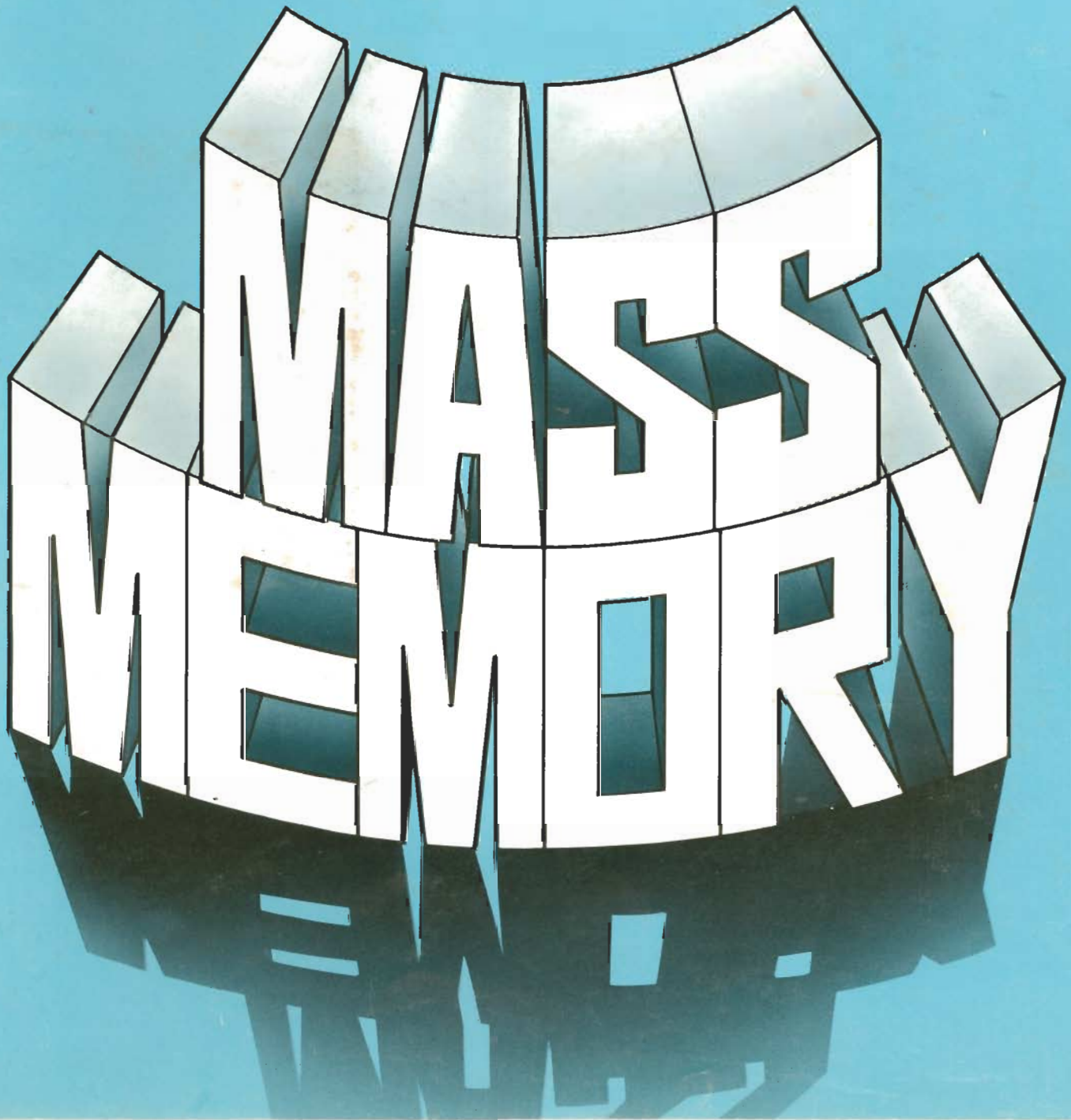


HEWLETT-PACKARD

KEYBOARD

VOL. 6 NO. 1



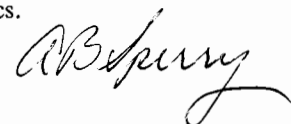
## OVERVIEW

If you have a need to handle large amounts of data, you may have wished for a large auxiliary memory in conjunction with your calculator. With 2.4 megabytes of storage capacity, the recently-announced Model 9880A/B Mass Memory systems designed for use with the Model 9830A Calculator may be the answer to your need. The article on page 2 describes the new mass memory, and several business applications using it are illustrated by the articles starting on page 5.

Photographs of the awards to winners of the first 9800 System Application Contest appear in this issue. Due to the enthusiastic response to the contest, a new one will be conducted in 1974. Details are given on the rear cover.

Watch for The Crossroads--John Nairn's new *KEYBOARD* series which will appear in each issue starting with Vol. 6 No. 2. This will deal with a number of calculator-mathematics-related topics to enable calculator users to optimize the use of their systems.

Please remember that any program, programming tip, or calculator application article you care to submit will be reviewed, and published if it is of significant interest. Each contribution should be fully documented and include a Program Submittal Form, which is found in the back of most program pacs.



**HP Computer Museum**  
**[www.hpmuseum.net](http://www.hpmuseum.net)**

**For research and education purposes only.**

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Ed Hop of the Hewlett-Packard manufacturing facility in Böblingen, Germany, is the new *KEYBOARD* field editor for Europe. We wish to extend a hearty welcome to Ed as a member of the *KEYBOARD* staff. European readers should send all their future correspondence and contributions of programs and programming tips to Ed.

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##### FOR HEWLETT-PACKARD CALCULATORS

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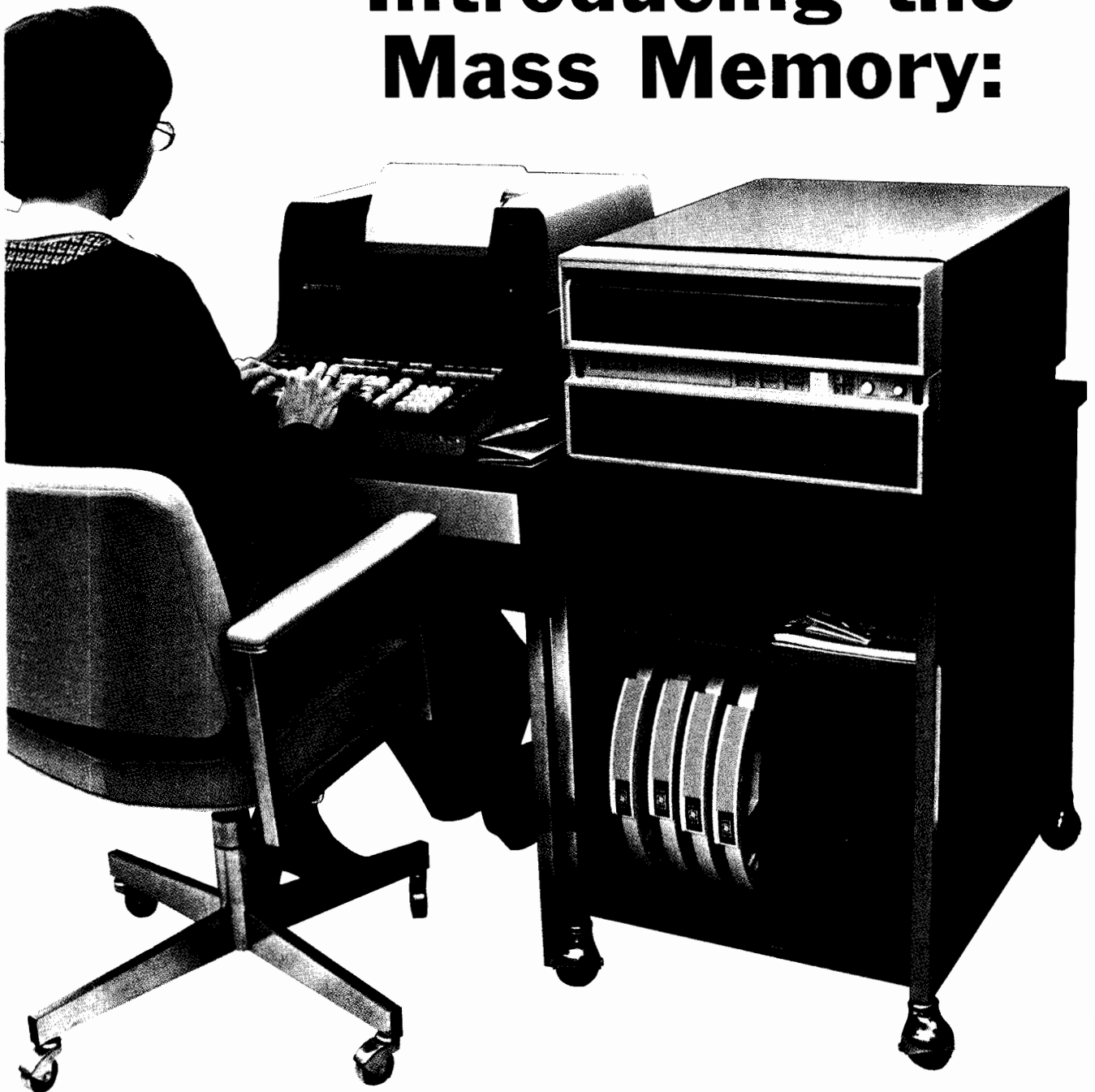
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# Introducing the Mass Memory:



**Add-On Capability Designed  
Specifically for the Model 30 Calculator  
by Donna Kimble\***

The desire for speed and accuracy in calculations prompted scientists and engineers to develop high-speed, sophisticated programmable calculators, like the HP Model 9830A. The problem of limited storage space, however, has always been frustrating. A calculator with the capability of manipulating large amounts of information accurately and quickly, when there is no equally fast and accurate method of permanently storing this information, is analogous to a powerful navy in a land-locked country.

