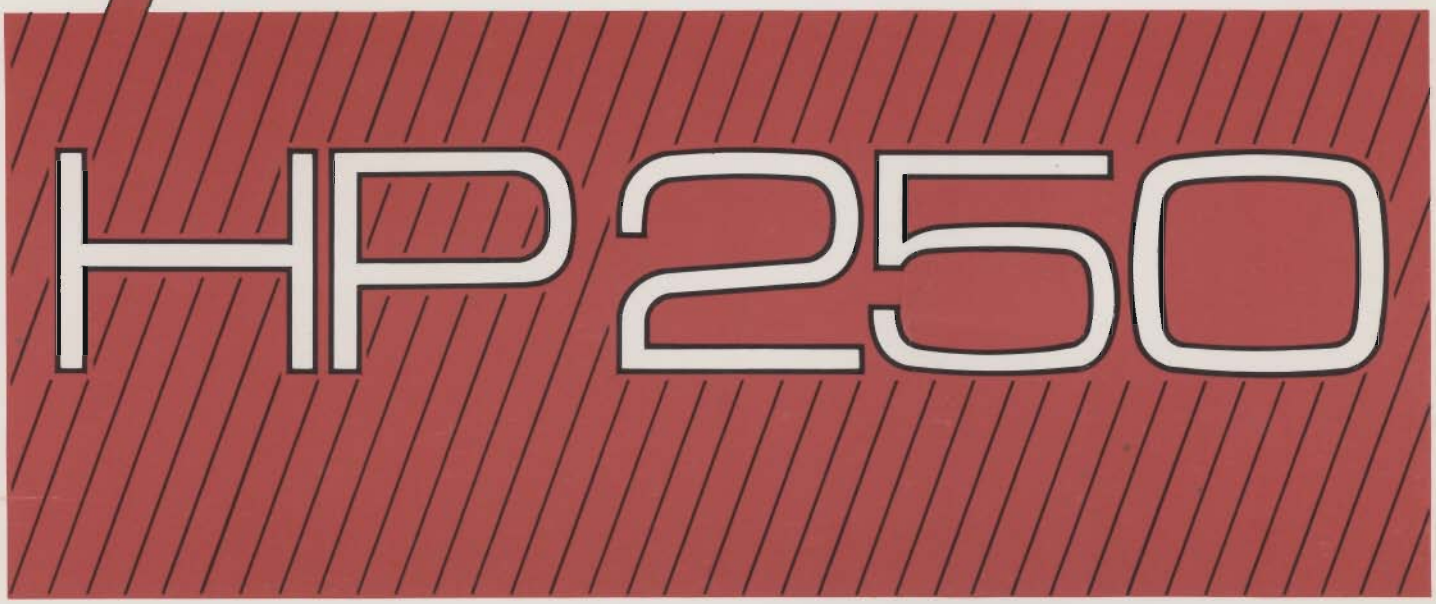
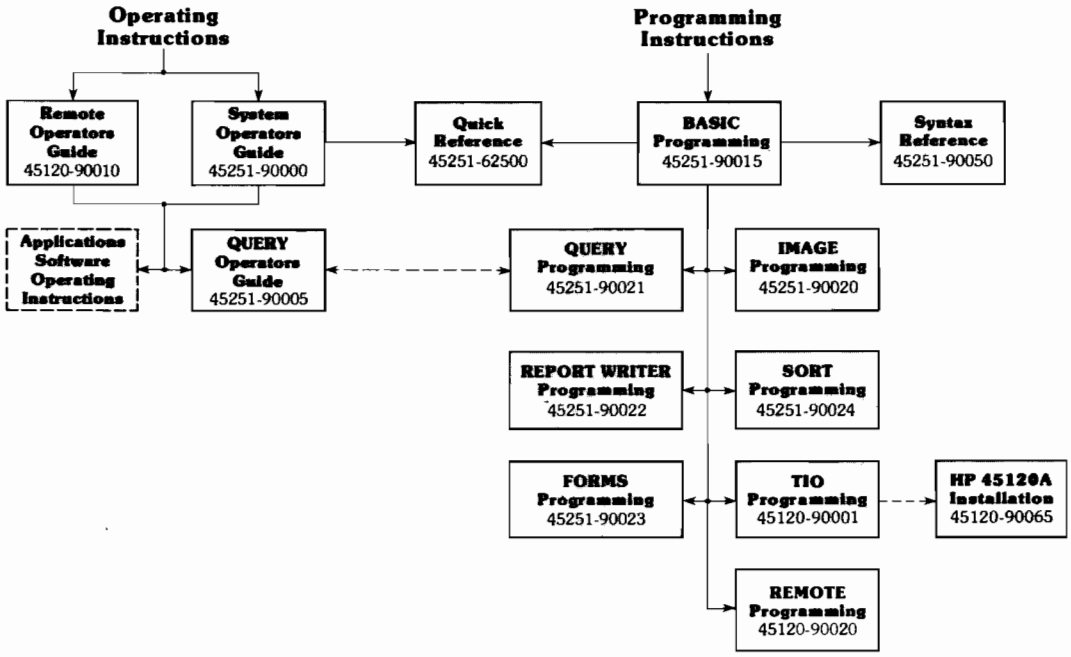
REMOTE/250 Programming Manual





