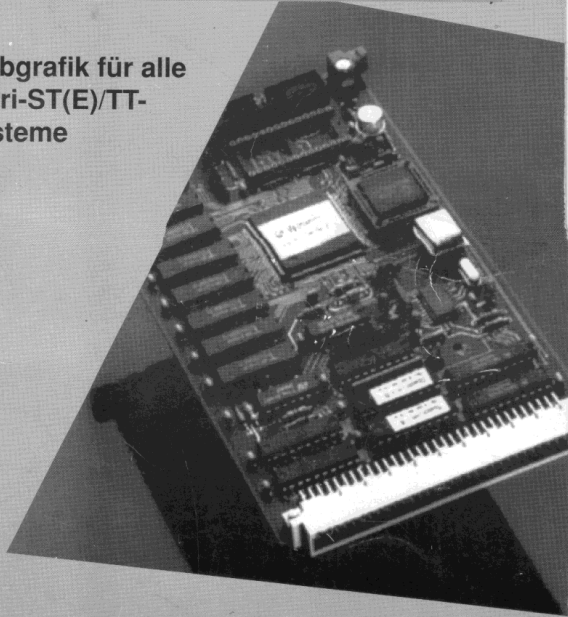


⊗ Wilhelm Mikroelektronik GmbH

Spektrumgrafikkarte

Farbgrafik für alle
Atari-ST(E)/TT-
Systeme



Spektrum Graphics Adapter

Color graphics for all
Atari-ST(E)/TT-Systems

User's Manual

English translation by Marcel Schön, Switzerland, 2013

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Hardware Installation

Installing the Spektrum graphics card is very easy. Below are the descriptions of how to insert the card into the various types of computers.

Installation requires only a small screwdriver with a cross slot and a regular screwdriver. Should you have any doubts about your mechanical skills, we recommend having the card installed by a local specialized dealer. Especially if your computer is a Mega ST, the sometimes required re-synchronization of the power supply should be done by an expert.

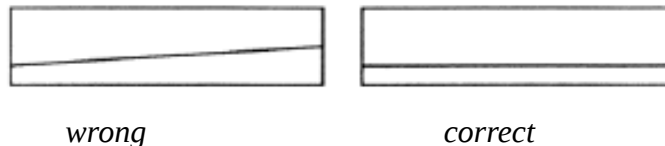
Naturally, the computer must be switched off before performing any hardware installation work. Please pull the power plug first!

Installation in a Mega STE

For the installation in a Mega STE, the protection cover of the VME bus slot must be removed first. The cover is labeled "VME" and held in place by two screws.

As soon as these screws are loose, the cover can carefully be removed by pulling it backwards. Behind it is the VME slot with slide-rails to both sides. Slide the card in these rails, horizontally, with the electronic parts (ICs etc.) upwards.

The VME slot from the side:



The card should be pushed without excessive force until its side-panel properly aligns with and closes the computer case. Fix the cards position with the two screws on both sides of the panel.

Installation in a TT

For the installation in a TT, the protection cover of the VME bus slot must be removed first. The cover is labeled "VME" and held in place by two screws.

As soon as these screws are loose, the cover can carefully be removed by pulling it backwards. There are two connectors for serial ports attached to this panel; remove them completely, or place them somewhere else in the TT case. Behind it is the VME slot with slide-rails to both sides. Slide the card in these rails, horizontally, with the electronic parts (ICs etc.) upwards.

The card should be pushed without excessive force until its side-panel properly aligns with and closes the computer case. Fix the cards position with the two screws on both sides of the panel.

Installation in a Mega ST

The installation in a Mega ST is more complicated. It is recommended to have a specialist do this, because doing it yourself may void your warranty.

The details of how to do this can be found in the original, german manual.

Software Installation

When using the Spektrum graphics card, a harddisc (HDD) is recommended as well. This chapter will explain how you can install the Spektrum software using the installation program. The Spektrum graphics card can be using with a harddisc drive as well as with a floppy disc drive. But in any case a special driver software is required for the operating system to be able to use the card.

Installation with only one floppy disc drive

The Spektrum software can also be launched from a floppy disc drive. The included original disk is pre-installed, so that you can boot the Spektrum software from it.

This requires a standard VGA monitor, more precisely, the TT color monitor PTC 1426.

In case you are using a different monitor without multisync-capacity, an appropriate timing must be created, or another monitor-timing-file (.INF) be renamed to SPEKTRUM.INF and copied into the AUTO folder.

