Series IV features an advanced, friendly interface, foreground/background processing, and a protected hierarchical file system. Intel's latest debug tools, I²ICE, iLTA, PSCOPE, and VLSiCE 96 can be hosted on the Series IV. Program Management Tools, the advanced text editor (AEDIT), 86/88 macro-assembler and utilities, and the software applications debugger (DEBUG-88) are provided with Series IV.

NETWORKS AND NETWORK TOOLS

Your host workstations can be a part of a complete development network using Intel's NDS II (Network Development System) and OpenNet networks, Intel's implementations of the high-performance Ethernet local area network.

NDS II

NDS II is specifically designed to connect Intel workstations—Series II, Series III, Series IV and Model 800—into a development network that gives users shared mass storage, print spooling, protected hierarchical file management, load sharing, electronic mail and program management tools. NDS II also provides file exchange with VAX systems.

OpenNET™

The OpenNET network is based on open, standard protocols. In a development application it lets iRMX™, XENIX†, and PC-DOS** based workstations share files resident on the NDS II Network Resource Manager with workstations connected to NDS II.

As a result of network flexibility, a development team can efficiently use a number of hosts, each selected for the task it is best suited for.

NRM

At the heart of the NDS II is the Network Resource Manager (NRM) which controls all NDS II resources. The mass storage (to 340 MB), back-up devices, and spooled line printer residing at the NRM, are available to all network workstations. In addition, all Intellec Development System workstations are available as network resources to process batch jobs created by any user. The NRM also links the NDS II and OpenNET networks.

ISIS Cluster

The ISIS Cluster puts more software engineers on line as a low-cost software workstation. An extension of the distributed processing environment, the ISIS Cluster processor board resides in an Intellec development system host, and requires a user-supplied terminal to complete connection to the network. The Cluster station has complete access to network resources, therefore, the Cluster software workstation provides an attractive low-cost alternative to adding incremental users for project development.

†XENIX™ is a trademark of Microsoft Corp.

**PC-DOS™ is a trademark of IBM Corp.

Distributed Job Control

Intel's NDS-II offers distributed processing with local workstation resources and remote network resources. DJC permits users on workstations to export a batch job to the NRM for remote execution. The NRM then moves the job to a free workstation for execution, returning the completed job status to the user's directory.

Program Management Tools

Managing all of the revisions of all of a group's software modules is a major task for most projects. Intel has responded to the need for automated software control with Program Management Tools.

The Software Version Control System (SVCS) tracks changes to programs. When an engineer needs a particular version of a file, whether the current version or some older copy, SVCS automatically retrieves the correct version from its database. In addition, SVCS helps project managers exercise precise control in large team projects by preventing individuals from making changes independently.

MAKE automates the procedures for generating a system from its modules. If modules depend on submodules, MAKE searches through its files to ensure that it compiles modules using the current submodules. MAKE compiles the needed modules only if a module or one of its submodules has been revised since the previous generation.

Electronic Mail

The electronic mail facility on Intel's NDS II network acts as an electronic central distribution center with user mailboxes, group mailboxes, and an electronic bulletin board of all users. In addition to supporting document distribution, electronic mail manages a file transfer facility to transmit both source and object modules among users on the network.

Compil$_e$ngine

The Compil$_e$ngine is an 80286-based supermicrocomputer system designed to boost the productivity of your development network by off-loading 16-bit compile and link/locate jobs from the Series II, III, and IV and Model 800 development systems, and VAX/VMS minicomputers connected to the NDS II network. Furthermore, PC-DOS systems connected via OpenNET to the Network Resource Manager (NRM) can also export compiles and link/locates to the Compil$_e$ngine. This allows your workstation to be utilized for other tasks during large compiles and link/locates.

NDS II/Series IV Toolbox

The NDS II/Series IV Toolbox is a collection of valuable software tools for the NDS II and Series IV user. Many of the tools include source code to allow you to customize them to your own environment. The toolbox includes:

- Multiple NRM network support
- MS-DOS*/Series IV disk read utility
- Remote Series IV from VAX terminal
- Series IV menu compiler

*MS-DOS is a trademark of Microsoft Inc.

Table 31. Component Family Support on Industry Standard Host Systems

	Components Supported					
	8086 80186 8088 80188		**80286**	**80386**	**8096**	**8044 8051**
Development Languages						
Assembler	Series IV* PC; VAX/VMS‡ iRMX™86; iRMX™286		Series IV PC; VAX/VMS PC** iRMX 286 XENIX 286	VAX/VMS** XENIX 286	Series IV PC	Series IV iPDS™; Series II PC**, iRMX 86**
PL/M	Series IV PC; VAX/VMS iRMX 86;		Series IV PC; VAX/VMS PC** iRMX 286 XENIX 286	VAX/VMS** XENIX 286	Series IV PC	Series IV iPDS; Series II PC**, iRMX 86**
C	Series IV PC; VAX/VMS iRMX 86			VAX/VMS** XENIX 286 PC**		
Pascal	Series IV PC; VAX/VMS iRMX 86		Series IV PC			
FORTRAN	Series IV PC; iRMX 86		XENIX 286	XENIX 286** VAX/VMS**		
Ada	VAX/VMS		VAX/VMS**			
Execution Environments						
Programs Generated with Intel languages can run on the host system as shown	Series IV PC; iRMX 86		iRMX 286 XENIX 286			
Debuggers						
PSCOPE	Series IV PC; iRMX™		XENIX 286			
TargetSCOPE (80186, 80188)	Series IV PC					
I²ICE™	Series IV; PC		Series IV; PC			
ICE™				PC**	Series IV PC	Series IV Series II, PC** iPDS (EMV 51/44)
VLSiCE™ (8096)						
General Tools (All Component Families)						
AEDIT	Series IV; PC iRMX 86; iRMX 286					
PROM Programming	Series IV; PC					
EPLD Development	PC					

*Tools that run on Series IV also run on Series III
**Available in 1986
‡VAX/VMS™ is a trademark of DEC Corp.

SOFTWARE

Intel offers an extensive selection of operating systems, high level languages, development and debug support that is specifically tuned for microprocessors and microprocessor-based boards and systems. Intel also offers applications software and maintains the Insite™ Library of user software. Intel also publishes a Software Handbook, a comprehensive directory of software available directly from Intel, as well as other software that is not sold by Intel but is endorsed.

OEM SOFTWARE

Intel offers a broad range of OEM operating systems and languages. For real-time, embedded and commerical applications, the iRMX Operating System family is the OEM software offering. The iRMX 86 Operating System is the entry level family member supporting a broad range of Intel processors, making it the current world standard for 16-bit applications requiring fast response times to real time events. The newest family member, the iRMX 286 Operating System is the evolving flagship 16-bit iRMX family member for the late 1980s.

Intel also supports XENIX 286 R3.0, a fully licensed version of UNIX tuned especially for Intel's System 310 and other microcomputers. XENIX is well suited to development and business applications. In addition, Intel provides a set of high-level languages and applications packages for the XENIX operating system. Many of these packages are sold by intel to provide single stop shopping for system customers. Also, Intel's microprocessor and microcontroller are supported by a set of high-level languages: PL/M, C, Pascal and FORTRAN and assemblers (refer to the Development Systems section).

The OpenNET software products, which currently include iRMX Networking software, XENIX Networking software and the iNA 960 Transport Software are based in industry standard networking protocols and provide transparent interoperation between XENIX, iRMX and PC/DOS or MS/DOS systems.

iRMX™ OPERATING SYSTEMS

The iRMX Operating System family is easy-to-use, real-time, multi-tasking and multi-programming software developed to provide OEMs standard off the shelf operating system services. These services manage and extend the resources of the appropriate hardware facilities. The iRMX 86 system manages the resources of iSBC 86/88/186/188 and 286 (real address mode) Single Board Computers as well as other 8086, 8088, 80186, 80188 and 80286 (real address mode) based microcomputers. The iRMX 286 system manages the resources of iSBC 286 (protected address mode) Single Board Computers as well as other 80286 (protected address mode) based microcomputers. Both the iRMX 86 and iRMX 286 systems are available in user configurable software packages and fully integrated into the System 286/3XX families of Microcomputer Systems. These Operating Systems provide a number of standard interfaces that allow iRMX Applications to take advantage of industry standard device controllers, hardware components, and a multitude of software packages developed by Independent Software Vendors (ISVs).

XENIX* Operating System

Intel offers the XENIX 286 R3.0 Operating System specially configured and optimized for the System 310AP supermicro system. XENIX 286 R3.0 for the 80286 is a fully licensed and enhanced version of UNIX** System III that has been codeveloped by Microsoft Corp. and Intel Corp. This is a multi-user, multi-tasking memory protected operating system that utilizes the features of the 80286 and 80287 to provide a high performance

cost effective UNIX engine. The integration of operating system features onto the 80286 chip also provides an unparalleled amount of software compatability between different machines running the XENIX Operating System. Intel's product engineering, evaluation, documentation and support groups are involved to insure that the software has been thoroughly tested for reliability and ease of use by systems builders.

