp image in a wide range of lighting conditions. The SPARCbook 3000XT is fitted with a 1024 x 768 display while the SPARCbook 3000ST model features an 800 x 600 resolution display. The brightness of the screen can be varied by the user using keyboard commands to suit the lighting conditions or can be dimmed or turned off when required to conserve battery power.

2.5 Removable hard disk drive

In addition to the main boards and display, the SPARCbook 3000 system contains is a 2.5 inch 5GB (or larger when available) IDE hard disk drive assembled within a removable module. The drive can be removed from the SPARCbook 3000 while the system is fully assembled.

3. System Architecture

See [Figure A](#)

The SPARCbook 3000 architecture is based around three main buses that are conventional for SPARC-based workstations. These are the Memory bus which connects the CPU to the main memory; the SBus which connects the CPU to the major I/O devices; and the EBus.

3.1 Memory bus

The TurboSPARC's integral memory controller is connected to the system DRAM directly via a 64-bit high speed memory bus and provides direct addressing and control for the main memory. It provides the write enable signal and RAS and CAS lines. The smallest data movement is 64 bits;

smaller transfers are carried out by using read-modify-write operations. Parity protection is provided by the CPU as 1 bit per word (32 bits) of data. SBus based master I/O devices are able to access the memory bus via the processor's SBus interface.

3.2 SBus

The TurboSPARC incorporates a complete SBus controller. The SBus connects the SPARC processor to the Weitek P9100 graphics controller, NCR89C105 SLAVIO, NCR89C100 MACIO, PCI0640 IDE controller and the T7259 ISDN controller.

The TurboSPARC provides an SBus Master and Slave interface which enables the I/O devices with integrated DMA capability to gain access to the main memory without encroaching unduly on processor bandwidth.

SBus master and slave operations can be single cycle or bursts, and dynamic bus sizing is supported (for single-cycle transfers). Master accesses by the TurboSPARC to the SBus cannot be cached, and only double burst accesses are supported.

3.3 Ebus

The third system bus within the SPARCbook 3000 is the Ebus. This is an 8-bit data bus driven by the SLAVIO. The SLAVIO divides the EBus address space into a number of regions by providing address generated EPROM, RTC/RAM and Generic chip select signals. The EBus interface of the SLAVIO is limited to a data bus and the chip select signals. For this reason the EBus address bus is driven by the TS102 ASIC to enable the CPU to gain access to the internal registers of devices on the EBus.

4. Description of Key Components

The main components utilized in the SPARCbook 3000 products include the following:

COMPONENT	FUNCTION
170 MHz TurboSPARC	Processor
Weitek P9100	Graphics Accelerator
IBM RGB528 Color Palette and Video Clock Generator	Color Palette (RAMDAC)
2MB Video RAM	Frame Buffer
12.1 inch Color TFT	Built-in Display
NCR 89C100 MACIO	SCSI Controller
	Ethernet Controller
	Parallel Port
Tadpole-Cycle TS102 ASIC	PCMCIA Controller
PCI0640B PCI to IDE Chip	IDE disk controller
Crystal CS4215	Audio
T7259	Dual Basic Rate ISDN controller
NiMH Battery	Internal Battery
5GB removable hard disk drive	Removable Hard Disk
64/128/256MB SIMM Memory	Main Memory

4.1 Processor

TurboSPARC microprocessor:

- SPARC compliant V8 32 bit Integer Unit (IU) core
- Memory Management Unit (MMU)
- Floating Point Unit (FPU)
- 16KByte Instruction Cache
- 16KByte Data Cache
- Memory Controller
- Sbus Controller, Master & Slave Interface
- 143 SPECint92, 119 SPECfp92
- MicroSPARC II emulation mode
- Support for up to 1MB of level 2 cache

The TurboSPARC processor operates at 170MHz clock frequency.

The Memory Bus interface is connected to the system DRAM. This is a high speed bus, and is used mainly for cache-line movements (32bytes). The smallest data movement is 64bits; any smaller transfers use read-modify-write operations. Parity is provided as 1 bit for 32 bits of data. SBus based master I/O devices may access the memory bus via the processor.

