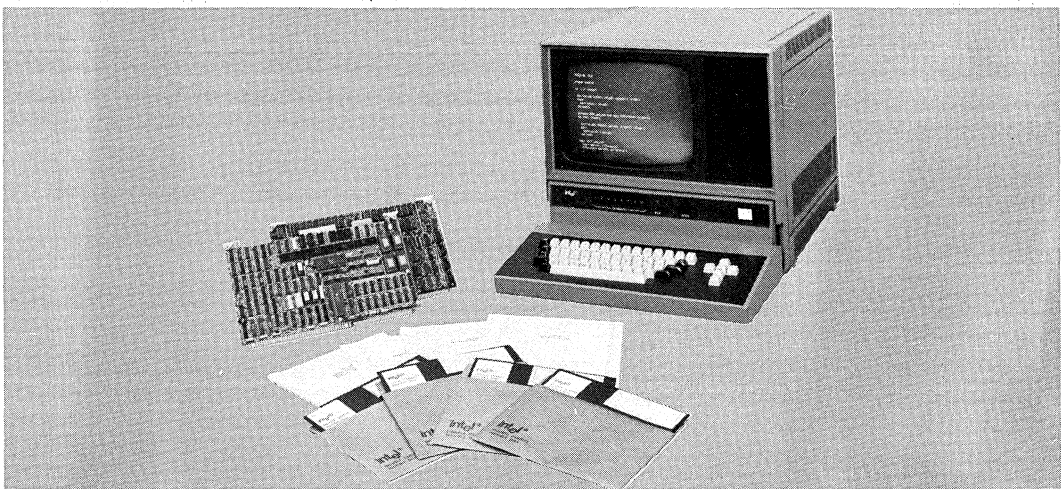# intel®

MODEL 286
INTELLEC® SERIES III
MICROCOMPUTER DEVELOPMENT SYSTEM

- Complete 16-bit High Performace, Microcomputer Development Solution for Intel iAPX 88/86 Applications. Also Supports MCS-85™, MCS-80™ and MCS-48™ Families
- Full Range of iAPX 88/86-resident, High-level Languages: PL/M-88/86, PASCAL-88/86, and FORTRAN-88/86
- 2 Host CPUs—iAPX 86 and 8085A—for Enhanced System Performance and Two Native Execution Environments
- 96K Bytes of User Program RAM Memory Available for iAPX 88/86 Programs

- Upgradeable from Intellec® Model 800, Series II/80 and Series II/85
- Compatible with Intellec® Distributed Development Systems
- Software Compatible with Previous Intellec® Systems
- Software Applications Debugger for User iAPX 88/86 Programs
- Integral 250K Byte Floppy Disk Drive with Total Storage Capacity Expandable to Over 2M Bytes of Floppy Disk Storage and 7.3 M Bytes of Hard Disk Storage (formatted)

The Intellec® Series-III Microcomputer Development System is a high performance system solution designed specifically for iAPX 88/86 microprocessor development. It contains two host CPUs, and iAPX 86 and an 8085, that provide two native execution environments for optimum performance and compatibility with the Intellec software packages for both CPUs. The basic system includes 96K bytes of iAPX 88/86 user RAM memory, a 2000-character CRT, detachable full ASCII keyboard with cursor controls and upper/lower case capability, and a 250K byte floppy disk drive. The powerful Disk Operating System maximizes system processing by utilizing the power of both host processors. Standard software includes a full range of iAPX 88/86 resident software and the high-level languages PL/M-88/86, PASCAL-88/86, and FORTRAN-88/86 are also available. A ROM resident software debugger not only provides self-test diagnostic capability, but also gives the user a powerful iAPX 88/86 applications debugger.

FUNCTIONAL DESCRIPTION

Hardware Components

The Intellec Series III is contained in a single package consisting of a CRT chassis with a 6-slot card cage, power supply, fans, cables, single floppy disk drive, detachable upper/lower case full ASCII keyboard, and four printed circuit cards. A block diagram of the system is shown in Figure 1.

System Components

Two CPU cards reside on the Intellec MULTIBUS™ bus, each containing its own microprocessor, memory, I/O, interrupt and bus interface circuitry implemented with Intel's high technology LSI components. The integrated processor card (IPC-85), occupies the first slot in the cardcage. A second CPU card, the resident processor board (RPB-86)

contains Intel's 16-bit HMOS microprocessor. These CPUs provide the dual processor environment.

