PCS Products and Services

The computers that production engineers developed.

Most computers are designed by computer specialists. People who understand digital design, but not production engineering or the special needs of industrial users.

Process Computer Systems is different. It's the one computer manufacturer that really understands what industrial environments demand of computer equipment. And, PCS's knowledge of production engineering shows throughout its entire line of products and services.

PCS makes microcomputers and microcomputer-based systems. But they're more than just computers. They're solutions. A broad range of products and supporting services innovatively developed and packaged to suit a vast array of process control requirements.

Your process control needs might involve gathering, analyzing, and sorting data, monitoring instrument readings, starting, stopping, and regulating events. They might include communicating with other computers. They might involve working in a hostile environment.

But, whatever the problem, PCS has a cost-effective solution — from a comprehensive line of compatible hardware to software, peripherals, interfaces, and customer support services.

Equipment in modular construction that makes configuring, changing, or expanding a system easy, economical, and trouble-free.

PCS systems — a new era in process control.

PCS systems — the better way to control processes.

A microcomputer monitors fire-sensing devices throughout an office building. In case of fire, the system sounds an alarm, controls elevators and doors, calls the fire department, and provides continuing information on the fire's location and rate of spread.

A self-service gas station operator has full control over the fuel pumps through a microcomputer-based dispensing system. From a keyboard, the operator can shut off a pump, switch to pre-paid operation, change prices, and get continuously updated sales and inventory records.

A microcomputer-based system monitors and controls lumber sorting by grade and dimension. It provides shift-by-shift or daily stock totals, and increases the over-all efficiency and productivity of the lumber yard.

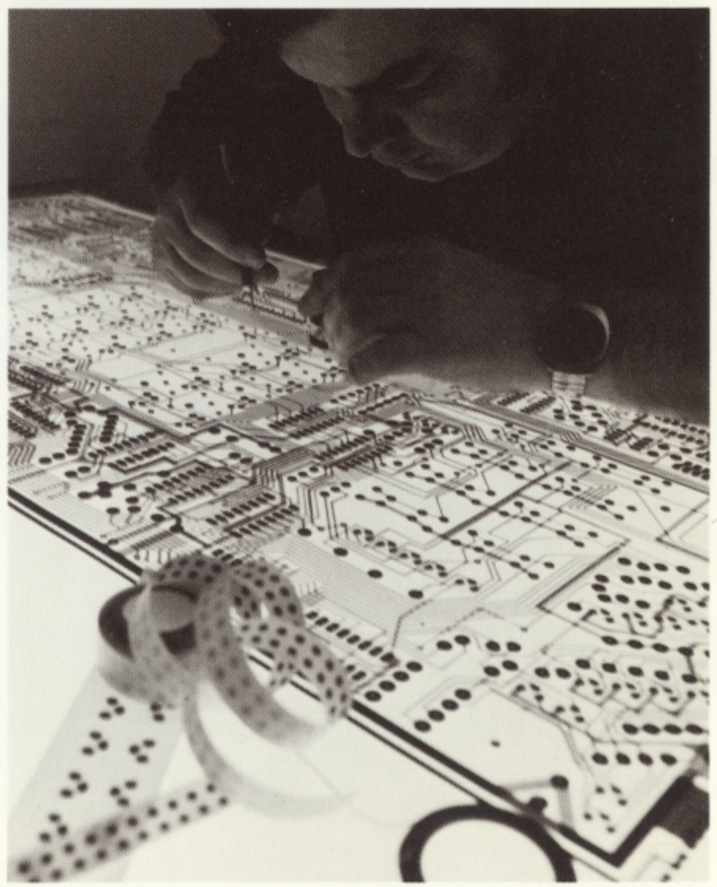
These are only a few examples of what PCS systems do. They also serve in a wide variety of other applications, including steel mills, auto assembly plants, power substations, and laboratories. But, whatever the application or environment, all PCS systems share basic similarities.

The latest technology

Not innovation for its own sake, but innovation to use the best, most up-to-date resources available to solve process control problems. PCS was the first systems manufacturer to use the Fairchild F8 and Intel 8080 microprocessors, which gave PCS systems capabilities unmatched by conventional hardwired or mechanical controls. The company introduced the first minicomputer interface to have stand-alone computer capability. PCS also originated the Flexibus™, a printed-circuit, multi-purpose backplane which makes possible a modular, "building block" approach to building process control systems. The Flexibus allows you to mix or match memory and I/O modules in any combination, without rewiring.

Adaptability

Because of the versatility of the Flexibus, PCS systems can easily adapt to change, both at first and in the future. As long as space is available in the chassis, adding or changing I/O and memory in any combination is a simple matter of plugging in printed circuit modules. Even the earliest PCS systems, developed for monitoring automobile assembly processes, have adapted easily to meet changes in industry requirements.



Low cost

Purchase prices for PCS systems compare favorably with those of other process control technologies. For many applications, a complete PCS system costs less than a hardwired sequence controller. And, the PCS system does much more.

But purchase price alone is only one part of the cost picture. Consider the savings that PCS adaptability can mean. If your requirements change or grow, you don't have to replace an entire system. You add or change only what you need.

The benefit of PCS production engineering know-how.

PCS expertise goes far beyond system design alone. It also encompasses the processes the system must control. For you, this means equipment that's really tailored to the job. Equipment that can survive hostile industrial environments. And a level of applications experience and knowledge other computer manufacturers can't match.

PCS offers a choice

When you have a process to control, there are two basic ways to do it. One is the conventional approach, typically using some combination of mechanical control, relay logic, or programmable controllers. But in some applications, this solution can become complicated and expensive. To control a grinding machine, for example, you must use several discrete subsystems — one for the control panel, another for status display, a third for sequence control, plus analog systems for gaging. Such a system is initially expensive, and changing or expanding it in the future can mean expensive, time-consuming redesign.

