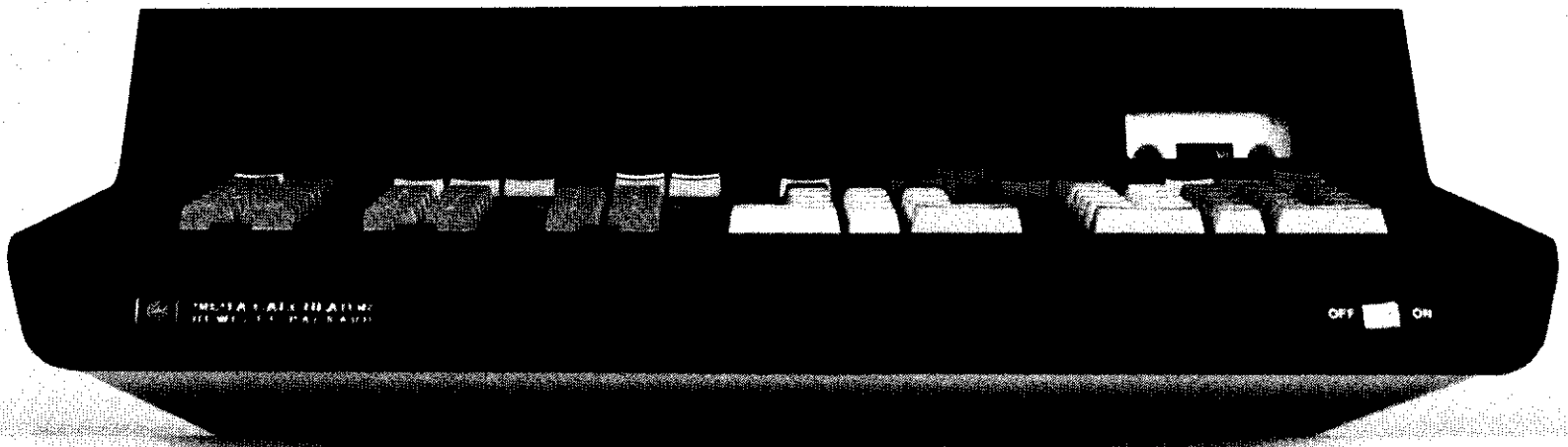


SERIES 9800



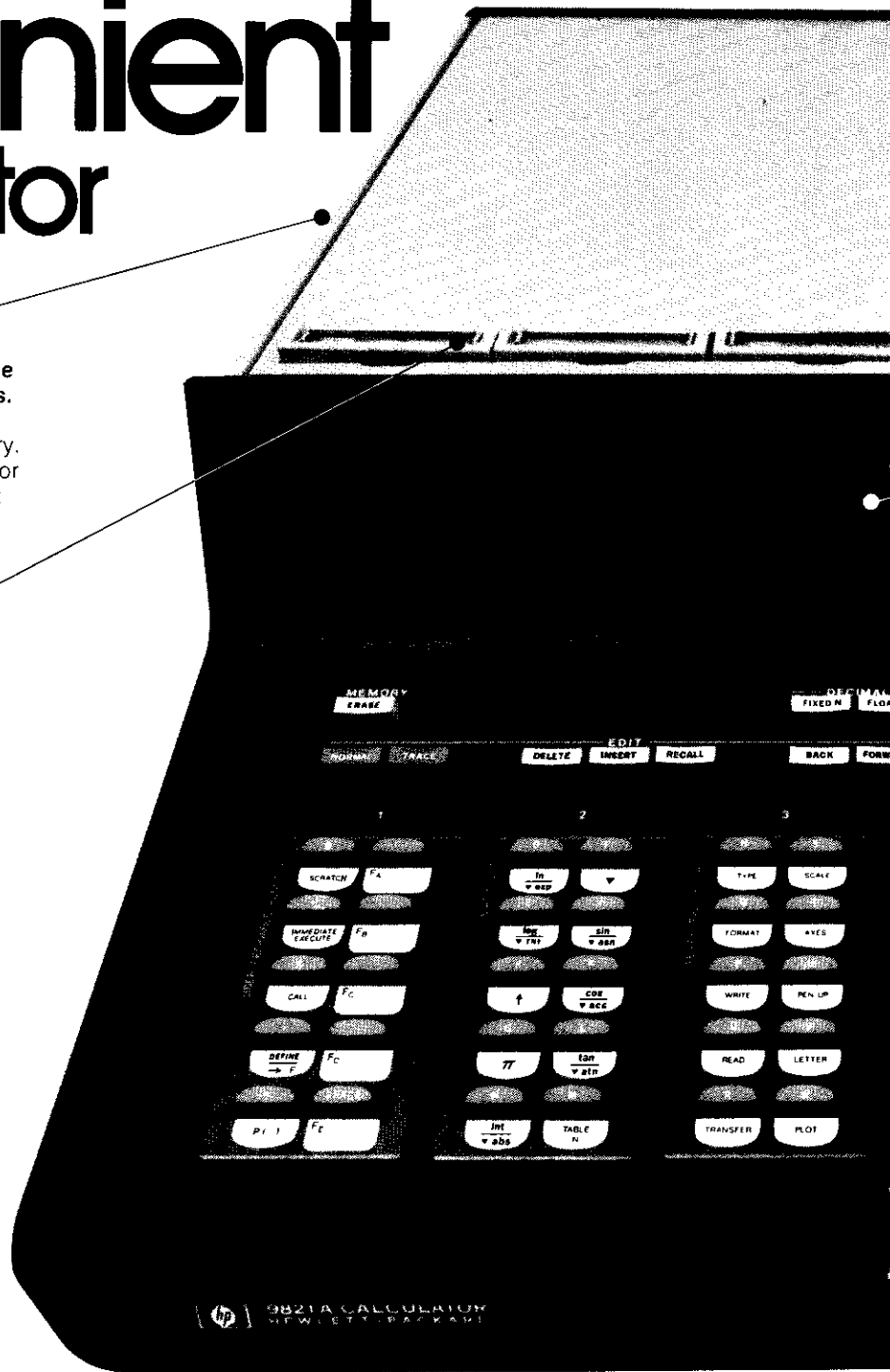
# Model 21

HEWLETT  PACKARD

# Meet the Convenient Calculator

**Match internal memory to the complexity of your problems.**  
The basic Model 21 starts you with a 167-register memory. Or you can specify 423, 935, or 1,447. Order the one that best suits your needs.

**Design your keyboard with the functions you use most.**  
Plug-in function blocks enable you to solve your important functions with a single keystroke.



**HP series 9800/Model 21: The programmable calculator that puts programs... solutions... data at your fingertips.** The key word for the Model 21 is convenience. Cassette memory, algebraic programming language, definable key blocks—are just some of the important features of the Model 21 that were designed with the user in mind. Plus, you

end up with a personal computing system that is still desktop in terms of space and power requirements.

**Already proven in terms of hardware and software.** As an addition to our popular 9800 Series, the Model 21 benefits from the technology of its predecessors. What this means is an established record of outstanding reliability. What's more, you can benefit from the library of programs already available for

**Choose peripherals to match your operating procedures.** The versatile I/O structure of the Model 21 lets you choose the combination of input, output, and control peripherals to handle data in the most convenient form for you.



