

PACKING LIST

The contents of the Aurora package

- The Aurora PCB

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| Default settings on the Aurora are: <ul style="list-style-type: none">- SVGA monitor, interlace disabled- Analogue RGB monitor signals (VGA, SVGA, and Multisynch monitor compatible setting)- QL ROM pair or Minerva MK1 or MK2 ROM- non-superHermes IPC chip |
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- SVGA monitor cable adapter
- This manual

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QUICK START

If you cannot meet any one of the requirements below, or are not sure, please skip this section and go on to chapter one of the manual, "Preface". Feel free to contact QUBBESoft P/D for assistance.

- **System requirements:**

1. A PC case with a 5V powered backplane, preferably Qplane
2. Super Gold Card or Gold Card (Gold Card must not be the old yellow type), modified for 5V operation.
3. Minerva MK1 or MK2
4. superHermes, IPC with DiRen keyboard interface or with other IBM keyboard interface
5. One floppy drive
6. Some knowledge of the QL's motherboard (extracting and inserting chips, chip locations)

- **Things to prepare:**

1. One blank formatted floppy disc for backup
2. Any hardware you might need to fix the Aurora board in your PC case

- **Things to check:**

1. Please check that you have all the necessary cable adapters that connect the ports on your system to the Aurora PCB. Consult QUBBESoft P/D if necessary. You will need at least a monitor and two serial port adapters. Please note that your Aurora will come with jumpers pre-set and the cable adapter for the monitor of your choice, so please be sure about it before ordering.

If you are satisfied that all of the above requirements are met, you can proceed with the installation as follows:

1. If you intend on using a Gold Card (NOT Super Gold Card) with your Aurora, then you can ignore all references to altering display sizes.
2. Make a new boot disc, which will enable the system to load all the necessary drivers, e.g. the superHermes driver and/or a mouse driver, a configed version of SMSQ/E (V2.85 or later).
3. You will need to remove three chips from your existing QL motherboard. You can of course use your 'spare' chips if you have them. If you are not sure about removing and re-inserting chips, QUBBESoft P/D will do it for you at the cost of return postage. The chips you will need to remove are the MINERVA PCB, the large chip marked 8302, located right below the SER1 socket, and the IPC chip with the PC keyboard interface, located adjacent to the microdrives, to the left-hand side.

You can use a small flat-bladed screwdriver or a chip extraction tool, if you have one. Be careful and pry the chip up (NOT the socket the chip is plugged into!) by the shorter edges, a bit at a time. Sometimes the 8302 chip will be plugged into a QIMI mouse interface (a small PCB board which will be plugged into the 8302 socket and the adjacent ROM socket). In this case, you will find that one pin on the 8301 chip is bent out, and you will need to carefully bend it back in line with the rest of the pins.

Most 8302 chips will have two resistors across them, soldered to the pins towards the bottom edge of the QL motherboard. You will need to remove these

as they are already fitted on the Aurora. You can carefully desolder them, if you know how, or snip them off carefully just above the chip pins, while the chip is still in the socket. Please be careful NOT to snip off the pins of the chip, as you will then need a replacement!

4. Remove the QL motherboard from your system - the Aurora will replace it. Also remove any other boards you have except for the backplane and the Gold or Super Gold card. The other boards can be returned when proper operation of the Aurora is verified.
5. Please turn to Appendix A, for a picture of the positions of all connectors and sockets. It might be a good idea to put a bookmark there as you will need to refer to Appendix A to complete the following steps of the installation.
6. Plug the chips you extracted from the QL motherboard into the Aurora board. Proceed as follows: first plug in the Minerva PCB, taking care to align the pins opposite to the notch on the ROM socket and the notch on the large chip on the Minerva PCB. Refer to A.4, "The ROM socket", in Appendix A, for an illustration. Then plug the 8302 chip taking care the notch on the chip is closest to the edge of the Aurora board. Next, plug in the IPC you use, together with the keyboard interface. You might need to refer to the IPC/keyboard interface manual. Take care that the notch on the chip (or pin 1) is furthest from the edge of the Aurora board. If you have a keyboard 90 interface, you might need riser-sockets, as it is almost as large as the Aurora itself. In this case please consult QUBBESoft P/D. Before proceeding please verify that all the components are plugged in and seated properly.
7. Plug the monitor adapter cable into the monitor connector on the Aurora board.
8. Gently but firmly plug the Aurora in place of the QL motherboard. You might need to adjust any retaining clips that hold the other boards in your system or provide new stand-offs for the Aurora board, because it is much smaller than the QL motherboard.
9. Hook up your monitor, connecting the cable from it to the monitor cable adapter.
10. Switch on the monitor and then the system. In a couple of seconds you should notice the familiar tweed pattern of the QL resetting, and the usual Minerva startup screen. If this does not occur, switch off IMMEDIATELY and check your installation. If everything seems OK contact QUBBESoft PD for assistance. If you can see the startup screen (you might need to adjust your monitor's picture size and position controls), it is safe to assume your system is running properly. Proceed to the next step.
11. Switch off the system and connect the rest of the connectors you use. In particular, if you use a PC case, you will be able to connect the power LED, the turbo LED (used as a network activity indicator on Aurora) and the reset switch directly. You will need to modify the speaker connector slightly in some cases (refer to chapter 2, "Fitting"). You can also put back all the extra boards you have and hook them up as usual. Please be certain to plug all the connectors into the Aurora first, as it is much smaller than the QL motherboard, so you might not be able to do this with the other boards plugged into the backplane.

12. Switch on the system and verify that everything is working correctly.
13. If you are using a Super Gold Card in your system, and you have booted up with SMSQ/E (V2.85 or later), your system should come up exactly as before. You will find that entering 'DISP_SIZE x,y' where x and y are the number of pixels in the horizontal and vertical direction respectively, will change the screen resolution as close to your x and y parameters as Aurora and your monitor will allow. Please refer to Appendix E for a table of resolutions, and to Chapter 3, Software, for more data on SMSQ/E. It is prudent to config SMSQ/E (V2.85 or later) to the display size that you prefer to use.

1. PREFACE

Why did we do it the way we did

The Aurora is a QL motherboard replacement, with many added features.

We have taken great pains to insure compatibility of the board, but have decided to sacrifice connector and mechanical compatibility to the QL motherboard wherever this impaired the added functionality.

However, this has made the installation less than straightforward.

Since most serious users have converted the QL to work in a PC or similar case, mostly from +5V supplies, the Aurora was designed with the following guidelines:

- Operation on a backplane with 5V power supply. There are several around, we recommend Qplane.
- PC case compatibility, regarding connectors and devices found in the PC case (reset button, LED indicators, speaker, connectors). Because there are many PC-case conversion schemes used on the QL, the Aurora does not have direct connectors, but rather uses extension cables, called cable adapters, which you can order to suit your system. The Aurora comes bundled with a SVGA monitor cable adapter.
- PC keyboard interface used instead of QL membrane (There are several interfaces available, DiRen being the most affordable)
- Operation with Gold Card or Super Gold Card (the later must be used to fully exploit all the Aurora features)

This all enabled us to squeeze much more useful bits and pieces for your money's worth! Regardless of these assumptions, we have tried, wherever possible to make things easier for systems for which they are not satisfied. In the following text we have tried to cover as many situations where the Aurora can be used as we could think of. If at any time you feel there is something missing, please feel free to inquire with QUBBESoft P/D, so we can help you solve your problem, and by all means give us feedback about our product and it's manual.

2. FITTING

Preparation and installation

Related information:

- Appendix A, "Connectors, sockets and jumpers"
- Appendix B, "Cable adapters"

2.1 Getting started

Before you can use Aurora you will have to prepare your system. The preparations will in general fall into two categories, software and hardware:

Software:

To gain access to higher resolutions you will need to use SMSQ/E operating system, and a Super Gold Card. This does not mean that they are required for the Aurora to work at all - If you do not use either, please skip on to the section titled 'Hardware'.

If you have purchased SMSQ/E with your Aurora then you only need to read the last paragraph in this section.

You will require SMSQ/E V2.85 or later as this Version is fully Aurora compliant. If you do have SMSQ/E but not V2.85 or later please contact the Vendor that you purchased SMSQ/E from and obtain an upgrade. If you are unable to contact the Vendor then please send the SMSQ/E Master Diskette to QUBBESoft P/D for upgrading.

SMSQ/E has config blocks which can be changed using Qjumps standard config program. Various Display sizes and Qimi detection can be configured.

Hardware:

You will have to remove some chips from your QL and transfer them onto the Aurora.

If you think you are not competent enough to transfer these chips please contact QUBBESoft P/D who will transfer the chips free of charge except for the return postage.

We are assuming that you are familiar with how to gain access to your QL's motherboard. At this point it might be a good idea to put a bookmark into Appendix A of this manual. You will find a picture of the Aurora PCB with the positions of the sockets where you will transfer the chips extracted from the QL motherboard, as well as various connectors.

The chips that are required to be transferred are marked as follows:

ZX8302

This chip can be found on the QL situated behind the Ser1 port, it usually has two resistors sitting on top which are soldered to two of the chips legs and a wire soldered to another chip on the QL's motherboard. These resistors are not required, as they are already on the Aurora. If the resistors are in place they can be carefully removed, either by de-soldering them once the chip has been removed or by carefully cutting/breaking the contact between the resistors and the ZX 8302 legs. If you are cutting them off you might do this while the chip is still in its socket, to prevent the pins on the chip from being bent.

Sometimes this chip is seated in another interface known as QIMI, which is a mouse interface. If you find that the ZX 8302 is seated in a QIMI interface then you will notice, after extracting the chip, that one of the legs is splayed out (pin 10). This leg must be reverted back to its original position before placing into the Aurora. You cannot use a QIMI interface on the Aurora as the dispositions of sockets do not allow this, however, Aurora has an integrated QIMI-compatible mouse interface so you don't lose any system functionality.

To extract the chip from its socket you can use a thin flat screwdriver placed under the chip (not the socket) and gently ease the chip out of its socket.

The ZX 8302 can now be placed into its associated socket on Aurora, as seen in the picture in Appendix A, so that the notch along the top edge of the chip (as located in a QL) is closest to the edge of the Aurora PCB.

