TELETYPE EMULATION UTILITIES USER MANUAL

MAY 3, 1977

PRELIMINARY MANUAL

HOW TO USE THIS MANUAL

Wang's teletype emulation utilities package for the Model 2228 and/or 2227B Communications Controller is available in two versions, a disk version and a cassette version. The disk version may be obtained on a Model 2270-type diskette or a Model 2240-type flexible disk. The version received should be checked to determine its compatibility with the peripherals in the Wang system being used for communication applications.

Chapter 1 presents an overview of the teletype emulator package.

Chapters 2 and 3 describe the disk and cassette versions of the teletype emulation utilities package and give operating instructions.

Before using either version of the teletype emulation utilities, readers of this manual should be familiar with the Wang system, in general, and the particular peripherals to be used for data transmission and reception.

CONTENTS

CHAPTER 1
OVERVIEW

THE MODEL 2228 COMMUNICATIONS CONTROLLER

Physically, the Model 2228 communications controller is a double-card controller which plugs into any I/O slot in a System 2200 Central Processing Unit (CPU). To operate the controller and a Wang-generated teletype emulator program associated with the controller, the CPU must include, as a minimum, the $GIO statements in its BASIC language instruction set. The statement is standard in several CPU models and available in the form of an option for other models (see Appendix A).

The Model 2228 controller has its own microprocessor and memory. Since space is reserved in memory for multicharacter input and output buffers, data transmission/reception operations performed by the controller with respect to a modem can overlap data input/output operations performed by the CPU with respect to the peripherals used for a communications application. The overlap feature increases data throughput capabilities and makes it possible for storage of received data during online operations.

Wang-generated microcode, included in the teletype package must be loaded into the controller's memory from the CPU prior to going online for data transmission and reception. The microcode implements asynchronous online data transfer, sets the appropriate baud rate clock, sets parity bits along with the number of bits per character, triggers the stop bits, and effects online data translation for both transmitted and received characters if desired.

THE MODEL 2227B COMMUNICATIONS CONTROLLER

The 2227B Communication Controller is physically like the 2228 Communications Controller, and again, the $GIO instruction must be included in the CPU's BASIC language instruction set. The 2227B Controller has space reserved in memory for multicharacter input and output buffers allowing for data transmission/reception operations performed by the controller with respect to a modem overlapping data input/output operations performed by the CPU with respect to the storage peripherals in use. The overlay feature increases throughput and allows online storage of received data.

The difference in the two boards is that microcode is not loaded into the 2227B board as it is in the 2228 communications controller board. All the features that the microcode provides in the 2228 Communications controller board are hard-coded into the 2227B (reference 2227B Preliminary User's Manual for Programming Information).

The Wang-generated teletype emulation program senses which of the two communications controllers is plugged into the CPU and provides the appropriate initialization. If a 2227B Communications Controller is being used, the program bypasses the loading of the microcode. If a 2228 Communications Controller is being used, the program effects microcode loading.

SUMMARY

With either the Model 2228 Communications Controller or the Model 2227B Communications Controller, a suitable modem, and the teletype emulator package utilities, a Wang computer system can transmit and receive data over telephone lines. Thus, the system can be linked readily to any host computer which communicates with terminals having the characteristics of a teletype.

INSTALLATION

The following applies to both the 2227B and the 2228 Communications Controllers.

Whether the communications controller is being added to an already installed Wang system or is a part of a system yet to be set up, installation of the controller is the responsibility of a Wang service representative who should be notified when the controller arrives.

After the controller is inspected, diagnostically checked, and installed in the CPU, one end of the cable supplied with the controller is plugged into the connector on the controller. Normally, the other end of the cable is plugged into a modem.

Installation of a modem is not the responsibility of a Wang service representative.

MODEM CONSIDERATIONS

The 2227B Communications Controller always supports asynchronous communications transmission and reception. The 2228 communications controller in conjunction with the Wang teletype emulator package utilities, also provides asynchronous communications transmission and reception.