Table 32. Operating Systems

Feature	iRMX™ 86	XENIX* 286
PRIMARY FEATURES		
Multitasking Support	Yes	Yes
Device Driver Support	Yes	Yes
File System Support	Yes	Yes
Optional Multiprocessing Support	Yes	Yes
Any Combination of PROM and RAM residency	Yes	No
Building-block approach	Yes	Yes
Multiprogramming Support	Yes	Yes
Interactive Support	Yes	Yes
On-target Development	Yes	Yes
ADVANCED FEATURES		
Hierarchical directories	Yes	Yes
Custom device drivers	Yes	Yes
Low-overhead random access support	Yes	Yes
File access control	Yes	Yes
Automatic buffering	Yes	Yes
Load-time location	Yes	Yes
Utility commands	Extensive	Extensive
Interactive debugger	Yes	Yes
Interactive configuration	Yes	No
Communications/Networking	Yes	Yes
Text Processing	Yes	Yes—Extensive
Source Code Control System	No	Yes

*XENIX is a trademark of Microsoft Corp.
**UNIX is a trademark of Bell Labs.

iRMX™ Languages and Utilities

The Intel iRMX languages and utilities provide full "on-the-target-system" software development capability for the 86/300 and 286/300 families of microcomputer systems and iSBC 86/88/186/188/286 or 86/88/186/188/286 based systems. This facility allows OEMs to allow their end users to make on-the-spot modifications and add additional capability to their applications. All languages are compatible with Intel's Universal Development Interface (UDI) "software bus".

The iRMX languages run only on iRMX 86 or iRMX 286 but are fully compatible with Intel's software development languages allowing users to develop programs on Intel's Development Systems and then easily move it to an iRMX system.

The iRMX languages allow OEMs to select the correct language for their application. For technical applications, FORTRAN or Pascal can be used, for systems programming use PL/M; commerical—Pascal; and for size optimization—Macro Assembler can be used.

The iRMX utilities provide all necessary software for development.

Table 33. iRMX™ Languages and Utilities

Product	Description	Applicable Standard
iRMX 286 UTILITIES (R286 ASM 86)	EDIT is a powerful line oriented editing facility. BIND connects object modules which have been individually compiled into a single, relocatable object module. BUILD maps the relocatable object code into the 80286 memory segments. LIBRARIAN allows creation of object module libraries.	N/A
iRMX 286 PL/M (R286 PLM 286)	PL/M compiler which provides users with a powerful, microcomputer oriented system programming language. iRMX 286 PL/M is a compatible superset of PL/M 86 offering easy portability of software.	Intel PL/M
iRMX 86 C (RMX 866)	C compiler which provides users with high level language offering flexibility and portability of programs.	Kernighan and Richie 1978
iRMX 86 BASIC (RMX 865)	BASIC interpreter which provides BASIC program generation.	N/A
iRMX 286 SCREEN EDITOR (R286 EDI 286)	A screen editor which provides users with a menu driven text-editor. By keeping the menu of commands always in view, even infrequent users of the editor are able to edit text quickly.	N/A

XENIX* Languages and Applications

Intel provides a set of high level languages and applications packages for the XENIX Operating System. Many of these packages are sold by Intel to provide single stop shopping for system's customers. Due to the need for a wide variety of software for a commercially oriented system. Intel also runs an active third party software program that provides systems, support and marketing assistance to third party developers who sell the resulting products directly to Intel OEMs. Please see the Database Products section for a description of the available, Intel supplied applications software.

Table 34. XENIX* Languages and Applications

Product	Description	Applicable Standards
XENIX 286 C Compiler	Included with the XENIX 286 Operating System. High performance compiler for the C programming language tuned for the 80286. Provides full implementation as per Kernighan Ritchie book along with extensive type checking and error handling, 80287 floating point support and large model segmentation support.	—
XENIX 286 FORTRAN	See Development Software section for description.	ANSI 77
XENIX 286 BASIC	Industry standard Microsoft BASIC Interpreter provides interactive development and execution of the most popular dialect of the BASIC language.	ANSI x3.60 1978 Subset
XENIX 286 COBOL Compiler (XNX2867) and Run-time Incorporation Fees (XNX2868)	Offering of Microfocus COBOL, a mainframe caliber package for ANSI 1974 programs. Supports easy migration of existing programs (through support of standard), easy program development (through interactive environment and FORMS II visual programming tool) and cost effective pass through (using lower cost run-time only package for volume shipments).	ANSI x3.23 1974 to Federal High Level
XENIX 286 PL/M	See Development System Section for description.	—

*XENIX is a trademark of Microsoft Corp.

Table 35. OEM Operating Systems and High Level Languages

Operating Systems	Languages Supported	Components(1)	MULTIBUS®(2) Boards	Systems(3)
iRMX 86	Assembler PASCAL 86/88 FORTRAN 86/88 BASIC-86 Interpreter C-86 PL/M 86	8086, 8088 80186, 80286 Family	iSBC 86/05 iSBC 86/12A iSBC 86/14 iSBC 86/30 iSBC 86/35 iSBC 88/25 iSBC 88/40 iSBC 186/03 iSBC 286/10A iSBC 286/12	86/380 86/310 286/380 286/310 310AP
iRMX 286	Assembler PL/M 286	80286	iSBC 286/10A iSBC 286/12	286/310 286/380 310AP
XENIX 286 R3.0 licensed version of UNIX System III	C language FORTRAN Cobol BASIC Interpreter	80286 Family PL/M	iSBC 286/10A iSBC 286/12	310AP

NOTES:
1. See Microprocessor Section on Page 32.
2. See Single Board Computer Section, Page 76.
3. See OEM Systems Section, Page 92.

OpenNET® Software Products

iNA 960 and its derivative iNA 961 implement the industry standard ISO 8073 transport protocols and provide reliable end-to-end message delivery between two networked systems on an IEEE 802.3/Ethernet or an IEEE 802.4 Token Bus LAN. iNA 960/961 is fully supported by Intel's IEEE 802.3 and IEEE 802.4 LAN hardware modules.

The iRMX Networking Software (iRMX-NET) and XENIX Networking Software (iXNX-NET) products are based on the Network File Access protocols developed by IBM, Microsoft and Intel and provide transparent remote file access between XENIX, iRMX and PC or MS DOS based systems. Transparent remote file access enables the user to work with remote files across the local area network as if they were local. iRMX-NET and XENIX-NET are supported by iNA 960 and Intel's LAN hardware modules. This first set of products run initially in IEEE 802.3 environments. In Q286 MAP Networking Software (MAP-NET™) will be available and will include FTAM, CASE, SESSION and run initially in the IEEE 802.4 environments.

The Intel OpenNET hardware and software products combined support all seven layers of the ISO Open Systems Interconnect Model.

Insite™ User's Library

Insite is a collection of programs that have been written by users of Intel microcomputers, single board computers, and development systems. These programs are available on paper tapes, diskettes or source listings and includes monitors, conversion routines, peripheral drivers, translators, math packages, and even games. The library can also serve as a learning tool for users unfamiliar with assembly or high level languages associated with Intel's microprocessors.

Table 36. Applications Software and Languages

Application Software and Languages	Operating System Required
Multiplan	CP/M 80
WordStar	CP/M 80
Personal Software Kit (WordStar, Multiplan, and CP/M 80)	CP/M 80
Insite User's Library	Intel Customer Developed Software

SINGLE BOARD COMPUTERS

The components that make the 'Open System' a reality . . . It all begins with MULTIBUS® System Architecture: the industry standard architecture. The foundation of Intel's microcomputer systems architecture was laid in 1976 with the introduction of the MULTIBUS system bus, and Intel's first single board computer product, the iSBC® 80/10 board. It was a solution the microcomputer industry needed to make microprocessor technology easier to use and more readily available for new product design and development. Its widespread use and popularity made it a defacto industry and IEEE standard (IEEE 796).

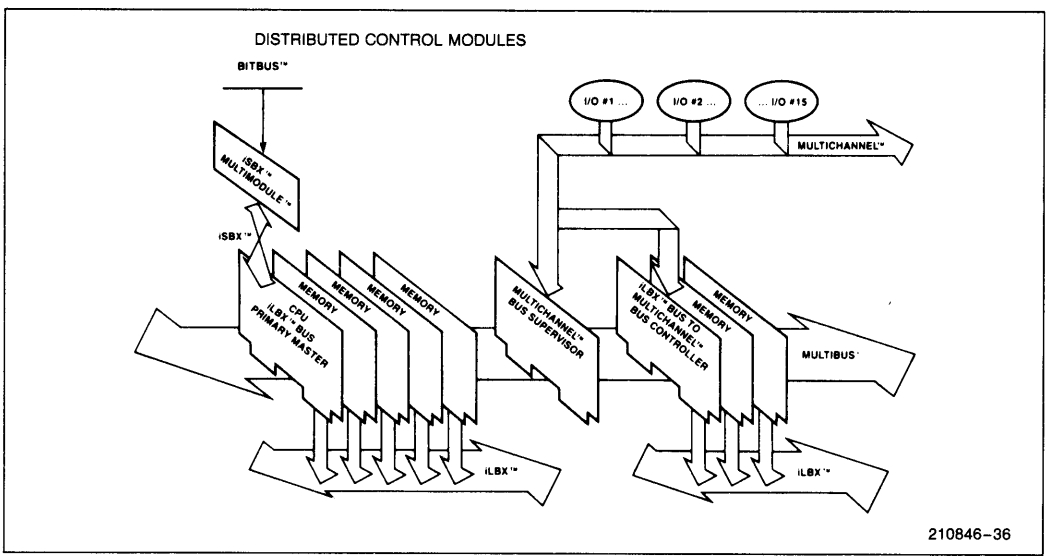
The bus architecture is the conceptual foundation and physical framework for interfacing the various pieces of the microcomputer system into a family of system solutions. This family now includes single board computers, memory expansion boards, a broad array of I/O expansion products, packaging products, microsystem software and integrated microsystems.

