

# THE FAT A2000 A Chip RAM expansion project for your Amiga 2000

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The A2000 conversion was performed on a revision 6 motherboard with 1MB of chip RAM already installed. Like the A500 revision 6a motherboard, this board uses 256KBx4, 20-pin RAM chips. Unlike the A500 board, there are no circuit traces that tie pin 5 of the RAM chips together for the `_DRA9` line. No jumpers exist to reroute the 8372B's pin 56 to this signal line, or pin 35 to the CPU address bus A20 line.

This is easily remedied by adding the necessary traces with wire. To connect the `_DRA9` line, two jumper wires are installed. The first jumper wire connects pin 5 of the RAM chips, and the second jumper wire ties the first jumper wire to a connection point for the 8372B's pin 56. The CPU address bus A20 line connection is made by lifting the ends of two resistors from the motherboard, and running one jumper line. After replacing the eight existing 256KBx4

RAM chips with four 1MBx4 RAM chips, and swapping the 8372B 2MB Fat Agnus chip for the original 8372A, the conversion is complete.

## The Conversion

The steps to convert your A2000 follow, but first, several cautions are necessary:

- 1) Place your A2000 on a level surface, such as a table. Ensure that the computer is sitting level before proceeding. This is important, as you will see in a later step. Remove the top of your A2000 case.
- 2) Next you will remove the drive/power supply platform.
- 3) If you have a card installed in the video slot beside the power supply, remove it now. If no card is installed, you should remove the slot cover from the back panel.
- 4) Look down into the chassis. Follow the power supply's wiring harness to the point where it plugs into the motherboard. Unplug this harness. Follow the floppy drive cable to the point where it plugs into the motherboard. Unplug this cable. If you have a hard disk installed, unplug its cable from the hard disk controller card. Remove the platform by tilting the front edge up, then lift it out and set it aside.
- 5) Refer to Figure 1. Locate the revision number on the motherboard, and look at the RAM chips. If the motherboard is revision 6 or above, or if the memory chips are 20-pin devices, you can complete the conversion. If neither of these conditions is met, you cannot convert your computer using this method.
- 6) Remove any expansion cards that may be installed and set them aside. Look at the motherboard and Figure 1. You should see 10 screws in the approximate locations shown in the figure. They should be easy to find, as each screw is located in the middle of a silver square on the motherboard. There are also two screws located on I/O port connectors—the disk drive connector at the rear of the case, and the mouse port at the front of the case. Remove these screws and set them aside. Look at the left side of the motherboard near the front panel. You should see a wire harness that plugs onto some pins there. Unplug the harness. Remove the motherboard from the case by tilting the front edge of the motherboard up, then lifting the board out.
- 7) Now you will need to remove the bottom shield and insulator from the motherboard. This is accomplished by first removing all the jackscrews from the I/O port connectors on the front and rear sides of the board. Then, place the board flat on the table with the mouse/joystick ports facing you. Flex the lip of the shield that covers those ports toward you and away from the ports. Tilt the front edge of the motherboard up, taking care that the ports do not catch on the shield. Lift the motherboard out of the shield, and set the shield and insulator aside.
- 8) You will first remove the existing 256KBx4 memory chips from the motherboard. Begin this process by clipping the chip leads flush with the chip body. After clipping all the memory chip leads and removing the chip bodies, set the motherboard on its side and support it in a way that allows access to both sides of the board simultaneously. Heat each clipped pin from the solder side of the board and pluck it loose from the component side with forceps or needlenose pliers. Do not hold the pin with the pliers or forceps while heating it. The tool will act as a heatsink and prevent the solder from melting.
- 9) After removing the RAM chips and leads, you will need to clean the solder from the holes at chip positions U501-U504. This is best accomplished with a heated desoldering gun. If you don't have one, you can heat each hole from the component side of the board, and remove the solder with a manual desoldering pump from the solder side of the board.
- 10) Next, install four, 20-pin IC sockets in positions U501-U504. Machine-pin IC sockets are highly recommended. Use the silk-screened legends on the motherboard as a guide. Insert

the sockets with the notch facing the same direction as shown by the legend. After installing the sockets, fill the empty holes at positions U505-U508 with solder, leaving U507's pin 4 hole unfilled for now. Filling the holes ensures that any feedthrough PC traces will make good contact.