The PCS microcomputer-based approach is simpler, less expensive, and accomplishes more. One system can integrate all the functions of the subsystems the conventional approach requires — often for the cost of only one of the subsystems. If you choose, you can assign the entire process to the system in one step. Or, you can phase in the microcomputer system in increments, and master one part of the total process before turning to the next. The system's low cost and reserve capacity give you this flexibility, and let you choose the most convenient way to apply the new technology to your process.

The PCS approach also lets you change or upgrade your system design easily and economically. Unlike a hardwired control system, a PCS system is expandable. Additional I/O or memory can be plugged in as needed. The system can be reprogrammed easily if you need to modify your process. And PCS modular construction lets you change your system configuration quickly and simply, with no need to replace the entire system.

The PCS approach costs less. Less to buy because of system simplicity. Less to maintain because there are fewer subsystems and other components to malfunction. And less to own over the years because its design and construction let you keep it current with your process control needs.

A full range of services and support

PCS offers a full range of customer services, from initial configuration, applications and systems development assistance, through training, to after-sales maintenance. Whether you're an OEM or end user, whether you buy in small, medium or large quantities, PCS offers a cost-effective answer to your needs.

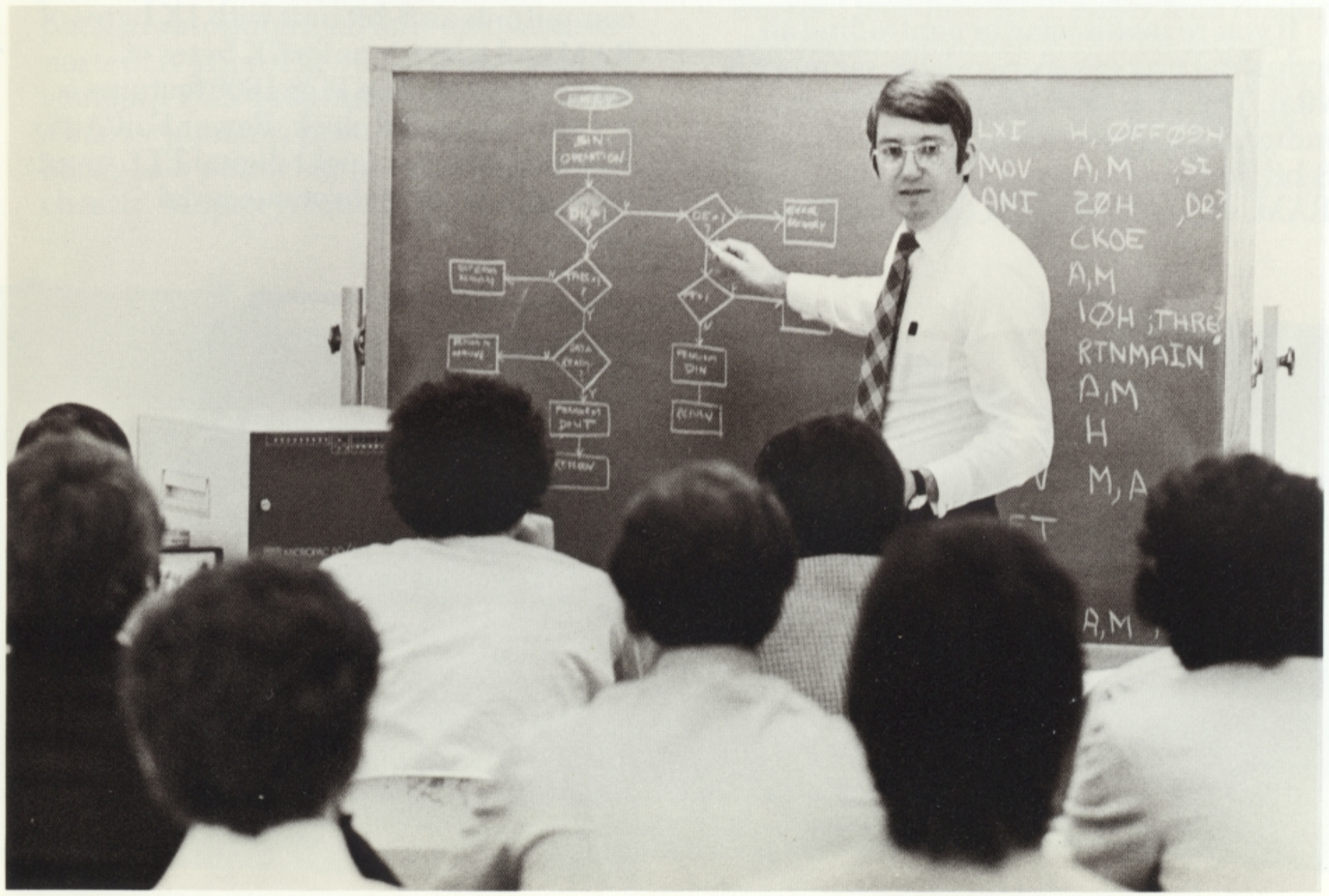
PCS customer service begins with the PCS product line, a combination of compatible off-the-shelf products and custom development services. This combination is designed to help all users, whatever their purchase quantity requirements, to develop a system with the optimum blend of standardization and custom development.

If you need small quantities, PCS's compatible hardware modules and software let you develop the right system while keeping system development costs at a minimum. If you need medium quantities, the PCS 180 line offers high-density packaging that effectively reduces hardware costs. You can take advantage of PCS's custom board, applications, and software development services, and still keep total per-system costs low. And if you need large quantities, PCS can custom develop that system that fully optimizes hardware and software for your application.

