



ISSUE No. 7
APRIL 1, 1976

computer systems COMMUNICATOR

The central graphic is a large purple rectangle. At the top, there is a photograph of an HP 3000 Mini Datacenter system, including a console and a large cabinet. At the bottom, there are two more photographs of computer systems. The top-left photograph shows a console and a cabinet, while the top-right photograph shows a console, a cabinet, and a printer. In the center of the purple area is a large white circle divided into three segments. The top segment is labeled "HP 3000 MINI DATACENTER". The bottom-left segment is labeled "2000/ACCESS REMOTE DATA ENTRY/ DATA COMMUNICATION". The bottom-right segment is labeled "9600 MEASUREMENT AND CONTROL SYSTEM".

subscription information

Annual subscriptions consisting of 6 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 name and 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)

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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 name and 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 No. 20
Mountain View, California 94043
U.S.A..**

SUBSCRIPTION CORRESPONDENCE

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

**Subscription Service Manager
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Mail Order Dept.
P.O. Drawer No. 20
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.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

**HEWLETT-PACKARD
COMPUTER SYSTEMS COMMUNICATOR ORDER FORM**



Please Print:

Name _____ Title _____
 Company _____
 Street _____
 City _____ State _____ Zip Code _____
 Country _____

<input type="checkbox"/> MAIL ORDER SUBSCRIPTIONS BASE SUBSCRIPTION \$ _____ _____ ADDITIONAL SUBSCRIPTION(S) \$ _____ No. _____ TOTAL AMOUNT ENCLOSED \$ _____	<input type="checkbox"/> 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 4/76

TABLE OF PRORATED \$ AMOUNT DUE PER ADDITIONAL SUBSCRIPTION												
<small>(Use only for ordering ADDITIONAL SUBSCRIPTION(S) against an existing Software Service Contract)</small>												
	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 (6 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 (6 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 name and address as the BASE SUBSCRIPTION.

**HEWLETT-PACKARD
COMPUTER SYSTEMS COMMUNICATOR ORDER FORM**

Please Print:

Name _____ Title _____
 Company _____
 Street _____
 City _____ State _____ Zip Code _____
 Country _____

MAIL ORDER SUBSCRIPTIONS

SOFTWARE SERVICE CONTRACT SUBSCRIPTIONS

BASE SUBSCRIPTION \$ _____

BASE SUBSCRIPTION (NO ADDITIONAL CHARGE) NAC

_____ ADDITIONAL SUBSCRIPTION(S) \$ _____

_____ ADDITIONAL SUBSCRIPTION(S) \$ _____

No.

No.

TOTAL AMOUNT ENCLOSED \$ _____

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 _____

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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

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 - a) Annual Base Subscription (6 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 (6 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

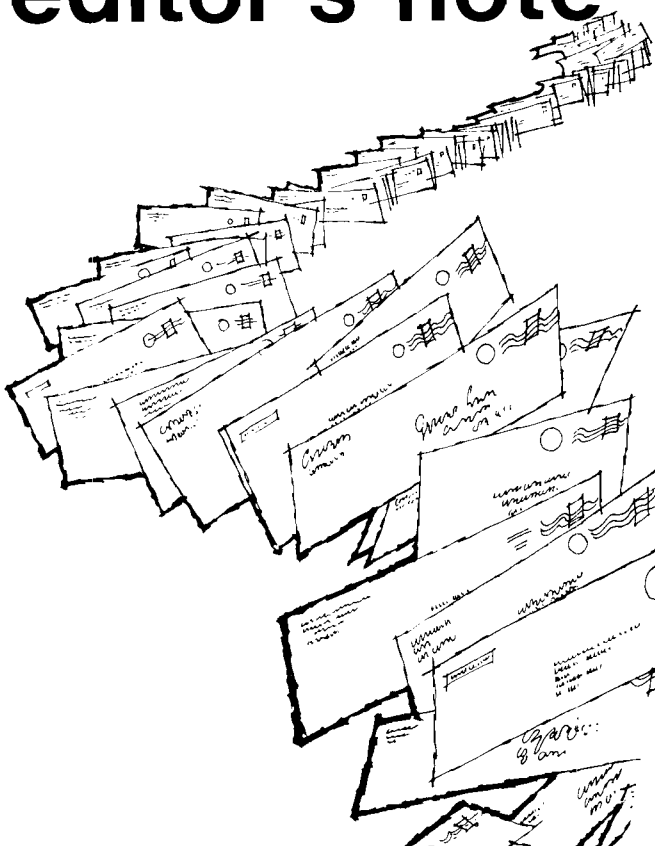
1. International customers who do not have Software Service Contracts are encouraged to use HP's Direct Mail Order System by remitting a bank draft in U.S. dollars according to the ordering procedures outlined in Instruction A above. Optionally, international customers may purchase the **Communicator** 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 name and address as the BASE SUBSCRIPTION.

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Rev. 4/76

editor's note

contents



We are happy to hear from your letters that **Communicator** articles are supplying you with helpful information for your computer applications. However, it seems that some readers are having problems getting their copies of the **Communicator** in a timely fashion.

This is to let you know that help is on the way. Although our best efforts cannot speed up the actual movement of mail once it leaves our hands, we have changed U.S. delivery from 4th to 3rd class mailing as of this issue, which should improve delivery times considerably. International mailings have regularly been sent as Air Printed Matter.

In this issue the Corporate Parts Center describes their role in getting the **Communicator** to you with the least possible delay (see page 273).

Our feature article in this issue gives you some practical guidelines in using the tape cartridge features of HP's 2644A terminals. As always, you are encouraged to contribute articles describing your particular application of HP systems. Send any contributed articles to one of the technical editors listed in the January 1st issue of the **Communicator**, or address correspondence to:

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

Subscription Information	i
Distribution of the Communicator	273
ABOUT THE HP 2000	
Software Tips	274
2000/F to 2000 Access Conversion Programs	274
Terminals Used on 2000 Access	274
FCOPY/2000	274
Bulletins	275
TSP Manuals	275
FCOPY/2000 Manual	276
2000 Access Update	276
Documentation	279
Training Schedule	281
ABOUT THE HP 3000	
Software Tips	282
Computing Directory Size	282
Timeouts on the 2780/3780 Emulator	282
Program File VS. Disc Extents	282
RIN's	283
HP 3000CX Modem Support	285
Bulletins	294
TRACE/3000 Reference Manual	294
HP 3000 Instruction Decoding Pocket Guide	295
New IMAGE and QUERY Manuals	295
Correction to Bulletin on COBOL Self Study Course	295
BASIC/3000 to IMAGE/3000 Interface	295
New Compiler Library Manual	295
Software Updates	296
MPE 32000C.00.11	296
2780/3780 Emulator, HP 30130B.01.04	298
BASICOMP/3000, HP 32103A.00.04	298
COBOL/3000, HP 32213B.01.05	299
Compiler Library/3000, HP 32211C.04.00	300
IMAGE/3000, HP 32215A.04.00	301
QUERY/3000, HP 32216A.03.00	302
RPG/3000, HP 32104.02.02	306
RTE-C Programmable Controller, HP 30301A.00.01	306
SPL/3000, HP 32100A.06.00	307
TRACE/3000, HP 32222A.02.03	308
Documentation	308
Training Schedule	310
FEATURE ARTICLE	
Using the Tape Cartridge on Your 2644	312
ABOUT THE 9600/9700	
Software Tips	315
RTE-III and Partitioning of Memory	315
Event Counting with ISA FORTRAN and 6940	315
Multi-Programmer	315
ACODE Problem in ALGOL Program	315
DCPC Contention	316
A Visit with SAM (System Available Memory)	317
Know your RTE, Part 1	319
Software Sam	328
Bulletins	328
Training News Flash	328
DSD Training Course Data Sheets	329
New Batch-Spool Monitor Reference Manual	329
New Releases from the Contributed Library	329
Software Updates	332
RTE-II/RTE-III	332
DOS-IIIB Modules	334
Documentation	335
Training Schedule	338

distribution of the communicator



*Edna Hill
HP Corporate Parts Center*

Subscriptions for the **COMMUNICATOR** are growing and we're anxious to do the best job possible in the way of processing and distributing this publication. We thought you might be interested in knowing a little about the Mail Order Department and the part we play in getting the **COMMUNICATOR** to you.

Our first subscription mailing of the **COMMUNICATOR** started with Issue 4 – November 15, 1975. Since then we have mailed Issue 5 – January 1, 1976, Issue 6 – February 15, 1976 and the issue in your hands, April 1, 1976. From the start, we had a familiar request and that was to send all previous subscription issues. The trend led to a routine which we followed through March 31st. We asked the computer to backdate a new subscriber's request so that it would allow us to send the first subscription issue (Issue 4) as well as subsequent ones. **In some instances, subscriptions will expire earlier than one year out (or one year from date of request) because of this.**

We process two distinct types of subscription orders – the regular Mail Order and the Software Service Contract Order.

The regular **Mail Order** requires that payment accompany the request and is sent directly to the Mail Order Department where it is assigned a subscription number. The shipping label generated will always carry this number and is interpreted this way: Order 6120186 (date of subscription expiration, followed by order number assigned); **6** (year 1976), **12** (month December), **0186** (order number).

The **Software Service Contract Order** is first approved by your local HP Customer Engineering Representative and then forwarded to the Mail Order Department where the same system records the order and assigns a number. If these orders are sent directly to the Mail Order Department before receiving your Customer Engineer's endorsement, we route them to the sales office and request their help. This same procedure applies to a Software Service Contract Subscription add-on or any contract transaction.

Unlike our daily shipments of mail orders for parts and supplies which are limited to domestic sales, direct mail **COMMUNICATOR** subscription orders are accepted from all over the world. Approximately one-third of the subscription orders are international.

The Mail Order Department maintains a very close relationship with the **COMMUNICATOR** staff members as well as our many field offices. While **they** are particularly concerned with technical inquiries and inputs, **we** keep all files pertaining to subscription records. We have found that details such as a wrong digit in your zip code can delay delivery, and therefore appreciate your attention to these little things which add to our assurance that the **COMMUNICATOR** reaches you in a timely fashion.

If you have questions or problems concerning your delivery of the **COMMUNICATOR**, address your correspondence to:

Subscription Service Manager
Hewlett-Packard Company
Corporate Parts Center
P.O. Drawer #20
Mountain View, Ca. 94043
U.S.A.

software tips

2000/F TO 2000 ACCESS CONVERSION PROGRAMS

Dan Jorgenson
HP General Systems

BASIC PROGRAMS

Physical conversion of *BASIC programs* stored on the 2000C' or 2000F HiBernate, SLEep or DUMp tape to 2000 Access System format is included in the price of the 2000F to 2000 Access Upgrade Kit, 19665A. This service is provided by your local HP Customer Engineer using a conversion program that runs on an HP 3000 system equipped with two tape drives.

If you have the use of an HP 3000 and wish to do this conversion yourself, you may order the conversion program at a price of \$40 with the following part numbers:

19665-10001 (9-track, 800 bpi tape), or
19665-11001 (9-track, 1600 bpi tape)

Procedures to use the conversion program are described in the 2000F to Access System Upgrade Kit Manual (19665-90001).

DATA FILES

Data files from 2000C' and 2000F may be converted to 2000 Access format on the 2000 Access System. A utility program called CONVERT is supplied with the Access System Master tape which allows the operator to restore 2000F and 2000C' files onto a slept 2000 Access System or to dump 2000 Access BASIC formatted files onto magnetic tape in 2000F format. The file conversion procedures are described in Appendix F of the 2000 Access Operator's Manual, 22687-90005.

TERMINALS USED ON 2000 ACCESS

Dan Jorgenson
HP General Systems

The following information is an attempt to answer the proverbial question "What terminals can I connect to an Access System?"

Eleven types of user terminals that can be connected to the 2000 Access System are listed below. The first ten generate ASCII code and the eleventh one generates CALL 360 or PTTC/EBDC (non-ASCII) code.

1. HP 2749 Teleprinter Terminal; ASR-33 or ASR-38 Teleprinter Terminals
2. HP 2640A or HP 2644A Interactive Display Terminals
3. HP 2600A CRT Terminal

4. HP 2762A Data Communications Terminal; strapped for ECHO-PLEX
5. GE TermiNet 300 Data Communications Terminal, Model B (10/15/30 cps) with Paper Tape Reader/Punch, Option 2; strapped for ECHO-PLEX
6. GE TermiNet 1200 Data Communication Terminal
7. ASR-37 Teleprinter Terminal with Paper Tape Reader/Punch. If the ASR-37 is equipped with the Shift Out (SO) feature, SO must be disabled because the 2000 Access System does not allow use of this feature.
8. GE TermiNet 30 Data Communications Terminal
9. Texas Instruments Silent 700
10. Execuport 300 Data Communications Transceiver Terminal
11. IBM 2741 Communication Terminal generates non-ASCII code and must be connected to the system over telephone lines. In addition, the terminal must be equipped with the following features:
 - a. Interrupt, Receive (IBM #4708) and Transmit (IBM #7900) associated with the terminal's ATTN key.
 - b. Dial-Up (IBM #3255) to enable system connection through a 103A modem or acoustic coupler.

In order to log on using the 2741, press the ATTN key rather than carriage return and linefeed. If your 2741 generates PTTC/EBDC code, the PLEASE LOG IN message will be garbled since the system only detects the code type when the H in the HELLO command is typed.

Note: In order to get the system's attention on the 2644 which has no linefeed key, you can either press the carriage return followed by a control-J or you can turn AUTO LF to ON and then press carriage return. If you use AUTO LF, it should be turned back to OFF after the PLEASE LOG IN message.

Any terminal equipped with an operator selectable automatic linefeed should be operated with this feature OFF.

FCOPY/2000

FCOPY/2000 (HP 22700A) is a file utility package written for the Hewlett-Packard 2000 Access System. It provides general file copying operations including capabilities for comparing files, code translations and printing files at line printers or terminals.

FEATURES:

- Copies entire file or portion of a file to another file.
- Copies data from 2000/Access BASIC formatted files to ASCII files and vice-versa.
- Stores copy of a disc file on a peripheral device for later restoration.

- Appends one BASIC formatted file to another file.
- Lengthens or shortens a BASIC formatted file.
- Compares contents of two files.
- Prints, lists and displays contents of files.
- Converts the ASCII data in a file to EBCDIC or BCD data, and vice-versa.
- Permits tape cartridge of an HP 2644A CRT terminal to be used as an input or output device.

OPERATING MODE

FCOPY/2000 can be used interactively from a terminal or controlled programmatically through a user-written BASIC application program.

COPYING FILE

Two types of files are available on the HP 2000 Access System: BASIC formatted files and ASCII files. FCOPY/2000 will transfer data from a BASIC formatted file to another BASIC formatted file or ASCII file, and from an ASCII file to another ASCII file or BASIC formatted file.

FCOPY/2000 allows the user to lengthen or shorten a BASIC formatted file by a specified number of records. BASIC formatted or ASCII disc files may contain up to 28,228 records of up to 512 bytes each.

Portions of a file may be extracted and copied to another file by specifying the record position numbers of individual records, or of a range of records.

Some FCOPY/2000 tasks permit the terminal to become an input or output file. Input from a terminal may come from the keyboard, punched papertape reader, or in the case of a HP 2644A terminal, its tape cartridge. Output to a terminal may be directed to the terminal's printer, CRT display, paper tape punch unit or to the magnetic tape cartridge of the 2644A CRT Terminal.

STORING AND RESTORING FILES

Basic formatted files may be stored on paper tape, magnetic tape, or on the magnetic tape cartridge of the HP 2644A Terminal. These files may later be restored to their original form on the system disc.

APPENDING FILES

A BASIC formatted file may be expanded by appending another BASIC formatted file to the end of it.

COMPARING FILES

FCOPY/2000 allows the user to compare two files, record by record, to determine if their contents are identical. The comparison may be terminated after a specified number of records have failed to match. The non-matching records may be printed at the user's terminal.

PRINTING, DISPLAYING FILES

The contents of a file may be printed on a line printer, on a hard-copy terminal or displayed on a CRT. The user can apply a number of options in various combinations to produce a variety of output formats. The output options include:

- Hexadecimal
- Octal
- ASCII code representation of control characters (shows ASCII control characters)
- Display of lower case letters as upper case.
- Compression of as many items as possible into one line.
- Paginated or unpaginated output.
- Unformatted output
- 72 or 132-column output with continuation on subsequent lines.
- Printing ASCII code representation of all string characters.
- Printing 22 line segments of output at a terminal, at a time.

FILE CONVERSION

Data in a file may be translated from ASCII to EBCDIC or BCD, or vice-versa, and saved in another file, or the same file.

FILE COMMANDS

The following HP 2000 Access System File commands are available as tasks within FCOPY/2000. The syntax of these tasks is identical to their corresponding 2000/Access BASIC commands.

CREATE	LOCK	SWA
FILE	PRIVATE	CATALOG
PURGE	UNRESTRICT	GROUP
PROTECT	MWA	LIBRARY

Contact your local HP sales office for ordering information or further questions on FCOPY/2000.

bulletins

TSP MANUALS

*Nancy Saylor
HP General Systems*

Manuals documenting the Telecommunications Supervisory Package/2000 for HASP Multileaving RJE Workstations are available from the Corporate Parts Center. Use the direct mail form in the back of this **Communicator** to request copies of the TSP manuals. Part numbers are:

- Telecommunications Supervisory Package/2000 Manager's Manual
Part number 20240-90001 Price: \$5.00

- Telecommunications Supervisory Package/2000 User's Manual
Part number 20240-90002 Price: \$3.50

FCOPY/2000 MANUAL

Mary Griffin
HP General Systems

The FCOPY Reference Manual for the HP 2000 Access System is now available and may be ordered using the Corporate Parts Center order form in the back of the **Communicator**.

FCOPY is a set of BASIC language utility programs that can be used to manipulate files on the 2000 Access System. For example, FCOPY will copy a file, or a portion of a file, to another file; compare the contents of two files; join two files together into one file; or lengthen or shorten a file.

The HP part number for this manual is 22700-90001 and the price is \$4.50.

software updates

2000 ACCESS UPDATE

There is a new release of the Access System — Revision 1614. If you are not already running this new revision, be sure to contact your HP Customer Engineer to get it installed. With the new revision all of the following problems are corrected. (As indicated, some of the problems were corrected in earlier revisions.)

Note: Revision 1614 does not have an accompanying paper tape patch tape. *No* patch tape should be used with Revision 1614.

Loader Problems Corrected:

1. On a power fail, the system would halt with a disc error message — only on 7905 disc based systems.
2. A Halt 31 was possible when using the MLOCK command.

(Both problems were corrected with Revision 1541.)

CONVERT Problems Corrected:

1. The CONVERT program rejected TSB selective dump, sleep, and hibernate tapes with 7 word labels (2000C'/F tapes from obsolete releases).

(Problem was corrected with Revision 1548.)

System Processor Problems Corrected:

1. A HELLO program which only contained the statement 10 END could hang when executed.
2. The STATUS command printed incorrect information for systems with more than 4 logical discs.
3. The MAT INPUT statement requested additional input when no extra input was really required.
4. The file-in-use flag was cleared when CHAINING from a program with a FILES statement to a program without a FILES statement.
5. The CATALOG, GROUP, LIBRARY, and both DIRECTORY commands would hang when trying to output a file entry equated to a non-shareable device if there were no non-shareable devices configured on the system.
6. A CHAIN with return variable would print a spurious error message when the program had a lot of variable names.
7. Spurious error messages were possible when reading from the high speed paper tape reader.
8. The paper tape reader driver was not ignoring parity on the first character of a record.
9. Some of the arguments to pre-defined functions were not being properly rounded as stated in the manual.
10. The following sequence of commands produced an incorrect error message:

```
GET-<name>                (protected program)
LIST*OUT = <name2>*
RUN ONLY                (correct)
GET-<name3>                (locked program)
FILE/DEVICE BUSY OR      (incorrect)
NOT PRESENT
```

11. A program would go into an infinite loop if a warning message was generated in the first execution of a FOR statement (e.g. FOR I = 1 to -2*1E38).
12. A loss of information could occur if a CHAIN was executed from a program running with an OUT = disc file specification.
13. A Halt 31 could have been generated when executing a CHAIN from a program running with an OUT = disc file specification and the target program was not CSAVED.
14. Spurious error messages and/or a Halt 2 was generated if an array was redimensioned with a LEN, POS, or NUM function (e.g. MAT READ A(LEN(\$\$))).

15. A random Halt 31 or infinite loop (total system lock-out) could occur if an interrupt were generated at an inopportune time.
 16. Several records worth of information could be lost when writing beyond the end of an ASCII disc file. The end-of-file condition was not diagnosed early enough.
 17. Block number 65536 was not accessible through a sequential BASIC formatted file PRINT.
 18. Specification of a non-existent portion of a string in the POS function would return a null string instead of blanks as specified in the manual.
 19. The LEN function would not return the proper length when the argument to the function was a substring specification.
 20. Use of the FILE command would result in an inaccessible file when all devices of that type were busy when the command was entered.
 21. An attempt to write exactly one record's worth of information plus two characters to an ASCII file would generate garbage when the record was read back.
 22. A Halt 31, loss of output, or port lockout could occur when a program would CHAIN to another and the first program had been RUN*OUT = <name>* and included prints to ASCII files.
 23. Following a MAT READ from a BASIC formatted file with another READ or MAT READ would cause an end-of-file condition.
 24. The system could do a HALT 31 if an interrupt occurred at an inopportune time during the listing or punching of a program.
 25. Accessing a BASIC formatted file with a protect mask and then unlocking that file could cause the next direct access READ or WRITE to apply the protect mask improperly.
 26. If a file was locked and a direct access read was attempted to the same record as a previous read or write, the file contents would not be current.
 27. Programmatically created files were not properly checked for valid first characters.
 28. An X-OFF (DC3) character was appended to strings returned by the SYSTEM statement.
 29. If a mag tape that was in use was taken off-line, the system would crash.
 30. A compile error (OUT OF STORAGE or ARRAY TOO LARGE) which occurred in a program with files would cause the files to remain busy.
 31. Use of a user defined function as a string subscript would cause a spurious error message.
 32. A warning error in the middle of a file print would cause the remaining items in the print list to be written to the user's terminal.
 33. A PRINT #n; CTL(24), CTL(24) would cause an EOF to be written in the first record of a file.
 34. The sequence PRINT #n; CTL(24) PRINT #n; <print list> caused data to be written in the wrong block of a file.
 35. The POS function returned 0 instead of 1 when searching for the null string.
 36. A fatal disc error on a system that was configured without non-shareable devices caused the system to crash.
 37. A random Halt 2 could occur if an interrupt were generated at an inopportune time.
 38. Both processors could hang if a system report was being generated concurrently with a user using the SYSTEM statement.
 39. The system would do a Halt 40 after two consecutive device error messages.
 40. A program could lose control of a device to another user when executing a CHAIN statement.
 41. A program executing a LOCK statement without a return variable was not always rescheduled when the file was unlocked by the controlling user.
- Problems 1 through 6 were corrected with Revision 1536
 Problems 7 through 9 were corrected with Revision 1541
 Problems 10 through 21 were corrected with Revision 1548
 Problems 22 through 26 were corrected with Revision 1549
 Problems 27 through 41 were corrected with Revision 1614
- I/O Processor Problems Corrected:**
1. Use of the 7261 card reader could cause random skipping of cards.
 2. RJE output would have random double/triple spacings inserted.
 3. If output to one line printer was broken and a second line printer started, the last line from the first line printer would be printed on the second line printer as the first line.
 4. The IOP could hang because of a loss of internal buffer space.
 5. The IOP could randomly go into an infinite loop with heavy activity on the line printer.

6. Type 0 terminals did not have sufficient delay characters.
7. Port lockouts could occur when either a null HELLO program was run or a string overflow occurred in an ENTER statement.
8. A low tape condition on the high speed paper tape punch was not properly detected.
9. Port lockouts could occur when a printer or punch was not ready or when the RJE facility needed to communicate with the system processor.
10. Proper EBCDIC to ASCII conversion was not being performed when using the RJE function with the job punch function.
11. A zero length print to a job transmitter function was not performed properly.
12. A Halt 2 could occur when receiving output from a CDC KRONOS host processor.
13. The RJE function could lock up when errors occurred during the startup of the communications line.
14. A breakable port lockout could occur when listing a program which exactly filled the output buffers.
15. A Halt 13 could occur when writing zero length records to the high speed paper tape punch.
16. A disconnect when a port was in tape mode could cause a port lockout.
17. A random halt could occur in 21MX processors because of a request to move zero words.
18. A port lockout could occur when a port disconnected.
19. A proper mapping of invalid CDC characters was not done when sending those characters to a CDC host processor.
20. The IOP could go into an infinite loop when a line of more than 132 characters was received from a CDC KRONOS host system.
21. An odd length message sent on the job inquiry function to a CDC host contained a garbage character appended to the end.
22. Lines exceeding 64 characters sent on the job inquiry function were truncated to 64 characters when echoed on the system console.
23. A power fail could result in locked out ports when power was restored.
24. The RJE facility could lock up on an otherwise normally operating system.
25. Log on timing did not start as soon as the modem answered the phone. It started only when carrier was detected. If carrier was never detected, the log off procedure was not followed.
26. Typing CR/LF characters during the printing of a log-off message could lock out the port.
27. Disconnect of a port in the middle of the log-on sequence could cause the IOP to do a Halt 52.
28. The IOP would drop into the PANIC loop (results in IOP lockout) when two users would internally collide when logging on.
29. A dial up port was not being disconnected when the phone's timing default expired (2 minutes).
30. On a heavily loaded system, a disconnect could cause port lockouts.
31. A port lockout or system lockout could randomly occur when a communication from the IOP to the system was lost.
32. Unpredictable halts could occur when operating peripheral devices.

Problems 1 through 5 were corrected with Revision 1536. Problems 6 through 13 were corrected with Revision 1541. Problems 14 through 20 were corrected with Revision 1548. Problems 21 through 32 were corrected with Revision 1614.

Remember to install the new system release by reconfiguring the I/O Processor and by performing a system update on the system processor. SLEEP or HIBERNATE the system after the system update to ensure that the new system is safely stored on backup tapes.

Problems Known but Not Corrected on Revision 1614:

1. When executing any command with an OUT= specification (excepting the RUN, LIST, PUNCH, EXECUTE commands) and the destination is an off-line magnetic tape, the MTn ATTENTION NEEDED message is printed at the system console and user terminal, but the AWAKE command will have no effect. The user must terminate the command with the BREAK key, put the mag tape on-line and repeat the command.
2. Using a terminal that keeps the Transmit Data line high when that terminal has not yet had its speed detected will disable automatic speed detect on other terminals connected to the same multiplexer which have not yet had their speed detected. Terminals that have this line strapped high should either be re-strapped or not be used on the Access System.

- 3. Using a card reader with RJE that repeatedly generates device errors because of bent or mutilated cards can cause unpredictable halts or lockouts in the I/O processor.
- 4. Device errors on the 2767 line printer can cause a breakable port lockout.
- 5. Use of the 7260 card reader in parallel with a terminal can cause lost columns on a heavily loaded system.
- 6. Powering up a 7260 card reader connected to a user port can cause a port lockout.
- 7. The system does not always detect an off-line line printer. Correction is to place the line printer on-line.

Please remember that although Hewlett-Packard attempts to solve all reported problems, those problems reported with cold dump reports fully filled out, IOP memory maps, and system console listings have priority over those problems reported with sketchy or incomplete documentation.

documentation

The following tables list currently available customer manuals for HP 2000 Systems products. This list supersedes the list in the last issue of the **Communicator**.

The most recent changes to the tables are indicated for easy reference. Prices are subject to change without notice.

Copies of manuals and updates 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 customer manuals.

Update packages are free of charge. If you require an update package only, send your request to:

Software/Publications Distribution
5303 Stevens Creek Blvd.
Santa Clara, Ca 95050

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manual(s) you need on the Corporate Parts Center form supplied at the back of the **Communicator**.

A few words about documentation terms:

New A new manual refers only to the first printing of a manual. When first printed, a manual is assigned a part number.

Revised A revised manual is a printing of an existing manual which incorporates new and/or changed information in its contents. For example, a manual is revised when an update package is incorporated into the manual: the manual gets a new print date and the update package disappears. Note that a revision to a manual effectively obsoletes the previous version of the manual.

