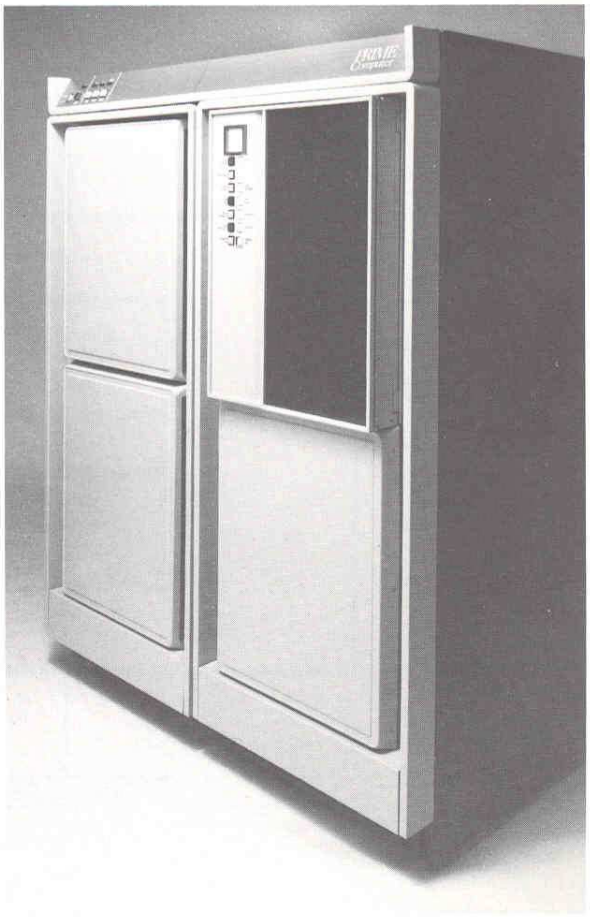
Product Bulletin

PRIME

Prime 550-II System

Features

- Central system includes Prime 550-II central processor with 32-bit architecture, error correcting main memory, 16-line asynchronous terminal controller, virtual control panel, system console, 15 board positions for peripheral or memory options and the PRIMOS® operating system.
- Expandable from 256Kb to 4 million-bytes of error correcting high speed MOS main memory.
- Up to 128 simultaneous active processes.
- 512 million-byte virtual address space for each user, with 32 million-bytes reserved for private user programs and data.
- 8K-byte, 80 nanosecond cache memory.
- Process exchange implemented in firmware.
- Memory security via ring protection.
- Hardware implementation of business instructions for decimal arithmetic, character manipulation and editing operations.
- Includes 32-bit integer arithmetic unit and hardware floating-point unit.
- Automatic microverification and parity checking throughout the system.
- Standard Virtual Control Panel for remote hardware and software diagnostics.
- Up to 64 direct connect terminal users.
- Uses the PRIMOS operating system, for interactive and batch operations.
- Software available includes industry standard languages (FORTRAN, Cobol, Pascal, BASIC, RPG-II and PL/I) and products for software development and debugging, computation, data management, communications and networking, office automation, and a wide variety of applications packages.

