DATAMAX UV-1
Zgrass GRAPHICS SYSTEM


OPERATOR'S MANUAL


June 1, 1982

# COPYRIGHT NOTICE

# DISCLAIMER

**** 

References are made throughout this documentation to the equipment listed below. We hereby acknowledge use of these names and/or trademarks in this publication.

| | |
|---|---|
| -ADM 5 Dumb Terminal Video Display Unit | Lear Siegler, Inc. Data Products Div. Anaheim, CA |
| -Micropolis Disk Drive | Micropolis Corporation Canoga Park, CA |
| -Bit Pad One Data Tablet/Digitizer | Summagraphics Corporation Fairfield, CT |
| -Datamax WD-1 Mini- Winchester or WFD-1 Winchester/ Floppy Disk Drive | Datamax, Inc. Elk Grove Village, IL |
| -Epson MX 80 Printer | Epson America, Inc. Torrance, CA |
| -CP/M (Control Program Monitor) | Digital Research Pacific Grove, CA |
| -Datamax RGB Monitor | Datamax, Inc. Elk Grove Village, IL |

# READ ME FIRST!

This sheet identifies standard documentation included with the UV-1 Zgrass System. It is recommended that you review all standard documentation in the order listed below.

## OPERATOR'S MANUAL

This manual instructs you on the set-up and testing of the computer and connection of peripheral devices. In addition, it provides you with important information about operating the system...such as, the hardware features and specifications; basic disk and audio tape management techniques; graphic considerations; etc.

## THE Zgrass GLOSSARY

This glossary is the standard reference to the Zgrass language which defines and demonstrates Zgrass commands and terms. Sample programs are used to clearly demonstrate commands.

## THE Zgrass LESSONS

This learning tool was designed to aid the interested novice in learning how to write Zgrass programs and create useful custom software.

## PAINT PROGRAM USER'S GUIDE

This guide functions as both a step-by-step learning tool and a reference manual for the Paint Program...to be used interactively in conjunction with the Paint Program disk provided with the system.

## UTILITY DISK USER'S GUIDE

This guide is to be used in conjunction with the multi-purpose Utility Disk provided with the system (on the flip-side of the Paint Program disk). The Utility Disk provides you with access to additional Zgrass commands (called SWAPS), additional fonts, Epson printer programs, and system test programs.

### IMPORTANT NOTICE

The 5-1/4 inch floppy disk included with the system contains the Paint Program (on one side) and the Utility programs (on the other side). Protect the life of this disk by duplicating the disk immediately, maintaining the original as your master copy, and using the duplicate for general work purposes. See DISK MANAGEMENT section of the OPERATOR'S MANUAL for instructions of copying disk.

DATAMAX UV-1 Zgrass GRAPHICS SYSTEM
OPERATOR'S MANUAL

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# DATAMAX UV-1 Zgrass GRAPHICS SYSTEM
## OPERATOR'S MANUAL


# 1.  INTRODUCTION

## 1.1  The System

The Datamax UV-1 Zgrass Graphics System is a highly interactive, dedicated micro computer color graphics system designed to easily produce visuals in motion. The UV-1 (University Version 1) hardware is Z80 microprocessor-based. The Zgrass (Z80 GRAphics Symbiosis System) software is both a high level computer graphics language and a sophisticated operating system. The EPROM (Eraseable Programmable Read Only Memory) firmware houses Zgrass and allows for easy software updates. The system's heritage derives from video arcade games, and the high-speed animation "tricks" so easily programmed on this computer are a result of the development of video game technology and custom video chips.


## 1.2  The Operator's Manual & Supporting Documentation

The Datamax UV-1 Zgrass Graphics System Operator's Manual has been designed to function not only as a guide for initial set up of the system, but also as a reference manual useful during routine operation of the system.

The TABLE OF CONTENTS doubles as a QUICK REFERENCE section, listing all section headings. Detailed instructions, descriptions, and appropriate illustrations are presented in the body of the manual to guide the user. The TROUBLESHOOTING section provides tips for solving problems. The INDEX OF SYSTEM TESTS locates all the testing programs (macros) contained within the body of the manual and explains how to use the UTILITY DISK to load and run these tests.

References are made throughout this manual to the following additional supporting documentation of the system:

The Datamax UV-1 Zgrass Lessons - The lessons were designed to aid the interested novice in learning how to control the system and create useful custom software.

The Datamax UV-1 Zgrass Glossary - The glossary defines and demonstrates commands and terms necessary for the use of the Zgrass language.

## 2. HARDWARE FEATURES

### 2.1 System Specifications

o  Zgrass firmware:  32K EPROM
o  32K user RAM expandable to 64K for CP/M compatibility
o  256K screen RAM;  16 screen pages of 16K bytes each, 12
   of which may also be used for solid state disk cache
o  256 possible colors, 4 colors per pixel (picture element)
o  320 x 201 x 2 bit resolution
o  Z80 microprocessor
o  custom I/O (Input/Output) processor
o  custom video processor
o  Arithmetic Processing Unit
o  3-voice sound synthesizer
o  1800 baud audio tape interface
o  Two DC motor controllers (reed relay closure for cassette
   tape units)
o  Two RS232C ports
o  capability  for Micropolis 1033-IV 5-1/4" floppy  disk
   drive and IMI Winchester-type hard disk drive
o  interface for graphics tablet
o  front panel connections for headphones,  light pen, and 4
   handcontrols (joysticks)
o  anti-static, formica-woodgrain cabinet
o  NTSC composite video output, channel 3 or 4 RF output,
   and R-Y,B-Y,Y output

   NOTE:  Specifications subject to change without notice.

# HARDWARE FEATURES

## FRONT PANEL



① CONSOLE LIGHTS

② CONSOLE SWITCHES

③ RESTART SWITCH

④ BREAK SWITCH

⑧ SPEAKER

⑦ LIGHT PEN JACK

⑥ VOLUME CONTROL KNOB

⑤ HEADPHONE OUT

⑨ JOYSTICK JACKS

⑩ POWER INDICATOR LIGHT
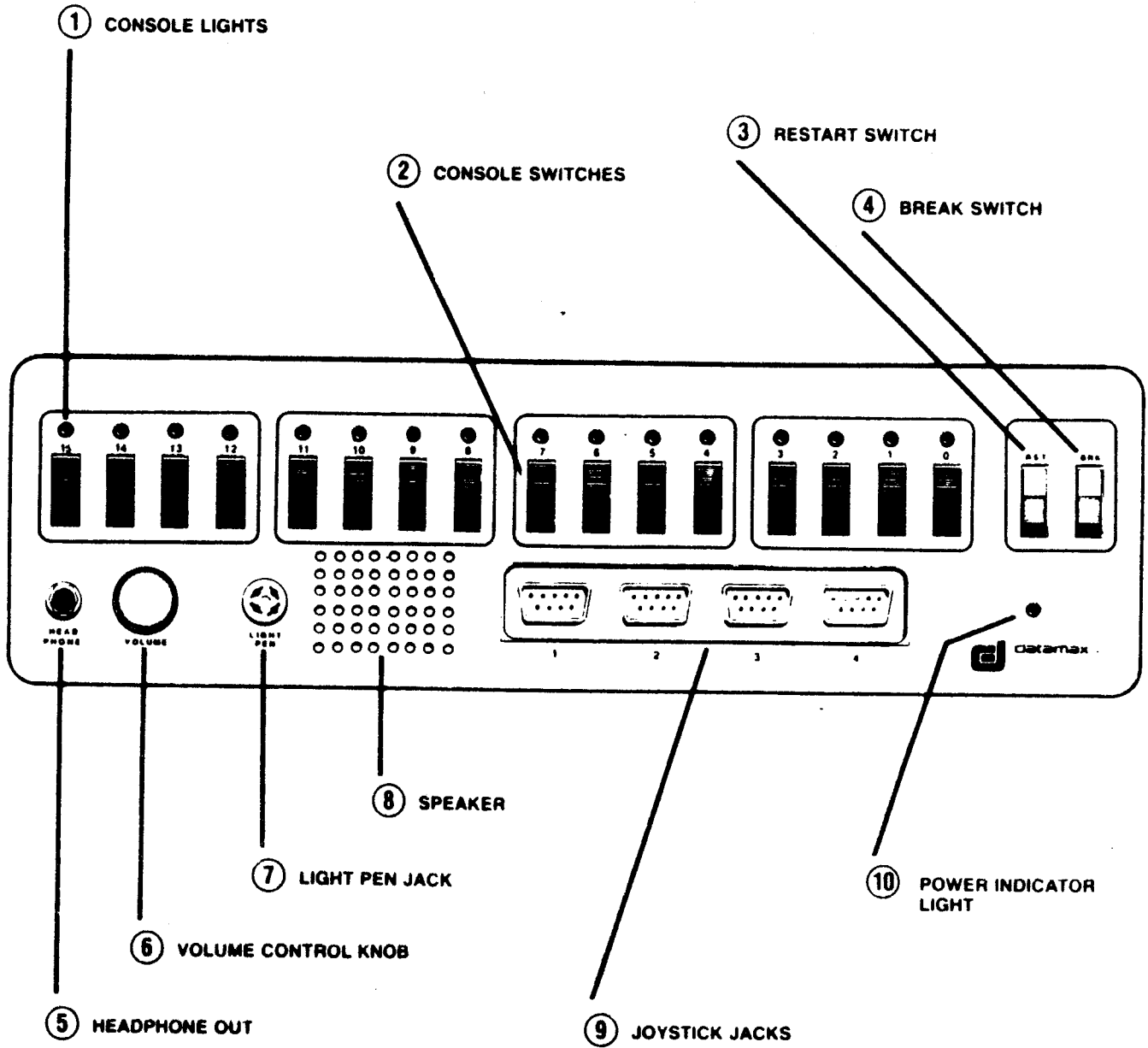
# 2. HARDWARE FEATURES - Continued

## 2.2 Front Panel Feature Detail

1) **CONSOLE LIGHTS** (16) - Assigned numbers 0-15, user-programmable on 2 different output ports (see PORT in Glossary).

2) **CONSOLE SWITCHES** (16) - Assigned numbers 0-15, user-programmable on 2 different input ports (see PORT in Glossary).

3) **RESTART SWITCH** (RST - leftmost of 2 red switches) - Same as RESTART command: clears user memory (RAM), and resets system to default colors if "Y" is typed in response to prompt on terminal. In the event of accidental restart, "N" response avoids the clearing of user memory.

4) **BREAK SWITCH** (BRK - rightmost of 2 red switches) - Same as RESTART SWITCH except that colors are not reset; same prompts and responses on terminal.

5) **HEADPHONE OUT** (1/4" phone jack) - Monaural, 8 ohms impedance, cuts out speaker, volume controlled by volume control dial; monitors audio output of 3-voice synthesizer accessed via PORT command (see Glossary).

6) **VOLUME CONTROL KNOB** - Controls audio output gain of headphone output and speaker.

7) **LIGHT PEN JACK** - Light pen option not supported at this time.

8) **SPEAKER** - Monitors audio output of 3-voice synthesizer accessed via PORT command (see Glossary). Speaker volume controlled by volume control dial; speaker disabled when headphone output is used.

9) **JOYSTICK JACKS** (four DB 9S joystick sockets) - Accessed as user-programmable device variables (see JOYSTICK and DEVICE VARIABLES in Glossary).

10) **POWER INDICATOR LIGHT** - Indicates status of power switch (located on rear panel).

# HARDWARE FEATURES
## REAR PANEL

① LINE AUDIO OUT

② RF OUT

③ NTSC COMPOSITE VIDEO OUT

④ R-Y,B-Y,Y VIDEO OUT

⑤ FUSE

⑩ AC IN

⑨ TAPE INTERFACE
CONNECTORS

⑧ TERMINAL RS232C
CONNECTOR

⑫ POWER SWITCH

⑦ ACCESSORY RS232C
CONNECTOR

⑪ AC OUT (UNSWITCHED)

⑥ BIT PAD CONNECTOR
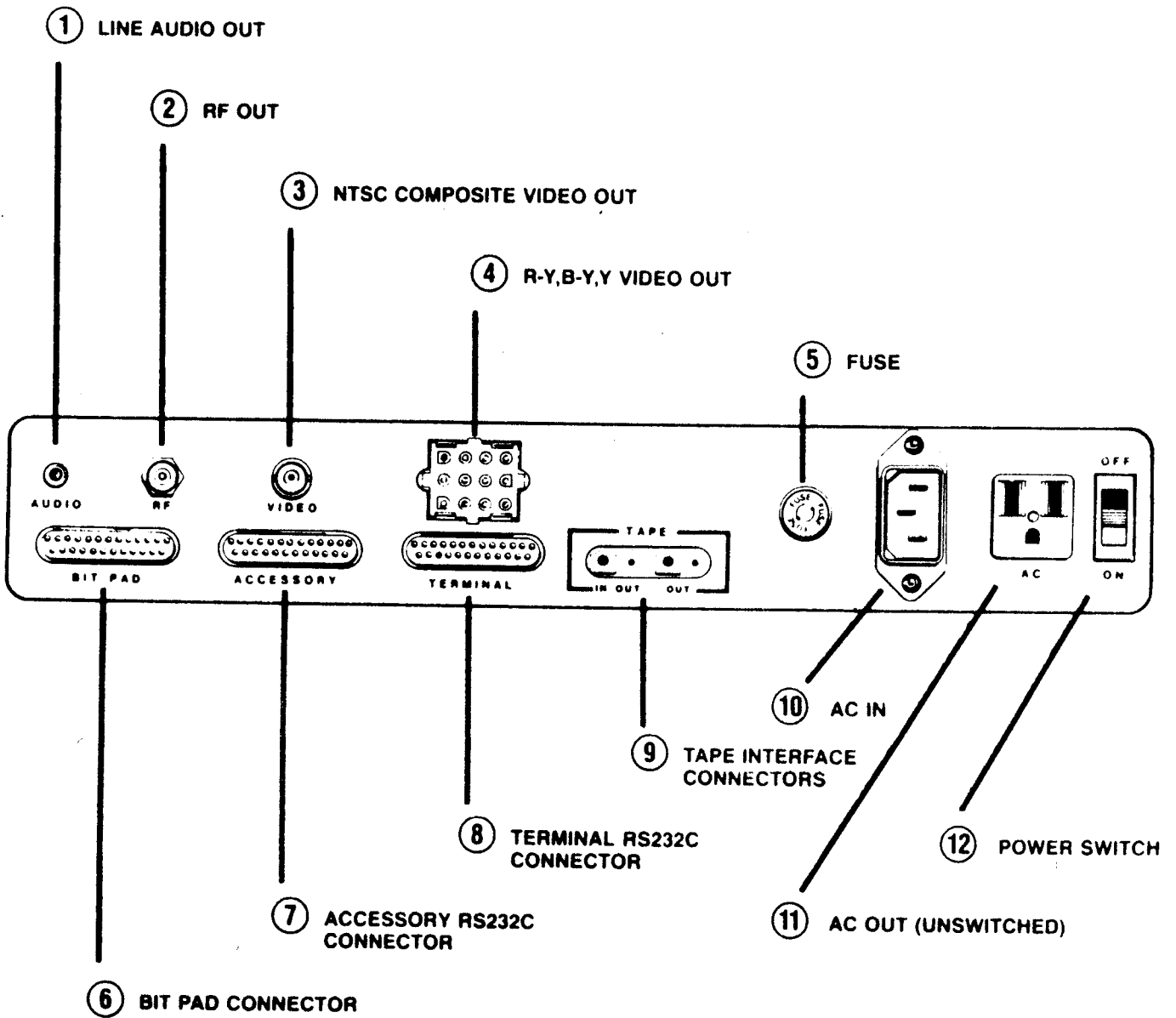
# 2. HARDWARE FEATURES - Continued

## 2.3 Rear Panel Feature Detail

1) **LINE AUDIO OUT** (RCA phono connector) - Approximately 1 volt P-P, 200 ohms impedance or higher. Output audio from 3-voice synthesizer, accessed via PORT command (see Glossary).

