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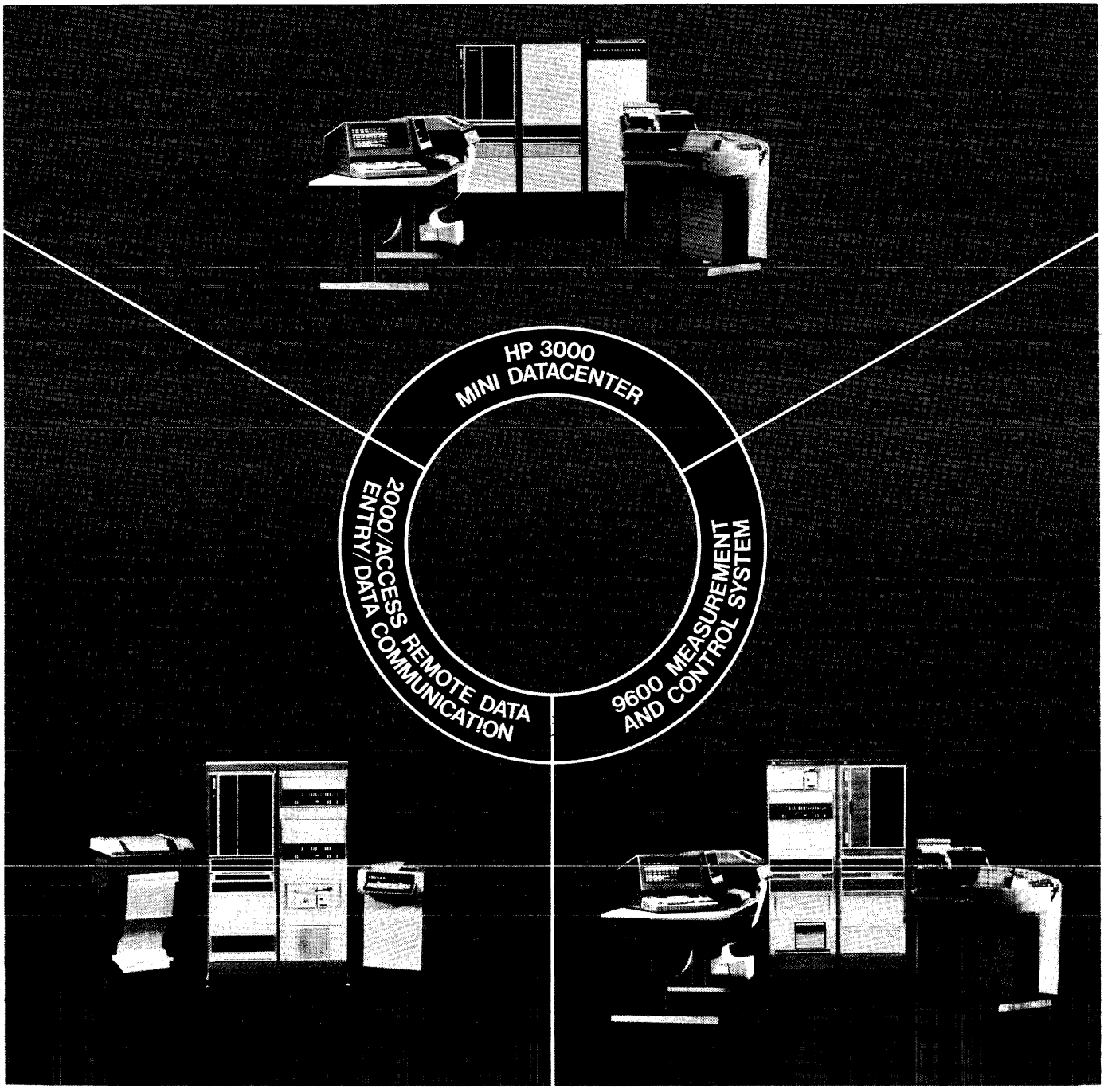
HEWLETT PACKARD

ISSUE 4
NOVEMBER 15, 1975

computer systems COMMUNICATOR



HEWLETT-PACKARD
COMPUTER SYSTEMS COMMUNICATOR ORDER FORM

Please Print:

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip Code _____

Country _____

☐ MAIL ORDER SUBSCRIPTIONS

BASE SUBSCRIPTION $ _____

_____ ADDITIONAL SUBSCRIPTION(S) $ _____
No.

TOTAL AMOUNT ENCLOSED $ _____

☐ SOFTWARE SERVICE CONTRACT SUBSCRIPTIONS

BASE SUBSCRIPTION (NO ADDITIONAL CHARGE) NAC

_____ ADDITIONAL SUBSCRIPTION(S) $ _____
No.

TOTAL AMOUNT YOU WILL BE BILLED $ _____

FOR HP USE ONLY

SUPPORT OFFICE NUMBER _____ ORDER DATE _____

APPROVED BY _____ C.E. NUMBER _____

SERVICE CONTRACT NUMBER _____ EXPIRATION DATE _____

AUTHORIZED TOTAL NUMBER OF SUBSCRIPTIONS _____

CUSTOMER'S HP OPERATING SYSTEM _____

Printed 10/75

TABLE OF PRORATED $ AMOUNT DUE PER ADDITIONAL SUBSCRIPTION

(Use only for ordering ADDITIONAL SUBSCRIPTION(S) against an existing Software Service Contract)

	Months Remaining in Service Contract											
	1	2	3	4	5	6	7	8	9	10	11	12
Cost of Each ADDITIONAL SUBSCRIPTION	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00

INSTRUCTIONS FOR ORDERING COMMUNICATOR

All Hewlett-Packard customers with Software Service Contracts are entitled to one BASE SUBSCRIPTION (1 copy per issue) at no additional charge. These customers may also buy ADDITIONAL SUBSCRIPTIONS whose purchase price is to be prorated against the remaining life of their Software Service Contract.

Customers who do not have Software Service Contracts may purchase Mail-Order Subscriptions through HP's Direct Mail Order System.

A. MAIL-ORDER SUBSCRIPTION(S)

1. Complete name and address portion of ORDER FORM.
2. Compute amount due:
   a) Annual Base Subscription (8 issues) $ 48.00
   b) _____ Additional Subscriptions* @ $12.00 ea. $ _____
   c) Total Order Amount (a + b) $ _____
   d) Transfer number of ADDITIONAL SUBSCRIPTIONS and all dollar amounts to ORDER FORM.
3. Mail check or bank draft with ORDER FORM to:

   HEWLETT-PACKARD CO.
   MAIL ORDER DEPARTMENT
   P.O. DRAWER #20
   MOUNTAIN VIEW, CA. 94043
   U.S.A.

B. SOFTWARE SERVICE CONTRACT SUBSCRIPTION(S)

1. Complete name and address portion of ORDER FORM.
2. Compute amount due: (BASE SUBSCRIPTION is at no additional charge.)
   a) Annual Base Subscription (8 issues) $ 0.00
   b) _____ Additional Subscriptions* $ _____
   Prorate the dollar amount to make the ADDITIONAL SUBSCRIPTIONS EXPIRE WITH YOUR Software Service Contract. (SEE TABLE)
   c) Total Order Amount (a + b) $ _____
   d) Transfer number of ADDITIONAL SUBSCRIPTIONS and all dollar amounts to ORDER FORM.
3. Forward ORDER FORM to your local HP Customer Engineering Representative. Your order will be approved and forwarded to the appropriate department. You will be billed for any ADDITIONAL SUBSCRIPTIONS by your local HP office.

C. SPECIAL INSTRUCTIONS FOR INTERNATIONAL CUSTOMERS

1. International customers who do not have Software Service Contracts are encouraged to use HP's Direct Mail Order System by remitting a bank draft in U.S. dollars according to the ordering procedures outlined in Instruction A above. Optionally, international customers may purchase the **Communicator** through their local HP Sales and Service Office. The customer should contact his HP Office for the subscription prices in the currency of his country, then complete the Order Form and forward it together with payment to his local HP Customer Engineering Department.

1. International customers with Software Service Contracts should follow the ordering procedure outlined in Instruction B above. If the customer wishes to purchase ADDITIONAL SUBSCRIPTIONS, he should contact the local HP Office for the subscription price in the currency of his country, then submit the ORDER FORM. The customer will be billed for ADDITIONAL SUBSCRIPTIONS by his local HP Office.

*All ADDITIONAL SUBSCRIPTIONS will be sent to the same address as the BASE SUBSCRIPTION.

editor's note

Thank you for subscribing to the **Communicator**. Response to the three preview issues was enthusiastic. In order to make this publication most useful to you, the Customer, we encourage you to continue sending us your comments and suggestions.

The **Communicator** is designed to keep you up-to-date with all the currently available software and documentation from the Data Systems Division and the newly established General Systems Division. The General Systems Division is responsible for the HP 3000, 2000 Access and 2000 Timeshare systems. You will find information about HP 2000 Timeshare and 2000 Access in the first section, and information on the HP 3000 system in the second section.

The Data Systems Division provides support for the HP21MX minicomputers, the 9600 systems, discs, and related products for the industrial and OEM markets. The section entitled "About the HP9600/9700" covers these products.

With this issue of the **Communicator**, the 9600/9700 product group is pleased to announce a new continuing column entitled SOFTWARE SAM. The column is meant to be a forum for information interchange between HP and its customers. HP actively solicits your input to this column. Ideas or suggestions concerning what you would like SAM to discuss will be routed to SAM for editorial consideration. SAM will discuss those topics which appear to have widest application to the greatest number of HP 9600/9700 users.

The Feature Article in this issue describes "Material Requirements Planning" – a powerful application of minicomputers that can reduce your company's operating expenses, increase productivity and improve customer service. If you have any ideas on topics you would like to see discussed in future issues of the **Communicator**, please let us know.

Address your correspondence to:

Editor
Computer Systems Communicator
HP General Systems Division
5303 Stevens Creek Blvd.
Santa Clara, Ca. 95050

contents

Recalling the RJE article in the last **Communicator**, you might have concluded that something more is needed in the way of a supervisory program, especially when multiple users are submitting RJE jobs from their timeshare terminals. To look at what we might want such a supervisor to do, let us examine TSP, HP's Telecommunications Supervisory Package. TSP is an RJE supervisor, written in BASIC, to provide simpler use of the RJE facilities of the 2000 Access System. (TSP is written only for IBM hosts.)

The user invokes TSP from the system library (A000) at his terminal. He is asked for a password (not his account password, but a password for TSP) and granted access to TSP's user or system manager facilities on the basis of this password. The passwords are not global but are unique to each account for extra security. The user is then asked the name of his job, and the name of the 2000 Access disc file his job resides in. (TSP does not provide facilities for entering the job into a disc file. The user uses a filecopy routine to read a card deck into a disc file, or an editor to enter his job on line into a disc file.)

A very convenient feature of TSP is its ability to merge several disc files into a single stream for submission. For example, a Fortran compile and load/go JCL deck may be stored on the 2000 Access disc, and the user may use it to run any number of Fortran jobs. Obviously, the last thing a beginning Fortran or COBOL programmer needs to do is hassle with JCL. With TSP, he can create his Fortran source on line and his JCK will be already available. (HP does not supply these JCL procedures, but they are easily generated from existing decks. The only addition required is a single card in the JCL to tell TSP that a source file should be inserted at that point. That card may contain a prompt, and the prompt will be displayed on the user terminal to aid him in entering the proper filename.) This in no way prohibits the user from using his own JCL if he so desires.

The actual submission of the job to the host is handled by TSP in a manner that is convenient to the user, but allows overall control to be exercised by the 2000 Access system manager.

The user may specify that he wants his job submitted immediately, as soon as possible, or at a specific time. The immediate option is the most straight forward, the job being merged into its final form and submitted at that time. The immediate function may be restricted by the system operator, however, either to restrict RJE to certain hours of the day because the RJE link is not established, or because the host system is down (etc.).

The next option, ASAP, asks that the job be submitted as soon as the system manager enables submission. With the last option, the user specifies a particular date and time that he wants his job to be transmitted. TSP will wait until that time and then submit the job, or whenever after that time the manager enables submission. This is convenient if the user requires unattended submission, say, if host CPU time is cheaper in the early hours of the morning, and the user doesn't care to be around at three in the morning to submit his job.

It is important to note that when a user requests a delayed type of submission (ASAP or Date and Time), his port need not be running TSP during the waiting period, but can be running BASIC, submitting other RJE jobs, used by other users, or logged off. It is obvious that something has to be going in order to do the submission; this is discussed below. TSP also allows print and punch output coming back from the host to be spooled onto disc or mag tape. TSP scans the header lines of the output as it comes over the printer or punch lines and determines to which user the output belongs. During the user submission dialogue, the user may specify that his output be sent to one of his own files or to TSP's spooling files.

After the user submits his job (or schedules it for delayed submission), he is free to submit other jobs, do BASIC programming, or log off his port for someone else's use. He can occasionally go back to TSP and ask for the status of his job(s), whether it has been transmitted yet, and whether the output is back. When his output is back, and if he has requested it to be written to his own disc file, he can use a utility copy to inspect it on his terminal or send it to the printer. If he has requested that it be spooled to TSP's own spooling files, he will need the system manager to dump it out for him.

Some questions may occur to experienced timeshare people at this point. If TSP is a BASIC program that works unattended, where does it actually run?

The decision was made not to force a user to leave his port running constantly as long as the job was active, but to allow him to do BASIC programming or log off altogether. Instead, several timeshare ports are devoted to running the supervisor portion of TSP constantly. One port is used to do the delayed job submission function (submitting a job ASAP or Date/Time), and at least one other port will be required if print output spooling is desired (the only option is to print all output directly to the printer), and one more for punch output spooling. Hard copy terminals are a good choice for this function as a log of all job submission and output reception is generated.

Let me add a few final notes on the user module of TSP. First of all, the dialogue is English language and the user need not know HASP control language to get the status of his jobs at the host, as he would if he were using the console. If all the options for delayed submission, spooling, file merging, etc., seem confusing, you will be relieved to know that if the user is confused or does not recall what options he can use or their exact syntax, he can enter a "?" and get a full menu of valid responses and correct syntax. If he enters an improper response, he usually gets an abbreviated form of this menu.

Let us now look at TSP from the 2000 Access system manager's point of view. First of all, the system manager has absolute control of the RJE functions, and may allow RJE operation only at restricted times or days. He also has the responsibility of setting up the supervisor port(s) and unloading TSP's own spooling file.

For each job submitted, TSP creates an entry in its log file containing the 2000 Access account number used to submit the job, the input and output file name(s), the number or lines/cards received, etc. This log is required by TSP to perform its functions, and is kept until cleaned out by a system manager command. It would be relatively easy to generate activity reports by processing this file. (Billing could also be done but much more complete billing records are usually kept by the host.)

It is important to note that a program to analyze the log is not a part of TSP, but must be written by the customer.

The last thoughts on the system manager portion of this article discuss security. This is especially important to educational institutions, whose users are usually enthusiastic in their attempts to bypass security measures. If one is to allow RJE from terminals without a supervisor, the users are able to do just about anything (uncontrolled submitting of jobs, cancelling jobs, pleading with the host system operator for higher priority, signing off RJE altogether, etc.). In the 2000 Access, such access may be restricted to a few accounts (or only the system manager's account), and thus require all RJE users to go through TSP. TSP preprocesses all card images and strips out all SIGNON, SIGNOFF, and console command (/*$ . . .) cards.

RJE console-type access is thus limited to displaying and cancelling jobs submitted from the user's 2000 Access idcode. In short, his RJE access is through TSP or not at all.

The situation may arise where TSP is inadequate (or overkill) for some applications. The facilities (file structure, string manipulation, programmatic RJE, security) in the 2000 Access are well suited for customer RJE supervisor programming. As TSP is a BASIC program, it is supplied as a source and available in A000, the system manager account, for some ideas on where to start. Bear in mind, however, that HP cannot support versions of TSP that are customer modified.

Gary Koerzendorfer
HP General Systems

bulletins

BEWARE: 2000F Educational Software Products do not run on the 2000 Access! Customers who are upgrading from 2000F to 2000 Access may order at cost the Access version of any product for which they have a signed license agreement.

The following products are now available:

2000 Access Part Number	Description
22690A	IMF
22691A	IDF
22693A	Math D & P
22694A	CIS
22689A	EBA
22699A	IMF, IDF, Math D&P
22697A	IMF, IDF
22696A	IMF, Math

Please contact your field engineer to order these upgrades and to receive instructions for conversion of your files.

Babs Brownyard
HP General Systems

New support policies regarding educational software packages, both instructional and administrative are now being implemented. These policies apply to the Access versions of the software as well as to the 2000F versions. The specific product numbers involved are listed below:

	2000F	Access
IMF	20308A	22690A
IDF	20309A	22691A
MATH	20310A	22693A
CIS	24384A	22694A
EBA	20352A	22689A
EPS	20353A	22688A
CWF	22383A	22692A
IMF, IDF, MATH	20004E*	22699A
IMF, IDF, CWF	20004D*	22698A
IMF, IDF	20004A	22697A
IMF, MATH	20004C	22696A
IMF, CWF	20004B	22695A
Graphics	20311	— —

*includes Graphics

The standard software warranty period of 90 days will be observed. After that time, updates and HP assistance will be available according to one of two service plans.

1. **Maintenance Agreement**

Updates will be sent to the local HP offices and installed by customer engineers at normal PM time. This service also includes HP assistance with use-it problems that can be solved by means of a phone call (either to the educational application operator or his system). Note that access to the system via a 103M Data Set or compatible modem is required.

2. **Time and Materials Support**

Customer must order updates. Any HP assistance, in regards to update installations or use-it problems, must be purchased on a time and material basis.

If you are a 2000F user of these products and do not have a maintenance agreement, please take special notice of this change. As of January 1, 1976, HP assistance with use-it problems must be purchased on a time and materials basis. Please contact your local HP office if you wish to convert to a maintenance agreement.

Marilyn Branthwaite
HP General Systems

2000 Access Operator's Manual

A new operator's manual is now available to accompany the recently released 2000 Access System. It contains information for a system operator, an RJE operator, and the system manager. The manual Part Number is 22687-90005 and the price is $10.00.

Nancy Saylor
HP General Systems

2000/Access BASIC Reference Manual

This manual provides detailed programming information for the newest timeshare system. Included is information for using peripheral devices and the remote job entry facility as well as the expanded set of BASIC statements and commands. HP Part Number is 22687-90001, and the price is $10.00.

Mike Caldwell
HP General Systems

documentation

The following tables list all currently available software manuals for the HP 2000 Timeshare and 2000 Access systems. This list supersedes the previous list in the **Communicator.** The column labeled DATE specifies the date of the latest edition of the particular manual. The column labeled UPDATE specifies the date of any applicable update package. Copies of manuals and update packages can be obtained from your local Sales and Service Office. The address and telephone number of the office nearest to you are listed in the back of all reference manuals.

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manuals you need on the Corporate Parts Center form supplied at the back of the **Communicator.** If you require an update package only, send your request to:

Software/Publications Distribution
11000 Wolfe Road
Cupertino, Ca. 95014

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02000-90048	20856A Timeshared BASIC/2000, Level E, Reference Manual	$10.00	9/74	
02000-90049	20856A Timeshared BASIC/2000, Level E, System Operator's Manual	5.00	9/74	
02000-90055	2000C/2000F IDF Author's Manual	8.50	1/73	8/74
02000-90073	20854A Timeshared BASIC/2000, Level F, Reference Manual	7.50	10/74	2/75
02000-90074	20854A Timeshared BASIC/2000, Level F, System Operator's Manual	10.00	6/75	10/75
02000-90080	HP 2000E to HP 2000F Conversion Guide	1.00	12/73	
02116-9077	20392A HP BASIC Reference Manual	15.00	9/74	
19665-90001	2000/F to 2000/Access System Upgrade Kit and Conversion Program Manual	2.00	7/75	
20308-90001	Instructional Management Facility Proctor's Manual	7.00	9/74	
20308-90003	Instructional Management Facility System Manager's Reference Manual	5.00	10/74	
20309-90001	Instructional Dialogue Facility Proctor's Manual	10.00	9/74	
20309-90003	Instructional Dialogue Facility Course Developer's Manual	6.00	8/74	
20309-90005	Instructional Dialogue Facility Author's Pocket Guide	3.50	10/74	
20310-90001	HP MATH Teacher's Handbook	5.00	9/74	
20310-90005	HP MATH Proctor's Manual	5.00	9/74	
20310-90007	HP MATH Curriculum Guide	20.00	7/74	
20311-90001	Timeshared Graphics for Tektronix Terminals	7.00	8/74	
20311-90003	Timeshared Graphics Plotting Package	25.00	6/74	
20352-90001	Educational Budget and Accounting System — System Overview	5.00	6/74	
20352-90002	Educational Budget and Accounting System Reference Manual	15.00	3/75	10/75
20352-90003	Educational Budget and Accounting System — Technical Manual	75.00	3/75	
20353-90001	Educational Payroll System — System Overview	3.50	10/74	
22687-90001	HP 2000/Access BASIC Reference Manual	10.00	9/75	
22687-90005	HP 2000 Access Operator's Manual	10.00	9/75	10/75
22687-90009	Learning Timeshare BASIC	3.00	5/75	
22690-90001	Instructional Management Facility for HP 2000 Access Proctor's Manual	6.50	9/75	
22690-90002	Instructional Management Facility for HP 2000 Access System Manager's Reference Manual	4.50	9/75	
22691-90001	Instructional Dialogue Facility for HP 2000 Access Proctor's Manual	6.00	9/75	
22691-90002	Instructional Dialogue Facility for HP 2000 Access Course Developers' Manual	5.00	9/75	
22691-90003	Instructional Dialogue Facility for HP 2000 Access Author's Manual	13.00	9/75	
22691-90004	Instructional Dialogue Facility for HP 2000 Access Author's Pocket Guide	3.00	9/75	

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
22693-90001	HP MATH for HP 2000 Access Teacher's Handbook	5.50	9/75	
22693-90002	HP MATH for HP 2000 Access Proctor's Manual	6.50	9/75	
22693-90003	HP MATH for HP 2000 Access Curriculum Guide	17.50	9/75	
24383-90001	Course Writing Facility	15.00	5/74	
24384-90001	College Information System — System Overview	5.00	6/74	
24384-90003	College Information System Reference Manual	19.00	10/75	
24384-90005	College Information System Technical Manual	95.00	5/75	
24387-90001	Basic Analysis and Mapping Program Manual	12.00	6/74	5/75
24387-90002	Basic Analysis and Mapping Program Pocket Guide (10 copies)	10.00	6/74	
5951-1352	The Librarian	1.00	1/71	
5951-1353	Special Purpose Magnetic Tape Loader/CAI English	1.00	1/71	
5951-1381	DOS-M/2000C Timeshared BASIC File Handler	1.00	5/71	
5952-4491	20854A Timeshared BASIC/2000, Level F, Pocket Guide	0.15	10/74	

training schedule

The schedule for customer training courses on General Systems Division Products is outlined below and in the HP 3000 section of this publication. Included here are 2000 Access courses and special seminars for the 6 month period, November 1975 through April 1976.

GENERAL SYSTEMS DIVISION COURSE SCHEDULE
Nov. 1975 — Apr. 1976

Course Dates and Training Center Location

COURSE NUMBER	COURSE TITLE	LENGTH	DATA SYSTEMS CUPERTINO	GENERAL SYSTEMS SANTA CLARA	EASTERN TRAINING CENTER — ROCKVILLE
22973A	2000 Access Data Entry, File Management and RJE	5 days	11/3/75 12/1/75	2/2/76 3/22/76	2/23/76
22974A	Minicomputers in Manufacturing Seminar	2 days	11/24/75	2/5/76 3/25/76	

HP Training Centers

During the time period covered by the above schedule, courses will be conducted at three different sites. In late December, the customer training program for the 2000 Access systems will move to the new General Systems Division facilities in Santa Clara, Calif. Course offerings through the week of December 15th will be taught at the Data Systems Division Training Center in Cupertino, Calif.

