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Version 1

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USER'S GUIDE

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# **1500 UNIVERSAL TERMINAL EMULATOR UNITRM15**

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UNITRM15

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NOTICE

Datapoint strongly recommends that its customers use Datapoint Customer supplies. These disks, diskettes, cassettes, ribbons and other products are certified by Datapoint to meet all Datapoint Hardware specifications for consistent optimum performance.

## PREFACE

UNITRM15 is a Terminal Emulator for use on the Datapoint 1500 diskette system. It handles full duplex communications in a teletype discipline at various selectable baud rates or half duplex communications over a 202-type modem at baud rates up to 1200 baud. It will replace a conversational remote job entry or remote access instant response terminal which operates in the same discipline. The only data medium available in UNITRM15 is disk files.

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## CHAPTER 1. INTRODUCTION

UNITRM15 is a Terminal Emulator for the Datapoint 1500 diskette system. It handles full duplex communications in a teletype discipline using an RS232 asynchronous modem at baud rates up to 1200 baud. It will optionally handle communications over a 202-type modem in half duplex at baud rates up to 1200 baud. It will replace a conversational remote job entry or remote access instant response terminal which operates in the same discipline.

UNITRM15 requires a 32K 1500 processor running under DOS.H. Disk files are the only data medium available in UNITRM15. Transfer between Datapoint processors to various mediums may be accomplished with the DATAPOLL utility.

Two disk files may be opened with UNITRM15, one into which data is received (receive file) and one from which data is transmitted (transmit file). These files are specified by the user at program load time or in configuration or command handler mode. Only text files in the Datapoint standard GEDIT format may be sent and received by UNITRM15. Multiple volume files may be transmitted and received (see Sections 3.3.3 and 3.3.4 for multiple volume file format).

UNITRM15 operates in three separate modes: program configuration mode, command handler mode, and interactive mode. When the program is initially loaded, it enters configuration mode. In this mode, the user may set operating options before communication is begun. These options include such items as keyboard mode and communications mode. Configuration mode may also be re-entered from the command handler.

Command handler mode allows the user to enable and disable devices (disk and printer), to specify transmit and receive files, and to position within a file. From this mode, the user may enter interactive mode, return to configuration mode, or return to the Disk Operating System.

When interactive mode is entered, the user is set up for communication. Interactive mode is divided up into two sections: input and output. Communications input may be directed to the disk receive file, printed on the printer, and displayed on the screen. Output is read from the disk transmit file or received from the keyboard and sent out the communications channel. The

user may return to the command handler from interactive mode at any time.

Communication options include full or half duplex data transmission, selectable baud rates, even or odd parity data transmission, and automatic telephone answering. In addition, UNITRM15 contains drivers for the keyboard, display and serial printer.

## CHAPTER 2. SYSTEM CONFIGURATION

UNITRM15 must be run in conjunction with DOS.H, Datapoint's 1500 Disk Operating System. In addition, an asynchronous modem is required for communication purposes. The type of modem used depends on the configuration selected. For a full duplex configuration a 103 modem, or equivalent, using a two-wire connection or a 202 modem, or equivalent, using a four-wire connection is required. For a half duplex configuration a 202 modem, or any equivalent modem which provides supervisory channel, is required. A 1500 asynchronous modem cable, model code 9028, is required for connecting the 1500 and modem. If printing is desired, a serial printer should be connected to the system also.

The following diagram illustrates the various communication systems which may be configured:

. Switched, 2-wire, using an external modem

1500	Bell 103/202 modem or equivalent	DAA*
------	-------------------------------------	------

. Leased, 2-wire, using an external modem

1500	Bell 202 modem or equivalent	DAA**
------	---------------------------------	-------

. Leased 4-wire using an external modem

1500	Bell 202 modem or equivalent	DAA**
------	---------------------------------	-------

\* Data Access Arrangement required if non-Bell modem used

\*\* Data Access Arrangement optionally required for proper line conditioning

## CHAPTER 3. OPERATING INSTRUCTIONS

UNITRM15 operates in three separate modes: configuration mode, command handler mode, and interactive mode. The user controls the passing between modes. Several operating options are available to the user which he may set either at program load time with parameters on the DOS command line or through configuration mode. If requested, the chosen options will be saved and re-used the next time the program is loaded.

### 3.1 Program Loading and Initialization

UNITRM15 may be run from the Disk Operating System with the following command:

```
UNITRM15 [<Transmit file>][,<Receive file>][,R][;parameters]
```

The program initially checks whether a concurrent job is executing. If it finds that one is executing it will abort with the message,

```
UNITRM15 CANNOT RUN WITH A CONCURRENT JOB. UNITRM15 WILL ABORT.
```

The program then checks the tasking/communication package to see if it is the correct one to be run with this version of UNITRM15. If not it will abort with the message,

```
INVALID TASKCOMM. UNITRM15 WILL ABORT.
```

Next, it will look up the other members which must be present in the library from which the command module was loaded. If any are missing the program will abort with the message,

```
LIBRARY MEMBER MISSING. UNITRM15 WILL ABORT.
```

and abort its execution. If an error occurs during the loading of an overlay during execution the program will abort with the message,

```
ERROR DURING LOAD OF OVERLAY
```

Next, the program begins to process any parameters given on the command line when it was loaded. The telephone line is automatically disconnected at program load time unless the third



file specification is 'R'. This indicates re-entry to UNITRM15. Re-entering UNITRM15 without disconnecting the line is only possible if the system is configured for connect mode. All file specifications and parameters are optional. If no file names or parameters are given, the program will enter configuration mode. Otherwise, the file names and parameters given at load time will be used to set the program up and command handler mode will then be entered. The re-entry option is not considered a parameter. If only the re-entry option is specified the program will enter configuration mode. Any file or parameter not specified on the command line will take on the pre-configured value if it exists. If no pre-configuration of the program exists, certain assumptions will be made (given in Section 3.1.2).

