

Installation and Operations Guide to **VXL[★]30 and RAM-32**

The 68030 Accelerator
and 32-Bit FASTRAM System
for the Amiga® 500 from

 **MicroBotics, Inc.**

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"VXL-30" is MicroBotics' trade name for its 68030 Accelerator for the Amiga 500;
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VXL-30 is a high speed accelerator system which employs the Motorola 68030 or 68EC030 processor chip rated at either 25MHz or 40MHz clock speeds. Also supported are the 68882 and 68881 Floating Point Units (FPU's) and the addition of 32-bit wide RAM via the separate VXL RAM-32 high speed memory board. This documentation is organized into two basic subjects: Installing your VXL-30 and RAM-32 and operating your VXL-30/RAM-32 system.

Installation

Do NOT install the board in your computer before first carefully reading through this entire Guide. Work on a table large enough to support your Amiga with ample space left over to work on VXL-30 and RAM-32. Make sure the lighting is very good.

CAUTION: Installing your VXL-30 and RAM-32 requires you to open your Amiga. Although numerous Amiga peripherals require you to do this, doing so may void the Commodore warranty on your Amiga. If you have any degree of uncertainty about your ability to successfully open your Amiga and install VXL-30 or RAM-32, you should have the installation done by your Amiga dealer.

Your dealer may impose a labor charge for installation, but this may well be worth it to avoid the risk of damaging your computer or your VXL-30. If you decide to do the installation yourself, proceed slowly and carefully when opening your Amiga. Take precautions to properly ground yourself before touching any electronics to avoid static damage to components on the Amiga and on VXL-30. Proceed slowly and cautiously when removing and inserting chips and VXL-30 itself. MicroBotics cannot assume any responsibility for damage that you may do to your Amiga or to the VXL-30 product.

Tools Needed:

1. A medium flat, thin-bladed screw driver
2. Torx T-10 key (supplied with VXL-30; Amiga 500 only)
3. A #2 (medium) phillips screw driver (Amiga 2000 only)
4. Small needle nosed pliers
5. Small cup or container to temporarily hold screws

TAKING APART YOUR AMIGA

Turn off your Amiga. Unplug the power cable and any other cables connected to the ports, including the mouse. Remove all peripherals from the Amiga and your worktable. All that should be in front of you is the Amiga itself.

FOR THE AMIGA 500

(skip to Step 11 if you have a 2000)

STEP 1: Flip your Amiga 500 over on its face (keyboard side down) with the front edge still towards you.

STEP 2: Use the Torx tool to remove the three Torx screws on the front edge of the base of the machine. Put the screws aside in a cup.

STEP 3: Use the Torx tool to remove the three Torx screws located on the back edge of the machine (on the lip of plastic above the ports). Put the screws aside.

IMPORTANT: DO NOT REMOVE ANY OTHER SCREWS ON THE OUTSIDE OF THE CASE 1

STEP 4: Firmly clamp together with your hands the top and bottom shells of the Amiga case, on both sides in line with the keyboard. Then, holding the system together with your hands, turn it back right side up with the keyboard towards the front, facing you. NOTE: while you perform this maneuver, the only thing holding the keyboard in the system is your hand pressure, so do it carefully or you'll drop the keyboard.

STEP 5: Lift the top plastic shell off your Amiga 500.

CAUTION: The edges of the bright-metal shielding on the Amiga are very sharp. Proceed with care and avoid cutting yourself on these metal edges.

STEP 6: The bundle of wires leading from the keyboard to a rectangular hole in the middle of the shielding has a rectangular plastic connector at its end. Unplug this from the motherboard by reaching into the hole and gripping the connector with two fingers. Pull straight up.

STEP 7: Do NOT try to remove the silvery grounding strap on the right side of the keyboard. Just lift the keyboard up carefully and swing it to the right and out of your way.

STEP 8: Using the flat-bladed screwdriver, bend up (straight) the four metal tabs on the metal shielding! One of these tabs is on the left side near the back, and the other three are just in front of the disk drive housing. Do not try to bend back these tabs with your fingers. Use a pliers.

STEP 9: Use the Torx tool to remove the four screws on the shielding. There are two in front and two on the left side, adjacent to the expansion bus connector.

