Mozart
DIGITAL AUDIO

Installation
and
User Guide

Introduction

The Mozart 16-bit Digital Audio Card upgrades the Acorn Risc PC 600 computer with digital 16-bit linear audio and sound mixing facilities.

The existing analogue 8-bit logarithmic sound system is still available in addition to the new features of the digital 16-bit linear system. Selection between the 8 and 16 bit systems is possible without hardware changes, by using the application software provided.

Mozart provides the following functions:

- Mixing of the sound output with one or two other sources, such as an internal CD-ROM drive.

- Emulation of the 8-bit system, when in 16-bit mode with improved output quality

Unpacking

The Mozart Digital Audio Card is packaged with the following:

- The hardware interface
- An audio lead
- A software support disc
- A registration card
- An End User Licence Agreement
- A release note
- and this manual

If any of these are missing, then please contact the supplier.

Registration

This product is part of the Yellowstone scheme of continual product development, and during the life of the product, software updates may be available.

To ensure you are notified of such updates you should register Mozart with Yellowstone by completing and returning the supplied registration card. Please use the correct postage and send it to the address on the card.

Once registered, Yellowstone will keep you informed of developments and new products.

Technical support

All Yellowstone products are developed in-house, with our own full-time hardware and software engineers. If you have a technical problem then you can contact Yellowstone and ask to speak to one of the engineers.

Before you call please have to hand the exact details of the problem, along with any reported software error messages that may be useful. We may not be able to offer a solution during the call, so be prepared to give us details of how to reply to you.

Naturally, our engineers are normally occupied on the development of current and new products, and therefore we have to restrict technical support from *3pm to 4.30pm Mondays to Fridays.* If this is inconvenient, then a letter or fax describing the problem may be all we need.

Installation

Installation is fairly simple and involves plugging the hardware interface onto the Risc PC main board.

After hardware installation the support software needs to be installed to allow Risc OS to recognise the new 16-bit sound support.

Hardware installation

To install the hardware you need access to the main board;

- Switch off the computer and unplug the mains lead. Open up the machine following the instructions given in your *Welcome Guide.*

- Remove any expansion cards that may be fitted, as access is needed to the main board.

Locating the card

Mozart requires two connections, one to the main board, and another to the audio output.

The first connection is to the header LK6, located midway between the VRAM socket and the rear of the computer.
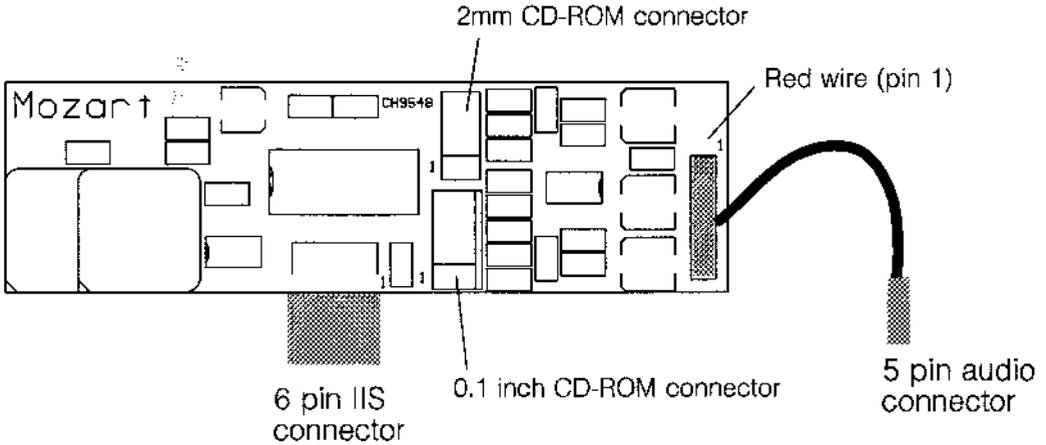
Mozart plugs onto the LK6 header, as follows:

- Connect the 6 pin connector from Mozart to the 6 pin header LK6 on the Risc PC main board, with the component side of Mozart facing the front of the computer. Pin 1, as shown, should align with pin 1 on the Risc PC.