### 3.1.1 File Specifications

File specifications follow the standard DOS format. Both file specifications are optional. The first file name specifies the transmit file. When this file is opened and enabled, data will be read from this file and sent out the communication lines. The second file name specifies the receive file. When this file is opened and enabled, any data received from the communication lines will be written to this file. The two file specifications may not be the same file. If they are, the message,

TRANSMIT AND RECEIVE FILES THE SAME

will be displayed and the program aborted. If no extension is given, /TXT is assumed. If no drive is given, all drives will be searched to see if the file already exists.

If the receive file does not exist, one will be created. If it does exist, it will be opened and positioned to beginning of file. The user should take care when specifying a receive file which already exists on disk. He could specify the wrong name and destroy the file unintentionally.

The transmit file must exist on disk. It will be opened and positioned to beginning of file. If it does not exist on disk, the program will abort with the message,

NO SUCH TRANSMIT FILE

If a file specification is not given at this time, it may be set up later through configuration or command handler mode. If only the transmit file is to be specified, the name should be preceded by a comma,

UNITRM15 ,TXMITF

If only the re-entry option is to be specified it should be preceded by two commas,

UNITRM15 ,,R

If no files are to be specified but parameters are, the parameters should be preceded by a semi-colon,

UNITRM15 ;<parameters>

### 3.1.2 Parameters

The following parameters may be specified at load time to configure UNITRM15 for the available options. All but the printer enable parameter (P) are order independent and those not specified will take on the pre-configured values if they exist; if the program is not pre-configured, the assumed values listed will be used. Refer to Section 3.2 for a more detailed description of program configuration options.

- <Q> Ignore all following parameters on command line and enter configuration mode immediately
- <G> After the program is set up, by-pass command handler mode and enter interactive mode immediately
- <T> Teletype keyboard (assumed if <T> or <U> not given)
- <U> Upper-lower case keyboard
- <Bn/m> Transmit/receive baud rate where n/m equals the desired rates. Both rates may be specified for full duplex operation but if only one is given it will be used for both transmit and receive. Only one baud rate need be specified for half duplex operation but if both are specified only the transmit rate will be used. Both n and m will be assumed to be 1200 if no baud rates are given. Baud rates given must not exceed 1200.
- <F> Full duplex data transmission (assumed if <F> or <H> not given)
- <H> Half duplex data transmission
- <L> Full duplex data transmission with local echo

- <E> Even parity data transmission (assumed if <E> or <O> not given)
- <O> Odd parity data transmission
- <K> Continuous device operation (assumed if <K> or <X> not given)
- <X> X-ON read mode
- <S> System printer connected (no printer assumed if <S> not given)
- <P> Printer enable; <S> must have been given; printer will be enabled when program is started
- <W> Enable disk write; receive file specification must exist; receive file will be enabled when program is started
- <R> Enable disk read; transmit file specification must exist; transmit file will be enabled when program is started
- <CS> Connect mode, sender (assumed if <CS>, <CR>, <AS>, or <AR> not given)
- <CR> Connect mode, receiver
- <AS> Answer mode, sender
- <AR> Answer mode, receiver
- <D> Disable interrupt, break, usage to prevent buffer overrun (assumed if <D> or <I> not given)
- <I> Enable usage of interrupt, break, to prevent buffer overrun

If a parameter is given which is not one of the above or one is in error,

INVALID PARAMETER: <p>

will be displayed where <p> is the bad parameter; the ABTIF bit is set in the DOSFLAG and the program is aborted. If more than one of the parameters are given for a particular option, the last one given will be the value set. For example,

UNITRM15 ;KACS

will set continuous device operation, connect mode, and system printer. The Answer parameter (A) is cancelled by the C parameter.

### 3.1.3 Examples

The following entered on the DOS command line will cause UNITRM15 to be loaded and configuration mode entered. Any pre-configured program options will be overridden,

```
UNITRM15 ;Q
```

The next DOS command line will cause UNITRM15 to be loaded and command handler mode entered. The options set by the command line are upper-lower case keyboard, baud rate of 300, continuous device operation, system printer, disk write enable, and answer mode, receiver. When connection is made, the transmit file will be enabled and anything received on the communications line or from the keyboard during interactive mode will be written to a file called PAYFILE/TXT on drive one. Assumed options are full duplex, even parity, and disable interrupt usage. Note that the 'G' parameter is included so that the command handler will be skipped and interactive mode entered after the program is set up.

```
UNITRM15 ,PAYFILE:DR1;UB300KSWGAR
```

### 3.2 Configuration Mode

Configuration mode may be entered when the program is initially loaded or returned to from the command handler. When the program is first loaded, configuration mode will be executed only if no file names or parameters were included in the DOS command line and no pre-configuration of the program existed. When configuration mode is entered from the command handler, all configuration questions will be asked.

In configuration mode all the questions to be answered are displayed on the screen of the processor along with either their default responses or the responses which have been recorded previously. The user is allowed to leave any of the displayed responses as they are, or change them. If a displayed response is not to be changed the <ENTER> key may be hit as the cursor is flashing over a displayed response. To change the displayed response, simply type over it. The configuration mode screen with all of the default responses given will appear as follows:

---

Record program options (Y or N)? Y      Disconnect (Y or N)? N

Skip Command Handler (Y or N)? N

Receive file: \_\_\_\_\_ . Change receive file (Y or N)? N

Transmit file: \_\_\_\_\_ . Change transmit file (Y or N)? N

Answer-back: \_\_\_\_\_ . Change (Y or N)? N

Teletype/Upper-lower case keyboard (T/U)? T

Enable/Disable 'Interrupt', 'Break', to prevent buffer overrun (E/D)? D

Full duplex/Half duplex/Local echo full duplex (F/H/L)? F

Connect-Sender/Connect-Receiver/Answer-Sender/Answer-Receiver (CS/CR/AS/AR)? CS

Baud rate (Transmit/Receive)? 1200/1200.      Even/Odd parity (E/O)? E

Continuous/X-On (K/X)? K                      System printer (Y or N)? N

, A RESPONSE OF '#' CAUSES THE QUESTION TO BE ASKED DURING EXECUTION.  
 A RESPONSE OF '\*' CAUSES RETURN TO THE DOS.