8049, Hermes, superHermes, Di-Ren Kybd I/Face or Keyboard 90 I/Face

All the above chips and interfaces are associated. If you already have a PC Keyboard Interface you will probably be familiar with its location. For those that aren't the location of this chip/interface is as follows:-

Just to the side of "mdv1", under where the ENTER/SHIFT/ALT keys are on the top of the QL case.

The Di-Ren Keyboard Interface or Keyboard 90 interface will have a standard 8049 or 8749 chip or a Hermes chip installed on them. You do not have to remove the chip, simply remove the interface board with it, as you will need to plug the assembly into the Aurora as it is.

Using a small screwdriver (as with the ZX 8302) carefully ease the chip/interface out of its socket.

The chip/interface can now be placed into its associated socket on Aurora, please see Appendix A for the position of the socket (labelled IPC socket).

Keyboard 90 users will need to use a riser socket (available from QUBBESoft P/D), and possibly a small piece of insulation material, as the interface will sit above the ROM socket. The socket should be placed into the Aurora IPC socket, and the Keyboard 90 plugged into it. The reason for this is that the Aurora is only slightly bigger than the Keyboard 90 itself, so the Keyboard 90 might interfere with other parts on the board.

The superHermes board can be fitted directly onto the Aurora without any riser sockets. SuperHermes has a 'flying lead' which, on a standard QL has to be connected to a pin on the expansion connector. Aurora has been designed with superHermes in mind, so instead of the flying lead, you have to put a jumper on the two pins you will find right beside the ZX8302 chip, to the left of it and along the edge of the Aurora board. This jumper has the same function as the flying lead, so you do not have to use it any more, and in fact you can remove it altogether. Please refer to Appendix A for details on the locations and functions of jumpers.

If you intend to use a standard IPC with a membrane or membrane-equivalent keyboard (such as the SPEM keyboard), you will need to construct a keyboard interface cable, or inquire with QUBBESoft P/D to purchase one. More on this can be found in Appendix A and B.

QL ROM chips, MINERVA MK1 or MK2

These chips can be found in two sockets, behind the Ctl1 and Ctl2 ports on the QL. Sometimes the one in the right-hand socket will be plugged into a QIMI mouse interface, and the interface plugged in its place (this interface is also plugged into the 8302 socket). Remove the chips, using the same procedure as outlined for the ZX8302, above.

If you have a Minerva, either MK1 or MK2, it will be plugged into one of the sockets, while the other will be empty (or there will be a QIMI interface plugged into it). You can simply plug the Minerva PCB into the ROM socket on the Aurora (consult Appendix A for the location).

All QL ROM chips have less pins than the socket on the Aurora. This socket can accept larger capacity ROM chips, which will be supported in future versions of the Aurora software. You must align the pins opposite to the orientation notch on the socket and the chips together, i.e. the top two pins on the left and right side of the socket (furthest from the edge of the Aurora PCB) should be left open.

In case you have the original QL ROM pair (any version), you must solder them piggy-back, onto each other. Please consult Appendix A (A.4, The ROM socket) for the procedure to do this, if you feel up to it and have the proper tools. If not, please inquire with QUBBESoft P/D for a pre-soldered ROM pair.

Appendix A (A.4, The ROM socket) also has an illustration on the proper positioning of the chips.

2.2 Installing the Aurora

Once the chips have been transferred to the Aurora PCB, you are ready to install the board into your system. Before you proceed, please check that the jumper settings on the board correspond to your system. The default settings are:

- QL ROM pair or Minerva ROM
- SVGA monitor, interlace disabled
- RGB analogue output signals to monitor

You can find all the other settings and the locations of jumpers in Appendix A.

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| <p>AURORA is designed for +5V power, preferably from a Qplane backplane. If you try to apply 9V power to the board, it WILL be destroyed, and the warranty void.</p> |
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For hints on using the board in a 9V powered system (e.g. original QL case), consult Appendix C.

The following paragraph assumes you have the QL built into a PC or similar case.

Please note that for some QL-to-PC case conversion kits, you might need to provide new mounting holes for the Aurora, as the ones that fit the original QL board will not fit the much smaller Aurora PCB. Before proceeding, you may want to make a jig to drill the holes by copying the positions of the mounting holes on the Aurora to a piece of cardboard. Do not use the Aurora as a jig as you can end up destroying the PCB.

Before proceeding with installation, please remove all the boards from your system, except the Gold Card or Super Gold Card. You must remove the QL motherboard as well, as Aurora replaces it. Once the Aurora is plugged into the system instead of the QL motherboard, you can plug the monitor cable adapter (this will mostly be a SVGA cable adapter which comes bundled with your Aurora) into the monitor connector (see Appendix A for connector locations). Plug in your monitor, switch it on, and switch on your system. In a few seconds you should see the familiar tweed pattern of the QL initializing, and a startup screen. If you do not, switch the system off IMMEDIATELY and check all the connections, cables, jumper settings, chip seating and orientation. If everything seems OK please call QUBBESoft P/D for assistance.

Once you have verified that the system starts up OK, you can return other boards you use into the system.

WARNING: If you are using Qubide and the Super Gold Card, the address jumpers on it have to be set to either the address of the ROM slot (C000 - default) or to the last 16k of the IO area (FC000). Other settings will prevent the correct operation of Aurora. Consult the Qubide manual for proper jumper settings.

With no modification to the boot files, your system should work exactly as before. Without SMSQ/E or with the GoldCard the Aurora is automatically set into compatibility mode, where it behaves as close as possible to the QL motherboard. To use the new display drivers refer to chapter 3, "Software".

To complete the installation of the Aurora you will need to connect the serial ports, the reset button, the power and network indicators, the speaker and the network connectors, using appropriate cable adapters. The list of cable adapters available on request from QUBBESoft P/D can be found in Appendix B. Please note that Aurora uses PC-case compatible connectors or adapters whenever possible. You should be able to connect most of the switches and indicators in your PC case directly.

2.3 Hints on PC cases

The Aurora's Utility connector should be able to accept the following PC case switches and indicators directly (refer to Appendix A for the location and pinout of the utility connector). The connector is shown overleaf, as viewed from above, so that it is located along the right-hand edge of the Aurora board.

| | | | | |
|-----------------------|---|----|-------------------------|--------------------------|
| Reset switch | 1 | 2 | Reset switch ground | ← reset switch connector |
| Network output | 3 | 4 | Network ground | |
| Network LED anode (+) | 5 | 6 | Network LED cathode (-) | ← turbo LED connector |
| Power LED anode (+) | 7 | 8 | Power LED cathode (-) | ← power LED connector |
| Speaker output | 9 | 10 | Speaker ground | ← speaker connector |

The reset, LED and speaker connectors are two-pin plugs which can be plugged beside each other into the utility connector. The LED connectors should be plugged in so that the black wire goes to pins 6 and 8 respectively (LED - terminals). On some cases the wire colors are different. If the LED indicators don't work, reverse the orientation of the LED plugs. On some cases the speaker connector is a 4-way plug with only two of the outer wires used. In case you have such a connector, you can move one of the pins so that they are adjacent with a bit of care. To connect the network, you will need to purchase a network cable adapter from QUBBESoft P/D or build one yourself from the data supplied in Appendix B.

Please consult your PC case manual or leaflet for identification of the proper cables.

2.4 Serial and mouse ports

Serial port connectors on your Aurora are wired to be compatible with the PC pinout standard. This means that the connectors on Aurora correspond to the ones found on the PC multi or serial I/O cards, and on PC integrated motherboards.

You can get standard PC style serial port connectors with flat cable extenders with IDC 10-pin on their ends. The connectors will be D-type, usually one 9-pin and one 25-pin, mounted onto a metal part which can be installed directly into the PC case expansion card openings. The IDC connectors will fit the serial connectors on Aurora directly.

You will find that you can use a serial mouse on the QL by simply plugging it into a 9-pin D connector as found on this standard PC accessory. If you cannot find this adapter, you might consider building one yourself if you have experience with press-on connectors (see Appendix B), or you can order one from QUBBESoft P/D.

The Aurora has a QIMI-compatible mouse interface integrated on the board. This has been provided for the many users of this excellent interface, which unfortunately we could not directly support because of the predisposition of the sockets it expects to find. However, a QIMI mouse can be used with a simple adapter, which is available from QUBBESoft P/D (specifications are given in Appendix B).

It is also possible to use an Amiga mouse, or a PC bus mouse (not serial or PS/2) with this interface, providing a proper cable adapter is used.

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| <p>The QIMI compatible mouse connector is of the same type as a PC standard D 9-pin serial port. Please be careful NOT to plug the mouse into the serial port or the other way around as you can cause damage to the Aurora and/or mouse!</p> |
|--|

You will find additional notes on the mouse interface in chapter 3 ("Software")

2.5 The ROM slot

Because the Aurora is far smaller than the original QL motherboard, it was not possible to preserve the positioning of the ROM slot. Instead, the Aurora has an IDC type connector, which also provides some new features. In order to use ROM slot oriented peripherals, you will need an adapter, available from QUBBESoft P/D on request (specifications can be found in Appendix B). In due course, manufacturers of ROM slot oriented peripherals might offer an Aurora compatible adapter as well.

Apart from the need to have an adapter, all ROM slot peripherals should work as the standard part of the ROM slot has been made completely QL compatible. There is only one case in which this will not work: EPROM cartridges will not work if you have a Qubide interface installed, with it's address set to the address of the ROM slot (C000h) - Qubide takes precedence. The extended features of the ROM slot will continue to operate normally.

2.6 Monitor considerations

Aurora has been designed to make the most of the hardware attached whenever possible. One particular instance where this is not only dependent on the Aurora itself, is the added graphics capability. This will depend on the monitor you are using as well. Although we have taken pains to optimize the display resolutions obtainable on any type of monitor, Aurora cannot perform miracles. Obviously, the best results can be expected from the best monitor, and the other way around.

There are many different kinds of monitors around. Some details on their interfacing are given in Appendix A, and a general description of what the Aurora is capable of depending on your monitor is given in Appendix E.