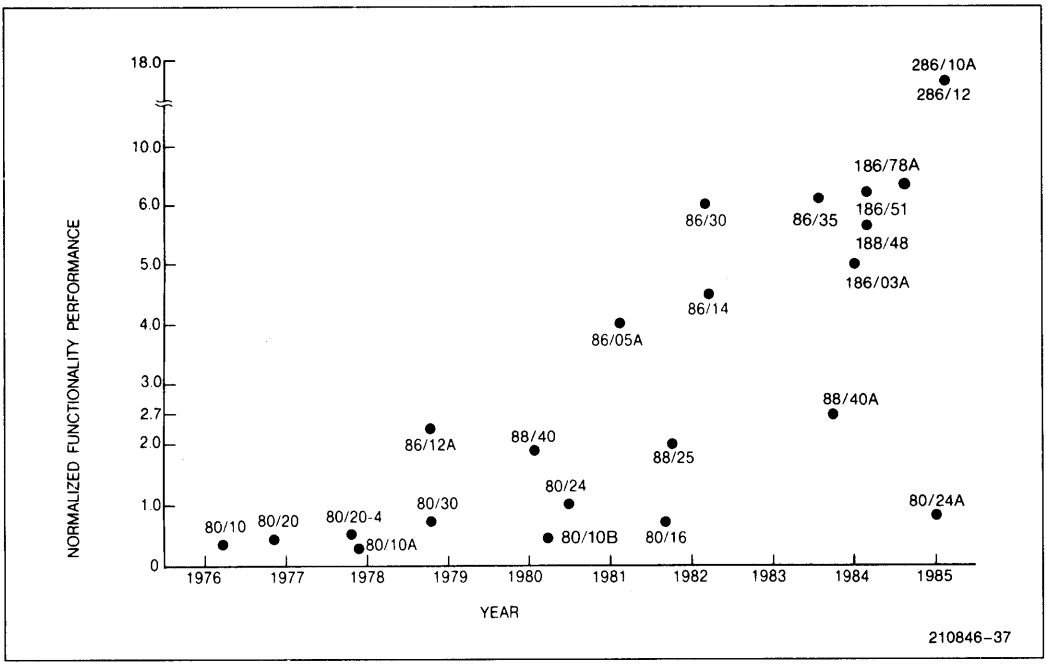
Support for multiple levels of expansion and design flexibility.

The five levels of iSBC expansion supported by Intel's MULTIBUS provide OEMs with the widest range of cost/performance solutions and open system flexibility in the industry.

- The MULTIBUS System Bus—system communication and interconnection
- The iLBX Execution Bus—large amounts of high speed memory
- The MULTICHANNEL™ I/O Bus—very high speed, high performance I/O
- The iSBX I/O Expansion Bus—low cost modular I/O
- iSBC MULTIMODULE Add-ons—on-board memory and math expansion
- BITBUS™ Distributed Control Bus—fast serial connection to microcontroller

Intel continues to develop new iSBC products to meet the industry's need for powerful, cost-effective, single board computer products. There are now more than 65 MULTIBUS expansion boards. There are also over 200 MULTIBUS vendors providing more than 1000 MULTIBUS compatible products, the largest assortment of compatible products in the industry today.





iSBC® CPU Boards—Relative Performance

Table 37. MULTIMODULE™ Expansion Options

MULTIMODULE™ BOARDS		iSBC® Boards																
Expansion	**Product**	**286/10A**	**286/12**	**86/05A**	**86/12A**	**86/14**	**86/30**	**86/35**	**186/03A**	**186/51**	**186/78A**	**88/25**	**88/40A**	**88/45**	**80/10B**	**80/20-4**	**80/24A**	**80/30**
RAM EPROM	iSBC® 341	■	■	■					■		■	■	■	■				
RAM EPROM	iSBC® 340				■													
H.S. Math	iSBC® 337A			■	■	■	■	■				■	■	■				
512K RAM	iSBC® 314							■										
128K RAM	iSBC® 304						■	■		■								
8K RAM	iSBC® 302			■								■						
4K RAM	iSBC® 301												■					
32K RAM	iSBC® 300A					■												
32K RAM	iSBC® 300				■													
Bubble Memory	iSBX™ 258	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Table 38. MULTIBUS® CPU Boards

Product	CPU(1)	RAM	EPROM E²PROM	iSBX™(2) Expansion Connectors	MULTIMODULE™(2) Expansion	Operating(3) System Software
iSBC 286/10A	80286	0–128 Kb	0–512 Kb	2	iSBC 341	iRMX 86 iRMX 286 XENIX+ 286 CP/M* 286
iSBC 286/12	80286	1 Mb	0–256K	2	iSBC 341	
iSBC 186/51	80186 82586	128 Kb	6,28-pin JEDEC sites	2	iSBC 304	iNA 960 iRMX 86
iSBC 186/03A	80186	0-64 Kb	0–512 Kb	2	iSBC 341	iRMX 86
iSBC 188/48	80188	64 Kb	2, 28-pin JEDEC sites	2	iSBC 341, iSBC 307	iRMX 86
iSBC 86/30	8086-2	128 Kb	8–64 Kb	2	iSBC 304 iSBC 337/A	iRMX 86 CP/M 86
iSBC 86/14	8086-2	32 Kb	8–64 Kb	2	iSBC 300A iSBC 337/A	iRMX 86 CP/M 86
iSBC 86/12A	8086	32 Kb	4–16 Kb	0	iSBC 300 iSBC 340 iSBC 337/A	iRMX 86 CP/M 86
iSBC 86/05A	8086-2	8Kb	8–16 Kb 8–256 Kb	2	iSBC 302 iSBC 341 iSBC 337/A	iRMX 86 CP/M 86
iSBC 88/45	8088 (8/16-bit)	16K	64K–128K	2	iSBC 341	iRMX 86 CP/M 86
iSBC 88/40A	8088 (8/16-bit)	4 Kb	16–32 Kb	3	iSBC 301 iSBC 341 iSBC 337/A	iRMX 86
iSBC 88/25	8088 (8/16-bit)	4 Kb	4–64 Kb	2	iSBC 302 iSBC 341 iSBC 337/A	iRMX 86 CP/M86
iSBC 80/30	8085A (8-bit)	16 Kb	8–8 Kb	0	iSBC 304	CP/M 80
iSBC 80/24A	8085A (8-bit)	8K	4–32 Kb	2	iSBC 301	CP/M 80
iSBC 80/20-4	8080A (8-bit)	4K	4–8 Kb	0	—	CP/M 80
iSBC 80/10B	8080A	1K-4K	4–16 Kb	1	—	—
iSBC 86/35	8086-2	512 Kb	32–256 Kb	2	iSBC 304 iSBC 314 iSBC 337/A	iRMX 86
iSBC 186/78A	80186 82720	512 Kb	8, 28-pin	2	iSBC 343 iSBC 341	iVDI 720

NOTES:
1. See Microprocessor Section.
2. See following tables.
3. See Software Section.

*CP/M is a trademark of Digital Research, Inc.
+XENIX is a trademark of Microsoft Corp.

Table 39. MULTIBUS® Memory Expansion Boards

Product	Memory Type	Memory Size (Bytes)	Parity	iLBX™ Interface	High Speed Interface
iSBC 28A	Dynamic RAM	128K	Yes	No	No
iSBC 056A	Dynamic RAM	256K	Yes	No	No
iSBC 012B	Dynamic RAM	512K	Yes	No	No
iSBC 012C	Dynamic RAM	512K	Yes	No	No
iSBC 010CX	Dynamic RAM	1M	Yes	Yes	No
iSBC 020CX	Dynamic RAM	2M	Yes	Yes	No
iSBC 012CX	Dynamic RAM	512K	Yes	Yes	No
iSBC 012EX	Dynamic RAM	512K	Yes	Yes	Yes
iSBC 010EX	Dynamic RAM	1M	Yes	Yes	Yes
iSBC 020EX	Dynamic RAM	2M	Yes	Yes	Yes
iSBC 040EX	Dynamic RAM	4M	Yes	Yes	Yes
iSBC 428	28-Pin Universal Site	0–1M	No	Yes	No
iSBC 300	Dynamic RAM	32K	No	No	No
iSBC 300A	Dynamic RAM	32K	No	No	No
iSBC 301	Static RAM	4K	No	No	No
iSBC 302	Static RAM	8K	No	No	No
iSBC 304	Dynamic RAM	128K	No	No	No
iSBC 340	24 Pin EPROM	4 Jedec Sites	No	No	No
iSBC 341	24/28 Pin EPROM/RAM	4 Jedec Sites	No	No	No
iSBC 254	Bubble Memory	128K-512K	Yes (Auto)	No	No
iSBX 251	Bubble Memory	128K	Yes (Auto)	No	No
iBCK 10	Bubble Memory Cassette	128K	Yes (Auto)	No	No
iBCK 12	Bubble Proto Cassette	128K	Yes (Auto)	No	No

Table 40. MULTIBUS® Memory and I/O Expansion Boards

Product	RAM	EPROM	Serial I/O	Parallel I/O	
				Lines	Connectors
iSBC 108A	8K	4-32K	1 (RS232C)	48	2
iSBC 116A	16K	4-32K	1 (RS232C)	48	2

Table 41. MULTIBUS® Analog I/O Expansion Boards

Product	Input Channels	Output Channels	MULTIMODULE™ Type
iSBX 311	8–16		iSBX Single Wide
iSBX 328		8	iSBX Single Wide