The HP 9880 Mass Memory Subsystem represents a revolutionary solution to this problem in the programmable calculator industry. Use of the Mass Memory Subsystem helps fulfill the Model 30's potential, providing the user with the kind of storage and speed unavailable in any self-contained calculator today.

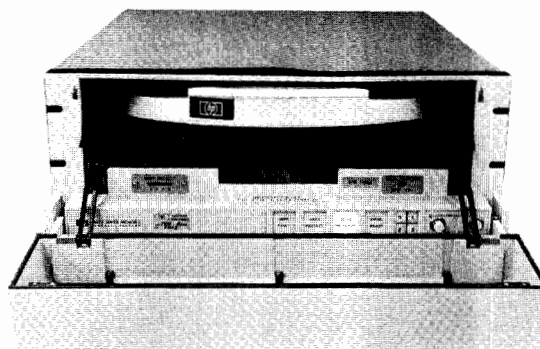
A vast amount of information can be stored and accessed on each platter used with the Mass Memory. In fact, the information contained on one platter (2.4 million bytes) would require a tape cassette over 1 3/4 miles long or a stack of data processing cards over 17 feet high! More than three hundred thousand 12-digit items can fit onto one platter.

As in most programming applications, time is an important and sometimes crucial parameter. When connected to the Mass Memory Subsystem, a Model 30 calculator can transfer an entire program almost before the user can exhale--so he never has to hold his breath! The Mass Memory is safe, efficient and fast. For example, a 10 by 10 full precision matrix or a 1000 word program can be stored permanently in one second.

A complete Mass Memory System includes a 9830A Calculator, a printer or typewriter, and the Mass Memory Subsystem, described above. The subsystem itself actually consists of a ROM, a controller, interface cables and a 9867A or 9867B Mass Memory Drive. While both drives contain a removable memory platter, called a cartridge, the 9867B Drive also has a fixed platter which doubles its storage capacity. Of course, additional cartridges can be purchased and used with either Mass Memory Drive. In fact, any of the subsystem components can be ordered separately and up to four platters (9.6 million bytes of storage) can be connected to one system.

\*Calculator Products Division, Hewlett-Packard Company, Loveland, Colorado

**THE MASS MEMORY DRIVE**

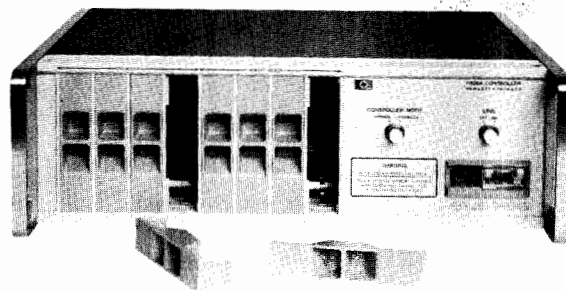


9867A/B MASS MEMORY DRIVE UNIT SELECT allows up to four mass memory platters to be accessed in a single system.

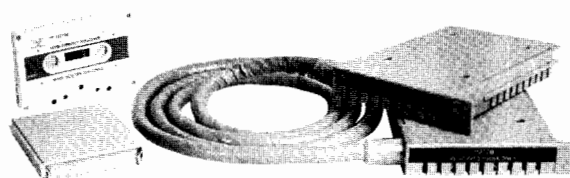
DATA PROTECT SWITCH, when ON, prevents data from being changed or erased.



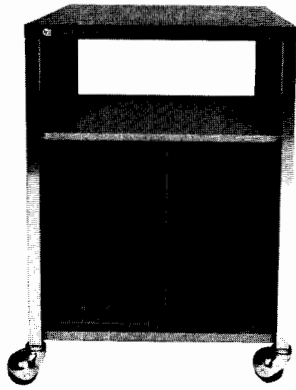
HP 12869A INTERCHANGEABLE MEMORY CARTRIDGE allows the user to lock important information safely in a cabinet overnight.



HP 11305A MASS MEMORY CONTROLLER provides interface for any combination of up to four calculators and up to four mass memory platters.



HP 11273B READ ONLY MEMORY AND INTERFACE CABLE provides Model 30 language commands for operation of the Mass Memory System.



HP 11304A MASS MEMORY CART (optional) provides support for the Mass Memory Drive, Model 9867A or 9867B and the controller, plus recommended upright storage for up to five memory cartridges.

### The Mass Memory ROM

With more than 25 new BASIC statements and commands, the Mass Memory ROM provides a language which is both easy to use and flexible. For example, files are stored on the Mass Memory by name. To find out what files are stored on your system there is a CATALOG command.

NAME	TYPE	ORIGIN		ABSOLUTE LENGTH(W)	CURRENT LENGTH(W)
		TRACK	RECORD		
DLIB2	D	274	10	758	
DLIB2	D	338	0	758	
T1	D	152	4	100	
T2	D	160	6	100	
T3	D	169	0	100	
T4	D	177	4	100	
RPKEY	K	401	7	1	160
AP	P	401	8	1	100
AP1	P	401	9	8	1968
AP2	P	402	5	3	736
AP3	P	402	8	10	2494
AP4	P	403	6	2	401

Although the Plug-in Mass Memory ROM is a standard Model 30 1K ROM, an additional 7K ROM is stored on every initialized memory cartridge for a total Read-Only-Memory of 8K words. This means that the Mass Memory ROM is actually larger than the basic Model 30 Calculator Read-Only-Memory, so that the capabilities of the Model 30 Calculator are more than doubled by the addition of the 9880 Mass Memory Subsystem.

When a command requires use of part of the 7K Mass Memory ROM, that portion is brought into a reserved area (300 words) of user read-write memory in the calculator for execution.

A simplified training cassette program is provided with every Mass Memory Subsystem. It is intended to supplement the instruction manual so that the user can become familiar with the Mass Memory as quickly as possible. Additional, more extensive training programs are available through local HP sales offices.

A general-purpose Mass Memory Data Base Routines Pac provides programs to copy, sort, and enter data in files. Other program pacs are now available or will be available soon for Structural Engineering, Accounts Receivable/Billing, Inventory Control, Accounts Payable and Payroll Applications.

For more information, fill out and return the postcard included in this issue of *KEYBOARD*. ●

# Mass Memory Accounting Systems

by Bert Desmond and  
Ron Vernon \*

The addition of the HP 9880A/B Mass Memory to the HP Calculator product line opens up commercial applications that were limited by cassettes. The advantages of the Mass Memory system in commercial applications are as follows:

- Capacity
- Speed
- Easy operation

## Capacity

The storage capacity of a Mass Memory platter is the equivalent of 32 magnetic tape cassettes. The advantage of this capacity is in storing data. For example, in Inventory Control, up to 1700 inventory items may be stored on a Mass Memory platter along with all the programs to operate the system and a backup copy of the inventory items.

## Speed

The speed of the Mass Memory can best be illustrated by comparing it to the tape cassette. It takes approximately one second to load a 1,000 word program stored on the Mass Memory. It would take at least fifteen seconds to load the same program from a magnetic tape and it could take up to two minutes depending on where it is located on the tape.

The speed of retrieving either programs or data from the Mass Memory is constant and fast.

In addition, by using what is called random data files on the Mass Memory, one record of information can be retrieved from a data file as fast as any other record. In other words, information retrieval time is the same for any location.

The speed makes the systems user oriented because the calculator is operating more efficiently and the speed makes it possible to develop applications that would be unreasonable on a tape cassette system.

\*Calculator Products Division, Hewlett-Packard Company, Loveland, Colorado

## Easy Operation

There are many features of the Mass Memory system that reflect easy operation.

First, all program and data files are referred to by a name entered by the user. The user can use a name that reflects the function of the file.

Second, alphanumeric and simple numeric variables are as easy to store as numeric arrays.

Third, backup copies of important program and data files can be copied easily from one platter to another in a multi-platter system or to magnetic tapes.

In summary, the 9880A/B Mass Memory has increased the storage capabilities of a calculator system, significantly reduced the time used for program and data retrieval, and made these capabilities very easy to use.

## Accounting Systems

Three general accounting applications program pacs are available on the Mass Memory: Accounts Payable, Accounts Receivable-Billing, and Inventory Control.

Each of the systems operates with a 9830A programmable calculator with 7616 bytes of memory, a String Variables ROM, a 9880B Mass Memory system and either a 9866A Thermal Printer or a 9861A Typewriter.

Each system resides on a single Mass Memory platter. The common features on each system are:

- Ease of operation
- Expandability

## Ease of Operation

Emphasis is placed on using the Special Function keys and the 32-character display. When adding information into the system such as adding parts to the inventory file, press the key labeled, ADD PARTS. The display shows the appropriate question about the part followed by a question mark. The information is entered through the typewriter-like keyboard of the 9830A and shown on the dis-

play. If an error is made entering the information, press the CLEAR key and enter the information again.