A third CPU card performs all remaining I/O including interface to the CRT, integral floppy disk, and keyboard. This card, mounted on the rear panel, contains its own microprocessors, RAM and ROM memory, and I/O interface logic. Known as the I/O controller (IOC), this slave CPU card communicates with the IPC-85 over an 8-bit bidirectional data bus. A 64K byte RAM expansion memory board is also included.

Expansion

Two additional slots in the system cardcage are available for system expansion. The Intellec expansion chassis Model 201 is available to provide 4 additional expansion slots for either memory or I/O expansion.
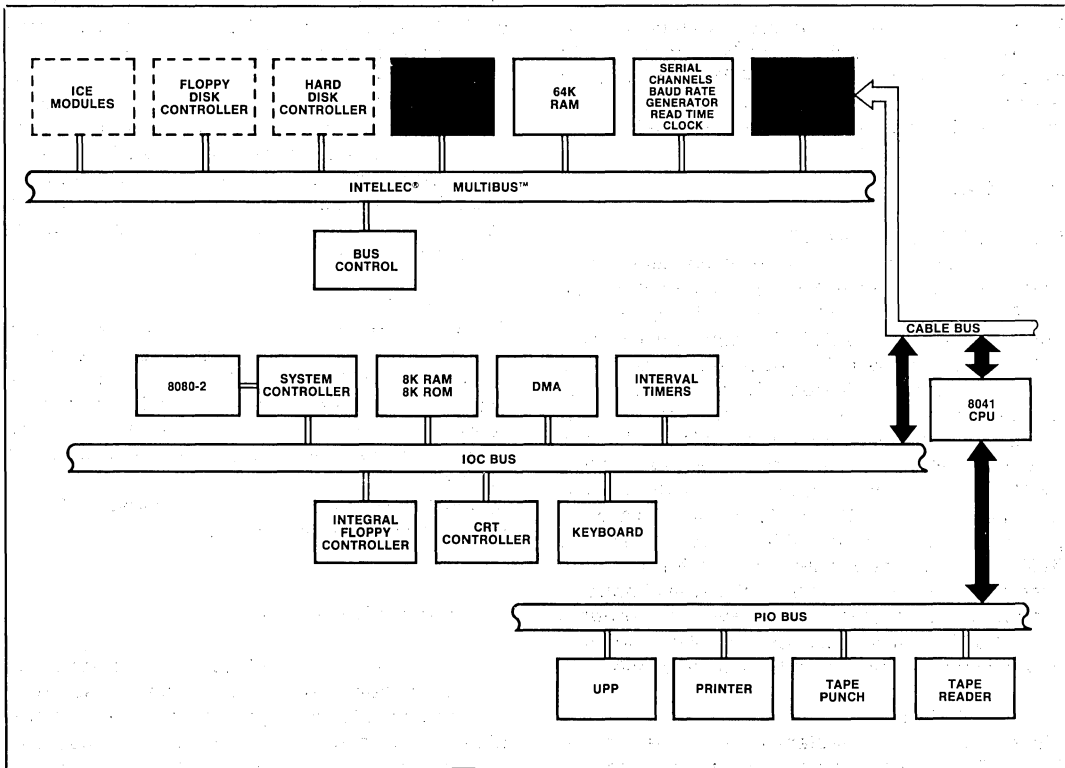

Figure 1. INTELLEC® Series III Block Diagram

CPU Cards

IPC-85

The heart of the IPC-85 is an Intel NMOS 8-bit micro-processor, the 8085A-2, running at 4.0 MHz. 64K bytes of RAM memory are provided on the board using 16K dynamic RAMs. 4K of ROM is provided, preprogrammed with system bootstrap "self-test" diagnostics and the Intellec System Monitor. The eight-level vectored priority interrupt system allows interrupts to be individually masked. Using Intel's versatile 8259A interrupt controller, the interrupt system may be user programmed to respond to individual needs.

RPB-86

The heart of the RPB-86 is an Intel HMOS 16-bit microprocessor, the iAPX 86 (8086), running at 5.0 MHz. 64K bytes of RAM memory are provided on the board. 16K of ROM is provided on board, preprogrammed with an iAPX 88/86 applications debugger which provides features necessary to debug and execute application software for the iAPX 88/86 microprocessors.

