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3271 BSC Emulation Implementation Guide and User Manual

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1st Edition — January, 1983

700-6979

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PREFACE

This manual is intended for users of the Wang 3271 Emulation software on a 2200 Series computer system. It is also intended for non-Wang personnel responsible for installing, initializing, and supporting the software. User information formerly available in the 2200 3271 Emulation User Guide (700-6978) has been included in this document; Publication 700-6978 is no longer necessary.

Chapter 1 consists of a general overview of the 3271 software and its implementation, and defines the 2200 hardware and software requirements. Chapter 2 describes the activation of the 3271 Emulation software. Chapter 3 describes the software parameters and explains how to configure an emulated 3271 cluster. Chapter 4 discusses the on-line functions accessible from the 3271 main menu, and Chapter 5 describes, in detail, the display characteristics of the 2200 Series terminal when it is operating in 3277 emulation mode. Chapter 6 discusses the 3271 off-line functions.

Appendix A provides the user with technical reference material for 3270 emulation. Host polling and selection functions are discussed; AID codes, an attribute byte summary, and a list of common communications abbreviations are provided in handy tables for easy reference purposes. Appendix B discusses the commands and orders used in 3270 communications. Appendix C shows the user how to alter the main menu assignments. Appendix D explains report/stream definition, and Appendix E provides a sample Automatic Load program.

The Wang 3271 Emulation software (Package Number 195-2159) consists of the following items:

- Diskette #701-2710
- 2200 3271 Emulation Implementation Guide and User Manual (700-6979)
- 3277 Special Functions Key Strip

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FIGURES

FIGURES (continued)

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CHAPTER 1
GENERAL INFORMATION

1.1 FUNCTIONAL OVERVIEW

The Wang 3271 emulation software, used in conjunction with a Model 2228D or Option 28D Data Communications Controller, provides distributed data processing capabilities for the 2200 Series product line. The 3271 software emulates an IBM 3271 Model 2 control unit, with its associated 3277 Model 2 display stations and 3288 Model 2 printers. Each unique configuration comprising one control unit and multiple display station and printer emulations is called a "cluster". The software facilitates interactive transaction processing for clusters with a combined total of up to nine terminals and printers. Data stored under an Information Management System (IMS), Customer Information Control System (CICS), or another program accessible by the Binary Synchronous Communications (BSC) protocol can be accessed by the Wang 3271 emulation software.

Communication between a 2200 system using 3271 emulation software and a host computer takes place over a leased, multidrop communication line from the host. Transmission takes place using the BSC protocol and EBCDIC line code at speeds of up to 9,600 bits per second (bps). The communications line is connected to a modem at the 2200 site; this modem must be compatible with the modem at the host site and operate at the same speed. A Wang 2228N null modem with an RS-232-C/V.24 connection can be used if the communication line between the host and the 2200 system does not exceed 100 cable feet.

The 3271 Emulator blocks data into units ranging in size from 1 to 256 bytes; each series of blocks addressed to the same device is referred to as a "data stream". At the 2200 3271 site, data streams transmitted to the host are initiated from the keyboard; incoming, host-originated data streams are received to CRT, disk, diskette, or printer. Data streams originating from or addressed to a display station are called station streams; data streams that are addressed to a printer are called printer streams.

While IBM 3271 systems always route printer-bound data streams directly to an on-line printer, the Wang 2200 3271 emulation system can route printer streams to a printer, disk, or diskette. The process of writing printer streams to disk or diskette is called spooling. When printer streams are spooled to disk or diskette, the user can choose the type of printer best suited to that particular data, e.g., a high-speed line printer or a high-resolution character printer.

In addition to the spooling feature, Wang 3271 emulation allows selective printing of data. Data can be printed and/or deleted by selected blocks in a stream or by user-defined report names.

1.2 SYSTEM REQUIREMENTS

The 3271 emulation software can run on a 2200MVP, LVP, or SVP system. LVP and MVP systems can support a combined total of nine data streams, up to four 3288 printer streams, and up to eight 3277 station streams. LVP and MVP systems with 512K bytes of memory can support an additional station stream, for a combined total of ten data streams. Multipartitioned SVP systems support a maximum of five data streams, up to two station streams, and up to four printer streams. To use the Wang 2200 3271 emulation software, the user must have the following hardware and software:

- One MVP, LVP, or SVP Central Processor Unit (CPU)
- MVP, LVP, or SVP microcode Release 1.8 or later
- 2236D, DE, or DW terminals; 2336DW terminals; 2886DE or DW terminals; or other Wang devices equipped with 2236DE emulation
- Optionally, from one to four printers
- One communications controller (2228D-4 for MVP and LVP systems; Option 28D-4 for SVP systems)
- Available memory of:
  - 5K for a Universal Global Area
  - 6K for the Master Control Task
  - 22K for the Printer Control Task
  - 28K for each station

NOTE

Remember that each station configured in the emulated 3271 cluster requires 28K of memory. Thus, the number of stations that can be configured in the cluster is dependent upon the amount of memory available on the 2200 system.

Modem Considerations

A modem suitable for use with the 3271 emulation software must be supplied by the 2200 user. The modem serves as an interface between the communications controller at the 2200 site and the leased line to the host. For the Model 2228D-4 or Option 28D-4 communications controller, the modem must be RS-232-C/V.24-compatible. In addition, the modem at the 2200 site must be compatible with the modem at the host site. Modems can be purchased from a modem vendor or rented from the local telephone company.

Software Backup

The 3271 emulation software is delivered on a diskette (Wang #701-2710). Duplication of this diskette should be performed before any attempt is made to load the software into the 2200 Series system. This ensures that if backup software is ever needed, the master diskette produced by Wang Laboratories, Inc. is intact.

A duplicate copy of the software can be made on another diskette or by transferring the software modules to the fixed system platter. Transfer of the software from one diskette to another or to the system disk is described in the Wang BASIC-2 Disk Reference Guide (700-4081).

1.3 SOFTWARE STRUCTURE

The 3271 emulation software consists of a Data Link Processor (DLP), a Master Control Task (MCT), a Printer Control Task (PCT), and multiple terminal tasks.

DLP

The Data Link Processor (DLP) is a microcode file that is loaded into the microprocessor on the communications controller when the software is being used to communicate with the host. The DLP is responsible for maintaining a 2K virtual device buffer for each device configured in the cluster.

These buffers can store data sent from the host to a device, even if the device is not yet attached, e.g., a broadcast message to all devices informing users of a scheduled system shutdown. When a station or printer is attached, the data in the virtual device buffer is transferred to the device's display or print buffer. After this transfer, the buffer becomes an "output-pending" storage area for data being transmitted from a device to the host.

Because the DLP maintains these virtual device buffers, the communications link to the host can be maintained even if no devices are attached to the cluster.

MCT

The Master Control Task (MCT) is the 2200-resident, BASIC language module that emulates 3271 control unit functions in background mode. The MCT maps 3271 cluster device addresses into 2200 peripheral device addresses, and provides control and status information for all devices in the cluster. The MCT requires one 6K partition of memory in Bank 1. Before a cluster configuration can be implemented, the MCT must be loaded and running in its allocated 2200 partition.

PCT

The Printer Control Task (PCT) emulates 3288 printer functions. The PCT, which requires a 22K partition, must be loaded and running in its allocated 2200 partition before any printer can be logically attached to the cluster.

The PCT controls the print functions according to the selected mode of operation. Two modes of operation exist for printer data streams: (1) Streams can be printed as received by an on-line printer, or (2) streams can be written to disk and printed at a later time.

Terminal Tasks

To emulate 3277 display station functions, a Terminal Task module is required for each logically attached station in the cluster. Whenever a request is made to logically attach a station to the cluster, the 3271 Attachment task loads a 28K terminal task into the partition allocated to the 2200 terminal issuing the request.

A terminal task manages display and keyboard functions, including storage and display of host-generated as well as keyboard-originated data. The task also controls formatting of fields according to host attribute bytes, positioning of the cursor according to cursor movement keys, generation of operator display indicators, and performance of field-oriented keyboard functions. The terminal task also generates AID (Attention Identification) codes according to PA (Program Attention), PF (Program Function), and ENTER key entries. Additionally, the task also transfers AID code and buffer contents to the output-pending buffers on the communications controller.

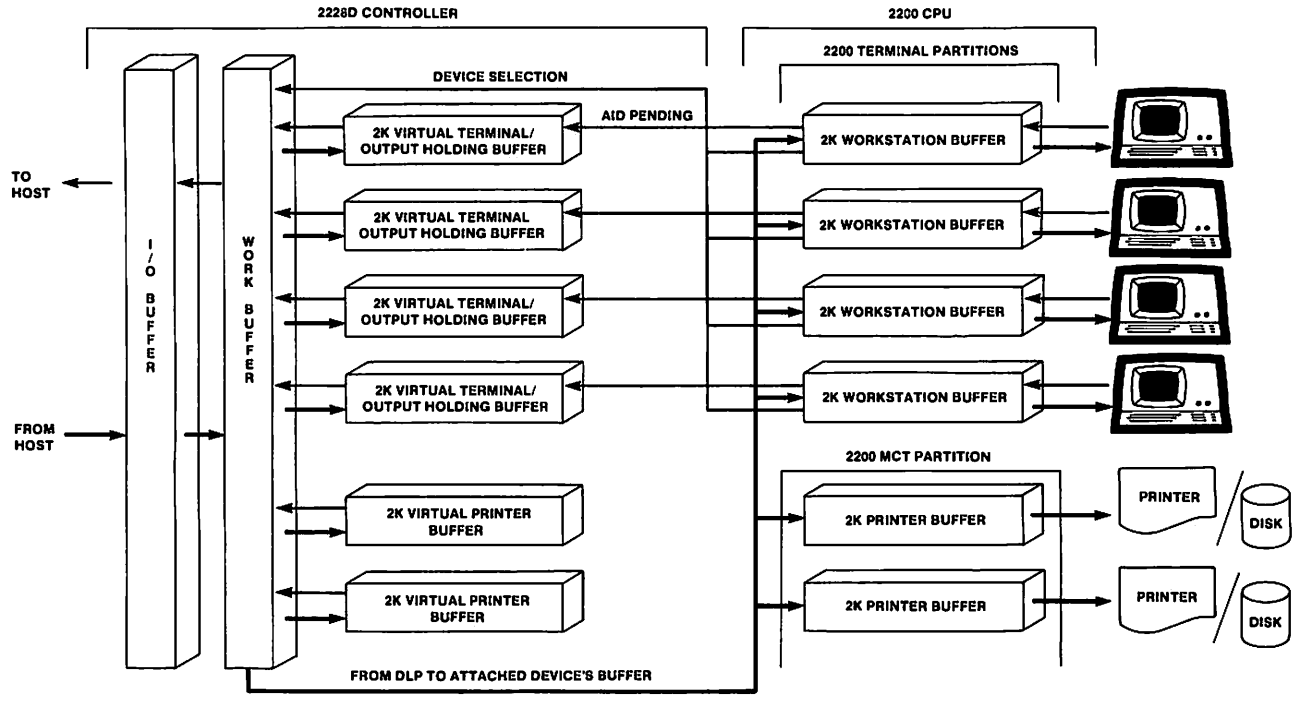

Figure 1-1. Buffer Management within the 2200 3271 Emulation System

1.4 CLUSTER CONFIGURATION AND DEVICE ATTACHMENT

Before 3271 communications with the host can begin, the cluster must be configured and loaded, and its terminals must be logically attached. The user configures and loads the cluster, and logically attaches terminals through procedure-selection and parameter-definition screens provided by the system.

When the 3271 emulation software is loaded from diskette to the user memory of the 2200 Series central processor, the communications system Start-Up task is invoked. The system Start-Up task generates the 3271 main menu display at the user's terminal. From this menu, the user can select one of several procedure options. When the system is being used for the first time, the user must access the Cluster Configuration task. Cluster configuration is the process of defining the number of stations and printers to be included in the cluster. Configuration parameters are saved under a user-specified name and can be recalled whenever communication with the host or modification of the parameters is necessary. If a suitable configuration already exists, the user can access the Cluster Loading task.

Once a configuration has been defined, it must be loaded into the 3271 emulation system. Loading occurs in two phases: (1) The modules comprising the control unit emulation (Master Control Task) are loaded into a background partition, and (2) 3271 protocol microcode (the Data Link Processor) is loaded into the communications controller.

After the cluster configuration parameters have been loaded, terminals that will be operating in 3277 emulation mode must be logically attached to the cluster to begin interactive processing with a host. Device attachment is performed through parameter-selection screens. Refer to Chapter 3 for a description of device attachment.

1.5 HOST RESPONSIBILITIES

The host system employs polling and selection to initiate communication with the emulated control unit and its associated devices. During general polling, the host invites any device with data in its buffer to transmit that data. During a specific poll, the host invites a particular control unit to transmit the buffer contents of a specified device. Selection is the process by which the host requests a 3277 station or 3288 printer to ready itself to receive data. Selection is performed as necessary, i.e., whenever the host has data for a certain device. Polling is based on a host-resident list of device unit addresses called a poll table. The host issues poll messages in a cyclical fashion according to the poll table entries.

To ensure reception by the appropriate device or control unit during a specific poll, addresses are imbedded within poll and selection messages sent by the host. The user assigns these host-defined hexadecimal addresses to devices during cluster configuration.

The host-defined 3271 control unit address as well as the 3277 and 3288 device unit addresses must be used in configuring a local cluster. Assigning invalid addresses to the 2200 emulated 3271 control unit and associated cluster devices prevents the control unit from communicating with the host. For further information on poll and selection sequences, refer to Appendix A.

1.6 DEVICE ADDRESSING AND NUMBERING

Device-addressing and numbering schemes for the 3271 emulation system are assigned in relation to two distinct systems -- the 2200 Series system and the 3271 emulation cluster. This dual-addressing scheme is necessary because specific hexadecimal addresses recognized by the IBM host are not valid addresses relative to the 2200 Series system.

Control Unit Addressing

A control unit address must be assigned for each configured cluster of devices. The host must supply the 2200 3271 user with the necessary control unit address for the site. Refer to Table 1-1 for a list of valid control unit addresses.

Terminal/Station Addressing

Each 2200 terminal operating as a 3277 station is assigned two addresses; one address is for local transactions between the 2200 central processor and its peripherals; the other is for transactions between the emulated 3271 cluster and the host. Refer to Table 1-1 for a list of valid station (device) addresses. Each terminal is also assigned a number based on the order in which it is physically connected to the terminal controller board.

In addition to these assignments, the emulated 3277 stations are also assigned numbers based on the order in which host-designated 3277 hexadecimal addresses are assigned (e.g., if C1 was the first address designated, it becomes the address of Station 1).

Data Stream Identification

Each station is associated with a data stream. Station data streams are assigned numbers that match the station numbers; for example, the data stream associated with Station 1 is assigned the name Stream 1. However, for clarity, the streams should be given 8-byte descriptive titles during cluster configuration (e.g., the data stream for Station 1 is Stream 1, but for clarity it could be renamed "Clerk", "User 2", or any other name that appropriately identifies the data stream).

Table 1-1. CUA or DUA Reference Information

Control Unit or Device Unit Address (Hex Value)	Control Unit Selection Address	Control Unit or Device Number (Decimal Value)
40	60	00
C1	61	01
C2	E2	02
C3	E3	03
C4	E4	04
C5	E5	05
C6	E6	06
C7	E7	07
C8	E8	08
C9	E9	09
4A	6A	10
4B	6B	11
4C	6C	12
4D	6D	13
4E	6E	14
4F	6F	15
50	F0	16
D1	F1	17
D2	F2	18
D3	F3	19
D4	F4	20
D5	F5	21
D6	F6	22
D7	F7	23
D8	F8	24
D9	F9	25
5A	7A	26
5B	7B	27
5C	7C	28
5D	7D	29
5E	7E	30
5F	7F	31

Terminal-Address Linking

During cluster configuration, a host-designated hexadecimal (hex) address and a user-generated stream title are entered for each emulated display station. Once the 3277 hex addresses have been assigned, station numbers are assigned, based on the order in which the hex addresses were entered. A set of 3271 addressing parameters is not actually linked to a terminal until each Terminal Task module is loaded into a foreground partition. Refer to Chapter 4 for an explanation of cluster loading and station-to-cluster attachment.

Printer Addressing

System printers are assigned 2200 device addresses in much the same way that terminals are assigned physical terminal numbers. Before attempting to configure 2200 system printers into a 3271 cluster as 3288 printers, the user must know the 2200 device addresses of those printers.

When configuring printers into a cluster, the user must enter the appropriate number of host-supplied 3288 addresses, along with an equal number of 2200 system printer I/O device addresses. The emulation software automatically links each 3288 hex address with a 2200 I/O device address according to the address entry sequence. For example, entering 3288 addresses C5, C7, and D3 and entering 2200 I/O device addresses 215, 216, and 217 establishes Printer 215 as Printer C3, Printer 216 as Printer C5, and Printer 217 as Printer D3.

