

EDITED BY CUSTOMER ENGINEERING DIVISION

2200 TELECOMMUNICATIONS; EMULATOR OPERATION CHANGES

Telecommunications software offerings on the 2200 product line have been reworked to provide users with better software and more extensive documentation. This new software microcode is functionally the same as the existing telecommunication software, but there is no need to SYSGEN the required emulator before it can be used with a telecommunications controller.

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WANG

LABORATORIES, INC.

1 INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 851-4111, TWX 710 343-8789, TELEX 94-7421

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1. NEW SOFTWARE RELEASE 4.0 OF ALL EMULATORS

The emulators contain a new parameter-selection module which replaces SYSGEN, and they are, in general, much improved versions of the existing software. They are available on either diskette or mini-diskette.

The following packages will replace all existing packages:

ASYNC I Telecommunications - including Teletype and 2741 Emulation. Package WL# 195-2056; Manual WL# 700-4718. (Included in this bulletin)

BSC I Telecommunications - including 2780, 3780, 3741, HASP workstation and 2200-2200 emulation. Package WL# 195-2057; Manual WL# 700-4719. (Included in this bulletin)

Burrough Emulation - For TC 500 Emulation in a Burroughs poll-select protocol. Package WL# 195-0047; Manual WL# 700-4746.

TC Support Utilities Release 2.0 - including revised Data Entry I, TC file conversion aids, and listing routines for TC files and spooled printer files. Package WL# 195-0026, Manual WL# 700-4086A plus addendum.

These packages are available immediately through the Software distribution system.

2. EMULATION DATA SHEETS

There are six new software data sheets available for various emulators.

| | |
|-----------------------------|--------------|
| Teletype Emulation | WL# 700-4704 |
| 2741 Emulation | 700-4706 |
| 2780/3780 Emulation | 700-4709 |
| 3741 Emulation | 700-4708 |
| HASP Multileaving Emulation | 700-4707 |
| Burroughs Emulation | 700-4705 |

All future communication hardware shipped will have the latest software included with it. In the field, Sales District Analysts will replace older software with new software. The changeover for the existing customer is not required immediately. The operation instructions given here replace Section 3 in Service Bulletin #77.

3. ON LINE CHECK FOR BI-SYNC EMULATORS

The IBM 370 at the Wang Data Center can now be used by Customer Engineering personnel to perform on-line checks for the 2228, 2228B, and OPTION 62B using 2780 and 3780 emulators. On-line procedure for Async is given in S.B. #77 on page 85.

Rules to be Observed

1. The sign-on procedures and keywords are strictly for Customer Engineering personnel use only.
2. Under no circumstances will the sign on or keyword be given to a customer; this will protect the data base at the Wang Data Center. Remember that the IBM 370 at Wang Data Center is a time sharing system, used by many customers.
3. Limit on-line checkout time to 10-15 minutes at a time; otherwise, you may tie up the line for Data Center Customers.
4. Before calling the Home Office for assistance, all on-line checks must be performed.
5. Successful checkout does insure that you have verified the functioning of hardware, software and modem. It does not verify any variations in protocols or sign-on procedure that a customer may encounter when using other remote host computers.

3.1 WANG DATA CENTER PHONE NUMBERS

*Model 201A MODEM (2000 BAUD) 617-272-9460
Model 201C MODEM (2400 BAUD) 617-272-6223,24
Model 208B MODEM (4800 BAUD) 617-272-4060

*or equivalent Modems

3.2 PREPARING SIGN-ON AND JCL RECORDS (DOCUMENTS)

A. Sign-on Record:

Prepare sign-on document/file exactly as shown below for proper terminal emulation.

NOTE: Column numbers above sign-on and JCL records are given for reference only they are not to be entered as records.

| | Column 1 | 16 | 28 |
|----------|----------|----------|----------|
| For 2780 | /*SIGNON | REMOTE53 | SEVXMTKL |
| For 3780 | /*SIGNON | REMOTE46 | TBKLDVXA |

For 2200 systems, after entering the above record using one of the utilities, press END OF FILE. That record will be transmitted by itself as a file. It is very important that the above procedure be followed for SIGN-ON record.

B. JCL Records

Prepare JCL (Job Card Language) records as a file, exactly as shown below.

| Column 1 | 29 |
|--------------------------------|----|
| //W33 JOB RAV, PRTY=8,CLASS=A | |
| /*ROUTE PRINT REMOTE53 (or 46) | |
| // EXEC PGM=IEBGENER | |
| //SYSPRINT DD DUMMY | |
| //SYSUT2 DD SYSOUT=A | |
| //SYSUT1 DD * | |

C. Test Messages/Text

Prepare a third file or document with test messages or text.
Please limit text to only a few pages.

3.3 INITIATING TRANSMISSION/RECEPTION

- A. Load the desired Emulator programs in the 2200 system. Call the appropriate phone number specified in Section 3.1 for your particular modem. Remember that Data Center phone numbers are assigned according to the type of modem.
- B. After few rings, a clear carrier sound should be heard. Push the DATA button on the modem telephone set. The DATA button light must be lit once the phone connection is established in above fashion: it will stay lit until phone line is disconnected.
- C. Key special functions key for 'SEND', then specify a file name corresponding to the sign-on file. Send this as a file by itself.
- D. When transmission has been completed, a message will be flashed on the 2200 workstation screen. Now key the 'SEND' special function key again and send the JCL and test data file. After successful transmission, a message will be displayed on the workstation screen. If transmission is not successful, follow the instructions from the beginning of this publication and re-dial.
- E. Depending on the time of the day that you dial the computer, 10 to 15 minutes may elapse before any data is received from the computer. During this time, no data activity is taking place. When data is received, it will be the same data/text that you sent to the computer, plus certain miscellaneous information relating to your job ID number, computer center notice, etc.

NOTE: If you do not get a response within 5 minutes,
(OPTIONAL) disconnect (hang up) and re-dial after 15 or 20
minutes. When you re-dial you must send just the
SIGN-ON document/file so that computer can recognize
your terminal number and route the data. You may come
across situations where during waiting someone else may
sign on with same sign on procedure and your data may
be routed to his system.

3.4 BRIEF ON-LINE CHECK FOR 2780/3780 EMULATOR

If one cannot spend the time required to do the BI-SYNC on-line
check then the following method is suggested.

- A. Prepare the sign-on file (sign-on record can be sent from
keyboard on 2200 system) as shown in Section 3.2A.
- B. Prepare the second document/file with the following. (This
can be sent from the keyboard).

```
Column 1   6  
        /*$ DA
```

- C. Send the sign-on file by itself. After transmission is
complete, send the command message in B or for 2200 systems
send the sign-on from the keyboard.
- D. The computer will immediately list all users currently
signed on to the system. This information will be
transmitted to your system.
- E. If you receive the user list, the test is complete and the
line can be disconnected (hang up the receiver).

The table on the next page replaces Table 1.1, page 7, of SB #77.

WANG TELECOMMUNICATIONS SOFTWARE

| SOFTWARE PACKAGE | PACKAGE NUMBER | CONTROLLER REQUIRED | MEMORY REQUIRED | | CUSTOMIZING REQUIRED |
|---|---|---------------------|---------------------------|----------------------------|-------------------------------|
| | | | MINIMUM | OPTIONAL* | |
| ASync I TELETYPE 2741 | 195-2056-3, 8 \$200 | 2227B or 2228B | | | |
| | Auto-Enclosure with 2227B (OP62B) | | 8K 8K | 16K 16K | None None |
| BISync I 2780 3780 3741 HASP 2200 to 2200 | 195-2057-3, 8 \$200 | 2228B | | | |
| | Auto-Enclosure with 2228B | | 8K 8K | 16K 16K | None None |
| | (OP 62B) | | 8K | 16K | None |
| | | | 16K ^{PRT} RCV | 24K ^{DISK} RCV | None |
| | | | 16K | — | None |
| BURROUGHS | 195-0047-3, 8 \$200 | 2228B | 16K | — | User Provided I/O Routines |
| TC SUPPORT UTILITIES DATA ENTRY I ATOMIZE DE-ATOMIZE OFF-LINE PRINT TC SUBROUTINES LIST/DUMP | 195-0026-3, 8 \$200 | 2227B or 2228B | | | |
| | Auto-Enclosure with 2227B (OP62) | | 16K 8K | — — | None None |
| | and 2228B (OP62B) | | 8K | — | None |
| | | | 8K | — | None |
| | | | 8K | — | None |
| | | | 8K | — | None |

*Emulators support more flexible disk handling with optional memory size.

ASYNCHRONOUS I PACKAGE OPERATORS GUIDE (INTERIM)

**EMULATION PROGRAMS
TELETYPE
2741**

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LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851, TEL. (617) 851-4111, TWX 710 343-6769, TELETYPE 94-7421

4. ASYNCHRONOUS 1 PACKAGE

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CHAPTER 1 OVERVIEW

1.1 SUMMARY

With either the Model 2228B Communication Controller or the Model 2227B Communications Controller, a suitable modem, and the Asynchronous emulator package, 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 or 2741.

1.2 THE MODEL 2227B AND 2228B COMMUNICATIONS CONTROLLERS

Physically, the Model 2228B 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 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.

The Model 2228B 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.

The 2227B Communication Controller is physically like the 2228B 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 overlap feature increases throughput and allows online storage of received data.

The 2227B Communications Controller always supports asynchronous communications transmission and reception. The 2228B communications controller in conjunction with the Wang Asynchronous package, also provides asynchronous communications transmission and reception. Unlike the 2227B, the 2228B also supports a variety of synchronous protocols.

1.3 INSTALLATION

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

1.4 MODEM CONSIDERATIONS

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.

1.4.1 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 103J Full duplex — up to 300 baud (replaces 103A)
- Bell 202C Half duplex — up to 1200 baud
- Bell 202S Half duplex — up to 1200 baud (replaces 202C)
- Bell 212A Full duplex — 0-300 and 1200 baud.

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

NOTE:

Ensure modem compatibility with the host computer before ordering.

1.4.2 Using a Null Modem (2227N)

If a Wang system is to be used as a terminal to another computer located in the same building within 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.

CHAPTER 2 CONFIGURATION GENERATION

2.1 GENERAL OPERATION

The Asynchronous diskette contains two emulators. To gain access to all the emulators, a "front-end" parameter selection module has been added. The function of this module is to:

1. Choose an Emulation (Teletype or 2741).
2. Specify User Parameters.
3. Save these Parameters in a disk file.
4. Allow the loading of an Emulator given a set of user-defined parameters (hereafter referred to as a "configuration").

Upon entry to the package, the user has the option of *loading* a configuration, or *generating* a configuration. If the user chooses to generate a new configuration, the user is prompted for a choice of emulators, followed by a series of questions unique to the given emulator. These responses are then *saved* on disk under a user-prescribed description and control is returned to the beginning of the program. From here, the user may generate another configuration or load the configuration just defined (displayed in a menu under the user-prescribed description).

The question and answer procedure is unique yet provides easy display and operator flexibility. All questions are performed on one or two screens allowing both forward and backward "walking" through the questions.