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REMOTE/250
Programming Manual

Manual Part No. 45120-90020
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Hewlett-Packard
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Printing History

New editions of this manual will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user. Each updated page will be indicated by a revised date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

August 1979...**FIRST EDITION**

PREFACE

This manual describes the special programming considerations which exist when REMOTE/250 is added to the HP250 system. The REMOTE/250 Operator's Guide should be referenced for operating considerations and physical differences between the system console and a remote console.

Table of Contents

CHAPTER 1

Introduction

The addition of the HP45120A Asynchronous Serial Interface (ASI) allows connecting up to five RS-232 asynchronous devices to the HP250. These devices may be application terminals, printers, REMOTE/250s or HP3000 computers. The TIO DROM is included in the HP250 operating system to control printers, terminals, and interact with HP3000 computers. The RIO DROM is included to enable REMOTE/250 operation. Any combination of application terminals, printers, HP3000s and REMOTE/250s can be used with the HP250. The devices used depend upon your applications.

The TIO/250 Programming Manual (part no. 45120-90001) describes how to program for applications terminals, printers, and HP3000s. The TIO DROM must be configured into the operating system by running the CONFIG utility, as described in the BASIC/250 Programming Manual (part no. 45251-90015).

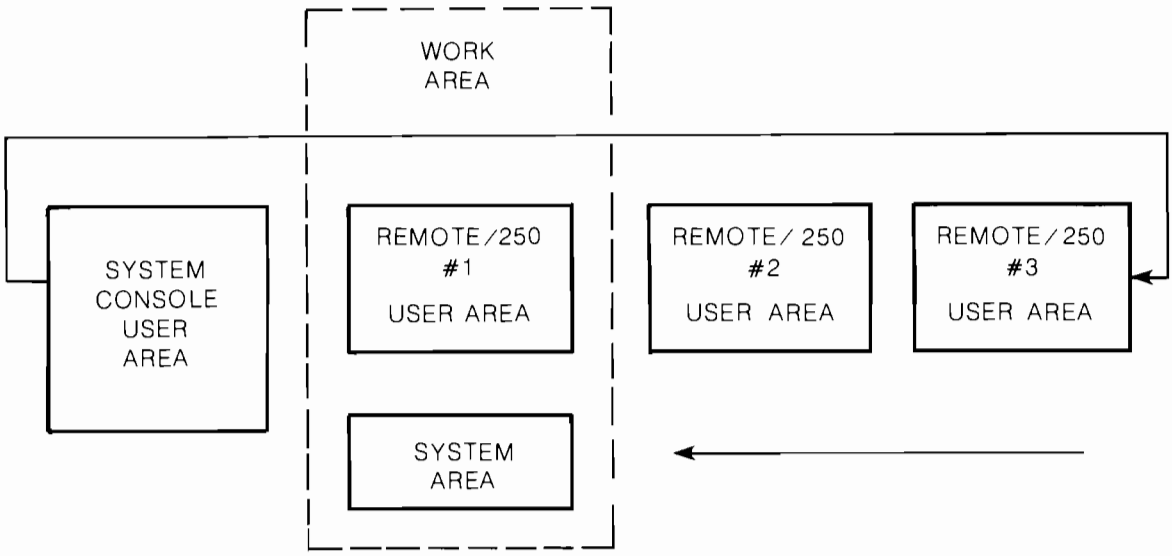
From the operation view point, REMOTE/250s are nearly identical with the system console: the same programs can be run from REMOTE/250s and the system console; FORMS can be used on REMOTE/250s; program development can be done and all utilities can be run from REMOTE/250s; application terminal programs can also be run from REMOTE/250s.