**Receive instructions and listings in English and algebraic symbols.** The printout and alphanumeric display lets you see your formulas and solutions in notation with which you are familiar.

**Store and retrieve programs and data quickly and conveniently.** The built-in cassette memory lets you store programs and data on removable cassettes. When you need your information again, just drop in a cassette, press the control keys, and you are ready to go.

**Use the cassette memory with a minimum of fuss.** A built-in cassette ROM lets you perform control functions such as load, rewind, and store with two or three keystrokes.

**Key your problem exactly as you would write it.** The algebraic language of the Model 21 lets you use symbols, implied multiplication, nested parentheses—all the traditional formulas you are used to.

our Model 20—these include both general as well as specific solutions to a variety of application problems. In fact, if you know someone with a Model 20, you can run any of his programs on your Model 21 without modification.

The same is true for peripherals. You have a broad selection of peripherals that you can match to your needs. And many

satisfied users have already proven their performance with Model 20 systems.

**Designed to solve your problems.** The Model 21 was designed for people like you—engineers, scientists, problem solvers. Algebraic language, cassette memory, definable keys, labeled printout... features that let you conveniently transform problems into answers without leaving your desk.

# A Choice of Inputs



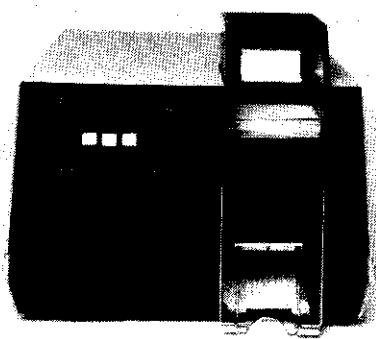
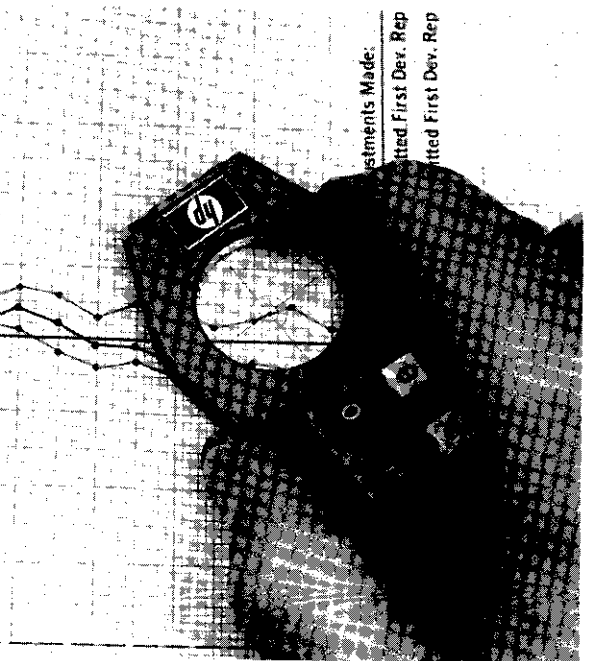
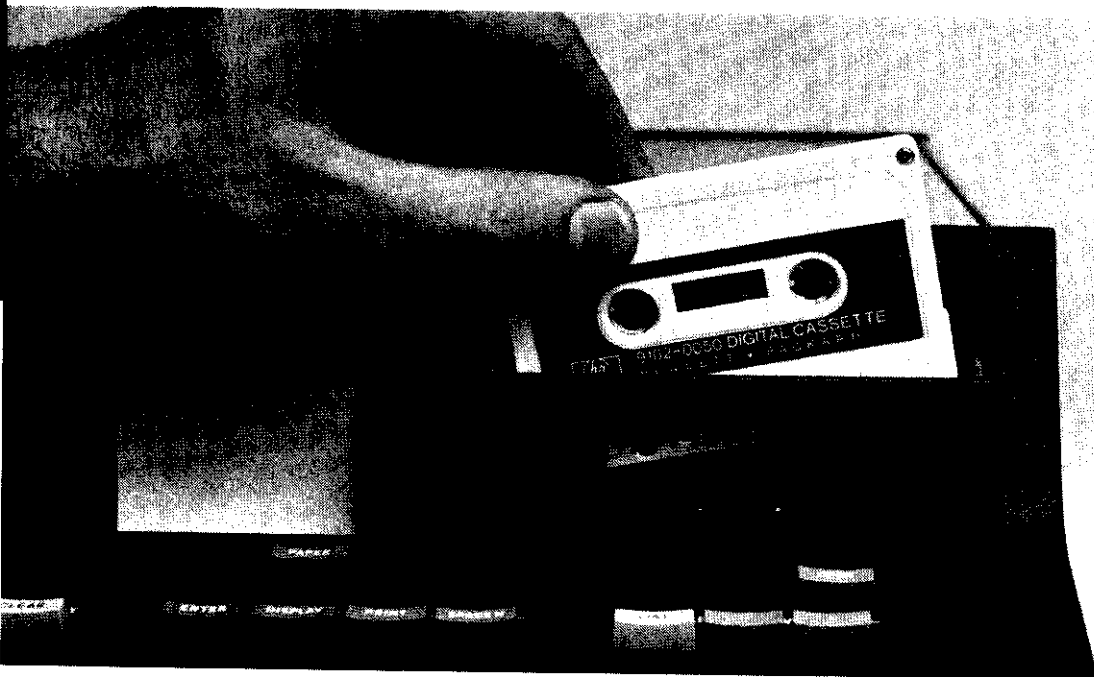
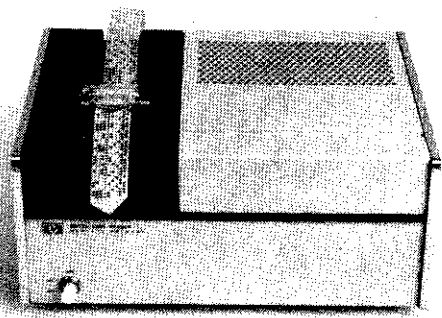
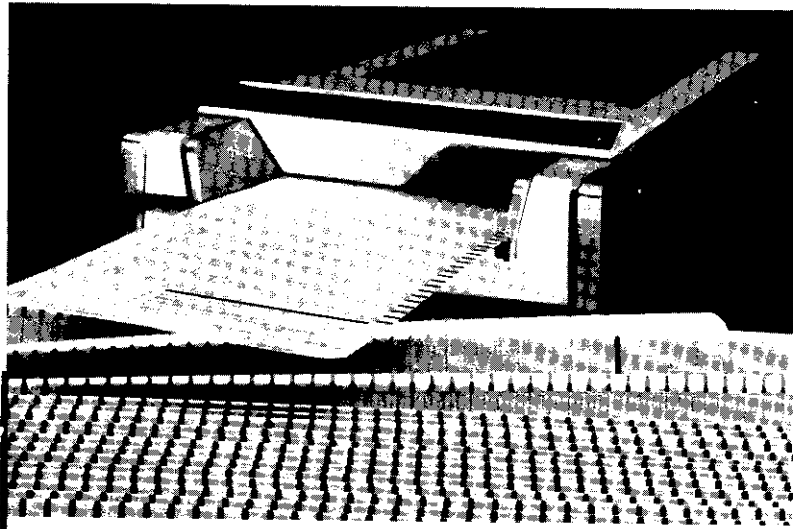
**The most effective way.** Programs, data, both . . . from cards, tape, diagrams . . . the flexible input structure of the Model 21 lets you access its processor in the way most convenient for you. The result is good use of your time and your money.

