

***INSTRUCTION MANUAL***

**INFOTEK**  
**MODEL EM-30**  
**EXTENDED MEMORY SYSTEM**

**FOR THE HEWLETT-PACKARD 9830A**

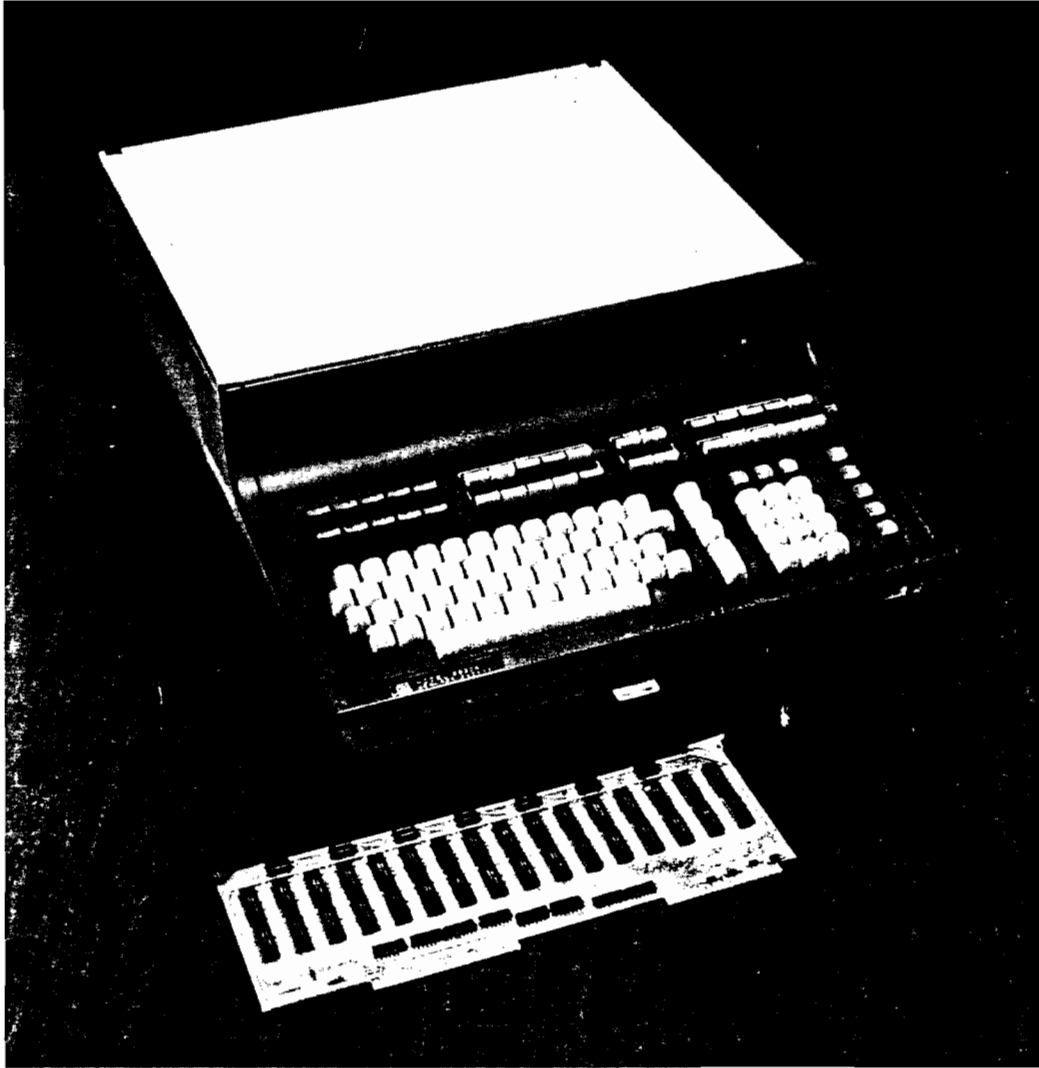


**infotek Systems**

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INFOTEK EM-30



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## INTRODUCTION

The INFOTEK EM-30 Extended Memory System was developed specifically to extend the memory capacity of the Hewlett-Packard 9830A Basic Language Programmable Calculator. The 16,096 word capacity of the EM-30 greatly expands the applications of the HP 9830A without requiring changes in programs or interface with peripheral equipment. All programs and diagnostics, whether basic, optional ROM, or binary tape, will function identically with the EM-30.