Using the installation program

The installation will be considerably easier when using a harddisc drive (or something similar). In that case, just insert the Spektrum floppy disc into your floppy disc drive and launch the program INSTA256.PRG, INSTA_HC.PRG, INSTA_HR.PRG or INSTA_TC.PRG, respectively (depending on the type of your graphics card).

The menu line consists of the following options:

- “SPEKTRUM”: Shows the copyright message of the Spektrum installation and accessories.
- “Datei” (“File”): Shows the following entries
 - “Neu” (“New”): Shows a dialog that allows to start the installation; “Install beenden” (“End installation”): The program exists.
- “Extra”: Shows the following entries
 - “Hilfe” (“Help”): Shows the online help.

Using the help function

The help function can be used either with the mouse or the keyboard.

You can click on underlined entries to see more information about the selected word

By clicking on “<<<” you return to the previous word.

An overview of the existing keywords of the “Help”-function can be found in the keyword index (“Stichwortverzeichnis”).

The “Help” function can also be used by keyboard:

- “Undo”: Shows the help text for the previously selected keyword
- Cursor keys: Scrolls the window content around
- Cursor keys + CTRL: Scrolls the window contents by a half page.

If additional fonts were installed through GDOS, to additional keys can be used:

- “<” and “>”: Switch between the fonts. Only non-proportional fonts will be used.
- “+” and “-”: Changes the font size.

Installation keyboard usage

Menu options can also be triggered through the keyboard. Each keyboard shortcut is listed at the corresponding menu option.

The “^”-character means that the specified key must be pressed together with the CTRL key.

Menu option “SPEKTRUM”

- CTRL-I: program information

Menu option “Datei” (“File”)

- CTRL-N: New, perform installation
- CTRL-Q: Quit, end program

Menu option “Extra”:

- Help

Other keys:

- “Esc”: Show window contents
- Cursor keys: scroll window contents
- Cursor keys + SHIFT: scroll window contents horizontally
- Cursor keys + CTRS: scroll window contents by a half page
- “Home”: Jump back to the beginnin in the upper left corner of the window
- “+”: Magnifier
- “0”: Normal size
- “-”: Overview
- “*”: Fullscreen size
- CTRL-W: Switch between windows
- CTRL-U: Close window

Alert boxes can also be handled with keyboard shortcuts:

- “1”: Select the first button
- “2”: Select the second button (if available)
- “3”: Select the third button (if available)
- “Undo”: Select “Cancel” button (if available)

A button with a bold border can be selected by pressing the “Return” key.

In dialog windows, an underlined character in a button label signals which key to use to select that button, e.g. “S” for “Start”.

Another important fact is the type of function that correlates with a certain button, e.g. the key “Undo” for “Cancel”, the key “Delete” for “Löschen” (“delete”) or the key “Help” for “Hilfe” (“help”).

It is possible that multiple keys may trigger the same function, e.g. cursor keys and “+” or “-” to move a scrollbar in a window.

Functions that can be triggered through the mouse.

Left mouse button:

- left upper window corner: close window
- upper window border: move window
- right upper window corner: maximize window
- scroll bar: scroll window contents
- lower right window corner: change window size

Right mouse button:

- in a window: move window contents
- lower right window corner: change window size
- window border: move window

By keeping the right mouse button pressed, even inactive windows can be used. When using only the left mouse button, only the top window will be used, or a lower window will be brought to top (foreground).

Using the Spektrum installation form

The installation program copies all the required files of the Spektrum software to the correct locations on the harddisk drive. To start the installation, select the menu option “Neu” (“new”) under the main menu option “Datei” (“file”).

This will trigger a form with the following setup options:

- “Monitor-Typ” (monitor type): Name of the INF-file which will be installed afterwards under the name “SPEKTRUM.INF” in the “AUTO”-folder.
- “Boot-Laufwerk” (boot drive): The harddisk partition which contains the AUTO-folder and the accessories, and where the ASSIGN.SYS file is located. Usually, drive “C” is the boot drive.
- “GEMSYS-Pfad” (GEMSYS path): The location of the directory which contains the fonts and VDI drivers.
- “CPX-Pfad” (CPX path): The directory where the control panel of Atari, “XCONTROL.ACC”, loads its CPX-modules from. Usually, this folder should be named “C:\CPX”.

Normally it is not necessary to change any settings here except for selecting the monitor type, because the installation program detects the settings automatically, or (if the directory locations cannot be determined) sets default values, which will then be used during the installation.