Connecting the audio lead

The second connection is to the Risc PC audio header LK14 located at the rear right of the computer, near the headphone socket.

An audio lead is supplied to connect Mozart to the main board audio output connector. One end connects to Mozart, and the other to LK14 on the main board.

The audio lead is either already connected to Mozart, or is supplied separately. If the lead is separate, then connect one end to Mozart as follows:

- Attach one end of the audio lead to the 5 pin header on Mozart, with the RED wire on pin 1 (nearest the hole on the circuit board, ie furthest away from the main board).

Next connect the other end of the audio lead to the main board.

- Remove any links that may be fitted to the LK14 header.

- Fit the 5 pin audio connector from Mozart to the audio header on the Risc PC, with the RED wire on pin 1 (closest to the rear of the computer).

This completes the main installation of Mozart, but before closing the case, it would be a good time to connect any other sound sources you would like to mix with the output from Mozart, as detailed in the next section.

Finally,

- Refit any expansion cards that were removed, and reassemble the computer as detailed in the *Welcome Guide.*

Mixing other sound sources

Other sound sources can connect to either of the two 4 pin headers on Mozart. Up to 2 CD-ROMs, or other audio sources can be connected, one to each of the headers.

Due to the varying standards used by CD-ROM manufacturers, you may find that the connector at one end of the lead supplied with your CD-ROM may not fit onto either of the Mozart headers.

Yellowstone can supply the correct audio lead for your CD-ROM for £4.20+VAT (or alternatively fit a new connector to your existing lead free of charge, if it is sent to us).

2mm CD-ROM connector

1   Ground
2   Left input
3   Ground
4   Right input

0.1 inch CD-ROM connector

1   Left input
2   Ground
3   Ground
4   Right input

Software installation

The support disc contains two applications; !MInstall and !MControl, to provide Mozart 16-bit support.
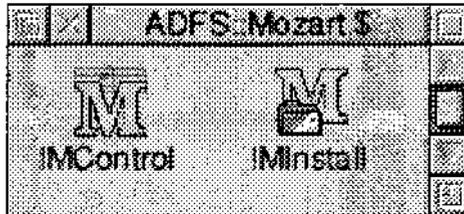
!MInstall

This application provides a dialogue box with options to install or remove Mozart support. The support software resides in the directory:

```
<Boot$Dir>.Choices.Boot.PreDesk.Mozart
```


Use the *Install* option first, there is no need to re-boot the machine for the installation to take effect.

To remove the software choose the *Remove* option.

Mozart Control Software

The application !MControl is used to control the type of sound system in use without hardware changes or machine re-boots.
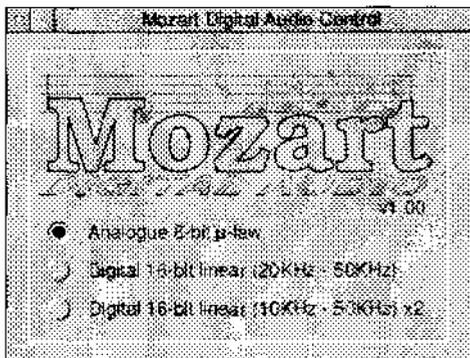

Analogue 8-bit p-law

This mode reverts the Risc PC back to the original analogue sound system, and does not use the 16-bit hardware. This may be useful for some entertainment software that does not recognise the new 16-bit support.

Digital 16-bit linear (20KHz - 50KHz)

This mode drives the sound hardware at the selected sample rate, resulting in excellent sound quality as a result of the operation of 4x oversampling, noise shaping and digital filtering in the output hardware.

Digital 16-bit linear (10KHz - 50KHz) x2

This mode uses the x2 oversampling facility of the Sound DMA module to allow the use of sample rates down to 10KHz. Sample rates below 25KHz are oversampled by two and then output to the sound hardware, which runs at twice the sample rate.

Sample rates between 25KHz and 50KHz are not oversampled.

