High Resolution Graphic Accelerator Card

G8

User Guide
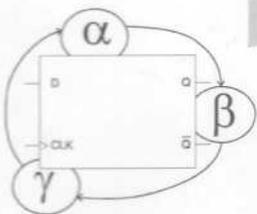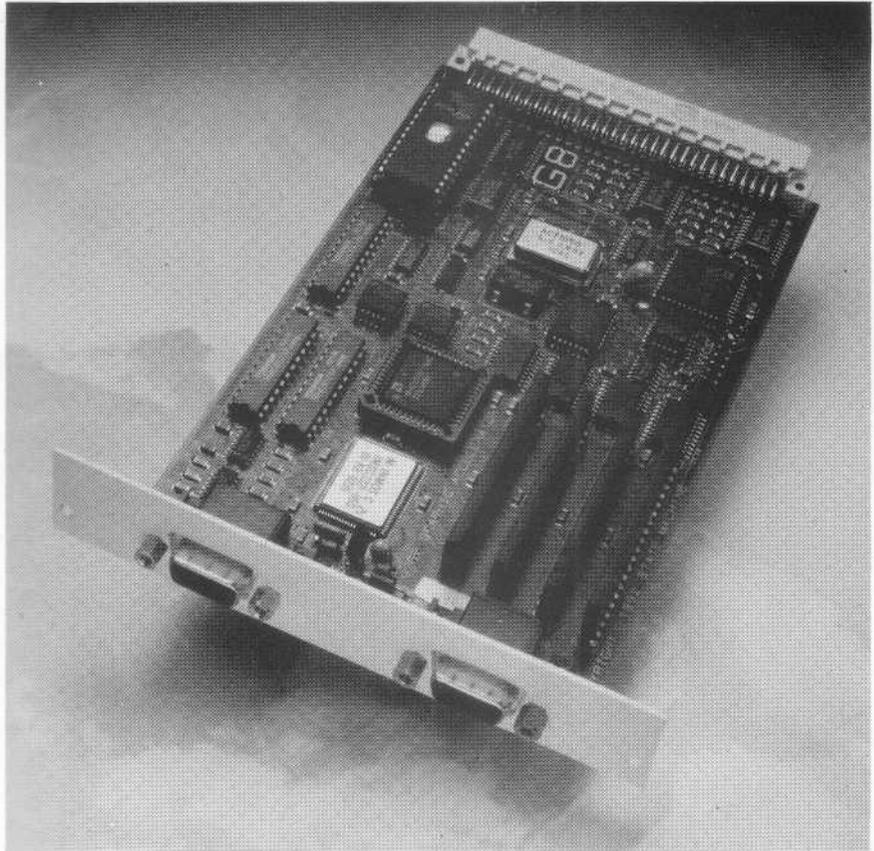
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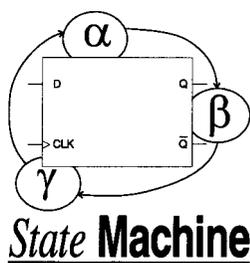
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Introduction to the G8 Card

Welcome to your G8 Graphic Accelerator Card

Thank you for purchasing an Archimedes G8 Graphic Accelerator Card. We hope the card performs to your expectations and improves the use of your Acorn Archimedes. Below is an introduction to the way that the G8 Graphic Card works, and why the card was designed the way it is, which you may find as useful background reading before you install the card.

We hope that this manual provides all of the information you require. If you find any errors or omissions, then please contact State Machine and we will endeavour to put them right in the next issue of the manual.

Introduction to graphics systems

The Archimedes graphics system

The Archimedes graphics system is the same in the new range of Archimedes as it was in the first A305 / A310 Archimedes. This means that the graphics capabilities of your Archimedes are based on technology that was developed over 5 years ago.

The VIDC based graphics of the Archimedes are now showing their age by not being able to do resolutions such as 800 x 600 in 256 colours, or 1024 x 768 in 16 colours, graphics which are easily attainable on IBM PC Compatibles with even the most basic SVGA graphics card.

The other problem with the Archimedes VIDC based graphics is that the main DRAM is used as the frame store. This means that the ARM processor has to stop accessing the main DRAM whenever the video system wants the next part of the screen.

This means that the Archimedes slows down as the resolution and / or the number of colours increases, as the video system has to access the main system DRAM

more often, leaving less time for the ARM processor to access the DRAM and perform useful functions.

The ARM 3 chip, with its local cache, alleviates this problem slightly by the fact that when the video system is accessing the main DRAM, if the data required by the processor is in the ARM 3 cache, the processor can access the cache simultaneously with the video system accessing the DRAM. However, if the data is not in the cache, or the processor wants to perform a write function, the processor still has to wait until the video system has finished accessing the system DRAM.

In order to get the higher resolutions and number of colours, the video system has to be slowed down to a level where the processor can still perform useful amounts of processing, with the video system only accessing the system DRAM at a relatively slow rate.

This can be easily achieved by lowering the frame rate of the mode being displayed. However, in most cases this would mean that the screen would flicker, producing eye strain, and thereby making the higher resolutions unusable.

VIDC enhancers

Various companies have produced VIDC enhancers for the Archimedes in order to try and extend the resolutions provided by the Archimedes graphic system. These achieved the higher resolutions by clocking VIDC with a faster clock. However this has various drawbacks in that the demand on the Archimedes video system becomes even greater, thereby slowing down the Archimedes, and also as the sound is generated by VIDC, the pitch of the sound goes up when the faster clock is supplied. Complex software has been written to overcome this, but the system cannot correct exactly, and this still results in the sound being played at the wrong speed.

The G8 graphics system

The G8 Graphic Accelerator card overcomes the problems above by having a local Video RAM' frame store on the graphics card and by permanently clocking the VIDC chip at the frequency for correct sound without any software modification.

The G8 Graphic Card takes the data from VIDC's nibble port, which provides 4 bits of data which represent the value of the pixel that VIDC is just about to display. These 4 bit nibbles are buffered, combined, and then written into one side of the VRAM store on the G8 Graphic Card.

The graphics controller on the G8 Graphic Card then accesses the other side of the VRAM frame store, and displays the data onto the screen.

' VRAM is a special kind of RAM which can be written to and read out of at the same time

What this means is that the Archimedes VIDC video system can run as though it was displaying 25 frames per second, and therefore display high resolutions without affecting the speed of the machine too much. The graphics controller on the G8 Card displays the screen at 60 / 70 frames per second, thereby eliminating any flicker that would be normally seen.

