(WANG)

MODEL 2236
INTERACTIVE TERMINAL
USER MANUAL

SYSTEM 2200
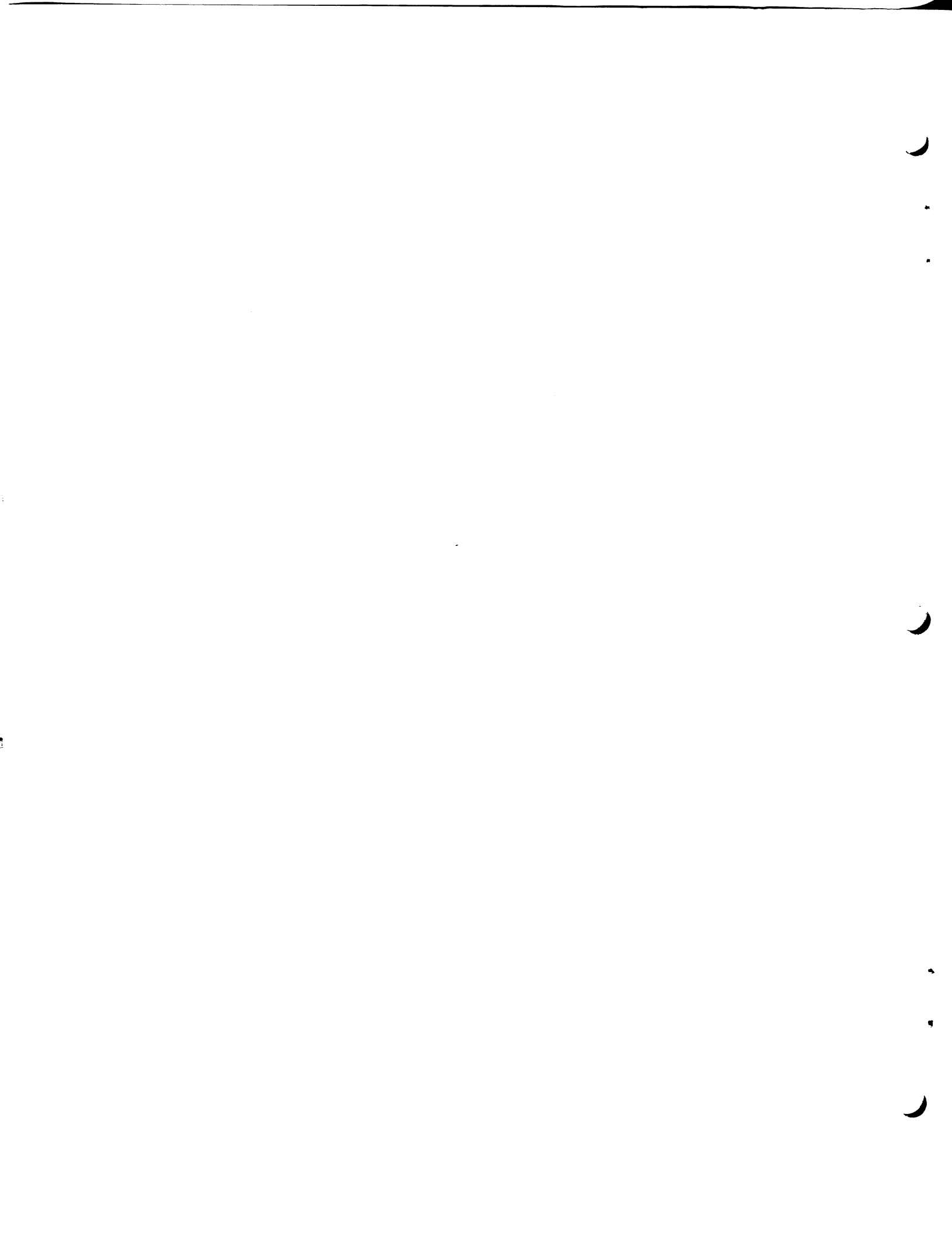
MODEL 2236

INTERACTIVE TERMINAL

USER MANUAL

Disclaimer of Warranties and Limitation of Liabilities

PREFACE

    This manual provides general information about the Wang Model 2236 Interactive Terminal and its functional interrelationships with a Model 2236MXC Multiplex Controller and 2200 Central Processing Unit. Also contained within this manual are installation guidelines and a description of Interactive Terminal features.
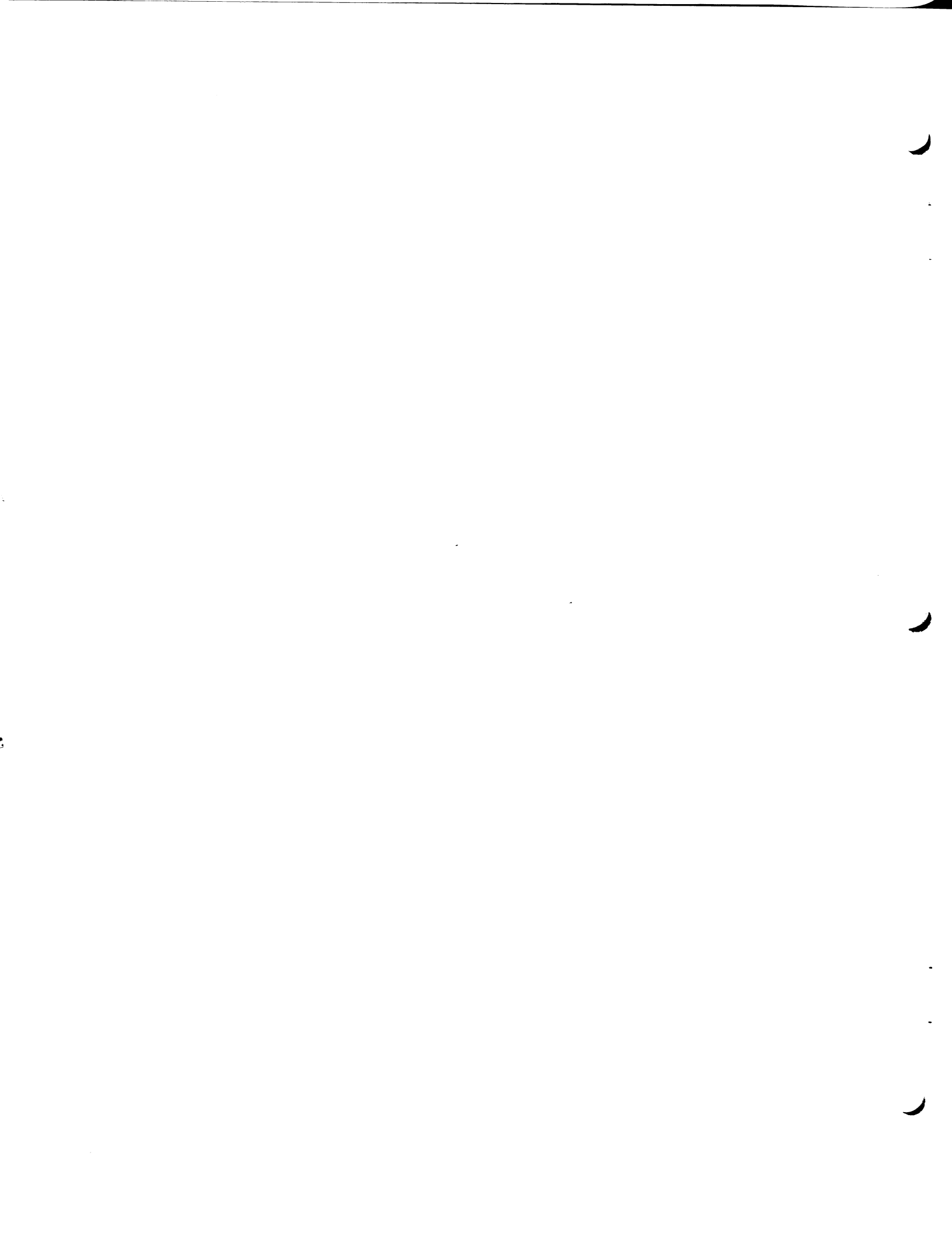
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CHAPTER 1

GENERAL INFORMATION

1.1 <u>INTRODUCTION</u>

The Wang Model 2236 Interactive Terminal brings to your office or department the capability to enter or retrieve computer-recorded data, which might be located either in the same room or hundreds of miles away. Located at the same site as the data storage device is a Wang 2200 Central Processing Unit (CPU). Under the control of a computer program running in the 2200 CPU, informative messages are displayed on the Interactive Terminal's TV-like screen. As the operator touches the appropriate keyboard keys in reply to the message, the characters keyed are displayed on the screen, thus allowing visual verification of the characters entered.

