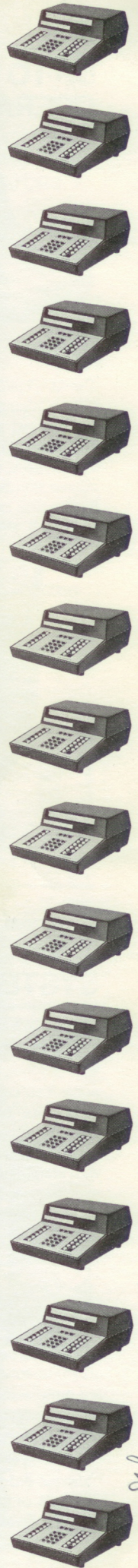
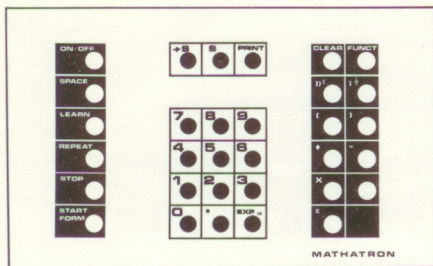


MATHATRONICS



July, 1969 - Prof Brown's home demonstration

THE MATHATRONICS SYSTEM . . . the only TRUE MATHEMATICAL PROGRAMMABLE CALCULATOR.



COMPARE THE MATHATRONICS ONE-STEP MATHEMATICAL OPERATION WITH THE ARITHMETIC OPERATION OF ALL OTHER ELECTRONIC CALCULATORS

The capability of the MATHATRONICS System to solve mathematical problems is unique among electronic calculators, all others of which will perform the arithmetic

only on instructions from the operator. The following example demonstrates the difference.

The simplicity of the MATHWRITER Keyboard is a result of the unique ability of the MATHATRONICS System to solve mathematical problems in one step. Because of this ability, problem entry is as simple as tapping in the numbers, signs, parentheses, and scientific notations, exactly as you would write them with a pencil. The MATHATRONICS System automatically sequences multiplication and division ahead of addition and subtraction. It also automatically recognizes parentheses thereby eliminating the need to store, write, or recall intermediate results.

Solve this example of a discriminant from the solution of a quadratic equation. (This quantity $b^2 - 4ac$ is familiar to all mathematicians).

Let $a = 1$, $b = 2$, and $c = 3$.

MATHATRONICS SYSTEM

Key in one step

$(2) \times (2) - (4) \times (1) \times (3) =$

$2 \times 2 - 4 \times 1 \times 3 = -8.00000000$

ALL OTHER CALCULATORS

$2 \times 2 - 4 \times 1 \times 3 =$

Step 1

Key in 2×2 , Store in Register 1

Step 2

Key in $4 \times 1 \times 3$, Store in Register 2

Step 3

Restate Problem

Register 1 — Register 2 = -8.00000000

THE MATHWRITER KEYBOARD SIMPLIFIES PROBLEM ENTRY . . . REQUIRES LESS OPERATOR TRAINING



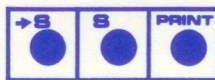
POWER-OF-TEN EXPONENT AND SIGNIFICANT DIGIT RETENTION

The Power-Of-Ten exponent extends the machine number range beyond nine significant digits to a one-hundred-digit capacity. Numbers of large or small magnitude may be entered using a power-of-ten exponent, and answers of more than nine digits will appear as the nine most significant digits plus a power-of-ten exponent in the range of from 10^{98} to 10^{-42} . The MATHATRONICS System retains up to the nine most significant digits. The decimal point will be automatically placed in the correct position in the answer.

PARENTHESES



The left and right parentheses, so valuable in writing a mathematical expression, are keyed directly into the MATHWRITER Keyboard exactly as they appear in a written equation. The ability of the MATHATRONICS System to recognize the meaning of parentheses and make the correct mathematical interpretation eliminates complicated and time consuming intermediate computations and storage necessary with conventional electronic calculators. It is even possible to nest parentheses with the MATHATRONICS System. Unlike other calculators, the MATHATRONICS System automatically follows the rules of algebra and performs all multiplication and division before addition and subtraction.



NUMBER STORAGE

The MATHATRONICS System provides up to 128 separate registers for the storage of constants. Each register is capable of storing a number of nine significant digits, decimal point, sign and power-of-ten exponents.



FULL FLOATING DECIMAL POINT

Decimal points are keyed into the MATHWRITER Keyboard exactly as they are written in all equations and are automatically placed in the correct position in the answer. With the MATHATRONICS System, there is no need to determine the correct placement of the decimal point. MATHATRONICS floating point allows a greater number range than possible with fixed point equipment.