To run the system:

1. Place the program diskette in the fixed drive 310.
2. Key CLEAR (EXEC)
3. Key SELECT DISK 310 (EXEC)

if on a Wang 2200, WCS, or PCS II:

4. Key LOAD DC F "START" (EXEC)
5. Key RUN (EXEC)

or if on a system 2200VP or 2200MVP

4. Key LOAD RUN (EXEC).

The CRT will blank and a menu will appear.

display

```
WANG 2200 TELECOMMUNICATIONS EMULATORS      (date)
TO OPERATE — Press S.F. KEY or DIGIT corresponding to name, or
position # via RETURN or BACKSPACE and key RUN, DELETE or RECALL
```

```
# '1 CREATE A NEW CONFIGURATION
```

At this time the user must *create a configuration* to be saved on disk. This procedure involves the specification of parameters unique to his system. To CREATE A NEW CONFIGURATION key RUN or SF'1.

2.1.1. Emulator Selection

The CRT will blank and a menu will appear. (Note: On mini-diskette versions this menu will vary depending on which diskette is loaded. If only one emulator exists on that diskette, the screen will automatically proceed to the next step).

display

WHAT EMULATION?

TO OPERATE — Press S.F. KEY or DIGIT corresponding to name, or position # via RETURN, SPACE or BACKSPACE and key RUN

'1 for Teletype

'2 for 2741

The user then chooses the desired emulator by pressing the appropriate Special Function key. The corresponding set of questions are then loaded and presented to the user in the following format:

display

| PARAMETER | CURRENT SELECTION |
|--|------------------------------|
| # (Question #1) | (selected option from below) |
| (Question #2) | (selected option from below) |
| —etc.— | —etc.— |
| OPTIONS FOR — (Selected Question) | ACTIVE KEYS |
| 1 (description 1) | — DIGITS — |
| 2 (description 2) | — RETURN — |
| 3 (description 3) | — BACKSPACE — |
| —etc.— | — RECALL — |
| | — RUN — |

2.1.2 Parameter Selection

The # is always located to the left of the selected question. It is moved using the RETURN or BACKSPACE key. The options for the selected question are displayed in the lower left corner of the screen. An option is chosen for the current question by keying the appropriate DIGIT for the option. When keyed, the current selection field to the left of the question will change to the corresponding description. By "walking" through the questions and making the desired selections a configuration is generated. When all parameters are as desired, the RUN Key is pressed and control proceeds to the next screen. Note that the RUN key is only active when the first Question is selected. This forces the user to answer all questions, necessary because some questions are optional depending on the selection of previous replies. The following keys allow easy selection of the parameters:

- DIGITS – Allow selection from one option to another within a given question.
- RETURN – Advances to the next logical question. (Note that some questions are only asked based on previous replies).
- BACKSPACE – Backspaces to the previous question.
- RECALL('15) – Resets all the selections to their initial setting. This is especially useful when in RECALL mode.
- RUN – Active only when positioned at the first question, it is used when all the desired selections shown are correct. The prompting then proceeds to the next set of questions or the SAVE/RUN phase.

2.1.3 Saving a Configuration

The selection of parameters may take one or two screens, depending on the emulator chosen. After the RUN key is pressed on the *last* parameter screen, the user is prompted for saving or loading the configuration.

display

```
SAVE IT OR RUN?  
TO RUN PRESS S.F. KEY OR DIGIT CORRESPONDING TO NAME OR  
POSITION VIA RETURN AND BACKSPACE AND KEY RUN  
# '1 FOR RUN CREATED VERSION  
'2 FOR SAVE CREATED VERSION
```

The following keys are then active:

- '0 to abort and return to 'START'
- '1 to proceed to the loading of the specified emulator and parameters. The configuration is not saved on disk for later loading.
- '2 to save the parameters on disk for later loading. The user is prompted for a description which is later displayed on the main menu.

display

SAVE THE PARAMETERS YOU HAVE GENERATED
EXISTING CALLS —

'2 FOR (user described calling sequences)
•
'n

THESE PARAMETERS

Emulator Type = (emulator name)
Input Capability = (input module description)
Output Capability = (output module description)
Key 1-40 byte1.....2.....3.....4
DESCRIPTION =? (prompt for user description)

Respond with desired description or SF '0 to abort configuration and return to main menu. Duplicate names are allowed since all configurations are positional and referenced by number.

2.1.4 Loading a Configuration

Once the user types a 40-byte description and keys RETURN, the main menu reappears.

display

WANG 2200 TELECOMMUNICATIONS EMULATORS Release 4.0. 4/07/78
TO OPERATE — Press S.F. KEY or DIGIT corresponding to name, or
position # via RETURN or BACKSPACE and key RUN, DELETE or RECALL

'1 CREATE A NEW CONFIGURATION
'2 LOAD user defined configuration
'3 LOAD another user defined configuration

To begin emulation using one of the above configurations the user keys function key 2 through n. The emulator is then loaded in and the emulation begins. Refer to the sections entitled "Operation of the Emulators" for operating instructions for a particular emulator. In the loading process, the parameters selected at configuration time will be displayed.

2.1.5 Other Functions

From the main menu, other special functions to maintain configurations may be performed. They include:

- Deletion — a configuration may be deleted by positioning # to a desired configuration (using the SPACE, RETURN or BACKSPACE Key) and keying SF'9 (DELETE). The configuration is then deleted from both the menu and disk. Keying '9 from the first position will force the loading of the 9th configuration (if defined).
- Recall — a configuration may be modified by keying SF'15 (RECALL) followed by the numeric key corresponding to the configuration to be modified. The parameters are then loaded and the parameter selection screen appears. When the parameters are changed, key RUN just as when creating a new configuration. The RUN/SAVE screen will appear. Specify SAVE and type a user description. It may be the same name or different. The old configuration is *not replaced* but *added*. To replace, simply delete the old configuration. (Note: duplicate names are allowed.)

- Clear — all existing configurations may be deleted by keying RESET and SF'31. When RUN is again keyed, all configurations are deleted.
- Setting CRT Length — the default CRT length is 64. If 80 column is desired, a modification to the START module is required. In the module START on line 12, change L = 64 to L = 80. L is a common variable and referenced by all the emulators; therefore, it need only be changed once in the start module.

2.2 TELETYPE CONFIGURATION OPTIONS

When Teletype emulation is selected for configuration from WHAT EMULATION?, the following parameters may be selected:

| PARAMETER | SELECTIONS |
|--|--|
| ?1 BAUD RATE | 1 = 110 2 = 150 3 = 300 4 = 1200 5 = 7200 (null-modem) |
| ?2 PARITY | 1 = Even 2 = Odd 3 = None |
| ?3 BITS PER CHARACTER | 1 = 7 2 = 8 |
| ?4 STOP BITS | 1 = 1 2 = 1.5 3 = 2 |
| ?5 MODEM OPERATION | 1 = Full Duplex 2 = Half Duplex |
| ?6 (HOST ECHO EACH CHARACTER) — asked if ?5 = 1, Full Duplex) | 1 = No 2 = Yes |

When RUN is keyed, a second screen will prompt for:

| PARAMETER | SELECTIONS |
|---|--|
| ?1 SEND FROM | 1 = Keyboard only 2 = Disk |
| ?2 (HOST REPLIES WITH) — asked if ?1 greater than 1 | 1 = LF 2 = LF — other 3 = Nothing |
| ?3 RECEIVE TO | 1 = CRT/line printer 2 = Disk, Dedicated 3 = Disk, Multiplexed |
| ?4 (DISK ACCESS METHOD) — asked if disk is specified | 1 = via Search, System over 8K 2 = via On Error, System to 8K |

Meanings of Teletype Parameters:

| | |
|---------------------------------|---|
| Baud Rate | Select the desired baud rate. This is a function of the other device which is being communicated with and the modem being used. |
| Parity | Indicates whether a parity bit is included in each character sent and whether it is odd or even parity. |
| Bits per Character Stop bits | Indicates the number of <i>data</i> bits excluding the start, stop and parity bits. A stop bit is used to terminate a character. Normally 1 stop bit is used (i.e., a termination level for a time interval equal to one bit). Optionally, the stop bit may be longer as 1.5 or 2 (twice) the normal interval. |
| Modem Operates | Normally full duplex is used for 300 bps and half duplex for 1200 bps. It is, however, a function of the modem and the receiving device. |
| Host Echo Each Character | If in full duplex, some host will echo each character sent. If this is done, specify Yes (#2). |
| Send From | If sending from disk is required, specify #2, which allows both keyboard and disk. If no disk send is required, specify #1. |
| Host Replies With | When sending from disk, the emulator waits between records before sending the next record. If the host does not reply to a record (terminated by a CR), specify #3. If reply is with 1 character, specify #1; if more than one character, specify #2. |
| Receive to | If disk receive is not required, specify #1. If disk receive is to be active, select #2 or #3, depending on the configuration being used. On an MVP or multiplexed disk configuration, use #3, else #2. |
| Disk Access Method | If disk is specified, the emulator takes over 8K of memory. To reduce this to 8K, the on error method may be used, which will terminate on an error if a file name is not found. Normally, #1 is selected. |

2.3. 2741 CONFIGURATION OPTIONS

When 2741 is selected, the following parameters are selectable:

| PARAMETER | SELECTIONS |
|---|--|
| ?1 CODE SET TO BE USED | 1 = Correspondence 2 = BCD 3 = EBCDIC |
| ?2 TRANSMISSION RATE | 1 = 134.5 Baud 2 = 300 Baud 3 = 1200 Baud 4 = 7200 (null-modem) |
| ?3 SEND FROM | 1 = Keyboard only 2 = Disk |
| ?4 RECEIVE TO | 1 = CRT/line printer 2 = Disk, Dedicated 3 = Disk, Multiplexed |
| ?5 (DISK ACCESS METHOD) — asked if disk is specified | 1 = via Search System over 8K 2 = via On Error, System to 8K |

Meanings of 2741 Parameters:

| | |
|---------------------|--|
| Code set to be used | Different networks use different character sets. Choose Correspondence, BCD, or EBCDIC. |
| Transmission Rate | Select the desired baud rate, which is determined by the modem and receiving device. |
| Send From | If sending from disk is required, specify #2, which allows both keyboard and disk send. If no disk send is required, choose #1. |
| Receive to | 1 = CRT/line printer 2 = Disk, Dedicated 3 = Disk, Multiplexed |
| Disk Access Method | 1 = via Search, System over 8K 2 = via On Error, System to 8K |
| Disk Access Method | If disk is specified, the emulator takes over 8K of memory. To reduce this to 8K, the on error method may be used, which will terminate on an error if a file name is not found. Normally, #1 is selected. |

CHAPTER 3 OPERATING THE TELETYPE AND 2741 EMULATORS

3.1 PERIPHERAL CONSIDERATIONS

Before going online to transmit and/or receive data via a Wang system equipped with the Model 2228B or Model 2227B communications controller and the emulator programs, 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 the configuration already generated to satisfy the above needs?