Table 42. MULTIBUS® Digital Interface and I/O Expansion Boards

Product	Description	I/O Capacity	Type
iSBC 569	Intelligent 8085-driven Digital I/O Slave	48 I/O Lines	MULTIBUS
iSBC 519	General Purpose Digital I/O	72 I/O Lines	MULTIBUS
iSBC 556	Optically-Isolated Digital I/O	48 I/O Lines	MULTIBUS
iSBC 350	Programmable I/O iSBX MULTIMODULE	24 I/O Lines	Single-Wide iSBX MULTIMODULE
iSBX 488	IEEE 488 GPIB/HPIB	16 I/O Lines 16 Control	Single-Wide iSBX MULTIMODULE
iSBX 351	Programmable serial I/O MULTIMODULE Board	1—I/O Port RS232C or RS422	Single-Wide iSBX MULTIMODULE
iSBC 589	Intelligent Multichannel DMA Controller	8/16-bit 1—MULTICHANNEL Port 2—iSBX Connectors	MULTIBUS
iSBC 580	MULTICHANNEL Bus to iLBX Bus Interface	1—16-bit MULTICHANNEL 1—16-bit iLBX Interface	MULTIBUS
iSBX 352	Programmable Serial I/O Module	1—I/O Port RS232C or RS422 SDLC/HDLC Only	Single Wide iSBX MULTIMODULE
iSBX 354	Programmable Serial I/O Module	2—I/O Ports RS232C or RS422	Single Wide iSBX MULTIMODULE

Table 43. MULTIBUS® High Speed Math Boards

	Chip	Speed	Fixed	Floating	Transcendental
iSBX 331	8231	4 MHz	Yes	Yes	Yes

			Multiply	Divide	Add	Subtract
iSBC 337	Execution Time (Microseconds)	Fixed	28	48	20	20
		Floating Point	29	40	29	37
iSBC 337A	Execution Time (Microseconds)	Fixed	12	20	8	8
		Floating Point	13	16	12	15

Table 44. Mass Storage Controllers

Product	No. of Boards	Interface Supported Transfer Rates	No. of Drives Supported	S/W Support
iSBC 208	1	SA800/850; SA400/450/460 8" –62.5 KBytes/sec 5¼" –31.25 KBytes/sec	4	iRMX 86
iSBC 215G	1	ANSI X3T9/1226 (1 Mbyte/sec transfer rate) in burst mode	4	iRMX 86 XENIX
iSBC 215G Kit (includes external data separator)	2	ST506/412 (transfer rate 5 Mbits/sec)	4	iRMX 86 XENIX
iSBX 217C	Single wide MULTIMODULE	QIC-02 or 3M HCD-75 (90K, 30K, 17K - depending on tape drive speed)	4	iRMX 86 XENIX
iSBX 218A	Double wide MULTIMODULE	SA800/850; SA400/450/460 5¼" –31.25 KBytes/sec 8" –62.5 KBytes/sec	4	iRMX 86 XENIX iRMX 286
iSBC 220	1	SMD (transfer rate 10 Mbits/sec)	4	iRMX 86
iSBC 226	1	Enhanced SMD (transfer rate 15 Mbits/sec)	2	iRMX 86
iSBC 254	1	Bubble Memory	—	iRMX 86
iSBC 186/03A	1	SCSI-single host environment (transfer rate 1.2 Mbytes/sec asynchronous)	single target environment	iRMX 86

Table 45. MULTIBUS® Human Interface

Product	Display Resolution	Character Size	Color or B.W.	Frame Rate
iSBX 270	80 Characters 24/80 24 Lines	5 × 7, 7 × 9 6 × 8	8 color or B&W	50 Hz or 60 Hz
iSBX 275	512 × 512 × 1 256 × 256 × 3	Up to 8 × 8	8 color or B&W	50 Hz or 60 Hz
iSBC 186/78A	640 × 480 × 4 1024 × 768 × 1	N/A	16 color or 16 Grey	50 Hz or 60 Hz

MULTIBUS® II ARCHITECTURE AND PRODUCTS

MULTIBUS® II ARCHITECTURE

Anticipating the demand for a bus with advanced features, Intel announced the MULTIBUS II architecture specification in November 1983. Requirements ranging from handling high performance 32-bit microprocessor CPU boards through increasing system performance and bandwidth through multi-processing are addressed by the MULTIBUS II bus architecture specification. Coupled with this demand for increasingly higher performance are other factors determined to be equally critical in developing advanced technology systems. These other factors include more and faster memory and I/O capabilities, highly reliable systems with high data integrity, flexible software with real-time applications, and systems that are easy to use and improved methods for sharing system information, resources, and processing.

MULTIBUS II bus is an open architecture suitable for a wide range of processor-independent applications. The multiple bus architecture includes three bus structures that are compatible with two existing MULTIBUS I I/O buses. The three new MULTIBUS II bus structures are the Parallel System Bus (iPSB), a 32-bit bus with 40M byte/sec throughput, the Local Bus Extension (iLBX II) offering high speed (48M byte/sec) access to large amounts of off-board memory, and the Serial System Bus (iSSB), a low cost serial interconnect offering the flexibility of MULTIBUS II boards being physically extended up to 10 meters apart. Carried over from the MULTIBUS I architecture are the iSBX™ I/O Expansion Bus and the MULTICHANNEL DMA (Direct Memory Access) I/O Bus. Choices can be made between implementation of any or all of the five buses depending on what functionality is to be optimized, a philosophy known as "functional partitioning".

An additional strength of MULTIBUS II rests with the definition of a standard bus interface. Intel has implemented this bus interface definition using VLSI technology and thus provides the key to multi-processing with intelligent boards that are processor-independent. Since the standard bus interface is handled on VLSI silicon and the bus interface handles all bus arbitration and interrupt messages, increased reliability and lower costs are obtained while increasing design flexibility.

Individually, the buses represent significant advances in bus architecture design. Together, they represent an evolutionary path to future VLSI technology, compatibility, and flexibility.

MULTIBUS® II PRODUCTS

Intel's family of MULTIBUS II products allow users to take immediate advantage of the bus advances outlined in the MULTIBUS II Architecture Specification. Using the building blocks offered by Intel in the open MULTIBUS II bus architecture provides the flexibility and ease of use demanded by either todays high performance applications or tomorrows technology driven markets.

Table 46. MULTIBUS® II Single Board Computer CPU Products

Product	Description
iSBC 286/100 Single Board Computer	• 8 MHz 80286 Microprocessor • MULTIBUS II iPSB interface for multimaster configurations and multiprocessing system expansion • MULTIBUS II iLBX II (Local Bus Extension) interface for high-speed memory expansion • MULTIBUS II interconnect space for software configurability and diagnostics • Resident firmware to support Built-In Self-Test (BIST) power-up diagnostics • Optional 80287 Numeric Data Co-Processor (socket on-board) • iSBX bus interface connector for I/O expansion bus • Four DMA channels supplied by the 82258 Advanced DMA controller with 8 Mbytes/sec transfer rate • 16 levels of vectored interrupt control and up to 255 distinct interrupt sources and 255 interrupt destinations are supported using message-based interrupts • Two 28-pin JEDEC sites • 24 programmable I/O lines configurable as SCSI interface, Centronics interface, or general purpose I/O • Two programmable serial interfaces, one RS 232C, the other RS 232C or RS 422A compatible • Double-high Eurocard standard form factor, pin and socket DIN connectors
iSBC 186/100 Single Board Computer	• 8 MHz 80186 Microprocessor • MULTIBUS II iPSB interface for multimaster configurations and multiprocessing system expansion • Two programmable serial interfaces, one RS232C DTE and the other RS422 DTE • One parallel port configurable for SCSI, Centronics, or General Purpose • Socket for full iSBX compatibility and BITBUS support • 256 KByte Dual Port DRAM expandable to 512 KByte supported on iPSB • 8 MHz Advanced Direct Memory Access Controller (ADMA) plug in option • MULTIBUS II interconnect space fully supported with 8751 controller • Double high Eurocard standard form factor, pin and socket DIN connectors

Table 47. MULTIBUS® II Memory Products

Product	Description
iSBC MEM/312 Cache-Based MULTIBUS II RAM Board	• 512 KByte Dual Port RAM board • High-speed cache-based boards with 8 KBytes of cache RAM • 32-bit MULTIBUS II Parallel System Bus (iPSB) and Local Bus Extension (iLBX II) interface support • Zero wait state over iLBX II on a cache hit, one wait state for cache misses, and writes at 8 MHz • Double-high Eurocard standard form factor, pin and socket DIN connectors • MULTIBUS II software interconnect support for dynamic memory configuration and diagnostics with no jumpers necessary on the board • Built-In-Self-Test (BIST) diagnostics on-board with both LED indicators and software access to error information • Automatic memory initialization at power-up and at power-fail recovery • Byte-parity error detection

Table 47. MULTIBUS® II Memory Products (Continued)

