Why start from scratch with microprocessors. We've already developed the subsystems, instruments and education you need.

Series 90 PROM Programer

Lets the design engineer program or duplicate any MOS or bipolar PROM directly from a master PROM, keyboard, teletype, paper tape reader, or computer.

Automatically and quickly programs production line quantities of PROMs.

Lightweight and fully portable for field service work.

Through the use of plug-in personality modules, the Series 90 can program any AMD, Harris, Fairchild, Intel, Intersil, Monolithic Memories, Motorola, National, Signetics, or Texas Instruments bipolar or MOS PROM—in short, any PROM made.

Microprocessor System Analyzers.

Instruments available for designing, troubleshooting, and testing both program and hardware in systems using 4004, 8008, 4040, 8080, or 6800 microprocessors.

They eliminate the need for control panels, diagnostic routines or other data processing tools for testing microprocessor-based systems.

Used in conjunction with a standard oscilloscope, they can test both program and hardware either together or individually. The analyzers display all data related to a selected instruction cycle and generate a scope sync pulse. They interface to the system under test through use of a DIP connector that clips onto the microprocessor. They can be attached to or detached from your system in a matter of seconds.
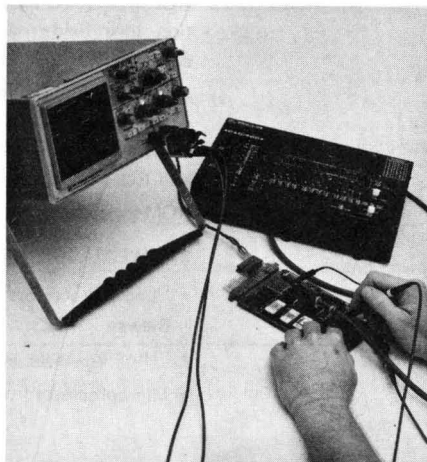
Education for the decision maker and the design engineer.

Our half day applications course for decision makers takes a hard look at the design and function of microprocessors in real world applications.

We've also got a three day hands-on course we've given to more than 1,000 design engineers in the past two years. The only prerequisite is that you know what a flip-flop and a gate are. If you do, we guarantee you'll come out of our course knowing how to design, program and use microprocessor modules because you'll have done it.

Contact Pro-Log for a complete list of course schedules and locations.

HOW
to
PROFIT from MICROPROCESSORS

A hard core look at the design and function of microprocessors in real world applications.

EQUATION FOR PROFITS: MICROPROCESSOR + PROM = UNIVERSAL LOGIC ELEMENT

A HALF DAY COURSE FOR DECISION MAKERS

This session has been specifically designed to meet the needs of **CORPORATE MANAGEMENT, ENGINEERING MANAGEMENT** and **DESIGN ENGINEERING** personnel.

If you think a microprocessor is "just a small computer" . . . you will:

- Turn design over to programmers.
- Waste money on "software".
- Waste time talking to your "software".
- At least **double** your hardware costs.
- Not have an effective way to service your systems in the field.
- Scare off the engineers who should be using the microprocessor in the first place.

TOPICS COVERED

HOW TO SELECT THE BEST MICROPROCESSOR FOR YOUR PROJECT. Includes a set of economical and technical screening tools to judge existing and future microprocessors on the basis of your priorities. **HOW TO DESIGN WITH MICROPROCESSORS.** A step by step design approach from product specification thru field-trials to final production which is completely analagous to hardwired logic design. This technique can be learned and effectively used by design engineers within one week. **HOW TO SELECT PROMS AND ROMS.** PROMs and ROMs are the key to the design revolution. Some ROMs now cost less than 0.1¢ per bit.

EACH PARTICIPANT RECEIVES:

- "Logic Processors for Dedicated Control" by Matt Biewer
- "How to Design with Microprocessors" by Ed Lee
- Microprocessor literature

Do you know the feeling?

- **PROM PROGRAMMERS**
  The **SERIES 90** intelligent programmer can program MOS or bipolar PROM's.

- **A COMPLETE LINE OF MICROPROCESSOR SYSTEMS**
  Logic Processor Cards, Microcomputer cards, Interface cards, Peripherals, Boards, Card Racks, Connectors, Sockets, Power Supplies and Memory Modules.

- **MICROPROCESSOR TEST EQUIPMENT**
  PROM programmers and system analyzers for Engineering, Production, Test, and Field Service.

- **EDUCATION**
  Pro-Log offers microprocessor courses nationwide: a half-day seminar course tells how to evaluate microprocessor modules; a three-day hands-on course teaches how to design, program and use micro-processor modules. Application Notes and Designer manuals are also available.

- **2 - 4 WEEKS DELIVERY ON MOST ITEMS**

- **VOLUME AND OEM DISCOUNTS**

- **INDIVIDUAL DATA SHEETS ARE AVAILABLE UPON REQUEST**

PRICE LIST INDEX

NOTE: (✝) Price Decrease   (▲) Price Increase   (N) New Product

SOME MANAGEMENT QUESTIONS AND ANSWERS

ON MICROPROCESSOR SYSTEMS

By Ed Lee
President of Pro-Log

WHAT IS A MICROPROCESSOR SYSTEM AND WHY SHOULD OUR COMPANY USE IT?

A microprocessor system is a standardized set of components usually including a microprocessor chip, ROM program memory, data memory, a clock oscillator and logic inputs and outputs. Simply by coding program memory, the system can perform hardware functions such as logic, timing, arithmetic, control, and many more.

Profit is the most likely reason your company should use a microprocessor in your system. Hardware cost-effectiveness, system flexibility and functional capability are so overwhelming when compared to any of the alternatives that you may find yourself vulnerable in the marketplace if you choose another approach. You should consider using a microprocessor system in any design which might otherwise use over 30 TTL IC's or the equivalent.

I UNDERSTAND THERE ARE SEVERAL DESIGN APPROACHES. . . . . . . WHICH ONE SHOULD I USE?

That depends on your design objectives. Below I have rated design approaches for production equipment.

RELATIVE RATINGS OF DESIGN APPROACHES FOR PRODUCTION EQUIPMENT				
FACTORS	HARD-WIRED LOGIC	CUSTOM LSI	IN-HOUSE DESIGN WITH MICROPROCESSOR CHIPS	PRO-LOG MICROPROCESSOR SYSTEMS
LEARNING CURVE	GOOD	POOR	FAIR	GOOD
LOWEST ENGINEERING AND PROTOTYPE COST	GOOD	POOR	FAIR	GOOD
SHORTEST DESIGN TIME	GOOD	POOR	FAIR	GOOD
MOST FLEXIBILITY	GOOD	POOR	GOOD	GOOD
GREATEST RELIABILITY	POOR	GOOD	GOOD	GOOD
LOWEST PRODUCTION COSTS:				
UNDER 500 SYSTEMS	FAIR	POOR	FAIR	GOOD
UNDER 10K SYSTEMS	FAIR	POOR	GOOD	GOOD
OVER 10 K SYSTEMS	POOR	GOOD	GOOD	GOOD
LEGEND:	GOOD	FAIR	POOR	

If your design requires under 30 IC's, the hard-wired logic approach is probably best. If you're planning for a production run of 10,000 or more identical units, custom LSI gives the greatest reliability at the lowest price. Between these extremes the microprocessor approach fits.

You now have two choices: go with an in-house design by mechanizing a microprocessor chip, with all its associated circuitry, on your own P.C. board, or use a ready-to-go, fully checked out module from Pro-Log, and in quantities have the option to manufacture that module yourself.

DO WE NEED A 4-BIT OR AN 8-BIT MICROPROCESSOR SYSTEM?

The odds are better than 20 to 1 that a 4-bit system will do your job with capacity to spare. If it can handle the job, its cost at system level will probably be less than half that for 8-bit systems doing the same job. The cost differential at system level is not due to the relative costs of the 4 and 8 bit microprocessor chips, but rather to their relative designs (see the Microprocessor User's Guide).

In any event, don't make the choice on the basis of your word size or number of inputs and ouputs . . . any microprocessor can handle any sized problem given adequate time. You trade time for money in many ways when using microprocessors.

WHO IN MY COMPANY SHOULD BE DOING THE DESIGN OF MICROPROCESSOR BASED SYSTEMS?

Your design engineer, unless yours is one of those rare companies which has a true data processing problem. Design engineers and test technicians can learn to use microprocessors the Pro-Log way in a few weeks. And they can learn to document microprocessor systems so that your present service organization can easily maintain them in the field.

WHO CAN SERVICE SYSTEMS WITH MICROPROCESSORS IN THEM?

With straight-forward documentation, a few days training and test equipment, your systems can be serviced by the same personnel who now handle mechanical or hard-wired logic systems.

WHAT PROBLEM AREAS DO I NEED TO BE AWARE OF?

A) Documentation: Get appropriate documentation from the design group, so that manufacturing and test personnel can build and service from this documentation. Establish your documentation standards at the beginning of the design cycle. Unfortunately, there are no industry standards at present. Pro-Log's courses and literature can do a lot to help you to quickly develop a practical standard for your company.

B) Vendor Selection: Stay away from sole-sourced items, either at chip or system level. Sole-sourced microprocessors abound, but they are not likely to become industry standards and could leave you at the vendor's mercy. Now that several good processors are second-sourced, there is little justification for purchasing sole-sourced items. Pro-Log only supports microprocessors that are or will be second-sourced industry standards.

Pro-Log keeps you from being sole-sourced at system level too. When you buy 250 or more of a specific microprocessor system from us, we supply you (free of charge) the manufacturing documentation and non-exclusive design rights so that you can manufacture the system yourself and use us as your second source. This policy also makes it unnecessary for you to waste development time and money building a microprocessor system from chip level.

C) Design Practices: Avoid overdependence on computer-aided design tools, such as assemblers, compilers and high level languages. These tools can be useful in some designs, but they shouldn't be used without a clear understanding of what they can and can't do. This understanding can only come from knowing how to "do it by hand". Remember . . . a designer's job is to create documentation suitable for practical manufacturing and field service. Getting a program or simulated system to work in the lab is not the most significant part of the design process.

HOW DO WE GET STARTED?

Contact Pro-Log or the Pro-Log representative listed for your area (See page 30). We have free literature. We have courses to get management and engineering education off on the right foot. We have hardware and documentation to minimize your design time and the cost and complexity of your final system. We have test equipment to enable you to design in the lab, test in the factory, and service in the field.

DEDICATED CONTROL		DATA PROCESSING
DESIGN ENGINEER ◀	— WHO'S THE DESIGNER? —	▶ PROGRAMMER
APPLICATION NOTES TEST EQUIPMENT ◀	WHAT ARE HIS TOOLS?	▶ SOFTWARE
HUNDREDS OF DOLLARS ◀	WHAT DOES HARDWARE COST?	▶ THOUSANDS OF DOLLARS
LARGE ◀	HOW HIGH IS PRODUCT VOLUME?	▶ SMALL
COST NOISE IMMUNITY POWER SIZE RELIABILITY ◀	WHAT ARE THE SIGNIFICANT CHARACTERISTICS? ▶	EASE OF PROGRAMMING THROUGH-PUT

PRO-LOG PLS SERIES LOGIC PROCESSORS

PRO-LOG MPS SERIES DATA PROCESSORS

| HARD WIRED LOGIC | PROGRAMMED LOGIC ARRAYS | CALCULATORS | MICRO-COMPUTERS | MINI COMPUTERS | LARGE COMPUTERS |

How PRO-LOG modules fit in the dedicated control/data processing spectrum.

PROM PROGRAMMERS

SERIES 90 PROGRAMMER with PM9001 and 9103 Erase Light Option installed, and a PM9003

SERIES 90 UNIVERSAL PROM PROGRAMMERS

The series 90 programmer can program any PROM. It consists of an M900 Master Control Unit and the appropriate Personality Module for the particular type of PROM to be programmed. The M900 can handle personality modules for PROMs or PROM arrays up to 4,096 words by 8 bits. PROMs may be programmed from the keyboard.

Note: For complete specifications on the Series 90 PROM Programmer, Personality Modules and Options; send for the "PROM USER'S GUIDE."