3.2 DATA CONSIDERATIONS

Each emulation program provides the capability to:

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

NOTE:

The emulation package emulates a teletype or 2741 protocol in that each character keyed is immediately transmitted. There is no provision for line buffering of keyboard inputted data.

The nature of the teletype and 2741 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 emulator 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. The emulator needs this information only when sending from disk in order to know when to send the next record.

As previously mentioned, data may be transmitted from a storage device 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. In this way minimum storage area is used.

3.3 THE CONTROL KEYS

The system is loaded when a menu of control keys is displayed. These keys vary based on the emulator running and the options selected. The definitions of the common control keys follow. Any control keys unique to teletype or 2741 are explained separately.

- '0 — This key recalls the main menu display. 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, open file, etc.). The key is inactive while data is being received and/or while batch data is being sent from storage. This key is active only if disk receive was selected at configuration time.
- '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. This key is active only if disk send was selected at configuration time.
- '3 — This key activates/deactivates the printer for printed output of received data. The key is inactive during batch transmission of data.
- '4 — This key activates/deactivates the storage of received data on the storage device. If active, all data received will be output to the disk. The key is inactive during receive or batch send operations and should therefore be activated prior to the reception of data to be stored. This key is active only if disk receive was specified at configuration time.

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 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. This key is active only if disk receive was specified at configuration time.

NOTE:

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

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, a 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, or HASP.

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 or 2741 protocol. It 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 emulation program does not in any way attempt to isolate re-transmission requests from the host computer.

The following control keys are unique to *Teletype* emulation:

- '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 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 by keying '15 and then a capital alpha character A through Z as a control character. 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. A list of control characters are listed in Appendix A.

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."

The following control keys are unique to 2741 Emulation.

- '6 — DISPLAY AND SET TAB STOPS. This key places the user in a mode allowing the setting of tab stops. A sample terminal line is displayed with a "." designating a character position and a "T" in a tab stop position. The SPACE and BACKSPACE key allow positioning within the record. A new tab stop is inserted by pressing a "T" and deleted by pressing LINE ERASE. When the desired tab stops are set, key RETURN. The user is asked if these are to be saved as defaults. If "Y" is specified, the settings are saved on disk for future runs of the emulator. If "N" is specified, the values are good only for the duration of *this* emulation.
- '12 — The TAB key. Used to generate a tab character. Note that when keyed, the cursor doesn't tab over. The tab stops are only referenced on received tab characters.
- '13 — The UPSHIFT key. Upshift key generates an upshift character by transmitting a HEX 'OE'.
- '14 — The DOWNSHIFT key. Downshift key generates a downshift character by transmitting a HEX 'OF'.
- '15 — The BREAK key. This key activates the break signal for normal operations. The key is inactive only during batch transmission of data since here it would have no significant meaning.

3.4 KEYBOARD ENTERED DATA

Once a line connection is established and the proper parameter settings have been selected, the program is acting as a teletype or 2741. 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: "←"

3.5 TRANSMISSION/RECEPTION CONSIDERATIONS

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

- Ensure that the correct BAUD rate has been selected for compatibility with the host computer.
- Ensure that the correct parity, number of start and data bits and echoing parameters have been set if using Teletype.
- Ensure that the correct character code has been selected if using 2741.
- If received data from the host computer is to be stored, insure that the proper storage media 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), keep in mind that the data will be read/written in the standard Wang telecommunications format as described below and in Appendix B:

- The storage/read array is an alphanumeric dimensioned (4)62. For example — I\$(4)62.
- Byte one (1) of the storage array has the following meaning.
 - HEX(00) = Not last sector/block of file.
 - HEX(F0) = 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 "1111" and "222," a hexprint of the storage array would reveal the following:

FOOD0531313131310332323220202020202020.....

Where,

- FO = last sector of record
- OD = 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 "1111."
- 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 specified in byte two of the storage buffer) have been exhausted.

Subroutines for reading, writing and listing files in TC file format are provided in the TC Support Utilities Package (Rel. 2.0).

3.6 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. 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).

APPENDIX A
TELETYPE CONTROL KEYS

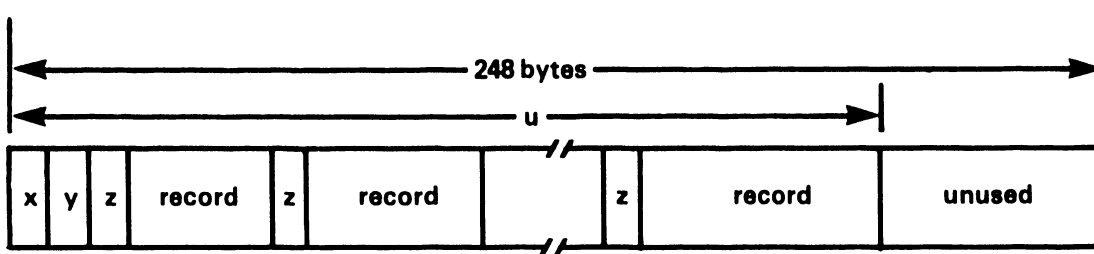
| HEX | CONTROL | KEY |
|-----|-------------------------|---|
| 01 | SOH start of header | '15 FOLLOWED BY "A" |
| 02 | STX start of text | '15 FOLLOWED BY "B" |
| 03 | ETX end of text | '15 FOLLOWED BY "C" |
| 04 | EOT end of transmission | '15 FOLLOWED BY "D" |
| 05 | ENQ inquiry | '15 FOLLOWED BY "E" |
| 06 | ACK acknowledgement | '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(" |

NOTE: The effect of the control key is to turn off the second bit (HEX '40) of the following character.

APPENDIX B THE TC FILE FORMAT

The "telecommunications (TC) file format" for disk data files is defined as follows:

1. Records are packed into a one-dimensional alphanumeric array having four elements, each 62 bytes long, e.g., DIM A\$(4)62. The array is saved into a single sector by using the DATA SAVE DC or DATA SAVE DA statements.
2. In packing the TC records into the array, element boundaries are ignored; the array is treated as if it were simply 248 contiguous bytes of storage.
3. Within the 248 bytes of storage, three types of control bytes are used (see x, y and z in the following diagram).



- x = a one-byte hexadecimal code indicating whether the sector is or is not the last sector in the file; in particular x = HEX(F0) denotes "is the last sector", x = HEX(00) denotes "not the last sector."
- y = a one-byte hexadecimal value denoting "the number of used bytes plus one" in the array. For example, in the diagram, y is the hexadecimal equivalent of $u + 1$.
- z = a one-byte hexadecimal value preceding each record to denote "the record length in bytes". For example, if the record contains 39 bytes, $z = \text{HEX}(27)$ since $(27)_{16} = (39)_{10}$.
- record = one complete record with trailing spaces truncated (except in the first record) — individual records do not overlap from one 248-byte array to the next.

Data Entry 1's SAVE or SAVE N command does not truncate trailing spaces in the first record of a file. Thus, the length of the first record is always 80 or 128 bytes.

**BINARY SYNCHRONOUS I
(BSC I)
TELECOMMUNICATIONS
PACKAGE
OPERATOR'S MANUAL
(INTERIM)**

**2780
3780
3741
HASP
2200-2200**

**©Wang Laboratories, Inc.
May 8, 1978**



LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 851-4111. TWX 710 343-6769. TELEX 94-7421

5. BINARY SYNCHRONOUS 1 PACKAGE

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CHAPTER 1 INTRODUCTION

The Binary Synchronous I (BSCI) Package is designed to give the user a flexible package for synchronous communications. Enclosed in the package are four (4) emulators:

IBM 2780/3780 Emulation
IBM 3741 Emulation
HASP Multileaving Emulation
2200 to 2200 Communications

The package has been combined to allow any user to easily configure the package to fit his unique communications requirements. Unlike previous TC packages, there is no lengthy SYSGEN process. Instead, the user "configures" a system by answering a series of questions. The answers are then saved on disk under a user-specified description. The package then allows the selective loading of one to twelve user-defined configurations. Therefore, on one diskette, there may reside a number of configurations for any of the above emulators.

Since each emulator is unique yet is contained in the same parameter selection scheme, this manual attempts to provide general discussion first, followed by detailed discussion for each emulation.

To accommodate mini-diskettes, a separate package has been developed which is similar in operation, but does not have all four emulators on a single disk. This BSCI package (#195-2057-8) is comprised of three mini-diskettes. The emulators are split as follows:

- diskette 1 - 2780/3780
- diskette 2 - 3741
- diskette 3 - HASP and 2200-2200

The only difference in operation is when selecting which emulation during configuration. At that time, either two or no choices are presented.

CHAPTER 2 CONFIGURATION GENERATION

2.1 GENERAL OPERATION

The BSCI diskette contains four emulators. To gain access to all the emulators, a "front-end" parameter selection module has been added. The function of this module is to:

1. Choose an Emulation (2780, 3780, 3741, HASP or 2200-2200).
2. Specify User Parameters.
3. Save these Parameters in a disk file.
4. Allow the loading of an Emulator given a set of user-defined parameters (hereafter referred to as a "configuration").

Upon entry to the package, the user has the option of *loading* a configuration, or *generating* a configuration. If the user chooses to generate a new configuration, the user is prompted for a choice of emulators, followed by a series of questions unique to the given emulator. These responses are then *saved* on disk under a user-prescribed description and control is returned to the beginning of the program. From here, the user may generate another configuration or load the configuration just defined (displayed in a menu under the user-prescribed description).

The question and answer procedure is unique yet provides easy display and operator flexibility. All questions are performed on one or two screens allowing both forward and backward "walking" through the questions.

To run the system:

1. Place the program diskette in the fixed drive 310.
2. Key CLEAR (EXEC)
3. Key SELECT DISK 310 (EXEC)

if on a Wang 2200, WCS, or PCS II:

4. Key LOAD DC F "START" (EXEC)
5. Key RUN (EXEC)

or if on a system 2200VP or 2200MVP

4. Key LOAD RUN (EXEC).

The CRT will blank and a menu will appear.

display

```
WANG 2200 TELECOMMUNICATIONS EMULATORS          (date)
TO OPERATE — Press S.F. KEY or DIGIT corresponding to name, or
position # via RETURN or BACKSPACE and key RUN, DELETE Or RECALL
# '1 CREATE A NEW CONFIGURATION
```

At this time the user must *create a configuration* to be saved on disk. This procedure involves the specification of parameters unique to his system. To CREATE A NEW CONFIGURATION key RUN Or SF'1.

2.1.1 Emulator Selection

The CRT will blank and a menu will appear. (Note: On mini-diskette versions this menu will vary depending on which diskette is loaded. If only one emulator exists on that diskette, the screen will automatically proceed to the next step).

display

WHAT EMULATION?