**With a minimum of keystrokes.** Whether composing programs or directly entering data, the built-in keyboard simplifies your job. We human-engineered this keyboard to efficiently use the computing power of the Model 21 while making it as easy to use as possible. Take a look at our keyboard. Note the number of control and program functions that can be performed with a single keystroke. What we are saying is that the Model 21 puts a lot of power at your fingertips without sacrificing versatility or simplicity.

**Or fast, automated readin.** For normal storage of data and program, there is the built-in cassette memory. But supposing your data is available on punched cards, mark-sense cards, punched tape, or even diagrams? The Model 21 has a peripheral to handle your data input needs. You're probably familiar with tape and card readers, but what about a digitizer? This fascinating device lets you "read" graphics such as diagrams or strip charts directly into the calculator for analysis.

**In real time too.** Do you deal with data from test instruments? Why risk conversion errors? You can order a controller that lets you "design" an instrumentation system based on your Model 21 for on-line data input and analysis.

**With automatic program verification.** What happens when you load a program developed by someone else or that you haven't used for awhile? How do you know that you have the right version? The Model 21 performs such checks for you with no action on your part. Every time you load a program and list it, a code printout is generated. Checking this code against the original one verifies that you have the program you want.



# A Language YOU Understand

**For natural communication.** The language of the Model 21 is simple to learn and simple to use. Your Model 21 speaks and understands a language designed for problem solving. It is a combination of

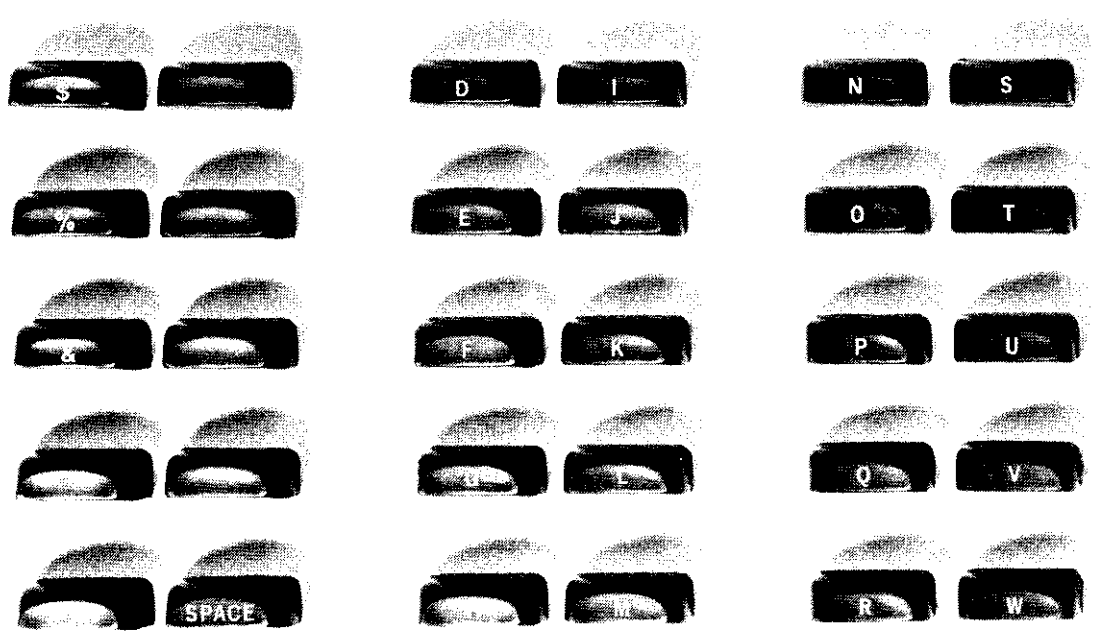
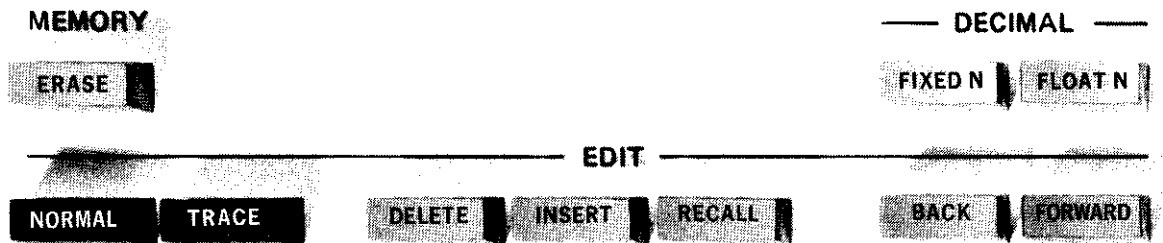
algebraic notation and English that lets you write programs with the same symbols and notation you use in your work.



**Yet providing programming power.** Even though simple, the programming language of the Model 21 offers you many computer-like features:

- Both conditional and unconditional branching.
- Boolean capability.
- Nesting of subroutines up to 30 deep.
- Use of up to 16 flags.
- Computed or indirect addressing.

Even though it sits conveniently on your desk, the Model 21 has enough power to handle the majority of computing problems you encounter each day.



**That facilitates editing.** Every entry is checked as it is entered. When you make an error, you know it and correct then rather than having to hunt for it later. When you make an error, the display lights up with a note that tells you the error type. Whether correcting errors or rewriting sections of your programs, the group of five edit keys lets you make changes with a minimum of keystrokes. When inserting or deleting a line, the Model 21 automatically fits the program to the required memory and renumbers the remaining lines.

**And conversational operation.** The simple language, plus the display and printer, let you write programs that "talk" you through their execution. Pretty convenient for a program that you do not run regularly or that you want any of your co-workers to be able to run. For example, the display could request each entry as it is required and then display the results.

```

0: ENT "ENTER A",A#
1: PRT "A=",A#
2: ENT "ENTER B",B#
3: PRT "B=",B#
4: ENT "ENTER C",C#
5: PRT "C=",C#SPC 2
6: IF 0>BB-4AC#GTO
  "IMAG"#
7: PRT "REAL ROOTS"
  #SPC 1#
8: PRT (-B+r(BB-4AC
  )/2A#SPC 1#
9: PRT (-B-r(BB-4AC
  )/2A#SPC 1#
10: GTO 0#
11: "IMAG"#
12: PRT "COMPLEX ROO
  -TS"#SPC 1#PRT "
  REAL"," IM
  AGINARY"#SPC 2#
13: PRT -B/2A,r(4AC-
  BB)/2A#SPC 1#
14: PRT -B/2A,-r(4AC
  -BB)/2A#
15: GTO 0#
16: END #
  
