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Hardware and Software — Design and Consulting

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Installation instructions for the M32S3 32 Megabyte memory board in the Akai S2800, CD3000 or CD3000 with Analogue to Digital board

Please call me if you have any doubts about how to proceed.
See separate, simpler, instructions for the S3000 and S3200.

Robin Whittle

Specifications

This memory board replaces all existing memory boards and functions *exactly* like four Akai 8 Megabyte memory boards. The existing board or boards in the sampler are not needed and cannot be used with the new board – so you can use them in another sampler or sell them. This includes any ROM boards – for instance those containing fixed piano samples.

32 Megabytes is the maximum memory the sampler can access, and provides around **three minutes and 8 seconds of stereo sampling at 44.1 kHz** or **six minutes and 16 seconds of mono**. The exact time depends on the relatively small amount of memory which may be taken by the sampler's operating system software for its own operations. 32 Megabytes is 16 megawords. This is exactly 16,777,216 words. At 44,100 samples per second, this is 380.436 seconds, or three minutes and ten seconds of stereo.

S2800 only:

The installation procedure enables the S2800 to access all four sets of 8 Megabytes. The only change to the S2800's operation is that the software runs as if it was in an S3000. This causes it to provide options for selecting between eight individual outputs, but the S2800 only has two – so remember to use individual outputs 1 and 2.

Warranty

The warranty is 1 year, or 5 years if the board is operated at temperatures no higher than 70°C (158 Fahrenheit).

I am concerned that some samplers are installed in crowded racks with little or no ventilation – causing extremely high temperatures to develop inside the equipment. This greatly accelerates electrical and chemical processes which cause the breakdown of semiconductors and other components.

There's nothing particularly temperature-sensitive about these boards, but commercial electronic devices are specified to operate between 0 and 70°C. Temperatures over 70°C are excessive, unnecessary and will significantly diminish the lifetime of all electronic components. Whether or not you use these memory boards, please ensure adequate ventilation for all your equipment in crowded racks!

Real World Interfaces will repair or replace the faulty board. The customer will be generally be responsible for transport costs regarding warranty repairs. Replacement or repair will only be contemplated after the customer makes a full fault report and works with *Real World Interfaces* to resolve all other possible sources of trouble. The customer is responsible for the installation being carried out by a suitably qualified electronic technician – someone who takes responsibility for their work.

If you have any problems, please contact *Real World Interfaces* via email at rw@firstpr.com.au. This is a permanent email address, and the permanent World Wide Web address is http://www.firstpr.com.au/rwi/ Phone or mail contact details are at the top of this page – but they are not as permanent as the email and web addresses. Please remember that Melbourne time is 10 hours before UK time and 15 to 18 hours before North American time.

Akai information on the Net

See my page for the latest information and links: http://www.firstpr.com.au/rwi/smem/ .

The S2800 and CD3000 use different operating system software – either in EPROM in the machine or loaded in from hard or floppy disk. In both cases, 2.0 is the final version. Curiously, the CD3000 version 1.68 has an extra feature – low-shelf, high-shelf and narrow/wide band EQ processing of one sample to create another.

0 – Who should install the board?

This board should be installed by an electronic technician who is competent and experienced with computer and/or MIDI electronic musical equipment. If the technician is not familiar with this particular kind of Akai sampler, then the owner should be present to assist in the final testing of the machine.

If you are not an electronic technician, and are considering doing the job yourself, consider the following questions:

1 - Do you already own a soldering iron, multimeter and relevant hand-tools?

2 - Do you have, or have access to, a 50 MHz oscilloscope and know how to use it?

3 - Do you understand the internal operation of MIDI and microcomputer equipment?

4 - Are you prepared to take responsibility for everything that happens to the memory board and the Akai sampler, and for your own safety and that of others?

5 - Did you *already* know that it is very easy to develop a static charge of thousands or tens of thousands of volts, and without realising it, cause this charge to connect with one or more circuit tracks in a piece of equipment, leaving permanent and intermittent damage to one or many integrated circuits, and that such damage is likely to cost up to a thousand dollars to fix in a machine (such as the Akai S2800/CD3000) with surface-mount custom LSIs?

If you cannot truthfully answer "yes" to all these questions – then get an electronic technician who can answer "yes" to all these questions to do the installation.

