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OPERATORS MANUAL

FOR THE

MV-SPECTRUM

VIDEO DIGITIZER GRAPHICS OVERLAY

AND FRAME GRABBER BOARD

MetraByte Corporation

440 Myles Standish Boulevard
Taunton, MA 02780

Telephone: (508) 880-3000

Fax: (508) 880-0179

PREFACE

This manual describes how to install the MV-SPECTRUM(tm) board in your computer, and how to write drivers for specific applications.

Chapter 1 gives a system description and a system specification. This chapter also suggests some typical applications for this product, but of course there are many more waiting to be discovered.

Chapter 2 lists the minimum equipment required to support this product. Chapter 2 also gives a procedure to install the adapter into your computer, and connect cables for the external equipment.

Chapter 3 describes GRABTEST, a sample program that enables you to experiment with the functions of MV-SPECTRUM. Follow the GRABTEST menu for the list of functions.

Chapter 4 shows the GRABTEST SETUP menu and allows you to set some operating parameters. You only need to change these settings if the SPECTRUM default values do not suit your VGA adapter.

Chapter 5 gives instructions and examples to enable you to write drivers for specific applications.

Chapter 6, Troubleshooting, gives assistance if the system does not operate properly after installation, or during normal operation.

Appendix A lists the MV-SPECTRUM Registers.

Appendix B, Changing Video Modes of Resolution, describes how to set MV-SPECTRUM for modes of resolution other than EGA, VGA, High Resolution (800 x 600 pixels), VGA 256 Colors (640 x 480 pixels), or Text (720 x 400 pixels).

Appendix C, gives the format of the .KCV file used to store pictures in MV-SPECTRUM.

Appendix D, Multiple Video Images, describes how to run the system using two or more video images.

Appendix E, describes the Monochrome and Display Only Boards.

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The interference may be corrected by re-orienting the receiving antenna, relocating the computer with respect to the antenna, move the computer away from the antenna, plug the computer into a different outlet so that the computer and device with the antenna are on different branch circuits.

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CHAPTER ONE

GENERAL DESCRIPTION

1.1 INTRODUCTION

The MV-SPECTRUM (tm) displays video pictures, text or graphics simultaneously on the monitor of an IBM PC-AT or compatible computer, see Figure 1. This high-quality display is programmable to EGA, VGA, 800 x 600, or VGA Text resolutions. The MV-SPECTRUM adapter can receive video from a live program, camera, disk, tape or any source outputting NTSC video, and is displayed using a selectable chroma key.

The MV-SPECTRUM can grab a screen display in less than 16 milliseconds and a number of software operations can be performed on the digitized image. The digitized video image can be zoomed to 4x, 2x, 1/2x, 1/3x and 1/4x. The MV-SPECTRUM can convert the grabbed video to TIFF or TGA file formats.

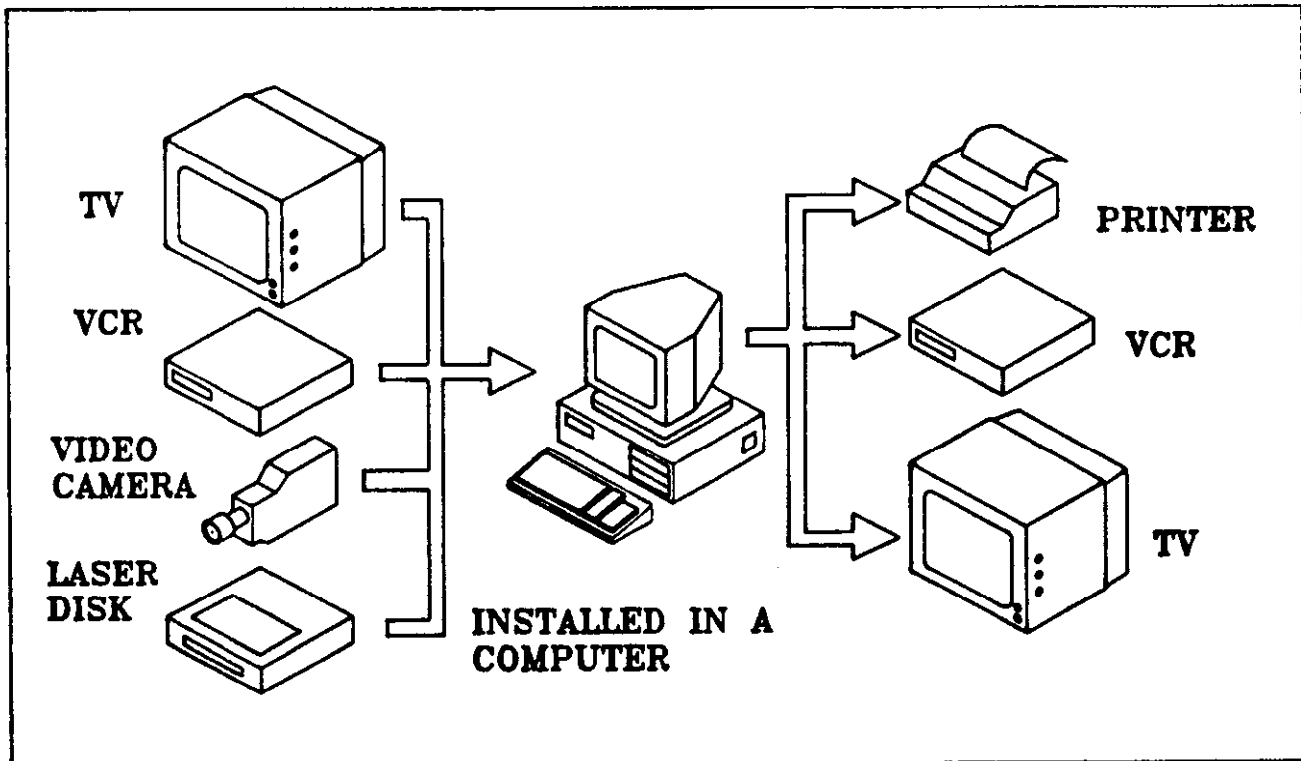


Figure 1 The MV-SPECTRUM Video Equipment.

MV-SPECTRUM provides an RS-170 output for a printer, VCR, or an external display. The computer parallel output also serves a printer. These printer outputs can drive a monochrome printer with 256 shades of gray, and provide an output for high quality color prints using a range of 16.7 million colors.

MV-SPECTRUM is designed to provide superior display and print characteristics at a reasonable cost. The unit has excellent synchronizing properties that allow it to accept sources with poor timing such as a VCR in the Pause mode. Panning moves a small picture anywhere on the screen, or pans the screen over a large picture.

1.2 APPLICATIONS FOR THE SPECTRUM SYSTEM

SPECTRUM can be programmed for many applications where pictures and text are combined on one computer screen. SPECTRUM has many features that make it useful for specific applications such as motion analysis.

Typical applications are:

- Personnel Records;
- Security Systems;
- Real Estate Records/Presentations;
- Computer-Generated Video Training Programs;
- Medical Records;
- Law Enforcement/Missing Persons Files;
- School/College/University Learning Programs;
- Advertising/Graphics Design Records;
- Architect Records;
- Designer Records;
- Engineering Documentation;
- Photo Journalist/Model Agency Listings;
- Motion Analysis;
- Remote Sensing Systems;
- Desktop Publishing;
- Video Inspection;
- Video Teleconferencing.

1.3 THE MV-SPECTRUM VIDEO EQUIPMENT

The MV-SPECTRUM hardware is contained on a single adaptor card that can be plugged into the expansion slot of an IBM PC-AT, or equivalent compatible computer, see Figure 2. SPECTRUM operates with most VGA adapters, but you should contact MetraByte Customer Service for a recommended list of compatible VGA adapters. More than one SPECTRUM adapter can be installed to enable you to work with simultaneous video windows.

SPECTRUM accepts any NTSC video input including live programs, video camera outputs, VCR outputs, as shown in Figure 1, and displays the video image on the monitor. SPECTRUM provides outputs via the computer parallel port or the SPECTRUM adaptor NTSC output for a VCR, printer, or TV monitor.

MV-SPECTRUM combines text and picture on the monitor using "chroma key" which makes the background color transparent to the video. The background color is usually black, but can be selected. The color code is stored in Palette Register 0.

NOTE:

Not all VGA cards supply the color register number on the feature connector, and may allow only a black background to be used. You should use a VGA card which supplies the color register number on the feature connector, since this allows you to use different background colors. This is very important for applications where the picture is zoomed to 1/2x, 1/3x, or 1/4x, which leaves a large area of the background color on the screen.

1.4 LIST OF VGA CARDS COMPATIBLE WITH MV-SPECTRUM

The following VGA cards are compatible with MV-SPECTRUM. Contact MetraByte Customer Service for more details.

ATI VGA Wonder; Everex EVGA EV-673; Genoa Super VGA, Model 5100; Nanao MD-B07; Paradise VGA Plus Card; Paradise VGA Professional Card; Video 7VRAM; Orchid Prodesigner

(Intentionally left blank)

Figure 2 The MV-SPECTRUM Adapter.

