ITT3290 File Transfer Program
Operating Guide

ITT 3290

RCSL No. 42-i 2381

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A/S REGNECENTRALEN af 1979

Information Department

December 1983

RCSL No. 42-i2381

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Keywords: ITT 3290 FTP, File Transfer Program, Operating Guide.

Abstract: This manual is an operating guide for the ITT 3290 FTP program. The manual describes the various capabilities of the File Transfer Program, how the program is operated, how the various functions are activated and how the program reacts to the operator commands. The manual also describes how error conditions are reported to the operator and how the operator may overcome the various problems. In addition, the manual contains all necessary information on how to create transfer specification files and how different types of data files should be transferred. The manual also describes the principles of code conversions used.

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1. INTRODUCTION

The ITT 3290 File Transfer Program (in short, FTP) is an application program which makes your intelligent ITT 3290 workstation capable of exchanging files with an IBM or IBM-compatible mainframe.

The fundamental idea behind FTP is to combine the power of your local CP/M-based software packages with the power of the mainframe. This is obtained by allowing you to switch between using your ITT 3290 workstation software packages locally and connecting your local diskette storage to the mainframe. During a FTP session you may send your previously prepared files to the mainframe, or you may receive new files from the mainframe, which you may then locally use for any purpose you may wish.

This manual applies to everyone who has an interest in knowing and using FTP. The main purpose of the manual is to support the terminal operator in the daily work with FTP. On the other hand the manual may as well be used to give a general idea of the FTP-capabilities. Combined with the ITT 3290 File Transfer Protocol and Application Programming Guide (1) this manual may give you a pretty good idea of how to plan and implement File Transfer applications on mainframes.

Section 1.3 of this chapter gives a survey of the chapters in this manual and explains how to use the manual.

1.1 What is the File Transfer Program

The File Transfer Program (FTP) is a 'menu-driven' application program which you may locally load under CP/M on your ITT 3290 workstation whenever you wish to deliver files to your mainframe or receive files from your mainframe. In addition, the File Transfer Program will use your local language whenever a menu (or other message) is presented to you.

In order to do this your ITT 3290 workstation must of course have a communication connection to a local Control Unit (e.g. an ITT 328X Cluster Controller, supporting the Courrier Level III Co-ax Protocol) which in turn must have a communication line to the mainframe. (An important feature of the File

Transfer Program is that it is a pure application program. This means that no changes in your existing telecommunication facilities are necessary, no matter if you are utilizing BSC or SNA telecommunication facilities).

With this configuration you may then load your File Transfer Program from the attached diskette drive, and you may then use FTP to transmit files which you have locally created, or to receive files which you may wish to use in your local work.

While running the File Transfer Program you may exchange as many files as you wish. Just specify the file names involved at the host end and at your workstation, and the direction in which the transfer is to take place. You may also, if you wish, specify all file names in advance. That is, you may create a list of file names while running under CP/M, by means of a text editor, and you may then later instruct FTP to use this list.

Before actually executing the file transfer session, which means doing as many file transfers as specified in the list, you may validate the transfer. This may help you to ensure that the necessary files are available. But even if you don't explicitly ask FTP for a validation FTP will do this for you when you activate the file transfer session.

1.2 What can the File Transfer Program Do

The File Transfer Program is capable of exchanging any type of file you may wish. Some of the files you are using may consist of pure ASCII characters and other files may consist of pure binary data (e.g. a program file), or perhaps your files consist of a mixture of these types.

You may use FTP for transmission in either Text Mode or Transparent Mode depending on the type of file data you want to exchange.

When FTP works in Text Mode then a conversion between your local ASCII character representation and the host end EBCDIC character representation automatically takes place. You may also wish to move the files without conversion (the Transparent Mode) and this also gives you the freedom to exchange files which contain non-ASCII characters.

So far only the FTP capability of moving data between disc files has been mentioned, but if your workstation has a printer attached you may also choose to receive data from the host directly on your printer.

As an extra facility the most necessary directory and file handling functions are made available in FTP.

1.3 How to Use This Manual

If you are an experienced user of FTP you will probably only need chapter 4 to support you in the daily work. Perhaps you may need to review chapter 3 from time to time for getting more theoretical explanations, and sometimes the appendices may be important to study.

If you have never been using FTP before it is advisable to study chapter 2 and 3 carefully before carrying on with using FTP. These two chapters give some important advices on the structure and facilities of FTP combined with the necessary information on preparations.

The manual is divided in 4 chapters and 7 appendices. Chapter 2 contains a description of the FTP menu and panel structure and a survey of the Program Function Keys used to select the various functions. Chapter 2 also contains a section on typical FTP applications with the purpose of giving you an impression of the wide range of possibilities with FTP.

Chapter 3 describes the theory behind the structure and functioning of FTP and covers items such as environmental requirements, the FTP internal structure, a discussion on data files and a detailed description of the various FTP functions. As a consequence this chapter does not provide FTP operating instructions.

Chapter 4 is intended to be the daily-work guide for users who have already some experience in operating FTP. It is assumed that the reader has fully prepared to operate the FTP by reading chapter 3. The chapter contains information on how to operate FTP with examples including example screen layouts. The chapter also contains information on how FTP handles menus, prompts and error messages.

The appendices cover items which are more rarely needed but although sometimes necessary to resolve problems.

Appendix A contains references to other important FTP documents.

Appendix B describes the principles of code conversion used by FTP.

Appendix C describes how to operate FTP when the host is running ITT's framework application (FWA) under CICS.

Appendix D describes host dependent items which differ from the operations explained in the main manual and in appendix C.

Appendix E is an installation guide describing the contents of the ITT 3290 FTP distribution diskette.

Appendix F describes keyboard functions with respect to function keys, editing keys and alphameric keys.

Appendix G describes FTP status messages during various activities.

2. AN OVERVIEW OF THE FTP

From the introduction you may already have understood what FTP is about. In this chapter the structure and features of FTP is explained more detailed and the usage of FTP is illustrated with some examples of application types.

2.1 Description of FTP

The File Transfer program communicates with the FTP user through 7 panels. Each of the panels have a fixed structure and the leading texts in each panel have a pre-determined meaning although the actual appearance of a text may occur in local language. In this manual all texts occur in english.

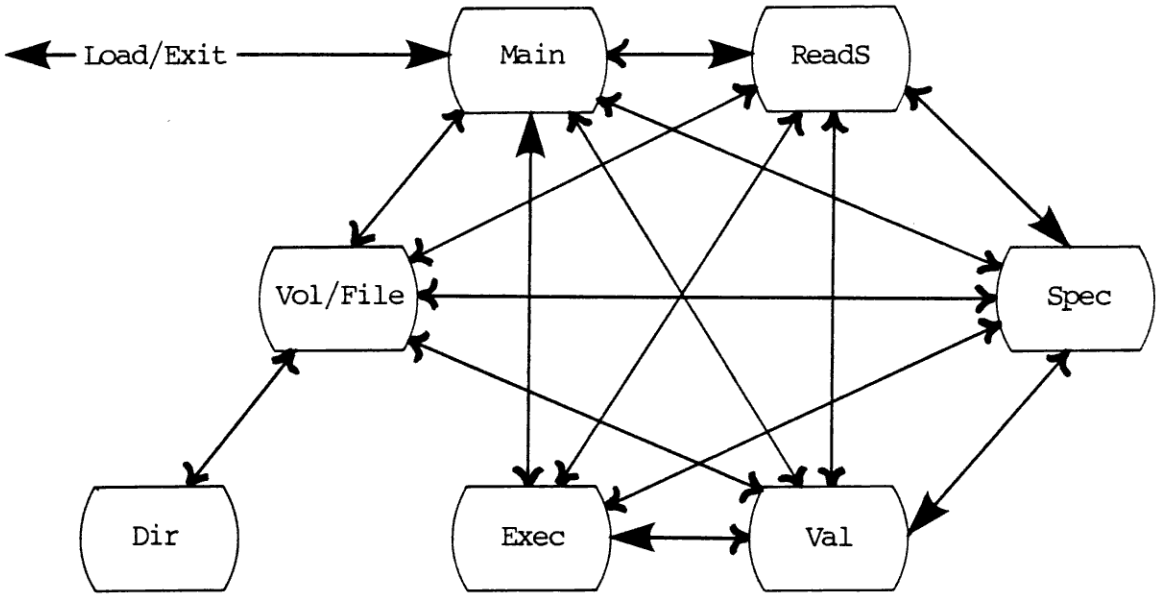

Figure 1. FTP Panel and Path Survey.

Each panel presents a menu of functions which you may choose. Some of these functions may be to select another panel. Other functions require some input to be keyed in.

In Figure 1 is shown all the paths leading from each panel to other panels (the panel names used in the figure are abbreviated names). Selection of a specific panel is always done with the same Program Function Key, e.g. the

Vol/File panel is always selected by pressing PF4 no matter which panel is actually displayed (provided PF4 is in the list of functions on the panel).

Figure 1 also exposes a natural path leading from the Main Menu panel through a series of panels with each their specific purpose and back to the Main Menu panel. This is the natural path to follow when a FTP session is accomplished.

When FTP is loaded from your CP/M diskette you are presented with the Main Menu. This menu serves the purpose of showing all the panels which you may choose. In addition, the Main Menu also exposes two function switches, called Trace Mode and Step Mode, and from the Main Menu you can terminate the FTP.

	Function Key Pressed								
	ESC	PF1	PF2	PF3	PF4	PF5	PF6	PF7	PF8
Current Panel	New Panel								
0. Main Menu		1	2	3	4	5	exit	0	0
1. Read Spec File	0		2	3	4	5			
2. Specification	0	1		3	4	5			
3. Validation	0	1	2		4	5			
4. Volume/File	0	1	2	3		5			
5. Execution								5	5
6. Directory	4								

Figure 2. FTP Program Function Key Survey.

The FTP Program Function Key Survey (Figure 2) shows you which function key to use to switch from one panel to another. Some additional function keys (PF9, PF10, PF11) which are shown in the Execution panel are used to overcome various kinds of problems as explained in section 4.3. The Trace and Step Mode functions are explained in subsections 3.4.6, 4.2.9.2 and 4.2.9.3. The Directory panel can not be directly selected but is used when a certain function in the Vol/File panel is selected.

From the Main Menu you would normally select the ReadSpec (Read Transfer Specification) panel. In this panel you may specify the name of a diskette

file (which you have previously created with a text editor) which is holding a list of mainframe file name and diskette file name pairs. This feature may be very convenient if you are often using the same file names.

After having read a Transfer Specification File FTP automatically proceeds to the (Transfer) Specification panel which will display the data read from the file. The purpose of this panel is to let you enter, delete or change file names and the other necessary informations. The list of file name pairs and transfer directions is handled as an entirety when you activate the execution of the file transfer and the accomplishment of the specified set of file transfers is denoted a FTP session.

You may choose to perform a validation of the information on the list before actually activating the FTP session. This is done by selecting the Validate (Transfer Specification Validation) panel.

When the Transfer Specification Validation panel is selected FTP automatically commences to control all information on the list of file names. First, the validity of all the transfer direction specifications and your diskette file names is controlled. If any error is found then an error description is displayed for each error found and the validation stops. If no errors were found then FTP proceeds with the validation of the mainframe file names; this results in a message for each single file transfer in the list showing whether the file transfer is "OK" or an error were encountered.