The 3271 emulation software assigns each printer a number (1, 2, 3, or 4) based on the order in which the 2200 system printer I/O device addresses are entered. For example, if 215 is the first address entered, that printer becomes Printer 1 relative to the 3271 cluster. The software also assigns each printer a data stream letter (A, B, C, or D) corresponding to Printers 1 through 4, respectively. If the 2200 I/O device address 216 is entered first, and D4 is the first 3288 address entered, 2200 Printer 216 automatically becomes 3288 Printer 1, D4, Stream A. As with station stream assignments, printer stream letters can be replaced by descriptive titles during configuration.

Printers and printer streams cannot be logically attached to specific stations during station-to-cluster attachment. When a printer is attached, the only designation made is whether the data stream associated with that printer is to be directed to an on-line printer or spooled to disk or diskette.

Disk/Diskette Addressing

Disk/diskette addresses do not have additional address associations beyond their local 2200 device addresses. When a print stream is assigned to disk or diskette, the actual 2200 disk I/O device address (e.g., B10, D30, etc.) is used to reference the disk drive.

CHAPTER 2
ACTIVATING THE 3271 SOFTWARE

2.1 INITIAL ACTIONS

Before the Wang 3271 emulation software can be loaded into the user memory of the 2200 central processor, two 2200 system functions must be performed: (1) User memory partitions must be generated, and (2) the Master Device table must be generated.

Generating Partitions

Size requirements for the necessary memory partitions and appropriate entries for the Master Device table are provided in this document, but knowledge of the actual procedures involved in partitioning user memory and generating the Master Device table is assumed. Anyone unfamiliar with these procedures should refer to the 2200 introductory manuals.

Memory Bank 1 should be divided into at least three partitions: 5K for a Universal Global area, 6K for the MCT, and 22K for the PCT (required only for clusters that include a printer). The memory remaining in Bank 1 and the memory in the other banks is divided to accommodate the 2200 terminals. Each terminal that performs 3271 functions requires a separate 28K partition.

Generating the Master Device Table

When generating a Master Device table to utilize the 3271 software, remember that two address entries must be made for the communications controller used by the emulation system. The first entry is the standard hexadecimal address of the controller; the second entry is calculated by setting the high-order bit of the middle digit of the controller address. For example, if the communications controller has the address 01C, the Master Device table must have the entries 01C and 09C for this controller.

Other entries in the Master Device table follow the standard conventions. Enter the 2200 system addresses of the system printers and disk drive units used by the cluster. Assign the 5K Universal Global Area, the 6K MCT, and the 22K PCT partitions to Terminal 0. Assign the 28K Terminal Task in Bank 1 to Terminal 1, and assign the other partitions to the remaining 2200 system terminals.

2.2 LOADING THE SOFTWARE

Once system memory has been allocated and the Master Device table has been generated, use Terminal 1 to load the 3271 software from the diskette. Perform the following steps to load the Wang 3271 software:

1. Enter SELECT DISK xxx, where xxx is the address of the disk drive.
2. Press RETURN.
3. Enter LOAD, and then press RUN.
4. Press RETURN.

If loading is successful, the system displays the main menu, illustrated in Figure 2-1.

```
WHAT PROCEDURE?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE or BACKSPACE and key RUN
Functions for Configuration       on Term = 1   Part. = 4

  # ' 1 to Attach to a running 3270 cluster
    ' 2 to Load a 3270 cluster
    ' 3 to Load 3270 off-line functions
    ' 4 to Create a new 3270 configuration
    ' 5 to Change or create any T.C. configuration
    ' 6 to Load any T.C. configuration
    ' 7 to Monitor cluster status display
    ' 8 to Detach from a running 3270 cluster
    ' 9 to Monitor 2200 Partition Status
```

Figure 2-1. Main Menu for Terminal 1

Be aware that the Wang 2200 3271 emulation software contains three versions of the main menu, each tailored for personnel with different levels of expertise. The full menu of nine functions is assigned to Terminal 1, a menu consisting of six functions is assigned to Terminal 2, and a menu comprising only three functions is displayed at other terminals.

Unless the software is loaded by entering instructions from Terminal 1, the full 9-function menu will not be displayed. The abbreviated forms of the main menu do not contain the procedure to generate a configuration. The capability to customize main menus and select the stations to which each menu is assigned has been built into the 3271 emulation software. If the menus that are part of the standard software do not suit the needs of a particular site, the menu elements can be changed. Also, the station assignments for the individual menus can be changed. Appendix C explains the procedures for designing menus and assigning them to individual terminals.

2.3 SELECTING A PROCEDURE FROM THE MAIN MENU

When Terminal 1 is used to load the 3271 emulation software from diskette into the 2200 user memory, the menu shown in Figure 2-1 appears at that terminal.

> **NOTE**
>
> Refer to Appendix C for the supervisor's main menu and the user's main menu.

To select a procedure from the main menu, press the Special Function (SF) key that corresponds to the number at the left of the desired procedure title, or position the pound sign (#) on the line with the desired procedure title; press RUN. The first screen associated with the selected procedure is displayed.

Each procedure, except Monitor 2200 Partition Status (SF '9) or Monitor cluster status display (SF '7), requires definition of several parameters. In some cases, all parameters are presented on one screen; in other cases, two or more parameter-definition screens are presented. Parameter screen format and definition techniques are described in the Section 2.4.

2.4 DEFINING PARAMETERS

Each parameter-definition screen is divided into quadrants, as illustrated in Figure 2-2. The upper portion of the screen contains a list of parameters on the left and the currently selected (or default) value for each parameter on the right. The lower left part of the screen contains a list of valid responses for the currently flagged parameter. The lower right part of the screen displays a list of active keys, whose functions are defined in Table 2-1.

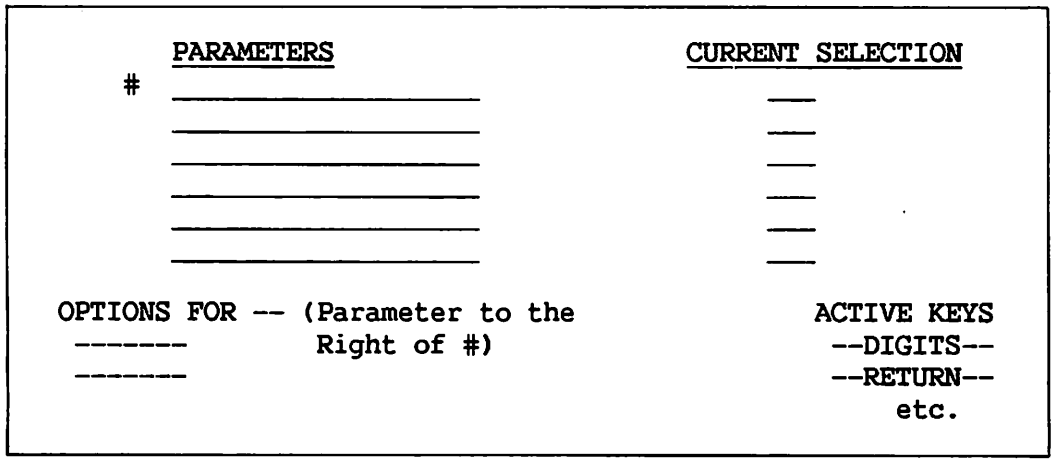

Figure 2-2. Parameter-Definition Screen Format

The pound sign acts as the flag for the parameter being defined. Use RETURN to move the pound sign down the parameter list; use BACKSPACE to move up the list. When the pound sign is positioned next to a parameter, the section titled OPTIONS FOR contains the valid responses for that parameter.

Table 2-1. Active Keys for Parameter Selection

Key	Function
Digits	Pressing the digit(s) corresponding to a valid response in OPTIONS FOR does the following: (1) changes the information in CURRENT SELECTION on the line corresponding to the currently selected parameter, and (2) moves # to the next parameter. Although certain responses, such as an address, are numeric (e.g., 215, 40, 52), other responses are merely represented by a digit (e.g., 1=Yes, 2=No). When a response is alphabetic, the alphabetic keys are active in addition to the digit keys.
RETURN	Moves # to the next position in the parameter list. When the flag is at the bottom of the list, RETURN moves the flag to the top of the list.
BACKSPACE	Moves # to the previous position in the parameter list. When the flag is at the top of the list, BACKSPACE moves the flag to the bottom of the list.
RECALL	Resets all parameters to their initial (default) settings.
RUN	Active only when # is positioned at the top of the parameter list. Once all desired selections are made and checked, pressing RUN accesses the next screen or the next phase of a procedure.

CHAPTER 3
CONFIGURING AN EMULATED 3271 CLUSTER

3.1 CREATING A NEW CONFIGURATION

When the 3271 emulation software is first installed, the user must configure a cluster control unit to communicate with a host site. The 2200 cluster configuration must comply with the host requirements. If the 2200 site communicates with more than one host, a configuration must be created for each host site with which the 2200 site communicates.

A configuration provides information about the cluster (e.g., cluster unit address, number of stations, number of printers, and station and printer addresses) to the 2200 system whenever the 3271 emulation programs are invoked. To generate a new configuration, the standard 2200 @GENPART procedure must have been executed, and the system must be operational.

To communicate with a host system, a 3271 cluster configuration must be active at the 2200 site. If the software has been used before, it is likely that a configuration already exists that is suitable for use with little or no modification. If no configuration exists, a configuration must be created, as detailed in this chapter.

As an alternative to manually activating a 3271 cluster configuration, the Wang 3271 Emulation Automatic Load feature allows a user to write a simple loading program. This program automatically loads a particular cluster configuration previously saved on disk and attaches one or more terminals and printers without any operator intervention. For a sample automatic load program, refer to Appendix E.

To create a configuration, the user selects Option 4, Create a new 3270 configuration, from the Terminal 1 main menu. The system displays the configuration parameter screen, illustrated in Figure 3-1.

```
                    3 2 7 1   P A R A M E T E R S

        PARAMETER                          CURRENT SELECTION

        CLUSTER UNIT ADDRESS               hh
        No. of STATIONS (1-8)              3
        No. of PRINTERS (0-4)              1
        NUMERIC LOCK?                      No
        3 STATION ADDRESSES                hh hh hh
        1 PRINTER ADDRESSES                hh
        SPOOLED PRINT TIME OUT             10
        USER EXIT                          START
        T.C. BOARD ADDRESS                 1C

 OPTIONS FOR -- CLUSTER UNIT ADDRESS              ACTIVE KEYS--
                                                  --DIGITS--
 Use hex digits from list below                   --RETURN--
 40 C1 C2 C3 C4 C5 C6 C7 C8 C9                    --BACKSPACE--
 4A 4B 4C 4E 4F                                   --RECALL--
 50 D1 D2 D3 D4 D5 D5 D7 D8 D9                    --RUN--
 5A 5B 5C 5D 5E 5F
```

Figure 3-1. Sample Parameter Screen for Creating a New Configuration

The following parameters must be defined when creating a new configuration:

- Cluster Unit Address -- Enter the host-designated hexadecimal address for the Wang-emulated 3271 control unit.

- No. of Stations (1-8) -- Enter the total number of emulated 3277 display stations to be included in the cluster.

- No. of Printers (0-4) -- Enter the total number of emulated 3288 on-line printers to be included in the cluster. The number must not exceed 4.

NOTE

The number of printers together with the number of station streams cannot exceed the maximum number of emulated 3271 devices allowed on user's 2200 system.

- Numeric Lock -- Select Yes to validate host-designated numeric-only fields. If numeric lock is selected, non-numeric characters cannot be entered into host-designated, numeric-only fields. Select No to allow alphanumeric characters to be entered into host-designated, numeric-only fields.

- Station Addresses -- Enter the host-designated set of unique addresses for the stations in the cluster. The number of station address entries must equal the number of configured stations.

- Printer Addresses -- Displayed only if the response to NO. of PRINTERS is not zero. Enter the host-designated set of hexadecimal addresses for the printers in the emulated 3271 cluster. The number of printer address entries must equal the number of configured printers.

- Spooled Print Time Out -- Sets the delay counter to compensate for the difference between the time it takes to write a print stream to disk and the time lapse the host expects when it sends a data stream to be printed. Generally, five seconds is sufficient; however, this may vary for particular host systems.

- User Exit -- Specify the name of a program module to be accessed upon termination of the 3271 emulation.

- T.C. Board Address -- Enter the device address of the communications controller to be used by the 3271 software.

After all parameters have been defined, "#" returns to the first parameter. Press RUN to initiate the next parameter screen in the configuration sequence. A Print Stream Data screen, similar to Figure 3-2, appears if there are printers in the proposed cluster. If the specified number of printers was zero, this screen is bypassed.

```
                    P r i n t   S t r e a m   D a t a

#    PARAMETER                      CURRENT SELECTION
     SYSTEM PRINTER ADDRESS         215
     1 PRINTERS CONFIGURED          D3
     ANY SPOOL TO DISK DATA         Yes
     STORAGE METHOD                 Create a new file
     SPOOLER FILE NAME              SpoolIT
     SPOOLER DISK ADDRESS           310
     NUMBER OF SECTORS              200

OPTIONS FOR -- SYSTEM PRINTER ADDRESS        ACTIVE KEYS--
 215 216 217 218                              --DIGITS--
                                              --RETURN--
                                              --BACKSPACE--
                                              --RECALL--
                                              --RUN--
```

Figure 3-2. Sample Print Stream Data Screen

The following parameters must be defined for the Print Stream Data screen:

- System Printer Address -- Specify the 2200 system device addresses for printers that are configured in this cluster.

- # Printers Configured -- No response is required. The number displayed next to the number sign (#), and the hexadecimal addresses in the CURRENT SELECTION field correspond to the entries made on the configuration screen (refer to Figure 3-1).

- Any Spool to Disk Data -- To spool print streams to disk or diskette, respond Yes. To print the data streams upon reception, respond No.

- Storage Method -- Displayed if the response to ANY SPOOL TO DISK DATA is Yes. Specify one of the following filing methods:

  - Add to an Existing File -- Adds spooled print streams to an existing file. The name of the file must be specified in response to SPOOLER FILE NAME.

  - Replace an Existing File -- Deletes the data currently stored in an existing file, and then writes the new data in its place. The name of the file must be specified in response to SPOOLER FILE NAME.

  - Create a New File -- This method should be chosen when a new spooler file is needed. Enter the file name in response to SPOOLER FILE NAME, and enter the number of disk sectors to be dedicated to that file in response to NUMBER of SECTORS.

- Spooler File Name -- Displayed only if the response to ANY SPOOL TO DISK DATA is Yes. Specify the name of the new or existing spooler file (called the Spool-to-Disk file).

- Spooler Disk Address -- Enter the 2200 system device address of the disk drive that contains the spooler file.

- Number of Sectors -- Displayed only if the response to STORAGE METHOD is Create a New File. Specify the number of sectors to be allocated to the new spooler file. Minimum and maximum values are 200 and 99,999, respectively. The appropriate value depends on the anticipated number of blocks of data to be received from the host. Each screen of data (1,920 characters maximum) sent by the host comprises one block and occupies eight sectors.

Once the parameters for emulated 3277 display stations and printers in the cluster have been defined, each configured data stream should be assigned an 8-character descriptive name. A sample screen for assigning descriptive names to data streams is illustrated in Figure 3-3.

```
                 E q u a t e   S t r e a m   N a m e s

       Parameters  Current Selection

                                        ---ID---
       Station  1  stream   40    is    PRIMARY
       Station  2  stream   C1    is    SUPERVIS
       Station  3  stream   C2    is    CLERK
       Station  4  stream   C3    is    CLERK2
       Station  5  stream   HH    is    STREAM.5


       Printer  1  stream   50    is    CLERK
       Printer  2  stream   D1    is    DAISY
       Printer  3  stream   D2    is    LINE

   Start of Report String
   End of Report String
           Key RETURN or RECALL
           Else Key RUN to save Equates
```

Figure 3-3. Sample Equate Stream Names Screen

Before information is furnished to the screen, the Printer/Station fields are filled in with X's, and the Stream fields are filled in with HH's. The Equate Stream Names parameters are defined as follows:

- Printer/Station X -- No response is necessary. The X field displays the 3271 emulation system number for each station and printer configured.

- Stream HH -- No response is necessary. The 3271 hexadecimal address assigned to the device associated with each stream is displayed in the HH field.

- ID -- If desired, specify a descriptive title (not exceeding eight bytes) to be associated with each configured data stream. Otherwise, station streams are numbered 1 through 8, and printer streams are lettered A, B, C, or D.

- Start of Report String -- Enter the host-designated, 16-byte report delimiter referred to as the Beginning of Report (BOR) record. Refer to Appendix D for a description of report/stream definition.

- End of Report String -- Enter the host-designated, 16-byte report delimiter referred to as the End of Report (EOR) record.

Once all of the parameters are complete, press RUN. Then, save the parameter specifications by following the procedure described in Section 3.3.