```

PAPER



OPEN

DISPLAY

INPUT/OUTPUT

PROGRAM

CLEAR

ENTER

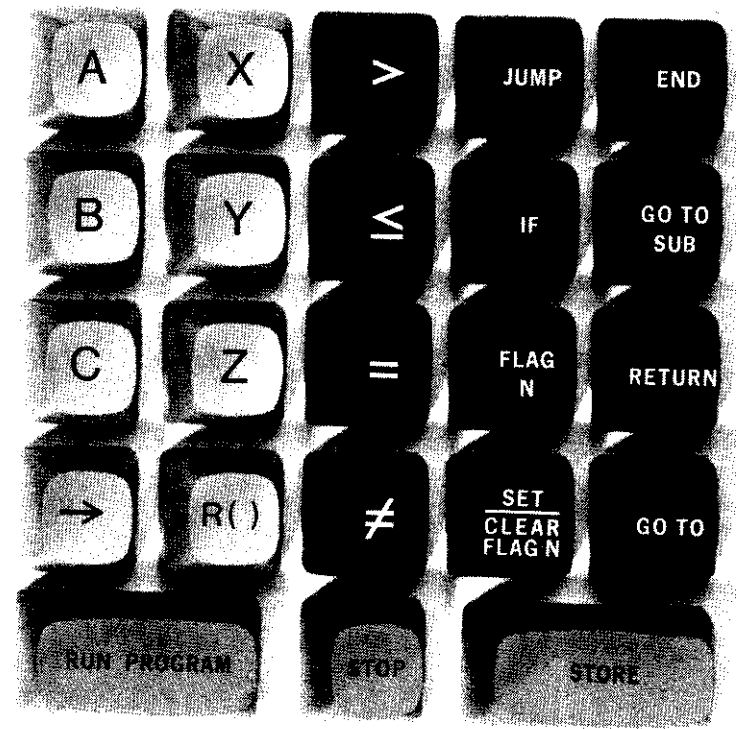
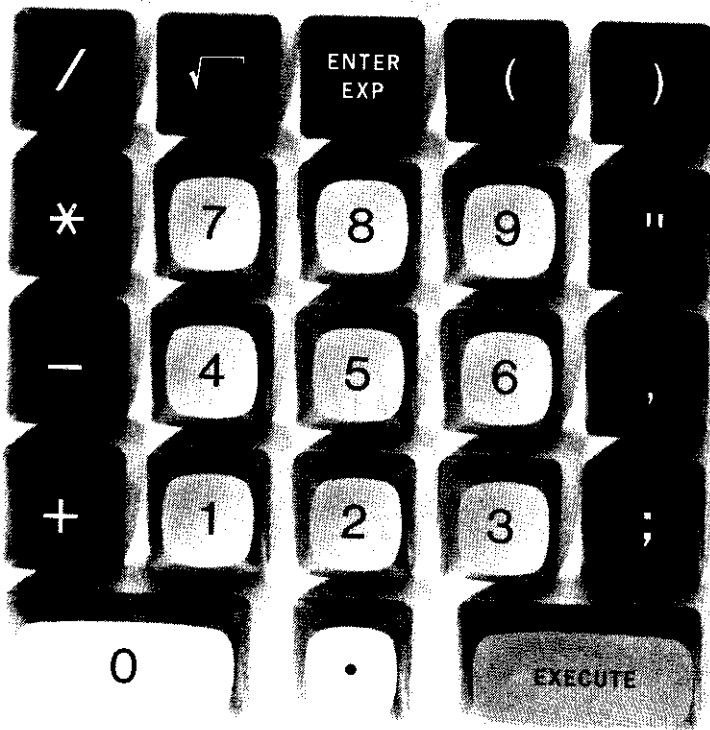
DISPLAY

PRINT

SPACE

LIST

LDF

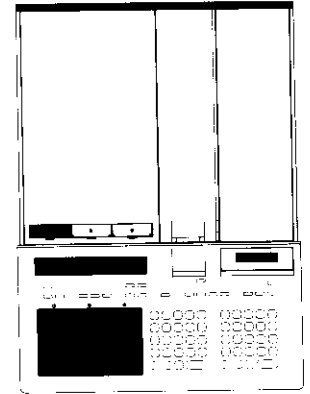


# The Keyboard You Design

**For any discipline.** Whatever your field, you can literally design the keyboard of the Model 21 to execute the functions you use most with the touch of a single key. You can customize the three left-hand key banks by specifying individual keys, an entire bank, or a group of banks. Insert a plug-in block, overlay the associated templates, and you're ready to start solving your problem.

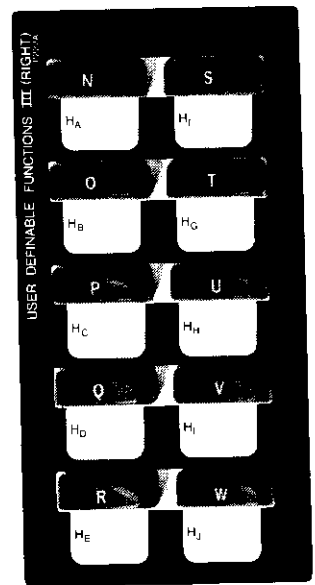
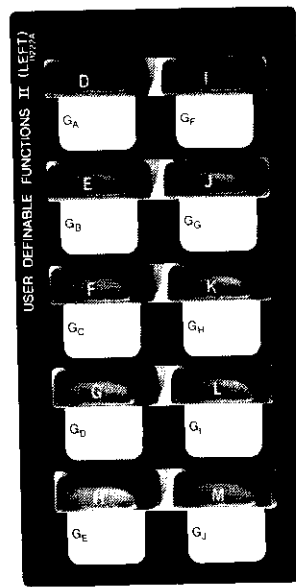
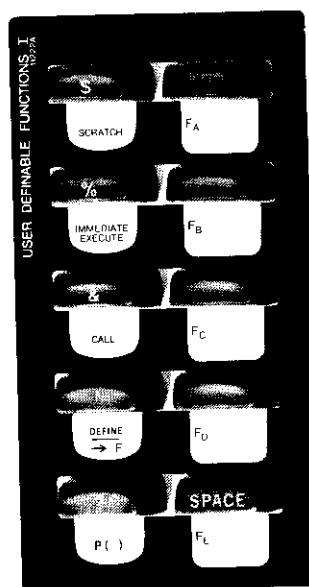


**With a choice of modules.** One, three different, or . . . you can use any combination of three modules at the same time. Each gives you special functions, plus more memory. Each block contains its own read-only memory (ROM). Here are the blocks currently available.

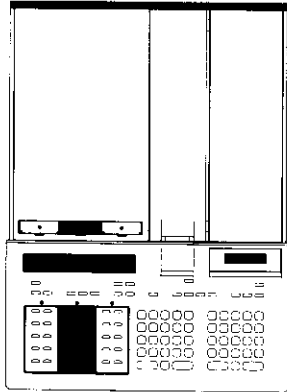


## DEFINABLE

With the User Definable Function Block, you can customize individual keys for the operations uniquely important to you. For example, the electrical engineer will probably want voltage, impedance, capacitance, and true RMS functions; the physicist, his mass, velocity, and acceleration functions; the chemical engineer, his fluid flow and heat transfer functions. With one definable block, you can specify 5, 15, or 25 keys depending upon whether the remaining banks are being occupied by other ROM's.

