TELEPHONE AREA CODE 617-894-0835

MATHATRONICS, INC.

257 CRESCENT STREET, WALTHAM 54, MASS.

REPRESENTED BY
COMPUTER ASSOCIATES, INC.
4142 LANKERSHIM BLVD.
NO. HOLLYWOOD, CALIF. 91602
PHONE: 877-1434

MATHATRON SYSTEMS PRICE SCHEDULE

October 1, 1964

MODEL	DESCRIPTION	PRICE
*4-24	Basic System 4 storage registers 24-step memory	$3,490.00
8-48	Expanded System 8 storage registers 48-step memory	$4,990.00
8-48 S	Statistical Model	$5,990.00
8-48 C	Civil Engineering Model	$6,790.00
8-48 M	Mathematicians' Model	$7,450.00

Lease plans are available.

* The Model 4-24 System may be later expanded through retrofitting at the net difference in price plus a $75.00 charge.

Pre-wired Program Sequences are available at the time of initial sale in accordance with prices shown on separate price schedule, or installed later at same prices plus a $75.00 charge for retrofitting.

Prices are F.O.B. Mathatronics, Inc. plant, Waltham. Massachusetts, and are subject to change without notice. Terms are Net 30 days.

Applicable state and/or local taxes on the sale, lease, use or maintenance of this equipment shall be added.

Warranty for 90 days from delivery date includes parts and labor costs. Service thereafter will be furnished at established rates on either a contract or per-call basis.

Quotations furnished on request for:

Special Pre-wired Program Sequences.
Engineering and design modifications to incorporate compatibility with peripheral equipment in data processing or numeric control systems.

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MATHATRONICS, INC.

257 CRESCENT STREET, WALTHAM 54, MASS.

PRICE SCHEDULE
FOR
MATHATRON INPUT/OUTPUT UNITS

October 1, 1964

Model	Description	Price
PTP	Input/Output Unit including paper tape reader and punch and page printer with mode controls and automatic format	$2,500.
4-24 PTP*	Mathatron Model 4-24 with PTP	$5,990.
8-48 PTP*	Mathatron Model 8-48 with PTP	$7,490.
8-48 DCA	Mathatron Model 8-48 DCA with PTP	$7,490.

Pre-wired Program Sequences are available at the time of initial sale in accordance with prices shown on separate price schedule, or installed later at same prices plus a $75.00 charge for retrofitting.

Prices are F.O.B. Mathatronics, Inc. plant, Waltham, Massachusetts, and are subject to change without notice. Terms are Net 30 days.

Applicable state and/or local taxes on the sale, lease, use of maintenance of this equipment shall be added.

Warranty for 90 days from delivery date includes parts and labor costs. Service thereafter will be furnished at established rates on either a contract or per-call basis.

Quotations furnished on request for:

Special Pre-wired Program Sequences
Engineering and design modifications to incorporate compatibility with peripheral equipment in data processing or numeric control systems.

* Credit of $100 allowed if strip printer deleted from system.

MPF-8

TELEPHONE AREA CODE 617-894-0835

MATHATRONICS, INC.

257 CRESCENT STREET, WALTHAM 54, MASS.

REPRESENTED BY
COMPUTER ASSOCIATES, INC.
4142 LANKERSHIM B VD.
NO. HOLLYWOOD, CALIF. 9.6[illegible]
PHONE: 877-1434

PRICE SCHEDULE
FOR
MATHATRON RACK MOUNTED DIGITAL CONTROLLER & ARITHMETIC ANALYZER

October 1, 1964

Model	Description	Price
4-24 DCA	Central Processor including 4 storage registers 24-step memory and electronic interface suitable for mounting in a 19" electronic relay rack	$3,590.
8-48 DCA	Central Processor including 8 storage registers 48-step memory and electronic interface suitable for mounting in a 19" electronic relay rack	$5,090.
PKB	Keyboard and Strip Printer Packaged	$ 900.
KB	Keyboard Packaged	$ 530.
KBO	Keyboard (not packaged)	$ 320.
P	Printer Packaged	$ 750.
PO	Printer (not packaged)	$ 540.

Pre-wired Program Sequences are available at the time of initial sale in accordance with prices shown on separate price schedule, or installed later at same prices plus a $75.00 charge for retrofitting.

Prices are F.O.B. Mathatronics, Inc. plant, Waltham, Massachusetts, and are subject to change without notice. Terms are Net 30 days.

Applicable state and/or local taxes on the sale, lease, use or maintenance of this equipment shall be added.

Warranty for 90 days from delivery date includes parts and labor costs. Service thereafter will be furnished at established rates on either a contract or per-call basis.

Quotations furnished on request for:

Special Pre-wired Program Sequences
Engineering and design modifications to incorporate compatibility with peripheral equipment in data processing or numeric control systems.

NEW MATHATRON PTP

PAPER TAPE PUNCH / READER PAGE PRINTER

REPRESENTED BY
COMPUTER ASSOCIATES, INC.
4142 LANKERSHIM BLVD.
NO. HOLLYWOOD, CALIF. 91602
PHONE: 877-1434

MATHATRONICS, INC.

Mathatron Paper Tape Punch/Reader and Page Printer Model PTP

For on or off line data recording, storage, and inter machine communication.

A versatile new addition to the Mathatron family of integrated data handling equipment, the NEW Mathatron Paper Tape Punch/Reader and Page Printer extends the already wide range of capabilities of the Mathatron desk top computer/calculator. It provides low cost, off line data storage, flexible inter machine communication media, and a choice of input-output media for the Mathatron.

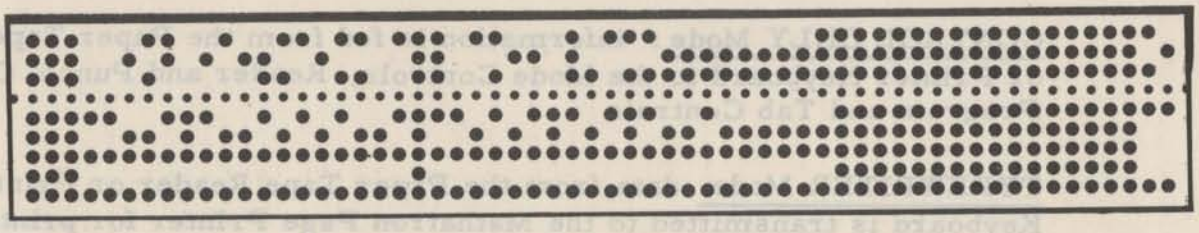
Through the use of the PTP, tabular tables, forms etc. can be automatically generated from complex calculations. Surveying charts, for example, are automatically typed in columnar form with both input directions and angles shown with computed coordinates for each line. Complex engineering equations, such as Bernoulli's equations, can be solved automatically using stored Mathatron programs with the tape reader and punch providing auxiliary storage. Actuarial analyses, billing, payrolls, inventory control, charts, plots, etc., can all be automated through the use of the Mathatron PTP.

When the Mathatron Paper Tape Punch/Reader and Page Printer is interconnected to the Mathatron through the standard Mathatron interface, output data from the Mathatron computer/calculator can be provided in any of three convenient forms to suit your particular requirements.

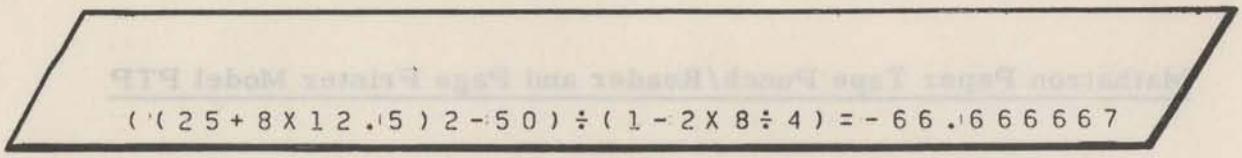
1. Output can be in the form of standard 8 level punched paper tape conforming to the American Standard Code for information interchange. This punched paper tape can then be used for re-entry of data into the Mathatron through the Mathatron Punched Paper Tape Reader, or as input for other computers, business machines, or electronic equipment.

2. Results can be printed out on the standard Mathatron 11/16" wide paper tape, which provides a complete and easily understandable record of all data entered and results computed.