$1800.00	M900	**MASTER CONTROL UNIT** Includes Hexadecimal keyboard, control keys for List, Program, Duplicate and Verify modes, 6 digit Hexadecimal Display, Data Invert control switch, connectors for personality modules, TTY and parallel interfaces and housed in an attache case.

OPTIONS

Options are factory installed on the M900 Master Control Unit.

900.00	9101	**PAPER TAPE READER SYSTEM** Includes 120 cps paper tape reader, control program, and power supply. Plugs into all factory modified Series 90 programmers. Use M301 paper tape reader system. ASCII Hex (9101-1), ASCII BNPF (9101-2), Binary (9101-3)
300.00	9102	**TELETYPE CONTROL** Allows full-duplex teletype to be used as keyboard control, paper tape, I/O and hard copy device with all Series 90 programmers. Includes mating connector.
150.00 (♦)	9103	**ULTRA-VIOLET ERASE LIGHT SYSTEM** Includes UV erase light, 30-minute timer and safety interlock. Mounted in an enclosure that fits in the M900 briefcase.
150.00 (N)	9103-1	**ULTRA-VIOLET ERASE LIGHT SYSTEM** Stand alone version of 9103. Comes with 5 foot power cord and wall plug. 115VAC only.
300.00	9104	**PARALLEL INPUT/OUTPUT INTERFACE** Provides 8 parallel input DATA lines, 8 parallel output DATA lines and 7 handshake control lines, internal handshake program and mating connector. TTL compatible. Precludes use of 9105 option.
300.00 (N)	9105	**RS232 INTERFACE** Provides an ASCII coded RS232 Interface allowing compatible interface to computers and semi-intelligent terminals. The Series 90 assumes the role of a modem and signal response and operation are tested accordingly. 1200 Baud. Precludes use of 9104 option.

$ 150.00 (N) | 9106 | **BENCH TOP BASE**

The 9106 Desk Top Base Option provides a rugged yet attractive solid wood base for the M900 chassis. The base enhances operator efficiency in desk top operation by tilting the chassis and its keyboard forward. The M900 chassis fits snugly into the base and is readily secured with two mounting screws.
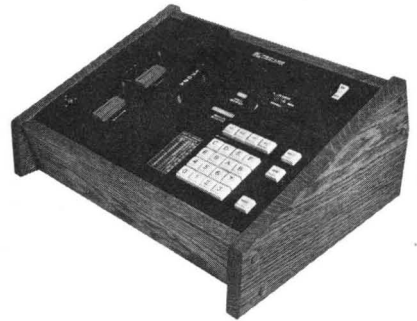
PERSONALITY MODULES

PM9000 PERSONALITY MODULES include:

- Zero insertion force PROM sockets for Master and copy PROMs.

- Binary Data Display for copy PROM (4 or 8 bits).

- Specialized Interface Circuits, regulators and program instructions for specific PROMs.

- Control switches as required to implement special functions.
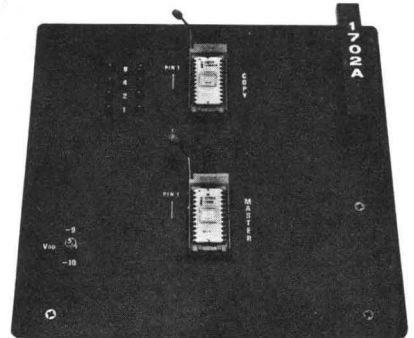
PM9001 Personality Module

PERSONALITY MODULE SELECTION GUIDE				
PERSONALITY MODULE	PROM TYPE	PROM SIZE	VENDOR	PRICE
PM9001A	1702A/4702A/8702A	(256x8)	Intel, MIL, NSC	$450.00
PM9002	5202A/5203	(256x8)	NSC	450.00
PM9003	3601	(256x4)	Intel	360.00
PM9004	3604/24	(512x8)	Intel	390.00
PM9005	2704	(512x8)	Intel	550.00
	2708	(1024x8)	Intel	
PM9006	5204	(512x8)	NSC	500.00
PM9007	5603/23, UPB403D	(256x4)	Intersil, NEC	450.00
	5604/24	(512x4)	Intersil	
PM9008A	82S126/129	(256x4)	SIG	400.00
	82S130/131	(512x4)	SIG	
PM9009	3602/22	(512x4)	Intel	360.00
PM9010	82S23/123	(32x8)	SIG	390.00
PM9011	1702/9702	(256x8)	Intel, MIL, AMD	450.00
PM9014	6330/31	(32x8)	MMI	390.00
PM9016	5600/10	(32x8)	Intersil	450.00 ( )
PM9017	6335	(256x8)	MMI	400.00
	6340	(512x8)	MMI	
PM9018	1024	(256x4)	Harris	360.00
PM9019	6300/01	(256x4)	MMI	390.00
	6305/06	(512x4)	MMI	
* PM9020	74S287/74S387	(256x4)	TI	360.00
* PM9021	82S114	(256x8)	SIG	425.00
	82S115	(512x8)	SIG	
* PM9022	74186	(64x8)	TI	390.00

*Not a stock item as of January 1, 1976 Call your PRO-LOG representive or PRO-LOG (see page 30) for availability information on these modules or modules for unlisted PROMs.

SERIES 90 Programmer

M422 System Analyzer
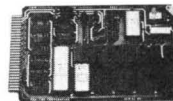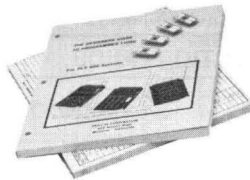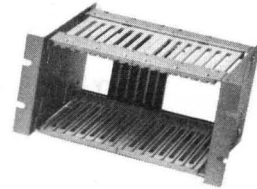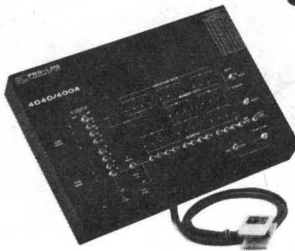
PLS-441 Logic Processor

SS-3   Starter Set

STARTER SETS

Design systems for logic and control applications right in your office or on your workbench. Use the Programmed Logic System components in your system prototype or as part of a deliverable system. Use the Engineering instruments to develop systems and reuse them indefinitely for other development efforts, production and production testing and for servicing microprocessor based systems in the field. The Pro-Log approach eliminates the need to build control panels., loaders, programming modules and software to support microprocessor based systems.

Starter Set provides a complete package at a significant discount. (No volume discounts on Starter Sets).

The SS-1 series of starter sets all involve the 4004 Microprocessor CPU chip and related specialized RAM registers and internal interface chips. This chip set was first developed by Intel and is now second sourced by National Semiconductor with pin compatible parts.

The SS-3 series of starter sets all involve the 4040 Microprocessor CPU chip and related specialized RAM registers, clock chip and internal interface chip. Most of these chips are available only from Intel.

The 4040 CPU is a technically upgraded version of the 4004. The CPU improvements include a 7 level address stack for subroutines (versus 3 levels for the 4004), an enlarged set of index registers, some logical instructions, interrupt, and the ability to single step. These technical improvements can be significant, and may be worth the risk of designing around a sole sourced chip. An interesting fact is that a program written and debugged on a 4004 system can be directly plugged into an equivalent 4040 system. The reverse is not true.

$2950.00 (3634.00) *	SS-1	**LOGIC PROCESSOR STARTER SET (4004)**

Completed Programmed Logic System Includes:

PLS-401	One Card Programmed Logic System
CR-10	1/2 Rack Card Cage
M272	Dual Power Supply
P561	Utility DIP Card
P562	General Utility Card
D256	(4 each) PROMs (1024 eight-bit words)
CF-1	Program Assembly Forms
DG-1	Designer's Guide to Programmed Logic
SZ-24	Zero Insertion Force Socket

Engineering Instruments
Reusable basic equipment for programming and system checkout.

M900	PROM Programmer for
PM9001	programming D256 and
9103	1702A PROM. Includes UV Erase Light System.
M422A	System Analyzer
P560	Card Extender

3100.00 (3794.00) *	SS-1A	**LOGIC PROCESSOR STARTER SET (4004)**

Same as SS-1 but with PLS-402 instead of PLS-401, CR-10 prewired for PLS-402, and two additional D256 PROM's.

3250.00 (3949.00) *	SS-1B	**LOGIC PROCESSOR STARTER SET (4004)**

Same as SS-1 but with PLS-403 instead of PLS-401, CR-10 prewired for PLS-403, and four additional D256 PROM's.

3100.00 (3769.00) *	SS-3	**LOGIC PROCESSOR STARTER SET (4040)**

Same as SS-1 but with PLS-441 instead of PLS-401, and M422 System Analyzer instead of M422A.

3250.00 (3929.00) *	SS-3A	**LOGIC PROCESSOR STARTER SET (4040)**

Same as SS-1 but with PLS-442 instead of PLS-401, M422 System Analyzer instead of M422A, CR-10 prewired for PLS-442 and two additional D256 PROMs.

3400.00 (4084.00) *	SS-3B	**LOGIC PROCESSOR STARTER SET (4040)**

Same as SS-1 but with PLS-443 instead of PLS-401, M422 System Analyzer instead of M422A, CR-10 prewired for PLS-443 and four additional D256 PROMs.

*(   ) *Prices of items if purchased separately.*

4-BIT LOGIC PROCESSORS

M422 System Analyzer

SERIES 90 Programmer

CM-41 Chassis Mounted Programmed Logic System

DS-1 Development Set
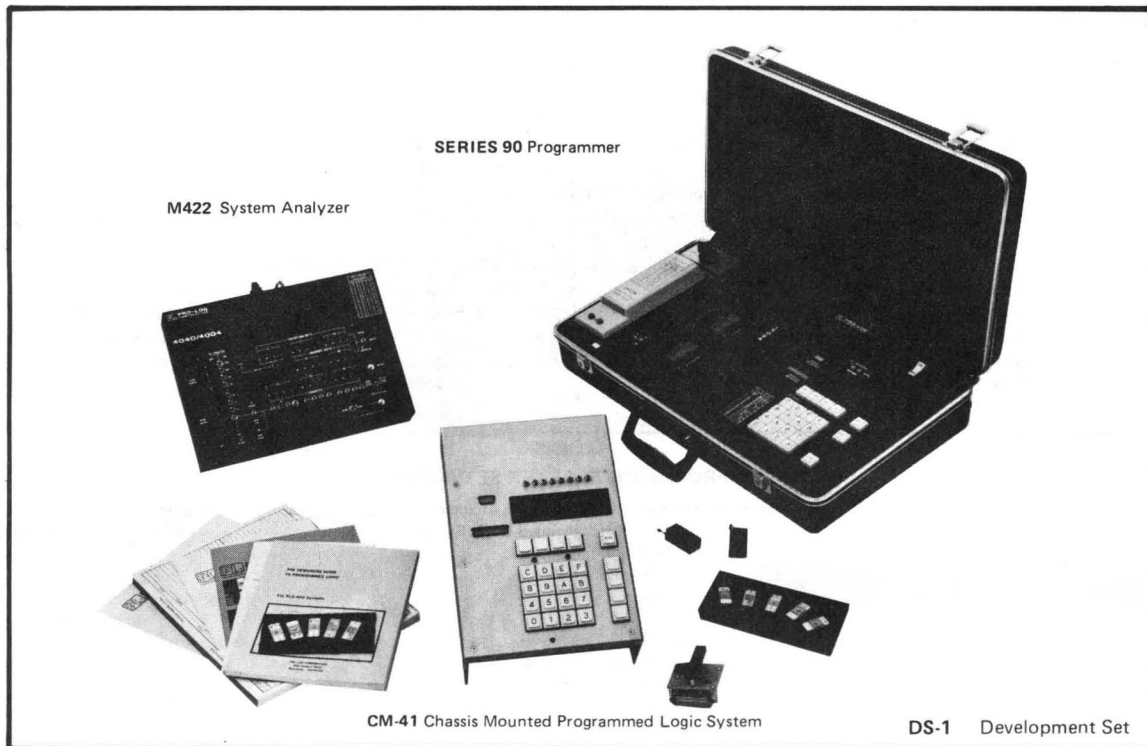
DS-1 DEVELOPMENT SET

The DS-1 is Pro-Log's latest starter system. It is especially suited for teaching, for self-education and for demonstrating the practical capabilities of microprocessors. In this system the microprocessor is already integrated with keys, switches, power supplies, connectors and 8 digits of hexadecimal display. The user can design operating systems using these elements simply by programming the PROMs and plugging them in.