2.7 Miscellaneous

The Aurora has an as yet unsupported feature which allows it to use higher capacity ROM chips. The maximum capacity is 512k bytes, using 274001 type EPROM chips. Because the proper exploitation of this feature depends on the system software, users will be able to take advantage of it when the proper software becomes available, which we hope will be soon. In that case there will be an addendum to this manual.

3. SOFTWARE

SMSQ/E

Related information:

- Chapter 2, Fitting, getting started
- SMSQ/E manual, config blocks
- Appendix E, Monitors, resolutions and modes

3.1 Operating system requirements

To properly exploit all the Aurora facilities, you will need to run the SMSQ/E operating system. This may change in the future, but as we do not hold any rights to any operating system this is currently out of our control..

Previously, the Aurora came either bundled with a version of SMSQ/E which works with it, or a patch disc which will unlink the built-in display driver of your existing copy of SMSQ/E and link a new one. The driver implements control over the new display capabilities, in particular changing of resolutions.

SMSQ/E V2.85 and later has been designed to be fully Aurora compliant so there is now no need to supply a patch program. If you own a pre-V2.85 then please contact the Vendor you purchased SMSQ/E from to obtain an upgrade.

3.2 Display control

SMSQ/E implements a command `DISP_SIZE`:

DISP_SIZE *x,y*

x = horizontal resolution

y = vertical resolution

Unlike the Atari TT, and similar to QXL, Aurora has discrete resolution steps that you can use in the x and y position above. These are:

x: 512, 640, 768, 1024

y: either $x * 0.5$ or $x * 0.75$ (thus 256, 320, 384, 480, 512, 576 and 768)

Other values can be input as well, but the software will round them to the first available lower resolution. Also, some resolution limiting may occur depending on the monitor type connected, as not all of them can display all resolutions. Because of this, other resolutions can be generated as well. See Appendix E for more detailed data.

The new driver also adds new config-block entries which can be changed the usual way. These enable you to set the resolution in which your system will power up when SMSQ/E boots.

3.3 Mouse

Aurora has a built-in QIMI compatible mouse interface. This is completely software compatible with the original interface. However, there are additional considerations - in particular using another mouse interface with the Aurora.

The QIMI mouse interface is handled in the part of SMSQ/E which implements PTR_GEN and WMAN functions of the original pointer interface extension. Because of the way this is done, other mouse drivers may not resolve button presses correctly. To avoid this, SMSQ/E has a config-block which enables or disables QIMI detection.

On the Aurora QIMI detection will always return a positive result since every Aurora has a QIMI compatible interface. When it is set not to detect QIMI, QIMI (any kind, Aurora or the original interface) will not be detected and will be disabled. If you use a non-QIMI mouse, please set QIMI detection to OFF.

3.4 16 and 256 color display modes

At present, the SMSQ/E driver only supports the standard MODE 4 and MODE 8. The Aurora hardware also supports a 16 and a 256 color mode, in several screen resolutions. A new version of SMSQ/E which supports this feature across all systems capable of displaying more than 8 colors is being developed. When it becomes available, it will come with an addendum to this manual.

3.5 Extended ROM

As outlined in the Hardware section, Aurora has a capability to use high-capacity EPROMs. Since the maximum is 512k bytes, there is a possibility of a ROM version of SMSQ/E. We do not consider this to be of high-priority, as SMSQ/E is still under development, which would make ROM updates impractical. However, developments will go into that area, as the ROM can also be used to store other frequently used software, in a manner of a ROM-disc. When the necessary software becomes available, it will come with an addendum to this manual.

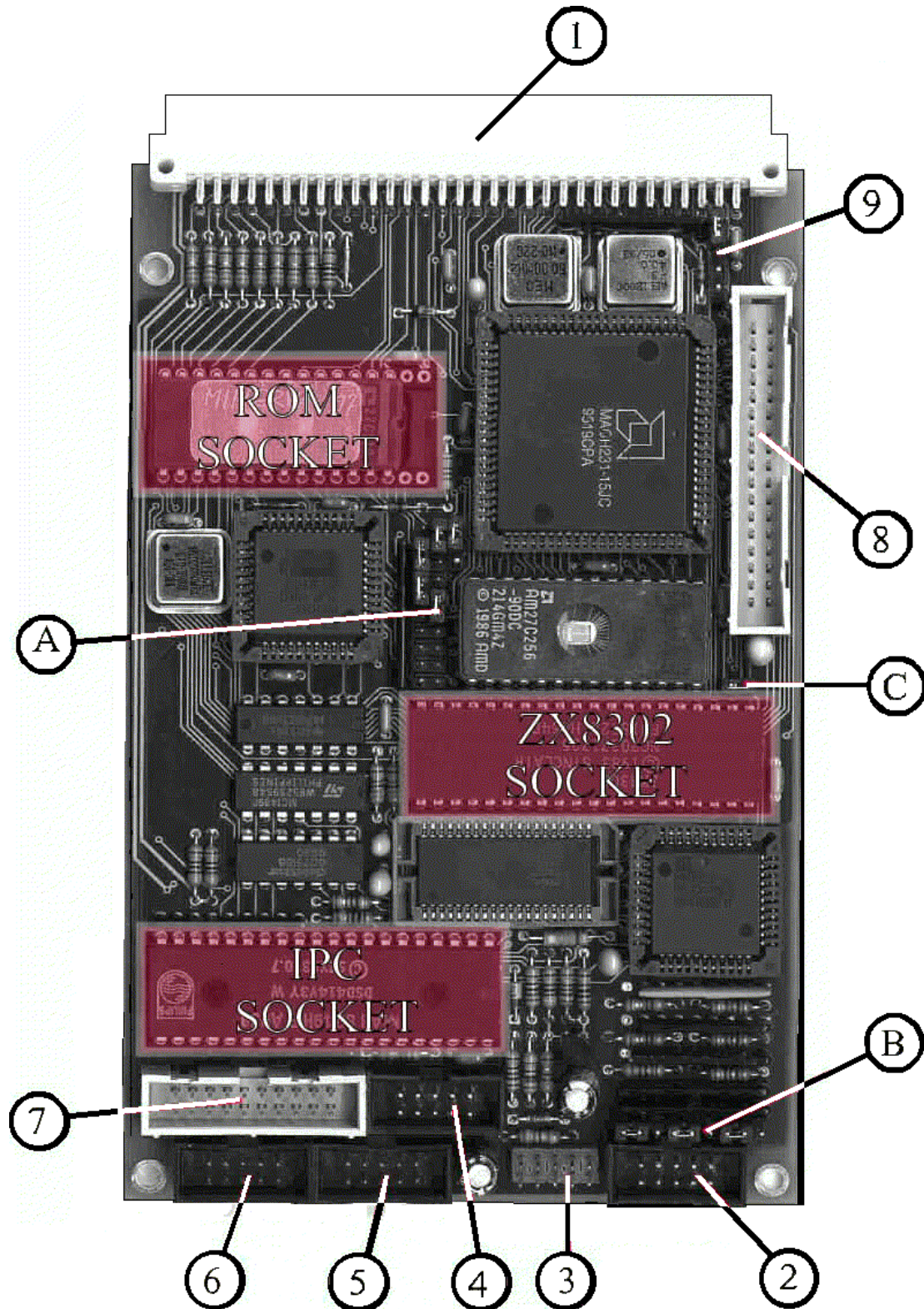
APPENDIX A

Connectors, sockets and jumpers

Related information:

- Chapter 2, "Fitting"
- Appendix B, "Cable adapters"
- Appendix C, "Non-obvious differences between Aurora and QL motherboards"
- Appendix D, "Hints on fitting Aurora into a QL case"

A.1 Connector and jumper locations

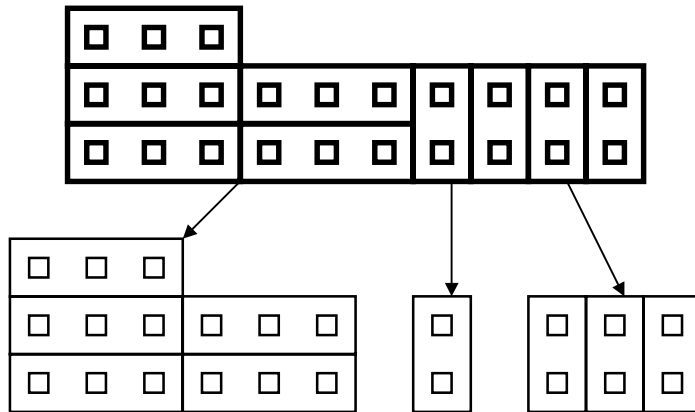


The Aurora will usually come with three sockets unpopulated (unless you have made different arrangements). On the picture above, these are marked 'ROM SOCKET', 'ZX8302 SOCKET' and 'IPC SOCKET'. Please refer to chapter 2, "Fitting", for instructions on these sockets. Connectors are marked with numbers, while jumper fields are marked with letters, as follows:

| | |
|-----------------------|--|
| 1 | The expansion connector. This would normally be connected into a backplane, or directly to a (Super)Gold Card, or a Qubide. Some pin assignments have been changed subtly, refer to appendix C for more information. |
| 2 | Display connector. The Aurora comes with a VGA cable adapter as standard (others are available as well, see appendix B), which is plugged into this connector. Depending on the type of adapter and connector, jumpers (B) may have to be set differently than the default settings, see below. |
| 3 | Utility connector. This connector has multiple purpose. The reset button, power and network activity LEDs, the speaker and the network adapter lead connect to it. See below for pin assignments. |
| 4 | Mouse connector. This connector accepts a cable extender/adapter for an Atari, Amiga, or IBM PC BUS (not serial, nor PS2!!!) style mouse. |
| 5, 6 | Serial port connectors. These will accept standard PC case extender cables with either a DB-9 or DB-25 serial connector, wired as per IBM PC standard. Connector 5 is ser2_ and connector 6 is ser1_. Other adapter styles may be available, consult QUBBESoft P/D. |
| 7 | Keyboard matrix connector. This may not be fitted on your board. It accepts a special adapter which enables connection of a standard QL membrane, or a keyboard matrix (partial or whole), or standard QL joysticks. |
| 8 | Extended ROM port connector. This will accept an adapter available from QUBBESoft P/D which enables the connecting of standard QL ROM cartridges and similar devices that connect to the QL's ROM slot. We recommend that you contact us with the particular application you have in mind as it's possible to avoid multiple adapters for some of them. The ROM port has also been extended with some useful signals, details on those can be found in appendix B and C. |
| 9 | External power connector. This may not be fitted on your board (a wire jumper is fitted instead). This connector can be used to power the system via the Aurora board, for instance if the board is fitted in a standard QL case, or there is no 5V powered backplane. For more information consult appendix B and D. |
| A | System configuration jumper. This is a multiple-purpose jumper field, used to set the type of ROM chip used, display type (QL, VGA, SVGA, Multisynch), enabling of interlaced scan, and if a LCD interface is fitted alongside with the Aurora. |
| B | Monitor signal level jumpers. These are used to set the signal levels compatible with the monitor you are using, e.g. analogue, TTL or TTL-level analogue, and monochrome. |
| C | superHermes IPC jumper. This jumper is used when a superHermes IPC is fitted onto the Aurora. |

A.2 Jumper settings

Jumper (A): System configuration jumper block



ROM type jumpers LCD jumper Monitor type jumpers

As shown above, this jumper block has several functions, divided into three groups. The function of each group is explained below.