---

The following paragraphs describe the questions asked by the configuration routine. The corresponding parameters which may be specified at program load time (if any) to set these options appear to the right of each question (see Section 3.1.2 for description of load time parameters). If recording of the responses is requested, some options may be left open by entering a leading '#'. Those questions will always be asked after any subsequent loading of the program. Any question answered with an asterisk (\*) will cause the program to terminate all files and return to the Disk Operating System without disconnecting the line. All buffers are clear in this mode of operation.

Record program options (Y or N)?

A reply of 'Y' will instruct the program to record the answers to the following configuration options in the first object record of the UNITRM15 library file's command module. The next time the program is loaded, these recorded answers will be used instead of asking for them from the user. However, any options left open (answered with '#') will always be asked. The recorded options may be overridden by specifying them in the command line

when the program is loaded or specifying the Q parameter which causes configuration mode to be entered immediately. If 'N' is replied to the question above, no recording of the program options will be made.

Disconnect (Y or N)?

An answer of 'Y' will cause the program to disconnect. The user may answer 'N' to reconfigure the program without disconnecting.

Skip Command Handler (Y or N)? <G>

An answer of 'Y' will cause the program to enter interactive mode immediately after configuration mode has been completed and the program has been set up for communication. An answer of 'N' will cause the program to enter the command handler after configuration mode has been completed.

Receive file: . Change receive file (Y or N)?

If a new receive file specification is to be entered, answer 'Y' to the prompt. The cursor will then be positioned in the file specification field. This entry should be the name of the file to be written to when disk write is enabled. The file specification follows normal Datapoint DOS format. If the format of the specification is invalid, the following message will be displayed,

INVALID FILE SPECIFICATION

and the file requested again. If no extension is given, /TXT is assumed. If no drive is given, all drives will be searched to see if the file already exists. If the drive specification is invalid the message,

INVALID DRIVE NUMBER

will be displayed and the file name requested again. If the file does not exist, it will be created. If the file does exist, the program will respond with,

RECEIVE FILE EXISTS. OVERWRITE?

The user should answer Y if he does not mind destroying the

existing file. Otherwise, the receive file request will be asked again. The receive file will be opened at this time and positioned to the first record on file. If no file is specified (<ENTER> key only), the file may be specified later in the command handler or by returning to the configurator.

Transmit file: \_\_\_\_\_ . Change transmit file (Y or N)?

If a new transmit file is to be specified, answer 'Y' to the prompt. The cursor will then be positioned to the file specification field. This entry should be the name of the file to be read from when disk read is enabled. The file specification follows normal Datapoint DOS format. If the format of the specification is invalid, the following message will be displayed,

INVALID FILE SPECIFICATION

and the file name requested again. If no extension is given, /TXT is assumed. If no drive is given, all drives will be searched for the file. If the drive specification is invalid the message,

INVALID DRIVE NUMBER

will be displayed and the file name requested again. The file must exist; if it does not, the message,

NO SUCH TRANSMIT FILE

will be displayed and the transmit file requested again. The transmit file will be opened at this time and positioned to beginning of file. The transmit file may not be the same as the receive file; if it is the same, the message,

TRANSMIT AND RECEIVE FILES THE SAME

will be displayed and the program will return to the receive file request. If no transmit file is given (ENTER key only), a file may be opened later in the command handler mode or by returning to configuration mode.

Answer-back: \_\_\_\_\_ . Change (Y or N)

If a new response is to be specified, answer 'Y' to the prompt. The cursor will then be positioned in the answer-back response field. The answer-back response is a string of characters which will be sent out the communication lines when an



answer-back is requested (control E received; see Section 3.4.4). If only <ENTER> is given, answer-back requests will be ignored. The answer-back string may only be set during configuration mode. The string may consist of any valid ASCII characters except for a leading '\*' or '#'. It may also include all control characters (characters with octal value less than 040) except for control '-' or control 'M' which have the control code 015. Code 015 cannot be embedded in the answer-back message. Control characters are specified by preceding the character with a '^'. For example,

Answer-back: HELLO^JSIGN ON \_\_\_\_\_ . Change (Y or N)? Y

After the answer-back response is entered by the user, it will be edited to convert any specified control characters to the corresponding control code. The octal value transmitted for a control character is equal to the character code minus 100 octal if the value is greater than or equal to 100 octal. Otherwise the value transmitted is the character code minus 040 octal. The example above actually consists of the following 13 characters ((012) is one byte):

HELLO(012)SIGN ON

When an answer-back string is displayed during configuration all control characters are converted to displayable characters by adding 100 octal to their value. When displayed they are preceded by the '^' character. The answer-back response is limited to 22 characters. However, when the string is requested from the user, he is allowed to enter 44 characters so that as many as 22 control characters could be entered. If, after the string has been edited, the string consists of more than 22 characters, the user will be asked to enter the string again.

Teletype/Upper-lower case keyboard (T/U)? <T><U>

If the response is T, teletype keyboard mode will be used. Lower case characters are converted to upper case. The upper case characters, A-O have 20 octal added to their value becoming 121-137 octal. The upper case characters P-Z have 20 octal subtracted from their value becoming 100-112 octal. Lower case alpha characters read from a file or received on the communication lines are converted to upper case. If U is responded above, full upper and lower case keyboard mode will be in effect. The characters are transmitted exactly as they are typed or read from the read file.

Enable/Disable 'Interrupt', 'Break', to prevent buffer overrun (E/D)? <D> <I>

It is possible for a remote terminal to transmit to UNITRM15 faster than UNITRM15 is capable of handling, especially when printing received data. If the system is to attempt to stop the sending terminal by sending an 'Interrupt' in order to prevent this type of overrun condition, answer 'E' to this question. An answer of 'D' will prevent any attempt to stop the sending terminal and allow the overrun condition to occur. Before answering 'E' to this question the user must make sure that the sending terminal is capable of handling a received 'Interrupt' properly. Some systems may respond to this 'Interrupt' in undesirable ways, such as terminating the current program and returning to a higher level of the system.