3. The same data can be printed on 8 1/2" wide copy paper in tabular or other form to any length desired.



Eight level punched paper tape produced by Mathatron Paper Tape Punch conforms to American Standard Code



Mathatron printed paper tape with typical printout of data entered and results computed.

THIS IS AN ACTUAL COMPUTATION PRINTOUT FROM THE MATHATRON PTP DOING THE TRAVERSE CLOSURE PROBLEM IN THE 8-48C INSTRUCTION SUPPLEMENT.

BEARING	DISTANCE	DEPARTURE	LATITUDE	ACC. DEP	ACC. LAT
803000	465.25	-458.869	76.788	-458.869	76.788
162730	295.32	83.669	283.219	-375.199	360.007
720900	259.33	246.846	-79.491	-128.353	280.516
771000	187.01	182.338	41.537	53.985	322.054
93000	326.63	-53.909	-322.150	.075	-.096

Typical printout from Mathatron Page Printer showing results in tabular form.

Operating Modes

A special control panel located to the right of the keyboard on the Mathatron Paper Tape Punch/Reader and Page Printer is equipped with a series of switches which can be used to control the six operating modes desired and other necessary punch, reader, program and tab controls. In addition, controls can be automatically changed via the paper tape reader. The two off-line modes are the CONTROL ONLY Mode and the TYPEWRITER Mode. When either of these is dialed, the Mathatron Paper Tape Punch/ Reader and Page Printer operates independently of the Mathatron 4-24 or 8-48 to which it is connected.

CONTROL ONLY Mode: information is fed from the Paper Tape Reader or Printer Keyboard to the Mode Controls, Reader and Punch Controls, Program and Tab Controls

TYPEWRITER Mode: data from the Paper Tape Reader or Printer Keyboard is transmitted to the Mathatron Page Printer for printing on 8 1/2" wide copy paper. The on line modes include the LOAD Mode, the TYPEWRITE-COMPUTE Mode, the "BOTH" Mode, and the MATHATRON Mode.

LOAD Mode: data is fed from the Mathatron Paper Tape Punch/ Reader and Page Printer directly into the Mathatron 8-48 or 4-24 for processing. The Mathatron Printer, the Page Printer and the Punch do not operate.

TYPEWRITE-COMPUTE Mode: information fed into the Mathatron 4-24 or 8-48 from the Paper Tape Reader of Page Printer Keyboard is printed out on the Mathatron Page Printer or punched on 8 level tape after processing in the Mathatron. Automatic Tab and formating are features of this mode. Also, a code can be generated and punched between each number to allow the tape punched in this mode to be used for subsequent automatic input to the Mathatron and when automatically tabbing, all decimals are aligned.

"BOTH" Mode: data is fed into the Mathatron 4-24 or 8-48 from the Punched Paper Tape Reader or Page Printer Keyboard controls. The Mathatron prints out the answer on the standard Mathatron printed paper tape, the Page Printer records the input controls, and the punch may record the inputs.

MATHATRON Mode: data read from punched paper tape by the Punched Paper Tape Reader or fed it from the Page Printer Keyboard is processed by the Mathatron 4-24 or 8-48 and printed out on the standard Mathatron printed paper tape.

Input/Output Media

Punched Paper Tape

When used on or off line, the Mathatron PTP provides facilities for storing data on 8 level punched paper tape. The tape can be used to record and store data which is to be reused repeatedly or it can even be combined with variable data to eliminate re-entry, retyping, reduce chances of error, and speed operations. If page printout is wanted, punched paper tape can be fed into the Mathatron Punched Paper Tape Reader and the data printed out on 8 1/2" wide copy paper by the Mathatron Page Printer. The 1" wide, 8 level tape produced by the Mathatron Paper Tape Punch conforms to the approved American Standard Code for information interchange. It supplies 10 code combinations per linear inch and can be used for input to a wide variety of computers, business machines, and electronic equipment. The tape is also useful for off line storage of formulas or programs in a convenient, easily read form.

The reader portion of the Mathatron Paper Tape Punch/Reader translates the information recorded on punched paper tape and feeds it directly into the Mathatron computer/calculator for processing. Frequently used

programs or other information can be stored on tape for use whenever needed. The data recorded on the tape can be intermixed with numbers entered manually through the Mathatron keyboard. For example: a program could be stored on punched paper tape and the variables entered using the Mathatron 8-48's direct entry keyboard. When used off line, the Mathatron Paper Tape Reader transmits data from punched paper tape directly to the Mathatron Page Printer Control for printing out on page width paper in the format specified. The Punched Paper Tape Reader can also automatically select and start any pre-wired program in the Mathatron to which it is connected.

Page Printout

Data and results are printed on 8 1/2" wide copy paper which feeds from a standard 5" diameter roll. When printing is completed, the paper may be torn off at any length desired. Standard printing width is 74 characters per line with 10 characters per horizontal inch. The paper feeding mechanism is adjustable for either single or double line printing. Standard single line printing provides 6 lines per vertical inch. The printer produces an original and one legible carbon copy. A typewriter type space bar on the printer keyboard may be used for manual spacing or spacing may be specified on the punched paper tape being used as input. Data to be printed can be fed in either directly from the Mathatron 4-24 or 8-48 or from the Mathatron Punched Paper Tape Reader.

Interface Connections

The Mathatron Paper Tape Punch/Reader and Page Printer is tied into the Mathatron computer/calculator through the standard Mathatron input/output interface connection boxes. A detailed description of this input/output interface is provided in the Mathatron Input/Output Interface Bulletin.

Dimensions

Width: 22 inches
Height: 8 3/8 inches, mounted on stand 24 1/2 inches high
Depth: 18 1/2 inches
Weight: approximately 44 lbs.
Cooling Requirements: Standard office environment satisfactory

COMPUTER ASSOCIATES, INC.
MATHATRON COMPUTER / CALCULATOR

February 19, 1965

California Institute of Technology
Lloyd House
Pasadena, Calif.

Attention: Tom Buckholtz

SUBJECT: Mathatronics Desk Top Computer

Dear Mr. Buckholtz,

Per our telephone conversation of February 18, 1965, please find enclosed, catalogue information on Mathatronics unique Desk Top Computer.

We would be happy to answer any questions or give you a demonstration on the Mathatron Desk Top Computer at your convenience.

Very truly yours,

Dick Harris

DH:t
enc.

4142 LANKERSHIM BLVD. • NORTH HOLLYWOOD, CALIFORNIA, 91602 • AREA 213 877-1434
1530 EAST 12TH STREET • OAKLAND 6, CALIFORNIA, ZIP 94600 • AREA 415 534-3338

THE NEW MATHATRON

electronic speed

+

printed output

+

stored-program digital computation

+

floating point arithmetic

+

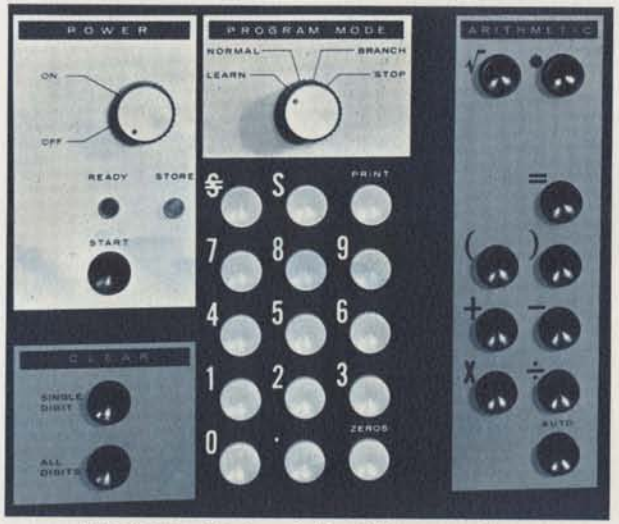
desk calculator convenience

((25+8X12.5)2-50)÷(1-2X8÷4)=-66.666667 999999999=S1 S1XS1XS1=999999997•18

Now you can have a complete automatic digital computation center right at your fingertips! Put a new Mathatron computer/calculator on your desk-top, plug it in, turn it on, and you're ready to compute. The Mathatron can help you multiply your productive hours, add to your creativity, and minimize the time you now spend on routine calculations. With the Mathatron, you get the answers to your calculations quickly, accurately, and economically.

