System Board D2509 for TX200 S4

Technical Manual

Edition October 2007

Comments… Suggestions… Corrections…

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Certified documentation according to DIN EN ISO 9001:2000

To ensure a consistently high quality standard and user-friendliness, this documentation was created to meet the regulations of a quality management system which complies with the requirements of the standard DIN EN ISO 9001:2000.

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Contents

1 Introduction

This technical manual describes the system board D2509, which can be equipped with one or two Intel® XEON™ processors.

Further information about drivers is provided in the readme files on the hard disk, on the supplied “ServerStart“ or “Update“ CDs.

You will find further information in the BIOS description.

Notational conventions

The meanings of the symbols and fonts used in this manual are as follows:

italics	indicates commands, menu items, file and path names or software programs
`fixed font`	indicate system output on the monitor
`semi-bold fixed font`	indicates values to be entered through the keyboard
Key symbol	indicates keys according to their representation on the keyboard If capital letters are to be entered explicitly, then the Shift key is shown, e.g. SHIFT - A for A. If two keys need to be pressed at the same time, then this is shown by placing a hyphen between the two key symbols.
“quotation marks”	indicates names and terms that are being emphasized.
►	indicates an operation that to be performed
CAUTION!	indicates warnings, which, if ignored, will endanger your health, destroy the system or lead to the loss of data.
	indicates additional information, notes and tips

Table 1: Notational conventions

2 Important notes

In this chapter you will find essential information regarding safety when working with your server.

CAUTION!

With the system board installed you must open the system to access the system board. How to access the system board of your system is described in the appropriate service supplement.

When handling the system board, refer to the specific notes on safety in the operating manual and/or service supplement for the respective server.

2.1 Notes on safety

CAUTION!

- The actions described in these instructions should only be performed by authorized, qualified personnel. Equipment repairs should only be performed by qualified staff. Any failure to observe the guidelines in this manual, and any unauthorized openings and improper repairs could expose the user to risks (electric shock, fire hazards) and could also damage the equipment. Please note that any unauthorized openings of the device will result in the invalidation of the warranty and exclusion from all liability.
- Transport the device only in the antistatic original packaging or in packaging that protects it from knocks and jolts.
- Only install expansions that are allowed for the system board. If you install other expansions, you may damage the requirements and rules governing safety and electromagnetic compatibility or your system. Information on which system expansions are suitable can be obtained from the customer service centre or your sales outlet.
- The warranty expires if the device is damaged during the installation or replacement of system expansions.

- Components can become very hot during operation. Ensure you do not touch components when making extensions to the system board. There is a danger of burns!.
- Transmission lines to peripheral devices must be adequately shielded.
- To the LAN wiring the requirements apply in accordance with the standards EN 50173 and EN 50174-1/2. As minimum requirement the use of a protected LAN line of category 5 for 10/100 MBps Ethernet, and/or of category 5e for Gigabit Ethernet is considered. The requirements of the specification ISO/IEC 11801 are to be considered.
- Never connect or disconnect data transmission lines during a storm (lightning hazard).

Batteries

CAUTION!

- Incorrect replacement of lithium battery may lead to a risk of explosion. The batteries may only be replaced with identical batteries or with a type recommended by the manufacturer.

  It is essential to observe the instructions in chapter “Replacing the lithium battery”.

Modules with electrostatic-sensitive components

Systems and components that might be damaged by electrostatic discharge (ESD) are marked with the following label:

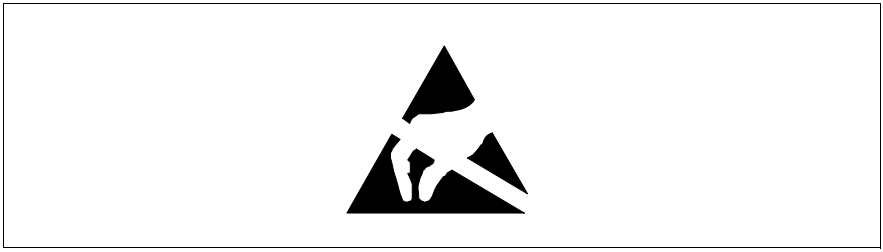

Figure 1: ESD label

When you handle components fitted with ESDs, you must observe the following points under all circumstances:

- You must always discharge yourself of static charges (e.g. by touching a grounded object) before working.
- The equipment and tools you use must be free of static charges.
- Remove the power plug from the power socket before inserting or removing boards containing ESDs.
- Always hold boards with ESDs by their edges.
- Never touch pins or conductors on boards fitted with ESDs.
- Use a grounding cable designed for this purpose to connect yourself to the system unit as you install/deinstall the board.
- Place all components on a static-safe base.

i You will find a detailed description for handling ESD components in the relevant European or international standards (EN 61340-5-1, ANSI/ESD S20.20).

