Model 6/16 Processor

PRODUCT DESCRIPTION

The Model 6/16 extends Interdata's 16-bit minicomputer technology by offering a powerful single-board processor with single-board memory as large as 64KB.

The memory is available in magnetic core with a cycle time of 1.0 microsecond, and MOS semiconductor with a cycle time of 500 nanoseconds.

Interdata's 16-bit hardware, software, and peripherals are upward compatible with Interdata's 32-bit products. This allows easy simple expansion without affecting application software. Present software stands up. No expensive interface redesign is necessary. All presently used peripherals—discs, mag tapes, cassettes, printers, and A/D equipment—are compatible.

The Model 6/16 combines hardware versatility with complete software compatibility to offer the OEM and end user a flexible, expandable and most economical minicomputer system.

FEATURES

- Advanced Architecture
  Task oriented 104-Instruction Set
  16 General Purpose Registers
  15 Index Registers
  Directly Addressable Memory to 64KB.
  Memory Module Sizes—8, 16, 32, 64KB

- Built-In Reliability
  Printed circuit back panel for all interlaced connections
  Thermal shock testing of all integrated circuits
  Vibration testing to 1.25 G's
  Burn test—52 hours at 50°C

- Field-Proven Software
  OS/16MT2—A real-time multi-tasking operating system
  Utilities—OS Edit, OS AIDS, OS Copy
  Languages—FORTRAN IV, FORTRAN V, Basic, MACROCAL

- Compatibility with Interdata's 32-bit products, application software, peripherals

SYSTEM ARCHITECTURE

The Model 6/16's inherently powerful third generation architecture, similar to the IBM 360/370 line, greatly simplifies system design, programming, and debugging.

The large task-oriented instruction set allows the programmer to concentrate on system programming instead of playing with tricky codes for such basic functions as exclusive OR, multiple shifts, and byte processing.

Sixteen general registers—15 of them index registers—cut execution time and simplify program development, reduce overhead, and minimize housekeeping. Temporary results can be sorted for instant recall. And register-to-register operations cut programming steps while reducing execution time.

Up to 64 KB of directly addressable memory totally eliminates time consuming design problems caused by paging and indirect addressing. The architecture allows programmers to write straightforward, simple, in-line code for the Model 6/16.

INPUT/OUTPUT

The Model 6/16 input/Output System handles up to 255 levels of interrupts. High speed devices can operate at up to 2,000,000 bytes per second over the optional Selector Channel, which makes use of Direct Memory Addressing. Medium and low speed devices are usually connected to the standard Multiplexor Channel.

Operation over the Selector or Multiplexor channels may be in the 8-bit parallel or 16-bit parallel mode. Both channels operate on a request-response basis for simple, reliable device-controller design. Multiplexor Channel devices are generally interrupt driven. Interrupts are automatically vectored for maximum machine efficiency and less software overhead.

Interdata offers a broad line of inexpensive peripherals for the Model 6/16 that are both program and interface compatible with all members of the Interdata family. Interdata also offers standard low cost interface modules to aid the user in designing special-purpose interfaces.

MEMORY

The Model 6/16 can accommodate one core or MOS semiconductor module of 8KB, 16KB, 32KB, or 64KB. All four module sizes are available with parity as an option.

Each of the modules is contained on a single 15-inch printed circuit board and occupies a single memory slot. Core memory cycle time is 1.0 microsecond, semiconductor memory cycle time is 500 nanoseconds.

PHYSICAL CONFIGURATION

The Model 6/16 consists of one central processor printed circuit board, one memory module, and space for I/O device controllers. The standard chassis is a 7-inch rack mountable unit with 8 subassembly slots. A single subassembly slot can accommodate up to two optional boards.

The Model 6/16 is also available with a 14-inch dual chassis that provides 16 subassembly slots.

INSTRUCTION FORMAT

REGISTER TO REGISTER (RR)

0	7	11	15

OP-CODE	R1	R2

SHORT FORMAT (SF)

0	7	11	15

OP-CODE	R1	DATA
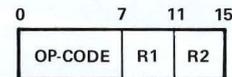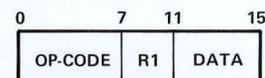
REGISTER TO INDEXED MEMORY (RX)

0	7	11	15	31

OP-CODE	R1	X2	16 BIT ABSOLUTE ADDRESS

REGISTER IMMEDIATE (RS)

0	7	11	15	31

OP-CODE	R1	X2	16 BIT DATA
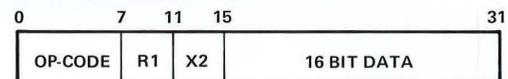
OP-CODE = HEXADECIMAL REPRESENTATION OF FUNCTION TO BE PERFORMED (ADD, MULTI.)

R1 = ANY ONE OR 16 G.P. REGISTERS AS A FIRST OPERAND.

R2 = ANY ONE OF 16 G.P. REGISTERS AS A SECOND OPERAND.