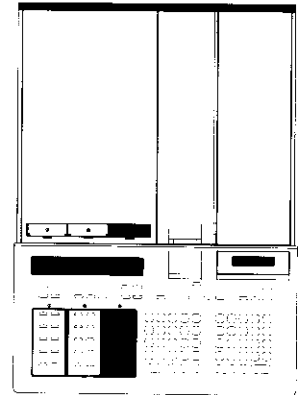
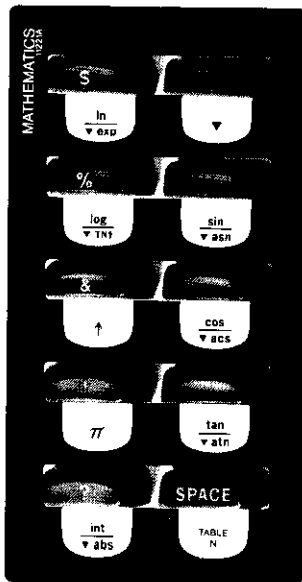






# MATHEMATICS

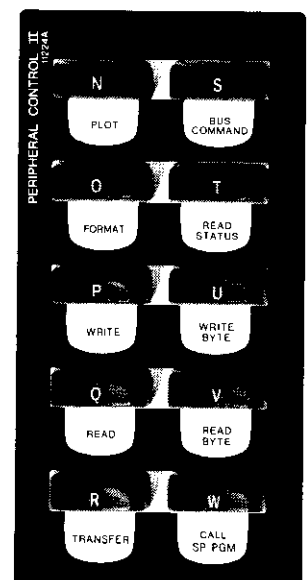
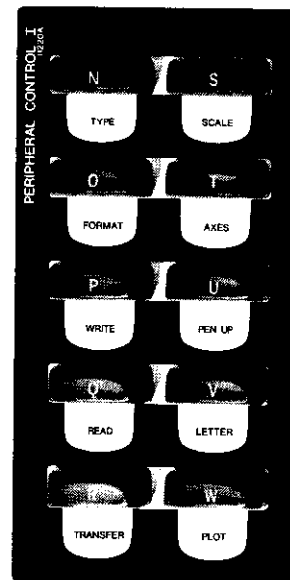
With the Mathematics Block, you get more than just keys and symbols—you get extra memory that has been permanently programmed to solve math problems. Under single-key command are sine, cosine, tangent, pi, log, natural log, integer value, and raising a number to a non-integer power. Plus you get a shift key that lets you compute the inverse of the preceding functions. Also, a key that allows you to set your arguments in degrees, radians, or grads.



# PERIPHERAL

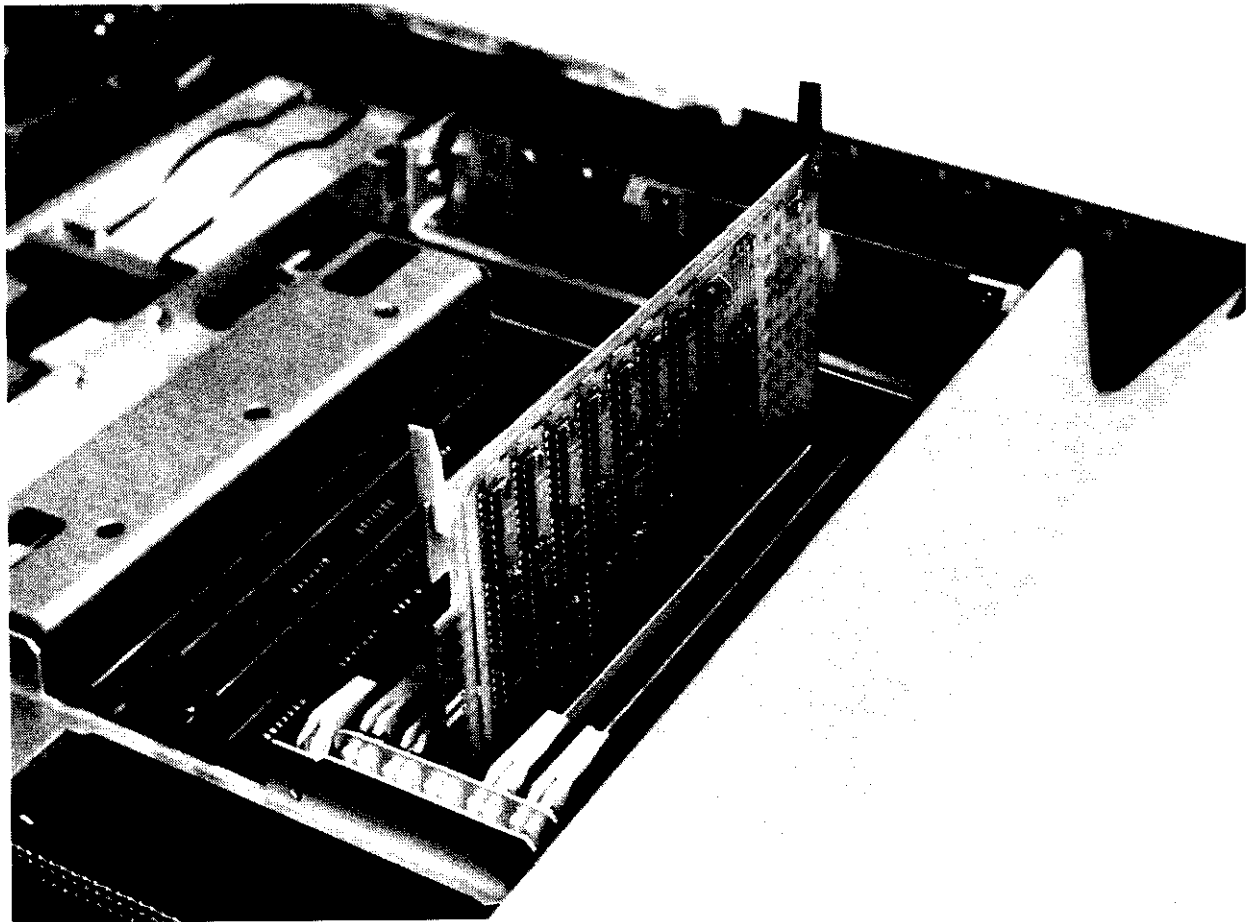
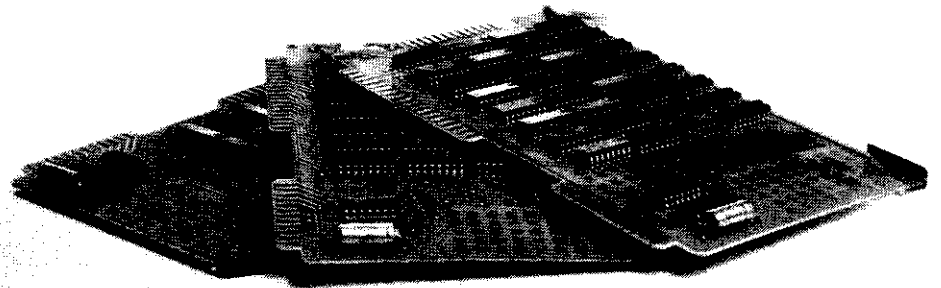
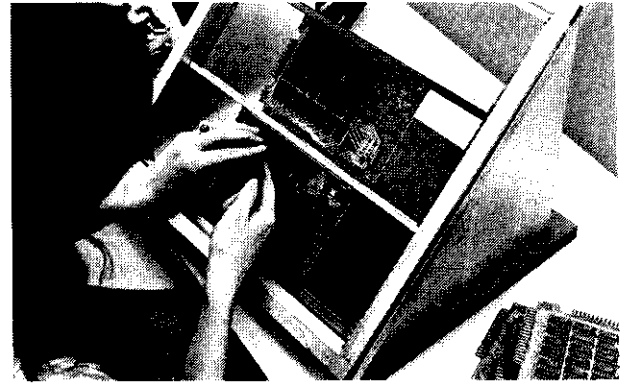
Two Peripheral Control Blocks provide simple direct control over the various peripherals you can add to your Model 21. **Peripheral Control I Block** has three groups of functions: plotter, typewriter, and systems. The latter facilitates program and data transfers between the various elements of your system; such as, calculator to peripheral or peripheral to peripheral.