A modem may be rented from the telephone company serving the locality where a Wang system is installed or may be purchased from any one of several modem vendors. In either case, installation of a modem must be scheduled with the local telephone company since modems purchased from a vendor must be connected to the telephone network via telephone company installed data access arrangements (DAA). DAA's consist of a telephone handset and modem interface rented from the telephone company.

Normally, a modem or DAA is wired permanently to a wall; therefore, it is important to know the planned location of a Wang computer system before a telephone company representative arrives to install the equipment. Keep in mind that subsequent relocation of the Wang system any great distance may necessitate having the telephone company relocate the modem or DAA.

Acoustic couplers may be used in lieu of modems.

COMPATIBLE MODEMS

With either of the communications controllers, the following dial-up modems (or their equivalents) can be used.

Bell 103A Full duplex - up to 300 baud

Bell 202C Half duplex - up to 1200 baud

Bell 202S Half duplex - up to 1200 baud

An acoustic coupler may be used in lieu of 103A modem.

NOTE: Insure modem compatibility with the host computer before ordering.

USING A NULL MODEM

If a Wang system is to be used as a terminal to another computer located in the same building with 124 feet, a modem is not required. Instead, an interface device called a "null modem" is available from Wang Laboratories for direct connection of two compatible systems. The null modem is a small unit with connectors on two sides.

For a "direct hookup" installation, a cable is connected between the communications controller in a Wang system and one side of the null modem. Also, a second cable is connected between the other side of the null modem and the other computer or terminal.

TELETYPE EMULATION PACKAGE

The Wang teletype emulation utilities package, in conjunction with one of the communications controller boards, allows the Wang 2200 system to "look like" a teletype terminal. The package is available on diskettes or cassettes. An outstanding feature of the diskette resident package is a SYSGEN (System Generation) program which permits the user, in response to a set of questions appearing on the CRT, to designate the I/O peripherals and other information such as the CRT line length which will be in use during the teletype emulation. Then, the SYSGEN program automatically generates on another diskette (or disk) a communications program having the following modules:

- A parameter inquiry module called TTYPARAM.
- An initialization/loader module called TTYSTART.
- A microcode data module for 2228 controller loading.
- A CPU/controller interface module related to the specific I/O configuration.
- A module holding the desire/default parameters, and
- A module containing the parameter setting display.

The generated teletype program includes such features as selectable host computer protocol parameters, i.e., baud rate, echoing by host (yes/no), parity type, etc. The program also contains special function key control over storage transmission/reception of data; activating/deactivating the printer on reception of data, and teletype control key/break key/escape key simulation.

With SYSGEN residing on a master diskette, no programming effort is required when a facility upgrades or wishes to change the designated I/O peripherals for a communications application. By running SYSGEN again, another program can be generated for a new I/O configuration.

The SYSGEN program, its options, and operating instructions are described in detail in Chapter 2. Also, questions requiring answers when SYSGEN is run are summarized in a checklist. If reproduced, the checklist provides an easy-to-use form for recording the options selected during generation of a communications program.

Readers of this manual should keep in mind that the SYSGEN feature is not available when a cassette-resident teletype emulator package is ordered from Wang Laboratories since SYSGEN is not suited to the sequential access methods of cassette storage. However, Wang's cassette resident teletype emulator package provides all of the options a cassette-based teletype emulator requires, i.e., keyboard/CRT interaction, printer optionally active on receive, all of the special function control keys active in the teletype emulation, and the ability to optionally send stored data from cassette/store receive data on cassette.

General operating instructions, including establishing a connection via a modem, are provided in Chapter 3. Data format and peripheral considerations are also provided in the chapter.

CHAPTER 2
GENERATING A COMMUNICATIONS PROGRAM

DISKETTE/CASSETTE RESIDENT UTILITIES

Wang's teletype emulation utilities package for either the model 2228 or 2227B is available in two versions, a disk version and a cassette version.

The diskette resident teletype emulator package provides the capability to generate many turnkey communications programs, each of which is suited to a particular choice of I/O devices for data transmission/reception.