The 8085A-2 and iAPX 86 access two independent memory spaces. This allows the two processors to execute concurrently when an iAPX 88/86 program is run. In this mode, the IPC-85 becomes an intellegent I/O processor board to the RPB-86.

Input/Output

IPC-85 SERIAL CHANNELS

The I/O subsystem in the Series III consists of two parts: the IOC card and two serial channels on the IPC-85 itself. Each serial channel is independently configurable. Both are RS232-compatible and is capable of running asynchronously from 110 to 9600 baud or synchronously from 150 to 56K baud. Both may be connected to a user defined data set or terminal. One channel contains current loop adapters. Both channels are implemented using Intel's 8251A USART. They can be programmed to perform a variety of I/O functions. Baud rate selection is accomplished through an Intel 8253 interval timer. The 8253 also serves as a real-time clock for the entire system. I/O activity through each serial channel is independently signaled to the system through a second 8259A (slave) interrupt controller, operating in a polled mode nested to the master 8259A.

IOC INTERFACE

The remainder of the system I/O activity is handled by the IOC. The IOC provides the interface and control for the keyboard, CRT, integral floppy disk drive, and standard Intellec-compatable peripherals including printer, high speed paper tape reader/punch, and universal PROM programmer. The IOC contains its own independent microprocessor, an 8080A-2. This CPU issues commands, receives status, and controls all I/O operations as well as supervising communications with the IPC-85. The IOC contains interval timers, its own IOC bus system controller, and 8K bytes of ROM for all I/O control firmware. The 8K bytes of RAM are used for CRT screen refresh storage. Neither the ROM nor the RAM occupy space in the Intellec Series III main memory address range because the IOC is a totally independent microcomputer subsystem.

Integral CRT

DISPLAY

The CRT is a 12-inch raster scan type monitor with a 50/60 Hz vertical scan rate and 15.5 kHz horizontal scan rate. Controls are provided for brightness and contrast adjustments. The interface to the CRT is provided through an Intel 8275 single chip programmable CRT controller. The master processor on the IPC-85 transfers a character for display to the IOC, where it is stored in RAM. The CRT controller reads a line at a time into its line buffer through an Intel 8257 DMA Controller. It then feeds one character at a time to the character generator to produce the video signal. Timing for the CRT control is provided by an Intel 8253 programmable interval timer. The screen display is formatted as 25 rows of 80 characters. The full set of ASCII characters are displayed, including lower case alphas.

KEYBOARD

The keyboard interfaces directly to the IOC processor via an 8-bit data bus. The keyboard contains an Intel UPI-41A Universal Peripheral Interface, which scans the keyboard and encodes the characters to provide N-key roll over. The keyboard itself is a typewriter style keyboard containing the full ASCII character set. An upper/lower case switch allows the system to be used for document preparation. Cursor control keys are also provided.

Peripheral Interface

A UPI-41A Universal Peripheral Interface on the IOC board provides built-in interface for standard Intellec-compatable peripherals including a printer, high speed paper tape reader, high speed paper tape punch, and universal PROM programmer. Communication between the IPC-85 and IOC is

maintained over a separate 8-bit bidirectional data bus. Connectors for the four devices named above, as well as the two serial channels, are mounted directly on the IOC itself.

Control

User control is maintained through a front panel, consisting of a power switch and indicator, reset/boot switch, run/halt light and eight interrupt switches and LED indicators. The front panel circuit board is attached directly to the IPC-85, allowing the eight interrupt switches to connect the master 8259A, as well as to the Intellec Series III bus.

User program control in the iAPX 88/86 environment of the Intellec Series III is also directed through keyboard control sequences to transfer control to the iAPX 88/86 applications debugger, abort a user program or translator and returning control to the IPC-85.

DISK SYSTEM

Integral Floppy Disk Drive

The integral floppy disk is controlled by an Intel 8271 single chip, programmable floppy disk controller. The disk provides capacity of 250K bytes. It transfers data via an Intel 8257 DMA Controller between an IOC RAM buffer and the diskette. The 8271 handles reading and writing of data, formatting diskettes, and reading status, all upon appropriate commands from the IOC microprocessor.