After having validated the Transfer Specification list you may proceed to start the FTP session by selecting the (FTP) Execution panel. During the FTP session FTP will execute all the file transfers specified on the list, one by one, and while a specific file transfer takes place the file names involved and the transfer direction together with file size and bytes transferred are displayed. When the FTP session is carried through FTP automatically returns to the Main Menu panel, ready to start another transfer specification and FTP session.

During your work with FTP you may need to control a directory or delete a file or check if a diskette has sufficient disk space available for your purpose. Such functions are made available by selecting the Vol/File (Volume/File Facilities) panel. With this panel you may also rename files, display the size

of a file and change the current logged volume (the default volume if omitted in CP/M file names).

2.2 Typical FTP Applications

This section has been included with the purpose of serving as an inspiration which may help you to utilize the File Transfer Program.

In your usage of the mainframe ressources you have previously been able only to update mainframe databases and extract information from the databases. But you have been unable to communicate your private files to the other mainframe users.

With FTP you have the possibility to transfer your private data files to the mainframe which is then available to other mainframe users.

If you have created a new version of a program running on your workstation you may use FTP to make the program available to other workstation users.

Similarly you may use FTP to exchange your data files with other workstations connected to the mainframe. It may be business letters or documents or whatever you decide.

Another class of important tasks which you may do with FTP is to receive data from the mainframe which you may then use or perhaps update locally, and maybe return to the mainframe after the local updating.

Instead of receiving listings from the mainframe site by mail you may directly receive files on your printer, or you may receive the files on your diskette and work with it before printing it locally. In this way FTP may help you to receive and use mainframe information much faster than previously possible.

It should also be mentioned that received listings can only be reviewed but received files can be worked on. You can correct the files or extract information from the files.

Finally it should be mentioned that the mainframe could offer not just one application program supporting FTP but could include several specialized application programs. Such applications could be programs which directly "understand" and use the file data transmitted from your workstation.

3. PREPARING TO USE FTP

This chapter provides some of the theory behind FTP. For precise operating instructions you should consult chapter 4. However, you are expected to be familiar with this chapter before carrying on with the FTP operation.

The chapter covers items such as environmental demands, the various remedies, the data files, the FTP functions, the FTP performance and the FTP messages.

3.1 The Environment

The FTP environment is an intelligent ITT 3290 workstation equipped with one or two 8 inch diskette drives and with a communication connection to a local Control Unit (e.g. an ITT 328X Cluster Controller supporting the Courrier Level III Co-ax Protocol) which in turn must have a communication line to the mainframe. Your workstation must have the ITT 3297 Terminal Emulator installed in PROMS.

Your ITT 3290 workstation must have a CP/M system (naturally) under which you can load various programs. This is only mentioned as a formality as FTP is utilizing the CP/M BDOS facilities.

On the mainframe side one or more application programs "understanding" FTP messages must be installed. As FTP is a pure application program this only means that the mainframe side must be able to exchange screen images with the workstation corresponding to the conventions for FTP communication. So no hardware changes are necessary to run FTP.

On your workstation there are no limitations on files which can be used in a file transfer, except that files which you want to send to the host must exist on one of the two diskettes mounted and files in which you want to receive data from the host must not exist.

On the mainframe side the conventions are slightly different as the files to which you send or from which you receive will normally be permanently installed. (There may be variations from mainframe to mainframe). This means

that you must know the names of the files installed on the mainframe and the rules for their usage. Appendix D of this manual is intended to contain such mainframe-specific information.

3.2 The Program Structure

The main system components in the FTP environment are the mainframe with some disk storage, the Control Unit and the workstation with diskette storage and (optionally) a printer.

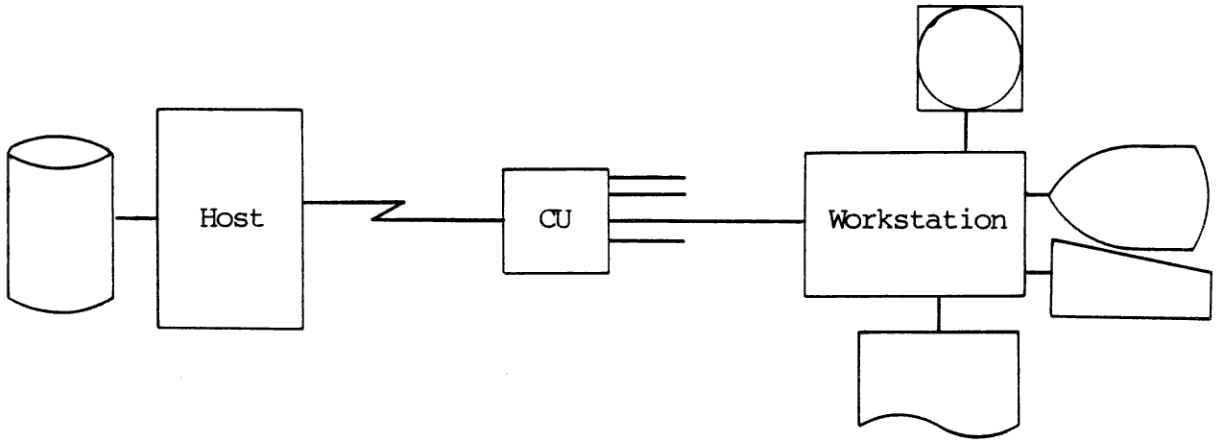

Figure 3. Main System Components

The mainframe and the CU communicate by means of the IBM 3270 BSC Communication Protocol or SNA and the CU communicates with 1 to 8 terminals by means of the Courrier Level III Co-ax Protocol. Each terminal must run the ITT 3297 Terminal Emulator program when communicating with the Mainframe.

When the terminal or workstation is running the ITT 3297 Terminal Emulator program the terminal functions according to the block diagram showed below.

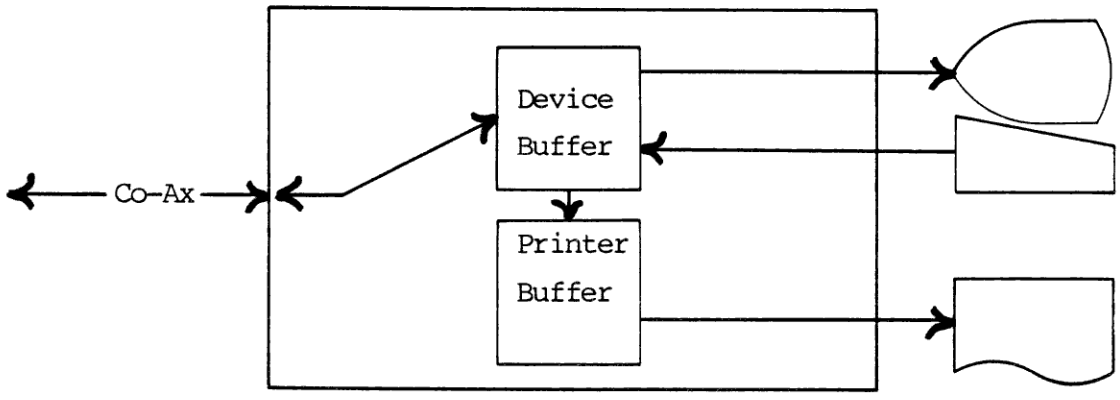

Figure 4. ITT 3297 Terminal Emulator

On the Co-ax communication line the terminal receives screen images in the device buffer and the contents of the device buffer is automatically shown on the display. Keyboard input causes an update of the device buffer (which may be seen on the display) and by means of attention keys the operator instructs the Terminal Emulator to send the device buffer on the Co-ax communication line.

When the workstation is running FTP you might say that the workstation still looks like an ITT 3297 Terminal Emulator to the CU. The CU still writes and reads in the device buffer according to the Courrier Level III protocol but the device buffer is no longer automatically shown on the display and the keyboard input is no longer automatically inserted in the device buffer.

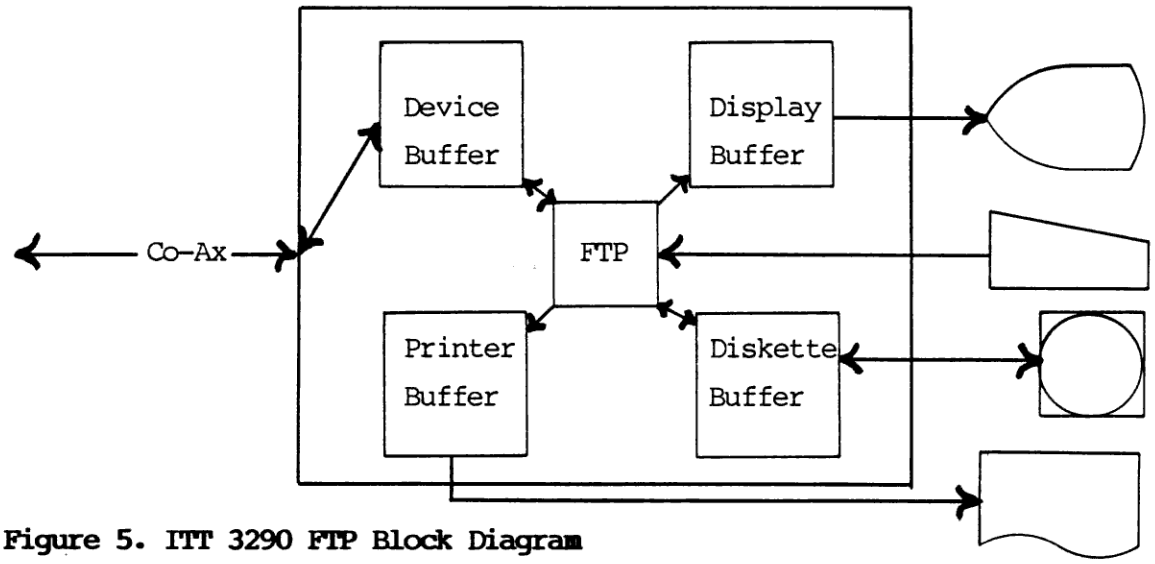

Figure 5. ITT 3290 FTP Block Diagram

The FTP generates its own panels which are shown on the display and FTP changes the display according to keyboard input without changing the device buffer. When FTP wants to communicate with the mainframe data is generated by FTP and inserted in the device buffer and a simulation of a keyboard attention key having been pressed is performed. This causes a transfer of the device buffer to the mainframe without disturbing the display shown to you. Similarly, screen images from the mainframe are received in the device buffer and are then interpreted by FTP.

The File Transfer Protocol defines the structure of screen images sent back and forth and the mainframe application and FTP are "talking" to each other by alternately sending screen images to each other. During a file transfer from the workstation to the mainframe the following sequence of events are repeated until the file has been completely transferred:

The mainframe sends a screen image to the workstation. This screen image contains among other necessary information the command REQ (request for data) instructing FTP to deliver more data. FTP will then read data from the current diskette file and insert the data in the device buffer (still without changing your display image), and the command in the device buffer is changed to TFD (transfer file data) along with other necessary information. Finally, FTP simulates that the SEND key were pressed on the keyboard causing the device buffer to be sent to the mainframe. The mainframe extracts the data part from the device buffer and writes the data in the specified mainframe file. Then the mainframe changes the command to REQ (request for data) again and sends the screen image to the terminal (FTP) and so on.