PCS customer service continues well after system delivery. The company conducts monthly workshops to familiarize customers with their PCS systems. Those who attend gain valuable hands-on experience under the guidance of qualified PCS instructors.

PCS design and construction maximizes system up-time. Exerciser routines in software help identify hardware problems early. High-density construction reduces the number of components that can malfunction. And every PCS system undergoes a rigid quality control process, which includes burn-in, testing, and inspection, before it's shipped.

But if a system needs service, repair is quick and effective. PCS modular design makes most troubleshooting a simple matter of plugging in a new module. And new modules are available quickly through the PCS board exchange program, under which a replacement module is shipped the same day an order arrives.



PCS microcomputers — the compatible industrial family

SuperPac 180

The SuperPac 180 is a revolutionary microcomputer system. It's the first computer to display front panel format and computer activity on an integral CRT screen. It provides a powerful front panel and integral display at a lower cost than that of most displays alone.

The SuperPac 180 System includes a PCS 1806 microcomputer, as well as a self-contained CRT and keyboard interface module. The unit has display memory; character generation, timing, and video electronics; 16-line, 16 or 64 character per line display capability; 1024 directly addressable character locations; programmable cursor, blink, and reverse video capabilities.

The SuperPac 180 is especially versatile for OEM applications. A user can add additional interface modules, and, if desired, the CRT interface module can be connected easily to a larger CRT monitor or to a different keyboard. Expanded chassis are available for larger configurations.

MicroPac 180

The MicroPac 180 is a low-cost, rack-mountable industrial microcomputer system. The MicroPac 180 includes a PCS 1806 microcomputer, as well as a four-slot chassis, power supply, and industrial front panel with on-off switch and status indicators.

PCS Single Board Microcomputers

If you're monitoring or controlling an industrial process, dependable memory is vital. The PCS 1810 has it. This powerful industrial microcomputer incorporates an 8-bit microprocessor, 256 bytes of CMOS RAM, expandable to 1K bytes, and provisions for 3K bytes of EROM/ROM. The PCS 1810 features Power Fail/Auto Restart and battery backup that can support the CMOS RAM for up to 10 days. The unit also includes a crystal-controlled clock, 16 3-30Vdc digital inputs, 16 30Vdc 500mA digital outputs, a 20mA current loop or RS232 serial I/O port, external interrupt, programmable baud rate 110-9600, five interval timers, DMA capability, and tristate bus port.

For applications where battery backup is not important and where more memory is required, PCS offers the less costly PCS 1806 microcomputer. This microcomputer is an 8-bit unit with 1K bytes of RAM and provisions for 7K bytes of EROM/ROM. The PCS 1806 features a crystal-controlled clock, Power Fail/Auto Restart interrupt, eight digital TTL inputs and outputs, asynchronous serial

transmitter/receiver, 20mA current loop, software programmable baud rates 110-9600, five timers, two programmable LED indicators, external interrupt, tristate bus port, and DMA capability.

Both the PCS 1806 and PCS 1810 are available as single board microcomputers or as 4-slot, 8-slot, and 20-slot chassis systems with power supplies.

MicroPac 80/A Basic multi-slot systems

The MicroPac 80 Basic is the most versatile microcomputer product family available today. System builders may choose from almost fifty different interface and peripheral options, all fully software supported. A MicroPac 80 Basic includes a standard PCS 4400 microprocessor board, a bus terminator, printed circuit backplane power supply, and a 20-slot chassis. Memory, interface, peripheral, and an optional industrial front panel for rack-mounting also are available.

PCS peripherals

All PCS microcomputers offer a full range of peripherals designed to enhance program development and support production systems. Peripherals include a programmer's console that includes a keyboard, 30 cps printer, and dual 1200-baud tape cassettes; a display terminal with alphanumeric video display/keyboard, 1920-character display (24 lines × 80 characters), 64 ASCII character set that operates at 2400 baud via current loop interface; paper tape reader and punch; standard ASR 33 teletypewriter; a fully buffered line printer with a speed of 60-200 lpm, 132 columns and a 64 ASCII character set; and a floppy disc system with a storage capacity of 1M bytes, (250K bytes per drive), and full sector read/write buffers that allow asynchronous data transfers to and from the microcomputer.

PCS PROM programmer

A desktop PROM programmer is available that may be used to program or copy a PROM or EROM in less than a minute. Typically used as part of the MicroPac Development System, the unit detects errors or non-zero PROMs at the start and verifies each chip after each programming cycle. The PCS PROM programmer features dual chip sockets so that an original PROM and a duplicate may be examined directly. Each byte of a PROM to be burned-in is automatically checked to ensure that chips with bytes already burned-in are reported via a computer print-out, with each error accompanied by an explanatory statement.

PCS Architecture and Software

From the earliest systems to the most recent, PCS architecture has been bus-oriented, offering system builders a design flexibility unequaled in the microcomputer industry. Using a unique PCS printed-circuit backplane, called the Flexibus, all I/O slots are treated as memory locations so that the CPU conducts I/O operations via memory reference instructions. Memory and I/O modules, therefore, can be easily mixed or matched in any combination, as long as chassis slots are available.