1.5 OPERATING SPECIFICATIONS

MV-SPECTRUM is supplied on a Standard full size IBM Adapter.

| | |
|----------------------|--|
| Input: | One baseband NTSC connector. |
| Digitizing Scheme: | G-R-G-B 8-8-8-8 |
| Display: | Standard Analog Multisync or VGA Monitor required. |
| Display Resolutions: | 640 x 350 pixels (EGA). 640 x 480 pixels (VGA). 640 x 480 pixels (VGA 256 Color). 720 x 400 pixels (Text). 800 x 600 pixels (High Resolution). These drivers may be modified for other resolutions, see Appendix C. |
| Picture Location: | Programmable, 4:3 aspect ratio. |
| Zoom: | 1/4x; 1/3x (except in field mode); 1/2x; 1x; 2x; 4x. |
| Panning: | Pans a small picture around the screen, or pans the screen over a large picture. |
| Overlay: | Chroma Key, any color (uses palette register #0). |
| Picture Control: | Contrast, brightness, hue, and saturation software adjustable and non-volatile. |
| Bus Width: | 16-bit transfers. |
| Frame Buffers: | 2. |
| Memory: | 1 megabyte on board, double frame buffered. Host Accessible (2 frames). |
| Color or Monochrome: | 16.7 million colors. 256-level gray scale. |
| Outputs: | VGA (or Multisync) Monitor. One baseband NTSC connector. Parallel port from the computer. |

CHAPTER TWO

HARDWARE REQUIREMENTS AND INSTALLATION

2.1 GENERAL

This chapter specifies the minimum equipment requirements to run the MV-SPECTRUM system, then gives full installation instructions. Go to Chapter Three (The GRABTEST Menu) when installation is completed.

Read the "README" file on the diskette for additional details of your MV-SPECTRUM System.

2.2 HARDWARE REQUIREMENTS

- 1 IBM PC-AT or compatible
- 1 VGA card (extended modes required for 800 x 600 resolution)
- 1 Analog multisync or VGA monitor
- 1 RCA phono jack cable (2 are required if you wish to use the NTSC-OUT feature).

2.3 MV-SPECTRUM EQUIPMENT LIST

This is a list of equipment included in the MV-SPECTRUM System package:

- 1 "Y" cable for multisync or VGA monitor.
- 1 VGA feature connector flat cable
- 1 The MV-SPECTRUM Adapter.
- 1 Software Diskette.
- 1 Manual.

See Table 2-1 for a list of cables and their part numbers.

2.4 BACKUP THE DISKETTE

First make a copy of the MV-SPECTRUM diskette, and place the original diskette in a safe place.

Table 2-1 MV-SPECTRUM Cable Part Numbers

This table gives the Feature/Video cable part numbers:

| GRAPHICS CARD | CABLES | MONITOR | | | | |
|------------------------------|------------------|------------------|--------------------------------|------------------------------------|---------------|-------------------------|
| | | SONY CPD-1302 | ZENITH ZCM1490-Z/ NEC-3D | NEC-Multisync II/JC- 1403HMA | NANAO 8060 | MITSUBISHI AUM-1381A |
| ATI VGA Wonder | Video Feature | A B | A C | A D | A D | A G |
| Paradise VGA Plus | Video Feature | A B | A C | A D | A D | A G |
| Nanao MD-B07 | Video Feature | F B | F C | F D | F D | F G |
| Genoa Super VGA 5100 | Video Feature | A B | A C | A D | A D | A G |
| Video 7 VRAM VGA | Video Feature | A B | A C | A D | A D | A G |
| Paradise VGA Professional | Video Feature | A B | A C | A D | A D | A G |

2.5 INSTALLING THE ADAPTER

2.5.1 Setting The Jumpers

Set the Port Address (JP1, JP2, JP3), Memory Address (JP4), and Video Input Sync jumpers (JP6, JP7) on the adapter, see Figures 3 and 4. Refer to subsection 5.4.12 if you change the software port and memory default addresses.

1. Port address. The adapter is set to 2e0. It can be changed to 2e8, 2f0, 2f8, 3e0, 3e8, 3f0, or 3f8 by changing the jumpers. **CAUTION:** The use of address 3f0 is not recommended because this is normally the address of the diskette drive adapter card.
2. Memory address. This is set at the factory to C80000H. Addresses B80000h, D80000H, AND E80000H are also available.

3. Horizontal Sync/Vertical Sync Polarity. SPECTRUM can receive positive or negative sync pulses. These jumpers determine whether SPECTRUM works in the EGA, VGA, or Text Mode. The board is set at the factory to VGA mode.

Table 2-2 Setting The Horizontal and Vertical Sync Polarity Jumpers For EGA, VGA, or Text Mode

| Lines | Mode | Horizontal Sync Jumper | Vertical Sync Jumper |
|-------|------|------------------------|----------------------|
| 350 | EGA | Positive | Negative |
| 400 | Text | Negative | Positive |
| 480 | VGA | Negative | Negative |

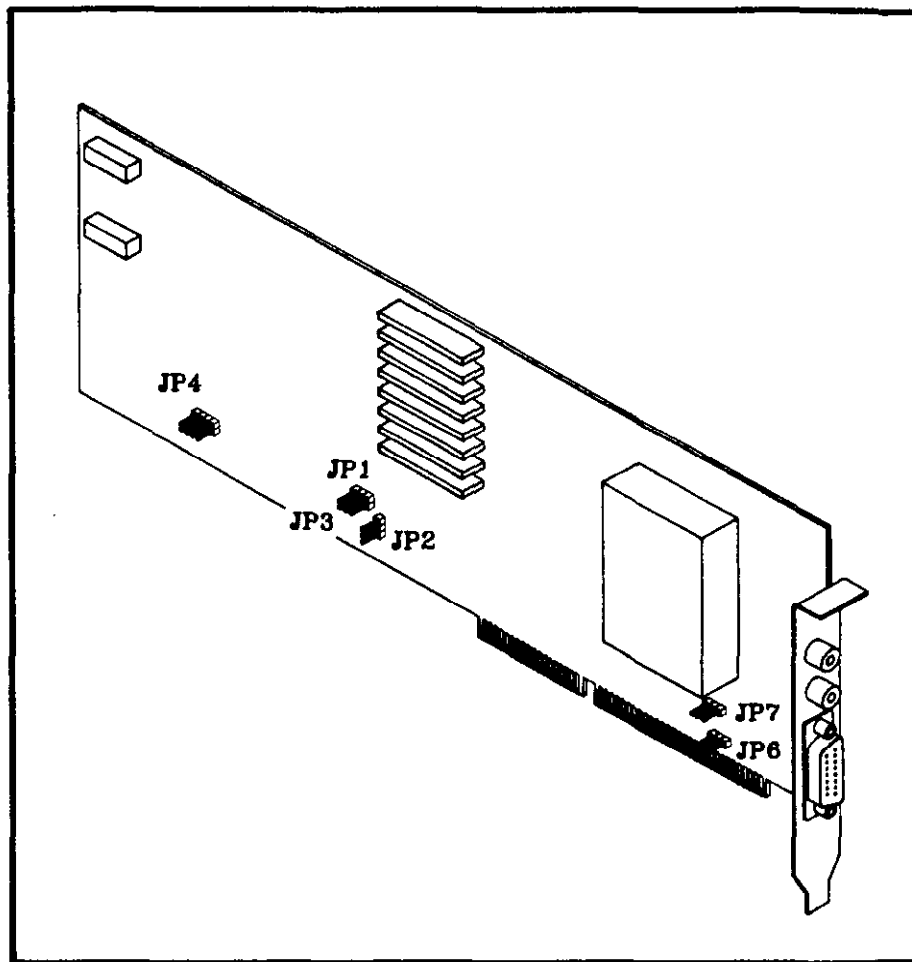


Figure 3 Jumper Locations.

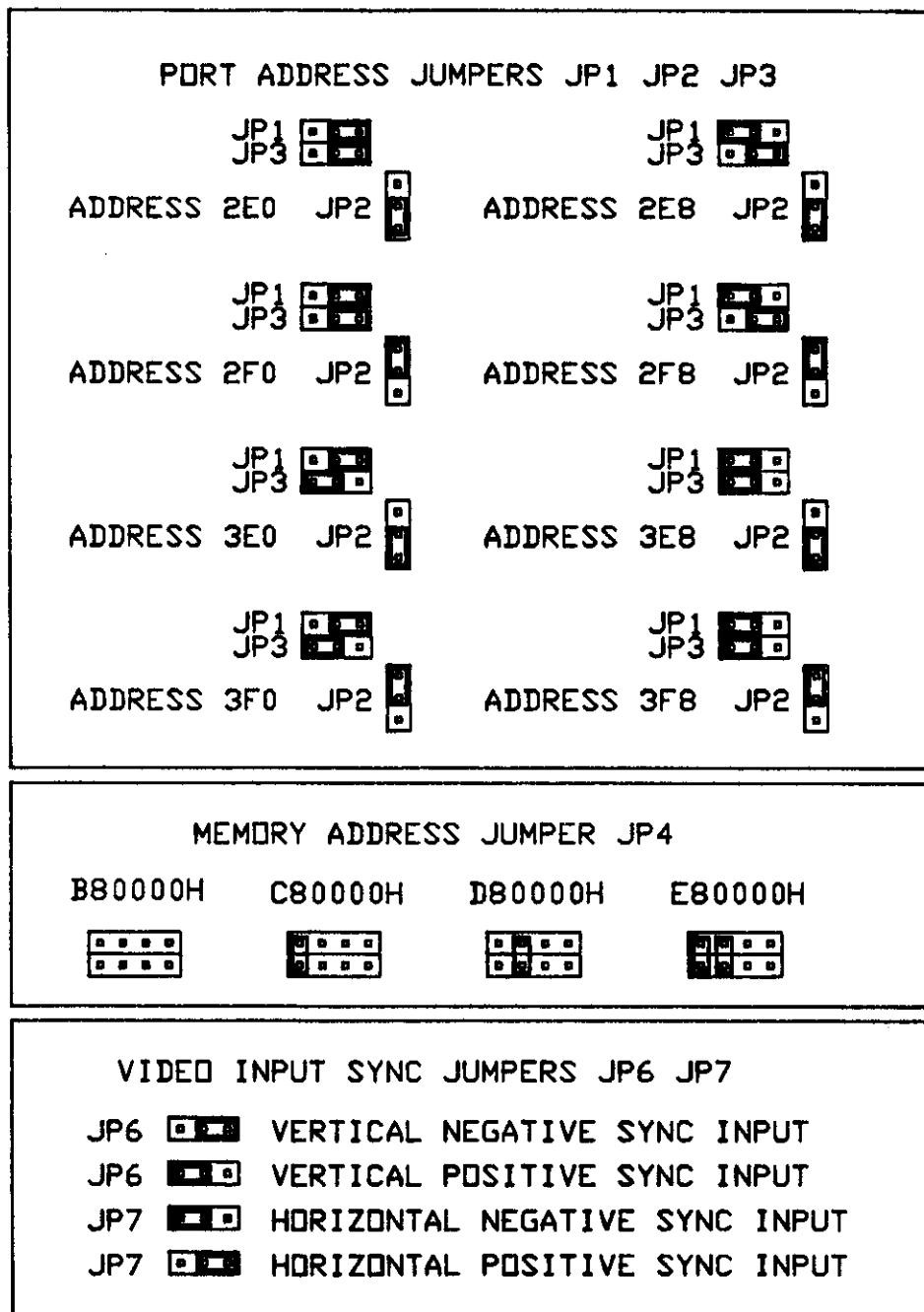


Figure 4 Setting the Jumpers.