Priced from as low as $3,490, the basic Mathatron includes a ten-key direct input keyboard, storage registers, ferrite-core program memory storage, solid-state computer logic, and printed output. You can add extra storage registers, program memory storage, constants, and special pre-wired programs to suit your own particular computing needs.

Numbers and formulas are entered directly in to the Mathatron, using ordinary mathematical notation. An electronically controlled printer produces a complete record on paper tape of all calculations and solutions. Automatic decimal point location, automatic parenthecation, pre-wired programs, large capacity number storage, automatic evaluation of ordinary mathematical statements, and solid-state electronics for maximum reliability are but a few of the features that make the Mathatron your best buy in desk-top computer/calculators.



Direct entry keyboard simplifies operations.

Direct entry of mathematical statements and formulas simplifies calculations. Numbers and formulas are typed directly into the Mathatron using ordinary mathematical notation on the convenient direct input keyboard. Standard function keys include: add, subtract, divide, and multiply, and for the first time in a desk-top computing machine — right and left parentheses. Special controls are provided for frequently used constants and special pre-wired programs.

Printed paper tape provides a continuous visual record of all computations. As each number key or operator key is touched, the corresponding number or symbol is automatically printed. When the = key is touched the = symbol and the solution to the calculation are printed. The problem entered and its solution are shown on tape in ordinary mathematical form. You can attach the tape to reports without any explanation.

Storage registers can be used to store both constants and the results of computations. The storage registers in the Mathatron are completely independent of the arithmetic registers. The model 4-24 Mathatron has 4 storage registers. The model 8-48 has 8 registers. Each register can store a ± number containing 9 significant digits multiplied by 10^n where n is equal to or greater than −41 and equal to or less than +49.

Automatic decimal point location materially simplifies problem solving procedures. When you enter numbers into the Mathatron, you simply type in decimal points in their proper location in the numbers being entered. The Mathatron automatically calculates and prints the solution with the decimal point in its correct mathematical position.

NO OF CUBIC INCHES IN THE EARTH IS ≃ 663141130 x 10^{17}

3963X5280X12=S1 (4÷3)3.14159XS1XS1XS1=663141130•17

EXPONENTIAL DECAY

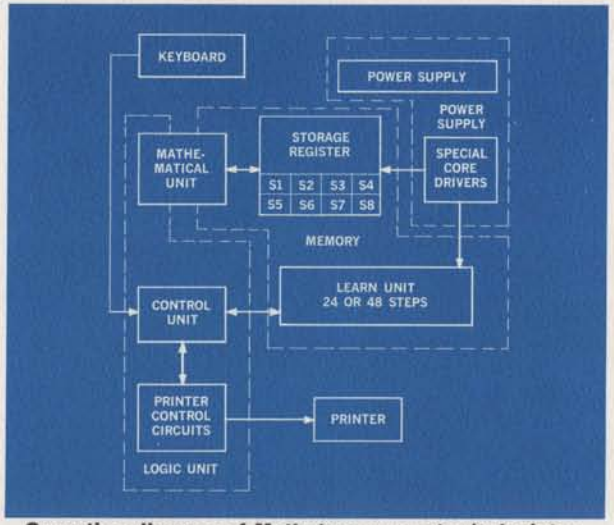
FIRST CALCULATION

2.71828183=S2 47.8=S3

Programs can be stored and re-used as often as desired with the Mathatron. When the MODE switch on the Mathatron keyboard is turned to the LEARN position, the Mathatron electronically records the sequence of operations entered and stores this information in an independent program memory. After the problem or formula has been worked once, all recorded operation steps are repeated automatically when the AUTO button on the keyboard is pressed. Only variables which cannot be defined by a mathematical process need be entered manually.

Large capacity number storage eliminates overflow problems. By using the unique exponent key provided on the Mathatron keyboard, you can specify any exponent ranging from −41 to +49. This 100 column capacity does away with the need for repeated re-entry of intermediate results and virtually eliminates overflow problems.

YOU can specify pre-wired programs to fit your special requirements. Every Mathatron is equipped with a pre-wired square root program which can be called in by pressing the special square root key on the keyboard. Many other mathematical operations such as sine, cosine, linear correlations, as well as frequently used constants and special mathematical sequences are available as customer options. These special pre-wired programs make it possible for you to specify a Mathatron which will exactly fit your computational requirements.



Operating diagram of Mathatron computer/calculator.

Ease of use + accuracy + speed + low cost make the Mathatron your best buy in desk-top computer/calculators. The Mathatron is easy to use . . . you type in data just as you would if you were writing a problem or formula. The Mathatron is accurate . . . each calculation provides at least 8 significant digits of accuracy over a range of 100 columns. The Mathatron is economical . . . only the Mathatron gives you the convenience of keyboard input + large capacity + electronic speeds + automatic printed output + stored program digital computation . . . for as little as $3,490.

The Mathatron is solving a wide range of problems for leading business, scientific and educational institutions.

Typical applications include:

- Determination of trigonometric functions
- Raising numbers to any power
- Solution of cubic, quadratic, and fifth degree equations using Lin's Method
- Evaluation of polynomials
- Simultaneous equations (up to 3)
- Linear correlations
- Octal-decimal-binary conversions
- Determination of standard deviations
- Correlations and distributions
- Radix conversions
- Great circle calculations
- Surveying calculations
- Estimation of operating costs
- Calculation of mortgage payment tables
- Evaluation of investment portfolios
- Determination of bond prices

IAL DECAY 47.8 VOLTS AFTER $T_1V = 17.58$, AFTER $T_2V = 6.469$, AFTER $T_3V = 2.379$, ETC. →
ULATION FROM KEYBOARD → REMAINING CALCULATIONS AUTOMATICALLY SUPPLIED →
. 8 = S 3 S 3 ÷ S 2 = S 3 S 3 = 1 7 . 5 8 4 6 3 7 3 = 6 . 4 6 9 0 2 6 5 = 2 . 3 7 9 9 2 1 8 5 = . 8 7 5 4 8 7 5 3 = . 3 2 2 0 7 3 8 6 3 = . 1 1 8

The NEW MATHATRON computer/calculator

Internal operations
Floating point, with built-in parenthecation

Speed
100 accumulations per second

Number range·
100 columns . . . $\pm 10^{-42}$ to $\pm 10^{+59}$

Accuracy
Addition; 9 significant digits (not rounded)
Multiplication/Divisions; 9 significant digits (manipulated)
8 significant digits (rounded)

Circuitry
Solid-state electronics, core memory

Power requirements
190 watts, 105-125 volts, 50 or 60 cycle

Cooling requirements
none

Dimensions
21½ inches wide, 25 inches deep, 13½ inches high

Program memory capacity
Model 4-24: 24 steps
Model 8-48: 48 steps
Mathematical operators: ()+×÷— each require 1 step, specifying storage register requires 2 steps

Storage registers
Model 4-24: 4 registers
Model 8-48: 8 registers
Each register can store a number ranging from ± nine significant digits multiplied by 10^n where n is equal to or greater than —41 and equal to or less than +49

Moveability
No special wiring or installation needed . . . weight approximately 75 pounds

Let the Mathatron help you solve your computational problems. We will be happy to provide you with more information on any of the applications listed, or help you with your special applications.

MATHATRONICS, INC.
257 CRESCENT STREET
WALTHAM 54, MASS.
PHONE 617—894-0835

Printed in U. S. A. 50M664

MATHATRON®

A NEW CONCEPT IN ELECTRONIC COMPUTATION

a new concept in efficient, low-cost computation

The Mathatron is the first electronic computing device to provide the benefits of automatically programmed electronic digital computation plus the convenience and simplicity of operation of desk calculators in a single low cost unit. For less than $5,000 (a fully equipped Mathatron 4-24 costs only $3,490), you can have a complete stored program electronic digital computation center right at your fingertips.

proven capability—printed output

The field proven Mathatron is the only electronic calculator that lets you enter data and programs using ordinary mathematical notation including parentheses. It's the only electronic calculator that gives you a complete printed record of all calculations and solutions. It's the only electronic calculator that gives you a choice of output media. It's the only electronic calculator that can grow to meet your increasing computational needs.

solid-state reliability—automatic decimal point location

But that's not all. There are many other features that have made the Mathatron the choice of hundreds of organizations throughout the United States and Canada. Ferrite core program memory and individually addressable storage registers eliminate the need for manual re-entry of formulas, numbers, programs, or intermediate results. All answers are computed to at least 8 significant digit accuracy with a 2 digit power of 10 exponent. One hundred column number capacity (10^{-42} to 10^{+58}) virtually eliminates overflow problems. Frequently used formulas, sequences, or constants can be pre-wired and called in by touching a single button on the keyboard. Floating point arithmetic locates decimal points completely automatically.

