

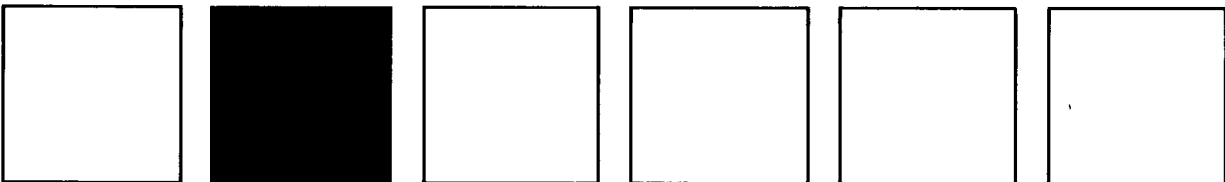


HP 82440A

Development Utility

Owner's Manual

For the HP-71





HP-71 Development Utility

Owner's Manual

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Introduction

The HP-71 Development Utility is a program that runs on the HP-71 and allows you to transfer files between the HP-71 and another computer called the "host."

An HP-71 Development Utility work station is the equipment and software that allow you to transfer files between the HP-71 and a host.

Using This Manual

The purpose of this manual is to give general information about how to set up and use an HP-71 Development Utility work station.

Section 2 explains how to set up an HP-71 Development Utility work station.

Section 3 explains how to transfer files from a host to the HP-71 (download) and how to transfer files from the HP-71 to a host (upload).

Section 4 explains how to customize the HP-71 program for a variety of hosts and interfaces. This section is not necessary for many work stations.

Appendix A is a review of the sections and is meant to be used as a quick reference guide.

Appendix B contains the listings of sample programs.

Appendix C is a glossary of terms used in this manual.

Appendix D is a list of error conditions, their causes, and possible solutions.

Capabilities

The HP-71 Development Utility work station is a file transfer system for the HP-71. It gives you the ability to transfer text files between the HP-71 and a host, thus allowing you to use the facilities of a desktop computer to develop files for the HP-71.

Included in this packet is the HP-71 Development Utility, which runs on the HP-71. This program is a general solution, flexible enough to transfer files to and from "all" potential hosts.

Requirements

A minimal HP-71 Development Utility work station consists of:

- A host with HP-IL.
- HP-IL cables.
- An HP-71 with HP-IL.

If the host does not have HP-IL, another interface with an interface converter can be used:

- HP 82169A HP-IL/HP-IB Interface and HP-IB cable, or
- HP 82164A HP-IL/RS-232-C Interface and RS-232 cable.

To copy the HP-71 Development Utility program, it is useful to have:

- An HP-71 card reader, or
- An HP 82161A Digital Cassette Drive.

Software is necessary on both the HP-71 and the host for the transfer process:

- The HP-71 Development Utility runs on the HP-71. This program controls the HP-71 end of the file transfers. It is provided on a magnetic card (a cassette tape is available through the HP User's Library). An annotated listing of this program is in **Appendix B: Sample Programs**.
- A program is needed on the host to upload the files. This program is very simple and is entered by the user. Sample upload programs are in **Appendix B: Sample Programs**.
- File download also requires software on the host. The sample programs in **Appendix B: Sample Programs** also contain downloading routines. In many cases, however, you can download a file using the printing capabilities of the editor or operating system.

References

This manual does not discuss the general operation of the HP-71, any possible hosts, or any of the interfaces or interface converters. Here is a short list of references on these topics:

- HP-71: *HP-71 Owner's Manual*.
- Hosts: Host system documentation.
- HP-IL: *HP 82401A HP-IL Interface Owner's Manual (HP-71)*, *HP 82938A HP-IL Interface Owner's Manual (Series 80)*, *The HP-IL Interface Specification*, and *The HP-IL Integrated Circuit User's Manual*.
- HP-IL converters: *HP-IL/RS-232-C Interface Owner's Manual*, *HP-IL/HP-IB Interface Owner's Manual*.

Configuration

This section covers the configuration of the HP-71 Development Utility work station with the HP-86/87 or the IBM Personal Computer as a typical host. Also, some guidelines are given for setting up a work station with other hosts.

HP-86/87 With HP-IL

Required Equipment

To set up an HP-71 Development Utility work station with the HP-86/87 as the host and HP-IL as the interface, the following equipment is needed:

- An HP-86/87 with a disc drive.
- An HP 82938A HP-IL interface.
- HP-IL cables.
- An HP-71 with HP-IL and a card reader or a cassette drive.

Connecting the Work Station

1. Power down: Turn off the HP-86/87, disc drive, the HP-71, and any other devices on HP-IL.
2. Connect cables: Connect HP-IL cables to and from the HP-71, the HP-86/87, and any other devices on HP-IL. Make sure that the HP-IL cables form a complete, unbroken loop.

Note: For use in the HP-86/87 program, note the device selector of the HP-IL interface (the default is 9). Refer to the *HP-86/87 Owner's Manual and Programming Guide* for more on device selectors.

3. Power up: Turn on the disc drive, the HP-86/87, the HP-71, and any other devices on HP-IL.

The HP-71 Development Utility work station is now connected and ready to run the HP-71 Development Utility (refer to **Section 3: Operation**).

Testing the Work Station

The following is a test to make sure that the HP-71 and HP-86/87 are communicating:

1. Prepare the HP-71 to receive data from the HP-86/87:

```
>ENTER DEVADDR("%1"); A$
```

2. Send a message from the HP-86/87 (assuming that the device selector of the HP-IL interface is 9):

```
OUTPUT 9;"Hello HP-71, how are you?"
```

3. Check to make sure that A\$ in the HP-71 has the message that you sent from the HP-86/87:

```
>DISP A$
```

HP-86/87 With HP-IB

Required Equipment

To set up an HP-71 Development Utility work station with the HP-86/87 as the host and HP-IB as the interface, the following equipment is needed:

- An HP-86/87 with an HP-IB interface and a disc drive.
- An HP-IB cable.
- An HP 82169A HP-IL/HP-IB Interface.
- HP-IL cables.
- An HP-71 with HP-IL and a card reader or a cassette drive.

Connecting the Work Station

1. Power down: Turn off the HP-86/87 and disc drive, unplug the HP-IL/HP-IB Interface, turn off the HP-71 and any other devices on HP-IL.
2. Set the mode switch on the HP 82169A to "mailbox" mode.
3. Connect cables: Connect one end of the HP-IB interface cable to the HP-IL/HP-IB Interface; connect the other end to the HP-IB port in the HP-86/87.

Note: For use in the HP-86/87 program, note the device selector of the HP-IL/HP-IB interface. Refer to the *HP-86/87 Owner's Manual and Programming Guide* for more on device selectors.

Connect HP-IL cables to and from the HP-71, the HP-IL/HP-IB Interface, and any other devices on HP-IL. Make sure that the HP-IL cables form a complete, unbroken loop.

4. Power up: Turn on the HP-86/87 and disc drive, plug in the HP-IL/HP-IB Interface, turn on the HP-71 and cassette drive, and any other devices on HP-IL.

The HP-71 Development Utility work station is now connected and ready to run the HP-71 Development Utility (refer to **Section 3: Operation**).