After completing the response, the keyed characters are sent to the CPU's computer program. The keyed characters, depending on the program in use, can be recorded as data at the storage device, can cause previously recorded data to be retrieved and displayed on the Interactive Terminal's screen or have other functions performed. An optional Wang printer may be connected to an Interactive Terminal, thus allowing hard copy output of retrieved data or other information.

Figure 1-1 shows a Wang Model 2236 Interactive Terminal. The compact Interactive Terminal may be placed on a desk top or other work surface.
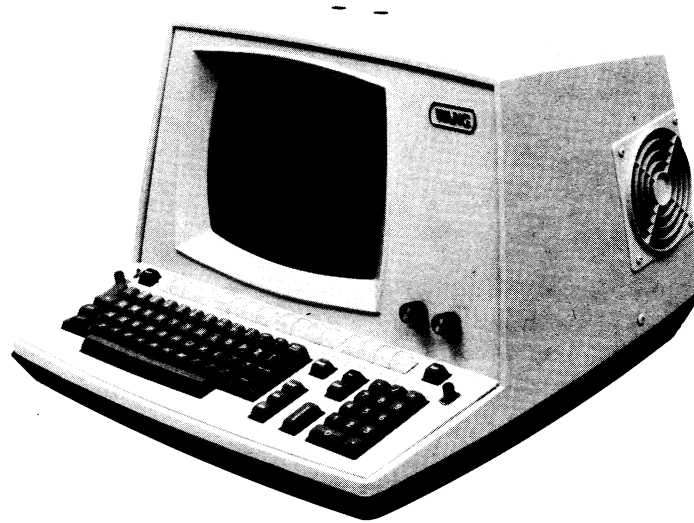
Figure 1-1. Model 2236 Interactive Terminal

1.2   <u>INTERACTIVE TERMINAL NETWORKS</u>

The Interactive Terminal is designed for use in networks where up to eight* Interactive Terminals are used concurrently. The CPU must be equipped with a Model 2236MXC (-1 or -2) Multiplex Controller, which contains plugs for individual connection to each Interactive Terminal. Cable connection distances, for each Interactive Terminal, thus depend on the distance between that Interactive Terminal and the CPU/Multiplex Controller. Interactive Terminals may be connected locally via cable or remotely via a telecommunication link.

*A 2200VP CPU and a Model 2236MXC-2 Multiplex Controller are required for networks with five or more terminals.

Example Interactive Terminal Network and Connections

Figure 1-2 illustrates the hardware components of a typical network of four Interactive Terminals. Each Interactive Terminal is connected to the CPU via the Multiplex Controller which is installed in the CPU. Each Multiplex Controller plug is labeled with a number from 1-4 (Model 2236MXC-1) or 1-8 (Model 2236MXC-2). Data storage devices are connected to the CPU.

For cable distances between an Interactive Terminal and a Multiplex Controller exceeding 1000 feet (304.8m), two modems must be purchased or rented from a modem vendor. One modem is plugged into the terminal; the other modem is plugged into the Multiplex Controller. Dedicated private lines or switched lines (e.g., telephone lines) link the two modems. In Figure 1-2, the Interactive Terminals connected to plugs 3 and 4 use modems, thus allowing data entry or retrieval from their respective remote sites. An optional printer may be connected to an Interactive Terminal, as shown in Figure 1-2.

The Interactive Terminal connected to plug 1 in the Multiplex Controller is referred to as the network's "primary terminal." A primary terminal functions not only as a terminal in the network, but as the CPU's system console when required. Because it can serve as the CPU's keyboard/display console, the primary terminal has greater capabilities than the other terminals in a network.

Wang Laboratories, Inc. recommends that the primary terminal be directly connected to the CPU/Multiplex Controller.

Alternatively, a Wang Model 2226 CRT/Keyboard Console may be connected to plug 1 to perform system console operations only. Unlike a Model 2236 Interactive Terminal, the Model 2226 cannot serve as one of the terminals.
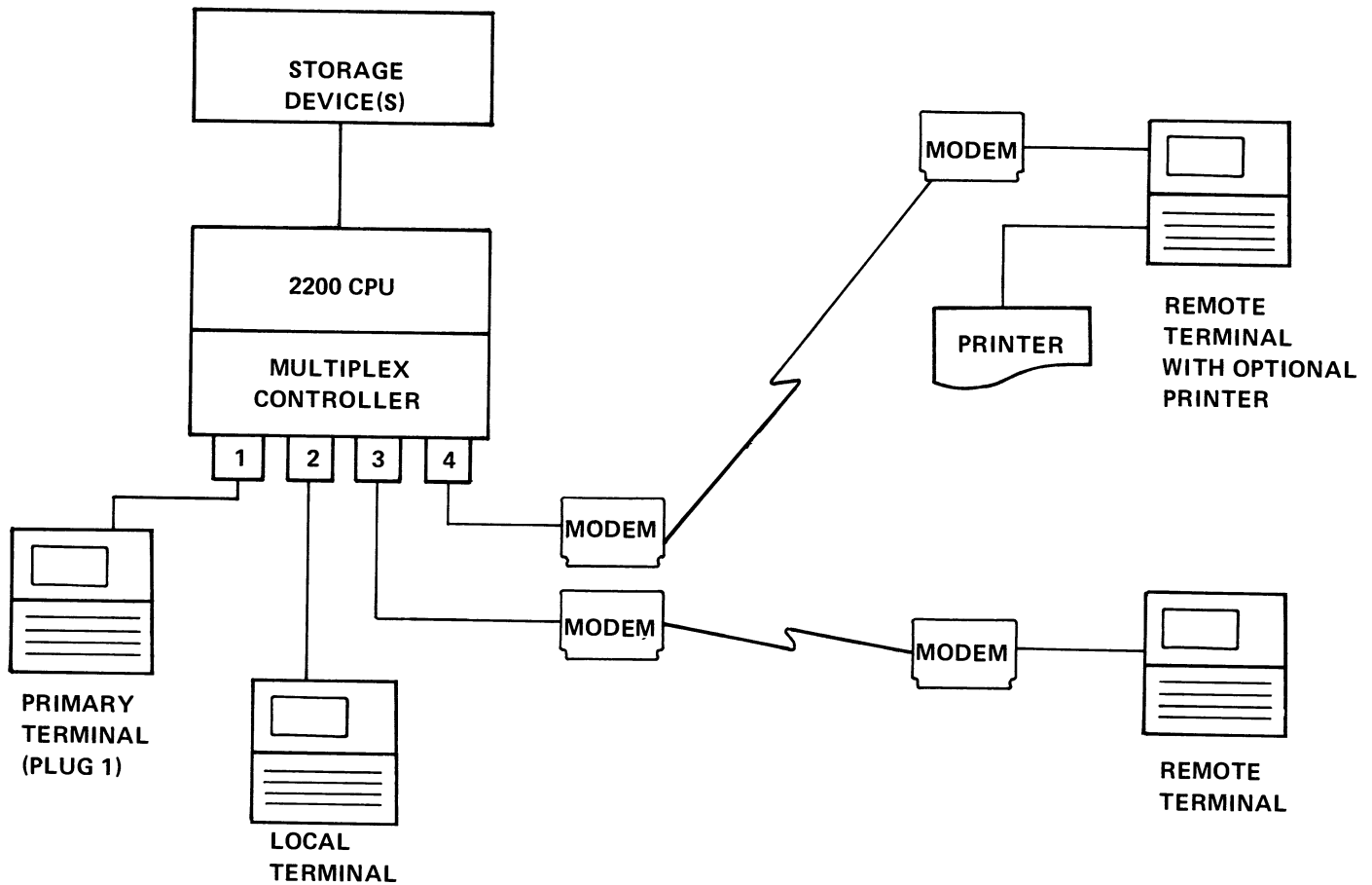
Figure 1-2. Example of an Interactive Terminal Network