Product	Description
iSBC MEM/310 Cache-Based MULTIBUS II RAM Board	• 1M Byte Dual Port RAM board • High-speed cache-based boards with 8 KBytes of cache RAM • 32-bit MULTIBUS II Parallel System Bus (iPSB) and Local Bus Extension (iLBX II) interface support • Zero wait state over iLBX II on a cache hit, one wait state for cache misses, and writes at 8 MHz • Double-high Eurocard standard form factor, pin and socket DIN connectors • MULTIBUS II software interconnect support for dynamic memory configuration and diagnostics with no jumpers necessary on the board • Built-In-Self-Test (BIST) diagnostics on-board with both LED indicators and software access to error information • Automatic memory initialization at power-up and at power-fail recovery • Byte-parity error detection
iSBC MEM/320 Cache-Based MULTIBUS II RAM Board	• 2M Byte Dual Port RAM board • High-speed cache-based boards with 8 KBytes of cache RAM • 32-bit MULTIBUS II Parallel System Bus (iPSB) and Local Bus Extension (iLBX II) interface support • Zero wait state over iLBX II on a cache hit, one wait state for cache misses, and writes at 8 MHz • Double-high Eurocard standard form factor, pin and socket DIN connectors • MULTIBUS II software interconnect support for dynamic memory configuration and diagnostics with no jumpers necessary on the board • Built-In-Self-Test (BIST) diagnostics on-board with both LED indicators and software access to error information • Automatic memory initialization at power-up and at power-fail recovery • Byte-parity error detection
iSBC MEM/340 Cache-Based MULTIBUS II RAM Board	• 4M Byte Dual Port RAM board • High-speed cache-based boards with 8 KBytes of cache RAM • 32-bit MULTIBUS II Parallel System Bus (iPSB) and Local Bus Extension (iLBX II) interface support • Zero wait state over iLBX II on a cache hit, one wait state for cache misses, and writes at 8 MHz • Double-high Eurocard standard form factor, pin and socket DIN connectors • MULTIBUS II software interconnect support for dynamic memory configuration and diagnostics with no jumpers necessary on the board • Built-In-Self-Test (BIST) diagnostics on-board with both LED indicators and software access to error information • Automatic memory initialization at power-up and at power-fail recovery • Byte-parity error detection
iSBC MEM/601 Universal Site MULTIBUS II Memory Board	• Two banks of eight 28-pin JEDEC sockets • ROM and EPROM up to 64K × 8 • EEPROM, SRAM, and iRAM up to 32K × 8 • 512 × 8 NVRAM • Full iLBX II and iPSB support • Data retention after power fail

Table 48. MULTIBUS® II Support Products

Product	Description
iSBC CSM/001 Central Services Module	• Integrates MULTIBUS II central system functions on a single board • MULTIBUS II Parallel System Bus (iPSB) clock generation for all agents interfaced to the MULTIBUS II iPSB bus • System-wide reset signals for power-up, warm start, and power failure/recovery • System-wide time-out detection and error generation • Slot I.D. and Arbitration I.D. initialization • MULTIBUS II interconnect space for software configurability and diagnostics • Built-In-Self-Test (BIST) power-up diagnostics with LED indicator and error reporting accessible to software via interconnect space • General purpose link interface to other standard (MULTIBUS I) or proprietary buses • Time-of-day clock support with battery back-up on board • Double-high Eurocard standard form factor, pin and socket DIN connectors
iSBC LNK/001 MULTIBUS II to MULTIBUS I Link Board	• Dual port 128 KByte DRAM programmable via MULTIBUS II interconnect space • Supports 16- and 24-bit address and 8- and 16-bit data paths • 16M Bytes of MULTIBUS I memory maps into MULTIBUS II memory space • 32 KBytes of MULTIBUS I/O memory maps into MULTIBUS II I/O memory space • Converts MULTIBUS I interrupts into MULTIBUS II interrupt messages • MULTIBUS I form factor board connecting to iSBC CSM/001 via flat ribbon cable

Table 49. MULTIBUS® II Software Products

Product	Description
iRMX 86 Operating System Release 7	• MULTIBUS II support for iSBC 286/100 is a configuration option applications in Real Address Mode, including support for the SCSI peripheral interface and up to 1M Byte addressability • Interprocessor signal support • Automatic software configuration of memory boards • Support for battery backed-up, global time of day clock • Extendable to allow addition of custom device drivers
iSDM 286 80286 System Debug Monitor	• Development support for iSBC 286- and 80286 based applications • Real Address Mode (RAM) and Protected Virtual Address Mode (PVAM) support • Support of MULTIBUS I and MULTIBUS II environments • Powerful debugging commands, including single step CPU operation • Software configuration of MULTIBUS II system boards at start-up and automatic configuration of memory boards • Universal Development Interface (UDI) support via development system connection • Command execution, including program load capability from Intellec Series III or Series IV Development systems • Supports 80287 Numeric Processor Extension (NPX) for high speed math applications

Table 50. MULTIBUS® II Packaging Products

Product	Description
iSBC PKG/606 and iSBC PKG/609 MULTIBUS II Card-cage Assemblies	• Available in two sizes to hold up to six or nine MULTIBUS II boards • Designed to mount inside a chassis or other enclosure • Uses a 6 layer Parallel System Bus (iPSB) backplane • All lines fully terminated per the iPSB MULTIBUS II specification • Assembly uses aluminum extrusion construction for strength and rigidity • Accommodates Intel iSBC PKG/902 and iSBC PKG/903 2 and 3 slot iLBX II backplanes
iSBC PKG/902 and iSBC PKG/903 MULTIBUS II iLBX II Backplanes	• Provides iLBX II interconnect for fastest CPU and off-board data memory transfers • Designed to mount in MULTIBUS II cardcage assemblies • Available in 2 slot (iSBC PKG/902) and 3 slot (iSBC PKG/903) sizes • Uses a fully terminated six layer backplane • Includes a 10 pin connector for BITBUS applications • Meets all electrical and mechanical requirements of the MULTIBUS II specification
iSBC PKG/622 MULTIBUS II Front Panels	• Front panels for attaching to custom MULTIBUS II boards, mounting iSBX MULTIMODULES, or filling empty slots in MULTIBUS II systems • Full adherence to MULTIBUS II specification with "U" shaped extruded aluminum to meet EMI/RFI requirements • Kit contains front panels, ejector tabs, and all mounting hardware
SYP/500PP MULTIBUS II System Chassis	• Full enclosure MULTIBUS II design development tool • 3 full height 5.25" peripheral bays • 6 slot MULTIBUS II cardcage assembly • 3 slot iLBX II backplane • 270 watt power supply

Table 51. MULTIBUS® II System Products

Product	Description
SYP MB2 MULTIBUS II Starter System	• Ready to run MULTIBUS II system based on Intel's 80286 microprocessor with optional 80287 numeric coprocessor • Supports industry standard iRMX Operating System and languages • 1M Byte RAM on iSBC MEM/310 • 320 KByte floppy • 40M Byte Winchester

Table 52. MULTIBUS® II Peripheral Controller Products

Product	Description
iSBC 186/224 MULTIBUS II Peripheral Controller Board	• High performance peripheral controller with 80186 microprocessor, 128 KByte DRAM, track caching, and DMA • Winchester interface supports up to 4 ST506/412, 5¼" drives, on board diagnostics, and ECC • Tape interface supports up to 4 QIC-02 streaming tape drives • Floppy interface supports up to 4 5¼" floppy drives, single or double sided, single or double density • Peripheral Communication Interface (PCI) gives command queing capability • Real-time multi-tasking Operating System

Table 53. MULTIBUS® II Compatible iSBX™ MULTIMODULES

Product	Description
iSBX 331	• High speed math board for fixed and floating point math
iSBX 258	• Interface MULTIMODULE board for Intel bubble cassette system
iSBX 350	• Parallel digital I/O MULTIMODULE board
iSBX 351	• Serial Communication MULTIMODULE board
iSBX 352	• SDLC/HDLC serial Communication MULTIMODULE board
iSBX 354	• Dual channel serial digital I/O MULTIMODULE board
iSBX 488	• General Purpose Interface Bus (GPIB) MULTIMODULE board
iSBX 311	• Analog input MULTIMODULE board
iSBX 328	• Analog output MULTIMODULE board
iSBX 344	• BITBUS distributed control bus MULTIMODULE Board

NOTE:
All MULTIMODULE boards are fully functional with the MULTIBUS II product line. This listing indicates which MULTIMODULE boards will attach directly to the CPU board without requiring any additional cabling.

DISTRIBUTED CONTROL MODULES

BITBUS™ MICROCONTROLLER INTERCONNECT

Introduced in early 1984, the BITBUS microcontroller interconnect bus is Intel's newest standard. It is designed to facilitate distributed intelligent control of industrial machines and I/O such as robots, numerical control machines and process controllers. The BITBUS bus makes possible simple, high performance communications among Distributed Control Modules (DCM) and their associated iSBC systems.

The BITBUS interconnect is based on Intel's 8044 which incorporates on a single chip the industry standard 8051 microcontroller and a high speed SDLC controller to provide fast and reliable transfer of control commands and responses. Distribution of control functions over the flexible, serial BITBUS interconnect standard will make the coordinated, automated factory more practical and cost effective.

Table 54. BITBUS™ Products

Product	Description
iSBX™ 344 BITBUS™ Intelligent Controller MULTIMODULE Board	• BITBUS MULTIMODULE expansion board for MULTIBUS Single Board Computers • High performance 12 MHz 8044 controller • Integral firmware including the iRMX 51 Real-Time Multitasking Executive • Memory sites for user's application programs
iRCB 44/10 BITBUS™ Digital I/O Remote Controller Board	• BITBUS standalone remote controller board with 24 programmable I/O lines • iSBX connector for low cost expansion • Eurocard formfactor • High performance 12 MHz 8044 controller • Integral firmware including the iRMX 51 Real-Time Multitasking Executive • Memory sites for user's application programs
iRCB 44/20 BITBUS™ Analog I/O Controller Board	• Standalone remote controller using 12MHz 8044 microcontroller • 16 single-ended analog input channels, ±10V • 2 analog output channels, ±10V • Programmable gain and 4–20 mA support • iSBX connector for low-cost expansion • Eurocard form-factor • Integral firmware, including iDCX 51 • Two 28-pin memory sites, one with SRAM standard
iDCX 51 Executive	• Real-time Multitasking Executive for the MSC-51 Microcontroller Family • Provides run-time scheduling services, message passing & speeds development • Only 2.2 KBytes of code
iDCX 510 iDCM Support Package	• Extends the functionality of BITBUS/iDCM systems • Software development support for BITBUS applications • Software interface for iDCX 86 and iPDS™ ISIS operating systems to BITBUS applications
BITBUS™ Toolbox Software	• Interactive software monitor for development and run-time • High performance interfaces for iRMX 86/286, iPDS, ISIS and operating systems

COMMUNICATIONS MODULES

OpenNET™ FAMILY OF LOCAL AREA NETWORK PRODUCTS

Intel's LAN system building blocks are all part of the OpenNET product family. These modules allow the user to implement networks based on Ethernet (IEEE 802.3) and MAP (IEEE 802.4) that have transparent interoperability between multiple operating systems including iRMX, XENIX and DOS. The OpenNET modules listed in Table 55 cover layers 1 through 4 of the OSI reference model. Used together with Intel's iRMX and XENIX Networking Software, the user can implement a complete seven layer solution for MULTIBUS systems as well as IBM PCs. The OpenNET product line provides quick time-to-market networking solutions.