3.3 The Data Files

FTP accepts to transmit any diskette file you may specify and to receive and write on the diskette any sequence of characters sent from the host. However, you must be aware of the two different principles of file transfer which FTP may use. The two principles are called Transparent Transfer Mode and Text Transfer Mode, respectively.

The principle of file transfer actually used depends on the mainframe which has a description of all its files installed for file transfer usage. When you send a file to the host then FTP receives REQ commands which also specify whether FTP should deliver the data in Transparent Transfer Mode or in Text Transfer Mode.

The difference between the two principles are that a file transfer in Text Transfer Mode always performs a conversion of each single character in the file transfer as the mainframe side normally handles text written in the EBCDIC alphabet whereas the workstation is working with the ASCII alphabet. In contrast to this the Transparent Transfer Mode simply copies each single character without changing anything. This means that if you are sending an ASCII character file in Transparent Transfer Mode then the mainframe file will contain ASCII characters when the file transfer is finished. Similarly, an EBCDIC file received from the mainframe in Transparent Transfer Mode will cause your diskette file to be filled with EBCDIC characters.

Although the transfer mode used is determined by the host file used you may still have the possibility to make your own choice on the transfer mode to be used. One possibility is that files on the mainframe are divided in two groups with each their transfer mode. Another possibility might be to alter the mainframe characteristics so suit your purpose, from your own workstation. This second possibility, however, depends on the availability of mainframe applications capable of performing the desired changes.

3.3.1 When to use Transparent Transfer Mode

The Transparent Transfer Mode should always be used in cases where you want a precise copy of a file to be transferred without any code conversion. If you want to transfer a CP/M program (a .COM file) to the mainframe e.g. for distribution to other workstations then you should use the Transparent Transfer Mode as the file is what could be denoted a binary file.

Transparent Transfer Mode should also be used if your text file contains non-ASCII characters (which is the case with e.g. WordStar files) in order to avoid "loss" of the non-ASCII characters.

3.3.2 When to use Text Transfer Mode

When you have a text file containing pure ASCII characters then you can use the Text Transfer Mode. This transfer mode also implies that your ASCII characters are stored as EBCDIC characters in the host file. If you transfer the EBCDIC file back again you will receive ASCII characters.

If your file contains non-ASCII characters then these characters are converted to spaces before the transmission. The CU will then convert the ASCII characters to EBCDIC according to the Standard or Alternate conversion table used.

On the mainframe side those EBCDIC characters conflicting with the 3270 protocol are converted to spaces before they are sent to the CU, and the CU will then convert the EBCDIC characters to ASCII characters according to the Standard or Alternate conversion table used before the characters are sent to the workstation.

One more code conversion should be mentioned. As your diskette data is containing ASCII characters conforming to the ISO standard which is slightly different from the ITT Standard and Alternate ASCII character sets a conversion between these two standards is performed before diskette data is sent to the mainframe and before data received from the mainframe is written on your diskette.

The Text Transfer Mode is best suited for transmission of program text files which can always be assumed to consist of ASCII characters only. Also data generated on the mainframe is well suited for Text Transfer Mode as the mainframe normally will use only Carriage-Return, Line-Feed and Form-Feed characters as text formatting characters, as opposed to various text-editing packages on your workstation. The mainframe kind of data is typically reports and other statistical material meant to be printed on fast drum or chain printers without letter-quality facilities.

3.3.3 End-of-File Definition

On your diskette data is stored in 128-byte records and this is also the recommended record size on a mainframe which stores data in fixed-length records. The 128-byte record is the minimum amount of data which BDOS can read or write. However, som utility programs running under CP/M obey the convention that whenever a character with the hexadecimal value '1A' is encountered this is regarded as an end-of-file condition.

This convention is also obeyed by FTP whenever you are performing file transfers in Text Transfer Mode.

In Text Transfer Mode the rules followed by FTP are as follows: When FTP is transmitting to the mainframe then characters are read from the diskette file and sent to the mainframe until the last byte of the last record of the diskette file or until a '1A' is encountered, whichever occurs first. If FTP has not sent an integer number of 128-byte records then the mainframe will fill the remainder of the last record with '1A' characters before writing the record on disk. When FTP is receiving from the mainframe then whatever received will be written in the diskette file. If the mainframe did not send an integer number of 128-byte records then FTP will fill the remainder of the last

record with '1A' characters before writing the record on the diskette. If FTP is receiving to the printer then printing stops whenever a '1A' character is encountered.

In Transparent Transfer Mode FTP will always send all of the characters in the diskette file, i.e. an integer number of 128-byte records are sent to the mainframe, and an integer number of 128-byte records are expected when receiving from the mainframe. However, the receiving part will always fill a possible remainder in the last record with binary zeroes before writing the record. This may happen if the mainframe for some reason uses a record size different from 128 bytes.

3.4 The Program Functions

This section describes how the various FTP functions may be utilized. You may recall from chapter 2 the description of the FTP panels (figure 1) and their connections. The figure also expresses the "natural path" to follow.

This sequence of events and actions is also followed in the subsections of this section.

3.4.1 How to Define a File Transfer Session

The File Transfer Session is defined in the Transfer Specification panel. This panel shows 10 lines of input fields and each line describes one file transfer. The set of file transfers constitute the File Transfer Session.

The file transfer information consist of (from left to right) the host file name (1 to 8 characters), the CP/M file name which is composed of 3 fields: volume (1 character, A or B), file name (1 to 8 characters, using CP/M name conventions) and file name extension (1 to 3 characters), and finally the transfer direction (1 character, R or T). The transfer direction is "seen from the workstation", i.e. T means transmit to host and R means receive from host.

The definition of a File Transfer Session simply consist of filling in a line for each file transfer (1 to 10 file transfers in a session).

Only capital letters are used and all fields are left justified.

3.4.2 How to use the Printer

The printer is selected by specifying the CP/M file name as "FPRINTER" when you define a File Transfer Session (see subsection 3.4.1). Volume and file name extension is not used. Transfer direction must be R.

HOST FILE	CP/M FILE	T/R
DATA83	FPRINTER	R

Figure 6. File Transfer from Host to Printer

In Text Transfer Mode printing terminates if a '1A' character is encountered in the received data. In Transparent Transfer Mode the '1A' character does not have this effect.

Appendix B contains descriptions of the code conversion principles used by FTP.

3.4.3 How to use a Predefined File Transfer Session

You may use a text editor to create one or more files with File Transfer Session specifications. Such files are called Transfer Specification Files.

The Transfer Specification File may describe 1 to 10 file transfers as the data must fit into the Transfer Specification panel (see subsection 3.4.1).

Each file transfer is described in one line as in the Transfer Specification panel and consist of the same data fields. The main difference is that the Transfer Specification File must have field delimiters to separate the data fields.

The formal specification of a file transfer line in the Transfer Specification File is:

<hostfile> / <volume> : <cpmfile> . <extension> / <direction> <cr> <lf>

The size of the fields and the legal contents of the fields is described in subsection 3.4.1.

```
HOSTFILE/A:MYFILE07.TXT/R
REPORT/B:MYCOPY/R
USE     /A:FIXED   .LAY/R
```

Figure 7. Example of Transfer Specification File Data

It is recommended to use a fixed format as in lines 1 and 3 in figure 7.

3.4.4 How to Validate the File Transfer Session

The File Transfer Session which is defined in the Transfer Specification panel is validated by selecting the Transfer Specification Validation panel.

FTP first controls the transfer direction and the CP/M file names for all the file transfers defined. For each file transfer line an error message may occur. If one or more errors are found then the validation stops. If no errors were found FTP proceeds with checking the host file names and will either display the message "OK" or an error message for each file transfer line.

For the CP/M files the general rule is that files to be transmitted must exist (sic!) and files to be received must not exist.

If the FTP Execution panel is selected then FTP performs a validation first and then continues automatically to the FTP Execution panel if no errors were found.

3.4.5 How to Execute a File Transfer Session

A File Transfer Session is executed simply by specifying the File Transfer Session and then selecting the FTP Execution panel. The diskettes involved in the file transfers must be inserted in the proper drives before the File Transfer Session can be started, and they must remain inserted until the end of the File Transfer Session.

This means that a diskette can not be changed during a File Transfer Session. If you intend to receive 10 files of 1 megabyte each then you simply have to divide the File Transfer Session in minor sessions.

When the File Transfer Session is started then FTP shows the FTP Execution panel (after the validation has been successfully carried out), and when the last file transfer of the session has been terminated then FTP displays the Main Menu panel again.

The file transfer specifications are remembered until you choose to delete or change them.

3.4.5.1 Progress of a Normal File Transfer Session

With the term Normal File Transfer Session is understood a File Transfer Session without any errors or problems during the file transfers (e.g. no paper in the printer, diskette directory full). After the validation FTP shows the FTP Execution panel and this panel will show the state of the actual file transfer by continuously showing selected parts of the latest transmitted or received device buffer in line 9 of the panel.

```
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC          010000 00 REQ 0 S      10 00
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC 017536 010400    TFD 1 S 0800 10
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC          010400 00 REQ 1 S      10 00
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC 017536 010800    TFD 0 S 0800 10
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC          010800 00 REQ 0 S      10 00
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC 017536 011200    TFD 1 S 0800 10
```

Figure 8. Progress Information During File Transfer (Example)

The progress information shown in figure 8 is a sequence of 6 instances of the information shown in line 9. The highlighted part of the figure is always present in the line whereas the other parts are only present when the Trace Mode function switch is on. All progress information in line 9 on the display appears highlighted.

The progress information also displays the size of the file currently being transferred and the number of bytes transferred so far. A more detailed description of the various fields in the line is given in subsection 3.4.6.

3.4.5.2 Error Possibilities - and Recoveries

The possible problems during a File Transfer Session are problems with the communication line and problems with your workstation devices.

Communication line problems may be that the mainframe does not respond within 60 seconds after FTP has sent a device buffer to the mainframe (time out) or that the workstation receives a device buffer with a content not corresponding to the File Transfer Protocol specifications. The latter is considered a severe error by FTP which will immediately move the received device buffer to the display and then terminate the FTP operation. In case of time out FTP will send an enquiry to the mainframe asking for a retransmission of the latest device buffer sent from the mainframe. After 3 unsuccessfull requiries FTP will terminate operation.

Printer problems are normally a question of paper supply or other temporary malfunction. FTP will report the problem and you then have the choice of repeating the printing of the latest received block of data or to terminate the file transfer.

Diskette problems may be due to insufficient disk space or catalog entries or hardware malfunction. In either case the problem is reported by FTP and you can choose to terminate the incomplete file transfer "as it is" or you can choose to clear the received file as if the file transfer were never started.

Whenever you choose to terminate a file transfer FTP will proceed to the next file transfer in the File Transfer Session.

3.4.5.3 File Transfer Session Abortion

The possibility of terminating a file transfer before it is completed is also available while the file transfer progresses normally. As in the case of an error the file transfer may be terminated in two different ways. You may choose to terminate the file transfer "as it is" (called Close) in which case the transmitted data remains in the receiving file or you may choose to clear (called Clear) the receiving file as if the file transfer were never started. The transmitting file is not affected. If the receiving file is on your CP/M diskette then the file name is removed from the catalog if you choose Clear.

As in the error situations the forced termination of a file transfer will cause FTP to proceed to the next file transfer in the File Transfer Session.