2) **RF OUT** ("F" connector) - Outputs RF video to antenna input on standard TV receiver on VHF channel 3 or 4, home videocassette recorder, etc.

3) **NTSC COMPOSITE VIDEO OUT** (BNC connector) - RS 170; 1 volt P-P, 75 ohms impedance. Outputs composite, NTSC standard video to video monitor, videotape recorder, switcher, etc. Contact Datamax for future availability of GENLOCK option.

4) **R-Y,B-Y,Y VIDEO OUT** (Mate'n'Lock connector) - Outputs R-Y, B-Y, Y video to Datamax RGB monitor which contains RGB convertor board (also available from Datamax). Contact Datamax for future availability of direct RGB board.

5) **FUSE** - MDA-1.5 amp.

6) **BIT PAD** (DB 25S connector) - Parallel interface currently compatible with Summagraphics Bit Pad One. Any other tablet uses accessory RS232C interface with user-developed software.

7) **ACCESSORY RS232C** (DB 25S connector) - Serial interface to connect disk drive, printer, plotter, modem, additional computer, etc. See BAUD RATE section of this manual for instructions on setting baud rate - also see RS232 in Glossary.

8) **TERMINAL RS232C** (DB 25S connector) - Serial interface to connect Hazeltine and ADM5 terminals or emulators. To set baud rate, see BAUD RATE section of this manual. See TERMINAL and RS232 in Glossary for instructions on setting editor control keys to your terminal and your taste. NOTE: The terminal used with the UV-1 must have both upper and lower case character capability.

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## 2.2   Rear Panel Feature Detail - (Continued)

9) **TAPE  INTERFACE** (two 1/8" mini phone jacks and two sub-mini phone jacks) - Mini jacks for audio data IN/OUT and OUT at 1,800 baud rate and sub-mini jacks for remote motor trigger of DC signals.  The motor controllers (reed relay closures rated at 1/2-amp,  100 volt DC,  500 ohms contact resistance) can be used to trigger other devices,  such as film cameras, time lapse videotape recorders,  etc.  See PORT in Glossary for direct program control of motor switch.  See AUDIOTAPE STORAGE Section 6.1.5  of this manual for connections and procedures.

10) **AC IN** (3-prong plug) - AC,  120V, 60 HZ, 150 WATTS MAX

11) **AC  OUT (UNSWITCHED)** (3-prong socket) - Unswitched AC power for peripherals.  NOTE:  Peripherals drawing AC through the UV-1 raise the line protection requirement.

12) **POWER  SWITCH** - On/Off status of the unit is indicated by the red power indicator light on the front panel.

# 3. INITIAL SET UP

Before configuring your UV-1 Zgrass Graphics System, consider your working environment. To avoid overheating the unit, set it up in a cool room. Always allow enough open space around the unit for adequate ventilation. Air is taken in from beneath the unit, then forced out through the back door by the fan. Be sure that paper is not allowed to get under the unit where it might be sucked up against the bottom and block airflow.

If you wish to reduce the possibility of static electricity interference, place an anti-static mat under your chair.

Carefully remove the unit and its power cord from the packing box. Locate the key taped to the back door and insert the key into the back door lock. **BEFORE YOU PLUG IT INTO AC POWER,** take time to inspect the unit as follows:

## 3.1 Careful Opening of Back Door

Set the unit on a flat surface on its feet. Because the fan attached to the back door is connected to the power source by wires, **care must be taken in removing the back door without pulling the fan wires.** Unlock the back door and grasp the key to tilt the panel out and down until there is enough clearance to grasp the edge of the panel; lift the panel up and away from the unit just enough to dislodge the tongue at the base of the panel from the groove of the cabinet floor. Unlock the Mate'n'Lock connector by pressing down on the tabs and pulling the connectors apart to release the fan wires from the AC power source. The door may now be removed from the unit.

> **WARNING!** Extreme care must be exercised in handling internal system hardware components. Printed circuit (PC) boards can be damaged by improper handling, causing the unit to malfunction. Handling of internal hardware components is advised **only when absolutely necessary.**

## 3.2 Removal of Foam Packing Material

Once the back door is open, **remove all foam packing material** that may be wedged just inside the back door opening.

## 3.3 Unit Inspection

Inspect the contents of the unit to see that all boards and connectors are in place and have not come loose during shipping. The diagram at the bottom of the next page illustrates the internal system configuration. NOTE: Placement of PC boards within the card rack may vary.

## 3.4 RS232C Interface Baud Rate (terminal and accessory)

**With the unit still unplugged from AC power,** set the interface baud rates according to your terminal and accessory requirements. See BAUD RATE SELECTION Section 5.3.1 of this manual for procedures.

## 3.5 Careful Replacement of Back Door

Reposition the back door and **reconnect the fan,** making sure you push the wires clear of the fan blades as you replace the back door.

## 3.6 Connection of Peripheral Devices

See PERIPHERAL DEVICE CONFIGURATION Section 6 in this manual for instructions on making appropriate connections between the UV-1, the terminal, video display device, etc., and then proceed with SYSTEM POWER-UP Section 4.

## UV-1 CARD RACK BOARDS

```
                 50 pin      40 pin      bundle
                                                  <- I/O LOGIC
                                                  <- extra slot
  CARD RACK         34 pin          26 pin
                                                  <- DISK
                                                  <- MEMORY
                                                  <- SCREEN
                                                  <- CPU
```
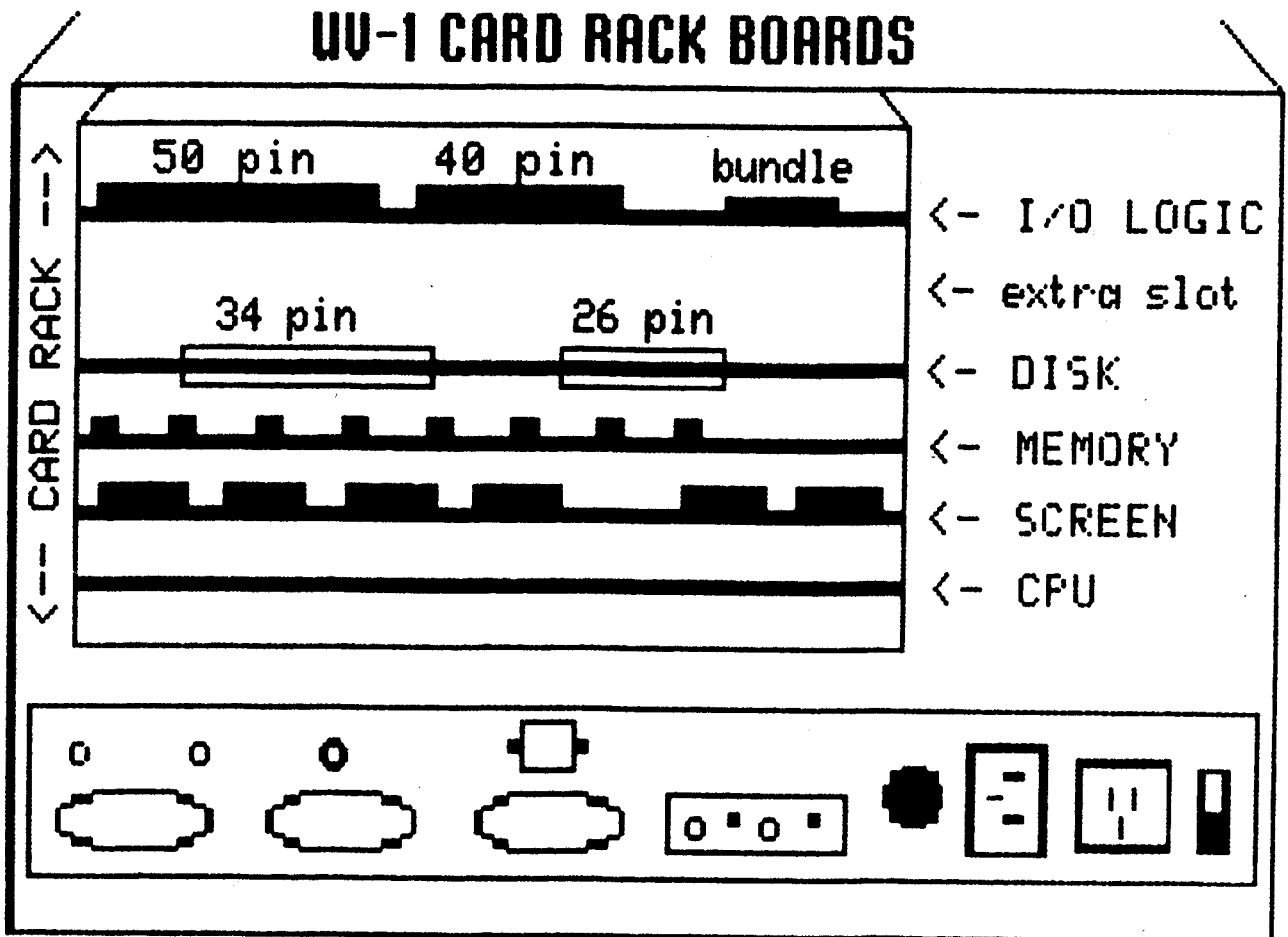
This image was generated on the UV-1 system using the Zgrass Paint Program.

# 4. SYSTEM POWER-UP

## 4.1 Plug In Power Cord

With the power switch on the rear panel OFF, plug the power cord supplied with the unit into the AC IN jack on the rear panel. Plug the power cord into a 3-wire AC grounded outlet supplying 120-V at 60 HZ with nominal 15 amp.

## 4.2 Power-On Terminal and Display Device

POWER-ON your terminal and display device (video or Datamax RGB monitor or TV). When the ADM 5 terminal is powered on, the red light of the CAP LOCK key on the keyboard is usually lit. Press it to turn the light off.

## 4.3 Power-On UV-1

When the terminal and display devices are warmed up (about 5-10 seconds), POWER-ON the UV-1. NOTE: If you hear a clicking noise coming from the UV-1, turn the unit off, unplug the power cord, and open the back door to push the fan wires away from the fan blades and return to the instructions in Section 4.1. At system start-up, always verify that the fan at the rear of the unit is blowing air out of the unit. If there is no air flow, turn the unit off and see TROUBLESHOOTING Section 7 of this manual.

## 4.4 Verify System Power-Up

When the UV-1 is powered-up, the red power indicator will light up on the front panel. The display device will display a white screen and the terminal will flash this message:

<div align="center">

Copyright 1982 Real Time Design, Inc.
All Rights Reserved

</div>

This is the official copyright notice of the Zgrass software residing in the EPROM firmware. The terminal will clear and then display:

<div align="center">

Zgrass V*.*
^C
>

</div>

The "*.*" of "V*.*" will be replaced with the version number of your unit's Zgrass software. The next line indicates that a Control C has been generated and the last line displays the Zgrass > prompt. The prompt indicates that the system is ready for input.

## 4. SYSTEM POWER-UP – Continued

Press the RST switch on the UV-1 front panel. The console lights will blink and the terminal will prompt you with:

### ERASE ALL? (Y OR N)

**respond by pressing the Y key.** This erases or clears all of user memory.

## 4.5 SYSTEM TEST 1: GRAPHICS

To run a system test animation called NICE BOXES, type:

### NB

Press the **RETURN** key. An animated display of colored boxes will appear on the display device; when the test has been completed, the Zgrass > prompt will appear on the terminal.

> **NOTE:** Follow all typed commands on the terminal by pressing the RETURN key.

If you type:

### NB

again, the boxes will erase themselves and clear the screen.

## SYSTEM TEST 2: SCREENS

Now type:

### NC

Press the RETURN key and a 16-screen animation of circles and squares will be drawn on the display device. When this test has cycled a few times, interrupt it by holding down the **CONTROL** key while pressing the C key. Throughout system documentation, this process of halting a program is referred to as **CTRL+C** or simply ^C.

### ^C

To complete this test, you must reset the screens and default colors by pressing **CTRL+B**:

### ^B

SYSTEM TEST 2:   SCREENS - Continued

To clear the screen, type:

**CLEAR**

Then, press RETURN.  If the system displays the tests as described above, the system has been successfully powered up.

## 4.6   What To Do If System Fails To Come Up

If any device fails to come up, see PERIPHERAL DEVICES Section 6 and TROUBLESHOOTING Section 7 of this manual before proceeding.

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# 5. UV-1 Zgrass SYSTEM CONFIGURATION

This section provides an overview of the UV-1, including the hardware, baud rate selection, and the use of the hardware ports.

## 5.1 Handling Hardware

Occasionally, it may be necessary for you to handle the main printed circuit (PC) boards contained in the card rack. For instance, to change baud rate settings of the RS232C ports, you must access the I/O Logic Board; to make a software update by changing the EPROMS, you must access the Memory Board 2.

**5.1.1** **WARNING!** Extreme care must be exercised in handling internal system hardware components. PC boards can be damaged by improper handling, such as fingerprinting the gold plating on edge connectors, exposing the board to static electricity, or unduly flexing the board. Handling of internal hardware components is advised only when **absolutely necessary.**

If it is necessary for you to access an internal hardware component, remember:

**5.1.2** **TURN THE UNIT OFF** and disconnect all power cords. NOTE: Even when the unit is turned off, if the power cord is plugged in, there will be 120 volts of power inside the chassis.

See Careful Opening of Back Door Section 3.1 for instructions on opening the unit to access internal hardware components.

## 5.2 Card Rack

This is the slotted mounting device designed to contain up to 6 PC boards. It is mounted on the front wall, with its opening facing the back door of the unit. Instructions for accessing and re-inserting PC boards follow. (Refer to board illustrations for highlighted information relating to each board.)

## 5.2.1 Accessing and Re-Inserting PC Boards in the Card Rack

TO ACCESS a board, pivot the card ejectors (white plastic tabs) located at the exposed corners of the board away from each other to eject the board from the card cage. Then, grasp the ejectors and pull the board straight back, away from the card cage, **only as far as necessary** to access a designated area of the board. DO NOT disconnect the cables attached to the board unless specifically instructed to do so by a board-handling procedure.

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# 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

## 5.2.1 Accessing and Re-Inserting PC Boards - Continued

In the event you find it necessary to completely remove a board from the card cage, you must disconnect the 40-pin ribbon cable connecting the I/O Logic Board to the back panel board. Instructions for doing so are contained in Section 5.5 (Memory Board 2).

TO RE-INSERT a board, carefully orient and re-connect any cables disconnected to access the board. If it has been necessary to fully remove the board from the rack, align it in the proper slot of the rack, component side up, being sure to insert the board into the metal tracks on either side of the card rack, and then re-connect any cables disconnected to access the board. Apply firm pressure to the card ejectors and push the board straight back into the card rack until all boards line up. You'll notice a little resistance in seating the edge of the board in the socket at the far end of the card rack. Gently rocking the board by applying pressure first to one card ejector and then to the other will help properly seat the board.

Remember to reconnect the ribbon cable from the I/O Logic Board to the back panel board if you disconnected it. **BE SURE TO CHECK THIS CONNECTION!** Both rows of pins must be connected and no pins should be exposed on either side of the connector. If there is no response on the terminal after system power-up, turn off the unit, unplug the power cord, and check this connection.

NOTE: All boards are inserted component side up, with the 100-pin edge connector inserted into the card rack first.

## 5.3  I/O Logic Board (Baud Rate Switch)

This board is the interface between the microprocessor and the peripheral world.  The DIP switch for setting baud rates of the two RS232C hardware ports is located on this board.  This board  is distinguished by the cables connected to the top of the board near the exposed edge.  The leftmost connection is a 50-pin ribbon cable leading to the front panel.  The middle connection is a 40-pin ribbon cable leading to the rear panel.  The rightmost connection  is a bundled cable harness leading to the Video Board located on the floor of the unit.

**VERIFY THAT AC IN POWER IS UNPLUGGED BEFORE PROCEEDING!!**

To access the DIP switch on the I/O Logic  Board,  carefully remove the 50-pin cable (the leftmost cable) by grasping the cable connector and gently pulling straight up.  Gentle prying with a small screw driver will help lift the cable connector from its mating connector which is soldered to the board.  DO NOT pull directly on the ribbon cable as this may separate it from its connector.