2.6 INSTALLING THE CARD

1. Remove the computer enclosure, and plug the MV-SPECTRUM adapter into a vacant 2-connector slot.
2. Using the Feature Cable, connect the SPECTRUM adapter to the VGA adapter, see Figure 5.
3. Using the "Y" Cable, connect the rear panel connectors.
4. Connect the MV-SPECTRUM input to the video source with an RCA phono jack cable.
5. Replace the computer enclosure.

2.7 LOADING THE SPECTRUM SOFTWARE

1. Copy the files from the diskette (COPY A:*.*) on to your computer disk.

The file ANSI.SYS must be present in the root directory and the statement "device = ANSI.SYS" must be in the file CONFIG.SYS.

2. Type "GRABTEST" to execute the program.

The video source should appear on the computer monitor. The screen is blank when no video input is present, refer to Chapter 6, "Troubleshooting".

CAUTION:

Do not adjust the trim caps or potentiometers on the board. These are factory adjustments and must not be changed or the performance of the product will be affected.

The file, FACTORY.SET, is unique to your board and cannot be replaced unless the board is returned to the factory for realignment.

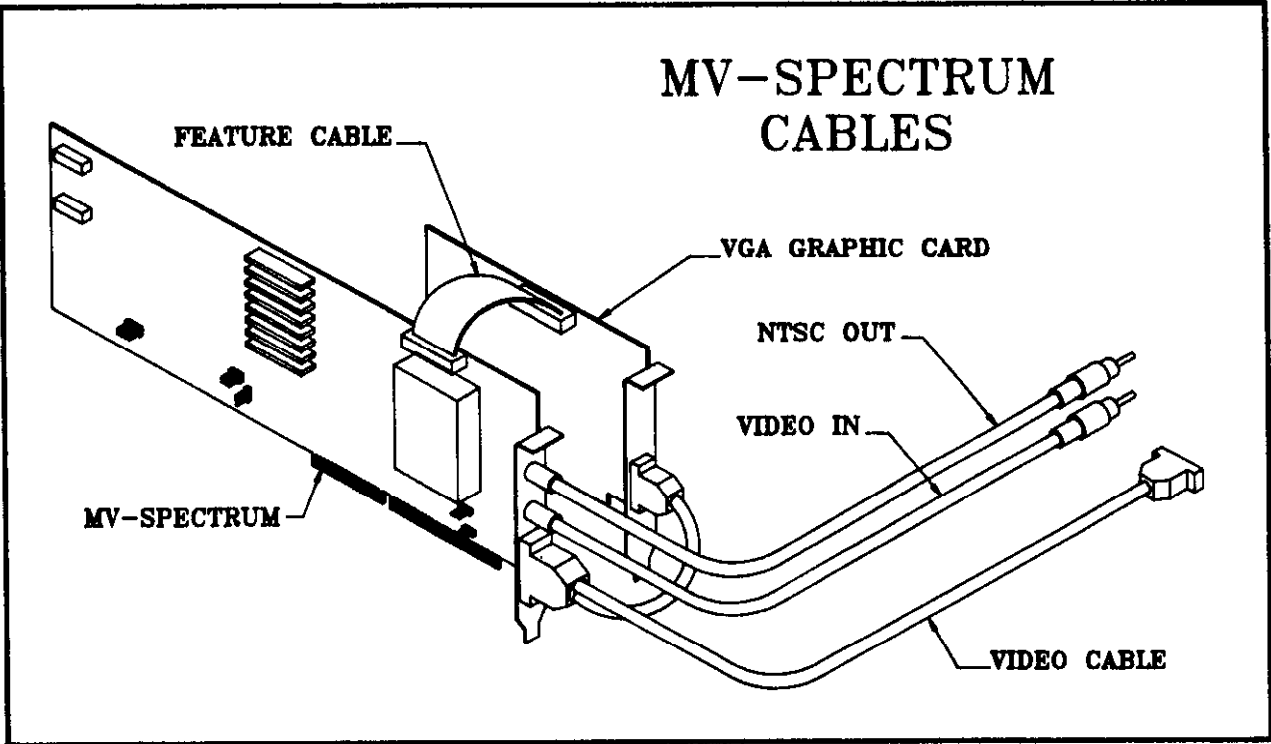


Figure 5 Connecting the Cables.

CHAPTER THREE

THE GRABTEST OPERATING MENU

3.1 GENERAL

GRABTEST is a demonstration and test program that enables you to see the basic set of features available with MV-SPECTRUM drivers. These features are contained in the following menu.

3.2 THE GRABTEST MENU

1. Enter <GRABTEST><Enter> in the directory containing this file. The Grabtest menu is displayed (if the video picture makes it difficult to read the Grabtest menu, press 'o' to blank the video):

THE GRABTEST OPERATING MENU REV 1.23

- VIDEO CONTROL -

| | | | |
|----------------------|------------------|---------------|------------------|
| B: Up Brightness | C: Up Contrast | H: Up Hue | S: Up Saturation |
| b: Dn Brightness | c: Dn Contrast | h: Dn Hue | s: Dn Saturation |
| J: Factory Settings | u: Change Colors | T: Color Bars | R: Erase Text |
| t: Set Synthesizer # | | | |

- ZOOM AND PAN -

z: Zoom Use ARROW keys to pan picture
n: Display Pan Coordinates

- VIDEO MEMORY -

K: Clear Video Memory

- MODE SELECTION -

| | | |
|-------------------------------------|--------------------|------------------------|
| I: Frame Mode | i: Field Mode | o: Blank Mode |
| O: Restore Picture | F1: Redisplay Menu | Esc: Exit w/o blanking |
| Q: Restore old screen mode and Quit | | |

- EDIT PICTURE -

| | | |
|------------------------|---------------------------|-----------------------|
| g: Grab Frame | p: Put Frame | f: Fetch Frame |
| l: Live Mode | A: Display Frame 0 | a: Display Frame 1 |
| k: Cut Picture | m: Paste Picture | V: Merge Picture into |
| VGA | | |
| r: Restore VGA Palette | v: Merge VGA into Picture | |

- SELECT OUTPUT -

| | | |
|-------------|------------------|-------------------------|
| N: NTSC Out | P: Print Picture | F: File Conversion Menu |
|-------------|------------------|-------------------------|

- Press F2 for SETUP Menu -

3.3 DESCRIPTION OF THE GRABTEST MENU FEATURES

3.3.1 Video Control

The incoming video can only be adjusted with the commands B, b, C, c, H, h, S, s, and J in Live Video mode. Commands u, R, and T can be used in grabbed mode.

NOTE:

No adjustments can be made after the frame is grabbed.

B: Increase Picture Brightness
b: Decrease Picture Brightness

C: Increase Picture Contrast
c: Decrease Picture Contrast

H: Increase Picture Hue
h: Decrease Picture Hue

S: Increase Picture Saturation
s: Decrease Picture Saturation

J: Reads file "FACTORY.SET", and restores the picture to the default values of brightness, contrast, hue and saturation.

u: Sets the background color to RED, GREEN, BLUE, or BLACK, and the border color to a digit 0-9.

R: Erase Text. Clears text from the screen, leaving the video picture.

T: Fills the screen with Color Bars to test the NTSC out feature.
t: Sets a new synthesizer number. The synthesizer number determines with width of the picture. A lower number will increase the width of the picture; a higher number will decrease the width.

3.3.2 Video Memory

K: Sets the entire current frame to black (0).

3.3.3 Zoom and Pan

z: Zoom. Displays the following menu:

| | | |
|---------------|---------------|---------------|
| 0 Zoom to 1/4 | 1 Zoom to 1/3 | 2 Zoom to 1/2 |
| 3 Zoom to 1x | 4 Zoom to 2x | 5 Zoom to 4x |

Enter Zoom Selection <0-5>:

- Pan:** Use the **ARROW** keys to pan. Panning places a small picture at any desired location on the screen, or moves the screen around a picture larger than the screen.
- n:** Display Current Pan Values. The display shows the coordinates of the current location, allowing you to program pan positions, refer to Section 5.4.4 in this manual.

3.3.4 Mode Selection

Frame and Field Modes. The SPECTRUM system may be set in the Frame or Field mode, depending on the application. In the Frame mode, the adapter has two frame buffers, Frame 0 and Frame 1. Each frame stores the two fields for a complete picture. This is the preferred mode for most applications. However, if the application includes motion viewing or analysis, there may be some shift between the two fields in the frame. In the field mode, Field A is repeated in Field B to eliminate the blurring effect of the movement.