The installation starts as soon as the “Start”-button on the installation form is selected.

Firstly, the GEMSYS-folder will be created if necessary, and all Spektrum VDI drivers will be copied into that folder.

For the Spektrum-1 card it's the file “SPEK_256.SYS” for the 256-color mode. For the Spektrum-HC card, also the file “SPEK_HC.SYS” for the HiColor-mode is copied.

For the Spektrum-TC card the file “SPEK_TC.SYS” is copied as well for the TrueColor mode.

Furthermore, the file “VDI.SYS” is copied into this folder as well.

Secondly, the “AUTO”-folder will be created if necessary, and the files

- SPEKTRUM.PAL,
- SPEKTRUM.INF,
- SPEKTRUM.PRG,
- SYSTEM08.FNT,
- SYSTEM09.FNT and
- SYSTEM10.FNT

will be copied into that folder.

Thirdly, the folder “CPX” will be created if necessary, and the control panel modules “SPEKTRUM.CPX” and “TIMING.CPX” will be copied into it.

Afterwards the file “ASSIGN.SYS” will be created in the root level of the boot partition.

Finally, the GDOS "AMCGDOS.PRG" will be copied into the "AUTO" folder and the control panel "XCONTROL.ACC" in the root level of the boot partition.

This concludes the installation.

If the installation finds files what would be overwritten during the installation process, an alert dialog box appears with three options:

- "Ersetzen" ("replace"): The new file will be created, and the old file will be backed up into a sub-directory name "OLD".
- "Weiter" ("continue"): The new file will not be created, the old file remains unchanged. There is one exception, the "ASSIGN.SYS" file; if "Weiter" is selected for this file, the existing file will not be replaced, but the contents of the new file will be merged into it, so that the previously installed printer drivers and fonts remain unchanged.
- "Abbruch" ("cancel"): The installation will be cancelled. **ATTENTION:** An incomplete installation can result in a non-bootable system. So, one should either perform the complete installation process again, or restore the previous system state, using the files that were backed up into the "OLD" subdirectories.

Testsoftware

For the Spektrum graphics cards, the test software is not a separate application; the test functionality is integrated into the installation program.

Under the menu option “Extra” is, besides the “Hilfe” (“help”) option, an option for the card testing functionality. Details about it can be found in the “LIESMICH.TXT”-File (“readme”) on your original floppy disk.

Choosing a monitor

The following monitors are available (depending on the version of the software, some of the monitors could be missing, or additional ones could be available). Please check the “LIESMICH.TXT”-file (“readme”) on your original floppy disk; this file also contains a mapping from monitor type to filename.

- Standard VGA
- Acer 7015
- Miro C1766
- Miro C2166
- Atari PTC 1426
- Atari SC1224
- Eizo 9070
- Eizo 660
- Eizo 6500
- Eizo 9500
- NEC 3FG
- NEC 4FG
- NEC 5FG
- NEC 6FG
- Sampo 1466D
- Sampo 1566D
- Sampo 1766D
- Samsung Syncmaster 3

Should your monitor not be among those mentioned here (i.e. not among those on your floppy disk), you may create a matching file yourself.

Installation of Charly-Image-software

Each Spektrum graphics card comes with a demo-version of the software “CharlyImage”. This software allows to demonstrate the capabilities of the graphics card. By using the original floppy disk, you may simple launch the software; it is completely installed ready-to-use on the floppy disk.

When using a harddisc drive, the contents of the entire floppy disk can just be copied into any folder on the harddisc.

It is also possible to start the “CharlyImage” tool with some parameters. This means that you can register this application for certain file types, such as “*TIF”.

You may images in all common file formats display on the cards with the maximum number of colors. The software supports the following formats:

- TIFF 5.0
- Windows BMP
- GIF
- Sun-Rasterfile
- GEM-Image
- STAD
- Degas PI1/PI3
- JPEG
- Spectrum 512
- TINY
- raw monochrome data
- raw RGB data
- Targa
- VORT-PIX
- PPM-/PGM
- ICM
- and others depending on the program version...

Using the software

Most GUI elements of the Spektrum software are implemented as CPX accessories. They will be installed by the Spektrum installation software.

The Timing control panel

With the help of the “Timing” control panel you can use almost any monitor with the Spektrum graphics card. It allows to freely change many parameters of the video signal created by the card. This way, even fixed-frequency monitors can be used with the Spektrum card.

