Mountain Computer
INCORPORATED

HP-IL 80-COLUMN VIDEO INTERFACE
Owner's Manual

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Owner's Manual

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SECTION 1

BASIC OPERATION

Introduction

The MC00701A HP-IL 80-Column Video Interface provides the user with a full screen video display capability for any of the HP-IL family of portable or handheld calculators or computers. A computing device, such as the HP-41C or the HP-75C, may control the MC00701A by means of the Hewlett-Packard Interface Loop (HP-IL). The MC00701A provides a high quality (80 columns by 24 lines) video output which may be displayed on a wide variety of low cost video monitors.

Some of the features incorporated in the Mountain Video Interface are:

Two Character Sets

The MC00701A displays up to 80 columns by 24 lines of characters. Two complete character sets are included: 1) Standard 96-character upper and lower case ASCII character set which can be displayed in normal or inverse video, and 2) Roman-8 character set (ASCII with Roman extension and no inverse video).

Screen Editing Features

The MC00701A provides useful features for cursor-oriented screen editing. The MC00701A provides 48 lines of screen memory. The 24-line display area may be scrolled line by line to view the entire screen buffer. Simple escape codes issued over the HP-IL allow the cursor to be moved anywhere on the screen. Insert line, insert character, delete line and delete character escape codes permit simplified editing of the displayed text. Two types of cursors are provided to visually prompt the user. The replace cursor is a flashing block. The insert cursor is displayed whenever the MC00701A is in the insert character mode and appears as a flashing under bar.

Software Features

The MC00701A incorporates a number of software selectable options to provide the user increased versatility. The character set may be switched between ASCII and Roman 8. The display format may be switched from 80 columns by 24 lines to 40 columns by 20 lines to enable the display device to be a television set rather than a video monitor. In this mode, the user must supply an external modulator to convert the MC00701A video output to RF. The video standard may be switched between NTSC (United States, Canada, Japan) and PAL (European) standards.

Installation

The following paragraphs contain information for unpacking and installing the MC00701A.

Unpacking

Your HP-IL 80-Column Video Interface is packaged with the following:

- The MC00701A Video Interface

- Owner's Manual

- One HP-IL cable

- One 9 Vac Power Adapter

- One video monitor cable

- Warranty Registration Card

If any of these items are missing contact your dealer immediately.   Fill out and mail the warranty registration card. Mailing this card helps to protect your investment by letting us know where to send updates and improvements that may be developed for the MC00701A.

Power

Power for the HP-IL 80-Column Video Interface is provided by the 9 Vac adapter. To connect the AC adapter to the interface,first plug it into an AC outlet, then insert the adapter plug into the power receptacle at the rear of the Video Interface adjacent to the power switch, as shown in Figure 1-1.

Figure 1-1   MC00701A   Rear Panel

Display Connections

The MC00701A video output can be routed to a monitor or a
television. Connection to a TV will require an RF modulator.

Monitor Connection

>   To connect the HP-IL 80-Column Video Interface to a monitor,
>   insert one end of the monitor cable into the monitor jack on
>   the video interface front panel and the other end into the
>   input jack on the monitor (see Figure 1-2). Either the 80 X
>   24 mode or the 40 X 20 mode may be used with a monitor. The
>   MC00701A should be set to NTSC or PAL according to the type
>   of monitor used. (See Appendix A for a complete list of
>   escape sequences used to change modes).

>   NOTE

>   The MC00701A is supplied with a standard video
>   cable; it connects to most of the monitors
>   presently on the market. The jack is an RCA
>   SO-239 phono jack. If you cannot connect the
>   video cable to your monitor, refer to the
>   monitor specifications and purchase an adapter
>   that will be compatible with our cable and
>   your monitor.

Figure 1-2 MC00701A Front Panel

Television Connection

Connect the HP-IL video cable to a modulator and the modu-
lator to the television set, as shown in Figure 1-3. There
are several RF modulators on the market. Two that work well
with the MC00701A are:

    Model USI COMPU-MOD 4
    USI Computer Products
    71 Park Lane, Brisbane, Ca. 94005
    Telephone (415) 468-4900

    M&R Sup' R Mod
    M&R Enterprises
    910 George St., Santa Clara, Ca. 95050
    Telephone (408) 980-0160

Figure 1-3   TV-Modulator-MC00701A Diagram

The following example demonstrates how to connect the USI
Compu-Mod 4 modulator between the MC00701A and a television.

1. Connect the video cable between the MC00701A front panel
    jack and the jack marked VIDEO on the Mod 4.

2. Plug the USI power pack 9 Vdc connector into the Mod 4
    and plug its power cord into any convenient 115 Vac
    duplex wall outlet.

3. Connect the USI coax cable between the Mod 4 TV connector
    and the VHF connector on the back of the TV.

4. Set the Mod 4 TV-COMPUTER switch to COMPUTER.

5. Set the Mod 4 CH3-CH4 switch to CH3 and set the channel
    selector on the TV to channel 3.

NOTE

The Video Interface must be set to the 40-
column by 20-line mode (a TV does not have
adequate bandwidth to display 80 by 24). Set-
ting the MC00701A in the 40 column mode is
performed by sending the unit an **ESC**] . See
Appendix A for a complete list of escape
sequences used to change modes.

HP-IL Connections

The Hewlett-Packard Interface Loop can consist of several per-
ipheral devices and a controller (handheld or portable computer).
The devices may be connected in any order - but all of the inter-
face cables must form a continuous loop. The device connected to
the left HP-IL connector on the back of the handheld or portable
computer, viewed from the back, will be the first device on the
loop as shown in Figure 1-4.

Figure 1-4 HP-IL System

To connect the HP-IL 80-Column Video Interface to the loop as
shown in Figure 1-4, first turn off the controller. Then, simply
disconnect the loop in one place and connect the Video Interface
in that place. (In some situations the Video Interface might be
the only peripheral in the loop.)

NOTE

The system's operation may be disrupted when
the loop is disconnected.

Initial System Verification

Verify that the HP-IL cables, the MC00701A Power Adapter and the
video output cable are connected. Turn the MC00701A rear panel
power switch ON. Turn the monitor (or TV) ON. A cursor should
be displayed at the top left corner of the screen. Refer to
Sections 2 through 4 for examples on how to use the unit with the
HP-41C, HP-75, and HP-80 computers.

Controlling the Video Interface

The video interface operates according to information it receives
on the interface loop. Specifically, it responds to the standard
HP-IL messages, including special data byte messages (in the form
of escape sequences, listed in Appendix A) that are interpreted
as instructions.

Default Conditions

When the video interface is first turned on and linked with the
HP-IL, it is in an inactive mode in the following default
conditions:

> 80 X 24 mode
> NTSC Video Standard
> ASCII character set
> Blinking block cursor in home position (line 0, column 0)

NOTE

While the AC adapter is plugged in, and the
power switch is on, the interface retains its
display memory whether or not the monitor is
turned on or connected.

FULL SCREEN DISPLAY FOR THE HP-41C

This section contains basic procedures for operating the Mountain
Computer 80-Column Video Interface with an HP-41C handheld Com-
puter via the Hewlett-Packard interface loop.

Verify that the system has been connected as described in Section
1 (a blinking cursor should be displayed on the monitor or TV).

HP-41C Examples

All of the functions of the MC00701A HP-IL 80-Column Video
Interface are available to the HP-41C by means of the HP-IL
Module. You can use the two character sets (ASCII with normal or
reverse video and Roman-8) and generate all of the escape
sequences that the MC00701A responds to.

Video Interface and HP-IL Module Functions

Table 2-1 provides a list of functions used to send information
and instructions to the MC00701A:

Table 2-1 HP-41C Function List

FUNCTION	MC00701A RESPONSE
ACA	Displays the contents of the ALPHA register. No end-of-line indicator is received.
ACCHR	Immediately displays the specified character in the Ø - 127 range. No end-of-line indicator is received. If a control character is specified, then the MC00701A responds to that instruction.
ADV	Receives an end-of-line indicator.
ACX	Displays the contents of the X-register. No end-of-line indicator is received.
BLDSPEC	Can be used to build characters in the range 128 - 255, which can be recalled to the ALPHA register and sent with OUTA or PRA. See examples.
LIST	Displays the specified program lines.

Table 2-1 HP-41C Function List (Continued)

FUNCTION   MC00701A RESPONSE

OUTA   Displays the contents of the ALPHA register.
             An end-of-line indicator is received, unless
             flag 17 is set. If control codes or escape
             sequences are in the ALPHA register, then the
             MC00701A responds to those instructions.