Block Switching

The user memory is divided into 32 or 64 Kbyte blocks. One block is assigned to each console. These blocks of memory are continually switched into and out of a work area as shown in the following diagram.

The switching is performed automatically and cannot be controlled by the user. Some operations such as a data base sort may slow the switching rate while the operation is being processed. These are described in the Programming Considerations Chapter.

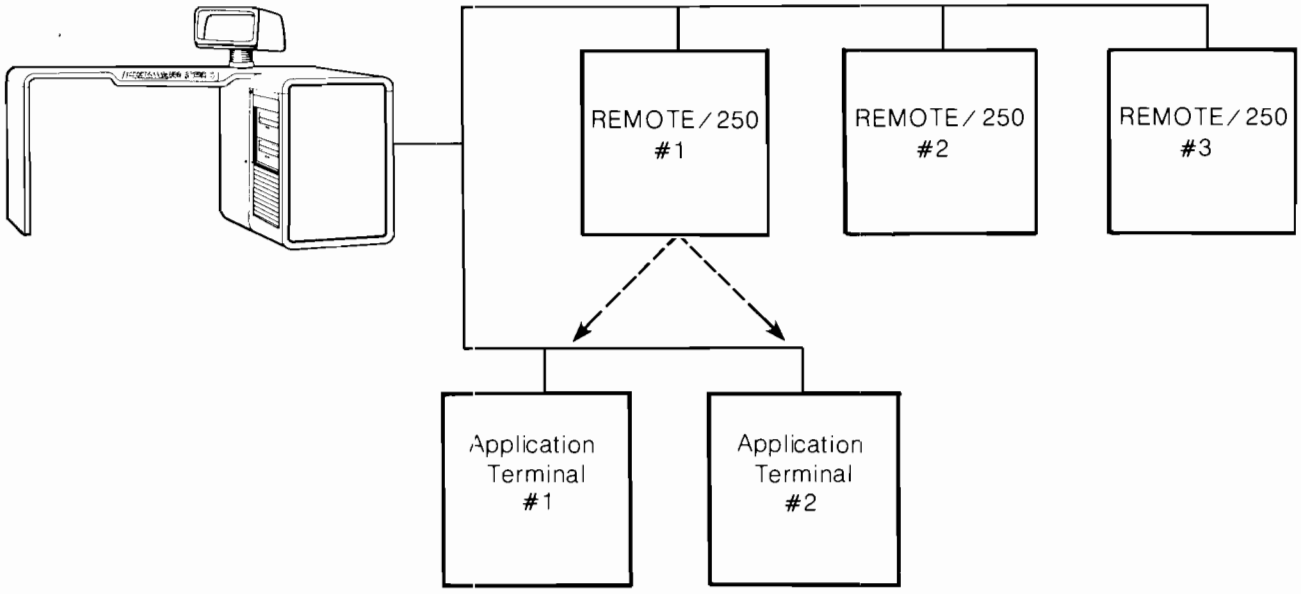
Each block of memory can have the same program in it or a different program. The program runs only when its block of memory is in the work area.



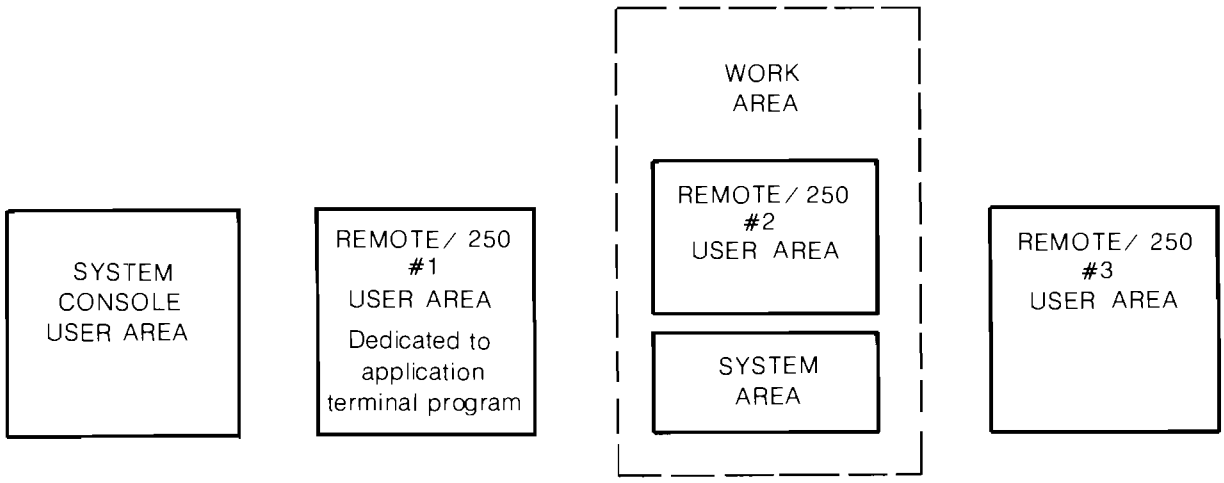
Block Switching

Comparing Terminals and REMOTE/250s

Assume there are two application terminals and three REMOTE/250s attached to the HP250. The program controlling the application terminals is run from REMOTE/250 # 1.