- 11) Now you need to create the RAM\_DRA9 address line by adding two jumper wires. Place the motherboard with the solder side up, and the joystick ports facing you.
  - a) First, you will tie the pin 5s of U501-U504 together with 24-gauge bus wire. Begin by cutting a four-inch length of wire. Place one end of the wire against pin 5 of U502 (at the far left). Lay the wire against the board in a manner that allows it to pass between the IC pads and across the remaining three chips. The other end of the wire should touch pin 5 of U501. Tack-solder the end of the wire at pin 5 of U502.
  - b) Measure and cut a piece of 1/16"-dia. heatshrink tubing long enough to cover the wire between U502's pin 5 and U501's pin 5. Allow a little overlap for shrinkage. Slip the tubing over the wire and slide it down to the solder joint at U502. Use a heat gun to shrink the tubing. Tack-solder the wire to U501's pin 5. Repeat this procedure to connect the wire from pin 5 of U501 to pin 5 of U504, and from there to pin 5 of U503. After soldering the wire at pin 5 of U503, clip off the excess wire.
  - c) Next, you will run a jumper wire from the empty hole you left at pin 4 of U507 to pin 5 of U503. Measure the distance between the two points and cut a piece of bus wire around 1/8" longer than that. Bend one end of the wire into an "L" approximately 1/16" from one end. Insert this end into the hole at pin 4 of U507. Keep the wire parallel to the PC board, and lay it so the other end is against pin 5 of U503. Solder the wire at the hole. Measure and cut a piece of 1/16"-dia. heatshrink tubing long enough to cover the wire between U507's pin 4 and U503's pin 5. Cut the tubing to length, allowing a little overlap for shrinkage, and slip the tubing over the wire. Slide it down to the solder joint at U507 and use a heat gun to shrink the tubing. Now tack-solder the wire's other end to U503's pin 5. This completes the new RAM\_DRA9 address line.
- 12) Now you will add the jumper that connects pin 35 of the 8372B Fat Agnus to the CPU address bus A20 line. Place the board component side up, with the mouse/joystick ports facing you. You will need to disconnect two resistors, R110 and R212. Refer to Figures 1 and 2. You will heat the lead of each resistor shown by the X in the figure, then pull it free from the motherboard with forceps or needlenose pliers. Once the end is free, straighten the resistor lead. Measure and cut two pieces of 1/8"-dia. heatshrink tubing that are long enough

to cover the resistor and extend slightly past the end of the lead. Place one piece over each resistor and use the heat gun to shrink it. This will prevent the resistors from accidentally making contact with other components on the board. Remove the solder from the hole at R212, but fill the hole at R110 with solder. Push the resistors back down so they are parallel to the board.

Place the motherboard with the solder side up, and the mouse/joystick ports facing you. You will need to run a jumper wire from the empty hole at R212 to pin 36 of the Gary chip. Measure the distance between these two points and cut a piece of bus wire around 1/8" longer than that. Bend an "L" at one end of the wire around 1/16" from the end. Insert the bent end of the wire into the hole, and lay the wire on the motherboard with the free end against Gary's pin 36. Solder the end at R212. Measure and cut a piece of 1/16"-dia. heatshrink tubing long enough to cover the jumper wire between the two points. Allow some overlap for shrinkage. Slide the tubing onto the wire and use a heat gun to shrink it, then solder the free end of the jumper wire to Gary's pin 36. This completes the connection from pin 35 of the 8372B Fat Agnus to the CPU address bus A20 line.

- 13) Turn the motherboard component side up. You will now install the 8372B chip. Refer to Figure 1 and your motherboard. The number 1 and a "V" are silk-screened on the motherboard near the edge of the chip socket. By orienting the chip so that the writing on its surface is right-side-up, pin 1 will be on the top row of pins. Using a PLCC chip puller, carefully remove the original Fat Agnus chip. You should not attempt to remove this chip using anything other than a PLCC chip puller. Doing so could crack the PLCC socket, preventing the socket from making reliable contact with your new Agnus chip.