### I/O LOGIC BOARD - ILLUSTRATION
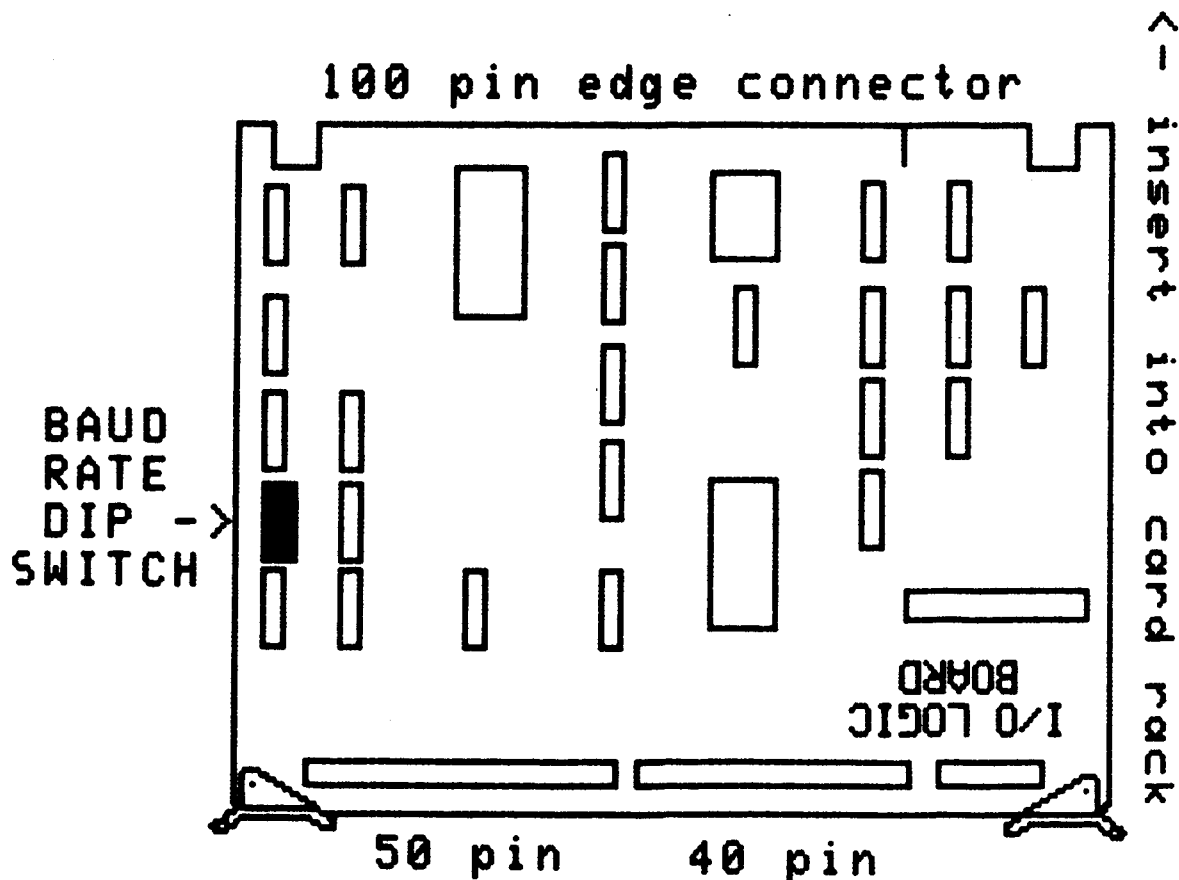


**This image was generated on the UV-1 system
using the Zgrass Paint Program.**

## 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

### 5.3.1 Baud Rate Selection

To enable the UV-1 Zgrass Graphics System to communicate properly with such peripherals as a terminal, printer, plotter, modem, etc., you must set the eight baud rate selector switches located on the I/O Logic Board DIP switch as specified for each peripheral. The factory pre-sets the baud rate selector switches for the terminal to 19200 and the accessory port to 600. If these settings are appropriate for your devices, there is no need to re-set the baud rates or to remove this board.

**VERIFY THAT AC IN POWER IS UNPLUGGED BEFORE PROCEEDING!!**

See Section 3.1 (Careful Opening of Back Door) for instructions on opening back door of the UV-1 unit and Section 5.3 (I/O Logic Board) illustration for location of the DIP switch on the I/O Logic Board. Spread the card ejectors and gently pull the board out of the rack far enough to disconnect the leftmost ribbon cable connector (be careful not to bend any pins!). Pull the board out just far enough to access the baud rate selector switches on the DIP switch which look like this:
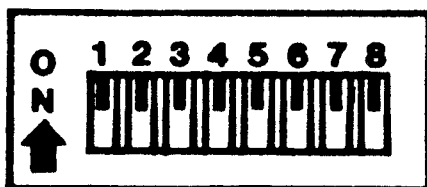


BAUD RATE SELECTOR SWITCHES
ON THE I/O LOGIC BOARD DIP
SWITCH

The bank of switches containing switches 1-4 controls the RS232C accessory interface; the bank containing switches 5-8 controls the terminal interface. The following table lists the switch settings for baud rates ranging from 50 to 19200. The setting for a specific baud rate is the same for either terminal or accessory, just set the proper bank of switches.

|  | SWITCH SETTINGS | | | |
|---|---|---|---|---|
|  | 1 | 2 | 3 | 4 (ACCESSORY) |
| BAUD RATE | 5 | 6 | 7 | 8 (TERMINAL) |
| 50 | ON | ON | ON | ON |
| 75 | OFF | ON | ON | ON |
| 110 | ON | OFF | ON | ON |
| 134.5 | OFF | OFF | ON | ON |
| 150 | ON | ON | OFF | ON |
| 300 | OFF | ON | OFF | ON |
| 600 | ON | OFF | OFF | ON |
| 1200 | OFF | OFF | OFF | ON |
| 1800 | ON | ON | ON | OFF |
| 2000 | OFF | ON | ON | OFF |
| 2400 | ON | OFF | ON | OFF |

---continued on next page---

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## 5.3.1  Baud Rate Selection - Continued

```
                           SWITCH SETTINGS
                            1    2    3    4 (ACCESSORY)
              BAUD RATE      5    6    7    8 (TERMINAL)
              ---------     ---  ---  ---  ---

                  3600     OFF  OFF   ON  OFF
                  4800      ON   ON  OFF  OFF
                  7200     OFF   ON  OFF  OFF
                  9600      ON  OFF  OFF  OFF
                 19200     OFF  OFF  OFF  OFF
```

The recommended baud rate for the terminal is 19200, although 9600 is acceptable. The higher the baud rate, the faster data is transferred between the UV-1 and the terminal. Baud rates for accessories vary depending on device requirements. For example, the Epson printer with 2K buffer can receive data at several baud rates, including 600 or 1200 baud; a modem may transfer data at 300 baud. The factory setting for the DIP switch on the I/O Logic Board is illustrated below:

**EXAMPLE**
**BAUD RATE DIP SWITCH SETTINGS**

```
        1     2     3     4     5     6     7     8

ON   |ON  |    |    |ON  |    |    |    |    |
     |    |    |    |    |    |    |    |    |
OFF  |    |OFF |OFF |    |OFF |OFF |OFF |OFF |
     ──────────────────────────────────────────
          ACCESSORY           TERMINAL
            600                 19200
```
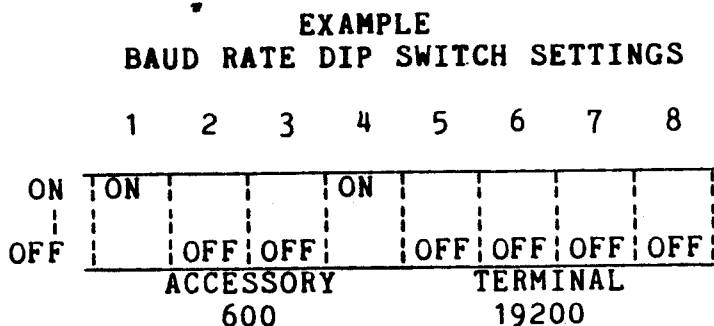
When you have completed setting the baud rate switches to the baud rate specifications required by your equipment, reconnect the leftmost ribbon cable and carefully slide the I/O Logic Board into its slot in the card rack. If you meet resistance, gently rock the board from side to side until it slips in--DO NOT FORCE IT!  Close up the back of the unit (per Section 3.5) and re-plug the AC IN to a power source.

Before going further, verify that the baud rates on the terminal and accessory device are set as specified by their documentation and that those rates agree with the rates you've just set on the I/O Logic Board DIP switch.

If the baud rates are incorrectly set, the terminal/accessory device will display unintelligible character sequences.

5.4    Mini  Floppy/Winchester Interface Board (Disk   Drive   Cable
Connection)

Refer  to the UV-1 Card Rack Boards Illustration in  Section
3.6 Connection  of Peripheral Devices for illustration  of  Disk
board edge connectors.

**VERIFY THAT AC IN POWER IS UNPLUGGED BEFORE PROCEEDING!!**

This  board  connects  the Micropolis  and  Winchester disk
drives to the system.   The cables connecting your disk drives to
the  UV-1  are connected to the exposed edge of  this  board,  as
follows:

Looking from the back of the unit, the leftmost and wider of
the  two  edge connectors accommodates the 34-pin cable  used  to
connect  a  Micropolis disk drive.   Pin 1 is located on the  top
right side of the connector,  with Pin 33 on the top  left.   The
rightmost  and  narrower connector accommodates the 26-pin  cable
used to connect a Winchester disk drive to the system.   Pin 1 is
on  the  top right  side with Pin 25 on the top left.   Refer  to
UV-1 Card Rack Boards illustration for location of 34-pin and 26-
pin edge connectors on disk drive board.

5.4.1    ATTENTION:   Allow  space for board  enhancement.

Boards numbered A084-91542-A948 should have a piggyback data
separator board for increased reliability.   Boards numbered A084-
91542-B948  have the circuitry included and <u>should not</u>  have  the
piggyback board.   The piggyback board is directly attached to the
top of the disk board.   This means two slots of the card rack are
required  to  accommodate this configuration.   Upon  cursory
inspection, the slot above the disk board may appear to be empty;
however,  closer  inspection will reveal that the upper  slot  is
actually  occupied by the piggyback board.   Accordingly,  do not
insert  another  board in the slot directly above  a  disk  drive
board  without  taking  the  piggyback  space  requirement  into
account.

5.5  Memory Board 2 (EPROMs for Software Updates)

This  board  houses 32K (K=1024) bytes of  EPROM  (Eraseable
Programmable  Read Only Memory—system firmware) in which  Zgrass
(system software) resides and also holds 32K bytes of RAM (Random
Access Memory),  expandable to 64K bytes.  The Memory Board 2 can
be distinguished in the card rack from its visible edge.   A bank
of 8 chips are aligned edge-on,  left of center.  In the event of
a Zgrass software update,  the 8 EPROMs (the largest chips on the
board) would need to be accessed, removed, and carefully replaced
by  new  EPROMs containing the update.   These  chips  should  be
replaced  in  the  same order and orientation as  marked  on  the
board.

# 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

## 5.5 Memory Board 2 - Continued

The EPROMs are numbered from 1 to 8 corresponding to the numbers printed on Memory Board 2 next to each socket. The EPROMs also have a notch on one end which must line up with the notch printed on Memory Board 2. Inserting EPROMs incorrectly can damage them and cause a software failure necessitating EPROM replacement.

**VERIFY THAT AC IN POWER IS UNPLUGGED BEFORE PROCEEDING!!**

In order to extract Memory Board 2 for an EPROM update, first disconnect the 40-pin ribbon cable connecting the I/O Logic Board to the back panel board which blocks the removal of Memory Board 2. Grasp the cable connector where it connects the back panel board and gently pull straight up. DO NOT pull directly on the ribbon cable as this may separate it from its connector. If necessary, gently pry the connector with a small screw driver, being careful not to bend the pins.

## MEMORY BOARD 2 - ILLUSTRATION
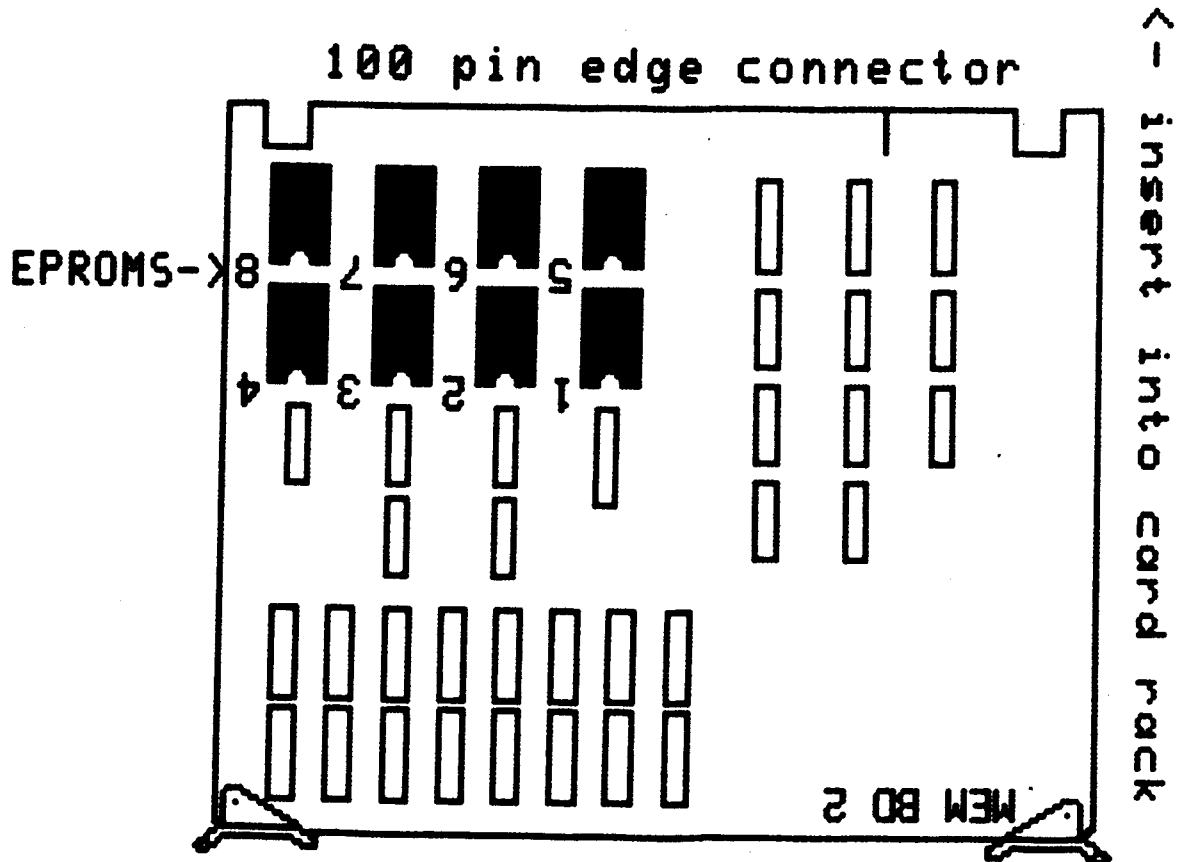


**This image was generated on the UV-1 system using the Zgrass Paint Program.**

# 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

## 5.6 Additional Boards

Although additional boards are mounted in the card cage, there should not be any need to access these boards.

### -Multi-Page RAM Board

This board contains 256K bytes of screen RAM (16 pages of screen memory, 16K bytes each). DO NOT alter the setting of the trim pot on this board.

### -CPU Board

This board houses the Z80 CPU (microprocessor), system clocks, and custom address and data chips.