Digital sound support for RISC OS

The Risc PC sound and video controller VIDC20 provides two sound output options. The first is fully backwards-compatible with the sound system on earlier Acorn 32-bit computers, and produces 8 channel stereo analogue output from 8-bit p-law format data, using the digital to analogue converter (DAC) built into VIDC20.

The second option is a digital interface supporting the industry standard serial IIS format in stereo 16-bit format, where an external DAC (Mozart) is used. The operation of VIDC20 allows only one of these options to be used at a time.

The revised Sound DMA module provided with Mozart supports both output options.

The Sound DMA module

When the Risc PC is operating in analogue 8-bit p-law mode (as selected with !MControl), the 16-bit hardware is not in operation and VIDC20 is used in backwards-compatible analogue mode. In this mode the SoundDMA module can only be used with 8-bit p-law data.

In 16-bit mode all sound output (both 8-bit p-law and 16-bit linear formats) is output digitally to the external DAC, and Mozart converts this to an analogue signal and mixes it with two other sources. In this mode the SoundDMA module emulates 8-bit p-law data converting it into 16-bit

linear format, and then combines it with any 16-bit linear data before output to the external DAC.

Oversampling

In oversampling mode all sample rates up to and including 25KHz are oversampled by a factor of two, before output to the Mozart DAC, using the process of linear interpolation.

This allows sample rates below the 20KHz limit of the Mozart DAC to be supported, in the case of 2 times oversampling, sample rates down to 10KHz can be used with Sound DMA. If lower sample rates are required, then application software must oversample before passing data to Sound DMA.

Software emulation of p-law sound

When a 16-bit mode is in use the SoundDMA module will also output p-law data by emulation. The emulation is performed using software and is achieved transparently, and usually no difference from the standard sound system will be noticeable.

However in 16-bit mode the range of sample rates is restricted by the frequency of the external DAC clock and the sample rate selection provided by VIDC20. In some cases it is not possible to select the exact 8-bit p-law sample rate required, and so the nearest sample rate will be used.

Technical specification

Mozart uses a high specification digital to analogue converter (DAC) normally employed for top end commercial CD players. The digital data received by the DAC is first oversampled by four and then digitally filtered according to the sample rate. This results in excellent sound quality across the DAC sample frequency range of 20KHz-50KHz.

The overall design ensures a high signal-to-noise ratio, wide dynamic range and excellent sound quality.

Sample rates

Mozart provides VIDC20 with an 11.2896MHz master sound clock, and SoundDMA can program VIDC20 to select the following standard sample rates:

20.833 KHz, 22.050 KHz, 25.000 KHz, 27.778 KHz
31.250 KHz, 35.714 KHz, 41.667 KHz, 44.100 KHz
50.000 KHz.

The following sample rates are also available when the 2 times oversampling mode is used. The actual sample rates are doubled by SoundDMA before output to the Mozart DAC.

10.417 KHz, 11.025 KHz, 11.364 KHz, 12.500 KHz
13.889 KHz, 15.625 KHz, 17.857 KHz.

Hardware Specification

The DAC used by Mozart is of the continuous calibration type and is combined with a noise shaping digital filter.

The digital filter uses four times oversampling techniques and consists of two sections which each increase the sample rate by 2. The noise shaper operates at four times the sample rate and reduces the in-band noise density.

The output from the DAC is fed to a class AB headphone driver, where it is mixed at the input with two other sources. The output from the driver feeds to the Risc PC speaker output.

Digital to analogue converter

Total harmonic distortion plus noise-to-signal ratio	0.032%
Signal to noise ratio (no signal)	-108dB
Sample frequency range	20KHz - 50KHz

Mixing inputs

Input level (for maximum output)	1V RMS
Input impedance	5Kohm

Headphone driver

Maximum output power	60mW
Output level	1V RMS
Minimum load impedance	
8ohm Class AB, Short circuit protected	
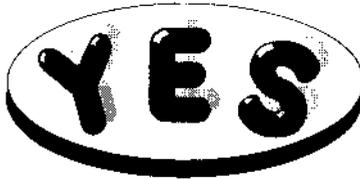
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