The cassette resident teletype emulator package provides a turnkey teletype emulator program for the following I/O combination:

- Optional cassette storage send/receive (optional printer receive is always available) for a 64-character line display.

The configuration listed above is a subset of the turnkey program which can be generated using the SYSGEN program available in a diskette resident teletype emulation package. The only difference is that the above configuration must be loaded from cassette address 10A. Generating the above combination from SYSGEN would allow loading from either cassette address 10A, 10B, or 10C.

NOTE: Anyone using a cassette resident teletype emulation package can skip to Chapter 3 since the cassette package does not contain the SYSGEN program discussed in the remainder of Chapter 2.

SYSGEN: WHAT, WHY, AND WHEN TO USE

WHAT IS SYSGEN?

SYSGEN, an abbreviation of the words "System Generation," is a convenient name given to a program designed to interrogate the user's preferences with respect to a set of options and then automatically construct a communications program fulfilling the specifications.

The SYSGEN program, together with a set of I/O modules and other files, resides on the master diskette in the disk version of the teletype emulation utilities package.

WHY IS SYSGEN PROVIDED?

SYSGEN is Wang Laboratories' answer to an ambitious objective - maximizing the communications capabilities of a disk-based Wang system while minimizing the complexity of a set of turnkey programs for a variety of communications applications.

Keep in mind that a particular facility may wish to transmit data currently stored on disk and receive data from immediate output to disk. A disk send/disk receive combination of peripherals may be the only I/O configuration to be used when communicating with a host. On the other hand, another facility (or the same with a different application) may wish to transmit and receive with the cassette tape. In this case, a cassette send/receive would be the answer.

Tailoring a communications program through SYSGEN to specific I/O peripherals not only reduces memory requirements but also reduces the operational complexity of the resulting program. Operational simplicity is an important goal since many people, including non-programming and programming personnel, may be involved in data transmission and reception at some facilities.

WHEN SHOULD SYSGEN BE USED

The SYSGEN program should be used initially to generate one communications program which is suited to a desired I/O configuration, along with other options. Thereafter, SYSGEN should only be run when the need arises for another communications program representing different options.

SYSGEN OPTIONS

The SYSGEN options are summarized for convenience in a checklist which appears twice in this manual. In this section the checklist (Table 2-1) serves as a preview of the set of questions which appear on the CRT sequentially when the SYSGEN teletype emulator program is run. Each question is discussed individually as follows (see Table 2-1 to correlate questions):

QUESTION A --- Give the number corresponding to the address of the drive on which the master diskette is currently mounted.

QUESTION B --- Give the number corresponding to the address of the drive on which the SYSGEN emulator is to be stored.

QUESTION C --- If ultimately to be cassette loaded, answer 2; otherwise, answer 1.

QUESTION D --- Enter the ultimate loading address of the generated teletype package. NOTE: This question is omitted if the answer to question C is 2.

QUESTION E --- Enter the ultimate loading address of the generated teletype package. NOTE: This question is omitted if the answer to question C is 1.

QUESTION F --- The answer specifies the type of input storage device from which data may be transmitted.

QUESTION G --- The answer specifies the type of output storage device to which data may be received.

QUESTION H --- The answer determines which disk file opening and closing method will be used.

Method 1 -- uses the statement ON ERROR to capture and flag errors when sending or receiving files; the operator must restart a data transfer sequence if an error occurs. When receiving files, each file is opened with the same amount of space (using the operator supplied value); unused space is not freed.

Method 2 -- searches the catalog for the validity of operator supplied file names when sending or receiving files; new names are requested automatically if needed. When receiving files, each file is opened with the allotted space temporarily equal to all available space; then unused space is freed when a file is closed.

NOTE: This question is omitted if the disk device is neither the send nor receive storage media.

QUESTION 1 --- Enter the CRT line length size for the system which will execute the teletype emulator.

SYSGEN OPERATING INSTRUCTIONS

To generate a teletype program, proceed as follows:

1. Mount the master diskette in any unit having an address 310, B10, 320, and B20.

2. Mount an indexed diskette (or disk) in any drive not used in Step 1 above.

3. Depending upon the drive used in Step 1 above, enter a command of the form:

```
LOAD DC F  /xyz, "SYSGEN"
       R
```

and key RETURN(EXEC).