## 5.7 Console Lights

These are the 16 LED's (Light Emitting Diodes) numbered 0-15 on the front panel. Functionally, these lights are divided into two banks (0-7 and 8-15), each bank considered a "port" software-accessible by the PORT command. These programmable lights provide feedback about the status of system processes. For instance, after pressing the RST or BRK switch, the blinking of the lights indicates that the system is looping through a process requiring input to end the loop. These lights also provide feedback during some commands which take a long time to execute. By watching the sequential blinking of the lights during disk operations, you can determine which sector of the disk is currently being DINITialized, DLOADed, OR DCOPY'd. See USING PORTS, Section 5.9 for details on evaluating and converting binary console light values to decimal values.

Console lights are set and cleared by the PORT command. Port 38 references lights 0-7 and Port 39 references lights 8-15. See PORT in the Glossary.

## SYSTEM TEST 3: LED'S/SWITCHES

Type in this test to lock console switches to LED's so that toggling a switch turns the light above it on/off:

```
TEST3=[.System Test 3: LED's/Switches
        PORT 38,PORT 20
        PORT 39,PORT 21
        SK -2]
TEST3
```

By locking the console switch ports to the console light ports, the output of the switch ports is the input of the light ports, turning them on and off.

To interrupt this test, press CTRL+C.

# 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

## 5.8 Console Switches

These are the 16 switches also numbered 0-15 on the front panel beneath the LED's. Like the console lights, these switches are functionally divided into two banks or ports (0-7 and 8-15) accessible via the PORT command. These switches may be programmed as input devices, program signals, user-programmable interrupts, signals to call utility programs, etc.

Console switches are set and cleared by throwing the switches as follows: SET a switch by pressing its lower rocker, throwing its upper rocker out; CLEAR a switch by pressing its upper rocker and throwing its lower rocker out. The status of a console switch may be determined by invoking the PORT command to read its status. Port 20 reads switches 0-7 and Port 21 reads switches 8-15. See PORT in the Glossary. See USING PORTS, Section 5.9 for information on evaluating the binary value of a switch.

If you did not try SYSTEM TEST 3: LED'S/SWITCHES while in the Console Lights Section 5.7, do so now.

## 5.9 Using Ports

Ports are addresses for system input and output which give you direct access to internal and external devices. Ports for the 3-voice synthesizer and console lights are "writeable", which means you can alter the port values by using the PORT command. Other ports, such as those used for console switches or joysticks, are "readable", which means that when a switch is toggled, the value associated with that port is changed and can be read by using the PORT command. Another type of port, such as the RS232 port, is a "read/write" port. See PORTS in the Glossary.

References to port numbers are in decimal notation (base 10), whereas the value of each port is stored internally in binary (base 2). Each port holds 1 byte of data composed of 8 bits. Each bit can have a value of either 0 or 1, referred to as cleared or set. Since each of the 8 bits have 2 possible states, 1 byte has a potential decimal value range from 0 (if all bits are cleared) to 255 (if all bits are set).

Certain devices require 2 ports. For instance, since there are 16 LED's (console lights), each of which can be set (lit) or cleared (unlit), 2 ports are needed to store the values. The same is true for the console switches. One port handles the low order byte (bits 0-7) and the other port handles the high order byte (bits 8-15).

Each bit has a value relative to its position in the byte. A byte is evaluated by adding the values for each set bit. Cleared bits have a value of 0.

# 5. INTERNAL SYSTEM CONFIGURATION - Continued

## 5.9 Using Ports - Continued

The following illustration gives the bit values for each position:

DECIMAL VALUE ->   128    64    32    16    8    4    2    1

```
    BIT OR      ┌───┬───┬───┬───┬───┬───┬───┬───┐  1=SET
BINARY VALUE ->│ 0 │ 0 │ 0 │ 0 │ 1 │ 1 │ 1 │ 1 │  0=CLEAR
               └───┴───┴───┴───┴───┴───┴───┴───┘
```

LOW ORDER BYTE:    7    6    5    4    3    2    1    0  <-BIT #

HIGH ORDER BYTE:  15   14   13   12   11   10    9    8  <-BIT #

This byte has a binary value of 00001111 and a decimal value of 8+4+2+1 or 15.

Re-type SYSTEM TEST 3: LED'S/SWITCHES provided in the Console Lights Section 5.7. Turn all LED's off by depressing the upper rockers of the console switches; then turn LED's 3, 2, 1, and 0 on by depressing the lower rockers of switches 3, 2, 1, and 0 in. By turning switches 0-3 on, you have loaded decimal values 8+4+2+1 into Port 38. This port displays the binary value 00001111 for LED's 7-0.

Some ports share bits in their byte with other ports. Ports 20, 21, 22, and 23 are examples of shared ports. (See 3-Voice Sound Synthesizer Section 5.10.) For instance, Port 22 controls two voices...the lower four bits for Voice A amplitude and the upper four bits for Voice B amplitude. By setting Port 22, Voice A can have a value ranging from 0 to 15 (0=low; 15=high). Voice B can also have a value from 0 to 15, but this value must be shifted to the upper bits by multiplying the value by 16. To load both values into Port 22, add (value of A) to ((value of B)*16)):

                Port 22=(0 to 15)*16+(0 to 15)
                        Voice B      Voice A

See PORT in the Glossary.

## 5.10  3-Voice Sound Synthesizer

Please refer to USING PORTS Section 5.9 before proceeding with this section.

The sound synthesizer can produce three tones at one time, with vibrato, noise, and amplitude control. The output from the

# 5. UV-1 Zgrass SYSTEM CONFIGURATION - Continued

Master Oscillator (a programmable frequency divider) is input to the three tone oscillators: Voice A, Voice B, and Voice C. Thus, changes made to the Master Oscillator affect all three voices.

## MASTER FREQUENCY FORMULA:

Master Oscillator frequency = 1789 Khz/(value of (PORT 16)+1)

## VOICE FREQUENCY FORMULA:

Voice frequency = 894 Khz/((PORT 16)+1)*((voice PORT)+1)
(refer to the following table for voice PORTs)

| PORT | VALUE RANGE | ORDER: LOW-HIGH | DESCRIPTION |
|---|---|---|---|
| 16 | 0-255 | 255-0 | Master Oscillator frequency |
| 17 | 0-255 | 255-0 | Voice A division ratio to compute tone |
| 18 | 0-255 | 255-0 | Voice B division ratio to compute tone |
| 19 | 0-255 | 255-0 | Voice C division ratio to compute tone |
| 20 | 0-63 | 0-63 | Amplitude of vibrato modulation of Master Oscillator |
| | +[0,64,128,192] | 0..192 | Frequency of vibrato modulation of Master Oscillator |
| 21 | 0-15 | 0-15 | Voice C amplitude |
| | +[0,16] | 0..16 | Switch: vibrato (0) or Noise (16) to modulate Master Oscillator |
| | +[0,32] | 0..32 | Switch: noise added to final output; NO (0) or YES (32) |
| 22 | 0-15 | 0-15 | Voice A amplitude |
| | +(0-15)*16 | 0-255 | Voice B amplitude |
| 23 | 0-15 | 0-15 | Amplitude of noise to modulate Master Oscillator |
| | +(0-15)*16 | 0-255 | Amplitude of noise added to final output |

NOTE: Ports 20 through 23 are shared ports, as indicated in Section 5.9 USING PORTS.

## SYSTEM TEST 4: SOUND

Please refer to Section 8 INDEX OF SYSTEM TESTS for System Test 4: Sound.

# Interactive Computer Graphics Facility

RGB Monitor or Color TV

Line Printer

Plotter

Turtle (or Robot)

Optical Printer

Animation Stand

Sound Synthesizer

Modem to Phoneline (Databanks, Networks, Type Setting)

VTR

Tape

Disk

IIV-I

Terminal

Digital Image Processor

Video Camera

Film Chain

Tablet (2D or 3D)

Joystick

Function Switches and Dials

Input
Output

231
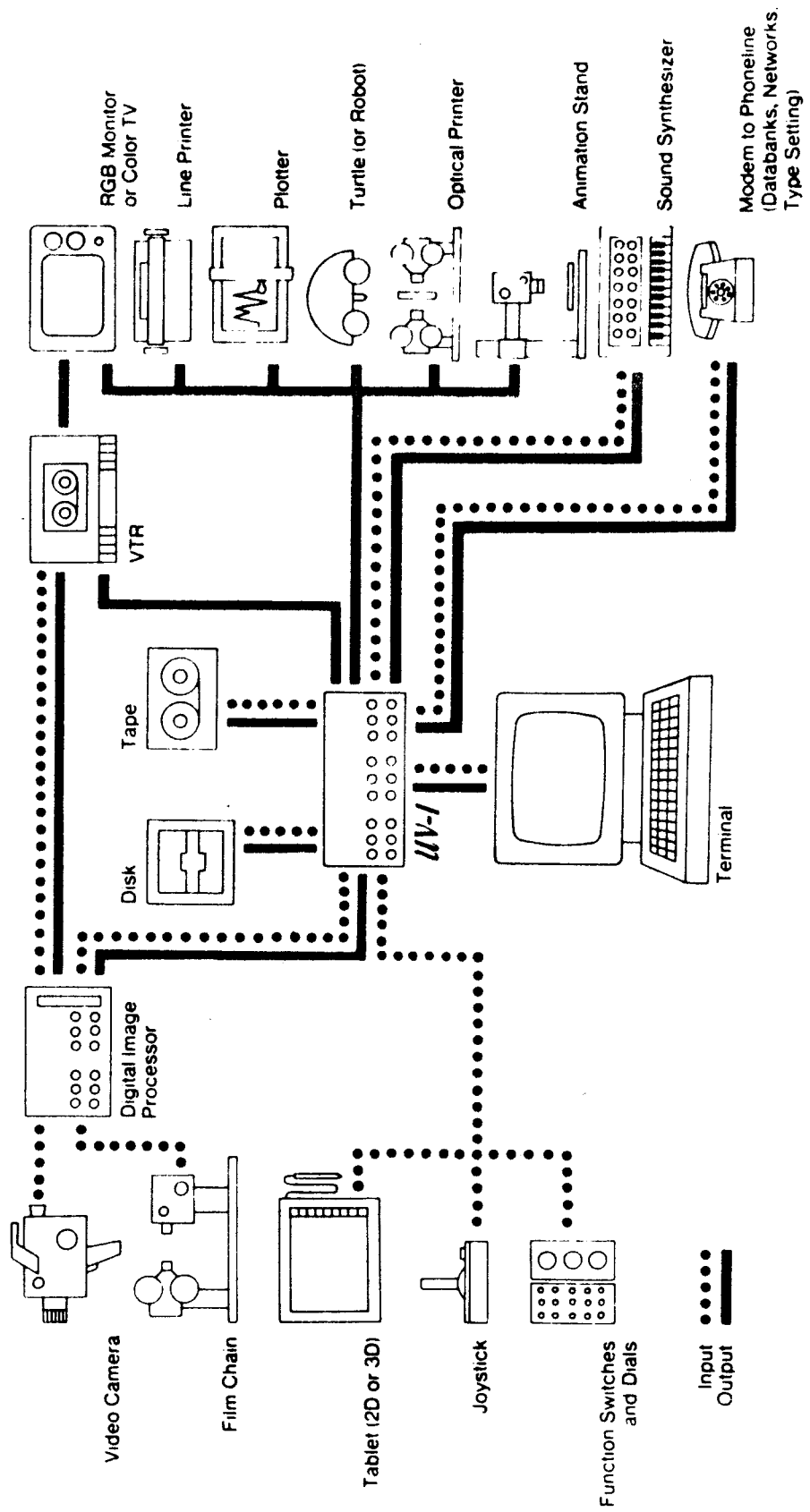
# 6. PERIPHERAL DEVICE CONFIGURATION

## 6.1 Data Interfaces and Peripheral Devices

Many of the features which make the UV-1 Zgrass GRAPHICS SYSTEM a powerful tool are those which support flexible interfacing with other data and video devices.

Some of these features are: programmability of DC signal controller and console switches, the 3-voice sound synthesizer, hardware interfaces for terminal, disk drives, printers, and plotters, and software for interactive controls such as handcontrols and a tablet. The diagram on the opposite page illustrates a fully equipped graphics station.

# 6. PERIPHERAL DEVICE CONFIGURATION - Continued

## 6.1.1 Terminal

The terminal used with the UV-1 must have both upper and lower case character capability. In Zgrass, general mode is upper case, with lower case being used only for local variables. This means that the Zgrass echo is the reverse of the upper/lower case functions of your terminal...so that, when you type something in unshifted, lower case mode, the characters will be echoed on the terminal screen in upper case.

The **editor control keys** of Zgrass are compatible with the cursor control characters (directional arrows and HOME key) of the ADM 5 terminal. See TERMINAL in the Glossary for instructions on reconfiguring the editor control keys.

The ADM 5 power switch is on the back of the terminal next to its power cord.

### -Terminal Preparation

It is suggested that you disable keyboard locking by setting Switch 4 inside the ADM 5 to GT (disable keyboard locking) instead of LK (enable keyboard locking). Refer to the ADM 5 User's Reference Manual for instructions.

The baud rate switches on the terminal and on the UV-1 I/O Logic Board should both be set to 19200 (although 9600 is acceptable). See BAUD RATE SELECTION Section 5.3.1 for instructions on setting UV-1 baud rate. If you are connecting an ADM 5 terminal to the UV-1, set the configuration switches on the back of the terminal, per the following diagram:

# DATA INTERFACES

TERMINAL

MODEM

TERMINAL | RS232C

AUDIOTAPE
INTERFACE

AUDIOTAPE
RECORDER(S)

PRINTER

ACCESSORY

RS232C*

DISK

HARD
DISK

PLOTTER

INTERFACE

DISK

MINI-FLOPPY
DISK

ANOTHER
COMPUTER

INTERFACE

BIT PAD

BIT PAD

PARALLEL

## UV-1 ZGRASS
## GRAPHICS
## SYSTEM
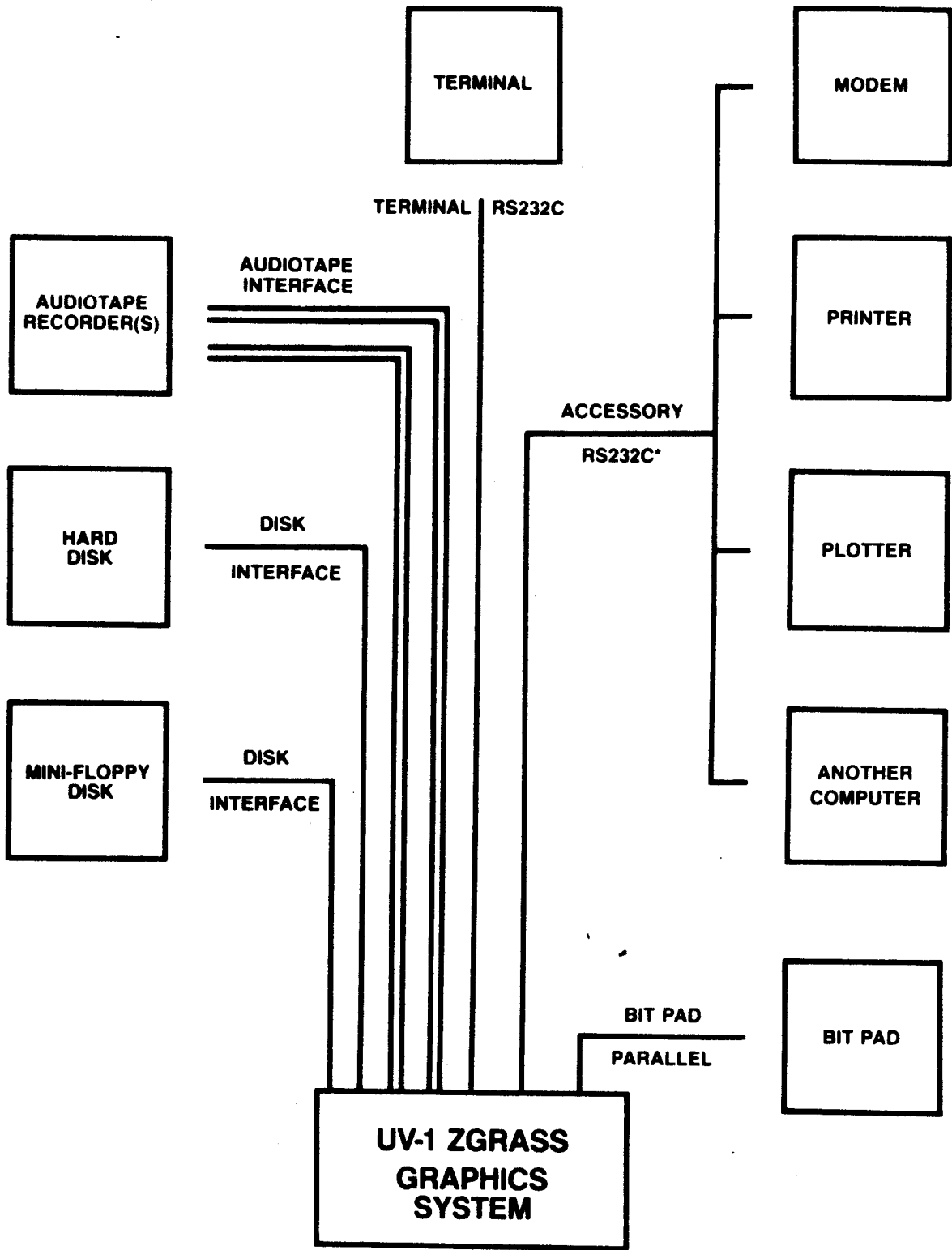
*X-ON/X-OFF PROTOCOL

-Terminal Preparation - Continued

### LEFT BANK - DEFAULT TERMINAL SETTINGS

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| OFF | OFF | | OFF | | OFF | OFF | | | OFF | |
| ON | | ON | | ON | | | ON | ON | | ON |

This enables auto new line, a scan rate of 60Hz, an I/O signal of RS232 at full duplex, one start bit, eight bits of data, one stop bit, no parity, etc.