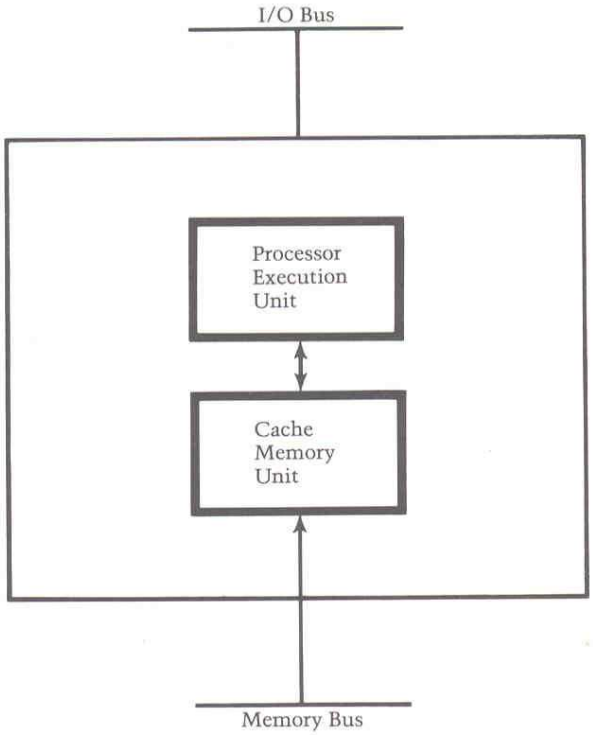


Description

The Prime 550-II is a high performance computer system for computational, commercial or Office Automation applications. It is also ideally suited for use in a distributed processing or networking environment.

The basic system components include the 32-bit Prime 550-II central processor (CPU), 512Kb, 1Mb, 1.5Mb, or 2Mb, of error-correcting memory (expandable to 4Mb), a 16-line asynchronous terminal controller, virtual control panel (VCP) for remote diagnostics, system console and the PRIMOS operating system. The standard 24 board chassis also includes 15 optional board positions. These optional board positions can be used for memory; any standard peripheral subsystem, such as magnetic disk, tapes or printers; additional asynchronous line controllers; multiline data link controller for synchronous communications; or the PRIMENET™ networking software Node Controller for local high-speed networks.

The Prime 550-II supports up to 64 simultaneous users. It uses the multi-terminal PRIMOS operating system, which supports interactive and batch operations and is compatible on all Prime computer systems. PRIMOS supports PRIMENET networking software and the x.25 international packet switching protocol for distributed processing capabilities. A wide range of RJE software packages and industry-standard business and computational programming languages are also supported on the Prime 550-II.



Special Performance Features

Cache Memory

A high-speed (80 nanosecond access) 8K-byte bipolar memory decreases the effective main memory cycle time to near that of the processor by storing data and instructions most likely to be used next by the processor. The cache, which is located on the central processor, eliminates memory bus delays in cache-to-processor transfers. Its high capacity provides a 90 percent "hit rate" on anticipated processor requirements.

Memory mapping is completely overlapped with cache memory to further reduce total instruction execution times.

Extended Instruction Set

The Prime 550-II's, 32-bit internal architecture uses hardware implemented instructions to support single- or double- precision floating point arithmetic. With a 32-bit path between the Floating Point Unit and central processor, floating point data is tranferred at an extremely fast rate. Registers assigned to floating-point operations are integral to the unit itself.

The Prime 550-II provides hardware support for COBOL, PL/I, and other business oriented languages with comprehensive instructions for decimal arithmetic, character field manipulation and editing operations.

COBOL and PL/I decimal arithmetic operations support up to 18-digit packed or unpacked signed numbers. Operands that differ in data type and/or scale factor are handled automatically during add, subtract, multiply, divide and comparison operations. Hardware instructions also allow rounding on numeric operations, and efficient binary-to-decimal and decimal-to-binary conversions.

Character manipulation is performed on fixed and variable length fields. Justification, truncation, and padding are done automatically in move, compare, translate, edit and similar operations. Numeric and character editing instructions support user-defined fields in COBOL and PL/I picture-like formats. For maximum efficiency, all business operations require a minimal number of on-line instructions.

Basic Architecture Features

Virtual Memory Management

The Prime 550-II has virtual memory management facilities that provide multiple users with individual address spaces far in excess of the system's physical memory. Each system user gets a private and a shared system address space of up to 512 million-bytes, which is divided into segments through automatic segmentation and paging. There are 256 segments (32 million-bytes) available to each user for private program space, and the remainder is used for shared operating system software. Operating system functions are embedded in each user's virtual memory space. This reduces system overhead by making all operating system functions immediately available, as if they were an integral part of a user's program.

Interleaved Main Memory

Like all Prime systems, the Prime 550-II uses MOS main memory and can address up to 4 million-bytes of error checking and correcting (ECC) main memory.