Testing the Work Station

The following is a test to make sure that the HP-71 and HP-86/87 are communicating:

1. Prepare the HP-71 to receive data from the HP-IL/HP-IB interface:

```
>ENTER DEVADDR("%67"); A$
```

2. Send a message from the HP-86/87 (assuming that the device selector of the HP-IB interface is 705):

```
OUTPUT 705;"Hello HP-71, how are you?"
```

3. Check to make sure that A\$ in the HP-71 has the message that you sent from the HP-86/87:

```
>DISP A$
```

IBM Personal Computer With RS-232

Required Equipment

To set up an HP-71 Development Utility work station with the IBM Personal Computer as the host and RS-232 to HP-IL as the interface, the following equipment is needed:

- An IBM Personal Computer with an RS-232 interface (serial interface) and a disc drive.
- An RS-232 cable.
- An HP 82164A HP-IL/RS-232-C Interface.
- HP-IL cables.
- An HP-71 with HP-IL and a card reader or a cassette drive.

Connecting the Work Station

1. Power down: Turn off the IBM personal computer and disc drive, unplug the HP-IL/RS-232-C Interface, turn off the HP-71 and any other devices on HP-IL.
2. Initialize the HP-IL/RS-232-C Interface: The standard configuration for this interface is DTE. To work with the HP-71 Development work station, the configuration needs to be DCE. This is done by switching the configuration selector. Refer to the *HP 82164A HP-IL/RS-232-C Interface Owner's Manual* for information on how to switch the configuration selector.
3. Connect cables: Connect one end of the RS-232 interface cable to the HP-IL/RS-232-C Interface, the other end to an RS-232 port of the IBM personal computer.

Note: For use in the IBM program, note which RS-232 port the cable is connected to. COM1 is the female port; COM2 is the male port. Refer to the IBM Personal Computer documentation for more on the RS-232 ports. (*On some systems the male port is COM1*).

Connect HP-IL cables to and from the HP-71, the HP-IL/RS-232-C Interface, and any other devices on HP-IL. Make sure that the HP-IL cables form a complete, unbroken loop.

4. Power up: Turn on the IBM Personal Computer and disc drive, plug in the HP-IL/RS-232-C Interface, turn on the HP-71, and any other devices on HP-IL.

The HP-71 Development Utility work station is now connected and ready to run the HP-71 Development Utility (refer to **Section 3: Operation**).

Testing the Work Station

The following is a test to make sure that the HP-71 and IBM Personal Computer are communicating:

1. Initialize the HP-IL/RS-232-C interface by giving the HP-71 the following commands:

```
>REMOTE
>OUTPUT RS232; "SB7;P4;SP0;SW0;"
>LOCAL
```

2. Initialize RS-232 for the IBM Personal Computer. Give it the following command (assuming that RS-232 is in communication port 1):

```
A>MODE COM1:600,N,8,1,RS,CS0,DS0,CD0
```

3. Prepare the HP-71 to receive data:

```
>ENTER RS232; A#
```

4. Send a message from the IBM:

```
A>COPY CON: COM1:
Hello HP-71, how are you?
[CONTROL]Z
```

5. Check to make sure that A\$ in the HP-71 has the message that you sent from the IBM:

```
>DISP A#
```

Other Hosts and Interfaces

The HP-71 Development Utility is flexible enough to work with most computers and interfaces. Although only the HP-86/87 with HP-IL and HP-IB, and the IBM Personal Computer with RS-232 are covered in the manual, here are some suggestions and warnings about setting up a work station using other hosts and interfaces:

- When using RS-232, make sure that baud rate, parity, and word length are compatible with the HP-71 and HP-IL (refer to **Section 4: Customization**).
- Ensure that the end-of-line and end-of-file sequences are correct (refer to **Section 4: Customization**).
- If the host is on HP-IL, it must be able to pass control to the HP-71.
- Send data across the interface manually before running the HP-71 Development Utility. Examples of how to do this are in the preceding subsections.

Operation

This section explains how to transfer files from a host to the HP-71 (download) and how to transfer files from the HP-71 to a host (upload).

HP-71

Running the HP-71 Development Utility: XFER

The bulk of the work for the HP-71 Development Utility work station is done by an HP-71 BASIC program called XFER. XFER is provided on magnetic cards (a cassette tape is available through the HP User's Library). An annotated listing of this program is in **Appendix B: Sample Programs**.

XFER can be copied and run from the HP-71 card reader or the HP 82161A Digital Cassette Drive. If there is no card reader or cassette drive, the program can be keyed into the HP-71 from the listing (stripping the comments saves HP-71 memory).

Example: Suppose you wanted to copy XFER from the magnetic cards and then run the program. To do this, you would give the HP-71 the following commands:

```
>COPY XFER:CARD  
>RUN XFER
```

To copy the XFER program from the magnetic cards and run it immediately, give the HP-71 the following command:

```
>RUN XFER:CARD
```

Similarly, to copy XFER from the cassette tape and then run the program, you would give the HP-71 the following commands:

```
>COPY XFER:TAPE  
>RUN XFER
```

To copy the XFER program from the cassette tape and run it immediately, give the HP-71 the following command:

```
>RUN XFER:TAPE
```

Refer to the *HP-71 User's Manual* for more on the COPY and RUN commands.

The start of the XFER program is signified by:

```
HP-71 transfer program
```

XFER searches the loop for an RS-232 interface, an HP-IB interface, or a controller. If only one of these devices is found, it is assumed to be the host. If none or more than one of these devices are found, XFER prompts for the host:

```
Host device?
```

In response to this prompt, specify which device is to be the host. You may enter:

- An HP-IL address (an integer 1 to 30).
- A device ID (an alpha numeric string such as “HP82169A” or “HP82164A”).
- An accessory ID (“%n”, where n is the decimal accessory ID).

An Overview of How XFER Works

All of XFER’s variables are local. This means that running XFER won’t change any user defined variables. Also, XFER’s variables are not available to the user unless XFER is running.

XFER makes the HP-71 the active controller on HP-IL and takes responsibility for the integrity of HP-IL. To make sure that HP-IL is set up, XFER executes the CONTROL ON statement.

After initializing HP-IL and internal variables, XFER sets up a host and is ready to start uploading and downloading files.

When downloading, XFER reads ASCII data from HP-IL and puts it into a text file specified by the user. When uploading, XFER outputs ASCII data to HP-IL from a text file specified by the user. For how to specify the text file, see **Downloading** and **Uploading**, later in this section. For the specifications of how XFER transmits and receives ASCII data, see the subsection on **Host Programs** at the end of this section.

Guidelines For Using XFER

At each prompt:

- You enter a response followed by an `END LINE`.
- If you have forgotten the meaning of a prompt, respond with a question mark (“?”) for a brief description of what is expected.
- XFER displays the default, if there is one. Responding with an `END LINE` re-enters this default value.
- The smallest, unique representation of a response is sufficient.
Example: “Y” and “YE” are equivalent to “YES”.
- XFER converts all responses to uppercase.
Example: “Yes” and “yes” are equivalent to “YES”.

Stopping XFER

Any time that XFER displays a prompt, the program can be stopped by responding with “END” or “E”. This causes XFER to close its files and return control to the HP-71 operating system.