The Set comes with several operating programs and their documentation. The programs, program documentation and hardware documentation are realistic examples of how to do designs and to integrate the program with the hardware.

The operating programs include: A 12 hour clock, Songs (played through the plug in speaker supplied with the system) The Saints Go Marching In and The Sting, Piano (turns the keyboard into an octave plus of a piano keyboard), Display program and a subroutine package including keyboard scan.

Once the learning process is complete the CM-41 system can be used as a controller, bread board development system, intelligent terminal, calculator, clock, etc. The Engineering equipment in the set is that supplied with the SS-1.

$3650.00 (N)
(4309.00)*

DS-1   **PROGRAMMED LOGIC DEVELOPMENT SET (4004)**

Development System

CM-41	Chassis Mounted Programmed Logic System (See page 17 for details)
	Plug in Audio Module
(5 each)	D256 PROMs
(4 each)	D256 PROMs with demonstration Programs.
DG-1	Designers Guide
Planbook-1:	Contains documentation of the demonstration programs.
CF-1	Program Assembly Forms
MUG	Microprocessor Users Guide

Engineering Instruments

Reusable basic equipment for programming and system checkout.

M900	PROM Programmer for
PM9001	programming D256 and
9103	1702A PROM. Includes UV Erase Light System.
M422A	System Analyzer

( ) Prices of items if purchased separately.
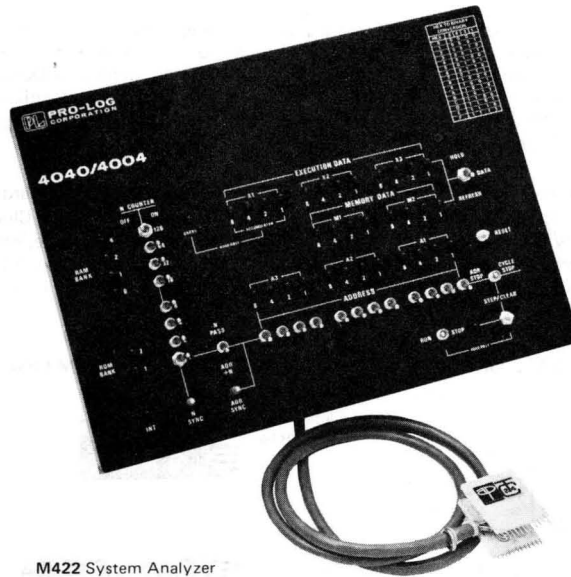
M422 System Analyzer

The M422 and M422A Analyzers are used for designing, troubleshooting and testing both programs and hardware in systems using the 4040 or 4004 microprocessor chip. The system analyzer offers a cost-effective alternative to software techniques used for program development and debugging of microprocessor systems. Use it to design, troubleshoot and debug, in real-time, both software and hardware problems. Satisfy your production and field service requirements too. The Analyzer eliminates the need for:

1) control panels
2) software diagnostic routinues (simulators)
3) special considerations for production and field service testing.

FEATURES

- Displays instruction (M1, M2) and execution (X1, X2, X3) data.

- Provides scope sync outputs.

- Clip-on (DIP) connector for quick easy interfacing.

- Self-referencing power supply.

- Static and dynamic display modes with counter for loop control.

- Provides for external system reset.

- State displays for Halt, Interrupt, RAM/ROM bank select codes.

- RUN/STOP and single cycle operation. (4040 ONLY)

$600.00 (▼)	M422	**SYSTEM ANALYZER (4040)**
		Self-Powered control panel that clips to 4040 CPU, for checkout of program and hardware. For lab, manufacturing or field service use.
550.00	M422A	**SYSTEM ANALYZER (4004)**
		Self-Powered control panel that clips to 4004 CPU or 4002 RAM register for checkout of program and hardware. For lab, manufacturing or field service use. Replaces M421. Can be used on limited basis to check out 4040 based systems by clipping on to 4002 RAM.

EDGE CONNECTED CARD SYSTEMS

PRO-LOG's 4004 and 4040 based Logic Processors are the cost effective solution for Dedicated Control Systems. A Dedicated Control System is any system that is doing its job whenever power is turned on. PRO-LOG's Logic Processor Systems are easily used by design engineers to replace almost all other Logic Elements. Design can be done o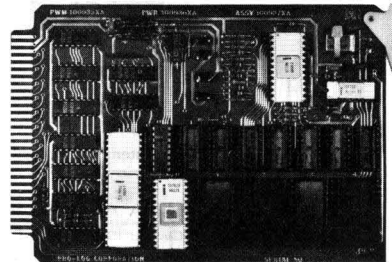n paper, breadboarded on PROMs with a Series 90 Programmer and debugged with a M422 tester and an oscilloscope. Production is simply a matter of buying more Logic Processor Systems and duplicating PROMs. Testing in production or in the field requires only the M422, or M422A tester and an oscilloscope.

Common Features: (Unless otherwise noted) All cards are 4.5" by 6.5" printed circuit cards with 56 pin card edge connectors on 0.125" centers. Operating temperature range is 0 to 55 degrees Centigrade. Clock circuits are all crystal controlled and have an accuracy of better than 0.01% over the operating temperature range. Instruction cycle times are 11.22 microseconds. PROMs are D256 or equivalent. RAM is 4002. Most cards use +5 and -10 volt power supplies and are TTL compatible for I/O. Some systems use +15V and are HiNIL or CMOS compatible for I/O.

PLS-441 ONE CARD PROGRAMMED LOGIC SYSTEM (4040)

$ 250.00 (♦)	PLS-401	**ONE CARD PROGRAMMED LOGIC SYSTEM (4004)** Includes 4004 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 1024 words. Contains an 80-character data RAM with capacity to 320 characters. Has 16 TTL input, 16 TTL output and 4 MOS output lines.
(See page 13)	PLS-401A	**ONE CARD PROGRAMMED LOGIC SYSTEM (4004)** PLS-401 without 256-word instruction PROM.
290.00 (♦)	PLS-411	**ONE CARD PROGRAMMED LOGIC SYSTEM (4004)** Includes 4004 CPU, clock, external and power-on reset, 256 word Instruction PROM with capacity to 768 words. Socket for Intel 8316 (2048 word ROM) or for 4125 ROM simulator card. Contains 80 character data RAM with capacity to 560 characters.* Has 16 TTL input, 16 TTL output and 4 MOS output lines.
285.00 (♦)	PLS-441	**ONE CARD PROGRAMMED LOGIC SYSTEM (4040)** Includes 4040 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 1280 words. Contains an 80-character data RAM with capacity to 640 characters. Has 16 TTL input, 16 TTL output, 4 MOS output lines, interrupt and stop lines. PLS-401 compatible in most applications.
(See page 13)	PLS-441A	**ONE CARD PROGRAMMED LOGIC SYSTEM (4040)** PLS-441 without 256-word instruction PROM.

$ 340.00 (↓)	PLS-402	**TWO CARD PROGRAMMED LOGIC SYSTEM (4004)** Includes 4004 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 1536 words. Contains an 80-character data RAM with capacity to 320 characters. Has 32 field selectable TTL I/O lines, card expandable with 4113, or 4123 to 128 lines. Has 4 MOS output lines. Uses 4113 and 4115.
425.00 (↓)	PLS-403	**THREE CARD PROGRAMMED LOGIC SYSTEM (4004)** Includes 4004 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 2560 words and card expandable with 4112-2 to 4096 words. Contains an 80-character data RAM with capacity to 640 characters and card expandable with 4111-2 to 1280 characters. Has 32 field selectable TTL I/O lines, card expandable with 4113 or 4123 to 128 lines. Has 4 MOS output lines. Uses 4111, 4112, 4113.
375.00 (↓)	PLS-442	**TWO CARD PROGRAMMED LOGIC SYSTEM (4040)** Includes 4040 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 2048 words. Contains an 80-character data RAM with capacity to 640 characters. Has 32 field selectable TTL I/O lines, card expandable with 4113, or 4123 to 128 lines. Has 4 MOS output lines, interrupt and stop lines. Uses 4113 and 4415. PLS-402 compatible in most applications.
460.00 (↓)	PLS-443	**THREE CARD PROGRAMMED LOGIC SYSTEM (4040)** Includes 4040 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 4096 words. Contains an 80-character data RAM with capacity to 1280 characters. Has 32 field selectable TTL I/O lines, card expandable with 4113 or 4123 to 128 lines. Has 4 MOS output lines, interrupt and stop lines. Uses 4417, 4418, and 4113.
555.00 (N)	PLS-446	**THREE CARD HI-NIL I/O PROGRAMMED LOGIC SYSTEM (4040).** Includes 4040 CPU, clock, external and power-on reset, 256-world instruction PROM with capacity to 2048 words (card expandable to 4096 words). Contains an 80-character data RAM with capacity to 640 characters. Has 32 Hi-Nil input lines and 32 Hi-Nil output lines. The outputs are card expandable to 64 lines with another 4413 card. Uses 4416, 4413, and 4414. Operates from +15 volt supply.
495.00 (N)	PLS-447	**THREE CARD CMOS I/O PROGRAMMED LOGIC SYSTEM (4040).** Includes 4040 CPU, clock, external and power-on reset, 256-word instruction PROM with capacity to 2048 words (card expandable to 4096 words). Contains an 80-character data RAM with capacity to 640 characters. Has 32 CMOS input lines and 32 CMOS output lines. The outputs are card expandable to 64 lines with another 4423 card. Uses the 4416, 4423, and 4424. Operates from +15 volt supply.

QUANTITY PRICING

Special quantity pricing is now offered by Pro-Log for some of its most widely used products. Quantity pricing provides substantial discounts from unit list price. No other discounts apply to items purchased at the quantity discount price.

The "A" versions of the PLS systems differ from the basic units, in that they do not include the D256 PROM.

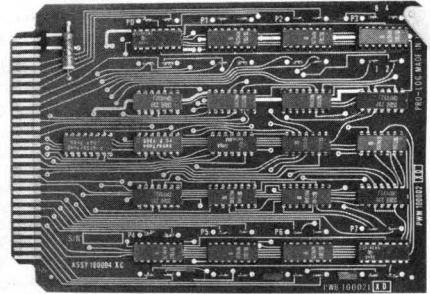| TOTAL ORDER QUANTITY (over 12 months)	10-24 UNITS	25-99 UNITS	100-499 UNITS*	500-UP UNITS**
MINIMUM QUANTITY PER SHIPMENT	10	10	25	50
SCHEDULE LEAD TIME TO FIRST SHIPMENT	2-4 WKS.	6 WKS.	8 WKS.	10 WKS.
ITEM	PRICE			
PLS-401A	$175.00	$150.00	$120.00	$ 99.00
PLS-441A	195.00	170.00	137.00	115.00

* Production documentation and production rights are given after first 250 units are paid for.