### RIGHT BANK - BAUD RATE SETTINGS

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | |
| ON | | | | | | | | | | ON |

This sets the terminal baud rate to 19200.

-Cable Connections

See the following cable illustration for cable specifications.

Connect either end of the RS232 cable to the MODEM socket on the back of the terminal and the other end to the 25-pin TERMINAL socket on the back panel of the UV-1.

-Cable Specifications - Illustration

See next page.

## SYSTEM TEST 5:   TERMINAL

H;H;H

This test speeds the display of the Zgrass HELP listing on the terminal. When the Zgrass > prompt returns, the screen should be readable. If the screen is unintelligible, see TROUBLESHOOTING Section 7.
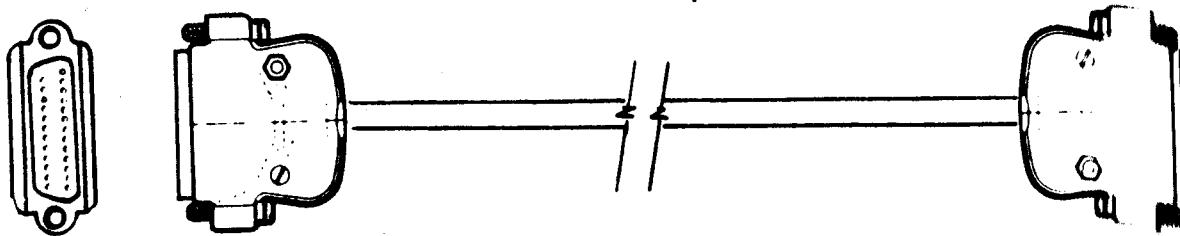
## CONNECTORS:

D-Subminiature 25-pin

Cinch No. DB-25 P (or equivalent)

## SHELL:

Dataphone Hood

Cinch No. DB-51226-1A

(or equivalent shell)

**SCHEMATIC:**



## CABLE:

3-Conductor Shielded

Vinyl Jacket

22-Strand Copper Vinyl Insulated

Belden No. 8771,8772,9770, or equivalent
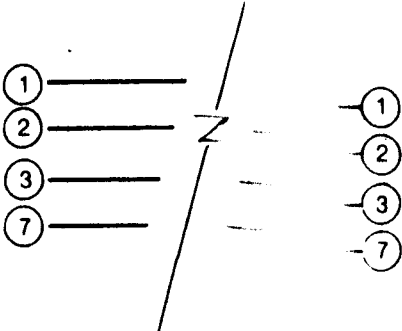
## 6.1.2 Tablet

The UV-1 Zgrass GRAPHICS SYSTEM can utilize the Summagraphics Bit Pad One as an input device to supplement keyboard commands and provide X and Y digitization of graphic input. The position of the cursor on the tablet can be used to generate graphics via use of the TABLET command, as in the Paint Program. See TABLET in the Glossary.

| ITEM | SPECIFICATION | PART NUMBER |
| ---- | ------------- | ----------- |
| Bit Pad One | parallel | 01-0016-002 |
| Power Supply | regulator, cable, & power connector | 115V 01-0019-001 |
| Four-Button Cursor | | C01-0012-001 |
| Data Interface Cable | parallel, 10-ft. | 78-6002-001 |

The tablet operates on the magnetostrictive principle. On a substrate beneath the tablet surface is a mesh of wires. When a current causes a strain wave to move down all the wires in one direction, the receive coil in the stylus or cursor senses the passing of the strain wave. The time delay for the strain wave to reach the receive coil is registered in a binary counter and formatted by the microprocessor for output as X and Y coordinate data.

### -Tablet Preparation

After unpacking and before initial operation, it is necessary to **bias** the tablet. Follow the directions on the magnetic strip shipped with the tablet. After biasing the tablet, do not store the magnetic strip near magnetic media (tablet, disks, or tapes)...the side of a refrigerator is commonly used as a safe storage location. Unless the tablet comes in contact with magnetic materials, it should not be necessary to repeat the biasing process. An indication that the tablet needs biasing exists if there appear to be "holes" or "dead spots" in an active display area.

If the tablet does not work, press the black reset button on the right side of the tablet. If it still doesn't work, verify or re-set the internal tablet DIP switch settings by opening up the tablet casing, as follows: First, disconnect all cables connected to the tablet. Next, turn the tablet upside down and unscrew the four screws located on the mounting brackets on either side of the lower compartment to expose the PC board.

## -Tablet Preparation - Continued

Avoid inadvertent removal of the other four screws next to the four rubber feet, or you will unnecessarily unmount the PC board located inside the lower compartment. The two DIP switches mounted on the PC board should be set as diagrammed below:

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----|-----|-----|-----|-----|-----|
| ON | | ON | ON | ON | ON |
| | OFF | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | ON | ON | | ON | | ON | ON | ON |
| OFF | | | OFF | | OFF | | | |

To replace the lower compartment, orient tne compartment to reconnect the mating power cord (the 5-pin cable "mating" the tablet to the lower compartment) and re-mount tne four screws.

NOTE:    The tablet is ON whenever its power supply is connected to a power source and OFF when not connected.

## -Cable Connection

o   connect the "mating" power plug to the 5-pin socket--this mates the tablet's writing surface to its lower compartment; use screws provided with tablet to hold plug in place

o   connect the cursor plug to the 7-pin socket

o   connect the power supply socket to the 6-pin plug

o   connect the tablet to the UV-1 with the cable illustrated in the next section; one end plugs into the 25-pin socket on the tablet and the other end plugs into the 25-pin TABLET socket on the rear panel of the UV-1

o   connect the tablet power transformer to a 3-prong power source

## -Cable Specifications - Illustration

See next page.

## SYSTEM TEST 6: TABLET

Please refer to Section 8 INDEX OF SYSTEM TESTS for System Test 6: Tablet.

## Bit Pad Interface Cable
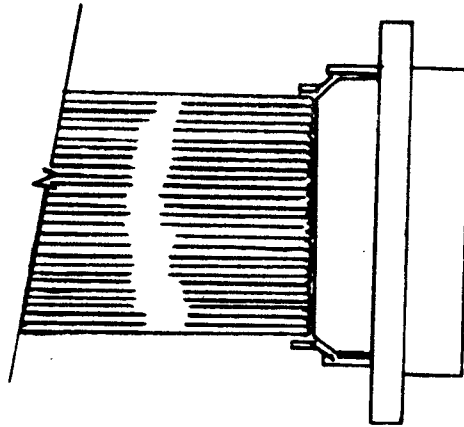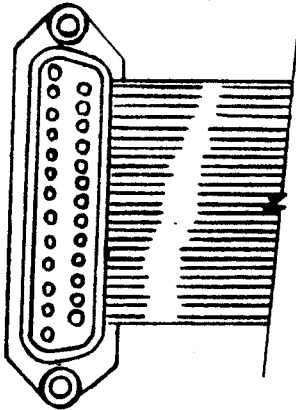
**CONNECTORS:**

D-Subminiature 25-pin RS232

Ansley 609-25P (or equivalent)

**SCHEMATIC:**
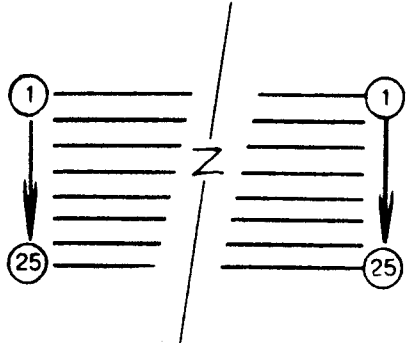
**CABLE:**

25-Conductor Ribbon Cable

Ansley 171-25 (or equivalent)

### 6.1.3 Handcontrols (Joysticks)

One handcontrol (joystick) is supplied with the UV-1 system; others may be purchased as additional input devices for for the UV-1. Programming control is accessed according to the number of the handcontrol jack on the front panel of the UV-1 (1-4), not the number on the handcontrol knob. For instance, the Paint Program **requires** the handcontrol to be plugged into Jack 1 of the UV-1. Either ignore the handcontrol knob numbers completely or plug each handcontrol into the corresponding jack.

The proper orientation for the joystick handcontrol is with the knob up and the trigger pointed away from you. These devices correspond and control access to the DEVICE VARIABLES as indicated in the table below:

### DEVICE VARIABLES CORRESPONDING TO JACK NUMBERS

| jack # | X axis | Y axis | knob rotation | trigger position |
|--------|--------|--------|---------------|------------------|
| 1 | $X1 | $Y1 | $K1 | $T1 |
| 2 | $X2 | $Y2 | $K2 | $T2 |
| 3 | $X3 | $Y3 | $K3 | $T3 |
| 4 | $X4 | $Y4 | $K4 | $T4 |

The knob range is from -128 (rotated all the way to the left) to +127 (rotated all the way to the right). The trigger range is 0 for rest position or 1 when trigger is depressed. See DEVICE VARIABLES in Glossary for additional information on range of possible values.

The knob on top of the handcontrol can also be pushed from its center position to the 8 other positions diagrammed below. When the knob is pushed to each position, the values for $X and $Y vary from -1 to 0 to 1, as shown below. To simplify the diagram, the number corresponding to the jack used is dropped from the $X and $Y variables and the $X and $Y variables are displayed in ordered pair notation.

```
             HANDCONTROL KNOB POSITIONS
                    ($X,$Y)


      (-1,1)     (0,1)     (1,1)    |     1 FORWARD
                                    |
                                    |
      (-1,0)     (0,0)     (1,0)    |     0 REST
                                    |
                                    |
      (-1,-1)    (0,-1)    (1,-1)   |    -1 BACKWARD
      ------------------------------------$X
                                    |
        -1         0         1      $Y
       LEFT       REST      RIGHT
```

## SYSTEM TEST 7:   HANDCONTROLS

Please  refer to Section 8 INDEX OF SYSTEM TESTS for  System Test 8:  Handcontrols.


### 6.1.4  Disk Storage

The UV-1 Zgrass GRAPHICS SYSTEM interfaces to the Micropolis 5-1/4" floppy disk drive, the Datamax WD-1 Mini-Winchester 5-1/4" hard disk  drive,  and the Datamax WFD-1 Winchester/Floppy disk drive.

The Micropolis double-sided dual floppy drives Model 1033-IV can  store and retrieve 192K bytes of data on each side  of  each disk.   With two disks inserted, total storage space available is 4 * 192K or 768K bytes.

On the front of the disk drive are two horizontal slots into which disks are inserted.  When the drive is turned on (the power switch  is  on the back above the power cord),  these  slots  are marked  0 and 1 by the ADDRESS lights.   Located in the center of each  slot  is the drive's load  lever,  a  black,  ribbed  lever resting on a blue panel.  When the drive is empty, the blue panel is fully exposed.   If a disk has been properly loaded,  you will have caused the blue panel to descend out of sight.

NOTE:   When a disk is inserted into the drive marked 0, the lower  side of the disk is referred to in the DSETUP  command  as Disk  0 and the upper side as Disk 4.   For a disk inserted  into the  drive marked 1,  its lower side is referred to as Disk 1 and its  upper side as Disk 5.   In other words,  you  determine  the identity  of  the opposite side of a disk by adding four  to  the value of the indicator light.

A  single-sided  Winchester-type  hard disk stores  as  much information as 29 one-sided floppy disks (about 5.5M bytes).


### -Disk Drive Preparation

See DISK MANAGEMENT later in this section for instructions on  DINITialization of disks for Zgrass compatibility.   Also, see DINIT in the Glossary.

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

### -Cable Connection

With the UV-1 power cord unplugged and the disk drive off, connect the disk ribbon cable as described in this section. Specifically, to connect the disk ribbon cable illustrated in the next section, open the back door (per instructions in Section 3.1 - Careful Opening of Back Door) and then connect one end of the ribbon cable to the edge of the disk board as described in Section 5.4 Mini Floppy/Winchester Interface Board. Run the ribbon cable through the rear panel cut-out of the back door so that it lies flat against the top edge of the rear panel. Close the door as instructed in Section 3.5 Careful Replacement of Back Door. Connect the other end of the cable to either the PC board tongue on the back of the Micropolis Disk Drive (Pin 1 up) or to the PC board tongue inside the chassis of the Winchester.

The 34-pin ribbon cable is for the Micropolis and the 26-pin ribbon cable is for the Datamax WD-1 Mini-Winchester. The Datamax WFD-1 Winchester/Floppy requires both the 26-pin and 34-pin ribbon cables.

### -Cable Specifications - Illustration

See next page.

# Disk Drive Interface Cable
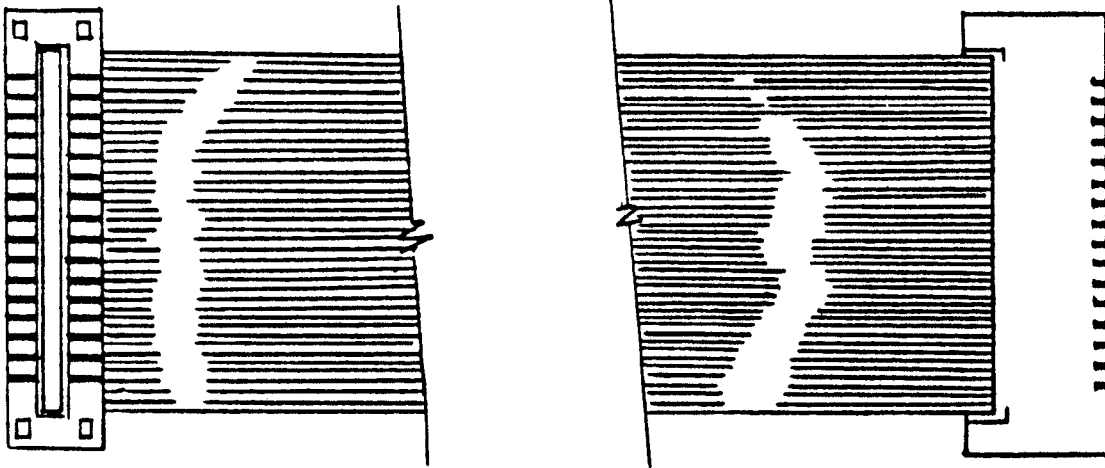
## icropolis Cable

**CONNECTORS:**

    **34-pin Card Edge Connectors**

    **Ansley 609-3415M (or equivalent)**

**CABLE:**

    **34-Conductor Ribbon Cable**

    **Ansley 171-34 (or equivalent)**

**SCHEMATIC:**
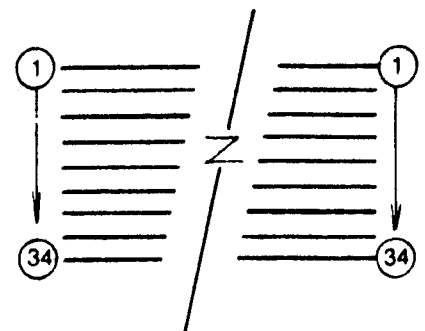
## -Floppy Disk Management

This section is designed to assist the UV-1 Zgrass GRAPHICS SYSTEM user in the management of disks. Information presented here supplements the Lessons and the Glossary.