3.4.6 How to use Tracing and Stepping Functions

In the FTP Execution panel some progress information is always displayed. This information should be sufficient during normal work, but for some purposes it may be convenient to take a closer look at the device buffer sent to or received from the mainframe.

If you suspect that your binary file is by mistake sent in Text Transfer Mode then you may check the transfer mode used by setting Trace Mode on. This has the effect of displaying some more information in line 9 and in addition lines 10 to 22 will show the contents of the "data part" of the device buffer.

The layout of line 9 (Trace Mode on) is shown in figure 9.

```
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC          010000 00 REQ 0 S       10 00
FTPIMAGE T PFJFT2A  A:MYPROG02.MAC 017536 010400     TFD 1 S 0800 10
1        2 3        4               5      6      7  8   9 10 11  12 13
```

Figure 9. Progress Information Fields.

The first field is merely a fixed text indicating that this is a File Transfer Protocol device buffer. The second field shows the transfer direction, here from the workstation to the mainframe. The third field is the name of the mainframe file and the fourth field is the volume and name of the CP/M file. The fifth field is the size of the file to be transmitted (number of bytes) and the sixth field is the number of bytes transferred. The seventh field is a status code indicating the status on the previous device buffer transfer. Only the mainframe sends status codes. The eighth field is the function code. REQ is in this case received from the mainframe and TFD is sent to the mainframe (it would be reverse if the transfer direction was R). The nineth field is the block id which is alternating between 0 and 1. The tenth field indicates the transfer mode. S means Transparent Transfer mode and A means Text Transfer Mode. The eleventh field indicates number of data bytes in

the device buffer. The twelvth field is the blocking factor indicating the number of lines of data to be filled into the device buffer. The thirteenth field is the pacing factor which indicates the number of seconds which FTP should pause before sending the next device buffer to the mainframe.

If you take a look at figure 8 you will see that although 800 bytes are transmitted with the TFD operation number of bytes transferred is only increased by 400. This is because the Transparent Transfer Mode (the S in field 10) only carries 4 bit of data in each 8-bit byte.

The Trace Mode and Step Mode function switches are available in the Main menu panel and in the FTP Execution panel.

The Step Mode function switch gives you the possibility to take a closer look at the trace information when necessary. If Step Mode is selected then FTP will pause after each transmission cycle until you ask FTP to proceed. If you are transmitting very short files which require only one device buffer with data to be sent then there will be no pause.

3.5 The Performance

As mentioned earlier the mainframe has a host file description table in which e.g. the transfer mode to be used is described. This table which is normally denoted the Host Destination File Table also contains information about the host file record size, the blocking factor and the pacing factor.

It may vary from host to host how you can get access to the Host Destination File Table. A description of the access method to be used with your host is found in appendix D of this manual.

The host file record size should never be changed by you. The recommended record size is 128 bytes as this is the record size used on your CP/M diskette. If the record size is not 128 bytes you should discuss this matter with the mainframe staff.

Blocking and pacing factors have an impact on the speed of your file transfer because they determine the size of the device buffers sent between

the workstation and the mainframe and because the pacing factor is actually a built-in adjustable delay in the file transfer.

3.5.1 Usage of Blocking and Pacing Factors

The device buffers sent back and forth between the workstation and the mainframe consist of, roughly, 80 characters of control information and 0 to 1840 bytes of data. The blocking factor determines the number of lines of data contained in the device buffer, e.g. a blocking factor of 10 means that 800 bytes of data are transferred in each single device buffer transmission. If you are using a 2400 bps transmission line then the transmission time for one device buffer with 80+800=880 bytes is 2.94 seconds. If you are using a blocking factor of 20 then the transmission time of a single device buffer increases to 5.6 seconds.

In principle, the protocol overhead decreases with increasing blocking factor, but the underlying 3270 protocol level might split the transfer of a large device buffer into several separate transfers due to limited memory ressources in the front end, or for other reasons. Therefore no general rule for the optimal blocking factor can be extracted, but in practice a blocking factor of 5 to 10 may show to be reasonable.

The pacing factor is a built-in delay which causes FTP to pause for the specified number of seconds before the next device buffer is sent to the mainframe. From your point of view the optimal pacing factor is of course 0 seconds.

3.5.2 Impact on other Terminals

When you are using a large blocking factor in your file transfer then this introduces long periods of time where other terminals will be delayed. This may or may not be acceptable to the other terminal users, depending on the kind of applications they are running. In general, you should not use a large blocking factor if many users are active on the same CU.

The pacing factor may be used to "give a chance" to the other terminal

users. You may use the pacing factor as a tool to not monopolizing the transmission line to the mainframe.

A reasonable compromise could be to use a blocking factor of, say, 5 to 10 combined with a pacing factor of 1 to 2.

3.6 The Program Messages

FTP communicates with you by means of 7 panels. In general, the panel allows you to select another panel or to fill in an input field and activate a function.

In the selection of another panel FTP controls the Program Function Key validity with your current panel and either responds immediately to your (legal) choice of another panel by showing this or activates the beeper.

In the filling in of input fields FTP will allow you to enter whatever you wish and when you then press ENTER the validity of the input field data is controlled. This control may cause an error message to be displayed if the input field data is found to be erroneously filled in or if the function specified by the input data can not be performed.

There are two places in the panel where program (error) messages may occur. In the Transfer Specification Validation panel, e.g., the messages occur to the right in the file transfer specification line. Other messages which can not be directly connected with input data in the panel will occur in the status line which is line 24 in the panel.

Most of the FTP messages are indicating errors in function selections or execution of functions, but FTP also provides positive acknowledge messages to you when you have selected a function or another panel. In the case of the panel the displaying of the selected panel is a positive acknowledge in itself and in other cases FTP displays a message showing that a function has been performed. In the Volume/File Facilities panel, e.g., the deletion of a file is acknowledged with a message in the status line that the file in question has been deleted.

When you are using Step Mode or Trace Mode the indication of the function being active is that the Step Mode and/or the Trace Mode line in the panel is highlighted.

During Step Mode FTP will display a message in the status line whenever you are requested to press a key (the ESC key) to continue.

The meaning of the messages themselves should be self-explanatory. The possible appearance of the messages are shown in proper places in chapter 4, and an exhaustive list of messages are included in appendix G.

4. OPERATING THE FILE TRANSFER PROGRAM

This chapter gives you the information necessary to operate the FTP. The chapter contains an example of a complete file transfer session which may be considered a simple tutorial. Then follows a more detailed description of the single steps of operating FTP. This part of the chapter is organized in a chronological order of actions to take, and within subsections the main activities are explained by examples. Possible error messages and other details are explained where they may occur.

When operating FTP you are supposed to be familiar with chapters 2 and 3 of this manual, and perhaps you are only using the manual occasionally. In this case you may utilize the table of contents to get quick access to the particular descriptions of interest.

4.1 A Complete Example of a File Transfer Session

First you press the CTRL+ESC keys simultaneously. This causes CP/M to be loaded. Key in "FTP" and press ENTER or Carriage Return. As a consequence FTP is loaded and started, but FTP will initially appear as an almost ordinary ITT 3297 Terminal Emulator.

Then you activate the host File Transfer Application by keying "FTPI" and then pressing the ENTER key. The mainframe activates the host application associated with the name "FTPI" and the application will in turn send you the "Change to FTP Mode" message. Then you press the ESC key which causes FTP to change to FTP Mode, indicated by the displayed MAIN MENU.

Now you press PF1 to select the READ TRANSFER SPECIFICATION FILE panel which is instantaneously presented to you. The cursor points to the input field.

Then you could key e.g. B CONTROL and then press the ENTER key.

FTP reads the file CONTROL on volume B and displays the TRANSFER SPECIFICATION panel with the data.

```
HOSTFILE    CP/M FILE     T/R
PFJFT1A   A MYFILE   TXT  T
PFJFT7B   B CORPDATA      R
PFJFT7C     FPRINTER      R
```

Figure 10. Transfer Specification File Read In (example)

which expresses what you want to do.

Then you press PF5 to start the File Transfer session.

FTP displays the TRANSFER SPECIFICATION VALIDATION panel and performs a validation causing the displaying of the panel:

```
HOSTFILE    CP/M FILE     T/R    VALIDATION RESULT
PFJFT1A   A MYFILE   TXT  T      OK
PFJFT7B   B CORPDATA      R      OK
PFJFT7C     FPRINTER      R      OK
```

Figure 11. Transfer Specification Validation Panel (example)

and FTP automatically proceeds to the FTP EXECUTION panel (as you pressed PF5) and starts to transmit your file MYNAME.TXT to the mainframe file PFJFT1A, then the mainframe file PFJFT7B is transferred to your diskette in drive B, file CORPDATA and finally FTP receives the mainframe file PFJFT7C on your printer.

After having completed the FTP session FTP displays the MAIN MENU to you again.

Then you press PF6 to terminate the FTP. Within a few seconds you are back in the ITT 3297 Terminal emulation mode again.

4.2 A Detailed Description of the Various Steps

In the following subsections the single steps with their respective possible variations are described in more detail.

4.2.1 Exit from Terminal Emulator to CP/M

Insert your ITT 3290 CP/M 2.2 BIOS 1.1 diskette containing the FTP files (program file and message text file) in drive A and press the CTRL and ESC keys simultaneously.

When CP/M has been loaded you may choose to immediately carrying on with FTP or you may choose to do some preparations while under CP/M, before you load FTP.

4.2.2 Various Preparations while under CP/M

When you have exited from the ITT 3297 Terminal Emulator mode to the CP/M mode then you may wish to prepare your diskettes for the file transfer. This may be to create new File Transfer Specification files or to remove old files on the diskettes, or other.

If you choose not to carry on with the file transfers you must remember to enter the ITT 3297 Terminal Emulation mode again and perform the necessary log off operations.

4.2.2.1 Creation of File Transfer Specifications

One of the possible tasks while running under CP/M could be to prepare the file transfer session by means of creating one or more file transfer specification files.

For this purpose you may use a text editor or if you want WordStar or other intelligent text editing packages.

A file transfer specification file must consist of 1 to 10 lines of file transfer specifications, i.e. 1 to 10 file transfers specified, and the format of the single file transfer specification must be as specified in subsection 3.4.3 which says that the file transfer specification line consist of the host file name followed by a slash, the CP/M file volume followed by a colon, the CP/M file name, and a dot, and then the CP/M file extension, followed by a

slash, and finally the transfer direction, followed by carriage return and line feed.

When you have created your file transfer specification files then you may make a listing of the files on your local printer. This may help you to control the progress of the file transfer sessions.

4.2.2.2 CP/M Householding

While running under CP/M you also have the possibility to prepare your diskettes by e.g. deleting file names which are no longer valid. You may also do copy functions between various diskettes.

You may even take your time to create the files to be transmitted. The mainframe side will patiently await your commencement of the file transfer session. Just remember to log off from the mainframe in case you decide not to start the file transfer session.

4.2.3 Loading of FTP

Load FTP on your workstation by typing "FTP" followed by ENTER or RETURN. When FTP has been loaded the message text file is read in order to build all the panels in your local language. This may take 5 seconds. FTP will now be in an initial state in which the most necessary ITT 3297 Terminal Emulator functions are available.

4.2.4 Activation of the Host File Transfer Application

Assuming that you have just loaded FTP on your workstation you must first perform a log on (if you are not already logged on) to the mainframe operating system. This is done in the standard way. Then you activate the host File Transfer Application by typing the name of the application and then pressing ENTER.