Dual Drive Floppy Disk System (Option)

The Intellec Series III Double Density Diskette System provides direct access bulk storage, intelligent controller and two diskette drives. Each drive provides 1/2 million bytes of storage with a data transfer of 500,000 bits/second. The controller is implemented with Intel's powerful Series 3000 Bipolar Microcomputer Set. The controller provides an interface to the Intellec Series III system bus, as well as supporting up to four diskette drives to allow more than 2 million bytes of on-line storage.

An additional cable and connectors are also supplied to optionally convert the integral floppy disk from single density to double density.

FLOPPY DISK CONTROLLER BOARDS

The diskette controller consists of two boards, the channel board and the interface board. These two PC boards reside in the Intellec Series III system chassis. The channel board receives, decodes and responds to channel commands from the 8085A-2 CPU on the IPC-85. The interface board provides the diskette controller with a means of communication with the disk drives and with the Intellec system bus. The interface board validates data during reads using a cyclic redundancy check (CRC) polynomial and generates CRC data during write operations. When the diskette controller requires access to the Intellec system memory, the interface board requests and maintains DMA master control of the system bus, and generates the appropriate memory command.

Hard Disk System (Option)

The Intellec Series III Hard Disk System provides direct access bulk storage, intelligent controller and a disk drive containing one fixed platter and one removable cartridge. Each provides approximately 3.65 million bytes of storage with a data transfer rate of 2.5 Mbits/second. The controller is implemented with Intel's Series 3000 Bipolar Microcomputer Set. The controller provides an interface to the Intellec Series III system bus, as well as supporting up to 2 disk drives. The disk system records all data in Double Frequency (FM) on 2 surfaces per platter. Each platter can be write protected by a front panel switch.

HARD DISK CONTROLLER BOARDS

The disk controller consists of two boards which reside in the Intellec Series III system chassis. The disk system is capable of performing six operations: recalibrate, seek, format track, write data, read data, and verify CRC. In addition to supporting a second drive, the disk controller may co-exist with the double-density diskette controller to allow up to 17 million bytes of on-line storage.

MULTIBUS™ Interface Capability

All models of the Intellec Series III implement the industry standard MULTIBUS protocol. The MULTIBUS architecture allows several bus masters, such as CPU and DMA devices, to share the bus and memory by operating at different priority levels. Resolution of bus exchanges is synchronized by a bus clock signal derived independently from processor clocks. Read/write transfers may take place at rates up to 5 MHz. The bus structure is suitable for use with any Intel microcomputer family.

SPECIFICATIONS

Host Processor Boards

INTEGRATED PROCESSOR CARD
—(IPC-85) 8085A-2 based, operating at 4 MHz
—64K RAM, 4K ROM (2K in monitor and 2K in boot/
   diagnostic)

RESIDENT PROCESSOR BOARD
—(RPB-86) 8086 based, operating at 5 MHz, 64K
   RAM, 16K ROM (applications debugger)

BUS
—MULTIBUS bus, maximum transfer rate of 5 MHz

DIRECT MEMORY ACCESS
—(DMA) Standard capability on the MULTIBUS bus;
   implemented for user selected DMA devices
   through optional DMA module
—Maximum transfer rate of 2 MHz

Integral Floppy Disk

Capacity—250K bytes (formatted)
Transfer Rate—160K bits/sec
Access Time—
   Track to Track: 10 ms max.
   Average Random Positioning: 260 ns
   Rotational Speed: 360 rpm
   Average Rotational Latency: 83 ms
   Recording Mode: FM

Dual Floppy Disk Option

Capacity—
   Per Disk: 4.1 megabits (formatted)
   Per Track: 53.2 kilobits (formatted)
Transfer Rate—500 kilobits/sec
Access Time—
   Track to Track: 10 ms
   Head Setting Time: 10 ms
Average Random Positioning Time—260 ms
Rotational Speed—360 rpm
   Average Rotational Latency: 83 ms
   Recording Mode: M^2 FM

Hard Disk Drive Option

Type—5440 top loading cartridge and one fixed
      platter
Tracks per Inch—200
Mechanical Sectors per Track—12
Recording Technique—double frequency (FM)
Tracks per Surface—400
Density—2,200 bits/inch
Bits per Track—62,500
Recording Surfaces per Platter—2
Capacity—
   Per Surface—15M bits
   Per Platter—29M bits
   Per Drive—59M bits
   Per Drive—7.3M bytes (formatted)
Transfer Rate—2.5M bits/sec
Access Time—
   Track to Track: 13 ms max
   Full Stroke: 100 ms
   Rotational Speed: 2,400 rpm