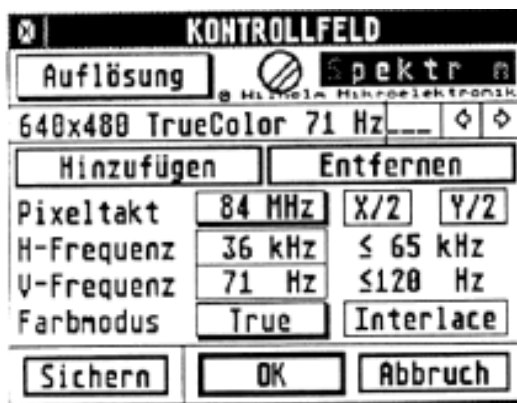
Should you have a very exotic monitor or simply want to use a very special resolution or picture frequency, the timing-editor for the Spektrum card can be used. It is a CPX accessory and can be invoked at any time.

Within the timing control panel there are four work pages. Use the pop-up menu in the upper left corner to switch between these work pages. It is also possible to switch between the four pages using the F1 to F4 keys.

On the first page, an arbitrary name can be given for every setting. If you don't want to think of a name for yourself, it's also possible to just click on the name area with the mouse, and the program will offer a name created based on the selected resolution parameters.

The arrow symbols can be used to switch between the predefined resolutions. The currently preselected resolution will be displayed in blue color on color monitors.

The software always manages a list of video timings, and allows to add and remove entries in this list by clicking on the buttons “Hinzufügen” (“add”) or “Entfernen” (“remove”) below the name area:



Auflösung = resolution

Hinzufügen = add

Entfernen = remove

Pixeltakt = pixel cycles / speed

H-Frequenz: horizontal frequency

V-Frequenz: vertical frequency

Farbmodus: color mode

Sichern = save

OK = confirm

Abbruch = cancel

Below these buttons, the selected horizontal and vertical frequency are displayed, as well as their respective allowed maximum values (as accepted by the monitor). The buttons “X/2” and “Y/2” enable special effects. With “X/2”, every pixel doubles in width, i.e. the card works with the pixel frequency cut in half. With “Y/2”, every screen line will double; this is useful for zoom functions.

Two other pop-ups allow to switch between different color modes and pixel frequencies. Depending on the type of card, the following options are available:

- 256 colors (palette colors)
- HiColor (65536 colors)
- HiColor 2 (32768 colors)
- TrueColor (16.777.216 colors)
- HiRes (16 colors)
- Monochrom (2 colors)
-

The available frequencies also vary from card to card. The HR- and the TC-card offer slightly higher maximum frequencies.

The second page shows the resolution parameters. Here, all the usually changed settings can be configured.

Timing		Spektr	
Bildgröße	Breite:	Höhe:	
Virtuell:	672	512	
Total :	693	508	
Sichtbar:	640	480	
Bildlage	Start:	Länge:	84 MHz
H-Sync: -	568	80	35.90 KHz
V-Sync: -	481	5	70.664 Hz

Bildgröße = picture size
Breite = width
Höhe = height
Virtuell = virtual
Total = total
Sichtbar = visible
Bildlage = picture position
Start = start
Länge = length
Sichern = save
OK = confirm
Abbruch = cancel

In the upper area, the virtual resolution for horizontal and vertical directions can be configured (“Virtuell”). Invalid values will be marked with red color.

Below, the resolution can be configured on which the timing is based (“Total”). This is the time that includes showing the video picture, including the sync- and blank-signal.

Below that, the visible resolution (“Sichtbar”) is configured for both directions (horizontally and vertically).

The picture position (“Bildlage”) is controlled by the sync- and blank-signal. Also, the length of these impulses can be adjusted. Some monitors can handle short impulses, other monitors require longer impulses. With shorter impulses, the image position can be changed in larger areas. If the impulses are too short, it is possible that the picture cannot be synchronized correctly.

To the right of these settings, the pixel frequency can be selected. The horizontal and vertical frequencies are a result of all these parameters and will be calculated by the control panel and displayed below the pixel frequency.

With the “Test”-button you can test the newly configured settings. There are four different options:

- “Desk” - The desktop will be displayed with the new settings, as long as the left mouse button is kept pressed.
- “Bild” (“picture”) - Like “Desk”, but a test picture instead of the desktop will be displayed.
- “Set!” - The parameters will be accepted and activated, and will remain active until the next reset / reboot.
- “Demo” - Like “Bild”, only that a little animation will be started that also provides an impression of the performance of the graphics card.