TO OPERATE— Press S.F. KEY or DIGIT corresponding to name, or position # via RETURN, SPACE or BACKSPACE and key RUN

'1 for Multi-leaving Hasp

'2 for IBM 2780

'3 for IBM 3780

'4 for IBM 3741

'5 for 2200 to 2200

The user then chooses the desired emulator by pressing the appropriate Special Function key. The corresponding set of questions are then loaded and presented to the user in the following format:

display

PARAMETER

#(Question #1)

(Question #2)

— etc. —

OPTIONS FOR — (Selected Question)

1 (description 1)

2 (description 2)

3 (description 3)

— etc. —

CURRENT SELECTION

(selected option from below)

(selected option from below)

— etc. —

ACTIVE KEYS

— DIGITS —

— RETURN —

— BACKSPACE —

— RECALL —

— RUN —

2.1.2 Parameter Selection

The # is always located to the left of the selected question. It is moved using the RETURN or BACKSPACE key. The options for the selected question are displayed in the lower left corner of the screen. An option is chosen for the current question by keying the appropriate DIGIT for the option. When keyed, the current selection field to the left of the question will change to the corresponding description. By "walking" through the questions and making the desired selections a configuration is generated. When all parameters are as desired, the RUN Key is press and control proceeds to the next screen. Note that the RUN key is only active when the first Question is selected. This forces the user to answer all questions, necessary because some questions are optional depending on the selection of previous replies. The following keys allow easy selection of the parameters:

- | | |
|---------------|--|
| DIGITS — | Allow selection from one option to another within a given question. |
| RETURN — | Advances to the next logical question. (Note that some questions are only asked based on previous replies.) |
| BACKSPACE — | Backspaces to the previous question. |
| RECALL('15) — | Resets all the selections to their initial setting. This is especially useful when in RECALL mode. |
| RUN- | Active only when positioned at the first question, it is used when all the desired selections shown are correct. The prompting then proceeds to the next set of questions or the SAVE/RUN phase. |

2.1.3 Saving a Configuration

The selection of parameters may take one or two screens, depending on the emulator chosen. After the RUN key is pressed on the *last* parameter screen, the user is prompted for saving or loading the configuration.

display

SAVE IT OR RUN?
TO RUN PRESS S.F. KEY OR DIGIT CORRESPONDING TO NAME OR POSITION VIA RETURN
AND BACKSPACE AND KEY RUN

'1 FOR RUN CREATED VERSION
'2 FOR SAVE CREATED VERSION

The following keys are then active:

- '0 to abort and return to 'START'
- '1 to proceed to the loading of the specified emulator and parameters. The configuration is not saved on disk for later loading.
- '2 to save the parameters on disk for later loading. The user is prompted for a description which is later displayed on the main menu.

display

SAVE THE PARAMETERS YOU HAVE GENERATED
EXISTING CALLS —

'2 FOR (user described calling sequences)
•
'n

THESE PARAMETERS

Emulator Type = (emulator name)
Input Capability = (input module description)
Output Capability = (output module description)
Key 1-40 byte1.....2.....3.....4
DESCRIPTION = ? (prompt for user description)

Respond with desired description or SF '0 to abort configuration and return to main menu. Duplicate names are allowed since all configurations are positional and referenced by number.

2.1.4 Loading a Configuration

Once the user types a 40-byte description and keys RETURN, the main menu reappears.

display

```
WANG 2200 TELECOMMUNICATIONS EMULATORS  Release 4.0.  4/07/78
TO OPERATE — Press S.F. KEY or DIGIT corresponding to name, or
position # via RETURN or BACKSPACE and key RUN, DELETE or RECALL.
```

- # '1 CREATE A NEW CONFIGURATION
- '2 LOAD user defined configuration
- '3 LOAD another user defined configuration

To begin emulation using one of the above configurations the user keys function key 2 through n. The emulator is then loaded in and the emulation begins. Refer to the sections entitled "Operation of the Emulators" for operating instructions for a particular emulator. In the loading process, the parameters selected at configuration time will be displayed.

2.1.5 Other Functions

From the main menu, other special functions to maintain configurations may be performed. They include:

- Deletion — a configuration may be deleted by positioning # to a desired configuration (using the SPACE, RETURN or BACKSPACE Key) and keying SF'9 (DELETE). The configuration is then deleted from both the menu and disk. Keying '9 from the first position will force the loading of the 9th configuration (if defined).
- Recall — a configuration may be modified by keying SF'15 (RECALL) followed by the numeric key corresponding to the configuration to be modified. The parameters are then loaded and the parameter selection screen appears. When the parameters are changed, key RUN just as when creating a new configuration. The RUN/SAVE screen will appear. Specify SAVE and type a user description. It may be the same name or different. The old configuration is *not replaced* but *added*. To replace, simply delete the old configuration. (Note: duplicate names are allowed).
- Clear — all existing configurations may be deleted by keying RESET and SF'31. When RUN is again keyed, all configurations are deleted.
- Setting CRT length — the default CRT length is 64. If 80 column is desired, a modification to the START module is required. In the module START on line 12, change L = 64 to L = 80. L is a common variable and referenced by all the emulators; therefore, it need only be changed once in the start module.

2.2 CONFIGURATION OPTIONS FOR 2780

For 2780 Emulation, the following questions will be prompted for after selection of 2780 in WHAT EMULATION?

| PARAMETER | SELECTIONS |
|--------------------------|---|
| ?1 MODEM TYPE | 1 = Synchronous 2000-4800 2 = 2400 BPS Null - Modem 3 = 4800 BPS Null - Modem |
| ?2 MODEM OPERATES | 1 = Dial up line 2 = Leased line |
| ?3 RECORD BLOCKING | 1 = Multi-record 2 = Single record |
| ?4 RECEIVE TRANSPARENCY? | 1 = To disk in ASCII 2 = To disk w/o translation |

On a second screen, the following questions will be asked:

| | |
|--|--|
| ?3 (DISK ACCESS METHOD) asked if disk is specified | 1 = via Search, System over 8K 2 = via On Error, System to 8K |
| ?4 (RECEIVE DISK) asked if ?2 response is disk. and if ?3 response is 1. | 1 = Dedicated 2 = Shared |

Explanation of 2780 Options

| | |
|----------------------|--|
| Modem Type | Normally, #1 will be selected for use on modems between 2000 bps and 4800 bps. When using a Wang null modem an internal baud rate must be selected as 2400 bps or 4800 bps (#2 or #3). |
| Modem Operates | If a dial-up line is being used select #1, else choose #2. |
| Record Blocking | Depending on the other device being communicated with, single or multiple records per block may be chosen. It is imperative that it be set correctly or blocks may be rejected on send or receive. |
| Receive Transparency | When transparent data is received, it is optionally translated to ASCII from line code (EBCDIC) by choosing #1. If #2 is chosen, the EBCDIC line code will be placed on disk. NOTE: Transparency to the printer is routed to the printer in HEX. |
| Send From | The send device may be <i>either</i> disk or card reader. |
| Receive To | There are two receive streams; print (including console messages) and punch. Print and punch may go to the printer (#1) or to disk (#3). Normally #2 is chosen allowing print streams to the printer, and punch streams to disk in TC file format. If both streams go to disk (#3) the print is spooled to disk by placing the printer control byte as the first character of each record. Spooled print files may be printed offline using a utility found in the TC Support Utilities, Rel. 2.0. |
| Disk Access Method | Normal operation uses the search method (#1). To run the emulator in under 8K of memory, the On Error method (#2) may be chosen. This method does not validate file names on send and will not automatically open consecutive receive files. NOTE: This Question is only asked if disk is specified. |
| Receive Disk | When a disk file is opened for receive, space is allocated for the remainder of the disk surface selected. This locks out other users trying to use that disk surface (on an MVP or multiplexed disk). When #2 is selected, only 500 sectors are allocated for receive leaving the remainder for other users. This limits the receive file size, however, to 500 sectors. Asked only where applicable. |

2.3 CONFIGURATION OPTIONS FOR 3780

For 3780 Emulation, the following questions will be prompted for after selection of 3780.

| PARAMETER | SELECTIONS |
|--|---|
| ?1 MODEM TYPE | 1 = Synchronous 2000-4800 2 = 2400 BPS Null – Modem 3 = 4800 BPS Null – Modem |
| ?2 MODEM OPERATES | 1 = Dial up line 2 = Leased line |
| ?3 RECORD BLOCKING | 1 = Multi-record 2 = Single record |
| ?4 RECEIVE TRANSPARENCY? | 1 = To disk in ASCII 2 = To disk w/o translation |
| ?5 RECEIVED DATA | 1 = Space Compressed 2 = Horizontal Tabs |
| ?6 (TRANSMITTED DATA) asked if ?5 response = 1. | 1 = Compressed 2 = As Is |

A second screen will prompt for the following questions:

Input/Output Modules

| | |
|--|---|
| ?1 SEND FROM | 1 = Disk 2 = Card Reader |
| ?2 RECEIVE TO | 1 = All streams to printer 2 = Printer and disk 3 = All streams to disk |
| ?3 (DISK ACCESS METHOD) asked if disk specified | 1 = via Search, system over 8K 2 = via On Error, system to 8K |
| ?4 (RECEIVE DISK) asked if ?2 response is disk. and if ?3 response is 1. | 1 = Dedicated 2 = Shared |

Explanation of 3780 Options

| | |
|----------------------|--|
| Modem Type | Normally, #1 will be selected for use on modems between 2000 bps and 4800 bps. When using a Wang null modem, an internal baud rate must be selected as 2400 bps or 4800 bps (#2 or #3). |
| Modem Operates | If a dial-up line is being used select #1, else choose #2. |
| Record Blocking | Depending on the other device being communicated with, single or multiple records per block may be chosen. It is imperative that it be set correctly or blocks may be rejected on send or receive. |
| Receive Transparency | When transparent data is received, it is optionally translated to ASCII from line code (EBCDIC) by choosing #1. If #2 is chosen, the EBCDIC line code will be placed on disk. NOTE: Transparency to the printer is routed to the printer in HEX. |
| Receive Data | Normally, a 3780 has space compression which eliminates blanks (#1). Optionally, this feature may be overridden and compression using horizontal tabs may be specified (#2). |

| | |
|--------------------|---|
| Transmitted Data | Transmitted data may be sent with (#1) or without (#2) space compression. |
| Send From | The send device may be <i>either</i> disk or card reader. |
| Receive To | For 3780, only one data stream exists, print. It may be routed to the printer (#1) or to disk (#3). The selection of #2 will result in streams being routed to the printer. When #3 is selected the print is spooled to disk by placing the printer control byte as the first character of each record. Spooled print files may be printed offline using a utility found in the TC Support Utilities, Rel. 2.0. |
| Disk Access Method | Normal operation uses the search method (#1). To run the emulator in under 8K of memory, the On Error method (#2) may be chosen. This method does not validate file names on send and will not automatically open consecutive receive files. NOTE: This Question is only asked if disk is specified. |
| Receive Disk | When a disk file is opened for receive, space is allocated for the remainder of the disk surface selected. This locks out other users trying to use that disk surface (on an MVP or multiplexed disk). When #2 is selected, only 500 sectors are allocated for receive leaving the remainder for other users. This limits the receive file size, however, to 500 sectors. Asked only where applicable. |