Physical Characteristics

Width—17.37 in. (44.12 cm)
Height—15.81 in. (40.16 cm)
Depth—19.13 in. (48.59 cm)
Weight—81 lb. (37 kg)

KEYBOARD
Width—17.37 in. (44.12 cm)
Height—3.0 in. (7.6 cm)
Depth—9.0 in. (22.86 cm)
Weight—6 lb. (3 kg)

DUAL FLOPPY DRIVE SYSTEM (OPTION)
Width—16.88 in. (42.88 cm)
Height—12.08 in. (30.68 cm)
Depth—1.0 in. (48.26 cm)
Weight—64 lb. (29 kg)

HARD DISK DRIVE SYSTEM (OPTION)
Width—18.5 in. (47.0 cm)
Height—34.0 in. (86.4 cm)
Depth—29.75 in. (75.6 cm)
Weight—202 lb. (92 kg)

AFN-01588A

ELECTRICAL CHARACTERISTICS

DC Power Supply

Volts Supplied	Amps Supplied	Typical System Requirements
+ 5 ± 5%	30.0	17.0
+12 ± 5%	2.5	1.1
−12 ± 5%	0.3	0.1
−10 ± 5%	1.0	0.08
+15 ± 5%*	1.5	1.5
+24 ± 5%*	1.7	1.7

*Not available on bus

AC Requirements for Mainframe

110V, 60 Hz—5.9 Amp
220V, 50 Hz—3.0 Amp

ENVIRONMENAL CHARACTERISTICS

System Operating Temperature—0°C to 35°C (32°F to 95°F)

Humidity—20% to 80%

DOCUMENTATION SUPPLIED

Intellec Series III Microcomputer Development System Product Overview, 121575

Intellec Series III Microcomputer Development System Console Operating Instructions, 121609

Intellec Series III Microcomputer Development System Pocket Reference, 121610

Intellec Series III Microcomputer Development System Programmer's Reference, 121618

iAPX 88/86 Family Utilities User's Guide for 8086-Based Development Systems, 121616

8086/8087/8088 Macro Assembly Language Reference Manual for 8086-Based Development Systems, 121627

8086/8087/8088 Macro Assembly Language Pocket Reference, 9800749

8086/8087/8088 Macro Assembler Operating Instructions for 8086-Based Development Systems, 121628

Intellec Series III Microcomputer Development System Installation and Checkout Manual, 121612

Intellec Series III Microcomputer Development System Schematic Drawings, 121642

ISIS-II CREDIT (CRT-Based Text Editor) User's Guide, 9800902

ISIS-II CREDIT (CRT-Based Text Editor) Pocket Reference, 9800903

The 8086 Family User's Manual, 9800722

The 8086 Family User's Manual, Numeric Supplement, 121586

For Series III Plus Hard Disk Systems Only:

Model 740 Hard Disk Subsystem Operation and Checkout, 9800943

ORDERING INFORMATION

| Part Number	Description
DS286 KIT	Intellec Series III Model 286 Microcomputer Development System (110V/60Hz)
DS287 KIT	Intellec Series III Model 287 Microcomputer Development System (220V/50Hz)
DS286FD KIT	Intellec Series III Model 286 Microcomputer Development System with Dual Double Density Flexible Disk System (110V/60Hz)
DS287FD KIT	Intellec Series III Model 287 Microcomputer Development System with Dual Double Density Flexible Disk System (220V/50Hz)
DS286HD KIT	Intellec Series III Model 286 Microcomputer Development System with Pedestal Mounted Hard Disk. (110V/60Hz)
DS287HD KIT	Intellec Series III Model 287 Microcomputer Development System with Pedestal Mounted Hard Disk. (220V/50Hz)
	Requires Software License

AFN-01588A

intel

MODEL 290
NETWORK MANAGER
INTELLEC® NETWORK DEVELOPMENT SYSTEM-I (NDS-I)

- Provides a distributed development system environment for Intellec® microcomputer development system users
- Supports all existing Intellec® development systems as workstations: Intellec® Model 800, Series II/80, Series II/85, and Series III models
- Functions as a Project Management tool to increase programmer productivity and coordinate large program development
- Shared background line printer

