

Hardware

COLLABORATORS

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Chapter 1

Hardware

1.1 EMPLANT - Hardware Guide

EMPLANT - Hardware Guide
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Please read this manual in its entirety before attempting to install or use EMPLANT!

Please check the disk for last-minute information and changes. Where a conflict appears between this manual and the 'hardware_readme' file, FOLLOW THE README FILE!

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1.2 About Your EMPLANT Hardware

ABOUT YOUR EMPLANT HARDWARE

The EMPLANT hardware was designed with quality in mind. Every effort was made to insure that your board will last forever. Every single EMPLANT board is hand inspected and tested. We feel this product is of the utmost quality and therefore can offer this warranty:

Your EMPLANT board is guaranteed to be free of defects in parts and workmanship for life. If at anytime the hardware has a problem that was not caused by misuse or neglect, please contact Utilities Unlimited, Inc. directly (not your dealer, if purchased from one) for return information. If you do decide to deliberately misuse your board, or somehow manage to install it backwards (or in an IBM) there will be a nominal charge for repair. :-)

Your EMPLANT board has the hardware ability to emulate virtually any computer on the market today, providing a software module is written to handle the OS. You will find many features on the EMPLANT board including ROM sockets, a SIMM socket, audio digitizer (requires two components that are user-supplied), battery backup system, auto-boot ability, dual serial ports (if model 'A' or DELUXE), and a high speed SCSI interface (if model 'B' or DELUXE).

DIP SRAM/ROM SOCKETS

The DIP sockets are provided so that you can insert ROMs from various computers and copy them to a disk-based file as well as allowing for static RAM to be used for both auto-booting and as a pseudo RAM drive.

SIMM SOCKET

The SIMM socket is for those ROM SIMMs that come with the latest computers out on the market. The SIMM socket is also EMPLANT's link to other processors, memory, and I/O boards. The SIMM socket has standard address and data lines from the Zorro bus along with battery backed up power, standard +5 volts, +12 volts, ground, read/write lines, memory protection line, and others. This was very well thought out when designed and will be a vital link for upcoming emulation modules.

AUDIO DIGITIZER

The EMPLANT board contains the basic components for an audio digitizer. The board does not include two of the parts necessary for this to function. These parts are readily available from Texas Instruments distributors. You need one each of a LM741 and a TLC548 (the TLC548 is about \$10.00 as opposed to \$2.00 for the digitizing IC used in such digitizers as 'Perfect Sound', 'Audio Master', and 'Master Sound').

Including these parts would have raised the retail price of EMPLANT, something that we did not want to do. The quality of this digitizing IC is much better than conventional 8 bit digitizer ICs, requiring less space, less power, and is much better at rejecting unwanted distortion.

The Macintosh only has a digitizing rate of 22Khz (compared to a Compact Disc at 44.1Khz). The digitizer on the EMPLANT hardware is capable of rates beyond that of the Compact Disc range. We will soon be providing support and/or software for the audio digitizer in the near future.

To install the digitizer ICs, you need to locate the two empty 8 pin sockets (near the top of the board, to right of the three large ICs in a row). The bottom of the two sockets is marked as ADC1 (on the circuit board, between the two rows of pins), place the TLC548 IC in this socket, making sure that the notch on the IC matches the notch on the socket. Insert the LM741 IC in the socket above the TLC548.

BATTERY BACK-UP

The EMPLANT hardware was designed to have a battery backed-up auto-boot system. This system consists of a battery (BR2325 or DL2325 lithium cell), and static RAM(s).

Some of the earlier EMPLANT boards came with 8Kx8 static RAMs. Later boards have no SRAM at all (note: if your board does not have a SRAM chip installed in the auto-boot socket, then the DIAGNOSTIC will show this chip as bad... for obvious reasons).

You can supply your own SRAM of virtually any size up to 512Kx8 for each socket. You could have up to 2.5 megs of memory on the EMPLANT hardware. Most commonly used RAMs are 32Kx8, or 128Kx8. Once the battery has been installed, the data in the RAM will stay valid until the battery is either removed or loses its power.

While the computer is on, the battery circuit is bypassed, and put on a very low current trickle charge to insure long life of the battery. The RAM will be used for auto-booting the SCSI controller or RAM drive, when these options become available.

SERIAL PORTS

The dual serial ports (if you purchased this option) are the same serial ports found on a real Macintosh. They are capable of handling rates of up to 230.4K baud normally, however, with the EMPLANT hardware the speed can be quadrupled to have up to 921.6K baud for AppleTalk (between two EMPLANT boards only) or 460.8K baud if connected to a DoubleTalk board.