ROM type jumpers:

The Aurora can accept several types of ROM chips: Standard QL ROMs (both are soldered piggyback and then inserted into the ROM socket, consult QUBBESoft P/D for piggyback ROM pairs), Minerva (both MK1 or MK2), or various EPROM chips, including the Minerva EPROM (i.e. chip without the printed circuit, only Minerva MK1). Depending on the chip used, the ROM type jumpers have to be set differently, according to the table below (Dark parts are the jumpers):

| | |
|--|---|
| | QL ROMs, Minerva MK1 or MK2 (on carrier) (48k capacity) (Default) |
| | 27512 or 27C512 EPROM Minerva MK1 EPROM (no carrier, straighten legs) (64k capacity) |
| | 27010 or 27C010 EPROM, 271001 or 27C1001 EPROM 28010 Flash ROM (Read only), 29EE010 Flash ROM (Read only) (128k capacity) |
| | 27020 or 27C020 EPROM 272001 or 27C2001 EPROM (256k capacity) |
| | 27040 or 27C040 EPROM 274001 or 27C4001 EPROM (512k capacity) |








Warning: All other configurations are not allowed and can lead to incorrect operation or damage.

Other chips such as flash EEPROMs with a pinout compatible with the chips in the table above may work as well, but have not been tested yet. Please feel free to consult QUBBESoft P/D for details if you wish to use such chips on the Aurora.

Monitor type jumpers:

The Aurora can drive four general monitor types: QL standard, VGA, SVGA and Multisynch. In addition, for the first three monitors, interlaced scan can be enabled or disabled. For a discussion on interlaced scan, and how it affects resolution and picture quality, please refer to 2, "Graphics".



The monitor type and interlace enable are encoded on the jumpers according to the following table (Dark parts are the jumpers):

| | | | |
|---|---------------------------------|---|---|
|  | QL monitor, interlace disabled |  | SVGA monitor, interlace disabled (DEFAULT) |
|  | QL monitor, interlace enabled |  | SVGA monitor, interlace enabled |
|  | VGA monitor, interlace disabled |  | Multisynch monitor (Interlace is not used) |
|  | VGA monitor, interlace enabled | | |

Warning: All other configurations are not allowed and can lead to incorrect operation or damage.

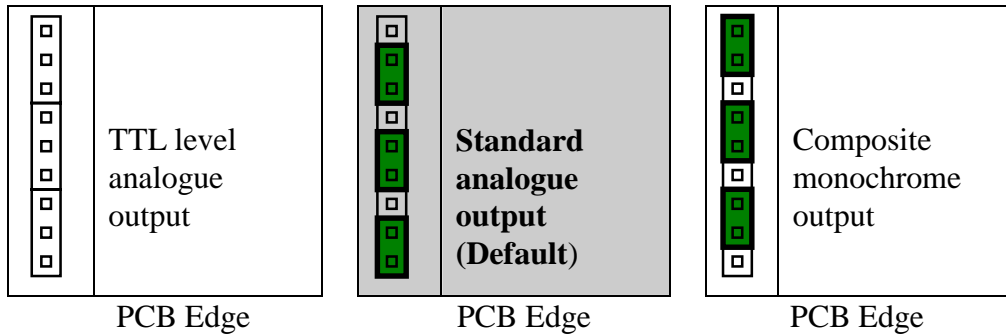
LCD jumper:

The Aurora has a provision to work alongside an LCD controller board. This jumper is only intended for future compatibility, and the setting will have no effect in a system using a Gold Card or a Super Gold Card, with or without the LCD controller. Jumper settings are as follows:

| | |
|---|--|
|  | LCD controller not fitted (Default) |
|  | LCD controller fitted |



Monitor signal level jumpers (B):

It is possible to produce three types of signals for the monitor with the Aurora: Standard analogue video (1Vpp into 75 ohms), TTL level analogue video (3Vpp into 1k ohms) or composite monochrome (1Vpp into 75 ohms). The last two are generally used only with QL type monitors, please consult Appendix E, and Chapter 2, "Fitting" for more details. When the jumper block is viewed so that it is behind the monitor connector and edge of board is to the right of it, jumper assignments are as follows:



superHermes jumper (C):

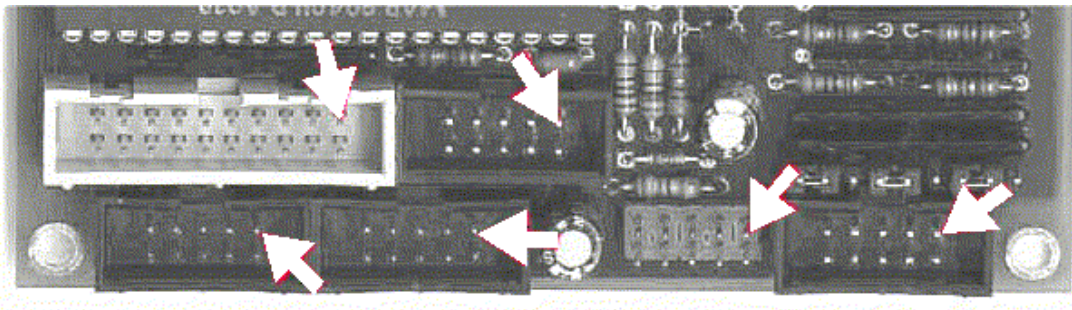
Aurora has been designed with superHermes in mind. The superHermes IPC has a 'flying lead' which is, in a standard QL system, fitted to a pin on the expansion connector (1). Because the Aurora design is a much more dense board, we have included a jumper which serves this purpose. If superHermes is installed into Aurora's IPC socket, this jumper has to be fitted, and the superHermes flying lead does not have to be used at all. In fact, if you are not planning to use superHermes anywhere else, you can remove the flying lead completely. Jumper assignment is as follows:

| | |
|---|---|
|  | superHermes not fitted (Default) |
|  | superHermes fitted (do not use flying lead!). |

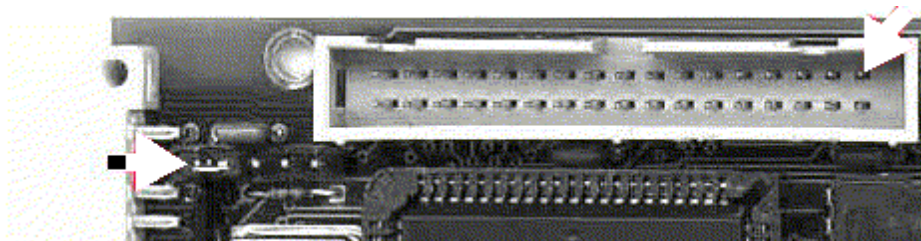
A.3 Connector pinouts

The connectors are shown below, with the pin numbering which applies to them, and the signals for each pin. To correctly apply the information check the positions of pin number 1 for each connector on the pictures below. Pin 1 is marked with an arrow, and the connector pinout schematic is a view from above (same as on the picture):

Serial, utility, keyboard, mouse and monitor connectors:



Extended ROM slot and external power connectors:



Connector pinouts follow:

Monitor connector:

| | | | |
|----------------------------|---|----|----------------|
| Composite monochrome | 1 | 2 | Ground |
| Red | 3 | 4 | Ground |
| Green | 5 | 6 | Ground |
| Blue | 7 | 8 | Ground |
| Composite/Horizontal synch | 9 | 10 | Vertical synch |

Pin 9 has the function of Composite synch (QL compatible) when QL monitors are used. For all other types of monitor pin 9 outputs the Horizontal synch signal.

Utility connector:

| | | | |
|-----------------------|---|----|-------------------------|
| Reset switch | 1 | 2 | Reset switch ground |
| Network output | 3 | 4 | Network ground |
| Network LED anode (+) | 5 | 6 | Network LED cathode (-) |
| Power LED anode (+) | 7 | 8 | Power LED cathode (-) |
| Speaker output | 9 | 10 | Speaker ground |

Serial port connector:

| | | | |
|----------------------------------|---|----|------------------------------|
| Not connected | 1 | 2 | Not connected |
| RXD (receive data) input | 3 | 4 | RTS (Request to send) output |
| TXD (transmit data) output | 5 | 6 | CTS (Clear to send) input |
| DTR (Data terminal ready) output | 7 | 8 | Not connected |
| Signal ground | 9 | 10 | Not connected |

Please note that BOTH serial port connectors have the same pinout, which is a standard on the PC and compatibles. Readily available cable adapters that adapt a 10-pin IDC type plug fitting into this socket to either a DB9 or DB25 standard serial connector can be used. A serial mouse can be connected directly without any adapter.