Network Flexibility

The example Interactive Terminal network just discussed represents only one of many possible networks. Interactive Terminals might all be directly connected to the CPU/Multiplex Controller, or they could all be remotely connected via modems except the primary terminal (or Model 2226). There might be only two or three terminals, or there might be five, six, seven, or eight terminals in a network. Whatever the case, an Interactive Terminal is always part of a network, and one of the terminals is a primary terminal (or Model 2226).

1.3 INSTALLATION GUIDE

Before summoning a Wang Service Representative to unpack, inspect, and install an Interactive Terminal, one must decide on a location for it.

Connection Between an Interactive Terminal and a CPU/Multiplex Controller

With locations where less than 1000 feet (304.8m) of cable is required between the Interactive Terminal and the CPU/Multiplex Controller, modems are not required. For cable distances exceeding 1000 feet, however, two modems and two modem cables are required per terminal.

A length of 25-foot (7.6m) direct connection cable is supplied with each Interactive Terminal, unless a longer direct connection cable is ordered. The standard 25-foot cable accommodates local connection to the Multiplex Controller. For extended local connection, direct connection cable is optionally available in lengths of 50 feet (15.2m), 100 feet (30.5m), and thereafter in 100 foot increments up to 1000 feet (304.8m). Direct connection cable is non-extendable; the male plug at each end is labeled to indicate whether that end plugs into the Multiplex Controller ("MUX") or the Interactive Terminal ("TER"). Direct connection cable is shielded from Electromagnetic Interference (EMI).

For remote connections, instead of being connected directly to the Multiplex Controller, the Interactive Terminal is connected to a modem. Modems are available from modem vendors as discussed in Appendix A. Modem cables are optionally available from Wang Laboratories, Inc. for modem connection to Wang equipment. A 12-foot (3.7m) modem cable meets most requirements, but can be extended up to 37 feet (11.3m) using an additional 25-foot (7.6m) extension cable. Modem cable is not shielded from EMI (see "Electrical Environment" below).

Figure 1-2 (on a previous page) illustrates direct connection and modem connection between the Multiplex Controller and Interactive Terminals.

Physical Operating Environment

In selecting an Interactive Terminal site, there must be ample room for the compact, desk-top Interactive Terminal. The fan grates on the Interactive Terminal's sides must never be blocked. If a printer is to be used, it too must have sufficient room.

When selecting a site for an Interactive Terminal, it is not sufficient to merely find enough space for it. Some preparation prior to delivery is necessary to select a suitable location for the terminal(s). The following describes the environment in which a terminal must operate and the preparations necessary to meet these criteria.

Temperature, because it can vary from day to day, is a very important factor. The recommended operating temperature is from 65°F to 75°F (18°C to 24°C), and the allowable temperature is from 50°F to 90°F (10°C to 32°C).

Low outside temperatures are usually not a problem because nearly all locations are heated. High temperatures can be a problem because many locations do not have air conditioning or proper ventilation. If the Wang equipment is used where temperatures exceed the maximum specified, component failure rate will drastically increase.

If an air conditioning unit is already installed, or if one is to be installed, it is imperative that a separate power line be used. If a separate power line is not used, system errors will occur when the air conditioning is in use.

While air conditioning is good for maintaining the proper temperature, it also removes moisture from the air, thereby lowering the humidity. If the Wang equipment is installed in a carpeted room, the lower humidity plus the static generating capability of carpets and synthetic clothing impart static electrical charges to operating personnel. When an operator comes in contact with the Wang equipment, the resultant static spark is uncomfortable, causes system malfunctions, and can even destroy data.

If carpeting is to be installed where the CPU or Interactive Terminals will be used, be sure it is a non-static variety. If carpeting already exists, and it is not a non-static carpet, it can be treated with an anti-static spray. Alternatively, an electrically conductive mat can be installed to prevent a static charge build-up, for example, under the table or desk the Interactive Terminal is located on. Carpets treated with an anti-static spray should be thoroughly cleaned before the first treatment, and retreated at least once every three months thereafter. If an electrically conductive mat is used, it should be installed under the operating area and must be properly connected to an earth ground.

The recommended humidity range is from 35% to 65% R.H., but 20% to 80% R.H. is allowable. (In cold weather, the humidity in heated buildings can be 10% or lower.) Humidifiers and dehumidifiers should be installed to increase or decrease the humidity as required.

Dirt and grease can accumulate rapidly on circuit boards and components, and can form a film that traps heat and provides a leakage path for signals. To prevent failures due to dirt, all air conditioning, heating, and ventilating units should have air filters. These filters should be cleaned or replaced regularly. In areas where ordinary filters do not remove airborne dirt sufficiently, an electrostatic filter can be installed.

Electrical Environment

For each Interactive Terminal, the main power line should be regulated to within ± 10% and be noise free. Never plug Wang equipment into a power line that also powers fluorescent lighting or motorized equipment such as typewriters, air conditioners, water coolers, copiers, or calculators.

If the line is not sufficiently regulated to the limits indicated above, a constant voltage transformer can be installed. If the line is noisy, however, a detailed analysis of the problem must be performed to ensure a correct solution.

Computers and peripherals are extremely susceptible to Electromagnetic Interference (EMI). In general, the source of the EMI must be determined before a solution is proposed. EMI can enter an Interactive Terminal (or other Wang equipment) by conduction along wiring and cabling or by direct radiation. If sources of EMI, which include office machines, air conditioning units, electric motors, machinery and arc welders, are in close proximity to an Interactive Terminal, EMI will enter by direct radiation. The noise generating device should be moved, repaired or filtered to prevent it from interfering with Interactive Terminal operation. If the source of the noise cannot be found, an EMI filter with a cut-off frequency near 10 KHz should be installed on an Interactive Terminal's AC power line. In all cases, check that the AC power line has been properly installed in steel conduit, and the conduit is properly connected to junction boxes. Also, ensure that other devices, including fluorescent lighting, are not connected to the same AC power line.

Installation by a Wang Service Representative

Wang equipment must be unpacked, inspected, and installed by a Wang Service Representative. Upon receipt of this equipment, contact a local Wang Customer Engineering office and request that this service be performed. Failure to follow this procedure voids your warranty.

The installation is the complete responsibility of a Wang Service Representative; this includes cable connections and, if modems are used, setting the transmission speed at each Interactive Terminal and the Multiplex Controller as requested. The Wang Service Representative is responsible for connecting modem cable to Wang equipment and its modem, but is not responsible for connecting the modem to transmission lines.

If modems are to be used, it is recommended that the transmission speed (i.e., baud rate) be determined before contacting a Wang Service Representative. It is also recommended that the modem equipment be installed before the Wang equipment is installed by a Wang Service Representative. Appendix A provides additional information on modem considerations including transmission speeds.