Full duplex/Half duplex/Local echo full duplex (F/H/L)? <F> <H> <L>

If communications in a teletype discipline over a full duplex modem is desired, answer 'F'. If communications over a half duplex modem with supervisory channel is desired, answer 'H'. If full duplex communications using local echo is desired, answer 'L'. When configured for half duplex the program will indicate to the user whether it is in transmit mode or receive mode by changing the flashing cursor character. In receive mode the cursor will appear as a capital 'R' in inverted video. In transmit mode the cursor will appear as a capital 'T' in inverted video.

Connect-Sender/Connect-Receiver/Answer-Sender/Answer-Receiver (CS/CR/AS/AR)?

The first letter of the response determines how the program will establish the communication connection. If the first letter is 'C', connect, the program will go off-hook and then into the automatic send/receive (ASR) mode. If the first letter is 'A', answer, the program will wait for an incoming call. When a call is received, the program will go into the automatic send/receive mode. The second letter of the response is only used if half duplex communication is configured. It determines whether the program will come up in transmit mode (Sender) or receive mode (Receiver) initially.

When initially loaded the program will attempt to establish communications according to the above configuration. Depressing the INTERRUPT key will abort the program, causing it to set the ABTIF bit in the DOSFLAG and return to the DOS.

If the program answers the phone during initial set-up but

detects no carrier signal within twenty seconds it will hangup the phone and wait for another ring indication.

Baud rate (Transmit/Receive): \_\_\_\_\_ . <Bn/m>

The user should type in the required transmit/receive baud rates. Both rates may be specified for full duplex operation but if only one is given it will be used for both transmit and receive. Only one baud rate need be specified for half duplex operation but if both are specified only the transmit rate will be used. Baud rates given must not exceed 1200.

Even/Odd Parity (E/O)? <E><O>

Type E for even or O for odd parity data transmission.

Continuous/X-On (K/X)? <K><X>

Type K for continuous or X for X-ON mode of transmission. In X-ON mode, every line of data except the first read from the transmit file is preceded by a Line Feed (012). Every line is terminated by a Carriage Return (015) and X-OFF (023). In continuous mode the above is true with the exception of the X-OFF character. Printer enable or disk I/O enable implies that the system should be in continuous operation mode. The X-ON mode directly emulates a teletype machine, equipped with X-ON reader control. The X-OFF causes a disk read disable.

System printer (Y or N)? <S>

If a printer is connected to the system, type 'Y'.  
Otherwise, type 'N'.

If requested, responses to the above questions will be recorded in the first record of the UNITRM15 library file's command module. The UNITRM15 command module must be named UNITRM15. If it is not, the message,

UNITRM15 LIBRARY MEMBER DOES NOT EXIST

will be displayed and the program aborted. If any questions were answered with '#', they will be reasked.

After all configuration options have been supplied, the program enters the command handler unless the user requested that the command handler be by-passed (see third option given above). In that case, the program will enter interactive mode. Before accepting any command handler mode commands or interactive mode keyin the program will attempt to establish communications according to the configuration. The message,

WAITING FOR COMMUNICATIONS TO BE ESTABLISHED

will be displayed on the bottom line of the DOS screen until communications is established. The user may abort the program during this time by depressing the INTERRUPT key. This will cause the ABTIF bit to be set in the DOSFLAG then the program will return to the DOS. Once communications is established the above message is erased and keyin is enabled.

### 3.3 Command Handler Mode

In command handler mode the user is allowed to enable and disable devices, specify transmit and receive files, and position files. When this mode is entered, the screen is erased and a list of the possible commands and their corresponding numbers are displayed as follows:

- 
- |                             |  |
|-----------------------------|--|
| 1 - Specify transmit file   | 11 - Enable printer                    |
| 2 - Specify receive file    | 12 - Disable printer                   |
| 3 - Terminate transmit file | 13 - Position transmit file            |
| 4 - Terminate receive file  | 14 - Position receive file             |
| 5 - Enable transmit file    | 15 - Display system status             |
| 6 - Disable transmit file   | 16 - Display interactive mode commands |
| 7 - Enable receive file     | 17 - Enter interactive mode            |
| 8 - Disable receive file    | 18 - Enter configuration mode          |
| 9 - Rewind transmit file    | 19 - Return to DOS                     |
| 10 - Rewind receive file    | 20 - Disconnect and Return to DOS      |

Specify command by number.

---

The cursor is left flashing at the bottom line under the message:

Specify command by number.

As commands are entered they are rolled up the bottom part of the screen, along with any messages the program displays. The commands remain on the top portion of the screen for operator viewing. Command handler mode may be entered from interactive mode. Data reception and transmission continues in command handler mode but only to and from the available memory buffers. For this reason the user is limited to the amount of time he spends in command handler mode. The following control characters

will be ignored if received while executing command handler mode: X-ON (021), X-OFF (023), TAPE-ON (022), TAPE-OFF (024), and answer-back request (005). The following sections describe the possible commands. Errors in a command will be designated with an appropriate message.

### 3.3.1 Specify Transmit File

The command number 1 allows the specification of a transmit file. When this command is input the program will respond with the prompt:

TRANSMIT FILE SPECIFICATION:

The file specification follows normal Datapoint DOS format. If no extension is given, /TXT is assumed. If no drive is given, all drives will be searched to see if the file already exists. The file must exist; if it does not, the message,

NO SUCH TRANSMIT FILE

will be displayed and the transmit file name will be requested again. The transmit file may not be the same as the current receive file; if it is, the message,

TRANSMIT AND RECEIVE FILES THE SAME

will be displayed and the transmit file name requested again. When a valid transmit file is given, it will be opened and positioned to beginning of file. The transmit file open request may be cancelled by entering a '\*' after the prompt for entering the file specification is displayed.

If another transmit file is currently open, it will be closed and the new one opened if the transmit file is not enabled. If the transmit file is enabled, the message,

TRANSMIT FILE ENABLED

will be displayed and the command ignored. The user must disable the current transmit file before designating another file for that use.