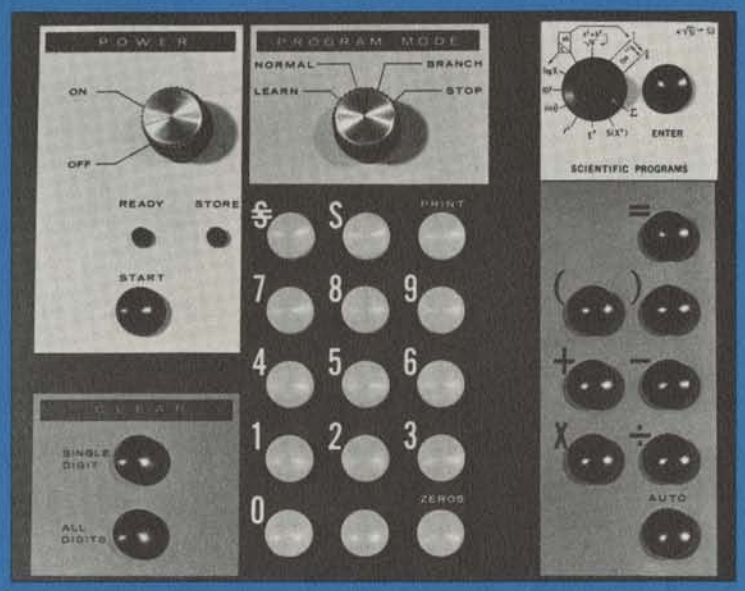
choice of input/output

And if that's not enough, you can choose any combination of input/output media to tailor the Mathatron to your specific computational needs. Output media include printed paper tape, page printout on 8½ inch wide paper to any length desired, 8 level punched paper tape, and direct connection to other devices through an electronic interface. Data may be entered directly through the Mathatron keyboard, through remotely located keyboards, by using punched paper tape, or directly through the Mathatron's electronic interface.

special models

If you're interested in mathematical, statistical, scientific, civil engineering, or surveying calculations there are special Mathatron models designed for maximum efficiency in these areas. If you're concerned with process control applications, there's a low cost Mathatron computational unit with direct electronic interface for rack mounting.

Whatever your computational problems may be, there's a Mathatron that can help you solve them efficiently and economically. Why not ask your Mathatron representative to arrange a demonstration for you in your office or laboratory. He'll be happy to show you how the Mathatron can save you time, money and effort.

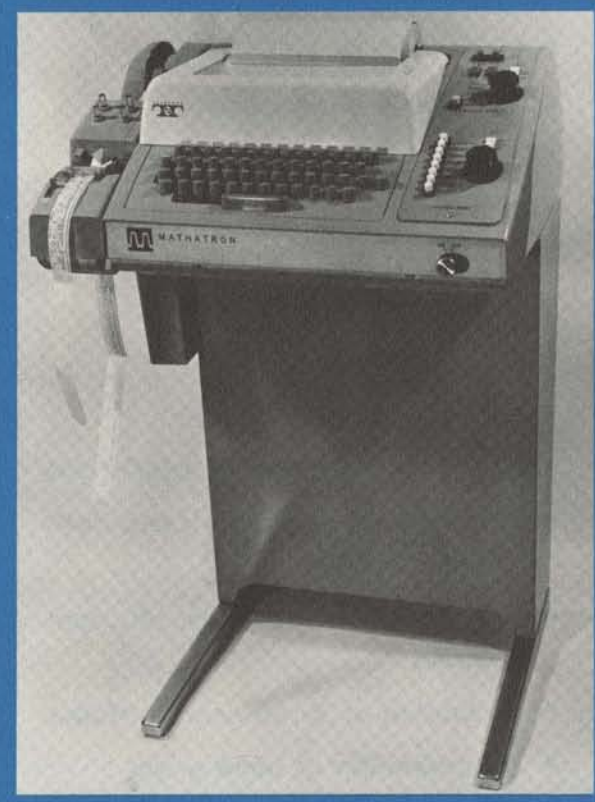


The Mathatron keyboard provides ease of operation and great flexibility. By touching only 2 or 3 keys, data may be stored or retrieved at will. Simple or complex programs and formulas may be entered, stored, and reused as often as desired. Pre-wired sequences and constants can be entered by touching a single key. Operator errors are easily correctable.

SAMPLE PRINTOUT OF LINEAR LEAST SQUARES CALCULATION

Y=A+BX A= 4•2860714 B= •951785714&01

"X"	CAL "Y"	DATA "Y"	OLD-CAL	(OLD-CAL)↑2
12	5•428214	5•7	•271785	•073867
18	5•999285	5•68	-•319285	•101943
24	6•570357	6•25	-•320357	•102628
30	7•141428	7•21	•068571	•470204
36	7•712499	8•02	•307500	•094556
42	8•283571	8•71	•426428	•181841
48	8•854642	8•42	-•434642	•188914



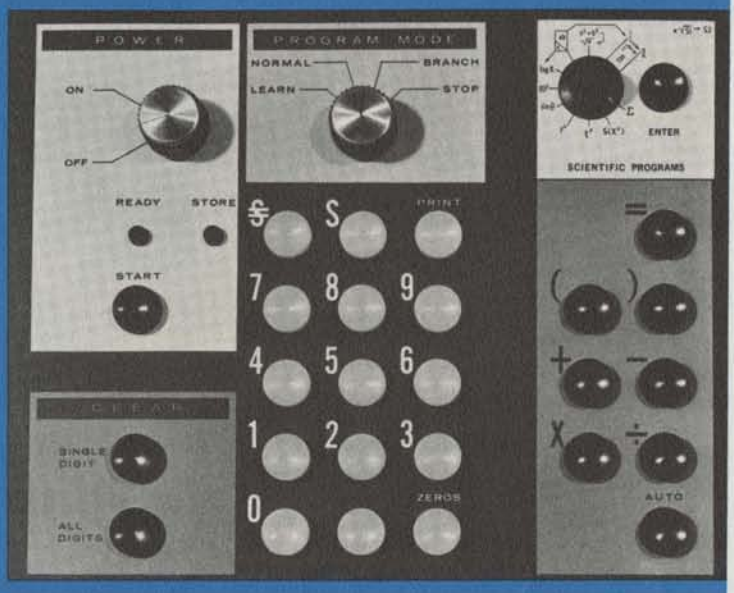
The Mathatron automatically provides a complete printed record of all calculations and solutions in easily readable form. Printed output can be stored for reference, mailed, or attached to other documents. Contents of storage registers may be printed out at any time for reference without affecting the calculation in process. Eight level punched punched paper tape can be produced as a by product.

PARENTHECATION AND AUTOMATIC DECIMAL POINT LOCATION ARE STANDARD FEATURES

((25+8X12.5)2-50)÷(1-2X8÷4)=-66.666667

COMPLEX NUMBERS CAN BE STORED AND RE-USED WITHOUT MANUAL RE-ENTRY

98546X81231=S1 S1XS1XS1=5129587O3•21



SAMPLE PRINTOUT OF LINEAR LEAST SQUAR

Y=A+BX A= 4•2860714 B= •9517857

"X"	CAL "Y"	DA
12	5•428214	5•
18	5•999285	5•
24	6•570357	6•
30	7•141428	7•
36	7•712499	8•
42	8•283571	8•
48	8•854642	8•

The Mathatron automatically provides a complete easily readable form. Printed output can be stored ments. Contents of storage registers may be print the calculation in process. Eight level punched pun

PARENTHECATION AND AUTOMATIC DECI LOCATION ARE STANDARD FEATU

((25 + 8 X 12 . 5) 2 - 50) ÷ (1 - 2 X 8 ÷ 4)

Hundreds of Mathatrons are now in use handling a wide range of scientific, mathematical, statistical, engineering, and business computations, with speed, accuracy, and economy. Typical applications include:

- Determination of trigonometric functions
- Raising numbers to any power
- Solution of cubic, quadratic and fifth degree equations
- Evaluation of polynominals
- Simultaneous equations
- Linear correlations
- Determination of standard deviations
- Correlations and distributions
- Radix conversions
- Great circle calculations
- Surveying and mapping calculations
- Estimation of operating costs, cash flow analysis
- Calculation of mortgage payment tables
- Evaluation of investment portfolios
- Determination of bond prices

Operating instructions are available on these and hundreds of others.