Why 25 frames per second?

The reason why the Archimedes video system is run at 25 frames per second is due to the trade off between speed and the quality of the displayed graphics.

By running some simple tests (redrawing a complex vector graphic) in the maximum resolution and colours, the approximate graph of the relative speed of the machine verses the speed (frames per second) of VIDC is shown below.
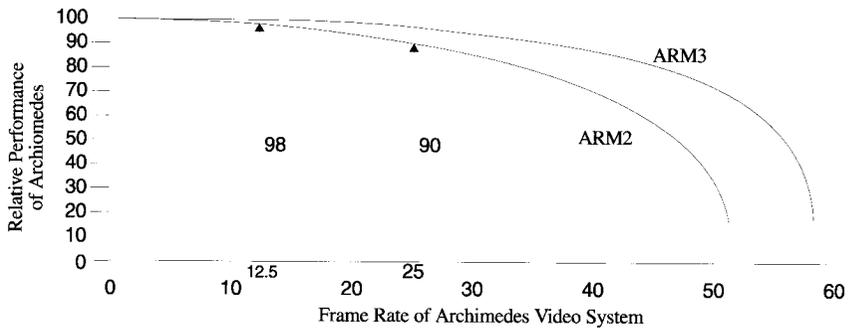
As can be seen, the Archimedes starts to slow down significantly when the video system is run at 30-40 frames per second, but there are very little speed gains to be obtained by running the video system at less than 25 frames per second. (Approximately 10% difference on an ARM 2 system, about 3% on an ARM 3 system)

Taking the above into account, the other main criteria for selecting the video frame rate is the quality of graphics that are displayed.

Animation software requires at least 25 frames per second update in order to make the animation appear smooth. However, in some sever cases, 50 frames per second is preferable. Trying to display animated graphics into a frame store that is only updated 10 or 15 frames per second produces jerky frame movement especially on sideways movement.

Also, when moving areas of the screen around in a diagonal fashion (such as dragging a window) if the frame rate is not high enough, severe tearing occurs. Tearing us where half of the window is left behind, giving an very un-smooth display.

Given the very little gains in an ARM 2 system of running the frame store at less than 25 frames per second, and the almost insignificant gains to be had in an ARN 3 based system, the G8 Graphic Accelerator runs all of its modes at at least 25 frames per second update, except in a few cases where the frame store is run at 23 frames per second to give the best trade off between speed and display quality.

Included in the G8 Graphic Card software are some 50 frames per second local VRAM update modes. These offer the wider range of colours that can be chosen, but give update rates that allow super smooth animation.

Software Compatibility

The G8 Graphic Card software has been designed to offer the maximum compatibility possible with desktop based and non desktop based software.

OS-Byte 19 (*FX 19)

All software that uses the OS Byte 19 `call` will usually use the `vsync` that is running on the G8 Graphics card, not the `vsync` that is generated by VIDC. This means that software that uses the OS Byte 19 for timing (!Tracker, !CabelView etc.) will run at the correct speed, rather than at the half speed if the `vsync` handler was not replaced.

In the 50 frames per second local VRAM update modes that are provided the VIDC `vsync` event is used, thereby giving a 50 frames per second `vsync` handler, with the display being shown at up to 100 frames per second to give perfectly flicker free displays with super smooth animation.

Palette definition

The new RISC OS 3 calls to define the palette are supported, allowing 256 grey scale, primary and other palettes to be defined easily. Sample palettes are provided with the support software on the G8 Card.

However, to enable compatibility with non desktop applications, the VDU 19 command is also supported, as are flashing colours.

16 bits per pixel modes

Although the graphics controller used on the G8 Graphic card is capable of 16 bits per pixel displays, there are various reasons why 16 bit per pixel images are not available with the G8 Graphics Card.

■ The maximum screen resolution that can be achieved is 800x300 pixels, i.e. just slightly taller and wider than a mode 12 / 15 screen.
At this resolution, black lines are visible between the lines of colour, where there are not enough lines to fill the screen, just as there is in mode 12 / 15. Also diagonal lines appear stepped just as they do in mode 12. Anti-aliasing these lines helps slightly, but you generally have an inferior display than the 8 bit per pixel 800x600 or 640x512 displays.

■ There is no palette control in 16 bit per pixel modes. This means that although you can display 65536 simultaneous colours on screen at once, you are limited to 32 greys, 32 pure reds, 32 pure greens and 32 pure blues. Surprisingly to most people, this is actually less than the number of pure grey, red, green and blue colours you can get with 8 bit per pixel modes with their 24 bit fully programmable colours.

In fact, in order to display 256 grey scales on a true colour display, you need either a 24 bit per pixel display (which would give a maximum resolution of 640 x 186 on the G8 Cards frame store - hardly useable) or a normal 8 bit per pixel display with a 24 bit per pixel palette as provided with the G8 Card, which gives a maximum resolution of 800x600.

■ RISC OS 3 does not support 16 bit per pixel in the desktop, and therefore no current applications could take advantage of the greater number of simultaneous colours.

■ Without proper colour calibration software, the 16 bit per pixel image will be no closer to what the image would look like if it was printed on a high quality colour printer than a dithered 8 bit per pixel representation.
RISC OS 3 has 8 bit per pixel colour calibration built into the ColourTrans module, enabling applications to take advantage of matching 8 bit per pixel images / artwork accurately. However, no support for 16 bit per pixel is built in.

In conclusion, having a maximum of 480 KByte frame store to use (which is the limit imposed by the Archimedes video system) gives inferior results (in most cases) in 16 bit per pixel modes than can be achieved with dithering an image on a high resolution 8 bit per pixel display to simulate more than 256 simultaneous colours available, especially with palette control which is available on the G8 Graphic Card.

G8 Professional Graphic Card

The G8 Professional Graphic Card has 1MByte of VRAM frame store available and supports 16 bits per pixel. This card enables resolutions such as 800x600 in 16 bit per pixel to be displayed outside the desktop, giving truly photographic images without any of the problems mentioned previously. For further details of the G8 Professional card, please contact State Machine.

1

Installing the
G8 Graphic Card Accelerator

Before you begin

The entire range of State Machine G8 Graphic Accelerator expansion cards have been designed to be easy to install and use. However, please take a moment to read the instructions below before you proceed to install the hardware or software.

Operating system required

The software requires the RISC OS 3 (version 3.10 or later) operating system to run. If you do not have RISC OS 3.10 already fitted, then you will need to upgrade before installing the card.