- Supports up to 8 workstations operating concurrently
- Files stored on central hard disk shared among workstations
- Provides substantial performance enhancement for floppy disk-based systems
- Distributes the costs of central mass storage among workstations
- Network Manager upgradeable from either Intellec® Model 240 or Intellec® Model 245

The Intellec® Network Development System-I (NDS-I) is designed to provide the user with tools necessary to support a distributed development system environment. NDS-I enables up to eight Intellec development systems to share both a common line printer and disk storage. Disk files may reside on either one or two central hard disks, providing up to fifteen megabytes of storage capacity. The major component of NDS-I is the Network Manager which controls all communications between the workstations and the shared disk. The powerful multitasking operating system of the Network Manager provides public/private file control for all files resident on the hard disk and printer sharing. As a project management tool, NDS-I helps coordinate the numerous program modules common to large multi-man projects. Productivity is increased and development time is shortened. An upgrade package is available to convert an existing Model 240 or 245 into a Network Manager.
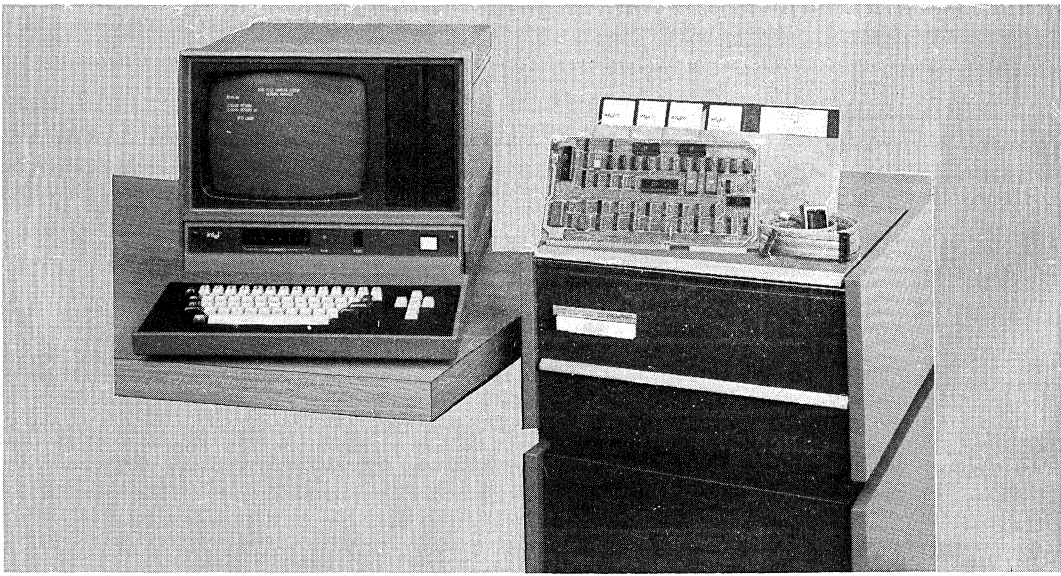
FUNCTIONAL DESCRIPTION

Hardware Components

The NDS-I Network Manager consists of CRT chassis with a 6-slot cardcage, power supply, fans, cables, single floppy diskette drive, a detachable full ASCII keyboard and five printed circuit cards. A free standing pedestal houses the hard disk drive along with power supply, fans, and cables for connection to the main chassis. A block diagram of the Network Manager is shown in Figure 1.

CPU
The master CPU card is built around the 8085A-2 and includes 64K bytes of on board memory, I/O, interrupt and bus interface circuiting fashioned from Intel's high technology components. Known as the integrated processor card (IPC), it occupies the first slot in the cardcage. A second slave CPU card is responsible for the CRT and keyboard interface. This card, mounted on the rear panel, also contains its own microprocessor, RAM and ROM memory, and I/O interface logic. Known as the input/output controller (IOC), the slave CPU card communicates with the IPC over an 8-bit bidirectional data bus.

DISK CONTROLLER
The hard disk controller consists of two boards, the channel board and the interface board, mounted in the system cardcage. The channel board receives,

decodes and responds to channel commands from the 8085A-2 in the Network Manager. The interface board provides the disk controller with a means of communication with the disk drives and with the Intellec system bus. The interface board generates a cyclical redundancy check polynomial and validates data during reads using a CRC polynomial. When the disk controller requires access to Intellec system memory, the channel board requests and maintains DMA master control of the system bus, and generates the appropriate memory command. The channel board also acknowledges I/O commands as required by the Intellec bus. The disk controller supports one or two hard disk drives.