Table 55. OpenNET™ LAN Products

Product	Description
iSBC 186/51 COMMputer™	• Integrates processing and communications capabilities onto a single board • Ethernet (IEEE 802.3) and two serial (RS-232/RS-422/RS-449) connections supported • Designed around the 80186 microprocessor and the 82586 LAN Coprocessors • Two iSBX bus connectors for low cost expansion
iSBC 552 Ethernet COMMengine and iSXM 552 Ethernet Transport Engine	• Dedicated Ethernet (IEEE 802.3) peripheral board • Based on the 80186 microprocessor and the 82586 LAN Coprocessor • Supports iNA 960 ISO Transport/Internetwork software • Can be used with multiple operating systems • iSXM 552 is preconfigured version providing a turnkey solution for ISO layers 1-4
iSBX 586 Ethernet Data Link Engine	• Low cost solution for Ethernet (IEEE 802.3) connections • Single wide iSBX MULTIMODULE for use with MULTIBUS boards with 16-bit iSBX capabilities • Takes advantage of the high performance 82586 LAN Coprocessor • 16KB of on-board buffer memory
Intellink	• Connects up to nine Ethernet compatible end nodes without the need for transceivers and coaxial cable • Can be connected directly to an Ethernet cable through a standard transceiver and transceiver cable
iSXM 554 MAP COMMengine	• Front End Communications Engine that supports a complete seven layer MAP solution • 10 Mbps IEEE 802.4 Broadband Token Bus Interface • Supports Preconfigured iNA961 ISO Transport/Internetwork Software • Intel's MAP Software for layers 5 through 7 can be run on-board
iNA 960 Transport/Network Software	• Supports both Ethernet (IEEE 802.3) and MAP (IEEE 802.4) protocols • Compatible with ISO Transport (8073) and Network (8473) standards • Provides reliable "virtual circuit" process-to-process message delivery service • Runs on 8086 and 80186 systems with the 82586 LAN Coprocessor

POINT-TO-POINT COMMUNICATIONS

Intel also provides the building blocks for point-to-point communications. These products can be used in terminal cluster control, modem control, host communications or general purpose applications. The product family supports a variety of communication electrical interfaces and protocols to allow open systems flexibility.

Table 56. Point-to-Point Communication Modules

Product	Description
iSBC 188/48 COMMputer™	• Intelligent 8 channel single board system • 6 MHz 80188 • Expandable to 12 channels via 2 iSBX 354 • Supports ASYNC/SYNC, SDLC/HDLC • Supports RS232C on 6–8 channels, RS422 on up to 2 channels
iSBC 88/45 ADCP (Advanced Data Communications Processor)	• Intelligent communications controller can function as single board multimaster CPU or slave data comm gateway • 8 MHz 8088/10 (8088-2) Microprocessor • Three half/full duplex communication channels support HDLC/SDLC/ASYNCH/SYNCH operation • Two iSBX bus connnectors to expand to 5 communication channels with iSBX 351 or iSBX 352 serial expansion MULTIMODULE boards
iSBC 544 Intelligent Communications Controller	• Acts as a single board communications controller or an intelligent slave for multi-terminal communications expansion • On-board dedicated 8085A CPU provides communications control and buffer management for 4 programmable synchronous/asynchronous channels • 10 programmable parallel I/O wires compatible with Bell 801 Automatic Calling Unit (ACU)
iSBC 534 Four-Channel Communications Board	• Four fully programmable synchronous and asynchronous serial communications channels • 16-bit parallel I/O interface compatible with the Bell 801 Automatic Calling Unit (ACU)
iSBC 354 Programmable Serial I/O MULTIMODULE Board	• Provides two serial Synchronous/Asynchronous communications channels using 82530 SCC • Serial interface RS232C or RS422A/449 • Supports HDLC/SDLC
iSBC 351 Programmable Serial I/O MULTIMODULE Board	• Provides serial communications capability using 8251A USART • Serial interface RS232C or RS422/449 buffered • Software programmable baud rate generator

SPEECH TRANSACTION PRODUCTS

The Intel Speech Transaction Family, iSBC 570, iSBC 576 and iSBC 577, is a set of products that provides a minimal risk path to adding speech Input/Output (I/O) to your product line. The Speech Transaction Family will allow you to move from evaluation to integral speech driven products without major redesigns. Depending on your stage of product development, whether it is an evaluation, a product simulation, an add-on speech option, or a fully integrated speech product, the Speech Transaction Family's flexibility allows your speech I/O application to grow with a minimal amount of engineering effort.

The iSBC 570, Speech Transaction Development Set will plug directly into your Intellec® Microcomputer Development System. The iSBC 576, Speech Transaction Board is compatible with Intel MULTIBUS single board computers, peripherals, card cages, and power supplies. If you desire, the iSBC 576 can be used with any non-MULTIBUS host system by communication via a RS232C serial link.

Table 57. Speech Transaction Products

Product	Description
iSBC 570 (Speech Transaction Development Set)	Complete Development Support Set for Intel Speech Product Family. The set includes: • Speech Transaction Generator • iSBC 576 Speech Transaction Board • iSBC 575 Operator Control Unit • Microphone • Demo Program This package is intended to provide the ability for technology evaluation, application development and application simulation.
iSBC 576 (Speech Transaction Board)	The iSBC 576 Speech Transaction Board is the heart of a speech I/O system. Besides providing Automatic Speech Recognition (ASR), a ROM-resident Speech Transaction Manager is included on the board. This provides a flexible operating structure for the system designer with a fully buffered speech generated input—transaction handling capability.
iSBC 577 (Speech Transaction Recognition Chip Set)	The iSBC 577 Speech Recognition Chip Set is a solution for high volume/maximum value-added speech I/O solutions. The chip set contains the Intel-developed proprietary components from the iSBC 576 Speech Transaction Board.
Development Support	See Development Systems Section.

OEM SYSTEMS

OPEN MULTIBUS® SYSTEMS DESIGNED FOR THE OEM

Intel offers the System 300 family of microcomputer systems based on the MULTIBUS (IEEE 796) standard and the industry standard 8086 or high performance 80286 microprocessors. These systems have been carefully engineered as Open Systems. They are:

- Open to the latest VLSI silicon
- Open to the OEM's special requirements
- Open to aftermarket suppliers of hardware and software
- Open to multiple levels of integration by the OEM

System 310 is the lowest cost system in the System 300 family, and is based on 5¼" peripherals and a seven slot MULTIBUS cardcage. The new System 310 AP offers significantly higher performance along with greater memory capacity and peripheral expansion options.

System 380 is a more expandable system which is based on 8" peripherals and a 14-slot MULTIBUS cardcage.

Both systems are available in several models which vary based on microprocessor, peripheral capacity, RAM, and other system charcteristics. The attached chart provides details, but contact your local Intel sales office for the latest information about any new models.

Intel's 311 is a flexible peripheral expansion sub-system for the Intel 310. With three full-height 5.25" bays, the 311 provides 310 users with a wide range of peripheral expansion options that include tape, Winchester, and floppy drives.

The 311 can be configured to any combination of peripherals desired by OEMs. The 311 can be ordered in its maximum configuration, with two full height Winchester drives, a half height tape and a half-height floppy, or in any subset of that configuration (for example: a "tape only" configuration or a "Winchester disk/tape" configuration). OEMs can also order the chassis-only configuration and integrate their own peripheral devices.

Extensive software is available for the System 300 family, including four operating systems supported by Intel. The iRMX Operating System is a widely accepted real-time, event driven operating system designed for use on the 8088/8086/80188/80186/80286 microprocessor architecture. The new iRMX 286 offers the same powerful features as iRMX 86 but uses the advanced capabilities of the 80286 processor to offer 16 Mbytes of memory addressing and enhanced debugging and reliability features through use of the memory protection circuits on-chip. XENIX* 286 R3.0 is an enhanced, fully licensed version of Bell Laboratories UNIX operating system designed for interactive applications that require standard off the shelf applications software. MS-DOS* is the standard operating system for IBM compatible personal computers.

Many popular programming languages and application software packages are also available. For information about specific languages or application software, please contact your local Intel sales office.