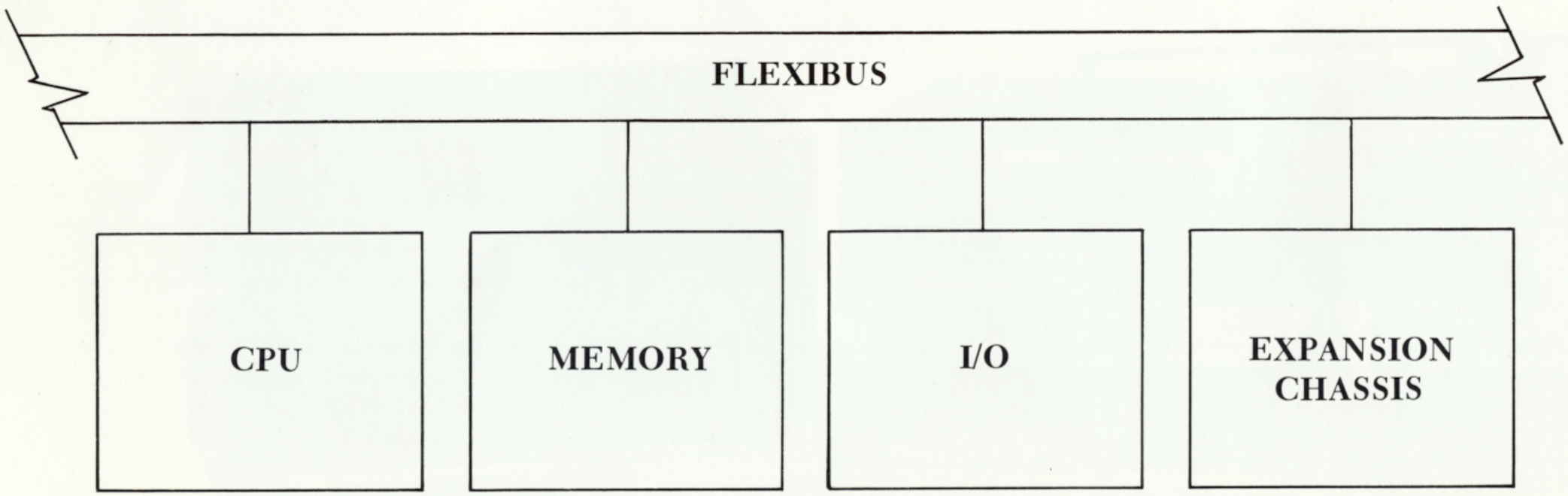
I/O modules have hard-wired addresses printed on the Flexibus so that you can interchange modules in a system by simply plugging in each board.

Memory registers have 16-bit addresses, providing the CPU with direct access to as many as 64K memory or I/O bytes. High-density modules in the MicroPac 180 series allow considerable expansion to meet customer requirements. In the MicroPac 80 series, up to 16 expansion chassis, each addressed via its address switch, can be added.

PCS software makes programming systems convenient and efficient. The PCS software list includes assemblers, loaders, debuggers, editing programs, and a library of I/O conversion and mathematical routines. PCS software permits easy system implementation and saves programming time by eliminating much of the duplication and repetition that program writing often involves. PCS software is compatible with both the MicroPac 80 and MicroPac 180 families. Programs to run on a MicroPac 180 can be generated on a MicroPac 80/A. Programs previously used on a MicroPac 80 can run on a 180.

Basic operating system (BOS 80/A) — programs MicroPac systems to operate as efficient development systems. BOS 80/A includes a driver routine for teletypewriter and CRT, and a debug program. Drivers for floppy disc, cassette printer, line printer, and tape reader and punch are also available.

Macro assembler (MAS 80/A) — is a 2- or 3-pass assembler, depending on the peripheral devices in use. It produces absolute hexadecimal object and source assembly outputs, with I/O handled by BOS 80/A. MAS 80/A includes a first-pass line editor, which greatly simplifies program editing. It also saves considerable programming time by operating as a conditional assembler. It lets the operator



program a number of routines into the source program, and then choose the routing to be included in an object tape.

Relocatable macro assembler (MAS 80R) and relocating and linking loader (REL 80)— form a powerful and flexible software package that drastically reduces software development time. MAS 80R and REL 80 let a user divide a large program into small, manageable segments and assemble and debug each one separately. The package then combines the segments into a single program. MAS 80R and REL 80 eliminate the need to assign memory addresses at assembly time; addresses are defined only at load time. They also eliminate the need to reassemble an entire program just to make one change. Together, these software items provide a level of flexibility unprecedented in microcomputer programming. Each is available separately.

Trace (Trac)— instructs the CPU to display the contents of any combination of registers or memory throughout execution of a program being developed. Trace allows the user to interact with the software under development. Programs under development are executed in an interpretive mode. As Trace executes a program, it can provide snap-shot memory dumps. It lets the operator command the computer to display register contents and then automatically resume program execution.

Editor (Edit 80/A)— instructs the CPU to locate and alter certain data strings in the program being developed. Edit 80/A is especially useful for changing an instruction that reoccurs throughout a program.

Debug (DBG 80)— lets the user display or change memory or register contents via the console printer and keyboard, display or dump memory contents between boards onto the console printer, and insert breakpoints in the program. DBG 80 allows full operator control over test program execution.

Library of I/O, conversion, and mathematical routines (LBR 80)— is the most extensive list of I/O, conversion, and mathematical routines available from any microcomputer manufacturer. It includes routines such as a floating point package, extended floating point, 16-bit square root, and binary to and from ASCII.