**Peripheral Control II Block** provides enhanced general interface capabilities. Special features include tape translation, general instrument control (via an ASCII Bus), formatted read/write, and calling special internal code programs.



# Memory

that grows  
with you



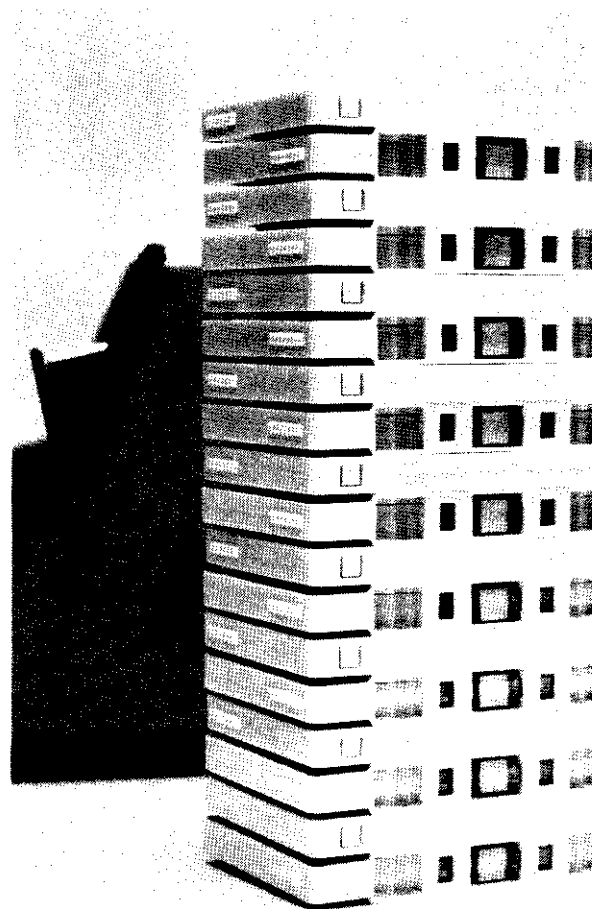
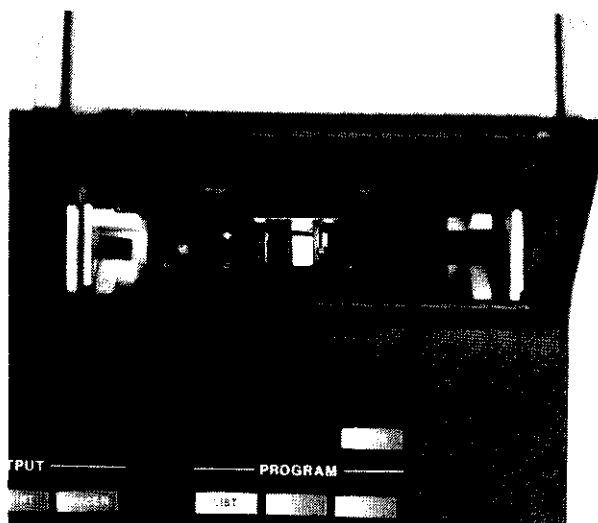
**An expandable internal memory for speed.**

Using advanced MOS/LSI technology, the Model 21 has a fast read/write memory for you to use. Basic capacity is 167 registers, but you can expand incrementally up to a maximum of 1,447. These numbers translate into the capability to solve 16 simultaneous equations on the low end and 70 on the high end.

**Plus unlimited off-line storage.** The built-in cassette memory offers you greater convenience and capacity. And the standard unit includes a control ROM that takes care of bothersome tasks like program linkage so you can easily handle any size program. One cassette gives a bulk storage capacity for roughly 40 times as much data and programs as the basic internal memory of the Model 21.

**Offering efficient usage of all memory.** Memory structure, language, addressing...all these things were designed to ensure efficient use of internal memory. The idea is to provide you with the most memory power possible no matter which size you order. Consider the following:

- **No artificial partitioning**—programs and data share the same storage.
- **No waste**—after program entry, all unused memory is available for data.
- **Editing leaves no gaps**—the Model 21 automatically repacks memory.
- **Automatic allocation**—your program is converted to machine code and efficiently fitted into storage.
- **A choice of addressing**—use any combination of direct, indirect, relative, and symbolic addressing to decrease program length and the amount of storage required.



# output

in the  
Most Usable Form



**How would you like your solutions?** The data is in. The problem solved. Ideally, you would like your answers in the final form that you need. With the Model 21, you have that capability. You no longer spend minutes solving a problem, then hours putting the results into final form.

**If all you need is answers.** You require nothing extra. The basic Model 21 does the job all by itself. The built-in alphanumeric display and printer can show the formula you are using, your data as entered (with labels, if you so choose), and the labeled solution.

**What about a graphic display?** By adding an HP X-Y Plotter, you can graphically display your data in whatever form you choose. Because it can draw continuous lines as well as print characters, this exciting device lets you conveniently draw histograms; pie charts; linear, log-log, semilog, or polar plots; circuit diagrams; or... it operates in all four quadrants, generates words and numbers, and automatically sets up both axes. In other words, with this plotter you add a visual dimension to your problem solving.

**For tabular data too.** Extend the versatility of your Model 21 with a Series 9800 Typewriter. Use it for tables, standard forms, letters, and data listings. It has full alphanumeric capability (upper and lower case). And most operations are under control of the Peripheral Control Block: tab setting and clearing, ribbon color, vertical and horizontal spacing....Once you've set up your problem, forget it. The Model 21 takes care of listing your results in the way you want them.