Check your G8 Graphic Accelerator package

To be sure that your package contents are complete, check them against the lists below. If any of the following items are missing or damaged, contact your supplier.

- Expansion card
  You should have received a half width expansion card. If you have an A3000, then your G8 Graphics card will have been installed already.

- A half width back panel blanking plate and a `T' piece with 2 bolts screwed into it.

- Ribbon Cable

- Registration Card

Register your G8 Graphic Accelerator

After you mail your registration card, you are a licensed G8 Graphic Accelerator owner with all rights and privileges. As a registered customer you are entitled to free technical support by State Machine. You are also eligible for warranty coverage, special offers and promotions, and first notice of future related State Machine products.

To register your G8 Graphic Accelerator, fill out the Registration Card in this package and mail it to State Machine. If you move to a new address please send a change of address notice to State Machine so we may keep our records up to date.

Installing the hardware

There are different fitting procedures for the A3000, A5000 and A300/400/500 series machines and you should follow the section that applies to your machine.

Please read all the installation instructions before starting to install your card.

If for any reason you are not able, or do not feel confident about fitting the interface card then you should consult any Acorn Authorised Dealer who will arrange to fit the card for you. Remember to take your computer in its original packaging. The Dealer may make a charge for this service.

What you will need

All you need to install the card is a No. 1 Pozidriv or Philips screwdriver to remove the screws retaining the computer's cover and blanking plates.

Handling precautions

In order to ensure long life and reliability from your interface card you should take care when handling it, especially to avoid damage by static electricity.

1. Always switch off the computer and unplug it from the mains.

2. Disconnect any peripherals such as printers or modems.

3. DO NOT remove the interface card from the protective anti-static bag until you are ready to fit it.

4. Avoid touching the components on the card; always handle the card by holding the rear panel.

To install the interface card the computer must be switched off and disconnected from the mains. All peripherals should be disconnected.

There are three simple stages required to fit the card:

*   Disassembly - remove the cover from the computer

*   Installation - fit the interface card.

*   Reassembly - replace the cover.

Please follow the steps for your particular machine from the following sections.

Genlock connector

Early A300 and A400 machines did not have the whole genlock connector fitted. If your machine has only 4 pins on the main mother board where the genlock connector is, then you will need to contact your dealer to have the other 10 pins required by the G8 Card fitted.

Also, if you have a VIDC enhancer fitted, then this will need to be removed from the genlock connector before the G8 Graphics card can be fitted as a VIDC enhancer is no longer required.

A3000 Installation

The G8 Range of Graphic Accelerator cards is installed by State Machine for the A3000 computer. If you have bought a G8 Graphic Accelerator and you are reading this section to find out how to install it in an A3000, then please contact State Machine as you have the wrong card for your machine.

A300, A400, A500 Installation

The interface card is a single half-width Eurocard designed to occupy a chosen slot in your expansion card backplane. A backplane and cooling fan must be installed in your computer before the interface card can be fitted.

The interface card is supplied with a short blanking plate, a T piece and two screws. These are used to extend the interface card panel up to the full width required if an adjacent slot has no installed card.

A300 / Early A400 Machines

In some early A300 machines the backplane and fan were optional, if you have one of these machines then you should first obtain a backplane and fan from your nearest Acorn Dealer.

Disassembly

To remove the top cover of the computer from A300/400/500 series machines:

1. Remove the five retaining screws for the cover, there are three at the top of the back panel, and a further two on either side.

2. The top cover is removed by sliding it carefully towards the back until it can be lifted up and away. If the sides are held slightly apart then it will be easier to slide off.

Back Screws

Side Screws
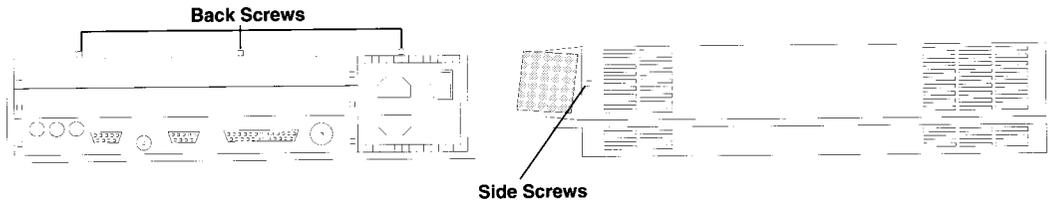
Installation

1. Locate the backplane and select a free slot for the card. On some machines the card will only fit into two of the four slots available due to the restriction of the length of the ribbon cable. The slots that can be used are:

   • A300 / A540 Machines
     No restriction- slot 2 is preferable.

   • A400 Machines
     Slot 0 / 2 - slot 2 is preferable.

   If your computer already has expansion cards in the available slots, then these will need to be removed and re-located to another slot. Please refer to the documentation supplied with those expansion cards on how to remove and re-fit the card.

   After selecting a slot to insert the card, you need to gain access to the genlock connector on the main PCB. The location of the genlock connector is shown on the opposite page.

   If there are any expansion cards in the way of the genlock connector, then these will be need to be removed to obtain access to it.

2. Once the genlock connector has been located, remove the two links from pins 1-2 and 3-4 and keep in a safe place. You will require these link if you ever wish to permanently remove the G8 graphics card in the future.

   If a VIDC enhancer has been fitted, then remove it and store in a safe place as it is no longer required.

3. Remove the corresponding blanking plate from the rear of the machine.

4. Connect one end of the ribbon cable to the genlock connector with the red ID wire nearest pin 1 of the connector.

5. Unpack the card from the protective anti-static bag.

A540

A300

A540 diagram labels:
- Expansion Card Backplane
- VIDC
- LK15
- IC64
- Rear of Computer
- Genlock Connector
- Floppy Drive Side

A300 diagram labels:
- IC17
- VIDC
- Genlock Connector
- PL36
- RGB VIDEO
- Serial
- Rear of Computer

A400

A400 diagram labels:
- Expansion Card Backplane
- IC8
- VIDC
- Rear of Computer
- Genlock Connector
- ROM1
- LK15
- Floppy Drive Side

6. Either: use the T -piece, blanking plate and screws to extend the card's rear panel to cover the full width of the blanking plate that was removed.

   Or: if another card is adjacent, use the Tpiece and screws to attach the rear panels together in the middle.

7. Support the top of the backplane with one hand and carefully pass the card through the hole in the rear of the machine and push the connector home onto the backplane socket. Ensure the connectors are aligned and that the card is at right angles to the backplane.