It is recommended that the host File Transfer Application is activated

under the name "FTPI" but this rule can not be followed on all hosts - one reason being that the mainframe might offer you more than one host File Transfer Application. The specific mainframe name conventions are described in appendix D of this manual.

The host File Transfer Application will send you an image with a message instructing you to change the workstation operation to "FTP mode". The layout of the image is host dependant but will look something like the example shown in figure 12.

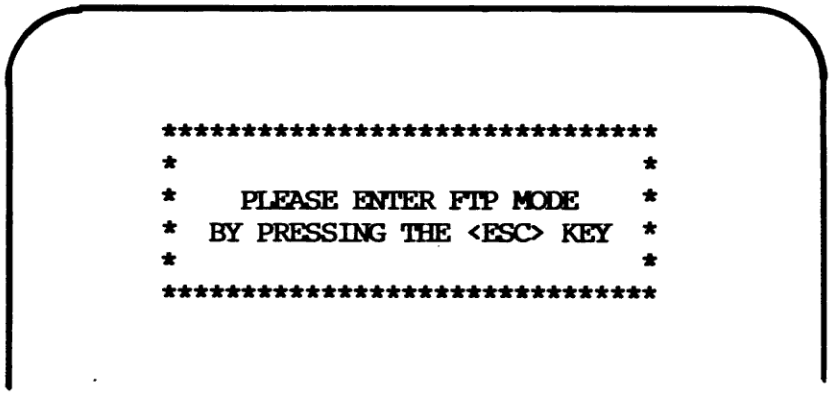

Figure 12. Panel sent from host File Transfer Application (example)

If you do not receive an image like the one shown in figure 12 then you should call the host operator to control that the host File Transfer Application is available or consult appendix D for host name conventions.

4.2.4.1 Entering FTP Mode

When the activation of the host File Transfer Application has been carried out you must change the FTP operation to FTP Mode. This is done by pressing the ESC key. FTP will then display the Main Menu panel.

The Main Menu panel is your entrance to FTP and your possible exit from FTP. The panel displays the various other panels which you may choose by means of function keys. You will notice that a specific panel is always selected with the same Program Function key.

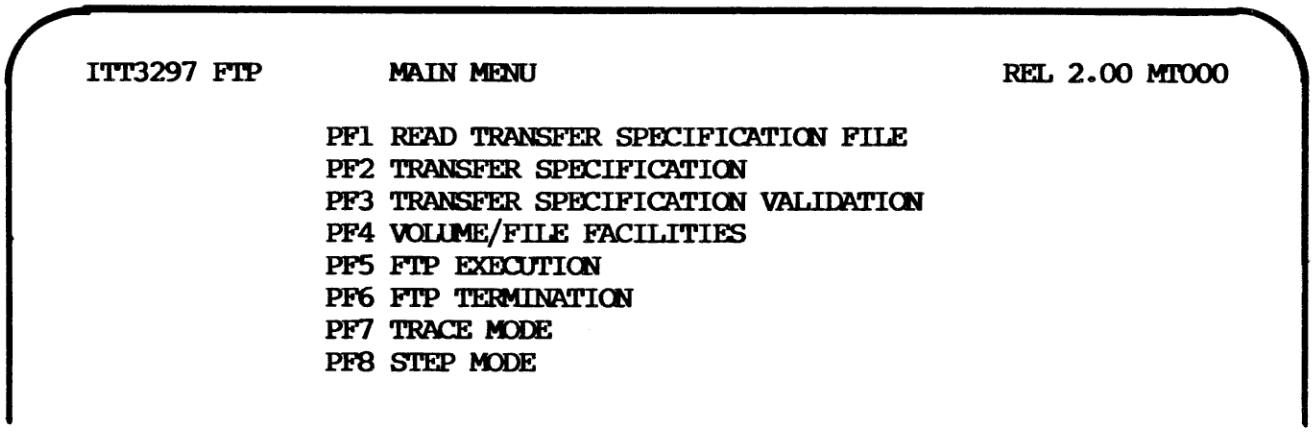

Figure 13. Main Menu Panel

The top line of the panel is a program version and panel identification line. The text "ITT3297 FTP" to the left will occur in all FTP panels telling you that you are running FTP. Then follows the panel name, e.g. MAIN MENU telling you which panel you are actually working with. To the right in the identification line is displayed the actual FTP version, e.g. "REL 2.00" followed by a message text file identification, e.g. "MT000" indicating your local language and the version of the message text file. Except for the panel name all FTP panels display the same identification line.

The Program Function keys PF1 through PF5 are used to select other panels, PF6 is used to terminate the FTP operation, and PF7 and PF8 are function switches (Trace Mode and Step Mode) which you may activate. A description of the purpose and usage of the Trace Mode and Step Mode function switches may be found in section 3.4.6.

In figure 1 on page 13 the natural path between the various panels is described. This may also be a usefull path for you to follow. You may select the Read Transfer Specification File panel (PF1) if you have already defined a set of file transfers (a File Transfer Session) while under CP/M or you may want to key in your own file transfer specification (PF2). You may of course also combine the two functions by first reading in a transfer specification file and then change it by editing the data.

You may also in the Main Menu panel define Trace Mode or Step Mode to be on or off as you require. The default condition is that the Trace Mode and

Step Mode are off. The function keys used are PF7 and PF8, and the on condition is visualized to you by showing the actual line in highlight.

If you press anything else than PF1 to Pf8 then the beeper will sound to indicate that you made an illegal choice.

No messages are displayed to you while in the Main Menu panel. Either your choice of another panel is fulfilled or your change of a Program Function is acknowledged by changing the displaying from normal to intensified (or from intensified to normal) or the beeper sounds to tell you that you selected an illegal Program Function.

4.2.5 Definition of a File Transfer Session

The definition of a file transfer session may have been prepared in advance or you may wish to key in the necessary information directly to FTP.

You may choose to use a pre-determined file transfer session file which you have previously prepared under CP/M or you may choose to key in the necessary information while running FTP.

If you have already defined a file transfer specification file then you must select the Read transfer Specification File panel by pressing PF1. If you intend to key in the necessary information directly to FTP then you should select the Transfer Specification panel by pressing PF2. In the case of pressing PF1 the panel will automatically proceed to the Transfer Specification panel after the reading of the specified file.

4.2.5.1 Reading a File Transfer Specification File

You may choose the Read Transfer Specification File panel by pressing PF1, and you may then key in the CP/M volume and file name. Pressing the PF1 key causes FTP to display the panel shown in figure 14.

In the Read Transfer Specification File panel you may select other panels by pressing ESC, PF2, PF3, PF4 or PF5, or you may enter the name of a transfer

specification file (including the CP/M drive where the file is situated) and then press ENTER. If you omit the drive specification the transfer specification file is supposed to be on the Current Logged Volume.

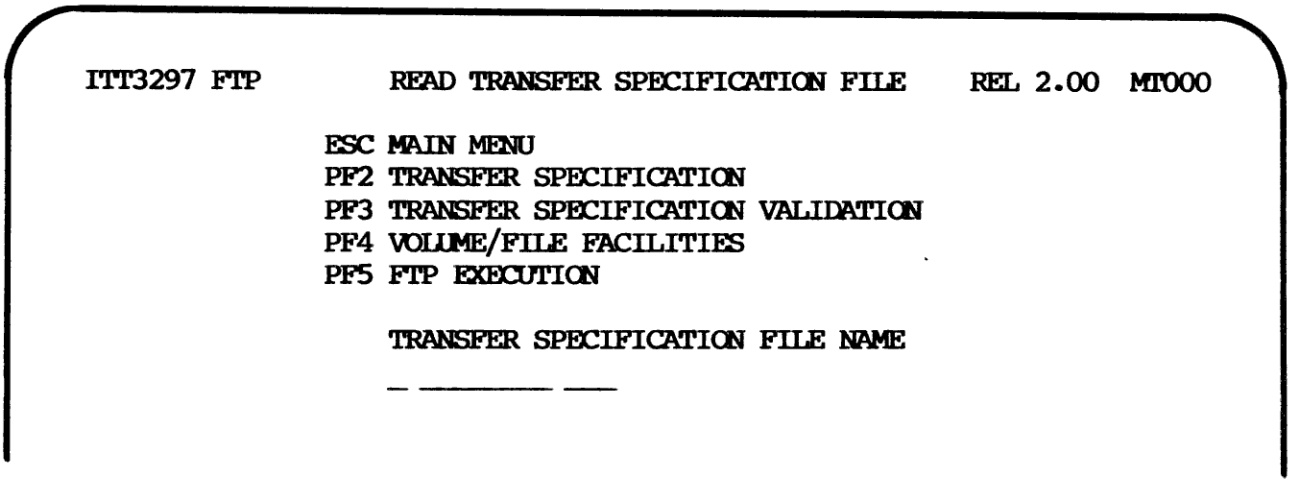

Figure 14. Read Transfer Specification File Panel

When you press ENTER FTP will look for the specified file and if found then the contents of the file is read. If the file is not found an error message "DISC FILE UNKNOWN" is displayed in the status line (line 24). It is extremely important that the structure of the transfer specification file corresponds exactly with the format described in subsection 3.4.3.

When FTP has read the transfer specification file without finding errors FTP automatically proceeds to display the Transfer Specification panel.

While entering the transfer specification file name you may use the editing keys cursor right, cursor left, cursor up, cursor down, cursor home, tab right, tab left, DEL, ERASE EOF, ERASE INP and Carriage Return. FTP will not attempt to read the transfer specification file until you press ENTER.

4.2.5.2 Editing a File Transfer Session

When you press PF2 or when you have specified a transfer specification file in the Read Transfer Specification File panel followed by pressing ENTER then FTP will display the Transfer Specification panel to you. In the first

case the input fields of the Transfer Specification panel will be empty (unless you have previously filled in some file transfer specifications) and in the second case the Transfer Specification panel will display what was read from the transfer specification file.

In both cases you may use the Transfer Specification panel to enter file transfer specifications or to correct file transfer specifications already entered.

In the Transfer Specification panel you may select other panels by pressing ESC, PF1, PF3, PF4 or PF5, or you may enter or correct up to 10 file transfer specifications. If you omit the CP/M volume then the CP/M file is supposed to be situated on the Current Logged Volume. Usage of other Program Function keys will activate the beeper.