1 – Dismantling

Unplug the power lead from the back panel. Don't connect a power cord to the machine when its cover is open – since there are exposed 240 /110 volt connections in the power supply which could cause injury or death if you touched them when power was applied. *Never rely on simply turning off the power on the front-panel, or at the power outlet – you may not be turning off the active line. Be sure to unplug the power cord from the rear panel of the machine*

Remove the top cover of the S2800/CD3000 so you can see inside the machine.

You will have one or two memory boards – small boards with four "ZIP" vertically mounted chips and one 20 pin chip. These boards will be plugged into connectors called J105 and J103.

Take precautions to avoid static electricity – which may seriously damage the electronics of your sampler or memory board. Always touch the metal chassis of the machine before touching any electronics.

Remove the one or two existing memory boards. These boards cannot be used when the *Real World Interfaces* 32 Megabyte board is installed. The S2800/CD3000/S3000/S32000 cannot access more than 32 Megabytes. This means you can use the old boards in another machine, or sell them.

CD3000 only:

Ascertain whether your machine has the A/D board. If it has, then you can record from analogue signals via two sockets at the rear of the unit – marked "ANALOG INPUT". If your CD3000 does not have such sockets, then it is an ordinary CD3000 and has not had the board fitted. You should be able to obtain this Akai retrofit board through your Akai dealer. It is an excellent addition and is reasonably priced.

In the S2800 and the CD3000 *without* the Analogue to Digital board, two screws holding the main printed circuit board to the chassis need to be removed and are no longer needed. These are located at either end of the J104 position.

CD3000 with A/D board only:

There is one Philips head screw to the left of the J104 position which you should remove. To the right of the J104 position is a brass spacer supporting a grey metal mounting bracket which supports the A/D board. This bracket is in the way of the new memory board, so you need to cut it. Please refer to Appendix A for details and return to the next section when that work is complete.

2 – Electrical installation

The S2800/CD3000 motherboard is basically the same as that of the S3000 and S3200. Both the S3000 and S3200 have four sockets to take four memory boards, but the S2800/CD3000 only has two sockets.

The orientation of the main circuit board in the S2800 is along the front of the machine, while in the CD3000 it is rotated anti-clockwise 90° and runs along the right side of the chassis. Consequently the instructions below distinguish between the two orientations.

To the right of (S2800) or behind (CD3000) the existing sockets J105 and J103 are two sets of holes on the printed circuit board which are labelled J104 and J102 respectively.

The 32 Megabyte memory board plugs into J105 and J103, but it needs to be connected to just one hole each on both the J104 and J102 positions. Two 120 mm long wires are provided – Yellow and Blue.

The Yellow wire goes to pin 1 of the J104 position and the Blue wire goes to pin 1 of the J102 position.

In the S2800, pin 1 is on the right-most row of the four rows of holes in the printed circuit. It is the hole nearest the front-panel. In the CD3000, pin 1 is the right hole on the rear row of holes.

The pins 1, 2, 35 and 36 are clearly labelled, so there should be no question of which is pin 1.

The new memory board mounts horizontally – differently from the vertical mounting of the original memory boards. To hold the board in place, two new spacers will be screwed into the holes on either end of the J104 position. Then the board is installed and two screws hold the board to the spacers.

The memory board is supplied with the Yellow and Blue wires, a short bare wire for the S2800 only, and two spacers, two screws and four fibre washers.

Install the two spacers, in the two holes at either end of the J104 position – using a fibre washer between the spacer and the printed circuit board. Use a shifting spanner to tighten the spacers reasonably firmly. Take special care that whatever tool you use does not scratch any little pieces of metal from the spacers. The Akai board has many finely spaced pins on many of its integrated circuits – and a tiny flake of metal could cause havoc with them.

Take the memory board out of its static-protective bag and solder the Yellow and Blue wires to the two large holes at the end of the board, as indicated by writing underneath the board.

Now solder the Yellow wire to the pin 1 hole of the J104 position and the Blue wire to the pin 1 of the J102 position. The next section contains instructions on how to plug the board in – don't plug it in just yet.

S2800 only:

A second task is to solder a piece of wire into a jumper position on the Akai main board. The S2800, S3000 and S3200 use the same software in EPROM (or loaded from hard or floppy disc). The software finds out which kind of machine it is running in by looking at two jumpers – J1 and J2. These are located on the top of the main board, on the far right, close to the front panel. These jumpers are very close to pin 10 of IC 16.

On the S2800, both these jumpers are open – they have no wires connecting them. This tells the software at least two things: Firstly that there are only supposed to be two memory boards – so it will not recognise any more. Secondly that there are only two individual outputs.