PRA   Displays the contents of the ALPHA register.
             An end-of-line indicator is received.

PRBUF   An end-of-line indicator is received.

PRFLAGS   Displays flag status listing.

PRKEYS   Displays listing of current key assignments.

PRP   Displays the specified program listing.

PRREG   Displays the contents of the storage
             registers.

PRREGX   Displays the contents of the storage
             registers as specified in the X-register.

PR $\geq$ Displays the contents of the statistical
             registers.

PRSTK   Displays the contents of the X-, Y-, Z- and
             T-registers.

PRX   Displays the contents of the X-register. An
             end-of-line indicator is received.

The end-of-line indicator for the HP-41C is Carriage Return (CR),
Linefeed (LF)--character codes 13 and 10. Flag 17 controls how
end-of-line indicators are sent to the MC00701A, using the OUTA
function. If flag 17 is clear, Data Byte sequences sent to the
MC00701A with **OUTA** contain an end-of-line indicator. If flag 17
is set, the HP-41C does not include an end-of-line indicator at
the end of Data Byte sequences sent with **OUTA.** However, some
functions always include an end-of-line indicator, regardless of
the status of flag 17.

Sending Escape Sequences

Escape sequences can be sent to the MC00701A (as the primary
device) from the HP-41C keyboard using **ACCHR** (in Auto mode), as
shown in the following example:

```
01 27
02 ACCHR    The character code for ESC is sent to the MC00701A.
03 69
04 ACCHR    The character code for "E" is sent to the MC00701A.  A
05 END      Soft Reset (ESC E) is completed.
```

A Cursor to Address instruction may be similarly executed. After
keying in the codes for ESC and %, two inputs are required to
specify the column (0 through 79) and line (0 through 23) that
the cursor should go to.

The following example shows how to instruct the interface to move
the cursor to column 12, line 8:

```
01 27
02 ACCHR    Sends the ESC character code to the MC00701A.
03 37
04 ACCHR    Sends the % character code to the MC00701A.
05 12
06 ACCHR    Sends the column number to the MC00701A.
07 8
08 ACCHR    Sends the line number to the MC00701A.  "ESC%" is now
09 END      executed.  The cursor is positioned at column 12 and
            line 8 of the video display.
```

Escape sequences can be combined with displayable characters in
ALPHA data strings, then sent using **OUTA**, **PRA** or **ACA**. The
strings are created by building the escape character in the X-
register with **BLDSPEC**, recalling it to the ALPHA register, keying
in the remainder of the sequence in ALPHA mode, then keying in
words to be displayed, as shown in the following example:

```
01◆LBL "EXMPL1"
02 CLA       Clears the ALPHA register.
03 CLX       Clears the X-register before creating a new character.
04 27        Builds the ESC character (the HP-41 display is
05 BLDSPEC   unintelligible).
06 ARCL X    Recalls the ESC character into the ALPHA register.
07 ⊢N HP-41  The ESC N sequence is completed and the characters
             "HP-41" are placed in ALPHA.
08 CLX       Clears the X-register
09 27
10 BLDSPEC   Builds the ESC character.
11 ARCL X    Recalls the ESC character into the ALPHA register.
12 ⊢R        The ESC R sequence is completed.
13 OUTA      The MC00701A is set to Insert Character mode (ESC N),
14 END       the characters "HP-41" are inserted at the cursor
             position, and the MC00701A is set back to Replace
             Character mode (ESC R).
```

Displaying Inverse Video or ROMAN-8 Characters

ASCII inverse-video characters or Roman-8 characters can be easily created using **BLDSPEC**. You can build special inverse or Roman-8 characters by executing **BLDSPEC** with a character code in the X-register, recalling the character into the ALPHA register, then displaying it using **OUTA**.*

The following example shows how to build and display the word "LOG" with inverse-video characters:

```
01◆LBL "EXMPL2"
02 CLA            Clears the ALPHA register.
03 1
04 BLDSPEC        Sets the most significant bit to 1.
05 76             Specifies the character code for "L".  The special
06 BLDSPEC        inverse "L" character is now in the X-register.
07 ARCL X         Recalls the inverse "L" to the ALPHA register.
08 CLX            Clears the X-register.
09 1
10 BLDSPEC        Sets the most significant bit for next character to 1.
11 79             Specifies the character code for "O".  The special
12 BLDSPEC        inverse "O" is now in the X-register.
13 ARCL X         Recalls the inverse "O" to the ALPHA register.
14 CLX            Clears the X-register.
15 1
16 BLDSPEC        Sets the most significant bit for next character to ·
17 71             Specifies the character code for "G".  The specia
18 BLDSPEC        inverse "G" is now in the X-register.
19 ARCL X         Recalls the inverse "G" to the ALPHA register.
20 OUTA           Sends the word to the MC00701A.
21 END
```

After executing the **OUTA** at line 20, the inverse-video word "LOG" will appear on the video display.

Flags and the MC00701A

Several flags that affect how the HP-41 sends information to printer type devices are described in the HP 82160A HP-IL Module Owner's Manual. However, the calculator responds differently to flags 12 and 13 when sending information to the MC00701A. When either or both of these flags are set, a space is inserted in front of data that is sent to the MC00701A (except by **OUTA**). Double-wide and lowercase modes are not available on the MC00701A.**

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* Inverse and Roman-8 characters can be sent to the MC00701A with **OUTA** only - **ACA** and **PRA** display characters normally.

** However, lowercase letters can be sent to the MC00701A using **ACCHR** with the appropriate character code in the X register.

SECTION 3

FULL SCREEN DISPLAY FOR THE HP-75

This section contains basic procedures for operating the Mountain Computer 80-Column Video Interface with an .HP-75 Portable Computer via the Hewlett-Packard interface loop.

Verify that the system has been connected as described in Section 1 (a blinking cursor should be displayed on the monitor or TV).

HP-75 Example

The **ASSIGN IO** command lets you identify loop devices by a one- or two-letter name. This name can then be used to identify individual devices in other HP-75 commands. The **PRINTER IS** and **DISPLAY IS** commands use the assigned device names to specify which device or devices should be treated as a printer device or a display device.

The following example shows how to set up the HP-75 so that it treats the Mountain Video Interface as a display when it is the only peripheral connected to the loop.

1. Enter **ASSIGN IO** on the HP-75 keyboard and press RTN.

   The HP-75 will show:

   > **1 DEVICE(S) ON LOOP**

   for a moment, then

   > **DEVICE #1 = ': '**

   will be displayed.

2. The HP-75 requires a one-or two-letter identifier for the MC00701A. Any identifier can be used, but for the example type **D1**, and press RTN.

3. The HP-75 can use the 80-Column Video Interface as the display device. This allows all information entered from the keyboard to be shown on the TV monitor, as will the results of all our programs or calculations. This is accomplished with the HP-75 **DISPLAY IS** command. This command expects to see a device identifier for the device that is to be the display. This is the identifier assigned with **ASSIGN IO** in step 1. Type:

   > **DISPLAY IS ':D1'**

   and press RTN.

A > will appear on the screen of the monitor with a
flashing cursor next to it. This is the command prompt
of the HP-75. Any input from the keyboard will be dis-
played on the screen; it will also be displayed in the
HP-75 window.

4. If the display is a TV, place the unit in the 40-column
    mode by entering: **ESC]** *

Now keyboard entry and the results of any command normally dis-
played as a single line in the HP-75 window will be displayed in
full screen on the monitor (or TV). Refer to the Escape Codes
listed in Appendix A for additional information regarding cursor
placement, scrolling, and operational modes.

NOTE:

If the display is set back to the HP-75 inter-
nal display (using the **DISPLAY IS *** command)
after using the Mountain Video Interface dis-
play (using the **DISPLAY IS ':D1'** command), the
Video Interface display will still be
operating, but the cursor will be turned OFF.

* ESC] can be sent from the HP-75 keyboard by holding the CTL
key depressed while pressing the BACK key, then pressing the
(SHIFT -) key and finally pressing RTN. If the HP-75 is in
BASIC, it will try to interpret the sequence ESC] as a Basic
statement and will beep and display "Bad Statement". To avoid
this, the escape sequence can be created as a Basic statement.
Type the following line followed by RETURN:

DISP CHR$(27)&CHR$(93)

SECTION 4

FULL SCREEN DISPLAY FOR THE HP-85

This section contains basic procedures for operating the Mountain
Computer 80-Column Video Interface with an HP-85 Computer via the
Hewlett-Packard interface loop.