Update An update package is a supplement to an existing manual which contains new and/or changed information. Updates are issued when information must get to customers, yet it is inappropriate to issue a revised manual. An update has no part number; it is automatically included when you order the manual with which it is associated.

PART NUMBER	MANUAL TITLE	PRICE*	DATE	UPDATE
02000-90048	20856A Timeshared BASIC/2000, Level E, Reference Manual	\$10.00	9/75	
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	8/75
02000-90073	20854A Timeshared BASIC/2000, Level F, Reference Manual	7.50	12/75	*R
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	12/75	1/76
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	1/76	*R
20240-90001	Telecommunications Supervisory Package/2000 Manager's Manual	5.00	1/76	*N
20240-90002	Telecommunications Supervisory Package/2000 User's Manual	3.50	1/76	*N
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	

PART NUMBER	MANUAL TITLE	*PRICE	DATE	UPDATE
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	5.00	8/74	
20352-90001	Educational Budget and Accounting System - System Overview	5.00	6/74	
20352-90002	Educational Budget and Accounting System Reference Manual	10.00	3/75	9/75
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	3.50	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	
22692-90001	Course Writing Facility Reference Manual	16.50	12/75	
22693-90001	HP MATH for HP 2000 Access Teacher's Handbook	5.50	7/75	
22693-90002	HP MATH for HP 2000 Access Proctor's Manual	6.50	7/75	
22693-90003	HP MATH for HP 2000 Access Curriculum Guide	17.50	7/75	
22700-90001	FCOPY/2000 Reference Manual	4.50	1/76	*N
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	9/75	
24384-90005	College Information System Technical Manual	95.00	5/75	
24387-90001	Basic Analysis and Mapping Program Manual	18.00	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	DQS-M/2000C Timeshared BASIC File Handler	1.00	5/71	
5952-4490	20856A Timeshared BASIC/2000, Level E, Pocket Guide	0.15	10/74	
5952-4491	20854A Timeshared BASIC/2000, Level F, Pocket Guide	0.15	8/75	

*R = Revised
 *N = New

*Prices listed are subject to change without notice.

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 for the 5 month period, April through August 1976.

GENERAL SYSTEMS DIVISION COURSE SCHEDULE

April - August 1976

COURSE NUMBER	COURSE TITLE	LENGTH	PRICE	Course Dates and Training Center Location	
				GENERAL SYSTEMS SANTA CLARA	EASTERN TRAINING CENTER - ROCKVILLE
22973A	2000 Access, Data Entry, File Management and RJE	5 days	\$500	6/14/76 8/23/76	

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

General Systems Division Training Center

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

software tips

COMPUTING DIRECTORY SIZE

Bill O'Shaughnessy
HP General Systems

A new and simpler equation* has been developed to determine the number of sectors of directory needed for a given HP 3000 system.

$$\text{Sectors} = 6 + 6 * A + [(4.2 * G)] + [(0.15 * U)] + [(0.05 * F)],$$

where

A = Total number of counts in the system
 G = Total number of groups in the system
 U = Total number of users in the system
 F = Total number of files on the system

and [] indicates that the result of the computation should be rounded to the next largest integer.

The number yielded by the above equation is an approximate maximum number of sectors required. This formula will best apply at initial configuration or after a RELOAD with the COMPACT option.

*The previous equation can be found in Appendix M of the HP 3000 System Manager/System Supervisor manual (32000-90006).

TIMEOUTS ON THE 2780/3780 EMULATOR

Jim Willits
HP General Systems

Several problems have been reported regarding the timeout feature of the 2780/3780 Emulator. Software problems have been isolated and all known problems were fixed in version B.01.04 released on MIT tape 1610.

Some of the reported problems with the timeout were actually the fault of IBM systems running ASP software. The receive timeout for our 2780/3780 Emulator begins with the initiation of the #RJOUT Command for each file requested. The timeout continues until data or an EOT is received; at this time the timeout is reset and begins again.

An EOT control character received from IBM signifies an end of file to the HP 3000 and this also resets the timeout and decrements the file counter on the RJOUT. The RJOUT is terminated when:

1. A timeout occurs or
2. The actual number of files requested has been received, e.g. #RJOUT, 99.

Some IBM ASP Systems send an EOT to the 2780/3780 at intervals of about 30 seconds as an idle sequence. This EOT satisfies the #RJOUT for one file and the HP 3000 2780/3780 Emulator restarts the timeout and decrements the file counter. Consequently, if a large number of files has been requested, it appears the timeout is not working on the 2780/3780 Emulator, when in fact it is.

The solution is to request a small number of files on the #RJOUT Command which will eventually be satisfied by the EOR's received from the IBM system.

The default timeouts for the 2780/3780 Emulator are:

- a. At-line Connection (#RJLINE):
 If first command is #RJOUT, timeout is infinite
 If first command is #RJIN, timeout is 3 minutes
 If first command is #RJIN and CONNECT=ANSWER, timeout is infinite.
- b. After-Line Connection:
 Timeout on #RJIN is 48 seconds (16 retries every 3 seconds).
 Timeout on #RJOUT is 3 minutes (can be overridden by using WAIT= parameter).

PROGRAM FILE VS. DISC EXTENTS

Tom Root/Linda Chonle
HP General Systems

Program files on the 3000 system must not reside in more than one extent. The reason for this is that, unlike data segments, code segments are not moved into the virtual memory area on the system disc. Instead, they are read directly from the program file.

This normally does not create any problems, except in the case where the program file is created with a :BUILD command. In this instance the following might occur:

```
:BUILD MYPROG;CODE=PROG
:PREP MYUSL,MYPROG
:RUN MYPROG
ERROR 34
PROGRAM CONTAINS MORE THAN ONE EXTENT
```

The BUILD command, used in this way, takes the default of 8 extents.

There are two ways to prevent this from happening:

1. Use the :BUILD command specifying one (1) extent.

```
:BUILD MYPROG;CODE=PROG;DISC=200,1
```

or a better way:

2. Allow the :PREP command (or :FORTPREP, :COBOLPREP,ETC.) to create the program file.

```
:PREP MYUSL,MYPROG
```

Either of these methods will cause a new program file to be created with the correct number of records in one extent.

NOTE

Remember MYPROG will be created as a job temporary file and a :SAVE must be issued to make it permanent.

RIN'S

*Madeline Lombaerde/Hal Goodwin
HP General Systems*

Several requests have been received asking for an example of a way to use global RIN's. In providing the following example, we assume that the reader has some familiarity with the concept of RIN's. Chapter 9 of the MPE/3000 Operating System Reference Manual (32000-90002) should be reviewed as background for this article.

LOCKING AND UNLOCKING GLOBAL RIN'S

Any global RIN assigned to a group of users can be locked by one job at a time with the LOCKGLORIN intrinsic. Once a RIN is locked, any other jobs that attempt to lock this RIN are suspended.

In order to lock a global RIN, you must know: (1) the RIN number returned by MPE when the RIN was acquired with the :GETRIN command, and (2) the password which was specified in the *rinpassword* parameter of the :GETRIN command. If you are a user with only the Standard MPE Capability, you can lock only one global RIN at a time.

USING RIN'S TO MANAGE FILE RECORDS

Most users are aware that a file can be locked in order to prevent concurrent access to a file by other processes trying to lock the same file. This allows a user to make sure, for instance, that a part of the file is not read while an update is being performed. This file locking is accomplished through the mutual cooperation of all processes accessing the file by means of the FLOCK and FUNLOCK intrinsics.

There may be times, however, when a file is large enough and enough processes need to access it regularly, that locking the entire file can result in a significant amount of lost time. This happens when all the other processes must remain suspended until the file is available.

One possible solution would be to lock only part of the file, allowing processes which plan to access a different part of the file to continue processing. Only those processes attempting to access the "locked" records would be suspended.

Figure A contains a program which uses the LOCKGLORIN and UNLOCKGLORIN intrinsics. The program allows a user to lock four records, as a RIN, in a file so that a record can be updated without any chance of another user updating the same record simultaneously. Additionally, the other users are not suspended when attempting to access and update records elsewhere in the file.

The file used in the example below contains 20 records and therefore five contiguous RIN's have to be acquired (there are four records per RIN) before the program is run. This is accomplished by entering five :GETRIN commands as follows:

```
:GETRIN BOOKRIN
```

where BOOKRIN is specified as the *rinpassword* parameter. BOOKRIN is the password which is used in the program to lock the RIN (see statements 6 and 36 in figure A).

TITLE: THE BORROWERS	LOCN: AVAILABLE
TITLE: ALICE IN WONDERLAND	LOCN: AVAILABLE
TITLE: PETER PAN	LOCN: AVAILABLE
TITLE: JUNGLE BOOK	LOCN: AVAILABLE
TITLE: MARY POPPINS	LOCN: AVAILABLE
TITLE: TOM SAWYER	LOCN: AVAILABLE
TITLE: TREASURE ISLAND	LOCN: AVAILABLE
TITLE: A CHRISTMAS CAROL	LOCN: AVAILABLE
TITLE: HOUSE AT POOH CORNER	LOCN: AVAILABLE
TITLE: THE WIZARD OF OZ	LOCN: AVAILABLE
TITLE: SLEEPING BEAUTY	LOCN: AVAILABLE
TITLE: TALES OF MOTHER GOOSE	LOCN: AVAILABLE
TITLE: AESOP'S FABLES	LOCN: AVAILABLE
TITLE: KIDNAPPED	LOCN: AVAILABLE
TITLE: OLIVER TWIST	LOCN: AVAILABLE
TITLE: DR. DOOLITTLE	LOCN: AVAILABLE
TITLE: WHEN WE WERE VERY YOUNG	LOCN: AVAILABLE
TITLE: H.M.S. PINAFORE	LOCN: AVAILABLE
TITLE: WORLD BOOK ENCYCLOPEDIA	LOCN: AVAILABLE
TITLE: COLLEGIATE DICTIONARY	LOCN: AVAILABLE

The program in figure A establishes the RIN number limits 2 and 6 (see statement number 14), thus using only RIN numbers 2, 3, 4, 5, and 6. MPE returns the RIN number assigned each time the :GETRIN command is entered. Because MPE does not always assign RIN numbers in sequence, however, it may be necessary to enter more than five :GETRIN commands in order to acquire the five contiguous RIN's 2, 3, 4, 5, and 6. Extra RIN's can be released with the :FREERIN command.

The statements

```
FWRITE(OUT,REQUEST,8,%320); CCNE(5);
```

request a book number from the user and perform a condition code check. Note that in statement number 16, CCNE has been defined as

PAGE 0001 HEWLFTT-PACKARD 32100A.05.1 SPL/3000 WED, NOV 26, 1975, 1:52 PM

```

00001000 00000 0 $CONTROL USLINIT
00002000 00000 0 BEGIN
00003000 00000 1 BYTE ARRAY INPUT(0:5):="INPUT ";
00004000 00004 1 BYTE ARRAY OUTPUT(0:6):="OUTPUT ";
00005000 00005 1 BYTE ARRAY NAME(0:8):="BOOKFILE ";
00006000 00006 1 BYTE ARRAY PASSWD(0:7):="BOOKPIN ";
00007000 00005 1 INTEGER IN,OUT,BOOK,LGTH,ACCNO,RIN;
00008000 00005 1 LOGICAL DUMMY,COND:=TRUE;
00009000 00005 1 AKRAY BUFR(0:35);
00010000 00005 1 BYTE ARRAY BBUFR(0)=BUFR;
00011000 00005 1 ARRAY HEAD(0:13):="LIBRARY INFORMATION PROGRAM.";
00012000 00016 1 ARRAY REQUEST(0:7):=%6412,"ACCESSION NO: ";
00013000 00010 1 ARRAY CHANGE(0:9):=" NEW LOCATION: ";
00014000 00012 1 EQUATE RINBASE=2, RECDS'PER'RIN=4, MAXRIN=6;
00015000 00012 1 DEFINE CCL =IF < THEN QUIT#;
00016000 00012 1 CCNE=IF <> THEN QUIT#;
00017000 00012 1
00018000 00012 1 INTRINSIC FOPEN,FREAD,FWRITE,FCONTROL,FREADDIR,FWRITEDIR,
00019000 00012 1 LOCKGLORIN,UNLOCKGLORIN,QUIT,BINARY;
00020000 00012 1
00021000 00012 1 <<END OF DECLARATIONS>>
00022000 00012 1
00023000 00012 1 IN:=FOPEN(INPUT,%45); CCL(1); <<SSTDIN>>
00024000 00012 1 OUT:=FOPEN(OUTPUT,%414); CCL(2); <<SSTDLIST>>
00025000 00024 1 BOOK:=FOPEN(NAME,%5,%304); CCL(3); <<OLD DISC FILE>>
00026000 00037 1 FWRITE(OUT,HEAD,14,0); CCNE(4); <<PROGRAM ID>>
00027000 00047 1 LOOP:
00028000 00047 1 FWRITE(OUT,REQUEST,8,%320); CCNE(5); <<REQST BOOK NUMBR>>
00029000 00057 1 LGTH:=FREAD(IN,BUFR,-10); CCNE(6); <<INPUT NUMBER>>
00030000 00070 1 IF LGTH=0 THEN GO EXIT; <<NO INPUT-EXIT>>
00031000 00073 1 ACCNO:=BINARY(BBUFR,LGTH); <<CONVERT NUMBER>>
00032000 00100 1 IF <> THEN GO LOOP; <<IF BAD TRY AGAIN>>
00033000 00101 1
00034000 00101 1 RIN:=RINBASE+(ACCNO/RECDS'PER'RIN); <<COMPUTE RIN NO.>>
00035000 00105 1 IF NOT(RINBASE<=RIN<=MAXRIN) THEN GO LOOP; <<BOUNDS CHECK RIN>>
00036000 00120 1 LOCKGLORIN(RIN,COND,PASSWD); <<LOCK FILE SUBSET>>
00037000 00124 1
00038000 00124 1 FREADDIR(BOOK,BUFR,36,DOUBLE(ACCNO)); CCL(7); <<READ BOOK DATA>>
00039000 00136 1 IF > THEN GO AGAIN; <<EOF - TRY AGAIN>>
00040000 00137 1 FWRITE(OUT,BUFR,36,0); CCNE(8); <<DISPLAY DATA>>
00041000 00147 1 FWRITE(OUT,CHANGE,10,%320); CCNE(9); <<REQST A CHANGE>>
00042000 00157 1
00043000 00157 1 BUFR(19):=" ";
00044000 00162 1 MOVE BUFR(20):=BUFR(19),(16); <<BLANK OLD LOCN>>
00045000 00170 1 LGTH:=FREAD(IN,BUFR(19),17); CCNE(10); <<READ NEW LOCN>>
00046000 00202 1 IF LGTH>0 THEN <<NEW LOCN ENTERED>>
00047000 00205 1 BEGIN
00048000 00205 2 FWRITEDIR(BOOK,BUFR,36,DOUBLE(ACCNO)); <<MODIFY THE FILE>>
00049000 00214 2 CCNE(11); <<CHECK FOR ERROR>>
00050000 00217 2 END;
00051000 00217 1 FCONTROL(BOOK,2,DUMMY); CCL(12); <<FORCE RECD POST>>
00052000 00226 1 AGAIN:
00053000 00226 1 UNLOCKGLORIN(RIN); CCNE(13); <<UNLOCK SUBSET>>
00054000 00233 1 GO LOOP; <<CONTINUE>>
00055000 00235 1 EXIT:END.
PRIMARY DB STORAGE=%021; SECONDARY DB STORAGE=%00124
NO, EPRORS=000; NO, WARNINGS=000
PROCESSOR TIME=0:00:03; ELAPSED TIME=0:00:10
    
```

Figure A. Using the LOCKGLORIN and UNLOCKGLORIN Intrinsics

IF<> THEN QUIT#;

This eliminates the need to repeat the entire statement at every point in the program where such a condition code check is required. Instead, the statement CCNE and an arbitrary number (5 in this case) can be used.

The book number is read with the statement

LGTH:=FREAD(IN,BUFR,-10);

and converted to a binary value with the statement

ACCNO:=BINARY(BBUFR,LGTH);

The RIN number to be locked is computed with the statement

RIN:=RINBASE+(ACCNO/RECDS'PER'RIN);

RINBASE and RECDS'PER'RIN have been equated to 2 and 4, respectively (see statement number 14). Thus, if book number 3 is entered by the user, the RIN number to be locked would be computed as RIN number 2, as follows:

$$\begin{aligned}
 \text{RIN} &= 2 + (3/4) \\
 &= 2 + 0 \text{ (integer division)}
 \end{aligned}$$

The record specified by the book number is displayed for the user and the change ("NEW LOCATION: ") is requested. The existing location information is filled with blanks with the statements

```
BUFR(19):=" ";
MOVE BUFR(20):=BUFR(19),(16);
```

The new location is entered and read with the statement

```
LGTH:=FREAD(IN,BUFR(19),17);
```

and the record is updated with the statement

```
FWRITEDIR(BOOK,BUFR,36,DOUBLE(ACCNO));
```

The statement

```
FCONTROL(BOOK,2,DUMMY);
```

is used in case the file which has been opened is a buffered file. This statement insures that the process' buffers are posted to the disc before the RIN is unlocked.

Note that in a program of this kind, it is important that the number of records per block and the number of records per RIN are the same. The RIN must contain a complete block of records.

The statement

```
UNLOCKGLORIN(RIN);
```

unlocks the RIN before the loop is repeated. When the user enters a new book number, a new RIN number will be computed and that RIN number will be locked.

When a carriage return is entered, signifying no input, the program terminates.

The results of running the program and the updated condition of the library file are shown below.

```
:RUN LIBIN
```

LIBRARY INFORMATION PROGRAM.

```
ACCESSION NO: 3
TITLE: JUNGLE BOOK      LOCN: AVAILABLE
NEW LOCATION: FACULTY LOAN - DR.
SCHWARTZ
```

```
ACCESSION NO: 10
TITLE: SLEEPING BEAUTY LOCN: AVAILABLE
NEW LOCATION: LOANED CARD# 451, DUE
JUNE 6
```

```
ACCESSION NO: 3
TITLE: JUNGLE BOOK      LOCN: FACULTY LOAN -
DR. SCHWARTZ
NEW LOCATION:
```

```
ACCESSION NO: 9
TITLE: THE WIZARD OF   LOCN: AVAILABLE
OZ
```

```
NEW LOCATION: INTERLIBRARY LOAN -
UNIV. OF OZ
```

```
ACCESSION NO: 3
TITLE: JUNGLE BOOK      LOCN: FACULTY LOAN -
DR. SCHWARTZ
NEW LOCATION: AVAILABLE
```

```
ACCESSION NO:
```

```
END OF PROGRAM
```

```
TITLE: THE BORROWERS   LOCN: AVAILABLE
TITLE: ALICE IN WONDERLAND LOCN: AVAILABLE
TITLE: PETER PAN       LOCN: AVAILABLE
TITLE: JUNGLE BOOK     LOCN: AVAILABLE
TITLE: MARY POPPINS    LOCN: AVAILABLE
TITLE: TOM SAWYER      LOCN: AVAILABLE
TITLE: TREASURE ISLAND LOCN: AVAILABLE
TITLE: A CHRISTMAS CAROL LOCN: AVAILABLE
TITLE: HOUSE AT POOH CORNER LOCN: AVAILABLE
TITLE: THE WIZARD OF OZ LOCN: INTER-
```

```
LIBRARY LOAN -
UNIV. OF OZ
TITLE: SLEEPING BEAUTY LOCN: LOANED
CARD #451, DUE
JUNE 6
```

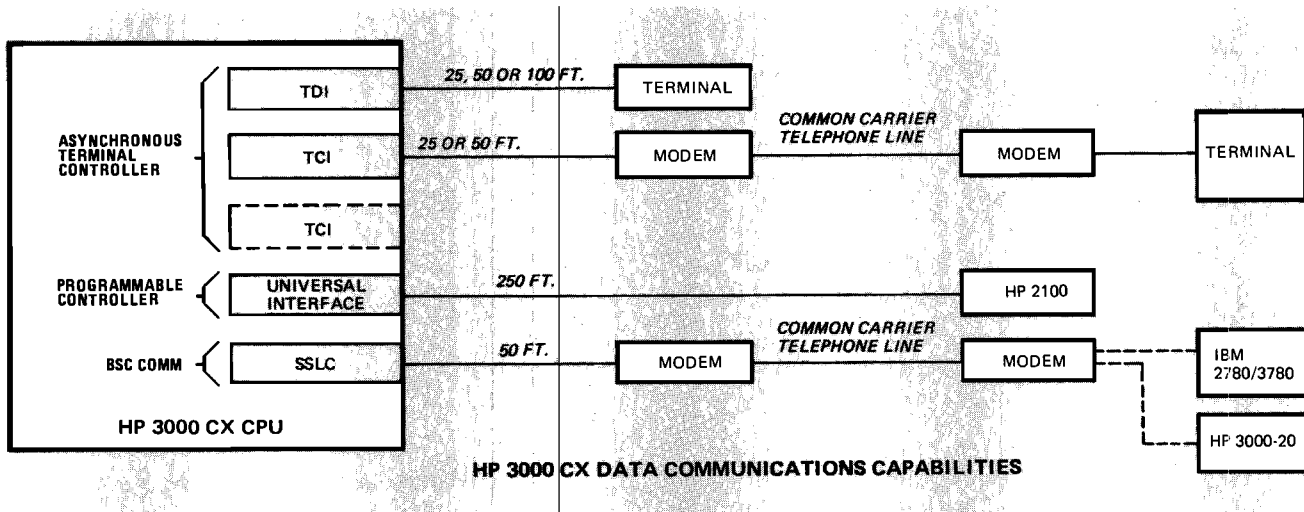
```
TITLE: TALES OF MOTHER GOOSE LOCN: AVAILABLE
TITLE: AESOP'S FABLES        LOCN: AVAILABLE
TITLE: KIDNAPPED             LOCN: AVAILABLE
TITLE: OLIVER TWIST          LOCN: AVAILABLE
TITLE: DR. DOOLITTLE         LOCN: AVAILABLE
TITLE: WHEN WE WERE VERY YOUNG LOCN: AVAILABLE
```

```
TITLE: H.M.S. PINAFORE      LOCN: AVAILABLE
TITLE: WORLD BOOK           LOCN: AVAILABLE
ENCYCLOPEDIA
TITLE: COLLEGIATE           LOCN: AVAILABLE
DICTIONARY
```

HP 3000 CX MODEM SUPPORT

*Don Van Pernis/Ed Ahrens
HP General Systems*

The HP 3000 CX System is capable of communicating to a variety of terminals and equipment via modems and telephone lines in conjunction with three different hardware controllers. This article describes these hardware controllers, supported modems, and cables and defines Hewlett-Packard's support philosophies pertaining to these components.



GENERAL HEWLETT-PACKARD MODEM SUPPORT PHILOSOPHIES FOR 3000 CX

EIA STANDARD RS-232-C (and CCITT v.24 in Europe) is a specification applicable to the interconnection of data terminal equipment (DTE) and data communications equipment (DCE) employing serial binary data interchange.

It defines:

1. Electrical characteristics (signal levels and impedances) of the interchange signals and associated circuitry between DTE and DCE.
2. Recommended mechanical characteristics (plug and pin usages) of the interface between DTE and DCE.
3. Functions of a set of data, timing and control interchange circuits for use as a digital interface between the DTE and DCE.

The Asynchronous Terminal Controller (30032B) and the Synchronous Single Line Controller (30055A) will only support those terminals and modems that conform to this standard.

SUPPORT OF COMMUNICATIONS SUBSYSTEMS – The 3000 CX hardware and software support a variety of recommended non-HP terminals and Western Electric (Bell) 100 and 200 series modems. Although proper functioning of these devices is a customer responsibility, HP is responsible for maintaining compatibility with those devices that have been specified for use with the HP 3000 CX system.

In the subsequent subsystem discussion various Western Electric (Bell) modems and their options have been specified. For those customers that choose other modem vendors it will be the responsibility of that customer and vendor to insure the vendor's modems and options are equivalent to the recommended Western Electric (Bell) modems and options. HP does not recommend any modem vendor other than Western Electric for use in the U.S. at this time.

In general HP will support from the junction panels of the controllers to as far out as our equipment exists. That is, if the cable is a standard HP cable and the device at the end of the cable is an HP device (excluding modems) then this entire configuration is supported. If the cable is not HP cable, but the device at the end of it is, we will support the device but not the cable. If neither the cable nor the device are HP's it is the customer's responsibility to support such a configuration. Any alteration to these cables becomes a customer responsibility.

HP 30032B ASYNCHRONOUS TERMINAL CONTROLLER

GENERAL

The HP 30032B subsystem for the HP 3000 Computer System is a control interface for low speed bit-serial devices. Logically the subsystem consists of 16 send and receive channels. The send/receive channels have programmable data transfer rates that range from 75 to 2400 bits per second (bps). In general, this subsystem is primarily used in supporting the system's interactive (log-on) terminals that operate in "character mode"; i.e. interrupt on each character processed. (This subsystem and MPE will not support page mode devices.)

This subsystem will support a variety of Western Electric (Bell) modems. The supported modems are 103A2, 103A3, 113B, 202C, 202S and 202T. Recommended modem options are specified at the end of this section.

SUBSYSTEM CONFIGURATION AND OPTIONS

Basic configuration – Provide full duplex I/O transfers for 16 hardwired devices if those devices require no control lines other than data-in and data-out lines. The test cable is utilized in diagnostic testing of the hardware. This configuration consists of:

1. 30032-60001 – Terminal Data Interface (TDI)
2. 30062-60001 – Connector Panel
3. 30060-60003 – Terminal Data Connector Cable
4. 30062-60002 – Test Cable

Option 001 – Adds the necessary control and status lines to operate up to 16 type 103 modems:

1. 30061-60001 – Terminal Control Interface (TCI)
2. 30061-60003 – Terminal Control Interface Cable

Option 002 – Adds a second TCI and cable to provide the necessary control and status signals for up to 16 type 202 modems.

1. 30061-60001 – Terminal Control Interface (TCI)
2. 30061-60003 – Terminal Control Connector Cable

SYSTEM HARDWARE CONFIGURATION

The HP 30032B subsystem circuit cards are typically installed in one of the lower (3 or 4) card cages in bay 1 as noted in figures 2 through 4. The one exception is noted in figure 5. Current configuration guides place the cards in the interrupt poll as follows:

1. Terminal data interface – polled immediately after the system clock.
2. Terminal control interface – polled immediately after the discs and SSLC and before any other SIO devices. Terminal control interface number two immediately follows number one.

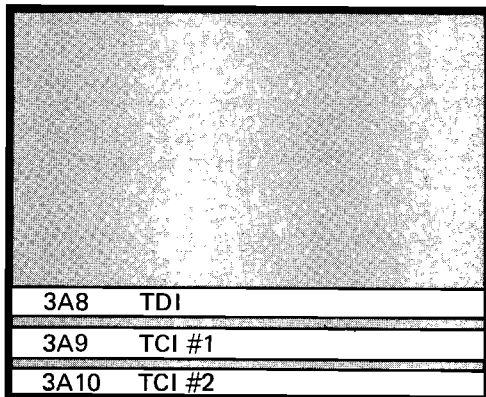


Figure 2. No Selector Channel

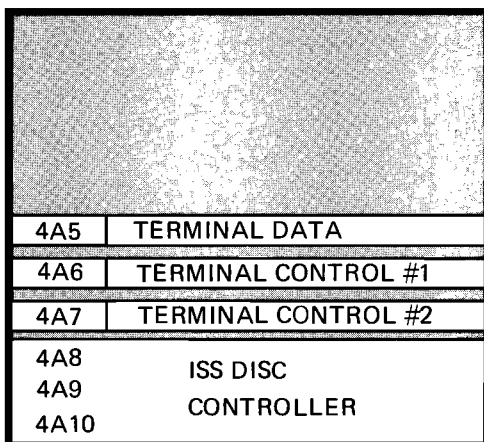
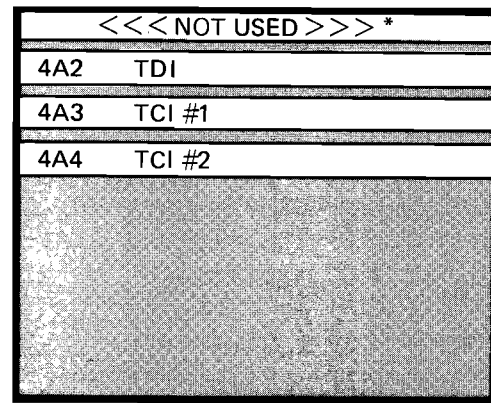


Figure 3. Selector Channel W/ISS



*NO IOP BUS CONNECTOR

Figure 4. Selector Channel W/7905

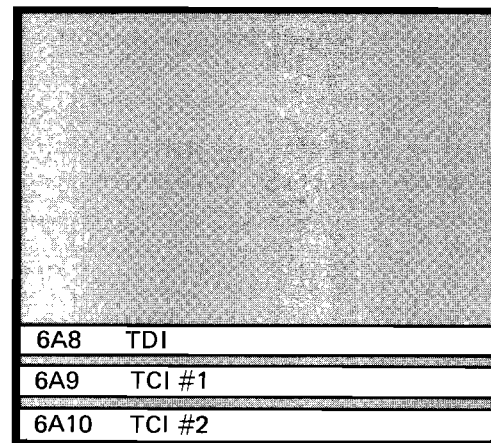


Figure 5. Selector Channel W/7905
2nd. Selector Channel W/ISS

The Device Reference Table entry (DRT) of the terminal data interface is as assigned by HP General Systems Division at integration time. The DRT's of the terminal control interfaces must be the DRT of the terminal data interface plus 1 and 2 respectively. This is an MPE software requirement.