Mouse connector

| | | | |
|----------------------------|---|----|-------------------------------------|
| Horizontal movement input | 1 | 2 | Right button input |
| Horizontal direction input | 3 | 4 | +5V Mouse power output (50 mA max.) |
| Vertical direction input | 5 | 6 | Ground |
| Vertical movement input | 7 | 8 | Left button input |
| Not connected | 9 | 10 | Not connected |

Keyboard matrix connector

| | | | |
|------------------|----|----|------------------|
| +5V (50 mA max.) | 1 | 2 | +5V (50 mA max.) |
| Row 0 | 3 | 4 | Column 5 |
| Row 1 | 5 | 6 | Column 4 |
| Row 2 | 7 | 8 | Column 3 |
| Row 3 | 9 | 10 | Column 2 |
| Row 4 | 11 | 12 | Column 1 |
| Row 5 | 13 | 14 | Column 0 |
| Row 6 | 15 | 16 | Column 6 |
| Row 7 | 17 | 18 | Column 7 |
| Ground | 19 | 20 | Ground |

External power connector

| | |
|---------------------------------------|---|
| Bus +5V or +9V power supply line | 1 |
| Aurora +5V power supply line | 2 |
| Ground (0V) | 3 |
| Aurora and bus +12V power supply line | 4 |
| Aurora and bus -12V power supply line | 5 |

Warning: This connector may not be fitted on your board. The Aurora is designed for 5V operation **ONLY** and is by default set to operate from the bus power line (pin 1) which should carry 5V power. Hence, by default there is a wire link or jumper between pins 1 and 2 on the external power connector. For the Aurora to operate in a 9V system (for instance in a standard QL case with a standard QL power supply), this link **MUST** be removed, or the board will be destroyed. In case of a 9V system, separate 5V power provided on pin 2.

Extended ROM slot connector

(Original ROM slot connector is shown on the right-hand side with the same orientation, for comparison. Notice that the pin numbering of the original ROM slot, as found in the concepts section of the QL's manual is different.)

| | | | | | |
|--------------------------------|----|----|--------------------------------|------------------|---------|
| -RESET (output, active low) | 1 | 2 | -EXIO (output, active low) | Bot. | Top |
| -EXTINT (input, active low) | 3 | 4 | +5V, 100mA max. (power) | Not used | +5V |
| A12 (output) | 5 | 6 | A14 (output) | A 12 | A 14 |
| A7 (output) | 7 | 8 | A13 (output) | A 7 | A 13 |
| A6 (output) | 9 | 10 | A8 (output) | A 6 | A 8 |
| A5 (output) | 11 | 12 | A9 (output) | A 5 | A 9 |
| Ground | 13 | 14 | +5V, 100mA max. (power) | Key (no pins) | |
| A4 (output) | 15 | 16 | A11 (output) | A 4 | A 11 |
| A3 (output) | 17 | 18 | ROMOE (output, active high) | A 3 | ROMOE |
| A2 (output) | 19 | 20 | A10 (output) | A 2 | A 10 |
| A1 (output) | 21 | 22 | A15 (output) | A 1 | A 15 |
| A0 (output) | 23 | 24 | D7 (bidirectional) | A 0 | D 7 |
| D0 (bidirectional) | 25 | 26 | D6 (bidirectional) | D 0 | D 6 |
| D1 (bidirectional) | 27 | 28 | D5 (bidirectional) | D 1 | D 5 |
| D2 (bidirectional) | 29 | 30 | D4 (bidirectional) | D 2 | D 4 |
| Ground | 31 | 32 | D3 (bidirectional) | GND | D 3 |
| -WR (output, active low) | 33 | 34 | -DS (output, active low) | | |

The expansion bus connector

(Front view)

| | | | |
|-----------------|-----|-----|---------------|
| | | | |
| Ground | 1b | 1a | Ground |
| D2 | 2b | 2a | D3 |
| D1 | 3b | 3a | D4 |
| D0 | 4b | 4a | D5 |
| Not connected | 5b | 5a | D6 |
| -DS | 6b | 6a | D7 |
| -WR | 7b | 7a | Not connected |
| -DTACK | 8b | 8a | A18 |
| Not connected | 9b | 9a | A17 |
| Not connected | 10b | 10a | A16 |
| A15 | 11b | 11a | CLK [CLKCPU] |
| -RESET | 12b | 12a | Not connected |
| -RFSH [-CSYNCH] | 13b | 13a | A14 |
| Not connected | 14b | 14a | A13 |
| POLL [VSYNCH] | 15b | 15a | A12 |
| -VPA | 16b | 16a | A11 |
| Not connected | 17b | 17a | A10 |
| Not connected | 18b | 18a | A9 |
| Not connected | 19b | 19a | A8 |
| FC1 | 20b | 20a | A7 |
| FC0 | 21b | 21a | A6 |
| A0 | 22b | 22a | A5 |
| ROMOE | 23b | 23a | A4 |
| A1 | 24b | 24a | A3 |
| A2 | 25b | 25a | -FTACK [-DBG] |
| Not connected | 26b | 26a | Not connected |
| -IPL0 | 27b | 27a | DSMC |
| -BERR (pull-up) | 28b | 28a | Not connected |
| -IPL1 | 29b | 29a | Not connected |
| -EXTINT | 30b | 30a | +12V |
| Bus power | 31b | 31a | -12V |
| Bus power | 32b | 32a | Bus power |

[] = old definition, see Appendix C

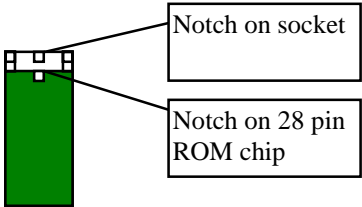
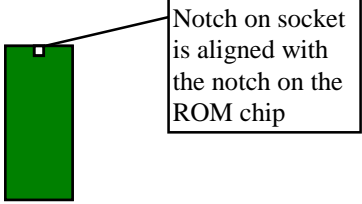
(pull-up) = Only a pull-up resistor is present on the Aurora, otherwise not used

Bus power = normally +5V, +9V optional through use of external power connector

Consult Appendix C, "Non obvious differences between Aurora and standard QL motherboards" for more details on changed signals.

A.4 The ROM socket

Not to be confused with the ROM slot, this is the 32 pin IC socket which accommodates the ROM chip. There are two general types of ROM chips which can be fitted onto the Aurora: 28-pin and 32 pin. They are fitted as follows:

| | |
|---|---|
|  | <p>The 28 pin ROM types (Standard QL ROM, Minerva boards - MK1 and MK2, as well as the Minerva EPROM on it's own or a 27(C)512 EPROM are fitted so that the bottom edge of the chip and the socket are aligned. The socket should have two unused pins on the top, on either side edge.</p> |
|  | <p>The 32-pin ROM types, i.e. 27(C)1001, 27(C)010, 27(C)2001, 27(C)020, 27(C)4001 and 27(C)040, as well as compatible FLASH EEPROMs should plug into the socket as usual, with notches aligned.</p> |

Please note that jumper settings on the board have to be adjusted to accommodate different ROM chips, otherwise incorrect operation or damage may occur.

The standard QL ROMs have to be fitted in a special way, since there are two chips, which need to be put into a single socket. Please inquire with QUBBESoft P/D for matched pairs of ROM chips if you are at all uncertain about the following procedure, or have no experience with soldering chips or chips in general.

To fit QL ROMs, you will need to 'piggyback' them one onto another and solder the pins together carefully, as follows:

1. Take the ROMs out of the QL, or have a pair prepared otherwise. Please make sure one ROM reads XX 0000 and the other XX 8000, where XX is the ROM version, which **MUST** be the same for both ROMs.
2. Align the ROMs, one onto another (it does not make any difference which is top and which is bottom), both with pins facing down, with the notches denoting pin 1 facing the same way. Carefully press the top onto the bottom, slightly shifting the top chip so that the pins of the top chip 'straddle' the pins of the bottom chip. The ends of the pins of the top chip should go right over the widened parts of the corresponding pins of the bottom chip. You might need to bend the pins of the top chip slightly outwards to accomplish this, by using a flat edge as a tool. Flat long pliers can be used nicely - take all the pins on one side in them and bend slightly. You can also use a knife (put the sharp edge between the chip body and the pins from the bottom side of the chip, i.e. pins facing upwards).
3. Carefully solder the pins together, taking care the solder does not flow over the exposed narrow parts of the bottom chip, as these will go into the socket on the Aurora. Turning the connected chips so that pins face upward might help.

This chip 'combo' can still be used in a standard QL by plugging it into any one of the ROM sockets on the original QL motherboard. If you desire so, QUBBESoft P/D is willing to program EPROMs with a ROM image of your choice, as long as you provide the original ROM pair you want to have replaced by an EPROM.

If you have an EPROM programmer at hand, be sure that you have programmed the ROM image into the BOTTOM 48k (i.e. starting at address 0). It may be prudent to leave the rest of the chip unprogrammed (all FFh) so it does not have to be erased anew if you wish to use the Aurora ROM-disc feature. Consult Appendix C for more details.

APPENDIX B

Cable adapters

Related information:

- Chapter 2, "Fitting"
- Appendix A, "Connectors, sockets and jumpers"

B.1 List of cable adapters available from QUBBESoft P/D:

- VGA/SVGA/Multisynch monitor cable adapter (included with Aurora)
- QL DIN-8 monitor cable adapter (available on request)
- Network cable adapter (available on request)
- Serial port IDC10 to D-9 male connector (available on request)
- Serial port IDC10 to D-25 male connector (available on request)
- Atari/Amiga mouse adapter for built-in QIMI interface (available on request)
- ROM slot adapter

B.1.1 List of adapters not available from QUBBESoft P/D

- QL keyboard adapter
- Standard Joystick adapter (cannot be used with keyboard adapter), D-9 connector (CTL1)

B.2 Cable adapter pinouts and diagrams

Monitor adapters

| Aurora socket pin | MD-15 fem. VGA connector pin | QL DIN 8 female connector pin: | Monochrome RCA (Cinch) plug pin: |
|-------------------|---------------------------------|--------------------------------|----------------------------------|
| 1 (MONO) | not used | not used | middle pin |
| 2 (GND) | 6 (red return) | 2 (gnd) | outer shell |
| 3 (R) | 1 (red) | 7 (red) | not used |
| 4 (GND) | 7 (green return) | not used | not used |
| 5 (G) | 2 (green) | 6 (green) | not used |
| 6 (GND) | 8 (blue return) | not used | not used |
| 7 (B) | 3 (blue) | 8 (blue) | not used |
| 8 (GND) | 5 and 10 (ground) | not used | not used |
| 9 (CS/HS) | 13 (hsynch) | 4 (csynch) | not used |
| 10 (VS) | 14 (vsynch) | not used | not used |

Notes:

QL colour and monochrome monitor output signals have to be set properly via jumpers on the Aurora, in addition to the use of the proper adapter.