4. Enter the command RUN and key RETURN(EXEC).

5. Respond to each question which appears on the CRT (See table 2-1 for the listing of questions).

6. Now the SYSGEN program automatically generates a communications program fulfilling the options selected in Step 5 above. Several displays appear on the CRT; each display indicates the name of a file currently being opened, copied, merged, or closed. No operator intervention or action is required during this phase.

7. When the following display appears:

```
SYSGEN SUCCESSFULLY COMPLETED.
STOP
:
```

remove the master diskette and store until a new communications program with different options is needed.

8. Enter the command CLEAR and key RETURN(EXEC).

9. The disk/diskette used in Step 2 above now contains the following

TTYSTART -- The initialization/loader module
TTYPARAM -- The parameter selection/default module
TTY-000A -- The control vector/parameter setting data file
TTY-000B -- The CPU/controller interface module plus the selected I/O modules.
TTY-000C -- The parameter screen display control data file.
ASC-000A -- The microcode data file for use with the 2228 communications controller only.

The existence of the files can be checked, if desired, by listing the contents of the catalog index.

10. Now, depending upon the reply to question C in Step 5, continue as follows:

    a. If the reply to C was "1" (i.e., the generated system will now be copied to cassette for loading); the operational teletype program now resides on the disk/diskette used in Step 2.

    b. If the reply to C was "2" (i.e., the generated system will be copied to cassette for loading), the teletype program residing on the disk used in step 2 must now be copied to a cassette in the following order:

       TTYPARAM
       TTY-000C
       TTYSTART
       TTY-000A
       ASC-000A
       TTY-000B

11. Label the operational teletype program obtained in step 10 a or b. (include the loading address corresponding to the reply given in step 5 for question D or E.

NOTE: Since the SYSGEN program always produces files having the names shown in Step 9, only one teletype program can be stored on the particular disk/diskette used in Step 2.

TABLE 2-1
CHECKLIST

A. THE SYSGEN PROGRAM WAS JUST LOADED FROM

1 DISK UNIT 310
2 DISK UNIT B10
3 DISK UNIT 320
4 DISK UNIT B20

B. THE GENERATED SYSTEM WILL BE CREATED ONTO

1 DISK UNIT 310
2 DISK UNIT B10
3 DISK UNIT 320
4 DISK UNIT B20

C. WILL GENERATED SYSTEM BE COPIED TO CASSETTE FOR LOADING

1 NO
2 YES

D. GENERATED SYSTEM WILL BE LOADED FROM

1 DISK UNIT 310
2 DISK UNIT B10
3 DISK UNIT 320
4 DISK UNIT B20

E. GENERATED SYSTEM WILL BE LOADED FROM

1 CASSETTE UNIT 10A
2 CASSETTE UNIT 10B
3 CASSETTE UNIT 10C

F. DATA WILL BE TRANSMITTED FROM

1 DISK
2 CASSETTE
3 DUMMY FOR TESTING

G. RECEIVED DATA MAY BE OUTPUT TO

1 DISK
2 CASSETTE

H. WHEN OPENING AND CLOSING DISK FILES, SYSTEM SHOULD USE

1 METHOD 1 (ON ERROR)
2 METHOD 2 (SEARCH CATLG)

I. THE CRT LINE LENGTH IS

1 64 CHARACTERS
2 80 CHARACTERS

CHAPTER 3
OPERATING A COMMUNICATIONS PROGRAM

PERIPHERAL CONSIDERATIONS

Before going online to transmit and/or receive data via a Wang system equipped with the Model 2228 or Model 2227B communications controller, and the teletype emulator program, an operator should know the following:

- Is data to be transmitted from a storage device? If so, which peripheral is to serve as the input device?

- Is received data to be stored? If so, which peripheral is to serve as the storage medium.

- Is a teletype emulation program already generated to satisfy the above needs? If so, where is the program stored?