1.4   PROGRAMMING CONSIDERATIONS

Programs which control multiple terminals using the Multiplex Controller are called "multiple terminal programs" because a single CPU-resident program supports all terminals in a network. Such programs must be developed by the user, unless the application involves forms-filling data entry. An optionally available software package called "Data Entry 2" is designed for multiple terminal forms-filling applications. This versatile, pre-programmed software package greatly reduces programming requirements.

When customizing an application program for a multiple terminal environment, the applications programmer may use (1) Terminal Access Method (TAM) subroutines or (2) logic control characters contained within BASIC language statements to control the Multiplex Controller. When certain TAM subroutines are incorporated into a user's BASIC language program, completed operator-keyed entries of up to 80 bytes (characters) are placed by the Multiplex Controller in a program-designated CPU buffer for processing. Logic control character programming similarly supports CPU-buffered keyed entries of up to 216 bytes; however, use of this procedure requires a more detailed knowledge of Multiplex Controller firmware than TAM.

Programming procedures for using the Terminal Access Method (TAM) software package are described in the Terminal Access Method User Manual. The TAM software package is supplied with each purchase of a Model 2236MXC Multiplex Controller.

Programming procedures for using logic control character programming techniques are included in the Model 2236MXC Multiplex Controller Manual which is supplied with the Multiplex Controller.

Programmers writing multiple terminal programs should have a working knowledge of the BASIC language applicable to the CPU in use. Refer to the BASIC Language Reference Manual supplied with the CPU.

CHAPTER 2

INTERACTIVE TERMINAL FEATURES

2.1   OPERATING MODES

In any Interactive Terminal network, there is only one primary terminal
(or a Model 2226 CRT/Keyboard Console).   Only the primary terminal can
function either as a terminal in the network or, when required, as the CPU's
system console.

When the primary terminal is serving as the CPU's keyboard/display
console, it is in the "Console Input/Output mode." In the Console
Input/Output mode, other Interactive Terminals in the network are inoperable,
because a multiple terminal program is not operating in the CPU.   The Console
Input/Output mode allows the primary terminal to perform any required
initialization procedures, enter or modify BASIC language program text, load a
multiple terminal program in the CPU, or operate a single terminal program
(i.e., a program designed for normal 2200 CPU operation).

After a multiple terminal program is loaded in the CPU, all Interactive
Terminals in the network become operable, and the primary terminal serves only
as a terminal (like any other network terminal). This mode, which allows all
terminals to enter or retrieve computer-recorded data located at the CPU site,
is called the "Normal Operating mode."

In summary, the Normal Operating mode involves all terminals, and the
Console Input/Output mode involves only the primary terminal (or Model 2226).

2.2   THE POWER ON/OFF SWITCH

The Interactive Terminal's power ON/OFF switch is located in the back of
the Interactive Terminal, on the right side as one faces the CRT screen.   The
picture (Figure 2-1) shows the location of the two-position power switch.   In
the "up" position (as shown), the Interactive Terminal's power is ON.   When
switched to the "down" position, the Interactive Terminal's power is OFF.

After switching the power ON, a cursor (underscore) appears in the upper-left corner of the screen, whether or not the Interactive Terminal is connected to the CPU/Multiplex Controller.
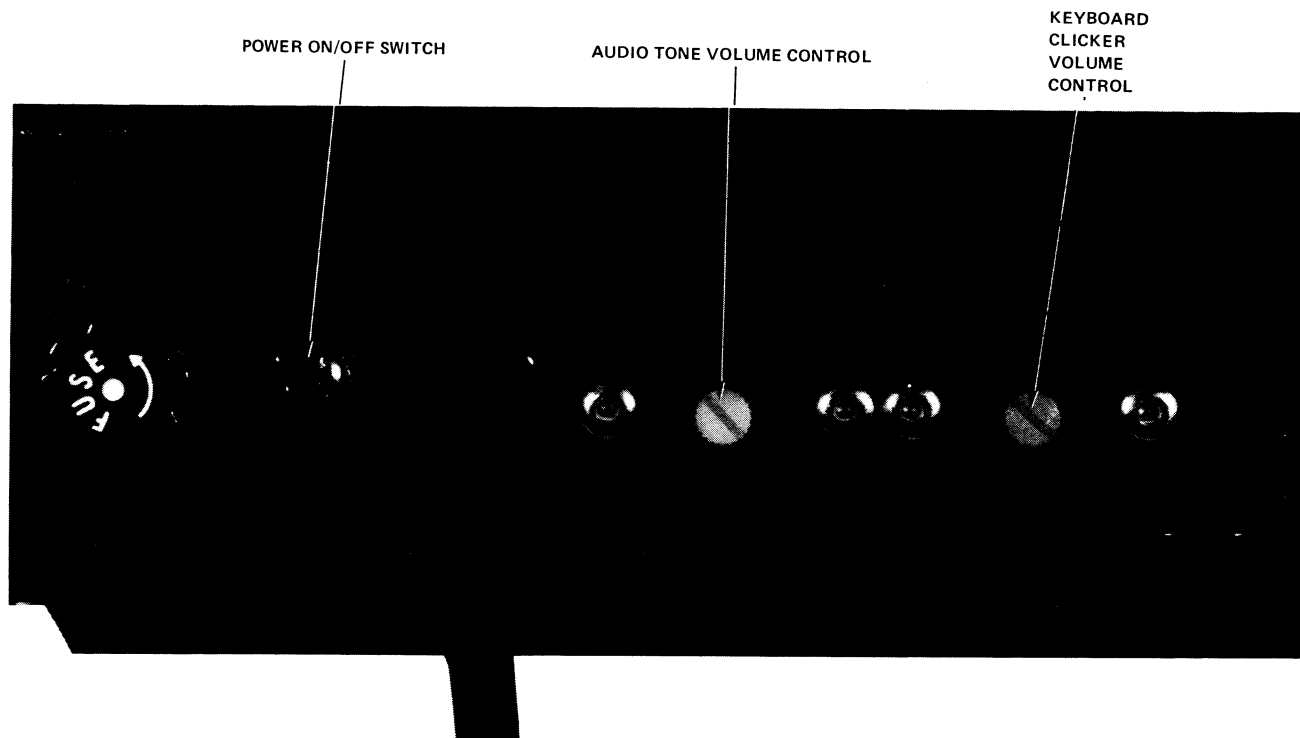
POWER ON/OFF SWITCH   AUDIO TONE VOLUME CONTROL   KEYBOARD CLICKER VOLUME CONTROL

Figure 2-1. Controls on the Back of an Interactive Terminal

2.3 THE CRT SCREEN

The TV-like screen of the Interactive Terminal allows operator viewing of easy-to-read displayed characters. The screen is capable of displaying 24 lines of characters, with 80 characters on each line (1920 character screen capacity). It serves the important purpose of providing the operator with immediate feedback. For example, depending upon the application program in use, the characters displayed might be operator-prompting messages, characters keyed at this terminal, or data retrieved from the CPU site.

When keying characters, the position of the next keyed character is indicated by an underscore line or "cursor." Usually, the cursor automatically advances one position to the right upon keying a character. Under control of an application program, the cursor may move to a specific location corresponding to the line and column position where forms-filling data should be entered.

Brightness and contrast controls on the front of the Interactive Terminal can be adjusted to provide a clear, bright screen image.

2.4   THE KEYBOARD

The keyboard is the operator's means of interactively controlling the system. Incorporated into this versatile keyboard are features associated with a typewriter, an adding machine, and a keypunch. Characters are placed into positions on the screen by touching the appropriate keyboard keys, in a manner similar to using a typewriter.

