PR1ME

2655™

Features

Economical, high-performance 32-bit supermini with up to 8Mb of error-correcting, high-speed MOS memory.

Compact design and quiet operation suitable for office installation.

Easy-to-use operator interface allows one-step system initialization.

Advanced, gate array based processor design.

Advanced Schottky implementation of TTL circuitry.

Pipelined central processor organization allows concurrent processing of two instructions.

Hardware decimal arithmetic to supplement COBOL performance.

16Kb of high-speed bipolar cache memory to reduce memory access time.

Up to 64 terminals and 255 active processes supported.

Hardware implemented instructions for quad precision floating-point operations.

Protection rings and embedded operating system to ensure memory security.

Automatic microverification and parity checking throughout system.

Diagnostic processor with two integrally packaged floppy diskettes for loading of operational and diagnostic microcode.

Full hardware and software compatibility with all 50 Series™ systems.

Efficient, multifunction PRIMOS® operating system plus a wide range of available system and application software.

Description

The 2655 superminicomputer is a high-performance, low cost office system ideal for distributed processing network nodes or compact, multi-user system applications. Because this system is hardware and software compatible with the entire line of 50 Series systems, users can upgrade without sacrificing their software investment.

The basic 2655 system includes a 32-bit central processor, 16Kb cache memory, 4Mb of memory and a diagnostic processor that also acts as a system console interface. The diagnostic processor has loadable control store which enables the 2655 to have a large library of microcode diagnostics. Floppy diskettes with microcode revisions can be loaded through loadable control store to provide improved system functionality.

The 2655 supports up to 64 terminals in an interactive environment of up to 255 processes. It uses the PRIMOS operating system which supports concurrent interactive and batch processing and is compatible across Prime's entire product line. Like all 50 Series systems, the 2655 can be networked to other Prime® systems using PRIMENET™ communications software and compatible, standard Prime peripherals and controllers.

Designed to fit into the office environment, the standard system is packaged in a 30-inch high cabinet that includes a 16-board chassis with power supply, two-board processor, diagnostic processor, a power distribution unit, and a cable connector bulkhead for easy reconfiguration of terminal and communications lines. The basic system, including the CPU, 4Mb memory and disk controller, uses seven of the 16 available board slots. The remaining slots can be used for additional memory, tape controllers, communications controllers, a line printer controller and other peripheral controllers. Disk, tape and some communication devices must reside in an additional 30-inch high peripheral cabinet.

50 Series Architecture Features

Compatibility

Prime systems are designed for hardware and software compatibility. Like all 50 Series systems, the 2655 runs under the PRIMOS operating system. The single operating system ensures total software portability across all Prime systems. User programs developed on one system will run on all the others without recompilation or modification. In addition, programmers use the same set of commands on all systems.

32-bit Architecture

The 2655 uses 32-bit architecture for internal operating efficiency and for large program support. Full 32-bit word length lets more information be processed during each machine cycle than is possible with 16-bit systems. As a result, the system does more work per cycle because it's manipulating a larger amount of data.

In addition, the 32-bit word length lets users specify a very large number of address locations. This permits program design without concern for address space restrictions.

The 2655 uses an advanced 32-bit implementation. It uses custom gate arrays and an advanced Schottky implementation of TTL circuitry to increase circuit density. This provides large system functionality in packaging suitable for office installation.

Virtual Memory Management

Running under the PRIMOS operating system, the 2655 gives each user a virtual address space much larger than physical memory. The mechanisms for virtual memory management are designed for system efficiency and total user transparency. Each user has 512Mb of virtual address space; 64Mb is reserved for private user program space. The rest is for shared libraries and operating system functions.

System functions, such as I/O, are embedded in the virtual address space of each process. This design increases system throughput by using ordinary procedure calls, eliminating the overhead of special system calls. A protection ring mechanism ensures operating system integrity.