2.4 CONFIGURATION OPTIONS FOR 3741

When 3741 is chosen in reply to WHAT EMULATION?, the following questions will be prompted for:

| PARAMETER | SELECTIONS |
|--|---|
| ?1 MODEM TYPE | 1 = Synchronous 2000-4800 2 = 2400 BPS Null — Modem 3 = 4800 BPS Null — Modem |
| ?2 MODEM OPERATES | 1 = Dial up line 2 = Leased line |
| ?3 RECORD BLOCKING | 1 = Multi-record 2 = Single record |
| ?4 TERMINAL I.D.? | 1 = No 2 = Yes |
| ?5 (1-4 CHARACTER I.D.) asked only if ?4 response = 2 | respond with alpha/numeric characters |

A second screen will prompt for the following questions:

Input/Output Modules

| | |
|--|---|
| ?1 SEND FROM | 1 = Disk 2 = Card Reader |
| ?2 RECEIVE TO | 1 = All streams to printer 2 = Printer and disk 3 = All streams to disk |
| ?3 (DISK ACCESS METHOD) asked if disk specified | 1 = via Search, system over 8K 2 = via On Error, system to 8K |
| ?4 (RECEIVE DISK) asked if ?2 response is disk. and if ?3 response is 1. | 1 = Dedicated 2 = Shared |

Explanation of 3741 Options

| | |
|--------------------|---|
| Modem Type | Normally, #1 will be selected for use on modems between 2000 bps and 4800 bps. When using a Wang null modem, an internal baud rate must be selected as 2400 bps or 4800 bps (#2 or #3). |
| Modem Operates | If a dial-up line is being used select #1, else choose #2. |
| Record Blocking | Depending on the other device being communicated with, single or multiple records per block may be chosen. It is imperative that it be set correctly or blocks may be rejected on send or receive. |
| Terminal ID | This is an optional feature on a 3741 which imbeds a 1-4 character terminal ID at the start of a message. If desired #2 should be selected. NOTE: This is <i>not</i> a terminal ID to be used as an address on a multi-point line. |
| Send From | The send device may be <i>either</i> disk or card reader. |
| Receive To | There are two receive streams; print (including console messages) and punch. Print and punch may go to the printer (#1) or two disk (#3). Normally #2 is chosen allowing print streams to the printer, and punch streams to disk in TC file format. If both streams go to disk (#3) the print is spooled to disk by placing the printer control byte as the first character of each record. Spooled print files may be printed offline using a utility found in the TC Support Utilities, Rel. 2.0. |
| Disk Access Method | Normal operation uses the search method (#1). To run the emulator in under 8K of memory, the On Error method (#2) may be chosen. This method does not validate file names on send and will not automatically open consecutive receive files. NOTE: This Question is only asked if disk is specified. |
| Receive Disk | When a disk file is opened for receive, space is allocated for the remainder of the disk surface selected. This locks out other users trying to use that disk surface (on an MVP or multiplexed disk). When #2 is selected, only 500 sectors are allocated for receive leaving the remainder for other users. This limits the receive file size, however, to 500 sectors. Asked only where applicable. |

2.5 CONFIGURATION OPTIONS FOR HASP MULTILEAVING

When HASP is selected, the following questions are asked:

| PARAMETER | POSSIBLE SELECTIONS |
|----------------------|--|
| ?1 INPUT DEVICE | 1. Disk 2. Card Reader |
| ?2 TRANSPARENT SEND? | 1. Send as is 2. Translate to EBCDIC before send. |
| ?3 PRINT STREAMS TO | 1. Printer 2. Disk (spooled) |
| ?4 PUNCH STREAMS TO | 1. None 2. Disk in ASCII. 3. Disk w/o translation. |

where selections and meanings are:

?2 TRANSPARENT SEND? 1. Send as is

Data streams are NOT translated by the 2200 or telecommunications controller.

?2 TRANSPARENT SEND? 2. Translate to EBCDIC before send

Data streams are translated by the telecommunications controller to EBCDIC.

?4 PUNCH STREAMS TO 3. Disk w/o translation.

Punch streams are NOT translated and are written to the receive disk surface in T.C format in the code received by the telecommunications controller.

?3 PRINT STREAMS TO 1. Printer

and ?4 PUNCH STREAMS TO 1. None

means printer output is routed to the line printer (215). The punch stream is inactive and the disk receive module is not loaded. This is the *only* configuration that will operate within a 16K 2200 configuration.

?3 PRINT STREAMS TO 2. Disk (spooled)

means punch streams are inactive while printer output is routed to the receive disk surface in T.C format with a vertical format control byte written preceding text data. These files may then later be listed with an off-line utility.

?4 PUNCH STREAMS TO 2. Disk in ASCII.

Punch streams are translated to ASCII and written to the receive disk surface in T.C format.

?4 PUNCH STREAMS TO 3. Disk w/o translation.

Punch streams are NOT translated and are written to the receive disk surface in T.C format in the code received by the telecommunications controller.

For a response of 2 to question C, or a response of 2 or 3 to question D, the disk receive module is loaded and prompt E given.

?5 MULTIPLEXED DISKS:

1. No opens receive files to the balance of the disk
2. Yes reserves a maximum of 500 sectors per file.

2.6 CONFIGURATION OPTIONS FOR 2200 TO 2200 OPERATION

The following two questions are asked when 2200 to 2200 is selected

| PARAMETER | SELECTIONS |
|-------------------|---|
| ?1 MODEM TYPE | 1 = Synchronous 2000-4800 2 = 2400 BPS Null - Modem 3 = 4800 BPS Null - Modem |
| ?2 MODEM OPERATES | 1 = Dial up line 2 = Leased line |

Explanation of Parameters:

Modem Type Normally, #1 will be selected for use on modems between 2000 bps and 4800 bps. When using a Wang null modem, an internal baud rate must be selected as 2400 pbs or 4800 bps. (#2 or #3)

Modem Operates If a dial-up line is being used select #1, else choose #2.

CHAPTER 3 OPERATION OF THE 2780, 3780, 3741 AND 2200-2200 EMULATORS

3.1 GENERAL OPERATION

Each emulation program provides two-way communications utilizing five modes of operation: CONTROL, BID, SEND, RECEIVE, and ATTENTION, as described in Table 3-1. A particular mode may be entered many times or not at all, depending upon operator input and the number of messages originating from the remote end of the line.

At any given time, only one mode of operation is in effect. For example, after loading, CONTROL mode is entered. The display shown in Figure 3-1 appears on the CRT, with the word CONTROL in the lower right corner under the mode label as follows:

— MODE —
CONTROL

Once in the CONTROL mode, the system waits indefinitely if no action occurs; however, when action occurs and the system enters another mode, the name of the current mode is displayed under the mode label in the lower right corner. Keep in mind that transmission (sending data or messages) is initiated by the operator, and reception is initiated by the remote end of the line — after a communications link has been established.

During each mode of operation, one or more currently active keyboard controls are displayed on the second line of the CRT. For example, during the CONTROL mode the first two lines of the CRT appear as follows:

ACTIVE KEYBOARD CONTROLS
'0 = CONTROL '1 = ATTN '2 = SEND '3 = SEND TRSP C/R = KYBD

The operator should be familiar with the action associated with each active control key, as described in Table 3-2.

Tables 3-1 and 3-2 should be studied carefully and kept readily available by anyone operating a communications program — until thoroughly familiar with a communications application. The active keyboard controls, as well as the action associated with each control, are device-independent for four of the five modes of operation (CONTROL, BID, SEND, AND RECEIVE); hence, Table 3-2 applies to any communications program, regardless of the particular I/O configuration specified for the configuration.

On the other hand, the active keyboard controls for the ATTENTION mode are device-dependent, as shown in Table 3-3. Keep in mind that the system enters the ATTENTION mode from the CONTROL mode only if the operator presses special function key I. However, there is no need to enter the ATTENTION mode until a prompt appears on the CRT indicating that a receive-device is not ready, or until the operator desires to adjust the paper in a printer via a special function key (if the printer is the designated output device), or desires to erase a disk file which is not automatically closed by the system.

3.2 INITIAL OPERATOR ACTION

Since data reception is controlled by the remote end of the line, the designated output device should be ready when the remote end begins to transmit data. For this reason, each emulation program automatically checks the device ready status of its designated output device. If the device is not ready, a message is displayed when the system first enters the CONTROL mode.

Generally speaking, unless an operator is certain that no data is to be received, the operator should ready the output device before establishing a connection with a host system or a terminal. In particular, if the output device is a printer which has been turned on and manually selected, no device ready status message appears; if not ready, the message PRINTER NOT READY appears. If the output device is a storage device (a disk), the message RECEIVE DISK FILE NOT OPENED appears. Normally, the operator should press S.F.'1 to activate the ATTENTION mode and then supply the device-related information described in Table 3-3. After the required information is furnished, the system automatically returns to the CONTROL mode.

Now, in accordance with prearranged and special procedures related to a particular application, the operator may establish a connection with a host computer or another terminal, or the operator may await a telephone call initiated by someone else. In either case, the operator should be familiar with the information in the next section.

3.3 DISPLAYS, PROMPTS AND STATUS MESSAGES

Prompts, as well as status and error messages, appear on the CRT during operation of any emulation program generated from Wang's utility package. The particular locations where specific types of information appear are shown schematically in Figure 3-1, using line numbers (1 through 13) to simplify the discussion which follows.

Some information is device-independent; other information is device-dependent. Some information is common to all modes of operation; other information is related only to specific modes of operation. For example, as discussed previously the active controls which appear on line 2 of the display are related to the current mode of operation as summarized in Tables 3-2 and 3-3. Five controls are active during the CONTROL mode, but only one is active during the BID, SEND, and RECEIVE modes. On the other hand, the number of active controls during the ATTENTION mode depends upon the designated output device. However, by observing the second line on the CRT, the operator knows immediately just which controls are currently active.

Line #:

```

1  ACTIVE KEYBOARD CONTROLS
2  (Currently active S.F. & other keys for control beyond input.)
3
4  (Send status messages. Prompts for receive-device info. Input indicator.)
5  (Prompts for send-device info. System action for receive. Input echo.)
6  (Error messages for send-file names.)
7  (Receive-device ready/not-ready status messages.)
8  (Automatic receive-file opening error messages.)
9  (Reception abort messages.)
10
11  — MODEM SIGNALS —      BLOCKS      BLOCKS
12  DTR DSR RTS CTS CAR    SENT        RECD      — MODE —
13  *  *  *  *  *          xxxx        yyyy      mmmmmmmm

```

Figure 3-1. Screen Layout During Emulation Program Operation

During all modes of operation, the labels shown as uppercase words in Figure 3-1 (see lines 1, 11 and 12) remain unchanged. Also lines 3 and 10 are always blank.

The current mode of operation is displayed in the lower right corner. In the figure, the name of the current mode is denoted by mmmmmmmm on line 13.