SYSTEM SOFTWARE CONFIGURATION

Terminal driver IOTERM0 requires configuration of ports to one of three subtypes as follows:

1. Subtype 0 – hardwired terminals **
2. Subtype 1 – Bell 103 modems
3. Subtype 2 – Bell 202 modems

These subtypes are utilized to develop the DRT of the necessary terminal interfaces – either TDI or TCI. Subtype 1 ⇒ 103 modem ⇒ TCI #1 which is DRT of TDI + 1.

**Four wire full duplex 202 modems without reverse channel. Operation in this mode does not require Option 1 or 2 on the 30032B subsystem.

MODEMS AND OPTIONS

Following are the recommended asynchronous modems and options to be used in conjunction with the 30032B sub-system. Note that these options are those required *at the CPU end* (local). To insure successful communication with the distant end, different options in the distant data set may be required.

103 OPTIONS AND RECOMMENDATIONS

OPTION	DESCRIPTION	RECOMMENDATIONS	
		COMPUTER	TERMINAL
A	1. Rotary Dial 2. Touch Tone Dial	Area Optional	Area Optional
B	3. With Card Dialer 4. Without Card Dialer	Customer Decisions	
C (Note 1)	5. Loss of CXR on Disconnect 6. No Loss of CXR Disconnect	C5	C5
D (Note 2)	7. Send Space Disconnect 8. Send No Space Disconnect	D7	D7
E	9. Receive Space Disconnect 10. No Receive Space Disconnect	E9	E9
F (Note 3)	11. Auto Answer Permanent 12. Auto Answer Select	F11	F12
<p>Note 1: CXR Disconnect. Data set disconnects with carrier loss for more than 160 msec.</p> <p>Note 2: Space Disconnect. A Space Disconnect is initiated by removal of DTR -- the associated CPU space will result in modem disconnect.</p> <p>Note 3: Auto Answer. Permanent on CPU side but selectable on terminal side -- this means the call to the terminal must be manually answered if F12 is selected.</p>			

For further definition of these options/modem capabilities refer to the relevant "Bell System Technical Reference" publication that is available from your local Bell System Representative.

Bell 103A3, 0-300 bits/sec, Asynchronous
(Replaces 103A2 which may still be available in some instances.)

Full Duplex on 2 wire operation -- no reverse channel is available. The 103 works with another 103 or 113 modem.

Bell 113B, 0-300 Bits/sec, Asynchronous
An "answer only" modem
Auto Dialing and calling is not available.
Full duplex on 2 wire operation -- no reverse channel is available.
The 113B works with other 100 series data sets that have originate capabilities.

113B OPTIONS AND RECOMMENDATIONS

OPTION	DESCRIPTION	RECOMMENDATIONS
U	Dummy Load	Required for 10
V	Common	Not installed
W	Common CB/CF	In
X	Ignore data terminal make busy	In
Y	Make busy implementation	In
Z	Data terminal controls disconnect	In

The 113B-L1 is an answer only modem which is rack mounted with auto seek for open port.

202C OPTIONS AND RECOMMENDATIONS

OPTION	DESCRIPTION	RECOMMENDATIONS		COMMENTS
		COMPUTER	TERMINAL	
A	1. EIA Interface 2. Contact Interface	A1	A1	Required
B	3. With 801 ACU 4. Without 801 ACU	B4	B4	
C	5. With Auto Answer 6. Without Auto Answer	C5	C6	If C6 installed no D option apply
D	7. Auto Answer Only 8. Auto Answer Key Control	D7	—	D options depend on C options
E	9. Carrier Soft Turn Off (In) 10. Carrier Soft Turn Off (Out)	E9	E9	*

***Note:** E9 normally used — when request to send is turned off, carrier frequency drops from 1200 Hz to 900 Hz. This can cause noise or transmission problems in a polling environment or on private lines; therefore, in these conditions, "E10" should be specified.

Bell 202C Modem, 0 to 1200 bits/sec, Asynchronous
THE HP 3000 REQUIRES REVERSE CHANNEL IN 2 WIRE HALF-DUPLEX TRANSMISSION FOR SWITCHED NETWORK SERVICE.

Bell 202S and 202T Modems, Asynchronous
202S — provides speeds up to 1200 bits/sec simplex or half-duplex transmission for Switched Network service.

202T — provides speeds up to 1800 bits/sec simplex, half-duplex or full duplex in private line service as follows:

- 2 Wire Private Line with Reverse Channel
 - up to 1200 bits/sec on Basic 3002 channel.
 - between 1200 and 1800 bits/sec on 3002 channel with C2 conditioning.

202S OPTIONS AND RECOMMENDATIONS

OPTION	RECOMMENDATION
Received Data Squelch	156 m/Sec.
Clear-to-Send Delay	180 m/Sec.
Fast Carrier Detection	Out (Normal Mode — 23 m/Sec.)
Soft Turn-Off	In (24 m/Sec.)
Local Copy of Primary/Reverse Channel	Out-On CPU Side * Note 1
Auto Answer (202S only)	Computer Side — Application Dependent
Received Data Clamp	In

***Note 1:** If terminal has internal echo capability use OUT, else use IN.

- 4 Wire Private Line and 2 Wire Private Line without Reverse Channel.
 - up to 1400 bits/sec on Basic 3002 Channel.
 - between 1400 and 1800 bits/sec on 3002 Channel with C2 conditioning.

THE 202S IS UTILIZED BY THE HP 3000 IN HALF-DUPLEX WITH REVERSE CHANNEL IN SWITCHED NETWORK SERVICE.

The 202T is utilized by the HP 3000 in half-duplex with Reverse Channel or full duplex, 4 Wire with "subtype" specified as "0" in Private Line service.

SUBSYSTEM INTERFACE CABLE ASSEMBLIES

CABLE DESCRIPTION	PART NUMBER
25 foot cable for connecting a data set to a connector panel.	30062-60004
25 foot cable for connecting a terminal directly to the connector panel.	30062-60006
50 foot cable for connecting a data set to the connector panel.	30062-60007
50 foot cable for connecting a terminal directly to the connector panel.	30062-60009
100 foot cable for connecting a terminal directly to the connector panel.	30062-60012

Modem/Hardwire Extension Cable Manufacturing Specifications (Cable, Unshielded). This specification establishes requirements for a 25 conductor external low voltage computer cable with overall jacket: U.L. style 2560.

ELECTRICAL

Voltage Rating: 30V for Class 2 wiring systems only (220V rms test between conductors).

MECHANICAL

Construction Details

Singles: Twenty-five 26 (7 x 34) AWG tinned copper; tinned after stranding.

Insulation: PVC, seven-mil minimum wall thickness; rated at +60°C

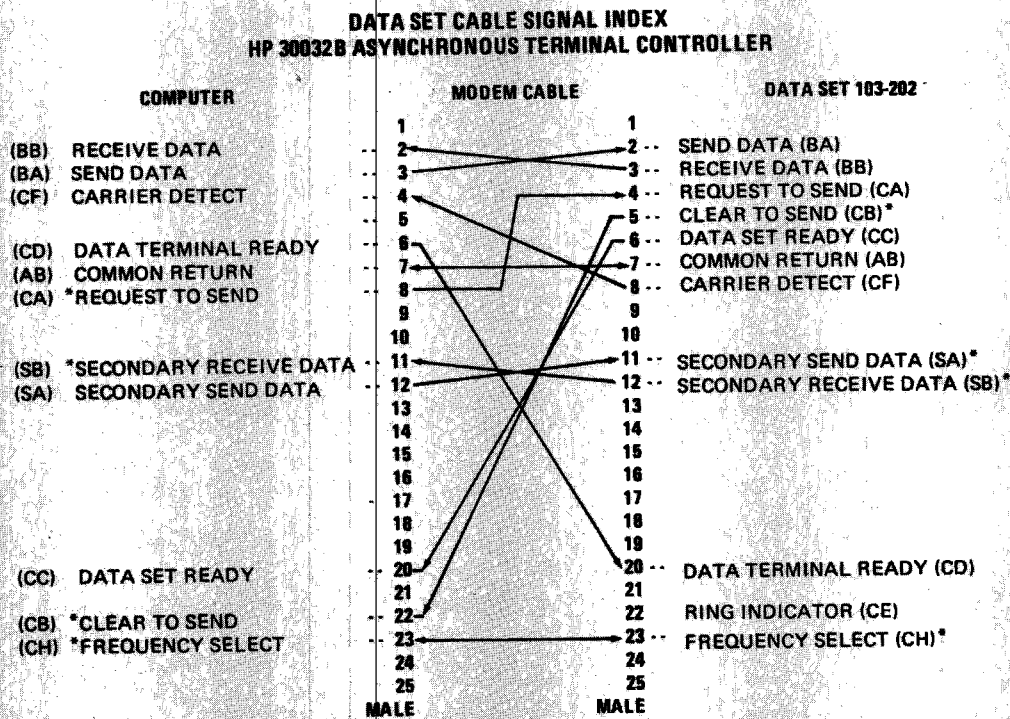
Colors -	BLK	WHT/BLK	WHT/BLK/BRN
	BRN	WHT/BRN	WHT/BLK/RED
	RED	WHT/RED	WHT/BLK/ORN

ORN	WHT/ORN	WHT/BLK/YEL
YEL	WHT/YEL	WHT/BLK/GRN
GRN	WHT/GRN	WHT/BLK/BLU
BLU	WHT/BLU	
VIO	WHT/VIO	
GRA	WHT/GRA	
WHT		

Cable Lay: Twist singles for flexibility and in the above color sequence. Fillers, cloth or nylon binding may be used for a smooth, round construction.

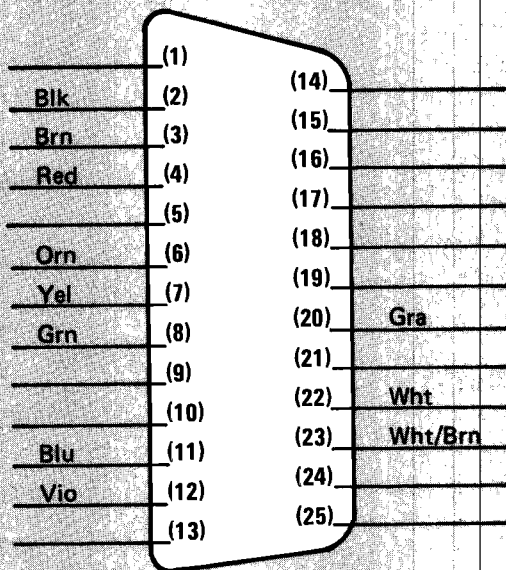
Jacket: PVC, 35-mil minimum wall thickness; rated at +60°C.

Color: Jade Gray per Visual Color Std., HP Part No. 6009-0021.

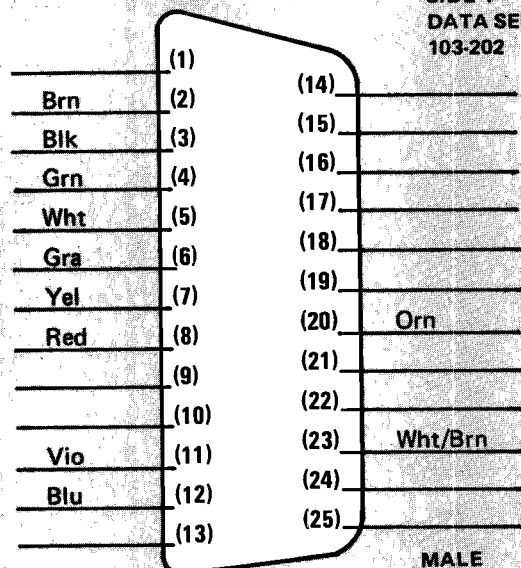


SIDE 1
MALE COMPUTER

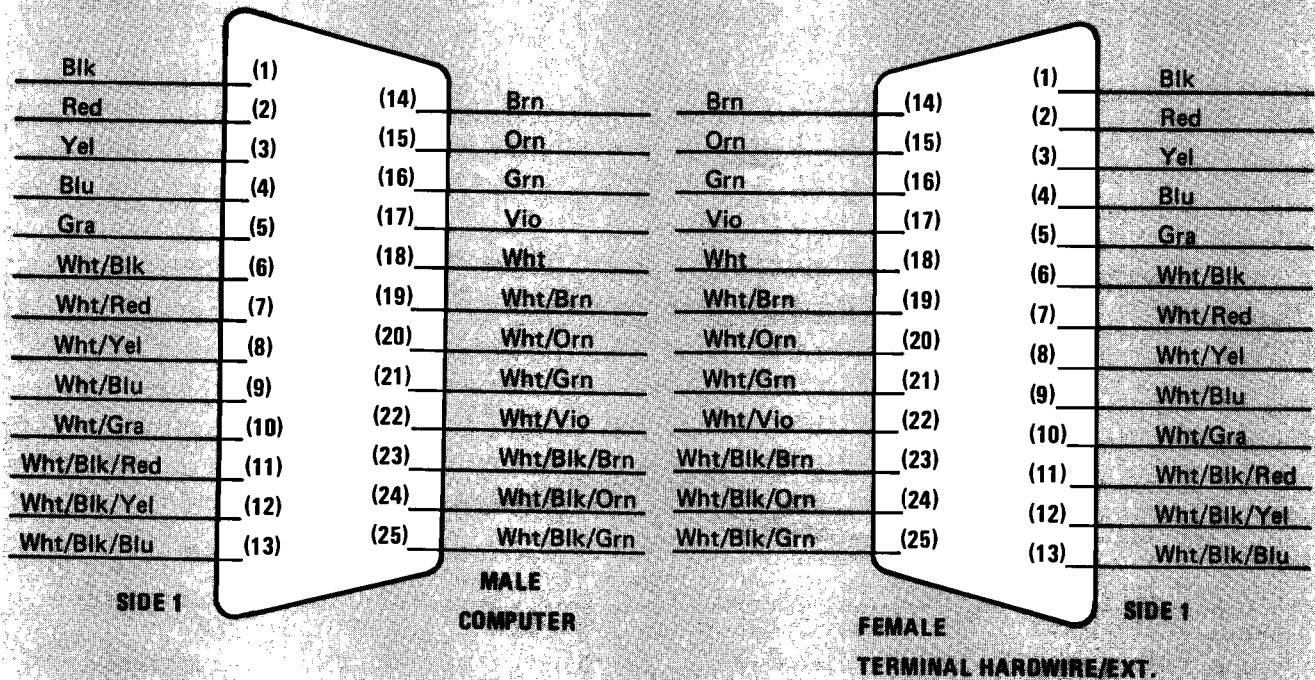
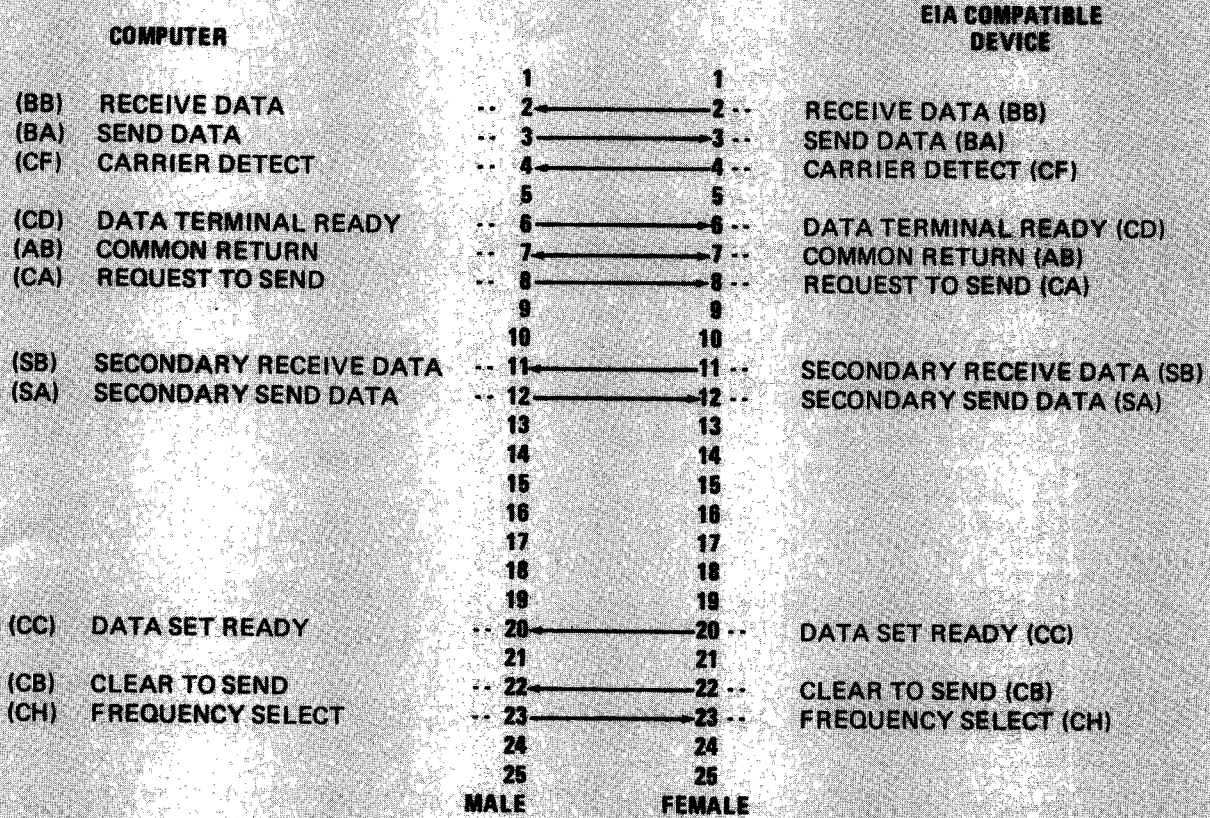
**The asterisk indicates signals required for 202 data sets only.*



SIDE 1
DATA SET
103-202



**HARDWARE/EXTENSION CABLE
HP 30032B ASYNCHRONOUS TERMINAL CONTROLLER**



HP 30130B 2780/3780 SUBSYSTEM

GENERAL

The HP 30130B subsystem emulates an IBM 2780/3780 Data Transmission Terminal and is used to transfer data between an HP 3000 to/from the indicated terminal, various IBM CPU's that have this emulator, or another HP 3000 System. This subsystem consists of both software and hardware.

The hardware consists of the necessary cables and controller interface (30055) that operates in a bit-serial synchronous data transfer mode using the IBM Binary Synchronous protocol for line disciplines. The supported modems are Western Electric (Bell) 201A3, 201B3, 201C, 208A and 208B.

Type of MODEM: Bell System Type 201A3 Data Set
 Type of Line: Public Telephone Network (Switched)
 Transmission Rate: 2000 bits-per-second

Type of MODEM: Bell System Type 201B3 Data Set
 Type of Line: Private Leased Line
 Transmission Rate: 2400 bits-per-second

201A3 OPTIONS AND RECOMMENDATIONS

OPTION NUMBER	DESCRIPTION	RECOMMENDATION
A1 A2	EIA interface Contact Interface	A1 (required)
B3 B4	With alternate voice Without alternate voice	B3*
C5 C6	With new sync. Without new sync.	C6 (required)
D7 D8	Half duplex (2-wire). Full duplex (4-wire).	D7
E9 E10	4-wire continuous carrier 4-wire carrier controlled by REQUEST TO SEND.	**

*If option B3 is selected and automatic answering is to be used, the automatic answering capability is normally provided as a key-controlled function. If you want the automatic answer to be permanently wired, then state so in the Remarks column on the Bell System order form.

**If option D7 is selected, the E options have no meaning and should be ignored.

201B3 OPTIONS AND RECOMMENDATIONS

OPTION NUMBER	DESCRIPTION	RECOMMENDATION
A1 A2	EIA interface. Contact interface.	A1 (required)
B3 B4	With alternate voice. Without alternate voice.	B3*
C5 C6	With new sync. Without new sync.	C6 (required)
D7 D8	Half duplex (2-wire). Full duplex (4-wire).	D8
E9 E10	4-wire continuous carrier. 4-wire carrier controlled by REQUEST TO SEND.	E9**

*If option B3 is selected and automatic answering is to be used, the automatic answering capability is normally provided as a key-controlled function. If you want the automatic answer to be permanently wired, then state so in the Remarks column on the Bell System order form.

**If option D7 is selected, the E options have no meaning and should be ignored.

Type of MODEM: Bell System Type 201C Data Set (also called DATAPHONE 2400)
 Type of Line: Public Telephone Network (Switched) or Private Leased Line
 Transmission Rate: 2400 bits-per-second

201C OPTIONS AND RECOMMENDATIONS

OPTION NUMBER	DESCRIPTION	RECOMMENDATION
A1	Transmitter internally timed.	A1 (required)
A2	Transmitter externally timed.	
B3	Without 801 Automatic Calling Unit.	B3
B4	With 801 Automatic Calling Unit.	
C5	EIA interface.	C5 (required)
C6	Contact interface.	
D7	Without automatic answer	D8
D8	With automatic answer.	
E9	Automatic answer permanently wired.	Either*
E10	Automatic answer key-controlled.	

*If option D7 is selected, the 2 options have no meaning and should be ignored.

Type of MODEM: Bell System Type 208A Data Set (also called DATAPHONE 4800)
 Type of Line: Private Leased Line
 Transmission Rate: 4800 bits-per-second

Type of MODEM: Bell System Type 208B Data Set (also called DATAPHONE 4800)
 Type of Line: Public Telephone Network (Switched)
 Transmission Rate: 4800 bits-per-second

30300/30301 PROGRAMMABLE CONTROLLER

Utilizing the HP 3000 Universal Interface, the Programmable Controller Subsystem adds either BCS HP 2100 or RTE HP 2100. Maximum transfer rate is 200 K words/sec parallel. Maximum supported cable length is 250 ft.

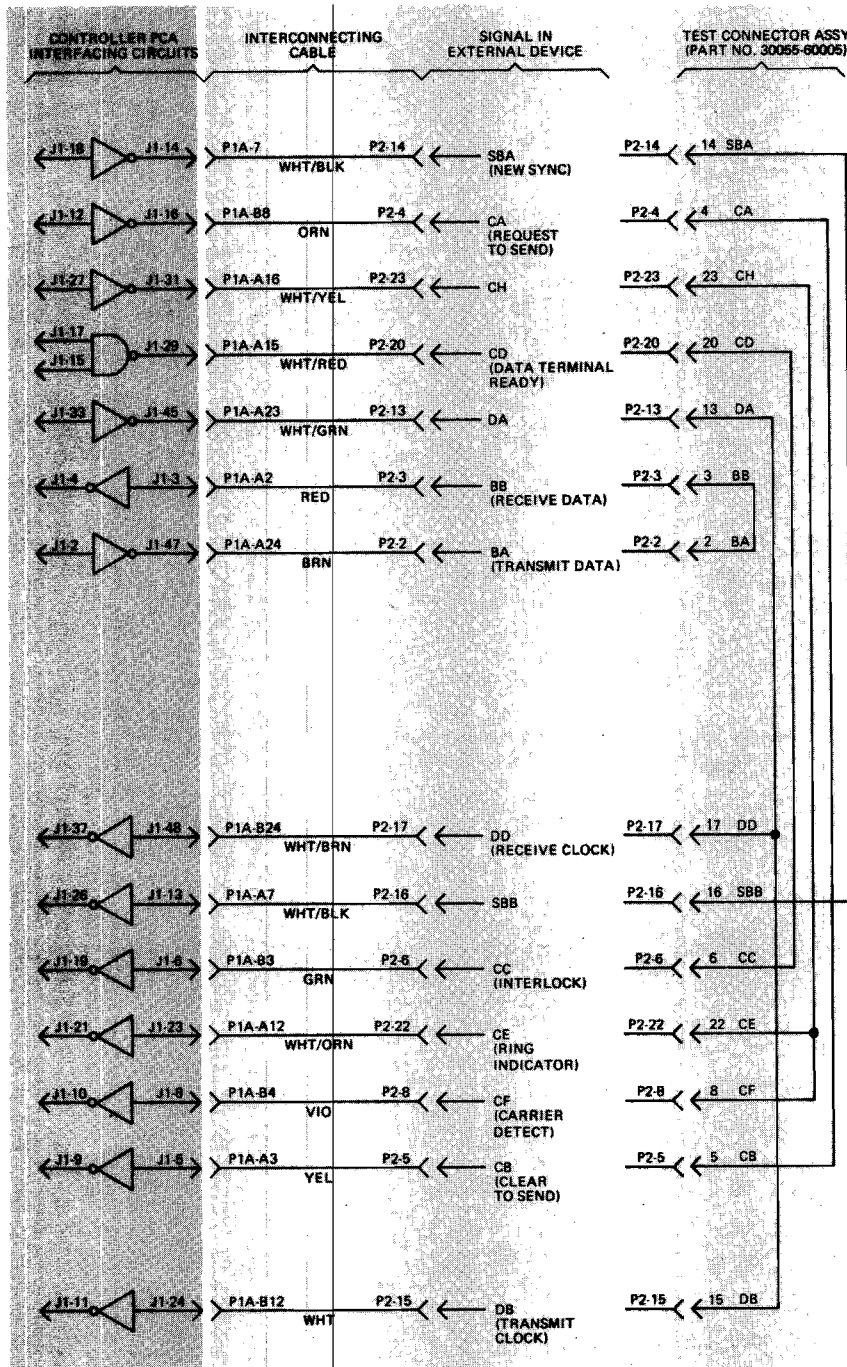
208A OPTIONS AND RECOMMENDATIONS

OPTION NUMBER	DESCRIPTION	RECOMMENDATION
A1	Transmitter internally timed.	A1 (required)
A2	Transmitter externally timed.	
B3	Continuous carrier.	B3
B4	Switched carrier.	
C5	Switched REQUEST TO SEND.	C8
C6	Continuous REQUEST TO SEND.	
D7	One second holdover used.	D7
D8	One second holdover not used.	
E9	With new sync.	E10 (required)
E10	Without new sync.	
F11	CC ON when analog loop is present.	F11
F12	CC OFF when analog is present.	

208B OPTIONS AND RECOMMENDATIONS

OPTION NUMBER	DESCRIPTION	RECOMMENDATION
A1	Transmitter internally timed.	A1 (required)
A2	Transmitter externally timed.	
B3	Without 801 Automatic Calling Unit.	B3
B4	With 801 Automatic Calling Unit.	
C5	CC OFF when analog is present.	C6
C6	CC ON when analog loop is present.	
D7	Without automatic answer.	D8
D8	With automatic answer.	
E9	Desk mounting	Either
E10	Rack or cabinet mounting.	

CABLING FOR THE 30055



Cable Assembly (Part No. 30055-60003)

bulletins

TRACE/3000 REFERENCE MANUAL

*Hal Goodwin
HP General Systems*

A new TRACE/3000 Reference Manual is available. The subsystem is explained in greater detail in the new manual.