The EM-30 utilizes current technology 4096-bit Random Access Memory (RAM) chips that dramatically reduce demand on the HP 9830A power supply. The 16K word EM-30 uses about 70% less power than the HP 8K memory resulting in reduced operating temperature of the HP 9830A.

Changing the HP 9830A memory system from 4K or 8K of memory to the EM-30 16K memory is an extremely simple procedure. Two plug-in circuit cards (three if machine has 8K of memory) are removed from the HP 9830A and replaced with EM-30 cards which have the same color coding and pin arrangement as the HP cards.

### CAUTION

**The INFOTEK and Hewlett-Packard memory systems are not compatible and cannot be mixed. Any attempt to operate a mixed INFOTEK and Hewlett-Packard memory system may damage the memory circuit cards and the calculator.**

# SPECIFICATIONS



## EM-30 EXTENDED MEMORY SYSTEM

### ADDRESS DECODER

INFOTEK Part No.	12017
Page Size	1,024 16-bit words
Maximum Pages	16 or 32,768 words
Power Requirements	Comparable to the original Hewlett-Packard M-Register circuit card.
Dimensions	Compatible with Hewlett-Packard 9830A main-frame and the M-Register card.
Color Coding of Extractor Handles	Compatible with Hewlett-Packard 9830A card slide colors and the M-Register card.
Plug Locations (Edge Connectors)	Compatible with Hewlett-Packard 9830A main-frame connectors and the M-Register card (09830-66582).

### MEMORY

INFOTEK Part No.	10500
Page Size	1,024 16-bit words
Maximum Pages	8 or 8,192 words
Power Requirements	Less than half the original Hewlett-Packard 4K Word Memory circuit cards.
Dimensions	Compatible with Hewlett-Packard 9830A main frame and the Memory card.
Color Coding of Extractor Handles	Compatible with Hewlett-Packard 9830A card slide colors and the Memory card.
Plug Locations (Edge Connectors)	Compatible with Hewlett-Packard 9830A main-frame connectors for the Hewlett-Packard Memory cards Part No. 09830-69584 or 11275-69584.

### CAUTION

**The INFOTEK EM-30 Extended Memory System circuit cards will not function with the Hewlett-Packard Memory circuit cards. Any attempt to operate a mixed INFOTEK and Hewlett-Packard memory system may damage the memory circuit cards and the calculator.**



# INSTALLATION

## IMPORTANT NOTICE

The first 200 Hewlett-Packard 9830's produced will not function with either the INFOTEK EM-30 or standard Hewlett-Packard Memory systems without modification. These units are identified by serial numbers 1233A-00101 through 1233A-00300 inclusive. Unless these machines are upgraded to current configuration, they should contain a decal placard that is reproduced here for your convenience.\*

### CAUTION

**This unit contains the original 9830A Memory Configuration.**

<b>M-Register</b>	<b>09830-69522</b>
<b>T-Register</b>	<b>09830-69523</b>
<b>2K R/W Memory</b>	<b>09830-69524</b>

**It cannot be serviced with a standard Memory Configuration.**

<b>M-Register</b>	<b>09830-69582</b>
<b>T-Register</b>	<b>09830-69583</b>
<b>2K R/W Memory</b>	<b>09830-69584</b>
<b>4-K R/W Memory</b>	<b>11275-69584</b>

**To avoid extensive instrument damage, refer to Service Note 9830A-1 for servicing instructions.**

## GENERAL

Installation of the EM-30 Extended Memory system requires removal of two or three Hewlett-Packard plug-in circuit cards and replacing them with the EM-30 cards (table 1). The EM-30 circuit cards have the same color extractors and the edge connectors are keyed to fit the same sockets as the HP circuit cards.

\*Reference: Page 6-1, Hewlett-Packard Service Manual. Hewlett-Packard Part No. 9830-90030, dated April 1975.



**Table 1. Hewlett-Packard and INFOTEK Circuit Cards**

Remove Hewlett-Packard	Replace With INFOTEK EM-30
M-Register Part No. 09830-69582	Address Decoder, Part No. 12017
2K R/W Memory Part No. 09830-69584 or 4K R/W Memory, Part No. 11275-69584	8K Memory, Part No. 10500 *

\* Two Memory circuit cards are used in a 16K system as direct replacement for either of the Hewlett-Packard Memory cards.