X2 = ANY ONE OF 15 G.P. REGISTERS AS AN INDEX VALUE (ADD TO APPARENT ADDRESS FIELD TO OBTAIN TRUE VALUE OF ADDRESS).

INSTRUCTION REPERTOIRE

The basic 104-instruction set provides big-machine capability that results in more time for applications programming and less worry about routine functions. While the 6/16 instruction formats are similar to those of the IBM 360/370, Interdata has added several classes of instructions to increase memory utilization efficiency. The instruction set provides both 16-bit and 32-bit formats and permits operation between any two general registers (RR), a general register and any memory location (RX), a general register and a 16-bit data constant carried in the primary instruction word (RI), or a general register and 4-bit data constant (SF). Signed multiply/divide hardware increases the number of instructions to 110.

The Model 6/16 includes a complete set of arithmetic and logical instructions. A complete set of conditional branch instructions permits branching to any location in memory without the use of skips. A full set of byte processing instructions simplifies handling of byte strings and pro-

vides for more efficient use of available memory. The input/output instructions permit operations between peripheral devices and general registers or between devices and memory. In addition to enabling programmers to write programs in as few instructions as possible, the 6/16's straightforward, efficient instruction set greatly simplifies the debugging and documentation problems associated with machines with smaller instruction sets.

OPTIONS

Model 6/16 options provide extensive flexibility so that the hardware configuration can be tailored to the application and easily field expanded.

- Memory Parity — Complete data and instruction protection.
- Power Fail/Auto Restart — Early power fail interrupt and power-up interrupt.
- Binary Display Panel — Complete user control of the system. Includes long life Light Emitting Diode (LED) binary readout and hexadecimal input keyboard.
- 6/16 Hexadecimal Display Panel — Complete user control of the system. Includes Hexadecimal LED readout and Hexadecimal input keyboard.
- Display Interface — Interfaces Binary Display, Hexadecimal display, or Turnkey console.

- Automatic Loader — Simple, single-switch bootstrap load capability. Can be preprogrammed with OS/16MT2 loader or can be used with a custom designed program.
- Turnkey Console — Switch control for Model 6/16 power, initialize, and execution.
- Signed Multiply/Divide — Hardware execution of 16-bit fixed point mathematical routines.
- Selector Channel — For high-speed I/O requirements provides completely autonomous block transfers on a cycle stealing basis for high speed I/O.
- Stretch 32 — Field updates a Model 6/16 processor to a software and I/O compatible 7/32 processor. The expanded system is capable of directly addressing megabyte of memory and executing a full complement of 32-bit fullword instructions.

BUILT-IN RELIABILITY

The Model 6/16 uses the latest techniques in logic design, solid state technology, mechanical packaging, and manufacturing testing to ensure maximum hardware reliability and to minimize downtime. A printed circuit back panel provides all interboard connections. Individual logic boards are connected to the back panel with in-line connectors, eliminating the contact problems associated with edge connectors.