Should you accidentally set a resolution that the monitor cannot synchronize with the “Set!” option, press F10 to revert to the old settings.

As long as the “Test”-button is kept pressed, the right mouse button allows to adjust the image position (“Bildlage”). With the plus-/minus symbols, the polarity of the sync-signals can be reversed. VGA monitors use this to detect the video mode and change some of the video settings for the picture size on a CRT tube.

“OK” accepts the settings, but only with “Sichern” (“save”) will they also be used when the system is rebooted again. “Sichern” will copy the required VDI driver to VDI.SYS, and adapt the SPEKTRUM.INF file accordingly.

The third page is a special page for the horizontal timing. Here, all parameters of the controller can be freely configured.

KONTROLLFELD			
H-Timing		Spektr	
Gesamt :	260	Desk	
Sichtbar:	240	Test	
Blank :	213	Länge:	47
Sync :	213	Länge:	30
			◇◇
			◇◇
Sichern		OK	Abbruch

Gesamt = total
Sichtbar = visible

Sichern = save
OK = confirm
Abbruch = cancel

In the lower area are graphical representations of the blank- and sync-area. The configured values will not be validated at all (beware of frying your monitor).

The fourth page is also a special page – for the vertical timing. Here, all parameters of the controller can be freely configured.

KONTROLLFELD			
V-Timing		Spektr	
Gesamt :	508	Desk	
Sichtbar :	480	Test	
Blank :	480	Länge :	26
Sync :	481	Länge :	5
			◇◇
			◇◇
Sichern		OK	Abbruch

Gesamt = total
Sichtbar = visible

Sichern = save
OK = confirm
Abbruch = cancel

In the lower area are graphical representations of the blank- and sync-area. The configured values will not be validated at all (beware of frying your monitor).

Creating a new timing

To create a new timing, follow these steps:

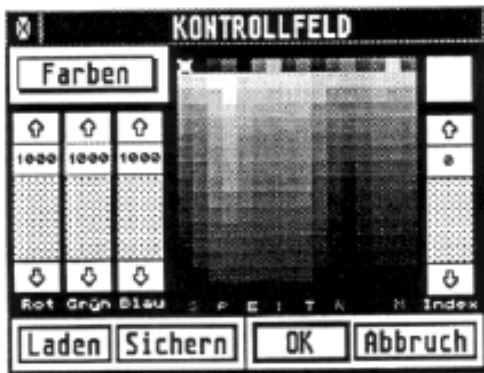
- Configure the visible resolution that you want – the monitor should be capable of displaying it.
- Then select a color mode. Afterwards, a matching pixel frequency must be chosen. In the HiColor mode, it must be twice as high, and in the TrueColor mode three times as high as the speed of the pixel rendering. Therefore, when you use the same videotiming with 256 colors and with HiColor mode, you will get only half the horizontal resolution in the HiColor mode, because rendering a pixel requires two pixel cycles. The pixels would then be twice as wide.
- The horizontal frequency must have a value supported by the monitor and corresponding to the pixel frequency. This can be done by changing the horizontal “Total” value or the vertical “Total” value. The vertical “Total” value must also be set to a value accepted by the monitor.
- In the meantime, the resolution can be tested with the “Test”-button. This works with only one or with two connected monitors. In the single-monitor setup, the old video parameters will be saved.
- Please note: With standard VGA monitors, the polarity of the sync signals is important!

The color control panel

The colors of the Spektrum card can be freely adjusted in all modes. There is an accessory that can be invoked at any time to do this. The color control-panel is a CPX-accessory, so it consumes memory only when it is actually used. Details about its installation can be found in the instructions for your control-panel.

Changing the color palette

The control-panel provides two pages for adjusting the colors. They can be selected with the F1 or F2 keys or with the mouse, through a pop-up menu.



Farben = colors

Laden = load

Sichern = save

OK = confirm

Abbruch = cancel

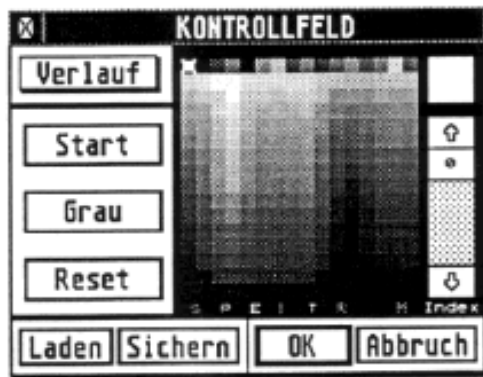
On the preselected page 1, all colors are listed in the area to the right. Depending on the mode, the palette contains up to 256 colors. The scrollbar to the right allows to select a certain entry. This can also be done by clicking on a color entry with the mouse. The currently selected color is shown in the upper right corner in a somewhat larger box.