Program Environment

Programs for the 2655 system operate in a multi-segment environment that includes a stack segment containing all local variables, a procedure segment containing executable code, and a linkage segment containing statistically allocated variables and linkages to common data. Highly efficient addressing modes provide rapid access to stack and linkage variables. In addition, stack management overhead is minimized by implementing the procedure call mechanism in firmware.

The 2655 stack management mechanisms optimize the efficiency of argument passing, subroutine and procedure calls, arithmetic expressions evaluation, and dynamic allocation of temporary storage. In addition, these mechanisms support re-entrant and recursive procedures.

High-density MOS Memory

Main memory of the 2655 processor, and all Prime processors, features high-density 256K MOS semiconductors for speed and miniaturization benefits. Expandable to 8Mb, the 2655 main memory supports wide-word self-interleaved operation to accelerate memory transfers. Error-checking and correction logic monitors memory integrity.

Process Exchange

All Prime processors use an advanced process exchange facility to accelerate performance in multi-user environments. The facility manages context switching, in which the processor transfers control from one process or program to another. Context switching algorithms are implemented in firmware for maximum efficiency and reside in the CPU's micro-programmed control unit.

Register Sets

The 2655 processor has 11 register sets, each containing 32 registers, for a total of 352 32-bit registers. Eight of the register sets are program addressable. One stores the execution state of the currently active process while the other seven store the state of the last seven previously active processes. If one of these processes is the next process to be activated, its state is already loaded, ready for execution. This parallel register set design greatly reduces process exchange overhead in multi-user environments.

The three remaining 32-bit register sets further enhance the processing efficiency of the system. Two sets support the operation of the micropro-grammed control unit. The other set contains the 32 direct memory access (DMA) channels.

High-speed Address Buffer

Frequently used virtual-to-physical address translations are stored in the high-speed Segment Table Lookaside Buffer (STLB). The STLB's large storage capacity ensures an STLB hit rate of greater than 99%, minimizing address translation overhead. Access to the STLB is completely overlapped with access to cache for maximum speed.

Hardware Integrity Features

The 2655 provides hardware system integrity through comprehensive error detection and reporting mechanisms. Microverification routines, invoked automatically when the system is initialized, test the validity of the CPU and controllers. While the system is running, parity checking ensures data integrity throughout the processor's internal busses, registers and other data paths.

In addition, the 2655 checks the parity of each microcode control word automatically. Main memory error detection and correction detects all double and single-bit errors and corrects single-bit errors. All detected errors are written to the system event log automatically, to help Prime's Customer Service Representatives troubleshoot component problems early.

Protection Rings

A hierarchical multi-ring protection mechanism ensures the security of memory contents. Every program runs at an access privilege level that is hardware enforced. Protection rings prevent processes from accessing unauthorized memory locations.

2655 Special Features

Instruction Pipeline Unit

The Instruction Pipeline Unit improves central processor throughout by prefetching and decoding up to four anticipated instructions. It's an advanced instruction look-ahead buffer that incorporates a two-stage pipelined design. This feature relieves the central processor of instruction preparation overhead by operating in parallel with the 2655's Instruction Execution Unit (IEU).

The first stage of the pipeline is an instruction buffer. It is managed by prefetch logic that transfers instructions from cache. The buffer stores up to four instruction words in a first-in, first-out (FIFO) organization.

Concurrently, the second stage of the pipeline prepares instructions for execution by decoding operation codes and by partially resolving effective operand addresses. This two stage pipeline allows the IEU to execute a new instruction immediately. This design speeds the 2655's execution by reducing instruction overhead.

Cache Memory

Cache memory greatly reduces the 2655 system's effective memory access time by storing frequently used instructions and data in fast buffer memory within the central processor. The high-speed components and efficient circuit design provide a cache access time of only 80 nanoseconds. With a 16Kb capacity and a 95% hit rate, cache memory gives the 2655 an effective main memory access time of only 132 nanoseconds. In addition, an efficient "write through" algorithm eliminates bus delays during main memory writes by letting information be written through cache.