In addition to the current mode, other status information appears in the last line of the display. In the screen layout in the figure, asterisks are shown on line 13 under the five modem signal categories DTR, DSR, RTS, CTS, and CAR; however, an asterisk is not always present for each category. Two asterisks are usually present and the other three appear to be blinking on and off if data is currently being transmitted or received. The significance of each modem category is described in Table 3-4.

Table 3-1. Modes of Operation

| Mode | Description |
|------------------|---|
| CONTROL | The system automatically enters the CONTROL mode first. While in this mode, the system monitors the communications line and the keyboard — awaiting action from either the operator or the remote end of the line. When action occurs, the system branches to an appropriate location in the program and may enter another mode of operation. If no action occurs, the system remains in the CONTROL mode indefinitely. |
| BID | If the operator initiates data transmission by pressing S.F.'2 (SEND) or S.F.'3 (SEND TRSP) during the CONTROL mode, the system prompts the operator to supply input-device-related information shown in Table 3-6, and then enters the BID mode. In this mode, the system bids for control of the line by requesting permission to transmit a message, and continues to do so until one of the following occurs: <ul style="list-style-type: none">a) permission is granted by the remote end,b) 16 requests fail, orc) the operator aborts the mode via S.F.'0 (ABORT). If permission to transmit is granted, the system enters the SEND mode; otherwise, the system returns to the CONTROL mode. |
| SEND | After entering this mode following successful completion of the BID mode, the system transmits data (normally or transparently depending upon whether S.F.'2 or '3 initiated the action) and continues to do so until one of the following occurs: <ul style="list-style-type: none">a) all data is sent,b) an operator at either end of the line aborts the transmission, orc) transmission difficulties arise such as the line being disconnected. In any event, the system returns to the CONTROL mode. |
| RECEIVE | Only the remote end of the line can activate the RECEIVE mode. In this mode, the system collects data being sent from the remote end and outputs the data to the designated output device, continuing to do so until one of the following occurs: <ul style="list-style-type: none">a) an end-of-transmission code is received,b) an operator at either end of the line aborts the transmission, orc) transmission difficulties arise, such as the line being any event, the system returns to the CONTROL mode. (Note: If outputting to a printer which has insufficient paper, the system may remain in the RECEIVE mode.) |
| ATTENTION | If the operator presses S.F.'1 (ATTN) during the CONTROL mode, the system enters the ATTENTION mode and displays the device-related active controls shown in Table 3-3. Normally, an operator activates this mode only for one of the following reasons: <ul style="list-style-type: none">a) to form feed, vertical tab, or line feed a printer before additional output is received,b) to supply disk-related information, if a RECEIVE DISK FILE NOT OPENED prompt appears, orc) to erase a file, if the last file opened by the system is not automatically closed. After the operator supplies information in response to a set of prompts, or presses special function key 0, the system returns to the CONTROL mode. |

Table 3-2. Available Operator Controls During Each Mode of Operation

| Mode | Active Controls | Action |
|-----------|--------------------|--|
| CONTROL | S.F.'0 = CONTROL | Directs the system to remove any status and error messages remaining from the last SEND and RECEIVE modes. (Note: the number of blocks sent is not altered until the next SEND mode occurs, and the number of blocks received is not altered until the next RECEIVE mode occurs.) |
| | S.F.'1 = ATTN | Directs the system to enter the ATTENTION mode, thereby allowing the operator to ready the output device, or supply information via the new set of active controls shown in Table 3-3. (Note: The available controls during the ATTENTION mode are device-dependent and are determined by the designated output device for the communications program being used.) |
| | S.F.'2 = SEND | Directs the system to send data in EBCDIC character form – after first requesting operator-supplied, input-device-related information shown in Table 3-6, and successfully bidding for the line. |
| | S.F.'3 = SEND TRSP | Directs the system to send data transparently, i.e., to send data in binary form, using special control characters defined by the BSC protocol – otherwise, same as S.F.'2. |
| | C/R = KYBD | The RETURN(EXEC) key directs the system to accept a single record to be entered via the keyboard. (This option is useful for sending a sign-on message to the host computer or sending status requests such as \$DN to a HASP operating system.) As a visual aid, a 63-character position-indicator is displayed, and each entered character appears below the indicator; the backspace and line erase keys are active for editing the keyboard input. The RETURN(EXEC) key must be used again to signify the end-of-message and direct the system to begin transmission; no message is sent if the line is blank. |
| BID | none | |
| SEND | S.F.'0 = ABORT | Directs the system to terminate the transmission. However, before returning to the CONTROL mode, the system sends the last data block currently in memory and then signals the remote end that transmission is aborted. (Note: Abort procedures vary from host to host – one host may clear the transmission; another may attempt to execute a partial transmission. In the latter case, a "cancel job request," entered as a single record via the keyboard, may be required in addition to the abort signal.) |
| RECEIVE | S.F.'0 = ABORT | Directs the system to terminate reception. However before returning to the CONTROL mode, the system signals the remote end that an abort request has been made, and then follows the abort procedure used by the remote end. |
| ATTENTION | See Table 3-3. | (Note: During the ATTENTION mode, the available operator controls are device-dependent, depending upon the designated output device.) |

Table 3-3. Device-dependent Active Controls During the ATTENTION Mode

| Output Device | Active Controls | Action |
|-----------------------------------|---------------------|---|
| Disk (Method 2, Srch Catlg) | S.F.'0 = CONTROL | Directs the system to return to the CONTROL mode. |
| | S.F.'1 = OPEN FILE | <p>Prompts the operator successively as follows:</p> <p style="padding-left: 40px;">ENTER RECEIVE DEVICE ADDRESS 1 = 310 2 = B10 3 = 320 4 = B20</p> <p style="padding-left: 40px;">ENTER FILE IDENTIFICATION NOT TO EXCEED 6 CHARACTERS</p> <p>Upon receiving a response to the second prompt, the following message appears:</p> <p style="padding-left: 40px;">SEARCHING CATALOGUE</p> <p>If the operator-supplied identifier is already in the catalog, the system displays an error message xxxxxx CATALOGUED RE-ENTER, where xxxxxx is replaced by the file identifier code; otherwise, the system opens the first file with the operator-supplied identifier. The allotted space is equal to all the currently available space on the disk. Then, the message</p> <p style="padding-left: 40px;">RECEIVE FILE xxxxxx01 OPENED</p> <p>appears, and the system returns to the CONTROL mode. (Note: Prior to displaying the first prompt, the system erases any currently open file on the disk.)</p> |
| | S.F.'2 = ERASE FILE | <p>Allows the operator to erase one of the following files:</p> <ul style="list-style-type: none"> a) the last file opened automatically by the system, thereby freeing unused disk space before terminating the communications program, or b) any file in the catalog index (space is not freed unless the file is the last file with respect to the sectors being used currently). <p>The following message appears</p> <p style="padding-left: 40px;">ERASE FILE — — — OR ?</p> <p>The message contains the name of the last file opened by the system during current operation of the program. After the operator supplies a different file name or keys RETURN(EXEC) to erase the file named by the system, the following messages appear:</p> <p style="padding-left: 40px;">SEARCHING FOR FILE FILE — — — ERASED</p> <p>Then, the system returns to the CONTROL mode.</p> |

Disk
(Method 1,
On Error)

S.F.'0 = CONTROL
(The first prompt
appears immediately.)

Directs the system to return to the CONTROL mode.

ENTER RECEIVE DEVICE ADDRESS
1 = 310 2 = B10 3 = 320 4 = B20

Upon receiving a valid response, the system prompts the operator successively as follows:

ENTER FILE IDENTIFICATION NOT TO EXCEED 6
CHARACTERS

ENTER NUMBER OF SECTORS TO OPEN RECEIVE
FILES

Upon receiving a response to the above prompt, the system attempts to open the first file. If the file name already exists, the message STOP NAME ALREADY CATALOGED appears (the operator must key S.F.'0 to resume); otherwise, the system opens the first file and displays the message.

RECEIVE FILE xxxxxx01 OPENED

Then the system returns to the CONTROL mode.

Printer

S.F.'0 = CONTROL

Directs the system to return to the CONTROL mode.

S.F.'13 = FORM FEED

Executes form feed operation and returns to the CONTROL mode.

S.F.'14 = VERT TAB

Executes vertical tab operation and returns to the CONTROL mode.

S.F.'15 = LINE FEED

Executes line feed operation and returns to the CONTROL mode.

Disk &
Printer

Note: If the designated output device for the operating communications program is a disk and printer, the system displays any not ready status messages related to the disk first. Any printer not ready status message, if applicable, appears after operator-supplied information is furnished for the disk. The active controls displayed during the ATTENTION mode depend upon which disk method is in effect. The controls are the same as shown for the particular methods 1 and 2 in the table.

Table 3-4. Modem Signal Categories and Status Messages

| Category | Definition | Status Message |
|-----------------|---------------------|---|
| DTR | DATA TERMINAL READY | If an asterisk is present, the microcode has been loaded in the Model 2228B controller by the emulation program, and the controller is now operational. |
| DSR | DATA SET READY | If an asterisk is present, the modem has been placed in the data position. Though the DSR asterisk must be present for data transmission/reception to take place, its presence does not always ensure the possibility. Depending upon the characteristics of the modem being used, the DSR asterisk may appear when the local modem is in the data position and the remote end has not yet completed the communications link (or has disconnected an already established link). |
| RTS | REQUEST TO SEND | If an asterisk is present, the Model 2228B is signaling the modem that it desires to send data. |
| CTS | CLEAR TO SEND | If an asterisk is present, the modem is signaling the controller that the modem is ready to send data. |
| CAR | CARRIER | An asterisk indicates a carrier is present, i.e., the sine wave which carries the transmitted or received signal is present. |

Now, observe in Figure 3-1 that additional status information appears in the center of line 13. In particular, xxxx and yyyy represent the number of blocks sent and received, respectively. Initially, both these values are blank. No value appears in the position xxxx until the system enters the SEND mode for the first time and actually transmits data; then xxxx is set to 0000 and incremented by 1 as each block is transmitted. When the transmission is completed, the total number of blocks sent remains fixed — the value of xxxx is not altered by entry into the CONTROL, RECEIVE, ATTENTION, or BID modes — the value is not reset to zero until the system again enters the SEND mode in response to operator action.

Similarly, no value appears in the position yyyy until the system enters the RECEIVE mode in response to action from the remote end of the line. Then yyyy is set to 0000 and incremented by 1 after each block is received. When reception is complete, the total number of blocks received remains fixed. The value of yyyy is not reset to zero until the system again enters the RECEIVE mode.

Other status information related to transmission and reception appears elsewhere on the CRT. See Table 3-5.

Table 3-5. Transmission/Reception Status Messages

| CRT Location | Message* | Meaning |
|---------------------|------------------------|--|
| Line 4 | SEND | The system is either sending or waiting to send non-binary data, i.e., data automatically translated into EBCDIC code. |
| | SEND TRANSPARENT | The system is either sending or waiting to send binary data (no translation is made). |
| | TRANSMISSION COMPLETED | The system has completed a send or send transparent operation. |
| | TRANSMISSION ABORTED | Transmission has been aborted in response to operator action at either end of the line. |
| Line 9 | RECEPTION ABORTED | Transmission has been aborted in response to operator action at either end of the line. |

*When the system returns to the CONTROL mode after transmission or reception is completed/aborted, any existing messages on lines 4 and 9 are not cleared since retention of the information removes the necessity for constant monitoring by an operator. By pressing S.F.'0 while the system is in the CONTROL mode, any such messages are removed.