Notes about boards

- During installation/deinstallation of the system board, observe the specific instructions described in the service manual for the server.
- Remove the plug from the mains outlet so that system and system board are totally disconnected from the mains voltage.
- To prevent damage to the system board, the components and conductors on it, please take great care when you insert or remove boards. Take great care to ensure that extension boards are slotted in straight, without damaging components or conductors on the system board, or any other components, for example EMI spring contacts
- Be careful with the locking mechanisms (catches, centring pins etc.) when you replace the system board or components on it, for example memory modules or processors.
- Never use sharp objects (screwdrivers) for leverage.

2.2 CE Certificate

CE

The shipped version of this board complies with the requirements of the EEC directive 89/336/EEC "Electromagnetic compatibility".

Compliance was tested in a typical PRIMERGY configuration.

2.3 Environmental Protection

Environmentally friendly product design and development

This product has been designed in accordance with standards for ”environmentally friendly product design and development“. This means that the designers have taken into account important criteria such as durability, selection of materials and coding, emissions, packaging, the ease with which the product can be dismantled and the extent to which it can be recycled.

This saves resources and thus reduces the harm done to the environment.

Notes on saving energy

Devices that do not have to be on permanently should not be switched on until they need to be used and should be switched off during long breaks and on completion of work.

Notes on packaging

Please do not throw away the packaging. We recommend that you do not throw away the original packaging in case you need it later for transporting.

Notes on dealing with consumables

Please dispose batteries in accordance with local government regulations.

Do not throw batteries and accumulators into the household waste. They must be disposed of in accordance with local regulations concerning special waste.

All batteries containing pollutants are marked with a symbol (a crossed-out rubbish bin on wheels). In addition, the marking is provided with the chemical symbol of the heavy metal decisive for the classification as a pollutant:

Cd Cadmium
Hg Mercury
Pb Lead

Notes on labeling plastic housing parts

Please avoid attaching your own labels to plastic housing parts wherever possible, since this makes it difficult to recycle them.

Returning, recycling and disposal

The device may not be disposed of with household rubbish. This appliance is labelled in accordance with European Directive 2002/96/EC concerning used electrical and electronic appliances (waste electrical and electronic equipment - WEEE).
The guideline determines the framework for the return and recycling of used appliances as applicable throughout the EU. To return your used device, please use the return and collection systems available to you. You will find further information on this at *www.fujitsu-siemens.com/recycling*.

For details on returning and reuse of devices and consumables within Europe, refer to the “Returning used devices” manual, or contact your Fujitsu Siemens Computers branch office/subsidiary or our recycling centre in Paderborn:

Fujitsu Siemens Computers
Recycling Center
D-33106 Paderborn

Tel. +49 5251 8 18010

Fax +49 5251 8 18015

3 Features

3.1 Overview

Processors

– 1 or 2 Intel® Xeon™ processors with socket LGA771
– supported processors:
  quad-core Intel® Xeon™ 5400 series
  quad-core Intel® Xeon™ 5300 series
  dual-core Intel® Xeon™ 5200 series
  dual-core Intel® Xeon™ 5100 series
– 2x VRM 11.0 onboard (EVRD)

Main memory

– 6 slots for main memory FBD533/PC2-4200F or FDB533/PC2-5300F Fully Buffered DIMM memory modules with 512 MB, 1 Gbyte, 2 Gbyte and 4 Gbyte
– Maximum 24 Gbyte of memory (6 memory modules)
– Minimum 1 Gbyte (2 memory modules)
– Maximum 12.5 or 16 Gbyte/s bandwidth
– Supports 2 way interleaved memory subsystems (2 identical memory modules have to installed at the same time)
– ECC multiple bit error detection and single bit error correction
– Memory scrubbing function
– Single Device Data Correction (SDDC) function (Chipkill™)

Chips on the system board

– Intel® 5000Z chip set
– Single-channel Gigabit LAN controller (Broadcom 5708C)
– Service LAN controller (10/100 PHY SMSC 8700)
– Super I/O controller (SMSC 47M107)
– 1 MB Flash BIOS
– Server Management with FSC iRMC
– VGA controller integrated in iRMC
– 8MBx16 Flash for iRMC
– 512KBx16 SRAM for iRMC
– Thermal and system management controller (ADT7462)