MicroPac Development System

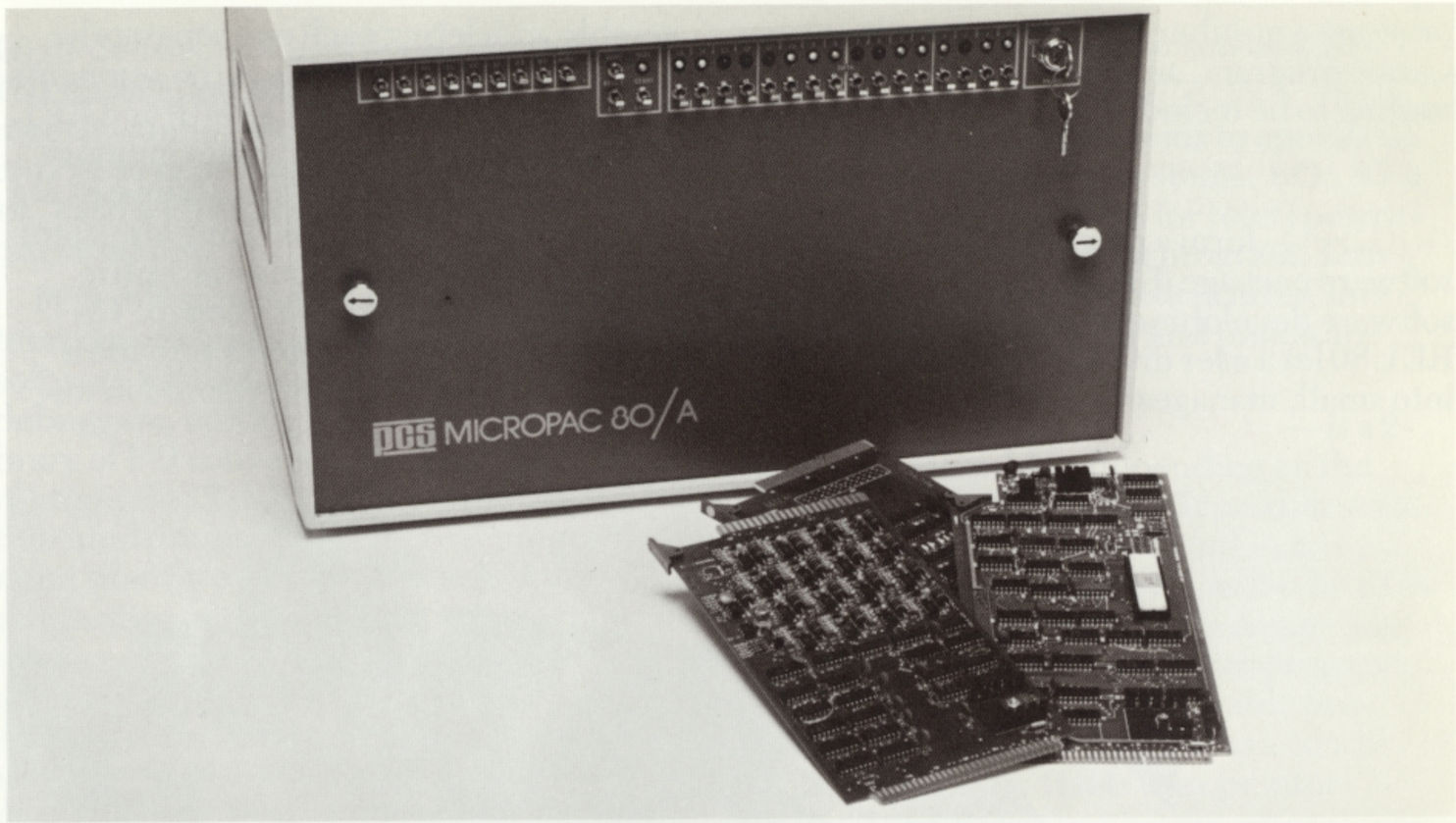
The MicroPac Development System (MPDS) combines all the hardware and software tools you need to carry your microcomputer system from design to installation in a cost-effective package. With the MPDS, you can run complete production programs, simulate a process, and develop and debug your microcomputer software, all on the same hardware that you implement. And, as your needs grow, the MPDS can be expanded to meet your changing requirements with additional MPDS options and peripheral devices.

