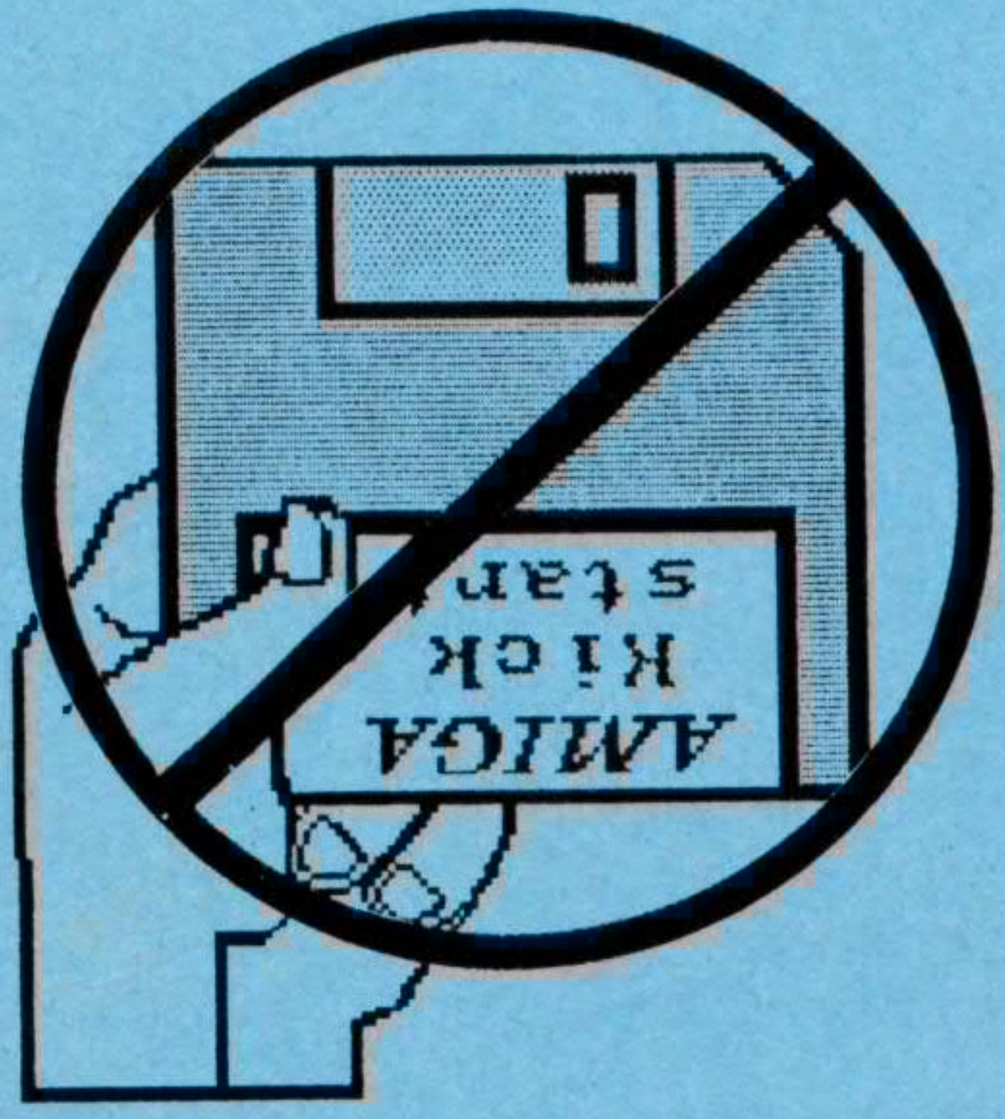
Kickstart Eliminator and RAM Expansion Kit

Instruction Manual



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Kickstart™ Eliminator and Ram Expansion Kit

Instruction Manual

Note: Installation of this kit will void the factory warranty on your computer. No support for this product is available from Commodore-Amiga and upgrades for future releases of the Kickstart software for machines with this modification are the sole responsibility of Creative Microsystems Inc.

Disclaimer: All of the programs are provided "as is" without warranty of any kind, either expressed or implied. The entire risk as to the performance and results of the programs is assumed by you. Should any component of this kit prove defective, you assume the entire cost of all necessary servicing, repair or correction. Further, Creative Microsystems Inc. does not warrant, guarantee or make any representations regarding the use of the programs in terms of correctness, accuracy, reliability, currentness or otherwise; and you rely on the programs and results solely at your own risk.

Required Tools:
- Low wattage soldering iron
- Rosin core solder
- Phillips head screw driver
- Long nose pliers
- Diagonal wire cutters

In addition, we highly recomend the use of a vacuum desoldering tool, such as the unit available from Radio Shack (catalog number 64-2098).

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Introduction: *A few words of encouragement*

Some of the people reading this manual will find it a bit lengthy and excessive. You know who you are. You wired your first computer by hand and brought it up with only a logic probe. You can disassemble 6502 code by inspection, and you balance your checkbook in hexadecimal. You can't even spell "quiche". This manual was not written with you in mind.

Rather, this manual is intended for those of you who are ambitious enough to want to perform this modification, but may not have vast experience in this sort of thing. We feel that by carefully following this set of instructions and by paying particular attention to the illustrations, you should be able to complete the job with no great difficulty. And if you're a seasoned veteran of microcomputer hacking, there's still a good chance that you'll be sucessful. So heat up those soldering irons, and let's go to it!

Description and Overview: *What's all this then anyhow?*

Way back in the summer of '85, the folks at Commodore-Amiga were preparing to launch a new microcomputer. In addition to multitasking, high perfomance graphics and sound capabilities, and a powerful yet flexible operating system, this computer was to have something not found on any other personal computer available: a full 256K bytes of ROM (Read Only Memory) installed in the computer that contained the operating system and kernal routines.

Unfortunately, the designers soon realized that it was very nearly impossible to completely debug that much complex assembly language code, let alone do it in time for the machines intended release date. Periodic updates of this software were going to be required, something made very difficult by having the code resident on ROM's in the machine. The decision was made to have the user load the operating system off of a floppy disk every time he turns on his machine. In this way, software updates could be accomplished by simply distributing new diskettes, which is much cheaper and easier than replacing the computers internal ROM chips.

This required that a new bank of RAM (Random Access Memory) be installed in the machine to accept the 256K of "Kickstart" software that is loaded off the diskette. This RAM takes the form of a "daughter board" that sits on top of the computer's main circuit board. It is called the WCS

board (for "Write Control Store") since it can only be written to once after power-up. Hereafter, we refer to this 256K as the "KickRAM".