The keyboard of the Interactive Terminal is arranged into four separate zones: (1) a typewriter-like alphanumeric keyboard, (2) program control function keys, (3) a numeric keypad, and (4) a row of Special Function and Edit Keys.
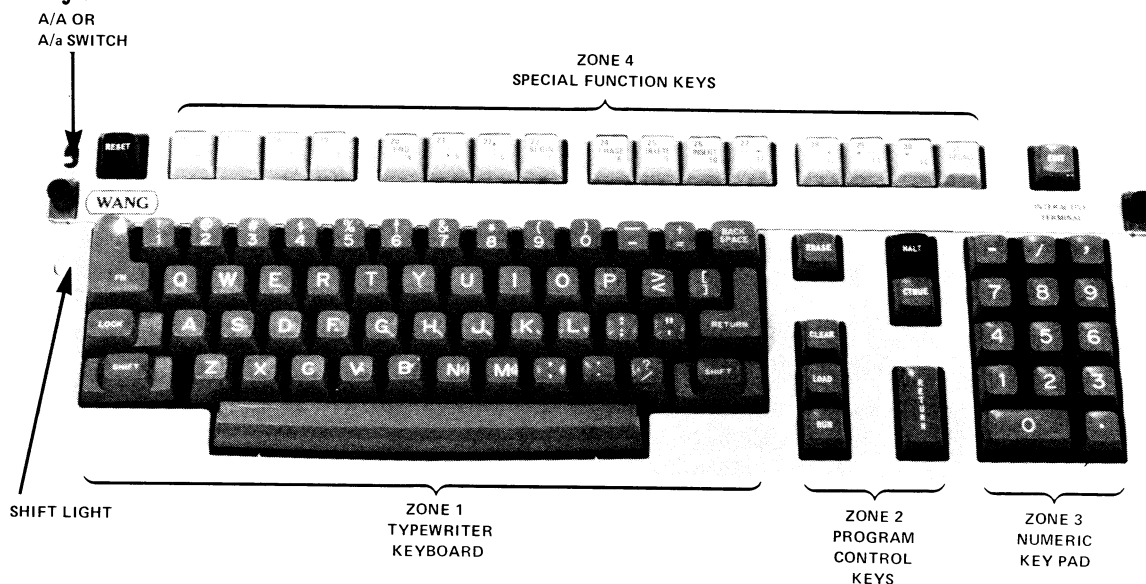

Figure 2-2.   Interactive Terminal Keyboard

Typewriter Keyboard (Zone 1)

Almost identical to the standard typewriter arrangement, the typewriter keyboard provides upper- and lowercase alphabetic characters, numeric characters, punctuation marks, and special characters. Two modes of typewriter keyboard operation are made possible by means of a switch, labeled "A/A" and "A/a", located in the upper-left corner of the keyboard (see Figure 2-2). Note that only alphabetic characters (letters) are affected by the position of the A/A or A/a switch.

When in the upper position, or "A/A" mode, only uppercase letters can be entered. In the A/A mode, the typewriter keyboard serves as a typical keypunch for data entry style keying.

When in the lower position, or "A/a" mode, the typewriter keyboard works just like a typewriter. Both upper and lowercase letters can be keyed. Each touch of a letter key when the SHIFT key (see below) is depressed produces an uppercase letter on the screen, whereas each touch of a letter key when SHIFT is not depressed displays a lowercase letter on the screen.

To the left of the typewriter keyboard is an indicator light called the SHIFT LIGHT (shown in Figure 2-2). The LOCK and SHIFT Keys control the SHIFT LIGHT and determine if the upper or lower character on each key is generated. The SHIFT LIGHT, when illuminated, causes uppercase characters to be generated from the typewriter keyboard. It can be temporarily illuminated by depressing the SHIFT key. However, merely touching the LOCK key once illuminates the SHIFT LIGHT, and it remains illuminated until the SHIFT Key is touched which switches it off.

All keys located in Zone 1, the typewriter keyboard area, generate displayable graphic characters except for the FN Key, the LOCK and SHIFT Keys, the RETURN Key, and the BACK SPACE and ERASE keys. The FN Key is discussed in Section 3.5.

Referring to Figure 2-2, notice that the RETURN Key is located in two places: in the right-most area of the typewriter keyboard and to the left of the numeric keypad. The RETURN Key is located in two places for convenience only; they may be used interchangeably when required by an application program.

Similarly, the number (numeric) keys located in the top row of the typewriter keyboard are also located in the numeric keypad (Zone 3) for the operator's convenience.

The BACK SPACE and ERASE Keys

The right-most key in the top row of the typewriter keyboard is the BACK SPACE Key; to the right of the BACK SPACE Key is the ERASE Key. Both the BACK SPACE and ERASE keys provide cursor movement to the left with character erasure. Touching BACK SPACE moves the cursor one character to the left and erases the vacated character. Touching ERASE moves the cursor to the left-most position of the current line, and erases all characters in that line.

Program Control Keys and the Numeric Keypad (Zones 2 and 3)

The program control keys (Zone 2) are discussed in Section 3.4. The ERASE and RETURN Keys (also located in Zone 2) are not program control keys and are there for operational convenience.

The numeric keypad includes all numbers and some arithmetic operator keys. Resembling a standard adding machine, the convenient numeric keypad allows rapid entry of numeric expressions and data.

The Special Function Keys (Zone 4)

The top-most row of keys are called Special Function Keys. The 16 Special Function Keys, in conjunction with the SHIFT Key, provide 32 possible Special Function Key functions. Note that when the Interactive Terminal is in the Edit mode, the Special Function Keys become Edit mode keys, and thus temporarily lose their program-designated significance. Edit mode is discussed in Section 3.2, along with the EDIT Key. The RESET Key, located to the left of the Special Function Keys, is discussed in Section 3.3.

Between the row of Special Function Keys and the top-most row of the typewriter keyboard is a removable plastic strip which accommodates labels indicating the program-controlled function of each Special Function Key.

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NOTE:

Touching the RETURN Key, the FN Key, or a Special Function Key indicates completion of the currently requested entries, depending on the application program in use.

</div>

Keyboard Use

When a valid key is touched, the keyboard produces an audible "click" to inform the operator that the keystroke was entered. Because keyboard action is electrical rather than mechanical, even when several keys are touched simultaneously, all characters are entered without keylock.

A speaker produces an audible tone when an invalid key is touched. The audio tone is fully programmable, and may be used to gain the operator's attention whenever required.

The keyboard clicker and the audio tone are both adjustable; that is, either may be made louder or quieter. Two thin, white knobs located in the rear of the Interactive Terminal function as volume controls (see Figure 2-1). Clockwise motion increases the volume, whereas counterclockwise motion decreases the volume.

CHAPTER 3

OPERATIONAL CONSIDERATIONS

3.1   DEPENDENCE UPON THE CPU AND MULTIPLEX CONTROLLER

An Interactive Terminal is entirely dependent upon the CPU and Multiplex Controller to which it is connected.   Only a multiple terminal program operating in a Wang 2200 CPU equipped with a Model 2236MXC Multiplex Controller can make each Interactive Terminal functional in a network.

3.2   EDIT FEATURES

The Interactive Terminal keyboard contains Edit mode keys which are convenient for editing displayed entries. The Edit features available with an Interactive Terminal depend on whether the CPU is in the Normal Operating mode (all terminals are operable) or in the Console Input/Output mode (only the primary terminal is operable). The EDIT Key, which is the operator's means of activating Edit mode, is located to the right of the Special Function Keys.

Edit Features: Normal Operating Mode

In the Normal Operating mode, a blinking cursor indicates that Edit mode is active, whereas a normal (non-blinking) cursor indicates Edit mode is not active.   Edit mode may be activated under program control or by the operator. Each touch of the EDIT Key activates Edit mode if it previously was not active, or deactivates Edit mode if it previously was active.   Typically, the operator touches the EDIT Key once to activate Edit mode, edits the entries, and then touches EDIT again to deactivate Edit mode.