The SBus circuitry provides the SBus Controller functions, and the Sbus Master and Slave interfaces. SBus master and slave operations may be single cycle or bursts, and dynamic bus sizing is supported (for single-cycle transfers). TurboSPARC master accesses to the SBus cannot be cached and only double burst accesses are supported.

4.2 DRAM SIMMS

The SPARCbook 3000's provides two SIMM sites and both sites must be occupied by 33 bit-wide (32 bits data and 1 bit parity) modules of identical size. The system requires 60 ns devices. 36 bit modules can be used but the extra bits are not used.

Modules are available in sizes of 4MB x 36, 8MB x 36, 16MB x 36 and 32MB x 36 giving usable memory configurations of 64MB, 128MB and 256MB respectively. The 16MB x 36 and 32MB x 36 SIMMs are custom manufactured for SPARCbook. The 32MB x 36 SIMMs used in the 256MB configuration differ from the other types in that they use 3.3 volt parts while all of the other SIMMs use 5 volt parts. For this reason memory upgrades to 256MB (or downgrades from 256MB) must be factory implemented.

4.3 Video Memory

SPARCbook 3000 utilizes four 256K x 16 dual-ported VRAM devices to provide a 2MB frame buffer. The frame buffer provides a random access port for graphics accelerator operations and a serial access port for concurrent access by the RAMDAC. No parity checking is performed on the VRAM.

The 2MB frame buffer supports display resolutions of up to 1280 x 1024 pixels at 8 bits per pixel, up to 1152 x 900 at 16 bits per pixel, or up to 800 x 600 pixels at 32 bits per pixel.

4.4 Graphics Controller

The graphics accelerator is the Weitek Power 9100 which incorporates the following features:

- 32 bit host interface
- 32 bit VRAM interface and control signals
- RAMDAC interface and control signals
- Video Timing Control (up to 165MHz)
- 2D Graphics Accelerator
- Supports X Window drawing mode
- Powerful graphics primitives

The Power 9100 has programmable display resolutions and supports sizes from 640 x 480 up to 1280 x 1024 pixels.

4.5 RAMDAC, Panel Driver and Video Clock Generator

The IBM RGB528 combines a video clock generator, RAMDAC, hardware cursor and flat panel control circuitry. It supports numerous display resolutions up to 1280 x 1024 and a maximum of 16,777,216 simultaneous colors. The primary mode of operation supports the internal TFT panel. In addition, the RAMDAC supports external monitors at resolutions of up to 1280 x 1024 in 256 colors (from a choice of 16M). The RGB528 also provides various power-down features. CPU communications to the RAMDAC device is via registers in the Weitek P9100 graphics controller.

The maximum dot clock speed is 170 MHz.

4.6 Tadpole-Cycle TS102 PCMCIA ASIC

The TS102 ASIC, designed by Tadpole-Cycle, interfaces between the SBus and the PCMCIA bus. In addition, it also carries out various miscellaneous I/O functions in SPARCbook 3000 products:

- 2 x PCMCIA Type I, II and III cards/devices
- Supports live insertion and removal
- Supports 8- and 16-bit cards and devices
- Microcontroller interface

4.7 NCR89C100 Master I/O Device

The NCR89C100 is a multi-function I/O device which supports the following interfaces:

- 53C90-style SCSI controller (Emulex FAS100A compatible) 10MB/s synchronous 8 bit data transfers
- 7990 style Ethernet controller
- Parallel port interface to 4MB/s
- Dual 64 bytes FIFOs
- SBus DMA controller

4.8 NCR89C105 Slave I/O Device

The NCR89C105 is a multi-function device supporting the following bus slave interfaces:

- 2 serial ports (sync/async 85C30 compatible) used for RS232 interfaces
- 2 serial ports (simplified 85C30 for keyboard and mouse)
- 2 programmable counter-timers (500ns period)
- Interrupt Controller
- 8 bit expansion bus (E-Bus) interface for EPROM and 8 bit I/O devices

The E-Bus interface is used for the following functions:

- System Flash EPROM (up to 4Mbit)
- Clock speed control
- MK48T08

4.9 PCI0640B IDE Controller

The IDE controller provides an interface between the SBus and the removable hard disk drive. It provides control for disk operations using polled I/O operations.