Line 7 of the CRT displays device ready status messages only for the designated output device. If the receive device is a printer, a not ready condition produces the message PRINTER NOT READY; a ready condition produces no message. If the receive device is a disk, a not ready condition produces the message RECEIVE DISK FILE NOT OPENED; a ready condition produces the message RECEIVE FILE xxxxxxxyy OPENED, where the first six characters are the operator-supplied file identifier and the last two characters are the sequential two-digit code supplied by the system.

After an operator presses S.F.'2 or S.F.'3 to initiate data transmission, device-related prompts appear on the CRT on line 5. Information requested by the prompts is summarized in Table 3-6.

Table 3-6. Device-dependent Information Required Upon Initiation of SEND or SEND TRSP

| Input Device | Prompts Requiring Responses After S.F.'2 = SEND or S.F.'3 = SEND TRSP Activated |
|-----------------------------------|---|
| Card Reader | <p>END OF FILE AT HOPPER EMPTY (1 = YES)? READY CARD READER. KEY RETURN/EXEC TO CONTINUE?</p> <p>Valid responses to the first prompt are as follows: a) Key 1 EXEC to answer yes. b) Key RETURN(EXEC) to answer no.</p> |
| | <p>The successive prompts appear initially and, also, after each hopper empty condition is sensed — unless the condition occurs following a "yes" answer; then, the system returns to the CONTROL mode after transmitting the last batch of cards.</p> |
| Disk (Method 2, Srch Calog) | <p>ENTER SEND DEVICE ADDRESS AS 1 = 310 2 = B10 3 = 320 4 = B20 ENTER FILE NAME x</p> <p>Initially, x is 1. As soon as the operator supplies the name of a file to be transmitted, the system searches the catalog to determine the validity of the name. If not valid, the message RE-ENTER appears below the invalid name, and a new name is awaited. If valid, the system increments the value of x by 1 and requests the name of the next file to be transmitted. The process continues until the operator keys RETURN(EXEC) without supplying a name, or the value of x reaches 5 (or 10 if the program was generated for communication between two Wang systems). Then, the following prompt appears if x 1:</p> <p style="text-align: center;">SEND FILES SEPARATELY OR COMBINED AS ONE (1 = SEPARATE)</p> <p>Valid responses are as follows:</p> <p>a) Key 1 EXEC if the files are to be sent as separate messages (or files) within a single transmission. b) Key RETURN(EXEC) if the files are to be combined and sent as a single message (or file), thereby appearing to the remote end as though the files originated as a single file (or a stream of cards).</p> <p>Afterwards, the system enters the BID mode. Upon successful completion of the BID mode, the system enters the SEND mode and transmits the specified files before returning to the CONTROL mode. (If the BID mode is unsuccessful, or transmission is aborted, or line difficulties develop, the system returns to the CONTROL mode prematurely.)</p> |
| Disk (Method 1, On Error) | <p>ENTER SEND DEVICE ADDRESS AS 1 = 310 2 = B10 3 = 320 4 = B20 ENTER FILE NAME x</p> <p>Initially, x is 1. As soon as the operator supplies the name of a file to be transmitted, the system checks the catalog to determine the validity of the name. If not valid, the message STOP NAME NOT CATALOGUED appears below the invalid name. The operator must key S.F.'0 to return the system to the CONTROL mode, then key S.F.'2 or S.F.'3 and name the files from the beginning. If a file name is valid, the system increments the value of x by 1 and requests the name of the next file to be transmitted. The process continues until the operator keys RETURN(EXEC) without supplying a name, or x reaches 5 (or 10 if the program was generated for communication between two Wang systems). Then, the following prompt appears if x 1:</p> <p style="text-align: center;">SEND FILES SEPARATELY OR COMBINED AS ONE (1 = SEPARATE)</p> |

Valid responses are as follows:

- a) Key 1 EXEC if the files are to be sent as separate messages (or files) within a single transmission.
- b) Key RETURN(EXEC) if the files are to be combined and sent as a single message (or file), thereby appearing to the remote end as though the files originated as a single file (or a stream of cards).

Afterwards, the system enters the BID mode. Upon successful completion of the BID mode, the system enters the SEND mode and transmits the specified files before returning to the CONTROL mode. (If the bid mode is unsuccessful, or transmission is aborted, or line difficulties develop, the system returns to the CONTROL mode prematurely.)

3.4 ERROR MESSAGES

As indicated in Table 3-6, an error message may occur when the system is processing operator-supplied names of the disk files to be transmitted. Depending upon the disk method in effect for the communications program, an invalid file name produces the following message:

- a) RE-ENTER, if Method 2 is in effect, or
- b) STOP NAME NOT CATALOGUED, if Method 1 is in effect.

The recovery technique for Method 1 is described in Table 3-6.

As indicated in Table 3-3, an error message may occur during the ATTENTION mode when the system is processing the operator-supplied file identifier for receive-to-disk files. If Method 2 is in effect, the system searches the catalog index and accepts the identifier only if the 6 (or less) supplied characters are unique with respect to the first 6 (or less) characters in every currently catalogued name — thereby ensuring the capability to open as many as 99 sequentially named files. On the other hand, if Method 1 is in effect, the system appends the characters 01 to the 6 (or less) supplied characters to create the first file name, and then checks the catalog for the uniqueness of only the first file name. An invalid file identifier produces the following message:

- a) xxxxxx CATALOGUED RE-ENTER, if Method 2 is in effect, or
- b) STOP NAME ALREADY CATALOGUED, if Method 1 is in effect.

The recovery technique for Method 1 is described in Table 3-3.

Other error messages may occur during the ATTENTION mode (or subsequently) when the system attempts to open a file and cannot do so because of space limitations on the disk.

For example, the message

- a) INSUFFICIENT SPACE ON RECEIVE DISK, if Method 2 is in effect, or
- b) STOP INSUFFICIENT SPACE ON RECEIVE DISK, if Method 1 is in effect,

can occur at the time the first file is being opened, or can occur when the system closes a file and attempts to open the next file.

To recover, the operator normally removes the platter having insufficient space and mounts a new, indexed platter at the same location. If Method 2 is in effect, the system is in the CONTROL mode; therefore, the operator should key S.F. '1 (ATTN) and supply a new file identifier for reception of additional files from the remote end. If Method 1 is in effect, key S.F. '0 followed by S.F. '1 and supply a new file identifier for reception of additional files.

If the system is in the RECEIVE mode and the file being received to disk overflows the allotted space, the following message code appears:

ERR 62

whether Method 1 or 2 is in effect. Keep in mind, that Method 2 opens each receive file by temporarily allotting all the currently available space on disk to the file (and freeing any unused space when the file is closed); but Method 1 opens each receive file by allotting the exact number of sectors specified by the operator (and does not free any space when the file is closed).

The system remains in the RECEIVE mode if reception to disk is interrupted by a Code 62 error message. By keying S.F. '0 many times, the system may return to the CONTROL mode; however, such a procedure is not a recommended recovery method. Usually the operator should clear the system, reload the program, contact the remote end of the line to request retransmission of all files, and exercise care to provide ample space on the receiving disk platter.

At some point in the loading or operation of a emulation program, the message

SYSTEM ERROR!

may occur. If so, the operator must clear the system and reload the program. An operator should exercise caution to avoid one source of such an error - do not touch HALT/STEP followed by S.F. '0 when the system is in the SEND mode. (Do not touch RESET at any time during program operation.) If repeated attempts to operate the program produce a SYSTEM ERROR, call the Wang Service Representative.

3.5 MVP CONSIDERATIONS-(BACKGROUND)

When running on a 2200MVP system, SF'30 is activated allowing the user to "jump" into background operation. When pressed, the emulator releases the console to any partition which is available. Normal operation continues utilizing any selected I/O devices. To return to foreground operation, a \$RELEASE TERMINAL command must be issued to "jump" back into the partition running the emulator. The emulator detects the terminal and regains normal operation. When going into background mode, the receive devices should be enabled to allow receive without operator intervention since no messages will be displayed and reception will be suspended. Transmission may also be initialized prior to entering background mode with the actual transmission taking place in background.

NOTE: Because separate \$GIO's are used on an MVP, the emulators will not run on an MVP running in VP mode. The loader thinks it is an MVP causing \$GIO failures on the VP operating system.

CHAPTER 4 OPERATION OF THE HASP MULTILEAVING EMULATOR

After a loading configuration has been selected the following display will appear.

display

| PARAMETER | CURRENT SELECTION |
|-----------------------|---|
| INPUT DEVICE | (DISK or CARD READER) |
| TRANSPARENT SEND? | (as specified) |
| PRINT STREAMS TO | (as specified) |
| PUNCH STREAMS TO | (as specified) |
| (MULTIPLEXED DISK) | (as specified) |
| ***** | |
| * * LOADING SYSTEM | WANG 2200 TELECOMMUNICATIONS (user described name) |
| * * | * * |
| ***** | |

The HASP emulator loader module program loads the 2228B microcode, dimensions arrays and variables, sets some variables, etc., and then loads the emulator requested. The HASP emulator then enters the dynamic display shown on the previous pages (DISPLAY TYPE 1).

NOTE:

If the disk receive module is loaded the emulator will go to PROMPT A and then PROMPT B before showing the standard displays described below.

Dial your host computer. At the tone depress the DATA button on the modem. Line 15 of the display will display LINE DISCONNECTED if the connection has not been established. Key S.F. '4 to activate the SIGNON sequence to your host system. A SIGNON prompt will occur on the CRT. Key in your appropriate signon sequence followed by (EXEC). Refer to the instructions for CONSOLE ENTRY for keyboard instructions, if necessary.

HASP Emulator CRT displays —

Two types of on-line displays occur within the HASP system.

1. Display Type 1, the "HASP Work Station Emulator" described on the following page is the standard display. This display describes valid interaction, the status of the telecommunications queues, text sent as console or signon messages, and system 2200 errors encountered.
2. Display type 2 is for console output messages.

4.3 CONSOLE ENTRY AND SIGNON PROMPTS

CONSOLE ENTRY — activated by keying '3 Console Entry.

SIGNON ENTRY — activated by keying '4 Signon.

action if in Display type 1 — CRT clears
or if in Display type 2 — the scrolled information is retained and

display

CONSOLE ENTRY (or SIGNON ENTRY) '0 ABORT
.....1.....2.....3.....4.....5.....6

respond key '0 to ABORT REQUEST and return to HASP interaction.
or key (EXEC) with no data to clear CONSOLE MESSAGE line on main display.
or key message of 1 to 80 characters terminated by (EXEC).

action On exit DISPLAY TYPE 1 will be restored with the display
Signon (or CONSOLE) Message Sent
(keyed text)

The following edit keys may be used in the console entry mode.