I: Selects the Frame mode of operation.

i: Selects the Field mode of operation.

Blank Mode. The Blank mode removes the picture to allow you to read the text part of the screen.

o: Invokes the Blank mode.

O: Exits the Blank mode, and restores the video component of the picture.

<F1>: Restores the menu, which is erased each time the mode is changed, or when you select another menu, or when **<R:>** erases the text.

Esc: Exits the program, leaves the monitor in Graphics mode.

Q: Restores the old screen mode and Quits the program. Goes to DOS.

3.3.5 Frame Grab Functions

g: Grab Frame. Freezes the current picture in the Frame 0 or Frame 1 video buffers.

- l: Live Mode. Use the <l> command to return the picture to the Live mode. You will lose the video picture in the buffers when you press <l>.
- p: Put Frame. This saves the grabbed frame from Frame Buffer 0 or 1, depending on the buffer you have selected, refer to A: and a: below. The picture is saved to disk and you are prompted for a Label (up to 255 characters), Directory Path (if not in logged drive) and Filename.

To select a picture, you may toggle between Grab and the live mode using the <g> and <l> keys until you have the picture you want. Then press <p> and save the picture on disk in a directory and file. The following menu will be displayed:

-----SAVE PICTURE TO DISK MENU-----

Filename:

0: DEFAULT: KCV FORMAT

1: TGA 16 (Type 2)

2: TGA 24 (Type 2)

3: TGA Black & White (Type 3)

4: TIFF RGB

5: TIFF Greyscale

Enter File Type

---Press ESC for OPERATING MENU---

Enter the file name and format. The extension "KCV", "TIF", or "TGA" will automatically be added, according to the format chosen.

NOTE: If you have monochrome board, you cannot save a file in TGA or TIFF color format.

CAUTION:

If your filename already exists, the new picture data overwrites the old file.

- f: Fetch Frame. This function, the reverse of Put, reads a stored picture from disk into Video memory. Enter <f> and the screen prompts you for the directory and filename. You must supply the extension, "KCV", "TIF", or "TGA". The picture is displayed exactly as it was stored, with the same picture adjustments and zoom factor.
- k: Cut. You may select a square or rectangular part of the picture, cut it and save it on disk. You must specify a new filename for the portion of the picture, the X and Y offsets of the top left corner, and the width and height of the part of the picture.

m: Paste. This is the reverse of Cut and Save. The picture part is placed into a 1x buffer, and displayed on the screen, displacing only the area of the screen where the picture is located. This allows you to combine several picture sections in one frame buffer. You must enter the filename (and directory if other than the logged drive), the X and Y offsets (to position the picture).

Selecting the Frame Buffer. The incoming video picture passes through Frame Buffers 1 and 0. When you press g: (Grab) the next complete frame is stored. Frame Buffer 1 contains the latest picture, and Frame Buffer 0 contains the previous frame. The commands a: and A: select the frame buffer you will grab (the selection must be made before you grab the picture).

If you zoom the grabbed frame to less than 1x, you will lose the contents of the other buffer, since this requires both frame buffers.

a: Grab and display the contents of Frame Buffer 1, which contains the latest picture.

A: Grab and display the contents of Frame Buffer 0, which contains one frame earlier than Frame Buffer 1.

Merging VGA and Picture. These commands merge the video picture into the screen, or merges the screen data into the video picture.

V: Merge Picture into VGA. Transfers the picture in video memory to the screen, using the same dithering technique that is used in printing. You will be asked to select 16 color or 256 color VGA. If you select 256 color, the following menu will be displayed:

-----SELECT 256 COLOR VGA BOARD-----

- 0: ATI VGA Wonder
- 1: Paradise VGA Professional
- 2: V7 VGA

r: Restore VGA Palette. Use this command after merging the picture into the VGA screen ('V'Command). 'V' causes the default palette to be changed; 'r' restores it. Changing modes also restores the palette.

v: Merge VGA into Picture. This merges the VGA overlay into the video memory. If you were to save the picture after doing this, the VGA overlay would be stored with the picture.

3.3.6 Selecting the Output

N: NTSC Out. If a monitor is connected to the NTSC output, the video picture is

displayed on the monitor (without the VGA overlay) instead of the computer screen. Live video can also be viewed on the monitor, but this output is not gen-locked to the input.

If a merger of the two (VGA & NTSC) is required, it can be achieved by using a driver called "VGA_TO_PICT" which puts the VGA screen into the frame buffer. (NOTE: This only works on stills) The resulting combination can be sent out the NTSC out connector.

P: Print. The monitor displays the following submenu:

```
X Offset on page0
Y Offset on page0
X Scale480
Y Scale384
PORTRAIT/LANDSCAPE (P/L)P
MONOCHROME/COLOR (M/C)M
HP/SEIKO/NEC/PJ (H/S/N/P)H
Number of Copies1
ToneAdjust/NoToneAdjustT
```

Press <Return> to accept the default value, or a enter a new value.

MV-SPECTRUM outputs the picture on the screen and the VGA part of the screen (if the information is present). Note that the source code for the print routines code is not included with the drivers. This driver contains a proprietary dithering algorithm which enhances the picture, but this enhancement requires some processing time. The time taken to print will depend on the size of the picture, whether the picture is monochrome or color range, and the speed of your computer.

MV-SPECTRUM only prints in the VGA graphics resolution mode. You must change to the VGA mode using the Grabtest Setup menu, refer to Chapter 4 of this manual.

To erase the VGA overlay and only print the video picture, enter: <R>.

Once processing is done, you may make multiple copies on printers that store the image.

MV-SPECTRUM drivers support the Seiko 5303, NEC 2200, HP Paint Jet, and the HP LaserJet II. See "GRABTEST" in Chapter 3 and "GRABPRINT" in Chapter 5 in this manual for more printing options.

F: File Conversion Menu. This command brings up the File Conversion menu, which enables you to convert file formats. The converted file is automatically given the extension .KCV, .TGA, or .TIF. For example, to convert

ESTHER.KCV to a Targa 16 file, enter <F> to call up the File Conversion menu. You will be asked for a file name; enter the name of the file you wish to convert, with the extension "KCV" or "TGA". Next enter <0>, and the file ESTHER.TGA will be created. **Make sure you have enough room on your disk!**

FILE CONVERSION MENU

-----MV-SPECTRUM FILE CONVERSION MENU-----

| | |
|-----------------------------|-----------------------------|
| 0: KCV to TGA 16 | 1: KCV to TGA 24 |
| 2: KCV to TGA Black & White | 3: TGA 16 to KCV |
| 4: TGA 24 to KCV | 5: TGA to KCV Black & White |
| 6: KCV to TIFF RGB | 7: KCV to TIFF Greyscale |

Filename:

Conversion:

---Press F2 for OPERATING MENU---

CHAPTER FOUR

GRABTEST SETUP PROCEDURES

4.1 GENERAL

This chapter describes how to set up the resolution of your MV-SPECTRUM adapter to operate with your computer and VGA monitor after you have installed the adapter, or if you change the resolution, video BIOS numbers, or change the port or memory jumpers on the adapter. Call up this menu from the GRABTEST menu described in Chapter 3 <F2>.

4.2 CALLING UP THE GRABTEST SETUP MENU

1. Enter <GRABTEST><Enter>

The monitor displays the Grabtest Menu.

2. Press <F2>

This brings up the Grabtest Setup Menu.

THE GRABTEST SETUP MENU

- RESOLUTION -

- | | |
|----------------------------------|--------------------------|
| 0: EGA Mode (640 x 350) | 1: VGA Mode (640 x 480) |
| 2: Hi-Res Mode (800 x 600) | 3: Text Mode (720 x 400) |
| 4: ATI VGA 256 Color (640 x 480) | |

- BIOS -

L: Alter BIOS Number

---PORT/MEMORY ADDRESSES---

P: Default Port/ Memory Addresses

D: SAVE NEW DEFAULTS TO DISK

- Press F2 for the OPERATING MENU -

4.3 CHANGING THE DEFAULT PARAMETERS

4.3.1 Resolution

Enter the resolution value you will use, either <0>; <1>; <2>; <3>; or <4>. The Resolution is set in the video BIOS (Int 10 Function 0). Default values are shown below:

| | | | |
|----|-----------|-------------------|-----|
| 0: | 640 x 350 | EGA | 10H |
| 1: | 640 x 480 | VGA | 12H |
| 2: | 800 x 600 | HI-RES | 58H |
| 3: | 720 x 400 | TEXT | 03H |
| 4: | 640 x 480 | ATI VGA 256 Color | 62H |

If your graphics card requires a different value, select <L:> and enter the required number.

4.3.2 Changing the Default Video BIOS Number

L: Change default video BIOS number.

If you have set a new value using <L:>, you can store the new value on disk, using D: below. GRABTEST reads the current BIOS value before initializing the SPECTRUM adapter.

4.3.3 Changing the Port and Memory Addresses

If you changed the Port or memory address jumpers, enter <P> to change the software defaults to the new value. The MV-SPECTRUM software checks that you entered a legal value and that the adapter is at the correct address, and returns "SUCCESS". If you entered an illegal value, or the adapter is not found, an error message is displayed.

4.3.4 Saving the New Parameters

Enter <D> to save the new parameters updated through the Setup Menu. This ensures that the new values are called up each time the system is booted up.

D: Save the New Parameters to diskfile "GRAB.SET"

CHAPTER FIVE**CREATING SOFTWARE APPLICATIONS****5.1 GENERAL**

Now that you have installed your MV-SPECTRUM System, and studied the GRABTEST program, you are ready to write software for a specific application.