3.2 MODIFYING AN EXISTING CONFIGURATION

The main menu for Terminal 1 (refer to Figure 2-1) provides access to the Change or Create any T.C. Configuration procedure. This procedure gives the user the capability to modify existing 3271 configurations. Also, if the site has other Wang communications emulators and all software modules have been incorporated into the large system disk, the procedure can be used to exit the 3271 software and select another emulator. Select the Change or Create any T.C. Configuration procedure to display a list of existing 3271 configurations. A sample list is shown in Figure 3-4.

```
WANG 2200 TELECOMMUNICATIONS EMULATORS
TO OPERATE -- Press SF 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 - 3271 three and three
      '3  Load - 3271 four stations and one printer
      '4  Load - 3271 eight stations
```

Figure 3-4. Sample Screen for Recalling an Existing Configuration

To modify an existing configuration, position the "#" next to that configuration and press SF'15 (RECALL). The parameter screens for that configuration (i.e., Create a New Configuration, Print Stream Data, and Equate Stream Names) are displayed. Each configuration screen has the existing parameter specifications in place. Modify existing specifications by positioning "#" next to the appropriate parameter and entering the new definition. Press RUN at the completion of each screen, as though the configuration was being generated for the first time. After the desired changes are entered, the modified configuration must be saved in the same manner as a new configuration is saved.

3.3 SAVING A CONFIGURATION

The opportunity to save a configuration is presented after the Equate Stream Names screen has been completed. The SAVE prompt is shown in Figure 3-5.

```
SAVE IT OR RUN?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to option,
or position # via RETURN, SPACE or BACKSPACE and key RUN.

      ' 0 TO EXIT WITHOUT SAVING CONFIGURATION
      ' 1 FOR RUN CREATED VERSION
      ' 2 FOR SAVE CREATED VERSION
```

Figure 3-5. Screen for Accessing the Save a Configuration Function

Three keys are active at this time: SF'0 to exit the configuration procedure without running or saving the current version, SF'1 to run the configuration without saving this version, and SF'2 to save the configuration. When the user presses SF'2, a screen similar to the one shown in Figure 3-6 appears.

```
SAVE THE PARAMETERS YOU HAVE GENERATED

EXISTING CALLS --
     ' 2 FOR 3271 ONE AND ONE
     ' 3 FOR 3271 7 Terminals and 2 Printers SPOOL1
     ' 4 FOR 3271 5 term 2 printer

THESE PARAMETERS--
     Emulator type    --- 3271
     Input Capability --- 7 Stations
     Output capability -- 2 Printers

     KEY 1-40 BYTE.... ....1.... ....2.... ....3.... ....4
     DESCRIPTION?_____________________________________________
```

Figure 3-6. Sample Screen for Saving a Configuration

The EXISTING CALLS section of the display lists all the currently available configurations. THESE PARAMETERS contains information from the configuration currently being created or modified. If desired, the user can enter a descriptive title (up to 40 bytes) for the configuration being saved. The descriptive title should convey enough information about the cluster to readily identify the cluster to the user. If a title is entered, it is added to the list of existing configurations displayed when the 3271 Cluster Loading procedure is invoked (refer to Section 4.1).

If a modified version of an existing configuration is being saved, it is added to the list of existing configurations. The original configuration remains the same. A unique name should be generated for the new configuration, although duplicate names are accepted. A configuration that has been saved can be removed from the system by deleting it from the Create a New Configuration menu.

When the sequence to save a configuration is complete, the main menu is redisplayed, and the procedure to load a cluster can be selected. Once a cluster is loaded, emulated 3277 display stations and 3288 printers can be logically attached, and interactive processing can begin.

CHAPTER 4
USING A CONFIGURED CLUSTER

4.1 LOADING A CONFIGURATION

To load an existing 3271 emulation cluster configuration, the user selects the procedure "Load a 3270 cluster" from the main menu. Once the procedure is selected, a screen similar to the screen shown in Figure 4-1 lists the existing configuration.

```
Load the 3270 Cluster
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, or BACKSPACE and key RUN

    ' 1 Load - 3271 ONE AND ONE
    ' 2 Load - 3271 7 Stations and 2 Printers SPOOL1
    ' 3 Load - 3271 5 Stations and 2 Printer
```

Figure 4-1. Sample Configurations Available for Loading

Choose the desired cluster configuration by pressing the SF key corresponding to that configuration, or by aligning the "#" with the appropriate configuration and pressing RUN. The system displays the 3271 parameters screen (refer to Figure 3-1) containing the appropriate selections for the chosen configuration. In addition to the selected configuration parameters, the system displays an initial loading message, shown in Figure 4-2, which indicates the name of the configuration being loaded.

```
**************************************************************************
*                                                                        *
*   LOADING SYSTEM          WANG 2200 TELECOMMUNICATIONS                 *
*                                                                        *
* **********************************************************************
```

Figure 4-2. Initial Loading Message

If a configuration is already loaded, a message, similar to that shown in Figure 4-3, is displayed.

```
Request to load a configuration into the Wang 2200/3271 emulator

  MCT task already loaded   The configuration requested is the same

  Key  '0  to Abort to START
  Key   L  to Load system anew
  Key   A  to Attach to the system already loaded
```

Figure 4-3. Initial Screen of the Loading Sequence

If the configuration is the same as the one already loaded, access the Attachment task by entering A, or abort the loading process by pressing SF'0. If the configuration is different from or the same as the one already loaded, enter an uppercase L to continue with the loading procedure. If there are printers in the configured cluster, a screen similar to the screen shown in Figure 4-4 appears. This screen prompts the user for the desired spool-to-disk parameters. If no printers are in the configured cluster, the screen is bypassed.

```
                A n y   S p o o l   T o   D i s k

     PARAMETER                    CURRENT SELECTION

     SPOOLING REQUIRED            Yes
  #  CHANGE DEFAULT VALUE         No
     1 PRINTERS CONFIGURED        D4
     STORAGE METHOD               Create a new file
     SPOOLER FILE NAME            SpoolIT
     SPOOLER DISK ADDRESS         310
     NUMBER of SECTORS            1000

  OPTIONS FOR -- CHANGE DEFAULT VALUE     ACTIVE KEYS--
   1 NO                                   --DIGITS--
   2 YES                                  --RETURN--
                                          --BACKSPACE--
                                          --RECALL--
                                          --RUN--
```

Figure 4-4. Sample Screen for a Cluster That Includes Printers

The following spool-to-disk parameters should be defined:

- Spooling Required -- If any print streams are to be spooled to disk or diskette, respond Yes. If the print streams are to be directed to an on-line printer, respond No.

- Change Default Values -- To change the existing parameters to other specifications, respond Yes. Respond No if the parameters set at configuration time are to remain intact.

- Printers Configured -- No response is necessary for this parameter. The number of printers in the configuration is indicated, and their addresses are displayed in the CURRENT SELECTION field.

NOTE

The explanation of the following parameters assumes that the response to the CHANGE DEFAULT VALUE parameter was Yes. If the response was No, the existing definitions are left intact.

- Storage Method -- Specify the name of the filing method to be used by the spooler file as follows:

  - Add to an Existing File -- Spooled print streams are added to an existing file, whose name must be specified in response to the SPOOLER FILE NAME parameter.

  - Replace an Existing File -- Deletes the data currently stored under the specified file name, and then writes the new data in this file. The name of the file is entered in response to the SPOOLER FILE NAME parameter.

  - Create a New File -- Creates a new spooler file. Enter the new file name in response to the SPOOLER FILE NAME parameter, and then enter the number of disk sectors to be dedicated to that file in response to the NUMBER of SECTORS parameter.

- Spooler File Name -- Specify the name of the new or existing spooler file being used.

- Spooler Disk Address -- Enter the 2200 device address of the disk where the spooler file is located.

- Number of Sectors -- Displayed only if the response to the STORAGE METHOD parameter is Create a New File. Specify the number of sectors to be allocated to the new spooler file. Minimum and maximum values are 200 and 99,999, respectively.

Press RUN after completing the parameters to display the screen shown in Figure 4-5. This is the last opportunity to alter the spooling parameters prior to completing the loading procedure. The four parameters on this screen have the same meanings as the last four parameters on the Any Spool to Disk screen in Figure 4-4.

```
        Loading program to open 2200/3270 Spooler File

Method A/C/R =  Create one
Volume Name  =  TESTONE
Disk Surface =  B10
# Sectors    =  dddd

Ready to execute?
Type  'Y' or 'N'
```

Figure 4-5. Sample Screen for Altering Loading Specifications

Once the parameters are defined and Y is pressed to execute the loading operation, a series of loading messages appear. After a message on the main menu signals that loading is complete, emulated 3277 display stations and 3288 printers can be attached to the cluster.

4.2 ATTACHING DEVICES TO AN ACTIVE CLUSTER

Before interactive communication with the host can begin at a 2200 terminal, the terminal must be attached to the 3271 emulation cluster. The attachment procedure can be executed from any 2200 terminal configured in the 3271 cluster. However, only the terminal at which the Attachment task is initiated can be attached. For example, a user who selects the Attachment task from the main menu displayed at Terminal 2 can attach only Terminal 2; that user cannot attach Terminal 4 from Terminal 2. Because configured printers are usually operated by people in a specific area, printers are usually attached from Terminal 1 or 2; however, they can be attached from any station in the cluster.

NOTE

Optionally, devices can be attached without operator actions by using the Automatic Load feature, discussed in Appendix E.

Prior to beginning the attachment procedure, the user should be familiar with Section 1.6, which describes the 3271 cluster addressing and numbering schemes.

To attach a device, begin with the main menu, and select the procedure "Attach to a running cluster". This procedure invokes a screen similar to the screen shown in Figure 4-6.

```
                    3 2 7 1   A T T A C H M E N T

        PARAMETER                   CURRENT SELECTION

  #     ATTACH DEVICE               Specific Station
        YOU ARE                     on Term.=1, Part.=4
        7 STATIONS CONFIGURED       40 C1 C2 C3 C4 C5 C6
        2 PRINTERS CONFIGURED       50 D1
        ATTACH STATION              40
        ATTACH PRINTER              50
        SPOOL-TO-DISK               NO
        PRINTER ADDRESS             215

  OPTIONS FOR -- ATTACH DEVICE        ACTIVE KEYS--
   1= Next Available Station          --DIGITS--
   2= Specific Station                --RETURN--
   3= Printer                         --BACKSPACE--
                                      --RECALL--
                                      --RUN--
```

Figure 4-6. Sample Attachment Screen

Define the attachment parameters as follows:

- Attach Device -- Specify whether the device being attached is to be a 3277 station or a 3288 printer. The OPTIONS FOR list shows the valid entries. Enter 3 to attach a printer. Enter 1 to attach a station whose address will be chosen by the system. Enter 2 to attach a station whose address will be specified in response to the Attach Station parameter.

NOTE

In the OPTIONS FOR list, Next Available Station is replaced by Reattach this Station if the terminal emulator program is reset while the station is being attached to the cluster. In this case, the Specific Station response is not allowed.

- You Are -- No response is necessary. The CURRENT SELECTION field displays the user's 2200 terminal and partition number assignment.

- Stations Configured -- No response is necessary. The number of configured 3277 stations is shown, and the addresses are listed in the CURRENT SELECTION field.

- Printers Configured -- No response is necessary. The number of configured 3288 printers is shown, and the addresses are listed in the CURRENT SELECTION field.

- Attach Station -- If Next Available Station is the response to the ATTACH DEVICE parameter, no response is necessary. The CURRENT SELECTION field displays the next available 3277 display station address, the associated stream name, and the terminal and partition number assignments.

  If Specific Station is the response to the ATTACH STATION parameter, the OPTIONS FOR list displays all the configured 3271 station addresses. Each address currently assigned to a terminal has the following prompt displayed next to it: "Attached Term. X Part. Y", where X and Y are specific values. Now, select the desired address by entering the 1-digit number corresponding to the address. The selected address appears in the CURRENT SELECTION field. If the station is being reattached, the CURRENT SELECTION field displays the address assigned to that station during the previous attachment procedure.

- Attach Printer -- Displayed only if the response to the ATTACH DEVICE parameter is Printer. Specify the number corresponding to the 3288 address of the printer to be attached.

- Spool-to-Disk -- Displayed if the response to ATTACH DEVICE is Printer, and Spool-to-Disk is loaded. Responding Yes indicates that data streams for this printer are to be spooled to disk, according to the parameters specified during the cluster loading procedure. Responding No attaches the printer as an on-line 3288 emulated printer.

- Printer Address -- Specify the hexadecimal address of the 2200 printer to be used.

Once the parameters in this screen are complete, press RUN to initiate logical attachment of the device. A series of attachment messages indicate successful attachment.

4.3 DETACHING DEVICES FROM AN ACTIVE CLUSTER

The Device Detachment procedure, selected from the 3271 main menu, enables a user to detach any station or printer. Pressing SF'31 (DETACH) allows users to detach only the station at which they are working. Figure 4-7 shows the screen that is displayed when the detachment procedure is selected. The prompts and their appropriate responses are similar to those provided on an attachment screen.

```
                    3 2 7 0  D E T A C H M E N T

      PARAMETER                        CURRENT SELECTION

#     DETACH DEVICE                    No
      7 STATIONS CONFIGURED            40 C1 C2 C3 C4 C5 C6
      2 PRINTERS CONFIGURED            50 D1
      DETACH STATION                   40
      DETACH PRINTER                   50  attached 215
      YOU ARE                          on Term.=5 Part.=5

OPTIONS FOR -- DETACH DEVICE             ACTIVE KEYS--
     1 -- No                             --DIGITS--
     2 -- Station                        --RETURN--
     3 -- Printer                        --BACKSPACE--
                                         --RECALL--
                                         --RUN--
```

Figure 4-7. Sample Detachment Screen

The detachment parameters are as follows:

- Detach Device -- Press 2 or 3 to detach an emulated 3277 display station or 3288 printer, respectively. Press 1 to abort the procedure and display the main menu.

- Stations Configured -- No response is necessary. The number of configured 3277 stations is indicated, and the addresses are listed in the CURRENT SELECTION field.

- Printers Configured -- No response is necessary. The number of configured 3288 printers is indicated, and the CURRENT SELECTION field displays the addresses.

- Detach Station -- Displayed only if the response to the DETACH DEVICE parameter is Station. The OPTIONS FOR section displays a list of station addresses. Enter the number corresponding to the station to be detached.

- Detach Printer -- Displayed only if the response to the DETACH DEVICE parameter is Printer. The OPTIONS FOR section lists the 3288 printer addresses. The prompt "Attached" is displayed next to the address of each printer that is currently attached. Enter the number of the printer to be detached.

- You Are -- No response is necessary. The CURRENT SELECTION field displays the 2200 terminal and corresponding partition number assignments.

After responding to all parameters on the detachment screen, press RUN. A series of detach messages are displayed. When the main menu appears, detachment is complete. Now, the 2200 terminal and its associated memory partition can be used for activities other than communicating with the host in 3271 mode.

4.4 ACCESSING THE STATUS DISPLAYS

Two status screens provide the user with information pertaining to the 3271 emulation system. The Cluster Status screen provides information about the 3271 cluster, and the Partition Status screen provides information about the memory allocation of the 2200 central processor.

Cluster Status Display

To access the Cluster Status display, select "Monitor Cluster Status Display" from the 3271 main menu. This display contains the number and addresses of configured devices, configured-device status, spooler file names, and report names. The display is divided into three sections: Configuration, Station Equates, and Print Streams, as illustrated in Figure 4-8.

```
                         CLUSTER 40 STATUS DISPLAY
                   This is Terminal = 4 in Partition = 6

CONFIGURATION                Stations                        Printers
                  1  2  3  4  5  6  7  8                 1  2  3  4
Configured:       40 C1 C2 C3 C4 hh hh hh                50 D1 hh hh
Attached:         40       C3                            50
Status:           80 00 00 80                            80 00 00 00
CPU Term.#         4        2                User exit = START
CPU Part.#         6        4                TC board  = 1C Active

                            Station Equates

   1 40 CLERK      |   2 C1 Station2   |  3 C2 Station3  |  4 C3 CHRIS
   5 C4 Station5   |                   |                 |

Print Streams                          Blocks  Disk usage--Report--
No.  Device  Add  Status      -Name-   Rcvd    Used Total  Number + Name
50   Printer 215  Attached
D1   Printer 216  Unattached

MCT active in Part. 2 background       PRNT in Part. 3 background
Key SF'0 to exit                       Other SF key to refresh display.
```

Figure 4-8. Sample Cluster Status Display

The configuration section of the Cluster Status display contains the following information:

- Configured -- The 3271 device-unit address of each device configured in the cluster under each numbered column (Stations 1-8, Printers 1-4).

- Attached -- The device-unit address for each currently attached device, in the appropriate column.

- Status -- A 1-byte status code for each configured device. Codes are interpreted according to the following conventions:

  00 -- Unattached
  10 -- Device Output Pending
  20 -- Printer Intervention Required
  40 -- Printer Busy
  80 -- Attached

  It is possible to have a device with two meaningful status situations (e.g., attached and busy). If this is the case, a bit set operation is performed between the two bytes, e.g., a printer that is both attached and busy has a status byte of C0.