Now that Kickstart version 1.2 has been released, we feel that the user should have the opportunity to gain the advantages of having this code in ROM. And as an added benefit, by changing a PAL (Programable Array Logic) chip on the WCS board, that extra 256K of fast RAM can be made available for use by the system.

In performing this modification, you will first remove the RAM daughter card, replace one of it's PAL chips and install a jumper into an existing set of pads. With the new PAL, the jumper will allow you to select either mode of operation; you can either install ROM's on the mother board and allow the Amiga to boot automatically, or you can change this jumper, restore the original boot ROM's and jumper settings on the mother board and your machine will once again load Kickstart from the floppy disk.

Once you have completed the modification, you can use the program "Addmem" on the included diskette to add the now available 256K of RAM to the system memory pool. Just place the program in the "c" directory of your favorite Workbench disk, and add the Addmem command to your Startup-Sequence file (see the section on Software). Or use the provided diskette as your new Workbench Disk.

Disassembling Your Amiga: *Once you open a can of worms, the only way to re-can them is to use a larger can*

Our first task is to remove the plastic top cover of your Amiga. Figure 1 shows the underside of the computer, with the "hand" pointers indicating the location of the screws that need to be removed. Throughout this manual, these "hands" will be used to point out particular details on the various illustrations.

Once these screws have been removed, it is necessary to do a bit of prying on the edge of the cover to remove it. There are two sets of "notches" that the cover snaps into, located about three inches from the front and back edges of the case. Using a small, flat-bladed screw driver gently pry the top cover away from the lower plastic sides of the machine (see figure 2) until it unsnaps. Lift the cover away.

Next we have to contend with the metal shielding that covers the circuit board itself. Figure 3 shows the locations of the numerous screws that