MV-SPECTRUM drivers are written in C language and are compiled using the LARGE memory model. There are two libraries of drivers, one compiled by Turbo C version 2.0 and the other compiled by Microsoft C version 5.1. Tiny, small, compact, medium, and huge memory models are not supported (See Section 5.5 and Section 5.6 if you need to modify the source code).

5.2 THE MV-SPECTRUM TOOLS

The software diskette contains files that provide the necessary information and code to write software. These files are:

GRABTEST.EXE - This is a menu-driven program which demonstrates all of the features available with MV-SPECTRUM.

GRABTEST.C/GRABPROG.C - Source code for the Grabtest module. These files give examples you can modify or copy when you write your own application.

FACTORY.SET - This file contains the original factory settings for brightness, hue, saturation, and contrast potentiometers. If you have made changes to these parameters and you are not satisfied with the result, you can reset these parameters to their original settings and start again.

KCV_TC.LIB - Object code library in Turbo C format.
KCV_MS.LIB - Object code library in Microsoft format.

MODETABLE.C - This file contains the table of parameters for different video graphics modes.

GRABHW.H - These are constants and definitions used by the drivers.

If you used GRABTEST to set a new video BIOS number, and you saved the new value, it was saved in the file called GRAB.SET. Refer to Chapter 4 in this manual.
Source Code Modules:

| | | | |
|------------------|-----------------|------------------|-------------------|
| MODE.C | ADJUST.C | PANZOOM.C | GRABLIB.C |
| PICTURE.C | DEPEND.C | CONVERT.C | PICT2VGA.C |

5.3 SPECTRUM ERROR CODES

Each function is declared type 'short', and each returns a value. If the function executes correctly, it returns SUCCESS which is defined as 0. If an error occurs, one of the following negative numbers is returned.

- 1 =FILE_OPEN_ERROR
- 2 =CANNOT_FIND_BOARD
- 3 =PICTURE_GRABBED
- 4 =FILE_READ_ERROR
- 5 =FILE_WRITE_ERROR
- 6 =FILE_NOT_FOUND
- 7 =ILLEGAL_PARAMETER
- 8 =COULD_NOT_GRAB
- 9 =BAD_X_PAN_VALUE
- 10 =BAD_Y_PAN_VALUE
- 11 =MALLOC_ERROR
- 12 =NOT_A_KCV_FILE
- 13 =PICTURE_NOT_GRABBED
- 14 =BAD_BANK_NO
- 15 =WONT_FIT
- 16 =ALREADY_BLANK
- 17 =ALREADY_RESTORED
- 18 =DISLPAY_ONLY_BOARD
- 19 =UNSUPPORTED_TIFF_FIELD
- 20 =UNSUPPORTED_TGA_TYPE
- 21 =NO_VGA_CARD
- 22 =ILLEGAL_CONVERSION

The function, "error_print" returns a pointer to an error message.

5.4 SOFTWARE INITIALIZATION

The default software parameters are:

```
boardptr->grab_mem = 0xc8000000;
boardptr->grab_port = 0x2e0;
boardptr->board_type=COLOR_BOARD
```

If your board is configured differently, the following software initialization procedure is recommended:

```
extern board *boardptr;
if((error=set_jumpers(boardptr->grab_port,boardptr->grab_mem)
<SUCCESS)
    /* process error */
```


5.5 SYNTAX

5.5.1 error_print

This function takes a negative error number as an argument and returns a pointer to a character string containing an error message.

Syntax: char *error_print (short error_number)

Example:

```
short error_no;

if ( ( error_no = pan ( 1000, -467 ) ) < 0)
    printf ( "%s", error_print (error_no) );
```

The screen displays: Bad X Pan Value

5.5.2 Mode

Mode sets the display mode to live or grabbed; switches between video graphics modes; switches between Frame 0 and Frame 1; switches between Frame mode and Field mode; sets the Framegrabber Display mode to BLANK or NTSC OUT; and initializes the MV-SPECTRUM registers.

syntax: short mode (short mode, short argument)

mode (LIVE_GRAB, LIVE) puts the frame grabber into the Live mode.

Live mode is not legal for a display-only board, and the error DISPLAY_ONLY_BOARD will be returned if the board type is set to DISPLAY_BOARD. (See Appendix E).

The return value is always SUCCESS.

mode (LIVE_GRAB, GRAB) puts the frame grabber into the Grabbed mode.

The driver tries for 100 milliseconds to grab the picture. If successful, it returns SUCCESS; if the picture could not be grabbed (usually because the board is not present) COULD_NOT_GRAB is returned.

mode(GRAPHICS_MODE, MODE_EGA) uses Int 10H to set the video BIOS mode to 10H.

mode(GRAPHICS_MODE, MODE_VGA) uses Int 10H to set the video BIOS mode to 12H.

mode(GRAPHICS_MODE, MODE_HI_RES) uses Int 10H to set the video BIOS mode to 58H.

mode(GRAPHICS_MODE, MODE_TEXT) uses Int 10H to set the video BIOS mode to 03H.

mode(GRAPHICS_MODE, MODE_ATI256_VGA) uses Int 10H to set the video BIOS mode to 62H.

SUCCESS is always returned.

Refer to Appendix C to change the video BIOS number, or to define a new graphics mode.

`mode(FRAME_FIELD, FRAME)` puts the frame grabber in the frame mode.
`mode(FRAME_FIELD, FIELD)` puts the frame grabber in the field mode.

SUCCESS is returned when mode is selected.

`mode(NTSC_OUT, ON)` puts the frame grabber in the NTSC OUT mode.
`mode(NTSC_OUT, OFF)` restores the previous video mode.
`mode(BLANK, ON)` turns off the video picture.
`mode(BLANK, OFF)` restores the video picture.

If you enter the current mode, an error message displays (already blank or already restored).

`mode(SELECT_FRAME, 0)` selects the first of two video frames.
`mode(SELECT_FRAME, 1)` selects the second of two video frames.
Only frame 0 is present on a display-only board, and the error `DISPLAY_ONLY_BOARD` will be returned if the board type is set to `DISPLAY_BOARD` (see Appendix E).

The picture must be grabbed before you can select the frame.

If the picture is live, `PICTURE_NOT_GRABBED` is returned.

`mode(INIT_BOARD, 0)` sends default values out to the eight MV-SPECTRUM registers.

This initialization must be done every time the board is powered up. It should not be necessary to change any of the default values. An explanation of the eight registers is contained in Appendix A.

SUCCESS is always returned.

Return: Except as noted above, these commands all return SUCCESS unless called with a mode or argument not listed above; in this case `ILLEGAL_PARAMETER` is returned.

5.5.3 Adjust

Adjust moves the hue, brightness, contrast, and saturation pots up or down a specified number of clicks ranging from -100 to +100. Negative numbers adjust the pot downward and positive numbers adjust it upward. If the number of clicks is 0, the specified pot is reset to its original level given in `FACTORY.SET`.

Adjustments can only be made in the live mode; a grabbed picture cannot be adjusted.

syntax: short adjust (short pot, short clicks)

adjust (BRIGHTNESS, <number of clicks, -100 to 100>)
 adjust (CONTRAST, <number of clicks, -100 to 100>)
 adjust (SATURATION, <number of clicks, -100 to 100>)
 adjust (HUE, <number of clicks, -100 to 100>)

Return: Adjust returns the error PICTURE_GRABBED and does nothing if the picture is grabbed. ILLEGAL_PARAMETER is returned if the number of clicks is outside the range -100 to 100, or if the pot is not BRIGHTNESS, CONTRAST, SATURATION, or HUE. When the number of clicks is 0, adjust attempts to read the file containing the factory settings. FILE_OPEN_ERROR or FILE_READ_ERROR will be returned in case of error. If the adjustment is made successfully, SUCCESS is returned.

5.5.4 Pan

Pan moves the picture over the screen or the screen over the picture, depending on whether the picture is smaller or larger than the screen.

Syntax: short pan (short x, short y)

The range of values is equal to the screen resolution of the current video mode.

| Mode | x range | y range |
|--------|---------|---------|
| EGA | 0-640 | 0-350 |
| VGA | 0-640 | 0-480 |
| HI-RES | 0-800 | 0-600 |
| TEXT | 0-720 | 0-400 |

For example, to place the upper left corner of a picture zoomed to 1/2 in the VGA mode exactly in the center of the screen, choose the values $x = 320$, $y = 240$.

To pan a VGA picture off the screen, choose the value $x = 640$ with any y value.

CAUTION:

When the picture is zoomed to less than 1x, it cannot be panned below the bottom of the screen in some video modes.

Return: SUCCESS is returned unless the picture is already panned to the limits, or pan is called with an number outside the limits; in this case BAD_PAN_VALUE is returned.

5.5.5 Zoom

Zoom sets the size of the picture to 1/4x, 1/3x, 1/2x, 1x, 2x, and 4x. Zooming to 1/3x cannot be done in the Field mode.

Syntax: short zoom (short which_zoom)

```
zoom ( X1 ) zooms to 1x
zoom ( X2 ) zooms to 2x
zoom ( X4 ) zooms to 4x
zoom ( QUARTER ) zooms to one quarter
zoom ( HALF ) zooms to one half
zoom ( THIRD ) zooms to one third
```

Return: SUCCESS is returned unless a value other than X1, X2, X4, QUARTER, HALF, or THIRD is specified, or a zoom of THIRD is specified when the board is in field mode. In these cases ILLEGAL_PARAMETER is returned. Zooming is not legal with a display only board; the error DISPLAY_ONLY_BOARD will be returned if the board type is set to DISPLAY_BOARD (See Appendix E).