Any time that XFER is in the process of transferring a file between the HP-71 and the host, the transfer can be stopped and any open files closed by typing “S” or “A” on the HP-71 keyboard:

- The “A” command stops the transfer and ends the XFER program.
- The “S” command stops the transfer and permits you to halt the host program without tying up the interface or HP-IL. When you press “S” during a file upload, XFER sends the end-of-file sequence (refer to **Section 4: Customization**), which halts the program automatically. If you press “S” during a file download, XFER continues to read data from the host but does not store the data in a file. If you then manually stop the host program, XFER detects the end of transmission after a 3-second interval.

Neither the “S” nor the “A” needs to be followed by an `END LINE`.

Example: Suppose you begin downloading a file with XFER and then decide that you want to upload rather than download. To halt the download, you could type “S” on the HP-71, stop the download on the host, and then set XFER to upload and restart the host program.

Changing XFER for the IBM Personal Computer

In order to work with the IBM Personal Computer correctly, XFER’s end-of-line variables need to be changed. The code to do this is in XFER as a remark line. To change XFER, remove the “!” from line 210:

```
210 ! E1#=CHR$(13) @ E1#=E0# ✓
```

This changes it to:

```
210 E1#=CHR$(13) @ E1#=E0# ✓
```

This makes lines 190-200 superfluous, so these lines can be deleted, made into remarks, or ignored. ✓

For more on customizing XFER for specific work stations, refer to **Section 4: Customization**.

Software Handshaking

Software handshaking is a method of automatically controlling the starting and stopping of data transfers on both sides of the interface. Interfaces such as the HP 82164A HP-IL/RS-232-C Interface and the HP 82169A HP-IL/HP-IB Interface support a variety of handshakings.

If your host is capable of handshaking on HP-IB or RS-232, the order in which you start running XFER and the corresponding program on the host does not matter—each program waits for the other to send data at the appropriate time.

If your host does not support software handshaking (the sample program for the IBM PC listed in **Appendix B: Sample Programs** does not use handshaking), you have to coordinate the data transfer by ensuring that the receiving end is prepared by the time it gets data.

To download a file:

1. Respond to XFER's prompts until the following is displayed on the screen:

```
Downloading <file name>...
```

2. Start the download from the host.

To upload a file:

1. Prepare the host to receive a file.
2. Respond to XFER's prompts until the following is displayed on the screen:

```
Uploading <file name>...
```

See the following subsections for more on XFER's prompts.

Downloading

In order for XFER to transfer a file, it needs to know which direction to transfer the file (upload or download) and the name of the file to be transferred. First XFER asks for the direction of transfer:

```
Download or Upload? D
```

or

```
Upload or Download? U
```

The "U" or "D" reflects the previous direction of transfer; this is the default for this prompt. In order to download, you would respond by entering "D":

```
Download or Upload? D 
```

or

```
Upload or Download? D 
```

XFER now asks for the name of the file to be downloaded:

```
Download file:
```

This is the text file that XFER creates to store the data received from HP-IL. If this file already exists when XFER tries to create it, you are warned:

```
File <file name> already exists.  
Purge old <file name>?
```

You can then proceed with the purge by typing "Y" or prevent the purge by typing "N". If the purge is prevented, another download file name is requested.

As soon as XFER has an acceptable download file name, it starts downloading:

```
Downloading <file name>...
```

At this point, you should run the program on the host that downloads the file.

If there is a display device on HP-IL, it echoes the data as it is transferred. Otherwise, the HP-71 display echoes the data. To maximize transfer speed in the latter case, set DELAY 0, 0.

After the file has been downloaded and XFER is ready to close the file, you are informed by the following message:

```
Download complete
```

If the file has been flagged as a BASIC file (refer to Section 4: Customization), it is transformed to BASIC after being downloaded:

```
Transforming <file name>...
```

XFER is then ready to upload or download another file and returns to the “Download or Upload?” prompt (see above).

Example: Suppose you wanted to download a file named “TEST”. To do this, you would respond to XFER’s prompts as follows:

```
Download or Upload? D 
Download file: TEST 
```

Suppose that you had downloaded “TEST” previously and now had a new version to replace the obsolete version. You would then want to purge the old version:

```
File TEST already exists.
Purge old TEST? Y 
```

XFER then purges the old “TEST”, creates a new one, and starts downloading:

```
Downloading TEST...
```

You would then download the file “TEST” from the host. As each line is downloaded, it is displayed on the display device, or the HP-71 if there is no display device.

The end of the download is signified by:

```
Download complete
```

If TEST has been flagged as a BASIC file, it is transformed into BASIC after it is downloaded:

```
Transforming TEST...
```

XFER then returns to the “Download or Upload?” prompt.

Uploading

To upload a file, enter “U” in response to the direction prompt:

```
Download or Upload? U 
```

or

```
Upload or Download? U 
```

At this point, you should run the program on the host that uploads a file.

XFER now asks for the file to be uploaded:

```
Upload file:
```

This specifies the file from which XFER transfers data via HP-IL. If this file doesn't exist, XFER displays "No such file," then prompts for another upload file name.

If the file is a BASIC file, it is transformed into text before being uploaded. To signify this, XFER displays the following:

```
Transforming <file name>...
```

After XFER has an acceptable upload file name and has finished transforming, it starts uploading and displays the following message:

```
Uploading <file name>...
```

If there is a display device on HP-IL, it echoes the data as it is transferred. Otherwise, the HP-71 display echoes the data. To maximize transfer speed in the latter case, set DELAY 0,0.

If the upload file was originally a BASIC program, it is transformed back to BASIC following the transfer:

```
Transforming <file name>...
```

XFER is then ready to upload or download another file and returns to the "Upload or Download?" prompt (see above).

Example: Suppose you wanted to upload a file named "TEST". To do this, you would respond to XFER's prompts as follows:

```
Download or Upload? U END LINE
Upload file? TEST END LINE
```

If TEST is a BASIC file, it is transformed into text before being uploaded:

```
Transforming TEST...
Uploading TEST...
```

As each line is uploaded, it is displayed on the display device, or the HP-71 if there is no display device.

After the transfer, TEST is transformed back into BASIC and the upload is complete:

```
Upload complete
Transforming TEST...
```

XFER then returns to the "Upload or Download?" prompt.

Host Programs

Program Specifications

Because of the variety of computers capable of acting as a host for HP-71 Development Utility work station, not all work stations can be fully documented. Instead, the specifications for host programs interacting with XFER are described and explicit examples of such programs are given. You will need to provide your host program yourself, either by keying in one of the sample programs from **Appendix B: Sample Programs**, or writing your own program from the specifications.

XFER is designed to be very flexible in the data transfer process, so that the host programs can be short and simple. **Section 4: Customization** explains how XFER can be customized for your specific work station.

Download Program Specifications

After XFER displays “Downloading <file name>...,” it has a text file prepared and expects ASCII data from HP-IL in the following form:

```
<dat><dat> ... <dat><end-of-line><dat><dat> ... <dat><end-of-line> ...
... <dat><dat> ... <dat>{<end-of-line>}<end-of-file>
```

where:

<dat>—ASCII data.

<end-of-line>—The download end-of-line sequence.

<end-of-file>—The download end-of-file sequence.

Refer to **Section 4: Customization** for how to change the default definition of the end-of-line and end-of-file sequences.

The stream of ASCII data is read into a string variable and transferred into the prepared text file as follows:

- When an end-of-line sequence is found, the data from the string variable is stored in the text file followed by a <carriage return><line feed> (the HP-71 defined end-of-line sequence):

```
string variable ← <dat><dat> ... <dat>
```

An end-of-line sequence causes:

```
text file ← string variable<carriage return><line feed>
```

After the data is stored, ASCII data is again read into the string variable.