Internal connectors

- 1 floppy disk connector (34 pin)
- 1 IDE primary
- 6 Serial ATA
- I^2C signaling connector
- SAS activity connector (HD LED)
- ATX power connector 24 pin (12V, -12V, 5V, 3.3V and 5V auxiliary)
- ATX power connector 8 pin (2x 12V)
- ATX power connector 4 pin (1x 12V)
- PC98 connector
- front panel
- dual USB type C (for USB port on front side)
- 2 USB connectors for optical drives
- 1 USB connector for internal USB stick
- 3 connectors for system fans (4 pin)
- 1 connector for system fan (5 pin)
- intrusion connector
- 1 RAID key

External connectors

- 2 serial ports (COM1, COM2)
- 1 parallel port (optional)
- 2 PS/2 interfaces for keyboard and mouse
- 2 USB 2.0 ports with 480 Mbits/s (rear side)
- 1 VGA port
- 2 RJ45 LAN ports

PCI slots

- 2 x PCI-X slots(64 bit / 133 MHz IOOP^{TM})
- 4 x PCI-Express slots, Gen1, mechanical PCIe x8; the slots can be switched in different ways:
  - 4x PCIe x4 slots (standard)
    or
  - 2x PCIe x4 slots and 1x PCIe x8 slot (optional)
    or
  - 2x PCIe x8 slots (optional)
- 1 x PCI slot 32 bit / 33 MHz)

BIOS features

- Phoenix System-BIOS V 4.06
- Rompilot
- SMBIOS 2.4 (DMI)
- MultiProcessor Specification 1.4
- Server Hardware Design Guide 3.0
- WfM 2.0
- ACPI 2.0 support
- USB keyboard/mouse
- boot possible from:
  - 120 MB floppy disk drive
  - CD-ROM/DVD
  - hard disk
  - LAN
- console redirection support
- OEM logo
- CPU, memory disable
- hotspare memory support

Environmental protection

battery in holder

Form factor

SSI EEB Baseboard 304,8 x 330,2 mm (12 x 13 inch)

CSS (Customer Self Service)

This system board supports the CSS functionality. You will find a description of CSS functionality in the operating manual of your server.

3.2 Main memory

The system board supports up to 16 Gbyte main memory. 6 slots (3 memory banks with 2 modules) are available for the main memory. Each memory bank can be populated with two 512 Mbyte, 1 Gbyte, 2 Gbyte or 4 Gbyte FBD533/PC2-4200F or FDB667/PC2-5300F fully buffered DIMM memory modules.

As in the basic configuration memory bank 1 is populated, the memory extensions can be performed up to two times for memory bank 2 and 3.

ECC with memory scrubbing and with the Single Device Data Correction (SDDC) function is supported.

You will find the descriptions how to install memory modules in the Options Guide of your server.

Module population

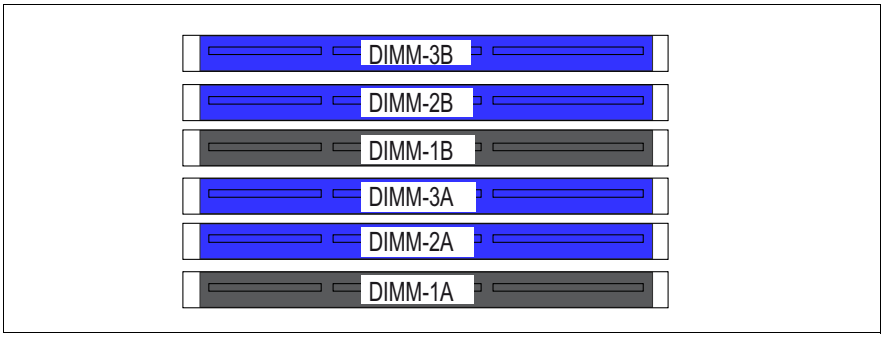

Figure 2: Main memory

– The memory modules have to be based on x4 or x8 organized single or dual ranked FBD533/PC2-4200F or FDB667/PC2-5300 fully buffered DIMM modules and must be populated in pairs. It is only allowed you use memory modules released by Fujitsu Siemens Computers.

– Each pair must consist of identical memory modules (2 way interleaved mode).

– The module capacity between pairs can differ: pair 1A/1B can be populated with two 512 Mbyte modules and pair 2A/2B with two 1 Gbyte modules.