Transmitting from the file will not begin until it is enabled. The command, 3, will terminate the current file. If the transmit file is enabled at this time, the current buffer will be processed and the file closed. The emulator will no longer

respond to transmit file enable commands until a new transmit file is opened.

### 3.3.2 Specify Receive File

The number 2 command allows specification of a receive file. When this command is input the program responds with the prompt:

RECEIVE FILE SPECIFICATION:

The file specification follows normal Datapoint DOS format. If no extension is given, /TXT is assumed. If no drive is given, all drives will be searched for the file. If the file does not exist, it will be created. If the file does exist, the program will respond with,

RECEIVE FILE EXISTS. OVERWRITE?

The user should answer Y if he does not mind destroying the existing file. Otherwise, the receive file name will be requested again. The transmit file may not be the same as the receive file; if it is, the message,

TRANSMIT AND RECEIVE FILES THE SAME

will be displayed and the receive file name requested again. When a valid receive file is entered, it will be opened and positioned to the beginning of the file. The receive file open request may be cancelled by entering a '\*' after the file specification prompt is displayed.

If another receive file is currently open, it will be closed and the new one opened unless the receive file is enabled. The message,

RECEIVE FILE ENABLED

will be displayed and the command ignored if that is the case. The user must disable the current receive file before designating another file for that use.

Writing to the file will not begin until it is enabled. The command, 4, will terminate the receive file currently open. If the receive file is enabled, the current buffer will be written to the file followed by an end of file mark and the file closed. The emulator will not respond to transmit file-enable until a new transmit file is specified.

### 3.3.3 Transmit File Enable and Disable

The command, 5, will enable the transmit file. The program will respond with,

```
NO TRANSMIT FILE SPECIFIED
```

and ignore the command if no transmit file has been specified for use. The command, 6, will disable the transmit file. Nothing will be executed if the transmit file was not enabled for use. The transmit file enable function is the same as the X-ON/X-OFF function of a teletype.

Transmit file enable or a received X-ON (021) causes UNITRM15 to start reading from the opened transmit file. The data read is then transferred into the same buffer as the data input from the keyboard. This data may then be transmitted out the communications channel. Disk reading will continue until a disable transmit file or X-OFF is given. The reading will also stop if the transmit file is terminated.

In X-ON mode a Line Feed (012) is transmitted before every line except the first, and a Carriage Return (015) and X-OFF (023) are transmitted at the end of every line. In continuous mode the above is true with the exception of the X-OFF.

Disk text files written in the standard GEDIT format may be read by UNITRM15. The only control characters (characters with octal values less than 040) allowed in the file are 015, 011, and 003. Any others that are read will be converted to 0377s. However, the user may desire control characters to be included in the text transmit file so he can enable and disable various devices from that file instead of through the command handler or from the keyboard. To keep the text file in GEDIT format, the read routine of this program will interpret the tilde character ('~', octal 0176) as an indicator that a control character follows. The character following the tilde should be the control character code plus 0100 octal (e.g. '~F' would be converted to an octal 006). If the character following the tilde is another tilde then a tilde will be transmitted. Note, that the program does not write text disk files in such a manner. Any control characters received are not written into the text file. Refer to Section 4.2 for further details on disk data file format.

Disable transmit file or a received X-OFF (023) causes the program to stop reading from the disk file until an enable transmit file or X-ON (021) is received. The transmit file is left opened at its current position when the transmit file disable



is issued.

Reading of the device will also stop if an End of File or other error condition is encountered (see Section 3.5). An appropriate message is displayed on the bottom line of the screen and the transmit file is disabled.

The transmit file may span multiple volumes only if the extension is /TXT or /TXn where n=1 to 9. When the end of the transmit file is reached, its extension is checked to see if it is multiple volume file format. If it is, the extension is changed to /TX1 if the current extension is /TXT or it is changed to /TX(n+1) if the current extension is /TXn. If n becomes greater than 9, the logical end of file is assumed. If the new transmit file is the same as the receive file, logical end of file is assumed. The new transmit file is searched for on all drives. If it does not exist, the logical end of file is assumed. If it does exist, the message, \*TRANSMITTING MULTIFILE\*, will be displayed in the bottom right hand corner of the screen and disk reading is continued from that file. If logical end of file is assumed, the message, \*END OF FILE\* will be displayed and the transmit file will be disabled. The last transmit file read from is left opened positioned before its end of file mark.

#### 3.3.4 Receive File Enable and Disable

The command, 7, will enable the specified disk receive file. If none has been specified,

```
NO RECEIVE FILE SPECIFIED
```

will be displayed and the command ignored. The command, 8, will disable the current receive file. The command will be ignored if the receive file was not enabled at that time. The receive file enable function is the same as the TAPE-ON/TAPE-OFF function of a teletype.

Once this command has been given by either an enable receive file, 8, or TAPE-ON (022), all data received will be written to the receive file. Data may come from the keyboard, communication lines, or transmit file. Lines are buffered and a physical file record is written when the hardware disk buffer is full (251 characters maximum). Any control characters (characters with octal value less than 040) received other than the carriage return (015) will not be written to the file.

Disable receive file, 9, or TAPE-OFF (024) causes the program

to stop writing to the receive file until an enable receive file, 8, or TAPE-ON (022) is given. Any data left in the buffer is then written to the receive file followed by an end of file mark. The file is not closed at this time and is left positioned before the end of file mark.

The remote TAPE-ON (022) and TAPE-OFF (024) commands may be used in place of the internal commands. This allows the user to control the information to be written to the disk receive file remotely.