- When an end-of-file sequence is found, the data from the string variable is stored in the text file followed by a <carriage return><line feed> (the HP-71 defined end-of-line sequence), same as with the end-of-line sequence. XFER clears HP-IL by reading any more data that may be on the loop. Neither the end-of-file sequence nor any data read after it are put into the text file.

To download a file to XFER, then, the host program must:

- Transmit the download file as a data stream broken into individual text lines separated by download end-of-line sequences.
- Signal the end of transmission by sending a download end-of-file sequence.

Upload Program Specifications

After XFER displays “Uploading <file name>...,” it puts ASCII data onto HP-IL in the following form:

```
<catalog entry>
<dat> <dat> ... <dat> <end-of-line> <dat> <dat> ... <dat> <end-of-line> ...
... <dat> <dat> ... <dat> <end-of-line> <end-of-file>
```

where:

<catalog entry>—The HP-71 file catalog entry.
 <dat>—ASCII data.
 <end-of-line>—The upload end-of-line sequence.
 <end-of-file>—The upload end-of-file sequence.

Refer to **Section 4: Customization** for how to change the default definition of the end-of-line and end-of-file sequences.

The first thing that XFER sends is the HP-71 file catalog entry. The host can use this information to set up its mass storage to receive the file data. The catalog entry is in the following form:

Characters	Contents
1-8	HP-71 file name.
9-17	Protection and file type.
18-22	HP-71 file size, in bytes.

Transmission of the catalog entry is terminated by the upload end-of-line sequence.

Following the catalog entry, XFER transmits the contents of the file as a continuous stream of ASCII data. XFER reads the file from memory, record by record, and sends each record followed by the upload end-of-line sequence.

After the last text line is sent, XFER transmits the upload end-of-file sequence.

To upload a file to XFER, then, the host program must:

- Initialize a file, either on a mass memory or in internal memory, to receive the transferred data.
- Read the catalog entry, and either use the information in the entry, or discard it. The catalog entry should not be stored in the file.
- Copy the incoming data into a file, in a format that can be utilized by a text editor on the host.
- Recognize the end-of-file sequence, and terminate the data transfer in a manner that leaves HP-IL ready for further operations.

Some general considerations you may wish to take into account in the host program are:

- Where is the data coming from?
- What file will the data be stored in?
- Where will the file be stored (mass storage device)?
- What type will the file be (BASIC, text, data)?
- What will happen if the file already exists?
- How will the data transmission end (end-of-line and end-of-file sequences)?
- How will an error in transmission be handled?

Refer to **Appendix B: Sample Programs** for examples of uploading programs.



Customization

The HP-71 Development Utility program is designed to handle a variety of hosts and work station configurations. Although the defaults are appropriate for most "common" configurations, they can be customized to other configurations.

How To Customize

Customization is achieved through altering the XFER program code. There are 11 variables that are used for customizing. These variables are on lines 140-210 and 1640-1670 of the XFER program:

```

140 X=120
150 C=1
160 B=1
170 Z0$="EOF"
180 Z1$="EOF"
190 E0$=CHR$(13)&CHR$(10)
200 E1$=CHR$(13)&CHR$(10)
210 ! E0$=CHR$(13) @ E1$=E0$
:
1640 B$="SB7"
1650 P$="P4"
1660 P5$="SP0"
1670 W$="SW0"

```

To change a variable in the XFER program, you need to:

- EDIT the program XFER.
- FETCH the line containing the variable.
- Change the value of the variable.

Refer to the *HP-71 Owner's Manual* for more on editing BASIC files on the HP-71.

Example: Suppose you wanted to change the value of variable B on line 160 from 1 to 0. To do this, you would give the HP-71 the following commands:

```

>EDIT XFER
>FETCH 160

```

In response to these commands, the HP-71 displays line 160 of XFER:

```

160 B=1

```

This line can then be changed to read:

```

160 B=0

```

After hitting the **END LINE** key, this change becomes permanent in the HP-71 memory.

Customizing XFER's Variables

Two string variables, X\$ and A\$, are used for temporary storage of data transferred to and from the HP-71. The string lengths are determined by the variable X (line 140). To minimize the memory used by XFER, you should dimension these strings as short as possible, by choosing a value for X according to the following guidelines:

- X\$ has length X; A\$ has length 2X.
- A\$ must be as long as the longest line in the file being transferred.

Customizing HP-71 Files

There are two variables that determine how XFER treats HP-71 files.

- C (line 150): Before downloading a file into a file name, any file which already exists by that file name is purged. The variable C determines whether or not the user is warned of this purging before it happens.

For example: Suppose you were downloading a file "TEST".

If C=1 (the default), XFER warns you of the impending purge by displaying:

```
File TEST already exists.
Purge old TEST?
```

You could then accept the purge by typing "Y" or stop the purge by typing "N".

If C=0, XFER automatically purges "TEST".

- B (line 160): Files are transferred by XFER as text files. The variable B is used for aiding in the development of BASIC programs. If B=1, XFER assumes that a file being downloaded is a BASIC file and transforms it after it is received.

For example: Suppose you were downloading a file "TEST".

If B=1 (the default), XFER transforms "TEST" into BASIC after it is downloaded.

If B=0, "TEST" would be stored in the HP-71 as a text file after it is downloaded.

Customizing End-of-Line and End-of-File Sequences

As a file is downloaded, XFER stores it as lines in a sequential text file.

The end of an individual line is determined by E0\$ (line 190). The end of the file is determined by Z0\$ (line 170). E0\$ and Z0\$ are from 1 to 18 characters.

During a file upload, XFER appends E1\$ (line 200 or 210) to each line of the file and transmits Z1\$ (line 180) to indicate the end of file. E0\$ and Z0\$ are from 1 to 18 characters.

Note: Make sure that the end-of-line and end-of-file sequences are unique and occur in the file only at the appropriate place(s). Non-uniqueness can lead to files being transferred incorrectly.

Customizing HP-IL

The subprogram “WH(H)”, lines 1510-1620, is provided to prompt you to specify a host when either:

- No HP-IL controller, HP 82169A, or HP 82164A is connected on HP-IL.
- More than one of the above devices are present.

If you expect to have one and only one host on HP-IL you may delete lines 1520-1620 to save HP-71 memory.

Customizing the HP 82164A HP-IL/RS-232-C Interface

The subprogram RS(H), lines 1630-1960, is provided to initialize the HP 82164A Interface. If you are not using this interface, you may delete lines 1630-1690 to save HP-71 memory.

RS-232-C is a very flexible interface with a wide variety of possible options. The HP 82164A can be initialized to incorporate these options. Four of these options are automatically initialized by the subprogram “RS(H)”. You can modify the values used by XFER or add RS-232-C configuration specifiers by editing the “RS(H)” subprogram. Refer to the *HP 82164A HP-IL/RS-232-C Interface Owner’s Manual* for what options are available and how to initialize them.

The RS-232 options automatically initialized by XFER are baud rate, parity bit, parity error shown, and word length. They are initialized to work with the IBM Personal Computer according to the configuration set up by the program in **Appendix B: Sample Programs**.