Registration

Requests for enrollment in any of the above courses should be made through your local HP Sales Office. Your Sales Representative will supply the Training Registrar at the appropriate location with the course number, dates, and requested motel reservations. Enrollments are acknowledged by a written confirmation indicating the training course, time of class, location and accommodations reserved.

Accommodations

Students provide their own transportation, meals, and lodging. The Training Registrar will be pleased to assist in securing motel reservations at the time your Sales Office requests a registration.

Cancellations

In the event you are unable to attend a class for which you are registered, please notify the Training Center Registrar immediately in order that we may offer your seat to another student. To avoid paying for a reservation which you do not use, we must receive notification of your cancellation no later than two weeks before the class begins.

Eastern Training Center

Hewlett-Packard
4 Choke Cherry Road
Rockville, Maryland 20850
(301) 948-6370

Data Systems Division Training Center

Hewlett-Packard
11000 Wolfe Road
Cupertino, California 95014
(408) 257-7000

General Systems Division Training Center

(beginning January 5th, 1976)

Hewlett-Packard
5303 Stevens Creek Blvd.
Santa Clara, Calif. 95050
(408) 249-7020

software tips

SORTB Parameter Consideration In Fortran/3000

Although the new Sort/3000 Reference Manual is available and contains detailed instructions for calling SORTB procedures from Fortran, one subtle consideration may be overlooked by the casual reader. On page 3-5, it states that even if a parameter that is passed by value is to be omitted (0 in bit map), a dummy parameter (usually a zero) ***must*** be enclosed in backslashes. The reason for this is as follows: when a zero (not in backslashes) is used as the parameter, Fortran puts a zero on the stack and then does a Load Relative Address (LRA) to obtain the address of that zero. After the PCAL, Fortran does a SUBS (subtract from S) to remove the zero from the stack (the address was automatically deleted by the EXIT from the routine).

The problem, then, when a call to SORTINITIAL is made is that SORTB allocates space on the stack which is ***not*** deleted upon exit from this procedure (the space is required by the other SORT routines). When Fortran does its SUBS, it deletes part of this allocation, not the zero it had originally placed on the stack. Problems can result, usually in the form of a bounds violation.

This problem does not result when the zero is enclosed in backslashes (i.e. passed by value) because in this case Fortran puts the zero directly onto the stack as part of the actual parameter list (instead of the address of the zero).

As an example, if SORTINITIAL is to be called and the parameters INPUTFILE, NUMRECS, ERRORPROC, KEYCOMPARE, and STATISTICS (see description of SORTINITIAL in Sort/3000 manual page 3-1) are to be omitted, a suitable call statement would be:

```
CALL SORTINITIAL
  (\0\,\OUTPUTFILE\,\0\,\72\,\0.0\,\2\,
    KEYS,\0\,\0\,\0\,FAILURE,\%1661\)
```

It would not be correct to use the statement:

```
CALL SORTINITIAL
  (0,\OUTPUTFILE\,\0\,\72\,0.0,\2\,
   KEYS,0,0,0,FAILURE,\%1661\)
```

Madeline Lombaerde
HP General Systems

LISTING FILES ON STORE/RESTORE TAPES

A quick way to list the files residing on a Store/Restore tape is:

```
:FILE LP;DEV=LP
:FILE TAPE;DEV=TAPE;REC=12,85,F,ASCII
:RUN FCOPY.PUB.SYS
>FROM=*TAPE;TO=*LP;SKIPEOF=3
>EXIT
```

This method lists the directory on the Store/Restore tape. (Other unsupported utilities must read the entire tape(s) and get the names from the file labels.)

Jim Willits
HP General Systems

TIP ON USING THE HP 3000 TEXT EDITOR

```
:FILE L;DEV=LP
:EDITOR *L

HP32201A.4.02 EDIT/3000  WED, OCT  8, 1975,  3:13 PM
/SET FRONT, FROM=10, DELTA=10,SHOPT; ADD
   10      TO ADD LINE NUMBERS TO
   20      THE FRONT FOR SEQUENCE
   30      NUMBERS OR BASIC LINE
   40      NUMBERS...
   50      SET FRONT
   60      THEN KEEP IN A FILE.
   70      TEXT THAT FILE UNNUMBERED
   80      CHANGE THE UNNEEDED COLUMNS
   90      TO BLANK OR NULL
  100      //
...
/KEEP X;SET FROM=1, DELTA=1,REAP;TEXT X,UNNUMBERED

CLEAR? YES
/LIST FIRST
    1      000010000TO ADD LINE NUMBERS TO
/CHANGE0 1/3 TO "" IN ALL
/LIST FIRST
    1      10000TO ADD LINE NUMBERS TO
/CHANGE0 3/5 TO " " IN ALL
/LIST ALL
    1      10 TO ADD LINE NUMBERS TO
    2      20 THE FRONT FOR SEQUENCE
    3      30 NUMBERS OR BASIC LINE
    4      40 NUMBERS...
    5      50 SET FRONT
    6      60 THEN KEEP IN A FILE.
    7      70 TEXT THAT FILE UNNUMBERED.
    8      80 CHANGE THE UNNEEDED COLUMNS
    9      90 TO BLANK OR NULL
/KEEP ABC,UNNUMBERED

/EXIT
CLEAR? YES

 END OF SUBSYSTEM
```

To share your Editor Tips, please send them to me.

Dick Sleght
HP General Systems

USING THE SYSDUMP PROGRAM

If you use the SYSDUMP program to modify the System Library (SL), SYSDUMP first copies the current SL into a temporary file called TEMPSL. If you abort SYSDUMP after TEMPSL has been opened, the file remains in the temporary file domain until you terminate your session or job. Consequently, if you re-execute SYSDUMP in the same session, any attempt to change the SL will fail due to a "duplicate file name" error. To correct the error, purge the file using a :PURGE TEMPSL,TEMP command and execute SYSDUMP once more.

Sam Boot
HP General Systems

SPOOLING AND JOB MANAGEMENT NOTES

This is the third and final installment in a series of separate articles related to Spooling and Job Management. The first two articles which were published in the second and third issues of the **Communicator** covered "User Facilities" and "Console Commands and Device Operation".

INSTALLMENT 3: INSTALLATION MANAGEMENT

1. **Accounting JOBs**

   See Note 1.1 of Installment 1 of Spooling and Job Management Notes in the August 15 issue of the **Communicator.**

2. **Inform Users of Causes for Interrupted Listings**

   When spooled output is interrupted, usually only the operator knows the reason. This is because he either explicitly intervened, the device or system failed, or he receives a message indicating the cause on the console. In all these cases, he should inform the user as to the reason for his partial listing, because the user receives no indication (other than "(INCOMPLETE)" or no trailer at all).

3. **System Initiation**

   3.1 **Devices**

   Note 2.5.2 of Installment 2 of Spooling and Job Management Notes in the October 15 issue of the **Communicator** stresses the importance of ensuring that all non-operational devices are =DOWNed. This should be done immediately after cold-loading. Should the non-operational device be initially-spooled, the spooler will have to be STOPped (=SPOOL) also after =DOWNing.

   3.2 **WARMSTART — Determine State**

   It is suggested that =SHOWJOB, =SHOWOUT and =SHOWIN always be performed following WARM-START (before lowering fences) in order to get a true picture of the system state. If a situation exists, preventing full recovery, it may show up in an "anomalous" display (e.g., garbage entry; a JOB without its $STDIN; etc.). This would also be useful for system debugging should a failure occur after the fences are lowered.

   3.3 **WARMSTART — Fences**

   Remember that the output and job fences must be lowered to enable output spooling and job acceptance (although HIPRI job/sessions can logon).

   3.4 **WARMSTART — Priority Compatibilities with the Preceding System**

   Default priority (input and output) is a function of logging (job and spool). Therefore, priority incompatibilities can occur when the logging state(s) is reversed on a WARMSTART. In particular, if it is enabled (and was disabled before), recovered JOBs/spoofles will have priorities of 13 while the default is 8. If it is disabled (and was enabled before), then the current default will be 13 but the recovered JOBs/spoofles will have 8. =SHOWJOB and =SHOWOUT (see note 3.2) will display these situations.

4. **"Spooling Doesn't Work!"**

   When it appears that spooling doesn't work, make certain that the critical configuration parameters have been correctly set:

   a. Max # of open spoofles >0
   b. Max # spoofle kilosectors >0
   c. "SPOOL" Class >0 discs
   d. Initially-spooled devices (if desired)

   Remember that an output spoofle will not be selected until it is READY. The state of an output spoofle changes from OPENED to READY when it is closed. The state of an output spoofle can be examined using the SHOWOUT command.

   Also, remember that =STREAMS must be re-enabled after every cold load.

5. **Limits on Job/Session Concurrency**

   In addition to =LIMIT, certain configuration resource limits will limit job/session concurrency. For example, data segments and processes are some internal resources that limit job/session execution. These kinds of "depletions" are printed on the system console as JOB OVERLOAD messages. But a required job resource that will also limit JOBs is job list device (and a job input device). These may be physically unavailable. For example, in a 1 line printer unspooled system, more than one JOB will never be executing (line printer

limit); the upper limit is also 1 on a spooled card/reader/line printer system if there's only two maximum open spoofles.

6. **Restart After Power Failure**

When power is restored after a power failure, the message **POWER FAIL RECOVERY will be output to the system console and the system will HALT. At this time, the console operator should restore all discs and other peripheral devices to the READY state and then press RUN.

7. **Nested Power Failures**

When a power failure occurs, it is often preceded by a series of power fluctuations that result in nested power fail/recovery operations. When this occurs, the message **POWER FAIL RECOVERY and its associated HALT will be repeated for each loss of power that was detected. No special recovery is required other than pressing RUN after each HALT.

ENHANCING BASIC CAPABILITIES OF THE 2640

The HP2640 is a multi-faceted terminal that provides many different levels of capabilities, each with its own set of programming requirements to utilize these capabilities.

The first level of capability is to use the 2640 as a standard terminal which at its relatively low price provides many advantages for the user. The first is the "feel" of the terminal with a very smoothly operating set of keys and the keyboard that is separate from the terminal. The 80 column width of the display provides many advantages over 72 column terminals. Also in terminals with extra memory beyond the standard 1K you have the capability to have lines retained in memory after they have scrolled off the top of the screen. That allows you to back up compiler listings, previous DEBUG operations or anything that exceeds the 24 lines of the display. It is strongly recommended that terminals be purchased with an additional 4K of added memory.

But, perhaps the main advantage of the 2640 as a basic terminal is the capability to enter new frontiers.

The first level that can be added by the user is to use the various display enhancements available on the terminal. The basic terminal contains inverse video (black characters on a white background), and the optional display enhancement board offers character blinking, underlining, and half bright in any and all combinations on a character by character basis. A first use of these features might be to print headings for a column of figures in inverse video. This can be done from any language and can even be included within quotes on HP3000 Query reports. The method of placing the enhancements within quotes can be used in any language.

Example:

```
05    Filler    Pic    X(5)    Value    "TOTAL".
```

can become enhanced by

```
05    Filler    Pic    X(9)    Value    "TOTAL".
```

but while typing hit the following four keys after the first quote: *ESC*&dB.

The enhance display key, which transmits an *ESC*&d sequence to the terminal but not to the computer can not be used to enter data to a program, unless the normal terminal strapping is changed.

This method has a slight disadvantage in that all sequences entered are executed when the program is listed to a terminal including during a compile. In SPL, equates and defines for certain sequences remove this slight problem. Also depressing the Display Function key will print out the escape sequences and not execute them.

Drawing forms on the screen can be a simple and very fast function. In COBOL for example a very extensive formatting can be defined on an 01 level and a DISPLAY statement will fill the screen with only one I/O request. This will probably require a FILE equation such as:

```
:FILE OUT=$STDLIST;REC=-500,1,F,ASCII
```

to allow more than 80 characters to be output to the terminal in a single write. With the optional line drawing character set very intricate and specialized forms can be generated which can greatly increase the "human engineering" of data input type programs. The use of protected and unprotected fields and input in the FORMAT mode further increases the ease of input.

This brings us to the next level of sophistication – block mode transfers. Because the asynchronous terminal controller on the 3000 was designed to handle character transfers rather than block mode transfers, a potential problem can crop up occasionally with data overrun (characters lost). But proper recovery methods can be written (staggered retransmission) to recover from these errors that will only occur when several terminals are transmitting simultaneously.

There are many combinations depending on mode (format on-off) and terminal strapping (page-line) that can be used for block transfers. It has been found that the FORMAT mode-on, strapped for page to be the easiest combination to use.

The method with this combination consists of outputting the screen, including unprotected fields in non-FORMAT mode and then switching to FORMAT mode for input.

During the initialization portion of a program a few things must be set up on the terminal. FCONTROL must be called to turn echo off (control code 13). In Fortran, FCONTROL must be called to accept a character in addition to carriage return as a terminator (control code 25 param of first 18 and then 30). This can be done from FORTRAN after a call to FNUM to get the MPE file number. Further reads can be done using regular Fortran reads to unit 5. Each unprotected field will be separated by a US (ASCII 31). Regular Fortran/3000 users may remember that the alternate termination character was not supported at one time but now is.

The program is a little more difficult in COBOL. Calls to FCONTROL can be made through the COBOL callable INTRINSICS (see **Communicator** Vol. 1), with the assumption that the MPE file number for the first file opened in the COBOL program is 1 the second 2, etc.

Note: Echo can always be turned off by hitting *esc;* (*esc*: for echo on).

All block transfers are initiated by hitting the ENTER key on the terminal which sends a DC2 to the computer. This should be read by a dummy read of 1 character (terminator of 18 in Fortran).

The terminal then waits for a DC1 to be returned. All HP3000 reads send out a DC1 so no explicit output of a DC1 should ever be done. Thus the following sequence will input a page of info:

```
01   DUMMY  PIC X.
       .
       .
       .
     ACCEPT DUMMY.
     READ TERM-2640 INTO INPUT-INFO.
```

TERM-2640 is the filename. INPUT-INFO is an area in WORKING-STORAGE. It is subdefined for each unprotected field followed by a 1 character filler for the unit separator. The last character in INPUT-INFO is a 1 character filler for the record separator.

```
01 INPUT-INFO.
   05 EMP-NO        PIC 9(6).
   05 FILLER        PIC X.
   05 HIRE-DATE     PIC X(8).
   05 FILLER        PIC X.
        .
        .
        .
   05 FILLER        PIC X.
```

In block transfers the data from the current cursor location to the end of memory is transferred. A write statement to position the cursor can be placed between the dummy read and the actual read so that the user need not be concerned about placing the cursor before hitting the ENTER key.

Block transfers in terminals strapped for line require a separate read for each unprotected field. This requires more programming and more I/O requests to the system. Non-FORMAT in the line mode is similar to FORMAT mode as far as programming goes. In the non-FORMAT strapped for page mode a new problem arises in that each line is followed by a ***carriage-return, linefeed.*** If you want to transfer several lines, the first line comes in and the carriage return is sensed by the 3000 driver as the end of input and the rest of the lines, although transmitted to the computer, are ignored. This method, if desired, can be used by calling WHO, getting the logical device number and reopening the file by device number which means that the device is no longer treated as a terminal.

In all these modes another useful aid is to call FSETMODE with a parameter of 4 which will defeat auto carriage-return line-feed at the end of a read.

Note: On the 3000 there is a limitation of 216 characters that can be read from any terminal with a single read statement. This includes unit and record separators and carriage returns, etc.

In summary the best combination for the use of block mode transfers is to strap the terminal for page transfers and use the FORMAT mode. The advantages of block mode input correction, character insertion and deletion far exceed the extra programming requirements involved in many user applications, and the 2640 becomes an even nicer terminal with which to work.

bulletins

NEW QUERY/3000 MANUAL AVAILABLE

A new edition of the QUERY/3000 Reference Manual is now available. The new manual reflects the changes to the software which were described in the August 15, 1975 issue of the **Communicator.** The manual Part Number is 32216-90001 and the price is $7.00

Greg Gloss
HP General Systems

CONTRIBUTOR'S GUIDE MATERIAL

The HP 3000 Contributed Software Index and Catalog, Volume 1, is now available. The Part Number is 36995-90001 and the price is $7.50. Also available are magnetic tapes for the 800 BPI (Part Number 36995-10001) and the 1600 BPI (36995-11001). The price of each is $50.00.

Brenda Mapp
HP General Systems

software updates

Each issue of the **Communicator** provides you with information pertinent to the status of 3000 software products including the latest software changes and enhancements.

Software updates described in this issue relate to the following products:

MPE 32000C.00.09
HP32104A RPG
HP 32213 COBOL-A and HP 32213 COBOL-B
HP 32216A QUERY/3000
HP 32204A STAR/3000
HP 32223A 2100 Cross Assembler
HP 30130B 2780/3780 EMULATOR
HP OFFLN OFF-LINE DIAGNOSTICS

Where changes in documentation are indicated, updates to the appropriate manuals will be printed. This information is provided simply as a temporary measure.

Products described are available through your Customer Engineer, or can be ordered directly via Customer Parts Center in Mountain View, California.

MPE 32000C.00.09

This article, along with the MIT, Date Code 1543, comprises the official release of MPE 32000C.00.09.

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N: New Source Release

X: Changes (Maintenance File)

II. Problems Fixed by MPE C0.09

a. An error that destroyed word 35_8 of the LDT whenever all available spoofle space was exhausted has been fixed. This error manifested itself as an operator request for $STDIN on logical device 5 when that device was used for spooled or streamed jobs.

b. When the intrinsics CLOCK, CALENDAR or CHRONOS are called in split stack mode there was a risk of overwriting a random word in core. Fixed.

c. An error in SYSDUMP that refused to accept the response "IN/OUT" to the question "IN,OUT, or IN/OUT?" (ref. System Supervisor manual p. 5-13, step 3.2.6.3.3) has been fixed.

d. An error in the driver IOMDISK0 that failed to recognize some invalid disc addresses has been fixed.

e. An error in the utility LISTDIR that reversed the capabilities SF and ND has been fixed.

f. Modifications were made to PROGEN to avoid hibernating any terminating process during a BREAKJOB. Previously, jobs suspended in this state would not be aborted until resumed.

g. FREEDSEG was fixed to return the proper condition codes. Previously, a shared DATASEGMENT would return CCG on the last release when it should be CCE.

h. A modification to the I/O system is believed to be a remedy to the system halt 200's problems. The apparent cause was a wrong setting of the DB register when coming back from an I/O wait. The problem was fixed by forcing DB to its proper setting.

i. The TermiNet 1200 was not receiving the proper number of null characters for the line feed character. It now supplies 36 nulls to avoid losing characters after LF.

j. When the Segmenter encountered an EOF, it did not report **FILE ERROR 0, but instead reported **FILE ERROR without mentioning an 0 (EOF).

k. An error in the MTAPE command of the utility SAEDIT, that could result in the wrong number of sectors being dumped or loaded, has been fixed.

l. An error in the STORE command that rejected the FILES=maxfiles parameter as being invalid has been fixed.

m. An error in the character translation for EBCD coded 2741 terminals has been fixed. The characters that were in error were lower case g, upper case L, and upper case R.

III. Enhancements to MPE C0.09

a. INITIAL and SYSDUMP have been modified so that when the volume table is listed, volume numbers are printed along with the volume names and logical device numbers.

b. A "SHOWTIME" command has been added to the console command set. Its format and output is identical to that of the standard user command.

c. RUN TIME ABORT messages have been changed to be more explicit in their wording and therefore should facilitate program diagnosis. For more specific information see the "Documentation Changes" section of this article.

d. Two new console commands have been introduced which allow operator's control over the emission of headers and trailers on an output device. See "Documentation Changes".

e. SEGUTIL module has been modified to report device controller DRTS that do not respond to direct I/O instructions during the I/O initialization phase of a system restart. The DRT number is reported as follows:

"DRT# XXX is non-responding — possible misconfiguration"

The most common occurrence of this type occurs when a system is configured improperly and the device controller does not exist in the system. A hardware device controller failure may also cause this failure.

Only non-responding DRT are reported and only those that are initialized by MPE may be expected to fail with this message. (i.e. PAPER TAPE READER, ASYNCHRONOUS TERMINAL CONTROLLER, etc.)

f. The utility programs SAEDIT and SAVIOUR have been updated to support 7905 discs. Previously, configuring a 7905 disc would result in the error message "LDEV #nn NO SUCH TYPE OR SUB-TYPE" on the first attempt to access the disc.

g. File Label Credibility

The file label is vulnerable to destruction because it is frequently updated during file access and it is a prefix to the file's extent. The file label may be destroyed because of faulty I/O when updating the file label, misdirected I/O because of garbaged FCB of stack, CPU of I/O subsystem malfunction, etc.

For the above reasons, file labels will now carry a checksum that will be a basis for allowing consistency checking to determine a file label's validity. Functions and actions taken by MPE modules sensitive to file label credibility will be described later.

Errors occurring while accessing/updating file labels are put into two categories, "hard" and "soft" errors. Hard and soft errors both cause the current operation (FOPEN,FREAD,STORE,etc.) to fail whereas hard errors additionally cause subsequent accesses to the file to fail.

g. 1. Hard Error — can be caused by the failure to successfully write the file label or by checksum discrepancy.

2. Soft Error — can only be caused by the unsuccessful read of the file label.

Hard errors will cause a file's system directory entry to be marked as an indication of its referenced file label being defective or inconsistent in some way. Checksums will be generated when the file label is to be written to disc. Checksums will not be verified for any file determined to be virgin (has never had a checksum generated). A virgin file is one whose checksum field in the file label is zero but whose generated checksum is not zero.

FILESYSTEM The FILESYSTEM will employ the previously described criteria for the determination of hard and soft errors. Attempts to FOPEN files marked defective will cause the FOPEN to fail with an FCHECK code of 108 (defective file label on disc). ***Hard*** file label errors occurring while the file is open will cause the current operation to fail and will prevent further access to the file for the duration of the "opened state" by the setting of EOF, NUMRECS, and USERLABELS fields to zero in the FCB. This will cause the various FILESYSTEM intrinsics to fail due to file boundary violations (attempt to read beyond EOF, attempt to write beyond physical bounds of file, etc.). User initiated FCLOSE's issued to files in a "hard" file label error state will also be failed. Only when the file is closed by termination of the process will the file be closed in an orderly fashion. That is, extra data segments and devices allocated to these files will be deallocated. Log entries for files closed in this way will be indicated by a disposition of 255. ***Soft*** errors will only cause the current operation to fail. Both hard and soft errors will cause a console message to be emitted indicating some kind of problem has occurred in file label accessing. The message will appear as:

ST/<time>/FILE LABEL ERROR: LDEV#<1dev>, <file name>.<group>.<account>

The disposition of files experiencing hard errors is that permanent files will become inaccessible but remain on the system, and references to temporary files will be removed.

STORE STORE will use the FILESYSTEM's criteria for the determination of "hard" and "soft" errors.

RESTORE — RESTORE will generate new checksums for files to be restored. A file will not be restored if it is to replace one marked defective. Files being restored are in a transitional state in that the Directory File entry does not contain a valid volume table index and disc address. Files in this state will be marked defective until *the* file has been fully restored. This is to protect against situations where the system crashes during a RESTORE and invalid File Entries remain in the System Directory.

INITIAL — INITIAL will generate new checksums for system files (SL in particular) during COLD LOAD (from tape) and for all files during a RELOAD.