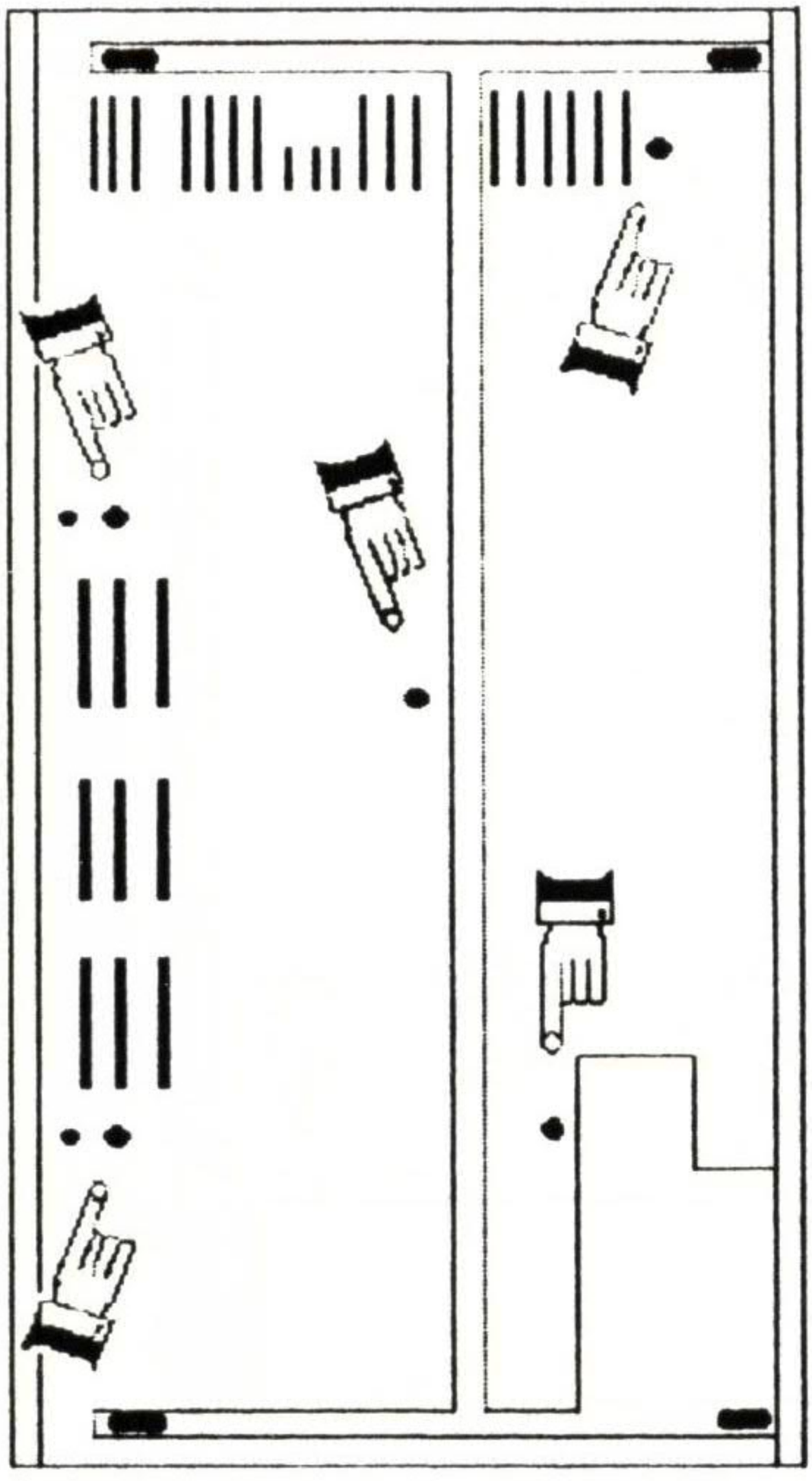

Figure 1: The bottom of the Amiga, showing locations of the top cover screws

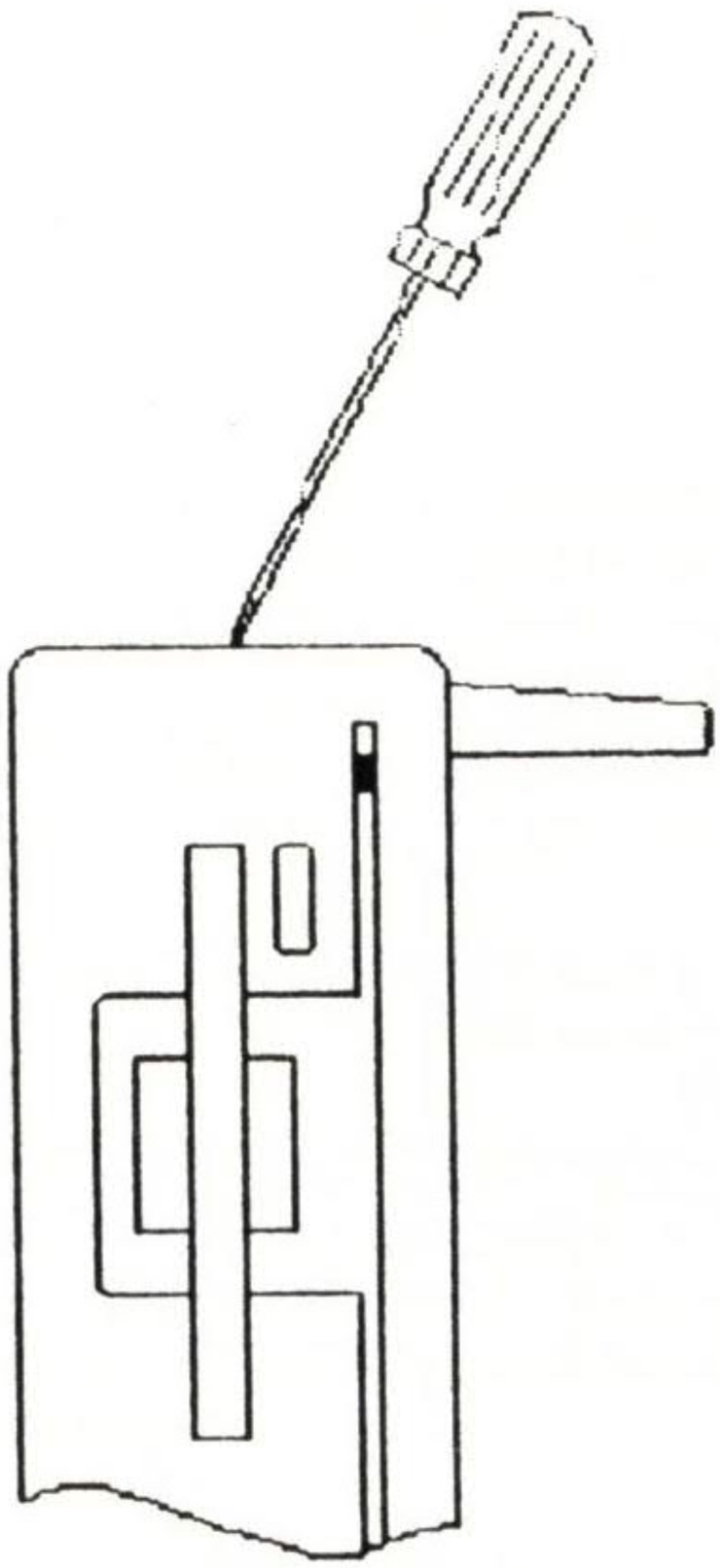

Figure 2: Removing the Amiga's top cover

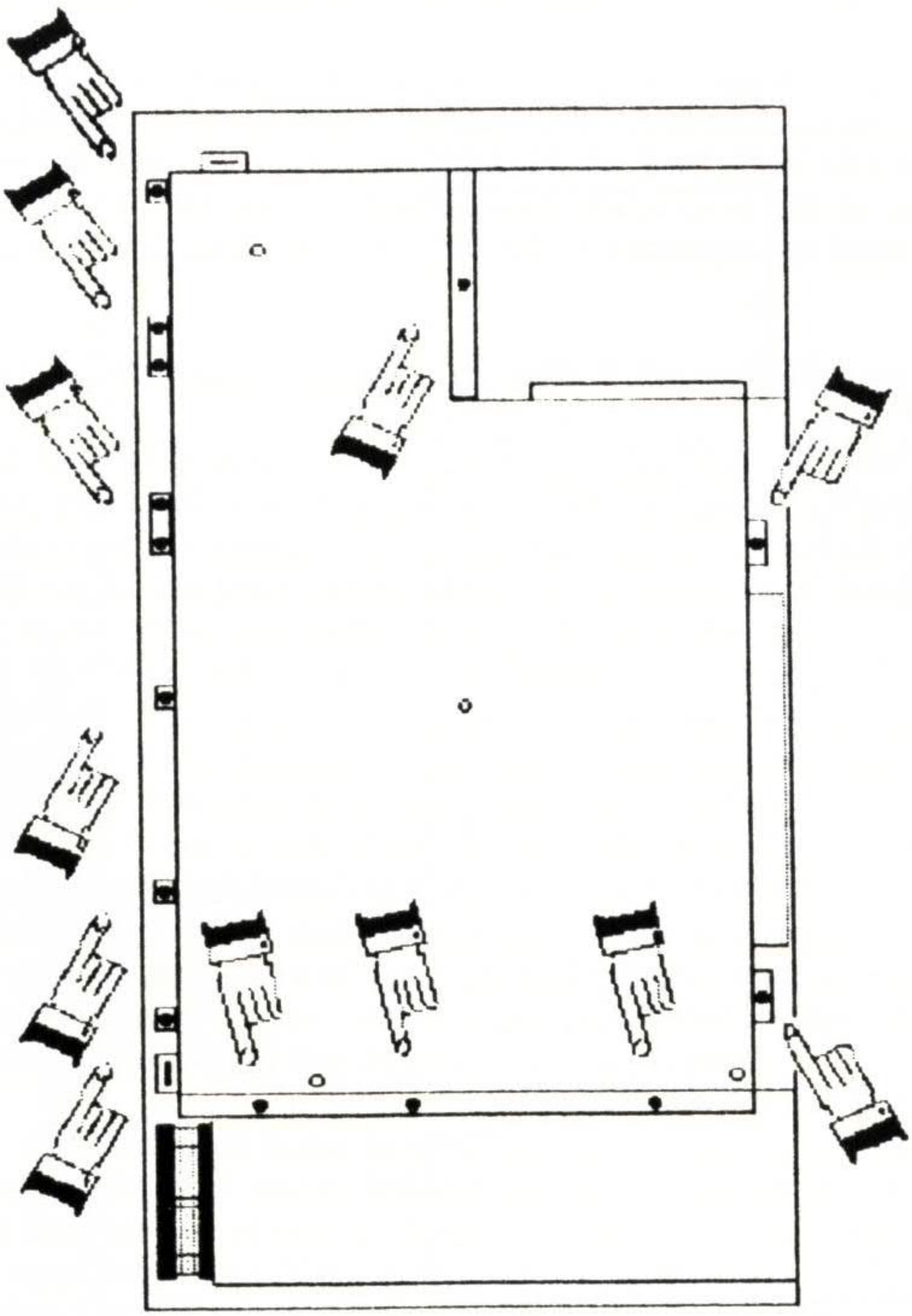

Figure 3: The Amiga with top cover removed

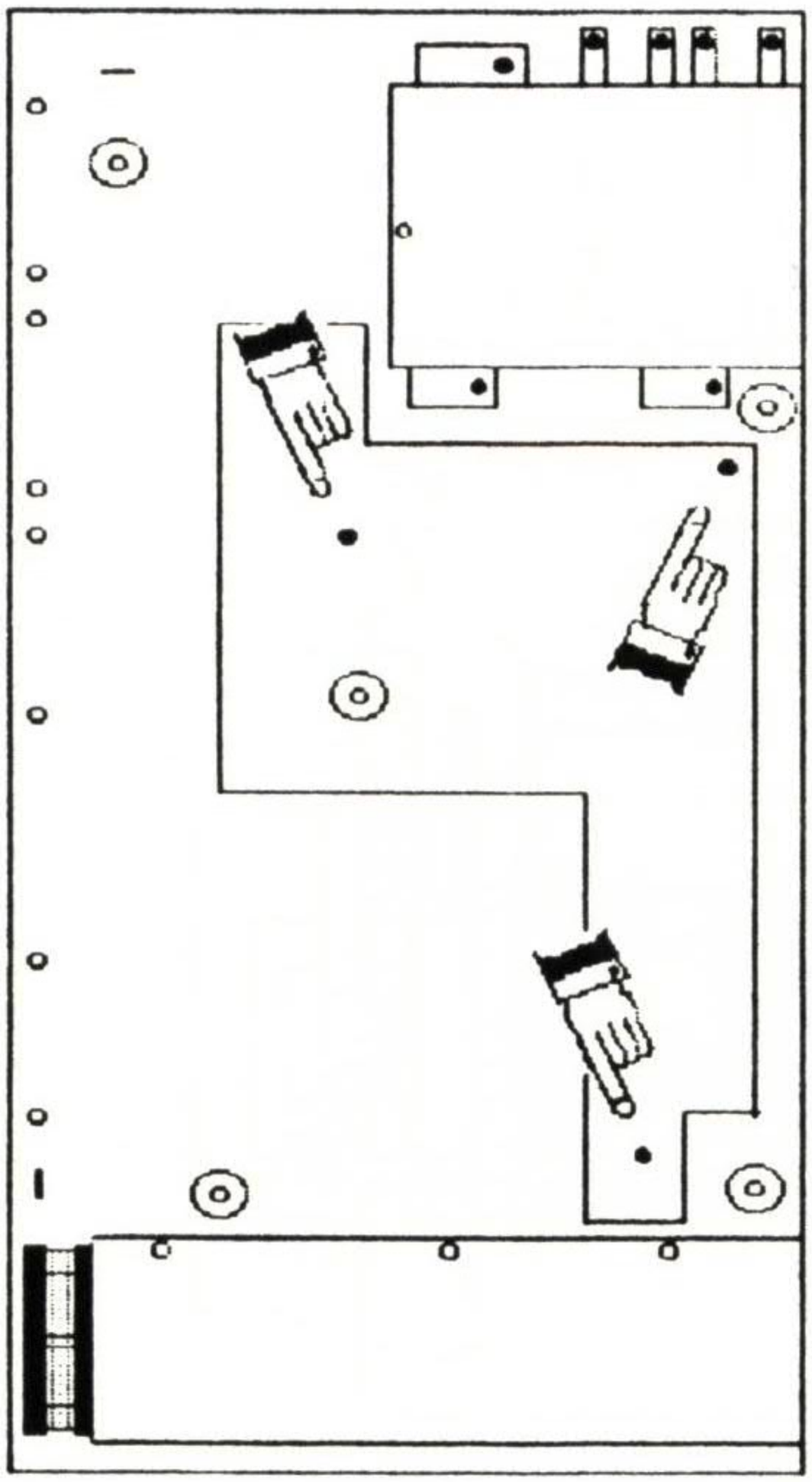

Figure 4: The Amiga with metal shielding removed, showing locations of WCS board screws

must be taken out in order to remove this cover. In addition, there are two metal tabs that originate on the metal shield that lies underneath the main circuit board that must be straightened before the top cover can be removed. This is most easily done with a pair of long-nosed pliers. The locations of these tabs are also shown in Figure 3; they appear as small dark dashes in rectangular boxes along the edges of the metal cover.

We are now ready to remove the WCS board. Figure 4 shows the location of three screws that hold this board in place. Once these are removed, very carefully pull this board up, off of the header pins that connect it to the main circuit board. Take care not to bend any of these pins, as it will make it more difficult to remount the board later.

The Modification--Phase 1: ***It's too late to turn back now***

Turn the WCS board so that the side that has the components on it is facing you, and it is oriented as shown in figure 5. The big circle in this illustration represents an enlarged view of the stuff contained in the small circle. On your board, identify the location of the parts shown. Our first task will be the removal of the 20-pin chip shown, U6J. Remember that the new PAL replacing it will function in both ROM-based machines, and machines with unmodified main boards that load Kickstart off the diskette. This means that we don't have to worry about destroying this part when we take it out. In fact, the easiest method of removal is to use a pair of small wire cutters to clip the legs of the chip as close to the circuit board as possible, and then remove the leads with your soldering iron and a pair of long nose pliers or a vacuum desoldering tool. The use of some sort of vacuum desoldering tool is highly recomended since the holes in the circuit board will often remain blocked by solder even after the leg of the chip has been removed.

The most difficult holes to clear are invariably those for pins 10 and 20 (lower right and upper left on the chip, respectively). We have found that they are most easily cleared of solder by setting the board on edge, and applying the soldering iron to one side while applying the tip of the desoldering tool against the hole on the opposite side of the board.

Once you have succeeded in clearing holes of solder (for which you are to be heartily congratulated), brush away any flecks of solder that may still be present on either side of the board. Take the supplied 20-pin socket and fit it into this location, making sure you orient it's notch to be consistent with the other chips on the board. Solder the socket into place.