Example Configuration



Block Switching with Example Configuration

The User Area for REMOTE/250 #1 is dedicated to the program running the application terminals. REMOTE/250 #1 cannot be used for program development or data entry while the application program is running.

The system console and REMOTE/250s #2 and #3 have their own work areas which are independent of each other and of REMOTE/250 #1's user area. The programs in each area can, however, share resources in the system area.

Hardware

The remote console is an HP2649D, a terminal designed specifically for the HP250. These terminals have all the functions of the system console including special function keys and display editing keys.

REMOTE/250s are connected to the HP250 through the Asynchronous Serial Interface board which has five ports.* The connection can be made in any of four ways:

1. Modem connection using limited distance leased line modems at up to 9600 baud.
2. Modem connection using switched lines, full duplex, Bell 103 or comparable.
3. Direct RS-232 connection to a maximum distance of 15 metres.
4. Direct current loop connection up to 100 metres.

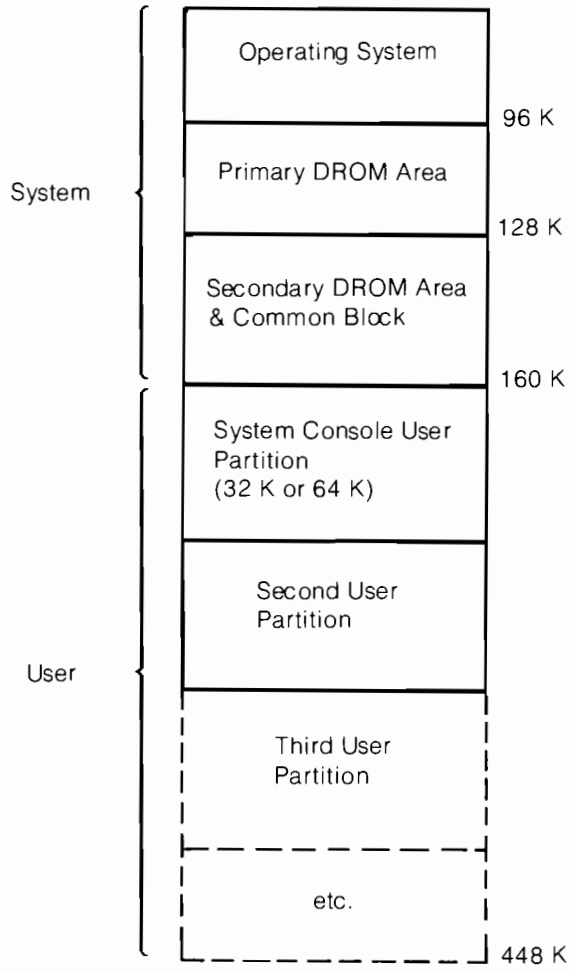
Memory

Up to 448 Kbytes of memory can be included in the HP250. The system requires 160 Kbytes for its operation. The remaining 288 Kbytes is divided into 32 or 64 Kbyte blocks for each REMOTE/250s and system console's user area.

* Refer to the 45120A Installation Manual (part no. 45120-90060) for details on installing the ASI.

Software

Memory is divided into several sections as shown below to accommodate different software.



Memory Diagram

The first 96 Kbytes of memory are reserved for the Operating System.

The next 32 Kbytes contain the DROMs (IMAGE, FORMS, RIO, etc.). If more memory is needed for DROMS, a Secondary DROM Area can be defined in the Common Block Area or in one of the User Partitions.

The Common Block of memory is used for Data Base Control Blocks. Whenever data bases are used in a multiple-user system, the Common Block must be present. It can be defined to be 32 or 64 Kbytes. A portion of this area can then be defind for the secondary DROM area.

The first User Partition is reserved for the System Console. It can be 32 or 64 Kbytes as can all the other User Partitions.