- CPU Term # -- The 2200 terminal number of each attached station.

- CPU Part # -- The 2200 memory partition where the corresponding 3277 terminal task resides.

- User Exit -- The name of the program module that will be accessed upon termination of the 3271 emulation software.

- T.C. Board -- The address of the communications controller being used for 3271 emulation. Next to the address, a message (idle or active) indicates the status of this controller.

The Station Equates section of the Cluster Status display shows the device number, the 3271 device unit address, and the user-defined data stream name for each configured station. For example, in Figure 4-8, Station 4 has address C3 and the assigned name CHRIS.

The print streams section of the Cluster Status display contains the following information:

- No. -- The 3271 device-unit address of each configured printer.

- Device -- Either Printer, referring to each emulated 3288 printer, or Spooler, referring to the spool-to-disk file.

- Addr -- The 2200 address of the printer or the disk address of the spooler file.

- Status -- Possible print stream conditions are:

  - Unattached -- The print stream is configured, but not attached to the cluster.

  - Attached -- The configured print stream is attached to the cluster, but data is not currently being received.

  - Detached -- During the time the current cluster has been active, this stream was attached, but is not now.

  - Not Ready -- The printer is not ready to receive data.

  - Printing -- Data is currently being received and printed.

  - Printed -- Print operations have concluded for the current incoming stream.

  - Intervene -- A problem exists with the printer (e.g., it is out of paper); if the problem cannot be solved, contact Wang support personnel.

  Some status conditions that apply to printer streams also apply to spooler streams. Attached, Unattached, Detached, and Intervene are all valid status conditions for spooler streams. Five additional conditions apply to spooler streams:

  - Ready -- The disk is ready to receive data, but no streams are currently being received.

  - Writing -- An incoming stream is currently being written to disk or diskette.

  - Saved -- The current incoming stream has ended and has been written to disk in its entirety.

  - Disk Full -- The disk file accepting incoming streams is full. Contact local site personnel responsible for disk operations.

  - Error XX -- Contact local personnel to interpret the numbered disk error message.

- Name -- The name of the 3271 spooler file.

- Blocks Rcvd -- A 5-digit number, indicating the number of blocks received by the spooler file.

- Disk Usage -- Has two subheadings: "Used" indicates the number of sectors already used within the spooler file; "Total" indicates the number of sectors reserved for the spooler file.

- Report -- The report number(s) and name(s) contained in the spooler file.

CPU Partition Status

Selecting the Monitor Partition Status function from the main menu produces the same result as executing the BASIC-2 function $PSTAT. Figure 4-9 presents a sample display of memory allocations and other information. For more information about this display, refer to the BASIC-2 Language Reference Manual (700-4080).

```
     **** PARTITION STATUS *****        MVP Release 2.3          Partition 6

 #PART USER-MSG  BANK  SPACEK  PRGM  #TERM   @NAME      ERR   TEXT   @P   DATA  I/O
   01            01    05.00   P     00-W    3270UNIV   77    01     01   01    00
   02            01    06.00   P     00-W    3270 MCT   00    02     01   02    00
   03            01    22.00   P     01-A               00    03     03   03    01
   04            02    56.00   P     01-A               00    04     04   04    01
   05            03    56.00   P     03-A               00    05     05   05    01
   06            04    56.00   P     04-A               00    06     06   06    00

     Press SF'0 to exit to START module
     Press SF'1 to attach terminal to a different partition
```

Figure 4-9. Sample CPU Partition Status Display

The following information is displayed on the CPU Partition Status Display screen:

- #PART -- The number of each partition in system memory.
- USER-MSG -- The user-specified message, if any, set with the $PSTAT statement.
- BANK -- The bank in which each partition resides.
- SPACEK -- The allocated memory size of each partion (in K bytes).
- PRGM -- P denotes a programmable partition; N/P (non-programmable) indicates that programming has been disabled.
- #TERM -- The 2200 system number of the terminal assigned to each partition, and a 1-character status message. A indicates the terminal is currently attached to its partition, D indicates the terminal is detached, and W indicates the terminal is waiting to be attached to its partition. Attachment and detachment refer to the memory partition, not to the emulated cluster in this case.
- @NAME -- The name of the task running in each global partition. This field is blank for each nonglobal partition.
- ERR -- The numeric portion (i.e., without alphabetic identifier codes) of the last error encountered in each partition.

- TEXT -- The partition where the program text is currently running. This number is the same as the partition except when global text is being executed within a partition.

- @P -- The partition selected for global operations.

- DATA -- The partition containing the DATA statements accessed by the program currently running.

- I/O -- The address of the device currently communicating with the partition.

CHAPTER 5
KEYBOARD AND DISPLAY CHARACTERISTICS

5.1 INTRODUCTION

When a 2200 terminal is logically attached to an emulated 3271 cluster, the terminal emulates the features of a 3277 display station. This chapter includes a brief explanation of display fields and attribute characters, as well as a description of the 3277-mode keyboard.

5.2 DISPLAY FIELDS

Imbedded in the 3277 display station buffer are control characters that define the characteristics, or attributes, of the data that follows. These characters are called attribute characters. Each attribute character, plus all the data following it up to the next attribute character, is called a field. Organizing the display data into fields facilitates display operations for the user.

Attribute characters, in addition to defining the start of a field, define the following field characteristics for all character locations contained in that field.

- Protection -- Protected fields are not available for data entry. Generally, they provide tutorial information defining the type of data to be entered into a subsequent unprotected field. Protected fields can wrap from the last position of one line to the first position of the next. The intensity with which a protected field is displayed is also controlled by the attribute character.

  Data can be entered into part or all of unprotected fields. Like protected fields, unprotected fields can wrap from the last position of one line to the first position of the next. However, data entry into unprotected fields is not without restriction; the attribute character for an unprotected field also defines the type of data (i.e., alphanumeric or numeric only) that can be entered into the field, and the intensity with which that field is displayed.

- Intensity -- If low intensity is specified for a field, data in that field is displayed at normal intensity. If high intensity is specified for a field, data in that field is displayed brighter than normal. For certain applications, such as security passwords, it may be desirable not to display data at all. If "blank" is specified in a field's attribute character, the data in that field is not displayed, and will not be printed. The 2236D terminal does not support the high-intensity or blank-field capabilities.

- Field Contents -- Any character can be entered if the attribute character for a field specifies alphanumeric data. In unprotected fields with a numeric-only attribute character, the digits 0-9, the decimal point (.), and the minus sign (-) are the only accepted entries.

Each attribute character occupies one character location in the buffer, but it cannot be displayed. During a display or a printout, its character location appears as a space. Attribute characters are treated as characters protected from operator intervention, i.e., they cannot be replaced by alphanumeric characters entered from the keyboard. Refer to Appendix A for a summary of the attribute structure.

If the attempted entry of data violates specifications defined by the attribute character (e.g., attempted data entry into a protected field), an audible tone sounds and an appropriate warning indicator appears on the screen. The entry is ignored, and the keyboard is locked to prevent further input. Press the 3277 RESET key to unlock the keyboard and continue data entry.

5.3 SYSTEM STATUS INDICATORS

When the 2236D/DE/DW keyboard is locked, the following display indicators are displayed in reverse video at the bottom of the screen display.

- Input Inhibit -- Indicates that an operation has disabled the keyboard. Any of the following five conditions can cause input inhibit:

  - Pressing an AID-generation key (refer to Appendix A for the list of keys that generate AID characters).

  - Performing a 3271 system input or output operation.

  - Pressing an alphanumeric key when the cursor is in a protected field.

- Entering nonnumeric data in a numeric-only field.

- The keyboard was locked by a Write command from the host, and the unlock order has not been received.

The input inhibit condition can be cleared by either of two methods: (1) The 3277 RESET key is pressed (refer to the keyboard layout in Figure 5-1), or (2) the host unlocks the keyboard.

- System Down -- Indicates that the cluster is not communicating with the host, and has not done so for at least 11 seconds.

- Line Down -- Indicates that the cluster has lost the Data Set Ready signal from the modem.

5.4 3277-MODE KEYBOARD CHARACTERISTICS

While the type of data entered during interactive processing is application-dependent, primary functions are standardized. Some of these functions have been built into the system to increase user speed and efficiency in performing repetitive tasks such as editing. Other functions improve user efficiency by increasing the speed with which data can be entered into the unprotected fields of a formatted screen (e.g., one function enables the user to tab from one field to the next rather than spacing through intervening protected fields). In addition to specialized functions, the keyboard provides the capabilities offered by a standard typewriter.

The following 2200 Series terminals can be used with the 3271 emulation software:

- 2236D, 2236DE, or 2236DW
- 2336DW
- 2886DE or 2886DW

Optionally, other Wang devices equipped with 2236DE emulation (such as a Wang Professional Computer equipped with Wang PC Asychronous Communications Support Software) can access a 2200 system and be logically attached to the software as emulated 3277 display stations. The 2236D, 2236DE, and 2886DE keyboards are identical; they are represented in Figure 5-1. The 2236DW, 2336DW, and 2886DW keyboards are illustrated in Figure 5-2. The keys with 3277 functions are labeled.

The 16 function keys at the top of each of these keyboards have identical functions. The 3277 function key strip that labels each function key is the same for all three terminals and is shown in Figure 5-3.

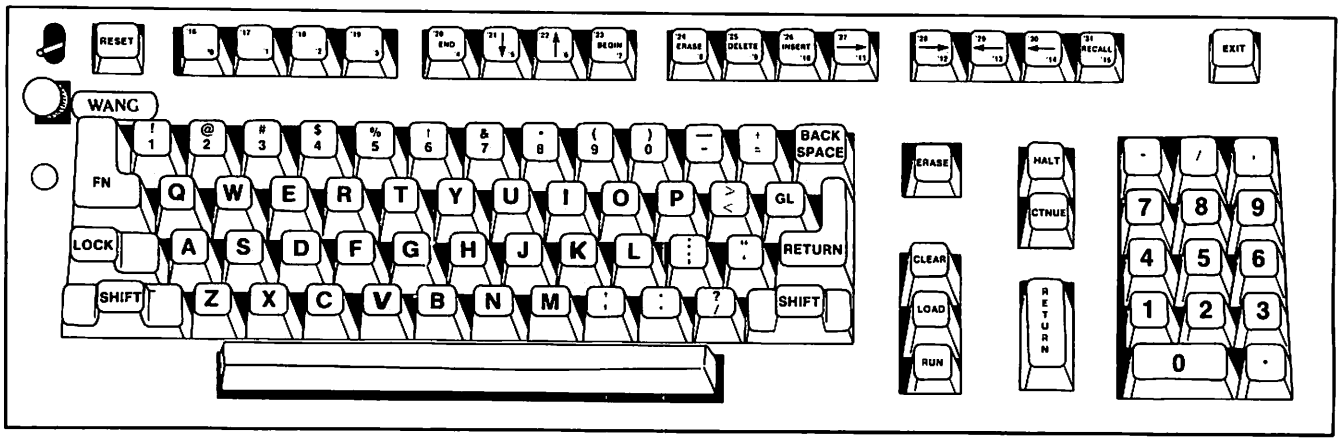

Figure 5-1. Layout of the D/DE Keyboard

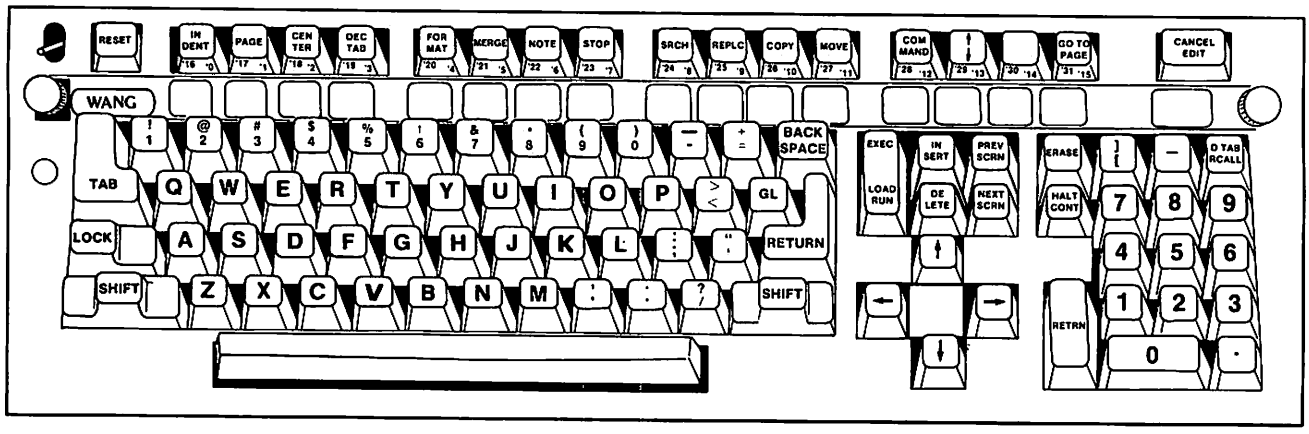

Figure 5-2. Layout of the DW Keyboard

PF 5	PF 6	PF 7	PF 8	PF 9	PF 10	PF 11	PF 12
PA 1	PA 2	PA 3	PF 1	PF 2	PF 3	PF 4	

Erase EOF			DISPLAY	NumLock	UTIL.	Test Req	DETACH
Erase EF	Delete	Insert	Curs.Up	C.Right	C.Left	C. Down	DUP

Figure 5-3. 3277 Function Key Strip for D, DE, and DW Terminals

NOTE

To view a display of the 3277 function strip and special keys by terminal type, press the UTIL key. This display also shows which stations are attached to the cluster, and the status of all the system printers.

5.5 CURSOR

The cursor displayed on the terminal screen is an underscore. Its location indicates where the next entered character will appear. Even though data entry into protected fields is prohibited, the cursor moves through these fields if directed to do so by means of the cursor movement keys. Successful entry of a character into an unprotected field causes the cursor to move to the next available character entry position. The cursor wraps from the last position of one line to the first position of the next line, or from the last position of the screen to the first position of the first line.

Cursor Movement Functions

The following four keys move the cursor without affecting the fields that the cursor passes through:

- Cursor Right -- Moves the cursor to the right, one character position at a time, regardless of whether the screen is formatted or not. At the end of a line, the cursor is moved to the first position of the next line; at the end of the screen, the cursor is moved to the first position of the first line.

- Cursor Left -- Moves the cursor to the left, one character position at a time, regardless of whether the screen is formatted or not. At the beginning of a line, the cursor is moved to the last position of the previous line; at the beginning of the screen, the cursor is moved to the last position of the last line.

- Cursor Up -- Moves the cursor upward, one line at a time, regardless of whether the screen is formatted or not. If Cursor Up is pressed at the first line, the cursor is moved to the corresponding column of the last line.

- Cursor Down -- Moves the cursor down, one line at a time, regardless of whether the screen is formatted or not. If Cursor Down is pressed at the last line, the cursor is moved to the corresponding column of the first line.

Field-Oriented Cursor Functions

The following four keys provide field-to-field movement of the cursor. Field-oriented movement of the cursor expedites data entry in a formatted screen.

- TAB -- Moves the cursor to the first position of the next unprotected field. If there are no unprotected fields on the screen, TAB moves the cursor to the first position of the first line.

- BACKTAB -- Moves the cursor to the first position of the previous field if the cursor is in the first position of a field. If the cursor is not in the first position of a field, BACKTAB moves the cursor to the first position of that field. If no unprotected fields exist, BACKTAB moves the cursor to the first position of the first line.

- NEW LINE -- Moves the cursor to the first position of the next line in an unformatted screen. In a formatted screen, NEW LINE moves the cursor to the first position of the next unprotected field. If the formatted screen does not have unprotected fields, the cursor is moved to the first position of the first line.

- HOME -- Moves the cursor to the first position of the first line in an unformatted screen. In a formatted screen, HOME moves the cursor to the first position of the first unprotected field.

5.6 FIELD MODIFICATION FUNCTIONS

Very often, the data entered in a field requires modification. The following field modification keys provide the capability to easily manipulate the data in a field:

- ERASE INP -- Causes all unprotected fields to be cleared and the cursor to be repositioned to the first position of the first unprotected field. If the screen is unformatted, the entire screen is cleared, and the cursor moves to Line 1, Position 1.

- ERASE-EF -- Clears all character positions between the cursor and the end of the field. The cursor itself is not moved. Pressing this key in an unformatted screen causes the keyboard to lock.

- INSERT -- Implements Insert mode at the workstation. Insert mode is denoted by an underscore at Line 24. If INSERT is pressed while the cursor is in a protected field or in a filled, unprotected field, the keyboard is locked. If INSERT is pressed in an unfilled, unprotected field, subsequent alphanumeric entries are displayed, and the data to the right of the cursor is moved one position to the right as each character is entered. This movement of existing characters to the right continues with each entry until the field is filled. When the field is full and data cannot move to the right to admit new entries, the keyboard is locked.