Consecutive memory locations are on separate memory boards, so that two-way interleaving can be used to speed-up sequential memory accesses and maximize the cache hit rate. In effect, interleaving provides high-speed transfers between memory and the central processor by allowing the processor to read or write four bytes at a time.

Register Sets

The Prime 550-II has 128, 32-bit hardware registers that are divided into four sections. One 32-bit register section handles firmware and operating system functions. Another controls the processor's 32 high-speed Direct Memory Access (DMA) channels. The remaining two sections hold the machine states of active processes. The process exchange facility dynamically and automatically manages register assignment to process.

Stack Architecture

Prime 550-II programs operate in a multi-segment environment that includes a stack segment containing all local variables, a pure instruction or procedure segment, and linkage segment containing statically allocated variables and linkages to common data. Highly efficient addressing modes provide access to stack and linkage variables. Firmware-implemented CALL and RETURN instructions eliminate the overhead of software stack management routines and argument passing.

The Prime 550-II stack architecture optimizes the efficiency of operations such as parameter passing, subroutine and procedure calls, arithmetic expression evaluation, and dynamic allocation of temporary storage.

Instruction Set

The Prime 550-II's instruction repertoire is a compatible set of machine instructions available with other Prime 50 Series systems. Addressing mode compatibility also lets programs written for any multiuser Prime system run without modification on any other Prime system.

The Prime 550-II features instructions that support the processor's eight general registers, as well as decimal arithmetic, character manipulation and editing operations.

Over 500 instructions provide enhanced operating system communication data handling and cooperating of processes. Highly flexible address formation techniques let all instructions use any of four user-access base registers, up to seven index registers, and 32-bit indirect words in any combination. This permits all memory reference instructions to reference the entire virtual address space.

Integer Arithmetic Unit

The processor's 32-bit arithmetic unit performs all integer arithmetic and logical operations, significantly improving the execution times of integer arithmetic instructions. The arithmetic unit's design also efficiently handles complex address formations, such as base-plus-displacement and indexing.

Process Exchange

A Process Exchange facility automatically transfers the central processor's attention from one user process to another, with minimum overhead and complete protection. It allocates resources to the highest priority process in a queue, and handles the logistics of processes ready for execution or waiting for a specific event to occur. The facility is implemented in firmware and hardware and automatically dispatches a process for execution and reorders remaining processes without software intervention.

Rings of Protection

Memory security is provided by a heirarchical multi-ring protection mechanism. Each process runs in a particular ring. At each memory reference the hardware automatically checks the access permitted to the addressed segment from the process' ring. If the attempted access is not allowed, an "access violation" fault is generated.

Input/Output

The Prime 550-II supports a broad line of peripheral products for mass storage, data entry and retrieval, communications, and printed output. All necessary software to enable customers to effectively utilize these devices is built into PRIMOS. Upgrades never obsolete peripherals, since all peripherals can be used on all systems.

Up to 2.4 billion bytes of data can be stored on-line using Storage Module Disk subsystems. Magnetic tape products include an advanced state-of-the-art 75 ips 6250 bpi GCR unit, with up to eight tape drives available per system. Various terminals can be used for local and remote input, for administrative functions of the Office Automation System, and as a system console. Finally, the range of printer options available includes a wide range of line printers (up to a high throughput, 1000 line per minute printer), matrix line printer/plotter and letter quality printer.

System Integrity

The Prime 550-II provides system integrity through comprehensive error detection and reporting mechanisms. Microverification routines, invoked automatically when the system is initialized, test the validity of the CPU logic and indicate any malfunction cause via a diagnostic status word. While the system is running, parity checking ensures data integrity throughout the processor's internal busses, registers, and other data paths. In addition, the Prime 550-II automatically checks the parity of each microcode control word. Error-correcting codes in real memory automatically detect and correct all single-bit errors, so they are totally transparent to users. All two-bit errors are reported as well.