Standard serial for modems is limited to 57.6K baud. Both serial ports are asynchronous, meaning that they are completely independent from each other.

You will find a 'empser.device' in the DEVS: directory of your EMPLANT disk. This is a device driver to use the serial ports on the EMPLANT hardware as serial ports on the Amiga side. Just change which serial device your terminal program is using and select either Unit 0 for PORT A (port nearest to the external SCSI connector on the EMPLANT board) or Unit 1 for PORT B.

The empser.device (like a real Macintosh) does not support normal RTS/CTS handshaking, but it does support DSR handshaking, so terminal programs such as 'Term' should have the handshaking set to this method when high speed modems are being used.

SCSI CONTROLLER

The SCSI interface uses the popular 53C80 SCSI IC. It is a fast and reliable SCSI controller. It is not SCSI-II. Transfer rates can be well over 1 megabyte per second depending on the processor your Amiga has and how fast the device you are using is.

The SCSI interface is designed to handle all known SCSI devices such as hard drives, SyQuest drives, film recorders, hand scanners, flat bed scanners, EtherNet cards, NuBus expansion units, CD-ROM units, tape backup units, DATs, Magneto-Optical drives, and any other SCSI-direct type of device.

Some SCSI devices require power (+5 volts) on pin 25 (please consult the user manual of your SCSI device for information regarding power requirements), so there is a jumper located to the right of the internal SCSI connector labeled JMP1, that is for this purpose. With the jumper closed (jumper over-top of both pins of the plug), +5 volts will be supplied to pin 25 of BOTH the internal and external SCSI connectors.

* WARNING * Some SCSI devices can be damaged if power is supplied to this pin! Do NOT set the jumper to start with, only if required by your SCSI device!

You will find a 'empscsi.device' in the DEVS: directory of your EMPLANT disk. This is the device driver required for using SCSI devices on the Amiga side.

Instead of creating fancy (and often confusing) formatting and partitioning software, we opted to make the device driver compatible with Commodore's HDToolBox program (located in your WorkBench 'Tools' drawer). You need to open a SHELL (or CLI) and then type at the prompt:

```
sys:tools/hdtoolbox empscsi.device    <press RETURN>
```

This will run the HDToolBox program and use the empscsi.device with it.

You can then format and/or partition the SCSI device like you normally would (please read the documentation for the HDToolBox program).

Please note that HDToolBox is software provided by Commodore when you purchase OS 2.05 (Kickstart 38) or higher. HDToolBox is NOT provided with any of the EMPLANT software packages.

The SCSI device driver handles SCSI-Direct commands, meaning that virtually

any SCSI device should function properly.

1.3 ROM Installation and Back-up

ROM INSTALLATION AND BACK-UP

* NOTE * DO NOT ATTEMPT TO INSTALL ROMS WITH THE EMPLANT BOARD PLUGGED INTO YOUR AMIGA!

Before any emulation module can be used, you may need the ROM image for the computer to be emulated. Some emulation modules will not require a ROM image. Please check with the manual for the emulation module you are intending use to see if your emulation does require a ROM image.

If you do need a ROM image, and you purchased these ROMs, please follow the instructions below. If you own the computer where the ROM image will come from, you do not have to disassemble your computer and remove the ROMs. There will always be a program written for each emulation that dumps the ROM image to a file using your original machine to be emulated. Please check with the manual for the emulation module you want to use for details.

If you already have a ROM image, proceed to Installing the EMPLANT Board.

INSTALLATION PROCEDURE

Place your EMPLANT hardware on a flat surface (lay a towel down to prevent scratching of the surface) while installing RAMs, ROMs, and auxiliary modules.

The EMPLANT hardware has been designed to accept a variety of different RAM/ROM configurations. Most ROMs will be either four twenty-eight pin DIPs, or a single ROM SIMM module. Refer to Figures 1-1, and 1-2 for visual assistance.

INSTALLING 'DIP' ROMS

Make sure that if you are installing a 28 PIN DIP, you offset the chip to be inserted by 2 pins downwards (opposite of the notch on the socket). This can be confusing, so look at Figure 1-2 (page 14) to see how this should be done.

Install the DIP ROMs on the EMPLANT board in sockets labeled "Socket 1", "Socket 2", "Socket 3", and "Socket 4". Note the direction of the notch when inserting the ROMs into their sockets.

It makes no difference which socket a ROM goes in. The ROM dump software is smart enough to figure out what chip is in each socket and provide a proper ROM image. Make sure that all pins line up and each pin has a matching slot for it to go into. When you are sure that each pin is properly in position, press the chip firmly into the socket by applying equal pressure from both ends of the chip simultaneously.