Examples are provided in SPL and FORTRAN which demonstrate how to use TRACE. The part number is 03000-90015 and the price is \$7.50.

HP 3000 INSTRUCTION DECODING POCKET GUIDE

Frank Coughlin
HP General Systems

The information in the HP 3000 Instruction Decoding Pocket Guide (part no. 5951-4403) is now in the Software Pocket Guide (part no. 03000-90126). We will obsolete the 5951-4403 and substitute the 03000-90126 on future orders.

NEW IMAGE AND QUERY MANUALS

Sandy Martensen
HP General Systems

New versions of the IMAGE/3000 and QUERY/3000 reference manuals are now available. These manuals document the features available with IMAGE version A.04.00 and QUERY version A.03.00, which are described in the Software Update section of this **Communicator**.

The new features include:

- additional modes of access
- a revised privacy and security scheme
- IMAGE procedures which interpret status information
- A QUERY LIST command
- QUERY register operations to be used in conjunction with the REPORT command.

In addition, the QUERY/3000 manual has been extensively revised. The new format

- makes commands easier to locate,
- includes additional examples illustrating the use of commands and statements, and
- provides tables which suggest action to take in response to QUERY error messages.

The IMAGE/3000 Reference Manual part number is 32215-90001, and the price is \$7.00. The QUERY/3000 Reference Manual part number is 32216-90001 and the price is \$7.00. The printing date for both manuals is March 1976.

CORRECTION TO BULLETIN ON COBOL SELF STUDY COURSE (ISSUE 5, JANUARY 1, 1976)

The part number for the Advisor's Guide should be 22957-60005.

BASIC/3000 TO IMAGE/3000 INTERFACE

A set of interface routines (procedures) to facilitate the calling of IMAGE procedures from BASIC programs has been contributed to the HP 3000 contributed library. This package, called "BIMAGE", is not part of the IMAGE/3000 or BASIC/3000 products, but has the approval of both projects. Do not confuse "BIMAGE" with the earlier contributed package "BASIMG", which has a much more limited set of capabilities. "BIMAGE" is both more powerful and more flexible.

Presently "BIMAGE" is available on a separate tape. The temporary part number for this tape is 36999-10006 (800 BPI) or 36999-11006 (1600 BPI), and is only valid until the release of volume 2 of the contributed library. The price of the mag tape is \$25.00. Copies of BIMAGE may be ordered from your local Sales and Service office. The address and telephone number of the office nearest to you is listed in the back of all reference manuals.

Customers in the U.S. may also order BIMAGE directly by mail. List the name and part number on the Corporate Parts Center form supplied at the back of the **Communicator**. When using the form, please remember to add to the \$25.00 any applicable local and state taxes, plus the additional \$1.50 handling charge. Your check or money order must accompany each direct mail order.

NEW COMPILER LIBRARY MANUAL

Greg Gloss
HP General Systems

The fourth edition of the *Compiler Library Reference Manual* is now available. The new edition reflects the enhancements to the software for the HP 32211C.04 version of the Compiler Library described in the "Software Updates" section of this issue. The edition is dated February 1976 and the manual part number is 03000-90009. Price: \$16.50.

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:

Product	Number	Update	Fix Level	MIT Tape Date Code
MPE	32000C	00.11		1610
2780/3780 Emulator	30130B	01.04		1610
BASICOMP/3000	32103A	00.04		1610
COBOL/3000	32213B	01.05		1610
Compiler Library/3000	32211C	04.00		1610
IMAGE/3000	32215A	04.00		1610
QUERY/3000	32216A	03.00		1610
RPG/3000	32104	02.02		1610
RTE-C Programmable Controller	30301A	00.01		1610
SPL/3000	32100A	06.00		1610
TRACE/3000	32222A	02.03		1610

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

MPE 32000C.00.11

This article describes MPE 32000C.00.11 as incorporated into the MIT tape, date coded 1610. The information in the article is organized as follows:

1. Modules modified for MPE C.00.11
2. List of problems solved in MPE C.00.11
3. Enhancements to MPE C.00.11
4. Known problems in MPE C.00.11
5. Documentation changes in MPE C.00.11

1. MODULE CHANGES C.00.XX MPE FIX LEVEL

MODULE	1	2	3	4	5	6	7	8	9	10	11
INITIAL	0	X	X	X			X	X	X	X	X
SYSDUMP	1	X	X	X		X		X	X		
SEGPROC	2	X	X			X			X	X	
SEG DVR	3										
DISPATCH	4		X			X				X	X
LOAD	5	X									
MAPP	6				X						
UCOP	7	X									
DEVREC	8										
PROGEN	9	X						X	X	X	
ININ	10				X		X			X	X
EXIN	11	X	X	X	X	X	X		X		X
LOG	12	X									
IOPTRDO	13										
IOPTPNO	14					X		X			
IOPLOTO	15										
IOMDISK0	16		X				X	X	X		
IOFDISK0	17		X				X	X			
IOTAPE0	18			X				X			
IOLPRT0	19										
IOCDR0	20		X			X					
IOCLTTY0	21										
IOTERM0	22										X
IOCDPNO	23										
IOPRPNO	24				N	X					X
IOREM0	25										
IOBSCO	26										
IOMDISK1	27	X	N				X	X	X	X	
PFAIL	30		X	X	X						
FILESYS	50	X	X	X	X	X	X	X	X	X	X
COMM'INT	51	X	X			X					X
STORE/RESTORE	52		X	X				X	X	X	
DIRC	53								X		
ALLOCATE	54		X	X				X			X
DISKSPC	55	X									X
MMCORER	56					X		X			X
MMDISKR	57										
ABORTRAP	58						X	X	X		X
MESSAGE	59							X	X	X	X
CROUTINE	60		X	X						X	X
IOUTILITY	61	X	X	X			X	X	X		
TTYINT	62		X	X	X		X	X			
PCREATE	63	X									X
MORGUE	64		X						X	X	
PROCMail	65										
PINT	66						X	X	X		X
DATASEG	67	X							X		

MODULE		1	2	3	4	5	6	7	8	9	10	11
IOPM	68		X			X						X
CHECKER	69											
UTILITY	70	X	X	X		X					X	
SEGUTIL	71	X		X				X		X		
LOADER1	72		X	X					X		X	
RINS	73						X					
JOBTABLE	74	X										
DEBUG	75	X										
NURSERY	76			X								
SYSDPLY	77						X					
FIRMMWARESIM	78	X								X	X	X
SPOOLING	79			X	X			X	X	X	X	X
SPOOLCOMS	80	X					X	X		X		
MESSAGE CAT				X			X	X	X	X		

2. PROBLEMS SOLVED IN MPE C.00.11

- a. A delta Q of zero in a stack marker could cause MPE to loop.
- b. A problem in which an in-use terminal could be FOPENED by another process was corrected.
- c. The default log-on termttype is now termttype zero. Previously there were too many nulls being provided for carriage return.
- d. Incorrect multiple usage of a field in the PCB (Process Control Block) occasionally resulted in overlapping virtual memory assignments, causing one data stack to partially overlay another. These 'bad' stacks occurred under heavy system load and were known to be a cause of the following failures:
 - 1) Bounds violation halts (segment number %11).
 - 2) System Failures 10, 15, 20, and 21 due to invalid stacks.
 - 3) System Failures 110, and 111 due to invalid extra data segments.
- e. File System Changes
 - 1) Bounds checking and default parameter values are now enforced for FREADLABEL and FWRITELABEL.
 - 2) In 48K systems a bounds violation (Halt in segment 11) could occur in the file system if the user's stack was near memory's upper bound.
 - 3) A NOBUF multi-record read from a terminal has been corrected.

- 4) FOPEN'ing of an OLDTEMP file would not allow the overriding (via a FILE equation) of a FCLOSE disposition of SAVE with a final disposition of TEMP. This overriding allows an OLDTEMP file to remain in the job temporary domain and not be saved (permanent) in the system domain.
- 5) If a user who did not have save-file (SF) capability attempted to :RENAME a file, the file was purged and MPE responded with:

ERR 100, 102
FILE SYSTEM ERROR

Error 102 is listed as a directory error. This would occur only if the user was the creator of the file. This means that the user previously had SF capability, but now it has been removed by the account or system manager. In other words, RENAME caused problems only for users who created files while possessing SF capability and attempted to RENAME them after having lost SF capability.

- 6) A FILE LABEL ERROR console message for an UNKNOWN file would cause the message to be processed until a binary zero was found somewhere in memory.
- f. A SPOOLER's DB+0 could unintentionally be zeroed, causing the SPOOLER to become 'suspended' with a dedicated memory area.
- g. One cause of port lockout has been fixed. If a user on a type 103 modem entered :BYE and then disconnected the telephone before the 3000 dropped the carrier it was possible for this port to become locked out.
- h. The printing reader punch driver for the HP 2894 has been changed. A more efficient algorithm is used to translate from HOLLERITH to ASCII, which should lessen the device's impact on the system when it is in use. The speed at which the HP 2894 operates is still the same, however.

3. Enhancements to MPE C.00.11

- a. PAUSE Intrinsic

The PAUSE Intrinsic will cause the calling process to be suspended for a specified number of seconds. When at least INTERVAL seconds have passed, the calling process is awakened automatically and control is returned to the caller. Currently INTERVAL has been defined as 5 seconds.

PROCEDURE PAUSE (INTERVAL);
REAL INTERVAL;

Calling parameter:

INTERVAL — Specifies the amount of time, in seconds, which must pass before the calling process can continue.

Condition Codes:

CCE — Request granted
 CCL — Parameter negative or too large
 CCG — Not returned (Reserved)

4. Known Problems in MPE C.00.11

- 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 spooles 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 spooles, each using four sectors of disc space. If the line printer is not spooled, these null spooles 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 spoofer is closed during this resource allocation loop, the job may be launched normally. In this case, the last spoofer for \$STDLIST will be the true job listing.

This bug can be overcome by increasing the maximum number of open spooles. 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 spoofer. When the file is closed (FCLOSE), the spoofer becomes unopened.

For example:

A SESSION's single access to a spooled line printer requires one opened spoofer; 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 spoofer.

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

5. Documentation Changes in MPE C.00.11

- a. MPE/3000 Operating System Reference Manual

Pg. 8-18. Following the specification of the intrinsic PROCTIME, insert the specification of the intrinsic PAUSE as it appears in this article.

Pg. 6-54. Add a new FCHECK code of 111: User lacks SF capability.

**2780/3780 EMULATOR
HP 30130B.01.04**

This article describes 2780/3780 Emulator HP 30130B.01.04, as incorporated into the MIT tape date coded 1610.

Problems Solved:

1. Halt 14 caused by line disconnect before RJE sent DLE EOT (BI-SYNC disconnect).
2. A 2780 Emulator problem of inability to receive data blocks of zero length ending with an ETX or ITB.

BASICOMP/3000, 32103A.00.04

This article describes BASICOMP/3000, HP 32103A.00.04 as incorporated into the MIT tape, date coded 1610.

Problems Solved in BASICOMP/3000:

1. MAT Scalar Multiply failed when the array was type-LONG or type-COMPLEX and the scalar expression was a simple or subscripted variable of a different data-type.
2. When reading strings from a binary file into a substring specified with two substring designators, the number of characters actually read was based on the physical length of the string variable instead of the length of the substring.
3. Comparison of a substring reference with a string literal might cause a stack underflow when the substring exceeded the logical bounds of the string variable and the length of the literal was longer than the difference between the physical and logical lengths of the string variable. Example:


```
10 DIM X$(5)
20 X$="1234"
30 IF X$(3;5)="34 " THEN 1000
```
4. A FOR-loop generally failed to execute if the control variable was initialized to the LEN of a string and the STEP and TO values were one of the constants zero, one, and negative one. Example:


```
10 FOR I=LEN($$) TO 1 STEP -1
```
5. MAT NUL\$ looped too many times, causing the stack to be clobbered when the string array was declared in a COM declaration with undefined dimensions ("(*,*)").
6. BUF(0) often returned type 2 (string) even when the next item in the input buffer was a number.
7. An incorrect index was computed for a string array reference if one of the following were true:
 - a. The subscript was not a constant and the physical length of each string element exceeded 252 characters.
 - b. The array was declared in a COM declaration with undefined dimensions ("(*,*)").
8. The RESTORE statement failed if the label specified was not a DATA statement.
9. Returning from a user-defined string function would infrequently cause a stack underflow.
10. Invalid code was generated for a string reference with substring designators in the parameter list for a user-defined function or external procedure, usually resulting in a bounds-violation abort in the BASIC library.
11. A subscripted array reference (without substring designators) in the parameter list for a user-defined function or external procedure caused incorrect code to be generated for succeeding expressions (i.e., by-value parameters).

12. An INPUT statement of the form "INPUT <quoted string>:" was not executed.
13. When there were no DATA statements, TYP(0) caused a run-time termination with an error message instead of returning an END-OF-DATA code.

Known Problems in BASICOMP/3000

1. When the base is type-REAL and the power is a type-LONG constant representable as an integer (e.g., "9**(-2L0)"), single-precision exponentiation is performed instead of double-precision arithmetic.
Work-around: Replace type-LONG constant power with a variable.
2. Unary minus (" - ") preceding a constant is not always handled correctly. This causes the following two incorrect results (where "X" is a constant and "Y" is any variable, constant or expression):
 - a. "-X MOD Y" is evaluated as "(-X) MOD Y" instead of "-(X MOD Y)"
 - b. "-X**Y" is evaluated as "(-X)**Y" instead of "-(X**Y)".
Work-around: Fully parenthesize expression or replace first constant with a variable.
3. Incorrect code is generated for I/O FOR-loops (e.g., "PRINT (FOR I=. .)") with a constant "-1" STEP size.
Work-around: Replace constant "-1" with a variable.
4. \$NULL is always treated as a binary file. This causes ADVANCE and file LINPUT to terminate with an error instead of recognizing end-of-file. UPDATE also terminates with the wrong message.
5. Incorrect code is generated for a FOR-loop which contains both an ONEND with a destination within the loop and a GOTO with a destination outside the loop. This situation will cause spurious run-time aborts when an end-of-file is detected while inside the loop.
Work-around: Place a superfluous GOTO outside the FOR-loop with a destination inside the loop. Note that the GOTO should not be executed.
6. Lower-case characters are not recognized as format specifications in PRINT USING format strings.

COBOL/3000, HP 32213B.01.05

This article describes COBOL/3000, HP 32213B.01.05 as incorporated into the MIT tape, dated 1610.

Problems Solved in COBOL/3000:

1. Using SORT in a subprogram failed because of undefined external.
2. Display of item with byte address >64K failed.

COMPILER LIBRARY/3000, 32211C.04.00

This article describes Compiler Library/3000, HP 32211C.04.00 as incorporated in the MIT tape date coded 1610.

Problems Solved in Compiler Library/3000

The lower case letters p, q, g, j, y are plotted in two steps. Those parts of the letter which drop below the line are handled by artificially altering the origin of the plot. The rotation algorithm in the procedure SYMBOL handled these parts of the letter incorrectly when plotted at other than 0 degrees rotation.

Enhancements to Compiler Library/3000

Several new procedures have been added. They include:

```
DOUBLE PROCEDURE JSIGN'(I,J);VALUE I,J;DOUBLE
I,J;OPTION EXTERNAL;
```

Calculate the absolute value of double integer I and give it the sign of double integer J.

```
PROCEDURE JMAX0'(N);VALUE N;INTEGER
N;OPTION EXTERNAL;
```

Calculate the largest of N double integers on the top of stack and return that double integer in S-2N+1.

```
PROCEDURE JMAX1'(N);VALUE N;INTEGER
N;OPTION EXTERNAL;
```

Calculate the largest of N real numbers on top-of-stack and return the double integer of that number in S-2N+1.

```
PROCEDURE JMIN0'(N);VALUE N;INTEGER N;OPTION
EXTERNAL;
```

Calculate the smallest of N double integers on top-of-stack and return that double integer in S-2N+1.

```
PROCEDURE AJMIN0'(N);VALUE N;INTEGER
N;OPTION EXTERNAL;
```

Calculate the smallest of N double integers on top-of-stack and return that double integer in S-2N+1 as a real.

```
PROCEDURE JMIN1'(N);VALUE N;INTEGER N;OPTION
EXTERNAL;
```

Calculate the smallest of N real numbers on top-of-stack and return the double integer of that number in S-2N+1.

```
PROCEDURE AJMAX0'(N);VALUE N;INTEGER
N;OPTION EXTERNAL;
```

Calculate the largest of N double integers on top-of-stack and return that double integer in S-N+1 as a real.

```
PROCEDURE CTAN(Z);REAL ARRAY Z;OPTION
EXTERNAL;
```

Complex tangent in radians

```
PROCEDURE CCOSH(Z);REAL ARRAY Z;OPTION
EXTERNAL;
```

Complex hyperbolic cosine

```
PROCEDURE CSINH(Z);REAL ARRAY Z;OPTION
EXTERNAL;
```

Complex hyperbolic sine

```
PROCEDURE CTANH(Z);REAL ARRAY Z;OPTION
EXTERNAL;
```

Complex hyperbolic tangent

```
PROCEDURE CTODR';OPTION EXTERNAL;
```

Complex base to double integer power. See CTOI in Compiler Library manual for meaning of V and R.

```
LONG PROCEDURE DCOSH(Y);LONG Y;OPTION
EXTERNAL;
```

Long hyperbolic cosine

```
LONG PROCEDURE DSINH(Y);LONG Y;OPTION
EXTERNAL;
```

Long hyperbolic sine

```
LONG PROCEDURE DTANH(Y);LONG Y;OPTION
EXTERNAL;
```

Long hyperbolic tangent

```
PROCEDURE LTODR';OPTION EXTERNAL;
```

Long base to double integer power.

```
PROCEDURE DTOI';OPTION EXTERNAL;
```

Double integer base to integer power.

```
PROCEDURE DTOD';OPTION EXTERNAL;
```

Double integer base to double integer power.

```
PROCEDURE RTOD';OPTION EXTERNAL;
```

Real base to double integer power.

PROCEDURE PRINTFILEINFO(F);VALUE F;INTEGER F;OPTION EXTERNAL;

Unprimed secondary entry point to PRINT'FILE' INFO.

There are *no known outstanding problems* in Compiler Library/3000, 32211C.04.00

Documentation Changes in Compiler Library/3000

An updated compiler library manual reflecting these additions and some additional corrections is available. Refer to the *Bulletins* section for details.

IMAGE/3000, HP 32215A.04.00

This article describes IMAGE/3000, HP 32215A.04.00 as incorporated into the MIT tape date coded 1610.

This version of IMAGE corrects two bugs, and contains a number of new features or enhancements. *It is necessary to do a conversion on existing data bases in order for them to be used with the new software.* Two possible methods of accomplishing the conversion are described, following the discussion of the enhancements.

Problems Solved in IMAGE/3000

1. There was an error in the way DBPUT and DBDELETE handled an automatic master data set which is related to a detail data set through more than one search item. An example of this fairly uncommon (but useful) situation is the sample data base "STORE" in APPENDIX A of the IMAGE Reference Manual. In this data base, the "SALES" detail data set is related to the automatic master data set "DATE-MASTER" through detail search items "PURCH-DATE" and "DELIV-DATE". The problem manifested itself in unpredictable ways, such as the occasional creation of multiple master data set entries with the same key value, none of which contained correct pointer information. The problem has been corrected.

If you have a data base containing a relationship of this kind, you should do a serial DBUNLOAD of it, erase it, and then do a DBLOAD. This will rebuild the data base structure, repairing any erroneous entries. (The DBLOAD must be done with the new version of IMAGE.) This process may be combined with the necessary data base conversion, if desired, by using method (1.), described below. Be sure to run DBUNLOAD with the entry point SERIAL.

2. There was a problem in DBGET, DBUPDATE, and DBPUT, such that occasionally an accessible data item in the list parameter would be disallowed, causing an erroneous condition word -52 (BAD LIST) to be returned. This has been corrected.

Enhancements to IMAGE/3000

Use of the new features of IMAGE is encouraged — they are intended to increase the flexibility of the product. However, some of the new features are fairly complicated; proper use of them requires a complete understanding of their purposes and a recognition of the subtleties involved. Before attempting to make use of the new features, refer to the new reference manual (see the *Bulletins* section) and the "note" file (NOON215A.HP32215.SUPPORT) distributed with the new software. The contents of this ASCII file should be listed to a printer, using FCOPY.

Summary of Enhancements to IMAGE/3000

- New access (DBOPEN) Modes (Modes 4 through 8)
- DBFIND and DBGET without locking in modes 1 and 5
- New DBCLOSE mode (Mode 3 — "Rewinds" the data set)
- New privacy and security scheme
- Intrinsic error code changes
- New error message routines (DBEXPLAIN and DBERROR)

Data Base Conversion

In order to implement the new privacy and security scheme, some changes have been made in the internal format of IMAGE root files. These files will now occupy a few more sectors of disc space than they did previously. (They are still relatively small.)

The change in root file format means that existing data bases cannot be opened with the new (A.04.00) or subsequent versions of the IMAGE software. The error returned by DBOpen will be condition word -91, which means "BAD ROOT MODIFICATION LEVEL". The corresponding error message from the IMAGE utilities is

OUTMODED ROOT

and the message produced by the new DBERROR procedure is

ROOT FILE (DATA BASE) NOT COMPATIBLE WITH CURRENT IMAGE INTRINSICS

Obviously, it is necessary to convert old data bases to the new format before accessing them with the new IMAGE software. Two alternative methods exist for doing this:

1. Using the old version of IMAGE (A.03.01), run DBUNLOAD on the old data base, backing up all entries to tape.
2. Purge the old data base using DBUTIL,PURGE.
3. Install IMAGE, (version A.04.00 or later).

4. Recreate the root file in the new format by using your original SCHEMA and the new DBSCHEMA program. DBSCHEMA will accept the old "LEVELS" format. If desired, the SCHEMA may be modified to take advantage of the new "PASSWORDS" facility.
5. Recreate and initialize the data sets of the data base using DBUTIL,CREATE.
6. Run DBLOAD on the data base, using the tape created in Step 1.

or

- II. Make use of the one-time conversion program, DBCONVRT. This program, distributed as part of IMAGE A.04.00 is run like any of the other IMAGE utilities. You must be logged on the same group and account in which the data base resides.

1. Enter the MPE command

```
:RUN DBCONVRT.PUB.SYS
```

2. DBCONVRT will prompt you for the data base name (and maintenance word) as follows:

```
WHICH DATA BASE?
```

3. Respond with the data base reference in the format described in Section 6 of the IMAGE reference manual.

4. DBCONVRT will create a new root file in the new format and purge the old one. It also accesses each of the data sets, so they must be present for its successful operation. It then prints

```
DATA BASE CONVERTED
```

before terminating.

An example of a DBCONVRT execution follows:

```
:RUN DBCONVRT.PUB.SYS
WHICH DATA BASE? SCHOOL/SUPER
DATA BASE CONVERTED
END OF PROGRAM
```

DBCONVRT runs in about a minute or less in a stand-alone environment. It needs to be used only once for each data base. Attempts to use it a second time will cause it to print the message

```
OUTMODED ROOT
```

which, in this case, means "DATA BASE ALREADY CONVERTED". The DBCONVRT program will be distributed as part of IMAGE for a few months only.

Documentation for IMAGE/3000

A new edition of the IMAGE Reference Manual, reflecting this version of IMAGE is available (refer to the *Bulletins* section).

The changes and enhancements in version A.04.00 of IMAGE are also fully documented in the "note" file (N00N215A.HP32215.SUPPORT) distributed with the new software. The contents of this ASCII file should be listed to a printer using FCOPY.

QUERY/3000, HP 32216A.03.00

This article describes QUERY/3000, HP 32216A.03.00 as incorporated in the MIT tape date coded 1610.

Problems Solved in QUERY/3000

The following error conditions have been corrected:

1. BAD ITEM LIST error message when REPORTing a master data item in MODE 1.
2. A DEBUG error in REPORT caused by not checking a FIND CHAIN using two master sets with no detail set specified.
3. UPDATE REPLACE modifying more than the first occurrence of a compound data item.

Enhancements to QUERY/3000

1. **CREATE**

Add LP and Rn (where 0<=n<=9) to the list of illegal procedure names.

2. **DATA-BASE**

LEVELWORD prompt changed to PASSWORD
MODE may now equal an integer from 1 to 8.

Change error message

```
LEVELWORD ERROR
```

to

```
PASSWORD ERROR
```

3. **DEFINE**

See DATA-BASE above.

4. **FIND**

Allow additional relational operators.

Operator	Meaning
<>	not equal
#	not equal
=	equal
<	less than
<=	less than or equal
>	greater than
>=	greater than or equal

Note: The operators <>, <=, and >= cannot have any intervening spaces (embedded blanks).

If you want to locate all entries in a data set the following FIND command may be used.

FIND ALL [set.] item

This is equivalent to

FIND [set.] item INE " "

Change error message

FIND PROCEDURE TOO LONG

to

COMMAND TABLE OVERFLOW

New error message:

BROKEN CHAIN POINTERS

A user with read-only access is sharing the data base with a user who is making structural changes to the data base.

5. **FORM**

FORM output on items and sets does not include the read/write level information.

6. **LIST**

The LIST command provides automatic spacing and column alignment. If the user wishes to display his entries in a different manner, the REPORT command provides the capability to print entries in formats totally under the user's control.

FORMAT

LIST data set name/data item list [FOR relation [AND/OR relation...]] [END]

where

- data set name name of a data set
- data item list list of data item names separated by commas
- relation [data set name.] data item name
 RELOP " "VALUE" "
 [," "VALUE" "...]
- RELOP is a relational operator
 IS/IE/EQ/=/ISNOT/INE/NE/
 #/<>/ILT/LT/</INLT/GE/
 />=/IGT/GT/>/INGT/LE/
 <=/IB
- VALUE is a data item value. It must be the same type and within the same value range as the data item named in the relation. Value need not be enclosed in quote marks (") unless the value contains special characters.

Note: The operators <>, <=, and >= cannot have any intervening spaces (embedded blanks).

The LIST command prints complete or partial entries complete with headings based on the data item names as defined in the data base.

The column headings are determined from the data item names and print field size is determined from the data item types.

Data items from the data set will be formatted as their widths dictate, as follows:

Item Type	Width	Max
I1	6	
I2	11	
J1	5	
J2	10	
K1	5	
R2	12	
R3	17	
Un	n	Output device
Xn	n	Line Size
Zn	n+1	20
Pn	n	20

Note: Only the first element of a compound data item will be displayed.

The data header (data item names) repeat at the top of every page of output. The data values begin two lines under the headers.

Alphanumeric fields are aligned left justified to their headers. Numeric fields are aligned right justified to their data headers. Data headers and item values are separated by two spaces from adjacent headers and values. Data truncation will occur when a data field causes line overflow because its defined size exceeds the line size.

The FOR condition, when included, selects for presentation only those entries which meet the stated condition(s).

In the case when the entry contains more items than can be printed on one line, only those items that fit the line width will be printed.

LIST command error messages:

CONSTANT LITERAL TABLE OVERFLOW

The number of data item values appearing in the LIST command have exceeded the capacity of the table used to hold them.

COMMAND TABLE OVERFLOW

A list command contains more than 10 logical (AND/OR) relationships.

DATA BASE NOT DECLARED

A LIST command has been entered prior to declaring the data base to be accessed.

DATA ITEM VALUE TOO LONG

The data item value entered exceeds 500 characters or exceeds the maximum defined size for the data item.

DUPLICATE ITEM IGNORED name

The same data item has appeared more than once in the list of items to be printed. The second time name appears, it is ignored; the first reference to name remains valid.

EXPECTED A CONNECTOR OR 'END'

The command is missing a logical connector ("AND" and "OR") or a terminating "END".

ILLEGAL DATA ITEM NAME name

The data item name does not belong to the data set specified or to the data base currently being accessed, or you do not have READ access to the data item.

ILLEGAL DATA SET NAME name

The data set called name does not belong to the data base currently being accessed or you do not have READ access to this data set.

ILLEGAL ITEM LENGTH

The data item being referenced is not of the proper size and type to be processed by QUERY.