Files marked as being defective can be removed from the system by the use of the "RECOVER LOST DISC" option during a COOLSTART, UPDATE, or COLDLOAD operation where the file's identification will be displayed on the console under the heading "FOLLOWING FILES PURGED – DISC ERROR". As an example suppose the file TESTFILE.PUB.SUPPORT encountered a "hard file" label access error. First of all the message:

```
ST/15:10/FILE LABEL ERROR:
LDEV#4,TESTFILE.PUB.
SUPPORT
```

Later during a COOLSTART:

```
RECOVER LOST DISC SPACE?
Y
FOLLOWING FILES PURGED-
DISC ERRORS
TESTFILE.PUB.SUPPORT
```

The System Directory file entry for this file is removed where the now unaccounted for disc space will be recovered.

IV. Known Problems in MPE

a. Closing a tape file with NO REWIND is not implemented.

b. FSPACE spaces tape files by blocks rather than by records.

c. Chained SIOs on magnetic tape do not perform correctly, causing transfer of blocks larger than 4096 words to fail if the record format is variable or undefined.

d. The character ":" is treated as an EOF on $STDINX.

e. The commands: LISTACCT, LISTGROUP, and LISTUSER can lock the directory indefinitely if the output is written to magnetic tape and the tape is not ready.

f. Input arguments to the intrinsic BINARY of 65536, 65537, 65538, and 65539 fail to return overflow.

g. If the FORMSG parameter of FOPEN begins on an odd byte boundary, the preceding byte is also printed.

h. Lower case :eod is not recognized as an end-of-file on data accepting devices.

i. Issuing a :DEALLOCATE command for a non-existent program file returns an ERR 217. The error should be ERR 217,52. The 52 is the file system error number returned from FCHECK.

j. DEBUG break points cannot be set in dynamically loaded procedures except by specifying the physical CST numbers.

k. When DPAN finds that the PCB table has been filled, it prints the erroneous messages "INVALID FIRST UNASSIGNED ENTRY" and "INVALID BACKWARD SUBQUEUE POINTER" even though there is no error in the PCB.

l. When the maximum number of open spoofles is not sufficient to handle all spooling requirements, spooled JOBs may cause endless numbers of null list files to be generated. This bug manifests itself as multiple $STDLIST files for a single JOB, each producing only a header and trailer. If the line printer is spooled, this results in many null spoofles, each using four sectors of disc space. If the line printer is not spooled, these null spoofles will begin printing immediately unless the printer is not ready. In this case, the system will crash due to an IOQ overflow. If an open spoofle is closed during this resource allocation loop, the job may be launched normally. In this case, the last spoofle for $STDLIST will be the true job listing.

This bug can be overcome by increasing the maximum number of open spoofles. The recommended value is 20, but a more exact figure can be found by examining the usage of your system. Each initial allocation (FOPEN) of a spooled device uses one open spoofle. When the file is closed (FCLOSE), the spoofle becomes unopened.

For example:

A SESSION's single access to a spooled line printer requires one opened spoofle; a spooled JOB requires at least two, one for $STDIN and one for $STDLIST. Each additional access to a file of device class LP requires an additional open spoofle.

One indication that the limit is being reached is allocation failures for spooled devices.

V. Documentation Changes MPE C0.09

a. MPE/3000 OPERATING SYSTEM console operator's guide manual (part 32000-90004) page 6-9.

ADD new paragraph 6-21.

6-21 HEADON/HEADOFF COMMANDS

To stop HEADER/TRAILER output to a device, enter:

=HEADOFF {LDN}

If the device is in use and the HEADER has already printed, the request will be satisfied after the TRAILER is printed for the current output.

To resume HEADER/TRAILER output to a device enter:

=HEADON {LDN}

If the device is in use, the request will be satisfied after the current output is completed.

HEADON is enabled every time the system is brought up.

b. MPE reference manual (part 32000-90002)

p.6-45 The FUPDATE intrinsic only applies to fixed and undefined length record files.

p- 6-47 The FPOINT intrinsic applies to fixed *and* undefined length record files.

c. Run Time Abort Messages

MPE reference manual (part 32000-90002) pages 10-17 to 10-30 should be replaced by the following text:

RUN-TIME MESSAGES

A user's program can be aborted as a result of any of the following general types of run-time errors:

- Special violations – those detected through the internal interrupt structure (such as arithmetic trap errors, parity errors, bounds violations, etc.) and other violations detected by MPE/3000 (such as stack overflows or invalid stack markers). These are PROGRAM ERRORS and are described in a following table.
- Explicit calls to the QUIT intrinsic (Section VIII).
- Explicit calls to the QUITROG intrinsic (Section VIII).
- Violations of other callable intrinsics, such as passing of illegal parameters or the invoking of an intrinsic without having the required capability class or a valid register environment. (These are listed in the RUN-TIME error table. The intrinsics are listed in the INTRINSIC table, and errors encountered by them are listed in tables by specific intrinsic: FILESYSTEM, LOADER, CREATE, ACTIVATE, SUSPEND, MYCOMMAND and LOCKGLOBIN.

If an appropriate error trap has been armed, control transfers to the trap procedure which may attempt recovery or take some other action. But if no trap has been armed for the type of error encountered, MPE/3000 terminates the user's process and transmits a ***run-time (abort) message*** to the user's output device. In a multi-process structure, QUIT aborts only the violating process but all other errors abort the entire program.

If the aborted program was running in a batch job, the job is removed from the system (if no :CONTINUE command overrides termination).

If it was running in a session, control of the session is returned to the user at the terminal.

Note: ***An abort-error will occur if a user process invokes certain callable intrinsics when the DB register is not pointing to its normal position (e.g. DB is pointing at an extra data segment). If this happens and a user trap procedure is invoked, the DB register is reset to the normal position before the trap procedure is entered.***

The format for run-time errors is:

ABORT:pname.segment.location:sname.segment.location

p-field s-field

<msgtype>#<msgno>:<message>[.PARAM{=/#}<number>]

m-field (from 1 to 7 lines)

where:

p-field is the last location of the last instruction executed in the user program prior to the abort.

s-field is output only if the abort occurred when executing code belonging to a library segment, referenced by the user program. The field provides the instruction location within the library segment that initiated the abort.

Within the p-field and s-field, the parameters are:

pname The name of the program file containing the user's program,and optionally, the group and account name.

In the special case of a process having been PROCREATED from a segment in a segmented library (SL) (for example, the Command Interpreter), an asterisk (*) is output followed by the SL name in symbolic form (sname, below).

sname The symbolic name of the SL in which the segment exists

SYSL – System SL
PUSL – Public SL
GRSL – Group SL

segment The logical number of the code segment relating to either the program or SL, whichever is appropriate.

location The location in the code segment. This is expressed in terms of the displacement (P-PB), where P is the absolute address of the instruction and PB the absolute address of the base of the code segment.

Note: Octal numbers are indicated by a percent sign (%) preceding the number.

If the stack is completely destroyed and no valid stack markers can be found that define a user environment, then the above-defined subfields will be output containing a question mark (?).

m-field contains the error message text.

The parameters within the m-field are

<msgtype> is one of:

PROGRAM ERROR
ERROR: INTRINSIC
RUN-TIME ERROR
FILESYSTEM ERROR
LOADER ERROR
CREATE ERROR
ACTIVATE ERROR
SUSPEND ERROR
MYCOMMAND ERROR
LOCKGLORIN ERROR

and corresponds to the names of the following tables.

<msgno> is a message number, which is an index into the <msgtype> table.

<message> is the text of the message which can be found along with the message number in the message type table.

<number> is the number of the invalid parameter passed to an intrinsic (the message will read: PARAM # <number>) or is the parameter passed to the QUIT or QUITPROG intrinsic (the message will read: PARAM =).

Some examples of run-time messages are:

Examples:

ABORT :BIN.ED.MPE.%0.%12
ERROR: INTRINSIC #62: BINARY
RUN-TIME ERROR #5: PARAMETER ADDRESS VIOLATION. PARAM #1

BINARY was called with an invalid byte address.

ABORT :0V.ED.MPE.%0.%177777
PROGRAM ERROR #20: STACK OVERFLOW

The program was in an infinite loop doing a DUP instruction.

ABORT :PRIV.ED.MPE.%0.%3
PROGRAM ERROR #6: PRIVILEGED INSTRUCTION

A return was made from a non-privileged segment to a privileged segment.

ABORT :QUIT.ED.MPE.%0.%1
PROGRAM ERROR #18; PROCESS QUIT. PARAM = 15

The program called QUIT Intrinsic with a parameter of 15.

ABORT :UF.ED.MPE.%0.%1
PROGRAM ERROR #29: STACK UNDERFLOW

The program was in an infinite loop doing a DEL instruction.

ABORT :EDITOR.PUB.SYS.%2.%7
ERROR: INTRINSIC #100: CREATE
CREATE ERROR #30: LOAD ERROR
LOADER ERROR #65: UNABLE TO OBTAIN CST ENTRIES

Nearly all CST entries were ALLOCATEd and the program tried to create a process which required more CST's than were available.

ABORT :EDITOR.PUB.SYS.%2.%13
ERROR: INTRINSIC #104: ACTIVATE
ACTIVATE ERROR #21: ACTIVATION OF MAIN PROCESS NOT ALLOWED

The program tried to activate a non-existent process.

The following is a list of <msgtype> tables, the message number and text for each message found for each type of message:

PROGRAM ERROR TABLE

MSGNO	MESSAGE	COMMENT
1	INTEGER OVERFLOW	Logic error in the program.
2	FLOATING POINT OVERFLOW	
3	FLOATING POINT UNDERFLOW	
4	INTEGER DIVIDE BY ZERO	
5	FLOATING POINT DIVIDE BY ZERO	
6	PRIVILEGED INSTRUCTION	
7	ILLEGAL INSTRUCTION	
8	EXTENDED PRECISION OVERFLOW	
9	EXTENDED PRECISION UNDERFLOW	
10	EXTENDED PRECISION DIVIDE BY ZERO	
11	DECIMAL OVERFLOW	
12	INVALID ASCII DIGIT	
13	INVALID DECIMAL DIGIT	
14	INVALID WORD COUNT	
15	INVALID DECIMAL OPERAND LENGTH	
16	DECIMAL DIVIDE BY ZERO	
17	STT UNCALLABLE	
18	PROCESS QUIT.PARAM=<number>	<number> is the value passed to the QUITPROG or QUIT intrinsic (Section VIII) by the terminating process. (This value is output only if it is *not* zero).
19	PROGRAM QUIT.PARAM=<number>	
20	STACK OVERFLOW	Logic error in the program. Probably looping and adding to stack. May require larger MAXDATA when preparing program.
21	PROGRAM KILLED	Program aborted from an external source.
22	INVALID STACK MARKER	Possible hardware problem.
23	ADDRESS VIOLATION	
24	BOUNDS VIOLATION	
25	NON-RESPONDING MODULE	
26	DATA PARITY	
27	MEMORY PARITY	
28	SYSTEM PARITY	
29	STACK UNDERFLOW	Logic error in program. Probably looping and popping stack.
30	CST VIOLATION	Invalid CST or STT discovered by hardware. Explicit PCAL from TOS may have referenced non-existent CST or STT. May be bad program file.
31	STT VIOLATION	

INTRINSIC TABLE

MSGNO (INTRINSIC NO.)	MESSAGE (NAME)	MSGNO (INTRINSIC NO.)	MESSAGE (NAME)
1	FOPEN	69	WHO
2	FREAD	70	SEARCH
3	FWRITE	71	MYCOMMAND
4	FUPDATE	72	SETJCW
5	FSPACE	73	GETJCW
6	FPOINT	74	DBINARY
7	FREADDIR	75	DASCII
8	FCLOSE	76	QUIT
10	FCHECK	77	STACKDUMP
11	FGETINFO	78	SETDUMP
12	FREADSEEK	79	RESETDUMP
13	FCONTROL	80	LOADPROC
14	FSETMODE	81	UNLOADPROC
15	FLOCK	82	INITUSLF
16	FUNLOCK	83	ADJUSTSLF
17	FRENAME	84	EXPANDUSLF
18	FRELATE	99	DEBUG
19	FREADLABEL	100	CREATE
20	FWRITELABEL	102	KILL
30	GETLOCRIN	103	SUSPEND
31	FREELOCRIN	104	ACTIVATE
32	LOCKLOCRIN	105	GETORIGIN
33	UNLOCKLOCRIN	106	MAIL
34	LOCKGLORIN	107	SENDMAIL
35	UNLOCKGLORIN	108	RECEIVEMAIL
40	TIMER	109	FATHER
41	CHRONOS	110	GETPROCINFO
42	PROCTIME	112	GETPROCID
50	XARITRAP	120	GETPRIORITY
51	ARITRAP	130	GETDSEG
52	XLIBTRAP	131	FREEDSEG
53	XSYSTRAP	132	DMOVIN
54	XCONTRAP	133	DMOVEOUT
55	RESETCONTROL	134	ALTDSEG
56	CAUSEBREAK	135	DLSIZE
60	TERMINATE	136	ZSIZE
62	BINARY	139	SWITCHDB
63	ASCII	191	PTAPE
64	READ,READX	200	GETPRIVMODE
65	PRINT	201	GETUSERMODE
66	PRINTOP		
67	PRINTOREPLY		
68	COMMAND		

RUN-TIME ERROR TABLE

Run-time errors are discovered by MPE performing parameter checking before attempting certain operations. These errors are caused by a logic error in the program.

MSGNO	MESSAGE
1	ILLEGAL DB REGISTER
2	ILLEGAL CAPABILITY
3	OMITTED PARAMETER
4	INCORRECT S REGISTER
5	PARAMETER ADDRESS VIOLATION
6	PARAMETER END ADDRESS VIOLATION
7	ILLEGAL PARAMETER
8	PARAMETER VALUE INVALID
9	INCORRECT Q REGISTER

FILESYSTEM ERROR TABLE

MSGNO	MESSAGE
0	END OF FILE
20	INVALID OPERATION
21	DATA PARITY ERROR
22	SOFTWARE TIME-OUT
23	END OF TAPE
24	UNIT NOT READY
25	NO WRITE-RING ON TAPE
26	TRANSMISSION ERROR
27	I/O TIME-OUT
28	TIMING ERROR OR DATA OVERRUN
29	SIO FAILURE
30	UNIT FAILURE
31	END OF LINE
32	SOFTWARE ABORT
33	DATA LOST
34	UNIT NOT ON-LINE
35	DATA-SET NOT READY
36	INVALID DISC ADDRESS
37	INVALID MEMORY ADDRESS
38	TAPE PARITY ERROR
39	RECOVERED TAPE ERROR
40	OPERATION INCONSISTENT WITH ACCESS TYPE
41	OPERATION INCONSISTENT WITH RECORD TYPE
42	OPERATION INCONSISTENT WITH DEVICE TYPE
43	WRITE EXCEEDS RECORD SIZE
44	UPDATE AT RECORD ZERO
45	PRIVILEGED FILE VIOLATION
46	OUT OF DISC SPACE
47	I/O ERROR ON FILE LABEL
48	INVALID OPERATION DUE TO MULTIPLE FILE ACCESS
49	UNIMPLEMENTED FUNCTION
50	NONEXISTENT ACCOUNT
51	NONEXISTENT GROUP
52	NONEXISTENT PERMANENT FILE
53	NONEXISTENT TEMPORARY FILE
54	INVALID FILE REFERENCE
55	DEVICE UNAVAILABLE
56	INVALID DEVICE SPECIFICATION
57	OUT OF VIRTUAL MEMORY
58	NO PASSED FILE
59	STANDARD LABEL VIOLATION
60	GLOBAL RIN UNAVAILABLE
61	OUT OF GROUP DISC SPACE
62	OUT OF ACCOUNT DISC SPACE
63	USER LACKS NON-SHARABLE DEVICE CAPABILITY
64	USER LACKS MULTI-RUN CAPABILITY
71	TOO MANY FILES OPEN
72	INVALID FILE NUMBER
73	BOUNDS VIOLATION
80	SPOOFLE SIZE EXCEEDS CONFIGURATION
81	NO "SPOOL" CLASS IN SYSTEM
82	INSUFFICIENT SPACE FOR SPOFLE
83	I/O ERROR ON SPOOFLE
84	DEVICE UNAVAILABLE FOR SPOOFLE
85	OPERATION INCONSISTENT WITH SPOOLING
86	NONEXISTENT SPOOFLE
87	BAD SPOOFLE BLOCK

MSGNO	MESSAGE
89	POWER FAILURE
90	EXCLUSIVE VIOLATION: FILE BEING ACCESSED
91	EXCLUSIVE VIOLATION: FILE ACCESSED EXCLUSIVELY
92	LOCKWORD VIOLATION
93	SECURITY VIOLATION
94	USER IS NOT CREATOR
100	DUPLICATE PERMANENT FILE NAME
101	DUPLICATE TEMPORARY FILE NAME
102	I/O ERROR ON DIRECTORY
103	PERMANENT FILE DIRECTORY OVERFLOW
104	TEMPORARY FILE DIRECTORY OVERFLOW
106	EXTENT SIZE EXCEEDS MAXIMUM
107	INSUFFICIENT SPACE FOR USER LABELS
108	DEFECTIVE FILE LABEL ON DISC
110	ATTEMPT TO SAVE PERMANENT FILE AS TEMPORARY

LOADER ERROR TABLE

MSGNO	MESSAGE	COMMENT
20	ILLEGAL LIBRARY SEARCH	
21	UNKNOWN ENTRY POINT	
22	TRACE SUBSYSTEM NOT PRESENT	
23	STACK SIZE TOO SMALL	
24	MAXDATA TOO LARGE	MAXDATA must be no greater than 31,232
25	DATA SEGMENT TOO LARGE	
26	PROGRAM LOADED IN OPPOSITE MODE	A privileged program is currently loaded in the opposite PRIV/NON-PRIV mode.
27	SL BINDING ERROR	
28	INVALID SYSTEM SL FILE	
29	INVALID PUBLIC SL FILE	
30	INVALID GROUP SL FILE	
31	INVALID PROGRAM FILE	
32	INVALID LIST FILE	
33	CODE SEGMENT TOO LARGE	System may be reconfigured by system supervisor/manager for larger code segment.
34	PROGRAM USES MORE THAN ONE EXTENT	Programs must be located in contiguous disc space. Build new program file with larger extent size.
35	DATA SEGMENT TOO LARGE	Data segment greater than 32,767 words, the hardware limitation.
36	DATA SEGMENT TOO LARGE	System may be reconfigured by system supervisor/manager for larger data segment.
37	TOO MANY CODE SEGMENTS	A program file can contain a maximum of 152 segments.
38	TOO MANY CODE SEGMENTS	System may be reconfigured by system supervisor/manager for more code segments.
39	ILLEGAL CAPABILITY	
40	TOO MANY PROCEDURES LOADED	
41	UNKNOWN PROCEDURE NAME	
42	INVALID PROCEDURE NUMBER	
43	ILLEGAL PROCEDURE UNLOAD	
50	UNABLE TO OPEN SYSTEM SL FILE	
51	UNABLE TO OPEN PUBLIC SL FILE	

MSGNO	MESSAGE	COMMENT
52	UNABLE TO OPEN GROUP SL FILE	
53	UNABLE TO OPEN PROGRAM FILE	
54	UNABLE TO OPEN LIST FILE	
55	UNABLE TO CLOSE SYSTEM SL FILE	
56	UNABLE TO CLOSE PUBLIC SL FILE	
57	UNABLE TO CLOSE GROUP SL FILE	
58	UNABLE TO CLOSE PROGRAM FILE	
59	UNABLE TO CLOSE LIST FILE	
60	EOF OR I/O ERROR ON SYSTEM SL FILE	
61	EOF OR I/O ERROR ON PUBLIC SL FILE	
62	EOF OR I/O ERROR ON GROUP SL FILE	
63	EOF OR I/O ERROR ON PROGRAM FILE	
64	EOF OR I/O ERROR ON LIST FILE	
65	UNABLE TO OBTAIN CST ENTRIES	System is loaded to capacity. Either a running program must terminate, or an ALLOCATED program or procedure not in use must be DEALLOCATED.
66	UNABLE TO OBTAIN PROCESS DST ENTRY	
67	UNABLE TO OBTAIN MAIL DATA SEGMENT	
68	UNABLE TO CREATE LOAD PROCESS	System is loaded and there are insufficient resources to create the load process.
70	SEGMENT TABLE OVERFLOW	
71	UNABLE TO OBTAIN SUFFICIENT DL STORAGE	
72	ATTIO ERROR	
73	UNABLE TO OBTAIN VIRTUAL MEMORY	
74	DIRECTORY I/O ERROR	
75	PRINT I/O ERROR	
76	ILLEGAL DLSIZE	
80	PROGRAM ALREADY ALLOCATED	
81	ILLEGAL PROGRAM ALLOCATION	
82	PROGRAM NOT ALLOCATED	
83	ILLEGAL PROGRAM DEALLOCATION	
84	PROCEDURE ALREADY ALLOCATED	
85	ILLEGAL PROCEDURE ALLOCATION	
86	PROCEDURE NOT ALLOCATED	
87	ILLEGAL PROCEDURE DEALLOCATION	

CREATE ERROR TABLE

MSGNO	MESSAGE	COMMENT
20	UNKNOWN SUBQUEUE NAME	
21	SUBQUEUE 'A' REQUESTED WITHOUT FROZEN STACK	
23	INSUFFICIENT CAPABILITY FOR NON-STANDARD SUBQUEUE	
24	UNKNOWN PORTION OF MASTER QUEUE	
25	INSUFFICIENT CAPABILITY FOR MASTER QUEUE	
26	ABSOLUTE PRIORITY REQUESTED WITHOUT CAPABILITY	
27	ILLEGAL PRIORITY CLASS SPECIFIED	
28	PRIORITY OMITTED WHILE FATHER PROCESS IN MASTER QUEUE	
29	PRIORITY RANK RESERVED TO SUPERVISOR CAPABILITY	
30	LOAD ERROR	Error occurred in loader.
31	LACK OF SYSTEM RESOURCE	System is loaded and there are insufficient PCB's to load process.
32	MAXIMUM ACCOUNT PRIORITY EXCEEDED	

ACTIVATE ERROR TABLE

MSGNO	MESSAGE	COMMENT
20	ACTIVATION OF SYSTEM PROCESS NOT ALLOWED	Process may not exist.
21	ACTIVATION OF MAIN PROCESS NOT ALLOWED	

SUSPEND ERROR TABLE

MSGNO	ERROR
20	INSUFFICIENT CAPABILITY

MYCOMMAND ERROR TABLE

MSGNO	ERROR
20	PARSED PARAM OF COMIMAGE >255 CHARACTERS

LOCKGLORIN ERROR TABLE

MSGNO	ERROR
20	INCORRECT PASSWORD FOR RIN
21	ONLY ONE RIN CAN BE LOCKED
22	RIN IS NOT ALLOCATED
23	FIN IS TOO LARGE FOR THE RIN TABLE
24	RIN IS NOT GLOBAL RIN

HP 32104A RPG/3000

This article, along with the MIT date coded 1543, will comprise the official release of HP 32104A.01.10 RPG/3000.

Incorporated in this fix level are corrections of the following problems which occurred in the previous release of HP 32104A.01.09.

1. DEBUG statement printed duplicate lines for field values, and if the field had more than 1 decimal place, the additional decimal positions were incorrect.