A QL 8-pin din adapter will function slightly differently than the original QL socket, the proper setting has to be used on the Aurora output signal jumpers to enable EITHER RGB colour OR composite monochrome output signals. Composite PAL is not implemented on the Aurora.

Network adapter

Material needed:

2-pin 2.54 mm header plug, 1 pc.

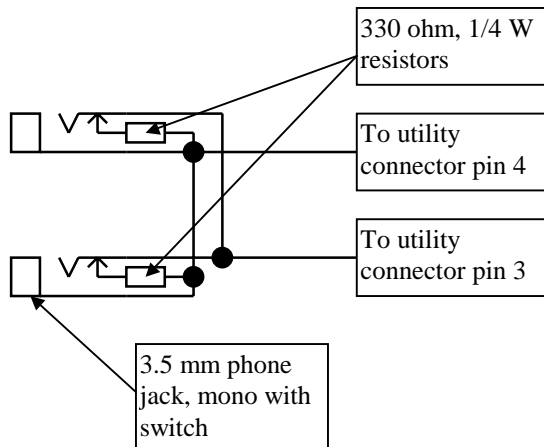
3.5 mm female phone jack, mono with switch, 2 pcs.

330 ohm, 1/4W resistor, 2 pcs.

2-strand wire, length as appropriate

PC case mounting bracket (optional)

Soldering skills are required, and the ability to drill the PC case mounting bracket to fit the connectors.



Serial port adapters

| Aurora socket pin | PC D-9 male connector pin | PC D-25 male connector pin | German QL Samsung QL D-9 connector SER1 | German QL Samsung QL D-9 connector SER2 |
|--------------------|---------------------------|----------------------------|---|---|
| 1 (not connected) | 1 (DCD in) | 8 (DCD in) | not used | not used |
| 2 (not connected) | 6 (DSR in) | 6 (DSR in) | not used | not used |
| 3 (RXD in) | 2 (RXD in) | 3 (RXD in) | 3 (RXD in) | 2 (RXD in) |
| 4 (RTS out) | 7 (RTS out) | 4 (RTS out) | 4 (DTR out) | 5 (DTR out) |
| 5 (TXD out) | 3 (TXD out) | 2 (TXD out) | 2 (TXD out) | 3 (TXD out) |
| 6 (CTS in) | 8 (CTS in) | 5 (CTS in) | 5 (CTS in) | 4 (CTS in) |
| 7 (+12V over 470Ω) | 4 (DTR out) | 20 (DTR out) | 9 (+12V) | 9 (+12V) |
| 8 (not connected) | 9 (RI in) | 22 (RI in) | not used | not used |
| 9 (GND) | 5 (GND) | 7 (GND) | 1 (GND) | 1 (GND) |
| 10 (not connected) | not used | not used | not used | not used |

Notes:

Connector gender is shown as found on the computer, NOT on the peripheral that plugs into it!

Hashed fields represent optional connections, which are present if PC accessory cables are used.

The PC D-9 cable adapter is simplest to make out of press-on connectors. It is a straight-through connector (can be made using a piece of 9-wire flat cable). The pin numbers appear different because the numbering convention on an IDC connector as found on the Aurora and a D-9 connector as used for serial IO are different.

Mouse adapters

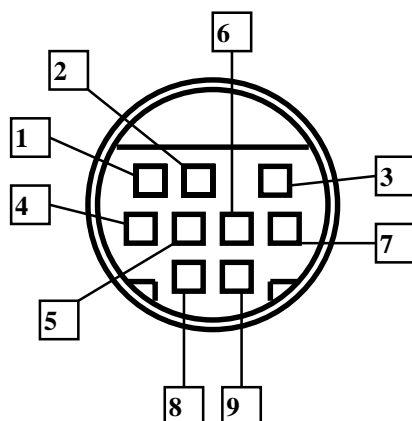
| Aurora socket pin | Atari and QIMI D-9 male connector pin | Amiga D-9 male connector pin | PC bus mouse modular 9-pin connector |
|--------------------|---------------------------------------|------------------------------|--------------------------------------|
| 1 (H movement) | 1 (HM) | 1 (Hmove) | 7 (H movement) |
| 2 (right button) | 8 (-RB) | 2 (Right button) | 2 (Right button) |
| 3 (H direction) | 3 (HQ) | 3 (Hquad) | 8 (H direction) |
| 4 (+5V power) | 4 (+5V) | 4 (+5V power) | 9 (+5V) |
| 5 (V direction) | 5 (VQ) | 5 (Vquad) | 5 (V direction) |
| 6 (GND) | 6 (GND) | 6 (GND) | 1 (GND) |
| 7 (V movement) | 7 (VM) | 7 (Vmove) | 6 (V movement) |
| 8 (left button) | 2 (-LB) | 8 (Left button) | 4 (Left button) |
| 9 (not connected) | 9 (NC) | 9 (NC) | 3 (Mid button) |
| 10 (not connected) | not used | not used | not used |

Notes:

Connector gender is shown as found on the computer, NOT on the peripheral that plugs into it!

Amiga adapter is a straight-through adapter, that can be made using press-on connectors and a piece of 9-wire flat cable. Connector pinouts appear different because the numbering convention on IDC 10 connectors as found on Aurora and D-9 connector as found on the mouse is different.

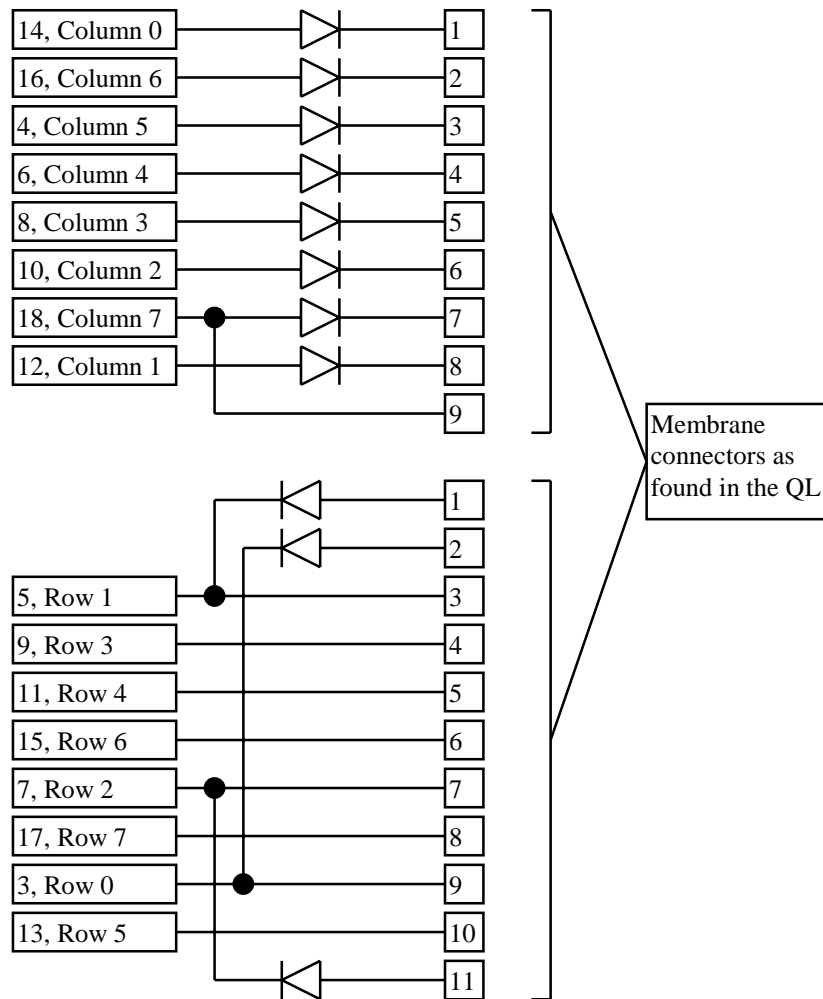
WARNING: Be carefull not to short or reverse the power supply pins (+5V and GND) as this will damage the mouse, the Aurora or both. Do NOT use a PC serial or PS/2 mouse, or plug a serial cable into the mouse port as you will damage the Aurora and/or the plugged in equipment.



PC bus mouse modular jack (female) pinout as found on a PC case (View into jack pin-holes)

Keyboard adapter

We recommend that you build the adapter using a small piece of PCB (Veroboard prototyping PCB is excellent for this). You will need QL-style membrane sockets (those can be desoldered from the QL motherboard), and 11 diodes, type 1N4148.



APPENDIX C

Non-obvious differences between Aurora and QL motherboards

Related information:

- Chapter 2, "Fitting"
- Appendix B, "Connectors, sockets and jumpers"

C.1 Expansion bus changes

The Aurora introduces some changes into the ways certain expansion bus signals are used. These should be completely transparent in 99% of all circumstances.