## REMOVAL OF HEWLETT-PACKARD CIRCUIT CARDS

1. Place input power switch to CFF.
2. Remove input power cord from wall outlet and power jack at the rear of the HP 9830A.
3. Lift thermal printer from the calculator (if so equipped) and place to one side.
4. Remove six screws from top cover of calculator with screwdriver supplied with the EM-30 (figure 1).
5. Slide top cover back about two-thirds of the way by using plastic handles at back of cover (figure 1).
6. Remove single screw that retains two crossed aluminum hold down brackets (figure 2). Note location of brackets and how they are attached. Remove brackets.

### NOTE

Figure 3 identifies the Hewlett-Packard circuit cards that are to be removed.

7. Locate the M-Register circuit card in figure 3 and in the calculator. The circuit card is identified by a red handle on the left side and a gray handle on the right side.
8. Raise extractor handles and position as shown in figure 3. Press outward on both handles with even pressure (figure 4 and figure 5). The card will resist for the first ¼ inch of travel. Lift card from slot (figure 6) and place to one side.



# INSTALLATION [Cont.]

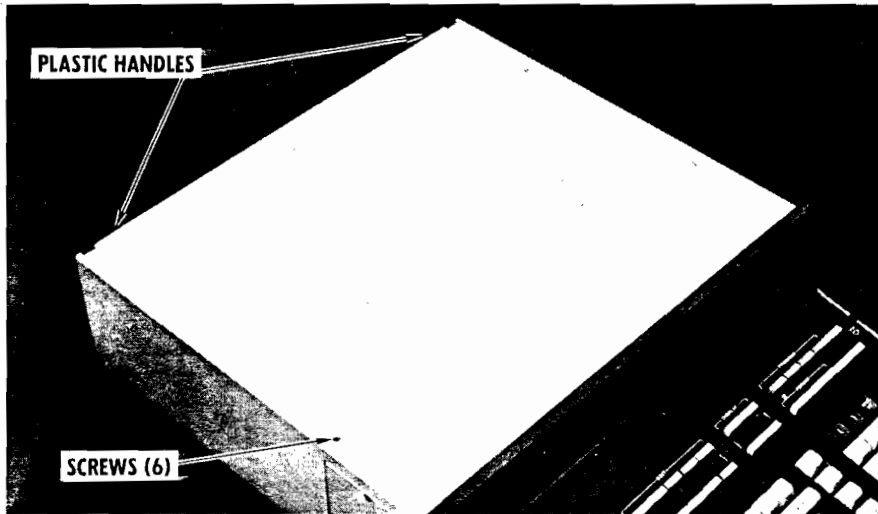


Figure 1.  
Removal of Cover

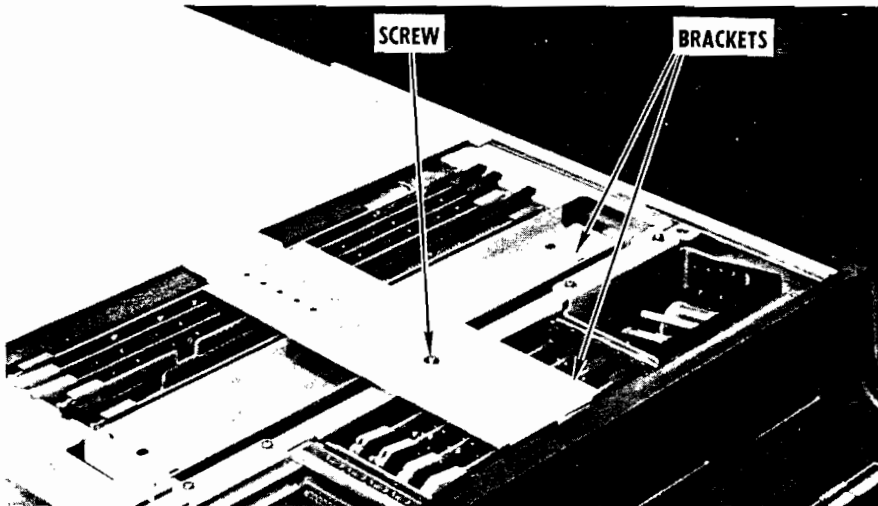


Figure 2.  
Removal of Brackets

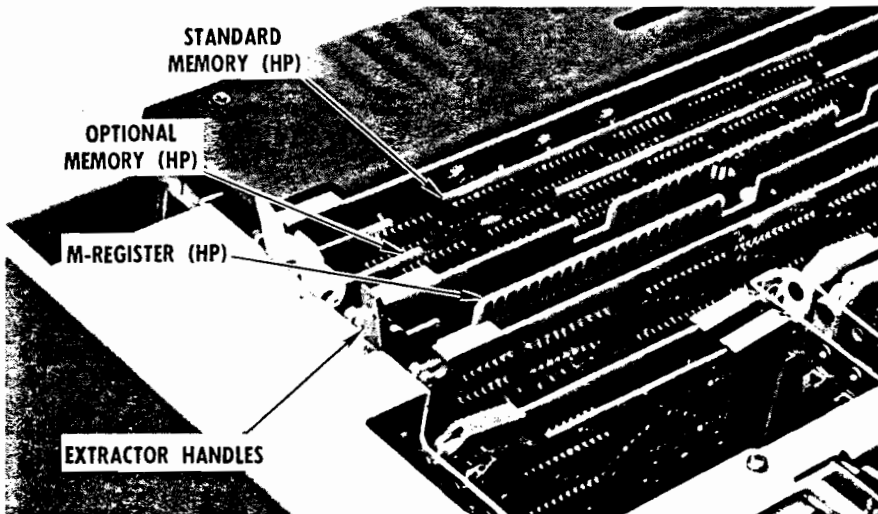
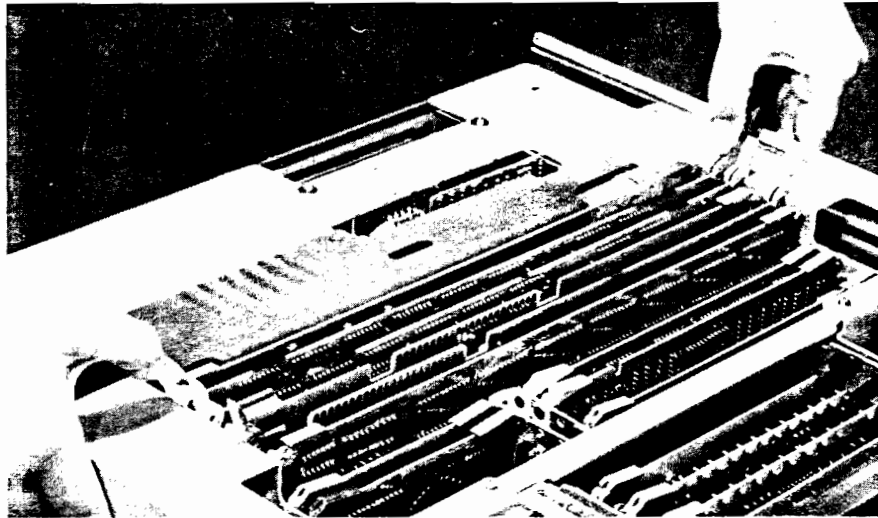


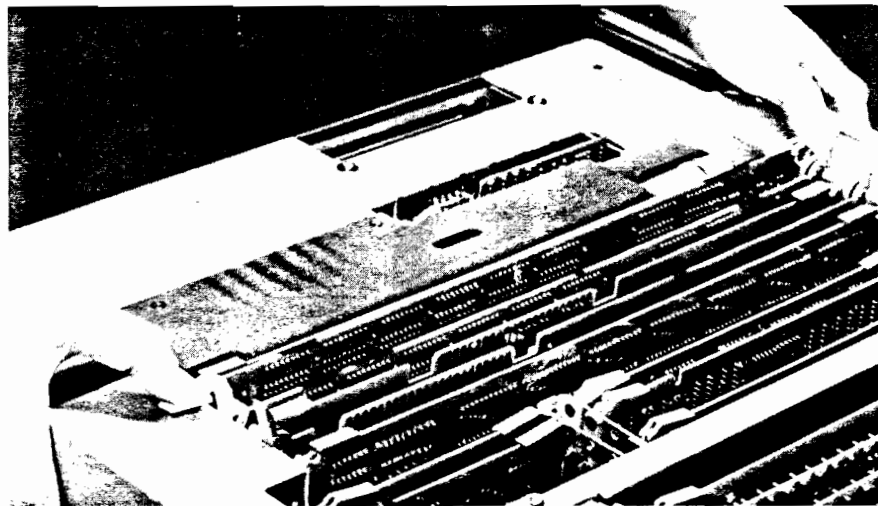
Figure 3.  
Location of Hewlett-Packard Circuit Cards



# INSTALLATION [Cont.]



**Figure 4.**  
Applying Pressure to  
Extractor Handles



**Figure 5.**  
Circuit Card Raised  
By Extractor Handles



**Figure 6.**  
Removal of  
Circuit Card





## OPERATION

### PROGRAMMING

The EM-30 does not require modification of HP 9830A programs or peripheral interface. All programs which previously functioned with a smaller memory will function exactly as before, the only difference being that the memory available for additional program material will be commensurately larger.