### --Disk Description

The disks used by the Micropolis Disk Drive are 5-1/4" double-sided, double-density, soft-sectored floppy disks. Each side will contain over 196,000 bytes of data, referred to as 192K bytes. NOTE: As a computer-related constant, K = 1024.

### --Handling Instructions

TO LOAD     The proper orientation for inserting a disk is
A DISK:     with the manufacturer's label up and the oblong
            disk head slot. edge entering the disk drive
            first. To insert a disk, gently push it into the
            slot until it clicks. It is then loaded
            by pressing the load lever down until it locks in
            place. The blue panel under the load lever
            descends out of sight.

TO UNLOAD   Press the disk load lever down momentarily and
A DISK:     the blue panel of the load lever will pop up. To
            eject the disk, "flick" the load lever up (the
            disk should pop out enough for easy withdrawal).

### --Write Protection

Write protection prevents the contents of a disk from being altered. A write-protected disk can only be read (or copied). Covering the small write-enable notch on the side of the disk with a small adhesive write-protection sticker write protects the disk. For example, in the process of making a back-up disk, if you accidentally DCOPY a blank disk onto the original as a result of transposing the arguments of the DCOPY command, the information on your original disk will be erased if it is not write-protected. The FILE PROTECT indicator next to the drive number on the front of the drive lights up when write-protected disks are loaded.

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

### --Care of Disks

o  Do not fold or bend.
o  Do not touch exposed **areas of magnetic disk.**
o  Keep away from: magnetic fields (i.e., tablets);
   air-borne contaminants (i.e., smoke); static
   electricity.
o  Insert carefully and gently.
o  Write on the label ONLY with fiber-tip pens;
   NEVER use ballpoint pens.
o  Return to protective envelope after use.
o  Do not power on or off the disk drive with a disk
   inserted in the drive.

### --Formatting

To prepare disks for use on the UV-1 Zgrass GRAPHICS SYSTEM, they must be formatted into 384 sectors (numbered 0 through 383), each containing 512 bytes. This process imposes an internal structure on the disk compatible with Zgrass. Formatting need be done only once.

The command to format disks, DFORMAT, is a swap command (not resident in the Zgrass EPROMs). Insert the PAINT/UTILITY DISK into the drive marked 0 and depress the disk drive lever. The following command sequence assumes that the UTILITY DISK program is on the upper side of the disk. It's a good idea to write-protect your Utility disk. Load the DFORMAT command into your system by typing:

            DSETUP 4
            DGET DFORMAT

This command selects Disk 4 and then loads the swap module DFORMAT into user RAM.

Now, to format a disk, insert a blank disk into the drive marked 1 and type:

            DSETUP 1
            DFORMAT 1

This selects Drive 1 and formats the disk in it. If the disk does not format (the system returns an Error 78, 79, or 80), first verify that the new disk is not write-protected. Then, try DFORMAT again. To verify that DFORMAT succeeded, type:

            DFETCH

The console lights will count down as Zgrass verifies that each sector has actually been created.

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

--Formatting - Continued

To DFORMAT the other side of the disk, type:

```
DSETUP 5
DFORMAT 5
DFETCH
```

--Initialization

After a disk has been formatted, a section of space must be reserved, starting at sector 0 (the outermost sector on the disk) for the directory of the contents of the disk (also referred to as the byte map). The command to set up the directory space is DINIT.

DINIT initializes the disk, erasing all previous information on the disk currently selected, reserving space for the number of entries specified by its argument, MAXNAMECOUNT. Different types of entries are: MACROs, ARRAYs, SNAPs, SWAP MODULEs, SCREEN DUMPs, and STRINGs, as defined in the Glossary.

It is important to plan the initialization of a disk. If you don't plan for enough entries, you may run out of space for names in the directory before you run out of actual space on the disk, in which case you'll get the DISK FULL error message. Likewise, if you allocate too much space for names in the directory, you could be wasting valuable disk space.

To calculate how much directory space should be reserved, use a ratio of 4 entries per sector of directory space. Each entry requires 128 bytes to store the entry name, type, size, comments, and pointer to the entry's actual location on the disk. In addition to the 4:1 ratio, allow several sectors for overhead.

For instance, using the DPUT.TV command to save a screen dump (saving on disk a full screen of information) uses 16K bytes (or 32 sectors) of a disk. Based on 32 sectors per dump, you can store up to 10 or 11 screen dumps on one side of a disk. To optimize usable space on a disk used for storage of screen dumps only, initialize the directory for roughly 20 entries, so that 8 sectors are used for the directory information and more than 370 sectors remain for storage of screen dumps. Type:

```
DINIT 20
```

## --Initialization - Continued

Suppose you'll be **storing many strings and macros.** In this case, you'd want to have a large directory of roughly 300 entries, using almost 78 sectors for the directory and leaving over 300 sectors of free storage space on the disk. Type:

DINIT 300

If you are in doubt about the kind of entries you'll be storing on a disk, a suggested value for MAXNAMECOUNT is 200, which should allow adequate directory and **storage space for general purposes.** Type:

DINIT 200

To see how many sectors are available, type:

DUSEMAP

NOTE: It is not necessary to initialize a disk (using DINIT) if you use DCOPY, since the directory information will be copied with the rest of the disk.

## --Disk Cache

DLOAD takes the currently DSETUP'd disk and loads it into SCREEN MEMORY, screens 4-15, for quick access. Thereafter, all references to that disk will access MEMORY instead of the drive until the system is reset or until you DLOAD.CLEAR. DLOAD.CLEAR does not clear the information stored in the screens--it releases the **reference** to the screens so that you reference the disk drive instead of the screens. DLOAD.SET re-enables the screen cache, re-establishing the reference to screens 4-15 and allowing access to the information previously stored there. For example, if you are working with a DLOADed disk and have to restart the system, typing DLOAD.SET will easily re-establish your DLOAD. See DLOAD in the Glossary.

## -Hard Disk Management

The Datamax WD-1 Mini-Winchester disk drive houses a permanently mounted 5-1/4" hard disk internally organized to emulate 29 floppy disks. These disks are referenced by the DSETUP command as disks -1 through -29.

See instructions accompanying the Datamax WD-1 for more information.

## 6.1.5  Audiotape Storage

The  audiotape interface allows you to store files  (MACROs, STRINGs, ARRAYs, SNAPs, SWAP MODULEs, SCREEN DUMPs) on audio tape and  then  read  files back into  memory  (RAM).  The  audiotape interface  transmits and receives computer data as audio  signals at 1800 baud rate.

### -Tape Recorder Preparation

Different models of audio tape recorders have a variety of controls  and  connections,  so experiment with interfacing your recorder/s  and  test the read/write operations with  a  simple program before attempting to store anything important.

### --Recorder Configurations - Illustrations

To use one audio recorder for both play and record (read and  write) functions,  connect audio cables to the  UV-1  as diagrammed below:
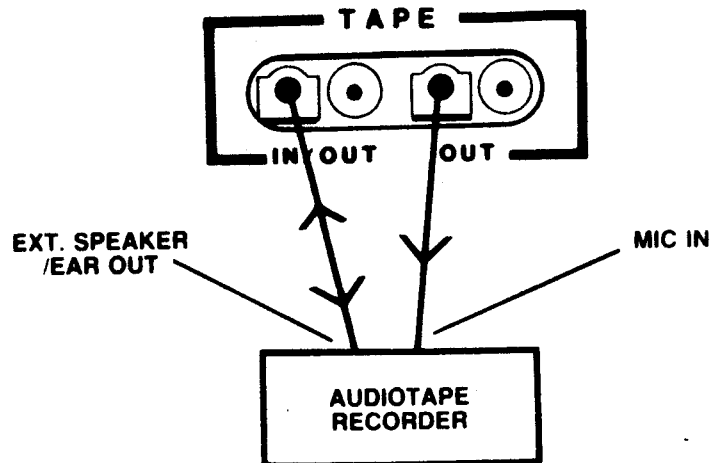


With this configuration,  reading files into memory from  the tape  as the tape plays back and writing files onto tape from memory  are separate tasks,  usually punctuated  by  changing tapes or fast-forwarding past existing files.

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

### --Recorder Configurations - Continued

To use two audio recorders, one to play and one to record (primarily useful for editing/copying tapes), connect audio cables to the UV-1 as follows:
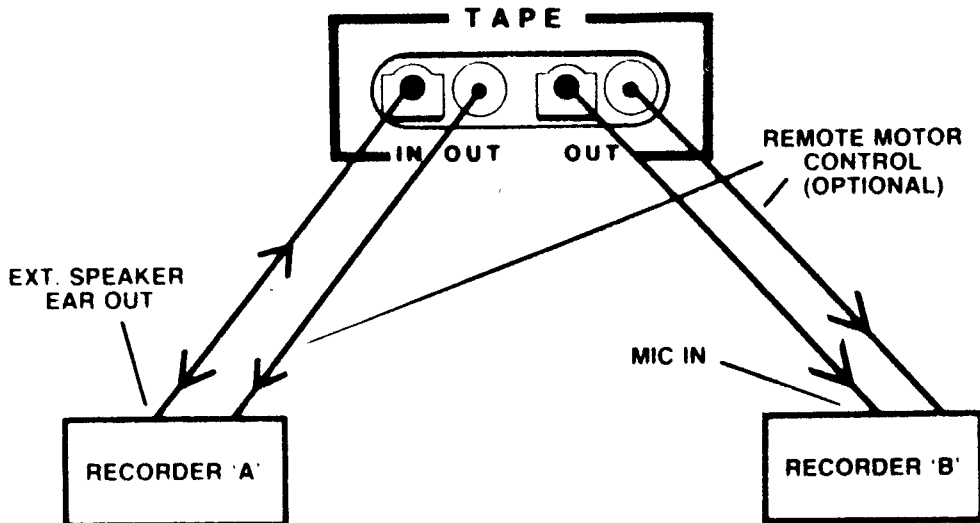


This configuration enables you to easily read files into memory from Recorder A (the "player"), edit them, and then write the new versions to another tape in Recorder B (the "recorder").

NOTE:   AUDIO OUT marking on recorders varies;  this may also be marked as EXTERNAL SPEAKER, EAR OUT, or MONITOR.

### --Recorder Tuning

TO RECORD files on audio tape:

    -if your recorder has a record-volume control dial,
     set it in the upper half of its range

    -if your recorder has a VU meter, set record level
     at 0db

TO PLAY files into memory:

    -set playback volume control in the upper half of
     its range

    -set tone control (if present) to HIGH or treble
     bias

Before proceeding beyond this point,  see GETTAPE,  PUTTAPE, and PUTTAPE.TV in Glossary and Lesson 5 in the Lessons.

# 6. PERIPHERAL DEVICE CONFIGURATION - Continued

## -(Audiotape) Cable Connections

Connect shielded coaxial cables having 1/8" mini phone plugs to TAPE IN/OUT and OUT on UV-1 rear panel. The other end can be connected to a tape recorder as illustrated in Recorder Configurations segment of this section.

If DC remote motor control triggers are desired, connect shielded coaxial cable having sub-mini phone plugs to either of the MOTOR CONTROL sockets (or both, if two signals are wanted).

See PORT in Glossary for information on programming motor controllers.

## -Tape I/O

### --Record (Output)

Position the audiotape to the locations where you want to begin storage of the file and its copies. Type in the PUTTAPE command with appropriate arguments; i.e., PUTTAPE NUMBEROFCOPIES,FILENAME,[COMMENTSTRING].

Start recording and then press the RETURN key on the terminal keyboard. The arguments passed with the PUTTAPE command are stored as a "header" on the tape preceeding the file.

When the record operation is completed, the Zgrass > prompt will return to the terminal screen. Note that the console lights display the number of copies you specify. When you've finished PUTTAPing files, turn the recorder off. See CONSOLE LIGHTS Section 5.7 and USING PORTS Section 5.9.

PUTTAPE COMMAND SWITCHES:   .TV FILENAME,[COMMENTSTRING];
a 16K dump of the display screen will be output on tape under the filename

NOTES:

-To take advantage of Zgrass' automatic file integrity checking feature, always PUTTAPE two or three copies of any file you store.

-Tape I/O is slow, sequential, and rather tedious; however, compared to disk I/O, it's very low-cost. To use it successfully, you must be organized and deliberate. A good technique is to keep frequently used "tool" programs together on one tape (always adding new and improved versions to the end) and to accumulate other MACROs, SNAPs, ARRAYs, and SCREEN dumps in affinity groups on separate tapes. When the

## --Record (Output)/NOTES - Continued

"tool" tape fills up with old versions, put the most up-to-date versions on a fresh tape and start again. It's probably a good idea to keep the old tape as a back-up. Keep an "image bank" tape for accumulating odd screen dumps. As you'll soon learn, shorter tapes are more convenient to use and save much shuttle time.

## --Play (Input)

Selection of a file to be read into memory may be accomplished by either setting the tape at the exact location where the file begins or by starting at the beginning of the tape and letting the computer search the tape for the file you want.

Type in the GETTAPE command with the appropriate file name. Start the recorder in PLAY mode and then press the RETURN key on your terminal keyboard. You will get a complete directory listing (header information) of the files on the tape as they are played back. NOTE: You can GETTAPE as many filenames in one operation as will fit on one line of the terminal screen.

Use BREAK or RESTART with an "N" response to stop the GETTAPE process prematurely. When you've finished GETTAPing files, turn the recorder off.

GETTAPE COMMAND SWITCHES:  .ERR  accept the file even if an
                                 error is read
                          .ANY  get the next file whatever
                                 its name is on the tape and
                                 read it in with the name
                                 specified
                          .OR   OR's the screen if doing a
                                 screen dump read
                          .XOR  XOR's the screen if doing a
                                 screen dump read

CAUTION: Pay attention when using the .ERR switch for GETTAPE. Sometimes, bad data can zap memory and result in an Error#23 or worse...so make sure you don't have anything irreplaceable in memory when you use it. CORE or USEMAP will indicate whether memory has been zapped.

--Play (Input) - Continued

NOTES:

.-As a file is read into memory, it is checked for errors. Should any occur, the next copy of the file specified will be read automatically. In order to take advantage of this feature, be sure to specify that several copies be recorded of each file you wish to store.

-If you want to GETTAPE two files that are widely separated on the tape and don't want to wait for the intervening tape to crawl past, GETTAPE the files in two separate operations. If you try to fast-forward the tape in between while still in GETTAPE mode, you may confuse your computer and are very likely to end up with a mess in memory. USEMAP will display ZAPPED next to destroyed files.

-BAD DATA: If you get this message while attempting to GETTAPE a file, go back and try to GETTAPE it again. Unless the tape itself is damaged, this will usually succeed the second time. If you are GETTAPing a series of files and you get BAD DATA, GETTAPing individually a second time is usually successful.

--Tape I/O Tips

o   I/O is a sequential process! Zgrass can only GETTAPE the filenames you request in the order they are listed in the GETTAPE statement. If this order does not conform to the order in which the files are actually recorded on the tape, you'll send Zgrass on a futile search throughout the rest of the tape, looking for the first filename that is out of order.

o   An efficient way to PUTTAPE and GETTAPE a number of filenames is to write macros which do it for you. Such storage and retrievval macros can be stored right along with the group of related files. This way, each time you change or generate new files, you can easily store and retrieve the entire updated batch without having to type out the comments each time. Don't forget to update your storage/retrieval macros!

o   Make sure that the order of filenames is the same in your retrieval macro as it is in your storage macro or you will have the problems described above.