1- 5

Very little force is required to fit the card, if it does not fit easily then remove it and try again, otherwise damage may be done to the card or backplane.

8. Connect the free end of the ribbon cable onto the 16 way header marked VIDC on the G8 Graphics card. Connect the cable such that the red ID wire on the ribbon cable points towards the back panel and nearest to pin 1 of the header of the G8 exnansion card as shown below.

Back Panel ➡

9. Screw the rear panel of the card (and any blanking plate) into the rear of the computer from where the original full width blanking plate was removed.

When properly installed the rear panel should be flush with the rear of the computer, if not then check that the card is plugged fully into the backplane. (On some early machines the card may protrude by a few millimetres, since the backplane on these machines was located incorrectly.)

Reassembly
Replace the cover, using the reverse process for disassembly, by following steps 1 to 2 for `Stage 1 Disassembly' in reverse making sure that the screws are securely tightened.

This completes installation of the hardware. Please now read the Installing the software section at the end of this chapter.

A5000 Installation
The interface card is a single half-width Eurocard designed to occupy a slot of the expansion card backplane.

The interface card is supplied with a short blanking plate, a T piece and two screws. These are used to extend the interface card panel up to the full width required if an adjacent slot has no installed card.

Disassembly
To remove the top cover of the computer from A5000 series machines:

1. Switch off and ensure all leads and peripherals etc. are disconnected.

2. Place the computer on a work surface covered by a clean soft covering (e.g. a blanket) and turn it over so that it rests on its top cover.

Fixing Screws

Front of Computer
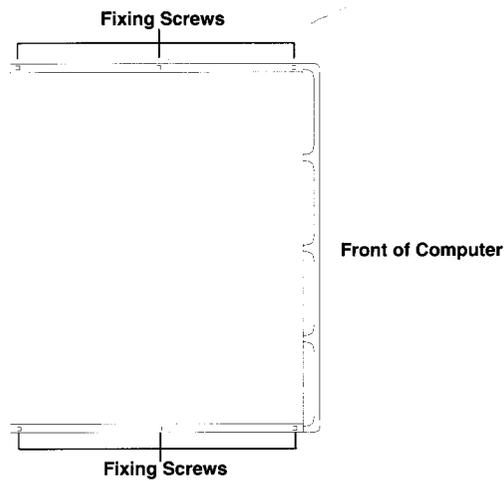
Fixing Screws

3. There are six cover retaining screws, three along each of the short sides, which should be removed.

4. After removal of the retaining screws turn the computer over, being sure to hold it along the longest sides to ensure the cover does not slide off.
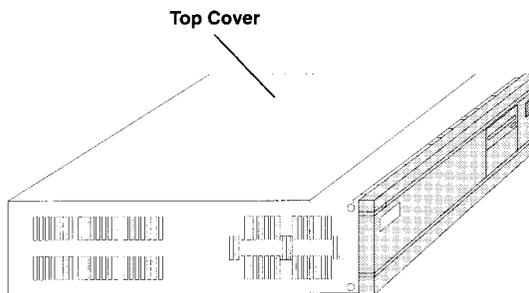
Top Cover

5. The top cover can now be removed by sliding it carefully towards the back until it can be lifted up and away. Remove the lid completely.

6. Some A5000 models incorporate an RFI shield over the case which must be removed. To remove the shield unscrew the five fixing screws on the right

hand side of the computer (as viewed from the rear). Slide the shield off carefully, using a screwdriver in the top hole if required (see below).

Installation

1. Locate the backplane and select a free slot for the card.

    After selecting a slot to insert the card, you need to gain access to the gen-lock connector on the main PCB. This is located as shown.
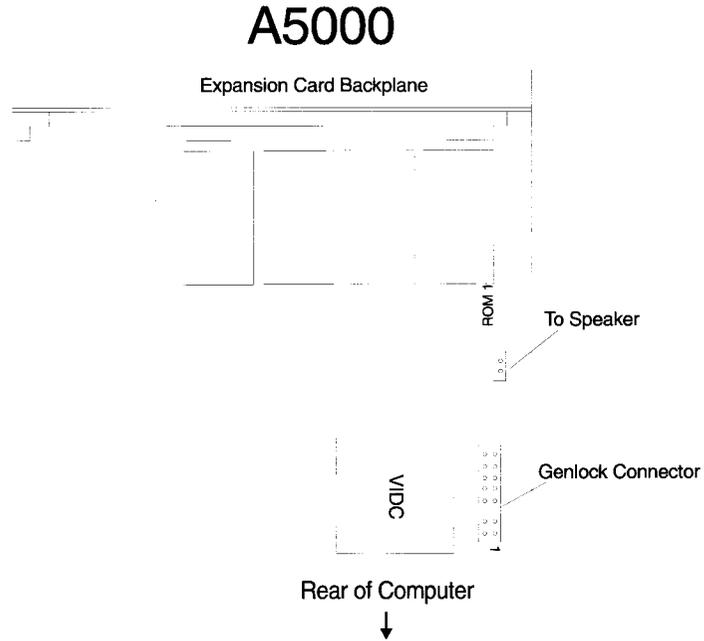
A5000

Expansion Card Backplane

ROM

To Speaker

VIDC

Genlock Connector

Rear of Computer

If there are any expansion cards in the way of the genlock connector, then these will be need to be removed to obtain access to the genlock connector.

2. Once the genlock connector has been located, remove the two links from pins 1-2 and 3-4 and keep in a safe place. You will require these link if you ever wish to permanently remove the G8 graphics card in the future.

3. Remove the corresponding blanking plate from the rear of the machine.

4. Connect one end of the ribbon cable to the genlock connector with the red ID wire nearest pin 1 of the connector.

5. Unpack the card from the protective anti-static bag.

6. Either: use the T -piece, blanking plate and screws to extend the card's rear panel to cover the full width of the blanking plate that was removed.

   Or: if another card is adjacent, use the Tpiece and screws to attach the rear panels together in the middle.

7. Support the top of the backplane with one hand and carefully pass the card through the hole in the rear of the machine and push the connector home onto the backplane socket. Ensure the connectors are aligned and that the card is at right angles to the backplane.

   Very little force is required to fit the card, if it does not fit easily then remove it and try again, otherwise damage may be done to the card or backplane.