It is even easier to generate reports. Press the appropriate key to obtain the desired report. Using either a high speed thermal printer or a typewriter, the report is generated automatically. At the end of every page, printing stops for three seconds while the display shows, "TEAR PAPER NOW", giving the user the opportunity to page the report.

In any accounting system, it must be easy to make backup copies of important files. For example, if a company has its inventory stored on a Mass Memory and something happens such as the user destroying the inventory file, all of this data then would have to be manually reentered into the system. The accounting systems utilize both platters in the 9880B system. The data from the removable cartridge can be transferred down onto the lower fixed platter simply by pressing the Special Function key labeled BACK-UP. The system is then powered down, the removable cartridge is taken out, another removable cartridge is inserted into the drive, and the information is transferred from the fixed platter to the removable platter. This provides the user with two removable platters with the same information on them.

The Accounting Systems are designed to be operated by a clerk who knows the accounting functions. The user does not need to know any programming or go to any special schools.

The systems operate in a typical office environment — no special air conditioned rooms or separate power supplies.

## Expandability

Programs and data files for each Accounting System are stored on removable Mass Memory platters. Each Accounting System has a fixed amount of storage space. If the application of a business exceeds the limits of a platter, there is a solution.

By separating the information into categories that fit into the capacity of a single platter, the package can still be used. That is, use two platters if a business has requirements that exceed the storage limits of a single platter.

The following articles give details on the Accounting Systems programs for the Mass Memory. ●



# Accounts Payable with the 9880B Mass Memory System

by Bert Desmond and  
Ron Vernon

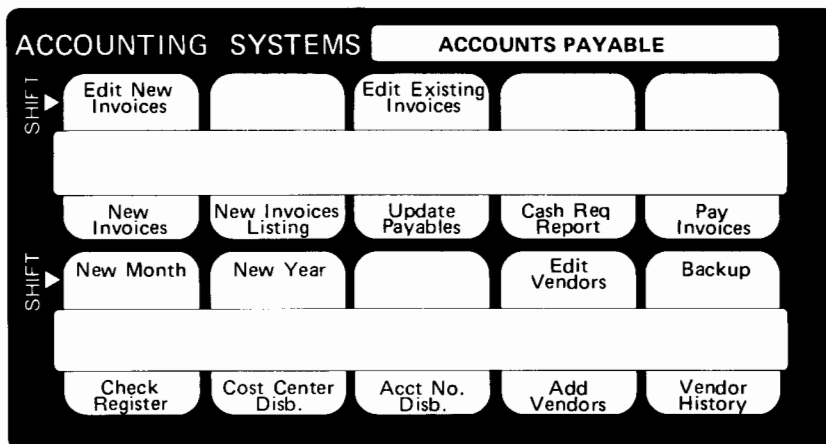


Figure 1

Careful control of Accounts Payable helps a business maintain a good credit rating by paying bills on time and it reduces the cash flow out of the business by taking advantage of early payment discounts.

The Accounts Payable system provides a company:

- Management reports to help anticipate future liabilities and take advantage of discounts
- Disbursement reports on both

accrual and cash basis

- The ability to make partial payments to selected invoices to balance cash available with cash requirements
- Check writing capability.

The system emphasizes easy operation through the Special Function keys and the 32-character display. The Accounts Payable template that fits over the Special Function keys is shown in Figure 1.

## Management Reports

The Accounts Payable system allows a company to see its future liabilities. Press the key labeled, 'CASH REQ REPORT' to see the outstanding invoices. The user has the option of either listing all the outstanding invoices or only those due on or before a specified date.

Figure 2 shows a listing of the outstanding invoices as of January 15, 1974.

To make payment on some of the outstanding invoices, press the PAY INVOICES key. The display will show 'ENTER CUTOFF DATE (M/D/Y)'. This criterion is then used to select those invoices that are due on or before this date for payment. The user then has the opportunity to either pay all of these invoices, partially pay some of the invoices, or delete some of them.

Cost center and account number disbursement reports are available at the touch of a key. Accrual basis reports are generated at the option of the user when the system is updated with new invoices. Figure 3 shows an accrual basis Cost Center Disbursement Report.

Cash basis disbursement reports are based on the most recently printed checks. To obtain a cash basis Cost Center Disbursement Report, press the key labeled, 'COST CENTER DISB'. An Account Number Disbursement Report is generated when the ACCT NO DISB. key is pressed. Figure 4 shows a cash basis account number disbursement report.

## Other Features

In addition to the reports mentioned above, the system provides a listing of all vendors showing month-to-date and year-to-date payments.

An accounting system should make allowance for operator mistakes such as misspellings or entering incorrect information. The Accounts Payable package allows the user to correct or edit the vendor file, existing invoices file, and the new invoices file by pressing the appropriately labeled key.

The Accounts Payable system has room for 750 vendors and 750 outstanding invoices per Mass Memory platter.

For more information on the system, contact your local Hewlett-Packard representative.

CASH REQUIREMENTS REPORT  
THRU: 01/15/74



DUE DATE	VENDOR NO.	INVOICE NO.	TOTAL AMT.	DISCOUNT	PARTIAL PAYMENT	NET AMT.
01/15/74	10010	2564	125.00	0.00	0.00	125.00
01/13/74	10020	2525	654.00	12.57	0.00	641.43
01/02/74	10040	52	100.00	0.00	0.00	100.00
12/31/73	10050	1000	1524.23	0.00	0.00	1524.23
01/01/74	10060	943	100.00	0.00	0.00	100.00
			2503.23	12.57	0.00	2490.66

Figure 2

COST CENTER DISBURSEMENT  
(ACCRUAL BASIS)  
JANUARY 31, 1974

COMPANY NAME (PAYEE)	COST CENTER	ACCT. NO.	PAYMENT
FRANK YOCKEY	4243	6020	100.00
JEFF OSBORNE	4243	6020	185.00
COST CENTER TOTAL			285.00
BERT DESMOND	4342	6010	21.00
BOB JEWETT	4342	6020	7349.00
COST CENTER TOTAL			7370.00
RON VERNON	4343	6010	125.00
JEFF OSBORNE	4343	6020	641.43
KAY PIERSOL	4343	6020	100.00
PAT WELCH	4343	6020	1524.23
COST CENTER TOTAL			2390.66
		TOTAL	10045.66

Figure 3

ACCOUNT NUMBER DISBURSEMENT  
(CASH BASIS)  
JANUARY 31, 1974

COMPANY NAME (PAYEE)	ACCT. NO.	COST CENTER	PAYMENT
RON VERNON	6010	4343	125.00
ACCOUNT NUMBER TOTAL			125.00
FRANK YOCKEY	6020	4243	100.00
JEFF OSBORNE	6020	4343	641.43
KAY PIERSOL	6020	4343	100.00
PAT WELCH	6020	4343	1524.23
ACCOUNT NUMBER TOTAL			2365.66
		TOTAL	2490.66

Figure 4

# Accounts Receivable-Billing with the 9880B Mass Memory System

by Bert Desmond and  
Ron Vernon

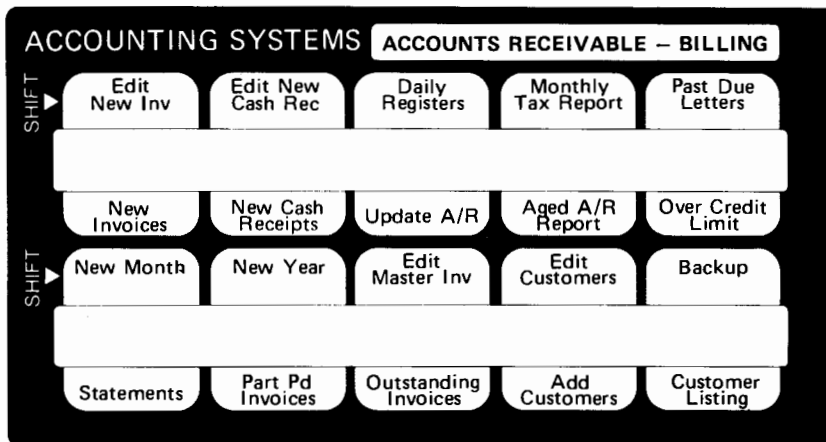


Figure 1

A major problem for business is increasing the cash flow into the firm as a result of sales. There are two main contributors to the problem. The first is the time lag between shipping a product and billing the customer. The second contributor is minimizing the time a customer lets the bill go unpaid.

The Accounts Receivable-Billing package provides for:

- Fast billing
- Orderly follow-up of receivables

Figure 1 shows the template used by the Accounts Receivable-Billing system. The system emphasizes ease of operation through the Special Function keys and the 32-character display.

## Fast Billing

The billing information on new invoices is entered by pressing the NEW INVOICES key. The display shows the questions for customer number, invoice number, amount billed, freight, service, discounts allowed and finance charges.

When all the new invoices are entered, the UPDATE A/R key is pressed and the new invoices are entered into the system.

Customer statements are generated automatically by pressing the STATEMENTS key. (Figure 2 shows a statement.)