** Production documentation and production rights are given after first 300 units are paid for.
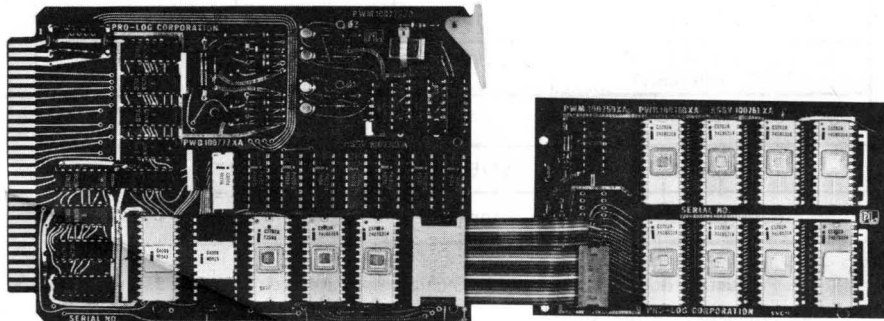
EDGE CONNECTED CARD COMPONENTS

$160.00 (↓)	**4111**	**CPU CARD (4004)** Includes 4004 CPU, clock, external and power-on reset, and an 80-character-data RAM. Has mixed capacity to 2048 ROM instructions and 32 I/O lines by using a 4001 masked ROM (with I/O lines) or 640 RAM data characters. Has 4 MOS output lines. Used in PLS-403.
60.00	**4111-2**	**RAM EXPANDER CARD FOR PLS-403** Capacity to 640 RAM data characters.
170.00 (↓)	**4112**	**ROM CARD** Includes 256-word instruction PROM with capacity to 2560 words. Used in PLS-403.
90.00	**4112-2**	**ROM EXPANDER CARD** Provides total PROM instruction capacity to 4096 words when used with 4112.
95.00	**4113**	**TTL I/O PORT CARD** Provides 32 lines, field selectable in groups of 4 as input gates or output latches. Used in PLS-402, PLS-403, PLS-442 and PLS-443. Interfaces with 4112, 4115, 4415, 4418 or with other TTL input or output ports.

4113 TTL I/O Port Card

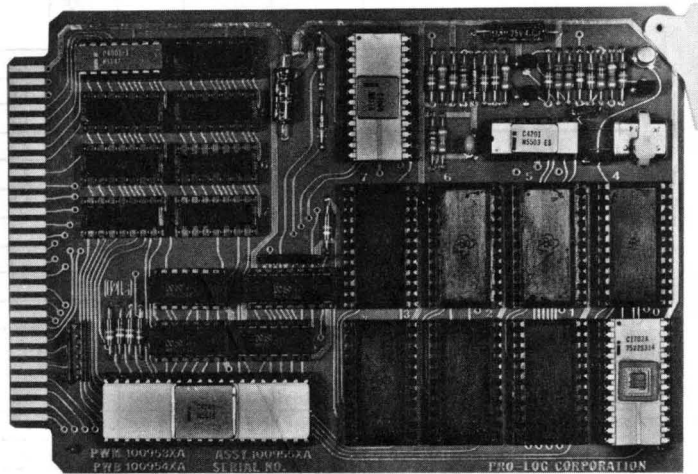|		
90.00	**4113-1**	**TTL OUTPUT PORT CARD** Contains 32 output latches.
75.00	**4113-2**	**TTL INPUT PORT CARD** Contains 32 input gates.
60.00	**4114**	**TTL INPUT EXPANDER CARD (Digital Multiplexer)** Digitally multiplexes 32 input lines to 4 lines controllable by TTL or MOS outputs.
70.00	**4114-2**	**TTL INPUT EXPANDER WITH TRI-STATE OUTPUTS (Digital Multiplexer)** Same as 4114 but allows direct output "OR"ing of two or more cards.
245.00 (↓)	**4115**	**CPU CARD FOR CUSTOM I/O** Includes 4004 CPU, clock, external and power-on reset and 256-word instruction PROM with capacity to 1536 words. Contains an 80-character data RAM with capacity to 320 characters. I/O bus for custom interfaces or remote I/O. Has 4 MOS output lines. Used in PLS-402.
105.00	**4117**	**EXPANDED READ/WRITE PROGRAM MEMORY CARD FOR PLS-403** Replaces 3072 words of instruction PROM with instruction RWM. Requires D1002 RAM or equivalent.
90.00	**4123**	**TTL I/O PORT CARD** Provides 16 output lines and 16 input lines with four common port addresses. Interfaces in same manner as 4113.
95.00	**4125**	**ROM SIMULATOR CARD** When used with D256 or 1702A PROMs it simulates the Intel 8316 ROM. Includes PROM sockets (for 2048 words of Program memory), interface circuitry and ribbon cable interconnect which plugs into 8316 socket on PLS-411 card. Mounts piggyback to PLS-411 card. Does not include PROMs.

PLS-411 Program Logic System   **4125** ROM Simulator Card

$ 130.00	**4413**	**HI-NIL OUTPUT CARD**

Contains 32 output latches. Each output can drive 10 Hi-Nil loads. Operates from +15 volts supply. Interfaces with 4416 CPU card.

110.00	**4414**	**HI-NIL INPUT CARD**

Contains 32 Hi-Nil input gates. Operates from +15 volt supply. Interfaces with 4416 CPU card.

280.00 (†)	**4415**	**CPU CARD FOR CUSTOM I/O (4040)**

Includes 4040 CPU, clock, external and power-on reset and 256-word instruction PROM with capacity to 2048 words. Contains an 80-character data RAM with capacity to 640 characters. I/O bus for custom interfaces or remote I/O. Has 4 MOS output lines, interrupt and stop lines. Used in PLS-442.

315.00 (†)	**4416**	**CPU CARD FOR HI-NIL, CMOS I/O (4040)**

Includes 4040 CPU, clock, external and power-on reset and 256-word instruction PROM with capacity to 2048 words. Contains an 80-character data RAM with capacity to 640 characters. Has 4 MOS output lines, interrupt and stop lines. I/O bus for custom CMOS interfaces, remote I/O or the 4414 and 4413 Hi-Nil input and output cards. Uses only +15 volts. For high noise, industrial control environments.

4416 CPU Card

205.00 (†)	**4417**	**CPU CARD (4040)**

Includes 4040 CPU, clock, external and power-on reset, and an 80-character-data RAM. Has mixed capacity to 4096 ROM instructions by using a 4001 masked ROM (with I/O lines) or 1280 RAM data characters. Has 4 MOS output lines, interrupt and stop lines. Used in PLS-443.

160.00	**4418**	**ROM CARD**

Includes 256-word instruction PROM with capacity to 4096 words. Used in PLS-443.

80.00	**4419**	**DRIVER OUTPUT CARD**

8 Drivers. Each Driver switches 500 ma at 35 volts. Terminal strip for outputs, GND and external supply. Each output has a diode clamped to the external supply and an LED display. Each display is visible with card plugged into rack.

125.00 (↓)	**4419A**	**DRIVER OUTPUT CARD**

Same as 4419 but each output switches up to 1.5 amperes.

110.00 (N)	**4423**	**CMOS OUTPUT CARD**

Contains 32 CMOS output latches. Each output drives up to 10 CMOS loads or 2 low power TTL loads. Operates from +15 volts supply. Interfaces with 4416 CPU.

80.00 (N)	**4424**	**CMOS INPUT CARD AND DIGITAL MULTIPLEXER**

Contains 32 CMOS input gates. Operates from +15 volt supply. Interfaces with 4416 CPU card or cascades with other 4424's as a multiplexer.

170.00 (N)	**4428**	**ROM EXPANDER CARD**

Interfaces with 4416 CPU card to expand program memory. Includes 256 word instruction PROM (D256) with capacity to 4096 words. Includes special ribbon cable interconnect to 4416. must be located in card rack adjacent to 4416. Requires 2 card slot depth on both 4416 and 4428 to accommodate height of ribbon cable connector.

LOGIC PROCESSOR CARD COMPATIBILITY TABLE

The table below shows the possible interconnecting of support cards with specific CPU cards. While there might be other combinations and while some combinations are limited by the capabilities of the CPU instruction sets, this table gives a general idea of the feasible system configurations. (Please see legend and notes below)

CPU CARD	PLS-401	PLS-411	PLS-441	4111	4115	4415	4416	4417
MEMORY	OC	OC	OC	OC	OC	OC	OC	O C
4111-2				X				
4112				X				
4112-2				X				
4117				X				
4125		X						
4428							X	
4418								X
INPUT/OUTPUT	OC	OC	OC					
4113	2	2	2	1,2	1,2	1,2		1,2
4113-1	2	2	2	1,2	1,2	1,2		1,2
4113-2	2	2	2	1,2	1,2	1,2		1,2
4114	2	2	2	2	2	2		2
4114-2	2	2	2	2	2	2		2
4123	2	2	2	1,2	1,2	1,2	1,2	1,2
4413							1,2	
4414							1,2	
4423							1,2	
4424							1,2	
*BUFFER CARDS								
4419							2	
4419A							2	
8401	2	2	2	2	2	2		2
8402	2	2	2	2	2	2		2
8403	2	2	2	2	2	2		2
8404-2	2	2	2	2	2	2		2
8404-4	2	2	2	2	2	2		2
8405	2	2	2	2	2	2		2
8406	2	2	2	2	2	2		2
8410	2	2	2	2	2	2		2

GENERAL SYSTEM ORGANIZATION

CPU CARDS	INPUTS	MULTIPLEX CARDS
	OUTPUTS	BUFFER CARDS
	MEMORY	
LEVEL 0	LEVEL 1	LEVEL 2
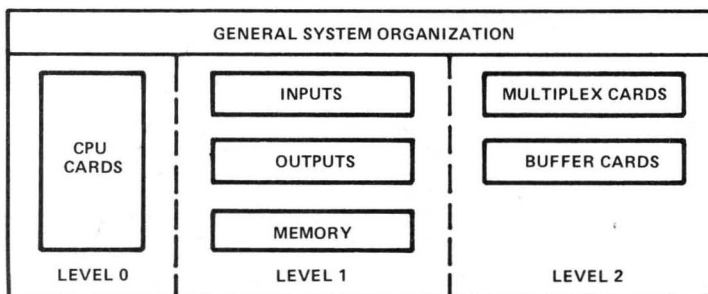
LEGEND:

X-- Indicates compatability (e. g. 4416 can use 4428).

OC-- Indicates item contained "on-card" (e. g. 441 has I/O on card).

1-- Indicates interface level 1

2-- Indicates interface level 2

1,2-- Indicates interface level 1 or 2

*NOTE: Buffer and multiplex cards are always interfaced at level 2 (i.e., they tie to existing I/O ports).

RIBBON CABLE CONNECTED CARD SYSTEMS

CM-41 Chassis Mounted Programmed Logic System

$ 950.00	CM-41	**CHASSIS MOUNTED PROGRAMMED LOGIC SYSTEM (4004)** Complete system, prewired, chassis mounted, and with power supply. Consists of: 4118, 4122, M272 Power Supply, CM-4118 Chassis, RC16-6 Interconnect and 12 hour clock test program on D256 PROM.

RIBBON CABLE CONNECTED CARD COMPONENTS

$ 490.00	4118	**KEYBOARD-DISPLAY-I/O CONTROL PANEL CARD** Contains 24 keys with 16 keys labeled O through F and 8 keys with blank tops, eight 2-position switches, eight digits of LED decoded hexadecimal display, a TTY serial bi-directional interface and a 12-line output/11-line input parallel interface. Connects to PLS-402, PLS-403, PLS-442, PLS-443, 4112, 4115, 4121, 4122, 4415 or 4417 thru Ribbon Cable Interconnects. Card measures 7.25 x 8.20 inches.
380.00	4121	**PROGRAMMED LOGIC SYSTEM CARD FOR REMOTE I/O (4004)** Includes 4-bit CPU, crystal clock, external and power-on reset and 256-word instruction PROM with capacity to 4096 words. Contains an 80-character data RAM with capacity to 1280 characters. I/O busing available for custom interfacing or remote I/O. Busing available on each of 4 (16 pin) sockets for ribbon cable connectors. Mounts without card rack. Card measures 7.25 x 8.20 inches.
320.00	4122	**PROGRAMMED LOGIC SYSTEM CARD FOR REMOTE I/O** Same as 4121 but with PROM capacity limited to 2048 words and DATA RAM capacity limited to 640 characters. Card measures 7.25 x 6.25 inches.

SUPPORT HARDWARE (Ribbon Connected Card Components)

$ 60.00	RM-4118	**19 INCH RACK PANEL MOUNT FOR 4118 (Panel only)**
70.00	CM-4118	**CHASSIS MOUNT FOR 4118 (Chassis only)**
10.00	RC-16-6	**RIBBON CABLE INTERCONNECT** Complete with 6 inch ribbon cable and two 16 pin DIP PLUGS. Use with 4118, 4121 and 4122.
35.00	RC-16-7	**RIBBON CABLE INTERCONNECT** Complete with 2 foot ribbon cable with 16 pin DIP plug on one end and CT-56 transition connector on other end. For wiring 4115 CPU to 4118 I/O card.