INTERCONNECT COMMUNICATION
An Interconnect Board (ICB), which occupies one slot in each workstation and the Network Manager cardcage, provides the communications interface between the workstations and the Network Manager. The ICB is a MULTIBUS™ bus compatible board with an 8085 microprocessor, 1.25 kbytes of RAM, 4 kbytes of ROM and seven I/O ports. The ICB accepts a command from the master CPU, executes the command without intervention by the master CPU, and signals completion by setting a flag and generating a MULTIBUS™ bus interrupt. The ICB moves data between the workstations and the Network Manager with a burst of data transfer rate of 40 kbytes per second.
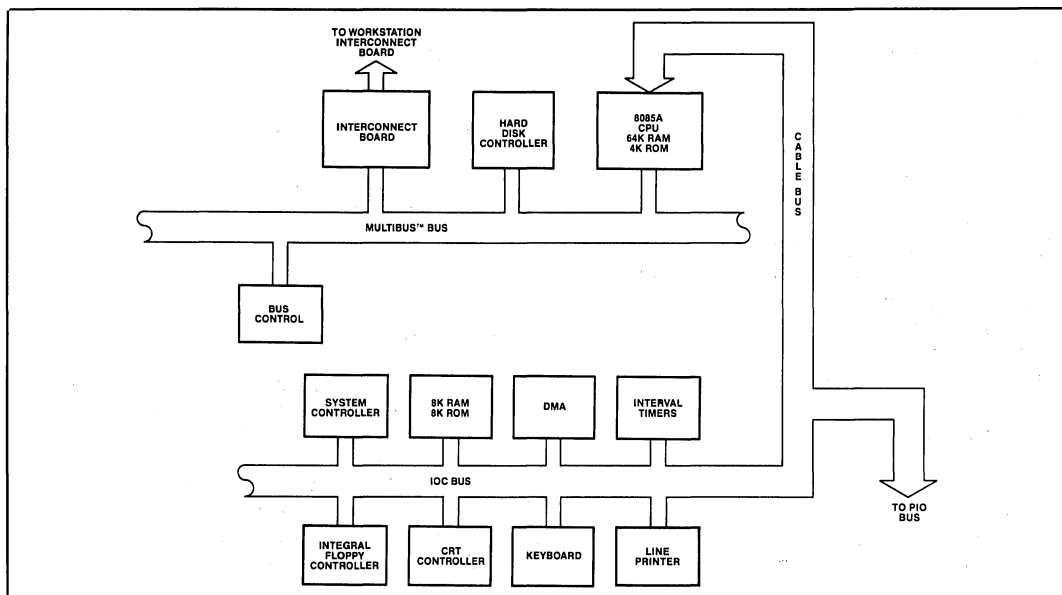

Figure 1. Intellec® NDS-I Network Manager Block Diagram

INTEGRAL CRT

The CRT is a 12-inch raster scan type monitor with a 50/60Hz vertical scan rate and 15.5kHz horizontal scan rate. Controls are provided for brightness and contrast adjustments. The interface to the CRT is provided through an Intel 8275 single-chip programmable CRT controller. The master processor on the IPC transfers a character for display to the IOC, where it is stored in RAM. The CRT controller reads a line at a time into its line buffer through an Intel 8257 DMA controller and then feeds one character at a time to the character generator to produce the video signal. Timing for the CRT control is provided by an Intel 8253 interval timer. The screen display is formatted as 25 rows of 80 characters. The full set of ASCII characters is displayed, including lower case letters.

KEYBOARD

The keyboard interfaces directly to the IOC processor via an 8-bit data bus. The keyboard contains an Intel UPI-41 Universal Peripheral Interface, which scans the keyboard, encodes the characters, buffers the characters and provides N-key rollover. The keyboard itself is a typewriter style keyboard containing the full ASCII character set. An upper/lower case switch allows the system to be used for document preparation. Cursor control keys are also provided.

FLOPPY DISK DRIVE

The integral single density floppy disk drive is controlled by an Intel 8271 single-chip, programmable floppy disk controller. The 8271 transfers data via an Intel 8257 DMA controller between an IOC RAM buffer and the diskette. The 8271 performs reading and writing of data, formatting diskettes, and reading status commands from the IOC processor.