Solder the short bare wire provided between the two pads which are J1. This is immediately to the right of pin 10 of IC 16. This tells the software that the machine is an S3000: that it has up to four memory boards and that it has eight individual outputs. The S2800 only has two individual outputs, so while the software enables you to assign signals to individual outputs beyond the first two – nothing will happen if you do.

3 – Mechanical installation

Now it is time to insert the memory board in the J105 and J103 sockets. This is pretty straightforward, but please do it gently. These connectors have very fine pins, and rough installation could damage them permanently. Place the board gently on the connectors. You should be able to feel by wiggling it that the connectors have started to mate.

You should also be able to see that the board is correctly located by the two mounting holes in the memory board lining up almost exactly with the spacers you have just installed.

Now, with both hands, smoothly press the board into place. This may take some pressure – there are two 68 pin connectors being fitted together. Try to make the board go down evenly, rather than one side or one end at a time.

When board is in position, use the two screws and two fibre washers provided to hold it in place properly. Tighten the screws moderately – not too firmly.

Now turn the machine upside down and shake out any debris from the preceding operations. There shouldn't be, but it is best to guard against lost screws and little blobs of solder.

Replace the top cover of the machine and reconnect the power cord.

4 – Testing the new memory system

Power the machine up. It should report that there are 16 Megawords of memory. A word is a 16 bit sample – and 16 bits is 2 bytes. So 32 Megabytes is 16 Megawords.

If the machine reports only 8 Megawords, then [S2800 only: perhaps you did not correctly connect the wire across J1 or] you did not connect the Yellow and Blue wires correctly to pin 1 of J104 and J102. If you have less than 8 Megawords, then something else is amiss. Perhaps you connected the Yellow and Blue wires to the wrong places. Disconnect these wires temporarily from the Akai main board (unplug the power lead first!) and wrap some tape around their ends so they can't touch anything. With these two wires disconnected, the board should still work from the signals it gets from J105 and J103. It should behave as two 8 Megabyte boards so when you turn the machine on, the front panel should report 8 Megawords. If this does not happen, remove the Real World Interfaces memory board and re-install the original board to test that you have not disturbed the Akai electronics.

If the display does not report 16 Megawords with the new memory board, or if the memory test below fails, then contact Real World Interfaces to report the problem. Before doing so, re-install your original memory boards and perform the memory test on them.

Ten seconds after the power is turned on, the machine should be ready to operate normally. Test the memory by performing the following front panel operations:

Press and hold the "MARK" button.
While holding it, press the "NAME" button too.
Release both these buttons.
Press the "+" button and then release it.

This will start the memory test operation – which takes just over five minutes to completely test the memory. The software will report its progress as it tests each of the four boards which

it thinks are installed. (The 32 Megabyte board behaves *exactly* the same as four 8 Megabyte boards.)

The memory test operation takes about four and a half minutes to test the four boards and another minute before it writes the final "`Press F8 to continue`" line. When the test is successfully completed, the display should show:

```
Testing Memory
slot1..testing 4M DRAM...okay
slot2..testing 4M DRAM...okay
slot3..testing 4M DRAM...okay
slot4..testing 4M DRAM...okay
     Press F8 to continue
```

(Early versions of the Akai software display a changing number during testing, and this number remains on the screen just before the "okay" message.)

If the four "boards" test out OK then all is well. Contact Real World Interfaces if there is any difficulty.

When the test is finished, turn the power off, and on again.

Now you should be able to load and play long samples from hard-disk – or record from an external audio source.

Potential problem with loading whilst playing

On the CD3000 with V2.0 software, and possibly on the S2800, S3000 and S3200, loading samples whilst playing the machine from MIDI can lead to erratic operation and may cause the operating system to crash. This may only occur when most of the memory is in use – so you may not have experienced this when your sampler had less than 32 Megabytes of memory. This is a problem with the operating system, not with the Real World Interfaces memory card.

Appendix A – modifying the CD3000 A/C board support bracket

Tools and care required for cutting metal

In addition to a Philips head screwdriver and a shifting spanner, you will need a hacksaw, jigsaw, tin-snips or guillotine to make a single cut in the metal support bracket. The exact location of the cut is not critical, and neither is its quality, but it is *very* important that you do not allow little pieces of metal to get into the CD3000.

It is best to cut the bracket somewhere far removed from where you are working on the CD3000. File the edges so there are no sharp points and then carefully clean away all possible traces of metal filings.