The CPU requirements for each I/O configuration are summarized in Appendix A.

DATA CONSIDERATIONS

Each teletype emulation program provides the capability to:

- Send data from the keyboard to the host computer using the full range of ASCII symbols and teletype control keys (to include the escape key and the break key).

- Send data stored on the medium selected during SYSGEN, i.e., disk or cassette.

- Output received data to the CRT. The CRT is always an active output media.

- Output received data to the line printer, in conjunction with data output to the CRT.

- Store received data on a storage media (either disk or cassette), in conjunction with data output to the CRT.

NOTE: The operator, through special function key activation/deactivation, chooses which of the above send/receive combinations are to be active at any given point in time. Keyboard send/CRT only on receive is always the default condition.

Furthermore, each program supplies a parameter selection/default creation module which allows the operator to:

- Select the desired BAUD rate of operation for compatibility with the host computer.

- Select the parity option which the host computer supports.

- Select the number of Bits per Character which the host computer supports.

- Select the number of stop bits needed for successful communications.

- Advise the system as to whether or not the host computer echoes each character it receives from the Wang 2200 system.

- Advise the system as to the host computer's normal response to each line of data transmitted to it.

NOTE: The teletype emulation package emulates a teletype protocol in that each character keyed is immediately transmitted. There is no provision for line buffering of keyboard inputted data.

The nature of teletype dictates terminal operator/host computer interaction through the operator's keyboard and display (CRT). Each line of data sent to the host is terminated by a carriage return code. The host normally reacts interactively in one of the following ways:

- Echoes each received character from the terminal.

- Responds to each received line (data stream terminated by a carriage return code) from the terminal with a line feed followed by one or more characters.

- Provides no response to each received line from the terminal.

The Wang teletype utilities package is designed to handle each of the above conditions which may occur in communicating with a host computer. The host computer's response is identified by the operator through the parameter setting module.

As previously mentioned, data may be transmitted from a storage device (i.e., disk or cassette) and/or may be received to a storage device. To accomplish this task, Wang Laboratories has defined a "communications format" (see Appendix B). This format optimizes data throughput for particular input devices. The appropriate input data format must be used when data is stored for subsequent transmission.

NOTE: The format allows variable length record packing of a disk sector or a cassette block. In this way maximum storage area is used.

LOADING A COMMUNICATIONS PROGRAM

Whether stored on disk or cassette, each teletype emulation program includes a file named TTYPARAM (the parameter setting/default module) and a file name TTYSTART (the loader module).

LOADING A PROGRAM FROM DISK

1. Mount the disk on the drive corresponding to the "loading address."

2. Using the appropriate F or R parameter and the address (if not a default address), enter a command of the form:

   LOAD DC F /xyz, "TTYPARAM" -- If the parameter settings are to be reviewed, or,

   LOAD DC F /xyz, "TTYSTART" -- If the defaulted parameter settings are to be used.

When the ready display (the colon and cursor) appears on the CRT, the program is loaded and a RUN command can be given. The displays, prompts, error messages, and general instructions associated with the operation of the programs are discussed in the sections which follow.

LOADING A PROGRAM FROM CASSETTE

The same procedure follows for that of loading from disk except that the load command is of the form:

LOAD /xyz "TTY-----"

OPERATIONAL FEATURES

THE PROGRAM TTYPARAM

Once the program is loaded and a run command is given, the display shown in table 3-1 is provided. There are six (6) groups of parameters that are set. They are:

- BAUD rate
- Parity type
- Bits per Character
- Stop bits
- Whether or not the host computer provides echoing
- The reaction of the host computer to each line received from the terminal (Wang 2200).

Provided with each parameter group is the allowable options within the parameter. For example, the parameter group BAUD rate has the following options:

- 110 BAUD
- 150 BAUD
- 300 BAUD
- 1200 BAUD

The selection of parameters choices is accomplished through a group of control keys (return/exec key, the space key, the backspace key and the run key). The combination of the listed active control keys allows the operator to conveniently access any/all parameters and input the choice. Settings during the operation of this module are considered to be the default settings of the teletype program until such time as the parameters are changed. The following is a description of each control key's meaning.