Software Components

Included with the Model 290 is the Network Manager operating system that controls all communications between the workstations and the shared hard disk. The operating system software provides concurrent disk input/output, communications, and file management, and offers substantial workstation performance enhancements compared to standalone, floppy disk-based development systems. The Network Manager operating system provides public/private file control for all files resident on the hard disk. The public/private file control provides a useful project management tool to help coordinate the numerous programmers and modules common to large development projects.

SPECIFICATIONS

Disk Drive

Type—5440 top loading cartridge and one fixed platter
Tracks per inch—200
Mechanical Sectors per Track—12
Recording Technique—double frequency (FM)
Tracks per Surface—400
Density—2,200 bits/inch
Bits per Track—62,500
Recording Surfaces per Platter—2

Disk System Capacity

Per Surface—15M bits
Per Platter—29M bits
Per Drive—59M bits
Per Drive—7.3M bytes (formatted)

Disk Performance

Disk Transfer Rate—2.5M bits/sec
Disk System Access Time
    Track to Track: 13 ms max
    Full Stroke: 100 ms
    Rotational Speed: 2,400 rpm

Diskette

Diskette System Capacity—250K bytes (formatted)
Diskette System Transfer Rate—160K bits/sec
Diskette System Access Time
    Track to Track: 10 ms max
    Average Random Positioning: 260ms
    Rotational Speed: 360 rpm
    Average Rotational Latency: 83 ms
    Recording Mode: FM

Physical Characteristics

Width—17.37 in. (44.12 cm)
Height—15.81 in. (40.16 cm)
Depth—19.13 in. (48.59 cm)
Weight—73 lb. (33 kg)

KEYBOARD
Width—17.37 in. (44.12 cm)
Height—3.0 in. (7.62 cm)
Depth:—9.0 in. (22.86 cm)
Weight—6 lb. (3 kg)

DISK DRIVE ON PEDESTAL
Width—18.5 in. (47.0 cm)
Height—34.0 in. (86.4 cm)
Depth—29.75 in (75.6 cm)
Weight—202 lb. (92 kg)

Electrical Characteristics

D.C. POWER SUPPLY

Supply Voltage	Amps Supplied	Typical System Requirements
+ 5 ±5%	30	17.0
+12±5%	2.5	1.1
−12±5%	0.3	0.1
−10±5%	1.0	0.08
+15±5%*	1.5	1.5
+24±5%*	1.7	1.7

*Not available on bus

A.C. REQUIREMENTS
FOR MAINFRAME AND 2 DRIVES
110V, 60Hz—16 Amp (Mainframe =5.9 Amp)
　　　　　　　　　(Drive =5.0 Amp)
220V, 50Hz—8.6 Amp (Mainframe =3.1 Amp)
　　　　　　　　　(Drive =3.0 Amp)

Environmental Characteristics

Operating Temperature—16°C to 32°C (90°F)
Humidity—20% to 80%

Equipment Supplied

Model 225 Chassis
Integrated Processor Card
I/O Controller Board
CRT and Keyboard
Model 740 Hard Disk Drive
Two Hard Disk Controller Boards with Cables
Disk Cartridge
NDS-I Interconnect Board with Cable
Two NDS-I Line Terminators
ROM Resident System Monitor
Network Manager Operating System
Network Manager Diagnostics

Reference Manuals

Hard Disk Subsystem Operation and Checkout Manual, 9800943.
Network Manager Console Operating Instructions, 121645.

Optional Equipment

Model 595　NDS-I Workstation Interconnect Package: Includes Interconnect board and workstation software to convert any Model 800, Series II/80, Series II/85, or Series III to a NDS-I workstation.

Model 596　NDS-I 10 ft. Interconnect Cable

Model 597　NDS-I 20 ft. Interconnect Cable

Model 743　(110V) Add on hard disk unit with cables and disk cartridge.

Model 744　(220V) Add on hard disk unit with cables and disk cartridge.

Model 746　Box of 5 blank hard disk cartridges.

ORDERING INFORMATION

Part Number　Description

DS-290 (110V)　NDS-I Network Manager: Includes
DS-291 (220V)　network console with hard disk subsystem, interconnect board, internal cable, and Network Manager software.

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