Following table shows the mandatory population order:

module pair 1A/1B (black)	**module pair 2A/2B (blue)**	**module pair 3A/3B (blue)**
populated	empty	empty
populated	populated	empty
populated	populated	populated

3.3 PCI slots

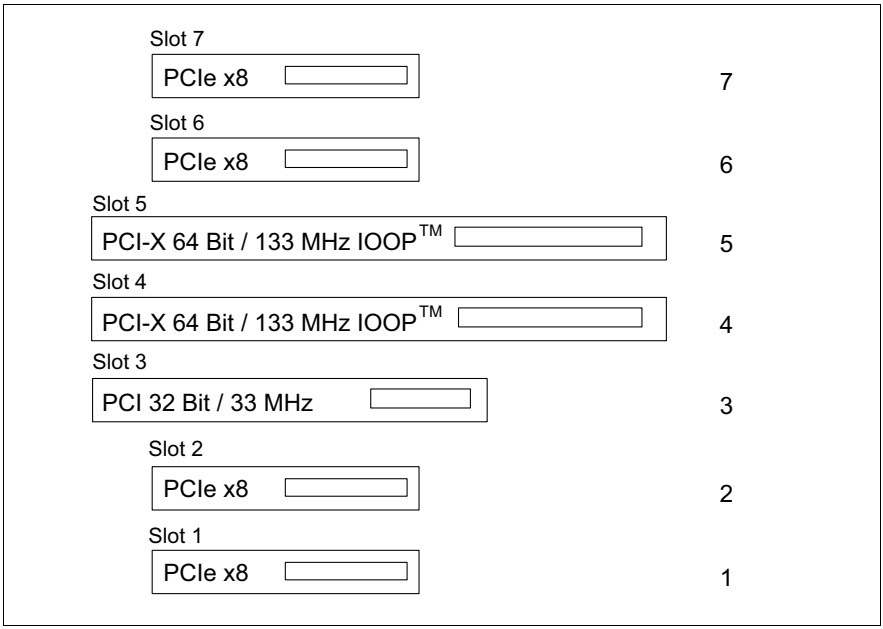

Figure 3: Mechanical PCI slots

PCI slots

The following table shows an overview of the PCI slots:

PCI slot	Type mechanical	Function
1	PCIe x8	PCIe x4 or PCIe x8 slot (optional)
2	PCIe x8	PCIe x4 slot or not available if slot 1 x8 (optional)
3	PCI 32	32-bit PCI slot
4	PCI-X 64	64-bit PCI-X slot 133 MHz if only one card has been populated in slot 4 or 5 100 MHz for population with 2 cards
5	PCI-X 64	
6	PCIe x8	PCIe x4 or PCIe x8 slot (optional)
7	PCIe x8	PCIe x4 slot or not available if slot 6 x8 (optional)

IOOP™ (PCI bus speed optimization)

The hardware of the system board optimizes the PCI bus speed of the slots 4 and 5, depending on the slots' population.

– the PCI bus speed is 133 MHz, if only one of the two slots (or no slot) is populated.

– the PCI bus speed is 100 MHz for all other population variants for slot 4 and 5.

PCI, PCI-X, PCI Express interrupts

Each device connected to a PCI bus, a PCI-X bus or PCI Express can use up to four interrupt signals depending on the functionality.

PCI and PCI-X buses use four lines named INTA to INTD, typically connected to all devices on the bus in order to periodically balance interrupt load. An interrupt signal may thereby be used simultaneously by multiple devices (interrupt sharing).

PCI Express devices send their interrupts through messages. The interrupts are defined by the system design.

The following interrupt signals are used in the system:

Slot/device	Property	Interrupt signal
VGA	iRMC graphic	PCI-INTA
LAN	BCM5708c Single Channel	PCI-INTB
Slot 7	PCIe x8	PCI_INTA, PCI_INTB, PCI_INTC, PCI_INTD
Slot 6	PCIe x8	PCI_INTA, PCI_INTB, PCI_INTC, PCI_INTD
Slot 5	PCI-X (133 MHz)	PCI-X-INTC, PCI-X-INTD, PCI-X-INTA, PCI-X-INTB
Slot 4	PCI-X (133 MHz)	PCI-X-INTA, PCI-X-INTB, PCI-X-INTC, PCI-X-INTD
Slot 3	PCI (33 MHz)	PCI-INTC, PCI-INTD, PCI-INTA, PCI-INTB
Slot 2	PCIe x8	PCI_INTA, PCI_INTB, PCI_INTC, PCI_INTD
Slot 1	PCIe x8	PCI_INTA, PCI_INTB, PCI_INTC, PCI_INTD

Assignment of the PCI interrupts

If you select *Auto* in the BIOS setup, the interrupts are assigned automatically and no further settings are required.

3.4 Screen resolution

Depending on the operating system used the screen resolutions in the following table refer to the graphic controller on the system board. The graphic controller is integrated in the iRMC (integrated Remote Management Controller).

Screen resolution	Supported colors
640x480	8 bit, 16 bit, 24 bit
800x600	8 bit, 16 bit, 24 bit
1024x768	8 bit, 16 bit, 24 bit
1152x864	8 bit, 16 bit, 24 bit
1280x1024	8 bit, 16 bit, 24 bit
1600x1200	8 bit, 16 bit

If you are using an external graphic controller, you will find details of supported screen resolutions in the operating manual or technical manual supplied with the graphic controller.