- DELETE -- Causes the character at the cursor position in an unprotected field to be deleted and subsequent characters to the right of the cursor to be moved one position to the left. If the unprotected field extends beyond one line, the left shifting of characters does not extend past the end of the line. Pressing DELETE in a protected field locks the keyboard.

- DUP -- Causes the DUP character to be entered into an unprotected field, and a TAB function to be executed. The DUP character, displayed as an asterisk (*), indicates to the host that the preceding character is to be repeated until the end of the field. For example, the 8-character field 9543A* is actually 9543AAAA. Pressing the DUP key while the cursor is in a protected field locks the keyboard.

- FIELD MARK -- Enables the user to designate the end of a field in an unformatted screen or the end of a subfield in a formatted screen. FIELD MARK is displayed as a semicolon (;) and is printed as an asterisk (*).

5.7 SYSTEM FUNCTION KEYS

The 3277 emulation display station is equipped with several keys that perform system functions. Unlike the field modification functions and the cursor movement functions, the system functions do not provide additional capabilities for efficient data entry. In general, they provide tutorial information (on a separate screen) to assist the user with the current procedure, or they enable the user to exit from the present procedure. The system function keys are as follows:

- RESET -- Enables recovery from a locked keyboard, or returns to the preceding screen in a multiscreen operation.

NOTE

This reference is to the 3277 RESET key, which is the EDIT key in a non-3277 application; it is to be distinguished from the 2236D/DE RESET key in the upper left corner of the keyboard.

- UTILITY -- Initiates a display that contains the 3277 special function key strip, the changed keyblock keys, and the Print Stream and Station Equates sections from the Cluster Status display. If UTILITY is pressed a second time, the original screen is redisplayed.

- DETACH -- Logically detaches the display station from the cluster, freeing the station for another application.

- DISPLAY -- Causes no visible action. The DISPLAY key is included for activation in future releases of the 2200 3271 emulation software.

- '0 -- Initiates a display of the descriptive title associated with the station data stream. Pressing '0 a second time restores the original display.

5.8 ATTENTION-GENERATING KEYS

Pressing the CLEAR, ENTER, Program Attention (PA), or Program Function (PF) keys causes a special code, called an AID character, to be generated and the keyboard to be locked. The next time the host does a poll, the AID code indicates to the host that the screen data is ready to be transmitted. CLEAR is the only one of these keys that causes a visible operation (i.e., the entire display is cleared).

Table 5-1 provides the user with a quick reference to the 3277 keys, their 2200 counterparts, and their definitions.

Table 5-1. Emulated 3277 Key Definitions

2200 Key	3277 Key	Definition
EDIT	RESET	Unlocks the keyboard or returns the display to the previous screen in a multiscreen procedure.
'29	UTILITY	Acts in toggle fashion. The first time the key is pressed, it initiates a display that reproduces the 3277 special function key strip, the changed keyboard keys, and the Print Stream and Status Equates sections from the Cluster Status display. Pressing the key a second time restores the original display to the screen.
'0	ID	Initiates a display of the descriptive title associated with the station data stream. Pressing '0 a second time returns the original display to the screen.
'31	DETACH	Changes workstation status from attached to unattached. This key will not function if input or output activity is in progress.
'27	DISPLAY	Causes no visible action at the present time.
'28	NUMERIC LOCK	Allows alphanumeric characters to be entered in numeric-only fields if the feature was selected during cluster configuration.

Table 5-1. Emulated 3277 Key Definitions (continued)

2200 Key	3277 Key	Definition
CLEAR	CLEAR	Clears the entire screen.
RETURN	ENTER	Instructs the system to accept the screen data and bid for transmission.
'30	TEST REQ	Generates an AID character
'02-'04	PA 1-3	Generates an AID character.
'05-'08	PF 1-4	Generates an AID character.
'16-'23	PF 5-12	Generates an AID character.
'11	UP ARROW	Moves the cursor up one line; the cursor wraps from first line to last line.
'12	RIGHT ARROW	Moves the cursor right one space; the cursor wraps from the last position of one line to the first position of the next line.
'13	LEFT ARROW	Moves the cursor left one position; the cursor wraps from the first position of one line to the last position of the next line.
'14	DOWN ARROW	Moves the cursor down one line; the cursor wraps from the last line to the first line.
RUN	NEW LINE	Moves the cursor to the first position of the next line or, if that position is part of a protected field, to the first position of the first unprotected field of the line.
STMT or FN	TAB	Moves the cursor to the next Tab stop or, in a formatted screen, to the next unprotected field.
ERASE	BACKTAB	Moves the cursor to the previous Tab stop or, in a formatted screen, to the previous unprotected field.
LOAD	HOME	Moves the cursor to the first character position of the first line or the first character position of the first unprotected field of the screen.
'8	ERASE INPUT	Erases all unprotected data in a formatted screen or all data in an unformatted screen.

Table 5-1. Emulated 3277 Key Definitions (continued)

2200 Key	3277 Key	Definition
'24	ERASE-END-OF-FIELD	Clears all character positions in the unprotected field containing the cursor, or all character positions from the cursor location to the end of the line in formatted screens.
'9	DELETE	Deletes the character at the cursor location and shifts all characters to the right of the cursor one position to the left. A null character is inserted to the right of the last character. If the unprotected field occupies more than one line, the shifting of characters does not extend to subsequent lines.
'10	INSERT	Facilitates the insertion of characters at the cursor location, and shifts the characters, from the cursor location to the end of the field, to the right. In a formatted screen, if the characters that are being shifted to the right reach the end of the field, subsequent character entries cause the characters at the extreme right of the field to be lost. In an unformatted screen, the shifting characters wrap to the next line.
'15	DUP	Repeats the character at the cursor location until the end of the field or line.
CONTINUE	FIELD MARK	Identifies the end-of-field in an unformatted buffer or the end-of-subfield in a formatted buffer when entered at the cursor location.

CHAPTER 6
USING THE 3271 OFF-LINE FUNCTIONS

6.1 OVERVIEW

An IBM 3271/3277/3288 cluster always receives print stream data to an on-line printer. As an alternative to on-line printing, the Wang 3271 emulation allows print stream data to be directed (spooled or stored) to a disk or diskette file (refer to Sections 3.1 and 4.1). As indicated in Figure 3-3, print data can be spooled to disk under control of user-defined (host-defined) report names. Once data from the host has been spooled to disk, there are off-line functions to simplify printing and erasing of spooler files. To access these functions, select "Load 3270 off-line functions" from the main menu. The menu shown in Figure 6-1 appears.

```
 Wang 2200 / 3270 system off-line functions
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE, or BACKSPACE and key RUN
             Configuration functions from terminal 5

#' 1  to List spooled print files
 ' 2  to Delete from spooled print files
 ' 3  to Flush and renew WP system file
 ' 4  to Examine WP system file
 ' 5  to Examine print queues
 ' 6  to Clear cluster & stop 2228D controller
```

Figure 6-1. Off-Line Functions Menu

The purpose of each off-line function is as follows:

- List Spooled Print Files -- Allows a user to print ("list") spooled files by report name or by stream number. The List function allows the listing of reports/streams on up to four printers concurrently. Up to 30 reports can be queued to any one printer.

  In addition, the user can view the status of the print operations from the terminal and can perform specific control functions, such as restarting a print operation, aborting a print operation and removing the item (report/stream) from the queue, or aborting the print operation and retaining the item on the queue.

- Delete from Spooled Print Files -- Allows a user to delete reports or specific blocks of data from a spooler file.

- Flush and Renew WP System File -- Allows a user to delete all existing spooler files from the word processing catalog.

- Examine Word Processing System File -- Allows a user to (1) display all the entries (spooler files) in the word processing catalog, (2) change the disk address of a spooler file, (3) detach a spooler file from the system, (4) attach a spooler file to the system, and (5) delete a spooler file from the system.

- Examine Print Queues -- Allows a user to (1) display the print queue list associated with a specific spooler file and initiate printing, (2) display a list of all the reports contained in a specific spooler file, (3) display a summary list of the print queue, and (4) back up (copy) the spooler and report name files. Unwanted items in the print queue and report name files can be deleted using the Initiate Printing function (Item 1).

- Clear Cluster and Stop 2228D Controller -- Terminates the communications link with the host without powering down the entire system.

The following sections present the various screens and prompts associated with the options of the Off-Line Functions menu.

NOTE

Unless stated otherwise (in the text or on the screen), SF'0 can be used at any time during an operation to return to the previous screen.

6.2 LISTING UTILITY

The Off-Line Listing utility allows spooled data from a disk or diskette file to be printed (listed) on an off-line printer. The data can be printed by stream number or by report name. The report names are generated by the host system. Unless the host identifies the information that has been addressed to each printer, selective listing of data cannot occur.

Reports are preceded by a Beginning-of-Report (BOR) record and terminated by an End-of-Report (EOR) record. These delimiters are inserted into the print streams (at the beginning of a transmitted block) by the appropriate host application program. Refer to Appendix D for more information about the use of BOR and EOR records.

Reports and/or streams can be listed from any on-line or off-line spooler file. The on-line spooler file, also called the active file, is the file currently open for receiving print data from the host. Conversely, an off-line spooler file is one that is no longer receiving data from the host.

To use the Listing utility, select the first option displayed on the Off-Line Functions menu. The system responds with a display similar to that shown in Figure 6-2.

```
 Wang 2200 / 3270 Listing Utility
To OPERATE -- Press S.F. key or DIGIT corresponding to name,
or position # via RETURN, SPACE, or BACKSPACE and key RUN

#' 1  to use 'SPOOL320' on 320 -- the active On-line Spooler file
 ' 2  to use 'SPOOL321' on 320 -- available off-line Spooler file
 ' 3  to use 'SPOOLAA ' on 320 -- available off-line Spooler file
 ' 4  to use 'SPOOLBB ' on 320 -- available off-line Spooler file
 ' 5  to use 'WPSYSTEM's other spooler file names
```

Figure 6-2. Sample Initial Listing Utility Screen

Choosing the last option on the initial screen invokes a list of the WPSYSTEM's other spooler files, as illustrated in Figure 6-3. This screen is for reference purposes only. After viewing the list, return to the previous display by pressing SF'0.

```
Wang 2200 / 3270 Listing Utility -- WPSYSTEM's other file names
To OPERATE -- Press S.F. '0 to return to prior display

 1)     SPOOLAB  on   B20  --  File not found
 2)     SPOOLMM  on   B20  --  No report names file
 3)     SPOOLXY  on   330  --  Disk is unavailable
 4)     ?????    on   350  --  Access error = 98
 5)     SPOOLEE  on   D40  --  disk not configured
```

Figure 6-3. Sample List of Unavailable Files

When the active on-line spooler file or any available off-line spooler file is selected from the initial screen, the system displays a message notifying the operator that the file is being opened. After opening the file, the system displays the main parameter screen, as illustrated in Figure 6-4.

```
   3270 Active Spooler File Off-Line List Utility ('0 = Exit)

350      = Spooler disk address          005    = Printer address
SPOOLTB9 = Spooler file name             2221   = Printer model
9        = Reports available
         = Items in list queue


Enter Printer address from following list
215 216 217 218 204 005

Reports available are:
  1 = CAROL FIRST ON 3     2 = STRM 2 REPORT 1     3 = STRM 1 REPORT TWO
  4 = STRM 1 REPORT 3      5 = STRM 2 REPORT 2     6 = STRM 2 REPORT 3
  7 = STRM 2 REPORT 4      8 = STRM 1 REPORT 4     9 = STRM 2 REPORT 5..
```

Figure 6-4. Main Parameter Screen of the Listing Utility

The screen displays the spooler disk address and spooler file name selected from the initial screen. The number of reports available is indicated, and the report names are displayed on the bottom of the screen. The user has the option of listing (printing) the data in the spooler file by either report name or by stream number. However, the user must first respond to several printer prompts, displayed one at a time in the boxed center section of the screen. These prompts are as follows:

- Printer Address -- The system prompts for the address of the printer that is to print the data. The default address is 005, the CRT. Press RETURN, or select a printer address from the list displayed in the boxed area; press RETURN.

- Printer Model Number -- Specify the printer model number, and press RETURN. A list of acceptable model numbers is displayed in the boxed area of the screen.

- Form Length -- If the printer model is 2281, specify the page length in inches, and press RETURN; the default length is 11 inches. If any printer model other than 2281 is selected, this prompt is skipped.

After the printer parameters are specified, the queuing mode prompt, shown in Figure 6-5, appears in the center section of the screen.

```
Key queuing mode   Scroll lists '11=Up  '12=Down  '13=Top '14=Rpts Queued
 1 = REPORT mode - List by report name regardless of stream
 2 = STREAM mode - List by block number within a single stream
```

Figure 6-5. Queuing Mode Prompt

Special Function (SF) keys '11, '12, and '13 allow the user to scroll through the list of available reports. SF'14 allows the user to display all the items (reports/streams) that are already queued, if any. The desired mode is selected by the digit key 1 or 2. Report mode and Stream mode queuing are discussed below.

Report Mode Queuing

When Report Mode is selected, the prompt in Figure 6-5 is replaced with the Report Mode prompts shown in Figure 6-6.

```
?   Key report number     Key space RETURN to execute or reprompt.
001      = Starting page                  999    = Ending page
1        = Number of copies               N      = Delete ? Y or N
```

Figure 6-6. Report Mode Prompts

The Report Mode prompts are as follows:

- Key Report Number -- Select a report from the list displayed on the bottom of the screen. Enter the report number, and press RETURN. The system displays the report name in place of the words "Key report number". Press the Space Bar and RETURN key to execute or reprompt (refer to Figure 4-16 and the paragraphs that follow it).

- Starting Page -- Press RETURN to accept Page 1 as the default, or key the page number (001-999) and press RETURN.

- Ending Page -- Press RETURN to accept the default (999, i.e., last page), or key a page number and press RETURN.

- Number of Copies -- Select one of the following options: (1) Press RETURN to accept the default of one copy; (2) enter a single digit (2-9), and press RETURN to print more than one copy; or (3) enter 0 (zero), and press RETURN to cancel the current print request.

- Delete ? -- To flag the report to be removed from the spooler file after printing, enter Y, and press RETURN; otherwise, press RETURN to accept the default of N.

The system now displays the report number, name, pages to be printed, etc., in the Items to List section of the display, as shown in Figure 6-7. The cursor is returned to the first prompt in the boxed area (Key report number) to allow additional reports to be queued for printing. Up to 30 reports can be queued to one printer.

```
3270 Active Spooler File Off-Line List Utility ('0 = Exit)

350      = Spooler disk address          216  = Printer address
SPOOLTB9 = Spooler file name             2221 = Printer model
9        = Reports available
1        = Items in list queue

  ?  Key_report number          Key space RETURN to execute or reprompt.
001 = Starting page                999 = Ending page
1   = Number of copies             N   = Delete ? Y or N

Items to list are:
No. Report Name          Pages    # Del No. Report Name        Pages    # Del
1   CAROL FIRST ON 3  001 - 999    1 N

Reports available are:
  1 = CAROL FIRST ON 3      2 = STRM 2 REPORT 1     3 = STRM 1 REPORT TWO
  4 = STRM 1 REPORT 3       5 = STRM 2 REPORT 2     6 = STRM 2 REPORT 3
  7 = STRM 2 REPORT FOUR    8 = STRM 1 REPORT 4     9 = STRM 2 REPORT 5
```

Figure 6-7. Items to List Display

Select additional reports, or press the Space Bar and RETURN to display the prompt shown in Figure 6-8.

```
Ready to execute?          '0 = Exit list utility or return to prompt 1
Type  1 = yes      2 = Change mode      3 = Reprompt all
?
```

Figure 6-8. Execute Listing Prompt

Several responses to the question "Ready to Execute?" are possible. Press 2 and RETURN to display the queuing mode prompt shown in Figure 6-5. Any items already saved in the list queue are retained and can be displayed by pressing SF'14.

Press 3 and RETURN to redisplay the first screen in the Listing utility, shown in Figure 6-4. This option allows the user to specify another printer and subsequently queue reports/streams to it. Since items already saved in the list queue are retained, reports/streams can be queued to several printers simultaneously.

Press SF'0 to abort the job and return to the main menu, or to abort the job and return to the first prompt in the Listing utility (i.e., Printer Address). The prompt that is displayed after pressing SF'0 is similar to the prompt shown in Figure 6-5, except that only options A and C are presented to the user.

To respond Yes to the prompt "Ready to Execute", press 1 and RETURN. The prompt shown in Figure 6-9 appears.

```
Type A = Abort job   B = Begin listing   C = Continue prompts __
```

Figure 6-9. Begin Listing

Again, there are several alternatives. Press A and then press RETURN to abort the job, i.e., to cancel all printing requests and display the main menu. Press C and then press RETURN to abort all printing requests and return the cursor to the first prompt in the Listing utility (i.e., printer address). In either case, the printing requests are retained in the queue; hence, the print operation(s) can be initiated at a later time.