When active, the Edit mode converts Special Function Keys 11/27, 12/28, 13/29, and 14/30 into "Edit Keys" for cursor movement purposes; all Special Function Keys temporarily lose any program-designated significance.   As indicated on the Edit Keys, they can move the cursor to the left one space (←) or five spaces (←----), or to the right one space (→) or five spaces (---- →). Edit Keys move the cursor without erasing characters.

Edit Features: Console Input/Output Mode

        The remainder of this section contains information of interest to readers who may use a primary terminal in the Console Input/Output mode to enter or alter program statements. Other readers may wish to skip to Section 3.3.

        When in the Console Input/Output mode, only the terminal designated as the primary terminal (or a Model 2226) can operate as a CPU console and perform editing functions. The number of Edit mode functions available in the Console Input/Output mode depends upon whether the primary terminal is connected to a 2200T or a 2200VP CPU.

        The following characteristics apply to Edit mode use in the Console Input/Output mode:

    a. The presence of a colon (:) indicates that Edit mode is not active.

    b. Edit mode is activated when the EDIT key is touched by the operator.

    c. The presence of an asterisk (*) indicates that Edit mode is active. Certain Special Function Keys become Edit Keys; all Special Function Keys lose any program-designed significance. Table 2-1 (below) lists and describes the available Edit Keys.

    d. A cursor accompanies the colon or asterisk indicator.

    e. Depending on the CPU used, Edit mode is deactivated by touching:

        1) the RETURN key with a 2200T or equivalent CPU.

        2) the RETURN or EDIT Key with a 2200VP CPU.

        For examples of Edit key use and additional information, refer to the BASIC Language Reference Manual supplied with the CPU.

        When an Interactive Terminal is ordered, one should specify whether it is to be used in conjunction with a 2200T or a 2200VP CPU. Labels on particular Special Function Keys correspondingly show the Console Input/Output mode Edit operations available for the CPU specified when the order was placed. Should an Interactive Terminal be used with a CPU which differs from the type of CPU originally specified, certain Special Function Key labels will not accurately reflect the Console Input/Output mode Edit operations available for the primary terminal.

The following Edit keys listed in Table 3-1 are available.

Table 3-1. Console Input/Output Mode Edit Keys

KEY	OPERATION
EDIT	used to enter Edit Mode; when touched, an asterisk replaces the usual colon at the beginning of the current line.
RECALL	used to recall a program line in memory to be edited.
◄-----	moves the cursor five spaces to the left.
◄-	moves the cursor a single space to the left.
-----►	moves the cursor five spaces to the right.
-►	moves the cursor a single space to the right.
INSERT	expands a line for additional text or data entry by inserting a space character prior to the current cursor position.
DELETE	deletes the character at the current cursor position.
ERASE	erases a line from the current cursor position to the end of the line.
BEGIN*	moves the cursor to the beginning of the current text line.
END*	moves the cursor to the end of the current text line.
*↑	moves the cursor up to the previous CRT line (only if the current text occupies more than one line on the CRT).
*↓	moves the cursor down to the next CRT line (only if the current text occupies more than one line on the CRT).
*Operable only with a 2200VP.	

Summary of Special Function Key Use and Edit Mode Indicators

Special Function Key use depends on (1) the Operating mode the CPU-controlled network is in and (2) whether Edit mode is active or not active at this terminal. Table 3-2 summarizes the features associated with an Interactive Terminal's Special Function Keys in each combination of Edit Mode and Operating mode.

Table 3-2. Special Function Key Use in the Operating and Edit Modes

OPERATING MODE	EDIT MODE	INDICATOR	SPECIAL FUNCTION KEY USE
Normal Operation (all terminals)	active	blinking cursor	11-14 and 27-30 only (cursor movement).
Normal Operation (all terminals)	not active	cursor	up to 32 user-defined functions.
Console Input/Output (primary terminal)	active	asterisk (*) and cursor	same as CPU in use (also see Table 3-1).
Console Input/Output (primary terminal)	not active	colon (:) and cursor	valid only if a single terminal program is in use.

3.3   THE RESET KEY AND SYSTEM ERRORS

If a system error occurs, the Console Input/Output mode automatically results, and an error message appears on the primary terminal's screen.

To the left of the row of Special Function Keys is the RESET Key. If RESET is touched at the primary terminal, this immediately terminates program execution, clears the primary terminal's screen of all characters, and the Console Input/Output mode results. If RESET is touched at any other terminal, that terminal's screen is cleared.

3.4   KEYS USED ONLY IN THE CONSOLE INPUT/OUTPUT MODE

Certain keys should only be used in the Console Input/Output mode, and therefore are valid only at the primary terminal. These keys are referred to as "program control keys."

Located on the right side of the keyboard (Zone 3 in Figure 2-2), program control keys provide single keystroke entry of some of the most commonly used system commands. These include CLEAR, LOAD, RUN, and CTNUE (CONTINUE). Also included are the RESET Key and the HALT (HALT/STEP) Key, both of which are black to indicate they should be used with caution. Touching the HALT Key at the primary terminal when the network is in the Normal Operating mode causes the Console Input/Output mode to result.

Consult the BASIC Language Reference Manual applicable to the CPU in use for an explanation of these keys.

3.5   THE FN KEY

A general function key labeled "FN" is located on the left side of the typewriter keyboard. The FN Key should only be used by an operator   when   the application program instructions indicate that its use is allowed.

APPENDIX A: MODEM CONSIDERATIONS

For an installation where the cable distance between an Interactive Terminal and the CPU/Multiplex Controller exceeds 1000 feet (304.8m), modems are required. There are two general categories of modems:

a. <u>Short-Haul Modems</u> provide connections of up to 5 miles (8 km), and require private, four-wire, voice grade lines.

b. <u>Telecommunication Modems</u> provide connections exceeding 5 miles, and may use private (dedicated) or switched (dial up, or Direct Distance Dialing) voice grade lines. The modem selected determines whether these lines must be two-wire or four-wire lines.

Private lines may be privately owned lines or leased from a common carrier company for the sole use of a customer and must be RS-232-C compatible.

Modem cables are available as optional equipment from Wang Laboratories, Inc. (see Section 1.3).

<u>TRANSMISSION SPEEDS</u>

The transmission speed for each Interactive Terminal connection may be set by a Wang Service Representative at 300, 600, 1200, 2400, 4800, or 9600 baud. The speed selected influences that Interactive Terminal's CRT display rate, which is about 1000 characters per second at a transmission speed of 9600 baud.

For direct connection and short-haul modem connection, the transmission speed is usually 9600 baud. For telecommunication modem connection, the transmission speed should be set at, or slightly below, the maximum transmission speed recommended by the modem's manufacturer.

<u>MODEM REQUIREMENTS</u>

All modems used must meet the following standards:

a. They must be asynchronous, full-duplex (four wire compatible) modems.

b. Modems must conform to RS-232-C standards, or in certain countries to CCITT V.24 standards.

c. They must have 25-pin RS-232-C plugs for modem connection to Wang equipment.

d. Two modems are required for each Interactive Terminal connection, and should be the same make and model modem (i.e., a matched pair).

e. The modems' maximum recommended transmission speed must equal or exceed 300 baud, which is the lowest transmission speed available for an Interactive Terminal connection.

SHORT-HAUL MODEM SELECTION AND USE

Short-haul modems meeting the above requirements include the following list. All short-haul modems specified below have a manufacturer's maximum recommended transmission speed of 9600 baud or above.

● Computer Transmission Model 611

● Gandolf LDS 100, LDS 120

● Penril PSH 96A

● Prentice Asynchronous Line Driver

● Spectron DT-401

Because short-haul modems are designed only for private line use, the only operational consideration is to ensure that the power of both the modem at the Interactive Terminal site and the modem at the CPU/Multiplex Controller site is switched ON when the Interactive Terminal is to be used.