- Baud rate (B\$, line 1640): baud rate determines how quickly data is passed along RS-232. The default is 600 baud. This rate is chosen as the maximum data rate that XFER can process with no software handshaking.
- Parity bit (P\$, line 1650): For error checking, there is usually a bit which is used for parity. The default parity is no parity.
- Parity shown (P5\$, line 1660): The parity bit is usually shown as the high order bit of the data byte. The default is for the parity bit to not be shown on the data byte.
- Word length (W\$, line 1670): If a parity bit is taking up part of the data byte, then the word length can be less than 8 bits. The default is an 8-bit word.

Quick Reference

Configuration

To set up an HP-71 Development Utility work station you need to:

1. Power down.
2. Initialize the interface converter if one is being used.
3. Connect cables.
4. Power up.

Operation

To Accomplish:	Respond With:
Entering download mode.	Download or Upload? D <input type="text" value="END LINE"/> Upload or Download? D <input type="text" value="END LINE"/>
Entering upload mode.	Download or Upload? U <input type="text" value="END LINE"/> Upload or Download? U <input type="text" value="END LINE"/>
Downloading a file.	Download file: <file name> <input type="text" value="END LINE"/>
Uploading a file.	Upload file: <file name> <input type="text" value="END LINE"/>

Customization

Variable,Line#	Purpose	Default	Possible Options
X,140	Variable lengths.	X = 120.	Positive integers.
C,150	User warned before files purged?	C = 1 (Warned).	C = 0 (Not warned), C = 1 (Warned).
B,160	BASIC or text files.	B = 1 (BASIC).	B = 0 (text), B = 1 (BASIC).
Z0\$,170	End of download file.	Z0\$ = "EOF".	< 18 characters.
Z1\$,180	End of upload file.	Z1\$ = "EOF".	< 18 characters.
E0\$,190	End of download line.	E0\$ = CHR(13)&CHR\$(10).	< 18 characters.
E1\$,200	End up upload line.	E1\$ = CHR\$(13)&CHR\$(10).	< 18 characters.
B\$,1640	Baud rate.	B\$ = "SB8" (1200).	B\$ = "SB1" (50), B\$ = "SB2" (75), B\$ = "SB3" (110), B\$ = "SB4" (135), B\$ = "SB5" (150), B\$ = "SB6" (300), B\$ = "SB7" (600), B\$ = "SB8" (1200), B\$ = "SB9" (1800), B\$ = "SBA" (2400), B\$ = "SBB" (3600), B\$ = "SBC" (4800), B\$ = "SBD" (7200), B\$ = "SBE" (9600), B\$ = "SBF" (19200).
P\$,1650	Parity bit used.	P\$ = "P4" (None).	P\$ = "P0" (Even), P\$ = "P1" (Odd), P\$ = "P2" (0), P\$ = "P3" (1), P\$ = "P4" (None).
P5\$,1660	Parity bit shown.	P5\$ = "SP0" (Disabled).	P5\$ = "SP0" (Disabled), P5\$ = "SP1" (Enabled).
W\$,1670	Data bits per word.	W\$ = "SW0" (8).	W\$ = "SW0" (8), W\$ = "SW1" (7).

Sample Programs

HP-71 Development Utility Program XFER

```

100 ! "XFER" Program for HP-71
110 CALL XFERX ! Makes program variables local
120 END
130 SUB XFERX
140 X=120 ! Set I/O array sizes
150 C=1 ! Purge warning
160 B=1 ! Automatic transform to/from BASIC
170 Z0$="EOF" ! EOF Download end-of-file
180 Z1$="EOF" ! Upload end-of-file
190 E0$=CHR$(13)&CHR$(10) ! Download end-of-line
200 E1$=CHR$(13)&CHR$(10) ! Upload end-of-line
210 ! E0$=CHR$(13) @ E1$=E0$ ! For IBM PC
220 ! Initialization:
230 DIM F$(8),F1$(15),A$(2*X),X$(X)
240 SFLAG -1 @ SFLAG -23 ! Quiet mode; stop on ETO
250 CONTROL ON J Assert system control on HP-IL
260 D=DEVADDR("DISPLAY") @ P=DEVADDR("PRINTER") ! Find display and printer
270 IF D>0 THEN DISPLAY IS :D ELSE DELAY 0,0 ! Choose a display
280 DISP "HP71 transfer program"
290 D$="Download" @ O$="Upload"
300 F$=""
310 ! Find potential hosts:
320 'HOST': L=DEVADDR("%1") @ R=DEVADDR("%66") @ G=DEVADDR("%67")
330 H=(R>0)+(G>0)+(L>0) ! Count hosts; if not 1 then query user
*340 IF H>1 OR H=-3 THEN CALL WH(H) ELSE H=MAX(L,MAX(G,R))
350 'DIR': DISP D$&" or "&O$&"? "; ! Input direction
360 INPUT "",D1$[1,1];D1$ @ D1$=UPRC$(D1$)
370 IF POS("END",D1$)=1 THEN 'CEND'
380 IF D1$="?" THEN CALL HELP(1,D$) @ GOTO 'DIR'
390 IF D1$[1,1]<>D$[1,1] THEN T$=D$ @ D$=O$ @ O$=T$
400 ! Get file name
410 'RDFN': DISP D$&" file: "; @ INPUT "",F$;F1$ @ F1$=UPRC$(F1$)
420 IF F1$="" THEN BEEP @ GOTO 'RDFN'
430 IF POS("END",F1$)=1 THEN 'CEND'
440 IF F1$="?" THEN CALL HELP(2,D$) @ GOTO 'RDFN'
450 ON ERROR GOTO 460 @ RENAME F1$ TO F1$ ! Check if file exists
460 OFF ERROR @ IF ERRN=58 THEN DISP ERRM$ @ GOTO 'RDFN' ! Invalid file name
470 F$=F1$
480 IF ERRN<>57 AND ERRN<>59 THEN DISP ERRM$ @ GOTO 'CEND' ! Unexpected error
490 IF D$[1,1]="U" THEN 'UPF'
500 IF ERRN=57 THEN 'CR' ! File does not exist
510 IF NOT C THEN 'PFN' ! Purge without warning
520 DISP F$;" already exists." @ WAIT .5
530 DISP "Purge old "&F$;" @ INPUT K$ @ K$=UPRC$(K$)
540 IF POS("END",K$)=1 THEN 'CEND'
550 IF K$="?" THEN CALL HELP(3,D$) @ GOTO 530
560 IF POS("YES",K$)<>1 THEN 'RDFN' ! Get a new file name