3.5 Temperature / system monitoring

Temperature and system monitoring aim to reliably protect the computer hardware against damage caused by overheating. In addition, any unnecessary noise is also prevented by reducing the fan speed, and information is provided about the system status.

The following functions are supported:

Temperature monitoring

Measurement of the processor and the system internal temperature by an onboard temperature sensor, measurement of the ambient temperature by a I^2C temperature sensor.

Fan monitoring

The CPU, power supply unit and system fans are monitored. Fans that are no longer available, blocked or sticky fans are detected.

Fan control

The fans are regulated according to temperature.

Sensor monitoring

The removal of, or a fault in, a temperature sensor is detected. Should this happen all fans monitored by this sensor run at maximum speed, to achieve the greatest possible protection of the hardware.

Voltage monitoring

When voltage exceeds warning level high or falls below warning level low an alert will be generated.

Cover monitoring

Unauthorized opening of the cover is detected, even when the system is switched off. However, this will only be indicated when the system is switched on again.

System Event Log (SEL)

All monitored events of the system board are signalized via the Global Error LED and recorded in the System Event Log. They could be retrieved in the BIOS Setup or via ServerView.

PRIMERGY Diagnostic LEDs

Optical signaling through the LEDs on the system board identifies defective modules and components as well as gaining information on the PDA.

3.6 LEDs

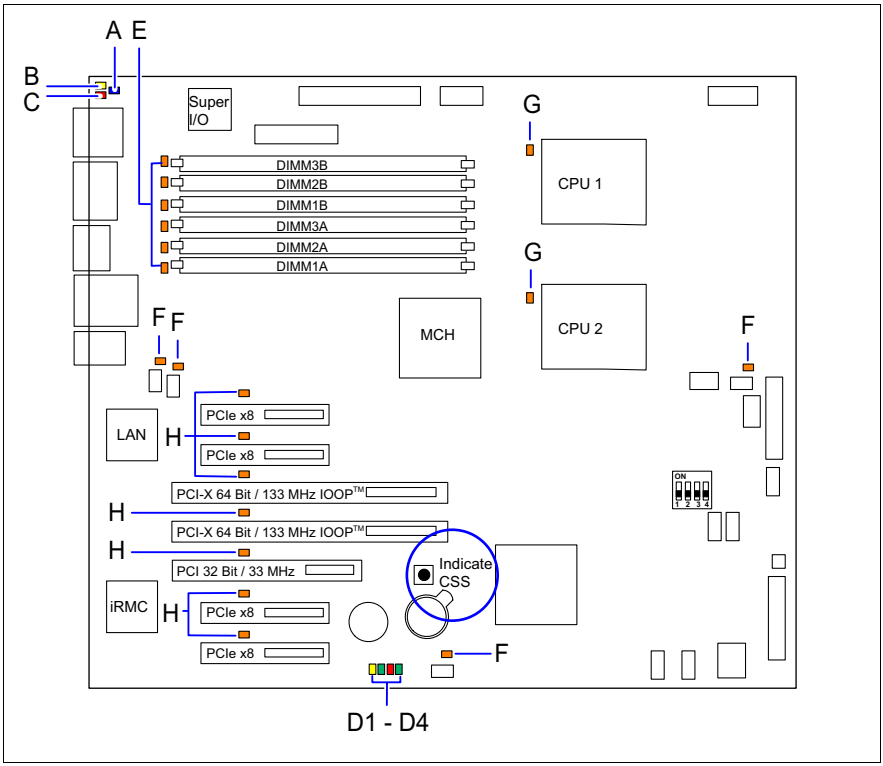

Figure 4: LEDs

LED s A, B and C are visible from outside on the rear of the server. All the other LEDs are only visible, if the cover of the server has been opened.

If the server has been powered off (power-plugs must be disconnected) it is possible to indicate the faulty component by pressing the indicate CSS button.