Instruction Set

The 2655 instruction set is compatible with all 50 Series machine instructions. This means user application programs written for any other Prime system will run on the 2655 without alteration.

More than 550 instructions enhance operating system communication, data handling, and process coordination. Highly flexible address formation techniques let all instructions use any one of four user-accessible base registers and 32-bit indirect words in any combination. This lets all memory reference instructions access the entire virtual address space.

The 2655 instruction set takes advantage of the 52-bit data paths and 32-bit internal architecture, and the expanded number of registers in the system to achieve maximum performance. Designed to increase speed in commercial high-level language execution, the 2655 instruction set features optimized machine instructions for decimal and character string operations. In addition, microcode assists have been implemented for frequently used Prime INFORMATION™ instructions. Seven of the eight 32-bit general purpose registers can be used as index registers. These can also be used for compiler optimization or as fixed-point and logical accumulators.

Operator Interface

The 2655 has been designed for ease of use. A hardcopy or video terminal can be used both as a system console and as a user terminal. The control panel features a system power switch and halt indicator and a keylock to ensure authorized control panel use.

Users – technical and non-technical – can bring up the 2655 by simply depressing the control panel system power switch. This switches power to the electronics and peripherals. When power is stabilized, the diagnostic processor runs a microverification routine and reports the results on the system console. Then it verifies that the CPU and memory are operational, and loads the appropriate operating system boot routines into main memory. These, in turn, fetch and configure the PRIMOS operating system. After PRIMOS is loaded, the integral battery powered clock then provides the date and time of day before prompting the user. During normal power-up operations, the 2655 does not require user intervention to become fully operational.

Software

The PRIMOS operating system supports both interactive and batch processing on all 50 Series systems. The operating system supports re-entrant procedures, letting many users share a single copy of a software module.

A wide range of high-level, industry-standard languages run on Prime systems. Available languages include FORTRAN 77, ANSI 74 COBOL, Pascal, PL/I Subset G, C, BASIC and RPG II. The Prime Macro Assembler, the Source-Level Debugger, and EMACS, the extendable screen editor, support these standard languages.

Prime offers a comprehensive family of data management products. Central to these are MIDASPLUS™ and PRISAM™ indexed sequential access managers, and CODASYL-compliant Prime DBMS. Complementing these data managers are: FORMS for screen management, the PRIME/POWER + product for query and reporting on MIDASPLUS and PRIMOS files, and the DISCOVER™ product for query and reporting on PRISAM and Prime DBMS files.

Other Prime software offerings include PRIMEWAY™ development and transaction management system; Prime INFORMATION software, a fourth generation, relationally-based data management product; and the Prime Office Automation System (Prime OAS).

For CAD/CAM/CAE applications, Prime offers the PRIME MEDUSA™ design and drafting package; the Product Design Graphics System™ (PDGS)™; GNC,™ Graphical Numerical Control, and the SAMMIE™ ergonomic design software packages. In addition, a large library of application packages is available from the Prime Users Library Service (PULSE) and from the Joint Marketing Agreements (JMA) that we have with third-party software houses.

System Diagnostics

The 2655 system includes a sophisticated diagnostic processor that assists at system start-up, and runs both local and remote diagnostics. The advanced microdiagnostic processor loads a full 8K words of microdiagnostics at system start-up, before any user code is executed. This provides fast, effective troubleshooting for identifying hardware problems and for performing comprehensive system software diagnostics. By depressing the "Remote Enable" button on the front panel, the local system operator or administrator initiates remote access. A second button puts the remote terminal in control mode. Once the terminal is in control mode, the system can be run completely from a remote location.

Two control panel indicators display the state of the remote communications link. One indicates that a remote user has been allowed to dial into the system and monitor operation. The second indicates whether or not a remote access is in progress.