```

*** If your system configuration consists of only the HP-71B, RS232 Interface and the IBM PC, you will need to change line 340 to ready 340 CALL WH(H). As it is, the conditional tests are not met. Therefore, the subprogram is never called.**

```

570 'PFN': PURGE F$
580 'CR': CREATE TEXT F$
590 'DF': DISP D$&"ing ";F$;"..." !      Download
600 ASSIGN #1 TO F$ @ A$=""
610 STANDBY .5 @ D1=0 !                    D1=0 means no data yet
620 'RDS': K1$=UPRC$(KEY$) !                Check keyboard
630 IF K1$="S" THEN ASSIGN #1 TO * @ GOSUB 'CLN' @ GOTO 'DIR'
640 IF K1$="A" THEN 'CEND'
650 SEND MLA TALK H !                       Make host talker
660 IF D>0 THEN SEND LISTEN D !             Make display listener
670 ON ERROR GOTO 'NODAT' @ ENTER :LOOP ;X$ @ SEND UNT UNL ! Read from host
680 OFF ERROR @ IF X$="" THEN 'RDS' !      If no data then try again
690 IF D<0 THEN DISP X$; !                 If no HP-IL display, show on HP-71
700 IF NOT D1 THEN D1=1 @ STANDBY 20 !     Data transmission has started
710 ON ERROR GOTO 'LTL' @ A$=A$&X$ @ OFF ERROR ! Add new data to current line
720 'RDL': P1=POS(A$,Z0$) @ P2=POS(A$,E0$) ! Look for EOF and EOL
730 IF P1>0 AND P2>P1 THEN P2=0 !         Discount EOL if after EOF
740 IF MEM<200 THEN 'TOBIG' !              Bail out if not enough memory
750 IF P2 THEN 'P2'
760 IF NOT P1 THEN 'RDS' !                 Neither EOL nor EOF; read more
770 IF P1>1 THEN PRINT #1;A$[1,P1-1] !     Trim off anything past EOF
-> 780 GOSUB 'CLN' @ GOTO 'FILEEND' !       Clear the host output
790 'P2': IF P2>1 THEN PRINT #1;A$[1,P2-1] ! Add data to file, up to EOL
800 P3=P2+LEN(E0$) !                       P3 indicates start of next line
810 IF P3<=LEN(A$) THEN A$=A$[P3] ELSE A$="" ! Keep next line in A$
820 GOTO 'RDL' !
830 'FILEEND': !                            Download complete
* 840 DISP "File ";F$;" downloaded."
850 ASSIGN #1 TO *
860 IF NOT B THEN 'DIR' !                   No transform
870 CFLAG -1 !                              Clear quiet mode
880 OFF ERROR
890 GOSUB 'T'
900 IF P>0 THEN DISPLAY IS :P !             Make printer list transform errors
910 ON ERROR GOSUB "TE" !                   Trap transform fail error
920 TRANSFORM F$ INTO BASIC
930 OFF ERROR @ IF P>0 THEN DISPLAY IS *
940 IF D>0 THEN DISPLAY IS :D
950 DISP "Transform "; !                    Check file type to see if transform complete
960 IF PEEK$(DTH$(HTD(ADDR$(F$))+16),4)<>"1000" THEN DISP "complete." ELSE DISP
970 SFLAG -1 !                              Restore quiet mode
980 GOTO 'DIR'
990 'TE': IF ERRN<>75 THEN DISP ERRM$ !     Transform errors
1000 GOTO 930
1010 ! Upload code. If file does not exist, get a new file name
1020 'UPF': IF ERRN=57 THEN DISP F$&" does not exist." @ GOTO 'RDFN'
1030 ! If the file is not BASIC, don't try to transform
1040 IF PEEK$(DTH$(HTD(ADDR$(F$))+16),4)="1000" THEN B1=0 @ GOTO 1060
1050 GOSUB 'T' @ TRANSFORM F$ INTO TEXT @ B1=1
1060 DISP D$&"ing ";F$;"..."
1070 ASSIGN #1 TO F$
1080 ENDLINE E1$
1090 X$=F$&" " @ X$=X$[1,8] !                Find catalog entry number:
1100 FOR I=1 TO 1000 @ IF X$=CAT$(I)[1,8] THEN 1120
1110 NEXT I
1120 DISPLAY IS * @ OUTPUT :H ;CAT$(I) !     Send the catalog entry to host
1130 K1$=UPRC$(KEY$) !                       Check keyboard
1140 IF K1$="A" THEN 'CEND'
1150 SEND MTA LISTEN H @ IF D>0 THEN SEND LISTEN D ! Listen host and display
1160 IF K1$="S" THEN 1210

```

```

1170 ON ERROR GOTO 1210 @ READ #1;A$ @ OFF ERROR ! Read a line; trap file end
1180 OUTPUT :LOOP ;A$ @ IF D<0 THEN DISP A$ ! Send the line to host
1190 SEND UNT UNL
1200 GOTO 1130 ! Read next line
1210 OUTPUT :LOOP ;Z1$ @ ASSIGN #1 TO * ! Send End-of-file
1220 SEND UNT UNL @ IF D>0 THEN DISPLAY IS :D ! Restore display
1230 OFF ERROR
1240 IF B1 THEN GOSUB 'T' @ TRANSFORM F$ INTO BASIC
1250 GOTO 'DIR'
1260 'T': DISP "Transforming ";F$;"..." @ RETURN ! Transform display
1270 'NODAT': SEND UNT UNL @ IF NOT D1 THEN "RDS" ! No data
1280 BEEP @ DISP "HP-IL Timeout" @ WAIT .5 @ GOTO 'CEND'
1290 'LTL': OFF ERROR ! Line too long
1300 DISP "Line too long." @ DISP D$&" aborted." @ GOSUB 'CLN' @ GOTO 'DIR'
1310 'TOBIG': BEEP @ DISP "Insufficient memory." @ GOSUB 'CLN' @ GOTO 'CEND'
→ 1320 'CLN': IF D>0 THEN DISPLAY IS :D ! Read any remaining output from host
1330 DISP "Wait..." @ STANDBY 3
1340 ON ERROR GOTO 1360
1350 ENTER :H ;X$ @ WAIT .1 @ IF X$<>" THEN 1350 ! ENTER loop
1360 RETURN
1370 'CEND': ASSIGN #1 TO * ! Normal program end
1380 STANDBY OFF @ CFLAG -1 @ ENABLE INTR 0
1390 ENDLIN @ DELAY .5,.125
1400 DISP "End of program." @ END SUB
1410 SUB HELP(X,D$) ! Help message subprogram
1420 I$="Enter: "
1430 ON X GOSUB 1470,1480,1490,1500
1440 DISP X$ @ WAIT .5
1450 IF Y$<>" THEN DISP Y$ @ WAIT .5
1460 GOTO 1510
1470 X$="Direction of transfer." @ Y$=I$&"U or D" @ RETURN
1480 X$=I$&"filename of" @ Y$="file to "&D$ @ RETURN
1490 X$=I$&"Y or N" @ Y$="" @ RETURN
1500 X$=I$&"host dev. spec:" @ Y$="DevID, %AccID, or addr" @ RETURN
1510 END SUB
1520 SUB WH(H) ! Select a host:
1530 INPUT "Host Device? ";H$ @ H$=UPRC$(H$)
1540 IF POS("END",H$)=1 THEN 'CEND'
1550 IF H$="?" THEN CALL HELP(4,D$) @ GOTO 1530
1560 ON ERROR GOTO 'NH'
1570 H1=DEVAID(H$) ! Determine selected device type
1580 H=BINAND(H1,240) @ IF H<>0 AND H<>64 THEN 'NH' ! Controller or interface?
1590 H=DEVADDR(H$) @ IF H1=66 THEN CALL RS(H) ! If RS-232 then initialize
1600 END
1610 'NH': DISP 'Invalid host.' @ WAIT .5 @ GOTO 1530
1620 END SUB
1630 SUB RS(H) ! RS-232 initialization
1640 B$="SB7" ! 600 Baud 3200 2400 SBA=2400
1650 P$="P4" ! No parity
1660 P5$="SP0" ! Disable parity error
1670 W$="SW0" ! 8 bit words
1680 REMOTE @ OUTPUT :H ;B$&";"&P$&";"&P5$&";"&W$ ! Send remote mode commands
1690 LOCAL @ END SUB

```

Sample Program for the HP Series 80

The sample transfer program for the HP series 80 looks very similar to the XFER program on the HP-71 when it is operating. The following is explicit instructions on how to use this program.