Disassembly

Follow these steps carefully – ticking each one as you go. Take special note of where screws and cables came from, because the re-assembly instructions assume that you are exactly aware of what you are pulling apart.

It is assumed that you are an electronic technician and so well aware of the dangers of static electricity.

Remove the Individual Output Board

This board is at the top at the back of the unit. It has eight sockets at the back panel and is labelled "L6028B5060 . . . . . PC OUTPUT".

[ ] Unplug the 20-way grey cable which goes into P601.

[ ] Unplug the 3 wire power cable which goes into P602.

[ ] Remove the five black rear panel screws.

[ ] Remove the two cadmium plated internal screws.

[ ] Remove the Individual Output Board and place it somewhere safe from people walking up to it and zapping it with static electricity.

Remove the A/D Board and its Mounting Bracket

[ ] Remove the nuts and washers which hold the input sockets to the rear panel.

[ ] Remove the cadmium plated screw which holds the grey metal mounting bracket to the spacer next to the J104 position. This screw will not be needed any more.

[ ] Remove the cadmium plated screw which holds the metal bracket to a spacer which is on the far right of the machine, near the back panel. This screw is accessed via a hole in the A/D board, just where it is labelled "MADE IN JAPAN".

[ ] Unplug the P1 and P2 34 way ribbon cables. Note how the one to P1 cable comes from underneath the adjacent stereo output board. The P2 cable comes from P112 on the stereo output board. (It may be necessary to remove the stereo output board if the cable and its connectors are caught under this board.)

[ ] Unplug the four wire cable (pink and 3 x grey) from P3. This comes from the power supply.

[ ] Unplug the four wire cable (red and 3 x white) from P4. This comes from P303 on the stereo output board.

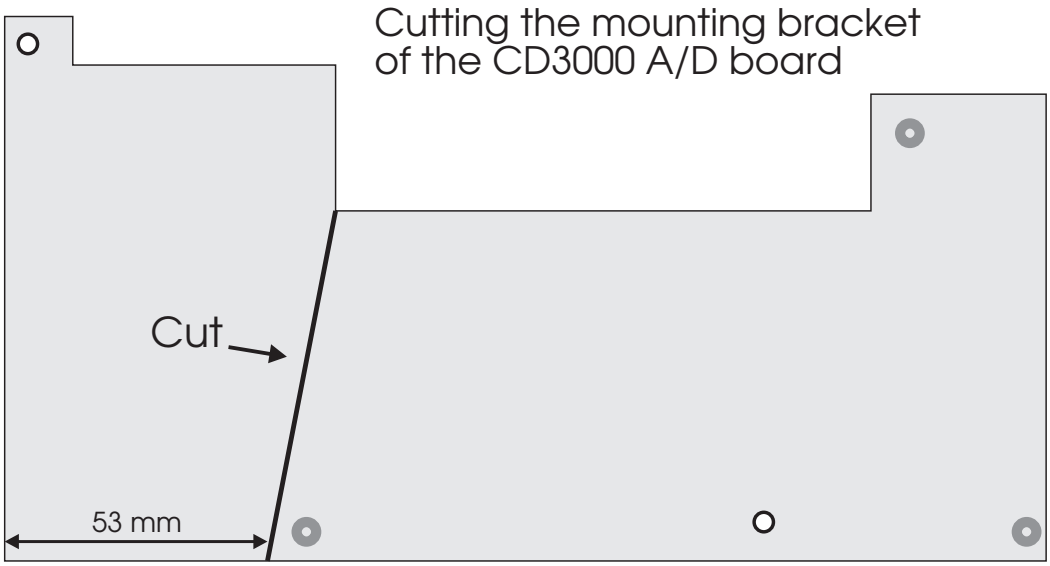
[ ] Remove the A/D board and its grey metal mounting bracket.

[ ] Remove the brass spacer which held the front of the mounting bracket – next to the J104 position. This spacer is not required any more.

[ ] Undo the three screws holding the A/D board to the mounting bracket.

Cut the mounting bracket

The diagram below indicates where to make the cut. The exact location of the cut is not important.



Reassemble

As they say in the classics, "Reassembly is the reverse of the disassembly procedure.".

Test the machine again

Temporarily re-install the old memory board(s), replace the cover of the machine, and test that the following functions still work.

The stereo output sockets.
The two analogue input sockets.
The eight individual output sockets

Unplug the power cord, remove the top cover and return to the main installation procedure: 2 Electrical Installation.