BE CAREFUL WHEN INSTALLING DIPs! YOU CAN EASILY BEND PINS!

INSTALLING 'SIMM' ROMS

Install the ROM SIMM module in the long thin socket (64 pin, 0.05" centers) located at the top edge of the board (closest to the front of the computer). Note that components on the ROM SIMM module should face toward the gold edge connector when it is installed.

1.4 Installing the EMPLANT Board

INSTALLING THE EMPLANT BOARD

The installation of the EMPLANT hardware requires the partial disassembly of your computer. If you have any doubts as to your ability to perform such a task, **please** seek someone who can assist you.

There are several screws that hold the lid to your computer in place. Locate all of the screws, remove them, and set them aside. Carefully remove the lid and set it aside. Now, locate the expansion slots in your computer (consult your Amiga owner's manual for slot locations). Select an empty slot.

Located on the back panel of the computer is a metal plate that is in-line with the selected slot. Remove the single screw that holds the metal plate in place and set it aside. Remove the metal plate and put it away for safe keeping, it will not be re-installed.

Now, with the front of the computer facing towards you, orient the EMPLANT board so that the metal plate attached to the board is away from you, and carefully insert the gold contact edge into the Amiga's slot. Press firmly on the top of the board until the board is seated properly. Using the screw set aside (which held the original metal plate in place), fasten the EMPLANT's metal plate securely to the back panel.

Re-assemble your computer if you wish, however, you will need to remove the ROMs from the EMPLANT board before you can use it. If you already have a ROM image, proceed to Testing Your EMPLANT Board.

DUMPING THE ROMS

Run the appropriate software to dump the contents of your ROMs to a disk file (see emulation documentation for details). Once the ROMs have been dumped, they **must** be removed. RAMs (if applicable) should be installed at this time. Re-install the EMPLANT board and re-assemble your Amiga. Be sure to read the instructions for the ROM dump program that you will be using before attempting to use it.

If you are having problems dumping the ROMS proceed to the 'Trouble Shooting' section of this manual.

* NOTE *

Under copyright laws, you are allowed to make archival copies of the ROMs you own (licensed ROMs cannot be duplicated without the permission of the manufacturer and/or license owner) contained in your computer. Archival copies may be used for emulation modules as long as the ROM image(s) and the computer(s) they came from are not running simultaneously. It is illegal to

give away or otherwise distribute archival copies of ROMs. In the event of sale of the original ROMs, all archival copies must be included with said sale, or destroyed.

The reason for using a disk-based ROM image is not to promote piracy of ROMs, but rather to allow multiple computer emulations to run at the same time, and the only practical way of accomplishing this is to have the ROMs as disk-based files. Please do not steal someone's work!

1.5 Testing Your EMPLANT Board

TESTING YOUR EMPLANT BOARD

Included in your EMPLANT package is a disk containing the file 'DIAGNOSTIC'. This program checks the EMPLANT hardware to make sure that it is functioning properly. This is the same program that is used to test EVERY EMPLANT board before it is shipped to the consumer.

Run the program by double-clicking on its icon. When the screen appears, you should be looking at an illustration of the EMPLANT board *you* purchased. The board displayed should look exactly like what your board looks like. If you ordered an option that does not appear on the board displayed, please contact Utilities Unlimited, Inc. for further instructions.

Click on the 'START' gadget to begin the test. You should see three 'VIAs' tested (both register and timer testing is done); then the SCC (if Option 'A' or DELUXE board) will be tested at various BAUD rates; followed by a quick test of the SCSI controller (if Option 'B' or DELUXE board) and the SRAM (if there is no SRAM in the auto-boot socket, it will test as BAD!); and finally a test of the various system clocks. If the SRAM tests as BAD, the board will still show up as 'OK'.

Early versions of the EMPLANT hardware were shipped with SRAM on the board. If any of the chips show up as BAD (besides the SRAM), contact Utilities Unlimited, Inc. for further instructions.

The DIAGNOSTIC program (like all other applications for EMPLANT) will open a NTSC 640x200 display regardless of what display mode your Amiga is currently set to use. This is for critical timing purposes. Your emulation module will run in whatever display mode that is selected with the emulation setup software.

1.6 EMPLANT Jumper Blocks

EMPLANT JUMPER BLOCKS

There are several jumpers on the EMPLANT board. The following is a technical description of what these jumpers are for:

JP1 controls one of the address lines to the ROM SIMM socket. With the jumper set to the left, this line to the SIMM socket is an address line

from the computer; when set to right, it is a line controlled by one the interface chips on the board. This line must be set to the right to be used with the current ROM dump program (Dump256KSIMM), and should come this way when you purchased your board.