The MATHATRON . . . a new concept in electronic computation . . .

INTERNAL OPERATIONS

Floating point arithmetic, built-in parenthecation, automatic decimal point location

SPEED

100 accumulations per second

NUMBER RANGE

100 columns . . . $\pm 10^{-42}$ to 10^{+58}

ACCURACY

Addition: 9 significant digits (not rounded)
Multiplication/Division: 9 significant digits (manipulated); 8 significant digits (rounded)

CIRCUITRY

Solid-state logic and circuitry, ferrite core program memory and storage registers

POWER REQUIREMENTS

190-240 watts, 105-125 volts, 50 or 60 cycle

COOLING REQUIREMENTS

none

DIMENSIONS

21½ inches wide, 25 inches deep, 13½ inches high

PROGRAM MEMORY CAPACITY

24, 48, or 480 steps
Mathematical operators: (,), +, ×, −, ÷, each require 1 step; specifying storage register requires 2 steps in the 24 or 48 step option and requires 3 steps in the 480 step option.

STORAGE REGISTERS

4, 8, or 48 individually addressable registers
Each register can store a number ranging from ±9 significant digits plus a 2 digit power of 10 exponent, plus sign

INPUT MEDIA

Direct entry keyboard, 8 level punched paper tape, remote location keyboard, electronic interface

OUTPUT MEDIA

Printed paper tape, page printout on 8½ inch wide paper to length desired, 8 level punched paper tape, electronic interface

The Mathatron is sold and serviced by:

EMTECH RESEARCH PRODUCTS CORPORATION
125 Beechwood Avenue, New Rochelle, New York Phone 914–NE 3-8721

ask them for a demonstration in your office or laboratory.

MATHATRONICS, Inc. **257 Crescent Street** **Waltham, Mass. 02154 U.S.A.**
Telephone: 617-894-0835

PATENTS APPLIED FOR

MA5 60M 565
PRINTED IN U.S.A.

MATHATRONICS, INC.
257 CRESCENT STREET
WALTHAM 54, MASS.
TW 4-0835

The Mathatron Model 8-48M
For Fast Automatic Computation of Common
Mathematical Functions

The Model 8-48M Mathatron has all the capabilities of the basic Mathatron described in the attached brochure. In addition, the special pre-wired mathematical programs in the model 8-48M materially simplify and speed the automatic calculation of trigonometric ratios and their inverses, the solution of simultaneous equations, and the calculation of logs and anti-logs. Any of these pre-wired programs can be selected by merely dialing the program switch and pressing a single button on the Mathatron keyboard. This greatly facilitates the solution of the following problems:

Two Simultaneous Equations
Three Simultaneous Equations
3 x 3 Determinate
Number raised to fractional powers
Logarithm (base 10 or e)
Arc Tangents
Sines - cosines - tangents
Resolution of Vectors
Square Root
Vector Angle and length, given the components

These same programs can be incorporated as needed in the solution of general problems. In addition, of course, the operator can manually generate and enter any other program desired into the memory for a given computation. These pre-wired programs generally use only 5 storage registors for their execution. In brief, the 8-48M Mathatron provides the scientist, engineer, or mathematician, with the ideal computing machine at a price that will definitely improve the profit picture and expand the capabilities of each member of your computing staff.

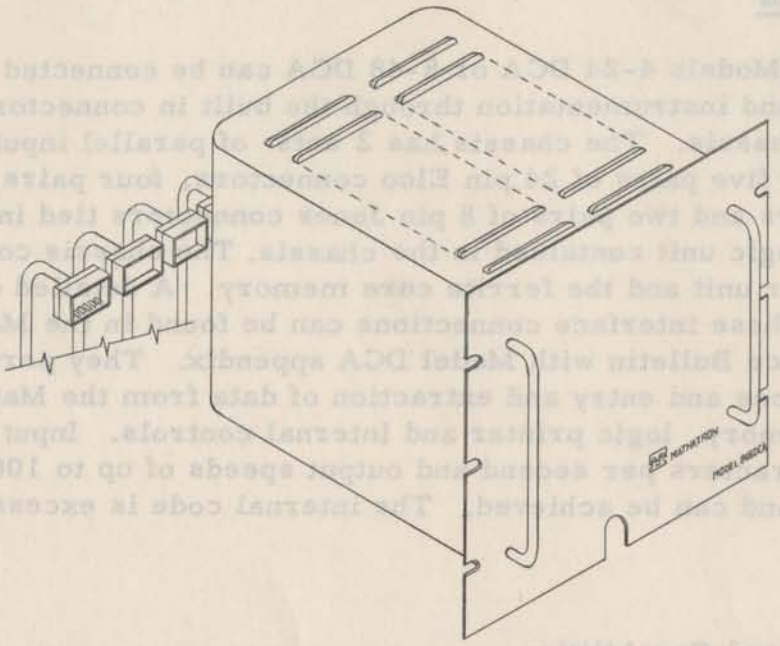
The price of the Model 8-48M Mathatron is $7450. plus applicable taxes, F.O.B. Waltham, Mass. The programs can be added to existing Model 8-48 Mathatrons at a cost of $2535. If leasing is desired, it can be arranged at approximately $275. per month for a three year period. This figure will vary slightly based on delivery point and applicable taxes. Firm quotations on request.

Some of the Many applications being handled by the Mathatron

- Chi Square
  - Contingency Table
  - Goodness of Fit
- Factorial $\frac{A!}{B!}$
- Linear Correlation
- Linear Least Squares
  - Any Interval of X
  - Constant Interval of X
- Mean
  - Grouped Data
  - Ungrouped Data
- Moving Average
- Quadratic Equation
  - Cubic Equation
  - Fourth Degree Equation - Lins' Method
  - Fourth Degree Equation - Lins' Method (48 Step)
  - Fifth Degree Equation - Lins' Method (48 Step)
- Radix Conversion
  - Convert Decimal to Binary or Octal
  - Convert Any Radix to Decimal
- Raise a Number to a Power
  - Raise Number to Whole Power (K^m)
  - Raise Number to Any Power
    1. With Special e^x Option
    2. Accuracy and Computation Time Notes
  - Raise e to the xth Power
- Random Number Generator
- Roots
  - Square Roots
  - Cube Roots
  - Fifth Roots
  - Fifth Roots (48 Step)
- Simultaneous Equation (two)
- Standard Deviation
  - Ungrouped Data (24 Step)
  - Grouped Data (48 Step)
  - Ungrouped Data (24 Step)
- T - Test of Sample Means (24 Step)
- T - Test of Sample Means (48 Step)
- Trigonometric Ratios
  - Arc Sin X
  - Arc Tan X
  - Combined Sin X Cos X
  - Cos X or Sin X

Mathatronics, Inc. 257 Crescent Street Waltham, Massachusetts 02154

Mathatron Model 8-48 DCA and 4-24 DCA
Rack Mounted Digital Controller and Arithmetic Analyzer



For process control, data analysis and computation

The low cost Mathatron Digital Controller and Arithmetic Analyzer is designed to fit two standard 19" electronic relay chassis, providing an inexpensive yet powerful electronic computation unit for the control of industrial and chemical processes, the analysis of intermediate data, and the calculation of final results. With options of 24 or 48 steps of program memory and 4 or 8 storage registers, the Models 4-24 DCA and 8-48 DCA can store numbers ranging from $\pm$ nine significant digits multiplied by 10^n where n is equal to or greater than -41 and equal to or less than $+49$. The smallest magnitude stored is 10^{-42} and greatest is 10^{+58}. This 100 column number range virtually eliminates overflow problems and does away with the need for repeated re-entry of intermediate data and results. Additional flexibility is provided by Mathatronics' special program storage features. Programs and formulas can be stored in an independent program memory and re-used as often as needed. Frequently used programs, mathematical sequences, and constants can be specified as pre-wired programs to suit specific requirements.