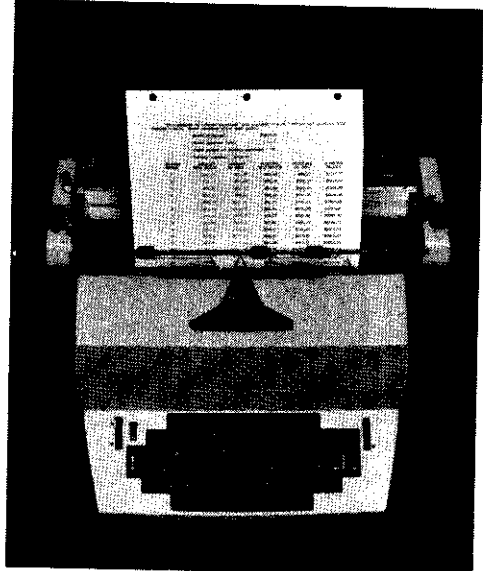
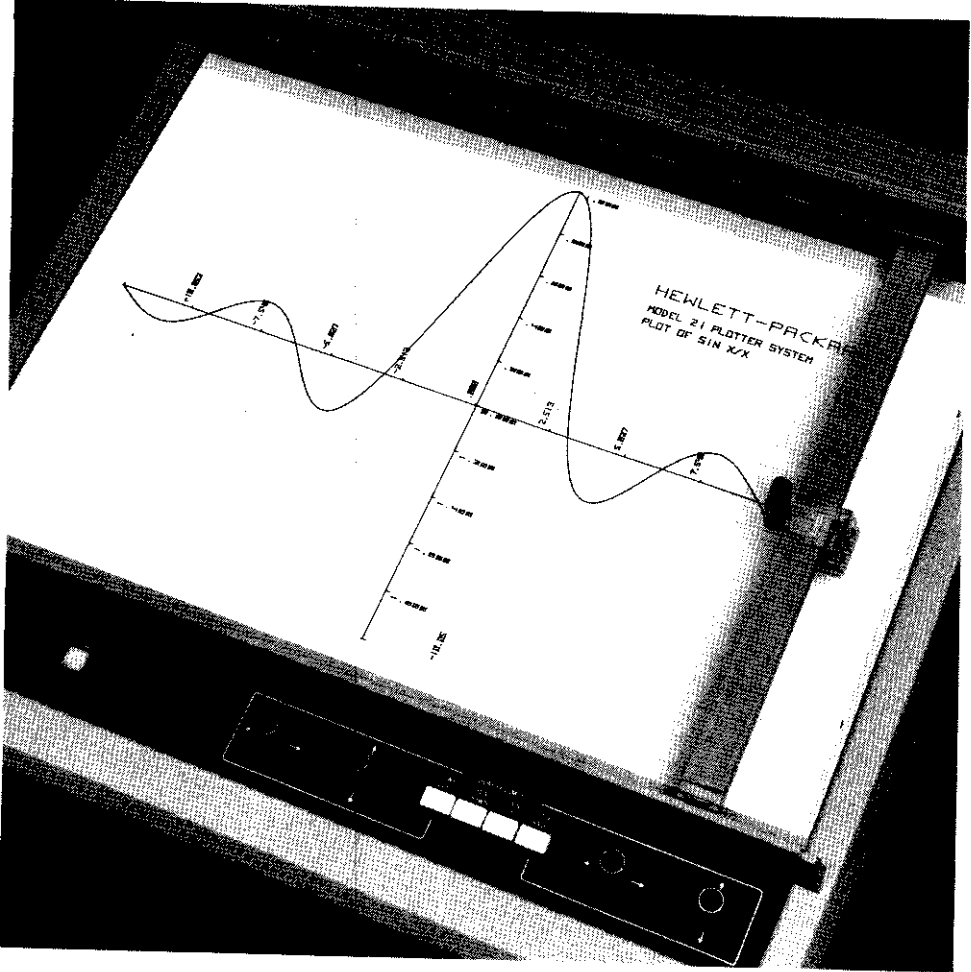
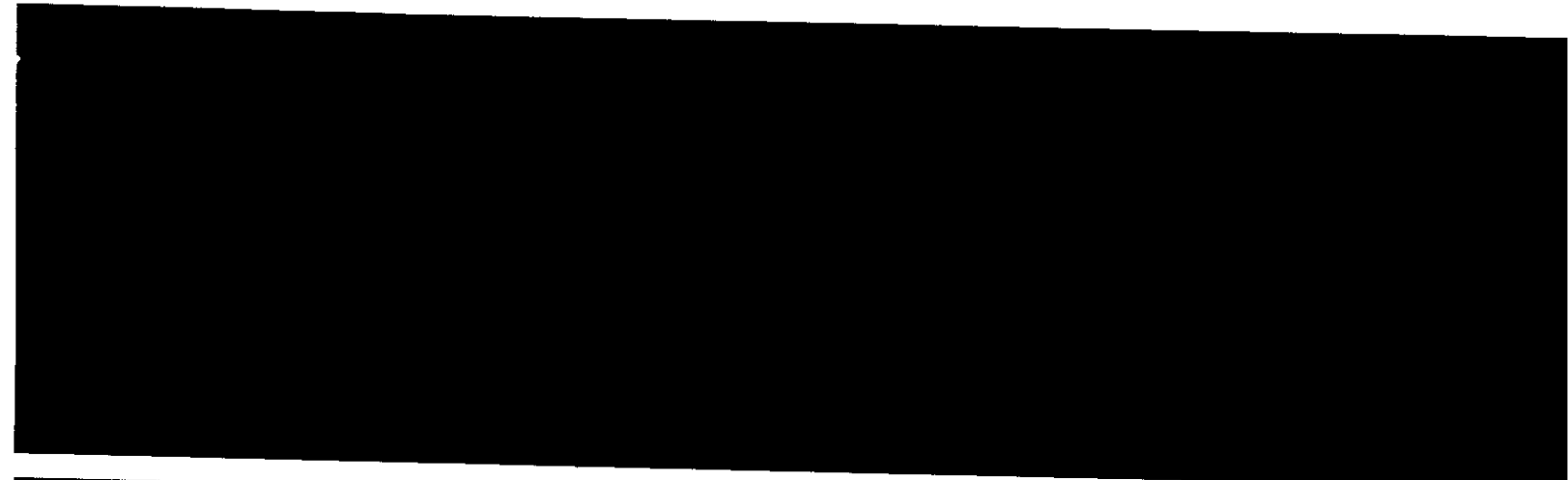
**As paper tapes too.** Do you need a copy of your results for automatic processing elsewhere? We offer a Paper Tape Punch that gives you this capability.