By generating statements as the information is available, the time delay using end of the month billing is reduced and cash flow into the company is increased.

## Orderly Follow-up of Receivables

With the press of a key operation, valuable management reports for keeping control of receivables are available upon request.

For a report on the status of all the receivables, press the OUTSTANDING INVOICES key.

This report lists all the outstanding invoices by customer. The information details the date the customer was billed, the total bill, any partial payments, adjustments, finance charges and the net balance due.

Control totals are printed to provide a balance check on the outstanding invoices.

For a listing of all invoices with a partial payment, press the PART PD INVOICES key. If a customer has made partial payment towards an invoice, the date of the most recent payment is printed. This gives management an insight into the effort a customer is making towards paying the bill. (Figure 3 is the Partially Paid Invoices Report.)

To see those customers who may be over extending their credit, press the

key labeled, 'OVER CREDIT LIMIT'. This report lists only those customers who have exceeded their credit limit.

Press the Special Function key labeled, 'AGED A/R' to obtain a breakdown of the outstanding invoices. Each invoice is categorized as either current, 30 to 59 days, 60 to 89 days, and 90 days or more overdue. (Figure 4 is the Aged Accounts Receivable Report.)

The total dollar amount and percent in each category is printed.

Press the Accounting Systems key labeled PAST DUE LETTERS to remind customers of their delinquent invoices. This program generates past due letters for outstanding invoices that were billed before a date entered by the user.

For each past due invoice, a finance charge, if one was specified when originally entering the invoice, is calculated and added to the outstanding balance.

## Other Features

A sensible accounting system should be designed so errors can be easily corrected. The Accounts Receivable-Billing System is designed so that any of the files - customer file, outstanding invoices file, new invoices file and new cash receipts file - can be corrected or edited by pressing the appropriately labeled edit key and answering the questions shown in the display.

In any accounting application, it is essential that the history of the system can be traced.

Audit trails, that is, reports which allow a user to trace the flow of an invoice through the system, are generated automatically. Whenever the Accounts Receivable-Billing system is updated, a dated Cash Receipts Transaction Register and a New Invoices Transaction Register are generated to provide audit trails. (Figure 5 shows a Cash Receipts Transaction Register.)

The system has room for 800 customers and 800 outstanding invoices per Mass Memory platter.

## Summary

The purpose of this article is to introduce the reader to the capabilities of the Mass Memory Accounts Receivable-Billing system.

For more complete information, contact your local Hewlett-Packard representative.

PIERSOL ENTERPRISES

DECEMBER 6, 1973

SOLD TO:  
PIERSOLS PANTRY  
1235 MARKET STREET  
SPRINGFIELD, PA 19064

SHIP TO:  
PIERSOLS PANTRY  
1235 MARKET STREET  
SPRINGFIELD, PA 19064

Dear Sir:

Per the attached documents, please remit the following:

Your Purchase Order Number: 466  
Invoice Number: 7000

Price of Goods	\$	152.14
Freight		12.50
Service		14.00
		=====
City Tax		3.04
State Tax		4.56
		=====
Total	\$	186.24
Less 1.00% Discount		
If paid in 10 days		1.66
Total	\$	184.58



Terms: 1.00% 10 days, net 30 days from date of statement.

Finance charge: 1.20% per month( 14.40% annual) will be added to all past due accounts.

Very truly yours,

K.P. PIERSOL  
CONTROLLER

Figure 2

PARTIALLY PAID INVOICES  
DECEMBER 6, 1973

CUSTOMER NUMBER	INVOICE NUMBER	AMOUNT BILLED	AMOUNT PAID	DATE PAID	ADJUST-MENTS	FINANCE CHARGE	BALANCE DUE
=====	=====	=====	=====	=====	=====	=====	=====
1040	2500	706.25	125.00	11/01/73	0.00	35.76	617.01
1090	4002	160.24	120.00	11/16/73	-0.48	0.00	39.76
1140	789	2185.00	1189.00	12/06/73	0.00	0.00	996.00
1140	1250	581.02	81.02	11/12/73	0.00	41.21	541.21
1170	1500	683.50	600.00	11/12/73	-0.50	40.99	129.99
1400	6000	2016.55	2000.00	12/06/73	0.00	0.00	16.55
TOTAL		6332.56	4115.02		-0.98	123.96	2340.52

Figure 3

AGED ACCOUNTS RECEIVABLE REPORT  
DECEMBER 6, 1973

CUSTOMER NAME	INVOICE NUMBER	TOTAL OUT	<30 DAYS	30-59 DAYS	60-89 DAYS	>=90 DAYS
=====	=====	=====	=====	=====	=====	=====
ANDERSONS DAIRY	5000	297.11	297.11	0.00	0.00	0.00
	6589	638.35	638.35	0.00	0.00	0.00
CUSTOMER TOTAL		935.46	935.46	0.00	0.00	0.00
ASMUS BOOK NOOK	3000	26.50	0.00	0.00	26.50	0.00
BALOG'S BAR	2589	687.25	0.00	0.00	687.25	0.00
BARNEY'S BOUTIQUE	2500	617.01	0.00	617.01	0.00	0.00
BRADEN'S ART SHOP	4002	39.76	39.76	0.00	0.00	0.00
PIERSOLS PANTRY	7000	186.24	186.24	0.00	0.00	0.00
THE FARMHOUSE	7001	516.68	516.68	0.00	0.00	0.00
CHURCHILL FORMS	1750	265.00	0.00	0.00	0.00	265.00
CONNELL PIZZA PALACE	789	996.00	996.00	0.00	0.00	0.00
	1250	541.21	0.00	0.00	0.00	541.21
	1260	681.03	0.00	681.03	0.00	0.00
	2589	591.00	0.00	0.00	591.00	0.00
CUSTOMER TOTAL		2809.24	996.00	681.03	591.00	541.21
BLASS GLASS FACTORY	1500	129.99	0.00	0.00	0.00	129.99
EAGLE'S BIRD STORE	5002	285.29	285.29	0.00	0.00	0.00
CARLOW'S GARAGE	7002	19.54	19.54	0.00	0.00	0.00
GUERRERO TAX DODGE	4003	185.14	185.14	0.00	0.00	0.00
HELLER SPORT SHOP	5001	55.67	55.67	0.00	0.00	0.00
GOMORRAH INN	6000	16.55	16.55	0.00	0.00	0.00
HEAVENLY HALOS	10000	1.00	1.00	0.00	0.00	0.00
TOTAL		6776.32	3237.33	1298.04	1304.75	936.20
PERCENT		100	47.77	19.16	19.25	13.82

Figure 4

CASH RECEIPTS REGISTER  
DECEMBER 6, 1973

CUSTOMER NUMBER	INVOICE NUMBER	ADJUSTMENTS	DATE PAID	CASH RECEIVED
=====	=====	=====	=====	=====
1030	1526	0.00	12/05/73	789.22
1140	789	0.00	12/06/73	1189.00
1400	6000	0.00	12/06/73	3000.00
TOTAL		0.00		3978.22

Figure 5

# Inventory Control with the 9880B Mass Memory System

by Bert Desmond and  
Ron Vernon

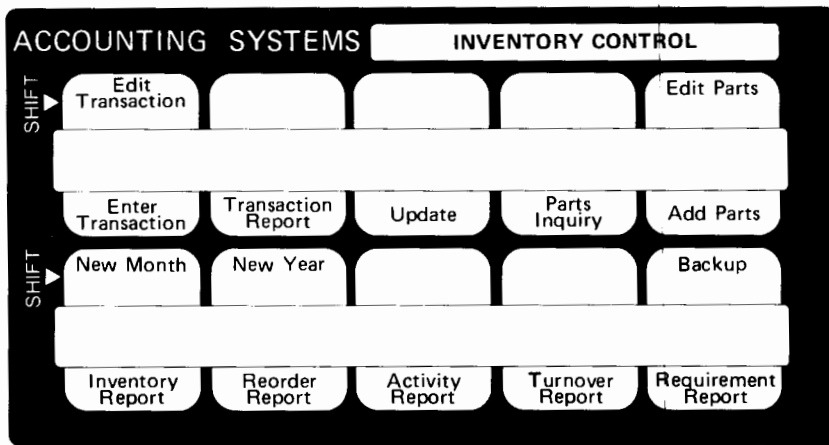


Figure 1

The proper control of inventory is essential for a business. Carrying too little inventory may slow down production and delay deliveries due to parts shortages. Too large an investment in inventory utilizes cash that could be spent elsewhere in the business.

The Inventory Control system gives a business:

- Management reports to help make inventory decisions
- Immediate inquiry into the status of any item in the inventory.

Figure 1 shows the template for the Inventory Control system. The system emphasizes easy operation through the Special Function keys and the 32-character display.

## Management Reports

The problem of proper levels of inventory can be analyzed through several reports.

Press the Inventory Control key labeled, 'INVENTORY REPORT' to see the status of each part. This report shows the unit price, quantity on hand, value on hand, the quantity on order and the unit of measure for each item.

For a listing of items that may have to be ordered, press the key labeled, 'REORDER REPORT'. This report lists only those items where the quantity on hand is less than the minimum quantity. For each of these items, the report shows the quantity on hand, the quantity on order, the lead time for delivery, and the slack (quantity on hand + quantity on order less the minimum quantity). Figure 2 shows the Reorder Report.