Dependable Performance

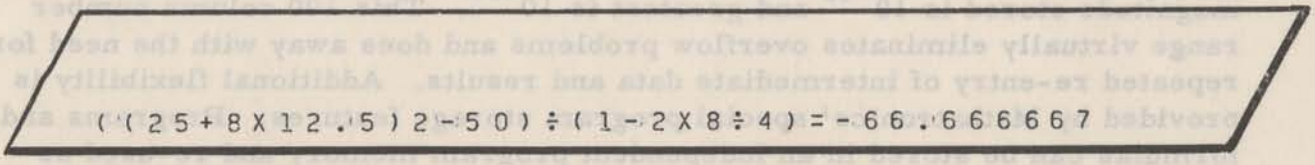
The solid state computer logic and circuitry used in the Mathatron DCA guarantees optimum reliability in performance. Ferrite core memory storage contributes to accurate data retention and facilitates rapid data retrieval. Additional storage is provided by 4 or 8 independent storage registers which can be used for the storage of numbers, constants, intermediate or final results, or other data. Each register can store a number containing $\pm$ 9 significant digits multiplied by an exponent ranging from 10^{-41} to 10^{+59}.

Flexible Input/Output

The Mathatron Models 4-24 DCA or 8-48 DCA can be connected to other electronic devices and instrumentation through the built in connectors mounted on the rear of the chassis. The chassis has 2 sets of parallel input/output plugs, consisting of five pairs of 24 pin Elco connectors, four pairs of 11 pin Amphenol connectors and two pairs of 8 pin Jones connectors tied into the logic unit and expanded logic unit contained in the chassis. The chassis contains the logic unit, power unit and the ferrite core memory. A detailed description of the operation of these interface connections can be found in the Mathatronics Input/Output Interface Bulletin with Model DCA appendix. They permit the simulation of functions and entry and extraction of data from the Mathatron Model DCA unit memory, logic printer and internal controls. Input speeds of up to 50 data characters per second and output speeds of up to 100 data characters per second can be achieved. The internal code is excess 3 Binary Coded Decimal.

Special Options Expand Capabilities

Several special options are available to expand the capabilities of the Mathatron Models 4-24 DCA and 8-48 DCA and tailor them to suit specific requirements. A packaged keyboard control and automatic printer unit which can be plugged into the back of the Model DCA provides manual control and set up of operations and continuous automatic monitoring of processes and calculations. The Model PKB unit supplies a complete printed record of all data entered and solutions calculated on 11/16" wide paper tape as shown in Figure 2.



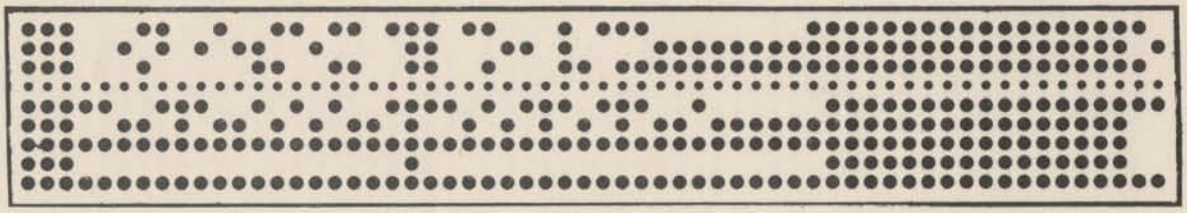
Typical Mathatron Tape Printout showing data entered and solutions calculated in ordinary mathematical notation.

A second optional feature, the Mathatron Model PTP, can be employed with the DCA unit when page or tabular printout with Punched Paper Tape Input and Output is preferred as shown in Figure 3.

BEARINGS			DISTANCE		LATITUDE	DEPARTURE	ACC. LAT.	ACC. DEP.
80	00	00	100 =	.. =	17.364=	98.480=	17.364=	98.480= .
40	00	00	100 =	.. =	76.604=	-64.278=	93.969=	34.202= .
20	00	00	100 =	.. =	-93.969=	-34.202=	.000=	-.000= .

Typical Mathatron Model PTP page printout showing results arranged in tabular form.

The Model PTP also provides capabilities for producing standard 8 level punched paper tape conforming to the American Standard Code for data interchange. This punched paper tape can be used for re-entry of data into the Model 4-24 DCA or 8-48 DCA, as input for other electronic devices, and for off line storage of information. A sample of this 8 level punched paper tape is shown in Figure 4.



Eight level punched paper tape produced by Mathatron Model PTP conforms to American Standard Code for information interchange.

Two other available options for the Mathatron Model 8-48 DCA comprise a separate plug-in keyboard for manual control of operations and entry of data and a plug-in printer which produces a complete record of data entered and results computed on 11/16" wide paper tape.

Compatibility with Other Equipment

All Mathatron Model 4-24 DCA and 8-48 DCA optional equipment is designed to fit standard 19" electronic relay chassis racks for ease in assembly and to simplify the integration of the Mathatron DCA and associated equipment into overall process control, data acquisition, or other electronic systems. Internal circuitry and external connectors have been set up to minimize interface problems and reduce installation costs.

Dimensions and General Specifications

Mathatron Model 4-24 DCA and 8-48 DCA

22 3/4'high x 19" wide x 20" deep

Weight: 60 lbs.

Power Requirements: 300 watts, 60 cps 105 - 125 vac.

Cooling Requirements: No special cooling required. Standard office environment 65^{o} to 95^{o} satisfactory.

Circuitry: Solid state throughout

Memory Storage: Ferrite core

Connectors: Standard Amphenol and Elco as specified

Mathatron Input/Output Interface

The Mathatron computer/calculator is a complete electronic digital computation device with solid state computer circuitry and logic, a calculator type keyboard for direct entry of data, an automatic serial printer which provides a complete printed record of operations and results up to 48 steps of ferrite core memory storage and up to 8 separate storage registers for intermediate storage of results, constants, or other data. The Mathatron input/output interface expands the basic capabilities of the Mathatron and make it possible to utilize these computational capabilities in process control, data analysis and calculation of final results. The low cost and dependable performance of the Mathatron with input or output interface connections make it particularly useful in applications requiring several relatively small yet integrated computation centers and in those areas where cost is a primary consideration.

Typical sources of input electrical signals are paper tape readers, character readers, analog to digital converters, external keyboards, etc. Typical receivers of the Mathatron output signals are typewriters, paper tape punches, x-y plotters, oscilloscope read outs, visual indicators, digital to analog converters, etc.

The following pages summarize the operation of the Mathatron input and output interfaces.

Input Interface Feature #22

The Input Interface consists of 32 wires to completely simulate the operation of the standard Mathatron keyboard and the manner in which it operates the Mathatron. In addition, an extra 9 wires are required if 11 pre-wired sequences are to be externally controlled, and an extra 2 wires are required if the power on-off is to be externally controlled. The 32 wires mentioned above do not simulate on a one-to-one basis the keys on the Mathatron keyboard, but provide a coded input. For instance, the10 numeric keys can be activated by appropriately activating 5 lines, one being a strobe, and the other four an "excess-three" code representing the numerics. Some keys, such as "AUTO", "decimal point" and "zeros" do have one line representing the key.

By appropriately controlling the input interface lines, all keyboard functions can be externally simulated and under proper circumstances, input character rates up to 50 characters per second can be achieved.

The connectors to which the input interface connect are located on the Mathatron logic unit and memory unit. If a customer uses these connections, he must either remove the keyboard unit and use his input

unit instead, or he must provide "Y" connections. To facilitate the use of the Mathatron's input interface in applications where the customer desires to keep the keyboard unit intact and does not want to risk the drilling of holes and other similar modifications required to install "Y" connections inside the Mathatron, we offer an "Input Interface Y Distribution Box" (Feature #22) which makes available to the outside rear of the Mathatron all input signals without disturbing the keyboard or requiring any special modified major unit. The major units plug to and from the "Y" box, which then provides the connection to the outside.

Output Interface Feature #23

The "Output Interface Connection" is mounted to the logic unit, presenting the output wires to a connector on the rear of the Mathatron.

The output interface consists of 5 coded lines, representing the 10 numerics in the "excess three" coded form and the 10 special characters as "upper case" versions of the 10 numerics. In addition to the data output lines, lines are provided to gate the output unit or when valid data is available, to inhibit the Mathatron printer, to control starting and stopping of the Mathatron, gate answer only, etc.