SERIES 90 Programmer

M821 System Analyzer

MPS-803 Microcomputer System

SS-2   Starter Set

STARTER SETS

Develop microcomputer applications or logic and control systems right in your office. Use the Microcomputer system elements of the starter kits as a prototype system or as part of deliverable hardware. The Engineering instruments, with conventional equipment such as an oscilloscope and a soldering iron, are all that are needed to design, debug and support microcomputer systems in the field. The Pro-Log approach eliminates the need to build in control panels, loaders, programming modules and the software necessary to support them. (No volume discounts on Starter Sets).
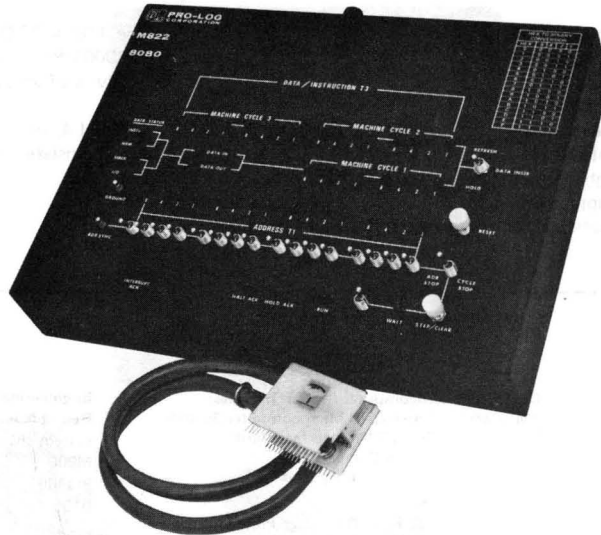
COMMON FEATURES OF STARTER SETS INCLUDE

Off-line PROM Programming hardware to program and erase the 1702A PROM or equivalent. Includes the M900 PROM Programmer, Erase light and PM9001 Personality Module.
. . Detachable System Analyzer (M821, M822 or M823) for analysis of an operating program. Enables hardware analysis when used with an oscilloscope.
. . Teletype Monitor Program loaded on 4 PROMs (MON-2, MON-4, or MON-6) and a Teletype Interface Card (8406) to Perform Load, Dump, Move, Translate and Edit functions through a teletype.
. . Power Supplies and a Prewired Cardrack for the microprocessor system.
. . Appropriate Support Hardware and Documentation.

$3700.00 | **SS-2** | **MICROCOMPUTER STARTER SET (8008)**

Complete Microcomputer System Includes:

*MPS-803	Three Card Microcomputer System
8406	Serial TTY Interface Card
P561	Utility DIP card
P562	General Utility card

Support Hardware

*CR-10	1/2 Rack Card Cage Prewired for MPS-803 and the 8406.
M273	Dual Power Supply
SZ-24	Zero Insertion Force Socket

Literature and Documentation

DF-2	Designers Guide to Programmed Logic
CF-1	Program Assembly Forms

Schematics and Assembly Prints

*Items which vary in other 8-bit starter sets.

Engineering Instruments

Reusable basic equipment for programming and system checkout.

M900	PROM Programmer for D256 or
PM9001	1702A PROMs. Includes UV
9103	Erase Light.
*M821	System Analyzer
P560	Card Extender

Software

*MON-2

Teletype Monitor Program loaded on 4 PROMs. Performs Load, Dump, Move, Translate and Edit functions for MPS-803 or MPS-805 systems.

3850.00 | **SS-2A** | **MICROCOMPUTER STARTER SET (8008)**

Same as SS-2 but with the MPS-805 instead of the MPS-803. CR-10 prewired for the MPS-805.

3700.00 (♦)
(4364.00) † | **SS-4** | **MICROCOMPUTER STARTER SET (8080)**

Like the SS-2 but with the MPS-883 instead of the MPS-803, the M822 tester instead of the M821, the M274 supply in addition to the M273, and the MON-4 program instead of the MON-2 program. The CR-10 is prewired for the MPS-883.

3850.00 (♦)
(4549.00) † | **SS-4A** | **MICROCOMPUTER STARTER SET (8080)**

Like the SS-2 but with the MPS-885 instead of the MPS-803, the M822 tester instead of the M821, the M274 supply in addition to the M273, and the MON-4 program instead of the MON-2 program. The CR-10 is prewired for the MPS-885.

3700.00 (N)
(4304.00) † | **SS-6** | **MICROCOMPUTER STARTER SET (6800)**

Like the SS-2 but with MPS-863 instead of MPS-803, the M823 tester instead of the M821, and the MON-6 program on PROMs instead of the MON-2. The CR-10 is prewired for the MPS-863. For orders shipped prior to March 1, 1975, the M823 will be back ordered for shipment by March 1 with billing for the M823 occurring at the time of its shipment.

3850.00 (N)
(4489.00) † | **SS-6A** | **MICROCOMPUTER STARTER SET (6800)**

Like the SS-2 but with MPS-865 instead of MPS-803, the M823 tester instead of the M821, and the MON-6 program on PROMs instead of the MON-2. The CR-10 is prewired for the MPS-865. For orders shipped prior to March 1, 1975, the M823 will be back ordered for shipment by March 1 with billing for the M823 occurring at the time of its shipment.

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† ( ) *Prices of items if purchased separately.*

TEST EQUIPMENT

M822 System Analyzer

The M821, M822 and M823 System Analyzers are used for designing, troubleshooting and testing both programs and hardware in systems using the 8008, 8080 or 6800 microprocessor chips. A system analyzer offers a cost effective alternative to software techniques used for program development and debugging of microprocessor systems. Use it to design, troubleshoot and debug, in real-time, both software and hardware problems. Satisfy your production and field service requirements too. The Analyzer eliminates the need for:

1) control panels
2) software diagnostic routines (simulators)
3) special considerations for production and field service testing.

COMMON FEATURES INCLUDE

- Displays address, instruction and execution data.
- Provides scope sync outputs at address cycle times.
- Clip-on (DIP) connector for quick easy interfacing.
- Static and dynamic display modes.
- Provides for external system reset.
- RUN/WAIT and single instruction operation.
- Internal power supply which automatically references to the microprocessor supplies.
- Each analyzer also includes special test and control features pertinent to the CPU it tests.

$ 550.00	M821	**SYSTEM ANALYZER (8008)** Self-powered control panel that clips to 8008 CPU for easy checkout of program and waveforms.
650.00 (✝)	M822	**SYSTEM ANALYZER (8080)** Self-powered control panel that clips to 8080 CPU for easy checkout of program. Includes scope syncs to enable waveform analysis.
650.00 (N)	M823	**SYSTEM ANALYZER (6800)** Self-powered control panel that clips to 6800 CPU for each checkout of programs. Includes scope SYNC to enable waveform analysis. Available starting February 1976.

EDGE CONNECTED CARD SYSTEMS

Common Features: (Unless otherwise noted) All cards are 4.5'' by 6.5'' printed circuit cards with 56 pin card edge connectors on 0.125'' centers. Operating temperature range is 0 to 55 degrees Centigrade. Clock circuits are all crystal controlled and have an accuracy of better than 0.01% 8008 and 6800 based systems use +5V and -10V power supplies. 8080 based systems use +12V, +5V and -10V or +12V, +5V and -5V depending on the program memory card used.

$ 600.00 (↑)   **MPS-803**   **THREE CARD 8008 MICROCOMPUTER SYSTEM**

Includes 8008 CPU with 2.8 usecond state cycle, crystal clock, DMA buffers and interrupt input with optional power-on restart. Contains 256-word instruction PROM with capacity to 1024 words (Uses D256 PROM or equivalent). Has 1024-word program or data RAM with capacity to 2048 words (Uses D1002 RAM or equivalent). Has 28 TTL I/O lines, field selectable in groups of four as input gates or output latches. Uses 8111, 8112, 8113, D1002, and D-256.

785.00 (↑)   **MPS-805**   **FIVE CARD 8008 MICROCOMPUTER SYSTEM**

Includes 8008 CPU with 2.8 usecond state cycle, crystal clock, DMA buffers and interrupt input with optional power-on restart. Contains 256-word instruction PROM with capacity to 2048 words (Uses D256 PROM or equivalent). Has 1024-word program or data RAM with capacity to 4096 words (Uses D1002 RAM or equivalent). PROM and RAM card expandable with 8116 and 8117 to a total of 16,384 words. Has 32 TTL output latches and 32 TTL input gates. Input/Output is card expandable with 8115 to 192 output latches and with 8114 to 64 input gates. Uses 8111, 8114, 8115, 8116, 8117, D1002 and D-256.

565.00 (N)   **MPS-863**   **THREE CARD 6800 MICROCOMPUTER SYSTEM**

Includes 6800 CPU with 1.6 microsecond state cycle crystal clock, DMA buffers and interrupt input with power-on restart. Contains 256 word instruction PROM with capacity to 1024 words, uses D256 word instruction PROM or equivalent. Has 1024 word program/data RAM with capacity to 2048 words (D1002 or equivalent). Has 28 TTI I/O lines field selectable in groups of 4 lines as input gates or ouput latches. Uses 8611, 8112, 8113-1, D1002 and D256. Requires +5 volts and -10 volts. Clock option (specify when ordering): 1.0 microsecond state cycle time (MPS-863-1) See page 24 for quantity pricing.

750.00 (N)   **MPS-865**   **FIVE CARD 6800 MICROCOMPUTER SYSTEM**

Includes 6800 CPU with 1.6 microsecond state cycle crystal clock, DMA buffers and interrupt input with power-on restart. Contains 256 word instruction PROM with capacity to 2048 words, uses D256 PROM or equivalent. Has 1024 words of program or data RAM with capacity to 4096 words, uses D1002 RAM or equivalent. PROM and RAM are card expandable with 8116 and 8117 to a total of 16,384 words. Has 32 TTL ouput latches and 32 TTL input gates. Input and Output are card expandable to thousands of lines with the 8115-1 and 8114 cards. Uses 8611, 8114, 8115-1, 8116 and 8117, D1002 and D256. Clock option (specify when ordering): 1.0 microsecond state cycle time (MPS-863-1). See page 24 for quantity pricing.

565.00 (↑)   **MPS-883**   **THREE CARD 8080 MICROCOMPUTER SYSTEM**

Includes 8080 CPU with 1.6 usecond state cycle, crystal clock, DMA buffers and interrupt input with optional power-on restart. Contains 256-word instruction PROM with capacity to 1024 words (Uses D256 PROM or equivalent). Has 1024-word program or data RAM with capacity to 2048 words (Uses D1002 RAM or equivalent). Has 28 TTL I/O lines, field selectable in groups of four as input gates or output latches. Uses 8811, 8112, 8113-1, D1002 and D-256. Requires +12V, +5V and -10V. See page 24 for quantity pricing.

750.00 (↑)   **MPS-885**   **FIVE CARD 8080 MICROCOMPUTER SYSTEM**

Includes 8080 CPU with 1.6 usecond state cycle, crystal clock, DMA buffers and interrupt input with optional power-on restart. Contains 256-word instruction PROM with capacity to 2048 words (Uses D256 PROM or equivalent). Has 1023-word program or data RAM with capacity to 4096 words (Uses D1002 RAM or equivalent). PROM and RAM card expandable with 8116 and 8117 to a total of 16,384 words. Has 32 TTL output latches and 32 TTL input gates. Input/Output is card expandable with 8115-1 to 192 output latches and with 8114 to 64 input gates. Uses 8811, 8114, 8115-1, 8116, and 8117, D1002 and D256. Requires +12V, +5V and -10V. See page 24 for quantity pricing.