POWER LOG



For the first time, a single key raises any number or quantity to any whole or fractional, positive or negative power, without the use of logarithms or exponentials. The same key will extract the log base e of any number or quantity or raise e to any power.



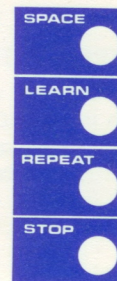
AUTOMATIC SQUARE ROOT

By expressing square root as "the power of $\frac{1}{2}$ ", the MATHATRONICS System has the ability to automatically extract the square root of an entire mathematical quantity as enclosed in the parentheses. The combination of the closing parentheses and "the power of $\frac{1}{2}$ " in a single key stroke eliminates the necessity of solving the equation in stages, and further to the machine's ability to accept algebraic equations exactly as written.

AUTOMATIC PROGRAMMING

The MATHATRONICS Systems will store and automatically execute complex formulas. They will solve formulas repetitively for any number of variables without the necessity of re-entering the formulas or constants. Such formulas may include conditional and unconditional branching and execution of sub-routines. Formulas may be printed from memory and corrections if necessary substituted.

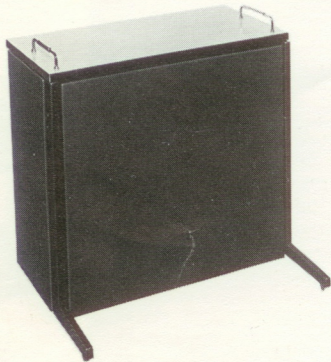
They will store formulas involving up to 2822 steps of algebraic instructions, including square roots, logarithmic, and exponential function. The storage capacity of the system may be divided equally among up to 16 keyboards or assigned in any combination.



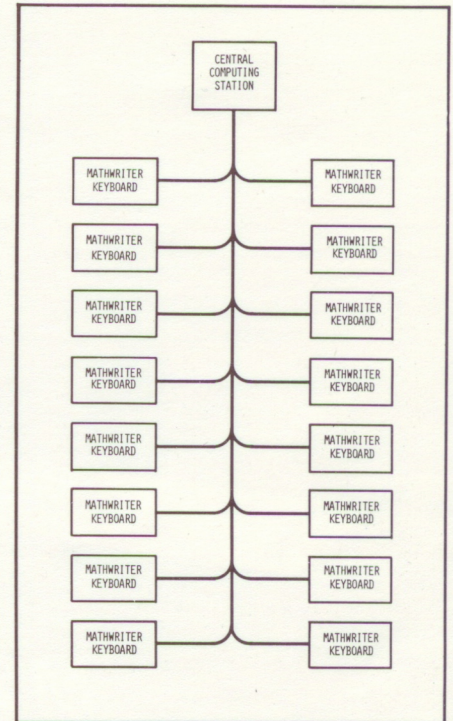
UP TO 16 REMOTE KEYBOARDS OR TYPEWRITERS OPERATE SIMULTANEOUSLY BY DIRECT WIRE OR TELEPHONE



The MATHATRONICS® Programmable Computer/Calculator System consists of a central computing station and up to 16 remote MATHWRITER® Keyboards or alphanumeric Typewriters, or a combination of both. Interconnection between the remote stations and the central computing station is made using



simple 4-wire telephone cord, or through existing telephone lines using acoustical couplers which are available as optional equipment or built-in to the keyboard units. This allows the location of remote keyboards at any distance from the central computing station.



SYSTEM EXPANDABILITY

The MATHATRONICS System is available with any one of three central computing stations. You can start with the simplest system at a price competitive with ordinary electronic desk calculators and by adding components expand to the powerful CS-3 System with simultaneous multiple keyboards, alphanumeric i/o devices and 2822 steps of program instructions.

CS-1 NATURAL LANGUAGE CALCULATOR

Provides true mathematical operation with ability to solve problems in one-step as they are entered. Problems of unlimited length may be entered by an optional tape reader. Unit has seven registers plus power log and may be expanded in the field by plug-in modules to CS-2 or CS-3 as described here.

CS-2

Provides 15 registers, 9 of which are uniquely available for storage under the operation control, and up to 96 program steps. Also provides the following automatic trigonometric and statistical functions. Specific systems are available for mathematicians and surveyors.