STEP 10: Lift off the metal shielding and put it aside. Note that there is a second, smaller piece of shielding under the main shield, around the expansion bus connector.

FOR THE AMIGA 2000

(Skip to Step 18 if you have an Amiga 500)

STEP 11: Remove the five case screws using the phillips screwdriver. There are two on each side of the case and one high on the back in the middle in an oblong hole. Store the screws in a cup temporarily.

STEP 12: Remove the top of the case (sliding it forward). Watch out for the screw tab in the center rear of the case so as to avoid snagging wires as you slide the top off.

STEP 13: Remove any cards installed in the slots near the power supply so that you will have ample room to work.

STEP 14: Remove the power cable connector (big oblong, white connector) from the motherboard and remove the floppy interface connector from the motherboard. Make a note on paper of how these connectors attach to the motherboard and their orientation so that you can later put them back correctly. Look closely at how the motherboard power connector is clipped onto the motherboard by a plastic spring, care is required to release the connector.

STEP 15: Unscrew the three screws that hold the power supply/drive platform to the front of the case (one on the left side; two on the bottom edge).

STEP 16: Unscrew the four screws that hold the power supply/ drive platform to the rear of the case.

STEP 17: Grasp the power supply/drive platform with both hands and lift it straight off the case. Put it aside.

REMOVING THE 68000 FROM THE MOTHERBOARD

The 68000 is the biggest rectangular chip on the motherboard. On the A500 it's directly adjacent to the expansion bus connector on the left side of the Amiga. On the 2000, it is located in the middle, towards the front of the computer directly adjacent and to the right of the coprocessor slot.

STEP 18: Use the flat bladed screwdriver to slightly pry up one end of the 68000 cpu chip. Then slightly pry up the other end. Work alternately on either end until the chip is freed from its socket. Do not rush. Do not use excessive force. Do not pry up too much on one side at a time. When the chip is freed, handle it by its ends.

STEP 19: Note that the 68000 chip you just removed has a semicircular notch on one end. This notched end should be pointed towards the VXL-30 name imprint ("south" on the board) when you install it on VXL-30. Take the 68000 chip and line it up with the matching socket holes on VXL-30. Carefully line up all the pins on the 68000 with the appropriate socket holes on the VXL-30 board. If the legs are slightly wider apart than the socket holes on VXL-30, then partially insert all the legs on the row of socket holes closest to the edge of the board. Now press carefully on the body of the chip, on the side not yet inserted in order to slightly bend the whole row of pins already inserted to the point where the uninserted row of pins now matches up with its row of socket holes. Hold the VXL-30 board in both hands (right hand on the top edge, left hand on the bottom edge) with your thumbs on the 68000 chip and your fingers on the back of the board (do NOT rest it on the table; that might result in bending the pins on the back of the board). Lightly press down on the middle of the chip then inspect the socket holes to make absolutely certain that the pins are going into the proper holes and are not being bent. Now use firmer pressure to insert the 68000 into the VXL-30 board. Make one final visual inspection of the chip to insure that you haven't bent under any pins.

CONNECTING RAM-32 TO VXL-30

STEP 20: If you have a RAM-32 to install on your VXL-30, this is the time to do so; otherwise, skip on to the next step. Hold VXL-30 in your left hand and RAM-32 in your right. Carefully line up the long black connector on RAM-32 with the gold-colored pins on the right edge of VXL-30. Lightly insert the pins into the connector and carefully inspect all the pins to make sure that none are missing the

socket holes and/or getting bent. Then press the two boards firmly together. Hold the boards very tightly and very straight while you do this. Make sure the boards are going together evenly while you do this. Work slowly. Avoid leveraging the boards against the pins as they are joined. When fully mounted on VXL-30, there should only remain a hairline of space between the two board edges (if any). Before installing the assembled VXL-30/RAM-32 in your Amiga, you should install an alternate KickStart ROM if you have one available. The ROM chip installs with its notch pointed towards the VXL-30 side of the RAM-32 board. See the installation diagram sheet. Note that there are two different versions of the 2.04 ROM: one with a jumper wire on it (for installation in older Amiga motherboards) and one without a jumper wire. If you install a 2.04 ROM on the VXL RAM-32, it should be the ROM *without* the jumper-wire. If your 2.04 ROM has a jumper wire on it (connecting pins 1 and 31) it will not work properly in RAM-32 unless you remove the wire.