2. RPG loaded with FORTRAN subprogram caused DEBUG problems.

3. MOVEL fixed.

4. Alternating Table Output fixed (alpha alternating).

5. PAGE conditioned by indicator initialized after being printed instead of before.

6. Compiler aborted when EXIT followed by many PARMS.

HP 32213 COBOL-A
HP 32213 COBOL-B

This article, along with the MIT date coded 1543, will comprise the official release of HP 32213.02.03 (COBOL-A) and 01.03 (COBOL-B) COBOL/3000.

1.0 The following problems were corrected in COBOL-A.02.03.

1.1 Move TIME-OF-DAY to numeric-edited field yields garbage result.

2.0 The following problems were corrected in COBOL-B.01.03.

2.1 Subtracting COMP-3 item from numeric display item may result in incorrect sign of result.

2.2 Move TIME-OF-DAY to numeric-edited field yields garbage result.

2.3 GO TO DEPENDING ON statements are incorrectly executed if the identifier is other than a COMP item with less than 10 digits. The result will be a fall through to the next statement.

2.4 SORT verb was limited to a maximum of 10,000 records.

HP 32216A QUERY/3000

This article, along with the MIT date coded 1543, will comprise the official release of HP 32216A.02.00 QUERY/3000.

Incorporated in this fix level are the corrections of the following problems which occurred in the previous release of HP 32216.01.02.

1. Data base remained LOCKed after an UPDATE DELETE or UPDATE REPLACE command.

2. INTEGER OVERFLOW when UPDATE ADDing some values of a data item of type J2.

3. If the first report statement read from a PROC-FILE was illegal, it caused another scan of the PROC-FILE directory and an "PROCEDURE NAME NOT FOUND" error message.

The following changes were made:

1. Message "ADD OVERFLOW" has been changed to "ARITHMETIC OVERFLOW".

2. All replies must be "YES" or "NO".

The following changes should be made in the manual:

1. Page 5-14 (Feb. 1975) or 5-17 (Aug. 1975)

   Change: 'ADD OVERFLOW'

   To: 'ARITHMETIC OVERFLOW'

HP 32204A STAR/3000

This article, along with the MIT date coded 1543, will comprise the official release of HP 32204A.00.06 STAR/3000.

"REGRESSION" procedure is no longer dependent on order when multiple dependent variables are specified.

No changes to the manual are required.

HP 32223A 2100 CROSS ASSEMBLER

This article, along with the MIT date coded 1543 will comprise the official release of HP 32223A.00.03 CROSS ASSEMBLER (XA2100).

The XA2100 version A.00.03 contains the following corrections to problems and enhancements:

1. Errors corrected:

   1.1 Cross Reference listing is now complete.

2. Enhancements:

   2.1 The RAM instruction emits both 105XXX and 101XXX type instructions:

   ```
   if     0 <=xxx<=777        then 105xxx
   if  1000 <=yxxx<=1777      then 101xxx
   ```

   2.2 A new system command, +COPYRIGHT, has been implemented to establish or change copyright information on listings.

   The user can specify a copyright statement to be printed on the bottom of each page of the compiler listing. The +COPYRIGHT command format is:

   +COPYRIGHT [string[,string] . . .]

   Each string parameter is a character string (bounded by quotation marks) that is combined with any other strings specified to form the copyright statement. In forming the copyright statement, the strings are stripped of their delimiting quotation marks; they are then concatenated from left to right. The entire parameter list can specify up to 104 characters, including spaces within the string but excluding delimiters and spaces between the strings.If the copyright statement contains fewer than 104 characters, the unused portion is filled to the right with spaces.

   If no string parameters are present in the +COPYRIGHT command, or if no +COPYRIGHT command is entered, the copyright statement is blank. When a new +COPYRIGHT command is encountered, it supersedes any previously specified copyright statements from that point on.

   If an ampersand (&) is the last non-blank character of this record, the command will continue on the next record (called the continuation record). A continuation record must begin with a plus (+) sign in position 1 and the command name COPYRIGHT should not be present.

   In continuing this command onto another record, the user cannot divide a primary element (command name or quoted strings).

   When the command containing one or more continuation records is encountered by the Cross Assembler, each continuation record is concatenated (beginning with the character following the +) to the preceding record; each + and continuation ampersand is replaced by a space.

   2.3 Addition of 21MX DYNAMIC MAPPING SYSTEM Instructions.

   Activated via:

   2.3.1 "PARM=1" on "RUN" command or

   2.3.2 "+CONTROL MX" in source file.

The following is a list of instructions now accepted by the Cross Assembler for the 21MX Dynamic Mapping System:

DJP	Disable MEM and Jump
DJS	Disable MEM and Jump to Subroutine
JRS	Jump and Restore Status
LFA	Load Fence from A
LFB	Load Fence from B
MBF	Move Byte from Alternate Map
MBI	Move Byte into Alternate Map
MBW	Move Bytes within Alternate Map
MWF	Move Words from Alternate Map
MWI	Move Words into Alternate Map
MWW	Move Words within Alternate Map
PAA	Load/Store Port A Map per A
PAB	Load/Store Port A Map per B
PBA	Load/Store Port B Map per A
PBB	Load/Store Port B Map per B
RSA	Read Status Register into A
RSB	Read Status Register into B
RVA	Read Violation Register into A
RVB	Read Violation Register into B
SJP	Enable System Map and Jump
SJS	Enable System Map and Jump to Subroutine
SSM	Store Status Register into Memory
SYA	Load/Store System Map per A
SYB	Load/Store System Map per B
UJP	Enable User Map and Jump
UJS	Enable User Map and Jump to Subroutine
USA	Load/Store User Map per A
USB	Load/Store User Map per B
XCA	Cross Compare A
SCB	Cross Compare B
XLA	Cross Load A
XLB	Cross Load B
XMA	Transfer Maps internally per A
XMB	Transfer Maps internally per B
XMM	Transfer Maps or Memory
XMS	Transfer Maps Sequentially
XSA	Cross Store A
XSB	Cross Store B

HP 30130B 2780/3780 EMULATOR/3000

This article, along with the MIT date coded 1543, will comprise the official release of HP 30130B.01.02 2780/3780 EMULATOR/3000.

A new feature has been added to enhance the use of an input and/or output procedure. The first 10 words of DB (DB+0 through DB+() are now available for the user and are initialized to zeros.

The following sentences should be added to the manual on pages 3-5, 3-8, 3-11, and 3-14:

"Ten words of global storage (DB+0 through DB+9) are available to the procedure and are initialized to zeros. This storage can be accessed in a SPL procedure by a DB direct array."

DIAGNOSTICS – HPOFFLN

This article, along with the MIT date coded 1543, will comprise the official release of HP OFFLN/3000.

The following programs are affected:

1. PD319A (update and fix level 02.00) 7905 DISC. A new manual (Sept. 1975) is in printing which explains in detail the following items:

   a. Changes were made in the execution control of all SIO programs due to changes in the microcode.

   b. Changes in the initialization of the cylinder table were done.

   c. Changes were made to some of the control messages.

2. PD211A (update and fix level 02.00) SLEUTH

   a. Several changes and additions were made due to changes in the 7905 microcode. These changes and additions are transparent to the user.

documentation

The following tables list all currently available HP 3000 software manuals. The column labeled DATE specifies the date of the latest edition of the particular manual. The column labeled UPDATE specifies the date(s) of the applicable update package(s). This list supersedes the previous list in the **Communicator.** Copies of manuals and update packages can be obtained from your local Sales and Service Office. The address and telephone number of the office nearest to you are listed in the back of all reference manuals.

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manuals you need on the Corporate Parts Center form supplied at the back of the **Communicator.** If you require an update package (the items under UPDATE in the tables) send your request to:

Software/Publications Distribution
11000 Wolfe Road
Cupertino, Ca. 95014

MPE/3000 MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
03000-90096	Multiprogramming Executive General Information Manual	$ 4.00	11/73	
03000-90126	HP 3000 Software Pocket Guide	3.50	7/75	
32000-90002	32000C MPE/3000 Reference Manual	19.50	1/75	
32000-90004	32000C MPE/3000 Console Operator's Guide	7.00	1/75	
32000-90006	32000C MPE/3000 System Manager/System Supervisor Manual	13.00	1/75	

LANGUAGE MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
03000-90002	SPL/3000 Reference Manual	$ 7.50	11/73	
03000-90003	SPL/3000 Textbook	13.00	11/73	3/75
03000-90008	BASIC/3000 Interpreter Reference Manual	10.00	7/75	
03000-90025	BASIC for Beginners	5.50	11/72	
03000-90047	Cross Assembler for 2100 Computers Reference and Application Manual	17.00	3/75	
03000-90050	BASIC/3000 Interpreter Pocket Guide	2.50	9/74	
32102-90001	FORTRAN/3000 Reference Manual	13.50	6/75	
32103-90001	BASIC/3000 Compiler Reference Manual	3.50	11/74	
32104-90001	RPG/3000 Compiler Reference and Application Manual	22.00	2/75	
32104-90003	RPG Listing Analyzer	0.50	4/75	
32213-90001	COBOL/3000 Reference Manual	12.50	10/74	

ADDITIONAL MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
03000-90009	HP 3000 Compiler Library Reference Manual	$10.00	10/75	
03000-90010	HP 3000 Scientific Library Reference Manual	5.00	7/75	
03000-90011	STAR/3000 (Statistical Analysis Routines) Reference Manual	5.50	11/72	
03000-90012	EDIT/3000 Reference Manual	7.50	8/75	
03000-90015	HP 3000 Symbol Trace Reference Manual	4.00	2/74	
03000-90019	HP 3000 Computer Systems Reference Manual	14.00	9/73	
03000-90064	FCOPY/3000 Reference Manual	6.00	3/75	6/75
03000-90107	HP 3000 Cross Loader for HP 2100 Computers	11.00	10/74	
03000-90121	A Guide for the Terminal User	7.50	6/75	
30130-90001	2780/3780 Emulator Subsystem Reference and Application Manual	10.00	12/74	
30300-90002	Programmable Controller Reference and Application Manual	12.00	2/75	
32215-90001	IMAGE/3000 Reference Manual	7.00	4/75	
32216-90001	QUERY/3000 Reference Manual	7.00	8/75	
32900-90001	Student Information System Reference Manual	18.00	3/75	
32900-90002	Student Information System – System Overview	7.00	9/74	
32900-90005	Student Information System – Technical Manual	18.50	3/75	
36995-90013	IBM 1130/1800 to HP 3000 FORTRAN Conversion Guide	6.00	2/75	5/75
32214-90001	Sort/3000 Reference Manual	6.50	4/75	
30301-90002	Real-Time Programmable Controller Reference Manual	9.50	2/75	
32901-90001	Student Assignment System Reference Manual	10.00	7/75	

training schedule

The schedule for customer training courses on General Systems Division products is outlined below and in the 2000 Access section of this publication. Included here are HP 3000 software courses and special seminars for the 6 month period November 1975 through April 1976.

GENERAL SYSTEMS DIVISION COURSE SCHEDULE
Nov. 1975 – Apr. 1976

Course Dates and Training Center Location

COURSE NUMBER	COURSE TITLE	LENGTH	DATA SYSTEMS CUPERTINO	GENERAL SYSTEMS SANTA CLARA	EASTERN TRAINING CENTER – ROCKVILLE
22962A	3000 Commercial/Business User	5 days	11/3/75 12/1/75	1/5/76 2/23/76 4/5/76 4/19/76	12/1/75 1/19/75 2/2/76 3/22/76 4/5/76
22963A	3000 Scientific/Engineering User	5 days	12/8/75	1/26/76 3/15/76	11/17/75 1/5/76 3/8/76 4/19/76
22964A	3000 System Management	3 days	11/10/75 12/15/75	1/12/76 2/2/76 3/1/76 3/22/76 4/12/76	11/24/75 12/8/75 1/12/76 1/26/76 2/9/76 3/15/76 3/29/76 4/12/76 4/26/76
22956A	3000 Image	5 days	11/17/75	1/19/76 3/8/76	12/15/75 2/23/76

Course Dates and Training Center Location

COURSE NUMBER	COURSE TITLE	LENGTH	DATA SYSTEMS CUPERTINO	GENERAL SYSTEMS SANTA CLARA	EASTERN TRAINING CENTER – ROCKVILLE
22974A	Minicomputers in Manufacturing Seminar	2 days	11/24/75	2/5/76 3/25/76	
22975A	System 3 Conversion Seminar	2 days	11/13/75	1/15/76 3/4/76 4/29/76	12/11/75

HP Training Centers

During the time period covered by the above schedule, courses will be conducted at three different sites. In late December the customer training program for the HP 3000 will move to the new General Systems Division facilities in Santa Clara, Calif. Course offerings through the week of December 15th will be taught at the Data Systems Division Training Center in Cupertino, Calif.

Registration

Requests for enrollment in any of the above courses should be made through your local HP Sales Office. Your Sales Representative will supply the Training Registrar at the appropriate location with the course number, dates,and requested motel reservations. Enrollments are acknowledged by a written confirmation indicating the training course, time of class, location and accommodations reserved.

Accommodations

Students provide their own transportation, meals, and lodging. The Training Registrar will be pleased to assist in securing motel reservations at the time your Sales Office requests a registration.

Cancellations

In the event you are unable to attend a class for which you are registered, please notify the Training Center Registrar immediately in order that we may offer your seat to another student. To avoid paying for a reservation which you do not use, we must receive notification of your cancellation no later than two weeks before the class begins.

Eastern Training Center

Hewlett-Packard
4 Choke Cherry Road
Rockville, Maryland 20850
(301) 948-6370

Data Systems Division Training Center

Hewlett-Packard
11000 Wolfe Road
Cupertino, California 95014
(408) 257-7000

General Systems Division Training Center

(beginning January 5th, 1976)

Hewlett-Packard
5303 Stevens Creek Blvd.
Santa Clara, Calif. 95050
(408) 249-7020

featuring -

MRP on a mini-computer

What is MRP?

MRP – "Material Requirements Planning" – is a powerful inventory planning and scheduling tool that has become practical with the advent of the computer. MRP just received widespread publicity as a very valuable technique in the early 1970's by Oliver Wight, George Plossl, and Joe Orlicky. Early MRP implementers had a tendency to be large companies with a high degree of technical expertise. Today, however, companies of all sizes are found planning and installing MRP systems. The intense interest in MRP stems from two factors: the higher cost of carrying inventory and the availability of lower cost computer equipment with the capability to do the job, i.e. HP3000.

It is the intent of this article to answer some basic questions about MRP such as: What is it?, How does it work?, What are the critical inputs to its success?, and What are its benefits?

✱ MRP is a way to order the parts.

✱ MRP is scheduling.

✱ MRP means you can eliminate hot lists.

✱ MRP lets people do their job better.

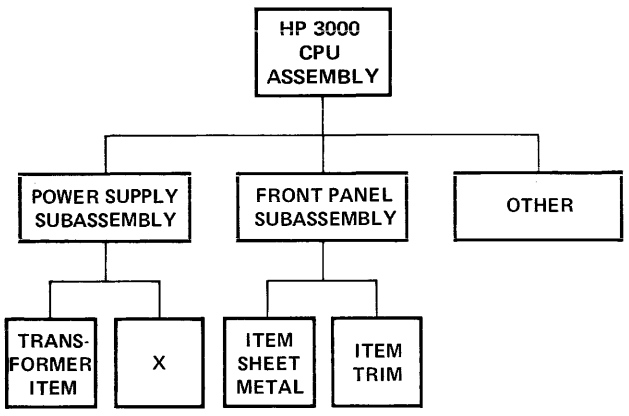
WHAT IS THE OBJECTIVE OF MRP?

MRP's objective is to get the right part in the assembly area at the right time while maintaining a minimal level of inventory. To accomplish this objective MRP must determine the gross and net requirements by date or time period for each item of inventory and then provide information from this calculation to management so that they can take the appropriate order action. This data from MRP will result in new order releases to procure or produce parts as well as revisions to previous order releases.

HOW DOES MRP WORK?

For an illustration of how MRP would schedule parts, let's look at how MRP would handle a special order for twenty (20) HP3000's with a due date (ship date) of February 15,

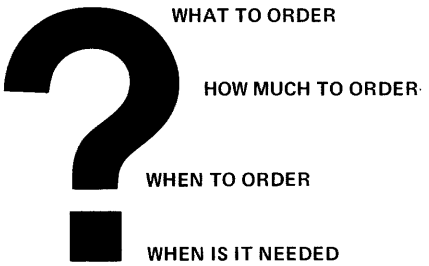
PRODUCT STRUCTURE



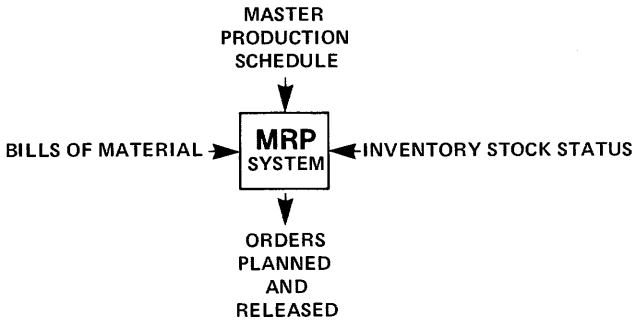
1975. MRP would just look at the total subassembly and components required to make the 20 HP3000's. Using this information and the associated lead times to procure or build the subassemblies and component parts, along with a knowledge of what is in inventory and on order, MRP would then perform the necessary calculations to schedule the order dates. The calculation logic (see MRP calculation below) would be performed for each item contained on the product structure. Depending on the nature of the parts MRP might also require such parameters as economic order quantity, reorder point, shrink factors and pan sizes for its calculation.

		Quantity
	Total Gross Requirements	20
minus	Total Scheduled Receipts	-5
minus	Parts on Hand	-1
equals	Total Net Requirements	16

MRP CALCULATION LOGIC



MRP ANSWERS QUESTIONS



INPUTS TO MRP

The master schedule, bill of materials and inventory status must be both timely and accurate if the MRP output is to be reliable. Even in MRP the garbage in, garbage out rule applies. Therefore accurate input data is essential.

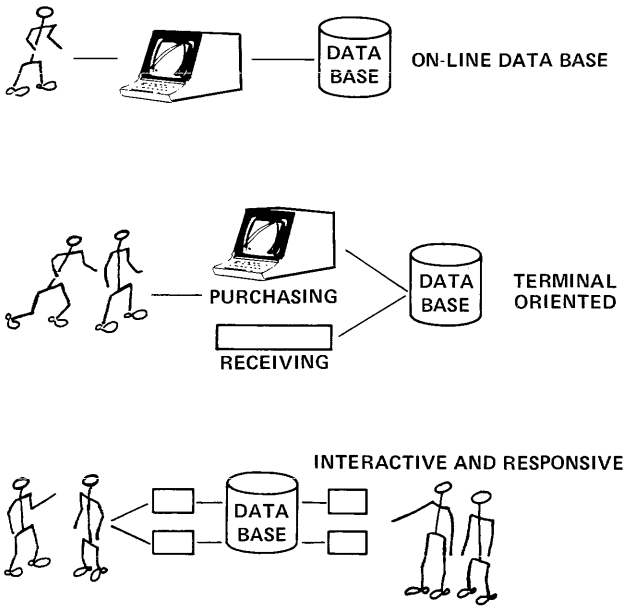
One of the best assurances for having good input data is to have these subsystems on-line. That is, let the person responsible for the data, input it directly to the computer system via a terminal.

Offline entry approaches could affect the MRP. If the inventory data needed for the MRP is keypunched, sorted and fed into the card reader a much greater possibility for error exists. As an example, if as a result of keying a data transaction to withdraw 11 power supplies (power supplies used in the HP3000) either an operator inadvertently punched a 1 or the transaction did not make the batch cutoff, the MRP could be in error. If this happened, the erroneous input data would lead the MRP to believe it had more power supplies that were really in inventory. The result would probably be a missed due date since power supplies are an essential part of a computer.

In other cases the lack of a key part could idle an entire assembly line. Additional direct labor costs occur rapidly when production workers are idled due to stocks running out, or when overtime is used as an attempt to get back on schedule.

"Only timely and accurate input data will assure the accuracy of an MRP system."

DESIRABLE FEATURES FOR MRP



AN HP 3000 WITH AN IMAGE DATA BASE MANAGEMENT SYSTEM FILLS THE BILL

Terminal online capability is needed for handling the bill of material creation and maintenance, master schedule inputs, and inventory additions, revisions and deletions. Batch processing capability is necessary to run a regenerative MRP. A data base will minimize the programming development time, eliminate redundancy and provide future growth potential.

WHAT ARE THE BENEFITS FROM AN MRP SYSTEM?

Most companies can reduce their inventory by 15% to 30% with MRP and achieve a 2%-10% reduction in operating expenses. For many companies savings such as these will often pay for the system in less than one year with continued benefits in inventory savings, increased plant productivity, improved customer service and lower inventory costs.

This subject is discussed in more depth in a seminar being offered by the HP General Systems Division, entitled "Minicomputers for Manufacturing Production and Inventory Control". For seminar information, refer to the Training Schedule in the HP3000 section.

Chuck Brewer
HP General Systems

DETERMINING OPTIMAL DCB SIZE

A Data Control Block (DCB) buffer is required to access all FMGR files of Type 2 or greater. The purpose of the DCB is to act as a packing buffer so that individual reads or writes to files need not cause physical transfers of data. This allows numerous "logical" reads or writes before a physical transfer need take place.

For example, consider a Type 2 file with four records and a record length of 2 blocks (256 words). If a DCB of 4 blocks (plus 16 control words) is dimensioned and 4 blocks (512 words) is used as the IDCBS value in the OPEN call, then only one physical transfer of data will take place for every two record reads or writes, and only two physical reads or writes will be required to write or read the entire file.

For actual Data transfers the system determines a buffer size that:

- is a multiple of 128 words long
- is less than or equal to the DCB buffer specified
- can be evenly and exactly divided into the total file size (in blocks).

For any type file of any size (other than Type 1 which does not use a DCB, the number of physical reads per DCB size required to sequentially fill the file can easily be determined. Consider the following example:

Suppose that you wished to sequentially write on a file with the following characteristics:

Type	=	2
# of Records	=	6342
Words/Record	=	32
Thus, File Size	=	202944 Words

To determine the number of physical writes per DCB size, do this:

1st) Find size of file in blocks
202944 ÷ 128 = 1585.5

2nd) Round file size in blocks up to an integer. Thus, file size is 1586 blocks.

3rd) Find factors of the file size

$$2 \mid 1586$$
$$12 \mid 793$$
$$61$$

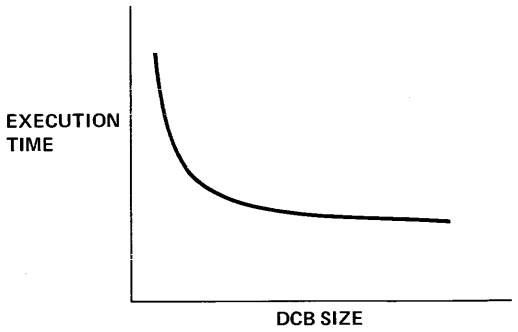
All possible combinations of these factors can be used for DCB size.

We can now create a table of possible DCB sizes and the number of physical writes (reads) that would be required to completely fill the file. These are listed in the first two columns of the following table.

POSSIBLE DCB SIZE (BLOCKS)	PHYSICAL WRITES REQ'D TO FILL FILE	AVERAGE RUN TIME OF PROGRAM LISTED BELOW (SEC. MSEC)
1	1586	41.410
2	793	22.390
13	122	20.740
26	61	19.270
61	26	18.440
122	13	–
793	2	–
1586	1	–

The third column of the table gives the average run time for the listed DCB sizes. The program used is listed below. The time is an average of the actual execution time of the DO loop portion of the code. The uncompleted items are for possible DCB sized too large to run in a reasonable size memory partition.