Running the HP Series 80 XFER Program

If the HP-86/87 is connected to HP-IL by the HP 82938A HP-IL Interface, the Series 80 XFER program can be used as it is listed below. If you are connecting the HP-86/87 to HP-IL via the HP 82169A HP-IL/HP-IB interface, you will need to alter line 30 of the program to read:

```
30 I= <device selector>
```

Where <device selector> is the device selector of the HP-IL/HP-IB Interface. Refer to the *HP-86/87 Owner's Manual and Programming Guide* for more on device selectors.

In the HP-71 XFER program, the end-of-line sequences E0# and E1# should both be set to CHR#(13)&CHR#(10) (carriage return, line feed). The end-of-file sequences Z0# and Z1# should both be "EOF". Refer to **Section 4: Customization** for more on XFER's end-of-line and end-of-file sequences.

To set up communications between Series 80 and the HP-71, you would do the following:

1. RUN "XFER" on the HP-71, specifying the appropriate host ("%1" for the HP 82938A, "%67" for the HP-IL/HP-IB interface).
2. RUN "XFER" on the HP-86/87.

When the HP-86/87 XFER is run, it asks for a direction of transfer:

```
UPLOAD OR DOWNLOAD?
```

To upload, you would respond with a "U", a "D" downloads.

Uploading

After the HP-86/87 has entered upload mode, it prompts for the upload file name:

```
UPLOAD FILE NAME: ?
```

At this point, you may enter:

- A file name followed by an `End line`.
- An `End line`. This causes the mass storage file anme to be the same as the filename used by the HP-71.

The HP-86/87 now waits until it receives the file catalog entry from the HP-71. It then creates a data file on the current mass storage device to receive the uploaded file. If a file already exists with the designated file name, the following prompt is given:

```
<file name> ALREADY EXISTS. PURGE OLD <file name>?
```

If you respond with "Y", the old file is purged. Otherwise you are asked for a new file name.

After the file is created, the display shows:

```
UPLOADING <file name>...
```

Then the file characters are echoed as they are received. When the end-of-file sequence is received, the HP-86/87 displays:

```
UPLOAD COMPLETE.
```

The program then returns to the UPLOAD OR DOWNLOAD? prompt to set up for another file transfer.

Downloading

After the HP-86/87 has entered download mode, it prompts for the download file name:

```
DOWNLOAD FILE NAME: ?
```

At this prompt, enter the file name of the file to be transferred from the HP-86/87 to the HP-71, followed by **End line**. If the designated file does not exist, the following message is displayed:

```
<file name> DOES NOT EXIST
```

A new download file name is then prompted for.

At the start of the download, the HP-86/87 displays:

```
DOWNLOADING <file name>...
```

The transmitted characters are displayed as they are sent to the HP-71. When the transfer is complete, the display shows:

```
DOWNLOAD COMPLETE
```

The program then returns to the UPLOAD OR DOWNLOAD? prompt to set up for another file transfer.

Program Listing

```

10 !           "XFER" program for HP Series 80
20 Z1$="EOF" @ Z0$=Z1$ !           Set end-of-file
30 I=9 !           Specify active interface
40 DIM X$[96]
50 DISP "UPLOAD OR DOWNLOAD";@ INPUT X$
60 X$=UPC$(X$)
70 IF X$="" OR X$="E" THEN END
80 IF X$="D" THEN 270 !           Download?
90 !           UPLOAD:
100 GOSUB 570 !           Get file name
110 ENTER I ; X$ !           Get catalog entry from HP-71
120 F=VAL (X$[18,22]) !           HP-71 file size
130 IF F$ <> "" THEN 160 !           Use user-supplied file name?
140 F$=X$[1,8] !           Catalog entry file name
150 P=POS (F$," ") @ IF P<> 0 THEN F$=F$[1,P-1] ! Truncate spaces
160 ON ERROR GOTO 440 !           Trap file already exists error
170 CREATE F$,1,F*1.1 !           Create destination file
180 OFF ERROR
190 ASSIGN# 1 TO F$
200 DISP "UPLOADING ";F$;"..."
210 ENTER I ; X$ !           Read one line from interface
220 DISP X$ !           Display each line
230 PRINT# 1 ; X$ !           Store in file
240 IF X$ <> Z1$ THEN 210 !           If line is not EOF, read more
250 ASSIGN# 1 TO * !           Close file

```



```

260 DISP "UPLOAD COMPLETE" @ GOTO 50
270 !
280 GOSUB 570
290 ON ERROR GOTO 390
300 ASSIGN# 1 TO F$
320 DISP "DOWNLOADING ";F$;"..."
325 ON ERROR GOTO 620 !
330 READ# 1 ; X$ !
340 DISP X$ !
345 OFF ERROR
350 OUTPUT 1 ;X$ !
360 IF X# <> Z0# THEN 325 !
370 DISP "DOWNLOAD COMPLETE."
380 GOTO 50
390 !
400 IF ERRN <> 67 THEN GOTO 530
410 OFF ERROR
420 DISP F$;" DOES NOT EXIST."
430 GOTO 280
440 !
450 OFF ERROR
460 IF ERRN <> 63 THEN 530
470 BEEP
480 DISP F$;" ALREADY EXISTS. PURGE OLD ";F$;
490 INPUT A$
500 IF A#[1,1]="Y" THEN PURGE F$ @ GOTO 160
510 GOSUB 570
520 GOTO 160
530 !
540 DISP "ERROR #":ERRN
550 DISP "PROGRAM HALTED."
560 END
570 IF X#="U" THEN DISP "UPLOAD ";ELSE DISP "DOWNLOAD ";
580 DISP "FILE NAME: ";
590 INPUT F$@ F#=UPC$ (F$)
600 IF F#="E" THEN END
610 RETURN
620 !
630 IF ERRN <> 72 THEN 530
640 X#=Z0# @ GOTO 340

```

DOWNLOAD:
Trap end of file error
Read a line from the file
Display the line
Output to interface
If not EOF, read more
Non-existent file error
Duplicate file error
Other errors
End of data error

Sample Program for the IBM Personal Computer

The sample transfer program for the IBM Personal Computer looks very similar to the XFER program on the HP-71 when it is operating. The following is explicit instructions on how to use this program.

Running the IBM PC XFER Program

The end-of-line sequences E0\$ and E1\$ in XFER on the HP-71 should both be set to CHR\$(13). The end-of-file sequences should be "EOF".

The IBM PC XFER is a BASICA program and should be run like other BASICA programs. When it is run, it gives the following prompt:

```

UPLOAD OR DOWNLOAD ?

```

To upload, you would respond with a "U", a "D" downloads.

Uploading

After the IBM PC has entered upload mode, it prompts for the upload file name:

```
UPLOAD FILE ?
```

At this point, you must enter a file name followed by an `[End line]`. The PC then creates a data file on disk, purging any existing file by that name. Then the following message is displayed:

```
UPLOADING <file name>...
```

Now run XFER on the HP-71, specifying host "%66" and upload. The IBM shows the lines of text as they are read from RS-232. When the end-of-file sequence is received, the PC displays:

```
UPLOAD COMPLETE.
```

The program then returns to the UPLOAD OR DOWNLOAD? prompt to set up for another file transfer.