Verify that the system has been connected as described in Section
1 (a blinking cursor should be displayed on the monitor or TV).

HP-85 Example

Using the MC00701A with the HP-85 requires that the HP-IL Inter-
face drawer (HP part number 82938A) be installed in slot at the
back of the HP-85. In addition, a Plotter/Printer ROM (HP part
number 00085.15002) must be inserted in a ROM Drawer (HP part
number 82936A) and installed in a slot at the back of the HP-85.
The HP-85 uses the CRT IS function; this allows the commands and
text embedded in a program to be routed to the MC00701A via the
HP-IL. Keyboard entry is not sent out over the HP-IL.

The following example shows how to set up the HP-85 so that it
treats the Mountain Video Interface as a display. It should be
the only peripheral connected to the loop.

Enter and run the following program:

```
10 CRT IS 901,80
20 DISP USING "#,K" ; CHR$(27)&
   "E"
30 DISP CHR$(27)&"]"
40 FOR I=1 TO 5
50 DISP USING "K" ; "THIS IS A
   SIMPLE VIDEO DEMO"
60 NEXT I
70 DISP USING "K" ; CHR$(27)&"%
   "&CHR$(8)&CHR$(12)&"THIS SHO
   WS CURSOR PLACEMENT"
80 DISP USING "#,K" ; CHR$(27)&
   "%"&CHR$(20)&CHR$(18)
90 CRT IS 1
100 END
```

THIS IS A SIMPLE VIDEO DEMO and THIS SHOWS CURSOR PLACEMENT
will be displayed on the monitor (or TV). Refer to the Escape
Code table in Appendix A for additional information regarding
cursor placement, scrolling, and operational modes.

APPENDIX A
CONTROL CHARACTERS and ESCAPE SEQUENCES

Control Characters

A control character, when sent to the video interface, is not displayed, but is treated as a command.

NOTE

Control characters will be displayed if the MC00701A has been placed in the monitor mode (ESC Y). In this mode, escape sequences will be displayed but not executed with the exception of ESC Z which turns off the monitor mode.

Characters zero through 31 in the character set (see Table B-1) are control characters; however, only characters 8, 10, 13, and 27 are used by the interface. These code numbers correspond to the following commands: Back Space (BS), Line Feed (LF), Carriage Return (CR) and Escape (ESC). All other control codes received by the interface are ignored. Control characters are the same in both the ASCII (Table B-1) and the Roman-8 (Table B-2) character sets.

Carriage return will move the cursor to column zero of the current line. Line feed causes the cursor to move down one line, unless the cursor is at the bottom of the display. If the cursor is at the bottom line, a line feed will cause the display to scroll up one line and display the cursor at the new bottom line. If the cursor is at the bottom of the screen buffer, then a line feed causes the first line in the buffer to be lost. Backspace causes the cursor to move one column to the left, unless the cursor is at column zero; then it will move to the last character of the previous line. It will not backspace beyond column zero, line zero.

Escape Sequences

The HP-IL 80-Column Video Interface responds to 30 escape sequences. An escape sequence is a string of characters that is sent out on the loop as a series of data bytes and interpreted as a special instruction by the device receiving it. An escape sequence always starts with ESC (Escape) - code number 27 - and is followed by one or more characters that define the instruction. Escape sequences are used by the video interface to position the cursor, scroll through display memory, clear the display, etc.

Many different escape sequences can be passed through the HP-IL; however, the video interface responds to only a few of these. When the interface receives an escape sequence that it does not recognize, it displays all but the first two characters in the sequence. Escape sequences recognized by the interface are shown in Table A-1.

Table A-1 Escape Sequences for The MC00701A

	Description
Escape Sequence	

ESC >   Cursor displayed. (Default.)

ESC <   Cursor not displayed.

ESC A   Cursor up.
       The cursor cannot be moved up beyond the top line
       of the screen. Cursor up never causes the screen
       to scroll, even if the top line of the screen is
       not the top line in the buffer.

ESC B   Cursor down.
       The cursor cannot be moved down beyond the bottom
       line of the screen. Cursor down never causes the
       screen to scroll, even if the bottom line of the
       screen is not the bottom line in the buffer.

ESC C   Cursor right.
       When the cursor is moved right past the end of the
       line (col 39 or col 79) it wraps to col 0 of the
       next line. When it is incremented past the end of
       line 23, it moves to col 0 of line 0.

ESC D   Cursor left.
       When the cursor is moved left past the left end of
       the line, it wraps to the last column (39 or 79)
       of the previous line. However, it will not move
       left past cursor position 0,0.

ESC E   Soft reset.
       Clear the screen memory, set the cursor to screen
       and buffer positions 0,0.

ESC H   Home cursor (current page).
       Move the cursor to relative position 0,0. Do not
       scroll screen memory.

ESC J   Clear screen memory from cursor to end of page.

ESC K   Clear screen memory from cursor to end of line.

ESC L   Insert line.
       Move all lines from (and including) the cursor
       line down one position. The last line in the
       buffer is lost. Write all blanks to the inserted
       line, and move the cursor to column 0.

Escape
Sequence   Description

ESC M   Delete line.
            Erase the line that the cursor is currently on,
            and move all other lines in the buffer up one
            position. Insert a blank line as the last line in
            the buffer.

ESC N   Enable insert character mode.
            Change the cursor to the insert cursor. Any input
            characters are inserted to the left of the cursor
            position, pushing the rest of the characters on
            the line towards the right side of the screen. If
            characters on the line are pushed past column 80
            (40), then a new line is automatically inserted
            below the current line and the characters scroll
            onto it. This means no characters are lost when
            inserting, and lines longer than the screen width
            can be edited normally.

ESC O   Delete character.
            Erase the character at the cursor position and
            move all the rest of the characters on the line
            one position to the left to fill the gap. If the
            line was originally longer than 80 (40) columns,
            then characters are wrapped back from subsequent
            screen lines. Lines longer than 80 (40) columns
            can therefore be edited normally.

ESC Q   Switch to the insert cursor, but do not enable
            insert mode.

ESC R   Disable insert character mode. (Default.)
            Turn off insert character mode and go back to
            replace mode. Also switch to the replace cursor.

ESC S   Scroll up (move window down).
            Move the information within the screen window up
            one line, but keep the cursor in the same relative
            position on the screen. This effectively moves
            the cursor down one line with respect to the text.

ESC T   Scroll down (move window up).
            Move the information within the screen window down
            one line, but keep the cursor in the same relative
            position on the screen. This effectively moves
            the cursor up one line with respect to the text.

Table A-1 Escape Sequences for The MC00701A (Continued)

Escape Sequence	Description
ESC Y	Enable Monitor Mode All control characters will be displayed except NULL, which will be displayed as a space. No control codes or escape sequences will be interpreted as commands except ESC Z to disable Monitor Mode.
ESC Z	Disable Monitor Mode.
ESC [	Display 80 columns by 24 lines. (Default.) Also causes the screen to be cleared.
ESC]	Display 40 columns by 20 lines. Also causes the screen to be cleared.
ESC \	Switch to NTSC mode. Also causes the screen to be cleared.
ESC =	Switch to PAL mode. Also causes the screen to be cleared.
ESC e	Hard reset. Clears screen memory, sets the cursor to screen and buffer positions $\emptyset$, $\emptyset$, and sets all soft switches to their default position.
ESC h	Home cursor (screen memory). Moves the cursor to screen and buffer positions $\emptyset$, $\emptyset$.
ESC j	Use Roman-8 character set.
ESC k	Use standard character set. (Default.)
ESC z	Performs an extensive self-test on the internal screen RAM. This test takes approximately 2 1/2 minutes to complete, and during this time the screen stays blank and all HP-IL operations are stopped. When the test is complete, results can be obtained by requesting status. Bits 5 and 6 of the second status byte are set to "1" for RAM U1$\emptyset$ or RAM U11 defective.
ESC % c r	Cursor relative address column and line; c and r are one byte binary numbers that represent the cursor position on the display screen.

APPENDIX B

MC00701A CHARACTER SETS

The two character sets provided with the unit are ASCII and ROMAN-8.