- '7 positions cursor to position 1.
- '8 ERASE from current cursor position
- '9 DELETE one character.
- '10 INSERT one space.
- '11 Move cursor 5 positions to the right though not beyond position 80.
- '12 Move cursor 1 position to the right though not beyond position 80.
- '13 Move cursor 1 position to the left though not before position 1.
- '14 Move cursor 5 positions to the left though not before position 1.
- '15 position the cursor to position 80.
- LINE ERASE to delete keyed data and put cursor on position 1.

NOTE:

When (EXEC) is keyed all console data displayed is transmitted. If no data is displayed, i.e., count = 0, no data is transmitted. The program returns to HASP on-line and DISPLAY TYPE 1.

4.4 SEND ROUTINE PROMPTS

Prompts for initiating data file transmission. Data file transmission is activated by keying '2 SEND when the HASP emulator is interactive with the host computer.

4.4.1 Disk Send

response '2 SEND
action activates request for transmission of standard data files.

display Send from Disk
'0 ABORT

NOTE:

The operator may abort any of the following requests by keying S.F. '0 to return the emulator to the interactive condition noted in DISPLAY TYPE 1.

display Send 1 = Normal 2 = Transparent
respond key 0 or 1 or 2 and (EXEC).

display ENTER DISK ADDRESS. 1 = 310 2 = B10 3 = 320 4 = B20?
respond key 0 or 1 or 2 or 3 or 4 and (EXEC).

display the valid address is placed on display line 1.

display ENTER FILE NAME d?
respond key valid file name and (EXEC)
or key (EXEC)

NOTE:

Prompt is repeated for as many as nine file names.

display the last entered file name is placed on display line 1.
as LAST FILE NAMED = name
or REENTER = name

display SEND FILES SEPARATELY OR COMBINED AS ONE (1 = SEPARATE)?
respond 1 and (EXEC) or (EXEC).
action As each file is transmitted the display will show:

Sending file name Snd Disk 310

When completed the display will show:

DONE file name Snd Disk 310

NOTE:

S.F. '2 may used to Abort transmission.

4.4.2 Card Send

condition *where the CARD READER input module is loaded.*

display '2 SEND

action activates request for transmission of standard data files.

display Initiate Card Send

'0 ABORT

'0 = Abort '1 = Normal '2 = Transparent '3 = Binary

- '1 Cards are sent in EBCDIC in non-transparent mode.
- '2 Cards are sent in EBCDIC in transparent mode. If a card containing a "/\$" in col. 1-2 is encountered, the remaining cards in the deck are sent in binary mode.
- '3 Data is read from reader in binary mode (ie 2 bytes per card position) and sent in transparent mode.

Display on the CRT line assigned to the Send Device.

if '1 keyed SEND NORMAL CARDS

If '2 keyed, SEND TRSP CARDS

If '3 keyed, SEND BINARY CARDS

The following SF Keys may be used to control the Card reader operation once the transmission has begun.

S.F. '2 may used to Abort transmission.

S.F. '5 End of File (active only if card reader is send device). Toggles the End File indicator ON/OFF. If set ON, EOF will be displayed starting in position 1 of the Send Device line. If set OFF, spaces are display on the Send Device line.

NOTE:

The EOF flag is used when sending card data. If the flag is off when the card hopper empties, the emulator waits for more cards before completing transmission. If the flag is on when the hopper empties, an ETX is transmitted and file transmission is completed.

4.5 DISK RECIEVE

4.5.1 Storage of Received Data Files:

Disk data for transmission and reception is stored in the standard Wang telecommunications file data format. The disk receive routine is designed to sequentially fill the catalog area of each disk surface specified. If large volumes of data are expected the operator should maintain a scratch disk in the alternate receive disk port. The program ping-pongs between primary and overflow surfaces filling the primary, then the overflow surface, and then automatically returning to the primary, etc.

4.5.2 File naming:

The disk receive function provides the capability to receive overflow files on multiple disk surfaces. To accomplish this the following file naming convention is used.

characters 1-4 an operator supplied root name.
character 5 an alphabetic volume designator (starts with "A").
characters 6-8 a numeric sequence number (001 - 999).

The *sequence number* is automatically incremented for each new file received. If perchance 999 files are received on a surface the volume designator would be incremented.

The *volume designator* is automatically incremented for each new disk surface.

NOTE:

If a received file overflows a disk surface, a partial file is written to one surface and the balance written as a separate file to the next surface. The files are named with a common sequence number but differing volume designators.

The following user interaction is prompted after the HASP emulator module is first loaded.

4.5.3 Assign Overflow Receive Disk Surface (**PROMPT A**)

This prompt occurs only if the receive to disk module has been loaded. Two disk surfaces may be specified to receive punch streams from the host system. The surfaces are treated in a Ping-Pong manner with data alternately filling first one disk, then the other. This prompt is requested of the user only once at startup time. Thus, an overflow surface is active for the entire duration of a session. Care should be taken to keep a disk in the overflow drive to prevent loss of data should that surface be required. The overflow logic is *disabled* if no surface ID specified at startup time.

display HASP Disk P.cv – Overflow Surface
1 = (F)310 2 = (R)B10 3 = (F)320 4 = (R)B20 5 = (F)330 6 = (R)B30
Disk = ?

respond (EXEC) or 1 or 2 or 3 or 4 or 5 or 6 and (EXEC)

where

(EXEC) causes *no selection* and exit to prompt B.

or

other response selects alternate surface as noted below.

display ddd = Unavailable.
repeat of prompt 1.

condition operator entered unavailable disk unit.
correction Reenter a valid response.

display Repeat of prompt 1

condition operator entered an invalid response.

correction Reenter a valid response.

response valid available disk address – (EXEC)
Go to prompt B.

4.5.4 Open Receive Disk File (**PROMPT B**)

This prompt occurs only if the receive to disk module has been loaded. Open Receive Disk file. This display entered at LOAD time and also from ATTN key during HASP emulation allows the operator to Open a Receive disk file. This prompt is off-line to T.C. interaction.

display Open Receive Disk File
1 = (F)310 2 = (R)B10 3 = (F)320 4 = (R)B20 5 = (F)330 6 = (R)B30 Disk = ?

respond (EXEC) or 1 or 2 or 3 or 4 or 5 or 6 and (EXEC)

where (EXEC) exits to mainline T.C. interaction.
other response selects surface for Receive file.

display ddd = Unavailable.
Repeat of prompt 1.

condition operator keyed an invalid response

or

correction the disk unit is unavailable
Reenter a valid response.

display DISK = ddd nnnn SECTORS AVAILABLE
ENTER FILE IDENTIFICATION NOT TO EXCEED 4 CHARACTERS?

respond unique four character name for a file and (EXEC).

display SEARCHING CATALOG

action The program searches the catalog area of the disk specified for a four character match.

display (name) CATALOGUED. RE-ENTER

condition If a match is found the user is asked to enter a new name. Go back to prompt 2.

display ABOVE DISK FILLED PICK ANOTHER

conditions If insufficient space is found, the program will request a new disk surface be used. Go back to prompt 1.

else If a match is not found, the program assigns the remainder of the cataloged area of the disk (only 500 sectors if Shared disks were specified at configuration time) to the file naming it (name)A001. The main display will show:

status File Stream Device
open nameA001 Rcv Disk B10

4.5.5 Attention Routine Prompts

The ATTENTION routine is activated by keying '1 ATTN when the HASP emulator is interactive with the host computer. These prompts are activated only if the Disk Receive module has been loaded.

display Hasp Attention Mode (Communications temporarily suspended).

| Receive | Disk | Sectors | File | Status |
|------------|------|---------|----------|--------|
| Primary = | B20 | 9577 | ROOTA001 | Open |
| Overflow = | 310 | | | |

prompt '0 = Control '1 = Open Rcv File '2 = ERASE

response '0 Control

action return control to the emulator and Display Type 1.

response '1 Open Rcv File

action If a Rcv File is open:

display Rcv Disk file (name) is Open

action If a Rcv File is not open:

Refer to the PROMPT B sequence to open a file.

response '2 ERASE FILE

action If a Rcv File is not open:

display Rcv Disk file (name) is Not Open

action If a Rcv File is open:

The Opened file is ERASED and control is returned to DISPLAY type 1. No Rcv File is then open.

action If a Rcv File is:

prompt ON DISK ddd ERASE FILE nameyyyy?

respond (EXEC)

or valid data file name and (EXEC)

display SEARCHING

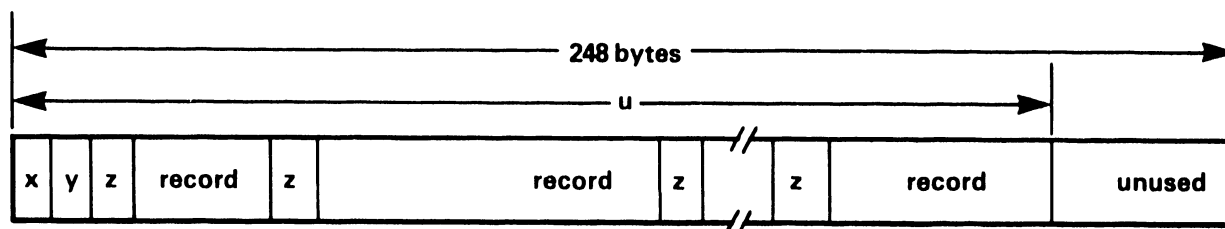
action the file name specified is removed from the disk catalog.

display the device code None on the display signifies that there is no open file for the Disk Receive queue.

APPENDIX A THE TC FILE FORMAT

The "telecommunications (TC) file format" for disk data files is defined as follows:

1. Records are packed into a one-dimensional alphanumeric array having four elements, each 62 bytes long, e.g., DIM A\$(4)62. The array is saved into a single sector by using the DATA SAVE DC or DATA SAVE DA statements.
2. In packing the TC records into the array, element boundaries are ignored; the array is treated as if it were simply 248 contiguous bytes of storage.
3. Within the 248 bytes of storage, three types of control bytes are used (see x, y and z in the following diagram).



- x = a one-byte hexadecimal code indicating whether the sector is or is not the last sector in the file; in particular x = HEX(F0) denotes "is the last sector", x = HEX(00) denotes "not the last sector."
- y = a one-byte hexadecimal value denoting "the number of used bytes plus one" in the array. For example, in the diagram, y is the hexadecimal equivalent of u + 1.
- z = a one-byte hexadecimal value preceding each record to denote "the record length in bytes". For example, if the record contains 39 bytes, z = HEX(27) since $(27)_{16} = (39)_{10}$.
- record = one complete record with trailing spaces truncated (except in the first record) — individual records do not overlap from one 248-byte array to the next.

Data Entry 1's SAVE or SAVE N command does not truncate trailing spaces in the first record of a file. Thus, the length of the first record is always 80 or 128 bytes.

WANG

LABORATORIES, INC.

ONE INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851. TEL. (617) 459-5000. TWX 710 343-6769. TELEX 94-7421

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