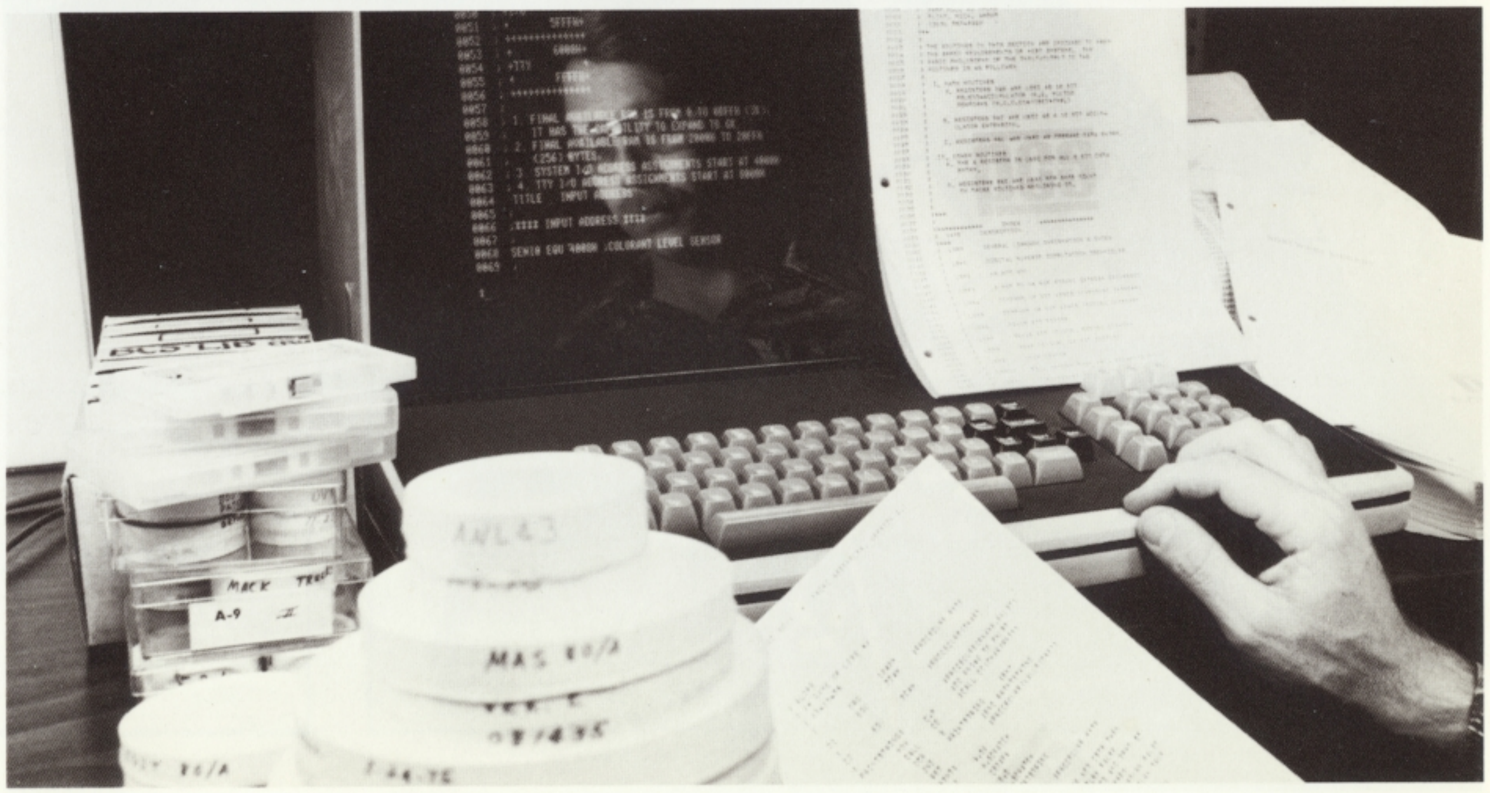
MPDS Hardware

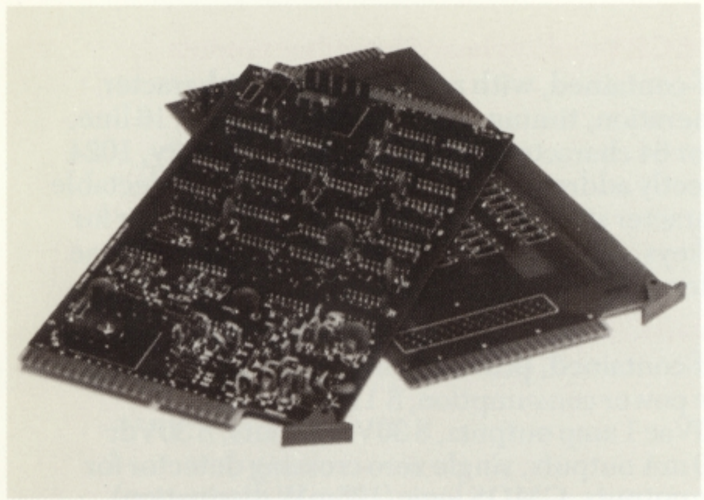
The MicroPac Development System includes the MicroPac 80/A microcomputer with 3K bytes of ROM, 16K bytes of RAM in an RS232 or 20 mA current loop serial interface (selectable baud rate 110 - 9600), and a programmer's console and interface. MPDS capabilities can be expanded by adding optional peripherals including line printers, cassette deck, floppy disc drives, CRT and standard teletypewriter terminals, and PROM programmer for either 1702 or 2708 PROMs.

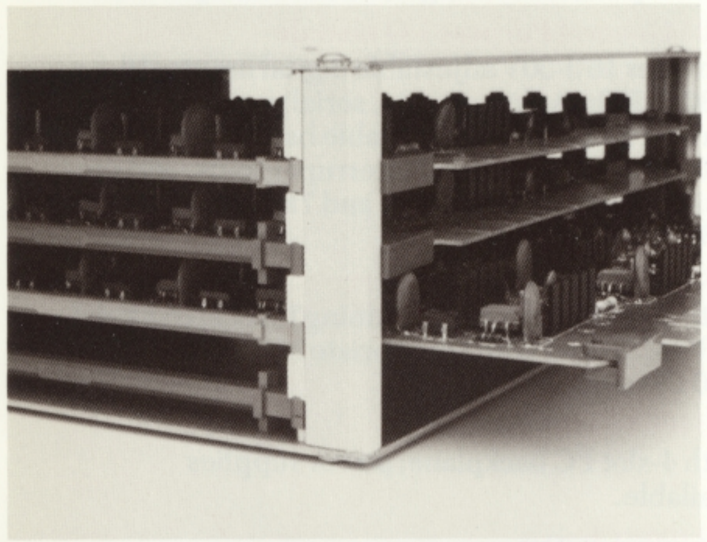
MPDS Software

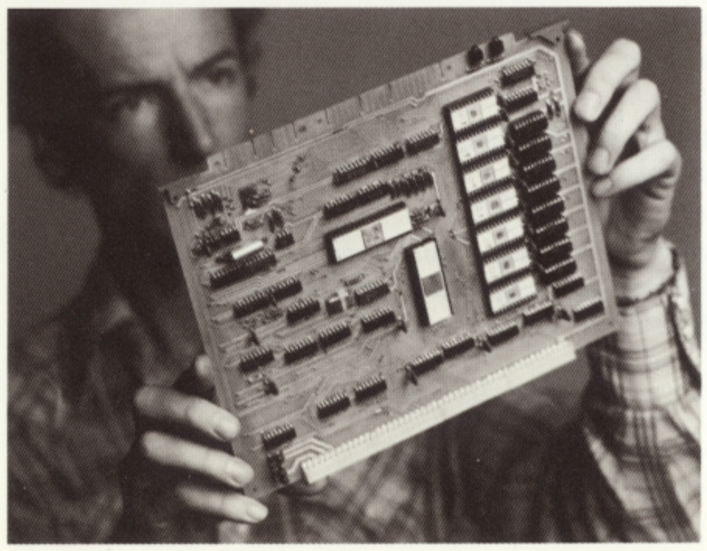
The MicroPac Development System includes the MPOS/80 operating system resident in ROM, MAS 80 relocatable macro assembler, REL 80 relocating and linking loader, EDIT 80 source editor, and LBR 80 library of I/O conversion and mathematical routines. I/O drives and handlers for optional peripherals are also available.