ASCII Character Set

The ASCII character set (Table B-1) contains 256 characters. Characters 0 through 127 are normal video and characters 128 through 255 are inverse video. The standard 96 character ASCII set is characters 32 through 127 in normal video and characters 160 through 255 in inverse video. Control characters 0 through 31 and 128 through 159 are displayed only in monitor mode (ESC Y).

The ASCII character set is the default character set and is available on power up and after a hard reset (ESC e). It can also be set by sending an ESC k.

Table B-1 ASCII CHARACTER SET

Decimal	Graphic	Description
0		NUL (null)
1	S_H	SOH (start of heading)
2	S_X	STX (start of text)
3	E_X	ETX (end of text)
4	E_T	EOT (end of transmission)
5	E_Q	ENQ (enquiry)
6	A_K	ACK (acknowledge)
7	♣	BEL (bell)
8	B_S	BS (backspace)
9	H_T	HT (horizontal tabulation)
10	L_F	LF (line feed)
11	V_T	VT (vertical tabulation)
12	F_F	FF (form feed)
13	C_R	CR (carriage return)
14	S_O	SO (shift out)
15	S_I	SI (shift in)
16	D_L	DLE (data link escape)
17	D_1	DC1 (device control 1 or X-ON)
18	D_2	DC2 (device control 2)
19	D_3	DC3 (device control 3 or X-OFF)
20	D_4	DC4 (device control 4)
21	N_K	NAK (negative acknowledge)
22	S_Y	SYN (synchronous idle)
23	E_B	ETB (end of transmission block)
24	C_N	CAN (cancel)
25	E_M	EM (end of medium)

Decimal	Graphic	Description
26	S_B	SUB (substitute)
27	E_C	ESC (escape)
28	F_S	FS (file separator)
29	G_S	GS (group separator)
30	R_S	RS (record separator)
31	U_S	US (unit separator)
32		Space
33	!	Exclamation point
34	"	Quotation mark
35	#	Number sign (hash mark)
36	$	Dollar sign
37	%	Percent sign
38	&	Ampersand
39	'	Apostrophe (closing single quote)
40	(	Opening parenthesis
41	)	Closing parenthesis
42	*	Asterisk
43	+	Plus
44	,	Comma
45	−	Hyphen (minus)
46	.	Period (point)
47	/	Slant (solidus)
48	0	Zero
49	1	One
50	2	Two
51	3	Three
52	4	Four
53	5	Five
54	6	Six
55	7	Seven
56	8	Eight
57	9	Nine
58	:	Colon
59	;	Semicolon
60	<	Less than sign
61	=	Equal sign
62	>	Greater than sign
63	?	Question mark
64	@	Commercial at
65	A	Uppercase A
66	B	Uppercase B
67	C	Uppercase C
68	D	Uppercase D
69	E	Uppercase E
70	F	Uppercase F
71	G	Uppercase G
72	H	Uppercase H
73	I	Uppercase I
74	J	Uppercase J
75	K	Uppercase K

Decimal	Graphic	Description
76	L	Uppercase L
77	M	Uppercase M
78	N	Uppercase N
79	O	Uppercase O
80	P	Uppercase P
81	Q	Uppercase Q
82	R	Uppercase R
83	S	Uppercase S
84	T	Uppercase T
85	U	Uppercase U
86	V	Uppercase V
87	W	Uppercase W
88	X	Uppercase X
89	Y	Uppercase Y
90	Z	Uppercase Z
91	[	Opening square bracket
92	\	Reverse slant
93	]	Closing square bracket
94	^	Caret (upward arrow head)
95	_	Underscore (low line)
96	'	Opening single quote
97	a	Lowercase a
98	b	Lowercase b
99	c	Lowercase c
100	d	Lowercase d
101	e	Lowercase e
102	f	Lowercase f
103	g	Lowercase g
104	h	Lowercase h
105	i	Lowercase i
106	j	Lowercase j
107	k	Lowercase k
108	l	Lowercase l
109	m	Lowercase m
110	n	Lowercase n
111	o	Lowercase o
112	p	Lowercase p
113	q	Lowercase q
114	r	Lowercase r
115	s	Lowercase s
116	t	Lowercase t
117	u	Lowercase u
118	v	Lowercase v
119	w	Lowercase w
120	x	Lowercase x
121	y	Lowercase y
122	z	Lowercase z
123	{	Opening brace (curly bracket)
124			Vertical line
125	}	Closing brace (curly bracket)

Decimal	Graphic	Description	
126	~	Tilde	
127		Delete (rubout)	
128		NUL (null)	Inverse Video
129	S_H	SOH (start of heading)	
130	S_X	STX (start of heading)	
131	E_X	ETX (end of text)	
132	E_T	EOT (end of transmission)	
133	E_Q	ENQ (enquiry)	
134	A_K	ACK (acknowledge)	
135	♣	BEL (bell)	
136	B_S	BS (backspace)	
137	H_T	HT (horizontal tabulation)	
138	L_F	LF (line feed)	
139	V_T	VT (vertical line)	
140	F_F	FF (form feed)	
141	C_R	CR (carriage return)	
142	S_O	SO (shift out)	
143	S_I	SI (shift in)	
144	D_L	DLE (data link escape)	
145	D_1	DC1 (device control 1 or X-ON)	
146	D_2	DC2 (device control 2)	
147	D_3	DC3 (device control 3 or X-OFF)	
148	D_4	DC4 (device control 4)	
148	N_K	NAK (negative acknowledge)	
150	S_Y	SYN (synchronous idle)	
151	E_B	ETB (end of transmission block)	
152	C_N	CAN (cancel)	
153	E_M	EM (end of medium)	
154	S_B	SUB (substitute)	
155	E_C	ESC (escape)	
156	F_S	FS (file separator)	
157	G_S	GS (group separator)	
158	R_S	RS (record separator)	
159	U_S	US (unit separator)	
160		Space	
161	!	Exclamation point	
162	'	Quotation mark	
163	#	Number sign (hash mark)	
164	$	Dollar sign	
165	%	Percent sign	
166	&	Ampersand	
167	'	Apostrophe (closing single quote)	
168	(	Opening parenthesis	
169	)	Closing parenthesis	
170	*	Asterisk	
171	+	Plus	
172	,	Comma	
173	-	Hyphen (minus)	
174	.	Period (point)	
175	/	Slant (solidus)	

Decimal	Graphic	Description	
176	0	Zero	Inverse Video
177	1	One	
178	2	Two	
179	3	Three	
180	4	Four	
181	5	Five	
182	6	Six	
183	7	Seven	
184	8	Eight	
185	9	Nine	
186	:	Colon	
187	;	Semicolon	
188	<	Less than sign	
189	=	Equal sign	
190	>	Greater than sign	
191	?	Question mark	
192	@	Commercial at	
193	A	Uppercase A	
194	B	Uppercase B	
195	C	Uppercase C	
196	D	Uppercase D	
197	E	Uppercase E	
198	F	Uppercase F	
199	G	Uppercase G	
200	H	Uppercase H	
201	I	Uppercase I	
202	J	Uppercase J	
203	K	Uppercase K	
204	L	Uppercase L	
205	M	Uppercase M	
206	N	Uppercase N	
207	O	Uppercase O	
208	P	Uppercase P	
209	Q	Uppercase Q	
210	R	Uppercase R	
211	S	Uppercase S	
212	T	Uppercase T	
213	U	Uppercase U	
214	V	Uppercase V	
215	W	Uppercase W	
216	X	Uppercase X	
217	Y	Uppercase Y	
218	Z	Uppercase Z	
219	[	Opening square bracket	
220	\	Reverse slant	
221	]	Closing square bracket	
222	^	Caret (upward arrow head)	
223	_	Underscore (low line)	
224	'	Opening single quote	
225	a	Lowercase a	

Decimal	Graphic	Description	
226	b	Lowercase b	Inverse Video
227	c	Lowercase c	
228	d	Lowercase d	
229	e	Lowercase e	
230	f	Lowercase f	
231	g	Lowercase g	
232	h	Lowercase h	
233	i	Lowercase i	
234	j	Lowercase j	
235	k	Lowercase k	
236	l	Lowercase l	
237	m	Lowercase m	
238	n	Lowercase n	
239	o	Lowercase o	
240	p	Lowercase p	
241	q	Lowercase q	
242	r	Lowercase r	
243	s	Lowercase s	
244	t	Lowercase t	
245	u	Lowercase u	
246	v	Lowercase v	
247	w	Lowercase w	
248	x	Lowercase x	
249	y	Lowercase y	
250	z	Lowercase z	
251	{	Opening brace (curly bracket)	
252	|	Vertical line	
253	}	Closing brace (curly bracket)	
254	~	Tilde	
255		Delete (rubout)	

Roman-8 Character Set

The Roman-8 character set (Table B-2) is ASCII plus a Roman extension, with normal video only; inverse video is not available with this character set. Roman-8 can be selected by sending an **ESC j** to the MC00701A.