- RETURN/EXEC key --- Cycles through the choices of the parameter group which the cursor is presently positioned in. The cycle is a closed loop within the parameter group.

- SPACE key --- Cycles forward through the parameter groups. The cycle is a closed loop within the six (6) parameter groups.

- BACKSPACE key --- Cycles backward through the parameter groups. Again, the cycle is a closed loop within the six (6) parameter groups.

- RUN key --- signals the system that the displayed parameter choices are acceptable to the operator. At this point the choices are stored as the default parameter settings and the TTYSTART module is loaded into the system.

NOTE: Selections are designated by the system with a number sign (#). All keys except the above-listed control keys are inactive during parameter setting.

THE PROGRAM TTYSTART

Once the program is loaded and a RUN command is given, the system loads the communications board (whether it be a 2228 or 2227B Communications Controller) with the parameters selected/defaulted via the program TTYPARAM. During loading, there are no operator input requirements.

The program TTYSTART may be loaded by the operator to bypass TTYPARAM (parameter review/setting), or it may be automatically loaded by the program TTYPARAM once a RUN is keyed.

The system is loaded when the menu display depicted in Table 3-2 is shown.

CONTROL KEYS -- SPECIAL FUNCTION KEYS ACTIVE DURING PROGRAM EXECUTION

There are nine (9) special function keys active during program operation. Their definition and use follow (those keys whose use is restricted are noted below):

- '0 -- This key recalls the menu display depicted in Table 3-2. The key is inactive while data is being received. When batch data is being sent from storage, the key identifies an abort transmission request.

- '1 -- This key calls the ATTENTION subroutine (a subroutine which allows the operator to ready the receive storage device, i.e., select device address of disk or cassette, open file, etc.). The key is inactive while data is being received and/or while batch data is being sent from storage.

- '2 -- This key activates the send from storage sequence. Once keyed, prompts relating to the storage media, i.e., device address, etc., are provided. The key is inactive during reception of data from the host and/or during batch transmission of data from a storage device.

- '3 -- This key activates/deactivates the printer for printed output of received data. The key is inactive during reception of data and/or during batch transmission of data. Therefore, the key must be activated prior to the reception of data to be printed.

- '4 -- This key activates/deactives the storage of received data on the storage device, i.e., disk or cassette. If active, all data received will be output to the sysgened device. The key is inactive during receive or batch send operations and should therefore be activated prior to the reception of data to be stored.

NOTE: The CRT is always active during a receive operation. Therefore, even if another peripheral is activated, the received data will be displayed. Also, only one extra peripheral may be active at any one given time. In other words, the combination on output of received data can never be CRT, printer and storage device.

- '5 -- This key signals the closing of a storage receive file. The key is only active when the communications line is "quiet." If data is output to a storage device, the data is stored sequentially for the duration of storage being selected as an output device. However, at the time storage is deselected, the file is not closed (an operator may wish to store additional data within the same file). The file is closed only when '5 is keyed.

NOTE: Once a file is closed, a new file is automatically opened.

- '13 -- The ESCAPE key. This key creates the escape code for normal teletype operations. The key is inactive during reception of data and/or transmission of batch data.

- '14 -- The BREAK key. This key activates the break signal for normal teletype operations. The key is inactive only during batch transmission of data since here it would have no significant meaning.

- '15 -- The CONTROL key. This key activates the "control" feature of normal teletype. Once '15 is keyed, the next alpha key struck is transmitted as a control alpha. For example, a control "A" would be transmitted by keying '15 and then the letter "A." If '15 is keyed and followed by a key other than an alpha character, the result is a deactivation of the control feature. Again, this key is inactive during reception of data and the transmission of batch data.

NOTE: If a control "A" and a control "B," for example, must be sent sequentially, the operator sequence would be to key '15, the letter "A," '15, and then the letter "B."