To initiate the listing, press B and then press RETURN. The following message is displayed: "Getting REPORT file information". The system then displays the Lister Task display shown in Figure 6-10.

```
                Wang 2200/3270 Active Spool File Lister


No.  Device      Status     Report name      Page   Strm    block   Pointers
 1 Printer 216   Printing   CAROL FIRST ON 3   1      3     1   5   242  1921

                     <<On-line Printer task monitor>>
     Spooler 350  Active         SPOOLTB9                          24   0

No.  Device      Status     Last Rcvd Report         Strm    block   No. blks
50 Printer 215  Unattached                                  1      0
D1 Printer 216  Unattached                                  2      0


    Key RUN to Clear Active Display              Key '0 to ABORT Job
    Key any other character to return to prompts
```

Figure 6-10. Lister Task Display

The Lister Task display is divided into two sections: (1) The upper portion of the display shows the status of the print operation(s) initiated from the user's terminal, and (2) the lower portion of the display allows the user to monitor the on-line activity of the active spooler file.

In addition to providing status and monitor functions, the Lister Task display allows the user to perform the following activities:

- Clear the display by pressing RUN.
- Abort the job by pressing SF'0.

- Suspend the print operation and display the Lister Task Prompts main menu, illustrated in Figure 6-11, by entering any other character.

```
__ What do you wish to do?
1 = Restart print of current list item
2 = Abort print of current list item
3 = Abort print and remove list queue
4 = Abort print and retain list queue
5 = Retain queues and return to prompts for more items
6 = Display queue
```

Figure 6-11. Lister Task Prompts Main Menu

From the Lister Task Prompts main menu, select one of the following:

- Enter 1, and press RETURN to restart printing of the current list item. When this option is selected, the user is prompted to enter the printer number (1, 2, 3, or 4) and the page/block number from where the print operation is to be restarted. After these parameters have been specified, according to the instructions displayed on the screen, the print operation is restarted, and the Lister Task screen is again displayed.

- Enter 2, and press RETURN to abort the printing of the current item (report/stream) and remove the item from the queue. When this option is selected, a screen is displayed prompting the user to enter the appropriate printer number. Enter the printer number (1-4), and press RETURN. Printing of the current item is aborted, and the item is removed from the list queue. Printing of the next item in the queue (if there is another item) is started, and the Lister Task display is shown on the screen.

- Enter 3, and press RETURN to abort <u>all</u> printing operations queued to a specific printer. Note that Option 2 deletes only the current item, while Option 3 deletes all the items from the selected queue. After the appropriate printer number is entered, the system scratches the selected printer's queue and then shows the Lister Task display.

NOTE

If items are queued on only one printer, the user must press A and then press RETURN after the Lister Task display is presented; Option C, "Continue off-line utility", is a valid selection only when more than one printer is being used.

- Enter 4, and press RETURN to abort the print operation(s), but retain the print queue associated with a selected printer. This option aborts all the print operations queued to a particular printer, but retains the print queue, allowing the user to resume printing at a later time. Enter the desired printer number (1-4), and press RETURN; the Lister Task display is presented.

- Enter 5, and press RETURN to suspend the print operations associated with a specific printer and return to the queuing mode prompts shown in Figure 6-5. This option allows the listing to be suspended while additional reports/streams are queued. In this case, the original print queues are retained while the new items are added. The print operation(s) can then be resumed using the updated print queue(s).

- Enter 6, and press RETURN to display a list of all outstanding queue items. As with the previous options, this option requires a printer specification (1-4). After the printer is selected, the system displays a list of all the items in the selected printer's queue, as shown in Figure 6-12. After viewing the list, enter any character to return to the Lister Task Prompts main menu.

```
                        Outstanding Queue Items

Item =  1  Report =  1  Pages =   1 -  999  copies = 1  CAROL FIRST ON 3
Item =  2  Report =  2  Pages =   1 -  999  copies = 1  STRM 2 REPORT 1
Item =  3  Report =  3  Pages =   1 -  999  copies = 1  STRM 1 REPORT TWO
Item =  4  Report =  4  Pages =   1 -  999  copies = 1  STRM 1 REPORT 3

                # Key any key to return to other prompts
```

Figure 6-12. Print Queue Display

Stream Mode Queuing

When Stream mode is selected in response to the Queuing Mode prompt in Figure 6-5, the system displays the first Stream Mode prompt, illustrated in Figure 6-13.

```
? Key print stream.          Key space RETURN to execute or reprompt.
1 = Strm    blocks received = 0026      2 = Strm     blocks received = 00027
3 = Strm    blocks received = 00005     4 = Strm     blocks received = 00000
```

Figure 6-13. First Stream Mode Prompts

Select a stream (1, 2, 3, or 4) from the list of available streams shown in the boxed area of the display, and press RETURN. Additional stream mode prompts are then displayed, as shown in Figure 6-14.

```
   1   = Print Stream requested      Key '0 to exit or reprompt
00001  = Starting block              00026 = Ending block
   1   = Number of copies
```

Figure 6-14. Additional Stream Mode Prompts

- Starting Block -- Press RETURN to accept Block 1 as the starting block, or specify a different starting block and press RETURN.

- Ending Block -- Press RETURN to accept the last block as the ending block, or specify a different ending block and press RETURN.

- Number of Copies -- Press RETURN to print one copy; type any digit from 2-9, and press RETURN to print more than one copy; or enter 0, and press RETURN to cancel the request.

At this point, the first Stream Mode prompt (refer to Figure 6-13) is displayed to allow additional streams to be specified. Any streams already specified are listed in the "Items to list" section of the display.

Continue to enter additional streams, or press the Space Bar and then press RETURN to display the prompt shown in Figure 6-8. Refer to the paragraphs following Figure 6-8 for further instructions regarding the Listing utility.

6.3 DELETION UTILITY

The off-line Deletion utility allows a supervisor to delete reports or blocks of data from on-line and off-line spooler files. Deletion is often performed after the reports/streams have been printed using the Listing utility.

Reports/streams that are queued for printing cannot be deleted. Even if the listing operation has been aborted, the print queue is maintained. However, any report/stream that has been removed from the print queue (through the Lister Task Prompts main menu, or as a result of being printed) can be deleted.

To use the Deletion utility, select the second option from the Off-Line Functions main menu. The first screen that is displayed is the same as the first screen of the Listing utility, shown in Figure 6-2. As with the Listing utility, if the option "to see 'WPSYSTEM's' other spooler file names" is selected, the system displays a list of the unavailable spooler files.

If the active on-line spooler file or any available off-line spooler file is selected from the screen shown in Figure 6-2, the system flashes a message notifying the user that the file is being opened for the Deletion utility. If the on-line spooler file is selected, the system then displays the message "Streams detached for duration of Delete". The host is prevented from sending any data to the active spooler file while the Deletion utility is being used. In addition, during the deletion of either on-line or off-line spooler files, the Listing utility is inhibited. Once the detachment message is displayed, the system displays the main screen in the Deletion utility, illustrated in Figure 6-15.

```
3270 Spooler File Off-line Delete Utility ('0 = Exit)

D24      = Spooler disk address          ?     = Delete mode
SPOOLTB9 = Spooler file name
8        = No. reports available

Key delete mode          Scroll list  '11=Up    '12=Down    '13=Top
1 = REPORT mode - delete by report name regardless of stream
2 = STREAM mode - delete by block number within a single stream

No.   Report name   Stream List Del?  No.  Report name   Stream List Del?
1   CAROL FIRST ON 3   3              2  STRM 2 REPORT 1   2
3   STRM 1 REPORT TWO  1              4  STRM 1 REPORT 3   1
5   STRM 2 REPORT 3    2    Q         6  STRM 2 REPORT 4   2
7   STRM 1 REPORT 4    1    Q         8  STRM 2 REPORT 5   2
```

Figure 6-15. Main Screen of the Deletion Utility

This screen displays the spooler disk address and spooler file name selected from the previous screen (i.e., the screen shown in Figure 4-10). The number of reports available is indicated, and the report names are displayed on the bottom of the screen. The List column specifies whether or not the item is queued for listing, and the Del column shows whether or not the item is flagged for deletion.

Data can be deleted from the file by report name (regardless of stream) or by specific blocks within a single stream. Select the Delete mode by entering either 1 (Report mode) or 2 (Stream mode), and then pressing RETURN.

Depending on which mode is selected, the system prompts for either a report number or stream number. Enter the report/stream number, and press RETURN. If a report number was entered (from the list of available reports shown on the bottom of the screen), the system displays the report name below the report number and proceeds to the prompt shown in Figure 6-16. If a stream number was entered (from the list of streams shown in the boxed area of the display), the system prompts for the starting and ending block numbers for the delete operation. After the block parameters are specified, the prompt shown in Figure 6-16 is displayed.

```
Add to delete list?   '0 = Exit delete utility or Continue at prompt 1

? Type 1 = yes   2 = No
```

Figure 6-16. Prompt to Add Item to Delete List

Pressing SF'0 invokes the prompt shown in Figure 6-17. The user may take either of two actions. Enter A, and press RETURN to cancel all delete requests. The 3270 main menu returns. Alternately, enter C, and press RETURN to cancel only the current delete request and return to the Delete mode prompt in Figure 6-15.

```
C Type A or C
  A = Abort - Exit delete utility
  C = Continue in delete utility - Return to Prompt 1
```

Figure 6-17. Cancel Delete

If the user enters 2 and presses RETURN in response to the prompt shown in Figure 6-16, the current request is canceled, and the Report Mode prompt or the Stream Mode prompt is displayed. With the report/stream prompt, the user is given the option to change modes (i.e., return to prompt 1 - "Delete mode?"), or to return to the prompt shown in Figure 6-17.

If the user enters 1 and presses RETURN in response to the prompt shown in Figure 6-16, the report/stream is added to the delete list, as shown in Figure 6-18.

```
3270 Spooler File Off-Line Delete Utility ('0 = Exit)

D24      = Spooler disk address          1     = Delete by report
SPOOLTB9 = Spooler file name             ?     = Report number
8        = No. reports available
1        = No. reports queued to delete

    ? Key report number  '0 = Exit delete utility or Continue at prompt 1

      Key space RETURN to execute or to resume or reset list

No.   Report name      Stream List Del?  No.   Report name     Stream List Del?
  1 CAROL FIRST ON 3     3             !   2 STRM 2 REPORT 1     2
  3 STRM 1 REPORT TWO    1             !   4 STRM 1 REPORT 3     1
  5 STRM 2 REPORT 3      2       Q     !   6 STRM 2 REPORT FOUR  2
  7 STRM 1 REPORT 4      1       Q     !   8 STRM 2 REPORT 5..   2
```

Figure 6-18. Add to Delete List

NOTE

To remove any item from the delete list (including items that have been flagged for deletion through the Listing utility), perform the following: When the question mark (?) is positioned next to the "Enter report/stream number" prompt, enter the report/stream number and press RETURN. The prompt shown in Figure 6-16 is displayed. Type 2 (No), and press RETURN. The item is removed from the delete list.

At this point, the following three options are available, as displayed in the prompt box shown in Figure 6-18:

- Enter another report/stream (and block) number, press RETURN, and then refer to the instructions following Figure 6-16.
- Press SF'0, and then refer to the instructions following Figure 6-17.
- Press the Space Bar and then press RETURN to display the prompt shown in the boxed area of Figure 6-19.

```
   3270 Active Spooler File Off-Line Delete Utility ('0 = Exit)

D24      = Spooler disk address          1     = Delete by REPORT
SPOOLTB9 = Spooler file name                   = Report number
8        = No. reports available         Name  = CAROL FIRST ON 3
1        = No. reports queued to delete

   Ready to execute   '0 = Exit delete utility or Continue at prompt 1
   ?   Type  1=Yes  2=No, reset list  3=No, resume list

No.   Report name     Stream List Del?  No.   Report name     Stream List Del?
  1 CAROL FIRST ON 3     3              !
```

Figure 6-19. Deletion Prompt

In reply to the prompt displayed in Figure 6-19, select one of the following activities:

- Press SF'0 to display the prompt shown in Figure 6-17, and then refer to the instructions following that figure.
- Enter 1, and press RETURN to delete all items in the delete list. When this option is selected, a DELETING message is flashed on the screen; the report(s)/stream(s) are deleted from the spool file, and the main screen in the Deletion utility is displayed.

- Enter 2, and press RETURN to cancel all delete requests and display the main screen of the Deletion utility.

- Enter 3, and press RETURN to display the screen shown in Figure 6-18, and then refer to the instructions following that figure.

6.4 FLUSH AND RENEW SYSTEM FILE UTILITY

Print streams directed to disk or diskette are stored according to the conventions of the 2200 WP File Management System. This system has an index catalog for all created files and their disk addresses. When a new disk/diskette is designated for spool-to-disk usage and existing files are no longer needed, it is necessary to remove existing entries from the catalog. Existing files cannot be accessed after the catalog is cleared.

NOTE

The 2200 emulated 3271 system uses the index file "32WPSYST" instead of "WPSYSTEM".

To use the Flush and Renew System File utility, select the third option on the Off-Line Functions main menu. The screen shown in Figure 6-20 is displayed.

```
                        You are going to cleanse the WP system file



Ready to execute?
Type 'y' or 'N'
 N
```

Figure 6-20. Procedure Screen for Purging WP System Files

Enter N, and press RETURN to redisplay the 3270 main menu without clearing the catalog, or enter lowercase y, and press RETURN to delete all the spooler files from the system and return to the 3270 main menu.

NOTE

Files can be "reattached" to the catalog through the Spooled Files Catalog utility discussed in the next section.

6.5 SPOOLED FILES CATALOG UTILITY

When the "Examine WP system file" option is selected from the Off-Line Functions main menu, the screen shown in Figure 6-21 is displayed.

```
        # LIST   All entries in 'WPSYSTEM' file
          CHANGE Spool File Address
          DETACH Spool File from System  -- (remove from List)
          ATTACH Spool File to System    -- (ADD to List)
          DELETE Spool File from System  -- (DETACH & Scratch)

OPERATING INSTRUCTIONS:  Select desired Function
                         by Pressing the RETURN, BACKSPACE or SPACE Key.
                         Key RUN to Activate Selected Function or
                         SF Key '0 to Restore Previous Screen.
```

Figure 6-21. Spooled Files Catalog Utility Main Menu

The Spooled Files Catalog utility allows a supervisor to perform the following functions associated with the WPSYSTEM file (catalog):

- List all the entries (spooler files) in the catalog.
- Change specific spooler file addresses.
- Detach (remove) specific spooler files from the catalog.
- Attach (add) specific spooler files to the catalog.
- Delete (remove and scratch) specific spooler files from the catalog.

These functions are discussed in the following paragraphs.

NOTE

In order to use the Spooled File Catalog utility, at least one spooler file must be attached to the catalog.

List

To display a list of all the spooler files in the catalog, refer to the operating instructions displayed on the screen in Figure 6-21, and select the LIST option. The system displays the file name, disk address, and status of each file in the catalog.

Change

To change the disk address of a spooler file, select the Change option from the Spooled Files Catalog Utilities main menu. The system displays the list of spooler files and prompts the user to select a specific file. Enter the selected file number, and press RETURN to display the screen shown in Figure 6-22.

```
                    Change Spool File Address


Spool File = SPOOLTB9
New Disk Address = 350

Valid Disk Addresses:

310 B10 350 320 B20 360 B60 330 B30 370 B70 D10 D20 D30 D40 D121 D22 D23 D24
```

Figure 6-22. Change File Address

Select an address from the list of available addresses displayed on the bottom of the screen, enter the new address, and press RETURN. The key options, shown in Figure 6-23, are displayed.

```
KEY OPTIONS:  A to ACCEPT New Disk Address
              E to EDIT New Disk Address
              '0 to ABORT Function
```

Figure 6-23. Key Options for Change Address Function

Enter A to accept the new disk address and return to the list of file names to select another file. Enter E to delete the new address and reestablish the original address. The system returns to the list of file names to allow another file to be selected. Press SF'0 to reestablish the old address and return to the Spooled Files Catalog Utility main menu.

Detach

When the Detach option is selected from the menu, a list of spooler files is displayed, and the user is prompted to indicate which spooler file is to be detached (removed) from the catalog. Enter the appropriate number, and press RETURN. The system displays the spooler file name and address, as well as the key options shown in Figure 6-23.

Enter A to accept detachment and display the list of files remaining in the catalog. Enter E to cancel the detach request. The list of files is displayed, and the user is again prompted to select a file for detachment. Press SF'0 to cancel the detach request and abort the DETACH function. The system displays the Spooled Files Catalog Utility main menu.

NOTE

If the catalog contains only one file, detaching the file will disable all catalog functions on the menu except attach.

Attach

Use the Attach function to add a file to the catalog. When this option is selected, the system requests the file name and its disk address. Enter the file name, and press RETURN. Then, select the appropriate address from the list displayed on the bottom of the screen, and press RETURN; the system displays the key options.

Enter E to reprompt; press SF'0 to cancel the request and return to the Spooled Files Catalog Utility main menu; or enter A to add the file to the catalog. When attachment is successful, the following message is displayed:

```
Attachment SUCCESSFUL

KEY OPTIONS:  A to Attach another
'0 to return to Utility menu
```

Delete

The Delete function is the same as the Detach function, except that the delete function removes the specified spooler file from the catalog and erases the spooler file from the system. To perform this procedure, refer to the instructions for the Detach function.