If, while writing, the disk space is exhausted or the file's Retrieval Information Block becomes full, an attempt to continue writing will be made by creating a multiple volume receive file. This attempt will be made only if the receive file is in multiple volume file format. The file extension must be /TXT or /TXn where n=1 to 8. If it is not in that format, FILE SPACE FULL will be assumed. If the receive file follows multiple volume file format, a new receive file will be created with the same file name and a file extension of /TX1 if the current extension was /TXT or /TX(n+1) if the current extension was /TXn. If the new receive file is the same as the current transmit file open, FILE SPACE FULL will be assumed. The new receive file will be placed on the first drive with available space. If no more space exists on any drive or the multiple volume file extension has passed /TX9, FILE SPACE FULL will be assumed. If a new receive file is successfully created, the message, \*RECEIVING MULTIFILE\*, will be displayed in the bottom right hand corner of the screen and writing will be continued into that file. If a new receive file cannot be successfully created, the message, \*FILE SPACE FULL\*, will be displayed in the bottom right hand corner of the screen and the receive file will be disabled. The last receive file written into will be left opened and positioned before its end of file.

Writing of a disk file will also stop if a file error is encountered (see Section 3.5). The receive file will be disabled.

### 3.3.5 Rewind Transmit File

The command, 9, will rewind the transmit file if one is specified and not enabled. The file will be positioned to beginning of file. If no transmit file is specified, the command will be ignored with the message,

NO TRANSMIT FILE SPECIFIED

If the transmit file is enabled, the command will be ignored with

the message,

TRANSMIT FILE ENABLED

### 3.3.6 Rewind Receive File

The command, 10, will rewind the receive file if one is specified and not enabled. The file will be positioned to beginning of file. If no receive file is specified, the command will be ignored with the message,

NO RECEIVE FILE SPECIFIED

If the receive file is enabled, the command will be ignored with the message,

RECEIVE FILE ENABLED

### 3.3.7 Printer Enable and Disable

The command, 11, will enable the printer. The command, 12, will disable the printer. If no printer is selected during configuration, the printer enable command will be ignored.

Printer Enable, 11, causes UNITRM15 to print all characters received from the communications channel, keyboard, or transmit file to the system printer.

Printer disable, 12, causes the program to stop printing to the printer. All characters left in the buffer will be printed. The remote Printer Enable (006) and Disable (011) commands allow the user to control the information to be printed remotely.

If the system printer has been configured but is not available, an error message will be displayed on the bottom line of the screen, and the printer will be disabled.

The user should realize that the printer is the slowest device on the system and as such is the easiest device to overrun. Reception of large amounts of data at high speed to the printer will undoubtedly cause loss of data due to buffer overrun. If data is to be received to the printer it should be done in small amounts or at low baud rates. Enabling the use of 'Interrupt' to prevent buffer overrun through the configuration option will

remedy this problem. However, the user must make sure that the remote system is capable of handling a received 'Interrupt' without reacting in an unsuitable manner. Some systems, for instance, will abort the currently executing program and return to a higher level of the system upon receipt of an 'Interrupt'.

### 3.3.8 Position Transmit and Receive Files

The position transmit file command, 13, allows the user to set the position of the current transmit file to a given line number. The program responds to this command by displaying the prompt:

LINE NUMBER:

The number entered is the number of the line which the user wishes to be the next line read from the transmit file when it is enabled. A response of '\*' will abort the positioning command without changing the position of the file. Any other non-digit response will cause the question to be repeated. If the transmit file is enabled when the position transmit file command, 13, is given the program will ignore the command and respond with the following message:

TRANSMIT FILE ENABLED

If no transmit file has been specified the program will ignore the command and respond by displaying the following message:

NO TRANSMIT FILE SPECIFIED

The position receive file command, 14, allows the user to set the position of the current receive file to a given line number. The program responds to this command by displaying the prompt:

LINE NUMBER:

The number entered is the number of the line which precedes the one that the user wishes to be overwritten when the next line is written to the receive file. A response of '\*' will abort the positioning command without changing the position of the file. Any other non-digit response will cause the question to be repeated. If the receive file is enabled the program will respond to the position receive file command, 14, by ignoring it and displaying the following message:

RECEIVE FILE ENABLED

If no receive file has been specified the program will ignore the command and respond by displaying the message:

NO RECEIVE FILE SPECIFIED

### 3.3.9 Display System Status

The display system status command, 15, will cause UNITRM15 to display a table representing the current status of the system. A sample status display appears below:

```
TRANSMIT FILE:  NAMENAME/TXT:DRO      STATUS:  ENABLED
RECEIVE  FILE:  NAMENAME/TXT:DR1      STATUS:  DISABLED
PRINTER:  ENABLED
```

### 3.3.10 Display Interactive Mode Commands

The command, 16, will cause a table of commands which may be used in interactive mode to be displayed on the screen. The table will remain on the screen until the user types the <ENTER> key at which time it will be erased and the command mode screen will be replaced.

### 3.3.11 Enter Interactive Mode

The enter interactive mode command, 17, causes the program to enter interactive mode. The screen will be switched to the interactive mode screen and the cursor left flashing at the last known cursor position. Initially the cursor is positioned at the top left hand corner of the screen.

### 3.3.12 Enter Configuration Mode

The command, 18, causes the program to return to the configuration mode. The program does not disconnect but all buffers are cleared.

### 3.3.13 Disconnect and Return To DOS

The return to DOS command, 19, causes the program to finish writing the current buffer to the receive file, if one is enabled, finish processing the current transmit file buffer, if one is enabled, wait for the current printer buffer to be printed, then disconnect the line and exit to the DOS.

### 3.3.14 Return To DOS

The return to DOS command, 20, causes the program to finish writing the current buffer to the receive file, if one is enabled, finish processing the current transmit file buffer, if one is enabled, wait for the current printer buffer to be printed, then exit to the DOS. The line is not disconnected.

### 3.4 Interactive Mode

When interactive mode is entered, the command mode screen is saved away and the interactive mode screen is displayed. Initially, the cursor is positioned in the upper left-hand corner of a blank screen. However, the screen will always be active as a receive device, though it may not be visible. Any data received will be put into the interactive mode screen's memory area and the cursor position will be changed accordingly. Whenever interactive mode is entered the screen, with whatever data has been stored into it, will be displayed with the cursor positioned according to the received data.