The LEDs have the following meaning:

LED	**Indicator**	**Meaning**
A - Identification	blue	server is identified via ServerView
B - CSS (Customer Self Service)	yellow	indicates a prefailure
	yellow flashing	indicates a failure
C - GEL (Global Error LED)	orange	indicates a prefailure
	orange flashing	indicates a failure. Reasons for a failure may be: - overheating of one of the sensors - sensor defect - fan defect - CPU error - Software detected an error
D1 - board	yellow	aux. voltage available
D2 - board	green	system running
D3 - board	red	configuration error. The system board will be held in reset. Possible configuration errors are e.g.: old CPU populated, CPUs with different FSB requirements populated, CPU1 not populated
D4 - board	green flashing	iRMC - server management controller is ok
	off	iRMC not alive
E - memory	off	memory module running
	orange	memory module failure
F - system fans	off	fan running
	orange	fan failure
G - CPU fans	off	fan running
	orange	fan failure
H - PCI card	off	PCI card okay
	orange	PCI card failure

3.7 Interfaces and connectors

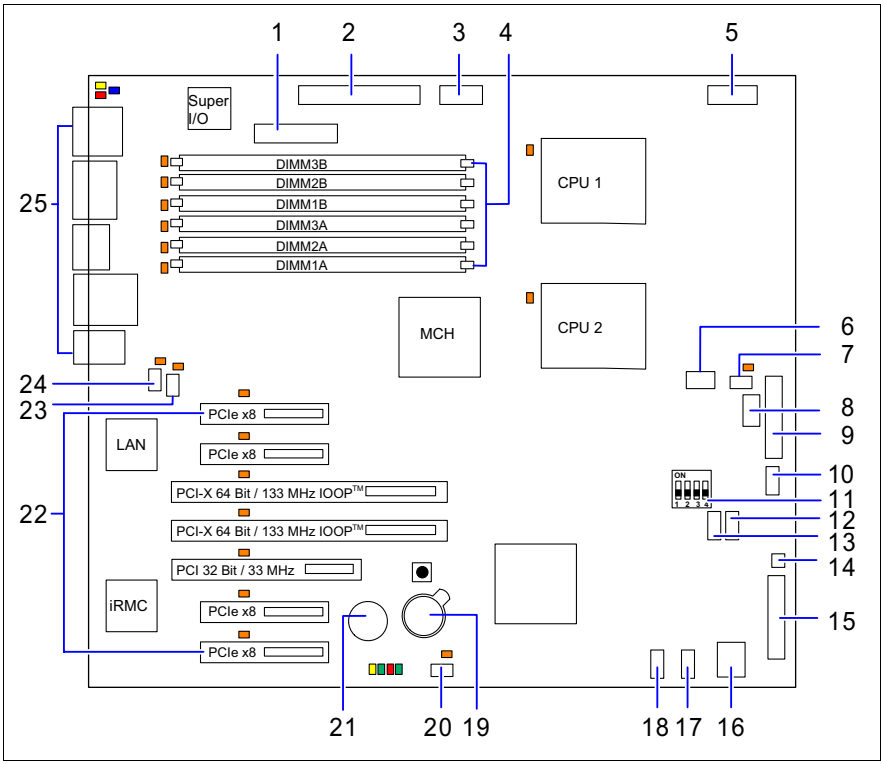

Figure 5: Schematic view of the system board D2509

1 = Printer (optional)
2 = Power supply PWR1
3 = Power supply PWR3
4 = Slots for main memory modules
5 = Power supply PWR2
6 = USB stick
7 = System fan 1
8 = PC98
9 = Front panel
14 = Intrusion
15 = Floppy disk drive
16 = SATA MLC1
17 = SATA 5
18 = SATA 6
19 = Battery
20 = System fan 2
21 = RAID key (SATA SW RAID)
22 = PCI slots

10 = USB Front
11 = DIP switch (see page 27)
12 = USB1 AUX
13 = USB2 AUX
23 = System fan 3
24 = Redundant system fan 4
25 = External ports

RAID key

The SATA SW RAID 5 functionality will be activated by installing a license key (RAID key).

3.7.1 External ports

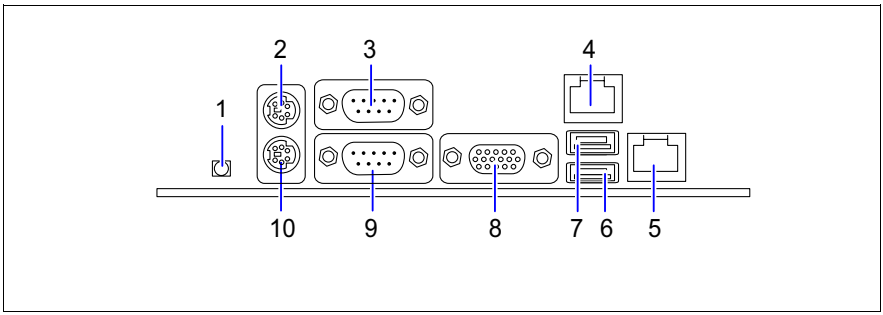

Figure 6: External ports of the system board D2509

1 = CSS LED (yellow)
Global Error LED (orange)
Identifications LED (blue)
2 = PS/2 mouse connector
3 = serial interface COM2
4 = LAN connector 1 (service LAN)
5 = LAN connector 2
6 = USB port
7 = USB port
8 = VGA port
9 = serial interface COM1
10 = PS/2 keyboard connector

The serial interface COM1 can be used as default interface or to communicate with the iRMC.