PCS modules — the building blocks for microcomputer systems

PCS offers a full range of microcomputer hardware features in module form for the MicroPac 80 and MicroPac 180 Series. PCS modules are fully compatible with their respective MicroPac series, and offer users important advantages.

PCS modules are the building blocks you select to assemble a complete microcomputer system. In low or moderate system quantities, hardware costs are reasonable, system development costs are held to a minimum, and the complete system is cost-effective.

PCS modules also can supplement the capabilities of an existing system. You can take advantage of PCS expansion capacity to economically add more memory or I/O, or other features you need, while avoiding the high cost of custom development. If your system quantity needs grow, PCS custom board design services can develop optimized hardware and help you reduce hardware expenses significantly.

The following PCS modules are available:

MicroPac 80 Series

CM4400 Micro CPU
self-contained, 8-bit, incorporating 8080 micro CPU, provides capability for 16-bit I/O operation, directly accesses up to 64K bytes of memory.

CM4500 Memory
with 1K bytes of RAM and provisions for up to 1K bytes of ROM.

CM4501 Memory
with 1K bytes of RAM and provisions for up to 4K bytes of RAM in 1K increments.

CM4503 Memory
with provisions for 4K bytes of EROM in 256-byte increments.

PM5001 Digital I/O Module
16 bit, provides a two-way interface between the CPU and any TTL compatible process or device; fully buffered data outputs.

PM 5004 High-Level Input Module
16-bit, accepts high level inputs (5-50 volts).

PM5005 High-Level Output Module
16-bit, provides the open collector switching necessary for signals up to 50 volts at 500mA. Output is buffered on the card.

PM5006 Optically Isolated Digital Input Module
16-bit, accepts and isolates (1500 volt) input data from 3-50 volts.

PM5007 Optically Isolated Digital Output Module
16-bit; provides data output interface and 1500 volt isolation between CPU and process or peripheral device, buffered outputs up to 50 volts.

PM5008 Interrupt Expander Module
8-channel interrupts for hardware priority.

PM5009 Relay Output Module
8-channel; provides eight 100VA Form C mercury wetted relay contact outputs.

PM5010 Digital Up/Down Counter
16-bit, records number of events through incrementing and decrementing of 16-bit up/down counter; includes maskable interrupt that detects counter overflow condition and initiates interrupt operation.

PM5011 Real-Time Clock
provides 13 programmable time bases from one microsecond to one hour.

PM5013 Real-Time Clock and Power Fail Detect
provides maskable interrupt of "pollable" flag at 10Hz rate and power fail interrupt at least 500 microseconds before low power condition stops program execution.

PS 3014 Battery Pack
provides backup power to support RAM.

PM5020 Stepping Motor Controller
2-channel, 12-bit pulsed output module provides parallel to pulse conversion between CPU and external translator.

PM5051 Digital-to-Analog Converter
2-channel, buffered outputs, selectable voltage and current ranges.

PM5054 Analog-to-Digital Converter
16-channel, capable of 10K samples per second.

PM5080 TTY Controller
provides 20mA control loop data transfer and control between CPU and terminal; includes RS232 transmit and receive capability.

PM5081 RS-232C Compatible Controller
interfaces MicroPac systems to most asynchronous modems, baud rates from 110 to 9600.

PM5082 Serial/Parallel Converter
8-bit, makes possible asynchronous full-duplex operation between computer and remote operation.

PM5061 Bus Extender
used to extend bus for scoping or signal tracing, not for expansion.

CM4402 Bus Buffer
provides expansion up to 16 chassis (256 I/O devices).

Breadboards
provides user with a tool to implement custom interface designs. Breadboards are available with 5V or 5 and 15V regulators.

EN1001 Enclosure
like a NEMA 12 enclosure, with blower, air filter, power disconnect, card chassis, power supply, bus terminator and termination panel.

MicroPac 180 Series

1810 Microcomputer
8-bit, with 8080A microprocessor, 256 bytes, expandable to 1K bytes CMOS RAM, 3K byte EROM capability, built-in battery backup that can support the CMOS RAM for up to 10 days, crystal-controlled clock, Power Fail/Auto Restart interrupt, tristate bus port, DMA capability.

1806 Microcomputer
8-bit, with 8080A microprocessor, 1K bytes RAM, 7K bytes EROM capability, crystal-controlled clock, Power Fail/Auto Restart interrupt, tristate bus port, DMA capability.

1813 Memory
self-contained, with 4K bytes RAM expandable to 16K and provisions for 16 K bytes EROM/ROM.

1814 Memory
self-contained, with 4K bytes CMOS RAM expandable to 8K, and battery backup with power sequencing and charging circuitry to prevent memory loss in case of power failure.

1820 High-level digital I/O module
self-contained, with 32 high-level 3-30Vdc programmable inputs, 32 high-level latched 30Vdc 500mA open collector outputs.