Now you will insert the 8372B chip into the socket. This procedure requires extra care. Align the pin 1 edge of the chip with the silk-screened legend on the motherboard. Set the chip on top of the socket but do not apply pressure yet. Make

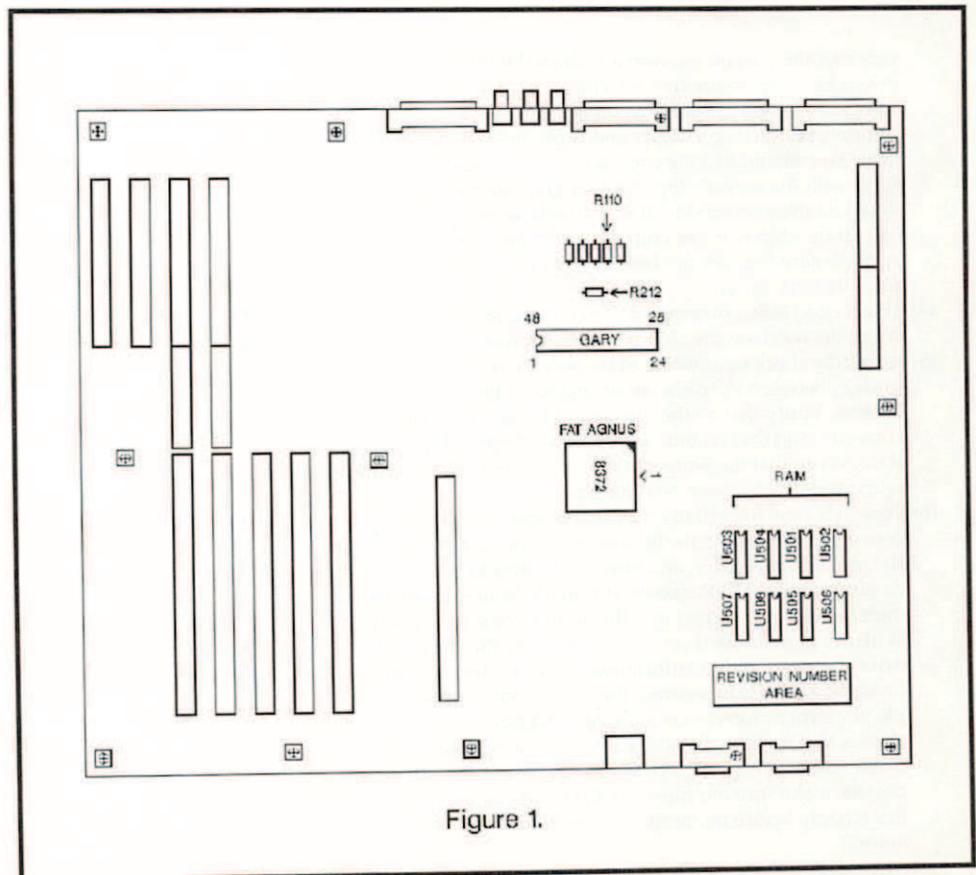
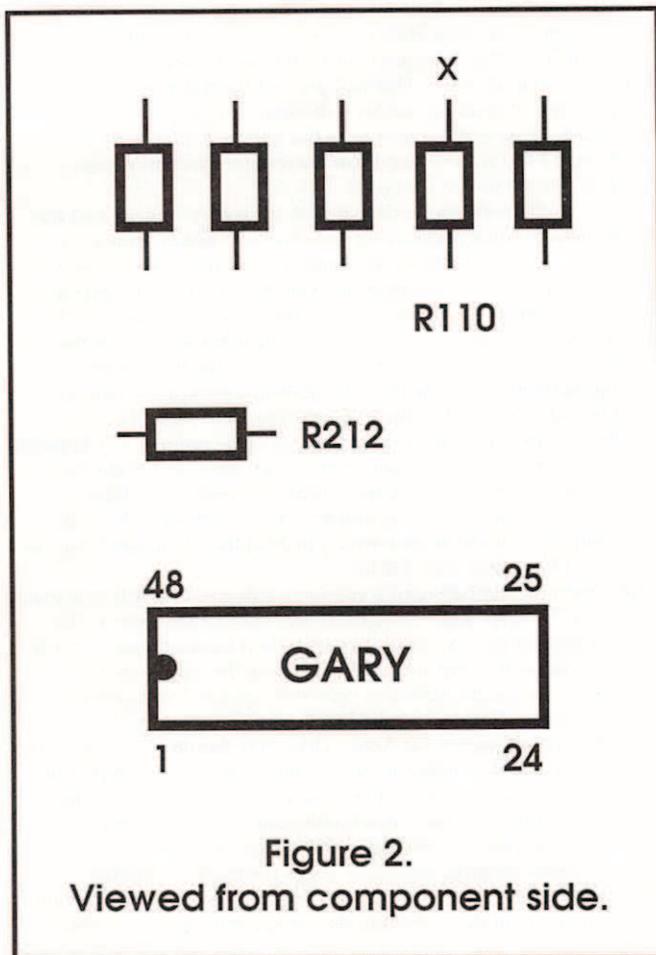


Figure 1.