4.10 Microcontroller Subsystem (H8-337)

A microcontroller is provided to off-load system housekeeping tasks from the main CPU. A Hitachi H8/337 microcontroller is used. The following microcontroller features are used in this design:

- 32K internal PROM, 1K internal SRAM
- 16 bit timer
- PWM outputs (Beeper)
- Three eight bit analog-to-digital converters (Internal Temperature and Keyboard Pointer)
- Two eight bit digital-to-analog converters (LCD contrast and battery charging level)
- Two serial communication channels (External Sun™ Keyboard and Mouse)
- Sleep mode (for power saving)

The microcontroller subsystem manages the following functions:

- Internal keyboard and pointing device control
- External keyboard and mouse control
- PSU and battery energy management
- System non-volatile storage accesses (RTC and serial EEPROM)
- Display brightness and audio volume control
- LCD status display (2 x 16 character) control
- System reset control

4.11 ISDN and 16 bit Audio Controller

The ISDN and audio interface consists of two major components, the AT&T T7259 ISDN Controller, and the Crystal Semiconductor Corporation CS4215 Multimedia Audio CODEC. The T7259 ISDN controller has the following major features:

- Simultaneous terminal endpoint (TE) and network termination (NT)
- CCITT I.430/ANSI T1.605 support for 4 wire ISDN 2B+D basic access at the S/T reference point
- Multiframing support: S&Q channel operation
- Automatic synchronization of ISDN interfaces
- On-chip HDLC formatter
- On-chip 16-channel DMA address generator and linked list buffer manager
- Supports AT&T Concentration Highway Interface (CHI)
- SBus master and slave interface

The CS4215 Audio Codec has the following major features:

- Stereo analog-to-digital and digital-to-analog conversion
- 4KHz to 48KHz sample rates
- 16 bit linear and 8 bit μ -law or A-law coding
- Serial digital interface, compatible with AT&T CHI (Concentration Highway Interface)
- Microphone and line analog inputs
- Line, headphone and speaker analog outputs

The ISDN controller combines a DMAC and data format converter (Parallel/Serial, Serial/Parallel and Time-Division-Multiplex). It has a number of DMA channels which are allocated to support the ISDN or audio functions. The DMACs provide linked-list command support, and deep FIFOs allow burst data transfers to be performed efficiently on the I/O bus. The resulting combination allows large amounts of ISDN or audio information to be moved to and from the I/O bus with a minimum of processor overhead. The data is formatted on-chip into a composite digital serial stream (the Concentration Highway Interface). This connects to additional on-chip ISDN support circuitry, and to the external audio CODEC. The ISDN interface is implemented as a 2B + D Terminal Endpoint. The Concentration Highway Interface of the ISDN circuitry provides a variety of different serial digital framing standards and data rates to the Audio Codec. This supports a majority of the world standard Digital Audio formats. Typical configurations include high-quality stereo 16bit 44.1kHz (CD), and telephony quality mono 8bit 8kHz (ISDN).

4.12 Audio Functions

SPARCbook 3000 products provide flexible audio I/O capabilities. A number of different functions are supported which range in complexity from the simple system bell functions up to full multimedia hi-fi stereo.

OUTPUT	SOURCED FROM
Stereo headphones	CS4215
Internal loudspeaker	Beeper (microcontroller)
	CS4215 (mono only)
	PCMCIA
	Modem

Stereo Line Outputs	CS4215
INPUT	SOURCED FROM
CS4125 Stereo Microphone inputs	Internal mono microphone
CS4215 Stereo Line inputs	External high quality source (e.g. CD or stereo mic)

The PCM functions of the CS4215 dual-codec device are controlled by the T7259 (ISDN) and are software configurable. PCM configurations may vary from simple 8-bit 8kHz monophonic audio, as used in digital telephony applications, up to full-specification 16-bit CD stereo (or better).