EDGE CONNECTED CARD COMPONENTS

|		
$ 330.00	**8111**	**CPU CARD (8008)** Contains 8008 CPU with 2.8 usecond state cycle, crystal clock, DMA buffers and interrupt input with optional power-on restart. Requires +5V and -10V.
80.00 (↓)	**8112**	**ROM/RAM CARD** Capacity to 1024-words of instruction PROM. (Uses D256 or equivalent) and 2048 words of instruction or data RAM (Uses D1002 or equivalent). Does not include PROM's or RAM. Requires +5V and -10V.
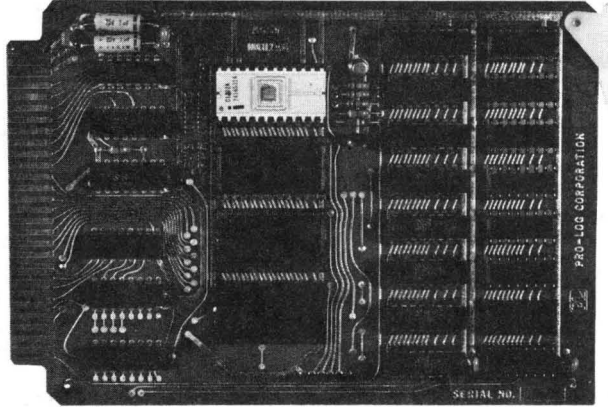
8112 ROM/RAM Card

95.00 (↓)	**8113**	**I/O CARD (8008)** Contains 28 TTL universal lines, field selectable in groups of 4 as input gate or output latches. Connects to 8811. Requires +5V.
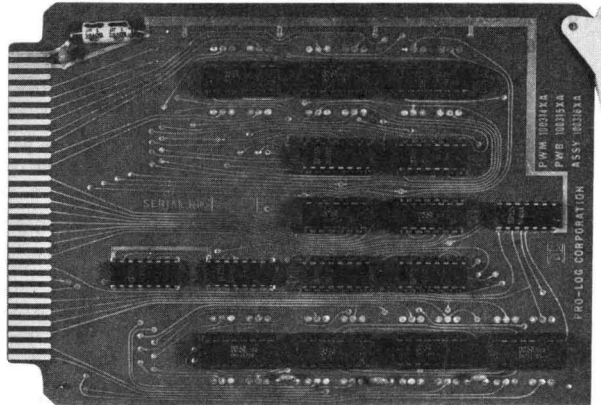
8113 I/O Card

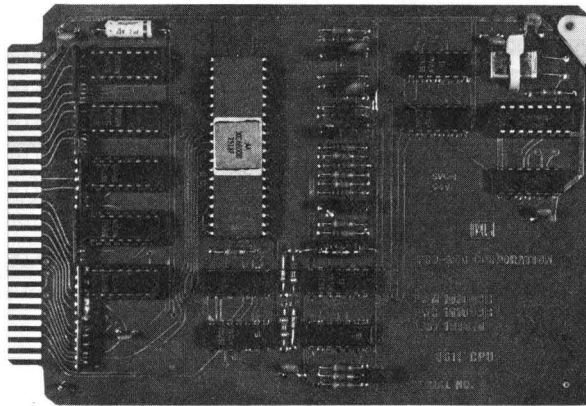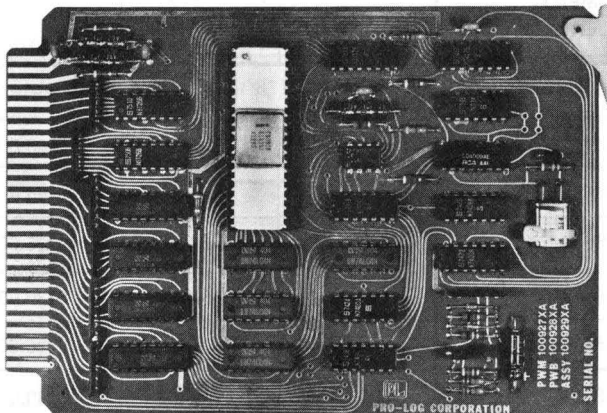|		
95.00 (↓)	**8113-1**	**I/O CARD (8080, 6800)** Contains 28 TTL universal lines, field selectable in groups of 4 as input gate or output latches. Connects to 8811 or 8611. Requires +5V.
80.00	**8114**	**TTL INPUT GATE CARD** Contains 32 input gates. Requires +5V.
95.00	**8115**	**TTL OUTPUT LATCH CARD (8008)** Contains 32 output latches. Connects to 8111. Requires +5V.
95.00	**8115-1**	**TTL OUTPUT LATCH CARD (8080, 6800)** Contains 32 output latches. Connects to 8811 or 8611. Requires +5V.

$ 80.00 (↓)	**8116**	**ROM CARD** PROM capacity to 2048 words. (Uses D256 or equivalent). Requires +5V, -10V. Does not include PROM.
105.00	**8117**	**RAM CARD** . . . . Capacity to 4096 words. (Uses D1002 or equivalent.) Requires +5V. Does not include RAM.
95.00	**8118**	**8-LEVEL PRIORITY INTERRUPT CARD** . . . . Expands 8111 or 8811 Interrupt to 8-levels of priority interrupt. Requires +5V.
95.00	**8118-1**	**8-LEVEL PRIORITY INTERRUPT CARD** Expands 8811 Interrupt to 8-levels of Priority Interrupt. Requires +5V.
295.00 (N)	**8611**	**CPU CARD (6800)** Implements the 8 bit 6800 Microprocessor as a fully TTL buffered CPU card with clock, reset, data, address, memory control and I/O control. Includes 6800 CPU, with 1.6 μsecond state cycle crystal clock. (timing is compatible with D256 or 1702A PROMs). Requires +5 volts. For 1.0 μsecond state cycle clock specify 8611-1. See page 24 for quantity pricing.

8611 CPU Card

295.00 (↓)	**8811**	**CPU CARD (8080)** Contains 8080 CPU with 1.6 usecond or 0.8 usecond state cycle (customer selectable) crystal clock, DMA buffers and interrupt input with optional power-on restart. Requires +12V, +5V and -10V or +12V, +5V and -5V. (Customer selectable to fit supply requirements of PROMs). See page 24 for quantity pricing.

8811 CPU Card

120.00	**8812**	**ROM/RAM CARD (8080)** Capacity to 8192 words of instruction PROM (2708) and 1024 words of RAM (D1002 or equivalent). Interfaces with 8811 CPU. Comes without PROM or RAM. Requires +12V, +5V and -5V. Avoid mixing with 8112 or 8116 cards because of power supply requirements.

SYSTEM PROGRAMS

Pro-Log has a teletype Monitor Program available for each of its 8-bit Microcomputer families (8008, 8080 and 6800). Each monitor program comes coded on 4 D256 PROMs and may be plugged into the first 1024 address locations in the system. The monitor program works through the 8406 TTY card or equivalent and performs the Load, Dump, Move, Translate and Edit functions when used with a teletype. Each program comes complete with program listing.

$ 200.00 (N)	MON-2	TTY MONITOR PROGRAM (8008)
200.00 (N)	MON-4	TTY MONITOR PROGRAM (8080)
200.00 (N)	MON-6	TTY MONITOR PROGRAM (6800)

QUANTITY PRICING

Special quantity pricing is now offered by Pro-Log for some of its most widely used products. Quantity pricing provides substantial discounts from unit list price. No other discounts apply to items purchased at the quantity discount price.

The "A" versions of the MPS systems differ from the basic units, in that they do not include the D256 PROM.

TOTAL ORDER QUANTITY (over 12 months)	10-24 UNITS	25-99 UNITS	100-499 UNITS*	500-UP UNITS**
MINIMUM QUANTITY PER SHIPMENT	10	10	25	50
SCHEDULE LEAD TIME TO	5 WKS.	7 WKS.	9 WKS.	10 WKS.
ITEM	PRICE			
8611	$210.00	185.00	165.00	150.00
8811	210.00	185.00	165.00	150.00
MPS-863A	390.00	355.00	325.00	295.00
MPS-865A	520.00	475.00	430.00	390.00
MPS-883A	390.00	355.00	325.00	295.00
MPS-885A	520.00	475.00	430.00	390.00

* Production documentation and production rights are given after first 250 units are paid for.

** Production documentation and production rights are given after first 300 units are paid for.
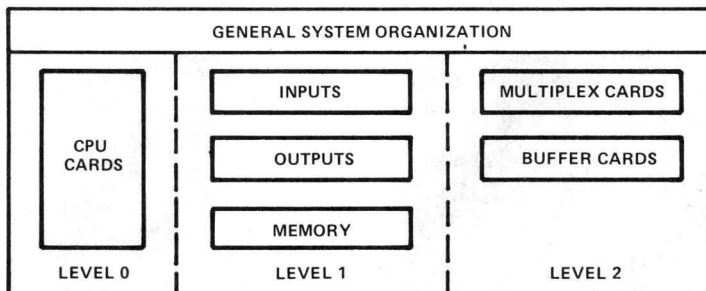
MICROCOMPUTER CARD COMPATIBILITY TABLE

The table below shows the possible interconnecting of support cards with specific CPU cards. While there might be other combinations and while some combinations are limited by the capabilities of the CPU instruction sets, this table gives a general idea of the feasible system configurations. (Please see legend and notes below)

CPU CARDS	8111	8811	8611
MEMORY CARDS			
8112	X	X	X
8116	X	X	X
8117	X	X	X
8812		X (1)	
INPUT/OUTPUT CARDS			
8113	1		
8113-1		1	1
8114	1	1	1
8115	1		
8115-1		1	1
INTERRUPT CARDS			
8118	X		
8118-1		X	
*INTERFACE CARDS			
8401	2	2	2
8402	2	2	2
8403	2	2	2
8404-2	2	2	2
8404-4	2	2	2
8405	2	2	2
8406	2	2	2
8410	2	2	2

(1) 8812 should not be mixed with 8112 or 8116, because of power supply requirements.

```
GENERAL SYSTEM ORGANIZATION

           |  INPUTS        |  MULTIPLEX CARDS
  CPU      |                |
  CARDS    |  OUTPUTS       |  BUFFER CARDS
           |                |
           |  MEMORY        |

  LEVEL 0  |  LEVEL 1       |  LEVEL 2
```
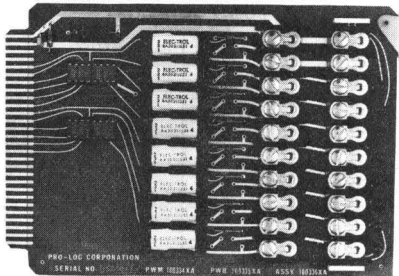
LEGEND: X-- Indicates compatability (e. g. 8611 can use 8112).
1-- Indicates interface level 1
2-- Indicates interface level 2
1,2-- Indicates interface level 1 or 2

*NOTE: Interface and multiplex cards are always interfaced at level 2 (i.e., they tie to existing I/O ports).

INTERFACE CARDS   The cards listed in this section can be used with any of the Pro-Log 4-bit or 8-bit microprocessor systems having TTL inputs and outputs. The buffer cards may be wired directly to the selected microprocessor ports or port multiplexers. These cards enable the user to efficiently connect his microprocessor system to real world loads such as relays, solenoids and motors.

$ 95.00	**8401**	**DRIVER OUTPUT CARD** Sixteen Drivers, 300 ma each, 28 VDC, screwdriver lug cable attachment.
110.00	**8401-2**	**DRIVER OUTPUT CARD** Same as 8401 but includes 16 LED Status indicators on card.
120.00	**8402**	**RELAY OUTPUT CARD** Eight relays, Form C isolated contacts, screwdriver lug cable attachment.
130.00	**8402-2**	**RELAY OUTPUT CARD** Same as 8402 but includes 8 LED status indicators on card.

8402 Relay Output Card

210.00	**8403**	**OPTO-ISOLATOR AC/DC INPUT CARD** Eight isolated inputs at 24 or 48 VDC or 115 VAC/VDC. Screwdriver lug cable attachment.