6.6 PRINT QUEUE UTILITY

The Print Queue utility is activated by selecting the "Examine print queues" option from the Off-Line Functions main menu. When this option is selected, the system first displays a screen listing the various spooler files used by the system (i.e., the screen shown in Figure 6-2). After the user selects an available on-line or off-line file, a file opening message is displayed, and the Print Queue Utility main menu, shown in Figure 6-24, is presented.

```
    Look at what list information?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE or BACKSPACE and key RUN

#' 1 for the queue list from a specific SPOOLER file
 ' 2 for all reports from a specific SPOOLER file
 ' 3 for a summary list of the PRINT QUEUE file by printer
 ' 4 to back-up the spooler and report name files
```

Figure 6-24. Print Queue Utility Main Menu

Display/Print Items in Queue List

The first option on the Print Queue Utility main menu allows the user to examine the print queue associated with a selected spooler file and, optionally, to start listing items in the queue. If there are no items queued to be printed, a message is displayed; press SF'0 to return to the Print Queue Utility main menu.

If the selected spooler file has items queued for printing, the system displays a message stating the number of items in the print queue. Press RUN to display a list of the items, shown in Figure 6-25.

```
Information in file SPOOLTB9  --  the REPORT NAME file from Terminal = 5


   Printer addr - 16     Model 2221 Form Length = 11 inches
Request 1  Report No.    1 Pages    1 -    999   1 copies
Request 2  Report No.    2 Pages    1 -    999   1 copies
Request 3  Report No.    3 Pages    1 -    999   1 copies
Request 4  Report No.    4 Pages    1 -    999   1 copies
Request 5  Stream No.    1 Blocks   1 -     26   1 copies
Request 6  Stream No.    2 Blocks   1 -     27   1 copies
Request 7  Stream No.    3 Blocks   1 -      5   1 copies


 <<pause   key anything to continue>>
```

Figure 6-25. Sample Print Queue List

Press any key except SF'0, HALT, or RESET to display the prompt shown in Figure 6-26.

```
  Key '7 to BEGIN list       Key '9 to DELETE LIST
# Key '0 to return to START  Key other to return to main menu
```

Figure 6-26. Print Queue List Prompt

Press SF'0 or any other key except SF'7, SF'9, HALT, or RESET to return to the Print Queue Utility main menu. Press SF'9 to delete all items from the print queue and return to the Print Queue Utility main menu. Press SF'7 to activate the Listing utility. When SF'7 is pressed, a message similar to the following message is displayed:

```
Opening Spooled Files for List Via Q Utility
File is SPOOLTB9 on 350
```

The Lister Task display (shown in Figure 6-10) is then presented and listing (printing) begins. Refer to the paragraphs following Figure 6-10 for instructions pertaining to the Lister Task display.

Display List of Reports

To display a list of all the reports in the selected spool file, select the second option on the Print Queue Utility main menu. In addition to displaying a list of all the reports, the system displays the following information about each of those reports:

- The stream the report is in
- The starting block
- The total number of blocks in the report
- The report delimiters

A sample report list is shown in Figure 6-27.

```
   Reports contained in Spooler file - SPOOLTB9
    1 CAROL FIRST ON 3       3 001 005 $$$$$$$$$$$$$$$$[[[[[[[
    2 STRM 2 REPORT 1        2 001 005 $$$$$$$$$$$$$$$$[[[[[[[
    3 STRM 1 REPORT TWO      1 001 005 $$$$$$$$$$$$$$$$[[[[[[[
    4 STRM 1 REPORT 3        1 006 008 $$$$$$$$$$$$$$$$[[[[[[[
    5 STRM 2 REPORT 2        2 006 004 $$$$$$$$$$$$$$$$[[[[[[[
    6 STRM 2 REPORT 3        2 010 005 $$$$$$$$$$$$$$$$[[[[[[[
    7 STRM 2 REPORT FOUR     2 015 005 $$$$$$$$$$$$$$$$[[[[[[[
    8 STRM 1 REPORT 4        1 014 008 $$$$$$$$$$$$$$$$[[[[[[[
    9 STRM 2 REPORT 5        2 020 004 $$$$$$$$$$$$$$$$[[[[[[[
   Done

# Key '0 to return to START            other to main menu
```

Figure 6-27. Sample Report List

Print Queue Summary

Selecting the third option on the Print Queue Utility main menu allows the supervisor to examine each print queue associated with the various devices (CRTs and printers) configured with the system.

When this option is selected, the system displays a list of all the devices, their addresses, and their model numbers, as shown in Figure 6-28. Press any key except RESET, SHIFT, HALT, or SF'0 to display the individual queue lists associated with each device. If a device does not have any items queued to it, the following message is displayed: << pause key anything to continue >>

After viewing the list, return to the Print Queue Utility main menu by pressing any key except RESET, SHIFT, HALT, or SF'0. Press SF'0 to return to the 3270 main menu.

```
Information in file '3270*PQ' -- the PRINT QUEUE file from Terminal = 5

 1 Queue list for terminal     print address 215  model = 2221
 2 Queue list for terminal     print address 216  model = 2221
 3 Queue list for terminal 1   print address 005  model = CRT
 4 Queue list for terminal 2   print address 005  model = CRT
 5 Queue list for terminal 3   print address 005  model = CRT
 6 Queue list for terminal 4   print address 005  model = CRT
 7 Queue list for terminal 1   print address 004  model = 2281  form = 13"
 8 Queue list for terminal 2   print address 204  model = 2281  form = 15"
 9 Queue list for terminal 3   print address 004  model = 2281  form = 13"
10 Queue list for terminal 4   print address 004  model = 2281  form = 13"
11 Queue list for terminal 5   print address 005  model = CRT
12 Queue list for terminal 5   print address 204  model = 2221


   <<pause        key anything to continue >>
```

Figure 6-28. Sample Device List

Back-Up Spooler/Report Name Files

The last selection on the Print Queue Utility main menu allows the user to copy a selected spooler (and report name) file. When this option is selected, the system displays the selected file name and then prompts for the disk address where the file is to be copied, as illustrated in Figure 6-29.

```
Back-up Spooler file and report name disks


SPOOLTB9 = SPOOLER FILE NAME
REPORTF9 = REPORT NAME FILE


Input will be on disk 350 which is referenced by D1$ and #2
Write to what surface egg. 350?_
```

Figure 6-29. Sample Disk Address Request

Specify the disk address where the input file is to be written, and press RETURN. The system displays the copy options shown in Figure 6-30.

```
Back-up Spooler file and report name disks
SPOOLTB9 = SPOOLER FILE NAME
REPORTF9 = REPORT NAME FILE

Input will be on disk 350 which is referenced by D1$ and #2
Write to what surface egg. 350?  D24_

1) move files onto scratch area.
2) move files over files of same name.
3) move files over files of different name.
4) move files over files of different name then rename.
5) move files onto scratch area, then rename.
6) rename files

key value 1 - 6?.
```

Figure 6-30. Copy Options

Select the appropriate option, and press RETURN. If either Option 3 or Option 4 is chosen, the system requests that a new name be entered. The system displays the names of the files being copied and/or renamed, and performs the selected operation. When the operation is completed, the following message is displayed:

```
COMPLETE
Press SF'0 to return to START    Key other to return to main menu
```

6.7 CLEAR CLUSTER AND STOP 2228D CONTROLLER

The Clear Cluster and Stop 2228D Controller function terminates the operation of the microcode in the communications controller and stops the controller from answering polls. To perform this function, select the last option on the Off-Line Functions main menu. A screen similar to the screen shown in Figure 6-31 is displayed.

```
Clear cluster & stop 2228D controller
Loaded configuration =
50 D1 hh hhSTART          E1D0540<42214503140 C1 hh hh hh hh hh hh
Key  Y for Yes     else No N
```

Figure 6-31. Sample Clear Cluster/Stop Controller Screen

Enter N, and press RETURN to cancel the request and return to the 3270 main menu. Enter Y, and press RETURN to clear the cluster and stop the communications controller. The system then displays the 3270 main menu.

APPENDIX A
TECHNICAL AIDS FOR 3270 EMULATION

A.1 POLLING AND SELECTION

The host computer with which the 3271 cluster communicates uses polling and selection to initiate communication with the emulated control unit and its associated devices. During polling, the host invites a control unit to transmit the buffer contents of any of its devices. During selection, the host requests a 3277 station or 3288 printer to ready itself to receive data. Selection is performed whenever the host has data for a certain device. Polling is based on a host-resident list of device addresses called a poll table. The host issues poll messages in a cyclical fashion according to the poll table entries.

To ensure reception by the appropriate device or control unit, addresses are imbedded within poll and selection messages. Host-defined 3271 control unit and 3277/88 device unit addresses must be used in configuring a local cluster. Assigning invalid addresses to the 2200 3271 control unit and associated cluster devices prevents the control unit from communicating with the host.

Polling

The host uses two types of polling: a general poll and a specific poll. A general poll is addressed to a control unit, while a specific poll is addressed to a device.

When issuing a general poll, the host scans the Device Status table to determine if any device has Status Pending or an Attention Pending. When issuing a specific poll, the host checks the particular device specified in the poll message for Status Pending or Attention Pending. Status Pending indicates that the controller is signaling the host that a particular device is busy or unavailable. Attention Pending indicates that the controller is signaling the host that a particular device has data to send. Attention Pending is generated whenever a user presses any key that causes an AID (Attention Identification) character to be transmitted. Refer to Table A-1 for a list of valid AID codes.

A control unit or device responds to a poll by transmitting a status response (e.g., device busy, device unavailable), or by transmitting data to the host.

Selection

When the host selects a device, the host asks that device to prepare to receive data or commands. The device addressed in the selection sequence can reply in one of three ways: ACK 0 (positive acknowledgement), WACK (wait acknowledgement), or RVI (reverse interrupt). If the device responds with an ACK 0, the host proceeds with the selection sequence and sends data and commands to the device. The WACK response causes the host to wait a specified period of time and then reselect the device. The RVI response causes the host to issue a command to read the status data at that device.

A.2 3270 TABLES

The following tables provide the user with a quick reference to frequently used data, including AID codes.

Table A-1. AID Codes

Key	Hex Code
ENTER	7D
PF1	F1
PF2	F2
PF3	F3
PF4	F4
PF5	F5
PF6	F6
PF7	F7
PF8	F8
PF9	F9
PF10	7A
PF11	7B
PF12	7C
PA1	6C
PA2	6E
PA3	6B
CLEAR	6D
TEST REQ	F0
DUP	No Aid Generated
FM	No Aid Generated
ERASE	No Aid Generated

Table A-2. Abbreviations Used in 3270 Communications

Abbreviation	Meaning
ACK	Positive Acknowledgment
AID	Attention Identification Character
BCC	Block Check Character
BSC	Binary Synchronous Communications
BTAM	Basic Telecommunications Access Method
CCC	Copy Control Character
CICS	Customer Information Control System
DEL	Delete Character
DLE	Data Link Escape character
EAU	Erase All Unprotected order
EM	End of Message order
ENQ	Enquiry character
EOT	End Of Transmission
ESC	Escape character
ETB	End of Transmission Block
ETX	End of Text
EUA	Erase Unprotected to Address order
FF	Form Feed printer order
FM	Field Mark
Hex	Hexadecimal
IC	Insert Cursor order
IMS	Information Management System
MDT	Modified Data Tag
NAK	Negative Acknowledgement
NL	New Line
PA	Program Access key
PF	Program Function key
PT	Program Tab order
RA	Repeat to Address order
RVI	Reverse Interrupt
SBA	Set Buffer Address order
SF	Start Field order
SOH	Start Of Heading
STX	Start of Text
SYN	Synchronous idle
TCAM	Telecommunications Access Method
TTD	Temporary Text Delay
VTAM	Virtual Telecommunications Access Method
WACK	Wait before transmitting Positive Acknowledgement
WCC	Write Control Character

Table A-3. Attribute Structure

Hex Position	EBCDIC Bit	Remarks
80	0	Value determined by contents of bits 2-7.
40	1	Must be set to 1.
20	2	Designates field protection class. When set to 0, the field is unprotected; when set to 1, the field is protected.
18	3	Legal data entries. When set to 0, both alphabetic and numeric entries are allowed; when set to 1, only numeric entries are allowed.
04	4 & 5	Display Control: 00 = Standard intensity 01 = Standard intensity 10 = High intensity 11 = Nondisplay, nonprint,
02	6	Reserved; must always be 0.
01	7	Modified data tag (MDT); when the host executes a Read Modified command, only those fields with the MDT bit set to 1 are transmitted.

APPENDIX B
3271 COMMANDS AND ORDERS

B.1 INTRODUCTION

The Wang 2200 system uses the Binary Synchronous Communications (BSC) protocol to emulate an IBM 3271 cluster and communicate with the host. IBM 3270 commands and orders are used to control the formatting, transmission, and reception of message text. This chapter discusses the commands and orders supported by the Wang 3271 emulation software.

B.2 COMMAND TYPES

The following types of commands are used in 3271 communications.

- Read commands
- Write commands
- Control commands

Table B-1 gives the name, hex code, and brief description of 3271 communication commands. The commands are explained in greater detail in the paragraphs following the table.

Table B-1. Commands

Command	Hex Code	Definition
Read Buffer	F2	Reads entire buffer
Read Modified	F6	Reads only modified fields
Write	F1	Writes into buffer
Erase/Write	F5	Erases buffer, then writes
Erase All Unprotected	6F	Erases all unprotected fields
Copy	F7	Copies from one buffer to another

B.3 READ COMMANDS

Read commands are used to transfer data and status information to the host computer. These commands can be generated by either the cluster controller or the host (usually by the host). The only time Read commands are generated by the cluster controller is when the host has sent a poll message to a device and the device has Attention Pending. The Read commands are as follows:

- Read Buffer -- Causes all data in the device buffer, from the current buffer address through the last buffer location, to be read and transmitted to the host. This command is used mainly for diagnostic purposes. In response to a Read Buffer command, the controller can reply with a NAK (indicating a BCC error has occurred), an EOT (indicating Status Pending), or with the transmission of buffer contents.

- Read Modified -- Results in the modified data only being sent to the host. The controller replies to a Read Modified in one of three ways: with a NAK (indicating a BCC error has occurred), with an EOT (indicates Status Pending), or with a stream of modified-only data.

Depending upon what action is taken by the operator at the workstation, the Read Modified operation initiates one of the following operations:

- Read Modified response
- Short Read response
- Test Request response

These operations are explained in the following paragraphs.

Read Modified Response

A user generates a Read Modified response by pressing ENTER and a PF key. All fields that have been modified by keyboard activity are transmitted to the host. All nulls are suppressed during data transfer and are not included in the read data stream.

Short Read Response

A Short Read response is generated by pressing PA and CLEAR. Short Read does not read the device's buffer. Only the AID byte is transmitted to the host. The AID byte identifies the key that was pressed.

Test Request Response

The Test Request reply to a poll is generated by pressing the TEST REQ key. Test Request usage is determined by the host access method (e.g., BTAM, TCAM, etc.). Ordinarily, the operator CLEARs the screen, enters the test request data in a predefined test format or pattern, and then presses the TEST REQ key.

B.4 WRITE COMMANDS

Write commands are used to transfer data and orders from the host system to the Wang 3271 emulation system. Two Write commands, Write and Erase/Write, are used to load, format, and selectively erase data in the device buffer. These commands can also be used to initiate certain device operations such as starting the printer, resetting the keyboard, and sounding the audible alarm (accomplished through the Write Control Character that follows the command).

Write and Erase/Write operations are identical, except that Erase/Write causes the entire buffer to be erased before the Write operation is performed. Thus, Erase/Write is used to load the buffer with completely new data, and the Write command is generally used to modify existing buffer data.

Write Control Character

The Write Control Character (WCC) byte optionally follows the Write and Erase/Write commands. WCC bit definitions are as follows.

Bit	0	1	2 & 3	4	5	6	7
	X		PRINT	START	SOUND ALARM	RESTORE KEYBOARD	RESET MDT BITS

Hex Position	EBCDIC Bit	Definition
80	0	Set to 1 or 0 to make the byte a legitimately transmittable character.
40	1	Always set to 1.
30	2 & 3	Specify print format: 00: Unformatted (New Line codes in the text indicate line ends). 01: 40-character line 10: 64-character line 11: 80-character line
08	4	If set, print operation begins automatically at the end of the Write operation.
04	5	If set, the keyboard alarm sounds when the Print operation is complete.
02	6	If set, the keyboard becomes automatically available when the Write operation is complete.
01	7	If set, MDT bits are reset before a Write operation begins.

If the WCC byte specifies a function that does not apply to the selected device (e.g., if the sound alarm bit is set, but there is no audible alarm present), the specified operation is not performed, and status information is not generated. When the WCC byte is followed by either "order" bytes or "data" bytes to be printed or displayed, only the last operation (i.e., reset the MDT bits) is performed before the write operation. All other functions specified by the WCC byte are performed after the data is written and/or the orders have been performed.