The three sliders on the left side allow to define the selected color. With them, the red-, green- and blue value of the color can be adjusted independently.

In the 256 color mode, changes will become visible immediately. In the HiColor and TrueColor mode, the changes will only be performed in the control-panel first. Only once the control-panel is closed by clicking on the “OK” button will any program that is launched afterwards use the new palette. This way, it is possible to use custom color palettes for separate applications under Multi-GEM, Multi-TOS or MAGIX.

“Laden” (“load”) and “Sichern” (“save”) allow to load and save entire color palettes.

With the functions on the second page, color gradients can be created:



Verlauf = gradient

Start = begin

Grau = gray

Reset = reset

Laden = load

Sichern = save

OK = confirm

Abbruch = cancel

This allows to create a linear gradient between two positions in the color palette. To do this, one color entry (the “Start” color) must be selected first and the button “Start” must be clicked. This button's label will then switch to “Ende” (“end”). Now the target color must be selected, and the “Ende” button must be clicked. This will create the gradient between the “Start” and the “Ende” color.

With “Grau” (“gray”) or “Farbe” (“color”), the color palette can be converted to shades of gray or vice versa. The behaviour is similar to that of the TT control-panel.

“Reset” sets the colors back to the values of the control-panel.

Color calibration

This is an additional feature which is available with some versions of the TrueColor (TC) or HiColor (HC) card. Details can be found in the LIESMICH.TXT (read-me) file on the floppy disk.

The function allows to define a separate gamma curve for each color channel, to compensate for color divergence in picture displayed by the monitor. This is useful for truecolor image processing. Regular color monitors don't have a linear correlation between the brightness of the phosphor and the voltage of the video signal, which can be compensated this way. Depending on the type of card, there is a third page in the color control-panel which allows to define the gamma curve. The curve can be defined separately for red, green and blue.

Spektrum for advanced users

Example for an ASSIGN.SYS file

The ASSIGN.SYS-file used by GDOS has the following structure (TT version):

```
PATH = A:\GEMSYS /* The folder with the fonts */
01 VDI.SYS
COUR10.FNT /* Optional: fonts */
02 VDI.SYS
03 VDI.SYS
04 VDI.SYS
05 VDI.SYS /* All screen drivers... */
COUR10.FNT /* Another font... */
06 VDI.SYS
07 VDI.SYS
08 VDI.SYS
```

Files on the original floppy disk

Start program:

\AUTO\SPEKTRUM.PRG: Switches the card on after boot
\AUTO\SPEKTRUM.INF: Info-file for the resolution / timing settings
\AUTO\SPEKTRUM.PAL: Color palette file

VDI-Driver:

\GEMSYS\VDI.SYS: active driver
\GEMSYS\SPEK_256.SYS: driver for 256 colors
\GEMSYS\SPEK_HC.SYS: driver for 32768 colors (HiColor)
\GEMSYS\SPEK_TC.SYS: driver for 16.777.216 colors (TrueColor)

System fonts for the VDI driver:

\AUTO\SYSTEM08.FNT: 6x6 system font
\AUTO\SYSTEM09.FNT: 8x8 system font
\AUTO\SYSTEM10.FNT: 8x16 system font

GDOS:

\AUTO\AMCGDOS.PRG: The GDOS loads the VDI driver listed in the ASSIGN.SYS file.

Additional programs:

\XCONTROL.ACC: The Atari control-panel
\CPX\SPEKTRUM.CPX: CPX module for configuring the colors in the control-panel
\CPX\TIMING.CPX: The change the SPEKTRUM.INF file, to switch to other resolutions or to generate new resolutions for new monitors.

The SPEKTRUM.INF file

This file contains the timing information for the timing control-panel. The structure of the file can change slightly between versions. For this reason, it is recommended only to change the documented values by hand.

The first two lines define the maximum frequencies for the horizontal frequency in Kilo-Hertz and for the vertical frequency in Hertz.

The value in the third line is an ID for a certain IC (microchip) on the graphics card.

The currently selected resolution is marked by a "*" character.