24VAC (8403-1)	24VDC (8403-4)
48VAC (8403-2)	48VDC (8403-5)
115VAC (8403-3)	115 VDC (8403-6)

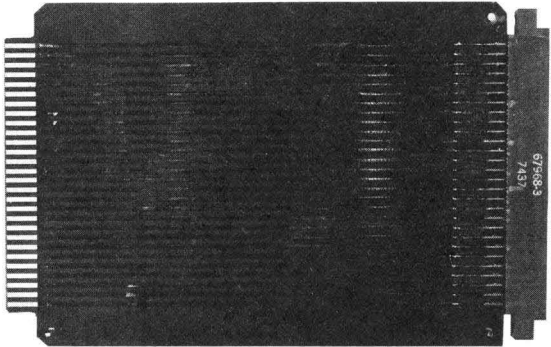|		
175.00	**8404-2**	**TRIAC OUTPUT CARD** Two 240VAC isolated ouputs @ 10A. Screwdriver lug cable attachment
280.00	**8404-4**	**TRIAC OUTPUT CARD** Same as 8404-2 but with four isolated outputs.
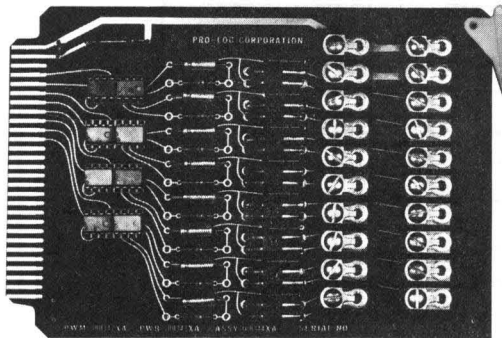
8403 Opto-Isolator AC/DC Input Card
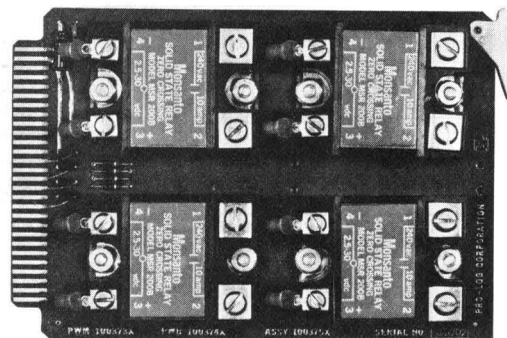
8404-4 Triac Output Card

| $ 60.00	8405	**TERMINAL STRIP INTERFACE CARD**

Provides connection of 50 screwdriver lugs to card rack.

55.00	8406	**SERIAL TTY INTERFACE CARD**

Provides interface to ASR33 20MA current loop.

90.00 (♦)	8410	**TTL TO HI-NIL I/O CARD**

Interfaces with 24 TTL I/O lines to produce Hi-Nil I/O.

12 HiNIL input gates and 12 HiNIL Output Drivers (8410-1)

24 HiNIL Output Drivers (8410-2)

24 HiNIL Input Gates (8410-3)

SYSTEM HARDWARE

BOARDS

$ 35.00	P560	**CARD EXTENDER**

For all PRO-LOG card edge connected cards.

P560 Card Extender

25.00	P561	**UTILITY DIP CARD**

Capacity for 48 dual-in-line IC packages, 56-pin card edge connections on 0.125 inch centers.

25.00	P562	**GENERAL UTILITY CARD**

Plated through holes on 0.1 inch centers, 56-pin card edge connections on 0.125 inch centers.
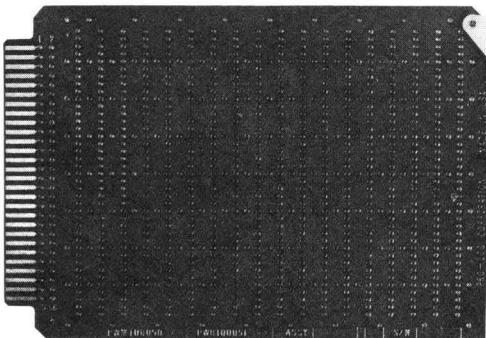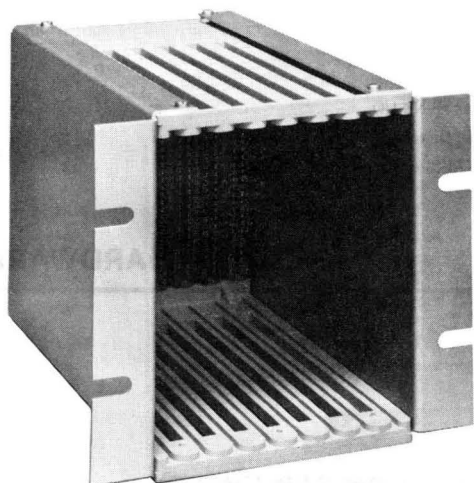

P561 Utility Dip Card

P562 General Utility Card
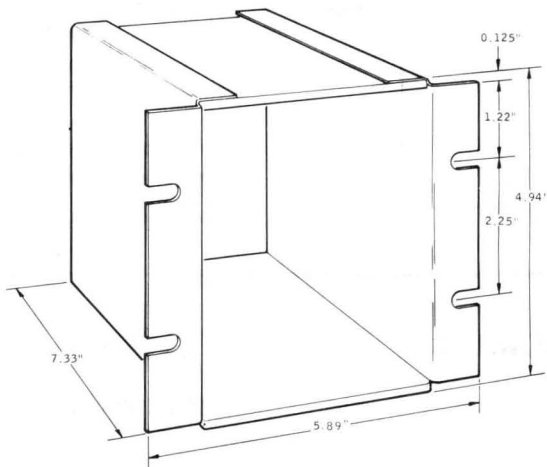
CARD RACKS

CR-5 Card Cage

CR-5 Card Cage Dimensional Drawing

$ 80.00	CR-5	**1/4 RACK CARD CAGE**
		Includes six CW56 connectors and power busing. Field expandable to 8 connectors. May be ordered prewired to standard PLS or MPS configurations.
90.00	CR-10	**1/2 RACK CARD CAGE**
		Includes six CW56 connectors and power busing. Field expandable to 16 connectors. May be ordered prewired to standard PLS or MPS configurations.
160.00	CR-19	**FULL RACK CARD CAGE**
		Full 19 inch rack with twelve CW56 connectors and power busing. Field expandable to 32 connectors. May be ordered prewired to standard PLS or MPS configurations and with additional connectors.

CONNECTORS

$ 12.00	CT56	**TRANSITION CONNECTOR**
		Mates discrete cable wires to CW56. Includes 40 pins.
7.00 (♥)	CW56	**WRAP CONNECTOR**
		Card edge 56-pin, 3-level wire wrap connector. Fits on CR-5, CR-10, CR-19.
		Pins are 0.025 inches square and spaced on 0.125 inch centers.

POWER SUPPLIES

$ 85.00	M272	**DUAL DC SUPPLY**
		Provides +5V @ 2A and -10V @ 1A. For PLS-400 systems.
130.00	M273	**DUAL DC SUPPLY**
		Provides +5V @ 6A and -10V @ 2A. For MPS-800 systems and large PLS-400 systems.
60.00	M274	**DC SUPPLY**
		Provides +12V @ 1A. Used with M273 in 8080 systems.
60.00 (N)	M275	**DC SUPPLY**
		Provides +15 V @ 1.5 A.
90.00 (N)	M276	**DC SUPPLY**
		Provides +12V @ 1A and -5V @ 2A for 8080 Systems.

SOCKETS

$ 15.00	SZ-24	**ZERO INSERTION FORCE SOCKET**
		24 pin socket adapted to mate with PROM's and PROM sockets. Expedites changing PROM. SZ-24's do not fit in adjacent sockets on most cards.

MEMORY DEVICES

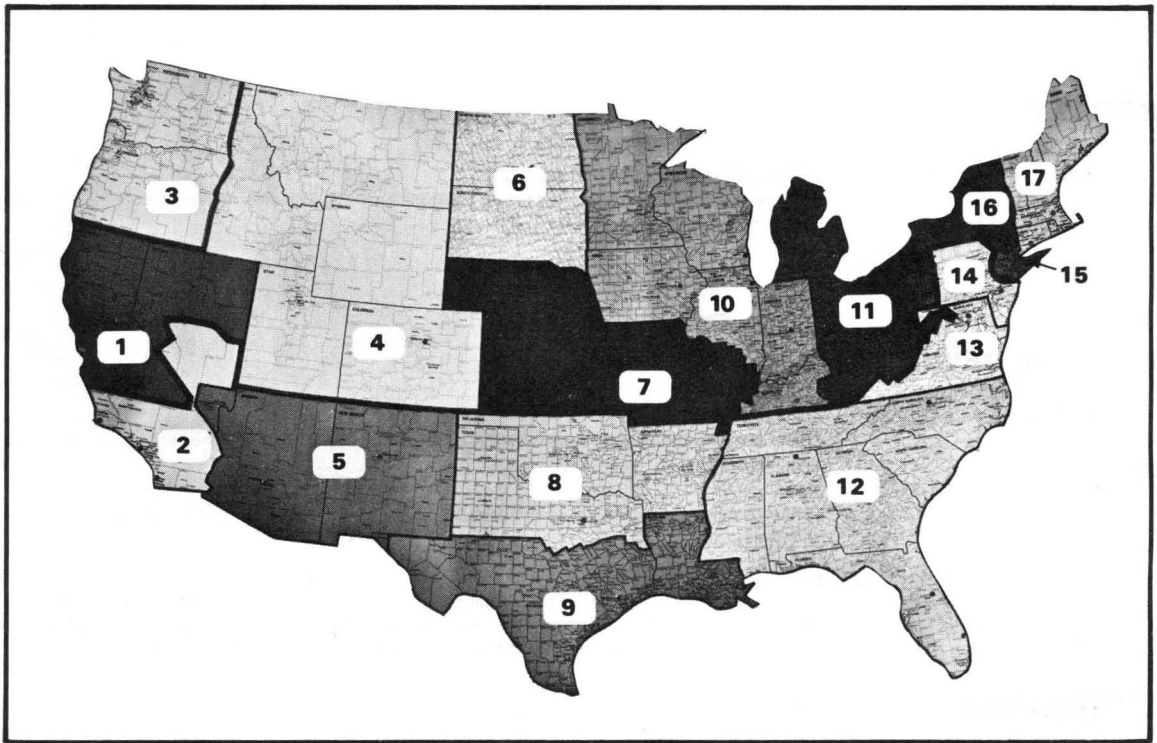|		
$ 35.00	D256	**UV ERASABLE PROM**
		PROM contains 256 eight-bit words (1702A equivalent). Works with all PLS and MPS systems. Sold only with card order.
60.00	D1002	**RAM**
		Static RAM (2102 type) 1024 eight-bit words in 8 packages. For MPS-800 systems or the 4117. Sold only with card order.
15.00	4002-1 and 4002-2	**RAM REGISTER**
		Contains 80 four-bit data characters organized as four registers of 16 data characters and 4 status characters. Order as -1 or -2 depending on system address. First two RAMS, including RAM supplied with system, are -1; next two are -2. RAMS alternate in groups of two. Includes 4 MOS outputs. Sold only with PLS Hardware.

LITERATURE

$ 4.00	CF-1	**PROGRAM ASSEMBLY FORM**
		Tablet of 100 Hexadecimal coded forms for assembling programs.
5.00 (⬇)	DG-1	**DESIGNER'S GUIDE TO PROGRAMMED LOGIC (4004)**
		For PLS-400 systems. Shipped at no charge with initial PLS order.
5.00 (⬇)	DG-2	**DESIGNER'S GUIDE TO PROGRAMMED LOGIC (8008)**
		For MPS-800 sytems. Shipped at no charge with initial MPS order.
NC	MUG	**MICROPROCESSOR USER'S GUIDE**
		A 36 page booklet on how to select microprocessor systems and how to design them into equipment. Includes the papers "Microprocessors for Dedicated Control" and "How to Design with Microprocessors".
NC	PUG	**PROM USER'S GUIDE**
		A 36 page booklet on PROMs and the Series 90 PROM programmer. Includes the papers "An Introduction to PROM Technology" and "How to use the 1702A MOS PROM Reliably" as well as PROM cross reference tables and complete data sheets on the Series 90 PROM Programmer, its options and personality modules.