ILLEGAL ITEM LENGTH – ITEM IGNORED

The item length exceeds the maximum for the data type, and is not printed. Item maximums are U136, X136, Z20, and P20.

INPUT TOO LONG – TRUNCATED

The data item value input was longer than the maximum defined length for the data item. The value is truncated on the left for numeric data types and on the right for alphanumeric data types (U and X) and processing continues.

INVALID CONNECTOR OR TERMINATOR xxxx

QUERY expected a logical connector ("AND" or "OR") or "END". xxxx is the offending character string appearing in place of the expected string.

INVALID NUMERIC DIGIT

A value input for a data item defined as type Z or type P contains an invalid or non-numeric digit.

INVALID RELATIONAL OPERATOR

A relational operator other than IS, IE, ISNOT, INE, IGT, ILT, INLT, INGT, IG, EQ, NE, LT, GE, GT, LE, =, #, <, <=, >, >=, or <> has appeared in the LIST command where one of the above was expected.

INVALID # OF VALUES FOR RELATIONAL OPERATOR

Multiple data item values may follow only the relational operators IS, IE, EQ, =, ISNOT, INE, #, or <>.

NON-NUMERIC IN REAL VALUE

A non-numeric digit has appeared in a real data item value. (This does not include values entered in scientific notation such as 12.44E+04.)

NUMERIC VALUE ERROR

A numeric value input contains an illegal digit or the value exceeds the maximum value allowable for the data type.

RETRIEVAL FROM MORE THAN ONE DATA SET

A LIST command has specified data items which cause access to more than one data set.

WHAT IS THE VALUE OF name

Prompts you to supply a value for the data item name when a LIST command with a null data item value (" ") is executed.

7. OUTPUT

The maximum allowable line size is 136 characters.

Change error message

LP DEVICE NOT AVAILABLE

to

'QSLIST' DEVICE NOT AVAILABLE



Change error message

ILLEGAL COMMAND

to

INVALID COMMAND

8. RENAME

When RENAMEing a procedure name, the new procedure name is checked to verify that it is not one of the illegal names discussed for the CREATE command.

9. REPORT

Add the following discussion of print element to the DETAIL, GROUP, and TOTAL Statements:

The print element may also be the number of a register Rn where n is a number between 0 and 9 and refers to a specific register containing data on which some arithmetic operation(s) have been performed.

A Total Statement may consist of only

Tn,Rn

where Tn corresponds to a control level break and Rn is the number of a register to be set equal to zero (0).

REGISTER Statement

The Register statement identifies a register and specifies an operation.

Each Register Statement specifies the register (from 0 to 9) to be used and one of the following operations:

LOAD
ADD
SUBTRACT
MULTIPLY
DIVIDE

FORMAT:

Rnumber,operator,data type

where

number is

an integer from 0 to 9

operator is

L[OAD] for load,
A[DD] for addition,
S[UB] for subtraction,
M[ULT] for multiplication, or
D[IV] for division.

data type is

a numeric value enclosed in quotes (""),
a data item name (numeric type), or
a Rn indicating the contents of a
register.

The Register Statement does not output any

data. It may be included in any other Report Statement (except Sort and Header) by specifying Rn as a print element parameter.

The contents of all registers are initially zero when a REPORT command is executed.

All arithmetic operations are cumulative. The contents of a register may be reset by using the L[OAD] operator or by use of a Total Statement to reset the register to zero when a control break occurs. For example, the statement T2,R3 sets Register 3 to zero when a control break occurs as a result of Sort level 2.

The maximum number of digits in a register is 19.

You can mix data types in a register operation. For example, you can add an integer to a real number. The data type of the register contents (after such an operation) is determined by the following order of precedence (or rank) of the data types.

The order is:

HIGHEST R3 (extended Precision Real numbers)
R2 (real numbers)
LOWEST I1, I2, J1, J2, K1, Zn, Pn (Integer, Zoned, and Packed Decimal numbers)

The new register content always has a data type which is the higher of the two operands types.

Change error message

ILLEGAL REPORT CONTROL STATEMENT
STATEMENT

to

PARAMETER ERROR

New REPORT command error messages:

ARITHMETIC OVERFLOW ON Rn

Some register arithmetic operation caused an overflow/underflow condition on Register number (n). The REPORT command terminates.

ILLEGAL DATA TYPE

The data type specified in a Register Statement is defined as a U or X data type or is not Rn where $0 \leq n \leq 9$.

ILLEGAL REGISTER OPERATOR

The operator specified is not L[OAD], A[DD], S[UB], M[ULT], or D[IV].

INVALID NUMERIC DIGIT

A numeric value specified an illegal digit or the value exceeds the maximum value.

NON-NUMERIC IN REAL VALUE

A non-numeric digit appears in the real value or exceeds the maximum allowable value. (This does not include values entered in scientific notation such as 12.44E+04.)

10. UPDATE

When ADDing data items of data types U, X, or Z and you respond with a null value (carriage return in SESSION or a blank record in JOB) the Z data types will be zero (ASCII) filled and U and X data types will be blank filled.

Change error message

BUFFER OVERFLOW – UPD TERMINATED

to

BUFFER OVERFLOW

11. XEQ

Add a new optional parameter

XEQ filename [,NODATA]

If NODATA is included in the command, then the filename will contain only commands and all command parameters will be read from the \$STDIN device.

New error messages:

EXPECTED A ','

A comma must follow the filename when using the optional NO DATA parameter

PARAMETER ERROR

The optional parameter NODATA is not recognizable.

Documentation for QUERY/3000

Refer to the *Bulletins* section for details on the completely rewritten QUERY reference manual.

RPG/3000, HP 32104.02.02

This article describes RPG/3000, HP 32103.02.02, as incorporated in the MIT tape dated 1610.

Problems Solved in RPG/3000

1. TESTB, BITON and BITOF only worked correctly if surrounded with single quotes.
2. BITON and BITOF could have caused a bounds violation, stack overflow or stack underflow.
3. TESTN was not recognizing a rightmost signed numeric as numeric.

4. Cross reference would sometimes give a zero referenced number instead of where field was actually referenced.
5. A subscript that was not numeric could have caused a file error during compile.
6. A compiled program would occasionally give an integer overflow error while executing a LOKUP instruction.
7. With certain terminal errors in output specifications, compiler would abort.
8. SQRT would sometimes abort with integer overflow at runtime.
9. MOVEA would cause a bounds violation if factor 2 or result field was an array subscripted by a variable.
10. A demand file's buffer was not blanked out before reading, leaving the previous contents of the buffer there if a short line were entered.
11. An error message was not given if there were no ENDSR after a BEGSR operation. The program would also loop while being prepared.
12. Z-SUB did not do decimal point alignment.
13. Z-ADD did not do half adjusting.
14. Illegal patch message while preparing an RPG compiled program.

Enhancements to RPG/3000

RPG now allows compile time tables and arrays to immediately follow an ** record at the end of the program.

A (array) records may still be used in the body of the program. These will be processed first, followed by tables/arrays after the ** record on the master file, followed by tables/arrays after the ** record on the text file.

This will eliminate a major conversion problem.

RTE-C PROGRAMMABLE CONTROLLER, HP 30301A

This article describes RTE-C Programmable Controller, HP 30301A.00.01 as incorporated into the MIT tape, date coded 1610.

Problems Solved in RTE-C, 30301A.00.01

When a file name with an entry point list was specified as a save file in the format

FILE(E1,E2,...EN)

then a blank was inserted into the character position preceding the first comma.

This caused an erroneous 'NOT LST ENTRY' to be printed by XL2100.

SPL/3000, HP 32100A.06.00

This article describes SPL/3000, HP 32100A.06.00 as incorporated into the MIT tape, date coded 1610.

Note: A \$COPYRIGHT command has been added to SPL which is used to add copyright information to the USL and program files. The SPL source contains this command and since old SPL's do not recognize this, an error message will be emitted if an old SPL is used. The SPL 6.0 source should be compiled with SPL 6.0 to prevent this from happening.

Problems Solved in SPL/3000

1. If both the text and master files are disc files and a new file is specified, the new file is opened with the number of records equal to the sum of the EOF's on the text and master files. In addition, unused space is returned to the system.
2. An error message is emitted if there are more than 64 local array declarations; previously bad code was generated with no message.
3. A warning message is emitted if there is a size mismatch between a formal parameter and an actual parameter for parameters by reference. (There has always been an error message emitted for a size mismatch for parameters by value.)
4. Error messages have been added for the following error conditions in data declarations.

```

INTEGER X=X;    << error is in next line >>
POINTER B:=@X; << X register does not have
                have an address >>
INTEGER A=Q+2; << error is in next line if
                global >>
POINTER C:=@A; << Q is not defined at com-
                pile time >>

```

Error messages have been added for this similar error in a statement.

```

@B:=X;          << using above declarations
                X has no address >>

```

5. If an error occurs during compilation the JCW word is now set. Previously, when this was not set then a PREP and a RUN could occur even though an error existed in the program file.
6. If outer block declarations and statements are interspersed then the USL file is now marked invalid. The SEGMENTER would occasionally loop with USL files created by such source files.
7. Incorrect code was emitted for the following: this has been corrected.

```

EXTERNAL LONG ARRAY LONG1(@);
LONG(0):=1L0;

```

The links to instructions referencing external variables were not chained properly.

8. The instruction counter printed alongside an SPL listing was off by one for the following sequence of statements.

```

TOS:=0D;
TOS:=A;

```

9. Incorrect addressing was generated for the following code: this has been remedied.

```

LOGICAL SUBROUTINE S;
BEGIN
  S:=(IF (FNUM:=FOPEN(FNAME.%4.
    %104.LEN)) <> 0
    THEN TRUE ELSE FALSE;
END;

```

10. When a simple byte variable was used as an actual parameter to a formal procedure, a logical shift was not being emitted to convert the word address to a byte address.
11. The sequence number was blanked out if the master file or text file contained both a \$CONTROL USLINIT and a \$CONTROL SUBPROGRAM command.
12. Incorrect code was emitted for the following statements: this has been corrected.


```

ARRAY A(*)=PB:=1,2,3;
ASSEMBLE(LRA A);

```
13. Error messages were emitted when formal procedures or entries were passed to other procedures.
14. The error message emitted when an attempt to store into a PB array is made has been changed.
15. The optimization for generating Add Immediate to the X register or the TOP of the stack resulted in negative numbers having only the last 8 bits being used.
16. OWN byte arrays with an odd lower bound resulted in the initialization list being displaced.
17. A byte comparison of a byte variable with a string of one character resulted in a Compare Immediate instruction even if an SDEC parameter was present. This eventually resulted in a syntax error. A byte compare is now emitted in the case where an SDEC parameter is present.
18. The following source was not interpreted properly.


```

IF (X:=A(4))=1 THEN GO BACK;
I:=B(4); << where X is declared to be the X
reg >>

```

The value of 4 was not reloaded into the X register.

19. If a subroutine consisted only of an assignment statement, the STORE address was incorrect.

Enhancements to SPL/3000

The following procedure declarations have been added to the SPLINTR file; no program changes were made to BUILDINT.

```
DOUBLE PROCEDURE CLOCK;OPTION EXTERNAL;
LOGICAL PROCEDURE CALENDAR;OPTION
EXTERNAL;
DOUBLE PROCEDURE JSIGN'(I,J); VALUE I,J;
DOUBLE I,J; OPTION EXTERNAL;
PROCEDURE JMAX0'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE JMAX1'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE JMIN0'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE AJMIN0'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE JMIN1'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE DFIXT'(L); VALUE L; LONG L;
OPTIONAL EXTERNAL;
PROCEDURE DFIXRT'(L,P); VALUE P; LONG L;
INTEGER P; OPTION EXTERNAL;
PROCEDURE AJMAX0'(N); VALUE N; INTEGER N;
OPTION EXTERNAL;
PROCEDURE CTAN(Z); REAL ARRAY Z; OPTIONAL
EXTERNAL;
PROCEDURE CTAN'(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE COSH(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE CCOSH'(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE CSINH(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE CSINH'(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE CTANH(Z); REAL ARRAY Z; OPTION
EXTERNAL;
PROCEDURE CTANH'(Z); REAL ARRAY Z; OPTION
EXTERNAL;
```

```
PROCEDURE CTODR'; OPTION EXTERNAL;
PROCEDURE CTODV'; OPTION EXTERNAL;
LONG PROCEDURE CDOSH(Y); LONG Y; OPTION
EXTERNAL;
LONG PROCEDURE DCOSH'(Y); LONG Y; OPTION
EXTERNAL;
LONG PROCEDURE DSINH(Y); LONG Y; OPTION
EXTERNAL;
LONG PROCEDURE DSINH'(Y); LONG Y; OPTION
EXTERNAL;
LONG PROCEDURE DTANH(Y); LONG Y; OPTION
EXTERNAL;
LONG PROCEDURE DTANH'(Y); LONG Y; OPTION
EXTERNAL;
PROCEDURE LTODR'; OPTION EXTERNAL;
PROCEDURE LTODV'; OPTION EXTERNAL;
PROCEDURE DTOI'; OPTION EXTERNAL;
PROCEDURE DTOD'; OPTION EXTERNAL;
PROCEDURE RTOD'; OPTION EXTERNAL;
PROCEDURE RPINTFILEINFO(FILENUM); VALUE
INTEGER FILENUM;OPTION EXTERNAL;
PROCEDURE PAUSE(TIME); VALUE TIME; REAL
TIME; OPTION EXTERNAL;
PROCEDURE DBCONTROL(BASE,QUALIFIER,
MODE,STATUS);
ARRAY BASE,QUALIFIER,STATUS;
INTEGER MODE;
OPTION CHECK 2,EXTERNAL;
PROCEDURE DBERROR(STATUS,BUFFER,LENGTH);
ARRAY STATUS, BUFFER;
INTEGER LENGTH;
OPTION CHECK 2,EXTERNAL;
PROCEDURE DBEXPLAIN(STATUS);
ARRAY STATUS;
OPTION CHECK 2,EXTERNAL;
```

TRACE/3000, HP 32222A.02.03

This article describes TRACE/3000, HP 32222A.02.03 as incorporated into the MIT tape date coded 1610.

Problems Solved in TRACE/3000

1. The input file "INTDECL" was opened with the FOPTION "FILE EQUATION DISALLOWED"; this has been changed to allow a file equation.

documentation

The following tables list currently available customer manuals for HP 3000 products. This list supersedes the list in the last issue of the **Communicator**.

The most recent changes to the tables are indicated for easy reference. Prices are subject to change without notice.

Copies of manuals and updates 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 customer manuals.

Update packages are free of charge. If you require an update package only, send your request to:

Software/Publications Distribution
5303 Stevens Creek Blvd.
Santa Clara, Ca 95050

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manual(s) you need on the Corporate Parts Center form supplied at the back of the **Communicator**.

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	10/75
32000-90004	32000C MPE/3000 Console Operator's Guide	7.00	1/75	10/75
32000-90006	32000C MPE/3000 System Manager/System Supervisor Manual	13.00	1/75	
32000-90008	MPE/3000 Operating System, System Utilities Manual	3.00	10/75	

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	FORTTRAN/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	7/75	10/75

ADDITIONAL MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
03000-90009	HP 3000 Compiler Library Reference Manual	\$16.50	2/76	*R
03000-90010	HP 3000 Scientific Library Reference Manual	7.00	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	7.50	10/75	*R
03000-90019	HP 3000 Computer Systems Reference Manual	14.00	9/73	
03000-90064	FCOPY/3000 Reference Manual	6.00	7/75	
03000-90107	HP 3000 Cross Loader for HP 2100 Computers	11.00	10/74	
03000-90121	Using the HP 3000: A Guide for the Terminal User	7.50	6/75	
30130-90001	2780/3780 Emulator Subsystem Reference and Application Manual	10.00	2/76	
30300-90002	Programmable Controller Reference and Application Manual	12.00	2/75	
32104-90004	IBM SYSTEM/3 to HP 3000 Conversion Guide	7.50	12/75	
32215-90001	IMAGE/3000 Reference Manual	7.00	3/76	*R
32216-90001	QUERY/3000 Reference Manual	7.00	3/76	*R
32900-90001	Student Information System Reference Manual	18.00	9/74	
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	

*R = Revised

A few words about documentation terms:

New A new manual refers only to the first printing of a manual. When first printed, a manual is assigned a part number.

Revised A revised manual is a printing of an existing manual which incorporates new and/or changed information in its contents. For example, a manual is revised when an update package is incorporated into the manual; the manual gets a new print date and the update package dis-

appears. Note that a revision to a manual effectively obsoletes the previous version of the manual.

Update An update package is a supplement to an existing manual which contains new and/or changed information. Updates are issued when information must get to customers, yet it is inappropriate to issue a revised manual. An update has no part number, it is automatically included when you order the manual with which it is associated.

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 offered in the U.S. and in Europe, for the period April through August, 1976. You

can also obtain a copy of the schedule from your local HP sales office. A European course schedule is available through the sales offices in Europe; a U.S. schedule through U.S. sales offices.

GENERAL SYSTEMS DIVISION COURSE SCHEDULE (U.S.)

April - August 1976

Course Dates and Training Center Location

NUMBER	COURSE TITLE	LENGTH	PRICE	Course Dates and Training Center Location	
				GENERAL SYSTEMS SANTA CLARA	EASTERN TRAINING CENTER - ROCKVILLE
22956A	3000 Image	5 days	\$500	5/3/76 6/7/76 7/12/76 8/16/76	5/17/76 7/26/76
22957A	3000 COBOL, Audio Self Study	30 hrs.	325	These courses can be ordered using the Direct Mail Order form in the back of the Communicator.	
22958A	3000 BASIC, Audio Self Study	30 hrs.	325		
22962A	3000 Commercial/Business User	5 days	500	4/5/76 4/19/76	5/3/76
22964A	3000 System Management	3 days	300	4/12/76 4/26/76	5/10/76
22975A	System 3 Conversion Seminar	2 days	200	4/29/76 6/14/76 8/23/76	
*22801A	3000, A Comprehensive Introduction (Replaces 22962A)	5 days	500	5/24/76 6/28/76 8/2/76 8/30/76	6/7/76 7/12/76 8/2/76 8/16/76
*22802A	3000 System Management and Operation (Replaces 22964A)	4 days	400	6/1/76 7/6/76 8/9/76	6/14/76 7/19/76 8/9/76 8/23/76

*New Courses: Course 22801A, HP 3000: A Comprehensive Introduction is a new offering. It is a combination and redesign of the 3000 Commercial and 3000 Scientific courses. The curriculum now requires less specific programming language skills on the part of the student. Course 22802A, HP 3000: System Management and Operation replaces 22964A (3000 System Management); the new class adds additional material and extends the training from 3 to 4 days.

Registration

Requests for enrollment in any of the 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.

GENERAL SYSTEMS DIVISION COURSE SCHEDULE (EUROPE)

April - August 1976

COURSE NUMBER	COURSE TITLE	LENGTH	BOBLINGEN (GERMAN)	WINNERSH (ENGLISH)	ORSAY (FRENCH)	MILAN (ITALIAN)	STOCKHOLM (ENGLISH)
22962A	3000 Commercial/ Business User	5 days	8/9	5/17			5/10 8/30
22963A	3000 Scientific/ Engineering User	5 days	6/21		6/28		6/14
22964A	3000 System Management	3 days			5/22 6/21	6/30	5/17

Training Center Addresses

Santa Clara
5303 Stevens Creek Blvd.
Santa Clara, California 95050
(408) 249-7020

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

Boblingen
Kundenschulung
Herrenbergerstrasse 110
D-7030 Böblingen, Wurttemberg
Tel: (07031) 667-1
Telex: 07265739
Cable: HEPAG

Winnersh
King Street Lane
GB-Winnersh, Wokingham
Berks RG11 5 AR
Tel: Wokingham 784774
Cable: Hewpie London
Telex: 847178 9

Grenoble
5, avenue Raymond-Chanas
38320 Eybens
Tel: (76) 25-81-41
Telex: 980124

Milan
Via Amerigo Vespucci, 2
1-20124 Milan
Tel: (2) 62 51
Cable: HEWPACKIT Milano
Telex: 32046

Stockholm
Enighetsvägen 1-3, Fack
S-161 20 Bromma 20
Tel: (08) 730 05 50
Cable: MEASUREMENTS
Stockholm Telex: 10721

using the tape cartridge on your 2644

Dwayne Murray
HP Data Terminals

The 2644 Mini DataStation incorporates all the features of the 2640 plus some additional ones which make it extremely attractive as a data entry terminal, time-share terminal, or system console. The addition of two tape units as an integral part of the 2644 permits off-line storage of 110 kilobytes per tape cartridge. The tape units can be controlled by a computer program via escape sequences or directly from the keyboard.

The versatility of the 2644 is demonstrated by resuming operations off-line should the computer system go "down". Your input data can be stored on the tape cartridge off-line. Then, when the system comes "up", data stored on the tape cartridges then can be entered into the computer system. Also, you can reduce computer connect time by entering data initially off-line, then loading the data into the computer from the tape cartridge.

DATA ENTRY

To enter data from a tape cartridge into a computer system, simply press the READ key. (The computer system must issue a DC1 to enable transmission of each record.)

For example, suppose you are using the Text Editor for the *HP 3000*, and you want to create a text file for the data you have on the tape cartridge. You have responded "add" to the "/" prompt. The Editor responds with line number 1. Now all you have to do is press READ. The data contained on the tape cartridge appears on the display following each line number and is sent simultaneously to the computer system. When end-of-data is reached, the reading of data stops and then you can type // to indicate end of data to the system. (You can embed the Editor commands on the tape cartridge to reduce your interaction with the system. Actually, you could embed *all* MPE and Editor commands from log-on to log-off; however you must anticipate the system prompts to prevent data being read as commands and vice versa.)



EXAMPLE: (You may try this if you like.)

1. Record the following on tape cartridge off-line, line-by-line:

```
< CR >
HELLO DWAYNE.HARDPUB;TERM=10
  (Use your own log-on sequence in this case.)
EDITOR
ADD
(ADD YOUR OWN TEXT HERE, LINE-BY-LINE)
//
KEEP <FILE NAME>
END
YES
BYE
```

2. Put your 2644 on-line to your computer system, and make sure that the AUTO LF key is up. Insert the tape cartridge into the left (or right) tape slot, press the

GOLD key and select FROM: L. TAPE (or R. TAPE), TO: DISPLAY, and press READ. Your tape cartridge will log on, select the Editor, enter your text into the work file, store the file, and log off.

A word of caution: Using a *number* of terminals at full speed in this way could cause problems in operating your HP 3000 System.

Entering BASIC programs into the *2000 Access* system from the tape cartridge can be accomplished by the same method — however, you must enter the TAPE command from the terminal keyboard prior to pressing READ key. This changes the *2000 Access* Systems handshake protocol so that the DC1 (X-ON's) are sent to the terminal. (The terminal requires DC1's to send data to the computer system.)

For example, suppose that you want to enter your program from a tape cartridge, and store it in a file.

EXAMPLE:

1. Record your program on the tape cartridge line-by-line:

```
10 FILES MSTR, BUFF
20 DIM A$(255), B$(60), C$(5)
30 IF END#1 THEN 300
```

ETC.

2. Put your 2644 on-line to your *2000 Access* system, make sure that the AUTO LF key is up, and log on. Insert the tape cartridge into the left (or right) tape slot, press the GOLD key, select FROM: L. TAPE (or R. TAPE), TO: DISPLAY, and press READ. Your program will be entered into the system line-by-line. You need only to enter commands to name your program, create the files used by your program, and save it.

DATA RETRIEVAL

Data retrieval from a computer system directly to a tape cartridge can be accomplished by simply pressing RECORD.

For example, suppose you are using the *HP 3000* Text Editor, and you want to store a text file on your tape cartridge. You have the file copied into the work area and are ready to respond to the "/" prompt with LIST ALL or LIST QALL.

1. Assign devices by pressing GOLD, FROM: DISPLAY, TO: R. TAPE.

2. Insert your tape cartridge into the right tape slot.
3. Type LIST ALL OR LIST QALL, then press RETURN. (Be prepared to press RECORD immediately after pressing RETURN to avoid missing data.) The data will not be displayed on the display, therefore, the only indication you will have that the data is being recorded is the blinking green indicator to the left of the tape slot. When the blinking stops, the end of the file has been reached.

For retrieving data from the *2000 Access* system, the same method is used, (simply pressing the RECORD key after entering the LIST command). Recording data from PRINT statements in an executing program can be accomplished by having your program prompt you to press RECORD immediately after pressing RETURN to the prompt. The program segment required to accomplish this could be:

```
90 PRINT "PRESS 'RECORD' AFTER PRESSING
      'RETURN' "
100 READ #1;A$ <Read the first record you want
              to record>
110 PRINT A$ <Print the record on the tape
             cartridge>
120 GOTO 100 <Read the next record>
```

CONTROLLING BY ESCAPE SEQUENCES

Controlling the tape units by escape sequences on the 2000 Access and HP 3000 systems is a simple process also. The escape codes required are found in the 2644A Owner's Manual (HP part no. 02644-90001). A typical program segment for a *data entry* from the left tape cartridge is as follows:

```
INPUT
10 FILES DATA
20 DIM A$(80)
30 PRINT '27'&p1s0R" <Read a record from
                    the tape cartridge>
40 LINPUT A$ <Transfer the record to
              the computer>
50 IF A$='30 THEN 80 <Check for file mark
                    on tape>
60 PRINT #1;A$;END <Write the record into
                    a file>
70 GOTO 30 <Read next record>
80 END
```

Note: Decimal 27 ('27') is equivalent to ASCII code for ESCape. Decimal 30 ('30') is equivalent to ASCII code for RS (Record Separator).

A typical program segment for a *data retrieval* to a tape cartridge is as follows:

OUTPUT

```

10 FILES DATA
20 DIM A$(80)
30 READ #1;A$ <Read a record from the file>
40 PRINT <Write the record on the tape
   '27"&p2dW"+A$ cartridge>
50 GOTO 30 <Read next record>

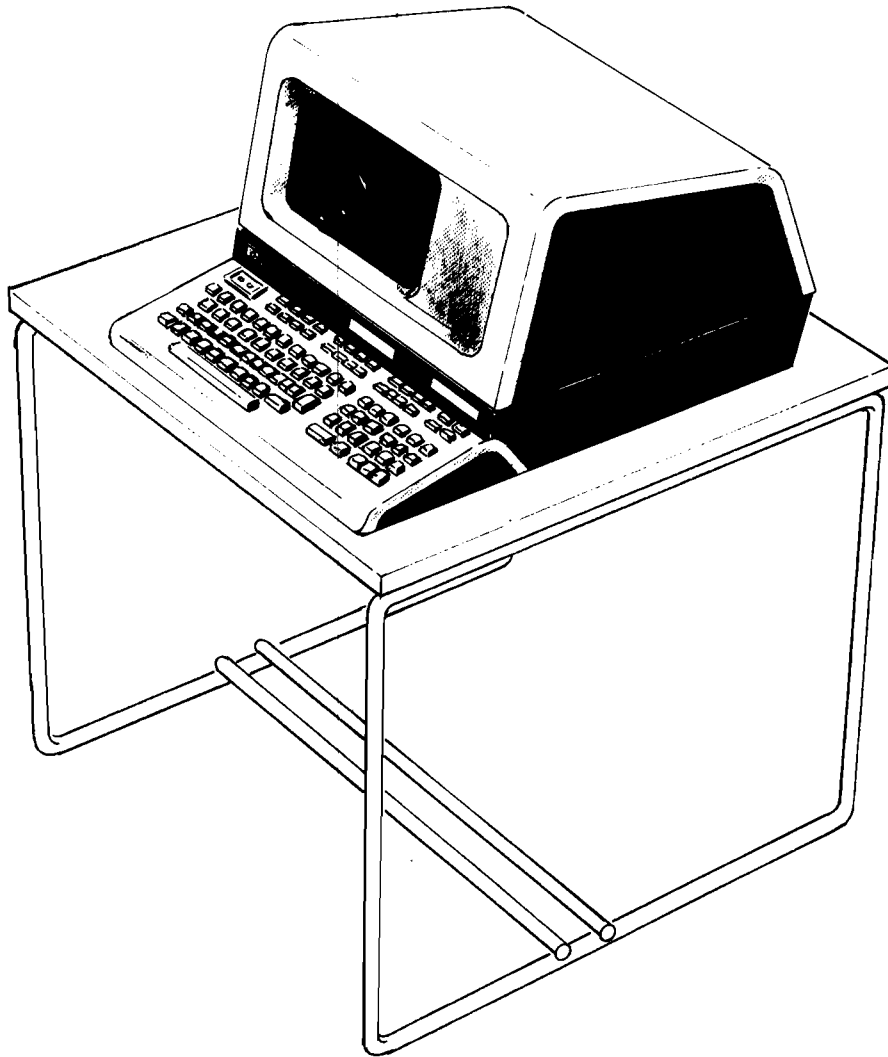
```

More sophisticated programs can be coded to control the tape units using other escape sequences. You can code such things as:

1. Rewinding
2. Space n records
3. Space n files

4. Locate end-of-data mark
5. Condition tape
6. Record file mark
7. Record end-of-data mark
8. Test cartridge tape unit
9. Skip n records immediately without recording end-of-data mark
10. Transmit next record
11. Retransmit last record only
12. Send byte count before sending next record
13. Send byte count before sending next record read
14. Copying records, files, or all data from one device to another.