8. Connect the free end of the ribbon cable onto the 16 way header marked VIDC on the G8 Graphics card. Connect the cable such that the red ID wire on the ribbon cable points towards the back panel and nearest to pin 1 of the header of the G8 expansion card as shown below.
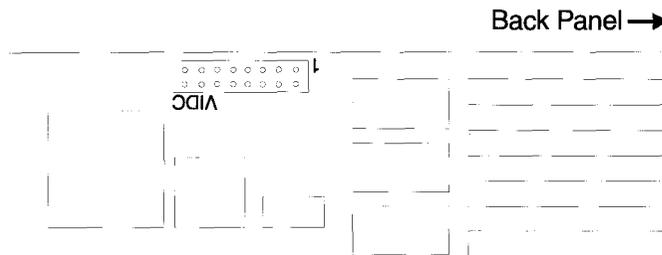
9. Screw the rear panel of the card (and any blanking plate) into the rear of the computer from where the original full width blanking plate was removed.

   When properly installed the rear panel should be flush with the rear of the computer, if not then check that the card is plugged fully into the backplane.

Reassembly
Replace the cover, using the reverse process for disassembly, by following steps 1 to 6 for `Stage 1 Disassembly' in reverse.

Make sure that the screws are securely tightened.

This completes installation of the hardware. Please now read the Installing the software section.

Installing the software

Expansion card software initialisation

All software for the G8 Graphics card is supplied on the ROM on the expansion card which must be present to use the G8 Graphic Accelerator expansion card.

Before using the G8 Graphics card, the software needs to be initialised in case some of the modules have become *unplugged*.

Switching on your computer

Connect your monitor to the Archimedes video output as normal.
If you connect your monitor to the G8 Graphics Card you will not see any output.

Switch on your computer with the 0 key on the main keyboard (NOT the numeric keypad) pressed down, and keep pressed down until you see the RISC OS message appear on your screen.

When the computer has finished initialising, obtain a command line (if you are in the desktop then press F12) and type the following:

```
*RMREINIT G8Resources

*RMREINIT G8Support

*CONFIGURE G8Monitor 0

*RMREINIT G8Modes
```

making sure that you only press the return key once at the end of each line - this will ensure all modules are loaded properly.

For now, keep your monitor attached to the Archimedes output while configuring the G8 software for use with your particular monitor.

The next time the machine is re-set then you should see the message

```
State Machine G8+ Graphic Accelerator
```

displayed on the screen. If this message does not appear, then the card has not been installed properly. Please switch off your machine and check over the installation.

Please read the next section on how to configure your card for your particular monitor.

2 *Using the G8 Graphics Card Accelerator*

GS Graphics Card configuration

In order that the G8 Graphics card can match your monitor to the modes generated, the card needs to be configured. Once the card has been installed correctly, obtain a command line (press F12 from the desktop) and set the settings below to the values appropriate to your monitor.

Please note that these configuration options should all be set as they may have been spuriously set to a value incompatible with your monitor before the card was installed.

Control of intelligent monitors

Certain monitors that have micro processor based sizing controls may not display the output from the G8 Graphics card correctly in some situations.

In order to compensate for this, there is a configuration option which allows the modes generated to be displayed correctly on a microprocessor controlled monitor.

However, if the microprocessor controlled monitor option is configured, modes displayed on a normal analogue monitor will not appear in the correct place on the screen.

It is usually best to see if your monitor will display the analogue version of the modes as some micro processor controlled monitors display these correctly.

The command to configure the display control type is:

```
*CONFIGURE G8Display <Analogue|Digital>
```

Refresh rate of screen modes

Depending on your monitor type configured, some modes can be displayed at higher refresh rates than normal. This means that flicker is reduced, thereby reducing eye strain when using the monitor.

Due to the design of the G8 Graphics Card, increasing the refresh rate of the modes does not affect the speed of the Archimedes at all, unlike increasing the refresh rate of the normal RISC OS screen modes when using VIDC.

It is therefore recommended that the higher refresh option is selected.

The command to do this is:

```
*CONFIGURE G8Refresh <NormallHigh>
```

Where   `Normal` is for normal refresh.
               `High` is for highest possible refresh.

Sync type

The type of the horizontal and vertical syncs of the G8 card can be set by the command:

```
*CONFIGURE G8Sync <SeparatelCompositelVideo>
```

Where   `Separate` is for separate syncs on G8 Graphics Card
               `Composite` is for composite sync on the G8 Graphics Card
               `Video` is for composite sync on video on the G8 Graphics Card

`Note:`
No link changes are required on either the G8 Graphic card or the main computer motherboard in order to generate the different sync signals.
The green video output should be used when using the sync on video configuration.

Monitor type

The monitor type can be one of the following.

G8Monitor	Type of monitor	Maximum resolution
0	None attached - G8 Graphics Card inactive	
1	15KHz to 38KHz line rate monitor	1024x768 interlaced
2	Hi-res 64KHz fixed line rate monitor	1152x896
3	30KHz to 64KHz line rate	1280x1024 non interlaced
4	64KHz+ line rate monitors	1280x1024 70Hz refresh

Depending on your monitor, type the following

    *CONFIGURE G8Monitor <type>

Where `<type>` is selected from the G8Monitor column above.

Please type `*Help G8Monitor` for more details on monitor types that may have been added since this manual was printed.

Notes:
When the G8 Graphics card is running, the normal RISC OS monitor type is ignored, and therefore should not be changed.

Mode 1280x1024 at 70Hz refresh (monitor type 4) is not guaranteed to work on all cards, as the clock rate is above the maximum recommended rate for the graphics controller. If the screen breaks up in the high resolutions, please configure your monitor to monitor type 3.

Connecting the monitor to the G8 Graphics Card

The G8 graphics card should now have been configured correctly. These configuration options will not take affect until the next hard reset on your machine.

Your monitor now needs to be connected to the G8 Graphics card, as the G8 Card will now take over all of the functions of the Archimedes graphics system.

To do this;

- Shutdown your machine using the Shutdown option on the Task Manager icon bar menu.

- Switch off your machine

- Unplug your monitor from the Archimedes.

- If your monitor has a 9 pin D-Type connector, then connect this straight to the G8 Graphics Card's 9 pin D-Type connector.

- If your monitor has a 15 pin VGA style D-Type connector, then connect this straight to the 15 pin VGA D-Type connector on the G8 Card.

- Tighten the screw locks on the monitor plug.

- Switch on your machine

If the graphics card has been installed correctly then you should see the normal RISC OS screen upon switch on, and your machine should initialise as usual.

If this does not happen, then switch off your machine and check all of the steps above.

If your card does still not appear to function, read the section below on trouble shooting. If your card still does not work, then please contact the State Machine technical department for help.