UP TO 255 DEVICES IN SYSTEM
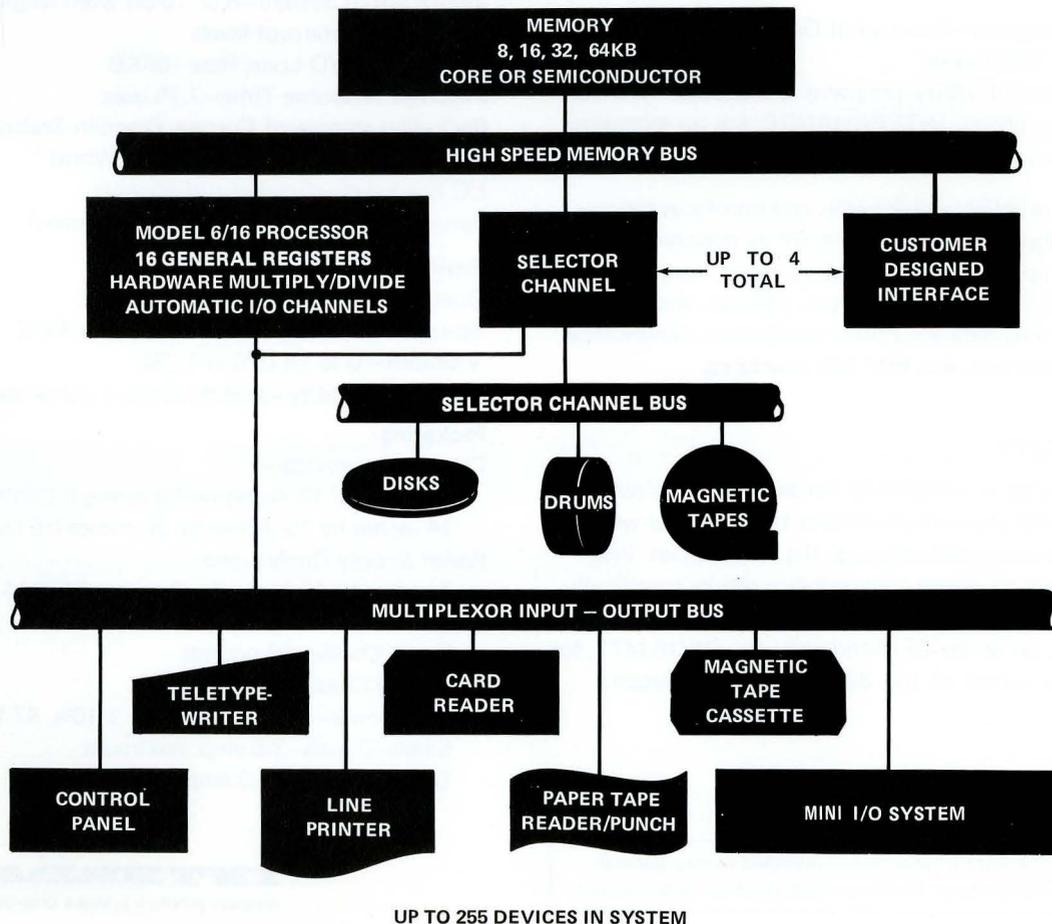
PACKAGING

Model 6/16 packaging is consistent with Interdata standards of ruggedness, durability, and reliability. Interboard connections are military-type pin and receptable connectors for sure, positive connection. Separately mounted power supplies, readily accessible test points and fuses, and plug-in modules mean fewer failures and less time for repairs. Interdata's testing includes thermal shock testing of all integrated circuits. The Model 6/16 is vibration tested at 1.25 G's while running diagnostic programs. Finally, all processors are run for 52 hours at 50°C — the quality is burned in.

OPERATING SYSTEMS AND DEVELOPMENT SOFTWARE

Interdata provides a comprehensive family of compatible operating systems and utility programs as off-the-shelf packages. All software is fully warranted and is supported by both field and home office staffs. Software includes:

- OS16MT2—Real-time based multi-tasking multi-programming operating system.
- OS Assembler—Symbolic assembler
- FORTRAN compilers—Extended FORTRAN IV and FORTRAN V.
- OS AIDS—Interactive de-bug program.
- CAL—A common assembly language for all Interdata processors.
- BASIC interpreter—Superset of Dartmouth standard.
- OS Edit — Text editor.

A complete line of utility programs is available. And the Interdata users group, INTERCHANGE, has an extensive software library.

A large array of reliable peripherals and interfaces reduces risk and development costs. The Interdata peripheral family includes a complete range of magnetic tapes, discs, card and paper tape equipment, CRT displays, printers, analog and digital converters, data acquisition equipment, communications access methods, and IBM 360 interfaces.

COMPATIBILITY

The Model 6/16 is completely hardware and software compatible with the entire Interdata 16-bit line, as well as being upward compatible through the 32-bit series. Interdata's emphasis on design compatibility results specifically in investment protection and broader applications capability at less cost to the OEM and end user. OS/16 MT2, for example, is a subset of the 32-bit operating system, OS/32MT.

SPECIFICATIONS

Technology
  Processor T^2L-MSI
  ROM Bipolar (60 ns access time)
Data Word Length—8, 16, 32 bits
Instruction Word Length—16, 32 bits
Number of Basic Instructions—104
  With Multiply/Divide Option—110
Fixed Point Arithmetic—2's Complement
Hardware Accumulators—16
Hardware Index Registers—15
Address Modes—Direct, Indexed, and Relative

Memory
Core Memory Cycle Time—1.0 usec
MOS Semiconductor Memory Cycle Line—500 nanoseconds
Memory Capacity—64K bytes
Memory Increments—8KB, 16KB, 32KB, or 64KB

Typical Instruction Execution Timing

	Semiconductor	Core
Register-to-Register	.90 usec	1.0 usec
Memory Reference	2.40 usec	3.0 usec
Immediate	1.50 usec	2.0 usec

Input/Output
High Speed DMA Channels—Four standard.
Maximum Selector Channel transfer rate: 2MByte
Input/Output System—8 or 16-bit word lengths
255 priority interrupt levels
Programmed I/O Loop Rate—66KB
Interrupt Response Time—7.75 usec
(including storage of Current Program Status Word and generation of New Program Status Word)
I/O Bus Levels—Ground and +5 volts
Hardware I/O Time Out—14 usec (approx.)

Environmental
Operating Temperature—0°C to 50°C
Storage Temperature Range—55°C to 85°C
Vibration—0 to 55 CPS at 1.25G
Relative Humidity—to 90% without condensation

Packaging
Chassis Dimensions—
  7 inches by 19 inches by 26 inches RETMA
  14 inches by 19 inches by 26 inches RETMA
Power Supply Dimensions—
  7 inches by 19 inches by 9 inches RETMA
Weight with Power Supply—
  Single Chassis, 50 pounds
  Double Chassis, 70 pounds
Primary Power—115 or 230 VAC ± 10%, 47 to 63 Hz
  Single Chassis—3.6 amp maximum
  Double Chassis—6.0 amp maximum

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