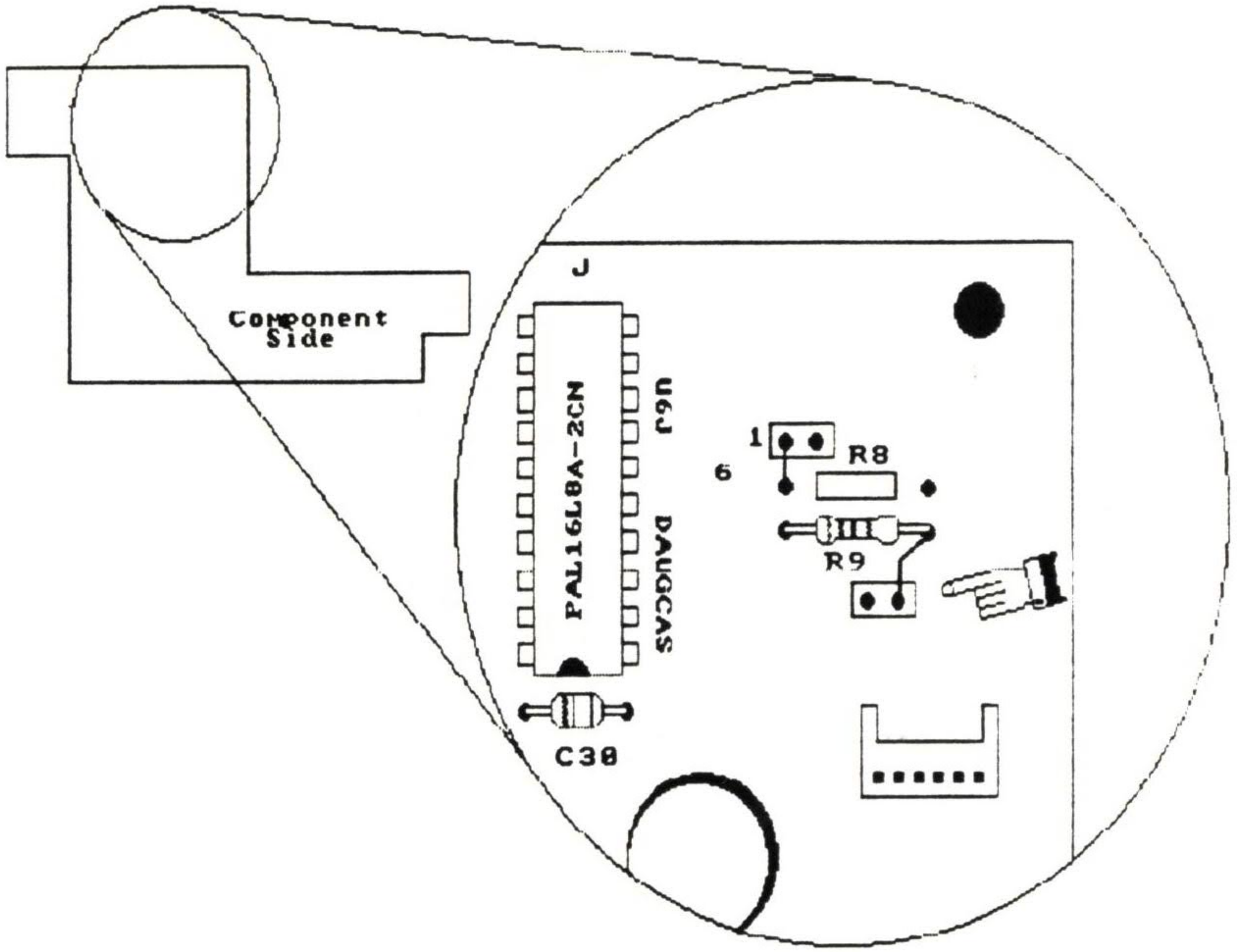

Figure 5: Detail of WCS board, showing PAL and jumper locations

Now refer back to figure 5. Note on your board the location of the two solder pads enclosed by a white box that the little hand in the illustration is pointing to. This is where you are going to install the removable jumper from the kit. The two solder pads are actually filled holes. Clear these holes as you did for the socket, and intall the jumper pins by inserting the short ends into the holes from the side of the board that the components are located on. Solder into place. Do not intall the removable jumper on these pins yet.

With the jumper off, the new PAL operates exactly as the old one did. This will enable us to test our work so far and verify that the modification to the WCS board was successful. First, install the new PAL chip, being very careful to orient the chip properly in it's socket. Then replace the WCS board, making sure that all of the pins from the main board match up with their receptacles. You don't need to replace the top cover or metal shielding yet, just hook the machine up to the monitor and power. Turn it on and check to see that you get the initial Kickstart Request image on the screen, and that after you load the Kickstart disk you get the Workbench Request image. If this fails to occur, re-check the board for errant specks of solder, bad solder joints, or an improperly installed PAL. Note that if power is applied to the board with the PAL installed backwards, the part will most likely be destroyed. Call CMI's customer service number for a few words of consolation and information on obtaining a new PAL.

The Modification–Phase Two: *Ever darker before the dawn*

The next step of the modification requires a bit more disassembly of the Amiga. First, disconnect all cabling that attaches to the main circuit board. This includes cables from the power supply, internal disk drive and status LED. Remove the internal disk drive by taking out the various screws that hold it in place (see figure 4) and lifting it up. Now refer to figure 6. The pointers indicate the location of four screws that must be taken out to remove the main circuit board. Once you've lifted the board out of the lower half of the plastic chassis, you'll notice that a metal shield is attached to the bottom of the circuit board with several more of those metal tabs. These must be straightened, and this shield removed.

Figure 7 shows an outline of the main circuit board, with the component side facing the viewer. Examine the area described by the smaller circle