Note:
It is always advisable to switch off your machine between unplugging the monitor from the Archimedes and plugging it into the G8 Graphics Card expansion card, however the graphics card does have limited static protection against the monitor lead accidentally falling out.

Never connect your monitor to the G8 without the monitor being earthed. A build up of static on the monitor could permanently damage the G8.

Trouble shooting - If you card does not work

If you card doesn't work after installation, please read the following common faults. If after reading this section your card still doesn't work then please contact State Machine's technical department for help.

There are only blue and white stripes on my screen, or
there is no image on my screen - it is just white, or
there are only stripes on my screen, or
my screen is blank, but
my machine makes a beep when it is turned on.
This is because no video data is getting from the genlock connector on the main PCB, through the cable to the connector on the G8 Card.

Check the following

1. That there are 14 or 16 pins on the main mother board, and the connector connects onto all of them. (Some machine have the third row of pins missed out, therefore there are only 14 pins on these machines rather than 16). If you have only 4 pins, then please read the section Genlock Connector at the start of the installation sections.

2. The cable is firmly seated on both the genlock connector and the connector on the G8 Card.

**The computer does not beep when switched on, and / or
the floppy disc light flashes slowly for about 10 seconds.**
Check the following

1. The cable is connected the correct way around and not the wrong way around on either the genlock connector on the main PCB or the connector on the G8 Card.

2. The cable is firmly seated on both the genlock connector and the connector on the G8 Card.

There is an image on my screen, but it looks a mess
Check the following

1. Your G8Monitor type is configured correctly.

2. You are not trying to display a mode greater than your monitor can cope with.

   • Switch off the machine.

   • Re-connect the monitor to the Archimedes video output.

   • Switch on the machine with the 0 key on the main keyboard (not the numeric key pad 0) until the normal RISC OS picture appears. (Holding down the 0 key disables the G8 Graphic Card)

   • Type the following

         *Configure Mode 27
         *Configure WimpMode 27
         *Configure G8Monitor 1

   • Switch off the machine.

   • Re-connect the monitor to the G8 Graphic Card.

   • Switch on your machine

   If your card is now working, carefully read the section on monitor type configuration and re-configure the G8Monitor setting. Then check what modes can be displayed on your monitor, and re-configure your Mode and WimpMode settings.

The image on my monitor bends at the top

Try

```
*Configure G8Display Digital
```

to cure this problem.

Using the G8 Graphics Card

The G8 Graphics card does not affect the operation of your machine, apart from the ability to display higher resolutions with a greater number of colours.

Mode numbers

The following mode numbers are supplied. However, it is advisable to use the G8 Application to select the desktop resolution. See the section below on *Using the G8 application.*

Mode	Resolution	Colours	OS Units	G8 Monitor Type	Normal Refresh Rate	High Refresh Rate
0	640 x 512	2	1280 x 1024	1,3,4	72Hz	110Hz
9	320 x 256	4	1280 x 1024	1,3,4	60Hz	60Hz
12	640 x 256	16	1280 x 1024	1,3,4	72Hz	110Hz
13	320 x 256	256	1280 x 1024	1,3,4	60Hz	60Hz
15	540 x 256	256	1280 x 1024	1,3,4	72Hz	110Hz
18	640 x 512	2	1280 x 1024	1,3,4	60Hz	60Hz
19	640 x 512	4	1280 x 1024	1,3,4	60Hz	60Hz
20	640 x 512	16	1280 x 1024	1,3,4	60Hz	60Hz
21	640 x 512	256	1280 x 1024	1,3,4	60Hz	60Hz
26	640 x 480	4	1280 x 960	1,3,4	60Hz	60Hz
27	640 x 480	16	1280 x 960	1,3,4	60Hz	60Hz
28	640 x 480	256	1280 x 960	1,3,4	60Hz	60Hz
29	800 x 600	2	1600 x 1200	1	56Hz	60Hz
30	800 x 600	16	1600 x 1200	1	56Hz	60Hz
31	800 x 600	16	1600 x 1200	1	56Hz	60Hz

Mode	Resolution	Colours	OS Units	G8 Monitor Type	Normal Refresh Rate	High Refresh Rate
32	800 x 600	256	1600 x 1200	1	56Hz	60Hz
30	800 x 600	16	1600 x 1200	3,4	60Hz	70Hz
31	800 x 600	16	1600 x 1200	3,4	60Hz˙	72Hz
32	800 x 600	256	1600 x 1200	3,4	60Hz	72Hz
29	800 x 600	2	1600 x 1200	3,4	60Hz	72Hz
29	800 x 600	2	1600 x 1200	2	72Hz	72Hz
30	800 x 600	16	1600 x 1200	2	72Hz	72Hz
31	800 x 600	16	1600 x 1200	2	72Hz	72Hz
32	800 x 600	256	1600 x 1200	2	72Hz	72Hz
66	1024 x 768	16	2048 x 1536	1	44Hz Interlaced	44Hz Interlaced
64	1024 x 768	2	2048 x 1536	3,4	60Hz	72Hz
65	1024 x 768	4	2048 x 1536	3,4	60Hz	72Hz
66	1024 x 768	16	2048 x 1536	3,4	60Hz	72Hz
64	1024 x 768	2	2048 x 1536	2	72Hz	72Hz
65	1024 x 768	4	2048 x 1536	2	72Hz	72Hz
66	1024 x 768	16	2048 x 1536	2	72Hz	72Hz
68	1152 x 896	2	2304 x 1792	2,3,4	64Hz	64Hz
69	1152 x 896	4	2304 x 1792	2,3,4	64Hz	64Hz
70	1152 x 848	16	2304 x 1696	2,3,4	64Hz	64Hz
72	1280 x 1024	2	2560 x 2048	3	60Hz	60Hz
73	1280 x 1024	4	2560 x 2048	3	60Hz	60Hz
72	1280 x 1024	2	2560 x 2048	4	60Hz	70Hz
73	1280 x 1024	4	2560 x 2048	4	60Hz	70Hz
76	1600 x 1200	2	3200 x 2400	5	60Hz	60Hz
80	1024 x 384	2	2048 x 1536	1,3,4	75Hz	75Hz
81	1024 x 384	4	2048 x 1536	1,3,4	75Hz	75Hz

Mode	Resolution	Colours	OS Units	G8 Monitor Type	Normal Refresh Rate	High Refresh Rate
82	1024 x 384	16	2048 x 1536	1,3,4	75Hz	75Hz
83	1024 x 384	256	2048 x 1536	1,3,4	75Hz	75Hz
84	1152 x 424	2	2304 x 1696	1,3,4	70Hz	70Hz
85	1152 x 424	4	2304 x 1696	1,3,4	70Hz	70Hz
86	1152 x 424	16	2304 x 1696	1,3,4	70Hz	70Hz
87	1152 x 424	256	2304 x 1696	1,3,4	70Hz	70Hz

To select these modes, just select a new mode number from the palette application as usual, or use the G8 Utility application (see later).