Characters Ø - 15 are displayed in monitor mode only (**ESC Y**).

Table B-2 ROMAN-8 CHARACTER SET

Decimal	Graphic	Description
Ø		NUL (null)
1	S_H	SOH (start of heading)
2	S_X	STX (start of text)
3	E_X	ETX (end of text)
4	E_T	EOT (end of transmission)
5	E_Q	ENQ (enquiry)
6	A_K	ACK (acknowledge)
7	♠	BEL (bell)
8	B_S	BS (backspace)
9	H_T	HT (horizontal tabulation)
10	L_F	LF (line feed)
11	V_T	VT (vertical tabulation)
12	F_F	FF (form feed)
13	C_R	CR (carriage return)
14	S_O	SO (shift out)
15	S_I	SI (shift in)
16	D_L	DLE (data link escape)
17	D_1	DC1 (device control 1 or X-ON)
18	D_2	DC2 (device control 2)
19	D_3	DC3 (device control 3 or X-OFF)
10	D_4	DC4 (device control 4)
21	N_K	NAK (negative acknowledge)
22	S_Y	SYN (synchronous idle)
23	E_B	ETB (end of transmission block)
24	C_N	CAN (cancel)
25	E_M	EM (end of medium)
26	S_B	SUB (substitute)
27	E_C	ESC (escape)
28	F_S	FS (file separator)
29	G_S	GS (group separator)
30	R_S	RS (record separator)

Decimal	Graphic	Description
31	U_S	US (unit separator)
32		Space
33	!	Exclamation point
34	"	Quotation mark
35	#	Number sign (hash mark)
36	$	Dollar sign
37	%	Percent sign
38	&	Ampersand
39	'	Apostrophe (closing single quote)
40	(	Opening parenthesis
41	)	Closing parenthesis
42	*	Asterisk
43	+	Plus
44	,	Comma
45	-	Hyphen (minus)
46	.	Period (point)
47	/	Slant (solidus)
48	0	Zero
49	1	One
50	2	Two
51	3	Three
52	4	Four
53	5	Five
54	6	Six
55	7	Seven
56	8	Eight
57	9	Nine
58	:	Colon
59	;	Semicolon
60	<	Less than sign
61	=	Equal sign
62	>	Greater than sign
63	?	Question mark
64	@	Commercial at
65	A	Uppercase A
66	B	Uppercase B
67	C	Uppercase C
68	D	Uppercase D
69	E	Uppercase E
70	F	Uppercase F
71	G	Uppercase G
72	H	Uppercase H
73	I	Uppercase I
74	J	Uppercase J
75	K	Uppercase K

Decimal	Graphic	Description
76	L	Uppercase L
77	M	Uppercase M
78	N	Uppercase N
79	O	Uppercase O
80	P	Uppercase P
81	Q	Uppercase Q
82	R	Uppercase R
83	S	Uppercase S
84	T	Uppercase T
85	U	Uppercase U
86	V	Uppercase V
87	W	Uppercase W
88	X	Uppercase X
89	Y	Uppercase Y
90	Z	Uppercase Z
91	[	Opening square bracket
92	\	Reverse slant
93	]	Closing square bracket
94	^	Caret (upward arrow head)
95	_	Underscore (low line)
96	'	Opening single quote
97	a	Lowercase a
98	b	Lowercase b
99	c	Lowercase c
100	d	Lowercase d
101	e	Lowercase e
102	f	Lowercase f
103	g	Lowercase g
104	h	Lowercase h
105	i	Lowercase i
106	j	Lowercase j
107	k	Lowercase k
108	l	Lowercase l
109	m	Lowercase m
110	n	Lowercase n
111	o	Lowercase o
112	p	Lowercase p
113	q	Lowercase q
114	r	Lowercase r
115	s	Lowercase s
116	t	Lowercase t
117	u	Lowercase u
118	v	Lowercase v
119	w	Lowercase w
120	x	Lowercase x

Decimal	Graphic	Description
121	y	Lowercase y
122	z	Lowercase z
123	{	Opening brace (curly bracket)
124	|	Vertical line
125	}	Closing brace (curly bracket)
126	~	Tilde
127		Delete (rubout)
128		
.		
.		- undefined -
.		
160		
161	À	Uppercase A accent grave
162	Â	Uppercase A circumflex
163	È	Uppercase E accent grave
164	Ê	Uppercase E circumflex
165	Ë	Uppercase E umlaut or diaeresis
166	Î	Uppercase I circumflex
167	Ï	Uppercase I umlaut or diaeresis
168	´	Accent acute
169	`	Accent grave
170	^	Circumflex accent
171	¨	Umlaut (diaeresis) accent
172	~	Tilde accent
173	Ù	Uppercase U accent grave
174	Û	Uppercase U circumflex
175	£	Italian Lira symbol
176	—	Over line (high line)
177		- undefined -
178		- undefined -
179	°	Degree (ring)
180	Ç	Uppercase C cedilla
181	ç	Lowercase c cedilla
182	Ñ	Uppercase N tilde
183	ñ	Lowercase n tilde
184	¡	Inverse exclamation mark
185	¿	Inverse question mark
186	O	General currency symbol
187	£	British pound sign
188	¥	Japanese yen symbol
189	§	Section sign
190	ƒ	Dutch guilder symbol
191	¢	U.S. cent symbol
192	â	Lowercase a circumflex
193	ê	Lowercase e circumflex
194	ô	Lowercase o circumflex
195	û	Lowercase u circumflex

Decimal	Graphic	Description
196	á	Lowercase a accent acute
197	é	Lowercase e accent acute
198	ó	Lowercase o accent acute
199	ú	Lowercase u accent acute
200	à	Lowercase a accent grave
201	è	Lowercase e accent grave
202	ò	Lowercase o accent grave
203	ù	Lowercase u accent grave
204	ä	Lowercase a umlaut or diaeresis
205	ë	Lowercase e umlaut or diaeresis
206	ö	Lowercase o umlaut or diaeresis
207	ü	Lowercase u umlaut or diaeresis
208	Å	Uppercase A degree
209	î	Lowercase i circumflex
210	Ø	Uppercase O crossbar
211	Æ	Uppercase AE ligature
212	å	Lowercase a degree
213	í	Lowercase i accent acute
214	ø	Lowercase o crossbar
215	æ	Lowercase ae ligature
216	Ä	Uppercase A umlaut or diaeresis
217	ì	Lowercase i accent grave
218	Ö	Uppercase O umlaut or diaeresis
219	Ü	Uppercase U umlaut or diaeresis
220	É	Uppercase E accent acute
221	ï	Lowercase i umlaut or diaeresis
222	ß	Sharp s
223	Ô	Uppercase O circumflex
224	Á	Uppercase A accent acute
225	Ã	Uppercase A tilde
226	ã	Lowercase a tilde
227	Đ	Uppercase D with stroke
228	đ	Lowercase d with stroke
229	Í	Uppercase I accent acute
230	Ì	Uppercase I accent grave
231	Ó	Uppercase O accent acute
232	Ò	Uppercase O accent grave
233	Õ	Uppercase O tilde
234	õ	Lowercase o tilde
235	Š	Uppercase S with caron
236	š	Lowercase s with caron
237	Ú	Uppercase U accent acute
238	Ÿ	Uppercase Y umlaut or diaeresis
239	ÿ	Lowercase y umlaut or diaeresis
240	Þ	Uppercase thorn
241	þ	Lowercase thorn
242		- undefined -
243		- undefined -
244		- undefined -
245		- undefined -

Decimal	Graphic	Description
246	—	Long dash (horizontal bar)
247	¼	One fourth (one quarter)
248	½	One half
249	ª	Feminine ordinal indicator
250	º	Masculine ordinal indicator
251	«	Opening guillemets (angle quotes)
252	■	Solid
253	»	Closing guillemets (angle quotes)
254	±	Plus/minus sign
255		Reserved

APPENDIX C

THEORY OF OPERATION

Internal Design

The MC00701A can be conceptually divided into nine functional blocks as shown in Figure C-1. This section describes the functions of each block. Figure C-2 at the end of this section is a complete schematic diagram for the unit.