The file looks like this:

```
65.000
120.000
30
*, "640x400 256 68 Hz", 0, 5, 100, 79, 79, 20, 88, 11, 520, 399, 400, 119, 455, 4, 0, 0, 0, 0, 640, 400
"640x480 High 100 Hz", 2, 15, 190, 159, 159, 30, 167, 12, 525, 479, 488, 28, 496, 4, 0, 0, 0, 0, 640, 480
```

Programming Instructions

This chapter is meant for programmers. It should help to create "clean" applications that run properly on graphics cards. This is absolutely possible, since the interface to the graphics card is standardized: The VDI (the so-called virtual device interface). To ensure that software will also run on future, not yet available graphics cards, only GEM-functions must be used for all graphical in- and output operations.

Never should the screen memory or any registers on the card be accessed directly! For this reason, this documentation does not discuss details of the registers of the graphics card.

To ensure that your custom software runs in all resolutions and color modes, you should only use VDI and AES functions for graphical operations. And keep in mind that the resolution and the memory requirements for a certain picture size may vary.

Don't use BIOS or XBIOS functions for graphical output operations. All graphical outputs must be clipped to the current screen size.

Data structures of the Spektrum software

The following data structures are created:

```
typedef struct {
long cookie;          /* VSCR */
long product;        /* product name */
int  version;
int  x,y,w,h;        /* visible window */
}
INFOVSCR;

typedef struct {
int  palette[256][3];
}
PALETTE;

typedef struct {
long  magic;          /* 'VINP' */
long  version;        /* 0x0100 */
long  factory;        /* 'JWME' */
long  product;        /* 'SPEK' */
long  product_version; /* '1 ', '1 HC', '1 TC' */
long  video_base;     /* address of 1st pixel in video memory */
int   width;          /* number of pixels */
int   height;         /* number of pixels */
int   line_offset;    /* number of pixels from line to line */
int   bits_per_pixel;
int   bits_per_pal;   /* number of bits in palette-RAM (6 or 8) /
PALETTE pal;
void  (*mouse_pos)(int x,int y,int button);
      /* positions the screen so that the mouse pointer is
        most likely in the visible area */
void  (*set_root)(int *redraw_pxy);
      /* Function which is called every time the desktop
        background should be redrawn. 'redraw_pxy' is a
        pointer to two corners of the area. */
int   freq;           /* the freq value configured last */
int   color;          /* 0=256, 1=High1, 2=High2, 3=TC, 4=mono */
size_t offset;        /* picture offset for virtual resolution */
}
VIDEO_INFO;
```

SPEKTRUM.PRG creates two cookies:

- “VINF”: Is used for the communication with the rest of the Spektrum software. It contains a pointer to a VIDEO_INFO structure.
- “VSCR”: Is used for the communication (among others) with the “*FlyDials*” of Julian F.Reschke and “*Let'em Fly*” of Oliver Scheel. It contains a pointer to a INFOVSCR structure.

Special attributes of VDI and AES in HiColor and TrueColor: Each VDI workstation gets its own color palette with 256 (or, to be precise: `work_out[13]`) entries. All these palettes can be changed independently of each other by any program. To do this, the VDI-functions “`vs_color()`” (for setting) and “`vq_color()`” (for detecting) the colors must be used. An invocation of “`vs_color()`” changes – other than usual – not the currently visible screen rendering. The user can change the palette, that should be used when a VDI workstation is opened, at any time through the control-panel.

For the filling functions, the mode FIS_HOLLOW always results in white, independent of the settings of the pseudo color palette. If this is not desired, the FIS_SOLID mode should be used instead.

“`vro_cpyfm()`” with mode 0 clears all bits – this results in the color Black.

“`vro_cpyfm()`” with mode 15 sets all bits, which results in the color White. Because of that, applications that want to fill a rectangle with a certain color should instead use “`vr_recfl()`”.

“`work_out[13]`” contains the number of available color pens. It is not correct to deduct the number of planes from this value! To get the correct number of planes, the function “`vq_extnd()`” can be used with “`work_ext[4]`”.

Unfortunately, AES wrongly refers to “`work_out[13]`”; because of that, all values in the “global” field of the AES that are referring to the video memory are invalid. Applications should NOT use these values. Reason: In TrueColor there are 24 bits per pixel, the number of independently displayable colors is 16.777.216. This exceeds the maximum value that could be set in “`work_out[13]`”, because it can only hold 16 bit. AES also sets the length of the video memory in the “global” field; with TrueColor, however, this value must be bigger than the maximum 16 bit value.