Unused pins:

| | |
|----------|--|
| R, G, B | except for CSYNCH and VSYNCH which have other functions, the video output signals are omitted on the bus. The Aurora can generate high frequency signals on these lines (in excess of 60 MHz) which violates current EMC regulations. Please use the display connector for all display related signals. Consult QUBBESoft P/D for the use of these signals to ensure future compatibility. |
| A19 | This address line is not used on the Aurora as the state on it is equal to A18 in a GC/SGC system. |
| -AS | Not used by Aurora, GC, SGC. Consult QUBBESoft P/D for the use of this signal to ensure future compatibility. |
| E | This is not QL compatible on GC and not generated at all on SGC. The Aurora does not use it. |
| FC2 | Not used by either QL or Aurora. |
| SP0..3 | Tied to ground on QL, open on the Aurora. The GC and SGC tie these signals to ground. |
| -BR, -BG | Bus arbitration signals. GC and SGC put ground on -BR, and do not use BG, to disable the on-board 68008 CPU on the QL. The Aurora does not have a 68008 on board so the signals are not used. Consult QUBBESoft P/D for the use of these signals to ensure future compatibility. |

Pins with changed functions:

| | |
|---------|---|
| -CSYNCH | Used by the SGC as a memory refresh initiation signal. The Aurora outputs a steady 16384 Hz signal instead, as the frequency of CSYNCH changes on the Aurora, depending on the monitor and resolution selected. The signal label is changed to RFSH. |
| VSYNCH | Used as the polling interrupt input, which among other things governs multitasking, the PAUSE statement, cursor flash, and other timing associated QDOS/SMSQ functions (except the clock). Since this signal changes on the Aurora depending on the monitor and resolution selected, a stable 51.2 Hz signal is generated and output to the bus. The signal label is changed to POLL. Because there is a slight difference between rates on the Aurora and the QL, timings are generally shorter by about 2.5%. |
| -DBG | Not used in any known setup. On the Aurora this is an output which enables fast 8-bit transfers for future CPU boards. The signal label is changed to -FTACK. Consult QUBBESoft P/D for the use of this signal to ensure future compatibility. |

| | |
|-------|--|
| -DSMC | Bi-directional signal on the QL. On the Aurora it is input only, with an equivalent function. |
| CLK | 7.5 MHz clock output. The clock is not used to generate any of the signals on the GC/SGC or the Aurora and is only provided for compatibility. |
| -VPA | Pulled low by Aurora when FC0 and FC1 are both high, for compatibility with the GC. This is the only function supported on the Aurora. |
| +9V | These are redefined as 'Bus power' on the Aurora. This is normally +5V in a system with an Aurora, requiring the GC/SGC and other peripherals to be set or modified to run off +5V power. If the external power connector is wired properly on the Aurora, these pins can still be used as +9V power pins, see Appendix D. |

'Pull-up' pins

| | |
|-------|--|
| -BERR | Not used on the Aurora and is only pulled to a logic high to enable proper function of the GC and SGC. |
|-------|--|

C.2 Extended ROM slot

The ROM slot on the Aurora has been extended with a few useful signals, see Appendix A, under A.3, connector pinouts. It is possible to construct a simple cable adapter to a standard QL-style ROM slot edge connector, by removing the extra pins from a 5.25" floppy connector (See appendix B for more data). Please note that a solder link is sometimes used between opposing pins on edge connectors as a key. This **MUST NOT** be done on such a cable adapter because it will result in short-circuiting of the power supply.

A total of 7 signals have been added:

| | |
|-------------|--|
| -RESET | Reset signal output, active low. Goes low momentarily on power-up and when the reset button is pressed. |
| -EXTINT | External interrupt input, active low. Pulling this pin low causes an external interrupt in QDOS/SMSQ. |
| -DS | Data strobe output, active low. Indicates presence of valid data on the data bus pins or that data should be presented to the data bus pins. |
| -WR | Write output, active low. Indicates that data is present on the data bus pins, to be written into the peripheral or memory. |
| -EXIO | Extra IO select signal output, active low. This signal indicates that an access is attempted to the Extra IO area. |
| +5V, GND | Additional power and ground lines |

The -EXIO signal is activated on accesses to the Extra IO area (See below) and can be used in conjunction with the address, data and other extended signals to decode up to 15.5 kbytes of IO addresses.

C.3 Memory map

The memory map of the Aurora is somewhat changed compared to the normal QL. Some outstanding changes are:

- Introduction of the Extra IO area.

This is a separately decoded 15.5 kbyte area in the memory map starting at \$18100 and extending to \$1BEFF. It can be used in conjunction with the signals on the extended ROM slot, in particular, the EXIO signal goes low when this area is accessed.

- New control registers.

Several new IO locations have been added to support extra features on the Aurora, located in the 256 byte block of addresses at \$18000. Do not access unless you know exactly what you are doing. QIMI compatible mouse interface uses the 256 byte block of addresses at \$1FF00.

- New screen memory.

Bottom 240k of the SGC IO area is used for Aurora extended screen memory. This appears at bus address \$C0000 and continues to \$FBFFF. The address at which it appears in the system memory map depends on the CPU card used, for the SGC this is \$4C0000, but may change with the introduction of future products. If the GC is used, this area is not accessible because the GC does not allow the proper addresses to appear on the expansion bus, hence the inability of the Aurora to display extended resolutions with a GC fitted.

- Old screen memory re-map.

The original screen area is automatically and transparently re-mapped by hardware to the new Aurora screen memory, so that programs which write to it directly, have the picture appear in the top left-hand corner of the screen, regardless of the resolution.

- 'Free' areas.

When the Aurora is fitted, only two peripheral address areas are left unused. The first is the ROM slot (at \$0C000..\$0FFFF), and the second is at the top of the SGC IO area (if a SGC is used), appearing at bus addresses \$FC000 to \$FFFFFF. If a Qubide is used, the address setting jumpers must be set to one of these, otherwise operation of the system will be incorrect. With a GC fitted, only the ROM slot area can be used, as usual. Use of the ROM slot address range does NOT affect the extra IO area.

C.4 Access speed to various addresses

Access speeds on the Aurora have been improved wherever possible. In fact, they could be several times faster than what the GC/SGC allow, which we intend to exploit with future products. In particular:

- Screen access (for the old screen memory area) has been improved. Writing to it is now twice as fast so expect old games to work even faster. The new screen area works as fast as the SGC can access it, however, actual speeds (bytes per second) are lower than the old screen because the memory area which it uses is not shadowed by the SGC. This may change with the introduction of future products.
- Accesses to the 8302 chip can occur twice as fast compared to the QL. This is mostly invisible but may provide a slight speed advantage with peripherals such as superHermes.

C.5 Miscellaneous

- Aurora is completely compatible with the QL video ULA software-wise, except for flashing in mode 8. The flash bit is retained for software compatibility, but the pixels in question will not flash (similar to the QXL). The signal is completely compatible if a QL monitor is used.
- The system might wait slightly longer at startup (this is mostly undetectable) trying to find the microdrives, which have become history.
- The Aurora cannot be used with a 'yellow' Gold Card.
- The superHermes mouse cannot be used if a QIMI compatible mouse is in use at the same time. This is a software problem and may be fixed in the future. QIMI takes precedence.

Appendix D

Hints on using the Aurora in a standard QL case

Related information:

- Chapter 2, "Fitting"
- Appendix A, "Connectors, sockets and jumpers"
- Appendix B, "Cable adapters"

Please note that these are by no means exhaustive instructions on how to put an Aurora into a QL case (preferably with other bits and pieces). The intention is only to point out some problems which you will encounter.

- Positioning and fitting of the boards

An Aurora with a Qubide and a SGC connected has the exact same dimensions as the original QL motherboard without the part over the microdrives, lengthened by the SGC (i.e. the SGC heatsink will still protrude outside of the left-hand side of the QL case). However, all connector positions will have changed. This combination of boards is narrower than the QL motherboard so you should be able to use the space left to route cables to the serial ports and the like. Since the microdrives cannot be used, and the part of the QL motherboard with the heatsink is not there, there should be sufficient space for a laptop type super-slim floppy and a 2.5" hard disc stacked on top of it (just to fire up your imagination...). The Aurora has four mounting holes. You can make a template using a piece of cardboard with the holes and the edges of the Aurora marked, to drill out holes in the bottom of the QL case.

- Power supply.

The Aurora is designed to run on +5V. It also needs +12V and -12V for the serial ports, although these will operate from +(5 to 12)V and -(5 to 12)V, instead of the standard values, but this is not recommended as maximum speeds and cable lengths become lower with lower voltages. The rest of the boards can work from a +9V power supply, providing the external power connector on the Aurora is used correctly.

Possible solutions:

- power the system from a (preferably internal, or at least not distant) switching power supply (providing +5 and +-12V). The wires should be kept as short as possible, thick (especially +5V and ground) and braided together, because of voltage drops and EMC. An external power supply with any appreciable length of wire is unlikely to work without proper decoupling techniques, once the wires reach the Aurora, so please don't even try it unless you know exactly what decoupling is and how it's used. Some peripheral boxes, such as used for external SCSI drives use power supplies which should fit inside a QL case. However, PLEASE BE VERY CAREFULL, as you are admitting mains voltage into the QL case, this is potentially lethal!
- use the standard QL power supply. In order to do the later, you will need to build a 5V regulator, a rectifier, and low-current +12 and -12V regulators. These components are situated on and under the large black heatsink on a standard QL motherboard. The link on the Aurora external power connector must be removed, and the unregulated 9V from a Sinclair power supply unit passed to the 'Bus power' (pin 1). The regulated 5V (78S05 2A regulator MUST be used) should be connected to the 'Aurora +5V' (pin 2). The ground wire should go to pin 3, and the +12 and -12 V power to their respective pins. NO OTHER lines should be attached, especially not ground wires to the expansion connector! Consult QUBBESoft P/D for the schematics of a QL Power supply to Aurora converter (You can use your old QL board as a source of parts if you are versed in desoldering).

- Keyboard

In order to connect the keyboard membrane you will have to construct a cable adapter (see appendix B). It is possible to interface joysticks and the keyboard off the keyboard matrix connector on the Aurora. The biggest problem you will have is the membrane, because the ribbon parts will have to be shortened and connectors with extender cables fitted to them (it's a good idea to use the connectors from a standard QL motherboard), and from there to the keyboard adapter. You will probably have to shorten the ribbon ends to about 1cm and stuff the connectors into the top of the casing.

- Connectors

You will need to plan carefully where to put each connector, and associated cable (especially with a Qubide and SGC in the same case). In particular, keep the monitor cable adapter as short as possible to prevent picture degradation. As the boards are narrower than the original motherboard, you should be able to route the connecting cables into the remaining 2cm or so between the boards and the connectors along the upper edge of the bottom of the QL case. You might need to make a support for the connectors, aluminium L-profiles are very good for that purpose, and they can double as heatsinks.