HP-IL Interface

The HP-IL interface (T1, U1) converts the serial analog pulse signals used to represent messages on the loop to parallel 8-bit bytes which can be used by the microprocessor. The interface is bi-directional; it both receives and converts messages from the loop and converts and transmits messages to the loop. Messages received which are intended for the MC00701A are transferred to the processor. Messages received which are not intended for the MC00701A are passed on to the next device on the loop.

Processor

The processor (U18) is a 8039 single-chip processor which utilizes an external 2732 (U2) 4K-byte EPROM for program storage. This EPROM contains the routines which run the video interface and communicate with the HP-IL.

Video Controller

The heart of the video controller is a 6545A (U19), which controls all video timing. U19 controls the outputting of the screen buffer to the video monitor and keeps track of the cursor position. In addition, U19 generates the vertical and horizontal synchronization and blanking signals required by the monitor.

Screen Buffer

The screen buffer consists of two 2K x 8 RAM chips (U10, U11) and associated address and buffer logic. The memory is under the control of the video controller and is accessed sequentially to provide a constant stream of characters to the monitor. During the vertical retrace, which occurs 60 times per second*, the processor may take control of the buffer for approximately 2.3 milliseconds to write new text.

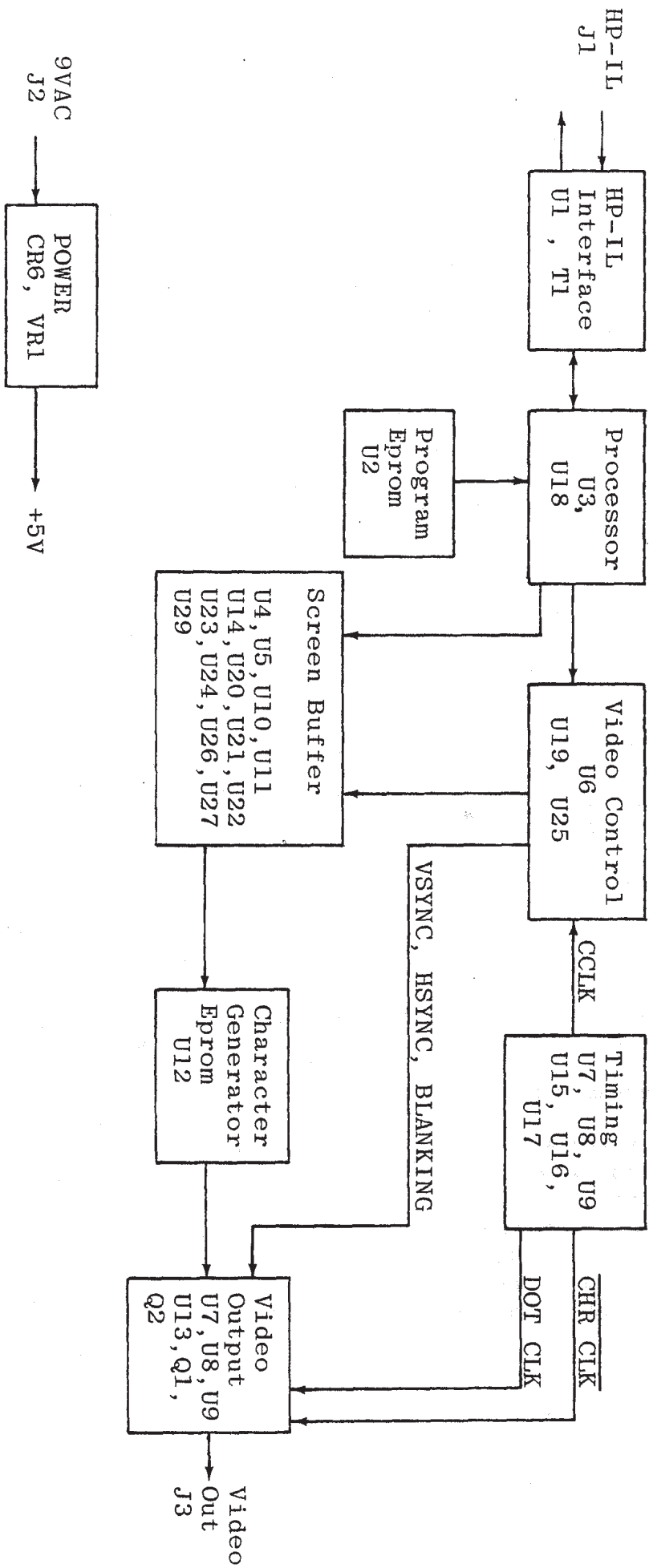*   NTSC only; vertical retrace occurs 50 times per second in PAL mode.

FIGURE C-1, VIDEO INTERFACE BLOCK DIAGRAM

HP-IL
J1

9VAC
J2

POWER
CR6, VR1

+5V

HP-IL
Interface
U1, T1

Processor
U3,
U18

Program
Eprom
U2

Screen Buffer
U4, U5, U10, U11
U14, U20, U21, U22
U23, U24, U26, U27
U29

Video Control
U6
U19, U25

Character
Generator
Eprom
U12

Timing
U7, U8, U9
U15, U16,
U17

CCLK

VSYNC, HSYNC, BLANKING

CHR CLK

DOT CLK

Video
Output
U7, U8, U9
U13, Q1,
Q2

Video
Out
J3

The buffer will hold 48 lines of text which may be either 80 or
40 columns wide, depending on the MC00701A display mode. In the
80-column mode, a window of 24 lines is visible on the display
monitor at any one time. In the 40-column mode, a window of 20
lines is visible on the monitor. The remaining lines may be
viewed by scrolling the display window. Lines which are scrolled
off the screen are retained in the buffer. ESC S moves the text
up (moves the window down through the buffer). ESC T moves the
text down (moves the window up through the buffer). The buffer
is not circular; if the display is at the top of the buffer, an
ESC T will not wrap the last buffer line back to the top of the
screen. Likewise, the display will not scroll past the end of
the buffer in response to an ESC S.

The MC00701A responds to linefeeds differently depending on
the position of the cursor with respect to the display window and
the window position in the buffer. If the cursor is located on
any line except for the last line of this window, a linefeed
behaves identically to a cursor down command (ESC B). If the
cursor is on the last line of the window and the window is not
scrolled to the bottom of the buffer (in other words, the last
line of the display is not the last line of the buffer) a
linefeed will cause the text line immediately below the screen to
be deleted. The text will scroll up one line and a blank line
will appear at the bottom of the display in place of the deleted
line. If the cursor is on the last line of the window and the
window is positioned so that this line is also the last buffer
line, a linefeed causes the entire buffer to scroll up one line
and a new blank line will appear at the bottom of the display,
deleting the first line of the buffer.

The MC00701A will accept lines which are longer than the display
width. The line sent from the HP-IL controller may be any length
terminated by a carriage return and linefeed in the usual manner.
The video interface will insert implicit carriage returns and
linefeeds to divide a long line into as many display lines (40 or
80 columns) as may be required. Editing commands (insert line,
insert character, delete line, delete character) will treat
theese long lines as a single line.

Timing

Timing for the MC00701A is derived from a 15.874 MHz crystal
oscillator (U15). This frequency is used directly to form DOT
CLK which shifts the character dots out of the video output shift
register in the 80-column mode. In the 40-column mode, DOT CLK
is 7.937 MHz (15.874 Mhz divided by 2). DOT CLK is divided by 8
to form CCLK and CHRCLK. These clocks occur at the character
rate (a character width is 8 video dots). The CCLK is used by
the video control circuit, and CHRCLK is used by the video output
circuit.

Character Generator

The character generator is contained in EPROM (U12). The EPROM contains dot matrix patterns for 256 individual characters.

Video Output

The video output circuit contains the video shift register (U13), the video output drivers (Q1, Q2), and the inverse video circuit (parts of U14 and U7). The shift register (U13) converts the character generator EPROM parallel output to a serial stream of dots at the DOT CLK rate. The video output circuit combines the dot output with sync and blanking signals from the video controller to provide a composite video output at J3. The inverse video circuit causes characters to be inverted by inverting the output of U13 using an exclusive-OR gate.

Power

Power is input to the MC00701A by means of a 9 VAC 1.2A AC adapter. Internally, the power supply consists of a bridge rectifier (CR6) and a LM7805 5 Volt voltage regulator (VR1). All internal circuits are driven by this 5 Volt output.