Example: To zoom a VGA picture (live or grabbed) to 1/3, and pan it to the upper right hand corner of the screen:

```
zoom (THIRD);
pan (426, 0);
```

If the vertical resolution is less than 480 pixels, you cannot zoom to 4x.

5.5.6 Picture

Picture saves a picture to a disk file, fetches a picture from a disk file to video memory, initializes the default frame to 0, and puts a label in the file header.

Syntax: short picture (short command, char *name, short conversion)

picture(CLEAR_FRAME, 0, 0) sets the entire current frame to 0, turning the screen black.

SUCCESS is always returned.

picture(ID_TO_HEADER, label, 0) inserts the label into the file header.

picture(PICT_TO_DISK, filename, conversion) writes the picture to the named disk file. The picture may be saved in TGA or TIFF format as well as KCV format.

The extension "KCV", "TGA", or "TIFF" will be added to the filename, depending on the conversion specified.

"Conversion must" be one of these types:

KCV_TO_TARGA_16: Save a color picture on TGA 16 format.

KCV_TO_TARGA_24: Save a color picture in TGA 24 format.

KCV_TO_TIFF_RGB: Save a color picture in TIFF RGB format.

KCV_TO_TARGA_BW: Save a color or black and white picture in TGA black and white format.

KCV_TO_TIFF_GREYSCALE: Save a color or black and white picture in TIFF 8 bit greyscale format.

DEFAULT: Save in KCV format.

Monochrome pictures cannot be saved in color format, but color pictures can be saved as TIF or TGA monochrome pictures.

You can save a picture of any of zoom setting. The extension .KCV is automatically added to the file name.

picture (PICT_FROM_DISK, filename, 0) reads the specified file into the video memory.

The filename must have the extension "KCV", "TIF", or "TGA", or the error "UNKNOWN_FILE_TYPE" will be returned.

TGA files, type 2 and 3, and uncompressed RGB or 8 bit greyscale TIFF files can be read into the framegrabber memory as well as KCV files. If the file to be read is not a supported type, the error UNSUPPORTED_TIFF_FIELD or UNSUPPORTED_TGA_TYPE will be returned.

The error WONT_FIT indicates that the current zoom setting does not match the zoom setting of the picture you are trying to read.

Return: The following error messages may be returned by picture:

FILE_OPEN_ERROR, FILE_READ_ERROR, FILE_WRITE_ERROR, WONT_FIT, NOT_A_KCV_FILE, MALLOC_ERROR, or ILLEGAL_PARAMETER.

SUCCESS is returned if no errors occur.

Example: picture (PICT_TO_DISK, "TIM", KCV_TO_TARGA24);

This command saves the current video buffer to a disk file "TIM.TGA".

5.5.7 Grabprnt

Grabprnt prints the picture with the following parameters:

Syntax: short grabprnt (short x_offset, short y_offset, short x_scale, short y_scale, short angle, short mono_color, short printer_model, short no_copies, short tone_no_tone)

Parameters:

x_offset and y_offset are the offsets on the printed page. A maximum of 4 digits is allowed. The offsets are measured in printer pixels.

x_scale and y_scale determine the size of the picture on the page. These numbers are integers which represent the desired scale; the upper byte represents the whole part and the lower part the fraction. For example, to use a scale of 1.5 multiply 1.5 times

256. The resulting integer, 384, is the number to use to obtain this scale.

angle is either `PORTRAIT` or `LANDSCAPE`. If the angle is `PORTRAIT`, the picture will be aligned vertically on the page. If the angle is `LANDSCAPE`, the picture is rotated 90 degrees on the page.

mono_color is either `COLOR_PRINT`, which produces a color print on a color printer, or `MONO_PRINT`, which produces a black and white picture.

printer_model is `SEIKO_CH5303`, `NEC_P2200`, `HP_LASER_JET2` or `HP_PAINT_JET`.

no_copies is an integer specifying the number of copies to produce. The default is 1; up to 3 digits are allowed.

tone_no_tone is either `TRUE` or `FALSE`. Tone adjustment is a software process that sharpens the contrast on monochrome pictures. Your picture may be printed with or without tone adjust, depending on which seems more appropriate for the particular picture.

`SUCCESS` is returned if no errors occurred.

`PRINTER_ERROR` is returned if the printer could not be accessed or other printer error occurs. (NOTE: in case of certain printer errors, the drivers display an error message and abort, rather than returning to the calling routine.)

`ILLEGAL_PARAMETER` is returned if `grabprnt` is called with a parameter other than those listed above. `MALLOC_ERROR` is returned if `grabprnt` is unable to allocate memory to execute the print algorithms.

`PICT_TO_VGA` (short vga_bits_per_pixel)

Grabs a picture and loads it into the VGA board. This enables you to send the picture to another computer that does not have a `SPECTRUM` board.

5.5.8 `kcv_cut`

`Kcv_cut` saves a selected rectangle of a picture to a disk file, with a specified filename. The extension `.KCV` is added.

Syntax: `short kcv_cut (char *filename, short x_origin, short y_origin, short x1, y1) width`

Example: `kcv_cut ("TIM", 10, 10, 384, 280)`

NOTE:

The X origin + the width cannot exceed 511; The Y origin + the height cannot exceed 479; or the system returns ILLEGAL PARAMETER. To store the portion of the current picture that begins 10 pixels down and 10 pixels in from the upper left hand corner and extends 280 pixels vertically and 384 pixels horizontally to a file called "TIM.KCV":

```
kcv_cut ("TIM", 10, 10, 280, 384);
```

Return: If a file error occurs, FILE_OPEN_ERROR or FILE_WRITE_ERROR will be returned; MALLOC_ERROR indicates not enough RAM; otherwise, SUCCESS is returned.

5.5.9 Convert

Convert translates a picture on the disk to TIFF or TGA format.

Syntax: convert (short conversion, char *name)

```
convert ( KCV_TO_TARGA_16, filename ) converts the .KCV disk file to 16 bit Targa format.
convert ( KCV_TO_TARGA_24, filename ) converts the .KCV disk file to 24 bit Targa format.
convert ( TARGA_16_TO_KCV, filename ) converts a Targa 16 bit file to .KCV format.
convert ( TARGA_24_TO_KCV, filename ) converts a Targa 24 bit file to .KCV format.
convert ( KCV_TO_TIFF_RGB, filename ) converts the .KCV disk file to TIFF RGB format.
convert ( KCV_TO_TARGA_BW, filename ) converts the .kcv disk file to black and white Targa format.
convert ( TGA_BW_TO_KCV_bw, filename ) converts a black and white Targa file to a black and white .KCV file.
convert ( KCV_TO_TIFF_GREYSCALE, filename) converts to 8 bit TIFF greyscale
convert ( KCV_TO_TARGA_BW, filename) converts to Targa type 3 format
```

The filename must include the extension "KCV", "TIF", or "TGA" or the error UNKNOWN_FILE_TYPE will be returned.

return: MALLOC_ERROR, FILE_NOT_FOUND, FILE_READ_ERROR,

FILE_WRITE_ERROR, FILE_READ_ERROR may be returned if there is an error; otherwise SUCCESS will be returned.

5.5.10 kcv_paste

Syntax:short kcv_paste (char *filename, short x_offset, short y_offset)

Example: to read a picture from the disk file "TIM.KCV" into a position 30 pixels from the left edge of the screen and 50 pixels from the top:

```
kcv_paste ("TIM", 30, 50);
```

Return:If a file error occurs, FILE_OPEN_ERROR or FILE_READ_ERROR will be returned; MALLOC_ERROR indicates not enough RAM; otherwise, SUCCESS is returned.

5.5.11 vga_to_pict

Normally only the picture is output from the NTSC output connector. `vga_to_pict` adds the VGA overlay to the picture. There is some reduction in quality since an 18 MHz signal is replaced by a 2 MHz signal, and some compensation should be made in the size of text and the detail of the graphics when using this command. VGA bits per pixel are VGA16 (4) or VGA256 (8).

Syntax: short `vga_to_pict` (short `vga_bits_per_pixel`)

5.5.12 pict_to_vga

`Pict_to_vga` converts the 16.8 million colors in the framegrabber to 16 or 256 colors in the VGA memory. 16 color VGA is a standard VGA card feature, but additional VGA memory is required for 256 color, and there is no standard method of implementation. The 256 color mode is currently supported for the Paradise Professional board, the ATI Wonder board, and the Video 7 VRAM board.

When a monochrome board is installed, this function always converts the picture to 256 shades of gray.

Function "`pict_to_vga`" saves the current video state (using DOS interrupt INT 10) before loading the palette registers. To restore the saved video state, use the function "`restore_vga`".

The board must have been set to the correct video mode before `pict_to_vga` is called, as follows:

```
/* 16 color or monochrome mode */  
mode (GRAPHICS_MODE, MODE_VGA);
```

```
/* ATI Wonder 256 color mode */  
mode (GRAPHICS_MODE, MODE_ATI256_VGA);
```

```
/* Paradise Professional 256 color mode */  
mode (GRAPHICS_MODE,MODE_PP256_VGA);
```

```
/* Video 7 VRAM 256 color mode */  
mode (GRAPHICS_MODE, MODE_V7256_VGA);
```

syntax: short `pict_to_vga` (short `vga_bits_per_pixel`)

ILLEGAL_PARAMETER will be returned if `vga_bits_per_pixel` is not VGA16 or GVA256. MALLOC_ERROR will be returned if memory cannot be allocated. Otherwise, SUCCESS will be returned.

5.5.13 restore_vga

When "pict_to_vga" is called, the current video parameters are saved before being altered. Use this function to restore the saved video parameters.

syntax: short restore_vga(void)
SUCCESS is always returned.