1850 High-level analog input module
self-contained, with 16 multiplexed single-ended analog inputs, expandable to 64, or 8 multiplexed differential analog inputs, expandable to 32; 4 programmable gain settings providing ±1, ±2, ±5, and ±10Vdc full scale inputs; sample and hold; 12-bit, 20kHz successive approximation A/D converters, and optionally two 12-bit buffered D/A converters, ±10 Vdc.

1812 CRT and keyboard interface module
self-contained, with refresh memory, character generation, timing, and video electronics; 16 line, 16 or 64 character per line display capability, 1024 directly addressable character locations, selectable character sizes, 8 × 8 matrix keyboard scanner for 64 keys, programmable cursor, blink, and reverse video capabilities; for use with video monitor.

1804 AC/DC input/output module
self-contained, providing high power output and low power consumption; 8 110Vac inputs, 8 110Vac 1 amp outputs, 8 30Vdc inputs, 8 30Vdc 500 mA outputs, single zero crossing detector for 8 ac outputs, CMOS logic (125mW dissipation).

1805 General Purpose I/O module
provides 16 3-30V adjustable digital inputs, 16 3-30V, 250mA dc outputs, serial port with 20 mA current loop, switch-selectable baud rates of 110-9600 baud, two external interrupt inputs, and provisions for lK bytes of RAM and 7K bytes of EROM/ROM.

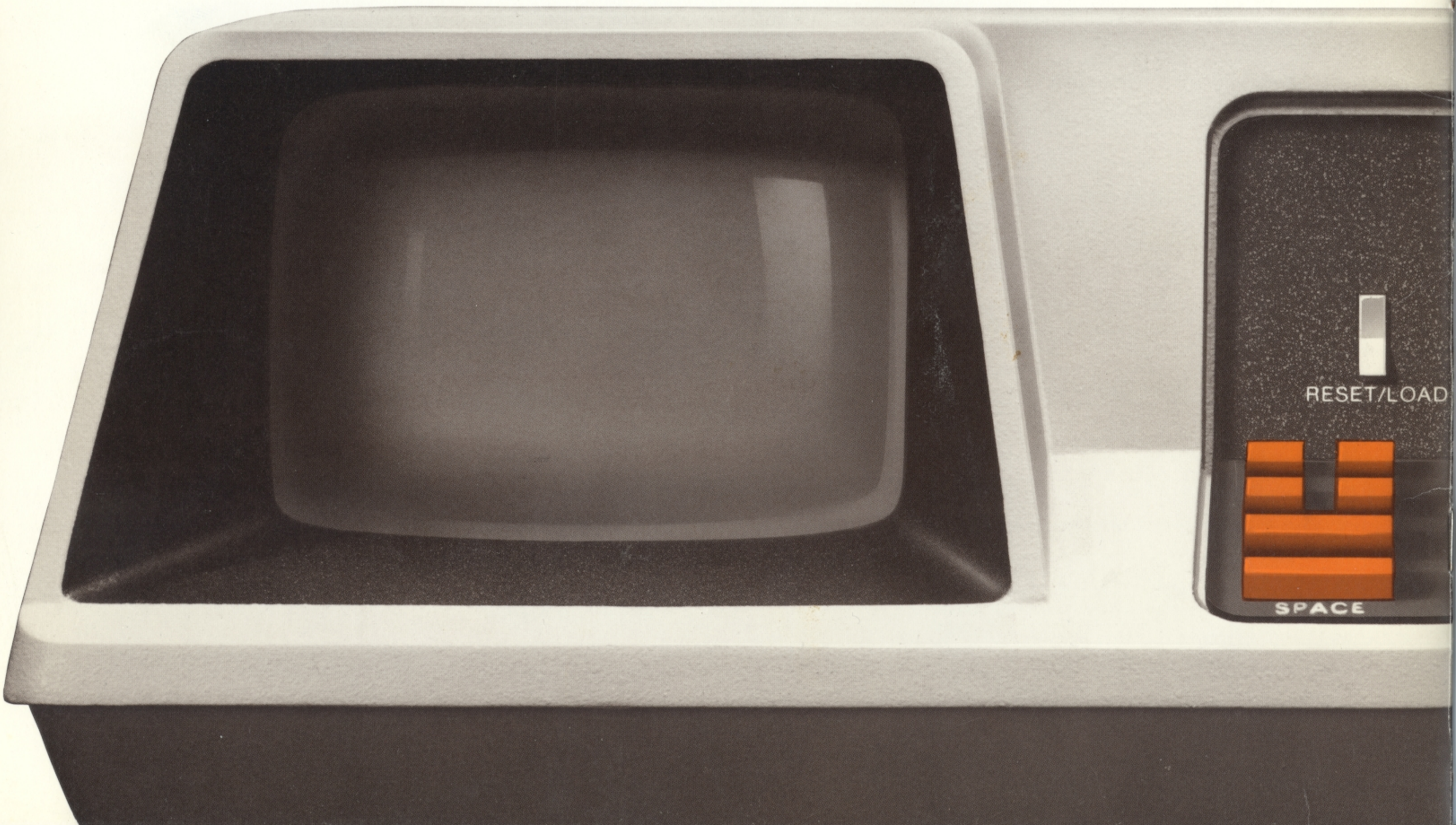
PB1001 PROM programmer
with capability for programming Intel 2708 8K-bit EROMS; used with appropriate MicroPac 80A or 180 I/O module.

CH1004 Chassis
with 4-slot PC backplane; power supplies available.

CH1008 Chassis
with 8-slot PC backplane; power supplies available.

CH1020 Chassis
with 20-slot PC backplane; power supplies available.

Breadboards
provides user with a tool to implement custom interface designs. Breadboards include bus interface logic.


RESET/LOAD
SPACE