Controlling the Video Interface (HP-IL Messages)

Most controllers perform a specified operation by automatically sending a pre-programmed sequence of HP-IL messages around the interface loop. You would not be using the actual HP-IL messages in this case, but rather you would be using the HP-IL capabilities built into your calculator, computer, or HP-IL extension.

When the MC00701A 80-Column Video Interface receives a message on the HP-IL, it responds according to the following list. (It does not respond to messages that are not listed.) Except where noted, it automatically passes the message on to the next device on the loop.

Table C-1 MC00701A Responses to HP-IL Messages

```
-------------------------------------------------------------------
|                          |                                       |
|    HP-IL MESSAGE         |    MC00701A Video Interface Response   |
|                          |                                       |
|-----------------------------------------------------------------|
|                                                                 |
|  COMMAND GROUP                                                  |
|                                                                 |
|    IFC       Removes talker or listener status.                |
|                                                                 |
|    DCL       Clears screen memory; cursor set to position 0,0; all |
|              mode switches set to their default state.         |
|                                                                 |
|    SDC       If the device is addressed as a listener, the     |
|              device is cleared as in DCL.                       |
|                                                                 |
|    AAU       Address is set to 31. Device will not respond to TAD or |
|              LAD.                                               |
|                                                                 |
|    TAD 0-31  If message address matches device address, device is |
|              removed from listener status and becomes a talker.  If |
|              message address doesn't match, device is removed from |
|              talker status.                                    |
|                                                                 |
|    UNT       Device removed from talker status.                |
|                                                                 |
|    LAD 0-31  If message address matches device address, device is |
|              removed from talker status and becomes a listener.  If |
|              message address doesn't match, no response.  If message |
|              address is 31, device is removed from listener status. |
|                                                                 |
|    UNL       Device is removed from listener status.           |
|                                                                 |
|    SAD 0-30  Following a TAD or LAD message, if primary and     |
|              secondary addresses match device's addresses, device |
|              becomes a talker or listener.                     |
|                                                                 |
|  READY GROUP                                                   |
|    SST       If a talker, the device will source two bytes of status |
|              followed by an EOT.  The first byte is device independ- |
|              ent and is always 'OK' ($80).  The second byte is |
|              device dependent and is defined as follows:       |
|                                                                 |
|              7 6 5 4 3 2 1 0                                   |
|              0 X X X X X X X                                   |
|                | | | | | | |                                   |
|                | | | | | | | ---- Screen width (0=80 col, 1=40 col) |
|                | | | | | | ------ Character set (0=ASCII/INV, 1=Roman 8) |
|                | | | | | -------- Video output (0=NTSC, 1=PAL) |
|                | | | | ---------- Cursor (0=displayed, 1=not displayed) |
|                | | | ------------ Insert/Replace mode (0=Replace,1=Insert)|
|                | | -------------- RAM U10 selftest (0=Good, 1=Bad) |
|                | ---------------- RAM U11 selftest (0=Good, 1=Bad) |
```
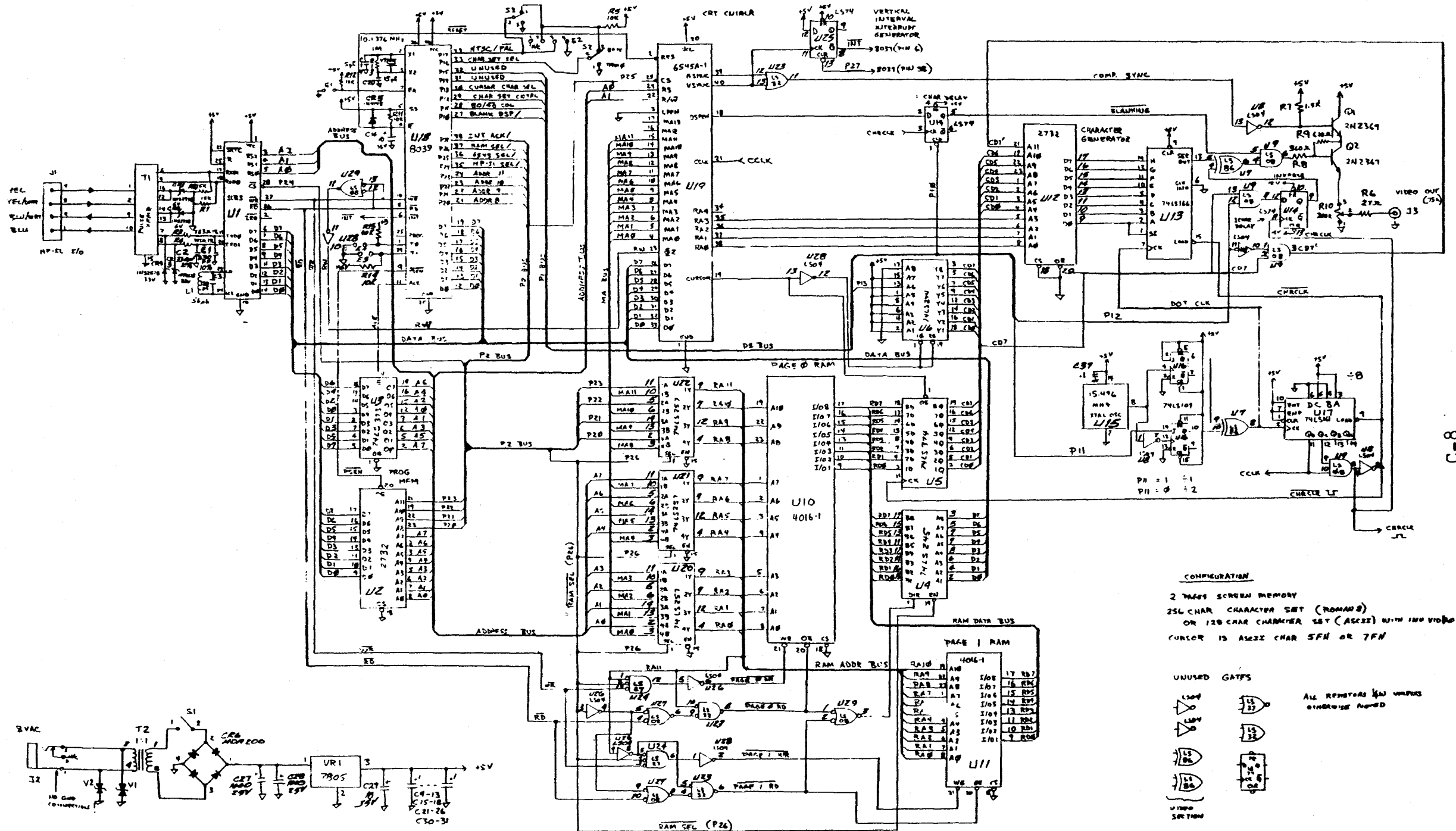
Table C-1   MC00701A   Responses to HP-IL Messages (cont)

HP-IL MESSAGE	MC00701A Video Interface Response
SDI	If a talker, the device will source the string "MC00701A" followed by a Carriage Return, Line Feed, and EOT.
SAI	If a talker, the device will source a single byte with the value $32 (50 dec.) followed by an EOT.
NRD	If a talker, the last data frame sent becomes the last data frame. It is followed by an EOT.
AAD 0-31	If the device has an assigned address, no response. If the message address is 31, no response. Otherwise, the device address is set to the message address, and the message address is incremented and passed on.
AEP 0-31	If device has an assigned address, no response. If message address is 31, no response. If not preceded by AES message, no response. Otherwise, device primary address is set to message address.
AES 0-31	If device has an assigned address, no response. If message address is 31, no response. Otherwise, the device secondary address is set to the message address, and the message address is incremented and passed on. (AES must be followed by AEP to establish valid device address.)
ETO	If a talker, device will send this frame after sending the last DAB.
ETE	If a talker, device will send this frame if the most recent DAB sourced returned with an error.
RFC	No response. (Not passed to next device until this device is ready for the next command message.)

Table C-1   MC00701A   Responses to HP-IL Messages (cont)

HP-IL MESSAGE	MC00701A Video Interface Response
DATA GROUP	
DAB	If listener, accepts data byte. If talker, sources next data byte.
END	If listener, accepts data byte. If talker, sources next data byte.