## SYSTEM TEST 9: AUDIO TAPE

Please refer to Section 8 INDEX OF SYSTEM TESTS for System Test 9: Audio Tape.

## 6.  PERIPHERAL DEVICE CONFIGURATION - Continued

### 6.2  Video Interfaces and Display Devices

One of the most useful features of the UV-1 Zgrass GRAPHICS SYSTEM is its ability to output real-time computer graphics as an NTSC standard video signal and to interface with video equipment ranging from videocassette recorders to educational video environments and commercial production switchers.

The UV-1 Zgrass GRAPHICS SYSTEM hardware and software have been optimized for accessible, interactive control structures and offer a rich, rapid feedback environment.  The terminal gives you feedback about your program and the status of variables.  For graphic feedback, you may choose from TV receiver, RGB monitor, or composite video monitor.  The form of visual feedback you choose depends to a high degree on what form of presentation/distribution you will be using.  The diagram on the next page illustrates possible video device connections to the UV-1.

# VIDEO INTERFACES

```
┌──────────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│  COMPOSITE   │  │    VIDEO     │  │    VIDEO     │  │  VIDEOTAPE   │
│    RASTER    │  │   SWITCHER   │  │   MONITOR    │  │   RECORDER   │
│   HARDCOPY   │  │              │  │              │  │              │
└──────────────┘  └──────────────┘  └──────────────┘  └──────────────┘
```

COMPOSITE VIDEO

```
┌──────────────┐
│     RGB      │
│   MONITOR    │
└──────────────┘
```

R-Y,B-Y,Y

VIDEO

```
┌──────────────┐                                    ┌──────────────┐
│     RGB      │                                    │      TV      │
│    RASTER    │                                    │   RECEIVER   │
│   HARDCOPY   │                                    └──────────────┘
└──────────────┘
```

RF

```
┌──────────────┐                                    ┌──────────────┐
│     FILM     │                                    │   HOME VCR   │
│    CAMERA    │                                    └──────────────┘
└──────────────┘
```

```
┌──────────────┐                                    ┌──────────────┐
│  TIME-LAPSE  │              DC                     │    AUDIO     │
│     VTR      │            CONTROL                  │   RECORDER   │
└──────────────┘                                    └──────────────┘
```

```
┌──────────────┐                                    ┌──────────────┐
│    VIDEO     │                          LINE       │     VTR      │
│   EDITING    │                         AUDIO       │   AUDIO-IN   │
│  CONTROLLER  │                                     └──────────────┘
└──────────────┘
```

```
┌──────────────┐  ┌──────────────┐      ┌──────────────┐
│              │  │ UV-1 ZGRASS  │      │   AUDIO OR    │
│ SYNTHESIZER  │  │   GRAPHICS   │      │     VIDEO     │
│              │  │    SYSTEM    │      │  SYNTHESIZER  │
└──────────────┘  └──────────────┘      └──────────────┘
```
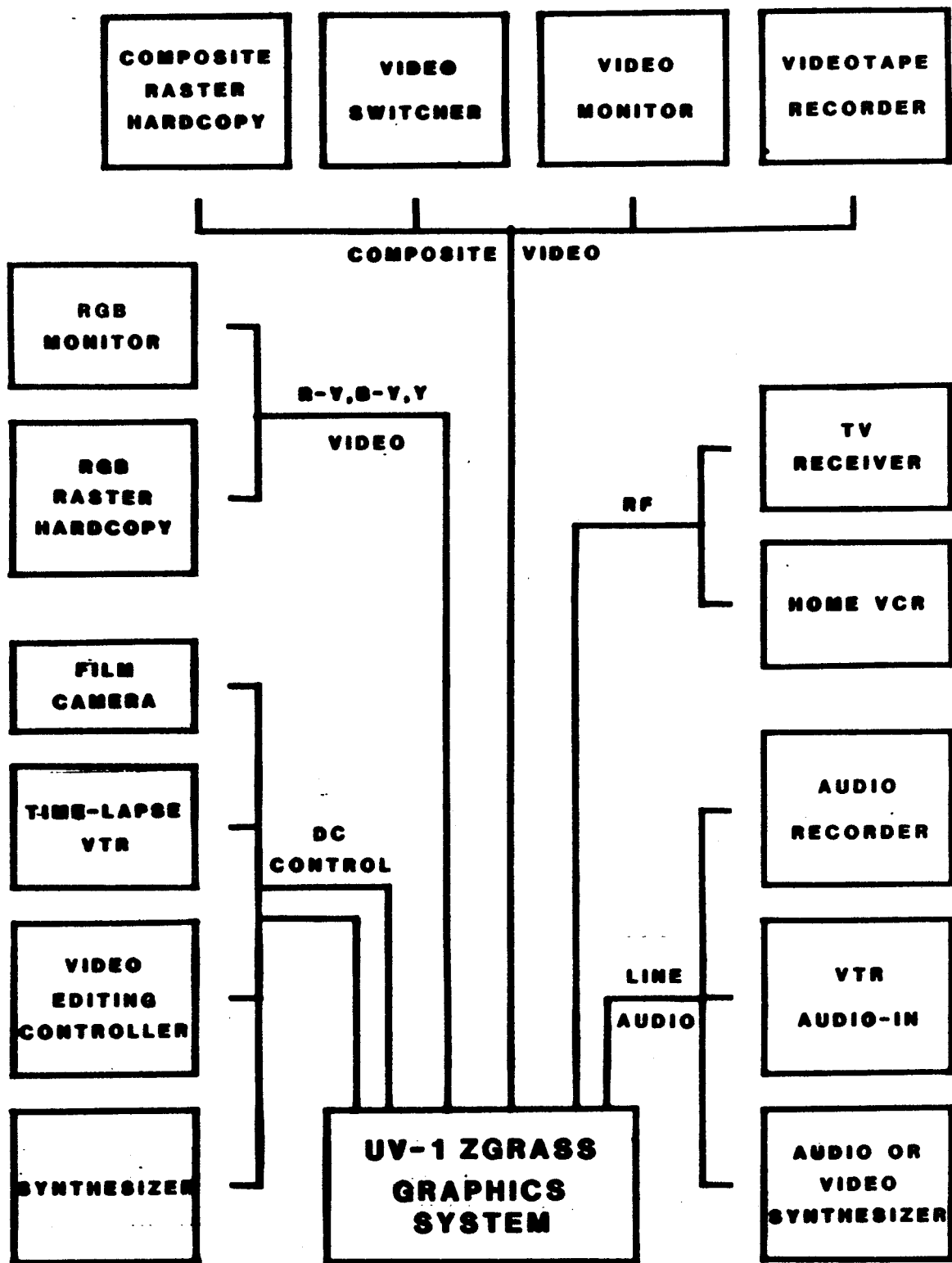
# 6. PERIPHERAL DEVICE CONFIGURATION - Continued

## 6.2.1 NTSC Composite Video and Audio Out

A composite video monitor provides feedback that is representative of how your graphics will look to the world of NTSC video.

### -Device Preparation

Select appropriate signal-in options on your display device, such as:

| OPTION | | SELECTION |
|--------|-----|-----------|
| LINE or TV or VTR | --> | LINE |
| TV or VTR | --> | VTR |

### -Cable Connection

VIDEO: Connect a shielded coaxial cable having a BNC plug to the VIDEO BNC socket on the rear panel of the UV-1. The other end can be connected to LINE IN on a video monitor, video tape recorder, composite raster hard copier, video switcher, etc.

AUDIO: Connect a shielded coaxial cable having an RCA phono plug to the audio RCA phono socket on the rear panel of the UV-1. The other end can be connected to AUDIO IN on your device.

## 6.2.2 RF

Feeding RF to a TV receiver has the virtue of being able to interface will all home video formats; unfortunately, it gives the least precise picture detail.

### -Device Preparation

The video signal is transmitted to a standard TV receiver on VHF Channel 3 or 4.

### -Cable Connection

Connect a shielded coaxial cable having an "F" plug to the RF "F" socket on the rear panel of the UV-1. The other end can be connected to ANTENNA INPUT on your device.

# 6. PERIPHERAL DEVICE CONFIGURATION - Continued

## 6.2.3  R-Y,B-Y,Y To RGB

An RGB monitor gives the sharpest picture detail. It is indispensible for working with RGB plotters, slides, etc., but it is a specialized device which is not easily interfaced with video equipment.

### -Device Preparation

The R-Y,B-Y,Y signal-out of the UV-1 can be converted into R,G,B, via the RGB Convertor Board inside the Datamax RGB Monitor. The power switch for the Datamax RGB Monitor is located on its back panel.

### -Cable Connections

Connect the Datamax custom bundled cable harness which has a 12-pin Mate'n'Lock plug to the 12-pin Mate'n'Lock socket on the rear panel of the UV-1. The other end connects to the 12-pin socket on the back of the Datamax RGB Monitor which contains the R-Y,B-Y,Y Convertor Board.

## 6.2.4  (Video) Display Considerations

### -Center of the Screen

Draw a box on the display screen by typing:

        BOX 0,0,320,201,1

The area of this box represents the Zgrass addressable area; i.e., that portion of the video raster where you can use Zgrass commands to draw and manipulate graphics. The color of the margins outside the addressable area can be assigned via the $BC DEVICE VARIABLE. The area of this box also represents the default WINDOW. See DEVICE VARIABLES and WINDOW in Glossary.

Now, draw this box by typing:

        BOX,0,90,50,50,3

You can see that any portion of a graphic element located outside this addressable area will be clipped.

The large box also demonstrates how the alignment (the centering of the video raster on the CRT) of your particular receiver or monitor is biased. The alignment of TV receivers and monitors is rarely perfect, with a range of variations in direction and extent. Most, however, seem skewed to the viewer's left.

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

### -Center of the Screen - Continued

You now have the choice of allowing for your device's bias when programming your graphics, having your receiver or monitor aligned, or using a monitor with underscan capability so you can see the entire video raster. Whichever you choose, you should still allow for the diversity of alignment biases. Alignment adjustment is a standard service any TV repairperson can provide; some monitors provide user-accessible controls.

### -Aspect Ratio

Aspect ratio is the proportion of frame width to frame height.

TV has a ratio of 4:3. Instead of being square (ratio 1:1), the display is a rectangle 33-1/3% wider (in the X direction) than it is high (in the Y direction).

Zgrass displays 320 pixels (picture elements) in the X direction and 201 in the Y direction. Its aspect ratio is 320:201, which reduces to 8:5.

When TV ratio and Zgrass ratio are combined and multiplied out as follows, the combined aspect ratio is 6:5, resulting in a vertical exaggeration of 20% for each pixel.

```
COMBINED ASPECT RATIO=(ZX/ZY)*(TVY/TVX)
    "       "       "    =( 8/5 )*( 3/4  )
    "       "       "    =( 8*3 )/( 5*4  )
    "       "       "    =(  24 )/(  20  )
```

What this all means is that pixels are rectangular, not square, so that when you draw a box on the screen by typing:

```
CL
BOX 0,0,100,100,2
```

even though XSIZE = YSIZE, the resulting box will appear to be rectangular, not square.

To draw a box that looks square or an ellipse that looks like a circle, use this formula:

```
XSIZE=YSIZE*1.2
```

and type in the following Zgrass command sequence to see for yourself:

```
CL
BOX 0,0,120,100,1
```

## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

-Color Map

The actual "color" you see on a video screen at any given point is determined by a number of components. The range of visually distinguishable UV-1 color values is 0-255, organized as 32 hues, each having 8 grey values. Each color value can be analyzed according to this formula:

$$COLORVALUE=(H*8)+G$$

H -> HUE value component (range 0-31)
G -> GREY value component (range 0-7)

The following diagrams illustrate the progression of hue component values and identify the video primaries and complements to +/- one value accuracy. The locations of these values closely approximate a vector scope display of video colorbars.

RED/P
H:10

MAGENTA/C
H:5

H INCREMENTS

H:0

YELLOW/C
H:15

H:31
BLUE/P

GREEN/P
H:20

CYAN/C
H:25

**H:HUE C:COMPLEMENTARY P:PRIMARY**
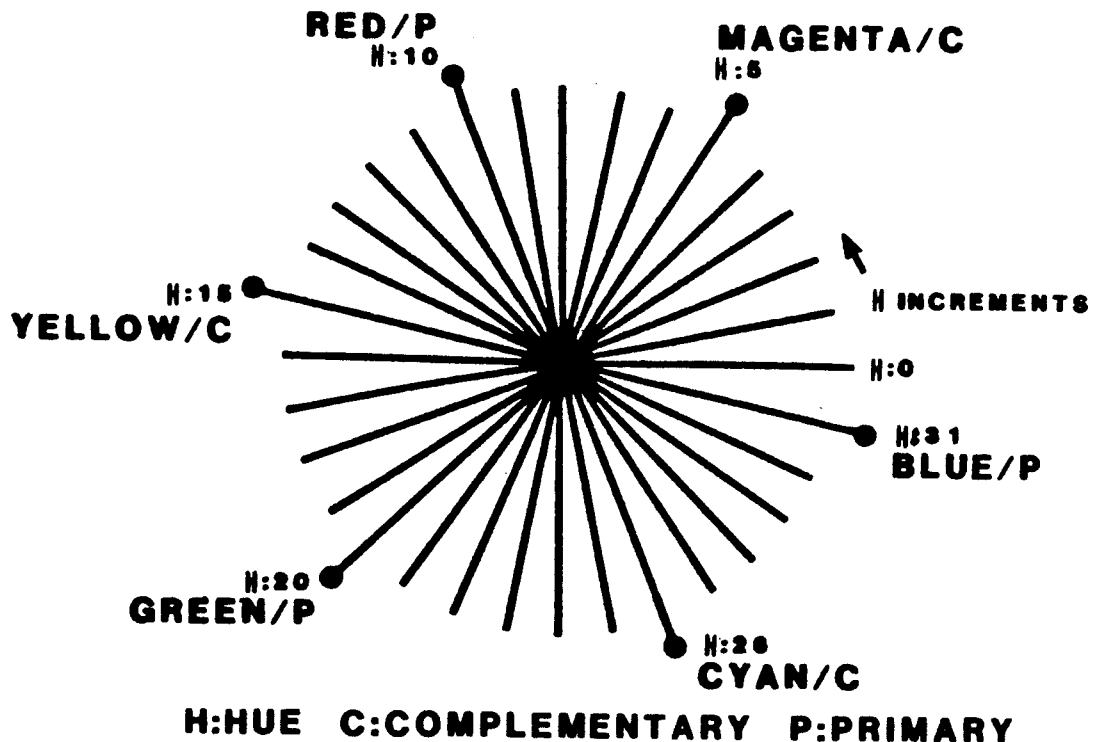
## UV-1 ZGRASS SYSTEM COLORMAP

```
8                          32 HUES (0-31)
                     1                   2                   3
                     1                   2                   3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
G   7 w
R   6                               y
E   5                                                     c
Y   4                                   g
L   3         m
E   2                 r
V   1                                                               b
E   0 B
L
S
```

## SYSTEM TEST COLORMAP:  COLORMAP TOUR

Please refer to Section 8 INDEX OF SYSTEM TESTS for System Test Colormap:  Colormap Tour.