The Beeper function is generated by the system microcontroller and is used for certain ergonomic functions and alerts the user to various events. The "PCMCIA" audio function allows PCMCIA devices to generate simple mono audio output. The function of this signal varies according to the PCMCIA unit installed.

The volume of the loudspeaker signal is controlled in software and may be muted completely.

The internal microphone provides a monophonic input to the codec for PCM sampling. This is a low-quality audio source which is adequate for speech input such as voice mail.

5. DISPLAY CAPABILITIES

5.1 Built-in Display

SPARCbook 3000ST Samsung 12.1 inch Active Matrix TFT display supporting 800x600 pixel resolution and capable of displaying up to 262144 simultaneous colors.

SPARCbook 3000XT Hitachi 12.1 inch Active Matrix TFT display supporting 1024 x 768 pixel resolution and capable of displaying up to 65536 simultaneous colors.

5.2 External Video

As well as the internal display resolution, SPARCbook 3000 products are capable of generating a wide range of video output resolutions to drive standard displays. A set of preconfigured parameters for a variety of such resolutions are provided by NCE as part of the software distribution, together with the capability to create new customized parameter sets.

External video output is via a standard 15-pin analog VGA port. An external display with the same physical resolution as the internal display can be run simultaneously with the internal display. It is not possible to simultaneously run an external display with a different physical resolution to the internal display because of hardware timing differences. Under these circumstances the internal display is switched off.

5.3 Display Resolutions and Color Depth

The maximum available video resolution is dependent on the frame buffer size and on the RAMDAC maximum dot clock speed.

The maximum number of simultaneous colors that can be displayed is dependent on the number of bits per pixel, on the capabilities of the RAMDAC, and on the display itself.

Even if the hardware is capable of supporting 16 and 32 bits per pixel, these can only be used if supported by the software. This support may not be present in earlier operating system releases.

6. Accessories

6.1 Power Supply

The base board incorporates power supply and battery management hardware which provides a range of power outputs from a single 12 V d.c. supply as follows:

- 3.3V, +/-5V, 12V, TFT Backlight supplies
- Internal battery pack
- Charge level monitoring
- Fast charging for the internal battery
- Battery charge cut-off (trickle charge)
- Short circuit protection
- Thermal protection (cut-out)

6.2 AC Adapter

The a.c. adapter supplied with the SPARCbook 3000 has the following characteristics:

- Universal input: 110-240 V a.c.50-60 Hz
- 12 V d.c. 5.0 A output
- Dimensions: 5.19 x 2.2 x 1.1 (132 x 56 x 28 mm)
- Weight: 0.6 lb (276 g)

6.3 Internal Battery Pack

The internal battery pack comprises ten NiMH A cells and incorporates temperature and charge sensing. It weighs 1.0lb (454 g). The internal battery provides 1.5 hours typical operating time or up to 2 hours with power management.

6.4 Car Adapter

The SPARCbook 3000 products can be operated in a vehicle using the optional 12 V car adapter. The adapter can be plugged into the cigarette lighter socket and directly to the SPARCbook DC-in socket. It provides similar output characteristics to the AC adapter and supports the operation of the main system unit and accessories in the same way.

6.5 Power Management

Power management is a vital aspect of any portable system. SPARCbook 3000 products incorporate a number of power-down features which are implemented on a by-device basis. These features are invoked under software control. Power saving facilities include internal screen dimming, screen off, disk drive spin down and automatic system power down. (See 'Tadpole-Cycle's Notebook Computing Environment' on page #28.)

6.6 Keyboard

The keyboard with integrated pointing device is supplied by Lexmark Inc. It supports auto repeat on all ASCII characters, cursor control and backspace functions. The keyboard is an alphanumeric, non-membrane, QWERTY-style with tactile response and 4mm of travel, which includes 12 user-programmable function keys. The keyboard variants are available with 84 or 86 full size keys and a number multi-function keys allow it to simulate 101/102 and 106 key positions.