Instructions for the above coding as well as other features of the 2644 can be found in the 2644A Mini DataStation Owner's Manual, part no. 02644-90001.



software tips

RTE-III AND PARTITIONING OF MEMORY

Jim Bridges
HP Data Systems

Several people have asked for more explanation of generator messages related to the partition sizes on RTE-III systems. Typically, the following sequence will occur. (Example applies to a 32K system):

```
LARGEST ADDRESSABLE PARTITION
W/O COM 19 PAGES
W/ COM 19 PAGES
```

```
LWA MEM RESIDENT PROGRAM AREA XXXX
ALIGN AT NEXT PAGE?
NO
```

```
SYS AV MEM XXX WORDS
```

```
1ST DSK FG 00015
CHANGE 1ST DSK PG?
NO
```

```
SYS AV MEM nnn WORDS
```

```
PAGES REMAINING: 00017
```

The largest addressable partition includes the base page — it has nothing to do with the amount of physical memory available. In the example above, *if* enough physical memory were available, a 19 page partition *could* be defined. However, since the first page available is 15 (in the example) and the last page is 31, only 17 pages remain.

The minimum partition which can be defined in RTE-III is 2 pages: 1 page for the main plus a base page. If a program has no links and fits on a single page, it might be best to make it memory resident. The base page for each partition is a separate page in physical memory.

Because each partition has its own base page, it has a linkage area from logical address 2 through logical address 1646. Therefore, overflow of base page is hardly ever a problem in RTE-III (as it sometimes is in RTE-II).

Each partition's base page is divided by the base page fence. The section above the fence (the system communication area) is always taken from physical page zero rather than mapped base page. Thus every user map base page will automatically contain all the communication area without requiring the system to move words.

EVENT COUNTING WITH ISA FORTRAN AND 6940 MULTI-PROGRAMMER

Joe Diesel
HP Data Systems

The overhead associated with processing an event sense interrupt in ISA FORTRAN is 40 msec. Put another way, if the event sense interrupt card is used for counting pulses, a (square-wave) pulse rate of 25 pulses/sec will completely monopolize the RTE System. If events come in at a random rate, separated in time by less than 40 msec, some will be lost.

A much more efficient way of counting pulses is to use a 69435A counter card. The 12-bit word corresponding to the number of counts can be read with the ISA FORTRAN digital input call.

ISA FORTRAN also supports the 69435A card in a preset count mode. This card works in conjunction with the 69431A digital input card or the 69434A event sense card. The counter cards can be cascaded to accommodate a number of counts greater than 4095. When the application requires flagging a predetermined number of events, this method is recommended.

ACODE PROBLEM IN ALGOL PROGRAM CAN BE "WORKED AROUND"

Jim Bridges
HP Data Systems

ACODE does not work in ALGOL if the destination is an array. One solution is to define a pseudo array which is a string of consecutive integers in memory.

For example:

```
HPAL,L,"TEST"
```

```
Begin
```

```
INTEGER B1,B2,B3,INPT:=12345;
PROCEDURE ACODE; CODE;
FORMAT F1 (16);
ACODE;
WRITE (B1,F1,INPT);
WRITE (1, #("RESULT:",3A2),B1,B2,B3);
END;
```

If you wish, after performing the internal conversion with ACODE, you can transfer the results to a "true" array.

For example:

```
BUFR[1] :=B1;
BUFR[2] :=B2;
BUFR[3] :=B3;
```

where BUFR must have been previously declared as in any ALGOL program.

The above procedure works because the ALGOL compiler places all integers in memory in the order they are declared and in consecutive memory locations.

The "standard" method (where the element passed is the first word of a true array) does not work because the compiler generates a call to .INDR to pick up the value of the array element. However, ACODE (or CODE in FORTRAN) modifies the actual program at execution time and expects to find an LDA ADDR [,I] instruction. It actually finds (but does not recognize it) a JMP instruction to a location which makes a call to ".INDR".

ADDENDUM

Feedback from J. Evan Deardorff of HP's Waltham division has resulted in a superior solution to this problem which does not require transferring the results to an array. See the example below:

```
HPAL,L,"TEST"

BEGIN
  INTEGER ARRAY B[1:3]; INTEGER I;
  OUTPUT INPT (12345);
  PROCEDURE ACODE; CODE;
  PROCEDURE ACODEWRITE (BUFFER, FRMT,
LIST);
    INTEGER BUFFER;
    FORMAT FRMT;
    OUTPUT LIST;
    BEGIN
      ACODE;
      WRITE (BUFFER,FRMT,LIST);
    END;
    FORMAT F1 (16);
    ACODEWRITE (B[1],F1,INPT);
    WRITE (1,#"RESULT:";3A2),
      FOR I:-1 TO 3 DO B[I]);
  END
```

Note the Buffer B is declared an *integer array* in the program but it is declared an *integer* in the procedure ACODEWRITE. You might expect that BUFFER would be declared an array — if this is attempted, however, the ALGOL compiler reports that this is an illegal construction.

DCPC CONTENTION

Doug Hoffman
HP Data Systems

When considering simultaneous, high speed, data transfers (DCPC or DMA) to two devices, there are some important facts to keep in mind.

In both the 2100 and the 21MX, the DMA and DCPC work on a cycle-stealing basis. This means that as the data transfer rate goes up, the CPU speed goes down. This can be critical in certain applications, especially as the total data rate approaches the full machine bandwidth. The total bandwidth remains constant, with the precedence being DMA1 (DCPC channel 1), DMA2 (DCPC2), and then the CPU.

In the 2100, the bandwidth is 1,020,400 words/instructions per second. The 21MX has a bandwidth of 616,666 words/instructions per second. Because of their design, most interface cards are not capable of stealing two consecutive cycles, and thus cannot take more than half the bandwidth. However, the 12962A (7905A DISC Subsystem) takes a bandwidth of about 470,000 words/second (over half the 21MX bandwidth), and therefore special consideration must be given to situations using simultaneous DCPC transfers to the 7905 and other high speed devices.

For example, the 7900 disc transfers data at 156,250 words/second. If simultaneous transfers are started to a 7905 and a 7900 in a 21MX, a bandwidth of 470,000 + 156,250 = 626,250, or about 10,000 words/second more than the DCPC can handle, will be attempted. The result will be a loss of data in at least one transfer. The Magnetic tape drives would not cause problems as a 45 ips, 9 track, 800 BPI drive transfers at 18,000 words/second, and a 1600 BPI drive transfers at 36,000 words/second.

This data contention can become extremely critical in real-time data-acquisition systems where execution and/or data transfer times are critical. Under RTE, both channels are often assigned, one for system or user disc transfers and the other for user I/O. One method of avoiding contention is to get both channels if data contention may occur. Refer to the hardware manuals for data rate specifications on specific pieces of hardware. See page 5-6 in either RTE-II or RTE-III reference manual (DMA allocation).

RTE-II/III handles disc overruns by automatic retrys. Hence, the only symptom observable is throughput reduction.

A VISIT WITH SAM (SYSTEM AVAILABLE MEMORY)

Jim Bridges
HP Data Systems

System available memory (SAM) is essential for nearly all practical applications of RTE-II and RTE-III software. Many people do not understand why the system needs this block of memory or how it is allocated to the system at the time of generation. This discussion will explain these points as well as illustrate how SAM is used to do I/O without wait.

It is easier to allocate memory to SAM during an RTE-III generation than during an RTE-II generation because the RTE-III generator reports the size of SAM. Specific prompts are also given to enable the user to increase the size of SAM. In the completed RTE-III system all of SAM will be contiguous. For these reasons, it is easy to give the system sufficient SAM for its needs even if the user does not understand what those needs are.

In RTE-II generation the system takes six opportunities to add pieces to SAM, although no message is given to indicate that this is happening. These opportunities are:

1. LIB ADDR XXXXX
CHANGE LIB ADDRS?
2. FG RES ADD XXXXX
CHANGE FG RES ADD?
3. FG DSC ADD XXXXX
CHANGE FG DSC ADD?
4. BG BOUNDARY XXXXX
CHANGE BG BOUNDARY?
5. BG RES ADD XXXXX
CHANGE BG RES ADD?
6. BG DSC ADD XXXXX
CHANGE BG DSC ADD?

In each case, if a new address (higher in memory than that reported) is entered, the gap in memory will be added to SAM. A common misconception is that the prompt

```
SYS AVMEM XXXXX
CHANGE SYS AVMEM?
```

is asking for the user to add to SAM. Actually, the address reported is the high boundary of the foreground disc resident area. A larger response will increase this boundary so that larger FG programs may be added on-line.

The RTE-II generator sets in base page EQT 1 through EQT 12 (1660 through 1672 and 1771) the address and size (respectively) of each of the six possible pieces of SAM. Upon boot-up, the system collects each piece and joins it to a linked list through \$ALC. The head of the list is entry point \$ALC + 174B, which contains the address of the first

free block of SAM, (\$ALC has not changed much with time so this location is fairly dependable. Current NAM record for \$ALC has identification code 741120.) The format for each free block in SAM is:

```
WORD 1 : SIZE OF BLOCK (N)
WORD 2 : LINK TO NEXT BLOCK
WORD 3 :
.....
WORD N :
```

The link of the last block will be 77777B.

When memory is requested by the system, the routine \$ALC allocates memory from the first block in the threaded list which can fill the need. The memory allocated will always be a single contiguous area. When the system makes a request to \$ALC to return a block of memory, \$ALC will check to see if the returned memory is contiguous to a block already in the free list. If it is contiguous, the returned memory will be added to the existing block.

SAM is used for the following functions:

- Automatic Output Buffering
- All Class I/O
- Reentrant Subroutines (including REIO)

By using SAM the system permits:

1. I/O without wait through buffering
2. Program swapping while in I/O suspend (REIO)

Reentrant I/O is accomplished through a reentrant subroutine (REIO) which obeys the same structural rules as all reentrant subroutines. Therefore it is an application rather than a separate system feature. Use of REIO permits a program to be swapped while it is I/O suspended (status = 2) because the system moves the I/O buffer to SAM before calling the driver. For all programs which are I/O suspended, the dispatcher checks to see if the buffer is within the swap area. A program using REIO will meet this test whereas one making a request through an exec call will fail the test.

Automatic output buffering is specified by setting bit 14 of word 4 in the EQT table for the device. This may be done at generation and modified (set or reset) on-line by the EQ command. By using class I/O calls, all requests (including input) will be buffered regardless of whether automatic output buffering is specified. A buffered request always causes the system to move the buffer to SAM. If memory is available in SAM and the upper buffer limit is not exceeded, the program is not suspended for I/O. Under these conditions, buffered I/O is I/O without wait. Note that buffered I/O excludes calls to REIO, which is merely a method to permit swappability without resorting to class I/O or to dependence upon automatic output buffering.

A buffered request will cause the requesting program to be placed in the memory suspend list (status = 4) if there is currently no free block in SAM to meet the need. If the

request calls for more memory than was given to SAM at generation, then the action taken by the system depends upon the request. If the request was through class I/O, then the program aborts with error message IO04. If automatic buffering was specified, then a standard I/O request is made instead (i.e. non buffered, causing I/O suspend). Note that this indicates that when class I/O is specified, device buffering is ignored (the request is inherently buffered).

Buffered requests will continue to queue up on the device EQT until the requests actually in the queue exceed the upper buffer limit (set at generation or by BL command). When the limit is exceeded the program will be suspended in the general wait state (status = 3). Note that even if the first request exceeds the limit, at least two buffers may be queued up because it is the queue that is checked — not the request.

When a buffered output request is completed, the sum of the pending buffers is checked against the lower buffer limit. If the sum falls below the lower buffer limit, any programs suspended for exceeding the upper limit are rescheduled. Keep in mind two things, (1) it is desirable to keep the device busy and (2) the program may have been swapped to the disc after making a request. Therefore the program may not be able to make more requests within the time required for a swap. If the device can output a buffer equal to the difference between the upper and lower limits in approximately the swap time, then the limits are optimized for the application.

The method of queueing up requests on a device EQT is given below and applies whether the request is buffered, non buffered, standard or reentrant. The "T field" shown in bits 15 and 14 of word 2 identifies the request as:

- 00 User Standard (including reentrant)
- 01 Automatic Output Buffering
- 10 System (format not shown below)
- 11 Class I/O

Internal system requests are not shown. System I/O requests do not use SAM. An active device will have EQT word 1 at the head of the list of queued request. These requests are linked in the order of the priority of the requestor.

1. User Standard (including REIO request)

The parameters from the request are stored in the temporary area of the ID segment. If the request is made through REIO, 4 words are used in SAM (see below).

WORD	CONTENTS
1	[Linkage word]
2	[T, control info, code]
3	[Buffer address]
4	[Buffer length]
5	[Disc track addr or zero]
6	[Disc sect addr or zero]
7	[Program priority]
8	—Remainder of ID segment—

If RTE-III and the buffer address is in SAM (REIO), then the sign bit will be set on the buffer address. For non privileged drivers, RTE-III checks the bit prior to calling the driver. If the sign bit is zero, the user map is enabled before entry into the driver; else the system map remains enabled. This permits non privileged drivers to run in either RTE-II or RTE-III

A privileged driver in RTE-III has no way of knowing which map contains the buffer. Because of this, the RTE-III generator gives the option of including common in the system map (as well as the user map). A portion of this area may be designated as subsystem global, which may be used to communicate between the program and the driver.

For all reentrant requests (including but not limited to REIO), the system puts a 4 word ID extension into SAM. (Bit 10 of word 21 in the ID segment is also set to indicate reentrant subroutine in control.) The ID extension is needed to keep track of whether or not the buffer has been moved (must be moved before entry into driver) and to release SAM upon termination (including possible abort).

2. Automatic Output Buffering

The block below will be constructed in SAM and queued as above.

WORD	CONTENTS
1	[Linkage word]
2	[T, control info, code]
3	[Program priority]
4	[Total block length words]
5	[User buffer length]
6	[Track option word]
7	[Section option word]
8	[Word 1 of user buffer]
.	
.	
N+7	[Word N of user buffer]

3. Class I/O

The block will be constructed in SAM and queued as above.

WORD	CONTENTS
1	[Linkage word]
2	[T, control info, code]
3	[Program priority]
	(Changed to status at completion)
4	[Total block length, words]
5	[Class ID word]
6	[User buffer length]
	(Changed to transmission log)
7	[Track option word]
8	[Sector option word]
9	[Word 1 of user buffer]
.	
.	
N+8	[Word N of user buffer]

KNOW YOUR RTE, PART I

This is the first of a new series of articles in the **Communicator** dealing with the inner works of HP's RTE systems. Hopefully, this information on how RTE works will enable you to use your system more efficiently and get more results with less effort.

In these articles we will go into some detail on how the system works; therefore, you should have already read and become familiar with the material in the RTE reference manual applicable to your system. We will try to present this information in a way that eliminates forward references, but this will not always be possible. Each article will build on previous articles so that we can get into the system in some depth. This first article discusses the \$LIST subroutine in SCHED/SCHEDM.

Figure 1 is a portion of the Generation Map to which we have added short descriptions of each of the entry points. This data should be useful when studying the system. Each entry point is flagged as to whether it is a target of a jump, subroutine, or variable. EXEC and \$MESS fall outside of these definitions in that EXEC is always entered via a memory protect and \$MESS while it is a subroutine, does not always return. We will have more to say about these routines at a later time, but for now, we are going to study the \$LIST subroutine in SCHED/SCHEDM.

It will be helpful at this point to have page A-3 of your RTE-II or RTE-III manual in front of you, showing the ID Segment Map.

The list processor (\$LIST) is a subroutine that is called to move a program from one major state to another. Figure 2 is a state transition table that describes what \$LIST does, and has the major states printed across the top. These are the states that are printed when a status (ST) system command is processed. The major states are:

- 0 DORMANT
- 1 SCHEDULED
- 2 I/O SUSPEND
- 3 GENERAL WAIT QUEUE
- 4 MEMORY SUSPEND
- 5 DISC TRACK WAIT SUSPEND
- 6 OPERATOR SUSPEND

In addition to these major states, there are substates which in some cases refer to deferred action information and in some cases refer to how the list processor is supposed to perform a particular state transition. These substates are defined by bits which are located in word 16 of the ID segment. (Refer to the ID Segment Map on page A-3 of your manual).

There are more bits in this word than we have mapped in Figure 2. Bits that have not been mapped are not particularly important to the list processor function, with the exception of the abort (A) bit. If the A bit is ever set on list processor entry, no matter what the request is for, the list processor will put the program DORMANT (major state 0, substate 0).

The substate bits important to this discussion are discussed below.

The operator suspend (O) bit. This bit is set when an operator suspension is attempted at a time when it is not feasible to do it directly. The bit indicates that the system should do it at some later time. This is what we mean by deferred action. The system tried to do something, found out, for one reason or another, that it wasn't feasible so it wrote a note to itself (set a bit) to remind it to do the requested action as soon as it is feasible.

The wait (W) bit is set whenever a program has scheduled another program with wait (EXEC 9 or 23). This is a status bit in almost the same category as the major state. It is not a deferred action but a true status.

The save resources (R) bit is set to indicate that the program would like to save its resources when it goes dormant. The R bit, for the most part, is also a deferred action bit in that it indicates how a program is to be set dormant when it is set dormant.

The dormant (D) bit is a deferred action bit which is set if a program cannot be set dormant on request. It indicates that the program is to be set dormant as soon as feasible.

Figure 2 shows the 16 possible combinations for the substates (numbered from 0-17g) in the first column. Entries in each major state/substate combination indicate what the next major state/substate will be, given a particular call to the list processor. The entries are of the form "Request Next State."

The first digit is the requested next major state (i.e. requested by the calling routine). The digit immediately before the decimal point is the resulting next major state and the digits after the decimal point indicate the next substate. For example, a program which was OPERATOR SUSPEND while waiting for a program it scheduled to complete, would be in major state 6, substate 4. A schedule request (generated by the GO command for example) would move the program to major state 3, substate 4 (to wait for completion of the program it scheduled). The whole purpose of this exercise is to understand how the system keeps track of a program so it knows when to run it and when not to run it. There are many stimuli operating on program transitions and the system moves them back to where they are supposed to be, when any given stimuli is removed. A program may be acted upon by the operator itself, its father, and its sons.

NEXT STATES in Figure 2, which are marked with a "*" indicate no change. States marked with an "X" indicate that the system doesn't expect them and so they are not explicitly implemented.

We want to emphasize that while Figure 2 indicates what the list processor does, it does not indicate how it does it — figure 2 simple indicates where it will go, given the current state/substate. The list processor gets information from the status word that indicates where the program is; finds out from the request where it is to go, and then puts it where it

should go as indicated in Figure 2. Code in the list processor does not match this figure in any way except that it performs the indicated functions.

The list processor does a few important things that are not indicated on the chart. First, the list processor makes entries in a push down stack headed at \$ZZZZ which is an entry point in the dispatcher, (DISP/DISPM). The list processor will push a program into this stack, linking through word 9 of the ID segment (the point of suspension save area) any time the program goes truly dormant. Truly dormant means without saving resources; that is, the next time it is run it has to be started from the primary entry point. The reason for this will become clear when we find out what the dispatcher does with this push down stack.

There is another operation that is not indicated on the chart. When the system makes a program dormant with the save resources bit set, it doesn't really leave the bit set. The system depends on the point of suspension (word 9 of the ID segment) being non-zero and, in some cases, upon the "NP" bit being set. This bit indicates (as shown on the ID Segment Map) that the system is not to pass parameters to the program. The system sets this bit whenever the program goes dormant through some stimulus other than the program itself. For example, an operator suspend (SS) request would set the NP bit so that when the "GO" request is processed no parameters are passed. On the other hand, if the program suspends itself the bit is not set. If the father suspends his son the bit is set. Since to pass parameters the B-register must be set, the system must keep close track of when parameters are acceptable.

The list processor, in general, implements transitions from one major state to another. It does not, in general, translate a program from substate to substate within these major states. A close examination of Figure 2 will show that there are some of these transitions which we must do but which are not implemented in Figure 2. These transitions are made outside of the list processor by setting or clearing bits in the substate part of the status word as required.

The list processor is responsible for maintaining the lists headed at:

LOCATION	MAJOR STATE
1711	1 SCHEDULED LIST
1713	3 GENERAL WAIT LIST
1714	4 MEMORY SUSPEND LIST
1715	5 DISC TRACK WAIT SUSPEND
1716	6 OPERATOR SUSPEND

Programs are moved in and out of these lists as their major state changes. The lists are maintained in priority order with the highest priority programs first. Each list is threaded through ID segment word 1 and is terminated with a zero.

We now turn to that list we left hanging at \$ZZZZ. Every time the system has nothing else to do, it jumps to \$XEQ in the dispatcher, DISP/DISPM (refer to Figure 3). Every time the system goes to \$XEQ it first checks \$ZZZZ. If it is non-zero it does the following to clean up the program:

First, if the program is disc resident, any swap tracks it may have are released. This may happen if you abort a program that is swapped out. A father may also abort his son causing this condition. When tracks are released by \$DREL in EXEC(M) it will call the list processor at \$LIST to reschedule any programs waiting for disc tracks. The system then calls \$ABRE in EXEC(M) to return any reentrant memory the program may have. This may happen if a program terminates or is aborted while in a reentrant subroutine. If the \$ABRE routine returns any memory, programs waiting for memory may be rescheduled by calls to the list processor. It should be clear by now why the list processor used this push down stack at \$ZZZZ. It is to avoid recursion. The system then calls \$WATR in the scheduler to schedule any programs that made SCHEDULE WITH QUEUE requests (EXEC 23,24) for this program. \$WATR calls \$SCD3 which calls \$LIST for any such programs. \$SCD3 scans the general wait list (major state =3) looking for entries which have word 2 of their ID segment equal to the ID segment address of the terminating program. Programs in the general wait list will have word 2 of their ID segment set as follows:

REASONS	CONTENTS OF ID (2)
WAIT TO SCHEDULE A PROGRAM	The programs ID segment address
WAIT FOR COMPLETION OF A "SON"	The "sons" ID segment address
RN ALLOCATE WAIT	Address of the RN table
RN LOCK WAIT	Address of the RN number
LU LOCK WAIT	Address of the RN number associated with the LU
	LOCK
DOWN DEVICE BUFFER LIMIT EXCEEDED	4
	Address of the EQT on which the limitation was exceeded

After \$WATR returns, the system calls \$TRRN which calls \$ULLU to unlock any lock LU's the program has. \$TRRN also unlocks any local RN locks and deallocates any local RN the program may have. Each of these processes may call \$SCD3 to pick up and schedule waiting programs. If there are any such programs \$SCD3 will call \$LIST. All of this clean-up takes place whenever a program terminates or is terminated.

Figure 4 lists most of the reasons for calling \$LIST and the request that is made. To further your understanding we suggest you trace through several sequences of operation using figure 4 and figure 1.

In the next issue we will examine how the system is booted, how the system messages are processed, and more. Your comments and questions are welcome. Send to: 9600 Technical Editor, Computer Systems Communicator, HP Data Systems Division, 11000 Wolfe Road, Cupertino, Ca. 95014.



FIGURE 1.

THE ANNOTATED SYSTEM

J ■ JMP ENT
 S ■ SUB ENT
 V ■ VARIABLE
 A ■ ADDRESS
 X ■ DANGEROUS
 ? ■ UNKNOWN?

```
DISPA(0000)02000 03165 92001-16012 REV.A 740801
J SRENT 02164 RETURN FROM $LIBX/$LIBR FOR PROGRAM DISPATCH
S $BRED 03057 SUBROUTINE TO LOAD A SEGMENT
V $ZZZZ 03115 TERMINATION STACK HEAD
J $XEQ 02036 WHERE TO GO WHEN YOU HAVE NOTHING TO DO.
DISPM ADDITIONAL ENTRY POINTS
A $MRMP ADDRESS MEMORY RESIDENT MAP. SET UP BY
GENERATOR.
V $ENDS PAGES OCCUPIED BY SYSTEM AND RESIDENT
LIBRARY. SET UP BY GENERATOR. DOES NOT CHANGE.
A $MATA ADDRESS FIRST ENTRY MEMORY ALLOCATION TABLE.
SET BY GENERATOR.
A $MPFT ADDRESS MEMORY PROTECT FENCE TABLE. SET
BY GENERATOR.
V $BGFR LIST HEADER FOR FREE BG PARTITIONS. SET
UP INITIALLY BY GENERATOR.
V $RTFR LIST HEADER FOR FREE RT PARTITIONS. SET
UP INITIALLY BY GENERATOR.
S $ALDM SUBROUTINE TO REMOVE A PARTITION FROM
ALLOCATED LIST AND LINK INTO DURMANT LIST.
S $DMAL SUBROUTINE TO REMOVE A PARTITION FROM DORMANT
LIST AND LINK INTO ALLOCATED LIST.
S $SMAP SUBROUTINE TO LOAD USER MAP.
S $PRCN SUBROUTINE TO RELINK PROGRAM IN ALLOCATED
LIST BY NEW PRIORITY (AFTER PR CHANGES).
A $EMRP LAST WORD ADDRESS MEMORY RESIDENT PROGRAM
AREA. SET BY GENERATOR.
S $XDMP SUBROUTINE FOR NON-PRIVELEDGED DRIVER TO
CALL TO SET UP USER MAP (2313 USES).

RTIME(0000)03166 03737 92001-16012 REV.B 741022
S $TADD 03637 ADD PROGRAM TO TIME LIST
J $CLCK 03166 TEN MS TICK ENTRY POINT
S $TREM 03661 REMOVE PROGRAM FROM TIME LIST
V $TIME 03370 SYSTEM TIME (10'S MS DAY (2 WORDS),DAY/YEAR (1 WORD))
S $TIMV 03436 CONVERT TIME TO 6 WORD ARRAY
S $ETTM 03604 CONVERT 4 WORD TIME TO 2 WORD TIME
J $TIMR 03532 EXEC 12 COMPLETION PROCESSOR
J $ONTM 03503 ON REQUEST COMPLETION PROCESSOR
J $TMRQ 03707 COMPLETES THE TM REQUEST
S $SCLK 03407 START SYSTEM CLOCK SUB. (USED BY PFAIL)
V $BATM 03365 BATCH TIMER (2 WORD 10'S MS)

$ASCM(0000)03740 04017 92001-16012 REV.A 740801
V $OPER 03770 OP CODE ERROR
V $ERIN 04010 INPUT ERROR
V $NOPG 04000 NO SUCH PROGRAM
V $ILST 03740 ILLEGAL STATUS
V $NOLG 03751 NO LOAD AND GO SPACE
V $LGBS 03761 LOAD AND GO IN USE

RTIOC(0000)04100 07723 92002-16022 REV.B 741022
S $CIC 04100 EVERY NON PRIVILEGED INTERRUPT COMES HERE
S $XSIO 05744 SYSTEM I/O ROUTINE (SYS TTY, DISC,SPOOL)
```

S SSYM 07040 SYSTEM MESSAGE TO TTY
 J SIORQ 04267 EXEC CALL FOR I/O (1,2,3,13,17,18,19,20)
 J SIOUP 07025 UP MESSAGE PROCESSOR ENTRY
 J SIDDN 06775 DN MESSAGE PROCESSOR ENTRY
 S \$ETEQ 07151 SETS UP EQT1 - 15
 J SIRT 04216 RESTORE STATE AND RETURN TO PROGRAM
 J \$XCIC 04114 ALTERNATE POST CLF ENTRY TO SCIC
 J \$DEVT 06717 DEVICE TIMED OUT ENTRY (FORM RTIME)
 J \$GTIO 05264 EXEC 21 (GET) ENTRY POINT
 J \$UPIO 07027 DRIVER UP ENTRY POINT
 S \$CVEQ 07127 CONVERT EQT # TO ADDRESS AND SET UP ON BP.
 J \$YCIC 04115 ALTERNATE POST CLF AND LIA 4 ENTRY TO SCIC
 V \$BLLO 00112 LOWER BUFFER LIMIT
 V \$BLUP 00113 UPPER BUFFER LIMIT
 J \$IOCL 07210 I/O CLEAR ENTRY (FROM OF)
 J \$LUPR 07325 LU REQUEST
 J \$EQST 07473 EQ REQUEST
 J \$CHTO 07561 TO REQUEST
 RTIOCM ADDITIONAL ENTRY POINTS FOR RTE III
 X \$DVM THIS ROUTINE SETS UP AND ENABLES THE CORRECT
 MAP NECESSARY TO ENTER A DRIVER. THIS ROUTINE
 SHOULD NOT BE CALLED BY ANYONE EXTERNAL TO RTIOC.
 THE ONE EXCEPTION IS THE SPOOL DRIVER.