- Heat

Heat buildup will be a serious consideration, you might want to drill holes all over the top part of the case. Please bear in mind that you can stuff much more hardware into the case compared to what it was originally designed for. If you use a linear regulator for 5V power (for instance if you want to use a standard QL power supply) you can anticipate problems with the heatsink(s) for it. Please note that heat buildup is also detrimental for the keyboard membrane, and this is another reason why it should be avoided.

APPENDIX E

Monitors, resolutions and modes

Related information:

- Appendix A, connectors, cables and jumpers
- Chapter 2, Fitting
- Chapter 3, Software

E.1 Monitor types

The Aurora supports 4 basic monitor types. The following table outlines what specifications have to be satisfied for each monitor type:

| | |
|-------------|---|
| Standard QL | This monitor type covers the general TV-compatible monitor family, such as can be connected to a standard QL. |
| | Horizontal synch frequency: Constant 15625 Hz Vertical synch frequency: Constant 50 Hz Signal type: Composite monochrome, RGB color 1Vpp (Composite synch) RGB color TTL level (Composite synch) Maximum vertical resolution: 288 pixels non-interlaced 576 pixels non-interlaced |
| VGA | This monitor type is the least common denominator amongst various VGA monitor types, and should cover even the oldest models. |
| | Horizontal synch frequency: Constant 31250 Hz Vertical synch frequency: Variable 50..60 Hz Signal type: RGB color, 1Vpp Maximum vertical resolution: 576 pixels non-interlaced 768 pixels interlaced |
| SVGA | This monitor type is optimized for the majority of recent VGA type monitors, also known as Super VGA (capable of displaying at least 800x600 resolution). Timings are optimized for high refresh rate whenever possible to reduce screen flicker. |
| | Horizontal synch frequency: Constant 31250 Hz Vertical synch frequency: Variable 50..82 Hz Signal type: RGB color, 1 Vpp Maximum vertical resolution: 576 pixels non-interlaced 768 pixels interlaced |
| Multisynch | This monitor type can be used with most mid-range multisynch monitors (capable of displaying 1024x768 resolution, non-interlaced). Some high-performance SVGA type monitors can be used as well. Refresh rates are optimized to be as high as possible for either the Aurora hardware or the monitor. |
| | Horizontal synch frequency: Variable 31250..48000 Hz Vertical synch frequency: Variable 50..82 Hz Signal type: RGB color, 1Vpp Maximum vertical resolution: 768 pixels (interlacing is not used) |

Aurora has separate options for signal type and monitor type, so many combinations are possible. The only mutual signal is the composite/horizontal synch signal. This always generates the composite synch signal for a QL type monitor, and a horizontal synch signal for all other monitor types.

Synch signals have no polarity encoding for SVGA monitors. In the unlikely event that this is required for your SVGA monitor, you will have to use the VGA setting. Values shown are as used by the Aurora, and not the original monitor specifications. Your monitor can of course have better specs, as long as the ones outlined in the table are met, you will be able to use the respective monitor type setting.

Vertical resolution can be lower than the figure in the table, depending on the mode selected.

E.2 Interlaced vs. non-interlaced scan, line doubling

Interlaced scanning is a technique where alternate display lines (even and odd) are displayed in alternate display fields. A display field are all the lines displayed in the period of one vertical scan (which is $1/\text{vertical synch frequency}$). This technique doubles the vertical resolution that can be displayed at the expense of halving of the refresh frequency, compared to non-interlaced scanning. *Non-interlaced* scanning displays all lines in one display field, i.e. there is no alternating of display fields.

Because the picture on your monitor fades in fractions of a second, once the circuitry draws it on the screen, it has to be constantly re-drawn. The frequency at which this occurs is referred to as the display refresh rate or refresh frequency, and should be kept as high enough for the eye to perceive a static picture. Depending on the refresh frequency the eye will be able to see more or less flicker in the picture. Because interlacing halves the refresh frequency (it takes two fields to display all the lines in the picture, instead of one), the refresh rate can drop sufficiently for the flickering to be noticeable. This depends on the individual and on the monitor used, and in some cases may make the display virtually unusable. This will mostly happen with interlaced scanning on a QL type monitor, because the refresh frequency will drop to 25 Hz. On some monitors the picture fades less rapidly (referred to as high persistence), so the results can be better.

The Aurora gives the user a choice of interlaced and non-interlaced scanning for all monitor types, except multisynch (Aurora cannot generate a sufficiently high resolution at which one would have to use interlacing to display it on that monitor type). The display driver is able to read the choice you have made and adjust the maximum resolution you will be able to set automatically.

Line doubling is a technique with which a line of pixels actually consists of two display lines, i.e. every pixel actually consists of two, vertically stacked pixels. This doubles the number of display lines that have to be generated. In a sense this is the exact opposite of interlacing, and is used when low vertical resolutions are displayed on monitors capable of much higher vertical resolutions. In order to do this, these monitors frequently have line widths so small, that displaying a low resolution on them results in unsightly gaps between lines. The Aurora will automatically use line-doubling in such circumstances (for instance displaying 512x256 on a VGA, SVGA and multisynch monitors which can easily display over twice the vertical resolution).

E.3 Signal types

There are several signal level standards in use on monitors today. Aurora can generate three types, as follows:

| | |
|----------------------|--|
| Composite monochrome | This is used by monochrome monitors, and requires a single signal wire and a ground. The video signal and the synchronization signals are all combined into a single signal. The Aurora should be set to use this type of monitor signal when a QL-type monochrome monitor is used. |
| RGB color analogue | This is used on some QL color monitors (Philips CM8833 and similar) and on VGA, SVGA and multisynch monitors in general (VGA monochrome monitors combine the three color signals into a monochrome signal in the monitor itself). |
| RGB color TTL-level | This signal type is provided for compatibility with some QL color monitors, notably the Microvitec CUB. Although the signal is analogue, the levels used are TTL logic standard, as expected by monitors with such inputs. Because on some such monitors inputs are purely digital, they can only generate 8 colors (the usual QL mode 8 colors). The Aurora can generate two new modes, with 16 and 256 colors respectively. The accurate representation of more than 8 colors on TTL input type monitors cannot be guaranteed. |

The signal type output to the monitor is selected by means of jumpers, please refer to appendix A for their location and settings.

E.4 New modes

The Aurora has two new modes in addition to the usual MODE 4 and MODE 8. These can display 16 and 256 colors respectively. Aurora has 240 kb of video memory dedicated to store the contents of the screen in any mode. Since this is a fixed value, and modes with more color require more bits per pixel, the maximum resolution that can be displayed is smaller as the number of colors rises:

| | Minimum resolution | Maximum resolution |
|----------|--------------------|--------------------|
| MODE 4 | 512x256 | 1024x768 |
| MODE 8 | 256x256* | 512x768* |
| MODE 16 | 512x256 | 1024x480 |
| MODE 256 | 512x256 | 512x480 |

Note that although MODE 8 resolutions may appear slightly perplexing, it is the exact consequence of compatibility with the QL which has to be maintained. MODE 8 halves the horizontal resolution as set for MODE 4. Otherwise, resolution is set independent of mode. MODE 8 is supported fully from the program's point of view. From the user's point of view the only thing not implemented is flashing (similar to the QXL).

If the resolution is limited in any direction by either the monitor setting, or the mode setting, the actual resolution in that direction will be the lower of those two limits. Limiting occurs independently for each direction, so for instance, choosing 1024x768 on a VGA monitor with non-interlaced scan will reproduce 1024x576 in MODE 4 (monitor is limited to 576 pixels vertically), 1024x480 in MODE 16 (MODE 16 is limited to 480 pixels vertically) and 512x480 in MODE 256 (MODE 256 is limited to

512 pixels horizontally and 480 pixels vertically). The picture will always appear centered on the screen.

E.5 Choosing resolutions

On the Aurora, resolutions are chosen separately from the display mode (however some restrictions may apply as outlined above and below). The starting point in choosing the resolution is the number of pixels in the horizontal direction. This can be either 512, 640, 768 or 1024. In addition to that, the user can choose between two different aspect ratios. This is the ratio between the horizontal and the vertical resolution. It can be either 2:1 (the vertical resolution is half of the horizontal) or 4:3 (the vertical resolution is 3/4 of the horizontal). The first is the standard QL aspect ratio, and is the only one in which circles will not appear elongated. The second one is similar to PC resolutions, and to the QXL and QPC. This gives a total of 8 combinations, however, as outlined above monitor or mode limitations may apply. The resulting resolutions are given in the table below, for all modes and monitor types (except mode 8, this is always half the horizontal resolution of mode 4 and the same vertical resolution as mode 4).

| Resolution chosen | Mode | Monitor type, interlacing | | |
|-------------------|-------------|-----------------------------|------------------------------------|------------------------------------|
| | | QL standard, non-interlaced | VGA/SVGA non-int, QL standard int. | VGA/SVGA interlaced and Multisynch |
| 512x256 | All modes | 512 x 256 | | |
| 512x384 | All modes | 512 x 288 | 512 x 384 | |
| 640x320 | MODE 4 & 16 | 640 x 288 | 640 x 320 | |
| | MODE 256 | 512 x 288 | 512 x 288 | |
| 640x480 | MODE 4 & 16 | 640 x 288 | 640 x 480 | |
| | MODE 256 | 512 x 288 | 512 x 480 | |
| 768x384 | MODE 4 & 16 | 768 x 288 | 768 x 384 | |
| | MODE 256 | 512 x 288 | 512 x 384 | |
| 768x576 | MODE 4 | 768 x 288 | 768 x 576 | |
| | MODE 16 | | 768 x 480 | |
| | MODE 256 | 512 x 288 | 512 x 480 | |
| 1024x512 | MODE 4 | 1024 x 288 | 1024 x 512 | |
| | MODE 16 | | 1024 x 480 | |
| | MODE 256 | 512 x 288 | 512 x 480 | |
| 1024x768 | MODE 4 | 1024 x 288 | 1024 x 576 | 1024 x 768 |
| | MODE 16 | | 1024 x 480 | |
| | MODE 256 | 512 x 288 | 512 x 480 | |