To see information on the month-to-date and year-to-date issues and receipts, press the ACTIVITY REPORT key. Through an analysis of usage from this report and information on the lead time for delivery of parts, guidelines for the minimum quantity on hand can be established. Figure 3 is the Activity Report.

To give management a tool for establishing proper inventory levels, a turnover report is available. For selected items in the inventory, the report shows the average year-to-date turnover.

When a company receives a quantity order for a certain number of parts that are needed for a manufacturing process, the impact of removing these parts from inventory can be seen with the Requirement Report. After touching the Requirement Report key, the system asks for entries of part number and quantity. Up to fifty parts can be entered. The report shows the parts required, the quantity on hand, the quantity on order, the slack and the lead time. This allows the user to determine if there are enough parts available to meet the objective.

## Other Features

In addition to the management reports mentioned above, the system provides reports on vendor order information, customer order information and a report of processed transactions as an audit trail.

When the inventory is updated, three reports are automatically generated: a Customer Order Report, a Vendor Order Report, and the Processed Transaction Report.

Figure 4 is the Customer Order Report. This report shows the total cost, the total sales, the gross profit and percent profit for each customer on all parts issued from inventory.

The Vendor Order Report shows the amount of each order by vendor.

The Processed Transaction Report shows the latest transactions entered into the system sorted by transaction code and part number. Figure 5 is the Processed Transaction Report.

The Inventory Control is designed for sensible operation. The parts file and the transactions file can be corrected or edited by pressing the appropriately labeled edit key and answering the questions shown in the display.

The system has room for 1700 items per Mass Memory platter.

## Summary

The purpose of this article is to show the capabilities of the Mass Memory Inventory Control System. For more complete information, contact your local Hewlett-Packard representative.

REORDER REPORT  
6 DECEMBER 1973

PART NUMBER	UNIT PRICE	MINIMUM QUANTITY	QUANTITY ON HAND	QUANTITY ON ORDER	SLACK	LEAD TIME
=====	=====	=====	=====	=====	=====	=====
11627301283	81.01	349	102	173	-74	51
24742325453	9.91	370	275	319	224	56
27867254463	65.80	441	22	436	17	83
31133835642	24.27	193	84	125	16	17
40583355768	50.97	720	46	30	-644	39
42868354368	58.37	939	347	427	-165	53
46181672283	45.64	845	256	375	-214	94
50265684044	41.34	699	341	224	-134	19
55395791356	96.35	344	103	360	119	31
68654793394	4.96	754	340	331	-83	84
74752444755	82.14	866	33	280	-553	57
77774953448	62.86	685	114	6	-565	4
84856201773	80.24	873	518	492	137	22
84872037503	89.52	921	639	441	159	37
94300486475	24.79	564	44	317	-203	23

Figure 2

ACTIVITY REPORT  
6 DECEMBER 1973

PART NUMBER	UNIT PRICE	MTD ISSUE	ISSUE DATE	MTD REC	RECEIPT DATE	YTD ISSUE	YTD REC
=====	=====	=====	=====	=====	=====	=====	=====
00146673853	98.23	339	11/20/73	341	11/25/73	3377	3108
04603234607	20.74	126	11/06/73	60	11/09/73	1209	586
11627301283	81.01	719	11/26/73	393	11/23/73	6691	3603
20133756263	27.47	362	11/29/73	400	11/17/73	3516	3670
21854897860	34.84	522	11/13/73	425	11/15/73	5193	4190
22377244049	1.16	622	11/10/73	220	11/25/73	5889	2171
22955529912	24.53	58	11/24/73	472	11/22/73	547	4524
23215259496	49.00	332	11/18/73	50	11/26/73	3114	462
24742325453	9.91	430	11/03/73	424	11/05/73	4190	4185
26213244016	59.57	322	11/21/73	446	11/20/73	2956	4304
26932654375	85.01	292	11/27/73	130	11/05/73	2764	1238
27428305126	9.64	410	11/24/73	542	11/09/73	4082	5210
27867254463	65.80	167	11/10/73	629	11/04/73	1573	6068
29259883740	24.98	715	11/25/73	502	11/02/73	6871	4908
31133835642	24.27	468	11/29/73	292	11/22/73	4462	2808
40583355768	50.97	167	11/11/73	271	11/10/73	1656	2608
42536785494	77.13	538	11/06/73	7	11/27/73	5313	64
42868354368	58.37	62	11/29/73	174	11/26/73	577	1580
46181672283	45.64	298	11/22/73	499	11/11/73	2908	4665
49263537088	60.33	487	11/23/73	399	11/01/73	4764	3605
50265684044	41.34	168	11/28/73	626	11/25/73	1597	5688
52668121848	78.98	522	11/14/73	365	11/06/73	4877	3604
52745882204	67.39	621	11/13/73	460	11/03/73	5695	4574
55119356845	70.35	531	11/17/73	95	11/29/73	5016	889
55232808634	37.93	303	11/24/73	636	11/04/73	2922	6139
55395791356	96.35	662	11/10/73	705	11/21/73	6161	7015
62406073793	77.23	583	11/14/73	297	11/26/73	5554	2949
66294631232	2.40	582	11/10/73	673	11/29/73	5819	6501
68654793394	4.96	515	11/03/73	564	11/18/73	4710	5344
70855574568	64.85	499	11/28/73	262	11/07/73	4776	2543
71688687514	27.03	414	11/12/73	217	11/09/73	4123	2077
74752444755	82.14	13	11/06/73	13	11/23/73	117	123
77774953448	62.86	443	11/25/73	678	11/27/73	3994	6692
84676579185	67.80	284	11/21/73	579	11/26/73	2687	5767
84856201773	80.24	527	11/02/73	236	11/05/73	4986	2151
84872037503	89.52	480	11/05/73	223	11/15/73	4770	2220
88657505140	69.85	249	11/21/73	629	11/05/73	2360	5824
94300486475	24.79	418	11/20/73	399	11/10/73	3975	3676

Figure 3

CUSTOMER ORDER REPORT  
6 DECEMBER 1973

CUSTOMER NUMBER	PART NUMBER	QTY ISSUED	SELLING PRICE	GROSS SALE	UNIT COST	TOTAL VALUE	GROSS PROFIT	% PFT
1112223	00146673853	1	120.00	120.00	98.40	98.40	21.60	21.9
12345678	20133756263	3	35.00	105.00	27.47	82.41	22.59	27.4
	23215259496	3	65.00	195.00	49.45	148.34	46.66	31.5
	27867254463	3	80.00	240.00	65.80	197.40	42.60	21.6
CUSTOMER TOTAL				540.00		428.15	111.85	
44444444	26213244016	5	75.00	375.00	59.57	297.85	77.15	25.9
	50265684044	5	50.00	250.00	41.34	206.70	43.30	20.9
CUSTOMER TOTAL				625.00		504.55	120.45	
TOTAL ORDER				1285.00		1031.10	253.90	

Figure 4



PROCESSED TRANSACTIONS  
6 DECEMBER 1973

PART NUMBER	TRANS CODE	QUANTITY	UNIT PRICE	DATE	CUSTOMER/VENDOR NUMBER	SELLING/PURCHASE UNIT PRICE
00146673853	1	100	99.00	12/06/73		
11627301283	1	50	85.00	12/06/73		
23215259496	1	40	50.00	12/06/73		
46181672283	1	75	46.50	12/05/73		
77774953448	1	25	65.00	12/06/73		
TOTAL RECEIPTS		5				
00146673853	2	1		12/06/73	1112223	120.00
20133756263	2	3		12/06/73	12345678	35.00
23215259496	2	3		12/06/73	12345678	65.00
26213244016	2	5		12/06/73	44444444	75.00
27867254463	2	3		12/06/73	12345678	80.00
50265684044	2	5		12/06/73	44444444	50.00
TOTAL ISSUES		6				
27428305126	3	100			11111111	10.00
40583355768	3	150			11111111	51.00
66294631232	3	500			22554477	2.45
84676579195	3	50			87878787	68.00
94300486475	3	50			87878787	25.00
TOTAL ORDERS		5				

Figure 5



by B. Albert Friedman

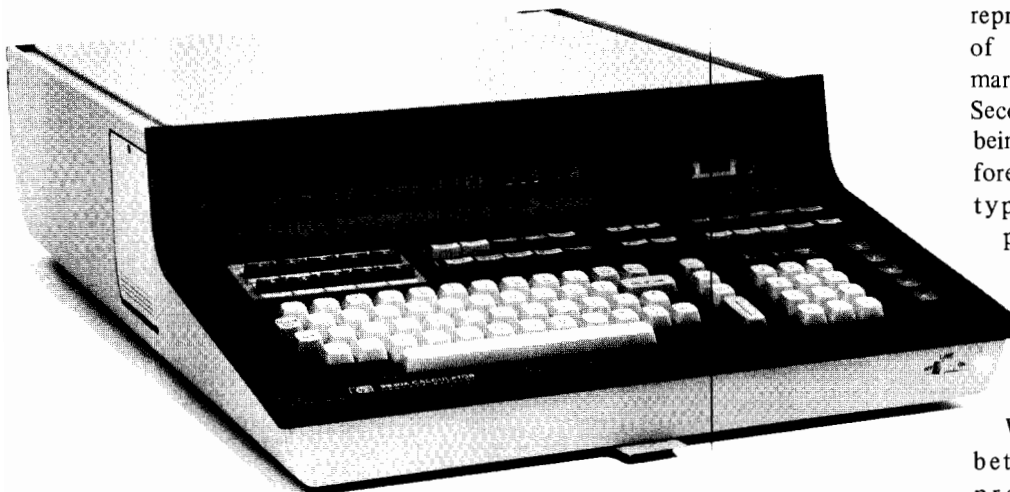
It is a well documented fact that the prime impetus for the development of computers and computer technology has primarily come from the scientific-engineering community. The professionals in these disciplines have always had the prime need for some sort of aid in their endeavors to obtain answers to difficult problems which involved the manipulation of numbers through a myriad of complicated calculations. As a result of this, most computers have been designed to aid the 'number-crunchers'. Only afterwards, almost as an afterthought, have these machines been applied to the problems of business.