Networking

The 2655 is ideal for networking and distributed processing environments. PRIMENET networking software lets Prime computers communicate among themselves, with terminals, and with other manufacturers' systems. Using PRIMENET facilities, up to 63 remote users can remotely log into another system. These users can share files among systems, and develop distributed applications. For local area networks, the 2655 can be attached in a high-speed network, via the RINGNET™ system, with any other 50 Series system. The ring provides intersystem communication via a coaxial cable or fiber optics for Prime systems using PRIMENET software and a PRIMENET node controller.

The 2655 supports all Prime communications hardware controllers. Available communications hardware options include IBM BISYNC for HASP and 2780/3780; High-Level Data Link Control (HLDC) protocol for X.25 packet-switching networks; Control Data 200UT; UNIVAC 1004; Honeywell GRTS; ICL 7020; and XBM.

Prime's Distributed Processing Terminal Executive (DPTX) lets the 2655 emulate and support 3271/3277 Display Systems.

The PRIME/SNA™ product family allows Prime systems to coexist with networks based on IBM's system network architecture, SNA.

Peripherals

Several peripheral products designed for the office environment are available in an office peripheral cabinet (two devices per cabinet). Sealed 315Mb Winchester disks provide users a highly reliable file and software storage medium. The initial office peripheral cabinet can house up to two 315Mb disks. A second peripheral cabinet can house one or two additional drives (six maximum per system) for the office.

Users can back up disk-stored data with either a streaming tape drive or machine room-only devices like the Prime 75 ips, 1600 bpi tape subsystem or high-end GCR device. PRIMOS utilities let users dump data – physically or logically – from disk to tape and back.

The 2655 supports all communication controllers. Included are the nine-line Intelligent Communications Subsystem Model 1 (ICS1), which provides eight asynchronous lines and one synchronous line, and the Intelligent Communications Subsystem Model 2 (ICS2), which can support up to 64 lines from one controller slot in the chassis. The ICS2 resides only in the peripheral cabinets in combination with the streaming tape drive for the office or with other devices for the computer room.

A variety of printing devices – band printers, matrix printers, letter-quality printers and matrix plotters – are supported by the 2655. The system's printer interface can be a serial asynchronous communications line or a parallel interface device used with the unit record controller. Video and hardcopy terminals are also available.

Regulations and Power

The 2655 has been certified to meet U.S. Safety and Noise Emission Regulations – U.L. and FCC EMI – as well as Canadian safety regulations. The system can be configured for North American and European AC power sources. An external power conditioning module is optional for the main cabinet and office peripheral cabinets on 2655 systems. It is most useful in areas where commercially supplied power suffers from frequent transient disturbances. In addition, support for an uninterruptible power supply (UPS) is standard on the 2655.

Specifications

System

Main memory:	Up to 8Mb
Cache memory:	16Kb
Effective memory access time:	132 nanoseconds
Virtual address space:	512Mb
Terminals supported:	Up to 64
Disk storage:	Up to 3.8 gigabytes
Tape storage:	2 streaming tape drives in office environment. Other Prime tape subsystems available for computer room.

Physical Height:
Height: 76cm (30")
Width: 52cm (21")
Depth: 79cm (31")

Power

Electrical requirements:	120 Vac, 11 amps running, 240 Vac, 5 amps running
Electrical consumption:	1.3 KVA

Environment

Noise Level:	Less than 60 DBA
Operating temperature:	15-32 degrees C (59-90 degrees F)
Operating humidity:	30-80% (non-condensing)
Operating altitude:	0-2.1 Km (0-7000 ft)
Heat Dissipation:	2,830 BTU/HR

U.S. Offices

Alabama
Birmingham

Alaska
Anchorage

Arizona
Phoenix
Tucson

California
Culver City
Irvine
Mountain View
Sacramento
San Diego
San Francisco
Walnut Creek
Woodland Hills

