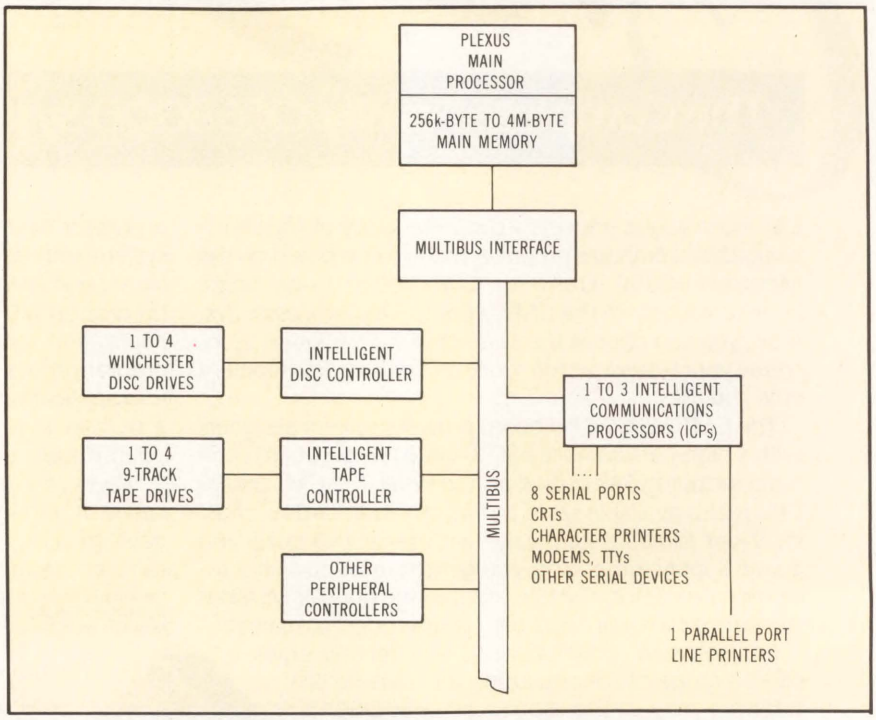
Compatible base architecture to optimize UNIX operating system



Plexus P/40 system. Industry standard hardware with extensive use of DMA channels allows intelligent controllers to offload tasks from main processors, while maintaining response time for up to 24 terminals

Specifically designed to run the UNIX operating system, Plexus P/40 computer utilizes a compatible base architecture concept to optimize the characteristics of UNIX. Plexus accomplishes this and also maintains flexibility and expansion paths for the OEM by using a distributed processing architecture that allows offloading of specialized tasks to separate processors and the standard MULTIBUS™. Thus every controller has its own processor, and different capabilities can be easily added by plugging in MULTIBUS cards that are available for a wide variety of functions.

In addition to taking advantage of UNIX multiprogramming and multi-user capabilities, the P/40 hardware design relieves some constraints imposed by a timeshared operating system. Since UNIX is memory and disc intensive, a DMA channel between disc and main memory, with a bandwidth of 3M bytes/s speeds disc transfers and overlays. A memory manager handles memory mapping and transfers between main memory and the peripheral controllers. Since UNIX is not a realtime operating system, its handling of interrupts is impaired; however, this situation is improved by multiple processors and intelligent controllers.

Memory consists of increments of 256k bytes using high speed 16k dynamic

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RAMs, expandable to 4M bytes. Organized as 22-bit words with 16 bits for data and 6 error correcting bits per word, memory performs single-bit error detection and correction, and double-bit error detection. Cycle time, with error detection and correction, is 600 ns.

The multiple processor architecture of the P/40 allows it to accept up to 8 processors, including the main or job processor; intelligent communications processors (ICPs) which handle serial communications; disc and tape controllers; and additional intelligent controllers selected by the user. Giving controllers local processing and memory greatly reduces the number of interrupts the job processor is called upon to handle, and potentially increases the number of interrupt levels in the system to several thousand. (See illustration.)

Based on the 16-bit Z-8000, the main processor includes a floating point processor that can perform single precision (32-bit) or double precision (64-bit) arithmetic functions. A battery operated realtime clock remains operational even when the system is powered down and gives the processor continuous time and date information. This feature, along with firmware power-up and self-test programs, allows a user to start up the system with a single switch.

System is designed to optimize UNIX operating system developed by Bell Laboratories. Typical 8-user Plexus P/40 has 512k bytes main memory, 72M bytes disc storage, 8-channel ICP, and 9-track tape unit

The intelligent communications processor, ICP, is designed to offload serial I/O tasks from the job processor. The ICP's onboard Z-8000 controls serial communications with eight RS-232 channels at 19.2k baud, performs buffering, and handles data transfers between the ICP and main memory. In addition to serial ports, the ICP has one parallel Centronics type port and nine DMA channels, each associated with a communications port. Data transfers between the ICP and main memory take place via the DMA channels.

Communication between the ICP and main processor takes place via command and status blocks located in main memory, which are controlled by the ICP's processor. The ICP can address 64k bytes, the lower 48k (16k are P/ROM) on its local board, and the upper 16k mapped into main memory by the system's memory manager. Plexus P/40 can handle up to three ICPs for a total of 24 users.

Other intelligent controllers supplied with the basic system include a disc controller, a storage module drive (SMD) type handling up to four 145M-byte Winchester drives; and a tape controller likewise handling up to four tape drives. The disc controller can detect an erroneous data burst up to 32 bits in length and correct a burst up to 11 bits long. It uses a 32-bit error code that it appends to each sector ID or data field when that field is written to disc. The 0.5″ (1.3 cm), 9-track 1600-bit/in tape subsystem can operate in streaming mode and back up 46M bytes in 4.8 min, or in conventional mode compatible with ANSI/IBM for exchanging data among computers. (See photo.)

Plexus deliberately chose Bell Labs UNIX Version 7 operating system, licensed from Western Electric, rather than license or write a UNIX-like system. The rationale was that programs that would run under UNIX would most likely run under systems similar to UNIX, but that the reverse was not necessarily the case. Also provided is a C compiler and a Z-8000 assembler. **Plexus Computers**, 2230 Martin Ave, Santa Clara, CA 95050.

—Thomas Williams
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