Downloading

Run XFER on the HP-71, specifying host "%66", and download. Continue with program execution until the "Downloading <filename>..." appears on the HP-71.

After the IBM PC has entered download mode, it prompts for the download file name:

```
DOWNLOAD FILE ?
```

At this prompt, enter the file name of the file to be transferred from the IBM PC to the HP-71, followed by `[End line]`. If the designated file does not exist, the following message is displayed:

```
<file name> DOES NOT EXIST
```

A new download file name is then prompted for.

At the start of the download, the IBM PC displays:

```
DOWNLOADING <file name>...
```

The transmitted characters are displayed as they are sent to the HP-71. When the transfer is complete, the display shows:

```
DOWNLOAD COMPLETE
```

The program then returns to the UPLOAD OR DOWNLOAD? prompt to set up for another file transfer.

Program Listing

```

1 REM          260          "XFER" PROGRAM FOR IBM PC
5 OPEN "COM1:600,N,8,1,RS,CS0,DS0,CDO" AS #1: REM Open RS-232 channel
10 PRINT "UPLOAD OR DOWNLOAD ";
20 INPUT D#          :REM   Input direction of transfer
30 IF D#="" OR D#="E" THEN 700
40 X#=""
50 E#="EOF""EOT"          :REM   End-of-file sequence
70 IF D#="U" OR D#="u" THEN PRINT "UPLOAD "; ELSE PRINT "DOWNLOAD ";
80 INPUT "FILE ";F#          :REM   Input file name
90 IF F#="E" OR F#="" THEN 700
100 IF D#<>"U" AND D#<>"u" THEN GOTO 260

```

34 Appendix B: Sample Programs

```

110 REM
120 ON ERROR GOTO 450
130 KILL F$
140 ON ERROR GOTO 0
150 OPEN F$ FOR OUTPUT AS #2
155 PRINT "UPLOADING ";F$;"..."
160 LINE INPUT#1,X$
170 LINE INPUT #1,X$
180 IF X$="" THEN GOTO 170
190 PRINT #2,X$
200 PRINT X$
210 IF X$<>E$ THEN GOTO 170
240 PRINT "UPLOAD COMPLETE"
250 GOTO 400
260 REM
270 ON ERROR GOTO 420
280 OPEN F$ FOR INPUT AS #2
290 ON ERROR GOTO 0
300 PRINT "DOWNLOADING ";F$;"..."
310 ON ERROR GOTO 600
320 LINE INPUT #2,X$
341 FOR I=1 TO LEN(X$)
342 X=ASC(MID$(X$,I,1))
343 IF X>127 THEN MID$(X$,I,1)=CHR$(X-128)
344 NEXT I
346 IF X<32 THEN X$=RIGHT$(X$,LEN(X$)-1) : GOTO 346 : REM Strip control chars
350 PRINT #1,X$
360 PRINT X$
370 IF X$<>E$ THEN 320
390 PRINT "DOWNLOAD COMPLETE"
400 CLOSE #2
410 GOTO 10
420 IF ERR<>53 THEN 500
425 PRINT F$;" DOES NOT EXIST."
430 RESUME 70
450 IF ERR <>53 THEN 500
460 RESUME NEXT
500 CLOSE #1
510 ON ERROR GOTO 0
520 END
600 IF ERR<> 62 THEN 500
610 X$=E$
620 RESUME 350
700 CLOSE #1:END

```

UPLOAD:

```

:REM Non-existent file trap
:REM Kill old version of file
:REM Open file for printing
:REM Throw away catalog entry
:REM Read a line from RS-232
:REM If no data, try again
:REM Print the line to the file
:REM Display the line
:REM If not EOF, read more

```

DOWNLOAD:

```

:REM Non-existent file trap
:REM Open the file
:REM Read a line from the file
:REM Strip control chars
:REM Print line to RS-232
:REM Display line
:REM If not EOF, read more
:REM Close file
:REM Non-existent download file error
:REM Non-existent upload file error
:REM End of data error
:REM Send end of file

```

Glossary

Baud rate—The rate at which data is transferred across RS-232.

Download—The process of transferring a file from the host to the HP-71.

Handshaking—See **Software Handshaking**.

Host—The computer which generates HP-71 files and transfers them to and from the HP-71.

HP-71 Development Utility—A program which runs on the HP-71 and allows the user to transfer files between a host and the HP-71.

HP-71 Development Utility work station—The set of equipment and software that allow the user to transfer files between a host and the HP-71.

Parity—An error checking method used by RS-232.

Software Handshaking—The method of automatically controlling the starting and stopping of data transfers on both sides of an interface.

Upload—The process of transferring a file from the HP-71 to the host.

XFER—The file name of the HP-71 Development Utility.

Troubleshooting and Errors

The following table provides suggestions for solving problems with the HP-71 Development Utility work station. This list is by no means complete. Frequently, there are several possible causes of a particular malfunction.

Condition/Message	Cause	Correcting Action
Nothing happens when XFER is run.	HP-IL is hung.	<ul style="list-style-type: none"> • Reset HP-IL: >RESET HPIL >RESTORE IO
HPIL timeout.	A break in HP-IL.	<ul style="list-style-type: none"> • Make sure that HP-IL cables form a complete, unbroken loop. • Make sure that all HP-IL devices on the loop are turned on and operating properly.
Host Device?	No host or multiple potential hosts on HP-IL.	<ul style="list-style-type: none"> • Respond with the HP-IL address, device id, or acc. id of the host.
Invalid Host.	The device specified at the "Host Device?" prompt is not an interface converter or a controller.	<ul style="list-style-type: none"> • Check the HP-IL cables to and from a valid host. • Re-enter the HP-IL address, device id, or acc. id of the host.
Invalid file name: <file name>	Unacceptable HP-71 file name.	<ul style="list-style-type: none"> • Re-enter an acceptable file name.
<file name> already exists.	A file already exists with the specified download filename.	<ul style="list-style-type: none"> • Purge the old file. • Rename the new file.
Purge old <file name>? <file name>	The HP-71 can't find a file with the name <file name>.	<ul style="list-style-type: none"> • Re-enter the file name.
does not exist.		
Files not being transferred.	Work station not correctly set up.	<ul style="list-style-type: none"> • Re-set up the work station.
Stray symbols in the transferred file.	Incorrect initialization of the HP 82164A.	<ul style="list-style-type: none"> • Re-initialize the HP 82164A.
Transferring process ending before the file is completely transferred.	Non-unique end-of-file sequence.	<ul style="list-style-type: none"> • Redefine the end-of-file sequence.

Condition/Message	Cause	Correcting Action
<p>Transferring process ending before the file is completely transferred.</p> <p>Transferring process not ending after the file has been transferred.</p> <p>Insufficient memory.</p> <p>Downloaded BASIC file has not been transformed into BASIC and is still a text file.</p>	<p>Non-unique end-of-file sequence.</p> <p>No end-of-file sequence found.</p> <p>Memory of the HP-71 has been exceeded.</p> <p>Transformation failed.</p>	<ul style="list-style-type: none"> • Redefine the end-of-file sequence. • Put the end-of-file sequence at the end of the file. • Purge unnecessary files in the HP-71. • Check download file for fatal errors.

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