LAN connectors

On this system board you will find two LAN controllers: a single-channel Gigabit LAN controller and a service LAN controller.

The single-channel Gigabit LAN controller supports the transfer rates of 10 Mbit/s, 100 Mbit/s and 1 Gbit/s. The Service LAN controller supports the transfer rates of 10 Mbit/s and 100 Mbit/s.

The LAN controllers support WOL function through Magic Packet™.

It is also possible to boot a device without its own boot hard disk via LAN. Intel PXE or iSCSI Boot can be used.

The LAN1 port serves as management interface and is prepared for RemoteView.

The LAN connectors are equipped each with two LEDs (light emitting diode) indicating the transfer rate and the activity.

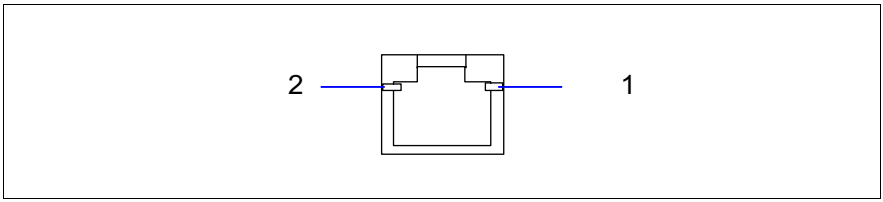

Figure 7: LAN connector single-channel Gigabit LAN controller

1	LAN transfer rate	green + yellow	off	transfer rate 10 Mbit/s
		green	on	transfer rate 100 Mbit/s
		yellow	on	transfer rate 1000 Mbit/s
2	LAN link/activity	green	on	LAN connection
			off	no LAN connection
			flashing	LAN transfer

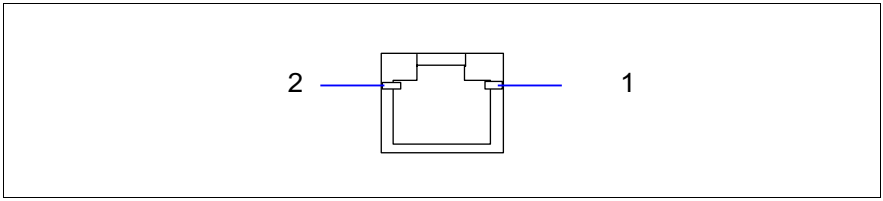

Figure 8: LAN connector service LAN controller

1	LAN transfer rate	green	off	transfer rate 10 Mbit/s
		green	on	transfer rate 100 Mbit/s
2	LAN link/activity	green	on	LAN connection
			off	no LAN connection
			flashing	LAN transfer

3.8 Settings with switches

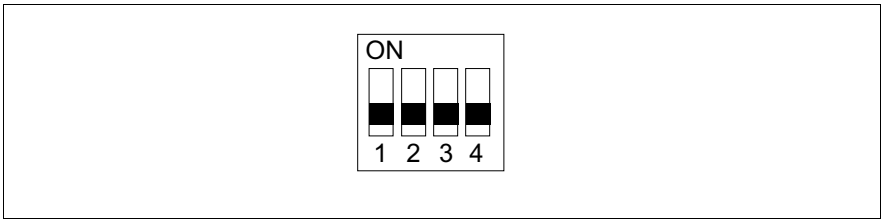

Figure 9: DIP switch

Preset for switches 1 to 4 = *Off*.

Recovering System BIOS - switch 1

Switch 1 enables recovery of the old system BIOS after an attempt to update has failed. To restore the old system BIOS you need a Flash BIOS Diskette (please call our customer service centre).

on The system boots from the “Flash BIOS floppy disk“ from drive A and reprograms the system BIOS on the board.

off The System BIOS is started with the system BIOS from the system board (default setting).

Skipping the password query - switch 2

Switch 2 is used to define whether the password is queried at system startup, if the password protection is enabled in BIOS Setup (in *Security* menu, the *Password* field must be set to *Enabled*).

on The password query is skipped. Passwords are deleted.

off The password query is effective (default setting).

Write protection for Flash BIOS - switch 3

Switch 3 is used to define whether the System BIOS is write protected or not.

on The System BIOS can neither be written to nor deleted. Flash-BIOS update from floppy disk is not possible.

off The System BIOS can be written or deleted. Flash-BIOS update from floppy disk is possible (default setting)

Write protection for floppy disks - switch 4

Switch 4 is used to define whether floppy disks can be written or deleted in the floppy disk drive. To write and delete floppy disks, the write-protection in BIOS Setup must be disabled (in menu *Security*, the field *Diskette Write* must be set to *Enabled*).

on The floppy disk drive is write-protected.

off Floppy disks can be read, written and deleted (default setting).