Memory space is allocated through the CONFIG program which is described in the BASIC/250 Programming Manual.

CHAPTER 2

Software/Programming Considerations

When developing or modifying programs to be run on a multiple-user system, consideration should be given to resource management. Such questions should be asked as: Should data bases be shared or is exclusive access needed? How can a program guarantee that its output is not interrupted by another program?

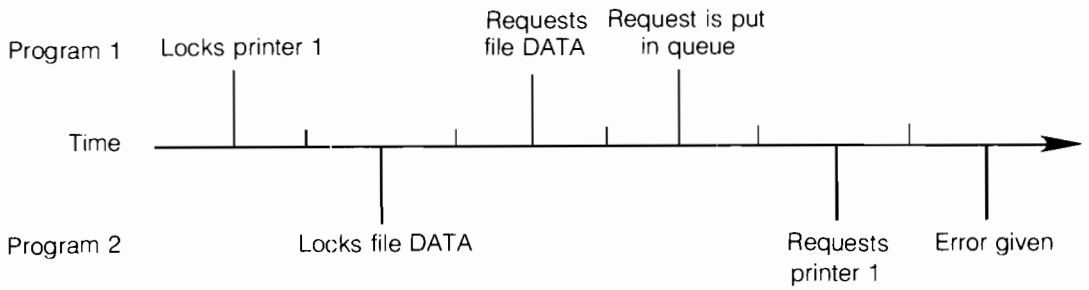
Once the resource questions are answered, performance needs to be considered. For example: when is instant printer output needed and when can spooling be done? Should the data base be updated or will a transaction file be kept?

Resource Management

Resources such as output devices, files and data bases are generally shared. A program requests exclusive access to a resource using one of the BASIC statements described next. Until the program releases the resource no other program can use it. If a program requests a resource and the resource is being used exclusively by another program, the request can be queued.

A problem could arise if one program is getting exclusive access to several resources and not allowing other programs access. The other programs have to wait. Therefore a resource should only be requested when it is immediately needed and then should be released after being used.

Another problem is called lock-out. One program has exclusive access to one resource and requests access to another. That resource is being used exclusively by a second program. The second program requests the resource to which the first program has access. A lock-out occurs: Both programs' requests are in a queue. The HP250 gives an error when this is about to happen so an actual lock-out does not occur.



Lock- out Situation

Managing Output Devices

Output which defaults to the system console (device address 8) is displayed on the REMOTE/250 from which the program is run. For example:

```
100    PRINTER IS 8
110    PRINT "HELLO"
120    END
```

When this sequence is run from the system console, it prints 'HELLO' on the system console's display. When run from a REMOTE/250, it prints 'HELLO' on that console's display.

A printer connected to the REMOTE/250 has an address of 10. Printers connected via a REMOTE/250 cannot be accessed by the system console or another REMOTE/250. A REMOTE/250, however, can access its own printer and any printers connected directly to the HP250.

If several consoles use the same printer, confusion could result as each console outputs a line or two when its user partition is in the work area. To avoid the confusion, use the REQUEST and RELEASE statements. These statements are completely described in the BASIC/250 Programming Manual. The syntax and an example are listed here for convenience.

REQUEST device address [, wait variable]

RELEASE device address

For example:

```
100 Wait=1
110 REQUEST 0,Wait
120 IF Wait THEN
130       PRINTER IS Spool
140       Flag=1
150 ELSE
160       PRINTER IS 0
170       Flag=0
180 END IF
190  ! Begin output
  .
  .
  .
300 RELEASE 0
  .
  .
  .
450 IF Flag=1 THEN GOTO Print
```

Managing Files

If more than one program is going to access a file, some handshaking must be done before one program changes data that another program is reading. The ASSIGN statement's class list parameter defines how the file is accessed by each program. The class list parameter is available beginning with operating system revision 2.D. ASSIGN is completely described in the BASIC/250 Programming Manual.

ASSIGN # file number TO file spec [,return variable [,protect code]] [;class list]

The access keyword can be EXCLUSIVE, UPDATE or READONLY. If EXCLUSIVE access is requested, only the requesting program can use the file. If another program is already using the file, EXCLUSIVE access is not granted. In UPDATE access, several programs can access the file, but a LOCK must be performed before any writes are allowed to the file. In READONLY access, several programs can access the file but none may update it.

The LOCK and UNLOCK statements are described in the BASIC/250 Programming Manual. The syntax and an example using ASSIGN and LOCK are shown here for convenience.