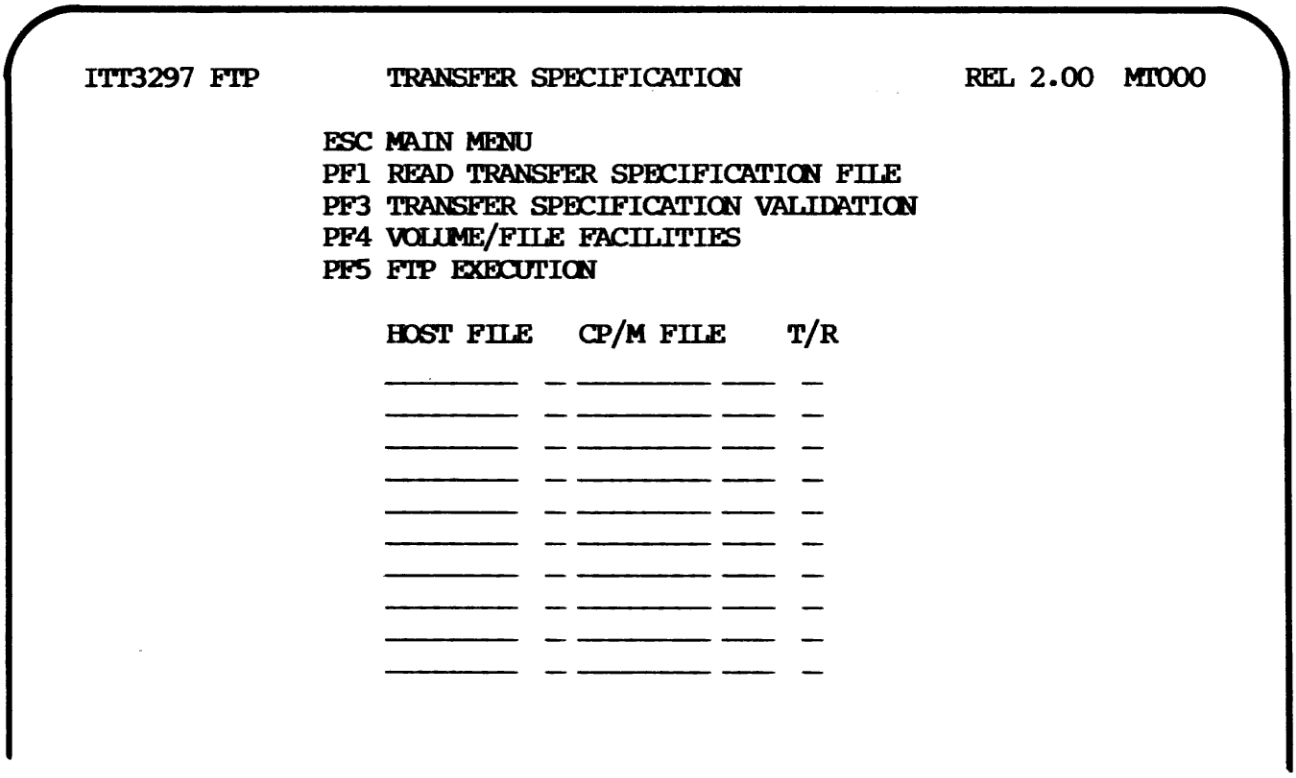

Figure 15. Transfer Specification Panel

A file transfer specification consist of a host file name, a CP/M file name and a specification of the transfer direction. You may specify from one to ten file transfers in one File Transfer Session.

The Transfer Specification panel is meant for entering file transfer specifications and there will be no messages from FTP whatever you enter. The information entered in the Transfer Specification panel is remembered by FTP until you change or overwrite it. If you e.g. press ESC to return to the Main Menu and then selects PF2 again then the Transfer Specification will display the same data as displayed before you pressed ESC.

If you want to receive data on your workstation printer then you should specify the CP/M file name as "FPRINTER" and the transfer direction should be R for receiving.

The edit keys cursor left, cursor right, cursor up, cursor down, cursor home, tab right, tab left, DEL, ERASE EOF, ERASE INP and Carriage Return are available while entering file transfer specifications.

4.2.6 Validation of a File Transfer Session

The validation of a file transfer session is selected by pressing PF3. It is supposed that you have previously defined the file transfer session by means of the panels Read Transfer Specification File and/or Transfer Specification.

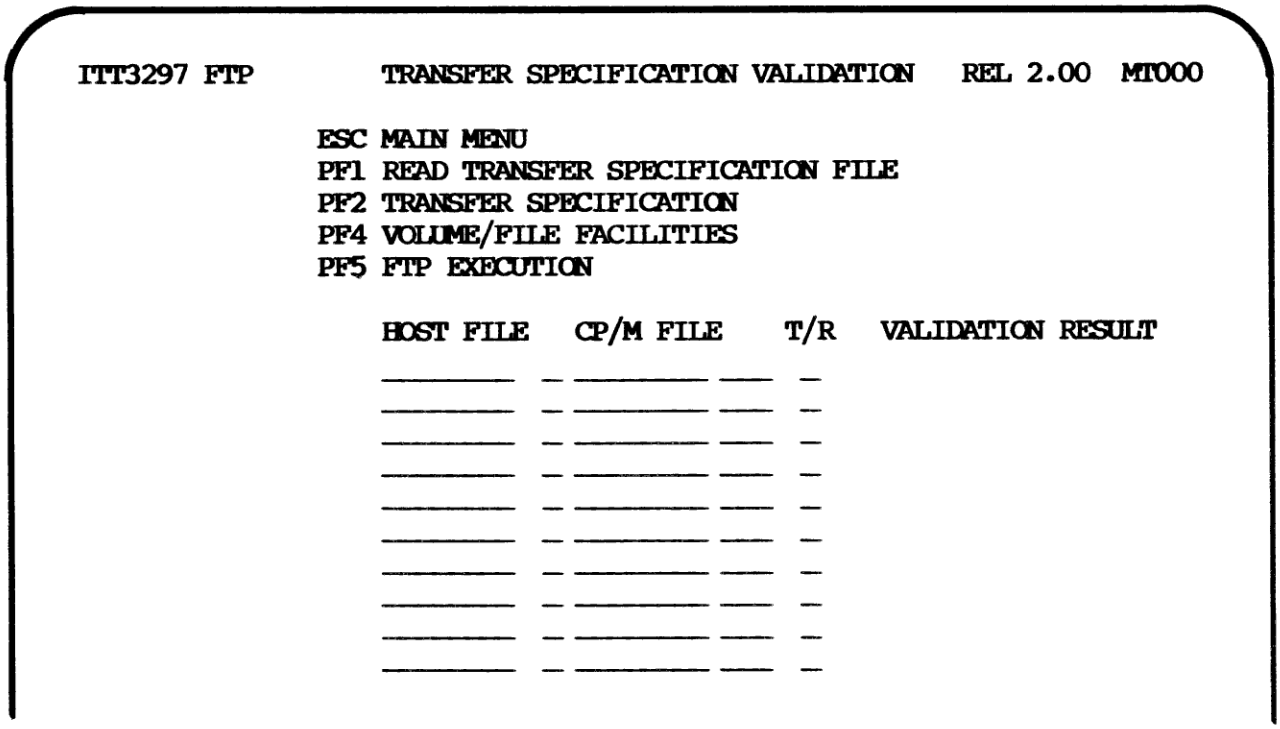

Figure 16. Transfer Specification Validation Panel

When you select PF3 then FTP displays the Transfer Specification Validation panel which look like the Transfer Specification panel except that one more column is added, the Validation Result column.

When the Transfer Specification Validation Panel is selected by means of pressing PF3 FTP commences a control of the transfer directions specified followed by a control of the CP/M file names specified. This may cause an error message to be displayed to the right of the file transfer specification in question (the validation result column). The possible error messages are as shown in figure 17.

DISC OFFLINE (I/O PARITY)	The diskette drive does not hold a diskette or the drive door is not closed.
DISC FILE UNKNOWN	File does not exist on the specified drive.
DISC FILE EXISTS	File already exists on the specified drive.
ILLEGAL VOLUME	Illegal character in CP/M volume field. The character must be A or B.
ILLEGAL DISC FILE NAME	The disc file name contains one or more characters not conforming to the CP/M file name conventions.
NOT DIRECTION	The transfer direction is illegal. The legal transfer direction is T or R.

Figure 17. Error Messages Related to the Workstation Side Specifications

All error messages in the Transfer Specification Validation panel occur in the same line (to the right) as the erroneous file transfer specification and consequently no error messages occur in the status line of this panel.

The meaning of the error messages should be self-explanatory.

In case of one or more error messages displayed you must go back to the Transfer Specification panel by pressing PF2.

If no CP/M file name errors or transfer direction errors were found FTP will automatically proceed to control the host file names. For each file transfer specification line a message will occur in the validation result column, either stating that the specified file transfer is "OK" or that a host error was found. The possible host errors during the validation is listed in figure 18 below.

HOST FILE UNDEFINED/CLOSED	The host file is either unknown or not available for the moment. This may be because the host side has not issued the necessary initialization commands.
INVALID TRANSFER DIRECTION	The host file is specified as an exclusice receive file or transmit file which conflicts with the transfer direction specified.
HOST FILE NOT EMPTY	You have specified a file transfer to a host file which is defined as a receive file only and the host file already contains data.
HOST FILE EMPTY	You have specified a file transfer from a host file which is defined as a transmit file only and the host file does not contain data.
HOST FILE NAME UNKNOWN	You have specified a file transfer where the host file name is unknown.

Figure 18. Error Messages Related to the Host End Validation

After the validation FTP checks whether you pressed PF3 (validation only) or PF5 (FTP Execution). If no errors were encountered then FTP will proceed to the FTP Execution panel provided you pressed PF5. If one or more errors were encountered or if you pressed PF3 then FTP will remain in the Transfer Specification Validation panel. In case of errors you may then select the Transfer Specification panel by pressing PF2 in order to correct the file transfer specifications being reported as erroneous or you may press PF4 to select the Volume/File Facilities panel.

If you are still in the Transfer Specification Validation panel after the validation you may use the ESC, PF1, PF2, PF4 and PF5 Program Function keys to select other panels.

4.2.7 Execution of a File Transfer Session

When you select PF5 then FTP will automatically perform a validation and if no errors were found then FTP proceeds to the FTP Execution panel. In this panel the Program Function switches PF7 and PF8 are available as in the Main Menu. In addition, the Program Function keys PF9, PF10 and PF11 are shown. Selecting PF7 or PF8 means changing the current state of the Trace Mode or Step Mode functions.

Normally PF9, PF10 and PF11 are used after errors but PF9 and PF10 may also be used during a normal file transfer. Both function keys mean termination of the currently active transfer, but PF9 will not only terminate the transfer but also clear the contents of the receiving file, and if the receiving file is on your CP/M diskette then the file name is even removed from the diskette directory as if the file transfer were never started.

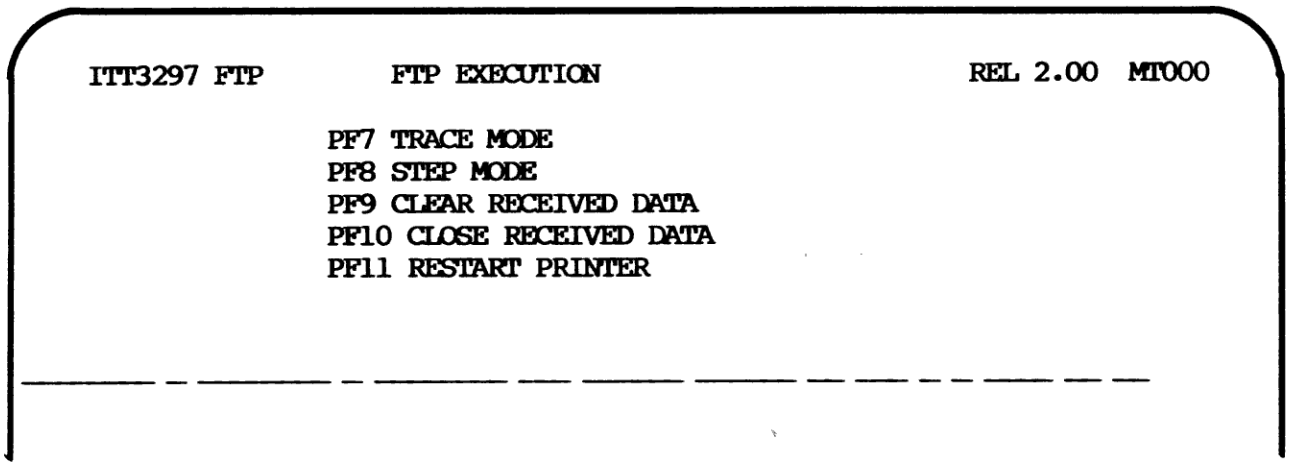

Figure 19. FTP Execution Panel

When FTP is showing the FTP Execution panel then some progress information is shown in line 9 of the display. The meaning of this information is described in subsection 3.4.6.