The keyboard routine automatically executes a line-feed after each line of data entered if configured for half duplex. At any time, the user may return to the command handler by depressing the F4 key. Even if the transmit file is enabled, the user may enter characters from the keyboard. However, if the communications output buffer becomes full, all characters from the keyboard, except remote enable and disable commands, will be ignored. In the case of remote enable and disable commands, those commands will be issued but the control character will not be placed in the communications output buffer (note Section 3.4.1 below).

When the program is configured for half duplex and both the reverse and main channels have been dropped, the program will assume the telephone connection has been lost. When the program is configured for full duplex and loses carrier it will assume the telephone connection has been lost. Any time the telephone connection is lost the program will switch back to the DOS screen, roll-up the screen, and display the message,

CONNECTION LOST

on the screen. It will then proceed to clean up any data left in its buffers before returning to the initial,

WAITING FOR COMMUNICATIONS TO BE ESTABLISHED

message. The user may abort the program at this time by pressing the INTERRUPT key, or allow it to re-establish communications.

The DISPLAY key depressed with any other keyboard key acts as the teletype control key. The octal value transmitted if the control key is depressed is equal to the character code minus 100 octal if the value is greater than or equal to 100 octal. But if

the character value is less than 100 octal, the character transmitted is equal to the character code minus 40 octal. All control characters entered from the keyboard will be sent out the communications lines. However, those control characters other than the ones described below which are received on the communications lines will be ignored.

The following sections describe certain control characters which have special meaning to UNITRM15.

### 3.4.1 Device Enable and Disable Controls

The following device controls may be entered from the keyboard or received remotely. If device controls are entered from the keyboard, the corresponding key should be depressed simultaneously with the DISPLAY key. If operating full duplex, the command code is placed in the communications buffer and is not executed until it is received on the communications line. In half duplex or local echo full duplex, the character is automatically placed in the various input buffers.

A list of the remote enable and disable control characters follows:

<u>Command</u>	<u>Character</u>	<u>Code</u>
Disk Read Enable	Control Q	021
Disk Read Disable	Control S	023
Disk Write Enable	Control R	022
Disk Write Disable	Control T	024
Printer Enable	Control F	006
Printer Disable	Control I	011

If the device is not available (file not specified or no printer) or the command has no meaning, the request will be ignored.

### 3.4.2 Screen Controls

The following are screen controls which may be entered from the keyboard or received remotely. These commands may be entered from the keyboard by depressing the DISPLAY key with the following characters:



<u>Command</u>	<u>Character</u>	<u>Code</u>
Cursor Down	Control K*	013
Cursor Right	Control X*	030
Cursor Left	Control Y*	031
Cursor Up	Control Z* (Control :)	032
Home-up	Control Shift M (Control =)	035
Erase End of Line	Control Shift N (Control >)	036
Erase End of Frame	Control Shift O (Control ?)	037
Line Feed	Control J*	012
Carriage Return	Control M* or Enter **	015
Printer Top of Form	Control L*	014
Bell	Control G*	007
Escape	Control Shift K or Escape** (Control ;)	033

\*In Upper-Lower Case each must be shifted.

\*\*These characters may be used in either Keyboard mode.

The characters in parentheses must be used in Upper-Lower Case mode.

Note: When placing screen control codes in a disk read file, the format '~<character>' should be used (see Section 3.3.3) where <character> is the character equivalent to the screen control code plus octal 0100. All the characters listed in the table above correspond to that formula except the following (the correct control format to be entered into the read file is listed under Control Entry):

<u>Command</u>	<u>Control Entry</u>	<u>Code</u>
Home-up	~]	0135
Erase End of Line	~^	0136
Erase End of Frame	~	0137
Escape	~[	0133

### 3.4.3 Break

The user may send a break by depressing the KEYBOARD key and the space key simultaneously. If UNITRM15 is operating half duplex and is in receive mode, the Break command causes a receiver initiated turn around. To send a break in receive mode, the program turns the supervisory channel carrier off for 200 milliseconds and then restores it. This should cause the sending terminal to turn the line around.

If UNITRM15 is operating full duplex or operating half duplex

and is in transmit mode, the Break command causes the program to invert data for 200 milliseconds and then restore it.

#### 3.4.4 Answer-Back

The answer-back is required by some timesharing systems for automatic identification of users. A twenty-two character string is placed in the output buffer when a control E (005) is received. The string may be initialized in configuration mode only (see Section 3.2). If no answer-back string was initialized, answer-back requests will be ignored. The task which moves the string into the output buffer is a separate task. If another task which fills the output buffer (disk read or keyboard input) is active at the same time, the answer-back message will be intermixed with other data. The user should take care that this condition does not occur.

The user may request an answer-back by depressing the KEYBOARD key and the E key simultaneously. If UNITRM15 is operating half duplex a 1/4 second delay occurs after the control E is sent before any other data is sent. If UNITRM15 is operating full duplex the next control E received will be ignored since the one being sent should be echoed back.

#### 3.4.5 End of Transmission

When operating half duplex the user may send an end of transmission (EOT) by depressing the DISPLAY key and the D key (control D). The EOT command is only allowed when the program is running under answer mode and is in transmit mode when the command is issued. If those conditions do not exist, the EOT command is ignored and the control D character (004) is placed into the output buffer. The EOT command causes a sender initiated turn around. When detected, the program drops the main channel carrier which causes the line to be turned around. The EOT command is ignored if communication is full duplex.

#### 3.4.6 Display Interactive Mode Commands

The user may at any time have the program display the possible interactive mode commands available by pressing the F5 key. The interactive mode screen is saved away and a screen is displayed which lists the possible commands. When the <ENTER> key is hit the interactive mode screen is re-displayed.

### 3.5 File Messages

The following messages may be displayed on the screen during file operations if certain conditions occur. If one occurs, the message will be displayed in inverted video in the lower right hand corner of the screen.

#### \*END OF FILE\*

An end-of-file mark was encountered during a read operation. In interactive mode, the end of the multiple volume file series was reached. The last file read from is left positioned before the end of file mark. The transmit file is disabled if enabled at that time.

#### \*TRANSMITTING MULTIFILE\*

The physical end of file of a multiple volume transmit file was reached. The file extension was changed to the next file in the series and the new transmit file successfully opened. Reading will continue from the new file. (See Section 3.3.3).