LOCK # file number [,wait variable]

UNLOCK # file number

```
100   ASSIGN #1 TO "Accnt",Return;UPDATE
110   IF Return=4 THEN GOTO Queue
120   IF Return<>0 THEN GOTO Error
130   Wait=1
140   LOCK #1,Wait
150   ! Read then modify
  .
  .
  .
200   UNLOCK #1
```

Data Bases

A data base may be shared by more than one program, and individual data sets or data items may be locked for exclusive access. Or, it might be advantageous to a particular application to allow only one program at a time to access the data base. All the data base statements are described in the IMAGE/250 Programming Manual. They are summarized here with references to multiple users. The syntax shown are available with operating system revision 2.D.

DBOPEN - A data base may be opened in one of these modes: shared access, exclusive access and read only. In shared access mode (mode = 1), multiple users can read from the data base. They can modify the data base only after locking the data set or data item to be modified. In exclusive access mode (mode = 3), only one user can read from or write to the data base. In read only mode (mode = 8), many users can read from the data base, but none may modify it.

DBOPEN (base$, pass$, mode, status(*))

LOCKING - The three statements PREDICATE, DBLOCK and DBUNLOCK are used together to gain exclusive access of the data base or data sets and data items.

The PREDICATE statement is used when more than one data set is to be locked or when data items are to be locked.

PREDICATE predicate$ FROM $set_1$$ [, $item_1$$ [, relop$, value]]
[; $set_2$$ ... [; $set_n$$ ...]]

The DBLOCK statement uses the predicate string defined in the PREDICATE statement or a data set name to lock the desired data sets and data items.

DBLOCK (base$, { set / set$ / predicate$ }, mode, status(*))

The DBUNLOCK statement relinquishes exclusive access of the area locked with DBLOCK.

DBUNLOCK (base$, { set / set$ / predicate$ }, mode, status(*))

For example:

```
100  Base$="DBASE"
110  Pass$="USER"
120  DBOPEN (Base$,Pass$,1,Status(*))
  .
  .
  .
180  Item$="MFG"
190  Set$="COST"
200  PREDICATE Predicate$ FROM Set$,Item$,"(",100
  .
  .
  .
300  DBLOCK (Base$,Predicate$,1,Status(*))
  .
  .
  .
400  DBUNLOCK (Base$,P$,1,Status(*))
```

Performance Considerations

When deciding how to manage system resources, some thought needs to be given to performance. For example, should a program wait for a printer to become free or should it spool its output? If waiting is a frequent occurrence, should another printer be added to the system console? Should a printer be added to a REMOTE/250?

Output Performance

If an output bottleneck is caused by having only one system printer, there are three options available. First, each program can put its output in a spool file. Then, one program can output the spool file contents to the printer at the end of the day or at any specified time. This ensures that other programs won't be tying up the printer when output is needed immediately. This is accomplished by using a file name as the device specifier in the PRINTER IS statement.

```
PRINTER IS "file name"
```

To output the file, use the COPY statement.

```
COPY "file name"
```

The second and third options include adding a printer to the system. The printer can be added to the system for all consoles to use, or it can be added to a REMOTE/250. If one console is continually using a printer but the other consoles only use a printer occasionally, add the printer to the busy console. If all consoles are keeping the printer busy, add a new printer to the system console.

Data Base Performance

When multiple users are accessing a data base, only the part which is to be modifid should be locked. This method allows other programs to modify other parts of the data base without waiting for each program to complete its processing.

Another method is to modify data base information indirectly. Any changes are put in a transaction data set or file. Then, at the end of the day, one program locks the entire data base and processes the transaction. This method allows more rapid access to the data base during the day and ensures that the data remain constant.

When a data base is large, it may span several flexible disc volumes. This could cause problems when one user wants to access a data set on one volume and another user needs to insert a different volume. To avoid this problem, a hard disc should be used. One hard disc can contain several programs, files, and data bases, thus eliminating the need to change discs frequently. Processing is also faster with a hard disc.

Hardware Performance

Under most conditions, there is no noticeable difference in performance between the limited distance modem or direct connections mentioned in Chapter 1. When connected via a BELL 103 modem over switched lines, however, performance is substantially degraded due to the 30 characters per second specification when entering commands and subsequent output.

The operating system updates the display buffer with every command; thus, the shorter the display buffer, the faster a command can be executed. When using the BELL 103 modem over switched lines, it is recommended to clear the display buffer, home the cursor and press SHIFT CLEAR before executing commands which cause output to the CRT and then clear the display after the output has been read.

REMOTE/250 Programming Manual

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