STEP 21: Examine the underside of the VXL-30. Note the two long rows of pins. Carefully line up these pins with the now empty 68000 socket on the motherboard. Let the pins just rest on the socket and then carefully examine them to make sure that they are all correctly lined up. Gently press straight down (with your fingers in the center of the row of pins on the top of the VXL-30). Stop and make sure that you're not bending any pins and that all the pins are properly lined up in the socket. Now press the VXL-30 board firmly and evenly down into the socket.

NOTE: If you have an Amiga 500 Plus or if you have some other plug-in accessory installed in another socket, you may have to install a socket-raising kit in the motherboard socket to allow VXL-30 to clear the obstruction. This kit is available through MicroBotics at nominal cost (it is merely a set of single-row sockets just like those on VXL-30). Note that a raised VXL-30 may interfere with the metal shielding on your Amiga. Check for such a condition before attempting to reattach the shielding. Do not force it back on in such a case.

STEP 22: Note the jumper block, on VXL-30, near the 68000, labelled "CPU". If you wish to cold boot from the 68000, put this jumper on both pins, otherwise leave it in its default position (hanging off one pin) which will cause cold boot to take place using the 68030. Note also the group of jumper blocks on the RAM-32 card. See the table in the Operations section of this document for detail on what these settings mean before closing up your Amiga.

STEP 23: Visually inspect and determine that VXL-30 is correctly installed.

CAUTION: Make ABSOLUTELY certain that none of the components on the Amiga motherboard are touching the underside of VXL-30. This is a crucial requirement in order to avoid shorts that could destroy your computer or VXL-30 system. Use a flashlight to aid you in this inspection. Then restore the shielding, keyboard connector and keyboard, and plastic top on your Amiga. Store the Torx key.

MATH CHIP INSERTION

Normally, you should buy your VXL-30 with its math chip already installed. If you wish to add a math chip to VXL-30, you should buy a MicroBotics Math Chip Kit through your dealer or directly from MicroBotics, Inc. . Both 68882 and 68881 math chips with crystals are available.

The polarity of the math chip is marked by the small dimple dot in the center of one edge of the square chip. This dimple must be turned towards the left side (68000 side)

of the VXL-30 board. For more guidance, refer to the VXL-30 Configuration, Chip Installation, and Upgrade Notes diagram sheet.

IMPORTANT NOTE: the Motorola math chip package (physical connection system) used on VXL-30 is the PLCC-type, not the much more common PGA type. Do not attempt to mount a PGA math chip on VXL-30; this is not possible and you will damage your VXL-30 trying.

MATH CHIP CLOCKING: It is very important to clock the math chip correctly. If the math chip is SLOWER than the processor chip, it must be clocked separately. NEVER "overclock" the math chip. This will damage the chip; give inaccurate results; and void your warranty.

Operations

DIFFERENCES IN PROCESSOR TYPES

The raw speed of the 68030 processor chip is measured in megahertz (MHz), that is to say, millions of processor cycles per second. VXL can fully support processor speeds of from 25MHz up to 40MHz (50MHz can be supported conditionally). 68030's are rated (at time of manufacture) as to how fast they may be operated. The VXL standard implementation is shipped with a 25MHz 68030. The standard VXL employs the EC030 variant.

The only operational difference between the EC030 and the regular 68030 is that the EC version of the chip does not have a Programmable Memory Management Unit (PMMU) built into it. As of this writing, there is no user-level applications software which uses the PMMU. The system utility program SetCPU (in the public domain), CPU in AmigaDOS, and the developer's utility Enforcer (from Commodore) are the only pieces of code of any significance which use the PMMU. Note that the bulk of the installed base of Amigas have no PMMU in them nor are they capable of supporting such without replacing the standard 68000 cpu. Commodore has publicly stated that applications should not make specific use of the PMMU.