Normal modes

Most of the frequently used standard RISC OS modes are re-mapped to equivalents that can be displayed on all monitors. This means that all modes have a minimum line rate of 30KHz, with the effect that the TV Broadcast modes such as mode 12 appear in *letter* box format on all monitors. However, if a high refresh rate is configured, then the image will become full screen.

All of the standard RISC OS TV broadcast modes have an update rate of 50 frames per second into the local VRAM store, with the Archimedes using the VIDC VSYNC handler, rather than using the VSYNC of the G8 Graphics Card. This means that even with high refresh rate configured, the Archimedes will still play well behaved games etc. at the correct speed. For an example of this, try running !Lander if you have a copy, or a similar game if not.

The high refresh rates attainable with these RISC OS modes are ideal for animation, as they give a flicker free display, with 50 frames per second update into the local VRAM frame store.

These modes are provided mainly for compatibility with non RISC OS applications that need a certain mode number. You should usually use one of the higher resolution modes as there is no longer a vast speed difference between 256 line modes such as mode 12 and 480 line modes such as mode 27.

Loading palettes

256 colour modes
Five palettes are defined in the support module. These can be accessed by the following command:

```
*G8Palette <filename> I <011121314>
```

Where   0 is for the default WIMP palette
       1 is for a linear 256 grey scale palette
       2 is for a primary colour palette (CMYK Based)
       3 is for a standard 256 colour VGA palette
       4 is for a linear greyscale palette with WIMP colours

or

       < f i 1 ename> is the name of a 256 entry palette file.

16 colour modes or below

In 16, 4 or 2 colour modes, the palette can be set as usual with the palette utility. This also means that double clicking on a 16 colour RISC OS palette file will set the G8 palette up correctly.

Disabling the G8 Graphics Card

There may be times when you wish to disable the G8 Graphics card and **use the** standard VIDC output, e.g. for games that poke VIDC directly which would not work on the G8 graphics card as it uses a totally different controller.

This can be achieved in three ways.

1. By **turning the machine on with the 0 key on the main keyboard (not the numeric** keypad) held down.

2. By typing the following

   ```
   *Configure G8Monitor 0
   ```

   and hard resetting the machine.

3. By typing

   ```
   *KillG8
   ```

   which will reset the Archimedes to use VIDC straight away.

The monitor will then have to be disconnected from the G8 Graphics card and re-connected to the Archimedes VIDC video output. It **is advisable to use the first option.**

To re-enable the G8 graphics card, either

- Turn the machine on with the correct number key held down to correspond

with the `G8MonitorType` required.

■ Type the following

        *Configure G8Monitor <Monitor Type>

■ and hard reset the machine.

Applications provided

The G8 Graphic Accelerator Card provides a new application to allow the easy selection of desktop resolutions and palettes. This application is stored in the Apps resource directory along with Draw, Edit and Paint.
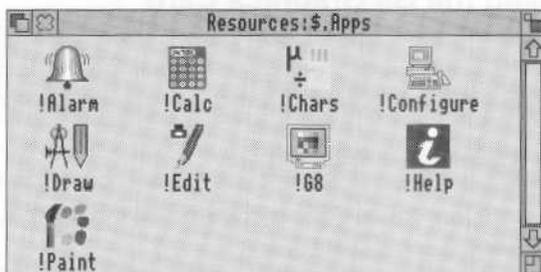
Using the G8 Utility

The G8 Utility is a desktop resolution and palette selector. In order to run the G8 Utility, open up the Apps directory on the left hand side of the icon bar by clicking on the Apps icon. Double click on the !G8 icon to run the program. A hourglass will appear for a short time while the modes available are sorted into order for easy selection. The G8 Utility always locates itself to the left of the Palette Utility.

The main icon bar menu

Info shows the current version number of the software. Please quote this version number when contacting State Machine.

The Resolution menu item leads to the desktop resolution selection window. See the section below on selecting the desktop resolution.

The Palette menu item leads to the palette selection sub-menu. See the section below on selecting palettes.

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The Quit menu item quits the application.

Selecting the desktop resolution

	Desktop Resolutions	
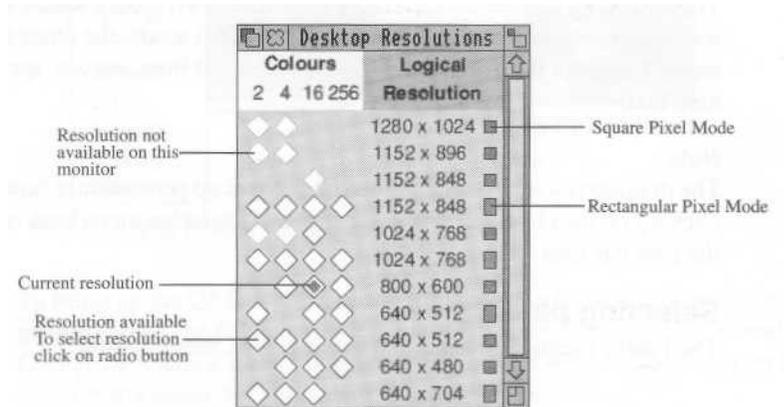
In order to select the resolution for your desktop, select the number of pixels and colours required. Click on the radio button in the appropriate place and the desktop will change to that particular resolution and number of colours.

Rectangular pixel modes
A rectangular pixel mode is where the operating system plots one physical pixel for every two logical pixels in the vertical direction, i.e. in a `1024x768` rectangular pixel mode, there are only `384` physical pixels on the screen vertically.

This means that the mode takes up half the amount of memory as a square pixel mode (see below) with the same logical resolution, and hence the mode can sometimes have more colours that its square pixel counterpart.

Although the windows, icons, text etc. will be the same physical size on screen as the corresponding square pixel modes, the lines that make up those windows will appear twice as thick. Diagonal lines and curves will appear more ragged and anti-aliased text will not appear as well defined.

Square pixel modes
In square pixel modes the operating system plots one physical pixel for each logical pixel. This means that the `1024x768` square pixel modes have `768` physical pixels down the screen.