Colorado
Colorado Springs
Englewood

Connecticut
E. Hartford
Stamford
Windsor

Florida
Hollywood
Jacksonville
Maitland
Tampa

Georgia
Atlanta

Hawaii
Honolulu

Idaho
Boise

Illinois
Chicago
Oak Brook
Schaumburg

Indiana
Carmel

Iowa
Iowa City

Kansas
Overland Park

Kentucky
Louisville

Louisiana
Metairie

Maryland
Baltimore
Rockville

Massachusetts
Framingham

Michigan
Flint
Grand Rapids
Lansing
Troy

Minnesota
Bloomington

Missouri
Kansas City
St. Louis

Nebraska
Omaha

New Jersey
Parsippany

New Mexico
Albuquerque

New York
Albany
Amherst
Brighton
Dewitt
Melville
New York

North Carolina
Charlotte
Greensboro

Ohio
Cincinnati
Middleburg
  Heights
Toledo
Worthington

Oklahoma
Oklahoma City
Tulsa

Oregon
Portland

Pennsylvania
Bridgeville
Camp Hill
King of Prussia
Philadelphia

Rhode Island
Providence

South Carolina
Greenville

Tennessee
Knoxville
Memphis

Texas
Austin
Dallas
Houston

Utah
Salt Lake City

Virginia
Williamsburg

Washington
Bellevue
Olympia

Wisconsin
Brookfield

International Offices

Argentina
·Buenos Aires

Australia
Adelaide
Brisbane
Canberra
Hobart
Melbourne
Neutral Bay
·North Sydney
Perth

Austria
Vienna

Belgium
Zaventem

Bolivia
La Paz
Santa Cruz

Canada
Calgary
Edmonton
Halifax
London
Montreal
Ottawa
Saint John's
·Toronto
Vancouver
Winnipeg

Chile
Santiago

Colombia
·Bogota
Medellin

Denmark
Copenhagen

Ecuador
Quito

Finland
Helsinki

France
Aix
Angers
Grenoble
Lyon
·Paris
Segres

Greece
Athens

Hong Kong

India
Ahmadabad
Bangalore
·Bombay
Calcutta
Madras
New Delhi

Indonesia
·Jakarta

Ireland
Dublin

Israel
Tel Aviv

Italy
·Milan
Rome
Turin

Jamaica

Japan
Fukuoka
Nagoya
Osaka
·Tokyo

Jordan
·Amman

Korea
Pusan
·Seoul

Kuwait
Hawalli

Malaysia
·Selangor

Malta
·Msida City

Mexico
Guadalajara
Mexico City

Netherlands
Zoetermeer

New Zealand
·Auckland
Christchurch
Wellington
Parnelu

Nigeria
Lagos

Norway
Sandvika

Peru
Lima

Puerto Rico
San Juan

Qatar
·Doha

Saudi Arabia
Al Khobar
Riyadh
Yanbu

Singapore

South Africa
Capetown
Durban
·Johannesburg
Pretoria

Spain
Barcelona
Madrid

Sweden
Stockholm

Switzerland
Bern
Geneva
·Zurich

Taiwan
Taipei

Thailand
Bangkok

Turkey
Ankara
Istanbul

United Kingdom
Bedford
Birmingham
Bristol
Central Park
City of London
Edinburgh
Feltham
Grange
·Hounslow
Leeds
Milton Keynes
Southampton
Stevenage
Sydenham
Warrington
Wilmslow

United Arab Emirates
·Dubai

Uruguay
·Montevideo

Venezuela
Caracas

West Germany
Dortmund
Düsseldorf
Hamburg
Hannover
München
Stuttgart
·Wiesbaden

·Main Office
(7/85)

The materials contained herein are summary in nature, subject to change and intended for general information only. Details and specifications regarding specific Prime Computer software and equipment are available in the appropriate technical manuals, available through local sales representatives.