Table 58. System 310 and System 310AP Product Features

Feature	System 310 Model 35	System 310 AP Model 17	System 310 AP Model 40	System 310 AP Model 41	System 310 AP Model 42	System 310 AP Model 44	System 310 AP Model 142
CPU	8086 (8 MHz)	80286 (8 MHz)	80286 (8 MHz)	80286 (8 MHz)	80286 (8 MHz)	80286 (8 MHz)	80286 (8 MHz)
H/W Floating Point	8087 (8 MHz)	80287 (8 MHz)	80287 (8 MHz)	80287 (8 MHz)	80287 (8 MHz)	80287 (8 MHz)	80287 (8 MHz)
RAM Memory	640KB	1MB	1MB	1MB	1MB	1MB	2MB
RAM Expanded to	896KB	16MB	16MB	16MB	16MB	16MB	16MB
Flexible Disk	320KB	320KB	320KB	320KB	320KB	320KB	320KB
Hard Disk (Formatted)	16MB	16MB	36MB	36MB	36MB	36MB	126MB
Cartridge Tape Back-Up	—	—	—	—	YES	—	YES
Serial I/O	2	2	2	10	10	6	10
Parallel I/O	1	1	1	1	1	1	1
MULTIBUS Slots	5	5	5	4	4	4	4
O/S	iRMX 86	iRMX 86 iRMX 286 XENIX 286	iRMX 86 iRMX 286 XENIX 286	iRMX 86 iRMX 286 XENIX 286	iRMX 86 iRMX 286 XENIX 286	iRMX 86 iRMX 286 XENIX 286	iRMX 86 iRMX 286 XENIX 286
Programming Languages	ASM, FORTRAN, COBOL, C, PL/M, PASCAL, BASIC (Not all programming languages are available on every O/S)						
Application Software	Many popular packages are available including spreadsheets, word processing and general office automation (Not all applications packages available on every O/S)						
Size Width 17 inches /43.2 centimeters Depth 20 inches/50.8 centimeters Height 5.5 inches/16.5 centimeters	System 310 may be mounted vertically in a floorstand or rack mounted Weight is less than 60 pounds/28 kilograms						

Table 59. System 311 Configurations

Features			Order Code	
W	W	T	115V	220V
		60MB	A02	B02
40MB			A13	B13
40MB		60MB	A14	B14
40MB	40MB		A16	B16
40MB	40MB	60MB	A17	B17
140MB			A33	B33
140MB		60MB	A34	B34
140MB	140MB		A36	B36
140MB	140MB	60MB	A37	B37

The various System 311 configurations are listed in Table 59 with their corresponding order codes:

W = 40MB (36MB formatted) 5.25″ Winchester Disk

140MB (126.9MB formatted) 5.25″ Winchester Disk

T = Archive 5.25″ 90 iPS streaming cassette drive. Up to 60MB using 600′ cartridge

NOTES:
1. All configurations come with external cables required for connection to 310 host system.
2. All configurations require separate purchase of "Host Controller SXMs" for installation in the host 310 system.
3. "311 Upgrade Kits" for OEM addition of Winchester drives or tapes are also separately orderable.

OEM PACKAGING PRODUCTS

Intel's MULTIBUS packaging product line consists of card cages, power supplies, and chassis which function to house, power, and cool single board computers and their peripherals. They provide the optimum operating environment for MULTIBUS applications.

Table 60. Chassis

Features	iSBC® 661-1	iSBC® 660	iSBC® 655	iCS™ 80/640	SYP 384-7	SYP 310-90
No. of Slots	8 2 iSBX 6 iSBC	8	4	4, expands to 12	14	7
Power	230W	230W	108W	230W	500W	220W
Current Supplied +5V	30A	30A	14A	30A	70A	30A
+12V	4.5A	4.5A	2.0A	0.5A	6.3A	4.7A
−12V	1.75A	1.75A	0.8A	0.75A	5.0A	4.7A
−5V	1.75A	1.75A	0.9A	0.75A	3.5A	N/A
+24V −24V	N/A	N/A	N/A	N/A	N/A	N/A
Input VAC	100, 120, 220, 240 VAC ±10%	100, 120, 220, 240 VAC ±10%	100, 115 215, 230 VAC ±10%	100, 120, 220 240 VAC ±10%	110/220 VAC ±15%	110/220 VAC ±20%
Input Frequency	47–63 Hz	47–63 Hz	47–63 Hz	47–63 Hz	50–60 Hz	47–63 Hz
Rack-mount	Yes	No	Yes	Yes	No	No
Slide Rack-mount	Yes	Yes	Yes	No	Yes	Yes
Table-Top	Yes	No	No	No	Yes	Yes
UL Certified	Yes	No	No	No	Yes	Yes
CSA Certified	Yes	No	No	No	Yes	Yes
FCC Certified	Yes	No	No	No	Yes	Yes
VDE Certified	Yes	No	No	No	No	Yes
Peripherals Supported	No	No	No	No	No	2" x 5¼"
Size						
Width	16.95"	19"	16.9"	17.4"	16.75"	16.5"
Height	8.75"	7"	3.5"	17.5"	12.25"	6.5"
Depth	19"	19"	19.4"	11.25"	21.0"	20"

Table 61. Cardcage Assemblies

Model	Application	No. Slots	Bus Arbitration	Multiple Processors Supported	Size (W×H×D)
iSBC 604 iSBC 614	Terminator Expansion	4	Serial	3	14.2 × 3.34 × 8.5 in
iSBC 608 iSBC 618	Terminator Expansion	4	Parallel	8	13.16 × 7.50 × 8.38 in

Table 62. Power Supplies

Model	Type	Watts	Input VAC	Current Output				Power Fail Signal	OVP	Accreditation	Size (L×W×H)
				+5	−5	+12	−12				
iSBC 640	Linear	230	100/120/220/ 240 VAC ± 10%; 47–63 Hz	30A	4.5A	1.75A	1.75A	Yes	Yes	UL, CSA	12.65 × 6.66 × 8.19 in

Table 63. Accessories

Model	Description
iCS-910	Analog Signal Conditioning Panel, 16/32 Channels
iCS-920	Digital Interface Panel, 24 Channel, Low Power, Optical Isolation
iCS-930	Digital Interface Panel, 16 Channel, High Power, Triac/SCR Optical Isolation
SYP 982	Front Bezel Kit for Rack-Mounted SUP384-7 Chassis

DATABASE PRODUCTS

Intel offers database management systems for a variety of users. The Data Pipeline™ products are an integrated series of microprocessor products that are designed to distribute data and data processing in today's modern office environments. The iDIS™ system is the primary Data Pipeline product.

DATABASE INFORMATION SYSTEMS

The Intel Database Information System (iDIS) is a complete, fully-integrated hardware/software microcomputer-based system that is a high level building block for departmental-level applications. The iDIS system provides user-friendly access to mainframe databases and application data files, and serves as a gateway between end-user personal computers and terminals, and mainframe data. Access to the mainframe databases is gained through menu-driven extract facilities. The iDIS databases can be populated through a host database extract (i.e., from a specific DBMS) or through remote file transfers that allow data down-loads from any application file system.

As an application delivery tool, the iDIS system provides a full range of information processing functions to multiple concurrent users at all levels of technical skills. The iDIS operating system is provided by XENIX, an enhanced version of UNIX. Electronic mail and electronic calendar are included.

The iDIS software provides a local relational DBMS facility, a word processor, a spreadsheet, and a menu processing system. The relational DBMS supports an interactive query/update language similar to that of IBM's SQL Data System. It also includes programmatic interfaces and bulk loading/unloading of data. The word processing system allows a full range of document preparation functions for both technical and non-technical users. The spreadsheet system supports "what if" decision-modeling with a two-dimensional matrix, or 'spreadsheet'. Interrelationships among the data are automatically maintained and data can be entered from the keyboard, the iDIS DBMS, a down-loaded mainframe database, or XENIX file.

Application development is facilitated by a screen menu/form development package, an on-line help processor, C programming language, and a full-screen editor. Other programming languages are also available.

Table 64. iDIS™ Database Information System

Standard Hardware	286-based, 1 Mb RAM, 320 Kb floppy storage, 40 Mb Winchester storage, support for 10 terminals or PCs.
Standard Software	XENIX, C programming language, iDB (relational DBMS), help (interactive user assist), iMENU shell, generic remote file transfer, electronic mail, electronic calendar, PC networking software.
Hardware Options	Winchester disk storage 40 Mb, 80 Mb and 140 Mb expandable to ½ gigabyte. Display terminal Printer (character, 200 cps) Communications: RJE (HASP or 3780/2780) or 3270 BISYNC
Software Options	iMENU (menu/forms development iWORD (word processing) iPLAN (spreadsheet) Host Database Extract COBOL programming language

QUALITY AND RELIABILITY

INTEL CORPORATE QUALITY POLICY

It is the policy of Intel Corporation to design, manufacture, and deliver products that not only meet the specified standards, but also satisfy our customer standards and perform reliably in their applications. To this end, Quality & Reliability at Intel has the authority to exercise control of quality & reliability over every phase of design, procurement and manufacturing processes.

CORPORATE QUALITY OVERVIEW AND CULTURE

Since the inception of the company, Intel has been recognized as an innovator and a leader in product quality & reliability—from silicon solutions to system products. This leadership was not achieved by accident. It resulted from a combination of clearly defined objectives, careful planning and thorough execution. At Intel "Quality" is a commitment, a philosophy, and a goal: a commitment to satisfy our customers' needs; a philosophy practiced as "do it right the first time" hinged on personal recognition that quality ownership rests on each individual; and a goal of excellence in the world marketplace.

ORGANIZATION: AN EFFECTIVE QUALITY MATRIX

All Q & R organizations come under a uniform policy, while still maintaining the flexibility to service the specific needs of all product areas. To perform in this manner, a unique matrix organization was developed. All Quality & Reliability functions report directly through Operations or Site Q & R Managers to the Director of Q & R for major policy and procedural matters. The flexibility is obtained by the Site/Operation QA Managers also reporting, in a matrix, to the Operation of Division General Managers for all matters related to production and products.