## SYSTEM COLORMAP KEY & COLOR VALUE CALCULATION

NOTE:  Key colors in system colormap correspond to those of the system COLOR BARS and indicate general color areas in this colormap.

| LETTER | COLOR NAME | COLOR VALUE | = | (HUE*8) | + | GREY LEVEL |
|--------|-----------|-------------|---|---------|---|-----------|
| w | white | 7 | = | ( 0*8) | + | 7 |
| m | magenta | 43 | = | ( 5*8) | + | 3 |
| r | red | 82 | = | ( 10*8) | + | 2 |
| y | yellow | 126 | = | ( 15*8) | + | 6 |
| g | green | 164 | = | ( 20*8) | + | 4 |
| c | cyan | 213 | = | ( 26*8) | + | 5 |
| b | blue | 249 | = | ( 31*8) | + | 1 |
| B | black | 0 | = | ( 0*8) | + | 0 |

## SYSTEM TEST CBARS:  COLOR BARS

This test displays color bars on your monitor for purposes of color tuning.  Type:

```
CBARS=[.System Test CBARS:  COLOR BARS
    CL;A=-149;C=0;$HB=21
    $R0=0;$R1=82;$R2=43;$R3=249
    $L0=7;$L1=213;$L2=126;$L3=164
    IF A<115,BOX A=A+45,0,46,202,C=(C+1)\3+1;SK 0]
CBARS
```

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## 6. PERIPHERAL DEVICE CONFIGURATION - Continued

-Color Map - Continued

The   UV-1   sets   its default  colors  as  calculated   in   the following table:

| COLOR # | DEFAULT COLOR-MAP VALUE | = | (HUE*8) | + | GREYLEVEL |
|---------|-------------------------|---|---------|---|-----------|
| 0 ($L0) | 7   | = | ( 0*8)  | + | 7 |
| 1 ($L1) | 91  | = | ( 11*8) | + | 3 |
| 2 ($L2) | 165 | = | ( 20*8) | + | 5 |
| 3 ($L3) | 8   | = | ( 1*8)  | + | 0 |

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# 7. TROUBLESHOOTING

## TROUBLESHOOTING CHART

### When in doubt, read the instructions!
### It works better if it's plugged in.

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| **UV-1** | **AS LISTED BELOW** | DETAILED INFORMATION IN SECTIONS 3,4,& 5 |
| UV-1 does not power up (indicator light is off) | UV-1 not plugged in | Plug power cord into AC in, not AC out; plug other end into power source |
| | UV-1 not turned on | Press power switch on UV-1 back panel to ON position |
| | Fuse blown | Replace fuse on back panel with MDA 1.5 amp fuse |
| Loud clicking noise coming from UV-1 | Fan blades touching fan wires | Turn UV-1 off; unplug power cord; open back door; push fan wires away from fan blades |
| No airflow from back of UV-1 | Fan wires not connected | Turn UV-1 off; unplug power cord; open back door; connect fan wire snap&lock connector |
| | Blocked airflow | Remove any paper sucked up against bottom of UV-1 and blocking air intake |
| UV-1 does not power up or no response at terminal after handling of printed circuit (PC) boards | Improper re-connections | Turn UV-1 off; unplug power cord; open back door; then:<br><br>-verify that boards are properly inserted into card rack and that all edges are flush<br><br>-align boards in metal tracks on either side of card rack |

| PROBLEM | CAUSE | SOLUTION |
|---------|-------|----------|
| | | (continued from previous page) |
| UV-1 does not power up or no response at terminal after handling of PC boards | Improper re-connections | -insert boards component side up |
| | | -connect 50-pin ribbon to I/O Logic board |
| | | -connect 40-pin ribbon to Back Panel board |
| | | -verify that all pins are plugged into ribbon cables: <br> --both rows of pins are connected <br> --there are no pins left out on either side |
| | | -refer to Section 5.1 Handling Hardware and Section 5.2 Card Rack |
| UV-1 does not power up after you've changed the EPROMs | EPROMs improperly inserted | Refer to Section 5.5 Memory Board 2 |
| Board does not re-insert | Board not aligned in tracks | Align board in metal tracks on either side of card rack, component side up |
| | Board aligned in wrong slot | Do not attempt to insert a board into the slot occupied by the piggyback board |
| Zgrass prints Error 27: "Not enough memory" | Not a large enough block of memory available | Save all files on disk or tape; then delete any unnecessary files; then restart UV-1 and set $BF=1 |
| System restarts by itself | Static interference | Place an anti-static mat under your chair and consider humidifying system's room |

## 7. TROUBLESHOOTING - Continued

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| | | DETAILED INFORMATION IN SECTION 5.10 |
| 3-VOICE SYNTHESIZER | AS LISTED BELOW | |
| No sound from synthesizer | Volume control knob turned down | Turn volume control knob up |
| | | DETAILED INFORMATION IN SECTION 6.1.1 |
| TERMINAL | AS LISTED BELOW | |
| No response on terminal | Terminal: <br> -not plugged in | Plug power cord into power source |
| | -not turned on | Press power switch to ON position (on ADM 5, switch is next to power cord) |
| | -confused | Power terminal down and then power it up |
| | -contrast turned down | Turn contrast up |
| | -incorrect DIP switch settings on back of terminal | Refer to Section 6.1.1 Terminal |
| | -incorrect baud rate setting on terminal | Refer to Section 5.3 I/O Logic Board |
| | -RS232 cable malfunctioning | Try another cable |
| Terminal displays unintelligible character sequences | Terminal confused | Power terminal down and then power it up |
| | Incorrect baud rate setting on terminal | Refer to Section 5.3 and 6.1.1 |
| Terminal locks up, not accepting input | Terminal confused | Power terminal down and then power it up |
| | Internal Switch 4 of ADM 5 is in LK mode | Power down terminal and change internal switch to GT, per instructions in ADM 5 User's Reference Manual |

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| **TABLET** | **AS LISTED BELOW** | **DETAILED INFORMATION IN SECTION 6.1.2** |
| No response from tablet | Improper connection | See Section 6.1.2 Cable Connection |
| | Internal tablet switches improperly set | See Section 6.1.2 Tablet Preparation |
| Dead spots on tablet-- some areas are not read and do not display | Tablet needs biasing | See Section 6.1.2 Tablet Preparation |
| **HANDCONTROLS** | **AS LISTED BELOW** | **DETAILED INFORMATION IN SECTION 6.1.3** |
| Handcontrols do not function | Plugged into another port not referenced by device variable | Use device variables corresponding to jack handcontrol is plugged into, not the number printed on top of the knob |
| **DISK** | **AS LISTED BELOW** | **DETAILED INFORMATION IN SECTION 6.1.4** |
| Cannot write on disk | No disk inserted in drive or disk is in the other drive | Insert disk and DSETUP the loaded drive |
| | Disk is write-pro-tected | Remove write protection sticker from notch on edge of disk |
| | Disk not properly inserted | See Section 6.1.4 Disk Storage |
| | Disk is not formatted | See Section 6.1.4 Disk Storage |
| | Ribbon cable not properly connected | See Section 6.1.4 Disk Storage |
| Unable to insert disk into disk drive | Disk not clearing write-protect sensor | There may be write-protect sensor resis-tance on the left side; gently repeat insertion |

# 7. TROUBLESHOOTING - Continued

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| AUDIO TAPE | AS LISTED BELOW | DETAILED INFORMATION IN SECTION 6.1.5 |
| Files not properly recording on tape | Cables improperly connected | Properly connect cables, per Section 6.1.5 Audiotape Storage |
| | Recording level too low | Turn level up |
| | Crosstalk between play and record circuits | Disconnect cable into EXT.SPEAKER/EAR jack during recording |
| | Recording over other computer programs | Erase tape before recording |
| | Faulty cables or adapters | Change cables |
| | Tape heads magnetized | De-magnetize record heads on recorder |
| Files not properly read into memory | Recorder playback volume or tone control too low or high | Change levels |
| MONITOR | AS LISTED BELOW | DETAILED INFORMATION IN SECTION 6.2 |
| No display on monitor | Monitor not plugged in | Plug power cord into power source |
| | Monitor not turned on | Press power switch to ON position |
| | Cables improperly connected | Verify that all pins are plugged into ribbon cables: --both rows of pins are connected --there are no pins left out on either side |
| | Monitor fuse blown | Replace monitor fuse |

# 7. TROUBLESHOOTING - Continued

| PROBLEM | CAUSE | SOLUTION |
|---------|-------|----------|
| | (continued from previous page) | |
| No display on monitor | Bundled cable harness from I/O Logic Board disconnected from Video Board while accessing boards in card rack | Turn UV-1 off; unplug power cord; open back door; check bundled cable harness connections from I/O Logic Board to Video Board |

# 8. INDEX OF SYSTEM TESTS

The purpose of this section is to provide you with an index summarizing all of the macros (programs) used to test the UV-1 system. These tests verify and demonstrate that internal and external I/O devices are operating.

The internal devices tested are: graphics, screens, LED's/switches, sound, handcontrols, colormap, and color bars.

The external devices tested are: terminal, tablet, disk drives, and audiotape.

This index is organized to provide you with the following information:

-the name of the test as referenced in the manual
-section of this manual which references the test
-a description of what the test does
-the actual test macro (program)
-the sequence needed to terminate the test

These test macros may be typed in as listed below OR you may load the test macros into the UV-1 system from the UTILITY DISK provided with the system. All system tests are stored in a submap on the UTILITY DISK identified as SUBTEST. To run the tests, load the UTILITY DISK into drive 0 and type:

```
DS 4,SUBTEST
DG SYSTEST
SYSTEST
```

A menu will provide all information needed subsequent to loading the UTILITY DISK as instructed above.

## 8. INDEX OF SYSTEM TESTS - Continued

SYSTEM TEST 1:  GRAPHICS                           SECTION 4.5

        -an animated display of colored boxes

            TEST1=[.System Test 1: GRAPHICS
                   NB;NB]
            TEST1

TERMINATION SEQUENCE:  screen will clear on completion of test


SYSTEM TEST 2:  SCREENS                            SECTION 4.5

        -a 16-screen animation of circles and boxes

            TEST2=[.System Test 2:  SCREENS
                   NC]
            TEST2

TERMINATION SEQUENCE:  after several cycles, press CTRL+C; then
                       press CTRL+B; then type:  CLEAR

SYSTEM TEST 3:  LED'S/SWITCHES                     SECTION 5.7

        -locks console switches to LED's so that toggling
         a switch turns the light above it on/off

      TEST3=[.System Test 3:  LED'S/SWITCHES
             PR "Press the console SWITCHES to blink the LIGHTS"
             PORT 38,PORT 20
             PORT 39,PORT 21
             SK -2]
      TEST3

TERMINATION SEQUENCE:  after testing lights and switches,
                       press CTRL+C

SYSTEM TEST 4:  SOUND                              SECTION 5.10

-produces an audio tone as it exercises each of the three voices

            TEST4=[.System Test 4:  SOUND
                   .VOICE A + B amplitude
                   PORT 22,15+15*16
                   .VOICE C amplitude
                   PORT 21,15
                   PR "VOICE A"
                     a=0
                     PORT 17,a
                     IF (a=a+1)<255,SK -1

## SYSTEM TEST 4:   SOUND/Macro - Continued

```
                        PORT 17,0
                      PR "VOICE B"
                        b=255
                        PORT 18,b
                        IF (b=b-1)>0,SK -1
                        PORT 18,0
                      PR "VOICE C"
                        c=0
                        PORT 19,c          '
                        IF (c=c+1)<255,SK -1
                      .NOISE
                        PORT 16,31
                        PORT 21,15+16+32
                        PORT 23,255
                      .QUIET
                        CONTROL 3,1
                      PR "DONE"]
              COMPILE TEST4,CTEST4
              CTEST4
```

TERMINATION SEQUENCE:  ports are cleared on completion of test

## SYSTEM TEST 5:   TERMINAL                          SECTION 6.1.1

    -speeds the display of the Zgrass HELP listing
            on the terminal screen

```
        TEST5=[.System Test 5:   TERMINAL
              H;H;H]
        TEST5
```

TERMINATION SEQUENCE:  the screen should be readable when the
                       Zgrass > prompt returns

## SYSTEM TEST 6:  TABLET                             SECTION 6.1.2

   -draws boxes on the monitor as the cursor moves on the tablet

```
        TEST6=[.System Test 6:   TABLET
              PR "Move the CURSOR around on the TABLET,
                 pressing the buttons to change the
                 size of the BOXES"
              CLEAR
              PR p=TAB(x,y),x,y
              BOX x/7,y/11,p*2+10,p*2+10,20
              SK -2]
        COMPILE TEST6,CTEST6
        CTEST6
```

TERMINATION SEQUENCE:  after you've tested the tablet, press CTRL+C

SYSTEM TEST 7:  HANDCONTROLS                              SECTION 6.1.3

   -prints knob and trigger values of handcontrols on terminal

```
    TEST7=[.System Test 7:  HANDCONTROLS
           PR "Plug HANDCONTROLS into jacks and test positions"
           PRO "  [# 1]",$X1,$Y1,$K1,$T1,"  [# 2]",$X2,$Y2,$K2,$T2
           PRO "  [# 3]",$X3,$Y3,$K3,$T3,"  [# 4]",$X4,$Y4,$K4,$T4
           SK -2]
    COMP TEST7,CTEST7
    CTEST7
```

TERMINATION SEQUENCE:  after you've tested the handcontrols,
                       press CTRL+C

SYSTEM TEST 8:  DISK DRIVES                               SECTION 6.1.4

  -tests both sides of both disk drives with PAINT/UTILITY disk

```
        TEST8=[.System Test 8:  DISK DRIVES
               PR "Put the PAINT/UTILITY disk in DRIVE 0"
               DS 0
               DFETCH;DUSEMAP
               DS 4
               DFETCH;DUSEMAP
               DS 4,SUBTEST
               DG SCREENTEST;$L0=0
               PR "Put the PAINT/UTILITY disk in DRIVE 1"
               DS 1
               DFETCH;DUSEMAP
               DS 5
               DFETCH;DUSEMAP
               PR "Disk Drive test successfully completed"]
        TEST8
```

TERMINATION SEQUENCE:  message appears on terminal when test ends

SYSTEM TEST 9:  AUDIO TAPE                                SECTION 6.1.5

    -tests recording and play-back of audio tape

```
    TEST9=[.System Test 9:  AUDIO TAPE
           PR "Put a TAPE in your RECORDER";WAIT 3
           PR  "Initialize your RECORDER'S counter";PR;WAIT 2
           KANGA=NB
           PR "Start RECORDing now";PR;WAIT 3
           PUTTAPE 3,KANGA,[ copy of NICE BOXES]
           PR "Stop your RECORDer now";PR;WAIT 3
           DEL KANGA
```

SYSTEM TEST 9:   AUDIO TAPE/Macro - Continued


```
            PR "Rewind your RECORDer now";WAIT 5
            PR "Start PLAYing back";WAIT 2
            GETTAPE KANGA
            KANGA
            PR "NICE BOXES SHOULD NOW BE DRAWN ON THE MONITOR"]
      TEST 9
```

TERMINATION SEQUENCE:   NB appears on monitor when test ends

SYSTEM TEST COLORMAP:   COLORMAP TOUR                SECTION 6.2.4

        -a tour of the UV-1 Zgrass colormap


```
    COLORMAP=[.System Test COLORMAP:  COLORMAP TOUR
            .  A tour of the colormap using the joystick#1 knob;
            .  Y controls hue and X controls grey level
            CL;STRIPE.OFF;$HB=37
            BOX -160,0,80,201,0;BOX -60,0,80,201,1
            BOX 20,0,80,201,2;BOX 98,0,76,201,3
            hue=0;A=0
            line=-11;inc=0
            STRIPE inc,line=line+12:25,hue,hue+1,hue+2,hue+3
            IF (inc=inc+1)<16,hue=hue+8;SK -1
            A=A-$X1+8*$Y1;hue=A;SK -3]

            COMPILE COLORMAP,CCOLORMAP
            CCOLORMAP
```

TERMINATION SEQUENCE:  When you've completed the tour,
                       press CTRL+C; type:  CLEAR;STRIPE.OFF

SYSTEM TEST CBARS:   COLOR BARS                    SECTION 6.2.4

    -displays color bars on your monitor to allow color tuning


```
      CBARS=[.System Test CBARS:  COLOR BARS
            CL;A=-149;C=0;$HB=21
            $R0=0;$R1=82;$R2=43;$R3=249
            $L0=7;$L1=213;$L2=126;$L3=164
            IF A<115,BOX A=A+45,0,46,202,C=(C+1)\3+1;SK 0]
      CBARS
```

TERMINATION SEQUENCE:   after you've tuned your monitor,
                        type:  CLEAR