The history of the Hewlett-Packard 9830A computer parallels the development outlined above. Designed to assist the engineer and the scientist with his problems, the machine has many built-in features which make it easy to obtain solutions to problems that involve complicated mathematics. Since the unit is marketed in a very competitive environment, the calculator (as it is called by HP) is very price competitive. These two factors (1) sophisticated computational ability and (2) cost effectiveness have made it a popular and well known machine within the scientific-engineering community.

From the standpoint of the businessman, however, the Hewlett-Packard 9830A until recently has represented a complete unknown. First of all, the machine has not been marketed to the business community. Second, the unit has the reputation of being a 'scientific computer' and therefore, not suited to the solution of typical business data processing problems. The first of these objectives is not within the scope of this article; therefore, attention will be focused on the second objective exclusively.

When analyzing the differences between scientific-engineering data processing and business data processing, the following observations can be made:

## The Model 30 in Business Applications



	SCIENTIFIC-ENGINEERING DATA PROCESSING	BUSINESS DATA PROCESSING
Data Requirements	Little amounts of data input and manipulated	Large amounts of data input and manipulated
Computation	Extensive calculations	Relatively little calculation
File Requirements	Little need for large files.	Much need for large files.
Output Requirements	Small amounts of output.	Large amounts of output.

The conclusion drawn from the above observations is that the prime differences in the equipment needed to manipulate business data as opposed to scientific-engineering data is in the input/output and file capabilities; not in the ability to do calculation. Based on this conclusion, there is no reason why any computer cannot be applied to the solution of business data processing problems as long as it can handle the amount of input-output needed for solution and as long as it can access relatively large files of data automatically. After all, the computer doesn't know what type of problem it is solving; it makes no difference to the machine whether the numbers represent some esoteric factor in a chemical equilibrium equation or a dollar amount of inventory. Given the task of adding numbers, the machine will do so--irrespective of what the numbers mean!

Because of this, one can look at the Hewlett-Packard 9830A with a new viewpoint. Just what capabilities does it have that make it applicable to operating in the business data processing environment?

Here are just some of these factors:

1. **EASE OF USE:** Most operators of office equipment in the average business are not familiar with complicated machines. The fact that the HP 9830A can be approached with no more difficulty than a typewriter or an adding machine makes it 'friendly'; therefore, the operators are not intimidated by the equipment.

The display on the 9830A also makes for a comfortable feeling on the part of the operators.

Since the visual display can 'lead' the operator through the various steps to be performed, and since the computer can check on many of the operator's activities, the fear of making a mistake and 'ruining things' is kept down and operators are able to gain confidence quickly.

2. **INPUT-OUTPUT CAPABILITY:** Since the 9830A has a variety of input-output capabilities, there is little problem in specifying a system that can meet the needs of the particular business. In most cases, the keyboard of the 9830A is more than adequate for entering the necessary data needed in the operation of most small/medium sized businesses. If there is more data input than can be accommodated through the keyboard of the machine, then it becomes an easy task to prepare data off-line on either cards or punched paper tape and then enter the data with either the punched card reader or the punched paper tape reader.

Although the primary output device for the Model 30 is considered the thermal printer, this unit is generally not satisfactory for most business applications. In most cases, businesses need multiple copies of reports output at the same time. In addition, businessmen like to see their reports produced in a very specific format and in a typeface that looks familiar. Therefore, for business applications using the Model 30, the output device recommended is the typewriter.

The general first reaction to typewriter output is that it is too slow. When compared to 3,000

line per minute printers, this is true. But, when compared against the specific requirements of a job, surprisingly enough, the typewriter output is more than adequate to handle most applications. One must remember that the typewriter is driven automatically from the computer with only a minimum amount of operator attention (just to change tapes and/or paper). In two or three hours of continuous operation, the typewriter can produce a great deal of information!

3. **FILE HANDLING CAPABILITIES:** Perhaps the most outstanding capability of the 9830A with regard to handling business data processing applications is its file capabilities. The magnetic tape cassette provides a means of creating and storing very large files and updating these files automatically. To take advantage of this capability, one must approach the application in the same way that one approaches any magnetic tape oriented application. Namely, the use of father-son tape updating. This means that the business data processing configuration for the 9830A requires three magnetic tape drives; one on the computer, and two 'outboard' drives. With three drives, it is possible to sort and merge files of any length. Therefore, the systems analyst does not have to worry about how long any file is, or how many exist. The computer can handle any size job. All it requires is the time available for completion.

The 9830A magnetic tapes have a unique feature which makes them particularly easy to use for business applications. It is this capability to 'find' data stored on tape via a file number. Other magnetic tape systems require tape searching on 'contents', which means scanning the entire tape. The blocking feature of the 9830A magnetic tape also permits 'selective' updating of the tape rather than a complete

tape copy. This feature comes in very handy when the need arises for changing one data element in a record.

The tape blocking feature is also used when doing tape sorts and merges. It permits the sorting of any single tape in one pass as opposed to consecutive tape manipulations as is required with non-blocked tapes. Tape merges also become easier to accomplish because it is possible to go to any selective area of a tape, read it into the computer and write it out in a selected area of another tape. By using this feature, all tape sorts and merges are accomplished without any operator intervention except for replacing a tape periodically when it is full and remounting a scratch tape in its place. From an operator convenience standpoint, this pleases the person handling the computer; from a systems standpoint, it eliminates the possibilities of wholesale tape mixups which occur frequently in other types of systems.

4. **MEMORY STORAGE CAPABILITIES:** The 9830A with 3808 words of storage can handle very extensive business problems. Since the BASIC compiler used by the computer takes no internal memory of its own, all available storage is useful to the programmer. This means that even if the program requires large arrays to be held internally, the program can usually also be held in its entirety within the machine. In those few cases where memory capacity is exceeded by the program and data, it is easy to split the program into modules and bring in new modules as needed from the magnetic tape cassette drives. This combination--large internal memory and the ability to bring in more program steps as needed automatically--means the Model 30 is capable of solving problems of unlimited size and scope.

There are still other features about the 9830A that make it an excellent

machine for business applications. Some of these are:

- Fast computation speed
- Wide range of peripherals available
- Complete format control of typewriter output.

These features, in combination with the others enumerated above create a computer which, in its price class, is absolutely unique in its field. It opens up the use of computers to businesses which never before could think of using this type of equipment to help them manage their affairs.

Every coin has two sides and to be fair, one must point out that the 9830A is not 'all things to all men' even when applied to business data processing. The main thing to think about when looking at the machine as it may be applied to a specific task is to ask the question "how much time will it take to do a specific task?"

Since the machine will be operating in a batch mode, each job should be timed separately. Then, one can develop a composite picture of machine usage to determine if, in fact, there is enough time to accomplish what must be done. For all intents and purposes, the primary timing considerations are those involving input, output, and file updating. There is nothing difficult about coming up with such timing figures--any reasonably astute analyst can do it in a short period of time.

After the feasibility analysis is done, the decision becomes self-evident: if there is enough time available to accomplish the given tasks, the Model 30 can successfully be programmed to do it! The computer has all the requisites:

- Ease of use
- Input-output capability handling
- File/Capability
- Memory storage capability
- Fast computation
- Wide range of peripherals
- Output format control.

These, together with its attractive price, make it a most valuable tool for a very wide range of businesses. ●



Mr. Friedman is Program Director, EDP, for Sinclair Community College in Dayton, Ohio. In addition, he is a partner in f-t-h, Inc., a systems consulting and computer software firm in Dayton.

He has been associated with the computer industry since 1957 and during his career, has been a programmer, systems analyst and field marketing manager. During that period of industrial work, he was associated with Westinghouse Electric Corporation, NCR and North American Rockwell.

Mr. Friedman holds a Bachelor of Science Degree in Mathematics from the University of Kansas City and an MBA from the University of Dayton.