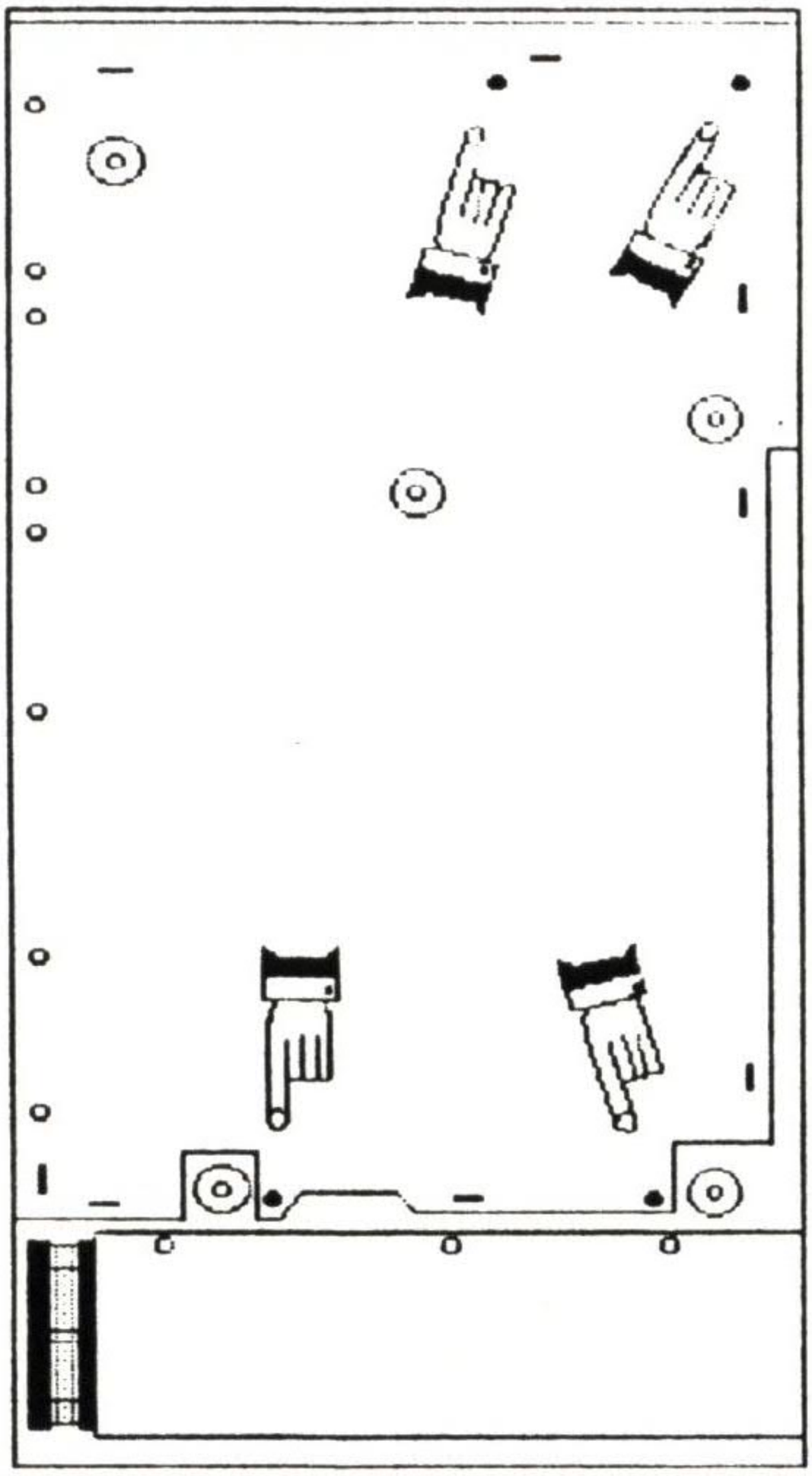

Figure 6: The Amiga with WCS board and internal drive removed, showing locations of main circuit board screws

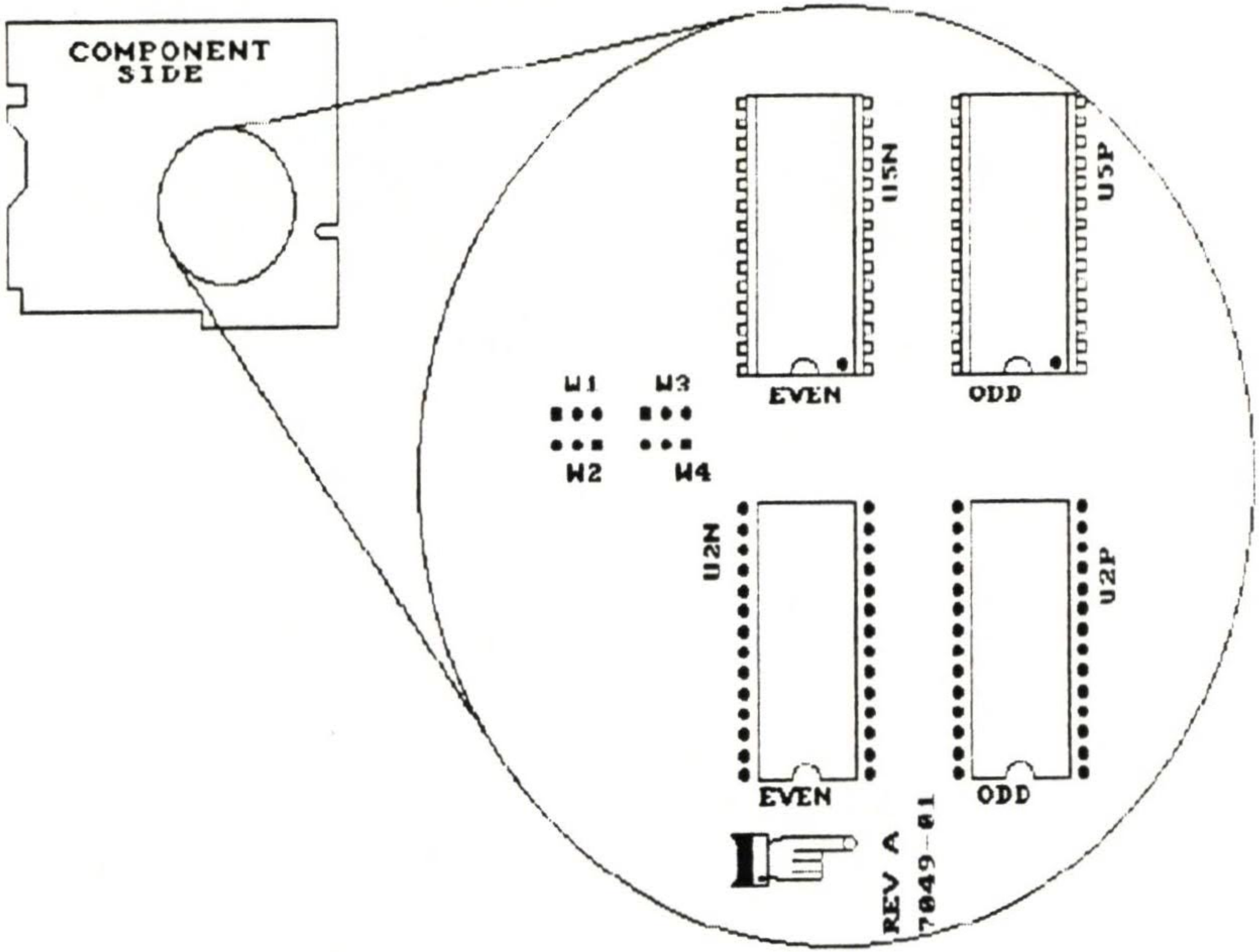

Figure 7: **Details of the main circuit board, showing the location of the ROM chips and jumpers**