An interesting relationship can be seen in the first and third columns. If we were to plot execution time vs DCB size the curve would look like this:



This means that when a DCB size is increased beyond a certain limit only marginal increases in run time efficiency can be expected. In the example program, increasing the DCB from 26 Blocks to 61 Blocks achieved less than 1 second improvement in execution time; but increasing DCB size from 1 Block to 2 Blocks took 19 seconds off execution time!

By being aware of the trade-offs depicted in the above curve and by realizing that DCB size can only be increased in discrete steps (as shown in the table), the programmer can optimize file management programs to suit his own applications.

Mike Manley
HP Data Systems

RTE II/III AND 21MX FAST FORTRAN PROCESSOR

Have you been receiving weird answers from your system when you try to compute sine or cosine? The problem may be due to a small error in the sine/cosine routines of the relocatable library (24248-60001B) that may occur when the Fast Fortran Processor (FFP) is being used.

The sine/cosine routines utilize a common code sequence which includes two separate calls to .PWR2 (also in the library). An internal flag is used to determine whether the answer is to be a cosine or sine. The second call (a JSB instruction) to .PWRZ is made incorrectly but the error turns out not to affect the answer as long as the .PWRZ routine comes from the library. But when the .PWRZ routine is microcoded, the results returned to sine/cosine are incorrect.

The solution to this problem is to load the DOS FFP subroutine library (12977-16001 rev 1451) immediately after the relocatable subroutines library (24248-60001 rev B) at RTE generation time. The FFP library contains a version of the sine/cosine routine which makes correct calls to .PWRZ. This procedure will produce a number of duplicate entry error messages (ERR 08 and ERR 05), which may be ignored. The correct routines replace the previously loaded routines and the error messages indicate that this is taking place. An additional advantage to this solution is that the required disc space for the system will be reduced.

It is still necessary to enter the RP commands when the "CHANGE ENTS?" message is output at system generation. These commands are as follow:

2100 FFP

DBLE,RP, 105201
SNGL,RP, 105202
. XMPY,RP, 105203
. XDIV,RP, 105204
. DFER,RP, 105205

. XADD,RP, 105213
. XSUB,RP, 105214
. GOTO,RP, 105221
. . MAP,RP, 105222
. ENTR,RP, 105223
. ENTP,RP, 105224

Additional for 21MX FFP

. PWRZ,RP, 105225
. FLUN,RP, 105226
. PACK,RP, 105230
. XFER,RP, 105220
. XPAK,RP, 105206
. XCOM,RP, 105215
. . DCM,RP, 105216
DDINT,RP, 105217
XADD,RP, 105207
XSUB,RP, 105210
XMPY,RP, 105211
XDIV, RP, 105212
MVW.,RP, 105777 (standard in 21 MX)

The only reason for loading this DOS library into RTE is to get the proper sine/cosine routine into the system.

The "proper" sine/cosine routine in the FFP library also corrects another bug, which will not be significant to most user programs. A call to compute the sine would fail after 32768 successive calls to compute the cosine. This is because an internal flag in the routine is being set by an ISZ instruction. In the sine/cosine routine in the FFP library, the flag is always set to -1.

If your problem is described above, you may wish to order the FFP subroutine library, HP part number 12977-16001.

Jim Bridges
HP Data Systems

59310A/HP INTERFACE BUS

This is the first of two articles that will present a capsule view of the HP Interface Bus (HP-IB), the 59310A, and 59310A/HP-IB programming and applications. This first article is designed to give a brief overview of the HP-IB. The second, which will appear in the next issue of the **Communicator**, will give more information of an applications nature.

On a conceptual basis, flexibility cost, capability, and component integration should be the objective of any bench instrument interface system. The interface must be capable of communication with a wide variety of instruments (e.g., Measurement & Stimulus Equipment, Displays, Storage Units and Controllers) and be able to handle a wide range of data codes, data rates and communications paths.

In the practical world these conceptual ideas yield the following rules of thumb for interface protocol, data rate, and interface dimension at the bench instrumentation level:

(1) There are usually 10-20 devices in any system – instrument controller and associated devices.

(2) Instruments are normally located close to one another. Total interface transmission length of 20 meters is normally adequate.

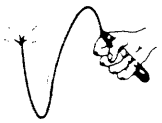
(3) Bench instruments typically are not programmable and do not generally output data in excess of a hundred kilobytes per second.

(4) Precise interface protocol and time relationships must be defined.

The HP-IB is the result of many man years of thought and experimentation on the above objectives. The general implementation of this universal interface is described below.

HP-IB Interface Bus

- A means of developing stimulus and response test systems, using programmable bench instrumentation.
- Detail of interface standard is covered in IEEE Std, 488-1975, "IEEE standard digital interface for programmable instrumentation".
- Passive standard piggyback connectors are used for interconnection of devices.
- All active TTL circuitry to drive the Bus is contained within the instruments on the Bus. The Bus can support up to 15 devices, one of which may be the computer.
- 15 devices can be supported on Bus including the computer.
- Bus instruments will fall into at least one of the following categories:



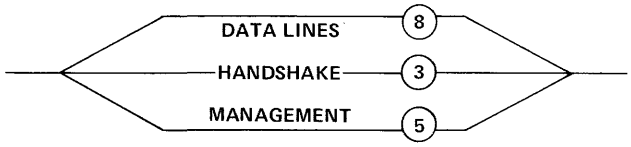
Controller Instrument that has the ability to control other instruments on the Bus.

Talker Instrument with the ability to communicate with other instruments on the Bus.

Listener Instrument with the ability to receive messages transmitted by a Bus talker.

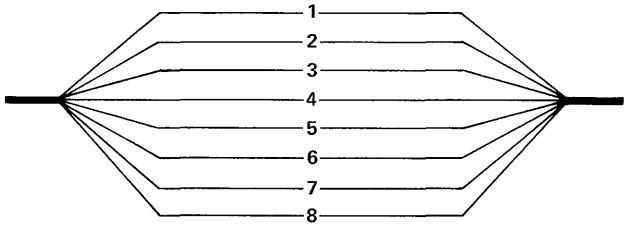
HP-IB Communications Structure

- 16 lines are contained in the HP-IB cabling.



- 8 data lines
- 3 lines used to effect the transfer of data over the data lines – called the handshake process.
- 5 lines are used to manage an orderly flow of information across the Bus.

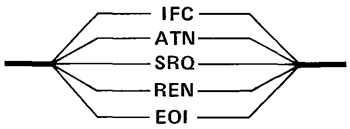
D101-8 Data Input/Output Lines



- Used to transfer all data
- Used to transfer all addressing information and multiline commands
- Transfer occurs in a bit parallel, byte serial fashion

General Interface Management Lines

- Lines are used by the controller or interact with the controller to manage communication over the HP-IB Bus.
- Only one Bus device at a time can be active controller.
- Logic States
  - hi = 2.4V
  - low = 0.4V



IFC - interface clear
ATN - attention
SRQ - service request
REN - remote enable
EOI - end or identify

ATN
- data word transfer
- address & commands

IFC
- (disabled)
- all talkers & listeners are unaddressed

REN
- places devices in local control
- places devices in remote control

SRQ
- no request for service
- indicates to controller that a device requires service

EOI
- (disabled)
- used to indicate end of multiple byte transfer

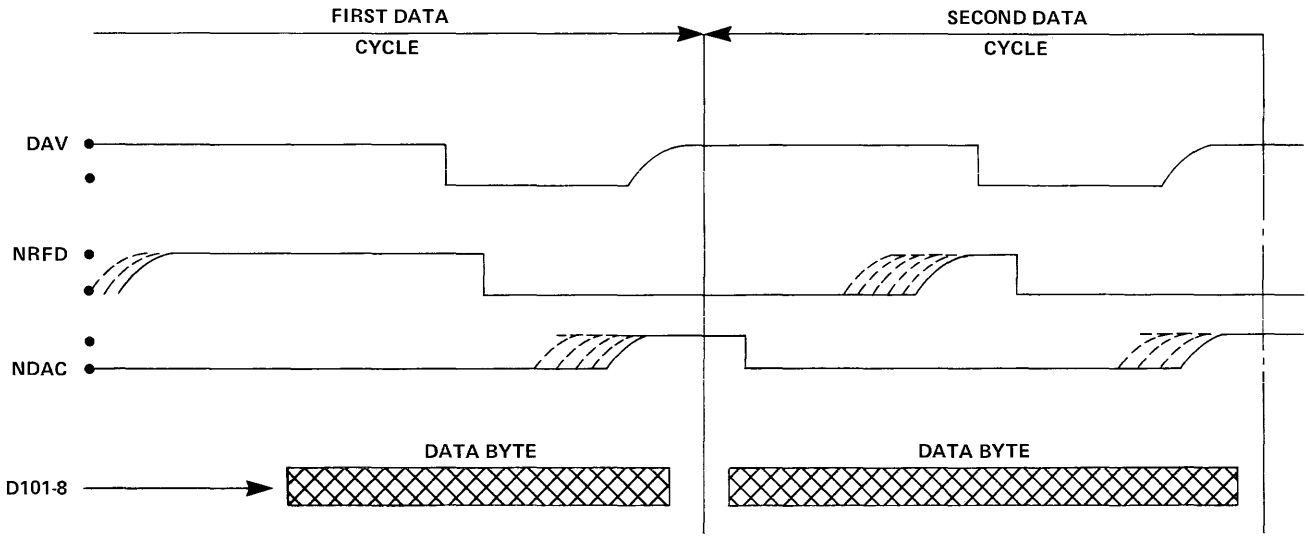
Handshake or Data-Byte Transfer Control Bus

- Used for the handshaking process by which a talker or controller can synchronize its readiness to transmit data with the listeners readiness to receive data.

DAV - data valid
NRFD - not ready for data
NDAC - data not accepted

- Talker sets DAV high before data or command is placed on data line.
- Listeners set NRFD high when all listeners are ready to accept data or commands.
- Talker sets DAV low when data may be accepted.
- NDAC line set high by listeners when all data accepted.

The purpose of the 59310A is to interface the 2100/21MX series computer to the HP-IB. This requires translation of the computer backplane CTL logic levels to the TTL logic levels used by the HP-IB. The HP-IB uses 8-bit words which



require conversion of the computer 16-bit word to two 8-bit words. The interface card performs four major functions; computer control word processing, Bus data output, computer data input, and status information to the computer. The four functions are controlled by the control signals applied from the computer through to the control logic.

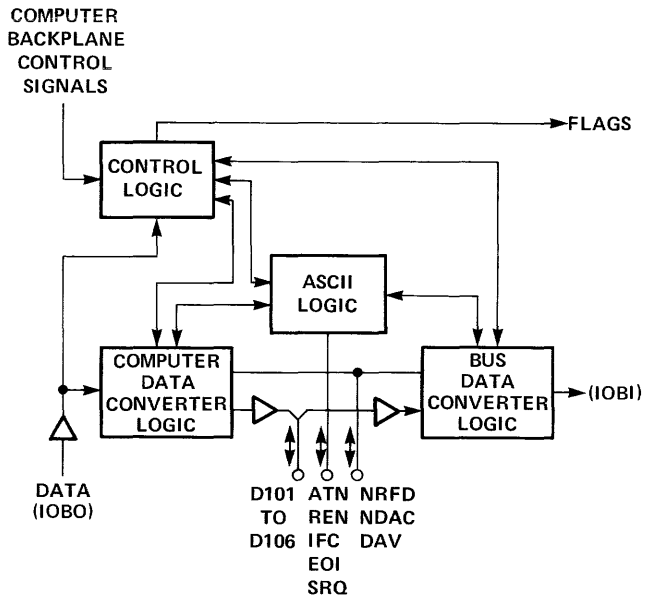


Figure 1. Simplified Block Diagram

Control Word Processing

The computer control word, which is applied to the control logic of the 59310A, determines the operating mode of the 59310AA. When control word processing is initiated by the control logic, the Bus Data Converter logic and the computer DATA Converter logic are inhibited. The control logic, in conjunction with the computer control word output, determines whether the Bus input/output card is either a listener or talker, the state of the ASCII logic, and the logic state of the flag outputs to the computer.

The control word is a sixteen (16) bit word (See Fig. 2) which is output to the 59310A under program control. The control word is divided into three parts referred to as Groups 1, 2, & 3. Group 2 is further divided into two sub-groups, 2A & 2B. The effect on the 59310A of each group is independent of the other groups. Each group may be used individually or in combination. The following 59310A modes are controllable with the control word:

1. Flag selection for interrupt or test
2. Packing enable/disable
3. DMA input or output

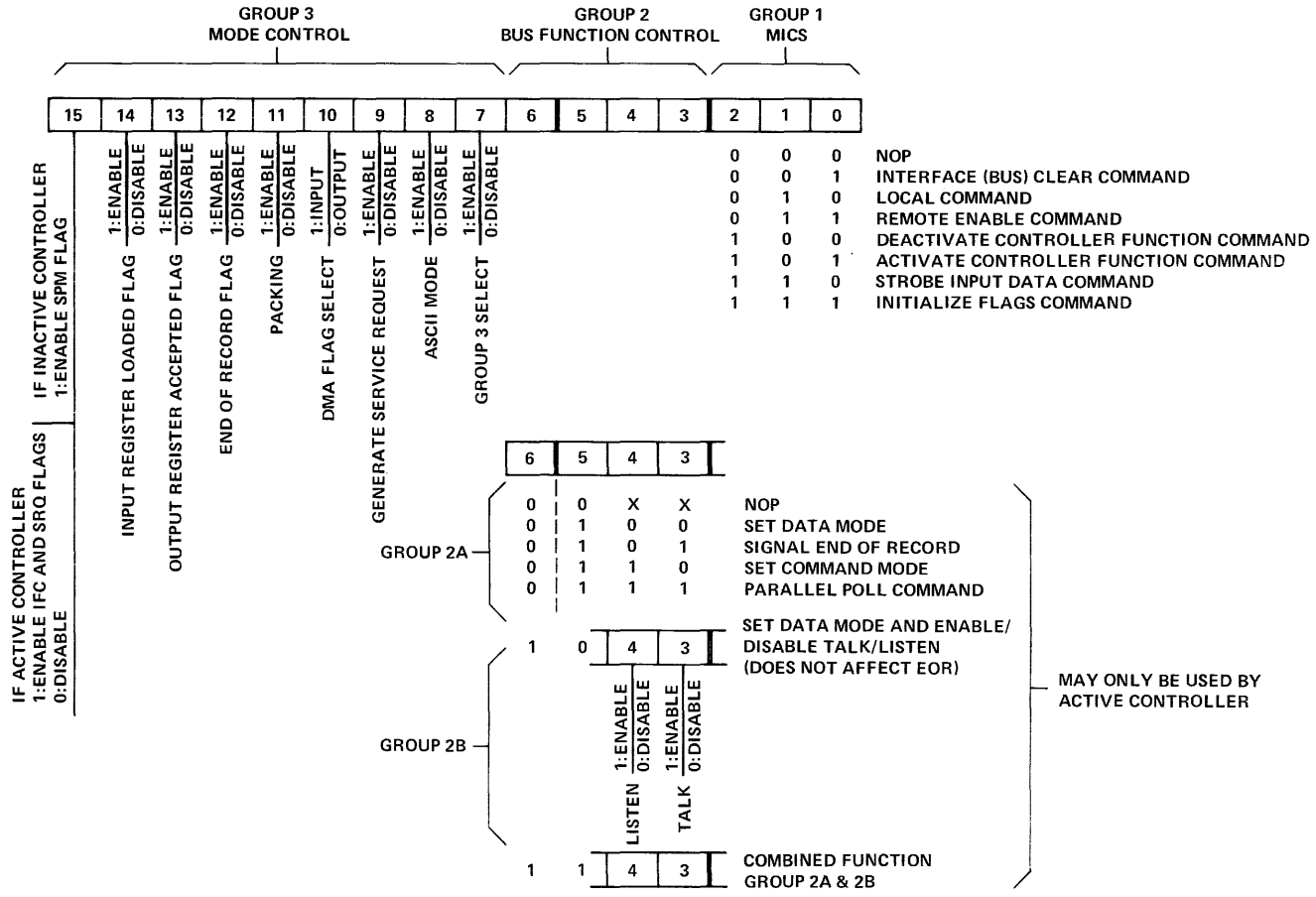


Figure 2. Control Word Format

4. Service request enable/disable

5. ASCII mode enable/disable

6. Forced input of data (without HP-IB handshake protocol)

7. Set flags

The HP-IB functions that are controllable through the 59310A with the control word are:

1. Set Bus instruments into the remote or local mode.

2. Pass or retain the (HP-IB) control function.

3. Enable/disable talkers
   Enable/disable listeners

4. Enable the computer to set the Bus in the DATA mode or the command mode.

5. Enable the computer to initiate a parallel pole.

Bus Data Output

The 59310A applies data to the Bus lines when the computer DATA converter logic is enabled by the control logic. The computer DATA converter logic stores the 16-bit word and, after the handshake sequence is completed, transfers eight bits to the (HP-IB) data lines. The output of the computer DATA converter logic is continuously monitored by the ASCII logic. If the ASCII logic is enabled by the control logic and the data output is a special ASCII character, the appropriate ASCII command output is activated.

Data is transferred from the computer to the 59310A via the A or B registers under program control or via memory under Direct Memory Access (DAM) control. Either whole (16 bits) or half words (8 bits) can be output from the computer. If whole words are to be used, 59310A's packing feature must be enabled by outputting a control word.

Data types output to the 59310A and the Bus may be categorized as following:

1. Device Data

2. Device Address

3. Device Commands

4. ASCII Type Data, Addresses & Commands

Computer Data Input

The 59310A card applies data to the computer when the control logic enables the Bus DATA Converter Logic. The Bus Data Converter logic converts two eight bit words into one 16-bit word before outputting to the computer. This is accomplished in the following manner: After completion of the handshake cycle, the first eight bits are transferred from the Bus data lines and stored in the Bus Data Converter logic. (Fig. 3) The handshake cycle is repeated and the second eight bits are clocked into the appropriate output register of the Bus Data Converter logic. Two eight bit words, now one 16-bit word, are clocked into the computer.

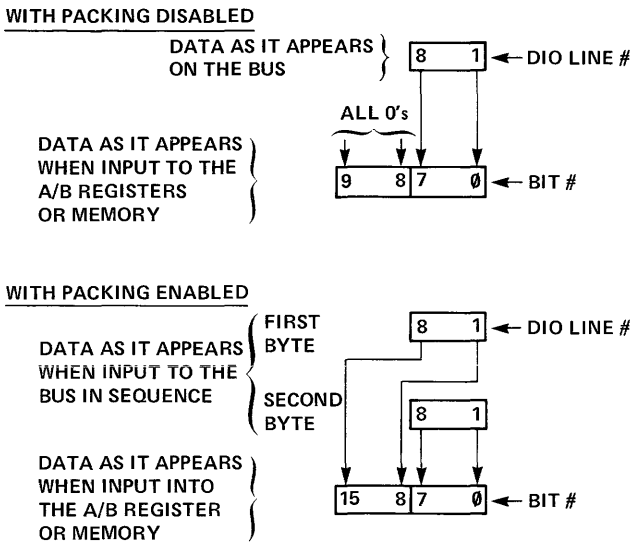


Figure 3. Input Data Formats

Data is transferred into the A and B registers of the computer in a method that is similar to data output. (Fig. 4) However, the only data that can be input to the computer when the 59310A is in the listen mode is that of a device addressed to talk.

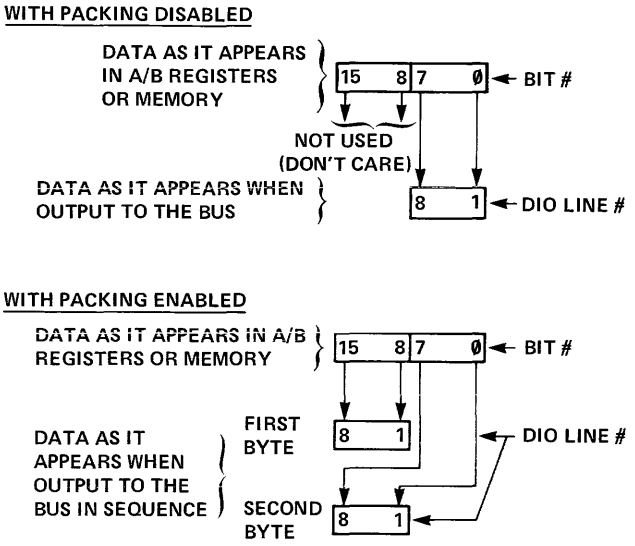


Figure 4. Output Data Formats

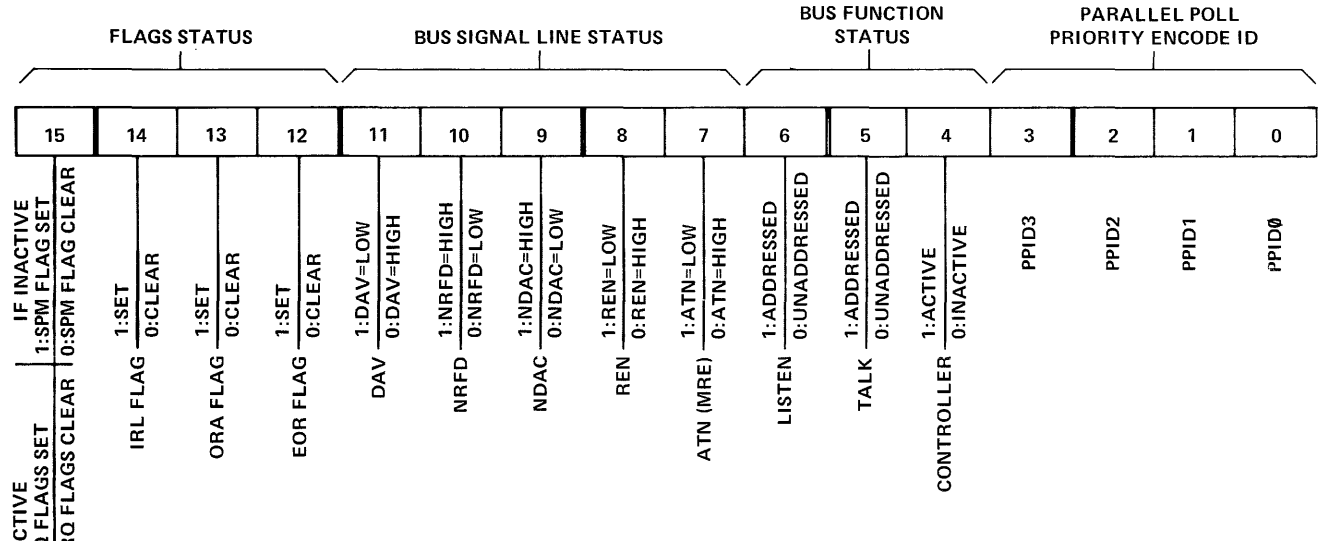
Status information input

The last major function of the Bus Input Card is to output card status information to the computer. The Bus DATA Converter Logic applies status information to the computer when the control logic inhibits the data output and enables the status word output. The status word output is used by the computer to monitor card operation to determine which flag caused an interrupt; to determine the state of the input/output handshake cycle; and to determine the state of the ASCII commands.

The status word is a sixteen (16) bit word (Fig. 5) which is input under program control to obtain information about the operating conditions of the 59310A and the HP-IB.

Therefore, the 59310A provides the following significant capabilities to a computer controlled HP-IB system.