X  
SIN X/X

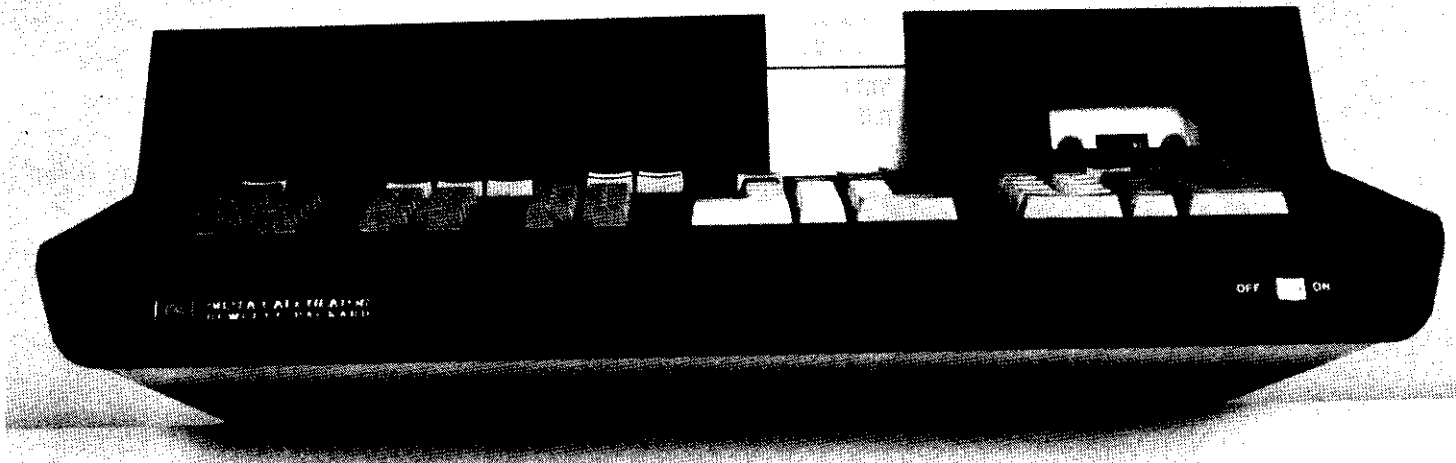
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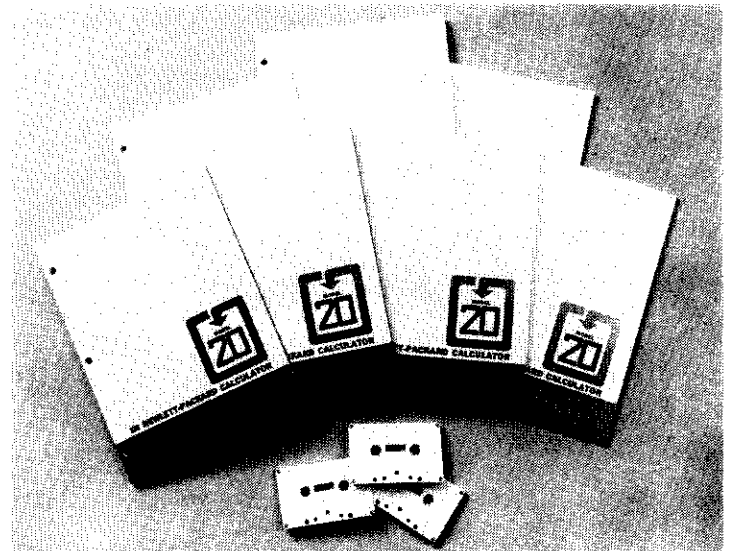
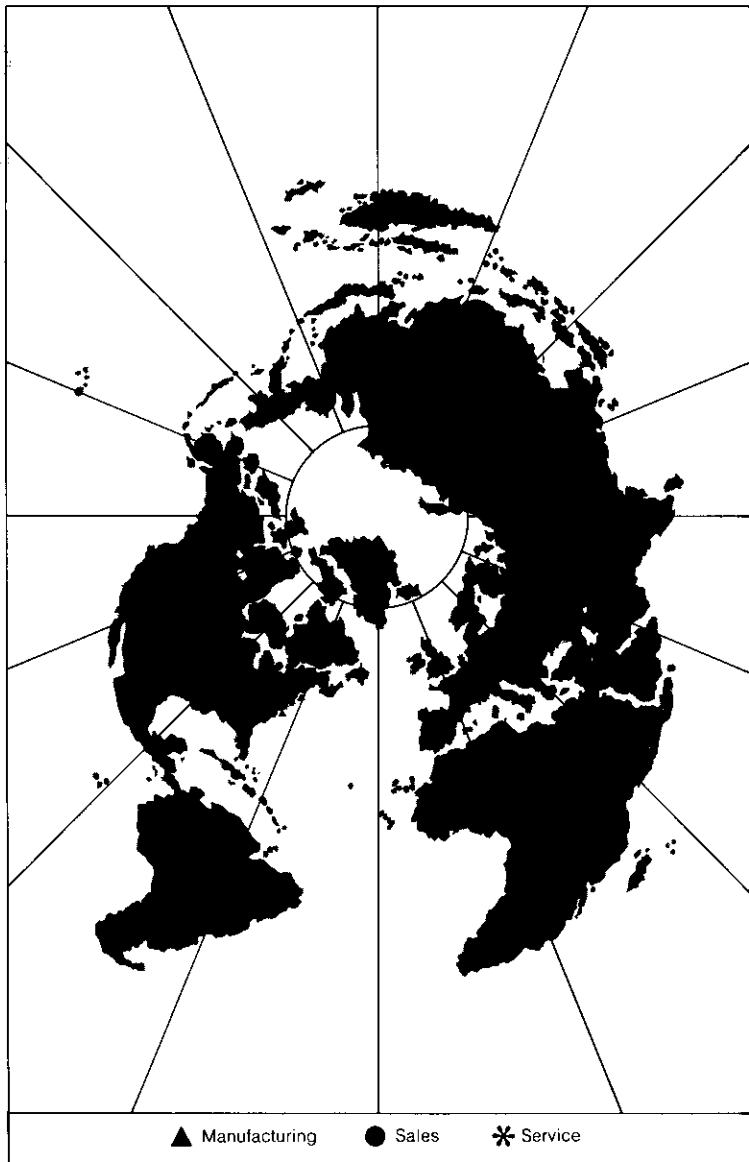
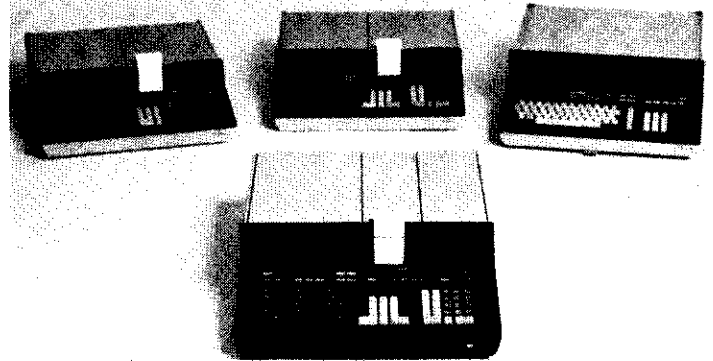


# Why an hp model 21?



- Another advanced product for measurement/computation from Hewlett-Packard.
- Based on the proven technology of our Series 9800.
- Available with ready-to-use applications software (developed for our Model 20) on tape cassettes.
- Supported, as are all HP products, worldwide.
- Offering you a choice of options and peripherals to match your needs.
- Conversing naturally with you.

In other words, this is **some** calculator. Your first hands-on demonstration should convince you of the convenience and power of this versatile desktop calculator. Call or write your local HP calculator specialist. He will show you what the Model 21 can do for you.





Sales and service from 172 offices in 65 countries.  
Loveland, Colorado 80537