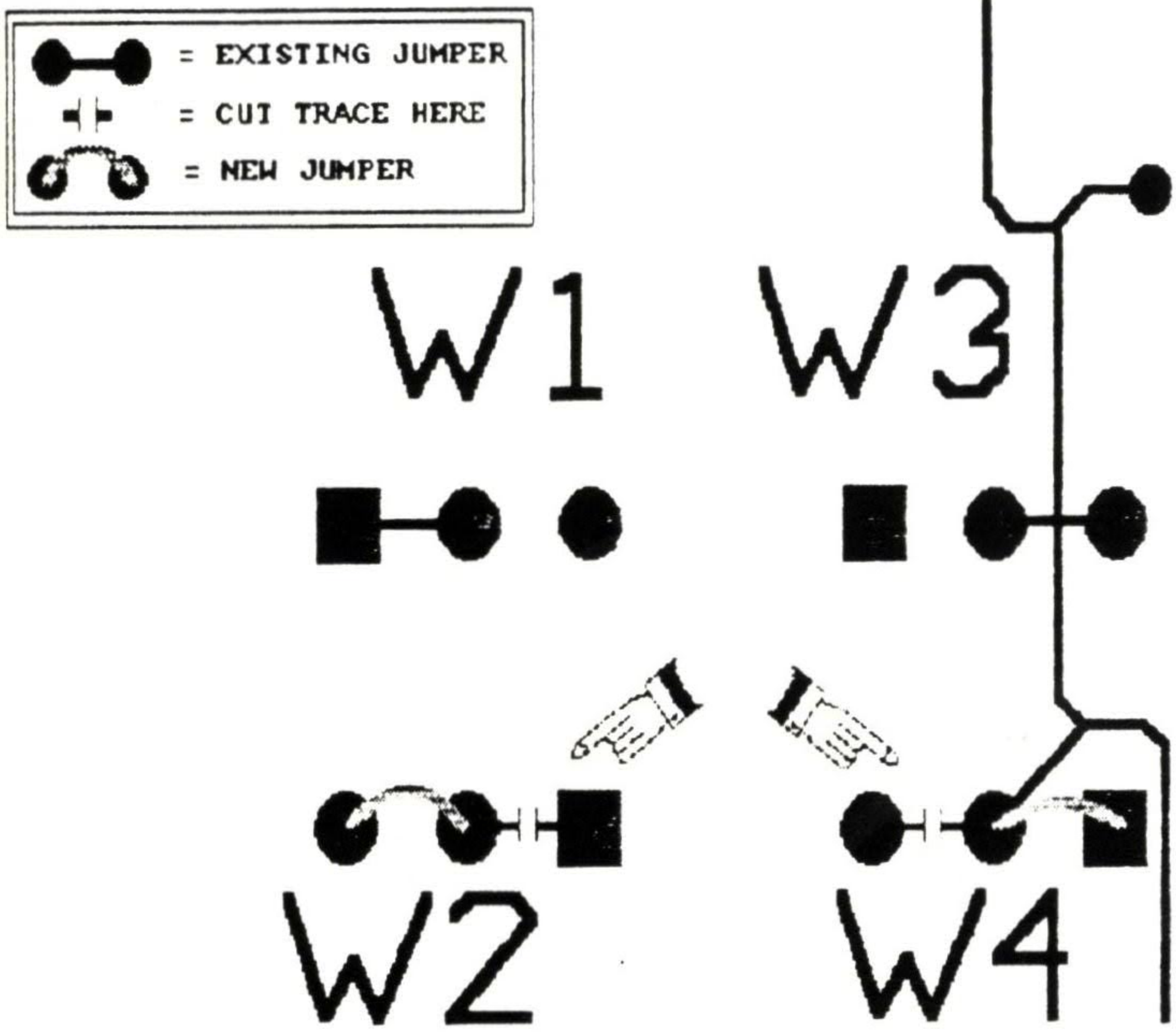

Figure 8A: Main circuit board strap changes for Revision 6 board

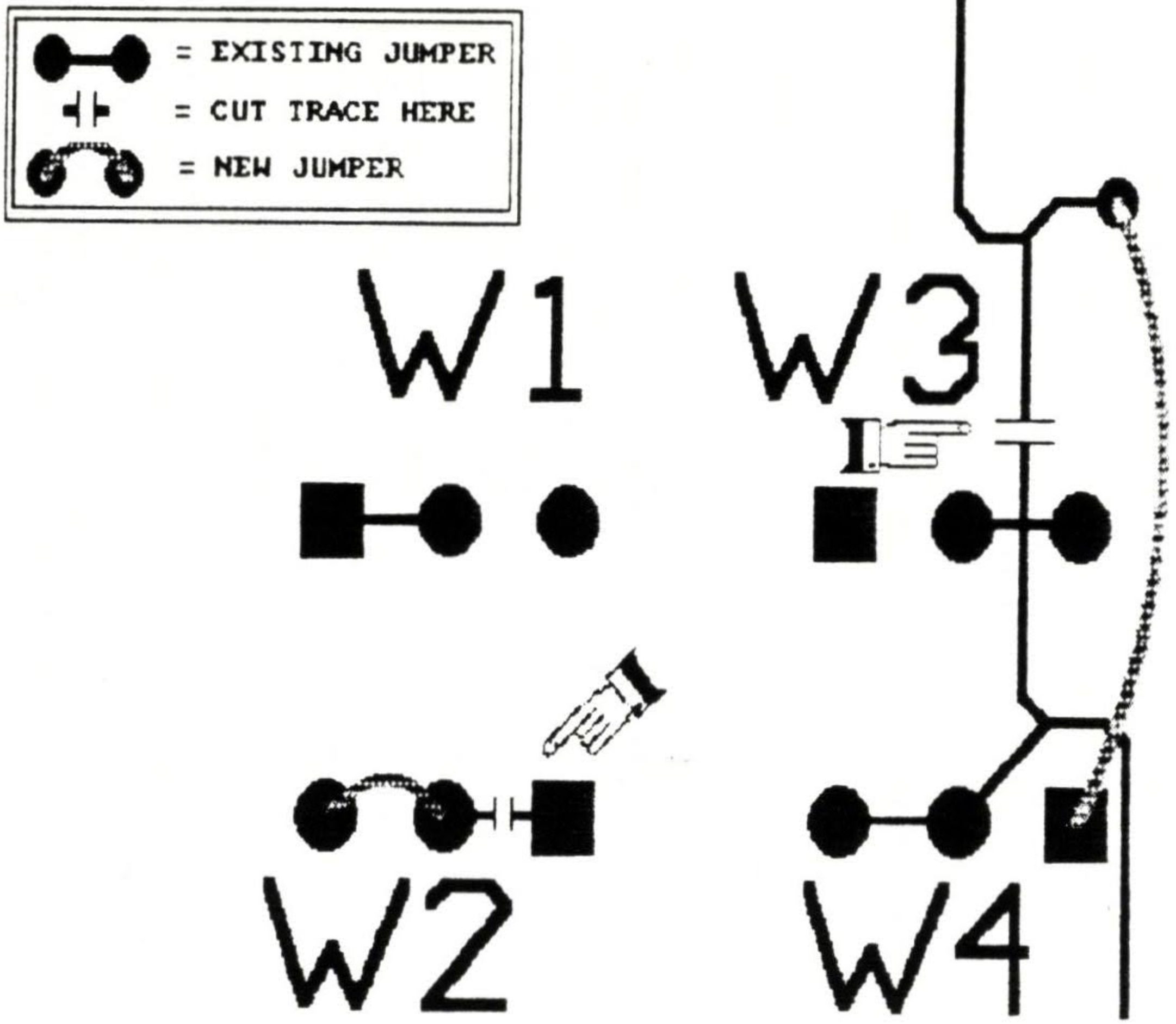

Figure 8B: Main circuit board strap changes for Revision A board

for the features shown in the larger circle. You will find two installed ROM's (U5N and U5P) and two sets of 28 pads with no sockets (for U2N and U2P). In addition, there is a set of four jumpers (three pads in a row) marked on the board as W1, W2, W3 and W4. The most important feature to note however is the one signified by the pointer: beneath the second set of ROM locations is a marking that states that the board is either a "REV A" ciruit board or a "REV 6" board. The necessary strap changes are different for these differing board revisions, so make sure you know which type you're dealing with before proceeding.

Perform the strap changes described below that pertain to your particular board type (A or 6) only. Existing straps are found on the underside of the circuit board, and may be cut with an x-acto knife, or razor blade. Take great care not to cut any traces other than those described below. New jumpers are to be soldered in place, and it is probably easier to clear the holes of solder before installing them.

Strap changes for Revision 6 type boards: See figure 8A. As shown, cut the existing straps on W2 and W4, and replace them with the provided jumpers in the alternate positions.

Strap changes for Revision A type boards: See figure 8B. As shown, cut the existing strap on W2 and use one of the provided jumpers in the alternate position. Next, locate the trace shown on the illustration that leads upward from the center pad of W4, on the component side of the board. Cut this trace exactly where indicated. Use the length of wire provided to connect the pads shown in the diagram. DO NOT cut the existing jumper trace on W4.

Socket installation: Clear the holes that make up the locations for ROM's U2N and U2P. There are 28 holes for each socket. Use your soldering iron and vacuum desoldering tool. Install the two 28 pin sockets provided into these locations, again making sure to orient their notches properly on the circuit board.

IMPORTANT NOTE: We've found that at least one vendor of internal floppy disk drives for the Amiga apparently did not meet Commodore-Amiga's specification for vertical clearance. Consequently, there is not adequate space for both the ROM chip and it's socket underneath the disk drive. In this situation, you'll have to solder the ROM chips directly into the main circuit board. The only disadvantage to this is that it will make it somewhat more difficult to upgrade your machine when a new version of Kickstart is released (1.3?).

So far, we've only encountered this problem with the NEC drives. However, you are advised to check the clearance on your system before you solder the sockets in place. This can be done by simply placing one of the provided ROM chips into a socket, inserting the socket into it's location on the main board and setting the internal disk drive in place to see if it contacts the top of the ROM chip.

Once you have successfully installed the two sockets for U2N and U2P, remove the existing boot ROM's from locations U5N and U5P. You probably want to mark them with their respective numbers before taking them out, in the event you ever want to return your Amiga to a disk-booting system. Now simply install the four new ROM's into their appropriate sockets, as determined by the label on each part. We shouldn't need to reiterate the importance of installing these chips with their proper orientation on the board.

It is advisable to test your machine before completely reassembling it. Just replace the WCS board (don't forget to put the jumper back on the two pins you just installed), replace the internal disk drive and reconnect the various plugs and connectors to the main circuit board. Now hook up the monitor and power cord and turn on the system. After a few seconds, the screen should display the Workbench request image. Again, if this does not occur examine your board closely for loose solder flakes, poor solder connections and chip leads that have been bent between the part and the socket.