Typical example of how the Mathatron with input/output interface will demonstrate its possibilities.

In a typical application, the Mathatron is used as the computational component in a system monitoring strain gages. The Mathatron automatically translates the strain gage voltage readings into micro inches per inch and then divides each reading by a constant to determine the percentage of a norm which it represents.

The Mathatron actually "learns" a series of mathematical steps or program. The machine equation becomes:

$E_1 \times K_1$ = strain, strain $\div K_2$ = %

where E_1 = voltage reading transferred from digital voltmeter via a coupler

K_1 = the constant used to convert volts to strain

K_2 = a constant which represents the norm

To enter this problem into the Mathatron requires no special problem preparation, the operator simply loads the following program using the Mathatron's direct entry keyboard.

1. With the Mathatron in NORMAL MODE, the constant K_1 is stored in storage register 1 by depressing the numbered key value of K_1, the S key, and the digit 1 key.

2. The operation is repeated for constant K_2.

3. Then, assuming a dummy voltage reading of 20, the operator touches keys (S)(1)(x)(2)(0)(S)(3) PRINT (3)(S)(3)(÷)(S)(2)(=).

As each key is depressed, the Mathatron printer automatically prints out the corresponding symbol on paper tape. The tape would look like this:

S1 x 20 S3 S3 - S2 =

When the = key is touched, the Mathatron computes the results and prints it out on the tape. When the Mathatron is connected to the system, if a voltage value of 25 is assumed, the output tape looks like this:

00 25 0 = 125.000000 = 31.250000

The symbol 0 is the AUTO symbol and indicates that an automatic process has taken place. Note that the answers provide 9 significant digit accuracy.

The new MATHATRON can handle such complex arithmetic functions as fifth degree polynomials

The fifth degree polynomial:

$$X^5 + AX^4 + BX^3 + CX^2 + DX + E$$

can be rewritten as:

$$((((X + A)X + B)X + C)X + D)X + E$$

using the Mathatron's storage registers:

let X = S7, A = S1, B = S2, C = S3, D = S4, E = S5

and make a direct substitution omitting the redundant ((((’s at the beginning of the formula

S7 + S1)S7 + S2)S7 + S3)S7 + S4)S7 + S5

then change one of the S7’s to P7 so the argument will be printed.

Next, form the answer, store in Register # 8 and print | = S8P8 |

Add Increment to Argument Value:

$\Delta X + X \rightarrow X$ Let ΔX = S6 and X = S7

S6 + S7 = S7	Then add dots :	((= S8P8

Switch to "LEARN" and type:

S7 + S1)P7 + S2)S7 + S3)S7 + S4)S7 + S5 = S8

P8 S7 + S6 = S7 ((= S8P8

Switch to "NORMAL" and type:

40.6 = S1, 168 = S2, -1024 = S3, -14 = S4, 3.52 = S5

For $Y = X^5 + 40.6X^4 + 168X^3 - 1024X^2 - 14X + 3.52$

Then for ΔX, .1 = S6 and Xo, -10 = S7 | AUTO |

Small Computers For Process Control Growing in Number

A new trend in process control is the appearance of small, rack-mounted digital computers. Some of these sell for less than $4,000 and are intended as standard self-contained packages for designers of process-control systems. Some of them take up only a foot or so of height in a standard 19-in. relay rack.

At the low-priced end of this new group of small computers are the control versions of two of the electronic desk calculators that were introduced earlier this year. Two units by Mathatronics, Inc., Waltham, Mass., sell for $3590 and $5090, the price difference being determined by the size of the memory and instruction steps. A basic unit by Wyle Laboratories, El Segundo, Calif., sells for $3550. Both these units were shown at the recent Instrument Society of America show in New York City.

An example of more powerful computers aimed at the middle-price brackets of this new application area are the Prodac 50 by Westinghouse Electric Corp., Pittsburgh, and the GE PAC 4000, Directo-Matic II, made by General Electric Co., Phoenix. As is typical of higher-priced machines in the low-cost digital control field, the basic price of the computer is often a small fraction of the total installed price to the customer. For example, Westinghouse says that although its Prodac-50 main frame costs only $20,000, the installations run from $25,000 to $150,000.

Mathatronics and Wyle Lab. computers are the newest in the field and represent the bare minimum in useful general-purpose digital-computer systems. The Mathatronics units use ferrite-core memories. Both computers have so far been built with low-cost germanium 2N404 transistors. In addition, the Mathatronics units use "Centralab-type" thick-film passive assemblies for their NOR logic building blocks. According to Roy Reach, president of Mathatronics, these NORs can be built for as little as 50 to 75 cents apiece. The lower-cost Mathatronics unit has a 24-step program memory (a ring counter steps the computer through the sequences) and four storage registers. The higher-cost Mathatronics unit has a 48-step program and eight storage registers. In this computer, the 9-digit words are stored on ferrite cores. A type of exponential floating-decimal-point memory is used to adjust the decimal point over a wide range.

To make the computer more useful, despite the limited program steps, Mathatronics has devised a means for storing programs in an independent memory, so that more than one program can be brought into the 24- or 48-step programs. Mathatronics supplies wired-in programs for handling routine mathematical sequences (such as square rooting) to further free the computer from the limitations of its small memory.

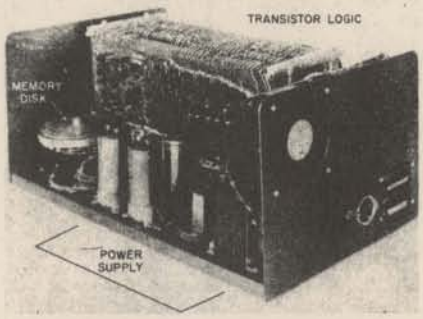
The Wyle machine has three arithmetic and three memory registers. These are all placed on a small oxide-coated memory disk which was specially developed by Wyle for the purpose. According to Wyle, the way the computer is organized to make maximum use of this disk is the secret of the machine's low cost. The 24-digit words are stored on the tracks on this disk along with the decimal points, which are treated as any other digit. The transistor logic operates directly from and to the tracks, thus there is no need for transistor flip-flop storage. The clock speed, determined by the disks rotational speed, is 50 Kc.

The same continuous CRT display of the six register contents that is available in Wyle's desk-top calculator is available for remote mounting, but at a $550 additional cost.

The uses to which these small computers would be put determine how attractive their various characteristics might appear to the potential users. The more expensive machines must have faster computing speeds and larger memories so they can be time-shared by many control loops. But the smaller, less-expensive machines can have slower computing speeds and smaller memories because it is economically feasible to apply them to a single small control system or to use a number of them to control a larger process. ■ ■

Lower-cost process computers are typically used for on-the-factory-floor digital control of individual portions of a process or production line. Westinghouse says this $20,000 basic-cost Prodac-50 unit is able to work in any factory environment that is suitable for humans. Usually, the typewriters are the part of the system most likely to fail.

Small Computers . . .



Low-cost digital computer for industrial control applications is derived from Wyle Labs solid-state desk calculator. Wyle says that the machine's $3,450 cost is made possible by the way in which the registers are all placed on a small memory disk. After the fashion of some drum-memory computers, the transistor logic circuit computations are made directly on the bits in the disk registers, in a way that entirely circumvents more costly transistor registers.

ON READER-SERVICE CARD CIRCLE 216 ➤

ESTIMATING PROBLEM

Labor	Over head	Mat'l	Mat'l Hndlg.	Gen'l Admin.	Profit	Safety Factor	Total
((35 x 1085 x 2.12		+ 17000	x 1.08)	1.09	+ 50000)	1.2	= 189318.04

- - - - - - - - - - - - - - -

Type the constant factors into the storage registers

Overhead	Mat'l Hndl'g	General Admin.	Safety Factor
2.12=S1	1.08 = S2	1.09 = S3	1.2 = S4

- - - - - - - - - - - - - - -

Teach the computer as you calculate by moving the memory mode switch to the learn position

((3 5 X 1 0 8 5 X S 1 + 1 7 0 0 0 X S 2) S 3 + 5 0 0 0 0) S 4 = 1 8 9 3 1 8 . 0 4

YOUR MATHATRON HAS AUTOMATICALLY LEARNED THE FORMULA

((_____ x _____ x 2.12 + _____ x 1.08)1.09+_____) 1.2 = _____

The MATHATRON will compute the next estimate for you as you type in the variable information. Turn MEMORY MODE switch to NORMAL after first computation.