5.5.14 set_jumpers

In most installations, port address jumpers JP1, JP2, and JP3; memory address jumper JP4 (refer to subsection 2.5.1 and Figure 4) are set in default positions. If you need to change these jumpers, you must also change the software settings.

syntax: short set_jumpers (short port, word *memory)

SUCCESS is returned if the call specifies the correct port and/or memory address.

ILLEGAL_PARAMETER is returned if the port or memory address is not a legal one (see Section 2.5.1).

CANNOT_FIND_BOARD is returned if the specified port or memory address does not correspond to the jumper settings.

5.6 LINKING

5.6.1 General

The MV-SPECTRUM drivers are compiled under LARGE MEMORY MODEL. Attempting to link them with objects or libraries that are not LARGE MODEL will cause a link-time or run-time error. If you require another memory model, make the necessary changes in the MV-SPECTRUM source code and recompile it.

To link the drivers to your application:

1. Put the statement "#include "grabhw.h"" at the top of your program.
2. Add the module "MODETABL.C" to your list of modules to be compiled and linked.
3. Include either KCV_TC.LIB or KCV_MS.LIB in your list of libraries.

5.6.2 Linking Examples

Turbo C Environment

Compiling and linking are controlled in the Turbo C environment by the PROJECT file. To compile and link your program "TEST", create the following file called "TEST.PRJ":

```
TEST.C(GRABHW.H)  MODETABLE.C  KCV_TC.LIB
```

Microsoft QUICK C

Compiling and linking are controlled by the MAKE file. To compile and link "TEST", create the following file called "MAKETEST":

```
TEST.OBJ: TEST.C GRABHW.H
QCL /c /AL TEST.C
```

```
MODETABL.OBJ:
QCL /c /AL MODETABL.C
```

```
TEST.EXE: TEST.OBJ MODETABL.OBJ
LINK/EXEPACK/STACK:8192 TEST+MODETABL,,,KCV_MS.LIB
```

Type "MAKE MAKETEST" from the command line to compile and link program "TEST".

5.7 COMPILER DEPENDENCY

The MV-SPECTRUM drivers have been compiled to ANSI standards using both Microsoft Version 5.1 and Turbo C Version 2.0. Parts of the code that are not ANSI standard, or which require different syntax depending on the compiler used, have been separated out into the file "DEPEND.C". If you want to compile the source code using a compiler other than Microsoft or Turbo C, make the changes due to compiler dependency in this file.

DEPEND.C consists of a number of "#ifdefs". First change the initial statement, which says:

```
#define TURBOC 1 or
#define MICROSOFT 1
to
#define MYCOMPILER 1
```

Next insert the function calls that your compiler uses for each of the functions in `DEPEND.C`, and compile to `DEPEND.OBJ`.

Finally, compile and link the remaining `MV-SPECTRUM` modules. If you want to link in a library of object modules rather than each separate object module, use your compiler's library manager to create or update the driver library.

CHAPTER SIX

TROUBLESHOOTING

6.1 GENERAL

This chapter lists the problems you may encounter when you first install the MV-SPECTRUM system, or when you are modifying drivers and using the system. This equipment receives an NTSC signal from an external source, and the data is processed and displayed on a computer monitor. The screen contents are put into a graphics file by the SPECTRUM adapter, and the video and graphics image may be output to a printer, VCR, or remote monitor. If a problem develops, you must examine all equipment for signs of failure, not just the MV-SPECTRUM adapter.

MV-SPECTRUM was tested at the factory before shipment, and should be working properly. Most problems are caused by faulty installation, such as wrong jumper settings, or cables not connected correctly.

This product is designed to conform to IBM PC-AT specifications. Your computer hardware may not be fully compatible with these standards, with respect to clock rate, bus rate, wait state, etc., and this may affect the performance of the system.

6.2 SYMPTOMS, POSSIBLE CAUSES, AND REMEDIAL ACTION

The tables in this chapter list the symptoms that indicate a problem and give a possible cause. The possible causes given here all relate to the MV-SPECTRUM hardware or software. If the fault is not found, then the problem may be in the computer or external equipment.

6.3 RETURN AND REPAIR

Warranty conditions are shown at the beginning of this manual. If the cause of the problem cannot be identified, contact your distributor.

6.4 CONTROLLER HAS A BLANK DISPLAY

Table 6-1 Controller has a Blank Display

| Possible Cause | Remedial Action |
|-------------------------------------|---|
| Sync Polarity set incorrectly. | Set Jumpers JP6 and JP7 on the SPECTRUM adapter, see Figure 4 and refer to Table 2-2. |
| Default BIOS number not compatible. | Default numbers 10H (EGA); 12H (VGA); 58H (Hi-Res); 03H (Text) may not be compatible with your VGA adapter. Refer to Section 4.3. |
| Your computer not compatible. | The clock rate, bus rate, or wait state may cause timing problems. Call MetraByte Customer Service. |
| No video source signal. | <p>Check the video source equipment.</p> <p>Check that the video input cable is connected to the VIDEO IN connector on the SPECTRUM adapter, see Fig. 5.</p> <p>Check that the Video Feature cable is connected properly, see Figure 5.</p> |

6.5 POOR VIDEO PICTURE

There are several things that may cause a poor video picture, not related to the MV-SPECTRUM board. Some monitors are designed for computer applications such as Computer Aided Design, and do not display NTSC signals well. Monitor color is controlled by the switch settings at the rear of the monitor, which may be set incorrectly. Live pictures may be too dark for the camera, especially those with limited light sensitivity (LUX values above 7).

Table 6-2 A Poor Video Picture.

| Possible Cause | Remedial Action |
|---------------------|--|
| Poor color balance. | Monitor controls for contrast and brilliance set incorrectly. Reset these controls. Software controls in the Grabtest program (brightness, contrast, hue, saturation: out of range). Restore these values or set them to their original values, refer to paragraph 3.3.1 (J). Your monitor may not display the full color range. |

6.6 GRABTEST FILE DOES NOT DISPLAY PROPERLY

6.6.1 General

The Grabtest display may have random characters or other display imperfections.

Table 6-3 Random characters in the Grabtest Operating Menu.

| Possible Cause | Remedial Action |
|---------------------------------------|--|
| ANSI.SYS file not properly installed. | Copy ANSI.SYS into the root directory (C:\) and add the item "device=ANSI.SYS" into the CONFIG.SYS file. |

6.7 USING THE CAMERA CORRECTLY

The quality of the video image depends on the lighting, camera light range (LUX value), lens, aperture and speed settings. All of these factors must be set to suit the type of subject, and its motion (if any).

If light levels are low, you must open the lens diaphragm (lower f-number), but remember that the larger the diaphragm opening gives a narrower the depth of field, and the possibility of over-exposure. When the light is extremely bright (beach and snow scenes, for example) the shutter speeds must be fast enough to avoid over-exposure.

Some subjects require polarizers to filter glare. Polarizers are used in front of the lens like ordinary filters, and partly or completely remove unwanted glare and reflections. The degree of reduction depends on the angle of the reflected light. At angles of approximately 30 degrees, glare reduction is more or less complete; at 90 degrees, glare is not affected at all. In between these values, glare is more or less eliminated. A polarizer only removes glare consisting of already polarized light. Most surfaces polarize light as they reflect it, such as water, glass, paint, varnish, polished wood, glossy paper. Metallic surfaces do not polarize light as they reflect it, and consequently highlights, reflections and glare from metallic surfaces cannot be reduced by polarizers.

The subject must be lit properly to receive a good quality image. Most subjects can be lit adequately with two lamps - a main light that sets the key for the illumination, and a fill-in light, which illuminates the shadows cast by the main light. If an additional lamp, an accent lamp for highlights and sparkle, is available, anyone with a feeling for light should be able to arrange a thoroughly professional illumination.

Photo floods (tungsten lamps) are incandescent bulbs of about 250 or 500 watts. Most photo floods are housed in aluminum reflectors; "reflector" floods have their own reflectors built into the bulbs and need no separate reflectors. Both give a bright but soft and even light and are equally suitable as main lights or as fill-in lights. If used with a diffuser (made of transparent drafting paper or spun glass) their light is practically shadowless; this is particularly desirable for fill-in purposes to avoid criss-crossing shadows.

Balanced lighting equipment is absolutely essential to light the scene evenly. A spotlight that is too weak or too powerful in comparison to the photo floods with which it is used is practically valueless. An excellent combination consists of two photo-floor lamps of 500 watts each and one 250- or 500-watt spotlight. Spotlights of less than 250 watts do not have any practical value except when used with small table-top setups. To "balance" the light of the two photo floods, place the one acting as the main light relatively close to the subject and slightly to one side; place the fill-in light about twice as far from the subject, as close as possible to the lens axis and slightly higher than the camera. Finally, use a spotlight as back lighting for adding sparkling highlights.

Illumination accentuates the forms and characteristics of the subject, creating an illusion of space and depth. The greater the contrast of light and shadow, of white and black, the stronger the illusion of depth. Conversely, less contrast of light and shadow, the flatter the appearance of the picture. It is up to the photographer to select the correct level of illumination to produce the desired effect.