During a batch transmission of data from a storage device, the only keys active are '0 (the ABORT key) and the RETURN/EXEC key. The RETURN/EXEC key is active in the event the line terminator transmitted by the system at the end of a batch line is received distorted. If that happens, a carriage return would renew the cycle of batch data transmission. Remember, teletype protocol does not provide for any error checking except parity, if so optioned. In a batch environment, teletype is not considered to be nearly as reliable as the bisynchronous protocols such as 2780, 3780, 3741, etc.

NOTE: If a batch line is transmitted from storage and that line is received incorrectly by the host computer, there are no provisions for re-transmission of that line in teletype protocol. Teletype is a visual check environment. One host may return an "INVALID CHARACTER" RE-ENTER" in recognition of a parity error, while another may send "ERROR, RE-ENTER LINE." In view of the many varied visual error responses a host may provide, and the added possibility that even the error message may have character distortion, the teletype emulation program does not in any way attempt to isolate re-transmission requests from the host computer.

KEYBOARD ENTERED DATA

Once a line connection is established and the proper parameter settings have been selected, the program is acting as a teletype. The keyboard is always active on send, and the typing of data results in the display of the typed data and the transmission of the data, character by character. For example, if the letter "A" is keyed, the letter "A" is displayed on the CRT and is also transmitted to the host computer. In addition to the normal type keys and the special function keys previously discussed, the following four keys are also active.

- SIN(or the upper case "(" -- This key displays and transmits an open bracket: "["
- COS(or the upper case ")" -- This key displays and transmits a close bracket: "]"
- PI or the upper case "/" -- This key displays and transmits a backward slash: "\"
- EXP(or the upper case "-" -- This key displays and transmits a left arrow: "←"

TRANSMISSION/RECEPTION CONSIDERATIONS

The following steps are necessary before going online for data transmission/reception:

- Insure that the correct BAUD rate has been selected for compatibility with the host computer.
- Insure that the correct parity option has been selected.
- Insure that the correct number of bits/character has been selected.
- Insure that the correct number of stop bits has been chosen.
- Insure that if the host provides echoing, the parameters are so set.
- Insure that the host's response to each transmitted line (i.e., each line terminated by a carriage return), has been properly entered into the parameters.
- If received data from the host computer is to be stored, insure that the proper storage media (i.e., disk or cassette) has been generated.

NOTE: If any of the above items are set incorrectly during the parameter selection program execution, the system will not effectively interface with the host computer as the host and the terminal would then be incompatible.

Further, if a storage media is to be used (either for transmission or reception of data (disk or cassette), keep in mind that the data will be read/written in the standard Wang telecommunications format as described below:

- The storage/read array is an alphanumeric dimensioned (4)62. For example -- x1$(4)62.
- Byte one (1) of the storage array has the following meaning.
  - HEX(00) = Not last sector/block of file.
  - HEX(FO) = Last sector/block of file.
- Byte two (2) of the storage array contains the binary count of the number of bytes used within the array plus one. The count automatically includes the first two bytes since they will always be used.
- Bytes three (3) to the end of the storage array contains the data records stored sequentially with the binary count of each record (one byte count) immediately preceding the record.

For example, if the file contains two records of the form "11111" and "222," a hexprint of the storage array would reveal the following:

FOODO5313131313103323232202020202020202020.....

Where,

- F0 = last sector of record

- 0D = 12 bytes used within the array since the second byte of the array is the number of bytes used (12) plus one. In this example, byte two must therefore equal 13 (12+1).

- 05 = 5 data bytes following since the binary count of the record precedes the record.

- Bytes four through eight contains the first record since the record count was five. The first record is therefore "11111."

- 03 = 3 data bytes following.

- Bytes ten through twelve contains the second record since its record count is three. The second record is therefore "222."

- There are no other records to be extracted from the storage buffer since the total number of bytes used (as specififed in byte two of the storage buffer) have been exhausted.

ESTABLISHING A CONNECTION

Once the system is loaded and the appropriate parameter settings have been made (or the default values are being used), the system is ready to interact with a host computer. To effect that interaction, a connection must be established between the host computer and the terminal (the Wang 2200). The connection is made through an appropriate modem (see Chapter one). After a line connection has been established, sign-on procedures and interactive communications are accomplished via the keyboard and CRT (or through one of the other selected medias).