JP2 is used to optionally provide writing capability to the SIMM socket. If the jumper is set to the left, the SIMM line is pulled up to +5V; if it is set to the right, the line is now a gated write select. If you plug in a MAC ROM SIMM board, this jumper must be set to the left, as MAC ROM SIMMs expect power to be applied to that line.

JP3 thru JP5 are used to provide power to a 28 pin DIP ROM/SRAM, or an address line to a 32 pin DIP ROM/SRAM. JP3 controls the line for the Auto-Boot socket; JP4 controls the two sockets closest to the auto-boot socket; and JP5 controls the other two sockets. When a jumper is set to the upper position, power is supplied to the proper pin for 28 pin DIP ROM/SRAMs; use this position for 28 pin chips (like 8Kx8 static RAMs, EPROMs, or EEPROMs).

When a jumper is set to the lower position, the line is now an address line needed for 32 pin DIP ROM/SRAMs; do not use the setting for 28 pin chips as they will not receive power if you do. Use this setting for 32 pin chips (i.e., 128Kx8 static RAMs).

JP6 is used to indicate to a MAC emulation module which audio output mode the user desires. When set to the upper position, the emulation module will try to produce only mono audio; when set to the lower position, the emulation module will try to produce stereo audio.

JMP1 is used to provide power to SCSI devices that require it. With a block on the jumper, +5 volts is provided to the SCSI bus. Most SCSI peripherals do not require power, so for these devices, do not have the block on the jumper.

RCA is not really a jumper block; it is an input for the audio digitizer circuit. The pin closest to the edge of the board is ground and the other pin is the audio input.

1.7 Trouble Shooting

TROUBLE SHOOTING

Machine won't boot with EMPLANT installed -

Check to see if board is seated firmly in the socket.

Make sure that the metal bracket is inserted into the proper opening and securely fastened (with a screw) in place. The EMPLANT board **must** have this metal bracket screwed in place for it to function.

Remove the board and inspect & clean the gold contact edge with contact cleaner (glass cleaner works too). Remove any dust or dirt from the contacts in your Amiga's socket.

Diagnostic shows NO BOARD! -

Follow the same procedure above.

Diagnostic shows the SRAM as BAD -

Check to see if your EMPLANT board has a SRAM chip in the auto-boot socket. If it does, then contact Utilities Unlimited, Inc.
(Only early EMPLANT systems were shipped with the SRAM installed)

Diagnostic shows one or more chips as BAD -

Contact Utilities Unlimited, Inc.

ROM Dump program does not recognize ROMs or SRAMs installed -

Make sure that ALL ROMs/SRAMs are installed with the notch facing in the correct direction (towards EMPLANT's metal bracket), and that 28 PIN DIPS are offset properly.

Check to see if jumpers JP3 thru JP5 are in the correct position for the ROMs/SRAMs you are using.

Printers and Modems do not respond when using EMPLANT's serial ports-

If you are trying to use a modem, make sure that you are using a RS-422 to RS232 modem cable that supports hardware handshaking. Build the modem cable shown in the diagram contained in the file 'MAC_Modem_Cable.IFF'. If you are trying to use a printer, make sure that you have a standard MAC printer cable. Build the cable shown in the diagram contained in the file 'MAC_Printer_Cable.IFF'.

High speed modems do not work with EMP SER.DEVICE -

Set your terminal to to use DSR handshaking.

AppleTalk devices are not recognized -

Check your AppleTalk connector(s) and cables.

Check the EMPLANT hardware to see if it passes the Diagnostic test.

Re-route your AppleTalk cables away from noisy power lines.

Make sure that the metal bracket on the EMPLANT board is securely fastened (with a screw) to the Amiga's back metal panel.

Check the -5V line on the Zorro bus. If it is not between -4.75V and -5.25V, have an authorized service center replace the -5V regulator.

Certain boards for the Amiga use level 6 interrupts and may interfere with

AppleTalk. Known boards are Merlin and Resolver graphics cards.

AppleTalk devices disconnect after awhile -

Follow the procedure above.

There is a known problem with early Amiga 4000s. All of those people who own an A4000 with a motherboard revision earlier than rev 'K' should consult an authorized Commodore service center to obtain a newer replacement motherboard. There is a problem with the BUSTER chip in the early versions that causes problems with the Zorro bus timing.

1.8 FCC Notice

F.C.C. Class B Verification

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and the receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

1.9 Notices

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1.10 Dedication

Dedicated in memory of John Droden

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