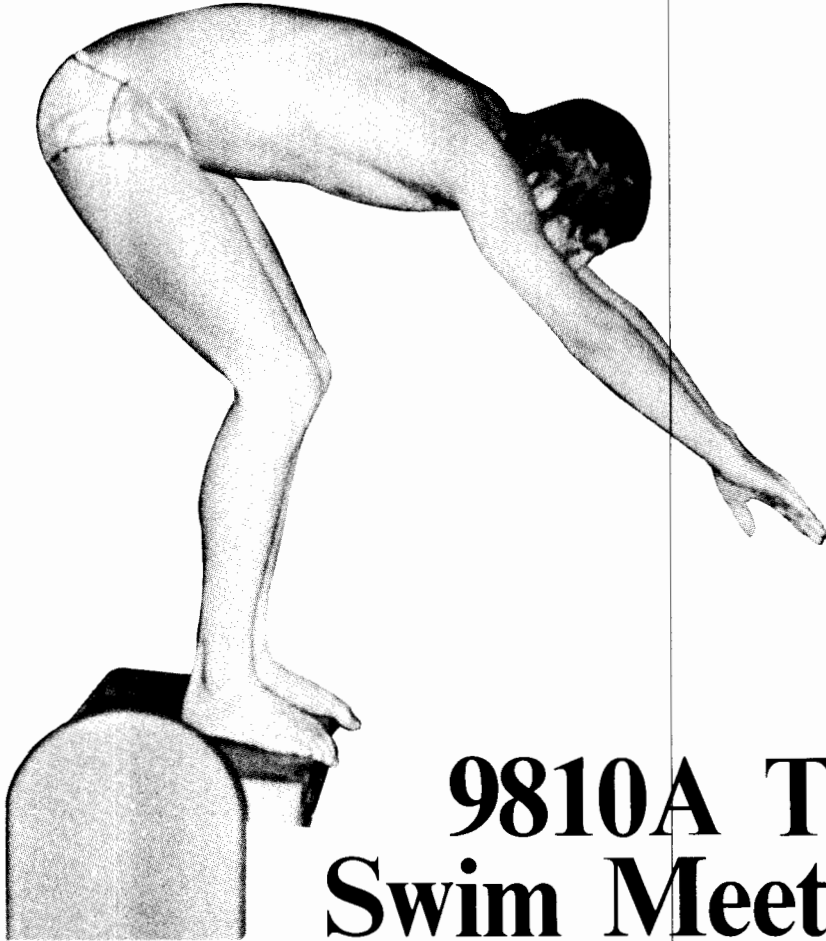
## Model 30 Contributes to Solid State Physics

Dr. M. Peter, a professor in the Department of Physics, University of Geneva, as well as a member of the Board of Directors at Hewlett-Packard S.A., has written a paper entitled 'Electronic Contributions to Shear Constants and Susceptibility in Cubic Transition Metals', which has been accepted for publication by Solid State Communications.

The paper describes a set of three programs that Dr. Peter designed for the HP Model 9830A calculator which compute the electronic contributions to shear constants of cubic transition metals, as well as their temperature derivatives.

The first program uses the Jakobi method to diagonalize the quantum mechanical angular momentum matrices. A second program calculates the band structure of an FCC metal (palladium) using overlap intervals of Posternak and plots the output. The third program calculates the electronic contributions to the shear constants of FCC metal, as well as the temperature derivatives, histogram of density of the states, and paramagnetic susceptibility. This program was considered by the experts to be an impossible undertaking, and represents a new contribution to the state of the art of solid-state calculations. This program was previously tried but with inconclusive results using a computer program 50 pages long which required over a year's programming time.

Dr. Peter stated that the morality of this experience is that, for the occasional calculations of the physicist, a superbly laid-out desk calculator may work faster than a big computer, even if the execution of a program like Shear takes nearly a week.



# 9810A Takes Over Swim Meet Officiating

by Robert J. Deffeyes

How would you like to go to a swimming meet where your children are participating and have to miss seeing them swim? This unhappy situation occurs at nearly every age group swim meet. Somewhere behind the scenes, there is a group of parents closeted away, sorting through the thousands of time cards and preparing the official meet records. At a recent Dallas area meet there were 1,250 youngsters from several states competing in over 100 different events. They generated over 8,000 time cards from which the meet officials had to:

- select the winners of each event
- rank the remaining swimmers in order of times
- prepare result sheets for posting
- list swimmers who swam faster than the AAU time standards (Class AA)
- list swimmers who did not make the meet entry qualifying standard

- calculate the team points (double the score for relay events, average the points awarded for ties, etc.)
- calculate team standings
- fill out award labels
- type result sheets for the coaches.

This manual paper-shuffling system is fraught with problems:

- parents really want to see the meet, not sort cards
- after a few hundred cards, human error creeps in (following which irate parents stomp in, causing more errors)
- official results lag the meet by hours.

Coach Doug Russell (who set four world swimming records and won two Olympic gold medals by beating Mark Spitz in Mexico City) and Bob Deffeyes used the HP 9810A at the Doug Russell Winter Invitational meet. The program input consists of two steps:



1. Entry of event data

Z = 4 digit code for event  
Y = 'AA' Time Standard  
X = Class 'A' time, (meet entry qualifying time).

2. The input data on each swimmer

Z = Club = 13  
Y = Swimmer = 23  
X = Time (one minute, 3.2 sec.) = 1.032  
This data is combined so that it occupies a single storage register as:

10320.2313

After data input is complete, the calculator prints out:

1. Number and title of event

2. Place winners, including:

- place
- swimmer number
- space to write in names
- official time
- club affiliation

This meets the needs for results posting

3. Remaining swimmers in order

4. Team standings (for posting)

5. Statistical analysis

6. Award labels to attach to ribbons and medals

7. Second printout of team standings for meet announcer.

The ease of operation of the 9810A proved to be a big asset. Mrs. Deffeyes, with a half hour of training prior to the meet, was able to keep up with the events. With any start-up there are problems. The calculator results did not agree with the team points assigned manually from the first race. After a little searching, we found that the 9810A was correctly scoring the relay events with double points; whereas, the human scorer had awarded points as if it were an individual event.

As written the program allows up to 80 swimmers per event and 14 teams. This general type of program would be applicable to track meets, skiing meets, bicycle racing, and other similar events.

Example:

Event #70

Women, (11 and 12 yrs.) 200 yard Freestyle

AA Time = 2.212

A Time = 2.410

Club	Swimmer	Time	(Place)
14	36	2.355	(13)
3	26	2.509	(20)
1	44	2.390	(16)
11	45	2.320	(10)
6	42	2.356	(13)
1	43	2.412	(19)
2	25	2.411	(18)
3	24	2.403	(17)
12	23	2.301	( 9)
4	22	2.361	(15)
3	12	2.333	(11)
1	31	2.263	( 7)
6	35	2.351	(12)
9	46	2.201	( 6)
11	41	2.282	( 8)
7	34	2.200	( 5)
12	13	2.177	( 2)
10	14	2.185	( 3)
13	33	2.185	( 3)
1	32	2.120	( 1)

DOUG RUSSELL  
 SWIM CLUB MEET  
 EVENT NO. 70.0000  
 Z=CODE  
 Y=AA TIME  
 X= A TIME 2231.0000  
 2.2120  
 2.4100  
 Z=CLUB NO.  
 Y=SWIMMER NO.  
 X= TIME  
 2.3550  
 2.3550  
 2.5090  
 2.3900  
 2.3200  
 2.3560  
 2.4120  
 2.4110  
 2.4030  
 2.3010  
 2.3610  
 2.3330  
 2.2630  
 2.3510  
 2.2010  
 2.2820  
 2.2000  
 2.1770  
 2.1850  
 2.1850  
 2.1200

RESULTS OF  
 EVENT NO. 70.0000

WOMEN  
 11+12  
 200  
 FREE  
 FIRST 32.0000  
 2.1200  
 MADE 'AA' TIME  
 DOUG  
 .....  
 SECOND 13.0000  
 2.1770  
 MADE 'AA' TIME  
 HBAC  
 .....

THIRD 14.0000  
 2.1850  
 MADE 'AA' TIME  
 W FAC  
 .....  
 FOURTH 33.0000  
 2.1850  
 TIE WITH ABOVE  
 MADE 'AA' TIME  
 DADS  
 .....  
 FIFTH 34.0000  
 2.2000  
 MADE 'AA' TIME  
 TNY  
 .....  
 SIXTH 46.0000  
 2.2010  
 MADE 'AA' TIME  
 SARC



After grade school and high school in Casper, Wyoming, Mr. Deffeyes graduated from Caltech in 1957 with a B.S. in Applied Chemistry. He spent several years at Dow Chemical before moving to Santa Clara, California, to join the Memorex Corporation in 1963. In Santa Clara his daughter Joan became involved in the competitive swimming program. After some time out for chemical engineering graduate studies at Stanford University, Mr. Deffeyes joined Graham Magnetics, Incorporated, in Graham, Texas as vice-president and assistant to the president. In 1971, he was named president of The Cobaloy Company, Graham Magnetics Arlington, Texas Division. ●

In *KEYBOARD* Vol. 5 No. 3, a contest was announced for practical uses of the smallest and largest available numbers in Hewlett-Packard programmable calculators. These are  $10^{-99}$  and  $10^{99}$  in the 9820A, 9821A, and 9830A;  $10^{-98}$  and  $10^{98}$  in the 9100A/B and 9810A. No entries were received by the December 20, 1973, deadline.

The contest was probably insufficiently challenging, for users who have found practical applications for these numbers. However, some explanation is presented here for those who are not using the full capability of the calculator by going to the calculator's dynamic limits.