Figure C-2 MC00701A Schematic Diagram

APPENDIX D

CARE, WARRANTY and SERVICE INFORMATION

Care of the 80-Column Video Interface

The MC00701A 80-Column Video Interface requires very little
maintenance. However, you should observe the temperature limits
listed in Appendix E.

Troubleshooting

If at any time you suspect that your MC00701A 80-Column Video
Interface or interface loop is not operating properly, you can
verify operation by doing the following:

1. Check that all HP-IL devices are turned on.

2. Verify that the HP-IL loop is continuous. Remember,
    device 1 is the first peripheral connected to the "OUT"
    HP-IL connector of the controller (the left-hand
    HP-IL connector if you are facing the back of the
    computer with the keyboard facing away from you).

3. Does the monitor or TV display a blinking cursor when
    the MC00701A is turned on? If not check power to the
    MC00701A, the video cable (RF modulator connections and
    TV channel for television operation), monitor power, and
    screen intensity.

4. If the cursor is displayed, power down the system and
    reconnect the HP-IL with just the computer and MC00701A.
    If the system functions properly, one of the peripheral
    devices removed from the loop may be defective.

If you still experience difficulty after performing these proced-
ures, refer to Service below.

Service

You may have your unit repaired at Mountain Computer's service
center whether it is under warranty or not. There is a charge
for repairs after the warranty period. Before sending your unit
in for repair, contact our Customer Service Representative for a
Return Merchandise Authorization (RMA) number; telephone Mountain
Computer customer service at (408) 438-4933.

Warranty

Your factory-built Mountain Computer 80-Column Video Interface is
warranted against defects in materials and workmanship for one
year as stated on your Warranty Registration Card. During the
warranty period, we will repair or replace a product that proves
to be defective, provided you return the product to Mountain
Computer Inc. Please see your Warranty Registration Card for
specific details regarding warranty.

Potential for Radio/Television Interference (for U.S.A. Only)

The MC00701A 80-Column Video Interface generates and uses radio
frequency energy and may cause interference to radio and tele-
vision reception. Your MC00701A Video Interface complies with
the specifications in Subpart J of Part 15 of the FCC Rules for a
Class B computing device. These specifications provide
reasonable protection against such interference in a residential
installation. If your Video Interface does cause interference to
radio or television reception, which can be determined by power-
ing down then powering up the Interface, you can try to eliminate
the interference problem by doing one or more of the following:

- Reorient the receiving antenna.

- Relocate the MC00701A with respect to the receiver.

- Move the MC00701A away from the receiver.

- Plug the AC adapter into a different outlet so that the
  MC00701A and the receiver are connected to different
  branch circuits.

If necessary, consult your dealer or an experienced radio/
television technician for additional suggestions. You may find
the following booklet helpful: **How to Identify and Resolve
Radio-TV Interference Problems.** This booklet is prepared by the
Federal Communications Commission and is available from the U.S.
Government Printing Office, Washington, D.C. 20402, Stock Number
004-000-00345-4.

APPENDIX E

SPECIFICATIONS

Physical

Size: 9.75 X 7.00 X 2.00 inches
                             24.8 X 17.8 X 5.1 cm.

Weight: 1.3 lbs.
                             0.585 kg.

Operating Temperature: 0° to +55°C

Storage Temperature: -40° to +75°C

Electrical

Power Requirements: 9 Vac @ 1 Amp
                    (115 Vac adapter provided)

Text Mode Format: 24 text lines by 80 characters or
                    20 text lines by 40 characters

Screen Buffer: 48 text lines

Character Set: 96 character ASCII with inverse video or Roman-8

Character Format: 5X7 dot matrix plus 1 dot row descender

Video Format: NTSC (USA, Japan, Canada) or PAL (Europe)
                      (NTSC: National Television Standard Committee
                       PAL: Phase Alternation Line)

Video Output: 1 Volt pk-pk into 75 ohms

Cursor Type: Flashing block (replace mode) or
                    flashing underbar (insert character mode)

Interface: HP-IL compatible including device identifi-
                    cation, accessory identification and status.

Status: Device Independent Status (First Byte) = 128
                    Device Dependent Status (Second Byte):
                      Bit 0: Screen width (0 = 80 col, 1 = 40 col)
                      Bit 1: Character set (0 = ASCII, 1 = Roman-8
                      Bit 2: Video format (0 = NTSC, 1 = PAL)
                      Bit 3: Cursor mode (0 = ON, 1 = OFF)
                      Bit 4: I/R mode (0 = replace, 1 = insert)
                      Bit 5: RAM U10 selftest (0=Good, 1=Bad)
                      Bit 6: RAM U11 selftest (0=Good, 1=Bad)
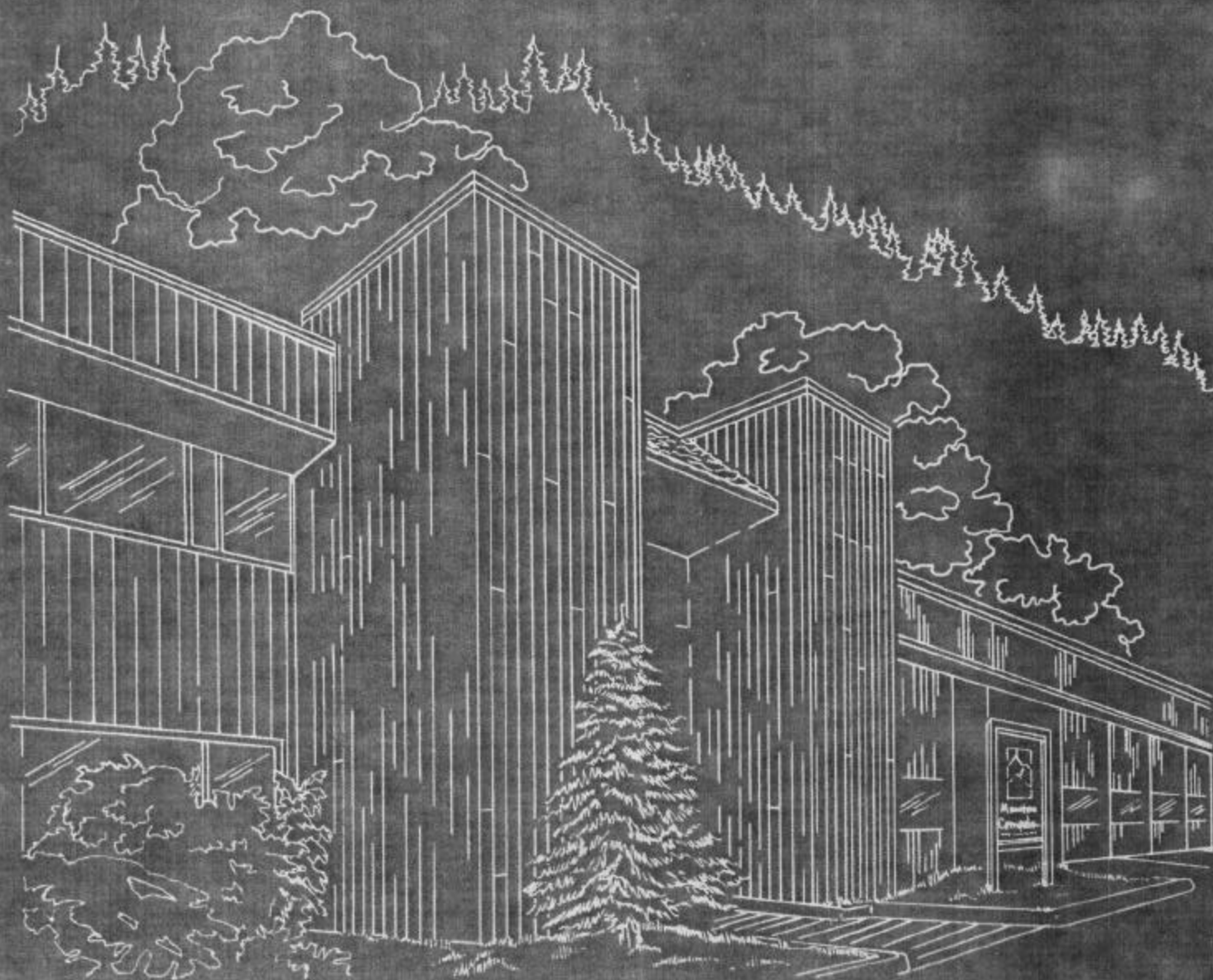
Device ID: MC00701A

Accessory ID: 50