Both order bytes and data bytes can follow a WCC character in an intermixed fashion. This intermixing of order bytes and data bytes allows the buffer data to be selectively written to specified locations within the buffer without altering nonspecified locations. As data is being written into the buffer, each byte is placed in a successive location unless otherwise directed by an order byte that changes the buffer address. The buffer address is incremented by one as each data character is stored. Data is entered into the buffer at either the address specified by the Set Buffer Address (SBA) order immediately following the WCC, or at the current buffer location address if no SBA is present.

B.5 CONTROL COMMANDS

There are two Control commands: Erase All Unprotected (EAU) and Copy. The Copy command copies one device's buffer to another device's buffer. The EAU command erases all unprotected screen fields and resets the MDT bits.

EAU Command

The EAU command performs the following five functions at the addressed device:

- Clears all unprotected buffer locations to nulls
- Resets the MDT bit to zero for each unprotected field
- Unlocks the keyboard
- Resets the AID byte
- Repositions the cursor to the first character location in the first unprotected field of the buffer

If the buffer contains no unprotected fields, the buffer is not cleared to nulls, and the MDT bits are not reset. However, the other operations are performed (the keyboard is unlocked, the AID byte is reset, and the cursor is repositioned to buffer location zero).

Copy Command

The Copy command transfers the buffer contents of one device to the buffer of another device. The type of data moved is specified by the Copy Control Character (CCC).

The destination ("To" device) is the device to which the data will be transferred, i.e., the currently specified device. This is either the device specified in the Specific Poll, or the device from which a response was last received during a General Poll operation. The source device ("From" device), which is the source of the data to be copied, is specified in the Copy data stream.

The Copy command is not executed if the CCC is missing or if the "From" device is invalid, unavailable, busy, or "Locked". If the Copy command is not executed, an EOT is sent to the host. Upon receipt of a poll, the following standard IBM status messages are sent to the host:

Status Message Bits	Condition Causing Message
DB, US, OC	The "To" and "From" device addresses are the same, and the device is busy.
DB, US	The "To" device is busy.
DB, OC	The "From" device is busy.
IR, OC	The "From" device is not configured.
OC, US	The "From" device buffer is locked.
OC	Invalid device address or CCC byte.

NOTES

A status message of DB, US, OC, or DE is sent to the host when a copy to print device is no longer busy.

A device buffer is "locked" if the character in the first buffer location is a protected alphanumeric.

Copy Control Character

The Copy command is followed by CCC. The CCC further defines the Copy command in the same way that the WCC further defines Write commands. The CCC defines the type of data to be copied, and can also be used to initiate printing operations at the device, specify the print format, and sound the keyboard alarm. The CCC bit definitions are as follows:

Bit	0	1	2 & 3	4	5	6 & 7
	X	1	PRINT FORMAT	START PRINT	SOUND ALARM	RESET MDT BITS

Hex Position	EBCDIC Bit	Definition
80	0	Set to 1 or 0 to make the byte a legitimately transmittable character.
40	1	Always set to 1.
30	2 & 3	Printout format: 00: Unformatted 01: 40-character line 10: 64-character line 11: 80-character line
08	4	If set, the print operation begins automatically after the copy operation is complete.
04	5	If set, the keyboard alarm sounds at the end of the copy operation.
03	6 & 7	Copy control bytes: 00=Only attribute characters are copied. 01=Only attribute characters and unprotected alphanumeric fields are copied. Protected alphanumeric fields are copied as nulls. 10=Only attribute characters and protected alphanumeric fields are are copied. Unprotected alphanumeric fields are copied as nulls. 11=Complete buffer is copied.

NOTE

The CCC byte must always follow the Copy command; otherwise, the command is aborted and error status is generated.

B.6 3271 ORDERS

An order is a control sequence inserted into a Write or Erase/Write command data stream. Two types of orders are described in this section:

- Buffer formatting orders
- Print formatting orders

NOTE

Print formatting orders are stored in the device buffer as data, whereas buffer formatting orders are executed by the Cluster controller and do not become part of the buffer data.

Buffer Formatting Orders

Buffer formatting orders perform the following three functions: (1) position, define, and format data being written into the buffer, (2) erase selected unprotected data in the buffer, and (3) reposition the cursor. The following paragraphs describe the functions of the various buffer formatting orders.

Start Field (SF) Order -- The SF order code is a Hex '1D'. When this code is recognized in a Write or Erase/Write data stream, the next byte in the stream is assumed to be an attribute character. The attribute character is stored at the current buffer address. During Read Buffer operations, an SF code is inserted immediately before the attribute character in the data stream. This allows the attribute characters to be identified by the mainframe program, and permits correct storage of attribute characters in the device buffer (in the event that the Read data is to be used for subsequent Write operations).

Set Buffer Address (SBA) Order -- The SBA order consists of three bytes. The first byte is the SBA code (Hex 11), and the second and third bytes are buffer address bytes. The SBA order is used to specify a new buffer address from which Write operations are to start or continue, and can be used to write data into various areas of the buffer. The value of the address bytes must not exceed 1920 (the size of the buffer), since the Write operation will be terminated at that point, resulting in the loss of data.

Insert Cursor (IC) Order -- When the IC order (Hex 13) is detected in the data stream, the cursor is repositioned to the location indicated by the current buffer address.

Program Tab (PT) Order -- The PT order (Hex 05) increments the current buffer address to point to the first character location of the next unprotected data field in the buffer. If the PT order is issued and the current buffer address is the location of an attribute byte of an unprotected field, the buffer address advances only to the next location of that field (one location). For example, assume the current buffer address is 12, an attribute byte is contained in Location 12, and the following unprotected field consists of Locations 13 through 22. If a PT order is issued, the buffer address is advanced only one location, i.e., from 12 to 13.

If a PT order does not immediately follow a command, order, or order sequence (e.g., 3-character sequence), nulls are inserted into the buffer from the current buffer address in the Write data stream to the end of the field, regardless of the protected/unprotected condition of the attribute character. When the PT order follows a command, order, or order sequence, the buffer is not modified.

The PT order operation terminates when the end of the buffer is reached. If no attribute character for an unprotected field is found by the time the end of the buffer is reached, the buffer address is reset to Location 0, and the tabbing operation is ended.

To continue searching the buffer, a new PT order must be issued. In this case, if the previous PT order was inserting nulls into each buffer location when the operation ended, the new PT order will automatically continue to insert nulls.

Repeat to Address (RA) Order -- The RA order (Hex 3C) causes a specified alphanumeric character or null character to be stored in all buffer locations, beginning at the current address and ending at (but not including) the specified stop address. The stop address is identified by the three bytes immediately following the RA order. The first two bytes define the buffer stop address, and the third, or last, byte specifies the character to be repeated.

If the stop address is lower than the current buffer address, the RA operation wraps from the end of the buffer to the beginning, and continues up to the stop address. If the stop address is the same as the current buffer address, the entire buffer is replaced with the specified character. If the value for the stop address is greater than the maximum buffer address, i.e., 1920, the stop address is invalid, and the operation is terminated without storing the specified character.

Erase Unprotected to Address (EUA) Order -- The EUA order (Hex 12) inserts nulls in all unprotected buffer character locations, beginning at the current buffer address and continuing up to (but not including) the specified stop address. The stop address is identified in the two bytes immediately following the EUA order.

If the stop address value is lower than the current buffer address, the EUA operation wraps from the end of the buffer to the beginning, and continues up to the stop address. If the stop address is the same as the current buffer address, all unprotected buffer character locations are erased.

If the specified stop address is invalid, the Write operation is terminated, and none of the buffer locations are erased (i.e., no nulls are inserted).

Print Formatting Orders

Print formatting orders implement various printer functions. Print formatting orders are defined by the Write Control Character (WCC) and are applicable only to print operations. The following paragraphs describe the print formatting orders.

New Line (NL) Order -- The NL order is transferred from the host application program as part of the data stream, and is stored in the buffer as data. The NL order is executed only when it appears in a print field during a print operation that does not have the line length specified. If the NL order is encountered in a print field that uses a line length format, it is not executed and is printed as a 5.

When an NL order is found in the buffer of a print field, and a print operation is specified, the printer performs the New Line function. However, if no NL order is encountered before the printer reaches the end of the line (determined by the maximum carriage length), the printer automatically performs a line feed and continues printing. When NL orders appear in a nondisplay/nonprint field, they are treated as alphanumeric characters and are printed as spaces.

End of Message (EM) Order -- The EM order is transferred from the application program as part of the data stream, and is stored in the buffer as data. EM orders are executed only when they occur in a print field that does not have the line-length format specified. If the line-length format is specified, the EM order is printed as a 9. When EM orders appear in a nondisplay/ nonprint field, they are treated as alphanumeric characters and are printed as spaces.

Form Feed (FF) Order -- The FF order is used with the Vertical Forms Control (VFC) feature, which vertically positions forms to a predetermined print line. When a valid FF order is found in the data stream during a print operation, the form is positioned to a predetermined line (under program control). Printing begins on the specified print line. The first print position of the line (the buffer location containing the FF character) is printed as a space. Printing and indexing operations continue until the print operation is terminated by either an EM order (in a buffer that does not have line-length format specified), or when the last character location in the buffer is printed.

Any number of FF orders can be included in the printer buffer. However, for an FF order to be valid, it must be placed in a buffer location corresponding to the first character position of a print line, in a field designated either print or nonprint. To ensure that this is accomplished, the FF character should be placed according to the following guidelines:

- As the first character location of a printer message
- After a valid NL order

- After the last printable character position of any print line, e.g., in Position 41 in a buffer with a line-length format of 40 characters per line, or in Position 133 in a buffer without a line-length specified (used with a line printer with a 132-character maximum carriage length).

If the FF character appears in any other position in the printer buffer, it is considered invalid; the Form Feed operation is not executed, and the FF character is printed as a < character, regardless of whether or not a line-length format is specified. A valid FF order prints as a space character.

If a valid FF order is found and the form is already positioned at a predetermined index stop line, the form will be positioned to the next predetermined stop line, and all lines between will be blank.

APPENDIX C
MENU DESIGN AND ASSIGNMENT

C.1 DESIGN OF THE MAIN MENUS

Generally, three types of personnel are needed to operate the 3271 emulation system: operators, supervisors, and local system support personnel. Operator responsibilities consist mainly of application-oriented keyboard operations during interactive communication with the host. Supervisors are normally given access to more 2200/3271 capabilities than operators, and local support personnel have access to the widest range of 2200/3271 capabilities. The main function menus for operators, supervisors, and support personnel are listed in Figures C-1, C-2, and C-3, respectively.

```
WHAT PROCEDURE?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE or BACKSPACE and key RUN
Functions for an Operator     on Term = 3  Part. = 6

' 1 to Attach to a running 3270 cluster
' 2 to Load 3270 off-line functions
' 3 to Monitor cluster status display
```

Figure C-1. Main Menu for Operators

```
WHAT PROCEDURE?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE or BACKSPACE and key RUN
Functions for a Supervisor    on Term = 2  Part. = 5

' 1 to Attach to a running 3270 cluster
' 2 to Load a 3270 cluster
' 3 to Load 3270 off-line functions
' 4 to Monitor cluster status display
' 5 to Detach from a running 3270 cluster
' 6 to Monitor 2200 Partition Status
```

Figure C-2. Main Menu for Supervisors

```
WHAT PROCEDURE?
TO OPERATE -- Press S.F. KEY or DIGIT corresponding to name,
or position # via RETURN, SPACE or BACKSPACE and key RUN
Functions for Configuration      on Term = 1  Part. = 4

' 1 to Attach to a running 3270 cluster
' 2 to Load a 3270 cluster
' 3 to Load 3270 off-line functions
' 4 to Create a new 3270 configuration
' 5 to Change or create any T.C. configuration
' 6 to Load any T.C. configuration
' 7 to Monitor cluster status display
' 8 to Detach from a running cluster
' 9 to Monitor 2200 Partition Status
```

Figure C-3. Main Menu for Local System Support Personnel

The supervisor's menu is an expansion of the operator's main menu, and the local support personnel's menu is an expanded version of the supervisor's menu. Each of the three menu types can be assigned to one specific terminal or to multiple terminals. When the software is loaded, terminals numbered three or higher normally display the operator's main menu. Terminal 2 displays the supervisor's main menu, and Terminal 1 displays the local support personnel's main menu.

The Off-Line Functions menu is also designed in this manner. The Off-Line Functions menu is accessible from each of the three main menus; however, it is not desirable for the operator to be able to perform the same off-line functions as the supervisory and support personnel. As with the main menus, an abbreviated version of the Off-Line Functions menu is normally assigned to terminals numbered three and higher (operator's terminals). Terminals 1 and 2 are assigned menus that list the complete range of off-line functions.

C.2 ALTERATION OF THE MAIN MENU ASSIGNMENTS

At some point, it may be desirable to have the various menus assigned to other terminals. For example, Terminal 6 may be needed for local support personnel, although it is currently being used by an operator.

To change the menu assignments, list the program module ASKAWHAT, Lines 90 through 180. Figure C-4 shows the pertinent lines. In Lines 90 through 130, each terminal is assigned the main menu functions. In the example in Figure C-4, the supervisory functions are assigned to Terminal 2; the support functions are assigned to Terminal 1; and the operator's functions are assigned to Terminals 3, 4, 5, 6, and 7. By changing the terminal numbers and the corresponding options, a different assortment of functions can be assigned to each terminal.

```
 90 REM %.Configuration options
100 REM .Terminals  -----Name-------Functions
110 A$="1........Configuration   123456789" IF STR( A$,#TERM,1)()"."THEN 140
120 A$=".2.......the Supervisor  123..6789" IF STR( A$,#TERM,1)()"."THEN 140
130 A$="1234567..an Operator     1.3...7.."
140 A1$=STR(A$,28)
150 REM Offline-Terminals Function
160 STR(N$,17)="1.........123.....": REM /.Configuration
170 STR(N$,33)="12.........123.....": REM /.Supervisor
180 STR(N$,49)="12345678...1.......": REM /.Operator
```

Figure C-4. ASKAWHAT Lines 90 through 180

Note that a prompt is associated with each set of main menu functions and terminal numbers. This prompt reads either "Configuration", "the Supervisor", or "an Operator". These descriptive titles are displayed on the appropriate main menu screens. If necessary, these prompts can be changed. The maximum length of each prompt is 17 bytes.

Lines 150 through 180 assign the off-line functions to terminals in the same manner as the main menu functions are assigned.

APPENDIX D
REPORT/STREAM DEFINITION

A report is a set of 3270 print records associated with a specific stream of data. A report is preceded by a Beginning-of-Report (BOR) record and terminated by an End-of-Report (EOR) record.

BOR and EOR records are unique records used to provide boundaries to reports and streams. The BOR and EOR records are sent from the host system as Bytes 1 through 36 of a transmission block (80 x 24 byte screen). The BOR and EOR records are 16 characters each, defined at the time the cluster configuration is generated on the 2200 system. These delimiters are inserted into the print streams by the appropriate host application program.

To ensure that a report name is generated in the event that the BOR or EOR record is not detected, the system automatically generates a report name based on the 8-byte stream ID. The 8-byte stream ID, defined during cluster configuration is the root name; a 7-digit incremental count is added to produce a unique 15-byte generated report name, also called a no-name report.

Report names are stored in the global variable @P$(n) when the BOR is detected (on reception) by the @3270PRNT@ module. The report name is stored in the global variable @P$(n) Bytes 47 through 64, and the no-name report is stored in Bytes 66 through 80.

A new entry is inserted into the index of report names only when the end of the report is reached. This entry contains information needed by the off-line Listing and Deletion utilities, i.e., report name, stream number, number of spool file blocks used, and starting block number.

APPENDIX E
SAMPLE AUTOMATIC LOAD PROGRAM

The Automatic Load feature allows a user to write a loading program that will automatically load a particular cluster configuration, previously saved on disk, and attach one or more terminals and printers without any operator actions. A sample program follows.

```
10  REM Automatic load of 3270 cluster
20  COM  N$64
30  SELECT DISK 320  :REM/.site of 2200  /  3270 emulator
40  N$="3270 Cluster 40 via ID to Host Simu"     :REM/.name of cluster to load

44  REM .. The following code simulates key stroke responses to certain
prompts.
46  REM .. Bytes 41-64 of N$ may serve as a keystroke glossary.
48  REM .. HEX(82) is the hex code for the RUN key.

50  STR(N$,41)         = "21" & HEX(82) & "Y" :REM/.Load with active spooling
60  STR(N$,LEN(N$)+1   = "322" & HEX(82)      :REM/.Attach printer on stream 1
70  STR(N$,LEN(N$)+1   = "312" & HEX(82)      :REM/.Attach printer on stream 2
80  STR(N$,LEN(N$)+1   = "1" & HEX(82)        :REM/.Attach next available term.
90  LOAD DC T #0, "B3270001"
```

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