The Spektrum VDI drivers load the system fonts at boot time automatically. Because of that, it is possible to use different fonts than the included ones as system fonts. On the other hand, this carries the danger that not all applications can handle different system fonts. The Spektrum VDI drivers normally use the font that is loaded as the 3rd font, as the default font.

The Spektrum software uses the XBRA-ID “SPEK”.

Memory structure

For applications not conforming to the GEM rules, this chapter discusses the structure of the video memory. In monochrome mode, the memory is organized the same as with the Atari's integrated graphics.

The video memory begins on all ST/TT computers at the address \$FEC0 0000.

The image data always begins in the upper left corner, i.e. directly at the start address.

The 256 color mode is organized in 8-bit pixels; one byte in the video memory represents one pixel.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
P7	P6	P5	P4	P3	P2	P1	P0

In the so-called HiColor mode, each word represents a pixel. The meaning of the bits is somewhat complicated.

High- and Low-byte are interchanged. This isn't a problem, because each pixel can be accessed with a word. There are always 5 bits reserved for red, green and blue.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
G2	G1	G0	B4	B3	B2	B1	B0	R4	R3	R2	R1	R0	G5	G4	G3

The TrueColor mode is organized in 3 bytes per pixel. The ordering of these bytes in the video memory is blue, green and red.

Byte 0	Byte 1	Byte 2
blau Bit 7-0	grün Bit 7-0	rot Bit 7-0

The RealColor mode is like the TrueColor mode, but only the upper 6 bits of each byte are being used.

Byte 0	Byte 1	Byte 2
blau Bit 7-2	grün Bit 7-2	rot Bit 7-2

In the HiRes mode, each byte represents two pixels:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Nibble Pixel 1				Nibble Pixel 0			
P3	P2	P1	P0	P3	P2	P1	P0

Extended Function of Spektrum VDI

Due to their extended color possibilities, Spektrum graphics cards provide extended functions as well. This includes TrueColor functionality and the possibility, to transfer picture data into the image memory without conversion. In order to avoid compatibility problems, the software creates a so-called "Cookie". This allows for any application to check if the graphics card is a Spektrum card.

The structure of this Cookie has been described in the previous chapter. Through the VDI, bitmaps can be copied in device-specific format in to the graphics card.

Connector pin assignment

The connectors on the graphics card have the following assignments:

The 15-pin video connector:

Pin-Nummer	Signalbedeutung
1	Videosignal rot
2	Videosignal grün
3	Videosignal blau
4	unbenutzt
5	GND
6	GND
7	GND
8	GND
9	unbenutzt
10	GND
11	unbenutzt
12	unbenutzt
13	Horizontal-Sync
14	Vertikal-Sync
15	unbenutzt

Technical Specifications

The specification of the Spektrum graphics card in short:

- simply pluggable for Mega STE and TT; in other STs through additional adaptors
- up to 16.777.216 colors simultaneously
- true color
- resolutions up to 1152 x 910 (or more)
- adjustable virtual resolution with hardware scrolling
- up to 256 true shades of gray, or colors, even in the highest resolution
- flickerfree
- immediately ready-to-use with the GEM VDI-driver
- ready to be used with a special Blitter for up to 30 times higher speed; of course, it is also possible to use the blitter of the computer system.
- ready to output NTSC/PAL and S-video signal
- video frequencies up to 130 MHz

The various different versions

The Spektrum graphics card is available in four versions. They differ in supported screen modes and video resolutions.

	Spektrum I	Spektrum I HC	Spektrum I TC	Spektrum I HR
Farbenanzahl				
bei 640 x 480	256	65.536	16.777.216 *	262.144 *
bei 768 x 576	256	65.536	65.536	65.536
bei 832 x 626	256	65.536*	65.536*	65.536*
bei 1024 x 768	256	256	256	256
bei 1152 x 910	256*	256*	256*	256
bei 1280 x 1024	-	-	-	16
bei 1600 x 1280	-	-	-	16*
virtuelle Modi				
bei 1024 x 1024	256	256	256	256
bei 1024 x 512	256	65.536	65.536	65.536
bei 682 x 512	256	65.536	16.777.216	262.144
max. Pixeltakt	80 MHz	80 MHz	84 MHz	130 MHz

	Spektrum I	Spektrum I HC	Spektrum I TC	Spektrum I HR
Mono-/ Duochrommodus	ja	ja	ja	ja
Bildwiederhol frequenz in Hz	>70	>70	>70	>70

If you own one of the smaller cards, they can still be upgraded.