Square pixel modes have thinner, more highly defined lines, smoother text and curves and higher definition graphics than rectangular pixel modes. However, as the mode has twice as many lines as a rectangular mode, this can restrict the maximum number of colours that are available.

The easiest way to see the difference is to select two modes which are the same logical resolution, with one being a rectangular pixel mode, the other a square pixel mode. Compare the difference between displayed lines, curves, sprites and anti-aliased text.

Note:
The desktop resolution window can be brought up permanently (until it is closed by clicking on the close icon) by selecting the *Resolution* menu item or by clicking on the icon bar icon.

Selecting palettes

The Palette menu item leads to a list of palette files available.

```
          G8
   Info        ⇨
   Resolution  ⇨    Palette
   Palette     ⇨   Show        ⇨
   Quit            16Default
                   16Greys
                   16Primary
                   Default
                   Grey
                   Grey192
                   Primary
                   VGA
```
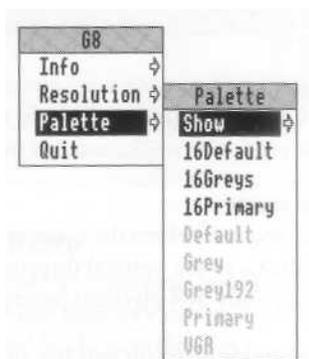
If a palette entry is greyed, then that particular palette is not suitable for the current mode. In **the example** above, the machine was in a 16 colour mode, therefore only the 16 colour palette files are available.

The Show menu item leads to a window that shows the current palette that the G8 card has defined.

256 Colour Palette

16 Colour Palette
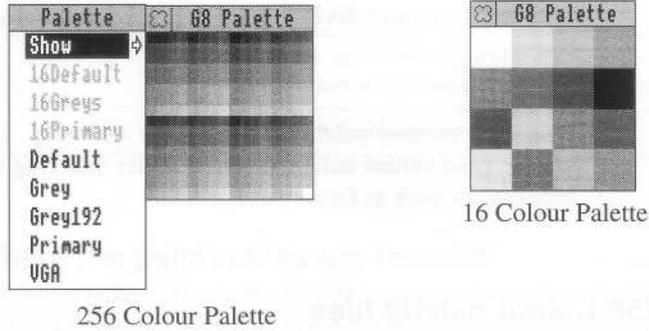
To bring up the G8 Palette window permanently, choose the Show item in the palette menu. The G8 Palette window will then remain open until closed. When the G8 Palette window is up, clicking menu over the window will bring up the Palette menu, but without the Show item, as show below.
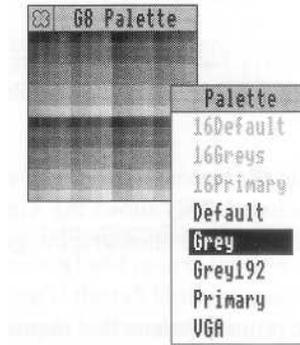
Note that this time the machine was in a 256 colour mode, therefore the 16 colour palette files are greyed out.

This feature also works if the G8 Palette window is iconised.

16 Colour palette files
The 16 colour files have the prefix 16 for easy recognition.

■ 16Default
    This is the standard 16 colour palette. It is the same as the palette set up

when the Default option is chosen from the Palette Utility menu.

- 16Greys
  This sets up 16 grey levels in a 16 colour mode. It is useful for displaying greyscale images.

- 16Primary
  This is the primary palette as supplied by ArtWorks. It offers pure cyan, magenta and yellow colours to allow better dithering when working with applications such as Draw, Artworks etc.

256 Colour palette files

These palette files can only be used in 256 colour modes.

- Default
  This is the default RISC OS 256 colour mode palette. Use this palette for applications that do not understand programmable palettes in 256 colour modes.

- Grey
  This palette file has 256 levels of grey, arranged in a linear fashion from black to white. This is ideal for displaying 256 grey level scans.

- Grey 192
  This palette file has only 192 grey levels, but it also has the 16 default wimp colours included. This allows the windows to retain their colours while still being able to display photographic grey level images.

- Primary
  This is the primary palette that improves the dithering in Artworks over the default RISC OS palette. It will also improve dithering in applications such as Draw.

- VGA
  This is the *standard* VGA palette, or the initial values held in the Colour Registers. The palette file is defined by 4 colour schemes as shown in the table below.

Palette Entry	VGA Colour Scheme
0 - 15	Identical to the 16 EGA colours initially loaded into the EGA palette registers

Where the palette files are located

The list of palette files in the Palette menu are found by scanning the path
`G8 : Palettes .` This path normally points to the resource directory
`Resources : $ . SMachine. G8 . Palettes` where the current palette files in
the ROM on the G8 Card are held.

To copy these files out for your own use, (to drop into Paint for example) use the
menu option *Open `$'* on the icon bar menu of the Apps icon. Go down the direc-
tory SMachine, G8 and Palettes where you will find the 256 colour palette files.

Any 256 colour palette file can be dropped onto the G8 Utility icon on the icon bar,
to set the 256 colour mode palette if possible.

Notes:

The G8 Utility remembers the 256 colour palette over mode changes (as
RISC OS does not) and re-sets the 256 colour palette on a mode change.
This means that if the G8 Utility is quitted after loading a 256 colour pal-
ette, and the mode is changed, the 256 colour palette will be forgotten.

The G8 Utility supports saving via the desktop boot option. This allows it to
be automatically loaded up on boot up.

3 *Technical Details*

Connector Pin Out

15 Pin VGA Connector

Pin Number	Function
1	Red Video
2	Green Video
3	Blue Video
4	Monitor ID Bit 2 (Not used)
5	Ground
6	Red Return (Ground)
7	Green Return (Ground)
8	Blue Return (Ground)
9	+5V Output
10	Sync Return (Ground)
11	Monitor ID Bit 0 (Not used)
12	Monitor ID Bit 1 (Not used)
13	Horizontal Sync / Composite Sync
14	Vertical Sync
15	Video Mux Output

9 Pin Connector

Pin Number	Function
1	Red Video
2	Green Video
3	Blue Video
4	Horizontal Sync / Composite Sync
5	Vertical Sync
6	Red Return (Ground)
7	Green Return (Ground)
8	Blue Return (Ground)
9	Sync Return (Ground)

Technical Reference Manual

A technical reference manual describing the Graphics Controller, hardware interface and full programming details is available from State Machine @ £7.95. Contact State Machine for further details.

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