The pointing device together with three easily activated mouse buttons gives effective mouse operation.

6.7 Hard Disk

Hard disk drives for the SPARCbook 3000 family are 2.5" industry standard IDE devices enclosed in a removable module. Disk drives are packaged into a durable housing that allows for easy storage and insertion and removal from the SPARCbook system unit.

The 5GB drive has the following characteristics:

Model: IBM DLGA-23080 Type: 2.5" 5GB IDE Data Transfer Capability: Up to 16.6MB/sec sync
12 ms average access time (read) 2.6 W power consumption (read/write) 1.1 W power consumption (low power idle)

7. I/O INTERFACES

See [Figure B](#)

ICON	NAME	DESCRIPTION
	Ethernet Interface	AUI 26-pin High Density Connector. The Ethernet interface allows connection to a wide variety of local area networks via an external transceiver.
	Parallel Port	26-pin High Density Connector (keyed) The parallel port allows for the connection of devices such as printers and scanners.
	Video Port	15way D-type (VGA style) The video port allows you to connect external displays. A wide variety of displays can be driven directly from this port.
	SCSI Port	50-pin High Density SCSI-2 Connector. The SCSI port allows you to connect external hard disks, tape drives and CD-ROM drives to your SPARCbook 3000.
	Keyboard/Mouse Port	8-pin mini-DIN The combined keyboard and mouse port allows you to connect a Sun-compatible keyboard and mouse. The external keyboard operates simultaneously with the built-in keyboard. The external mouse operates simultaneously with the Pointing Stick.
	Serial Ports A and B	RS232 8-pin mini-DIN. The serial (or TTY) ports allow the connection of devices such as serial printers, terminal and external modems
	Headphones	Stereo headphone socket provided for personal listening

	Audio In	The audio interface provides stereo line-in and line-out connections. It allows stereo sound input from an external sound source, such as a microphone or CD player, to be recorded and stored by your SPARCbook 3000 and then played out to external audio equipment.
	Audio Out	
	ISDN Interface	RJ45 Connector. The ISDN interface allows connection to the Integrated Service Digital Network services provided by telephone companies.
	DC In	1.8mm Power Jack
	PCMCIA	Two slots (side access to system) For two Type-I or II or one Type-III card

8. International Product Variants

8.1 Keyboards

The SPARCbook 3000 product is offered with a complete range of international keyboard variants. The following variants are supported:

- US
- UK English
- French
- German
- Denmark
- Swiss-German
- Swiss-French
- Japanese (Kanji)

Other keyboard variants (available for all international territories) are available subject to a minimum order quantity requirement.

8.2 International operating environments

Full international versions of the Solaris 2 operating environment for European language variants and Japanese are available for SPARCbook 3000.

9. Standards

The SPARCbook 3000 system family do or will meet the following standards. Please consult your Tadpole-Cycle representative for current status of approvals.

9.1 Safety

US UL 1950
Canada CSA C22.2 No. 950
Europe EN 60950
Japan Based on IEC950 + local variations
Others SEMKO, DEMKO, NEMKO

9.2 EMC

US FCC Part 15 Class B
Canada Accepts US approvals
Europe EN 55022 (Emissions)
EN 50082-1 (Immunity)
Japan VCCI

9.3 ISDN

US National ISDN 1
Canada CS03 Part 6
Europe NET3
Japan JATE requirements

10. Software Specifications

10.1 Operating System support

SPARCbook 3000 systems ship with the Solaris 2.6 operating environment preloaded with extension to support the internal graphics system, Save and Resume and the NCE functionality.

Additional Tadpole-Cycle developed software is provided for the SPARCbook 3000. This includes graphics drivers and the notebook computing environment (NCE) supplied to enhance operation in a portable environment. Tadpole-Cycle's NCE provides extensive power management and communications facilities for effective use of your SPARCbook in a mobile environment.

The OpenBoot monitor environment is also provided on the SPARCbook 3000 family. Enhancements have been made to support Tadpole-Cycle's Technology's Save and Resume feature, allowing the SPARCbook 3000 products to be powered down and quickly restarted exactly where it was switched off.