TABLE 3 - 1
TTY PARAM

TELETYPE EMULATOR PARAMETERS

BAUD RATE	PARITY/	BITS/CHAR	STOP BITS
110	EVEN	7	1
150	ODD	8	2
300	NONE		
1200			

HOST ECHOES EACH CHARACTER RECEIVED FROM TERMINAL - YES NO

HOST RESPONDS TO EACH LINE RECEIVED FROM TERMINAL WITH:

LINE FEED ONLY LINE FEED AND OTHER CHARS NOTHING

CONTROLS .. SPACE/BACKSPACE = SKIP TO NEXT/PRIOR PARAMETER GROUP
RETURN(EXEC) = CYCLE TO NEXT PARAMETER OPTION
RUN = STORE SELECTED PARAMETER SETTINGS

TABLE 3 - 2
MENU
TTYSTART LOADED

'0 = MENU
'1 = ATTENTION
'2 = SEND FROM STORAGE
'3 = PRINTER RECEIVE ON/OFF SWITCH
'4 = STORAGE RECEIVE ON/OFF SWITCH
'5 = CLOSE STORAGE RECEIVE FILE
'13 = ESCAPE KEY
'14 = BREAK KEY
'15 = CONTROL KEY

CPU REQUIREMENTS

CPU requirements for exectuion of the teletype emulation utilities package vary depending on the selected storage media, but is categorized as follows:

- SYSGEN operation -- 2200C, 16K, Options 2 and 5.
- Emulation operation --
- Disk media used with method 1 (on error) -2200C, 8K, Options 2 and 5.
- Disk media used with method 2 (search catlg) -- 2200B, 16K, Options 2 and 5.
- Cassette media used -- 2200B, 8K, Option 2.
- TTYPARAM OPERATION -- 2200B, 8K, Options 2 and 5.

TELETYPE CONTROL KEYS AND THEIR WANG SYSTEM

COUNTERPARTS

HEX	CONTROL	KEY
01	SOH start of header	'15 FOLLOWED BY "A"
02	STX start of text	'15 FOLLOWED BY "B"
03	ETX end of text	'15 FOLLOWED BY "C"
04	EOT end of transmisson	'15 FOLLOWED BY "D"
05	ENQ inquiry	'15 FOLLOWED BY "E"
06	ACK acknowledgment	'15 FOLLOWED BY "F"
07	BEL bell	'15 FOLLOWED BY "G"
08	BS backspace	'15 FOLLOWED BY "H"
09	HT horizontal tab	'15 FOLLOWED BY "I"
0A	LF line feed	'15 FOLLOWED BY "J"
0B	VT vertical tab	'15 FOLLOWED BY "K"
0C	FF form feed	'15 FOLLOWED BY "L"
0D	CR	'15 FOLLOWED BY "M"
0E	SO	'15 FOLLOWED BY "N"
0F	ST	'15 FOLLOWED BY "O"
10	DLE delete	'15 FOLLOWED BY "P"
11	DC1	'15 FOLLOWED BY "Q"
12	DC2	'15 FOLLOWED BY "R"
13	DC3	'15 FOLLOWED BY "S"
14	DC4	'15 FOLLOWED BY "T"
15	NAK neg. ack.	'15 FOLLOWED BY "U"
16	SYN sync. char	'15 FOLLOWED BY "V"
17	ETB end trans. block	'15 FOLLOWED BY "W"
18	CAN	'15 FOLLOWED BY "X"
19	EM	'15 FOLLOWED BY "Y"
1A	SUB	'15 FOLLOWED BY "Z"
1B	ESC escape	'15 FOLLOWED BY "SIN(" -- OR
'13 ONLY		
1C	FS field skip	'15 FOLLOWED BY "PI"
1D	GS group skip	'15 FOLLOWED BY "COS("
1E	RS	'15 FOLLOWED BY "1"
1F	US	'15 FOLLOWED BY "EXP("