### DIAGNOSTICS

All Hewlett-Packard diagnostic tapes and binary program tapes will load and function exactly as with Hewlett Packard memory. The system diagnostic tape will function normally and will state the system operational status as though the system was operating with Hewlett-Packard memory.

### TAKING ADVANTAGE OF LARGER MEMORY

The scope of practical applications of the HP 9830A has, of course, been very substantially broadened by the EM-30 Extended Memory System. The effective execution speed of programs can also be increased by the Extended Memory by restructuring programs such that cassette tape motion is held to an absolute minimum. The HP 9830A can do substantial work in the time that it takes the tape transport to load or store information. For example, given sequential data access, the tape transport (averaging search time with data rate) has a throughput of approximately 40 words per second. Given a program requiring a data base of 6,000 words, the processor can access the required word stored in array, many thousands of times faster than the tape transport can access the same information by any possible combination of program and data file structure combinations.

The second opportunity for speeding execution arises from the fact that while the processor of the HP 9830A is serial, arithmetic functions are executed in 4-bit BCD. Programs which perform extensive calculations on array variables will run faster if the arrays are full-precision. Of course, the accuracy of the data will also increase.

### HELPFUL TIPS

Now that there is more memory available, it may be convenient to merge a number of programs which have been previously linked to reduce tape motion. This will result in more efficient programs, as duplication of routines occasioned by the "piece-meal" operation is no longer necessary.

The most convenient way to MERGE a number of previously linked or program loaded programs is to load them into the memory in an order exactly reversed from execution. Begin by loading the last program first and renumber it such that the first line number will be greater than the last line number of the next program to be merged. Now



MERGE the next program and again renumber the entire contents of memory with the first line number greater than the last line number of the next program to be merged. Continue in this manner until all of the programs are loaded.

As a starting point, renumber by one. There is little risk of over-running 9999 program lines which is the machine limit. After renumbering by one, a FETCH 9999 will yield the last line of the program thereby telling you whether a renumber by 10's will be possible. If there are more than 999 program lines, the renumbering increment will have to be specified.

Now list the program and streamline it by removing any duplications of sub-routines in the various segments.

After a program is streamlined and renumbered, store on a new cassette file rather than over-writing the original programs. Retain the original program for temporary use in the event a failure occurs in one of the 8K Memory circuit cards. Remember, to operate with one 8K Memory circuit card, it must be in the memory slot closest to the **front** of the calculator (figure 8).



## TROUBLESHOOTING

It is important to determine which part of the machine is at fault when a problem occurs. If after applying power the lazy T does not appear, the problem may lie in the read/write memory system. However, it could just as well exist in any one of several other areas of the machine. The best procedure is to replace the EM-30 with Hewlett-Packard Memory by reversing the procedure followed during the EM-30 installation. Remember that Hewlett-Packard systems using only one Memory card require that the card be installed in the **rear** memory card slot.

If normal operation is restored by reinstalling Hewlett-Packard memory, contact your INFOTEK representative or INFOTEK directly for immediate assistance in the repair or replacement of the EM-30. If normal operation is not restored after replacing with HP memory, arrangements should be made for service by Hewlett-Packard as the problem exists in some part of the machine unrelated to memory.

If the lazy T comes on when power is applied but the machine malfunctions, install the TEST cassette and execute LOAD BIN Ø. Type in TEST, EXECUTE and note the response on the display (if any). If the display indicates an error other than READ/WRITE MEMORY ERROR, the EM-30 is probably not at fault. If the displayed message indicates READ/WRITE MEMORY ERROR, then the EM-30 may be at fault. Should this occur, replace the EM-30 with Hewlett-Packard cards and repeat the test. If the machine functions normally, contact your INFOTEK representative. If the machine continues to malfunction with HP memory, Hewlett-Packard service is necessary.



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