 X \$RSM THIS ROUTINE RESTORES THE USER MAP, IF IT
 WAS CHANGED, TO ITS STATUS PRIOR TO ENTERING A
 DRIVER. THIS ROUTINE SHOULD NOT BE CALLED BY ANYONE
 EXTERNAL TO RTIOC. THE ONE EXCEPTION IS THE SPOOL
 DRIVER.

 V \$MEU MEU STATUS AT INTERRUPT. IT IS USED BY
 THE MESSAGE PROCESSOR IN SCHED.
 \$ALC (0000)07753 10160 92001-16012 REV.A 740801
 S \$ALC 07753 ALLOCATE MEMORY
 S \$RTN 10044 DEALLOCATE MEMORY

 EXEC (0000)10164 11720 92001-16012 REV.B 741022
 ? EXEC 10164 GUESS WHAT
 S \$ERMG 11554 SEND ERROR MESSAGE AND ABORT
 J \$RQST 10166 MP VIOLATION PROCESSOR
 J \$OTRL 11376 COMPLETE THE RT COMMAND
 S \$LIBR 10374 PRIV/RENT SUBROUTINE ENTRY
 S \$LIBX 11055 PRIV/RENT SUBROUTINE EXIT
 S \$DREQ 11430 ALLOCATE N TRACKS
 S \$DREL 11514 RELEASE N TRACKS
 S \$SDRL 11403 RELEASE ALL TRACKS OWNED BY THIS PROGRAM
 S \$SDSK 11532 SCHEDULE ALL DISC SUSPENDED PROGRAMS
 J \$ERAB 11371 ADD "00" TO B, CALL SERMG, GO TO \$XEQ
 V \$PVCN 10506 PRIVILEGED COUNTER
 S \$REIO 10642 CHECK IF I/O BUFFER IN TDB AND MOVE IF SO
 S \$CREL 11272 CONDITIONAL TRACK RELEASE (LG / GLOBAL)
 S \$RSRE 10711 RESTORE ALL TDB'S FOR CURRENT PROGRAM
 S \$ABRE 10776 RETURN ALL RENT MEMORY (CALLED ON TERMINATION)
 V \$PWRS 10247 PFAIL MUST: LIA 5 / STA \$PWR5 WHEN GOING DOWN
 *EXEC ADDITIONAL ENTRY POINTS FOR RTE III
 V \$MVBV TDB MOVED TO SYSTEM AVAILABLE MEMORY FLAG.
 IT IS USED BY RTIOC TO DETERMINE WHICH MAP IS
 NECESSARY FOR AN I/O CALL FROM A PROGRAM WITH
 RE-ENTRANT BIT SET.
 A \$SGAP START ADDRESS OF SUBSYSTEM GLOBAL AREA.
 IT IS SET UP BY THE GENERATOR AND IS USED FOR

THE UPPER BOUNDS TEST FOR A RESIDENT LIBRARY CALL.

```

STRRN(0000)11726 12071 92001-16012 REV.A 740801
S STRRN 11726 RELEASE/ RETURN ALL LU LOCKS/ RN'S
S SCGRN 11772 DRIVER ENTRY TO CLEAR GLOBAL RN
S SULLU 12014 UNLOCK ALL LU'S

SCHED(0000)12135 15177 92002-16012 REV.B 741027
S $LIST 12177 LIST PROCESSOR
S? $MESS 12476 SYSTEM COMMAND PROCESSOR
S $CVT3 14273 CONVERTS A NUMBER TO ASCII (8 DIGITS)
S $CVT1 14337 CONVERTS A NUMBER TO ASCII (2 DIGITS)
S $ABRT 14426 ABORT SUBROUTINE
J $TYPE 14343 SOMEBODY HIT A KEY ON SYS. TTY
J $MPT1 14470 EXEC 6 COMPLETION (TERMINATION)
J $MPT2 14626 EXEC 7 COMPLETION (SUSPEND)
J $MPT3 14637 EXEC 8 COMPLETION (SEGMENT LOAD)
J $MPT4 14727 EXEC 9,23 COMPLETION (SCHEDULE WITH WAIT)
J $MPT5 14747 EXEC 10,24 COMPLETION (SCHEDULE WITHOUT WAIT)
J $MPT6 14766 EXEC 11 COMPLETION (GET SYSTEM TIME)
S $SPRS 12610 SYSTEM COMMAND PARSE ROUTINE
J $SSTR 13430 START SYSTEM HERE
S $SCD3 14705 RESCHEDULE ALL PROGRAMS SUSPEND BECAUSE ...
J $INER 14005 SEND INPUT ERROR MESSAGE
J $MPT7 15020 EXEC 12 COMPLETION (PUT PROGRAM IN TIME LIST)
V $ASTM 12541 TM ENTRY IN COMMAND TABLE
J $MPT8 15144 EXEC 22 COMPLETION (SET/CLEAR CORE LOCK/MEMORY FLAGS)
S $IDNO 15005 GET THIS PROGRAMS ID SEGMENT NUMBER
V $SWORK 12145 LAST PROGRAM PROCESSED BY $LIST (ID ADDRESS)
S $SWATR 14616 SCHEDULE PROGRAMS QUEUED TO SCHEDULE THIS ONE
V $IDSM 14057 SMP'S ID SEGMENT ADDRESS IF ANY (USED BY RTIME)
SCHEDM ADDITIONAL ENTRY POINTS FOR RTE III
V $MPSA SYSTEM AVAILABLE MEMORY WORD, BITS 0-9 HAVE
THE STARTING PAGE OF SAM, AND BITS 10-15 HAVE THE
NUMBER OF PAGES. IT IS SET UP BY THE GENERATOR AND
IS USED DURING SYSTEM INITIALIZATION TO BUILD THE
SYSTEM MAP.
J $MSEX THE RETURN POINT FOR ALL COMMANDS GOING THROUGH
THE MESSAGE PROCESSOR. IT IS IMPERATIVE ALL RETURNS
GO THROUGH THIS POINT BECAUSE IT RESTORES THE STATUS
OF THE MEU AT INTERRUPT.

DVP43(0000)15263 15610 92001-16004 REV.B 741028
S $POWR 15263 POWER FAIL ENTRY POINT
S IP43 15556 I. ENTRY FOR POWER FAIL (GET TIME OF FAILURE)
S CP43 15460 C. ENTRY FOR PFAIL (TIME OUT ENTRY FOR EQT PROCESSING)

```

FIGURE 2.

SLIST STATE TRANSITION TABLE:

THE FOLLOWING TABLE DETAILS THE STATE TRANSITIONS EFFECTED BY SLIST. THE MAJOR STATES ARE 0 THRU 6 (DORMANT THRU OP-SUSP) AND THE STATE MODIFIERS ARE THE ADDITIONAL BITS SET FROM TIME TO TIME IN THE STATUS WORD. THE BITS WHICH AFFECT OR ARE MODIFIED BY SLIST ARE (SEE ABOVE DESCRIPTION):

BIT WEIGHT	POSITION	
O 10	9	OPERATOR SUSPEND
W 4	12	WAIT STATE
R 2	7	RESOURCE SAVE
D 1	6	TO BE SET DORMANT AT NEXT SCHEDULE

THESE BITS ARE COMBINED TO FORM 16 SUBSTATES AS PER THE STATE TABLE. THE ENTRIES IN EACH SQUARE OF THE TABLE DEFINE THE NEXT STATE AS FOLLOWS:

THE FIRST DIGIT IS THE REQUESTED MAJOR TRANSITION (FROM THE SLIST CALL).
THE SECOND TWO NUMBERS (SEPERATED BY A ".") DEFINE THE NEXT MAJOR STATE , SUBSTATE. THUS 62.10 INDICATES A OP-SUSPEND REQUEST (6) CAUSES A MOVEMENT TO I/O SUSPEND (2) SUBSTATE 10 (THE 0 BIT IS SET).

A "*" AS THE DESTINATION INDICATES THE CURRENT STATE/SUB-STATE I.E. NO CHANGE.
ILLEGAL OR UNEXPECTED STATES ARE MARKED WITH "X"

ONLY EXPECTED CALLS ARE PLOTTED.

IN GENERAL CODE EXTERNAL TO SLIST MOVES PROGRAMS FROM SUB-STATE TO SUB-STATE WHILE ONLY SLIST CAN MOVE A PROGRAM FROM ONE MAJOR STATE TO ANOTHER.



FIGURE 2 (CONT.)		SYSTEM STATE TABLE			SYSTEM STATE TABLE		
MAJOR STATE #		1	2	3	4	5	6
SUB-STATES							
0	11.0	00.0 22.0 33.0 44.0 55.0 66.0	02.1 11.0 62.10	00.0 11.0 66.0	00.0 11.0 66.0	00.0 11.0 66.0	00.0 11.0
1 D	X	X	02.1 10.0 62.11	X	X	X	X
2 R	11.0 66.3	00.2	02.3	00.2	00.2	00.2	06.3
3 RD	X	X	0* 10.2	X	X	X	0* 10.2
4 W	00.0	33.4	00.0	00.0 1* 66.4	00.0	00.0	00.0 13.4
5 WD	X	X	X	X	X	X	X
6 WR	0* 13.4 66.7	X	X	00.6	X	X	06.7
7 WRD	X	X	X	X	X	X	0* 10.6
10 D	X	X	02.11 16.0 6*	X	X	X	X
11 OD	X	X	0* 10.0 6*	X	X	X	X
12 OR	X	X	02.13	X	X	X	X
13 ORD	X	X	0* 16.3 6*	X	X	X	X
14 OW	X	X	X	X	X	X	X
15 OWD	X	X	X	X	X	X	X
16 OWR	X	X	X	X	X	X	X
17 OWRD	X	X	X	X	X	X	X

FIGURE 3.

CALLS TO SLIST THAT SET A PROGRAM DORMANT WITHOUT SAVING RESOURCES (OF, EXEC 6,0,2,3, SABRT, SERAB, SERMG) CAUSE SLIST TO QUEUE THE ID ON A CLEAN UP QUEUE. THE QUEUE HEAD IS AT \$ZZZ AND IS LINKED ID(9) < POINT OF SUSPENSION >. THIS IS A FILO LIST WHICH \$XEQ EXAMINES AT EACH ENTRY. THUS:

1	2	3	4	5	6	COMMENTS
\$XEQ						HERE TO DO NEXT THING.
	ABORT					IF \$ZZZZ # 0
		\$DREL				IF DISC RESIDENT, RELEASE, IF ANY
			\$SLIST			, SWAP TRACKS.
						SCHED DISC SUSP. PROGS.
	\$ABRE					RELEASE ANY REENTRANT MEMORY.
		\$RTN				RETURN MEMORY
			\$SLIST			SCHEDULE MEMORY SUSPENDED PROGS.
	\$WATR					PROGRAM(S) QUEUED FOR THIS ONE ?
		\$SCD3				SO, SCHEDULE THEM ALREADY.
			\$SLIST			DONE DONE.
	\$STRN					IF ANY RN'S OWNED, RELEASE THEM.
		\$ULLU				UNLOCK ANY LU'S.
			\$SCD3			SCHEDULE RN LOCK WAITERS.
			\$SLIST			DONE DONE
			\$SCD3			SCHEDULE RN ALLOCATION WAITERS
			\$SLIST			DONE DONE
			\$SCD3			SCHEDULE RN LOCK WAITERS FOR THIS
			\$SLIST			RN
			\$SCD3			DONE DONE
			\$SLIST			SCHEDULE RN ALLOCATION WAITERS
			\$SLIST			DONE DONE DONE

ACTION	RESULTING SLIST REQUEST TO MAJOR STATE:
I/O REQUEST -	
STANDARD UNBUFFERED	2
EQT DOWN	3
BUFFERED - NO MEMORY NOW	4
BUFFERED - NO MEMORY EVER	2
BUFFERED - LIMIT EXCEEDED	3
CLASS - NO MEMORY NOW	4
CLASS - NO MEMORY EVER	aborted IO04
CLASS - BUFFER LIMIT EXCEEDED	4
ON LOCKED LU	3
OTHERWISE	no change
I/O COMPLETION -	
DISC PARITY LU 2 OR 3	aborted
STD I/O COMPLETION	1
BUFFERED COMPLETION (LOW BUFFER LIMIT CROSSED)	1 (all waiters for BL on this EQT)
BUFFERED COMPLETION	1 (all memory waiters) *
CLASS COMPLETION	1 (for the GE Ter)
CLASS GET	
EXEC 21	
REQUEST AVAILABLE	no change
REQUEST NOT AVAILABLE	3
RN OR LU REQUESTS	
LU OR LOCK, RN ALLOCATE NO NUMBER NOW	3
LU LOCK - LU ALREADY LOCKED TOGETHER	3
RN LOCK - RN ALREADY LOCKED TOGETHER	3
RN OR LU UNLOCK	
RN DEALLOCATE OR LU UNLOCK	1 (all waiters) 1 (all number waiters)
TRACK REQUESTS	
NO TRACKS	5
RELEASE	1 (all 5 list waiters)
REENTRANT SUB	
CALL AND NO MEMORY	4
EXIT -> MEMORY RELEASED	1 (4 list waiters) *
COMPLETION CALL	
EXEC 6, X,)	0
EXEC 6, X, -1	0
EXEC 6, X, 1	R bit set, then 0
EXEC 6, X, 2	0
EXEC 6, X, 3	0
OFFSET TIME LIST	A

*Not always true - see future articles in the **Communicator**.

Figure 4.

ACTION	RESULTING \$LIST REQUEST TO MAJOR STATE:
EXEC 12, 0	R bit set, other 0
PROGRAM SUSPEND	
EXEC 7	6
SS, X	NP-bit, then 6
GO, X	1
PROGRAM SCHEDULE	
EXEC 9, 23	
IF PROGRAM AVAILABLE	W-bit set, then 3
EXEC 9, 10 IF PROGRAM NOT AVAILABLE	No change
EXEC 10, 24 IF AVAILABLE REQUESTER	target - 1, no change
EXEC 23, 24 PROGRAM NOT AVAILABLE	3 (PW-bit set in target)
ON or RU IF AVAILABLE	1
OF, X OR AB	0
OF, X, 1 OR 8	0 (A bit is set first)
AB, 1	0 (A bit is set first)

Note: Program completion may imply multiple \$LIST calls as resources are released — see text.

Figure 4. (Continued)

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

bulletins

TRAINING NEWS FLASH

Tom Lowe
HP Data Systems

Starting May 1st the Real Time Measurement and Control training course (22965A) will take on a new look. 22965A will be replaced by a new course, RTE-II/III (22965B), a 10-day course that will cover the RTE-II/III operating system, Batch Spool Monitor, and File Manager only. The Measurement and Control Subsystems course (22968A) will no longer be included in this 10-day course, but will be offered as a separate 2-day module.

Also effective May 1st we will offer a 3-day Multi-user Real Time BASIC course (22979A).

The price for each of the above courses will remain at \$100 per student day.

See the Training Schedule in this section of the **Communicator** for places and dates.



Software Sam

Software Sam is away . . . attending the Computer Caravan, but will be back for the next issue.

DSD TRAINING COURSE DATA SHEETS

Jane Seligson
HP Data Systems

Data sheets are now available for all Data Systems courses. They explain the purpose, contents and prerequisites for each course taught. The titles and part numbers are:

5952-9913	RTE-II/III
5952-9914	21MX Maintenance
5952-9915	DOS III Operating System
5952-9916	7900A Disc Drive
5952-9917	2100 Computer Maintenance
5952-9918	21MX Microprogramming
5952-9919	Distributed Systems
5952-9920	2100 Series Assembler
5952-9921	Measurement and Control
5952-9922	2100 Image Data Base Management
5052-9923	Terminal Control System B
5952-9924	Multiuser Real Time Basic
5952-9925	7970E Mag Tape Unit Maint. (Boise)
5952-9926	7970B Mag Tape Unit Maint. (Boise)

Contact your local HP sales office for complimentary copies.

NEW BATCH-SPOOL MONITOR REFERENCE MANUAL

Peter Baker
HP Data Systems

Here is a new manual for all RTE-III users and RTE-II users whose systems include the Batch-Spool Monitor. The manual serves the new user as well as the experienced user.

For those people learning about Batch-Spool Monitor capabilities, the manual provides a system overview of file management, batch processing, and spooling, then describes how to use the product in these functional categories:

- Batch and file control with FMGR operator commands
- File management through FMP program calls
- Using the Spool Monitor
- Spool control with GASP operator commands
- Spool control through SMP calls
- FMP and SM configuration and initialization

The manual also explains error codes, has an extensive index, and shows many examples of Batch-Spool Monitor Functions.

Each section is organized so that new users can learn to use the commands and calls in relation to their function. For experienced users, the manual provides summary indexes of command and call syntax at the beginning of each section, as well as complete descriptions within the sections.

This manual replaces the old Batch-Spool Monitor Programming and Operating Manual, part number 92002-93001, which is now obsolete. The price of the new manual is \$9.50; its HP part number is 92060-90013.

NEW RELEASES FROM THE CONTRIBUTED LIBRARY

Melanie Van Vliet
HP Data Systems

This article serves as an update for the 2100/21MX Contributed Library Programs Catalog (22999-90040).

The new contributed programs listed below are now available. Contact your local HP sales office to order Contributed Library material, or (if you are in the U.S.) you can use the Direct Mail Order form at the back of the **Communicator**.

Order No.	Description and Price
22681-18958	DOS-IIIB BASED PREPARE CONTROL SYSTEM This DOS-IIIB program allows the user to generate a BCS system under DOS from relocatable files. Operator dialogue is similar to the supported version of PCS. Additional hardware requirements are a console terminal, and a paper tape punch. \$30.00 for Source Paper Tape plus documentation.
22681-18960	Spache Readability Formula Given three samples (each of one hundred words) from a text, this program uses the Spache Readability Formula: $\text{grade level} = \text{average sentence length per 100 words} \times 0.141 + \% \text{ of "unfamiliar words"} \times 0.086 + 0.839 + 5$ to calculate the grade level (readability age) appropriate to that text. Options are also included within the program for listing the familiar words file, creating a new "familiar words" file and adding and deleting words from the "familiar words" file. \$50.00 for Source Paper Tape plus documentation.
22681-18963	TODS-C DISC EDITOR This utility provides editing freedom to examine or alter any portion of a TODS disc. Three edit modes are available. The first mode allows convenient access to any TODS disc catalog file. The second edit mode gives access to ALL files regardless of type. The last edit mode allows disc access by absolute sector. This program, in general, functions interactively with the user. A minimal TODS-C is required including an HP 2116 or HP 2100 CPU, a CRT or teletype, and

Order No.	Description and Price	Order No.	Description and Price
	<p>a 7900A or 7901A Disc System (single drive).</p> <p>\$30.00 for Source Paper Tape plus documentation.</p>		<p>tine UDRTR with entry points: FKILR, NWFIL and SHRTR). 5) The transmission of the logical unit number of the batch device (subroutine BATCH). 6) The transmission of the system generation code (subroutine SYSGC). All these subroutines are callable in FORTRAN except for ALOC which can only be used in ASSEMBLER.</p> <p>\$20.00 for Source Paper Tape plus documentation.</p>
22681-18967	<p>BCS PLOTTING ROUTINES USING A TEKTRONIX 4010-1</p> <p>PLOTPAK is a series of interlocking subroutines and functions which, along with a plotting driver for a Tektronix 4010-1 terminal, allows the programmer to produce plots of various styles with a minimum of memory (3-6K). Hardware requirement is a 4010-1 Tektronix Scope Terminal.</p> <p>\$80.00 for Source Paper Tape plus documentation.</p> <p>Extended documentation: 22681-90967 \$5.00</p>	22681-18973	<p>PROGRAM FOR SAVING AND RESTORING DISC FILES ON MAG TAPE</p> <p>This utility program allows disc files of any type (UM, US, SS, RB, AB, BD) to be saved on magnetic tape for later retrieval. When a file is to be restored to disc, this program automatically creates an appropriate DOS-M directory entry prior to copying from tape to disc. This program also has provisions for listing a directory of tape files and for initializing a tape. A 60-character ID record and a date is associated with each tape file. When restoring a file to disc it is possible to specify a date; in this way, various revisions of a program may be retrieved. Extensive error checking is included along with a provision for verifying each file as it is written. Large (1-track) buffers are used to improve the execution speed of the program. Because of these large buffers, a 32K DOS-M system will generally be required for this program.</p> <p>\$20.00 for Source Paper Tape plus documentation.</p>
22681-18968	<p>PRE-ASSEMBLER/FILE GATHERER (PRASM) FOR DOS-M</p> <p>PRASM builds a source file input for the HP assembler by concatenating multiple disc-resident source files specified by the user. The concatenated files (output) are placed in the work area of the system disc. PRASM then sets the appropriate base page words to point to the work area and calls the assembler. Thus, source files images of paper tape files need not be externally concatenated to be assembled. In addition, program development can take place in small pieces (thus speeding up the editing process), with PRASM used whenever a full listing/output tape is required. PRASM causes the assembler to preserve tape (file) numbering so that the original source files may be easily identified.</p> <p>\$30.00 for Source Paper Tape plus documentation.</p>	22681-18974	<p>ALPHA: PAPER TAPE IDENTIFICATION</p> <p>This RTE and DOS-M paper tape utility punches large block letters on paper tape. The user may change the internally represented ASCII characters. Hardware requirements - system console and a paper tape punch.</p> <p>\$10.00 for Source Paper Tape plus documentation.</p>
22681-18971	<p>DOS-M UTILITIES PACKAGE</p> <p>This package contains a set of subroutines making available some potential functions of the DOS-M system. These functions are the following: 1) The retrieval of the date entered at start-up of the system (subroutine DATE). 2) The modification of a single or of all the bits of the switch register (subroutine STSWI; applicable only to 2114 and 2100 computers). 3) The transmission of the address and of the length of the part of the core memory which is not used by the program (subroutine ALOC). 4) The destruction, the creation, or the modification of an entry in the directory of the user's disc (subrou-</p>	22681-18975	<p>DOS-M DISC EDITOR</p> <p>This program is a DOS-M-based conversational disc editor which has complete freedom to examine or alter any portion of a DOS-M disc on a track-sector basis. List or change operations can be done in ASCII, integer, octal, or floating point (even or odd word) format. A minimal DOS-M, with an HP 2116 or HP 2100 CPU, CRT or teletype, and a 7900 disc is the required equipment.</p> <p>\$20.00 for source paper tape plus documentation.</p>

Order No.	Description and Price	Order No.	Description and Price
22681-18977	<p>TODS-C BASIC MAG TAPE BCS DRIVER</p> <p>This package is a collection of subroutines designed to allow the use of the BCS D.23 magnetic tape driver within TODS-C ATS BASIC. It is mainly an adaption of BCS library routines MAGTP and PTAPE. Use of D.23 driver within TODS-C instead of the AMD division mag tape driver (HP #24118-80066) has two important advantages: 1) it can be handled with the mag tape, 2) D.23 reads and writes on mag tape in a format that is compatible with many other systems (such as DOS-M), whereas the AMD driver does not. Addition of this contributed program to a TODS-C system is a natural extension of D.23 to allow its utilization (for real number mag tape I/O) within ATS BASIC.</p> <p>\$30.00 for Source Paper Tape plus documentation.</p>	22682-18901	<p>numbers without spaces (or carriage return/line feed). This subroutine modifies the BASIC compiler for the duration of the Call. If a keyboard interrupt occurs, stop service is routed through the subroutine so that the compiler is restored before the program is stopped.</p> <p>\$10.00 for Source Paper Tape plus documentation.</p>
22681-18981	<p>HIGH SPEED DISC INPUT/OUTPUT</p> <p>HSDIO enables the DOS-M/DOS-III user to have the following improvements for file accessing as compared to the standard system EXEC 14 and EXEC 15 disc I/O requests. 1) Direct access of a file instead of searching the file directory each time for the file address, then accessing the file. (Increases access speed approximately 10-20 times.) 2) Allows the user to access the scratch area of the current user disc as another data file identified by the name 'USER'. 3) Allows the user to read or write to ANY disc file on the current disc.</p> <p>\$10.00 for Source Paper Tape plus documentation.</p>	22682-18903	<p>D.06 BCS DRIVER FOR PRINTER TECHNOLOGY MODEL PRINTEC 100 PRINTER</p> <p>D.06 is an assembly language driver for a Printer Technology Printec 100 Serial Printer. The driver accepts the standard BCS calling sequence for write and control functions. Driver examines record and generates automatic CR/LF pair after 132 characters have been printed. D.06 could be used with any printer that functions as a high speed teletype.</p> <p>\$10.00 for Source Paper Tape plus documentation.</p>
22681-18990	<p>21MX MICROCODED SIN-COS-TAN</p> <p>This 21MX Assembler/Microcode routine computes the SINE and COSINE five times faster than the standard DOS/RTE library routines. The TANGENT function runs three times faster. Execution times are: SINE 302-340 ms, COSINE 297-335 ms, TANGENT 685-715 ms. Equipment requirement is a 21MX. The program operates in a BCS, DOS, or RTE environment with respective minimum core requirements.</p> <p>\$30.00 for Source Paper Tape plus documentation.</p>	22682-18904	<p>SINGLE TERMINAL-TIMESHARE BASIC CONVERSATIONAL LINK</p> <p>The program provides a conversational link between HP 20392 single terminal BASIC and HP 2000F Timeshare BASIC. It consists of an absolute assembler program which overlays and modifies the standard BASIC compiler of the single terminal system. No modification to the timeshare system is required. Among the capabilities of the system are: 1) Programs running simultaneously in both timeshare and single terminal systems can pass data to and from each other. 2)</p>
22682-18900	<p>BASIC CALL TO PRINT NUMBER WITHOUT SPACES</p> <p>This subroutine allows the user to print</p>		

Order No. **Description and Price**

Single terminal commands can be issued from a running program in the timeshare system. 3) Output to the teletype can always be formatted using the timeshare formatter. 4) Single terminal programs can be stored in, retrieved from, and run by the timeshare system. 5) A program resident in core of the single terminal system can be transferred to a file store in timeshare for later retrieval and running.

\$30.00 for Source Paper Tape plus documentation.

22681-18905

BINARY TO BCD CONVERSION
 This subroutine allows an assembly language, or Fortran program, to convert any positive integer from 0 to 9999₁₀ to a 4-digit BCD number contained in a 16-bit word returned to the calling program.

\$10.00 for Source Paper Tape plus documentation.

software updates

Listed below are the software parts and manuals which are shipped with RTE-II and RTE-III systems. Revision levels (A, B, C, D, etc.) or date codes (1543, 1546, etc.) are included for your reference.