4 Replacing the lithium battery

In order to save the system information permanently, a lithium battery is installed to provide the CMOS-memory with a current. When the charge is too low or the battery is empty, a corresponding error message is provided. The lithium battery must then be replaced.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer (CR2450).

Do not throw lithium batteries into the trash can. It must be disposed of in accordance with local regulations concerning special waste.

Make sure that you insert the battery the right way round. The plus pole must be on the top!

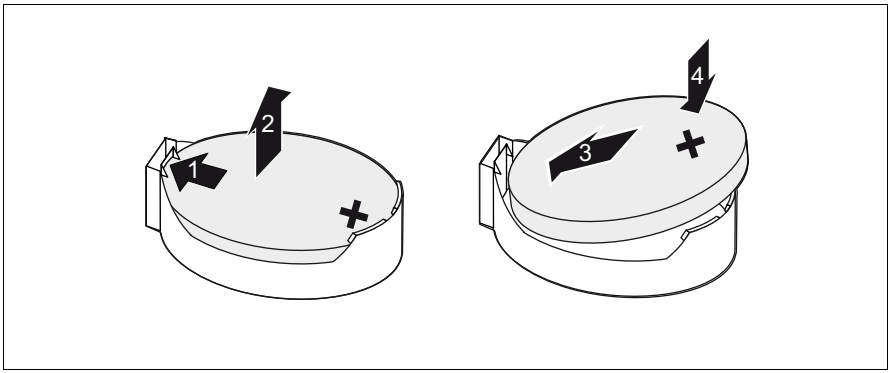

Figure 10: Replacing the lithium battery

- Press the locking spring into direction of the arrow (1), so that the lithium battery jumps out of its socket.
- Remove the battery (2).
- Insert a new lithium battery of the same type into the socket (3) and (4).

Abbreviations

The technical terms and abbreviations given below represent only a selection of the full list of common technical terms and abbreviations.

Not all technical terms and abbreviations listed here are valid for the described system board.

ACPI
Advanced Configuration and Power Interface

ASR&R
Automatic Server Recovery and Restart

ATA
Advanced Technology Attachment

BBU
Battery Backup Unit

BIOS
Basic Input Output System

BMC
Baseboard Management Controller

CMOS
Complementary Metal Oxide Semiconductor

COM
COMmunication port

CPU
Central Processing Unit

DDR
Double Data Rate

DIMM
Dual In-line Memory Module

DIP
Dual In-line Package

DMI
Desktop Management Interface

DRAM
Dynamic Random Access Memory

ECC
Error Correction Code

EEPROM
Electrical Erasable Programmable Read Only Memory

EPROM
Erasable Programmable Read Only Memory

EMRL
Embedded RAID Logic

EVRD
Enterprise VRD

HPC
Hot-plug Controller

ICE
In Circuit Emulation

IDE
Integrated (intelligent) Drive Electronics

IME
Integrated Mirror Enhanced

IOOP
Intelligent Organization Of PCI

IPMB
Intelligent Platform Management Bus

IPMI
Intelligent Platform Management Interface

iRMC
integrated Remote Management Controller

LAN
Local Area Network

LED
Light Emitting Diode

MPS
Multi Processor Specification

NMI
Non Maskable Interrupt

OEM
Original Equipment Manufacturer

OHCI
Open Host Controller Interface

OS
Operating System

PCI
Peripheral Components Interconnect

PDA
Prefailure Detection and Analyzing

PIO
Programmed Input Output

PLD
Programmable Logic Device

PS(U)
Power Supply (Unit)

PWM
Puls Wide Modulation

PXE
Preboot eXecution Environment

RAID
Redundant Array of Inexpensive Disks

RSB
Remote Service Board

RST
ReSeT

RTC
Real Time Clock

SAS
Serial Attached SCSI

SATA
Serial ATA

SCSI
Small Computer Systems Interface

SDDC
Single Device Data Correction

SDRAM
Synchronous Dynamic Random Access Memory

SHDG
Server Hardware Design Guide

SMB
System Management Bus

SMM
Server Management Mode

SMP
Symmetrically Multi Processing

UHCI
Unified Host Controller Interface

USB
Universal Serial Bus

VGA
Video Graphics Adapter

VRD
Voltage Regulator Down

VRM
Voltage Regulator Module

WfM
Wired for Management

WOL
Wake up On LAN

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