MATH COPROCESSORS

The Motorola Floating Point Units (FPU's) 68881 and 68882 are supported on the VXL-30. An FPU kit (consisting of the math chip and appropriate crystal) is available from MicroBotics. The operation of a properly installed math chip is transparent to the user running under AmigaDOS 1.3 or 2.0. The FPU provides a significant performance increase when running software which is computationally intense; particularly that software which makes heavy use of transcendentals and floating point math. If a math chip is installed, and if you are running VXL in 68000 mode, the FPU will not be available to the system.

RAM-32 JUMPER SETTINGS

Nr.	Function	OFF	ON	Soft?
1	RAM Mapping	High	Low	soft
2	RAM Size	2 Megs	8 Megs	hard
3	Boot KickStart ROM	Motherboard	RAM-32	soft
4	RAM Access Mode	No Burst	Burst	soft
5	RAM Speed	80ns	60ns	hard
6	CPU Speed	25Mhz	40; 50 Mhz	hard

The default maps RAM "low" (in the Amiga's normal system RAM space) so that it will automatically appear upon start up (this is called autoconflguration). Mapping RAM

"high" requires you to use a SetVXL ADDMEM software command to make the memory available. High memory cannot be accessed directly by DMA disk interfaces such as the CBM A590. The "Soft?" column indicates whether that function can also be affected by soft-switches in the SetVXL software.

SETVXL SOFTWARE

You should be using version 1.90 (or later) of SetVXL. The version is shown on screen when used. SetVXL lets you change VXL-30's operational state as well as that of any attached VXL RAM-32. SetVXL will present you with an interactive menu when you run it unless you suppress the menu via the USE command. The following is a glossary of command-line switches to be used with SetVXL:

68000 Soft switch to the 68000 processor upon automatic warm reboot of the system. RAM-32 can be mapped high from this state, or remapped low and AddMem'ed but none of the other soft-switches are relevant (except on going to 68030).

68030 Soft switch to the 68030 processor upon automatic warm reboot of the system.

CACHE Turn on both the 68030 Instruction and Data caches. The caches are specialized 256-byte buffers inside the 68030 for cpu instructions and data.

NOCACHE Turn off both the 68030 Instruction and Data caches.

BURST Enable both Instruction and Data burst modes (only if Fast Page Mode 32 bit wide RAM is installed). Burst is a processor mode which makes for more efficient memory read access.

NOBURST Disable both Instruction and Data burst modes (only if Fast Page Mode 32 bit wide RAM is installed).

DATACACHE Turn on the 68030 Data cache.

NODATACACHE Turn off the 68030 Data cache.

INSTCACHE Turn on the 68030 Instruction cache.

NOINSTCACHE Turn off the 68030 Instruction cache.

DATABURST Enable Data burst mode (valid only if Fast Page Mode 32 bit wide RAM is installed).

NODATABURST Disable Data burst mode (valid only if Fast Page Mode 32 bit wide RAM is installed).

INSTBURST Enable Instruction burst mode (valid only if Fast Page Mode 32 bit wide RAM is installed).

NOINSTBURST Disable Instruction burst mode (valid only if Fast Page Mode 32 bit wide RAM is installed).

USE When used as a CLI keyword or icon tooltype, suppress the interactive interface to SetVXL; use command line switches or icon tooltypes only.

MAPHIGH If VXL-30 has 32 bit memory available, soft-map it to appear at address HEX 0800 0000 upon auto warm reboot. Should not be used with MAPLOW. Memory mapped high is not directly addressable by DMA peripherals (such as the CBM 590). High memory is also not accessible to the 68000. This fact can be used to "hide" the memory in 68000 mode when running old software that can't cope with FastRAM.

MAPLOW If VXL-30 has 32 bit memory available, soft map it to autoconfigure at address 0020 0000 upon auto warm reboot. Should not be used with MAPHIGH. Normally, your memory should be mapped low.

ADDMEM If VXL RAM is attached and mapped high, this switch will add the memory to the free memory list (thus making it accessible to the system in 68030 mode). Does not cause auto-reboot. The included MAddMem utility will also do this job.