SOFTWARE	RTE II	RTE III
Core Res Sys	92001-16012 C	92060-12003 B
Loader	92001-16002D	92060-16004 B
Multi Term Monitor	92001-16003 B	Same
Sys Library	92001-16005 1545	Same
DVP43 (Power Fail)	92001-16004 C	92060-16001 A
Autor (Auto Restart)	92001-16014 B	Same
Autor Source	92001-18014 -	Same
Spool Monitor	92002-12001 C	Same
Spool Program	92002-12002 C Option	92060-12001 A
Batch Monitor Libr	92002-16006 C Y13	Same
EDITR	92002-16010 C	Same
EDITOR	20805-60001 C	Not included
DVR00	29029-60001 1543	Same
DVR31 (7900 Disc)	29013-60001 C	Same
DVR32 (7905 Disc)	92060-16031 A	Same
7900 System Generator	92001-16013 C	92060-16029 A
Fixed Head Generator	92001-16018 1546	Not Supported
7905 System Generator	92001-16026 A	92060-16032 A
WHZAT	Not Available	92060-16006 B
Assembler	92060-12004 A	Same
XREF	92060-16028 A	Same
\$PVMP	Not applicable	92060-16035 A
FORTRAN II	20875-60001 E	Same
	20875-60002 E	Same
	20875-60003 E	Same
	20875-60004 E	Same
	20875-60005 E	Same

SOFTWARE	RTE II	RTE III
FORTRAN IV	24170-60001 C	Same
	24170-60002 C	
	24170-60003 C	Same
FORTRAN IV (10K Area)	24177-60001 1442	Same
	24177-60002 1442	
ALGOL	24129-60001 C	Same
	24129-60002 C	Same
RELO SUBR LIBR-EAU	24151-60001 D	Same
RELO SUBR LIBR-FP	24248-60001 C	Same
FFP SUBR LIBR	12977-16001 1451	Same
FTN4 SUBR LIBRARY	24152-60001 C	Same
FTN II FORMATTER	24153-60001 C	Same
16K SIO MAG TAPE 9 TR	13022-60001 B	Same
16K SIO MAG TAPE 7 TR	13030-60001 B	Same
16K SIO PAPER TAPE RDR	20319-60001 A	Same
16K SIO PAPER TAPE PUNCH	20320-60001 A	Same
16K SIO SYSTEM DUMP	20335-60001 B	Same
16K SIO TTY (LP COMPAT)	24127-60001 C	Same
16K SIO 2767 LP	24166-60001 B	Same
16K SIO 2762/2615	24329-60001 A	Same
16K SIO 2607 LP	24347-16001 1346	Same
PUNCH/VERIFY	20312-60001 A	Same
24K SIO TTY (LP COMPAT)	29100-60017 A	Same
24K SIO SYSTEM DUMP	29100-60018 A	Same
24K SIO PAPER TAPE RDR	29100-60019 A	Same
24K SIO PAPER TAPE PUNCH	29100-60020 A	Same
24K SIO 2767 LP	29100-60022 A	Same
24K SIO MAG TAPE 9 TR	29100-60023 A	Same
24K SIO MAG TAPE 7 TR	29100-60049 A	Same
24K SIO 2762/2615	29100-60050 A	Same
Manuals		
RTE REFERENCE	92001-93001 -	92060-90004
BATCH/SPOOL MONITOR	92002-93001 - Option Y13	Same
ASSEMBLER	92060-90005 -	Same
FORTRAN II	02116-9015 -	Same
FORTRAN IV	5951-1321 -	Same
ALGOL	02116-9072 -	Same
RELO SUBR	02116-91780 -	Same
SIO DVR 2762/2615	02762-90002 -	Same
SIO DVR 2767 LP	12653-90004 -	Same
SIO DVR 2607 LP	12987-90006 -	Same
SIO DVR 7970 B/E 9 TR	13022-90010 -	Same
SIO DVR 7970B 7 TR	13029-90010 -	Same
SIO INTRO	5951-1369 -	Same
SIO SYS CONFIG.	5951-1374 -	Same
SIO SUBSYS	5951-1390 -	Same
ERROR MESSAGES	5951-1377 -	Same
DVR00	29029-95001 -	Same

Following is a list of the drivers, (with part numbers, and revision levels) available for RTE systems.

RTE DRIVERS

DRIVER	PART #	REV LEVEL	DESCRIPTION
DVR00	29029-60001	1543	
DVR11	29030-60001	B	2892 Card Reader
DVR12	29028-60002	A	2767 Line Printer
DVR12	92001-16020	1534	26XX Line Printers
DVR31	29013-60001	C	7900 DISC
DVR32	92060-16031	A	7905 DISC
DVR15	09601-16021	A	7261A Card Reader
DVR23	92202-16001	A	9 Track MT
DVR30	20747-60001	C	Fixed Head DISC
DVR24	25117-60499	D	7 Track MT
DVR72	09611-16005	A	6940 A/B Local & Remote
DVR62	02313-16001	A	2313B DVR
	29009-60001	C	2313B DVR
	29011-60001	E	R2313

DOS-IIIB MODULES

The Index below indicates the modules available for DOS-IIIB systems, HP 24307B, date code 1523.

This Index relates the names of the relocatable modules to the part numbers of the equivalent paper tapes and indicates the purpose of the modules. Modules not specifically designated for the 2100A/S or for the 21MX computers are to be used on either.

NAME	PART NUMBER	REV	DESCRIPTION
DISCH	24307-16069	1523	DISC MONITOR
\$EXMD	24307-16070	1523	EXEC MODULES
DVR00	20985-60001	1516	TTY-LIKE CONSOLE/TERMINAL
DVR01	20987-60001	1419	PAPER TAPE READER
DVR02	20989-60001	1419	PAPER TAPE PUNCH
DVR05	24157-60001	1419	TTY-LIKE CONSOLE
DVR15	24307-16017	1446	7261A MARK SENSE CARD READER
D2892	24272-60001	1419	2892B CARD READER (DVR11)
D2767	24168-60001	1419	2767A LINE PRINTER (DVR12)
D26XX	24307-16011	1446	DVR12 FOR 2607, 2610, 2614, 2613, 2618
DVR23	13024-60001	1446	7970B/E MAG TAPE
DVR26	24307-16018	1507	2762A/B AND 2615A CONSOLE
DVR30	24307-16073	1523	DISC BATCH DRIVER
DVR31	24156-60001	1419	7900/7901 DISC
DVR67	24341-60001	1419	12889A HI SPD SERIAL IF
DVR70	24307-16009	1446	DVR70 FOR 12618A SYNC INTERFACE
DVR71	24307-16013	1515	12967A SYNCH MODEM IF
DVR72	24350-16001	1523	12587B ASYNC DATA SET IF
DVR73	24377-16001	1523	12920A/B MULTIPLEXOR
DVR74	24307-16014	1515	12966A/12968A ASYNCH IF

EFMP	24309-60002	1523	EXT FILE MGR EXEC MODULES
	24309-60003	1523	EXT FILE MGR UTILITIES
JOBPR	24307-16071	1523	JOB PROCESSOR
RLODR	24307-16072	1523	RELOCATING/LINKING LOADER
ASMB	24307-16006	1419	2100/21MX ASSEMBLER
.FTN4	24170-60001	C	FORTRAN IV COMPILER
	24170-60002	C	
	24170-60003	C	
FTN4	24177-60001	1442	FORTRAN IV COMPILER (10K AREA)
	-60002	1442	
ALGOL	24129-60001	C	ALGOL COMPILER
	24129-60002	C	
XREF	24223-60001	1523	2100/21MX CROSS REF TABLE GEN
F4D.N	24152-60001	C	RELO SUBRLIBR FTN4
F2E.N	24151-60001	D	RELO SUBR LIBR (EAU)
F2F.N	24248-60001	B	RELO SUBR LIBR (FP)
FFP.N	12907-16001	A	2100A/S FFP SUBR LIBRARY
\$SETP	12907-16002	1350	2100A/S FFP SUBR \$SETP
ATD01	24381-16001	1503	ASYNC TERMINAL DRIVER No. 1
ATD02	24307-16012	1442	ASYNC TERMINALL DRIVER No. 2
PMT01	24307-16008	1438	PAGE MODE TERMINAL DRIVER No. 1
PMT02	24307-16016	1503	PAGE MODE TERMINAL DRIVER No. 2
SLC	24307-16010	1438	SYNCHRONOUS LINE CONTROL DRIVER
DVR33	24278-60001	1419	2100/21MX WCS DRIVER
MASMB	24332-60001	1419	2100A/S WCS MICRO ASSEMBLER
WCSUT	24333-60001	A	2100/21MX MICRO UTILITIES
MDBUG	24334-60001	1419	2100A/S WCS MICRO DEBUG EDITR
XASMB	12978-16001	1437	21MX WCS MICRO ASSEMBLER
XDEBUG	12978-16002	1437	21MX WCS MICRO DEBUG EDITOR
FFP.X	12977-16001	1451	21MX FFP SUBR LIBRARY
XSETP	12977-16002	1451	21MX FFP SUBR \$SETP



documentation

The following tables list currently available customer manuals for Data Systems Division products. This list supersedes the list in the last issue of the **Communicator**.

The most recent changes to the tables are indicated for easy reference. Prices are subject to change without notice.

Copies of manuals and updates 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 customer manuals.

Update packages are free of charge. If you require an update package only, send your request to:

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

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manual(s) you need on the Corporate Parts Center form supplied at the back of the **Communicator**.

A few words about documentation terms:

- New** A new manual refers only to the first printing of a manual. When first printed, a manual is assigned a part number.
- Revised** A revised manual is a printing of an existing manual which incorporates new and/or changed information in its contents. For example, a manual is revised when an update package is incorporated into the manual; the manual gets a new print date and the update package disappears. Note that a revision to a manual effectively obsoletes the previous version of the manual.
- Update** An update package is a supplement to an existing manual which contains new and/or changed information. Updates are issued when information must get to customers, yet it is inappropriate to issue a revised manual. An update has no part number; it is automatically included when you order the manual with which it is associated.

9600/9700 SYSTEM MANUALS

MANUAL NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02005-90001	Real-Time Executive Software System	\$12.00	10/71	6/73
02313-93002	RTE 2313B Analog-Digital Interface Subsystem Operating and Service Manual	12.50	2/74	8/75
02320-93002	RTE System Driver DVR76 for HP 2320A Low Speed Data Acquisition Subsystem Programming and Operating Manual	1.00	8/74	
02321-93001	RTE System Driver DVR74 for HP 2321A Low Speed Data Acquisition Subsystem Programming and Operating Manual	1.00	8/74	
09600-93010	RTE System DVR11 for HP 2892A Card Reader Programming and Operating Manual	1.00	8/74	
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	1/75
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	12/75
09610-93003	ISA FORTRAN Extension Package Reference Manual	2.50	10/75	
09611-90009	9611A Operating 406 Industrial Measurement and Control System	.25	4/75	
09611-90010	HP 6940A/B Multiprogrammer Verification Manual	4.50	8/75	
12604-93002	RTE DVR40 for 12604B Data Source Interface	1.00	8/74	
12665-93001	RTE System Driver DVR65 for HP 12771A Computer Serial Interface Kit	1.00	8/74	
12989-99001	RTE System Driver DVA 15 for Card Reader Punch Subsystem 2894	1.00	1/75	

9600/9700 SYSTEM MANUALS (Continued)

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
25117-93003	RTE System Driver DVR24 for HP 7970 Series Digital Magnetic Tape Unit	1.00	8/74	
29003-93001	RTE System Driver DVR66 for HP 12772A Coupler Modem Interface Kit Programming and Operating Manual	1.00	8/74	
29003-93003	RTE System Driver DVR66 for HP 12770A Coupler Serial Interface Kit Programming and Operating Manual	1.00	8/74	
29009-93001	RTE System Driver DVR62 for HP 23138 Subsystem	2.50	8/74	
29013-90001	DVR31 RTE Moving Head Driver	10.00	2/73	
29014-90001	Moving Head Real-Time System Generator	20.00	4/72	
29015-90001	Fixed Head Real-Time System Generator	15.00	4/72	
29016-90002	RTE Scheduler	50.00	9/72	
29016-90003	Real-Time Input/Output Control	50.00	12/73	
29022-90001	Real-Time Relocating Loader	10.00	6/73	
29028-95001	RTE HP 2610A/2614A Line Printer Driver	1.50	8/73	
29029-91001	Real-Time Executive Multiple-Device System Control Device (DVR00) Program Listing	10.00	9/72	
29029-95001	Real-Time Executive System Driver DVR00 for Multiple Device System Control Small Programs Manual	1.50	11/75	
29033-98000	Real-Time Executive-File Manager System	10.00	3/73	
29100-93001	RTE System Driver DVR40 (29100-60041) for HP 12604B Data Source Interface Programming and Operating Manual	1.00	8/74	10/74
29100-93003	RTE System Driver DVR61 for HP 6940A, 6941A Bidirectional Multiprogrammer Programming and Operating Manual	3.00	8/74	
29101-93001	RTE Core-Based Software System Users Manual	10.00	1/76	*R
29102-93001	RTE BASIC Software System Programming and Operating Manual	10.00	3/74	8/75
29103-93001	RTE System Cross Loader; Programming and Operating Manual	2.50	3/75	11/75
91060-93005	RTE Driver for X-Y Display Storage Subsystem (HP Model 1331C-016) Programming and Operating Manual	1.00	8/74	
91062-93003	Real-Time Executive System Driver for DVM/Scanner Subsystem	9.00	8/74	
92001-93001	RTE II Software System Programming and Operating Manual	10.00	8/75	
92060-90004	RTE-III Software System Programming and Operating Manual	12.00	10/75	
92060-90005	RTE Assembler Reference Manual	7.00	5/75	
92060-90010	RTE Batch/Spool Monitor and Operating System Pocket Guide	3.00	10/75	
92060-90012	RTE-III: A Guide for New Users	6.50	10/75	
92060-90013	Batch-Spool Monitor Reference Manual	9.50	12/75	*N
92060-90014	RTE Interactive Editor Reference Manual	6.00	10/75	
92060-90016	Multi-User Real-Time BASIC Reference Manual	12.00	10/75	12/75
92200-93001	RTE System Driver DVR12 for HP 2607A Line Printer Programming and Operating Manual	1.00	8/74	
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	8/74	
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	4/75	

*R= Revised

*N= New

Note: The Batch-Spool Monitor Reference Manual, 92060-90013, was listed erroneously in the last issue of the *Communicator* as a revised manual. It is a new manual. See the *Bulletin* in this issue.

SOFTWARE INPUT/OUTPUT SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02100-90072	HP 2605A Console Printer Driver	\$ 1.00	3/72	*O
02116-91760	Teleprinter Driver (LP Compatible) Manual	1.00	8/73	
02762-90002	HP 2762A Terminal Printer Driver	1.00	5/73	
02892-90003	HP 2892A Card Reader Driver	1.50	6/72	
12602-90022	Mark Sense Card Reader Drivers	1.00	6/70	
12653-90004	HP 2767 Line Printer Driver	1.00	9/70	1/73
12845-90005	HP 2610A/2614A Line Printer Driver	1.00	2/74	
12987-90006	HP 2607 Line Printer Driver	5.00	1/73	
13022-90010	HP 7970 Magnetic Tape Unit Driver	1.00	2/72	
13029-90010	Magnetic Tape Driver (7-Track)	1.00	2/72	
5950-9276	SIO Drum-Disc	1.00	2/70	
5951-1374	Software Input/Output System Configuration	1.00	7/74	
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	1/74	
02100-90073	HP 2605A Console Printer Driver	1.00	3/72	*O
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	8/74	10/74
02116-9017	Basic Control System Manual	8.50	12/71	
02116-91751	Prepare Tape System	2.50	8/74	
02116-91752	Magnetic Tape System	6.00	6/71	
02116-91780	2100 Series Relocatable Subroutines	11.00	12/74	
02762-90003	HP 2762A Terminal Printer Driver	1.00	5/73	
02892-90004	HP 2892A Card Reader Driver	1.50	6/72	
12602-90021	Mark Sense Drivers	1.00	6/70	
12653-90005	HP 2767 Line Printer Driver	1.00	10/70	
12845-90004	HP 2610A/2614A Line Printer Driver	1.00	6/72	
12987-90008	HP 2607 Line Printer Driver	5.00	12/73	
13023-90010	HP 7970 Magnetic Tape Unit Driver	1.00	5/74	
13026-90010	Magnetic Tape Driver (7-Track without DMA)	1.00	5/71	6/72
13027-90010	Magnetic Tape Driver (7-Track with DMA)	1.00	5/71	6/72
5951-1371	HP 2100 Front Panel Procedures	1.00	8/73	
5951-1376	Basic Binary Loader/Disc Loader, Basic Moving-Head Disc Loader	1.00	4/74	
5951-1391	Basic Control System	1.50	10/74	
5951-1392	Magnetic Tape System	1.00	7/71	

DISC OPERATING SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02100-90074	HP 2605A Console Printer Driver	\$ 1.00	3/72	*O
02767-90007	DOS/RTE 2767 Line Printer Driver	1.00	12/70	
12560-90023	DOS RTE and BCS Calcomp Plotter Drivers	1.50	10/75	
12602-90023	DOS/RTE Mark Sense Drivers Kit 12602B	1.00	8/70	
12908-90004	HP 12908 Writable Control Store Driver	1.00	2/75	

*O = Obsolete

DISC OPERATING SYSTEM MANUALS (Continued)

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
24307-90006	DOS-III Reference Manual	20.00	1/76	*R
24307-90012	DOS-III Data Communications Drivers	7.50	8/75	11/75
24307-90018	DOS-III Pocket Guide	3.50	12/75	*R
24307-90022	DOS-III Terminal Printer Driver	1.00	1/75	
24307-90073	DOS-III Standard Drivers	6.00	1/75	
24376-90001	IMAGE/2000 Data Base Management System Reference Manual	11.00	8/75	
5951-1366	Cross Reference Table Generator	1.00	8/74	
5951-1381	DOS-M/2000C Timeshared BASIC File Handler	1.00	5/71	
5951-1394	2000C File Interface for DOS-M	1.00	6/71	

LANGUAGE MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	UPDATE
02116-9014	HP Assembler Manual	\$ 6.50	8/75	
02116-9015	HP FORTRAN Manual	5.00	3/74	
02116-9016	Symbolic Editor	4.50	2/74	
02116-9072	ALGOL Reference Manual	10.00	2/76	*R
12907-90010	Implementing the HP 2100 Fast FORTRAN Processor	5.00	11/74	
24307-90014	DOS III Assembler Reference Manual	8.00	7/74	11/75
92060-90005	RTE Assembler Reference Manual	7.00	5/75	
5951-1321	HP FORTRAN IV Reference Manual	6.00	12/75	*R

*R= Revised

training schedule

See the *Bulletin* in this issue of the **Communicator** regarding Training Course Data Sheets. The schedule for customer training courses on Data Systems Division products has been expanded to include courses offered at our European training centers. Listed below are courses offered in the U.S. and in Europe during the period April through August 1976.

You can also obtain a copy of the training schedule from your local HP sales office. A European course schedule is available through the sales offices in Europe; a U.S. schedule through U.S. sales offices.

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.

*Prices quoted are for courses at the two U.S. training centers only. For prices of courses at European training centers please consult your local HP Sales Office.

Training Center Addresses

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

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

Boblingen
 Kundenschulung
 Herrenbergerstrasse 110
 D-7030 Böblingen, Wurttemberg
 Tel: (07031) 667-1
 Telex: 07265739
 Cable: HEPAG

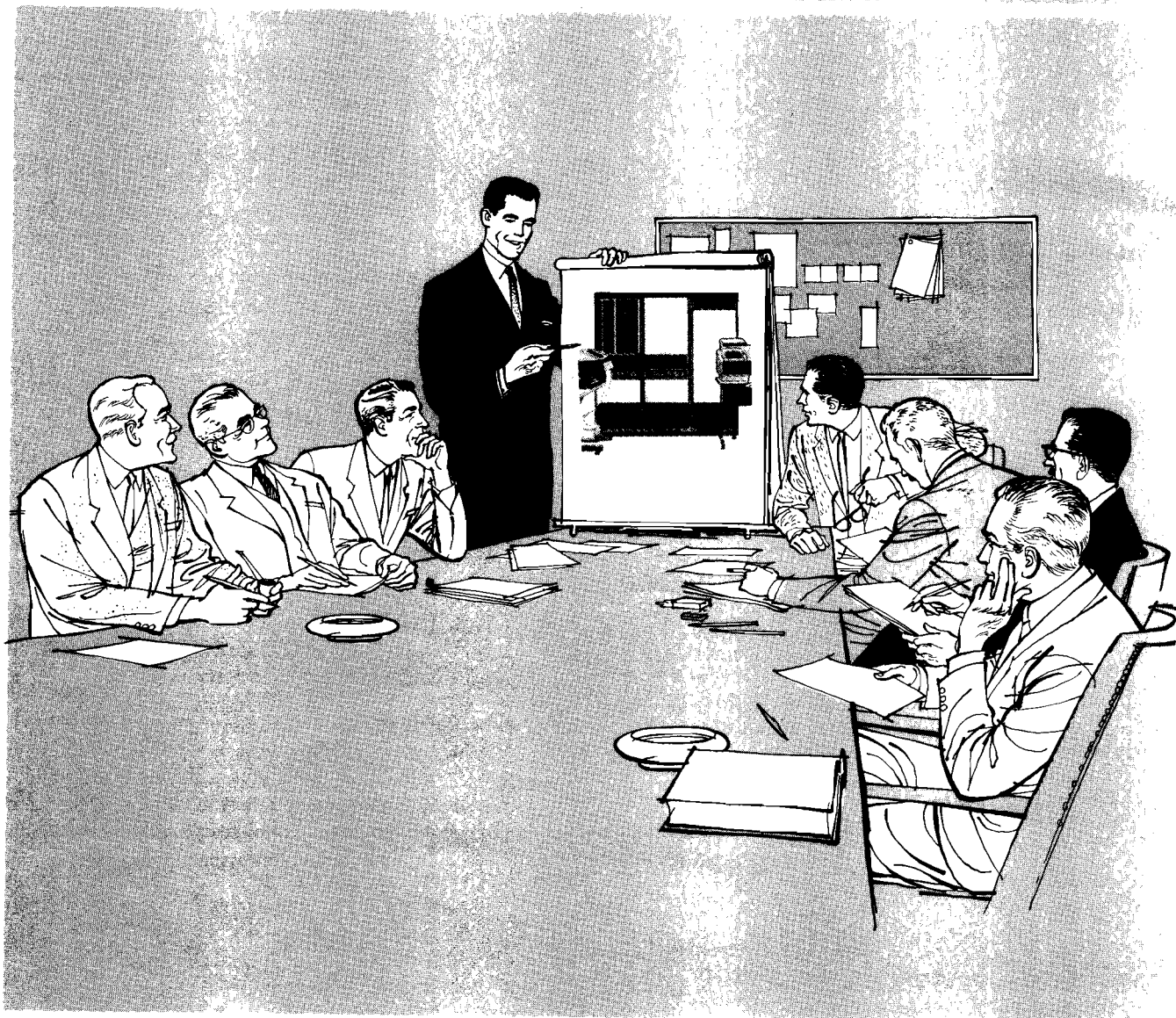
Winnersh
 King Street Lane
 GB-Winnersh, Wokingham
 Berks RG11 5 AR
 Tel: Wokingham 784774
 Cable: Hewpie London
 Telex: 847178 9

Grenoble
 5, avenue Raymond-Chanas
 38320 Eybens
 Tel: (76) 25-81-41
 Telex: 980124

Milan
 Via Amerigo Vespucci, 2
 1-20124 Milan
 Tel: (2) 62 51
 Cable: HEWPACKIT Milano
 Telex: 32046

Madrid
 Jerez No 3
 E-Madrid 16
 Tel: (1) 458 26 00
 Telex: 23515 hpe

Stockholm
 Enighetsvägen 1-3, Fack
 S-161 20 Bromma 20
 Tel: (08) 730 05 50
 Cable: MEASUREMENTS Stockholm
 Telex: 10721



COURSE NUMBER	TITLE	LENGTH	PRICE	TRAINING COURSE RATES AND CENTER LOCATIONS									
				CUPERTINO	ROCKVILLE	BOBLINGEN	WINNERSH	GRENOBLE	MILAN	MADRID	STOCKHOLM	AMSTERDAM/BRU.	
22940A	2100 MAINT. 10 days \$1000			5/3 6/21 8/2	5/10 8/23								
22941A	21MX MAINT. 5 days \$ 500			4/5 5/17 7/12	4/19 8/9			5/17 (English)					
22942A	7900 MAINT. 5 days \$ 500			4/5 5/17 7/19 8/23				5/24 7/12 (English)					
22943A	7970 B/E MAINT. 5 days \$ 500			5/24 8/16				5/31 7/19 (English)					
22950A	2100 SER. ASSM. 5 days \$ 500			5/24 6/21 7/19 8/16	4/5 5/3 5/24 6/7 6/28 7/26 8/16								
22952A	DOS III B 5 days \$ 500			7/12									
22952B	DOS III B 5 days \$ 500					4/26 8/9		4/26 7/5		5/17		5/31	8/23
22953A	2100 IMAGE 3 days \$ 300			7/21									
22959A	ASSEMBLER/21MX 5 days \$ 500					5/3 8/2	5/10 7/5	4/5 6/21	6/7	5/10		4/26	5/10
22960A	21MX MIC. PROG 5 days \$ 500			4/5 6/7 7/28									
22968B	RTE-II/III 10 days \$1000 (Course includes: RTE-II/III operat- ing system, batch spool monitor and file manager)			4/26 5/10 6/7 6/14 7/12 7/26 8/9 8/16	5/17 6/14 7/12 8/2 8/23	* { 5/10 } { 5/17 }	* { 4/5 } { 4/26 }	* { 4/12 } { 5/3 }	* { 8/21 } { 7/5 }	* { 5/31 } { 6/7 }		* { 5/3 } { 5/10 }	* { 5/31 } { 6/7 }
22968A	MEASUREMENT & CONTROL 2 days \$ 200			4/8 4/29 5/27 6/28 8/9 8/30	4/29			5/31 (Francais)					
22969A	DISTB. SYS. 5 days \$ 500			4/12 5/17 8/2	5/31	8/16	8/9	5/17					
22978	TCS 2 days \$ 200			7/19									
22979A	REAL TIME BASIC 3 days \$ 300			5/24 8/30	8/11 9/1								

*Note: Dates within brackets are starting dates for week 1 and week 2 of the RTE course. In some cases there is a break between the two weeks of the class.

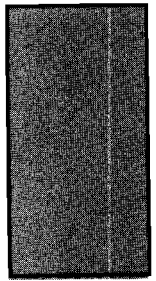
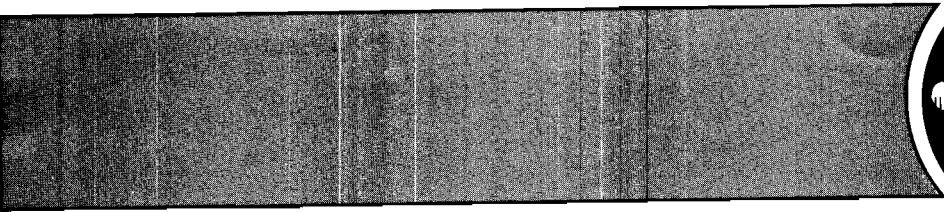


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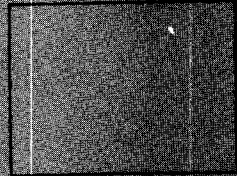
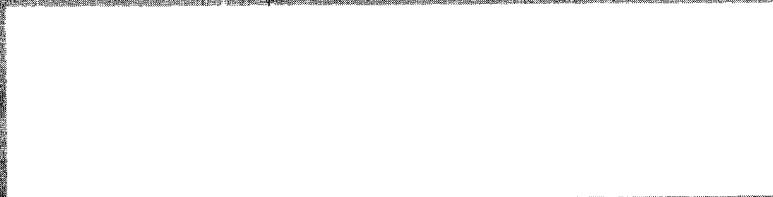
**USERS
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Information through interface and involvement



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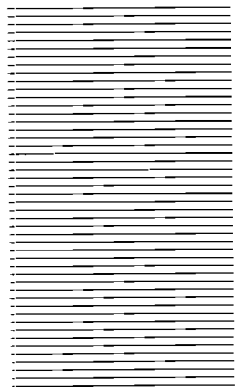


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