During a normal file transfer session no messages will occur in the FTP Execution panel, but if an error occurs, and if the error requires your intervention then a message is displayed in the status line (line 24).

The possible error messages are shown in figure 20.

DISC FULL	The diskette or the diskette directory is filled. You must terminate the file transfer.
DISC OFFLINE (I/O PARITY)	This message indicates a hard error on the diskette. Terminate the file transfer.

Figure 20. Disc Error Messages During a File Transfer

When a file transfer has been completed then FTP automatically proceeds to the next file transfer in the File Transfer Session. When there are no more file transfers in the File Transfer Session FTP returns to the Main Menu which is then displayed.

4.2.7.1 Repetition of File Transfer Sessions

As mentioned above FTP returns to the Main Menu after having completed the File Transfer Session. You may then choose to define a new File Transfer Session by selecting PF1 or PF2 and commence with the panels displayed to you.

If you were transmitting workstation files to the mainframe in the previous session you may repeat this operation if you like but if you were receiving mainframe files you can not re-use the workstation file names unless you first delete the previously received files.

4.2.7.2 Termination of File Transfer Sessions

You may use the PF9 or PF10 Program Function keys to terminate a normally progressing file transfer or to terminate a file transfer which was interrupted because of an error. PF9 means then that the file transfer is to be terminated as if the file transfer were never started (i.e. if you were receiving in a CP/M file then the file is removed from the directory) and PF10 means that the file transfer is terminated "as it is" i.e. the data received until the interruption is saved.

4.2.8 Termination of File Transfer Mode Communication

When you want to terminate the FTP mode you must first return to the Main Menu. Then you may select PF6 which will terminate the FTP operation and bring you back to ITT 3297 Terminal Emulation mode.

4.2.8.1 Returning to CP/M

Returning to CP/M operation is performed by first exiting from the FTP mode by selecting PF6 and then pressing CTRL+ESC simultaneously.

4.2.8.2 Returning to Normal ITT3297 Emulation Mode

A return to the ITT 3297 Terminal Emulation mode is performed by selecting the PF6 Program Function key.

4.2.9 Auxiliary Functions

In addition to the already mentioned FTP functions you may use FTP for the most common diskette directory and file operations, and you may activate the FTP functions switches Trace Mode and Step Mode.

4.2.9.1 Volume/File Facilities

```
ITT3297 FTP        VOLUME/FILE FACILITIES              REL 2.00  MT000

                ESC MAIN MENU
                PF1 READ TRANSFER SPECIFICATION FILE
                PF2 TRANSFER SPECIFICATION
                PF3 TRANSFER SPECIFICATION VALIDATION
                PF5 FTP EXECUTION

                  1 DELETE CP/M FILE

                  2 RENAME CP/M FILE

                  3 CP/M FILE SIZE

                  4 CURRENT LOGGED VOLUME

                  5 VOLUME STATUS

                  6 DIRECTORY LIST
                    _
```

Figure 21. Volume/File Facilities Panel

You may select the Volume/Files Facility panel by pressing PF4. This will cause FTP to display the panel shown in figure 22.

In the Volume/File Facilities panel you may choose among 6 different functions. The function selection is performed by using the numeric keys 1 through 6 and causes the cursor to move to the appropriate input field.

As a general rule you may come back to the Volume/File Facilities panel from one of the specific functions by pressing ESC. Pressing ESC once more brings you back to the Main Menu.

4.2.9.1.1 Delete File

When in the Volume/File Facilities panel the delete file function is selected by pressing 1. As an acknowledge the cursor moves to the appropriate input field. You may then key in the volume and file name followed by ENTER and FTP will then execute the delete operation. If you omit the volume specification then FTP assumes Current Logged Volume to be used.

If the file was found and deleted by FTP a positive acknowledge message is shown in the status line (line 24) indicating that the file has been deleted. If the file was not deleted then an appropriate error message occurs in line 24, e.g. "DISC FILE UNKNOWN".

4.2.9.1.2 Rename File

By pressing 2 you move the cursor to the rename file input fields. First you key in the volume (or you may bypass the field if the file is on Current Logged Volume) of the file to be renamed. Then you key in the old file name and finally you key in the new file name. When you press ENTER FTP will rename the file for you.

If the renaming was performed successfully a positive acknowledge message is displayed in the status line. If the renaming was not performed successfully then an error message is displayed in the status line.

4.2.9.1.3 Size of File

By pressing 3 you move the cursor to the CP/M file size input field. You must first key the volume and then the file name. If you omit the volume then the file is assumed to be on the Current Logged Volume. When you press ENTER then FTP will calculate the file size which is then displayed to you as the lowest multiple of 2K greater than or equal to the actual file size.

The reason why FTP tells you the file size in steps of 2K is that even if the file is currently less disc space has actually been reserved in blocks of 2K by CP/M.

4.2.9.1.4 Current Logged Volume

By pressing 4 you move the cursor to the Current Logged Volume input field. The current logged volume is displayed to you. If you want to change the current logged volume you simply key in the new current logged volume (i.e. A or B) which will then be displayed.

Current Logged Volume is used wherever no volume was indicated. If you ask for the size of file PIP without specifying the volume FTP will look at the volume specified by Current Logged Volume.

4.2.9.1.5 Used and Free Entries and Disk Space

By pressing 5 you move the cursor to the Used and Free Entries and Disk Space input field. You may type the volume (i.e. A or B) and FTP will then report the number of used entries, the number of free entries, the number of used KiloByte disk space (counted in multiples of 2K) and the number of free KiloByte disk space.

4.2.9.1.6 Directory List

By pressing 6 you move the cursor to the Directory List input field. You may type the volume (i.e. A or B) and then press ENTER. FTP will then change

to a special panel with room for up to 128 file names. The directory of the specified volume is scanned and FTP writes out the file names.

You may return to the Volume/File Facilities panel by pressing ESC.

4.2.9.2 Trace Mode

The purpose of the Trace Mode program function switch is to allow you to control the contents of the device buffers sent between the mainframe and the workstation. When in the Main Menu panel or in the FTP Execution panel you may change the current state of the Trace Mode Function Switch by pressing PF7. The on condition is indicated with highlighted display.

4.2.9.3 Step Mode

The purpose of the Step Mode program function switch is to allow you to examine the contents of the device buffers sent between the mainframe and the workstation. By specifying the Step Mode on the display is freezed until you instruct FTP to proceed.

When in the Main Menu panel or in the FTP Execution panel you may change the current state of the Step Mode Function Switch by pressing PF8. The on condition is indicated with highlighted display.

4.3 Problems during the FTP Mode Operation

During the execution of FTP some situations may occur, where FTP is unable to proceed to do its task, unless you intervene. In such situations FTP attempts to report the kind of problem during descriptive messages which will help you to overcome the problem. If for example you are receiving a file to your local printer and the printer runs out of paper then FTP will display the message "PRINTER OFFLINE" in the status line (line 24), and you may then continue the file transfer after having inserted paper in the printer, by pressing PF11, or you may choose to terminate the file transfer by pressing PF9 or PF10.

The purpose of this section is to describe the kind of problems which you may experience while working with FTP and to indicate the proper actions you may take. An exhaustive list of messages is included in appendix G.

4.3.1 Problems with the Host

If we assume that you have a properly working transmission line to the host while operating your workstation as an ordinary ITT 3297 Terminal Emulator then the most likely problem is to establish your connection to the host File Transfer Application.

After having performed your log on operation to the mainframe operating system and after having loaded FTP you must activate the proper host File Transfer Application by typing the name of the application and then pressing ENTER.

In this case the host operating system may either establish the connection or report to you that the application is unavailable. If the latter occurs you may have misspelled the name of the host File Transfer Application or the application is really not available right now. You should then contact the mainframe computer staff in order to have the application made accessible.

Other problems with the host are described in some of the following subsections.

4.3.2 Problems during switching to FTP Mode

The switching to FTP mode is performed in several steps. You must first press CTRL and ESC to activate your local CP/M operating system and then type the text FTP followed by ENTER or CARRIAGE RETURN.

If FTP is not installed on the diskette inserted in drive A CP/M will report this. If FTP is properly installed CP/M will start loading the FTP program and then start FTP.

FTP will then attempt to open and read the file FTPMSGS.TXT which contains

your local language texts used for panel building, and descriptions of differencies between your "CP/M world" ASCII character sets and the ITT standard and alternate ISO character sets.

If FTP does not succeed in reading the message text file an error message will be displayed, and you must then check that the FTP (program) and the message text file is properly installed on the diskette which you have inserted in drive A. Appendix E contains the necessary information to perform an installation.

It should be mentioned that when FTP has been loaded and the message text file has been read then the presence of the files FTP.COM and FTPMSGS.TXT are no longer required on drive A. This means that when FTP has displayed the Main Menu panel then you can replace the diskette in drive A if you like.

When loaded, FTP is initially in a mode almost similar to ITT3297 Terminal Emulation mode, the difference being that only the most fundamental functions are available. You must then invoke the host File Transfer Application by typing its name (probably FTPI) and then pressing the ENTER key. As described in the previous subsection it may happen that the host application is not available.

Assuming that you have received the "Change to FTP Mode" message on your screen you must now press the ESC key in order to complete the switching to FTP mode.

4.3.3 Problems during FTP Session Definition

The definition of an FTP session may take place in two different ways. You may prepare a file transfer specification file in advance or you may edit the necessary information into the File Transfer Specification panel.

If you are using a file transfer specification file then it is very important that you obey the syntax described in subsections 3.4.1 and 3.4.3. If syntax errors are encountered by FTP while reading a file transfer specification file then the reading will stop.

On the other hand FTP does not validate the contents of your file transfer defininitions while they are read in or keyed in, as long as the syntax is correct.

4.3.4 Problems during FTP Session Validation

When you have defined the FTP session then the next step is to validate the informations defined. FTP does this in two steps. The first step is to validate the information associated with your workstation and the second step is to validate the information associated with the host.

Validation of the workstation information comprises a check of the transfer directions and a check of the workstation files. If you are transmitting a file to the host the workstation file must be present and if you are receiving a file from the host the workstation file must not be present.

Errors found during the validation of the workstation information will cause error messages to be displayed for each erroneous file transfer (see subsection 4.2.6, page 45, figure 17).

If no errors were found in the workstation information then FTP commences with the checking of the host information. This may cause FTP to display error messages as shown in figure 18, page 46.

In case of the error message "HOST FILE UNDEFINED/CLOSED" you should contact the mainframe computer staff in order to have the file made accessible.

4.3.5 Problems during FTP Session Execution

The most likely problems to occur during an FTP session execution is lack of ressources. As described in section 4.3 your printer may e.g. run out of paper.

Other possible problems are that your diskette becomes filled, the host file does not suit your needs or a transmission line failure occurs.