Additionally, each product group has a Q & R organization under a single manager. This involvement on product specific levels provides the Customer and Intel with the timely response needed to maintain a product that meets all the customer requirements and totally complies with internal and external specifications. Should a problem arise, it is handled quickly and effectively at local levels, and elevated, if need be, to the rest of the organization. This results in a "team" approach among quality, reliability, design engineering, manufacturing, procurement—making state-of-the-art technology available in usable form to our customers.

COMPONENTS GROUP QUALITY AND RELIABILITY

The objective of the Components Quality and Reliability organization is to drive the component DPM (defects per million) down to the lowest possible level and to achieve unexcelled reliability for all of our components to all of our customers. To this end, Intel has built a Quality and Reliability organization dedicated for problem prevention and problem solving. As problems are identified through the various inspections, monitors, qualifications, or by our customers, corrective actions are defined, implemented, and monitored to ensure a permanent solution.

COMPONENT RELIABILITY

The Component Reliability organization consists of three groups who are responsible for the development and qualification of Intel's reliable processes and products. Reliability Engineering is also an important member of a problem solving team whether the problem occurs in design, manufacturing or in use by the customer.

1. **Process Reliability**—responsible for doing fundamental reliability studies on Intel's Fab processes and defining the design and process parameters under which reliability of the products can be assured.
2. **Package Reliability**—responsible for doing fundamental reliability studies on Intel's assembly processes. Additionally, this group qualifies and monitors all assembly processes, assembly plants and package types.
3. **Device Reliability**—responsible for defining and executing the qualification of all products prior to revenue shipment. This group is located at the site and reports in a matrix to the division general manager responsible for the product.

COMPONENT QUALIFICATION

The key to establishing a new product, process or package, or to changing an existing one, is meeting the rigid qualification requirements. Qualification must be run and approved by the appropriate reliability department before any revenue shipment can be made. The reliability goals which have been set during the concept stage must be demonstrated by the qualification. Consider one example, the qualification of a new wafer fab technology for one time programmable EPROMs. The first five wafer lots face the following tests during qualification:

125°C burn-in	168 hours
125°C lifetest	2000 hours
150°C HTRB	1000 hours
Low-temperature lifetest	1000 hours
250°C storage	1000 hours
85°C/85% RH	1000 hours
Steam	168 hours
Temperature cycle	−55°C to +125°C
Thermal shock	−55°C to +125°C
Test pattern study	
Program/erase cycling	
System verification	

The sequence of tests determines infant mortality, random failure rates, and associated failure mechanisms. This data also becomes the basis of reliability reports made available to our customers.

COMPONENT RELIABILITY MONITORING

While successful completion of qualification is the key to product introduction, it would be meaningless if the device were not sampled throughout its product life. On a rotating product bases, 125°C dynamic burn-in and lifetests are performed continuously to monitor all technologies. Fifty thousand devices each month are allocated for the Reliability Monitor Program by the Components Division. In this manner, all generic technology families are continuously scrutinized to ensure that reliability goals are met.

In the same manner, Intel Package Reliability performs an extensive package monitor program to ensure the mechanical integrity of every package type produced by every assembly facility.

COMPONENT QUALITY

The Component Quality Organization consists of three groups who are responsible for the development of quality systems and the inspection and monitoring of raw materials, processes and products such that the end product will meet the needs of the customer in both Quality and Reliability.

1. **Quality Engineering**—responsible for defining and implementing quality systems. Problem identification, problem solution, and problem prevention are the major emphasis of the quality engineer.
2. **Materials Quality Control**—responsible for ensuring that all piece parts and raw materials meet Intel's needs for the production of reliable quality components. MQC engineers develop inspection procedures for masks, chemicals, gasses, and package components and work with our vendors to help them solve their quality problems.
3. **Product Assurance**—responsible for ensuring that all components shipped meet Intel's quality requirements. To achieve this goal, inspection gates are placed throughout the process and prior to shipment to the customer. Additionally, this group is responsible for process controls in manufacturing to minimize the effect of process variations on product quality and reliability.

SPECIAL COMPONENT QUALITY PROGRAMS

1. **FACR's**—The need for an Intel-customer correlation effort has grown with device complexity. In response to this need, an FACR (Failure Analysis Correlation Request) system has been estabished within each division or operation. Operating through the Field Sales Engineers, the object of the program is to eliminate electrical test discrepancies between Intel and its customers in a timely manner. The system provides direct contact with a product-oriented Quality Engineer to eliminate test program or equipment discrepancies between the customer and Intel without returning all products shipped. The success of the program may be measured by the number of lots that have been shipped to customers and have been questioned and accepted after utilizing FACR system. The obvious by-product of this system is to build customer confidence to the point where Intel's final test and FQA data becomes the customer's incoming inspection data.
2. **Military**—the Military Quality Assurance program, operated out of the Phoenix site, attends to customers within the aerospace or military industry or in some cases, to customers who have special documentation requirements. To perform in this product area, the Military Q.A. acts as an overlay on all sites and operations, defining the Q.A. program requirements in that particular area. The success of this program may be gauged by the acceptance of selected high-technology products by the Federal Government, and the product processing areas certified by an agency of the Federal Government. This department also performs process audits on a regular basis of applicable Intel manufacturing facilities to ensure compliance to rigid military traceability and process requirements.

SYSTEMS GROUP QUALITY & RELIABILITY (SQR)

ORGANIZATION

The Systems Group SQR organization is comprised of a central policy and standards group and a matrixed manufacturing site process and product audit group. SQR activities are in accordance with current internationally recognized standards for quality programs. Specifically, SQR is organized to support ANZI 1.8 and Z 1.15 standards. SQR is an integral part of all phases of a product's life cycle. SQR audits internal practices and organizations to assure control and foster continuous quality improvement.

1. **Systems Group Reliability Engineering (SGRE)**

   Administers the reliability program, develops new methods for predicting and demonstrating product reliability, and performs fundamental product reliability research. SGRE also manages the Systems Group environmental lab which standardizes product evaluations for vibration and shock, temperature and humidity, and reliability demonstration testing.

2. **Systems Materials Quality Engineering (SMQE)**

   Manages the overall quality program for procured items as a member of Intel's Materials Commodity Management Team. Performs supplier selection, survey, and qualification activities. Monitors supplier's process and Intel's factory yield of commodities to focus on continuous quality improvement. Certifies suppliers who demonstrate process control to enter our dock-to-stock preferred vendor program.

3. **Customer Quality Team (CQT)**

   Provides liason with customers for all quality related matters. Produces monthly managment reports with indicators of product performance in the field based on customer inputs. Champions the resolution of quality problems by responsible Intel organizations to assure the customer's problem does not recur.

4. **Manufacturing Site QA (SQA)**

   Responsible for process and product audits performed to monitor production quality and focus corrective actions to assure continuous quality improvement. SQA is matrixed to the Director of SQR to assure uniform technical standards and policies.

5. **Strategic Programs and Technologies**

   Provides long-term quality improvement programs which integrate quality technologies and processes into design, manufacturing, and administrative operations. Key programs such as statistical process control (SPC) are organized, trained, and implemented. Integrated quality information management computer programs and data analysis techniques are developed and implemented.

6. **Corporate Components Engineering (CCE)**

   Responsible for the selection, qualification, and control of all commercial electronic parts used in the designs of systems products. Provides component engineering analysis of components and Intel applications to ensure their proper specification in designs. CEE is matrixed to the Director of SQR to assure uniform technical standards and policies and reports administratively to Design Engineering.

7. **Product Safety Engineering (PSE)**

   Responsible for the evaluation and acceptance of all designs for product risk analysis, for regulatory agency compliance (such as UL, CSA, UDE, IEC, FCC), and management of field product safety programs.

PRODUCT QUALITY

Controlling product quality and reliability is a complex task requiring a high degree of integration, organizational involvement and use of specialized disciplines, notably:

— Design Control through part selection and application, design rules, circuit analysis, derating requirements and assiduous environmental and reliability qualification testing. Key to this task is that reliability engineering is part of the product development team, and thus influences the design from the onset.

— Procured Material Control through a rigorous supplier selection, qualification and monitoring process. Our computerized supplier control system automatically assures procurement only from selected, qualified and approved sources. The priviledge for any supplier to be on our approved list must be earned, while being included in our "Dock-to-Stock" program provides significant benefits to the suppliers as well as to Intel.

— Product Quality Monitoring and control through our automated reporting and analysis systems. Our system provides the right information to the Quality & Manufacturing engineers for early adverse trend detection. It also allows for product and process improvement through a corrective action system. But the final measure of our outgoing product quality is our continuous product sampling program, where finished product is subjected to a "customer audit". Only products which meet the stipulated quality levels may ship.

— Customer Quality Team reporting system completes the cycle. This full system provides timely feedback and gives us the ability to rapidly improve the product design and manufacturing processes.

Our approach to quality is based on a very fundamental policy: DO IT RIGHT THE FIRST TIME, while our quality philosophy is structured on two Intel corporate objectives. OUR PRODUCTS MUST MEET THE CUSTOMERS NEEDS AND BE IN ABSOLUTE COMPLIANCE TO OUR SPECIFICATIONS.

To provide you with additional insight on how the Intel Systems Group operates and assures quality of all products and services, a video tape presentation is available entitled "INTEL SYSTEMS—SUCCESS BY DESIGN". Other sources of information, more product and process specific, are our Reliability Reports, of which a number have been released. All of these can be obtained from your Distributor or Intel Salesperson.