One practical use of the smallest number is to avoid operator confusion, error indications, and stopping program execution when division by approximately zero is required. Dividing a finite quantity by a very small number will usually allow program operation to continue without significantly affecting results. Dividing by an expression equal to  $10^{-98}$  or  $10^{-99}$  as appropriate gives the following results in the HP programmable calculators:

Model	$1 \div 0$ Result	$1 \div \epsilon$ Result
9100A/B	Error light; program continues.	No error light.
9810A	Status light; program continues.	No status light.
9820A, 9821A	NOTE 10; program stops.*	No NOTE 10; program continues.
9830A	ERROR 103; program stops.	No ERROR 103; program continues.

Uses of  $10^{98}$  or  $10^{99}$  in practical calculations such as ARCTAN  $10^{XX}$  will be covered in the new CROSSROADS column by John Nairn in *KEYBOARD* Vol. 6 No. 2.

\*NOTE 10 can also be avoided by setting Flag 14.

# How do you use $10^{\pm 99}$





### MODEL 20 CALCULATOR USERS CLUB

In case you missed the article in *KEYBOARD* Vol. 5 No. 2, we would again like to invite you to join the Model 20 Calculator Users Club. This Club service, by operating on an exchange basis, provides an excellent means for Model 20 users to obtain programs. One program contribution entitles the user to 5 selections from the many disciplines of the CUC Central File.

During 1974, the Club will expand its efforts more toward providing the Club Members with information on newly available software and hardware for the 9820A. Also, Club Meetings will be held in several countries. At these meetings, users will see the Model 20 in action along with its many peripherals. They will have the opportunity to ask questions and to get together with other Club members like themselves to exchange ideas.

A single program contribution is all that is needed to make use of the Club's many services. Please mail all program contributions and correspondence to:

Model 20 Calculator Users Club  
Hewlett-Packard GmbH  
703 Boeblingen  
Postfach 250  
Germany

# PROGRAMMING

## tips

### $X^Y$ (9810A)

Our thanks to Mr. W.J. Butterworth, Admiralty, Underwater Weapons Establishment, Portland, Dorset, England, for sending us the following Model 10 programming tip.

The use of the  $X^Y$  function of the Model 10 Mathematics ROM is limited to  $X \geq 0$ . Also when an attempt is made to raise a negative number to a non-integer power the result is wrong and the status light is lit. For all of you that would like to get around this problem the secret is to check the values of X and y prior to executing the function. If X is negative and y is an even integer the result is positive. If X is negative and y is an odd integer the result is negative. If X is negative and y is non-integer ring a bell, display a message, do anything but execute the function  $X^Y$ .

### FASTER INTEGER POWERS (9820A)

The following is a time-saving tip for the Model 20 given to us by D.L. Schacher, Tel-Instrument Electronics Corporation, Carlstadt, New Jersey.

A surprising amount of program execution time can be saved by efficient coding. Functions such as  $X \uparrow Y$ , which is calculated by the 9820A Math ROM as  $Z = e^{(Y \ln X)}$  where both  $e^A$  and  $\ln A$  are calculated by an iterative method, are time consuming. Consequently, when a function is squared or taken to an integer power of a reasonable size, it improves execution time to use straight multiplication rather than the power function. For example the function:

$$(A + B - 2c/x) \uparrow 2 \rightarrow Y$$

should be coded as

$$(A + B - 2c/x) \rightarrow Z; ZZ \rightarrow Y.$$

Of course there are many other similar examples of efficient coding that can save you time. If you think of one that might be helpful to our readers please let us know.

### FLAG 1 SWITCH DURING PROGRAM EXECUTION (9820A)

Our thanks to Mr. C.T. McCullough, Collins Radio Company, Cedar Rapids, Iowa, for sending us an example of using the 'SET-FLAG-ZERO-WHILE-RUNNING' feature of the Model 20 presented in 'It's the Little Things That Count', *KEYBOARD* Vol. 5 No. 2. He uses this feature to toggle FLAG 1 to indicate whether or not to print intermediate data during program execution. Key in the following program and see how it works.

```
0:
  FLG 1=FLG 0+A;
  CFG 1;SFG 1=A;
  CFG 0F
1:
  IF FLG 1;DSP "FLAG 1 IS A ONE";
  GTO 0F
2:
  DSP "FLAG 1 IS A ZERO";GTO 0F
3:
  END F
R092
```

### EXTENDING 9820A DEFINABLE FUNCTIONS

Mr. D.F. Ashcroft, Senior Mining Engineer, Cobar Mines PTY. LTD., Cobar, N.S.W., Australia, sent us this helpful Model 20 programming tip.

When using a Model 20 with 3 plug-in ROMs (e.g., UDF, Math, PC I) only 5 keys remain available for user-defined functions or subprograms. This limitation can be overcome by combining several functions on a single key by using the UDF parameter "P1" to define a jump to the particular routine. For example the code would be organized as follows:

```
0: "SUB"; JMP P1-
1: Routine one
2: Routine two
```

A particular routine can be called by:

CLL SUB 5

where 5 is the line number of the routine being called.

### IMPROVED TAPE IDENTIFICATION (9865A)

Mr. A. Scott Parrish, Bureau of Research, Maryland Department of Transportation, Brooklandville, Maryland, shared this programming tip with us for the tape identification program in the 9865A cassette memory pac. He has altered the program so that each file marked on the tape is identified whether there are any errors or not. His changes begin at step 209.

Mr. Parrish's changes make the program identify each file as it finds it rather than using register 'a' as a counting sequence.

```
0209--FMT---42
0210-- 5 ---05
0211-- 5 ---05
0212--CLX---37
0213--FMT---42
0214-- 5 ---05
0215-- 5 ---05
0216--EEX---26
0217--PNT---45
0218--FMT---42
0219-- 5 ---05
0220-- 5 ---05
0221--CLX---37
0222--RUP---22
0223--PNT---45
0224--RUP---22
0225--PNT---45
0226--RUP---22
0227--PNT---45
0228--PNT---45
0229--FMT---42
0230-- 5 ---05
0231-- 5 ---05
0232--CHS---32
0233--GTO---44
0234-- 0 ---00
0235-- 2 ---02
0236-- 1 ---01
0237-- 3 ---03
0238--LBL---51
0239-- 4 ---04
0240--FMT---42
0241--FMT---42
0242--CLR---20
0243-- X ---36
0244-- X ---36
0245-- X ---36
0246-- X ---36
0247-- X ---36
0248-- X ---36
0249-- X ---36
0250-- X ---36
0251-- X ---36
0252-- X ---36
0253-- X ---36
0254-- X ---36
0255-- X ---36
0256-- X ---36
0257-- X ---36
0258-- X ---36
0259--CLR---20
0260--FMT---42
0261--S/R---77
0262--END---46
```

# Contest Awards



Clyde Lee, head of a private consulting firm in Houston, Texas, submitted a 9820A application which allows a complete analysis of stock market data to win the U.S.A. branch of the 1973 Calculator System Application Contest. Here Mr. Lee (right) is accepting his prize, an HP-45 Pocket Calculator, from Joe Wilbanks of the HP sales office in Houston.

R.J. Walsingham of Thorn Lighting Ltd., Leicester, England, won the other-countries branch of the 1973 Calculator System Application Contest with his application of the 9820A as an aid in shipwreck location (*KEYBOARD* Vol. 5, No. 3). Dr. L. Whitakker (left) of Thorn Lighting is shown accepting the HP-45 Pocket Calculator price for Mr. Walsingham. HP's Ron Page presented the award at a recent meeting of the HP Calculator Users Club in London.



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## CALCULATOR SYSTEM APPLICATION CONTEST

*KEYBOARD* is conducting a new contest for unusual applications of HP programmable desktop calculator systems. To allow the greatest opportunity for equipment diversity, as well as variety of applications, this contest will include 9100A/B systems in addition to the 9800 series.

Two branches of the contest are being held with different time limits to allow equal opportunities for participation by calculator users in all countries. The U.S.A. branch of the contest will run until June 15, 1974. The branch for all other countries will run until August 15, 1974.

The winner of each branch of the contest will receive his choice of an HP-45 or an HP-80 Pocket Calculator, or an equivalent value prize in the form of a 9800 series plug-in Read-Only Memory or HP calculator software. Additional rules are:

1. Each entry shall be in the form of an article suitable for publication in *KEYBOARD*, and a publication release shall be included.
2. The inclusion of programs used in the contest application is desirable but not essential to win. Each program submitted shall be fully documented and include a program submittal form found in the back of most HP software pacs.
3. Entries shall be typed double-spaced on paper approximately 8½ by 11 inches (21,6 cm by 27,9 cm).
4. Pertinent photographs, charts, and other illustrations shall be included. Photographs must be good contrast black-and-white prints between 4 by 5 inches (10,1 cm by 12,7 cm) and 8 by 10 inches (20,3 cm by 25,4 cm). The author's photograph and curriculum vitae should be included.
5. Entries shall be submitted to either a field editor or directly to HP *KEYBOARD*, P.O. Box 301, Loveland, Colorado 80537, U.S.A., postmarked not later than the deadline date.
6. Entries become the property of Hewlett-Packard and cannot be returned.
7. A proof copy of any article to be published will be submitted to the author for approval prior to publication.
8. Employees of Hewlett-Packard Company, its affiliates and subsidiaries are not eligible to compete.

**Win  
an  
HP-45  
or  
HP-80**