TRIGONOMETRIC FUNCTIONS

Computes Sin θ
 Computes Cos θ
 Computes Tan θ
 Computes Sin⁻¹
 Computes Tan⁻²

STATISTICAL FUNCTIONS

ΣX , $\Sigma (X^2)$, N
 ΣX , ΣY , $\Sigma (X^2)$, $\Sigma (Y^2)$, $\Sigma (X \cdot Y)$
 \bar{X} , S_x , $S(X^2)$, Coefficient of Variation,
 Standard Error X
 \bar{Y} , S_y , $S(Y^2)$, Coefficient of Variation,
 Standard Error Y

t Test, Degrees of Freedom,
 Standard Error
 Coefficient of correlation,
 Least Squares Regression $A \& B$
 Various Chi-Square Statistics

CS-3

Permits up to 16 MATHWRITER Keyboards or Alphanumeric Typewriters or any combination of both to be operated simultaneously. System has 128 storage registers and up to 2822 steps of program instruction.

Three position administrative control switch allows restriction of writing into memory as follows:

1. All terminals to use any portion of the memory in any desired way.
2. Any of the terminals to assign its memory to some other terminal.
3. To restrict the assignment of memory or storage.

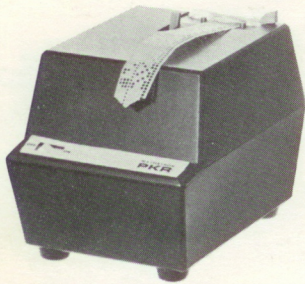
SERIAL STRIP PRINTER PROVIDES HARD COPY FOR ERROR DETECTION AND FUTURE REFERENCE

As problems are keyed into the MATHWRITER Keyboard, they are printed out from left to right, including signs and exponents. The strip printer provides a hard copy for visual error detection and future reference and also is an extremely valuable help in keeping place when interrupted. The printer also allows long programs to be run automatically without the operators continual attention.

$((2-3\div 64)\div(8\times 14.7))\bullet\bullet(1.416\div 3)=.144541421$

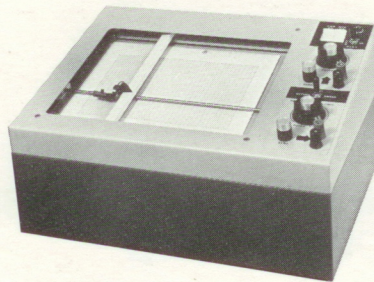
OPTIONAL EQUIPMENT

In addition to expandability as described above, the MATHATRONICS Programmable Computer/Calculator may also be increased in versatility by the addition of any or all of the following accessories, of which the paper tape reader, X, Y plotter and the Mathcoupler may be plugged in to any MATHWRITER Keyboard.



PAPER TAPE READER

Designed to provide automatic input of programs and constants, the Paper Tape Reader is plugged directly into any MATHWRITER Keyboard and reads paper tape in ASCII code.



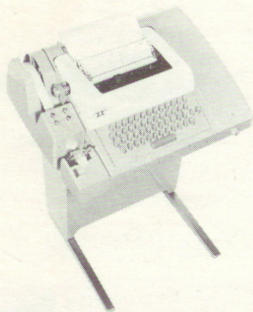
X, Y PLOTTER

A high quality versatile plotting device for either straight-line or point scatter plotting. The plotter may be interfaced "on-line" to any MATHATRONICS System or used off-line as an analog plotter.



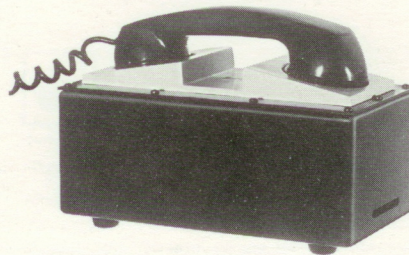
ACOUSTICAL MATHWRITER

Allows one to use the powerful capabilities of the central stations from any telephone location through the use of the acoustical coupler built into the MATHWRITER.



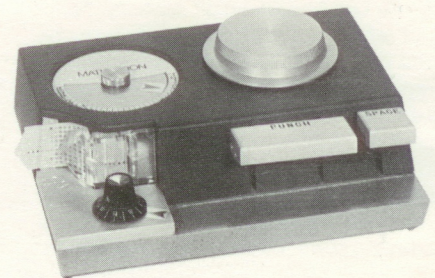
TYPEWRITER I/O TERMINAL

Provides 8½" wide alphanumeric print-out at the rate of 10 characters per second. The Typewriter may be used in place of a MATHWRITER Keyboard in the system.



MATHCOUPLER

Acoustically couples MATHWRITER Keyboard to central station through ordinary telephone handset. For use as optional equipment with any terminal.



PAPER TAPE PUNCH

A compact portable unit that easily produces eight channel ASCII punched tape for use with the Paper Tape Reader to provide automatic entry of long or frequently used programs.

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