Most Solaris 2 language versions offered by SunSoft (including Japanese Language Environment) are available for the SPARCbook 3000 product range.

10.2 PC-compatible Application Support

SPARCbook 3000 products will support both Wabi (Windows application binary interface) from SunSoft and SoftWindows from Insignia Solutions. Microsoft™ Windows™ applications running under these packages on the SPARCbook 3000 perform at the emulator. These new offerings allow SPARCbook users access to Windows software running at top end Intel notebook performance levels within the standard Solaris Operating Environment. This allows user access to both the Solaris environment for their application specific needs, as well as access to standard Windows-based productivity tools for the portable environment.

11. Notebook Computing Environment

The Tadpole-Cycle Notebook Computing Environment (NCE) provides a suite of tools designed to facilitate the use of the UNIX Operating System on a portable computer. A user friendly GUI allows configuration of devices and power management facilities to meet individual user requirements. NCE also provides file synchronization facilities which insure files on the portable machine are automatically kept up to date with those on the server; communications facilities to establish connections over modems or ISDN to remote computers; and a powerful 'Location' facility. Using the Location tool the user can select between a number of ready-configured Locations with information on, for example, timezone, hostname, Internet address, network naming information or accessible printer types. NCE allows for easy configuration of the location

information and the ability to change locations by menu selection, without having to reboot the computer.

Other features include:

- Access to Save and Resume and Sleep facilities
- Configuration of internal and external devices
- Configuration of power management tools
- Handling of remote collection and despatch of electronic mail
- Configuration of security keys

The NCE application comprises two key parts:

- The NCE Toolkit
- NCE Status information

11.1 The NCE Toolkit

The Toolkit contains icons to enable configuration and use of the NCE interface for the portable environment:

Location Panel Allows automatic configuration of hostname, Internet address, timezone and UNIX databases

Server Panel Allows the user to configure the attributes of the server or remote system

Security Panel Allows modification of system passwords to prevent unauthorized access

Battery Panel Enables users to control the method for battery drain and recharge

Power Manager Panel Provides ability to customize power management facilities, including disk spindown time, inactivity timeout and screen-off time

Save Panel Configures Save and Sleep features to enable or disable function. Sleep facility performs a Save operation to disk without switching off the computer

Connect Panel Allows connection to remote system and displays connection status

Files Panel Allows maintenance of file synchronization between server and client files

Mouse Panel Provides control over internal and external pointing device responses

Keyboard Panel Allows user-configurable operating parameters to be defined for internal or external keyboard

Audio Panel Controls audio interface characteristics

Modem Panel Allows selection of PCMCIA modem, set auto answer mode and modem connection audio level

Display Panel External display selection and configuration

PCMCIA Panel Allows selection of available PCMCIA cards

11.2 The Status Area

Comprises three sections, the Status Area provides information on the operating status of NCE facilities. The top section displays mail and file transmission data, while the lower two sections provide status information on current connections such as modem, ISDN, Ethernet and PCMCIA. Two clocks are displayed in the system clock area. These clocks show system time, derived from the system timezone and clock information, and local time.

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About Tadpole-Cycle

Tadpole-Cycle, a subsidiary of Tadpole Technology Plc, is the global leader in the design and manufacture of portable UNIX workstations and server systems for Sun and Hewlett-Packard environments. Its North American headquarters are based in Carlsbad, California and European operations in Cambridge, England. Tadpole-Cycle is certified ISO-9001 and operates through a global network of specialist distribution channels providing applications in industry, commerce and government. Tadpole-Cycle can be visted at www.tadpole.com.

About Tadpole Technology plc

Tadpole Technology is a listed company on the London Stock Exchange and also pioneer of mobile Java solutions called Cartesia for the world's utilities and related industries. Leveraging developments in Java and intranet technology, Cartesia brings the full advantages of integrated corporate workflow to the mobile environment allowing utilities to deploy the first set of truly location-independent, platform-neutral business tools that generate reductions in IT costs and gains in mobile workforce productivity.