TELECOMMUNICATION MODEM SELECTION AND USE

Telecommunication modems meeting the above requirements include the following list. Note that the manufacturer's maximum recommended transmission speed is included for each modem.

● Bell 103A or 103J, which operates at 300 baud.

● Bell 212, which operates at up to 1200 baud (may not be available in certain areas).

● Vadic 3400 (Full Duplex version), which operates up to 1200 baud.

Modems used on switched (dial up) lines usually contain a typical telephone as part of the modem itself. The modem's telephone allows a number to be dialed to establish a line connection with the CPU/Multiplex Controller site. A modem may contain a switch that allows normal voice communication to occur (called "TALK" mode), or the transfer of characters in computer form (called the "DATA" mode). Both modems' power must be switched ON and both modems must be in the DATA mode for Interactive Terminal operation to occur.

With private line use, both modems' power must be switched ON for Interactive Terminal Operation to occur.

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APPENDIX B: CHANGING THE TRANSMISSION SPEED AT AN INTERACTIVE TERMINAL

A customer may change an Interactive Terminal's transmission speed, called the "baud rate." Before beginning the procedure outlined below, read the following note.

```
+--------------------------------------------------------------+
|                                                              |
|                           NOTE:                              |
|                                                              |
|  The baud rate set at an Interactive  Terminal  must  exactly|
|  equal the baud rate set at the Multiplex  Controller's  plug|
|  for that terminal.  If the Interactive Terminal's baud  rate|
|  must be changed,  a  Wang  Service  Representative  must  be |
|  summoned to change the Multiplex Controller's baud rate  set|
|  for that terminal's plug.                                   |
|                                                              |
+--------------------------------------------------------------+
```

To change the Interactive Terminal's baud rate, complete the steps which follow:

1. Switch the Interactive Terminal's power OFF.

2. Locate the position of the cap in the rear of the Interactive Terminal, as shown in Figure B-1. If necessary, the Interactive Terminal may be moved slightly to provide better access to the cap.

3. Using a screwdriver as shown in Figure B-1, gently remove the cap by placing the tip of the screwdriver under the cap.

4. After removing the cap, place it nearby. The baud rate switch is now exposed. As shown in Figure B-2, there are two types of baud rate switches: the "slide" type (top picture) and the "push in" type (bottom picture). Follow the instructions for the type of baud rate switch installed in your Interactive Terminal.
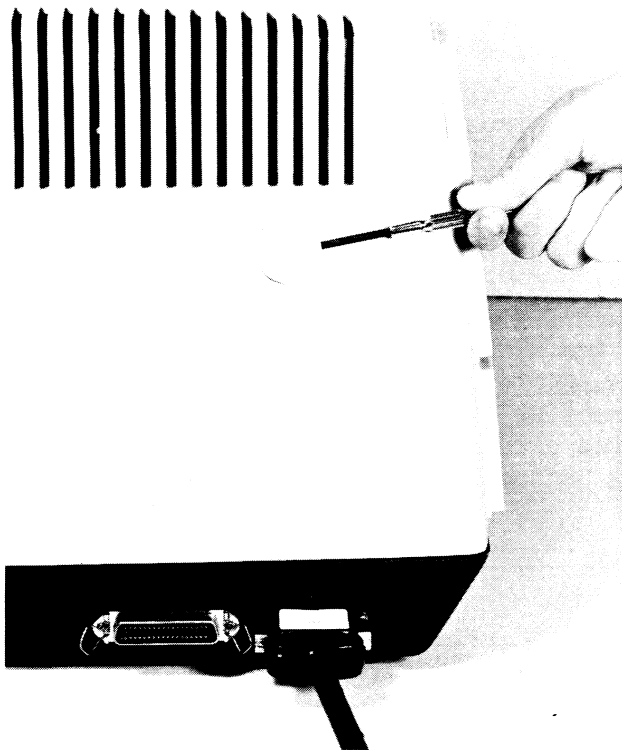
Figure B-1. Removing the Cap
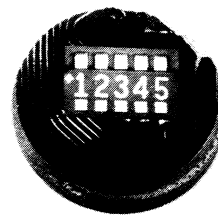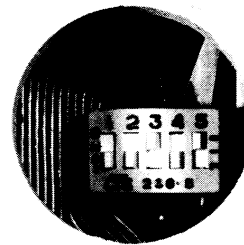
Figure B-2. The Baud Rate Switches

5. The three right-most switches (labeled 3, 4, 5 in Figure B-2) of either type of switch are the baud rate switches; the two left-most switches (labeled 1, 2) are not to be touched by a customer.

    With the "push in" type of switch, each switch consists of two white squares; one above and one below its number. If the bottom white square is pressed in, the top square projects OUT and the bottom square is recessed IN. If the top white square is pressed in, the bottom square projects OUT and the top square is recessed IN.

    The "slide" type of switch requires a sliding motion to either an up or down position.

    The switch settings that correspond to each possible Interactive Terminal baud rate appear in Table B-1 for either type of switch. Set each of the three right-most switches to its appropriate position for the baud rate desired.

6. After setting the switches, place the cap back into its position on the back of the Interactive Terminal.

7. The Interactive Terminal's power may now be switched ON.

Table B-1. The Baud Rate Switch Settings

BAUD RATE	"SLIDE" TYPE SWITCH	"PUSH IN" TYPE SWITCH

9600 baud
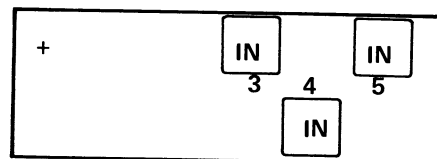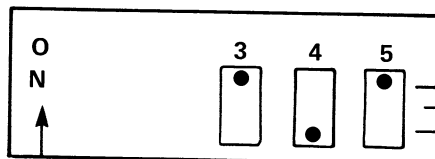
4800 baud
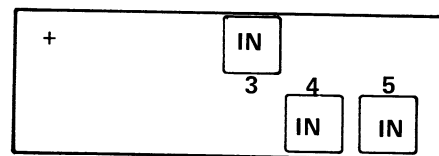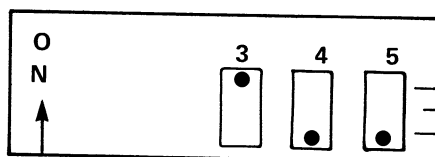
2400 baud
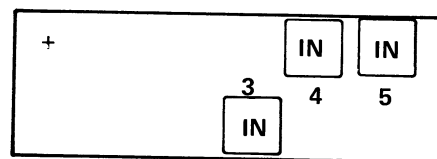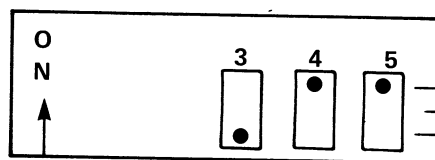
1200 baud

600 baud

300 baud

23
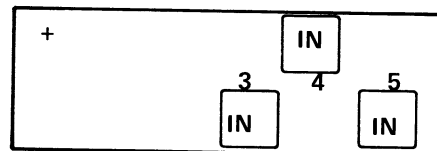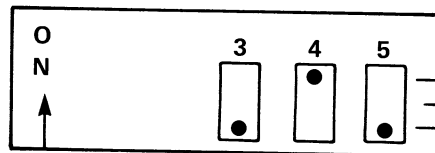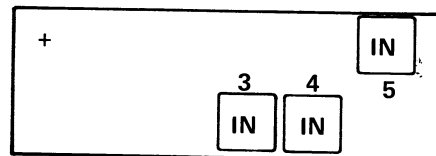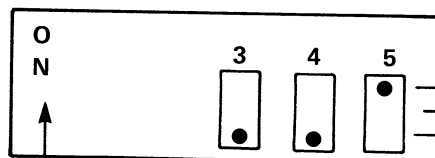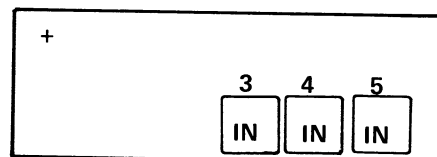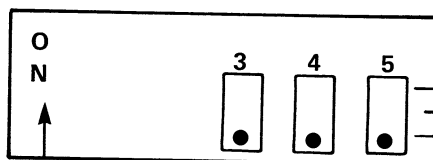
APPENDIX C: SPECIFICATIONS