The general way to cover with the problems during a file transfer session is to either repair the error or to terminate the transfer.

If for example during a reception of a file your diskette is full (no more disk space or no more entries) you may choose to terminate the transfer "as it is" or to terminate the transfer as if it never took place.

As you can see you should not start a file transfer session which requires more disk space than available when you start the transfer, as FTP will not allow you to change diskettes during a file transfer session.

A. REFERENCES

(1) RCSL No 42-i2382
ITT3290 File Transfer Protocol and Application Programming Guide
Reference Manual

(2) RCSL No 42-i2134
ITT3290 Intelligent Terminal Work Station
CP/M Operating System, User's Guide.

B. FTP CHARACTER CODES AND CONVERSIONS

When FTP is running the internal character representation is identical to the one used when your ITT 3297 functions as a workstation.

Several conversions take place between this local "CP/M world" character representation and the various peripheral devices. Keyboard input is converted to internal ISO by means of the Keyboard-to-ISO (KTI) table. Output to the display is converted from internal ISO by means of the ISO-to-Display (ITD) table. Output to the printer is converted from internal ISO by means of the ISO-to-Printer (ITP) table. Input and output from/to the diskette is not converted as the characters on the diskette correspond to the internal ISO representation.

Output to the printer is first compared to a filter. The NULL character and all characters greater than 127 are changed to spaces. The character values 4 and 25 should not be used as they are used as special buffer end markers by the printer module. The filtered characters are then converted in accordance with the ITP (ISO-to-Printer) table.

Output to the transmission line (from terminal to host) are also passing through a filter. This is because conflicts with the special IBM 3270 Protocol control characters must be avoided.

The rule is that characters with values in the range 0..9, 14..31 or 128..255 are changed to spaces. All other characters (10..13 and 32..127) are passing unchanged through the filter and constitute the legal CP/M ISO characters with respect to IBM 3270 BSC Protocol.

As the internal ISO character set is slightly different from the ITT standard and alternate character sets transmitted characters are converted to either ITT standard ASCII or ITT alternate ASCII, depending on the character set defined in the Non-Volatile-Memory. Similarly, received characters are converted to internal ISO representation. These character conversions depend on the local language and thus exist in several versions. The conversion used is defined in the FTPMSGS.TXT file.

One more conversion must be mentioned. The characters sent between the

terminal and the CU are ASCII characters in some modified version as explained above. The CU converts ASCII characters to EBCDIC before they are sent to the host, and received EBCDIC characters are converted to ASCII before they are sent to the terminal. These conversions take place in accordance with tables stored in the CU.

C. FTP OPERATION WHEN THE HOST IS ITT'S FRAMEWORK APPLICATION UNDER CICS

The ITT host framework application (FWA) is installed under the name FTPI and the host Destination File Table (DFT) maintenance application is installed under the name FTPM.

With FTPM you can get access to DFT which contains a list of all the host files known to CICS and FTPI. For each file name in the list is an associated list of file attributes which are: Record size (local to the host, must not be changed), transmission direction (Send, Receive, Bidirectional), transfer mode (ASCII = text mode, or Split = transparent mode), blocking factor (1 to 22) and pacing factor (0 to 99 seconds).

The operation of FTPM should be straight-forward as the application contains various help panels describing the various operations.

D. HOST DEPENDENT ITEMS

E. INSTALLATION GUIDE

The ITT 3290 FTP distribution diskette is an 8" DS/DD CP/M formatted data diskette containing the following files:

File Name	File Description
FTP.COM	CP/M program file containing the FTP.
FTPMSGS.TXT	Code conversion and message text file.

The distribution diskette should be regarded as a master. You will have to copy the above described files from the distribution diskette, which does not contain a CP/M operating system, to your working diskettes before you can start to use FTP.

F. KEYBOARD FUNCTIONS

In the FTP mode the ITT 3290 keyboard functions as described below.

F.1 Function Keys

The following function keys are used in FTP mode:

Key	Function
ENTER	is used to proceed with the activity currently selected (see the individual panels for details).
ESC	is used to abandon the activity currently selected ,e.g. to return from some panel to the MAIN MENU (see the individual panels for details).
PF1	selects panel 2 from which it is possible to read a pre-edited CP/M file containing 1 to 10 transfer specifications.
PF2	selects panel 3 allowing interactive entry of up to 10 file transfer specifications.
PF3	validates whatever file transfers are currently specified.
PF4	selects panel 5 providing access to volume/file facilities.
PF5	starts actual file transfer and gives access to panel 7 offering monitor and interrupt facilities
PF6	results in exit from FTP mode to 3297 mode.
PF7	selects trace mode (see 3.7).
PF8	selects step mode (see 3.8).

PF9 deletes all data received.

PF10 closes the file containing the data already received.

PF11 restarts the printer after an error.

F.2 Editing Keys

The following editing keys are active in FTP mode:

Key	Function
->	(cursor right) moves cursor 1 position to right.
<-	(cursor left) moves cursor 1 position to left.
↑	(cursor up) moves cursor 1 line up.
↓	(cursor down) moves cursor 1 line down.
↖	(cursor home) moves cursor to first position of first unprotected field.
-|	(tab right) moves cursor to next unprotected field
|-	(tab left) moves cursor to first preceding start position of unprotected field.
<┘	(carriage return) moves the cursor to the first unprotected position on the next line.
DEL	deletes the character at the cursor position.
ERASE EOF	erases all characters from cursor position to end of field.

ERASE INP erases all characters from cursor position to end of field.

F.3 Alphameric Keys

The alphameric keys (i.e. numeric and non-numeric character keys) are used for typing data in the FTP input fields of panels 2,3 and 5. The character typed will be displayed in the current cursor position, and the cursor will advance to the next unprotected position.

F.4 Illegal Use of Keys

Any key not mentioned above is illegal in the FTP mode and will activate an alarm if pressed.

The keys described in F.1 - F.3 above will likewise activate the alarm if unavailable within the current panel. Chapter 4 indicates the legal keys for each panel. Please note that alphameric keys may only be pressed within input fields.

G. STATUS MESSAGES

This appendix contains an exhaustive list of messages used by FTP. The messages, which are the english version texts, are ordered in groups related to specific tasks. Thus, the same message may appear in several groups.

G.1 Reading the Transfer Specification File

ILLEGAL VOLUME	:	Illegal character in volume field.
ILLEGAL DISC FILE-NAME	:	Illegal character(s) in the CP/M file name.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FILE UNKNOWN	:	File does not exist on disc.
DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation.
INVALID DISC RESPONSE	:	FTP received an unknown status code.

G.2 Validating Files

ILLEGAL VOLUME	:	Illegal character in volume field.
ILLEGAL DISC FILE-NAME	:	Illegal character(s) in the CP/M file name.
NOT DIRECTION	:	The character in the field is not T for transmit or R for receive.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FILE UNKNOWN	:	File does not exist on disc. If direction is T (transmit) the CP/M file must be present.
DISC FILE EXIST	:	If direction is R (receive) then the CP/M file must not exist.
DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation. Indicates a system malfunction.
INVALID DISC RESPONSE	:	FTP has received an unknown status code which indicates system malfunction.

HOST FILE UNDEFINED/CLOSED	:	The host file is closed or undefined. Consult the Host System Administration to have the problem solved.
INVALID TRANSFER DIRECTION	:	The specified transfer direction does not match with Host System specifications.
HOST FILE NOT EMPTY	:	The host file already contains data.
HOST FILE EMPTY	:	A transfer from host to terminal has been specified, but the host file does not contain data.
HOST FILE FULL	:	No more space in host file.
HOST FILE-NAME UNKNOWN	:	The specified file does not exist on the host.
BLOCKID RECEIVED TWICE	:	The host application (FWA) has received the same block twice. Indicates protocol violation.
HOST ERROR 08	:	Invalid host status code (08). Indicates error in host application.
INVALID TRANSFER-CODE	:	The host application (FWA) has received an invalid transfer code. Indicates system error on either host side or terminal side.
INVALID STATUS-CODE	:	Invalid host status code (in the range 10 to 89). Indicates system error on either host side or terminal side.

G.3 Using the Volume/File Facilities

G.3.1 Delete

ILLEGAL VOLUME	:	Illegal character in volume field.
ILLEGAL DISC FILE-NAME	:	Illegal character(s) in the CP/M file name.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FILE UNKNOWN	:	File does not exist on disc.
INVALID DISC RESPONSE	:	FTP has received an unknown status code which indicates a system error.

G.3.2 Rename

ILLEGAL VOLUME	:	Illegal character in volume field.
ILLEGAL DISC FILE-NAME	:	Illegal character(s) in the CP/M file name.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FILE UNKNOWN	:	The file does not exist on disc.
DISC FILE EXISTS	:	The new name is already in use.
INVALID DISC RESPONSE	:	FTP received an unknown status code. Indicates a system error.

G.3.3 Filesize

ILLEGAL VOLUME	:	Illegal character in volume field.
ILLEGAL DISC FILE-NAME	:	Illegal character(s) in the CP/M file name.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FILE UNKNOWN	:	The file does not exist on disc.
DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation. Indicates a system error.
INVALID DISC RESPONSE	:	FTP received an unknown status code. Indicates a system error.

G.3.4 Current Logged Volume

No status messages.

G.3.5 Volume Status

ILLEGAL VOLUME	:	Illegal character in volume field.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.

DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation. Indicates a system error.
INVALID DISC RESPONSE	:	FTP received an unknown status code. Indicates a system error.

G.3.6 Directory List

ILLEGAL VOLUME	:	Illegal character in volume field.
DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation. Indicates a system error.
INVALID DISC RESPONSE	:	FTP received an unknown status code. Indicates a system error.

G.4 Executing the File Transfer

DISC OFFLINE (I/O PARITY)	:	Disc offline/not mounted or CRC error.
DISC FULL	:	No more room on disc.
DISC STREAM ERROR	:	Problems with the disc streams. Indicates a system error.
DISC WRITE-PROTECTED	:	It is not allowed to write on the disc.
REJECTED DISC OPERATION	:	Disc operation not executed. Indicates a system error.
DISC INPUT OVERRUN	:	The input buffer is too small.
ILLEGAL DISC OPERATION	:	Illegal operation. Indicates a system error.
INVALID DISC RESPONSE	:	FTP has received an unknown status code which indicates a system error.
HOST FILE FULL	:	No more room in the host file.
BLOCKID RECEIVED TWICE	:	The host application (FWA) has received the same block twice. Indicates a system error on either host side or terminal side.

HOST ERROR 08	:	Invalid host status code (08). Indicates an error in the host application.
INVALID TRANSFER CODE	:	The host application (FWA) has received an invalid transfer code. Indicates a system error on either host side or terminal side.
INVALID STATUS CODE	:	Invalid host status code (10-89). Indicates an error in the host application.
PRINTER BUSY	:	The printer is busy with a previous request.
PRINTER OFFLINE	:	Printer is offline/power off.
PRINTER NOT READY	:	Printer is not ready due to a timeout.

RETURN LETTER

Title: ITT3290 File Transfer Program RCSL No.: 42-i2381

A/S Regnecentralen af 1979/RC Computer A/S maintains a continual effort to improve the quality and usefulness of its publications. To do this effectively we need user feedback, your critical evaluation of this manual.

Please comment on this manual's completeness, accuracy, organization, usability, and readability:

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