A comprehensive, hardware-controlled memory protection system has a multi-ring protection hierarchy that allows programs to be assigned to any of several security levels. This lets multiple users have full access to specified programs, protects other programs and databases from unauthorized access, and guards operating system software against accidental user intrusion.

Remote Diagnostics

The Prime 550-II includes a sophisticated Virtual Control Panel (VCP) that allows a diagnostic specialist to locally or remotely control any system. This provides fast, effective troubleshooting for identifying a hardware problem and for performing comprehensive system software diagnostics.

The local system operator or administrator initiates remote access by simply depressing a "Remote Enable" button on the VCP. A second button places the remote terminal in control mode, or gives the remote terminal the capability to control the system as if it were the local system console. The remote system administrator, when in control mode, can completely run the system from a remote terminal, including tasks such as bootloading and on-line operations.

Two VCP indicator lamps display the state of the remote communications link. One lamp indicates a remote user has been given the ability to dial into the system and monitor operations. The second lamp indicates whether or not a remote access is in progress. If it is flashing, the remote user has been given the same control as the local system operator or administrator.

Software

The multi-terminal PRIMOS operating system lets all Prime 50 Series systems perform interactive and batch operations. It supports reentrant procedures, permitting a single copy of a software module, such as the text editor or FORTRAN compiler, to be shared by many users. PRIMOS further supports ANSI'74 COBOL, ANSI'77 FORTRAN, BASIC/VM, RPG II, PL/I, Pascal, Prime Macro Assembler, the Source-Level Debugger, and the query and reporting facilities provided by PRIME/POWER. PRIMOS also supports DBMS, Prime's CODASYL-compatible Database Management System, and the DBMS Query/Report Writer; MIDAS, the Multiple Index Direct Access System; FORMS, the Forms Management System; Prime/TAPS, the Terminal Application Processing System, and Prime's Office Automation System. A wide variety of application packages, supplied by users and third-party vendors, is available from the Prime Users Library Service (PULSE).

Networking

The Prime 550-II supports networking and distributed processing with an array of software and hardware communications products. PRIMENET™ networking software lets Prime computers communicate among themselves, with terminals, and with other manufacturers' systems by using a variety of communication facilities. These facilities allow users to remotely log into other systems, share files among systems and develop distributed applications. Users can interface Prime computers to a range of terminals from communications lines with multiple protocols and remote job entry options: IBM BISYNC for HASP and 2780/3780; High-level Data Link Control (HDLC) protocol for X.25 packet switching networks; Control Data 200UT: Univac 1004; Honeywell GRTS: and ICL 7020.

Prime's Distributed Processing Terminal Executive (DPTX) allows the Prime 550-II to emulate and support IBM 3271/3277 Display Systems.

The Prime 550-II supports all of Prime's communications hardware controllers. User terminal communications are handled by the Asynchronous Multi-Line Controller (AMLC). Communications for all of the synchronous software products are handled by the Multi-line Data Link Controller (MDLC), a controller handling multiple line protocols. For local area networks, the 550-II can be attached in a high speed ring network with any other 50 Series system. The ring network provides inter-system communication via a coaxial cable for up to fifteen Prime systems using PRIMENET networking software.

Summary of Features	250-II	550-II	750	850
32-bit architecture	■	■	■	■
Simultaneous active processes	128	128	128	128
Direct connect terminal users	32	64	96	128
512Mb virtual address space per user	■	■	■	■
Bipolar cache memory	2KB	8KB	16KB	32KB
Instruction preprocessor unit			■	■
I/O bandwidth (Mb/SEC)	2.5	2.5	8	8
Multi-stream architecture				■
Hardware instructions for floating point arithmetic, decimal arithmetic and character string manipulations		■	■	■
Single and double precision floating point arithmetic	■	■	■	■
32-bit integer arithmetic	■	■	■	■
Microprocessor control unit with process exchange facility	■	■	■	■
Internal process or parity checking	■	■	■	■
Hardware Protection	■	■	■	■

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