APPENDIX A

MV-SPECTRUM REGISTERS

A.1 GENERAL

The MV-SPECTRUM uses eight write-only registers to control the functions of the system. The functions of these registers are:

| Bit Register 0 | Register 1 | Register 2 | Register 3 |
|------------------|----------------|-------------|-----------------|
| Horizontal Delay | Vertical Delay | Combo Reg 0 | Synthesizer No. |
| 7 HD7 | VD7 | POTCLOCK | SYNTH. |
| 6 HD6 | VD6 | DM1 | FREQ. |
| 5 HD5 | VD5 | DM0 | NUMBER |
| 4 HD4 | VD4 | POTUPDN | |
| 3 HD3 | VD3 | POT3 | |
| 2 HD2 | VD2 | POT2 | |
| 1 HD1 | VD1 | POT1 | |
| 0 SLOW | VD0 | POT0 | |
| Bit Register 4 | Register 5 | Register 6 | Register 7 |
| Combo Reg 1 | Serial Access | Mem In | |
| 7 LIVEGRAB | "0" | VERTICAL | HORIZONTAL |
| 6 DM3 | SAMIN | START | START |
| 5 FMCLR | ADDR | ADDRESS | ADDRESS |
| 4 FMPRES | | | |
| 3 DM2 | | | |
| 2 BANK2 | | | |
| 1 BANK1 | | | |
| 0 BANK0 | | | |

The hardware uses a number called the display mode to control many of its functions. The display mode functions according to the following table:

| Display Mode No | Zoom Factor | Frame/Field | AB Mode |
|-----------------|-------------|-------------|---------|
| 0 | 4x | Frame | AB |
| 1 | 2x | Frame | AB |
| 2 | 1x | Frame | AB |
| 3 | .5x | Frame | AB |
| 4 | .33x | Frame | AB |
| 5 | .25x | Frame | AB |
| 6 | spare | | |
| 7 | NTSC out | Frame | AB |
| 8 | 4x | Field | AA |
| 9 | 2x | Field | AA |
| a | 1x | Field | AA |
| b | .5x | Field | A |
| c | blank | | |
| d | .25x | Field | B |
| e | 2X | Field | BB |
| f | 1X | Field | BB |

A.2 REGISTER ACCESS

The MV-SPECTRUM memory supports access in 16-bit words. 8-bit word access and DMA are not supported.

APPENDIX B**DEFINING OR CHANGING A NEW GRAPHICS MODE****B.1 GENERAL**

The parameters for different video graphics modes are found in `MODETABL.C`. Five video graphics modes are defined in `MODETABL.C`:

EGA (640 x 350), VGA (640 x 480), ATI VGA 256 Color (640 x 480); high resolution (800 x 600), and Text (720 x 400). There are nine parameters for each video mode:

the BIOS mode number, the synthesizer number, the slow bit, the horizontal screen resolution of the video mode, the vertical screen resolution of the video mode, the initial horizontal delay pan register, vertical delay pan register, initial horizontal start address, initial vertical start address.

The BIOS mode number is a number used by a particular video card to set it in a certain mode. These numbers vary with the video board used. The mode numbers used by the drivers are 10H for EGA, 12H for VGA, 62H for ATI VGA 256 Color, 58H for high resolution, and 03H for Text.

The synthesizer number determines the width of the picture. Legal values are 80 - 170.

The slow bit is set to 1 to divide the synthesizer frequency in half.

The horizontal and vertical screen resolution numbers are the pixel numbers for the video graphics mode.

The initial horizontal and vertical pan delay register numbers define the location of the top left of the picture on the screen for pictures zoomed to 1x or less.

The initial horizontal and vertical start address register numbers define the location of the top left of the picture on the screen for pictures zoomed to 2x and 4x.

The drivers use the following enum (found in "grabhw.h") as an offset into the mode table:

```
typedef enum {MODE_EGA; MODE_VGA; MODE_HI_RES; MODE_TEXT;  
MODE_AT256_VGA} graphics_modes;
```

B.2 CHANGING A PARAMETER

To change a parameter for one of the existing video graphics modes (MODE_EGA, MODE_VGA, MODE_HI_RES, MODE_TEXT, or MODE_ATI256_VGA), change the appropriate value in module MODETABL. Re-compile MODETABL and re-link your application (see Section 8.4).

B.3 ADDING A NEW VIDEO GRAPHICS MODE

1. Add the nine new parameters to the bottom of the array mode_table. For example:

```
{/* video_bios_mode */ 0x099,  
/* synth_no          */ 145,  
/* slow_bit          */ 0,  
/* hor screen res    */ 1056,  
/* vert screen res   */ 400,  
/* init hpd reg      */ 254,  
/* init vpd reg      */ 246,  
/* init hsa reg      */ 0,  
/* init vsa reg      */ 0},
```

2. Add the new mode to the enum in grabhw.h. For example:

```
typedef enum { MODE_EGA, MODE_VGA, MODE_HI_RES, NEW_MODE,  
MODE_ATI256_VGA } graphics_modes;
```

The drivers will use NEW_MODE to point to the new entry in mode_table.

3. Recompile and link MODETABL and your application. See Section 8.4 and 8.5 for instructions on linking and compiling.
4. To set the new mode, use the command mode (GRAPHICS_MODE, NEW_MODE) in your application.

APPENDIX C**FILE FORMATS****C.1 GENERAL**

The .kcv picture file format consists of a header, which is the same size for all pictures, followed by data, which varies in length depending on the size of the picture. The data consists of sets of four bytes, each set containing GREEN-RED-GREEN-BLUE. The largest pictures have 491520 bytes of data.

C.2 FILE STRUCTURE

The file has the following structure:

| | |
|--------------------|---|
| byte idSize; | size in bytes of image identification label |
| byte spare0; | not used. |
| byte colorType; | =128 for GRGB 8-8-8-8 |
| byte spares[5]; | not used. |
| word Xoffset; | upper left corner x coord. |
| word Yoffset; | upper left corner y coord. |
| word width; | width of image. |
| word height; | height of image. |
| byte spare1; | not used. |
| byte spare2; | not used. |
| char imageID[255]; | ASCII image identification label. |

APPENDIX D

MULTIPLE VIDEO IMAGES

D.1 GENERAL

You may display two or more video images on the monitor screen at the same time. Each video image requires a MV-SPECTRUM adapter, and the software must control each adapter separately.

When two or more boards are displayed on the monitor with the same zoom and pan settings, the picture from the adapter last initialized by the software will be on top. To view the pictures separately, zoom them to less than 1x, and pan them to separate locations on the monitor. You may also zoom the top picture to less than 1X and view it over the other picture(s).

Each adapter in use must have a structure defined for it in the application in the MODE module. You must define the structure for each additional adapter.

D.2 SWITCHING FORM ONE IMAGE TO ANOTHER

To switch from one image to another, assign the structure pointer "boardptr" to the board you want to control, as follows:

Initialize and pan two_boards

```
#include "grabhw.h" /* Constants & protos used by the drivers */
```

```
extern board *boardptr; /* pointer to currently active board */
```

```
extern board board0; /* Structure for 1st board defined in MODE*/
board board1 = { /* Define a structure for second board */
```

```

    /* kcvmode                */ /* MODE_VGA,
    /* video_bios_mode        */ /* 0X012,
    /* slow_bit                */ /* 0,
    /* mirror[NO_REGS]        */ /* 250,
    /* Horizontal pan delay register */ /* 240,
    /* Vertical pan delay register */ /* 0x40,
    /* Combo register 0        */ /* 0xAA,
    /* Synthesizer frequency register */ /* 0xb0,
    /* Serial Access Memory Address reg */ /* 0x00,
    /* Vertical Start Address register */ /* 0x00,
    /* Horizontal Start Address register */ /* 0X00,
    /* grab_port                */ /* DEFAULT_PORT_ADDR,
    /* grab_mem                  */ /* DEFAULT_MEMORY_ADDR,
```



```
    /* frame_field          */ FRAME,
    /* last_zoom            */ X1,
    /* zoom                 */ X1,
    /* blank_mode           */ OFF } ;

void main () {short error;

boardptr=&board0; /* INITIALIZE THE FIRST BOARD */

if ((error=set_jumpers(0x2e0, (word*)0xc8000000))<SUCCESS)
    printf("%s",error_print (error));
else {
    mode(GRAPHICS_MODE, MODE_VGA);
    mode(INIT_BOARD,0);
}

boardptr=&board1; /* INITIALIZE THE SECOND BOARD */

if ((error=set_jumpers(0x2e8, (word*)0xd8000000))<SUCCESS)
    printf("%s",error_print (error));
else {
    mode(GRAPHICS_MODE, MODE_VGA);
    mode(INIT_BOARD,0);
}

/* Zoom the top picture to 1/3 */
if ((error=zoom(THIRD))<SUCCESS) error_print(error);

/* Zoom the bottom picture to 1/3 and move it to upper left corner */

boardptr=&board0; /* Assign boardptr to the first board */
if ((error=zoom(THIRD))<SUCCESS) printf("%s",error_print(error));
if ((error=pan (340, 0))<SUCCESS)printf("%s",error_print(error));
getch();
}
```

APPENDIX E

MONOCHROME AND DISPLAY ONLY BOARDS

The monochrome board has half as much RAM as the color board; the video is black and white. Pictures saved to disk are half the size of the equivalent color pictures.

The display-only board also has half as much RAM as the color board; the memory for the second frame is missing. The display-only board displays color or monochrome pictures, but has no live video functions.

The default board type is a color board.

Software written for the display-only board must initialize a variable in the "board" structure for a monochrome or display only board. This can be done in two ways:

1. Include this code at the beginning of your application:

```
extern board *boardptr;  
boardptr->board_type=board_type();
```

The function `board_type()` determines what kind of board is installed, and returns `COLOR_BOARD`, `MONO_BOARD`, or `DISPLAY_BOARD`.

2. You can set this variable directly if you are sure the software will never be running with more than one board type -

```
extern board *boardptr;  
boardptr->board_type=MONO_BOARD;  
    or  
boardptr->board_type=DISPLAY_BOARD;
```

Functions not supported for the display board:

The display board will not zoom; the picture size is always 1X.

Live video is not allowed.

Switching to the second frame is not allowed.