Charles Dixon
Earl Keiser
HP Data Systems



PARALLEL POLL PRIORITY ENCODED ID

BUS SIGNAL LINES									STATUS WORD BITS			
IFC	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	BIT3	BIT2	BIT1	BIT0
H	H	H	H	H	H	H	H	H	0	0	0	0
H	H	H	H	H	H	H	H	L	0	0	0	1
H	H	H	H	H	H	H	L	X	0	0	1	0
H	H	H	H	H	H	L	X	X	0	0	1	1
H	H	H	H	H	L	X	X	X	0	1	0	0
H	H	H	H	L	X	X	X	X	0	1	0	1
H	H	H	L	X	X	X	X	X	0	1	1	0
H	H	L	X	X	X	X	X	X	0	1	1	1
H	L	X	X	X	X	X	X	X	1	0	0	0
L	X	X	X	X	X	X	X	X	1	0	0	1

Figure 5. Status Word Format

KNOW YOUR ASSEMBLER

It is estimated that over 99% of language translation is carried out by assemblers, often called Autocoders or Translators. Most domestic compilers produce an intermediate output which requires additional assembly. Further, most small machines have relatively small memories and are less suitable for full compilation or even macro assembly. Thus, when you consider how much computer time is spent in translation (at least 20%?) and what part the assembler plays in translation (99%?) you can't avoid the conclusion that:

You should know your assembler!

Mnemonics make it easy for the programmer to handle machine commands; symbolic addressing removes from the programmer's consideration actual data assignments. Identifying symbols so that they may be referenced by name elsewhere is a natural extension. All in all, the assembly language is the first step in the complex and complicated art of computer language development and application.

This article is the first in a series to follow relating to the capabilities and extensions, practical exercises, or any unusual observations you have made relating to the 2100 and 21MX assembler. If you have any such contributions that you would like to see published, please send to:

Communicator 9600/9700 Group
HP Data Systems Division
11000 Wolfe Road
Cupertino, Ca. 95014

We will review your contribution as quickly as possible.

As an opener, here is an interesting problem (submitted by the author) which you might try:

ROUTINE

```
ASMB,L,A
                ORG 77B
ORG             JMP BEGIN,I
A               EQU 0
B               EQU 1
                ORG ORG+*
                LDA VAL
                ADA TAM,I
LEMON           STA RES+1-120B
                ADB A+B+LOC-1
                CMB,INB
                ADB ORG+18-*+115B
                HLT 55B
                JMP *-LEMON-A-2,I
VAL             DEF LOC
LOC             EQU *-66B
RES             NOP
TAM             DEF LOC
BEGIN           DEC 71
                ORG 50B
                OCT 30
                ORG 32B
                OCT 61
                ORG A+B+2
                DEC 153
                END
```

Without using the assembler, simulate the following:

1. Set P=77_8
2. Press RUN
3. When the routine halts, find:

   (A) = ?
   (B) = ?

After RUN is pressed again, at what address will the computer execute the next instruction? Also, generate the coding for each instruction. Good luck. Remember, we need suggestions for future articles!

Larry Smith
HP Data Systems

Software Sam

Since this is the first issue of the **Communicator** to have Sam's column, Sam has no letters to answer. So instead Sam will answer a question previously asked in a training seminar.

DEAR SAM: Is there any way to find out the contents of a memory location without halting the machine or writing an assembly language program?

Yes, the current Fortran IV compiler will allow the user to remove the relocation base for dimensioned arrays during execution time. The 7 line program called IGET and its mixed listing below show how to remove the relocation base.

```
FTN4,L,M,T
      PROGRAM IGET
      DIMENSION I(1)
      I(0) = 1
      IVALUE = I(1651B)
      END
      END$
```

```
PROGRAM IGET
 00000  000000        NOP
 00001  016001X       JSB CLRIO
 00002  000003R       DEF *+1
 00003  026006R       JMP 00006
DIMENSION I(1)
I(0) = 1
 00004  000005R       DEF *+1
                      BSS 00001
 00006  062024R       LDA 00024
 00007  042025R       ADA 00025
 00010  042004R       ADA *-4
 00011  072026R       STA A,001
 00012  062032R       LDA 00032
 00013  172026R       STA A,001,I
IVALUE = I(1651B)
 00014  062030R       LDA 00030
 00015  042025R       ADA 00025
 00016  042004R       ADA 00004
 00017  160000        LDA 0,I
 00020  072027R       STA IVALUE
END
 00021  016002X       JSB EXEC
 00022  000024R       DEF *+2
 00023  000031R       DEF 00031
 00024  000000        OCT 000000
 00025  177777        OCT 177777
                      BSS 00002
 00030  001651        OCT 001651
 00031  000006        OCT 000006
 00032  000001        OCT 000001
```

Note line 4 in the mixed listing (DEF * + 1). The instruction defines the location of the first element of the array. By executing a I(0) = 1 the relocation base is replaced by a 1. Any subsequent references to the I array will now return the contents of the absolute location specified in I's argument. Thus, in the 7 line IGET, the contents of location 1651 (octal) were placed into IVALUE. To do an indirect reference merely repeat the procedure with what was returned in IVALUE.

Software Sam has also included an interactive IGET program at the end of this column. It should be useful for troubleshooting and also for helping users learn the system. Appendix A of the RTE II and RTE III Manual gives a list of pointers on base page to all system tables. With IGET the user can wander through the system using a high level language. Additional uses of IGET should also suggest themselves.

If you have questions, suggestions, or comments about your 9600 system, let Sam help. Write to

SOFTWARE SAM
c/o Communicator 9600/9700 Group
HP Data Systems Division
11000 Wolfe Road
Cupertino, Ca. 95014

```
FTN4,L,M,T
      PROGRAM IGET
      DIMENSION I(1)
      I(0) = 1
10    WRITE(1,50)
50    FORMAT("ENTER MEMORY LOCATION ")
      READ(1,75)  MEMLOC
75    FORMAT(#6)
      IVALUE = I(MEMLOC)
      WRITE(1,100) MEMLOC,IVALUE
100   FORMAT("THE CONTENTS OF LOCATION ",#6," IS ",#6," . ")
      WRITE(1,150)
150   FORMAT(/,"ANOTHER LOCATION ?  YES OR NO,")
      READ(1,200) ISTOP
200   FORMAT(A2)
      IF (ISTOP .EQ. 2HYE) GO TO 10
      END
      END$
```

bulletins

RTE II WITH 21MX

An assembler capable of generating 21MX code is now available and will be shipped with RTE II (92001A), RTE III (92060A) and systems using RTE II and/or RTE III software. The assembler and a companion program, XREF (cross reference symbol table generator) will accept 21MX code and assemble on a 2100A or 21MX computer. HP Part Numbers are as follows:

92060-12004	RTE II/III Assembler
92060-16028	XREF
92060-90005	Assembler Manual

If this assembler was not available at the time you received your system software, you may wish to order the above parts from HP.

Jim Bridges
HP Data Systems

software updates

The following pages list the currently available HP software for RTE I, RTE II, RTE III, DOS, BCS, and Distributed System satellites. In some cases individual modules of software packages are broken out to show current revision level and date code. When ordering software from this list be sure that the composite part number and not the individual module part number is used. Refer to the last issue of the **Communicator** or your sales representative for composite numbers.

PART NUMBER		TYPE	LABEL	
02313-16001	A	R C	2313B RTE DRIVER, DVR62D	(MAPPED RTE SYSTEMS ONLY)
02313-16002	A	R	↓2313 REAL TIME EXEC	ON-LINE 2313 VERIFICATION
02313-18002	A	S	↓2313 REAL TIME EXEC	ON-LINE 2313 VERIFICATION
02313-62001	A	A	HP 2313B SUBSYSTEM	VERIFICATION TEST
02607-16004	1538	A	2607A LINE PRINTER	24K SIO DRIVER
02607-16004	1538	S	2607A LINE PRINTER	24K SIO DRIVER
09600-60126	A	A	12759A OPT. 100	TEST PROGRAM
09601-16001	A	R	RTE DEVICE SUBR FOR	16 BIT REGISTERS
09601-16009	A	R	5326A-H18 RTE-B DEVICE	SUBROUTINE
09601-16010	A	R	5327A/B-H48 RTE-B DEVICE	SUBROUTINE CTR27
09601-16011	A	R	RTE DEVICE SUBR FOR	12604B DSI CARD
09601-16014	A	R	3480D DVM RTE DEVICE	SUBROUTINE
09601-16020	A	R	HP12555B D TO A CONV	DEVICE SUBROUTINE
09601-16021	A	R	HP7261A RTE DVR15 DRIVER	
09601-16022	A	R	12556B OUTPUT REGISTER	DEVICE SUBROUTINE
09610-60017	A	R	ISA FTN LIBRARY	
09610-60018	A	A	TABLE GENERATOR	
09610-60019	B	R	EVENT SENSE HANDLER	
09610-60020	A	R	TABLE GENERATOR	
09610-60021	A	R	ANALOG INPUT	
09610-60022	A	R	ANALOG OUTPUT	
09610-60023	A	R	DIGITAL I/O	
09610-60024	A	R	EVENT SENSE	
09610-60025	A	R	EXC. & BIT ROUTINE	
09611-16005	A	R	HP6940A/B RTE MPG DRIVER	DVA72 - LOCAL/REMOTE
09611-16006	A	R	T6940 - HP6940 RTE	ON-LINE VERIFICATION TEST
09611-16007	A	R	SENSE - 6940 VERIFICATION	INTERRUPT HANDLER
09611-16009	A	R	↓$#&% OFF-LINE 2313/6940	VERIFICATION START-UP PROG
09611-16010	A	R	↓$#&A OFF-LINE 6940	VERIFICATION DATA TABLE
09611-16011	A	R	↓$#&B OFF-LINE 2313	VERIFICATION DATA TABLE
09611-16012	A	A	OFF-LINE 2313/6940 VERIF.	RTE-C CONFIGURATION OVRLAY
09611-16013	A	A	HP6940 OFF-LINE	VERIFICATION TEST
09611-16014	A	A	HP2313 OFF-LINE	VERIFICATION TEST
09611-16015	A	R	HP6940 RTE VERIFICATION	TEST SUBROUTINES
09611-18006	A	S	T6940 - HP6940 RTE	ON-LINE VERIFICATION TEST
09611-18007	A	S	SENSE - 6940 VERIFICATION	INTERRUPT HANDLER
09611-18009	A	S	↓$#&% OFF-LINE 2313/6940	VERIFICATION START-UP PROG
09611-18010	A	S	↓$#&A OFF-LINE 6940	VERIFICATION DATA TABLE
09611-18011	A	S	↓$#&B OFF-LINE 2313	VERIFICATION DATA TABLE
09611-18012	A	S	OFF-LINE 2313/6940 VERIF.	RTE-C CONFIGURATION OVRLAY
09611-16015	A	S	HP6940 RTE VERIFICATION	TEST SUBROUTINES
12970-16001	1518	A	SIO MAG TAPE DMA DRIVER	8K
12970-16002	1518	A	SIO MAG TAPE DMA DRIVER	12K
12970-16003	1518	A	DR-16K SIO DMA 9T	
12977-16001	1451	R	21MX DOS III FFP	SUBR LIBRARY
12977-16003	1451	R	21MX-BCS FFP -	SUBROUTINE LIB
12978-16003	1437	R	21MX BCS MICRO-	ASSEMBLER (WCS)
12978-16004	1437	R	21MX BCS MICRO DEBUG	EDITOR (WCS)
12989-16003	1506	R	HP2894 RTE DRIVER	DVA15
13021-60001	B	A	8K SIO HP7970 MT	DRIVER
13022-60001	B	A	16K SIO HP7970 MT	DRIVER
13023-60001	B	R	BCS HP7970 MT	DRIVER (D.23)
13025-60001	A	R	RTE HP7970 MT	DRIVER (DVR23)
13026-60001	B	R	BCS 7 TRACK DRIVER	W/O DMA
13027-60001	B	R	7970 7T BCS DRIVER	W/DMA
13029-60001	B	A	8K HP7970 7-TRACK	SIO MAG TAPE DRIVER
13030-60001	B	A	16K HP7970 7-TRACK	SIO MAG TAPE DRIVER
14900-60001	B	R	6936A/6937A BCS	DRIVER D.61
14901-60001	B	A	6936A VERIFICATION	TEST
14902-60001	A	R	DVS BCS DRIVER	D.70
14903-60001	B	A	DVS VERIFICATION & TEST	
14904-60001	D	R	6940A/6941A BCS	DRIVER D.61

14907-60001	D	R	RTE MULTIPROGRAMMER	DRIVER DVR61
14908-60001	A	R	DCPS RTE DRIVER DVR70	
14911-60001	A	R	6940A/6941A BCS	LIBRARY
14912-60001	A	R	6940A/B-6941A/B RTE	LIBRARY
20001-60001	1430	R	4K BCS RELOCATING	LOADER
20002-60001	B	R	BCS DEBUG ROUTINE	
20005-60001	B	R	BCS TAPE READER	DRIVER D.01
20006-60001	1430	R	BCS PAPER PUNCH	DRIVER D.02
20007-60001	A	R	BCS INCREMENTAL MAG TAPE	DRIVER D.20
20008-60001	B	R	BCS 8421 DSI	DRIVER D.40
20009-60001	B	R	BCS DVM PROGRAM	DRIVER D.41
20010-60001	C	R	BCS 8421 SCAN CONTROL	DRIVER D.42
20011-60001	B	R	BCS 4221/8421 DSI DRIVER	D.40A
20012-60001	C	R	BCS 8421/4221 SCANNER	CONTROL DRIVER D.42A
20014-60001	A	R	BCS PLOTTER	DRIVER D.10
20016-60001	A	R	BCS TAPE PUNCH DRVR.	D.02 (IBM 8 LEVEL)
20017-60001	C	R	BCS TTY DRVR, D.00	
20018-60001	1430	R	BCS RELOCATING	LOADER
20019-60001	B	R	BCS CARD READER	DRIVER D.11
20021-60001	C	A	PREPARE CONTROL	SYSTEM
20024-60001	A	R	BCS DVM PROGRAM DRIVER	D.41B
20025-60001	A	R	BCS 2912 SCANNER CONTROL	DRIVER D.42B
20028-60001	B	R	2323 ANALOG SCAN	ROUT, SCN12 D.77
20073-60001	C	R	BCS A-D CONVERTER	NON-DMA DR.D.56
20074-60001	A	R	L5610 FORTRAN/ALGOL	INTERFACE SUBROUTINE
20075-60001	D	A	VERIFY 5610A A-TO-D	TEST
20076-60001	A	R	BCS DR, 2312A	D.55
20078-60001	A	R	2312A DRIVER/FTN INTERFACE	
20079-60001	A	A	8K SIO DISC/DRUM	DRIVER
20081-60001	A	A	16K SIO DISC/DRUM	DRIVER
20093-60001	C	R	BCS 5610 A-D CONV.	DVA DRIVER D.56A
20094-60001	B	R	MULTI/MINIVERTER	SCAN ROUTINE D.76
20096-60001	A	R	DATA CONVERSION ROUTINE	(ADC READING/MV)MCONV
20098-60001	C	R	BCS 40 BIT OUTPUT	REG DRIVER D.54
20100-60001	B	A	SYMBOLIC EDITOR	
20201-60001	C	R	BCS PLOTTER	LIBRARY
20210-60001	A	R	ICONV BCD/FP CONVERSION	(2401/2402)
20235-60001	A	R	RTE 2323A	DRIVER DVR77
20236-60001	A	R	RTE 2320A/2322A	DRIVER DVR76
20237-60001	A	A	LIBRARIAN	
20288-60001	A	R	BCD/FP CONVERSION	ROUTINE (RTE TYPE 7)
20297-60001	C	R	2310/2311	DRIVER DVR56
20301-60001	C	A	4K SIO SYSTEM DUMP	
20303-60001	A	A	4K SIO TAPE READER	DRIVER
20304-60001	A	A	4K SIO TAPE PUNCH	DRIVER
20306-60001	A	A	8K SIO TAPE READER	DRIVER
20307-60001	A	A	8K SIO TAPE PUNCH	DRIVER
20312-60001	A	A	PUNCH/VERIFY	ROUTINE
20313-60001	C	A	8K SIO SYSTEM DUMP	
20316-60001	A	A	8K SIO TAPE PUNCH	DRVR,(IBM 8 LEVEL)
20317-60001	A	A	4K SIO TAPE PUNCH	DRVR,(IBM 8 LEVEL)
20319-60001	A	A	16K SIO TAPE READER DRIVER	
20320-60001	A	A	16K SIO TAPE PUNCH DRIVER	
20324-60001	B	A	8K S10 CARD READER	DRIVER
20327-60001	A	A	12K SIO TAPE	READER DRIVER
20328-60001	A	A	12K SIO TAPE PUNCH	DRIVER
20332-60001	A	A	16K S10 CARD READER	DRIVER
20335-60001	B	A	16K SIO SYSTEM DUMP	
20338-60001	D	A	2310C VERIFICATION	TEST
20392-60001	B	A	BASIC SYSTEM	
20392-60002	B	A	PREPARE BASIC	SYSTEM
20396-60001	A	R	RTE 10-BIT A-TO-D CARD	12564A DVR57
20398-60001	A	R	RTE DRIVER FOR	2312A DVR55
26501-60001	E	R	SCN-ANALOG SCAN	ROUTINE 8421

20502-60001	B	R	TIME BASE GENERATOR	DACE DRIVER D.43
20517-60001	C	R	SCN-ANALOG SCAN	ROUTINE 4221
20520-60001	C	A	4K SIO MARK SENSE	CARD READER DRIVER
20521-60001	C	A	8K SIO MARK SENSE	CARD READER DRIVER
20522-60001	C	A	16K SIO MARK SENSE CARD	READER DRIVER
20530-60001	D	A	VER34 2321 VERIFICATION	
20532-60001	A	R	2321 SCAN ROUTINE	SCAN34 (3450/2911)
20533-60001	A	R	2321 CONV BCD/FP CONV	CONV34 (3450/2911)
20548-60002	A	A	FORTRAN COMPILER	PASS 2
20549-60001	A	A	4K FORTRAN COMPILER	PASS 1
20549-60002	A	A	4K FORTRAN COMPILER	PASS 2
20549-60003	A	A	4K FORTRAN COMPILER	PASS 3
20549-60004	A	A	4K FORTRAN COMPILER	PASS 4
20594-60001	B	A	8K MT SYSTEM	BOOTSTRAP
20594-60002	B	A	8K MT SYSTEM	.IPL.
20594-60003	B	D	8K MT SYSTEM	UTILITY
20595-60001	B	A	16K MT SYSTEM	BOOTSTRAP
20595-60002	B	A	16K MT SYSTEM	.IPL.
20595-60003	B	A	16K MT SYSTEM	UTILITY
20747-60001	C	R	RTE DISC/DRUM	DRIVER (DVR30)
20802-60001	C	A	SYSTEM DUMP	
20805-60001	C	R	RTE EDITOR	
20808-60001	B	R	RTE PLOTTER	DRIVER (DVR10)
20810-60001	B	R	RTE/DOS PLOTTER	LIBRARY
20817-60001	B	R	BCS MARK SENSE DRVR.	(D.15) KIT 12602A
20819-60001	C	R	BCS MARK SENSE DRVR.	(D.15) 12602B KIT
20821-60001	B	R	RTE MARK SENSE DRVR	(DVR15) 12602B KIT
20823-60001	D	R		
20874-60001	D	R	RTE ASSEMBLER	MAIN CONTROL
20874-60002	D	R	RTE ASSEMBLER	SEGMENT D
20874-60003	D	R	RTE ASSEMBLER	SEGMENT 1
20874-60004	D	R	RTE ASSEMBLER	SEGMENT 2
20874-60005	D	R	RTE ASSEMBLER	
20874-60006	D	R	RTE ASSEMBLER	
20874-60007	D	R	RTE ASSEMBLER	
20875-60001	E	R	RTE FORTRAN	MAIN CONTROL
20875-60002	E	R	RTE FORTRAN	PASS 1
20875-60003	E	R	RTE FORTRAN	PASS 2
20875-60004	E	R	RTE FORTRAN	PASS 3
20875-60005	E	R	RTE FORTRAN	PASS 4
24016-60001	A	A	PREPARE TAPE SYSTEM	
24031-60001	B	A	EXTENDED ASSEMBLER	NON-EAU
24032-60001	B	A	EXTENDED ASSEMBLER	EAU
24038-60001	B	A	4K ASSEMBLER	NON-EAU
24039-60001	B	A	4K ASSEMBLER-EAU	
24044-60001	B	A	ALGOL COMPILER	
24109-60001	B	A	CROSS-REFERENCE	SYMBOL TABLE GENER.
24123-60001	A	A	4K SIO TTY DRIVER	(LP-COMPAT)
24125-60001	A	A	8K SIO TTY DRIVER	(LP-COMPAT)
24127-60001	A	A	16K SIO TELEPRINTER DRIVER	(LP-COMPAT)
24129-60001	C	R	RTE/DOS ALGOL	MAIN CONTROL
24129-60002	C	R	RTE/DOS ALGOL	SEGMENT 1
24145-60001	B	R	BCS RELOCATABLE	LIBRARY (EAU)
24146-60001	B	R	BCS RELOCATABLE	LIBRARY (NON-EAU)
24147-60001	B	R	4K BCS RELOCATABLE	LIBRARY (NON-EAU)
24148-60001	B	R	4K BCS RELOCATABLE	LIBRARY (EAU)
24149-60001	B	R	BCS FORTRAN IV	LIBRARY
24150-60001	D	R	RTE/DOS RELOCATABLE	LIBRARY (NON-EAU)
24151-60001	D	R	RTE/DOS RELOCATABLE	LIBRARY-F2E (EAU)
24152-60001	C	R	RTE/DOS FORTRAN IV	LIBRARY
24153-60001	C	R	RTE/DOS FORTRAN	FORMATTER
24164-60001	B	A	4K SIO HP2767 LINE	PRINTER DRIVER
24165-60001	B	A	8K SIO HP2767 LINE	PRINTER DRIVER
24166-60001	B	A	16K SIO HP 2767 LINE	PRINTER DRIVER