**Figure 2.**  
Viewed from component side.

sure that the pins on the chip are aligned with the slots on the socket, and ensure that the chip is not skewed or crooked. With the PC board sitting flat on the table, place your thumb squarely on the chip's center and push down. Use care but be firm. You should feel the chip seat, and it should be nearly flush with the socket's top. If it is slightly uneven, push down on the uneven side. If it is grossly uneven, carefully extract the chip with the chip puller. Inspect the chip leads to make sure they are not bent. Carefully straighten any bent pins, then try again.

- 14) Insert one 1MBx4 memory chip in each IC socket at U501-U504. Align the notch on the chip with the notch on the socket.
- 15) Carefully check your work. Make sure there are no solder bridges between PC pads on the memory chip sockets. Verify that all the memory chips are inserted correctly, and that no pins were bent under the chip bodies. Also, verify that the jumper connections were properly made, with no shorts between adjoining pins.
- 16) Now it is time to partially reassemble and test your conversion. I stressed the importance of placing the computer flat on the table earlier, and now I will show you why. Look carefully at the A2000 chassis. It is made from flimsy sheet metal with ribs punched into the bottom for semi-rigidity. With the motherboard securely fastened to the chassis, the drive/power supply platform installed, and the top case installed and tightly secured, the chassis will not flex. If the platform or top case is missing, it is easier for the chassis to flex. This physically stresses the motherboard and could cause damage. Before inserting the motherboard into the chassis, make sure the chassis is flat on the table. It may flex slightly before motherboard insertion, but this is normal.

- a) Insert the motherboard back into the shield. This is best accomplished by inserting the back edge first, placing the I/O port connectors through the holes. Gently flex the shield's front edge that covers the mouse/joystick ports toward you, to allow the ports to clear. After the board is properly seated, straighten the shield by pushing the front edge against the ports. Fasten the shield in place by putting one jackscrew in any I/O connector on the back side and on the front side.
- b) Fasten the motherboard into the chassis with the appropriate screws. Reattach the wire harness to the front left corner of the motherboard. The two wires on the plug should be on the rear and middle pins. The pin nearest the front should not have a wire on it.
- c) Place the drive/power supply platform into the chassis. The edge of the platform under the disk drives and between the mounting ears has a lip on it. This lip goes into a matching slot on the chassis. The ears go outside the front panel. There are also two mounting lips on the back panel, and the bottom edge of the platform rests against them. Secure the platform. Plug the power supply harness into the motherboard. The ridge along one side of the connector faces away from the platform. Plug the floppy drive cable into the motherboard. Do not install any other cards at this time.
- d) Plug in the mouse, keyboard, power cable, and video monitor. Insert a boot floppy into DF0: and turn on the machine. It should boot as normal. Double-click on the floppy disk icon and open a window. You should see a message in the status bar reflecting around 1.8MB of free RAM. If you get a green screen, this indicates a memory problem. This could be caused by a bad solder joint, defective memory chip, incorrect or shorted jumper, or defective 8372B. Turn the A2000 off, check your work and correct any problems you discover.

Once you have determined that your conversion was successful, finish reassembling your computer.

### Conclusion

Performing this conversion will not only add valuable chip RAM to your A2000, but it will save money and help stave off obsolescence. As newer Amiga models are introduced, the temptation to trade in your old computer will be great. Remember this: if you can upgrade your old machine to have the features you need at a reasonable price, you should do so. You will spend less money, and your initial investment will continue to pay off.

### Parts Needed

- (1) 8372B Fat Agnus Chip
- (4) 1MB x 4, 80nS or faster DIP-style DRAM chips
- (4) Machine-pin DIP sockets, 20-pin
- (1) 6" length of 1/16"-diameter heatshrink tubing
- (1) 6" length of 1/8"-diameter heatshrink tubing
- (1) 12" length of 24-gauge bus wire, uninsulated (Radio Shack part number 278-1341)

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