MODEL 2236 INTERACTIVE TERMINAL SPECIFICATIONS

Size: Height. . . . . 13 1/2 in. (34.3 cm)
       Depth . . . . 20 1/2 in. (52 cm)
       Width . . . . 19 3/4 in. (50.2 cm)

Weight: 51 lb (23.1 kg)

CRT Screen: Display Size. . . . . 12 in. diagonal (30.4 cm)
             Capacity. . . . . 24 lines, 80 characters/line
             Character Size
                Height. . . . . 0.16 in. (0.41 cm)
                Width . . . . 0.09 in. (0.23 cm)
             Character Set . . . . 112 displayable "graphic"
                                                     characters, with or with-
                                                     out underline, including
                                                     upper- and lowercase
                                                     letters.

Keyboard: Typewriter Keyboard capable of generating 88 different ASCII
           graphic characters including upper- and lowercase letters.   A
           convenient Numeric Keypad, several Program Control Keys, a general
           function (FN) key, and 16 Special Function Keys are also included.

Power Requirements: 115 or 230 VAC + 10%
                      50 or 60 Hz + 1/2 Hz
                      40 Watts

Fuses: 2 amp @ 115V/60 Hz
        1 amp @ 230V/50 Hz

Operating Environment: 50°F to 90°F (10°C to 32°C)
                        20% to 80% relative humidity, allowable
                        35% to 65% relative humidity, recommended

Cable: One 8 foot (2.4m) cord to power source. One length of 25 foot (7.6m)
        direct connection cable is provided with each Model 2236, unless an
        optional direct connection cable is ordered for that terminal.   All
        direct connection cables have double male plugs and thus are not
        extendable. Cables are optionally available in lengths of 25 feet
        (7.6m), 50 ft (15.2m), 100 ft (30.5m), and thereafter in increments of
        100 ft (30.48m) up to 1000 ft (304.8m).   Direct connection cable is
        shielded cable.

        Modem cables are optionally available in lengths of 12 feet (3.7m),
        with additional extensions of 25 ft (7.6m) and 50 ft (15.2m); however,
        combined cable distance from Wang equipment to its modem is 50 ft
        (15.2m) maximum according to EIA standards.

Transmission Rates: 300,   600,   1200, 2400, 4800, or   9600   baud, user
                      selectable (manual switch).

MODEL 2236MXC MULTIPLEX CONTROLLER SPECIFICATIONS

Operating Environment: Same as 2200 CPU.

Power Requirements: Supplied by CPU.

Communication Modes: Full-Duplex Asynchronous Wang mode for Model 2236 Interactive Terminals.
Full-Duplex Asynchronous Teletype® mode for non-Wang, RS-232-C compatible, Teletype-equivalent terminals.

Transmission Rates: 300, 600, 1200, 2400, 4800, or 9600 baud.

Asynchronous Communication
Character Format Options: Parity: odd, even, or none.
Number of Data Bits: 5, 6, 7, or 8.
Number of Stop Bits: 1, 1.5, or 2.
One Start bit (standard).

Non-Wang Terminal Requirements: An RS-232-C compatible, Teletype-equivalent terminal must (1) have a 25-pin RS-232-C compatible plug, (2) communicate at one of the Multiplex Controller transmission rates, and (3) use one of the Multiplex Controller's software-selectable asynchronous communication character formats. A non-Wang terminal may use the same cable as an Interactive Terminal.

Number of CPU I/O Slots: Model 2236MXC-1 requires one I/O slot and supports up to four terminals.
Model 2236MXC-2 requires two I/O slots and supports up to eight terminals.

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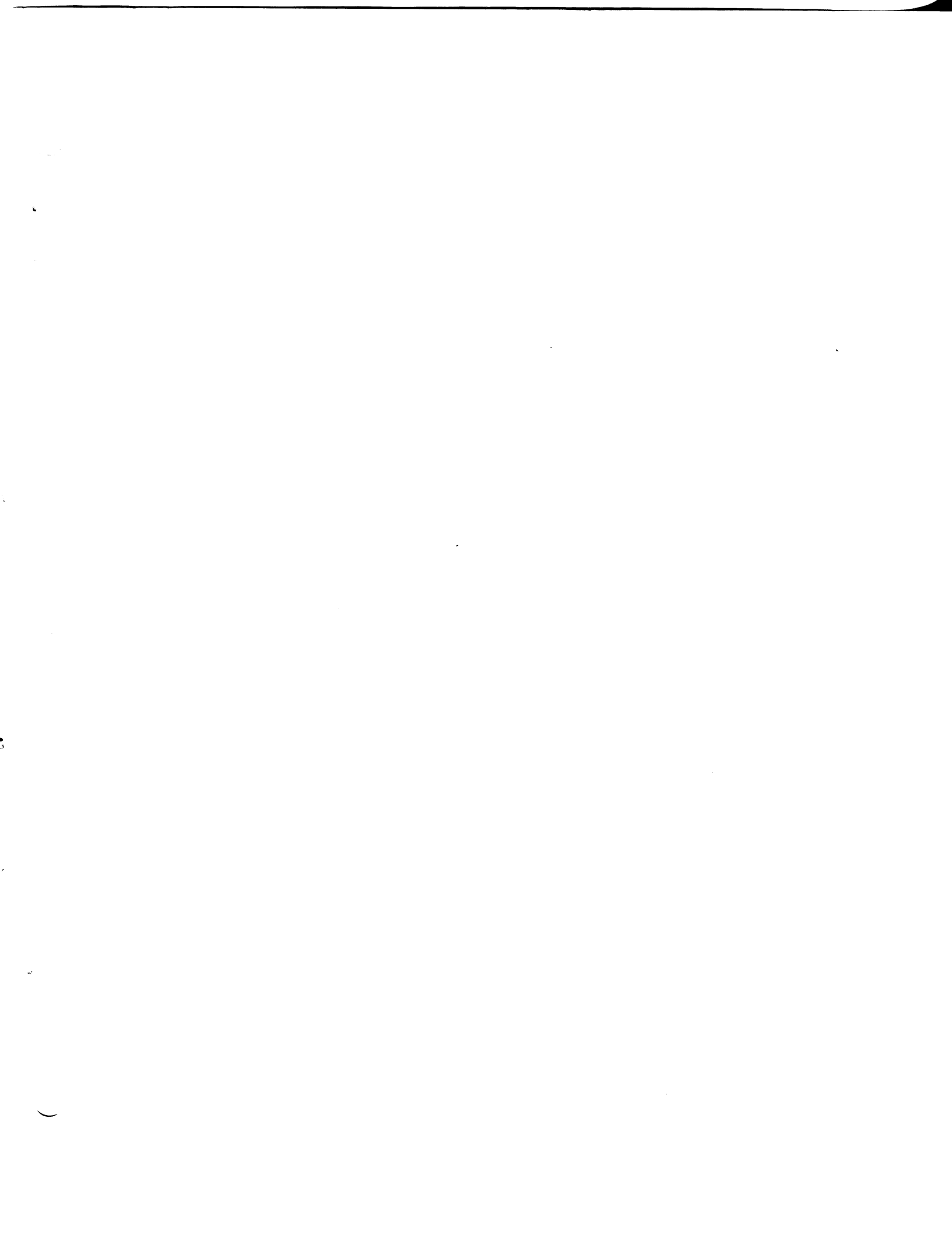
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