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24167-60001 1401  R    BCS 2767 LINE PRINTER        DRIVER
24169-60001 A     R    RTE HP2767 LINE              PRINTER DRVR (DVR12)
24170-60001 C     R    RTE/DOS FORTRAN IV           COMPILER
24170-60002 C     R    RTE/DOS FORTRAN IV           COMPILER
24170-60003 C     R
24172-60001 A     R    INPUT/OUTPUT                 CONTROL (BUFF.)
24173-60001 A     R    INPUT/OUTPUT                 CONTROL
24177-60001 1442  R    FORTRAN IV COMPILER          (10K AREA)
24177-60002 1442  R    FORTRAN IV COMPILER          (10K AREA)
24246-60001 A     A    EXTENDED ASSEMBLER           FLOATING POINT
24247-60001 A     A    4K ASSEMBLER                 FLOATING POINT
24248-60001 B     R    RTE/DOS RELOCATABLE          LIBRARY-FLOATING PT
24249-60001 B     R    4K BCS RELOCATABLE           LIBRARY-FLOATING PT
24250-60001 B     R    BCS RELOCATABLE              LIBRARY-FLOATING PT
24256-60001 A     A    4K SIO HP2605A CON-          SOLE PRINTER DRIVER
24257-60001 A     A    8K SIO HP2605A CON-          SOLE PRINTER DRIVER
24258-60001 A     A    16K SIO HP2605A CON-         SOLE PRINTER DRIVER
24259-60001 1408  R    BCS HP 2605 DRIVER (D.25)
24260-60001 A     R    DOS HP2605A CONSOLE          PRINTER DRVR (DVR25)
24264-60001 A     A    4K SIO HP2892A CARD          READER DRIVER
24265-60001 A     A    8K SIO HP2892A CARD          READER DRIVER
24266-60001 A     A    16K SIO HP2892A CARD         READER DRIVER
24268-60001 A     A    4K SIO HP2610A/2614A         LINE PRINTER DRIVER
24269-60001 A     A    8K SIO HP2610A/2614A         LINE PRINTER DRIVER
24270-60001 A     A    16K SIO HP2610A/2614         LINE PRINTER DRIVER
24273-60001 A     R    BCS 2610A/2614A LINE         PRINTER DRIVER(D,12)
24274-60001 A     R    BCS HP2892A CARD             READER DRIVER(D,11)
24277-60001 A     R    12908A WCS BCS               DRIVER (D,33)
24279-60001 A     R    BCS HP2100 MICRO             ASSEMBLER
24281-60001 A     R    MICRO DEBUG EDITOR
24283-60001 A     R    WCS I/O UTILITY              ROUTINE
24287-60001 1416  R     12909B PROM WRHNTROL PROG   RAM                ATCHES
24298-60001 A     A    12K SIO SYSTEM DUMP
24299-60001 A     A    12K SIO TTY DRIVER
24300-60001 A     A    12K SIO 2605 CONSOLE         PRINTER DRIVER
24301-60001 A     A
24303-60001 A     A
24312-60001 A     A    12K SIO HP7970 MAG           TAPE DRIVER
24313-60001 A     A
24326-60001 A     A     4K HP 2762A SIO             DRIVER
24327-60001 A     A     8K HP 2762A SIO             DRIVER
24328-60001 A     A    12K HP 2762A SIO             DRIVER
24329-60001 A     A    16K HP 2762A SIO             DRIVER
24330-60001 A     R    BCS HP 2762A                 DRIVER          (D,26)
24335-16001 1403  A
24336-60001 A     A    12K SIO 7 TRACK 7970 DRVR
24341-16002 1419  R    RTE DVR67 - 12889A           SERIAL IF
24344-16001 1346  A
24345-16001 1346  A
24346-16001 1346  A
24347-16001 1346  A
24348-16001 1346  R
24353-16001 1405  D
25117-60289 B     A    FORTRAN COMPILER   PASS 1
25117-60402 B     A    MTLS2                        8K ABSOLUTE
25117-60412 B     R    MULTIFUNCTION METER          RTE DRIVER  DVR46
25117-60414 B     R    DVR 70
25117-60438 B     A    MULTIFUNCTION METER          SUBSYSTEM VERIFICATION
25117-60467 B     R    C3484                        BCD TO FLOATING POINT CONV
25117-60477 1523  R    RTE DVR47                    DRIVER
25117-60478 A     R    RTE SCNIT                    VERIFICATION
25117-60499 D     R    7970B 7TRK RTE DRIVER        DVR24
25117-60551 A     R    DVR54                        40-BIT RTE DRIVER
25117-60563 A     R    BCS HP3460/85 DRIVER         SCN45(D,77)
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25121-60014	A	A		FORTRAN COMPILER PASS 2	EAU VERSION	
25123-60031	A	R		TEKTRONIX TCS LIBRARY		
28051-60003	B	A		K21-5321B DIGITAL CLOCK	SUBSYSTEM VERIFICATION	
28051-60004	B	R		K21-5321B DIGITAL CLOCK	CLK 21	
28051-60005	A	R		5321-K21 DIGITAL CLOCK	FLGCK	
29000-60001	A	R		RTE 2321A SUBSYSTEM	DRIVER DVR74	
29001-60003	D	R	C	COMPUTER SERIAL INTERFACE	RTE DRIVER DVR65	
29001-80003	D	S	C	COMPUTER SERIAL INTERFACE	RTE DRIVER DVR65	
29002-60001	B	R		COMPUTER SERIAL INTERFACE	BCS DRIVER D.65	
29002-60003	C	R	C	D.65	BCS	
29003-60001	A	R		COUPLER SERIAL INTERFACE	RTE DRIVER DVR66	
29004-60001	A	R		COUPLER SERIAL INTERFACE	BCS DRIVER D.66	
29007-60001	C	R		2313A BCS DRIVER (NON-DMA)	D.62	
29008-60001	E	R		2313A BCS DRIVER (DMA)	D.62A	
29009-60001	C	R		2313B RTE DRIVER	DVR62	
29010-60001	A	R		2313A ALGOL/FTN	DRIVER I/F I2313	
29011-60001	E	R		2313B RTE - DVR I/F	MAIN MODULE, R2313	
29011-60002	A	R		2313A RTE DVR I/F	PACER MODULE P2313	
29011-60003	A	R		2313A RTE-DVR I/F	2930A MODULE,R2930	
29011-60004	A	R		2313A RTE-DVR I/F	DUAL DAC MOD, D2313	
29012-60001	B	A		2313A VERIFICATION		
29013-60001	C	R	P	RTE DISC DRIVER	DVR 31	
29014-60001	B	A	P	MH RTGEN REAL TIME	SYSTEM GENERATOR	
29015-60001	B	A	P	FH-RTGEN REAL TIME	SYSTEM GENERATOR	
29016-60001	D	R	P	EXECUTIVE	RTE EXEC	
29016-60002	D	R	P	SCHEDULER	RTE SCHED	
29016-60003	E	R	P	R/T INPUT/OUTPUT CONTROL		
29017-60001	A	R		FORTRAN/ALGOL INTER. SUB.	FOR BCS DRVR D.65	
29018-60001	A	R		LISTEN MODE ASSEMBLER	FOR BCS DRIVER D.65	
29019-60001	A	R		LISTEN MODE FORTRAN	FOR BCS DRIVER D.65	
29020-60001	A	R		FORTRAN/ALGOL INT. SUB	FOR BCS DRIVER D.66	
29020-60002	A	R	P	FORTRAN/ALGOL INTERFACE	FOR BCS DRIVER D.65 (L.65)	
29021-60001	A	R		FORTRAN/ALGOL INTERFACE	FOR RTE DRVR DVR65 DLK65	
29022-60001	B	R	P	RTE RELOCATING LOADER		
29023-60001	A	A		HP 12772 COUPLER MODEM	INTERFACE CARD DIAG	
29024-60001	B	A		HP 12773 INTERFACE	CARD DIAGNOSTIC	
29025-60001	A	A		HP 2313 DUAL DAC	VERIFICATION TEST	
29028-60002	A	R		RTE HP2767 LINE PRINTER	DVR12	
29029-60001	C	R	P	RTE MULTIPLE - DEVICE	SYSTEM CONTROL DVR (DVR00)	
29030-60001	B	R		HP2892A CARD READER RTE	DRIVER DVR11	
29033-60001	C	R	P	RTE FILE MANAGER	FMGR	
29033-60002	B	R	P	RTE FILE MANAGER	LIBRARY	
29034-60001	B	R		TEKTRONIX PLOT 10 LIBRARY		
29035-60001	B	R		RTE TEKTRONIX PLOT 10	LIBRARY INTERFACE	
29036-60001	C	R		BCS TEKTRONIX PLOT 10	LIBRARY INTERFACE	
29037-16001	A	A	C	SCE/1	(SCE/1 DS/1B)	
29037-16002	A	A	C	XBBDL	(SCE/1 DS/1B)	
29037-60001	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(4K)
29037-60002	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(4K)
29037-60004	B	R	P	91701A/B TERMINAL	MODULE NAME:	#TAM
29037-60005	B	R	P	91701A/B TERMINAL	MODULE NAME:	RFAIN
29037-60006	A	R		91701A/B TERMINAL	MODULE NAME:	IOC
29037-60007	B	R		91701A/B TERMINAL	MODULE NAME:	D.00D
29037-60008	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(8K)
29037-60009	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(8K)
29037-60010	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(12K)
29037-60011	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(12K)
29037-60012	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(16K)
29037-60013	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(16K)
29037-60014	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(24K)
29037-60015	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(24K)
29037-60016	B	A	P	91701A/B TERMINAL	MODULE NAME:	TCE1(32K)
29037-60017	C	A	P	91701A/B TERMINAL	MODULE NAME:	TCE2(32K)
29037-60052	B	R		D.13B BCS DRIVER FOR 1331C		

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29037-60053 A     R     DIGITAL CLOCK DRVR D.43C     BCS
29037-60054 A     R     TKLNK  BCS                   4010 LIBRARY LINK
29037-60055 B     A     HP9866A ABS VERIFICATION
29100-16001 A     R     RTE DEVICE SUBR FOR DVR70    (6130 ETC)
29100-16003 A     R     RTE DEVICE SUBROUTINE             LIBRARY
29100-16004 A     R     RTE DEVICE SUBROUTINE             DFEXT
29100-16005 A     R     RTE DEVICE SUBROUTINE             ERROR
29100-16006 A     R     RTE DEVICE SUBROUTINE             XERLU
29100-16007 A     R     RTE DEVICE SUBROUTINE             BCD6
29100-60001 A     R     RFMAP
29100-60002 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      QUEUE
29100-60003 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      DISP
29100-60004 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      TAM
29100-60005 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      RFAM
29100-60006 B     R P   91701A/B RTE CENTRAL        MODULE NAME: DISC
29100-60007 C     R P   91701A/B RTE CENTRAL        MODULE NAME:      PROGL
29100-60008 C     R P   91701A/B       RTE CENTRAL  MODULE NAME:      DLIST
29100-60009 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      ERR
29100-60010 C     R P   91701A/B       RTE CENTRAL  MODULE NAME:      LSTEN
29100-60011 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      EXEC
29100-60012 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      QUDIS(8)
29100-60013 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      QUDIS(16)
29100-60014 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      QUDIS(32)
29100-60015 A     R P   91701A/B       RTE CENTRAL  MODULE NAME:      QUDIS(24)
29100-60016 A     A     TTY DRIVER, BUFFERED                              SIO 24K
29100-60017 A     A     TTY DRIVER, LP-COMPAT        SIO 24K
29100-60018 A     A     SYSTEM DUMP                                       SIO 24K
29100-60019 A     A     PHOTO-READER DRIVER                               SIO 24K
29100-60020 A     A     TAPE PUNCH DRIVER                                 SIO 24K
29100-60021 A     A     LINE PRINTER DRIVER (2778)                        SIO 24K
29100-60022 A     A     LINE PRINTER DRIVER (2767)                        SIO 24K
29100-60023 A     A     MAG TAPE DRIVER (7970)                            SIO 24K
29100-60024 A     A     MAG TAPE DRIVER (2020)                            SIO 24K
29100-60025 A     A     MAG TAPE DRIVER (3030)                            SIO 24K
29100-60031 B     R     DRIVER/LIBRARY
29100-60032 B     R P   TC3GN
29100-60036 A     R     DVR43  RTE DRIVER            FOR 1331C X/Y DISPLAY
29100-60037 A     R     $LK43 B P LINK               FOR DVR43
29100-60038 A     R     RTE SCONF & POINT            FOR 1331C X/Y DISP
29100-60039 B     R     RTE CHAR                     FOR 1331C X/Y DISP
29100-60040 A     R     V1331 RTE VERIF              FOR 1331C X/Y DISP
29100-60041 A     R     12604B DSI RTE (DVR40)
29100-60042 A     R     TIMER-COUNTER SUBSYSTEM      RTE LINK (LNK27)
29100-60043 A     A     24K SIO DRIVER FOR           MARK SENSE READER
29100-60044 A     R     TIMER/COUNTER SUBSYSTEM      RTE LINK - L5327
29100-60045 A     R     93009A RTE LINK SUBROUTINE   TEKLK
29100-60048 A     A     2610/2614 LP DRIVER                          24K SIO
29100-60049 A     A     7-TRACK 7970 MT DRIVER                       24K SIO
29100-60050 A     A     2762A TERMINAL PRINTER                       24K SIO
29100-60102 B     R P   91701A/B       RTE CENTRAL  MODULE NAME:      UPLIN
29100-68001 A     R     CONFIGURED DATS/RTE          REMOTE MANAGER
29101-60001 B     R P   RTE-C EXEC
29101-60002 B     R C   RTE-C SCHED
29101-60003 B     R P   RTE-C RTIOC
29101-60004 B     R P   RTE-C APLDR
29101-60005 A     R P   RTE-C RELOCATING LOADER      MAIN CONTROL
29101-60006 A     R P   RTE-C RELOCATING LOADER      SUBORDINATE CONTROL
29101-60007 B     R C   RTE-C GENERATOR              MAIN CONTROL
29101-60010 A     A P   RTE-C RELOCATING LOADER
29101-60011 B     A C   RTE-C GENERATOR              MAIN CONTROL
29102-16001 A     R     RTE-B BASIC ERROR
29102-16002 A     R     RTE B CONST SUBROUTINE
29102-16003 A     R     RTEB DEVICE SUBS  A6940      FOR 6940 MULTIPROGRAMMER
29102-18003 A     S     RTEB DEVICE SUBS  A6940      FOR 6940 MULTIPROGRAMMER
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29102-60001	D		R		RTE-B LIBRARY	
29102-60002	A		R	P	RTE-B TELETYPE SCHEDULER	TTYS
29102-60003	A		R	P	RTE-B SYSTEM SCHEDULER	BSCHD
29102-60004	B		R	P	RTE-B SYSTEM SUPERVISOR	BSUPV
29102-60005	B		R	P	RTE-B SYSTEM COMMANDS	CMNDS
29102-60006	A		R	P	RTE-B OCTAL CONVERSION	OCT
29102-60007	A		R	P	RTE-B BIT MANIPULATION	BITCR
29102-60008	B		R		RTE-B MAG TAPE INTERFACE M	TTDR
29102-60009	B		R	P	RTE-B STD BRANCH-MNEM TBL	BMTBL
29102-60010	A		R	P	RTE-B MNEMONIC TABLE	MNEM
29102-60011	B		R	P	RTE-B BRANCH TABLE	BRTBL
29102-60012	A		R	P	RTE-B TRAP LIBRARY	TRLIB
29102-60013	A		R	P	RTE-B TTY EVENT SENSE	TTYEV
29102-60014	A		R	P	RTE-B 6940 ALARM	ALARM
29102-60015	C		A		RTE-B RTBTBL GEN PORG.	
29102-60016	B		R		RTEB DEVICE SUBS A2313	FOR 2313
29102-60017	A		R	P	RTE-B 6940 SUB-SYSTEM	A6940
29102-60018	B		R		RTE-B TABLE GENERATOR	(RTBTG)
29102-60019	C		R		RTE-B TBL GEN LIST	LISTN
29102-60020	A		R	P	RTE-B TBL GEN ADD	ADDN
29102-60021	B		R		RTE B RELFM SUBROUTINE	
29102-60022	A		R	P	RTE-B TBL GEN OUTPUT	OUTRL
29102-60023	A		R	P	RTE-B TBL GEN UTILITY 1	UTIL1
29102-60024	A		R	P	RTE-B TBL GEN UTILITY 2	UTIL2
29102-60025	A		R	P	RTE-B TBL GEN OUT RELOC	OUTBR
29102-60026	A		R	P	RTE-B TBL GEN SIO INTERFC	FSIOS
29102-60027	A		R	P	RTE-B TBL GEN HI LEV INT	SIOIO
29102-60028	A		R	P	RTE-B TBL GEN INSTR CONFG	C2313
29102-60030	A		A		RTEB RTBTG	TABLE GENERATOR
29102-80016	B		S		RTEB DEVICE SUBS A2313	FOR 2313
29102-80018	B		S		RTE-B TABLE GENERATOR	(RTBTG)
29102-80019	C		S		RTE-B TBL GEN LIST	LISTN
29103-60001	C		R		SXL COMPOSITE RELOCATABLES	FOR USE DURING RTGEN
29103-60002	D		R	C	SXL	
29103-60119	B		R	P	BCSGN	
91000-60002	A		A		HP 91000A SUBSYSTEM	VERIFICATION TEST
91062-16001	A		R		BCS RELO TAPE	START
91062-16002	A		R		BCS RELO TAPE	.CURE
91062-16003	A		R		BCS HP3480/85 SUBSYSTEM	VERIFICATION TEST (VMSCN)
91064-16001	A		R		TIMER/COUNTER SUBSYSTEM	BCS LINK - L5327
91064-16002	A		A		TIMER/COUNTER SUBSYSTEM	VERIFICATION
91064-16003	A		R		TIMER/COUNTER SUBSYSTEM	RTE VERIFICATION
91064-16004	A		R		TIMER/COUNTER SUBSYSTEM	VRCTR
91065-16001	A		R		TIMER-COUNTER SUBSYSTEM	RTE VERIFICATION (TCNTR)
91065-60001	B		R		TIMER-COUNTER SUBSYSTEM	BCS LINK (LNK27)
91065-60002	B		A		TIMER-COUNTER SUBSYSTEM	VERIFICATION
91065-60003	B		R		VERCT	
91200-16001	1523		R		RTE DRIVER DVR13	
91200-16002	1523		R		TV INTERFACE LIBRARY	
91200-16004	1523		R		RTE TV VERIFICATION	
91700-16001	B		R	P	PLOS	
91700-16002	B		R	P	REMAT	
91700-16004	B		R	P	PRUGL	
91700-16005	B		R	P	OPERM	
91700-16006	B		R	P	DLIST	
91700-16007	B		R	P	UPLIN	
91700-16009	C		R	C	LSTEN	(CCE DS/1B)
91700-16010	C		R	C	DAPOS	(CCE DS/1B)
91700-16011	C		R	C	DCLOS	(CCE DS/1B)
91700-16012	C		R	C	DC/NT	(CCE DS/1B)
91700-16013	C		R	C	DCRET	(CCE DS/1B)
91700-16014	C		R	C	DLOCF	(CCE DS/1B)
91700-16015	C		R	C	DNAME	(CCE DS/1B)
91700-16016	C		R	C	DOPEN	(CCE DS/1B)

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91700-16017 C     R C  DPOSN                          (CCE DS/1B)
91700-16018 C     R C  DPURG                          (CCE DS/1B)
91700-16019 C     R C  DREAD                          (CCE DS/1B)
91700-16020 C     R C  DSTAT                          (CCE DS/1B)
91700-16021 C     R C  DWIND                          (CCE DS/1B)
91700-16022 C     R C  DWRIT                          (CCE DS/1B)
91700-16023 C     R C  POPEN                          (CCE DS/1B)
91700-16024 B     R P  PTOPM
91700-16025 B     R P  RFAEX
91700-16026 B     R P  RFAM
91700-16027 B     R P  EXECM
91700-16028 C     R C  DEXEC                          (CCE DS/1B)
91700-16029 B     R P  RES
91700-16030 C     R C  QUEUE                          (CCE DS/1B)
91700-16031 B     R P  FLOAD
91700-16032 B     R P  DMESS
91700-16033 B     R P  DMESG
91700-16034 B     R P  RELRN
91700-16035 B     R P  MSTR
91700-16036 C     R C  GET                            (CCE DS/1B)
91700-16037 B     R P  SCEGN
91700-16038 B     R P  SCGN0
91700-16039 B     R P  SCGN1
91700-16040 B     R P  SCGN2
91700-16041 B     R P  SCGN3
91700-16042 B     R P  SCGN4
91700-16043 B     R P  SCGN5
91700-16044 C     R C  CCELIB1                        (CCE DS/1B)
91700-16045 B     R P  CCE LIB 2
91700-16047 B     R P  D65SV
91700-16048 B     R P  STMCF
91700-16049 C     R C  PLOSB                          (CCE DS/1B)
91703-16002 C     R C  TEXEC                          (SCE/3  DS/1B)
91703-16003 C     R C  RFAIN                          (SCE/3  DS/1B)
91703-16004 C     R C  *TAM                           (SCE/3  DS/1B)
91703-16006 B     A P  SCE/2 (4K)
91703-16007 B     A P  SCE/2 (8K)
91703-16008 B     A P  SCE/2 (12K)
91703-16009 B     A P  SCE/2 (16K)
91703-16010 B     A P  SCE/2 (24K)
91703-16011 B     A P  SCE/2 (32K)
91704-16001 B     R P  %RFAN
91704-16002 B     R P  %ASGN
91704-16003 B     R P  %INTR
91704-16004 B     R P  %BSPV
91704-16005 B     R P  %OPMD
91704-16006 B     R P  BRTBL
91704-16007 B     R P  NMTBL
91704-16008 B     R P  %TAM
91704-16010 B     R P  %BUFR
91704-16011 B     R P  BNTBL
91704-16012 B     R P  %PTP
91704-16013 B     R C  SCE/4 BASIC
91705-16001 B     R P  #QUE
91705-16002 B     R P  #DISP
91705-16003 B     R P  #DEQ
91705-16005 B     R P  ENABL
91705-16006 B     R P  #INTR
91705-16007 B     R P  #RQPR
91705-16008 B     R P  APLDR (FOR SCE/5 ONLY)
91705-16009 B     R P  REMAC
91705-16010 B     R P  #REFA
91705-16011 B     R P  #PTP
91705-16012 B     R P  DMESG
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91705-16013 A      R P  #CLCK
91780-60001 A      R P  DVR50  SYSTEM RESIDENT       BISYNC DRIVER
91780-60002 A      R P  #RDTS  DEVICE EMULATOR       (ASCII, NO FMP)
91780-60003 A      R P  #INRP  OPERATOR INTERRUPT    PROGRAM
91780-60004 A      R P  #BSC   LIBRARY RESIDENT      BISYNC DRIVER
91780-60005 A      R P  #DIAL  MANUAL DIAL PROGRAM
91780-60006 A      R P  #TIME  BISYNC TIMEOUT        PARAMETER MODULE
91780-60007 A      R P  #RDTS  DEVICE EMULATOR       (EBCDIC, NO FMP)
91780-60008 A      R P  #INXT  OPERATOR INTERRUPT    PRIV LIB SUBROUTINE
91780-60009 A      R P  #RDTS  DEVICE EMULATOR       (ASCII, WITH FMP)
91780-60010 A      R P  #RDTS  DEVICE EMULATOR       (EBCDIC, WITH FMP)
91780-60011 A      R P  #CORE  PROGRAM FOR MAKING    #BCS CORE-RESIDENT
91780-60012 A      R P  #JP50  INTERRUPT LINKAGE     FOR DVR50
92000-16001 A      R C  AUTO RESTART PROGRAM         AUTOR
92000-16002 A      R C  MEMORY ALLOCATION            $ALC
92000-60001 B      R C  RTE-B OPERATING SYSTEM       RTBOS
92000-60002 A      R P  RTE-B I/O CONTROL            RTC
92000-60003 A      R P  RTE-B BUFFERING              BUF
92001-12001 B      R P  RTE ASSEMBLER
92001-16002 C      R C  RTE-II LOADR
92001-16003 B      R P  MUL. TERM. MONITOR           (PRMPT, R$PN$)
92001-16004 C      R C  PWR FAIL (DVP43)
92001-16005 B      R P  RTE SYSTEM LIB
92001-16012 C      R P  CORE RES OPER SYS
92001-16013 C      A C  RTE II SYSTEM GENERATOR      7900 DISK (RTGEN)
92001-16014 B      R    AUTO RESTART (AUTOR)
92001-16018 1529   A C  RTE II SYSTEM GENERATOR      (FIXED HEAD DISC)
92001-16020 1534   R    RTE LINE PRINTER DRIVER      DVA12
92001-16020 1534   S    RTE LINE PRINTER DRIVER      DVA12
92002-12001 C      R C  BATCH MONITOR PROGRAM
92002-12002 C      R C  SPOOL PROGRAM
92002-16006 C      R C  BATCH MONITOR LIBRARY
92002-16010 C      R C  RTE EDITR
92060-12001 A      R C  SPOOL PROGRAM
92060-12003 B      R C  RTE III MEMORY RESIDENT      OPERATING SYSTEM
92060-12004 A      R C  RTE ASMB REL
92060-16001 A      R    PWR FAIL(DVP43)
92060-16004 A      R C  RTE III  LOADR REL
92060-16006 A      R C  WHZAT
92060-16026 A      R C  RTE ASMB XREF
92060-16029 A      A C  7900 RTE III RTGEN ABS
92060-16034 A      R C  SP.CL
92060-16035 A      R    $PVMP
92202-16001 A      R    7970  MAG TAPE UNIT RTE     DRIVER DVR23
92401-60001 A      R    THERMOCOUPLE LINEARIZATION  PACKAGE
92402-60001 A      R    HUMIDITY PACKAGE
92403-60001 A      R    STATISTICAL ANALYSIS        PACKAGE
92404-60001 A      R    CODE CONVERSION PACKAGE
92405-60001 A      R    CURVE FITTING PACKAGE
92406-60001 A      R    INTERPOLATION PACKAGE
92407-60001 A      R    INTEGRATION PACKAGE
92409-60001 B      R P  7210 PLOTTER LIBRARY                    PLOTLIB
92413-16001 A      R    ISA FTN FREQ                FREQUENCY MEASUREMENT
92413-16002 A      R    ISA FTN ADC..               ANALOG INPUT
92413-16003 A      R    ISA FTN AOF.W               ANALOG OUTPUT
92413-16004 A      R    ISA FTN DI.O                DIGITAL INPUT/OUTPUT
92413-16005 A      R    ISA FTN #GET!               TABLE SUBROUTINE
92413-16006 A      R    ISA FTN TRPNT               TRPNT FIX FOR ALARM
92413-16007 A      R    ISA FTN ALARM               EVENT SENSE INTERRUPT PROG
92413-16008 A      R    ISA FTN EVSNS               EVENT SENSE
92413-16009 A      R    ISA FTN STALL               STALL ALARM PROGRAM
92413-16010 A      R    ISA FTN LIBRARY             LIBRARY TAPE
92413-16011 A      A    ISA FTN           RTETG     TABLE GENERATOR
92413-16012 A      R    ISA FTN TBL GEN   C2313     2313 AND 6940 CONFIGURATOR
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92413-16013	A	R	ISA FTN TBL GEN	RTETG	MAIN PROGRAM
92413-18001	A	S	ISA FTN FREQ		FREQUENCY MEASUREMENT
92413-18002	A	S	ISA FTN ADC..		ANALOG INPUT
92413-18003	A	S	ISA FTN AOF.W		ANALOG OUTPUT
92413-18004	A	S	ISA FTN DI.O		DIGITAL INPUT/OUTPUT
92413-18005	A	S	ISA FTN #GET¡		TABLE SUBROUTINE
92413-18006	A	S	ISA FTN TRPNT		TRPNT FIX FOR ALARM
92413-18007	A	S	ISA FTN ALARM		EVENT SENSE INTERRUPT PROG
92413-18008	A	S	ISA FTN EVSNS		EVENT SENSE
92413-18009	A	S	ISA FTN STALL		STALL ALARM PROGRAM
92413-18012	A	S	ISA FTN TBL GEN	C2313	2313 AND 6940 CONFIGURATOR
92413-18013	A	S	ISA FTN TBL GEN	RTETG	MAIN PROGRAM
93005-16001	A	R	93005A/9866A		BCS VERIFICATION TEST
93005-16002	A	R	93005A/9866A		RTE VERIFICATION TEST
93009-60001	A	A	HP 93009A SUBSYSTEM		VERIFICATION
93009-60002	A	R	93009A RTE VERIFICATION		T4010
93501-60001	A	A	DVM/SCANNER SUBSYSTEM		VERIFICATION
93501-60002	A	R	DVM/SCANNER SUBSYSTEM		RTE VERIFICATION
93501-60003	A	R	DVR47 RTE DRIVER		DVM/SCANNER SUBSYSTEM
93501-60004	A	R	TSCAN		
93505-16001	A	R	93505A VERIF.		TASK1 RELOC.
93513-16001	A	A	HP 2801A SUBSYSTEM		VERIFICATION
93513-16002	1518	R	HP2801 RTE DRIVER		DVA76
93513-16003	1518	R	HP2801 BCD TO FLOATING PT.		CONVT
93513-16004	1518	R	HP2801 RTE VERIFICATION		TEST(V2801)
93520-16001	1520	R	HP5360 RTE DRIVER		DVR53
93520-16002	1520	R	HP5360 BCD TO DP FP		C5360
93520-16003	1520	R	HP5360 RTE VERIFICATION		V5360
93520-18001	1520	S	HP5360 RTE DRIVER		DVR53
93520-18002	1520	S	HP5360 BCD TO DP FP		C5360
93520-18003	1520	S	HP5360 RTE VERIFICATION		V5360