#### \*RECEIVING MULTIFILE\*

The file space on the disk where the current receive file was located was exhausted or the receive file's Retrieval Information Block became full. A successful attempt was made to continue writing a multiple volume receive file. A new receive file was created on the first drive with available space and writing continued into that file. (See Section 3.3.4).

#### \*READ PARITY\*

A record parity error occurred during a read operation. The transmit file is disabled if enabled at that time.

#### \*FORMAT ERROR\*

A format error occurred during a read operation. This indicates the DOS formatting of this record is in error. The transmit file is disabled if enabled at that time.

#### \*RANGE ERROR\*

A range error was encountered during a read operation. This usually indicates a missing end of file mark in the file. The transmit file is disabled if enabled at that time.

#### \*WRITE PARITY\*

A parity error occurred during a write operation. The DOS disk write routine re-reads each record after it is written. The

receive file is disabled.

**\*FILE PROTECTED\***

The user specified a receive file which was DOS write protected and an attempt was made to write into that file. The receive file is disabled.

**\*FILE SPACE FULL\***

While writing into the receive file, the DOS needed to allocate more space to that file but none was available. Either the receive file was not in multiple volume file format or no more space existed on any on-line drive. (See Section 3.3.4). The receive file is disabled.

**\*DRIVE OFF LINE\***

The program tried to access a disk drive during some file operation and the drive was off line.

**\*PRINTER ERROR\***

The user tried to enable the printer and it was not connected to the system, it was not powered up, or it was off-line.

**\*PTR OVERFLOW\***

The print buffers became full and characters which should go to the printer have been thrown away.

**\*DISK OVERFLOW\***

The disk buffers have become full and characters which should go to the disk have been thrown away.

**\*RECEIVER OVERFLOW\***

The internal receive buffer became full and received characters have been lost.

## CHAPTER 4. POSSIBLE UNITRM15 MODIFICATIONS

UNITRM15 contains a conversion table for both input and output characters. These tables may be modified by the user to provide for code conversion before transmitting and upon reception of characters. The two tables are each 128 bytes long, one byte for each possible ASCII character. Before transmitting a character UNITRM15 will use the octal value of the character as an index into the CCOUT table to access the character which is actually to be transmitted. Upon receiving a character, UNITRM15 will use its octal value as an index into the CCIN table to access the character which is actually to be processed. Initially, each table contains the standard ASCII character set values 000-177 octal. The user may modify these tables with the DOS FIX utility. The starting address of the CCOUT table is octal 046600. The starting address of the CCIN table is octal 046400. Both of these tables are in member UN15MAIN at the UNITRM15 library file.

As released, UNITRM15 recognizes an octal 0137 (left arrow or underline) as the backspace character. The backspace character causes the cursor to be positioned one position to the left when displayed on the screen. When written to the receive file it causes the last character put into the receive file to be overwritten with the character which follows the backspace. In order to cause UNITRM15 to recognize a different backspace character, location octal 052305 in library member UN15MAIN should be modified to contain the octal value of the desired backspace character.

**NOTE:** The locations given above are valid for UNITRM15 release 1.1 but are subject to change in future releases. Refer to the release form for information on the locations for future releases.

## APPENDIX A. EXAMPLE OF CHAIN DRIVEN PROCESS CONTROL

The following is an example of how UNITRM15 may be used with the DOS CHAIN driven process control. Briefly, CHAIN allows the DOS user to specify several processes to be executed by DOS sequentially. The user should refer to the DOS User's Guide for a description of the CHAIN utility if he is not familiar with its operation.

In setting up the CHAIN file, the user must supply a separate line for each question that will be asked by the program chained to. UNITRM15 uses the DOS KEYIN\$ routine in configuration mode and command handler mode. If the CHAIN facility is used, the program will look to the CHAIN file for any user responses required in execution of those modes instead of obtaining them from the user through the keyboard. Once interactive mode is entered, the program uses a different keyin routine. However, if the user returns to command handler mode from interactive mode, the program will again look to the CHAIN file for the command line instead of allowing the user to enter it from the keyboard.

The following warnings should be heeded when using UNITRM15 under control of the CHAIN program. UNITRM15 cannot be used with CHAIN under the assumption that no operator intervention is needed. This condition exists since the program cannot return to the command handler (and thus to the DOS) from interactive mode unless there is someone at the console to depress the F4 key. In addition, the user should remember that if he returns to the command handler from interactive mode to execute some command, that command has to be included in the CHAIN file and cannot be entered by the user from the keyboard.

The following CHAIN file when executed would append the disk file NXTPAY/TXT to the existing text file PAYROLL, and transmit that file over the communication lines while printing it on the system printer. When the user depresses the F4 key, the program will return to the command handler and then to the Disk Operating System.

The ABTIF bit is checked so that the CHAIN file will be discontinued if UNITRM15 was aborted during an attempt to establish communications.

PROGRAM: SAPP PAYROLL, NXPAY, PAYROLL  
//ABTODFF OFF  
UNIT: UNITERM15 PATROLL; TB300KSPRGS  
18  
20  
//ABTIF

## APPENDIX B. HALF-DUPLEX LINE CONVENTIONS

UNITRM15 controls line-turnarounds through use of the supervisory channel carrier and selected control characters when operating in half-duplex mode. The following list describes the conditions which cause UNITRM15 to turn the line around.

In transmit mode:

1. Loss of supervisory channel carrier.
2. User keyed control D (EOT), only if configured for Answer.
3. User keyed control space (break).

In receive mode:

1. Loss of main channel carrier.
2. Receipt of 015, only if configured for Answer.
3. User keyed control space (break).
4. Receipt of inverted data (break).



## APPENDIX C. INTERFACING TO NON-STANDARD DEVICES

UNITRM15 may be used to capture data from non-standard ASCII devices when configured for Connect and Full duplex. If this is to be done the user must supply the following signals to the 1500's communication channel to insure proper operation:

1. Clear To Send
2. Dataset Ready
3. Carrier Detect