COURSES AND SEMINARS

NC	DC-1	**HOW TO PROFIT FROM MICROPROCESSORS**
		Half-day lecture and demonstration session on the fundamentals of how to select and use a microprocessor. Geared to the corporate decision maker. (See page 2 for details).
$ 300.00	DC-3	**DESIGN COURSE FOR INDIVIDUAL**
		Three day, hands-on lab and lecture course on designing with microprocessors. Scheduled throughout the country. Includes lunches, course notes, DG-1 and DG-2 Manuals. (See page 33 for details).
4,000.00	DC-5	**"IN PLANT" DESIGN COURSE**
		Includes an Instructor and his transportation, housing, lab equipment and course material in the Continental United States for a 3 day hands-on design course. Contact PRO-LOG to establish schedule dates. (Only a limited number of dates are available). Customer must supply the lecture and lab area suitable for 20-25 students.

SALES REPRESENTATIVES

1. **MANCO**
   Mt. View, CA (415) 964-7281

2. **BASIC SYSTEMS**
   Los Angeles, CA (213) 938-2833
   Santa Barbara, CA (805) 963-2071
   San Diego, CA (714) 279-9641

3. **HAYES TECHNICAL**
   Seattle, WA (206) 763-2210
   Portland, OR (503) 232-5343

4. **EISSLER SALES & SERVICES**
   Denver, CO (303) 794-1779

5. **TREMBLY ASSOCIATES**
   Albuquerque, NM (505) 293-4444
   Phoenix, AZ (602) 966-4428

6. **PRO-LOG CORPORATION**
   Monterey, CA (408) 372-4593

7. **PALATINE SALES**
   Kansas City, KS (913) 492-7020
   Wichita, KS (316) 788-0621
   Cedar Rapids, IA (319) 365-8071
   St. Louis, MO (314) 426-7055

8. **LEAR ASSOCIATES**
   Dallas, TX (214) 231-5388

9. **SESCO-HOUSTON**
   Houston, TX (713) 668-7840

10. **SYSTEMS ENGINEERING ASSOCIATES**
    Indianapolis, IN (317) 846-2593
    Chicago, IL (312) 282-6694
    Milwaukee, WI (414) 547-6637
    Minneapolis, MN (612) 425-4455

11. **ELECTRO SALES**
    Cleveland, OH (216) 261-5440
    Dayton, OH (513) 426-5551
    Detroit, MI (313) 526-8800
    Pittsburgh, PA (412) 371-9449

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    Orlando, FL (305) 851-5710
    Palm Beach, FL (305) 746-2996
    Huntsville, AL (205) 536-9990
    Greensboro, NC (919) 294-2754

13. **REP-TRON**
    Columbia, MD (301) 465-6433
    (301) 953-7580

14. **MEGARGEL-HIMMELSTEIN**
    Camden, NJ (609) 662-3081

15. **TECNIMAT**
    Fort Lee, NJ (201) 461-8686

16. **db ASSOCIATES**
    Syracuse, NY (315) 446-0220

17. **INSTRUMENT CONSULTANTS**
    Boston, MA (617) 969-9881
    Hamden, CT (203) 288-5246

INTERNATIONAL DISTRIBUTORS

Australia:

A. J. FERGUSON
Prospect
Phone: 269-1244

Canada:

DATAGRAPHICS
Toronto
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DATAGRAPHICS
Edmondton
Phone: (403) 424-2287

DATAGRAPHICS
Ottawa
Phone: (613) 225-0411

DATAGRAPHICS
Calgary
Phone: (403) 281-1636

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Camberley, Surrey
Phone: Camberley 26517

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Phone: 657-11-47

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SPEZIAL-ELECTRONIC
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INTEGRERAD ELEKTRONIK AB
Djursholm
Phone: 08/7530330

Switzerland:

LASER & ELECTRONIC EQUIPMENT
Zurich
Phone: 01/55-33-30

GENERAL INFORMATION

PRO-LOG CORPORATION

PRO-LOG is a manufacturer of microprocessor systems and related instruments. The company was founded in November of 1972 in Southern California and moved to Monterey, California in mid 1973. In its third year of operation it shipped over $2 million in goods and services. Its controlled growth and sound profitability have continued into its fourth year.

PLACING AN ORDER

Orders may be placed through your local PRO-LOG Representative (page 30) or directly with the factory. Telephone orders are accepted pending credit verification and confirming paperwork. When telephoning an order to Pro-Log ask for the Order Desk. We have specially trained personnel to handle your order promptly.

PRODUCT AVAILABILITY

PRO-LOG's normal shipment time is 2-4 weeks ARO on most products. Should you require shorter turn-around, PRO-LOG will try to accommodate you. There will be a $50 expediting charge on any order requiring less than 4 week delivery.

IF YOU SHOULD NEED SERVICE OR TECHNICAL SUPPORT

Contact your local Representative or call PRO-LOG direct and ask for the Service Desk. If it is necessary to return some equipment to PRO-LOG for repair, the Service Desk will provide you with a return number and the instructions which will expedite handling of your equipment by PRO-LOG.

FUNCTIONS AND LIMITATIONS OF PRO-LOG REPRESENTATIVES

PRO-LOG is represented domestically by a network of sales representatives (See Page 30). These people are ready to answer most of your questions about PRO-LOG and its products and can assist you in getting the support and information you need to solve your problems. Our representatives are not authorized to quote prices other than those listed in our published price list, nor can they commit PRO-LOG to any contractural arrangements. Such pricing and arrangements can be made only in writing by an officer of PRO-LOG Corporation.

SPECIAL CONFIGURATIONS

PRO-LOG is a manufacturer of standard products and as such does not normally consider special purpose designs or hardware configurations. However, PRO-LOG may be willing to quote specialized product configurations, specialized packaging and additional products, services and documentation as part of an OEM agreement.

PRICING

VOLUME AND OEM PRICING

PRO-LOG factory quotes quantity orders for its products on the basis of customer specified product configuration, total quantities and delivery schedule. These quotations provide firm prices for up to 18 months. To qualify for factory quoted volume or OEM pricing an order must be for at least 50 units of one microprocessor system over a 12 month period or have a total list price value exceeding $25,000. Orders not meeting one of these qualifications will be priced according to the latest published price list and the Dollar Volume Discount Policy.

DOLLAR VOLUME DISCOUNT POLICY

PRO-LOG grants its customers significant discounts from unit list price based on the total dollar volume of orders placed for its products and paid for promptly. Late payment penalties include loss of the entire discount on the related order. The Volume Discount Policy has been established by PRO-LOG and is subject to change without notice.

BASE PRICE

The price basis for an order made under this policy is the published Price List in effect at the time a particular order is placed. Starter kits or volume prices for cards are not discounted.

ORDERING INFORMATION

DISCOUNT

The discount is determined from the Volume Discount Schedule shown in Table . It is applicable to all items on an order except those shown on the published Price List as having no discount or limited discounts.

ACCUMULATED DOLLAR VALUE	DISCOUNT
$ 0 - $ 5,999	None
6,000 - 14,999	10%
15,000 - 24,999	15%
25,000 - UP	20%

DISCOUNT CALCULATION

PRO-LOG calculates the discount for an order, by adding the list price of that order to the invoiced or invoiceable amounts of all previous orders placed since the starting date of the agreement. (Except for those invoices subjected to the late payment penalty.) The total figure is "Accumulated Dollar Volume." The applicable discount rate will be determined from the table above. The discount is applied only to the order in question and is not retroactive to previous orders.

NON-DISCOUNTABLE ITEMS

Some items are shown on PRO-LOG's Price List as non-discountable or as quantity pricing. They are always billed at list price but their amount is included in "Accumulated Dollar Volume."

LATE PAYMENT PENALTIES

An invoice not paid within 60 days of the invoice date is "overdue". The following penalties automatically occur on an overdue invoice:
1. All discounts on that invoice are voided. A new invoice for the amount of the discounts will be issued. The original invoice remains due and payable in full.
2. The amount of an overdue invoice shall not be included in any later computation of "Accumulated Dollar Volume".
3. Future orders from the customer will be accepted only on a C.O.D. or cash with order basis until credit is reestablished to PRO-LOG's satisfaction.

TERMS

1. 2%–10 Days, Net 30 Days; F.O.B. Monterey, California.
2. Cancellation charges on orders for standard products will be charged at the rate of 10 percent of the amount of the purchase order covering standard products. This will apply in all instances where orders for standard products are cancelled after PRO-LOG acceptance of purchase order.
3. Minimum Order: $100.00; all orders subject to credit verification.
4. Discounts voided on invoices not paid in 60 days.
5. International orders must be preceded by an irrevocable letter of credit.

WARRANTY

WARRANTY: Seller warrants that the articles furnished hereunder are free from defects in material and workmanship and perform to applicable published PRO-LOG specifications for six months from date of shipment. This warranty is in lieu of any other warranty expressed or implied. In no event will Seller be liable for special or consequential damages as a result of any alleged breach of this warranty provision. The liability of Seller hereunder shall be limited to replacing or repairing, at its option, any defective units which are returned F.O.B. Seller's plant. Equipment or parts which have been subject to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation are not covered by warranty. Seller shall have the right of final determination as to the existence and cause of defect. As to items repaired or replaced, the warranty shall continue in effect for the remainder of the warranty period, or for ninety (90) days following date of shipment by Seller or the repaired or replaced part whichever period is longer. No liability is assumed for expendable items such as lamps and fuses. No warranty is made with respect to custom equipment or products produced, to Buyer's specifications except as specifically stated in writing by Seller and contained in the contract.

enroll in PRO-LOG'S hands-on
MICROPROCESSOR DESIGN COURSE

A 3 DAY COURSE FOR DESIGN ENGINEERS ON "HOW TO DESIGN WITH PROGRAMMED LOGIC."

Are you or your company considering microprocessors? Are you a hardware designer familiar with registers and gates, but want to learn how to use microprocessors? If it ~is your responsibility to develop cost-competitive systems involving logic and control, then this course is for you.

- 3 full days

- Presented by design engineers in engineering terms.

- Learn to develop cost-competitive logic and control systems.

- Develop a cost effective design approach applicable to most microprocessors.

- Go from theory to actual hands-on microprocessor implementation in daily laboratory sessions.

- Only $300 per student.

- Includes textbooks, all lab materials and lunches.

- Informal evening Lab work.

- Enrollment is on a first-come first-served basis and limited to 25 students per session. Telephone enrollment is accepted if followed by check or P.O. within 5 days. Literature will be provided prior to the session to enable the student to prepare.

For scheduling information or to schedule this course at your facility, call your PRO-LOG representative (page 30) or PRO-LOG.
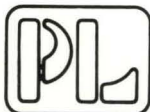
33

PL PRO-LOG

CORPORATION 2411A Garden Road Monterey, California 93940 ▪ (408) 372-4593 TWX: 910-360-7082

NAME _____   TITLE _____

COMPANY _____   DEPARTMENT _____

ADDRESS _____   CITY _____

STATE _____ ZIP _____   TELEPHONE _____

MY REQUIREMENT IS: _____

PLEASE SEND ADDITIONAL INFORMATION

☐ PLS-400 4-BIT PROGRAMMED LOGIC SYSTEM
AND AUXILIARY HARDWARE.

☐ MPS-800 8-BIT MICRO-COMPUTER SYSTEMS
AND AUXILIARY HARDWARE.

☐ SYSTEM ANALYZER:☐ 4-BIT ☐ 8-BIT
☐ DESIGN MANUAL: ☐ 4-BIT ☐ 8-BIT
COST $5.00, CASH OR CHECK PLEASE

☐ 3-DAY DESIGN COURSE.
☐ HALF-DAY ECONOMICS SEMINAR

☐ ADDITIONAL COMMENTS: _____

☐ SERIES 90 PROM PROGRAMMERS
TYPES OF PROMS: _____

☐ I HAVE AN IMMEDIATE NEED. _____

_____

_____

I WOULD LIKE

☐ A DEMONSTRATION OF _____

☐ A COPY OF "PROM USER'S GUIDE"

☐ A COPY OF "MICROPROCESSOR USER'S GUIDE"

100500   1-76