documentation

The following tables list all currently available software manuals for Data Systems Division products. This list supersedes the previous list in the **Communicator.** Copies of manuals and update packages can be obtained from your local Sales and Service Office. The address and telephone number of the office nearest to you are listed in the back of all reference manuals.

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manuals you need on the Corporate Parts Center form supplied at the back of the **Communicator.** If you require an update package only send your request to:

Software/Publications Distribution
11000 Wolfe Road
Cupertino, Ca. 95014

9600/9700 SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02005-90001	Real-Time Executive Software System	$12.00	10/71	
02313-93002	RTE 2313B Analog-Digital Interface Subsystem Operating and Service Manual	12.50	02/75	
02320-93002	RTE System Driver DVR76 for HP 2320A Low Speed Data Acquisition Subsystem Programming and Operating Manual	1.00	08/74	
02321-93001	RTE System Driver DVR74 for HP 2321A Low Speed Data Acquisition Subsystem Programming and Operating Manual	1.00	08/74	
09600-93010	RTE System DVR11 for HP 2892A Card Reader Programming and Operating Manual	1.00	08/74	

9600/9700 SYSTEM MANUALS (Continued)

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
09600-93015	91200A TV Interface Kit; Programming and Operating Manual	4.50	07/75	
09601-93007	RTE Device Subroutine for HP 5327A/B-H48 Counter	2.50	12/74	
09601-93009	RTE Device Subroutine for HP 5326A-H18 Counter	2.50	12/74	
09601-93014	RTE System Driver DVR15 Mark Sense Card Reader Programming and Operating Manual	1.00	08/74	
09601-93015	RTE for 40-bit Output Register #12556B	1.00	10/74	
09603-93001	9603A/9604A Control System and Scientific Measurement Operating and Service Manual	7.50	06/75	
09610-93003	ISA FORTRAN Extension Package	2.50	05/75	07/75
09611-90009	9611A Operating 406 Industrial Measurement and Control System		04/75	
09611-90010	HP 6940A/B Multiprogrammer Verification Manual	4.50	08/75	
12604-93002	RTE DVR40 for 12604B Data Source Interface	1.00	08/74	
12665-93001	RTE System Driver DVR65 for HP 12771A Computer Serial Interface Kit	1.00	08/74	
12989-99001	RTE System Driver DVA 15 for Card Reader Punch Subsystem 2894	1.00	01/75	
25117-93003	RTE System Driver DVR24 for HP 7970 Series Digital Magnetic Tape Unit	1.00	08/74	
29003-93001	RTE System Driver DVR66 for HP 12772A Coupler Modem Interface Kit Programming and Operating Manual	1.00	08/74	
29003-93003	RTE System Driver DVR66 for HP 12770A Coupler Serial Interface Kit Programming and Operating Manual	1.00	08/74	
29009-93001	RTE System Driver DVR62 for HP 23138 Subsystem	2.50	08/74	
29013-90001	DVR31 RTE Moving Head Driver	10.00	02/73	
29014-90001	Moving Head Real-Time System Generator		04/72	
29015-90001	Fixed Head Real-Time System Generator			
29016-90002	RTE Scheduler		09/72	
29016-90003	Real-Time Input/Output Control		09/72	
29022-90001	Real-Time Relocating Loader	10.00	06/73	
29028-95001	RTE HP 2610A/2614A Line Printer Driver	1.50	10/72	
29029-91001	Real-Time Executive Multiple-Device System Control Device (DVR00) Program Listing	10.00	09/72	
29029-95001	Real-Time Executive System Driver DVR00 for Multiple Device System Control Small Programs Manual	1.00	10/72	03/75
29033-98000	Real-Time Executive-File Manager System	10.00	03/73	
29100-93001	RTE System Driver DVR40 (29100-60041) for HP 12604B Data Source Interface Programming and Operating Manual	1.00	08/74	
29100-93003	RTE System Driver DVR61 for HP 6940A, 6941A Bidirectional Multiprogrammer Programming and Operating Manual	3.00	08/74	
29101-93001	RTE Core-Based Software System Users Manual	5.00	08/73	
29102-93001	RTE-B Programming and Operating Manual	10.00	03/74	08/75
29103-93001	RTE System Cross Loader; Programming and Operating Manual	2.50	03/75	
91060-93005	RTE Driver for X-Y Display Storage Subsystem (HP Model 1331C-016) Programming and Operating Manual	1.00	08/74	
91062-93003	Real-Time Executive System Driver for DVM/Scanner Subsystem	9.00	08/74	
92001-93001	Real-Time Executive II Software System	10.00	01/75	
92002-93001	RTE Batch-Spool Monitor Programming and Operating Manual	$10.00	02/75	05/75
92060-90004	RTE-III Software System Reference Manual, Preliminary	22.00	06/75	
92060-90005	RTE Assembler Reference Manual	7.00	05/75	
92200-93001	RTE System Driver DVR12 for HP 2607A Line Printer Programming and Operating Manual	1.00	08/74	
92200-93005	Real-Time Executive Operating System Drivers and Device Subroutine Manual	5.00	11/74	
92202-93001	RTE System Driver DVR23 for HP 7970 Series Digital Mag Tape Units Programming and Operating Manual	1.00	08/74	
93005-93005	Thermal Line Printer Subsystem for Driver DVR00 (RTE)	2.50	12/74	
93513-90002	RTE System Driver DVA 76-DVR40 for 2801 Quartz Thermometer System	1.50	04/75	

SOFTWARE INPUT/OUTPUT SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02100-90072	HP 2605A Console Printer Driver	$ 1.00	03/72	
02116-91760	Teleprinter Driver (LP Compatible) Manual	1.00	08/73	
02762-90002	HP 2762A Terminal Printer Driver	1.00	05/73	
02892-90003	HP 2892A Card Reader Driver	1.50	06/72	
12602-90022	Mark Sense Card Reader Drivers	1.00	06/70	
12653-90004	HP 2767 Line Printer Driver	1.00	09/70	01/73
12845-90005	HP 2610A/2614A Line Printer Driver	1.00	02/74	
12987-90006	HP 2607 Line Printer Driver	5.00	11/73	
13022-90010	HP 7970 Magnetic Tape Unit Driver	1.00	02/72	
13029-90010	Magnetic Tape Driver (7-Track)	1.00	02/72	
5950-9276	SIO Drum-Disc	1.00	02/70	
5951-1374	Software Input/Output System Configuration	1.00	07/74	
5951-1390	Subsystem Operation	2.00	10/74	

BASIC CONTROL SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02022-90014	Magnetic Tape Reformatting System Support Utilities	$ 1.50	01/74	
02100-90073	HP 2605A Console Printer Driver	1.00	03/72	06/72
02100-90129	HP 2100 Microassembler Coding Form	5.00		
02100-90140	Decimal String Arithmetic Routines	6.50	10/73	
02108-90008	Microprogramming 21MX Computers Reference Manual	5.00	08/74	02/75
02116-9017	Basic Control System Manual	8.50	12/71	
02116-91751	Prepare Tape System	2.50	08/74	
02116-91752	Magnetic Tape System	6.00	06/71	
02116-91780	2100 Series Relocatable Subroutines	11.00	10/73	
02762-90003	HP 2762A Terminal Printer Driver	1.00	05/73	
02892-90004	HP 2892A Card Reader Driver	1.50	06/72	
12602-90021	Mark Sense Drivers	1.00	06/70	
12653-90005	HP 2767 Line Printer Driver	1.00	10/70	
12845-90004	HP 2610A/2614A Line Printer Driver	1.00	06/72	
12987-90008	HP 2607 Line Printer Driver	5.00	12/73	
13023-90010	HP 7970 Magnetic Tape Unit Driver	1.00	05/74	
13026-90010	Magnetic Tape Driver (7-Track without DMA)	1.00	05/71	06/72
13027-90010	Magnetic Tape Driver (7-Track with DMA)	1.00	05/71	06/72
24380-90001	HP 2100 Remote Job Entry Processor	3.00	10/73	
5951-1371	HP 2100 Front Panel Procedures	1.00	08/73	
5951-1376	Basic Binary Loader/Disc Loader, Basic Moving-Head Disc Loader	1.00	04/74	
5951-1391	Basic Control System	1.50	10/74	
5951-1392	Magnetic Tape System	1.00	07/71	

DISC OPERATING SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02100-90074	HP 2605A Console Printer Driver	$ 1.00	03/72	
02762-90004	HP 2762A Terminal Printer Driver	1.00	05/73	
02767-90007	DOS/RTE 2767 Line Printer Driver	1.00	12/70	
02892-90005	HP 2892A Card Reader Driver	1.50	06/72	
12560-90023	DOS and RTE CALCOMP Plotter Driver	1.50	02/70	
12587-90011	HP 12587B Asynchronous Data Set Interface Driver Reference Manual	5.00	05/74	
12602-90023	DOS/RTE Mark Sense Drivers Kit 12602B	1.00	08/70	
12908-90004	HP 12908 Writable Control Store Driver	1.00	02/75	
12920-90004	HP 12920B Asynchronous Multiplexer Interface Driver Reference Manual	5.00	05/74	

DISC OPERATING SYSTEM MANUALS (Continued)

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
24307-90006	DOS-III Reference Manual			
24307-90012	DOS-III Data Communications Drivers	7.50	11/74	01/75
24307-90018	DOS-III Pocket Guide	3.50	04/75	
24307-90002	DOS-III Terminal Printer Driver	1.00	01/75	
24307-90073	DOS-III Standard Drivers	6.00	01/75	
24376-90001	IMAGE/2000 Data Base Management System Reference Manual	11.00	11/74	
5951-1366	Cross Reference Table Generator	1.00	08/74	
5951-1381	DOS-M/2000C Timeshared BASIC File Handler	1.00	05/71	
5951-1394	2000C File Interface for DOS-M	1.00	06/71	

LANGUAGE MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02116-9014	HP Assembler Manual	$ 6.50	11/74	
02116-9015	HP FORTRAN Manual	5.00	03/74	
02116-9016	Symbolic Editor	4.50	02/74	
02116-9072	ALGOL Reference Manual	10.00	10/74	
12907-90010	Implementing the HP 2100 Fast FORTRAN Processor	5.00	11/74	
24307-90014	DOS III Assembler Reference Manual	8.00	07/74	
92060-90005	RTE Assembler Reference Manual	7.00	05/75	
5951-1321	HP FORTRAN IV Reference Manual	6.00	11/74	

training schedule

The schedule for customer training courses on Data Systems Division products is outlined below. Included here are courses for the 6 month period November, 1975 through April, 1976.

DATA SYSTEMS DIVISION CUSTOMERS COURSE SCHEDULE
Nov. 1975 – Apr. 1976

Training Course Dates and Center Location

COURSE NUMBER	COURSE TITLE	LENGTH	DATA SYSTEMS CUPERTINO	EASTERN TRAINING CENTER – ROCKVILLE
22940A	2100 MAINT.	10 days	12/1/75 1/19/76 3/22/76	11/3/75 12/8/75 1/12/76 3/1/76
22941A	21MX MAINT.	5 days	11/17/75 1/26/76 3/8/76 4/5/76	12/1/75 2/9/76 4/5/76

Training Course Dates and Center Location

COURSE NUMBER	COURSE TITLE	LENGTH	DATA SYSTEMS CUPERTINO	EASTERN TRAINING CENTER – ROCKVILLE
22942A	7900 MAINT.	5 days	12/8/75 2/2/76 3/15/76 4/5/76	
22950A	2100 SER. ASSM.	5 days	11/17/75 1/12/76 2/9/76 3/8/76 3/29/76 4/26/76	11/17/75 12/1/75 1/5/76 1/19/76 2/2/76 3/15/76 3/29/76
22952A	DOS III B	5 days	11/3/75 3/1/76	
22953A	2100 TCS/IMAGE	5 days	11/10/75 3/8/76	
22960A	21MX MIC. PROG.	5 days	12/1/75 1/19/76 2/23/76 4/5/76	
22965*	REAL TIME MEASUREMENT AND CONTROL [Course includes: RTE Oper. Sys., 5 days, B.S. Monitor, 2 days, and Meas. and Cont., 3 days.]	10 days	11/3/75 12/1/75 1/5/76 1/19/76 2/2/76 2/23/76 3/15/76 3/29/76 4/19/76	11/3/75 12/8/75 1/5/76 1/26/76 3/1/76 3/22/76 4/19/76
22969A	DISTB. SYS.	5 days	12/15/75 2/2/76 4/12/76	11/17/75 3/15/76

Registration

Requests for enrollment in any of the above courses should be made through your local HP representative. He will supply the Training Registrar at the appropriate location with the course number, dates, and requested motel reservations. Enrollments are acknowledged by a written confirmation indicating the Training Course, time of class, location and accommodations reserved.

Accommodations

Students provide their own transportation, meals, and lodging. The Training Registrar will be pleased to assist in securing motel reservations at the time of registration.

Cancellations

In the event you are unable to attend a class for which you are registered, please notify the Training Center Registrar immediately in order that we may offer your seat to another student. To avoid paying for a reservation which you do not use, we must receive notification of your cancellation no later than two weeks before the class begins.

Eastern Training Center

Hewlett-Packard
4 Choke Cherry Road
Rockville, Maryland 20850
(301) 948-6370

Data Systems Division Training Center

Hewlett-Packard
11000 Wolfe Road
Cupertino, California 95014
(408) 257-7000

subscription information

Annual subscriptions consisting of 8 issues are available as outlined below.

I. CUSTOMERS WITH SOFTWARE MAINTENANCE AGREEMENTS OR SOFTWARE SUBSCRIPTION SERVICE AGREEMENTS (SOFTWARE SERVICE CONTRACT SUBSCRIPTIONS)

All Hewlett-Packard customers with Software Service Contracts are entitled to one BASE SUBSCRIPTION (1 copy per issue) at no additional charge. These customers may also buy ADDITIONAL SUBSCRIPTIONS whose purchase price is to be prorated against the remaining life of their Software Service Contract. A proration table appears on the ORDER FORM which is bound into this issue.

To receive a BASE SUBSCRIPTION at no charge as well as to purchase ADDITIONAL SUBSCRIPTIONS under the provisions of the Software Service Contract Program, complete the ORDER FORM and forward it to your local HP Sales and Service Office. Your local Customer Engineer will validate your order and mail it to the appropriate HP department.

Rates:	U.S.A.	NON-U.S.A.
BASE SUBSCRIPTION	NAC*	NAC*
ADDITIONAL SUBSCRIPTIONS (ea.)	$12/yr.	**

1) ADDITIONAL SUBSCRIPTIONS must go to the same address as the BASE SUBSCRIPTION to qualify for the reduced rates.

2) ADDITIONAL SUBSCRIPTIONS ordered at a later date than the BASE SUBSCRIPTION must include, with the order form, a copy of the address label for proper identification.

3) Charges for ADDITIONAL SUBSCRIPTIONS will be prorated to expire with your Software Service Contract.

4) Orders for ADDITIONAL SUBSCRIPTIONS from a customer with a Software Service Contract will be verified by the Customer Engineer who will complete the "FOR HP USE ONLY" portion of the subscription form and direct the order to the appropriate HP department. The customer will be billed by his local HP Customer Engineering Department.

*No Additional Charge (NAC)
**Contact your local HP Customer Engineer for the price in the currency of your country.

II. CUSTOMERS WITHOUT SOFTWARE MAINTENANCE AGREEMENTS OR SOFTWARE SUBSCRIPTION SERVICE AGREEMENTS (MAIL ORDER SUBSCRIPTIONS)

Rates:	U.S.A.	NON-U.S.A.
BASE SUBSCRIPTION	$48/yr.	***
ADDITIONAL SUBSCRIPTIONS (ea.)	$12/yr.	***

1) ADDITIONAL SUBSCRIPTIONS must be ordered at the same time as the BASE SUBSCRIPTION and go to the same address as the BASE SUBSCRIPTION to qualify for the reduced rate.

2) The customer is to include payment (check, bank draft, money order, etc.) with the order. This is a Direct Mail Order procedure; please do not send a purchase order to HP.

3) Complete the ORDER FORM as directed and mail together with your payment to:

Hewlett-Packard Co.
Mail Order Dept.
P. O. Drawer #20
Mountain View, California 94043
U.S.A.

SUBSCRIPTION CORRESPONDENCE

Address all correspondence relating to **COMMUNICATOR** subscriptions to:

Subscription Service Manager
Hewlett-Packard Company
Corporate Parts Center
333 Logue Avenue
Mountain View, California 94043
U.S.A.

***The international customer is encouraged to also use HP's Direct Mail Order System by remitting a bank draft in U.S. dollars according to the order procedure outlines above. If the currency regulations in the customer's country disallow the purchase of bank drafts in American dollars, or if the customer does not have ready access to the required banking services, the customer may order subscriptions from the local HP Sales and Service Office through his Customer Engineer. The customer should contact his HP Office for the price of the subscription in the currency of his country then complete the ORDER FORM and forward it together with payment to his local HP Office.

HEWLETT hp PACKARD

CORPORATE PARTS CENTER

Direct Mail
Parts and Supplies Order Form

SHIP TO:

NAME _____

COMPANY _____ CUSTOMER REFERENCE # _____

STREET _____ TAXABLE*? _____

CITY _____ STATE _____ ZIP CODE _____

Item No.	Check Digit	Part No.	Qty.	Description	List Price Each		Extended Total	

Special Instructions

Sub-total		
Your State & Local Sales Taxes*		
Handling Charge	1	50
TOTAL		

*Tax is verified by computer according to your ZIP CODE. If no sales tax is added, your state exemption number must be provided: #_____. If not, your order may have to be returned.

Check or Money Order, made payable to Hewlett-Packard Company, must accompany order.

When completed, please mail this form with payment to:

HEWLETT-PACKARD COMPANY
Mail Order Department
P.O. Drawer #20
Mountain View, CA 94043

Phone: (415) 968-9200

Most orders are shipped within 24 hours of receipt. Shipments to California, Oregon and Washington will be made via UPS. Other shipments will be sent Air Parcel Post, with the exception that shipments over 25 pounds will be made via truck. No Direct Mail Order can be shipped outside the U.S.

Although every effort is made to insure the accuracy of the data presented in the **Communicator**, Hewlett-Packard cannot assume liability for the information contained herein.

Prices quoted apply only in U.S.A. If outside the U.S., contact your local sales and service office for prices in your country.

direct mail order form

To expedite your order for software, manuals, or other materials described in this publication, use this form to order directly from the Corporate Parts Center in Mountain View, California.

1. Enter your name, address, customer reference number, and tax exemption information.
2. List the item or items you want by part number and description.
3. Compute the amount due and enclose a check or money order payable to Hewlett-Packard.

If you need assistance in placing your order, contact your local HP Sales Office.

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Manual Distribution Center
Hewlett-Packard
11000 Wolfe Road
Cupertino, Ca. 95014

Computer Systems **Communicator**
Published by:
HP General Systems Division
5303 Stevens Creek Blvd.
Santa Clara, CA. 95050

November 1975

Address Correction Requested