FASTROM If VXL RAM is attached, copy the system ROM into 32 bit wide memory for faster AmigaDOS operation. Note that no MMU is necessary to perform this operation. Does not cause auto-reboot. Note also, that although it achieves the same result as the FASTROM option in the PD utility, "SetCPU", or in AmigaDOS 2.0, "CPU" command, it does so by different means. The two programs are not interchangeable. Do NOT call FASTROM from SetCPU or CPU unless you have an MMU. Use FASTROM from SetVXL instead. FASTROM will significantly speed up operating system functions but it will occupy 512k of your RAM-32 memory. Not available in 68000 mode.

NOFASTROM Return FASTROM memory to normal use.

MBROM Use the KickStart ROM installed on motherboard as the system ROM.

VXLROM Use the KickStart ROM installed on RAM-32 as the system ROM. Not available in 68000 mode.

COMMAND LINE EXAMPLES:

SETVXL 68000 USE

Soft-switch from using the 68030 to the 68000 processor (and auto reboot the system).

SETVXL 68030 MAPHIGH USE

Enable the 030 processor. Memory attached to VXL-30 will be mapped at a high address (hexadecimal 0800 0000) after auto rebooting.

SETVXL ADDMEM USE

High mapped memory attached to VXL-30 will be added to the system free memory list.

SetVXL can be used from the CLI or from the Workbench. SetVXL can accept more than one command at a time. Some commands are mutually exclusive or work only with RAM-32. Some commands cause the system to reboot.

ADDITIONAL SOFTWARE PROVIDED

MBRTTest-2 memory test software can be found on the VXL-30/RAM-32 diskette. Your RAM-32 is tested before shipment using this software. See the on-disk documentation.

TROUBLESHOOTING

Even the most reliable devices can have problems occasionally. If your VXL-30 should appear not to function properly, consider the following checklist:

1. Are your jumpers properly set?
2. Are all chips correctly installed and firmly seated in their sockets? Do the VXL-30 and RAM-32 boards clear all the parts on the Amiga motherboard?
3. Is the VXL-30 board firmly seated in the Amiga socket?
4. Does your VXL-30 work without other peripherals at-

tached to the Amiga?

5. Have you installed a second board in the CPU socket (this arrangement will not work reliably and MicroBotics will not support VXL-30 in such an environment)?

6. If you have problems with a particular piece of software, have you discussed it with the software publisher? Have you tried running in 68000 mode?

7. Have you tried running your system without background utility software (i.e., running from a "fresh-out-of-the-box" Workbench disk without any modifications)?

8. Have you tried running your software without the Instruction or Data caches enabled? Some software is not well designed for compatibility with caching. Some disk drive interfaces may have problems with caching.

9. If you are using AmigaDOS KickStart 1.3 or earlier with a 40MHz or faster VXL-30 and have occasional boot or reboot problems (system hangs) this is because KickStart 1.3 has some timing dependencies in it that do not work well with very fast processors. This problem is cleared by installing a KickStart 2.0 ROM in your system. The problem also clears upon a repeated reboot.

10. If you are using an Amiga 500, and it has one or a number of other peripherals drawing power from it (external floppies, ram boards, harddisks, etc.) you may need a bigger power supply if you are experiencing intermittent problems that seem to have no other logical cause.

11. If you are using a system with no FastRAM (RAM mapped at CO 0000 is not true FastRAM), the speed of VXL-30 will be limited by ChipRAM contention; you should have at least some FastRAM on your expansion bus to attain the benefits of acceleration; best of all, RAM-32. Without wide memory (RAM-32), all memory operations are slowed down to the speed of the 68000 since the only memory then available is memory limited by the Amiga bus speed. Processor operations will still be fast, but reads and writes to memory will be slow.

12. If you have a DMA disk interface (such as CBM's 590 or GVP's Series II), memory mapped high will create an access problem. Change the mask value to 0x00ffffe (see your drive's Rigid Disk Block prep software and documentation) else map the memory low.

13. If you have a 16-bit RAM peripheral which has a conflict with RAM-32, try mapping RAM-32 high. Some 16-bit RAM designs (for example, DataFlyer) inflexibly "hard-map" the location of their RAM thus creating a conflict with RAM-32's in autoconfiguration space.

If you have worked your way through the above checklist and are still experiencing problems, see your VXL-30 dealer. Alternatively, you may call MicroBotics Technical Support, but only after working through the checklist. Please be sure to make a note of your serial number and board revision number.

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