For example:

• • 3 6 • • 9 8 5 • • 1 7 5 0 0 • • 4 9 5 0 0 • = 1 8 2 4 5 0 . 3 6 •

• • 2 X 1 8 ÷ 3 6 • 1 0 5 0 • • 1 5 0 0 0 • • 4 8 / 0 0 • = 1 1 4 5 6 8 . 8 9 6 •

CONSTANT PAYMENT MORTGAGE CALCULATION

This program will compute the fixed monthly payment for any principal amount, for any rate and for any term.

EXAMPLE:

Principal	$3,300.00
Rate	6%
Term (in months)	60

PROGRAM MODE	ENTER
LEARN:	S1 x S2 = S1 + S3 = S3 ÷ S3 + S4 = S4

DECISION:

Constant	1 + Monthly Interest	Constant	1 Less Term (in months)	
1 = S1	1 + .06 ÷ 12 = S2	1 = S3	1 - 60 = S4	AUTO

Answer obtained by typing into the MATHATRON the following:

Principal	Answer
S1X3300S1S1XS2÷S3=63.798243	

MORTGAGE BALANCE

This program will determine the unpaid balance and amount of interest after each payment.

EXAMPLE:

Principal	$3,300.00
Monthly Interest	.005
Payment	63.80

PROGRAM MODE	ENTER
LEARN:	P1 x S2 = S3 P3 + S1 + S4 = S1

DECISION:	Negative Principal	Monthly Interest	Payment
	-3300 = S1	.005 = S2	63.80 = S4

NOTE: S1 is reduced by each calculation to reflect the new unpaid balance of the loan after each payment. S3 contains the amount of each payment that is to be considered as interest.

PRINCIPAL	INTEREST
0	= -3300 = -16.5000000
= -3252.70000	= -16.2635000
= -3205.16350	= -16.0258175
= -3157.38931	= -15.7869466
= -3109.37625	= -15.5468813
= -3061.12313	= -15.3056157
= -3012.62874	= -15.0631437
= -2963.89188	= -14.8194594
= -2914.91133	= -14.5745567
= -2865.68588	= -14.3284294
= -2816.21430	= -14.0810715
= -2766.49537	= -13.8324769
= -2716.52784	= -13.5826392
= -2666.31047	= -13.3315524
= -2615.84202	= -13.0792101

PRINCIPAL	INTEREST
= -2565.12123	= -12.8256062
= -2514.14683	= -12.5707342
= -2462.91756	= -12.3145878
= -2411.43214	= -12.0571607
= -2359.68930	= -11.7984465
= -2307.68774	= -11.5384387
= -2255.42617	= -11.2771309
= -2202.90330	= -11.0145165
= -2150.11781	= -10.7505891
= -2097.06839	= -10.4853420
= -2043.75373	= -10.2187687
= -1990.17249	= -9.9508625
= -1936.32335	= -9.6816168
= -1882.20496	= -9.4110248
= -1827.81598	= -9.1390799

PRINCIPAL	INTEREST
= -1773.15505	= -8.8657753
= -1718.22082	= -8.5911041
= -1663.01192	= -8.3150596
= -1607.52697	= -8.0376349
= -1551.76460	= -7.7588230
= -1495.72342	= -7.4786171
= -1439.40203	= -7.1970102
= -1382.79904	= -6.9139952
= -1325.91303	= -6.6295652
= -1268.74259	= -6.3437130
= -1211.28630	= -6.0564315
= -1153.54273	= -5.7677137
= -1095.51044	= -5.4775522
= -1037.18799	= -5.1859400
= -978.57393	= -4.8928696 5
= -919.666799	= -4.59833400
= -860.465133	= -4.30232567
= -800.967458	= -4.00483729
= -741.172295	= -3.70586148
= -681.078156	= -3.40539078
= -620.683546	= -3.10341773
= -559.986963	= -2.79993482
= -498.986897	= -2.49493449
= -437.681831	= -2.18840916
= -376.070240	= -1.88035120
= -314.150591	= -1.57075296
= -251.921343	= -1.25960672
= -189.380949	= -.94690475
= -126.527853	= -.63263927
= -63.360492	= -.31680245 0

PAYROLL # 1

This sequence is designed to compute gross pay assuming an overtime rate of $1\frac{1}{2}$ time standard time

	S.T.Hrs.		S.T.Rate		O.T.Hrs.		O.T.Rate		Gross Pay
EXAMPLE:	40	×	2.50	+	10	×	3.75	=	137.50
	40	×	2.50	+	5.2	×	3.75	=	119.50
	40	×	2.50	+	1.75	×	3.00	=	85.25

PROGRAM MODE — ENTER

LEARN: = S4 S1 × S2 + N × S3 × S2 =

Hrs.	S.T.Rate	O.T.Factor
40 = S1	2.50 = S2	1.5 = S3

Repeat for each calculation

Employee #		O.T.Hrs.		
1234	AUTO	10	AUTO	= 137.500000
1235	AUTO	5.2	AUTO	= 119.500000

Change S.T.Rate

2 = S2

1236	AUTO	1.75	AUTO	= 85.2500000

PAYROLL # 2

This sequence is designed to compute the FICA, Federal and Mass. Tax and deduct them from the gross pay. This sequence requires a 48 step 8 register Mathatron.

EXAMPLE: 100 - [.18(100 - 13×3)] - (.03625×100) - [100 - (.18 (100 - 13×3) - (.03625×100) - 39.42 - 9.62 - (7.69×2)].03 =

Gross Pay	FICA	Fed Tax	State Tax	Net Pay
100.00	10.98	3.625	.738	84.658

PROGRAM MODE	ENTER
LEARN:	S5 - N)S4 = S8 S3 × S5 = S6 S5 - S8 = S4 - S2 - N - N)S1 = S7 P5 - P8 - P6 - P7 =
NORMAL:	State Tax Constants: .03 = S1 39.42 = S2 — FICA Constant: .03625 = S3

Repeat for each calculation

Fed Tax Constant	Gross Pay		13×#dep.		9.62 or 0		7.69 × # of children	
.18 = S4	100	AUTO	13 × 3	AUTO	9.62	AUTO	7.69 × 2	AUTO

Mathatron will automatically print out

Gross Pay	FICA	Federal Tax	State Tax	Net Pay
100.000000	10.9800000	3.62500000	.738000000	84.6570000

MATHATRONICS, INC.
257 CRESCENT STREET
WALTHAM 54, MASS.
TW 4-0835

The Model 8-48S MATHATRON, for Statistical Analysis and Computations

Today, almost every type of business, governmental, scientific, and educational organization is involved with statistical methods, and arithmetic operations such as summarizations, determination of averages, distributions, deviations, variances, correlations, etc. The MATHATRON is designed to provide a maximum assistance to those people who are handling this ever-growing flow of figures.

The basic MATHATRON has already made significant contributions in this area. The new Statistical Model MATHATRON-Model 8-48S- which incorporates 6 pre-wired statistical programs, further simplifies and speeds the handling of such data. Once the basic tabulations and arrays have been established, the actual computation on the MATHATRON can be carried out even by untrained personnel. The printed paper tape record provided by the MATHATRON printer during processing supplies a ready check and reference on all computations.

The pre-wired programs, used singly or in combination, yield:

1. Square Root $\sqrt{}$
2. Basic Accumulations $\Sigma X, \Sigma X^2, \Sigma XY, \Sigma Y, \Sigma Y^2$
3. Sums of squares $S(x^2), \Sigma X, \Sigma X^2, N_x, \bar{X}$
4. T-test, pooled variance $(\bar{X} - \bar{Y}), t^2$
5. Paired data analysis $\Sigma d, \Sigma d^2, N, \bar{d}, \left(\Sigma d^2 - \frac{(\Sigma d)^2}{N}\right)$
6. Correlation coeff. r

The price of this machine is $5,990.00 plus applicable taxes, F.O.B. Waltham, Mass. If leasing is desired it can be arranged at approximately $250.00 per month for a three-year period. This figure will vary slightly based on delivery point and applicable taxes. Firm quotations on request.