Software for Memory Expansion: *Oh! What fun we'll have*

The included diskette has everything you need to add the 256K of "KickRAM" to the system's free memory pool (that number displayed in the title bar of your Workbench screen that precedes the words "free memory"). The diskette is a duplication of the V1.2 Workbench with a startup-sequence that tests for the availability of KickRAM. If none is found, it will report this fact during startup and load the Workbench normally. If KickRAM is available, the startup-sequence will automatically add this memory to the system before loading the Workbench. Also included on this disk are the following utilities:

Addmem

By now you should have a functioning, reassembled, ROM-based computer with a minimum of left-over parts. As mentioned before, you can make use of the 256K of RAM on the WCS board with a program that is included on the enclosed disk of software. This program is called "Addmem". To use this program, you need only copy it into the "c" directory of a Workbench disk, and use the following line as the first command in the Startup-Sequence of that disk:

```
Addmem 0f80000 0fbffff
```

When this program is executed, it will return a message that states: "262144 Bytes added to available memory".

FixHunk

If you have not used any additional memory with your Amiga before (beyond the basic 512K of "chip" RAM), you will quickly discover that many of the earlier pieces of software for the Amiga do not function properly with expanded memory (known as "fast" RAM). This is because the Amiga's internal Direct Memory Access (DMA) devices do not have access to memory that lies outside that initial 512K block. Since these devices handle the graphics and sound on the Amiga, it is necessary for graphics and sound data to be stored in the "chip" RAM. However, "fast" RAM is still very useful for storing programs, program data, RAM disks, etc. In fact, if fast RAM is present the operating system will attempt to load programs there first, and save chip RAM for graphics and sound data.

The problems arise when a particular piece of software loads into fast RAM, and is not smart enough to request an allocation of chip RAM to store it's graphics and sound data. The program FixHunk is designed to modify executable programs by searching for references to memory in the program and modifying them so they point to chip RAM. It doesn't work on every piece of software that fails with fast RAM, but it has successfully modified a number of programs that otherwise fail when used with expanded memory, such as TextCraft.

The important thing to note however is that FixHunk actually modifies that target program. Only use this program on a BACKUP COPY of your original software.

RamOn\Off

In those instances where FixHunk is not able to render the software compatible with expanded memory, there is still another option short of rebooting the system and eliminating the added fast RAM. RamOn\Off is a program that simply checks the amount of available fast RAM and then allocates it, or "fills it up" so as to prevent any other sofware programs from loading data into this space. This may prove convenient in a few instances where you need to use older software with your modified workbench.

GfxMem

GfxMem is a neat little utility that gives a graphical representation of the amount of chip and fast RAM available and currently in use by the system. It is especially usefull when playing with Addmem and RamOn\Off, to see what's going on.

Customer Service: *The Customer is always Right, even when He's Wrong*

Updates: When Commodore-Amiga releases a new version of the Kickstart software, Creative Microsystems will make available at reasonable cost new ROM's with this code in them. In addition, customers will be able to exchange their old ROM's for updated parts for a minimal fee.

Creative Microsystems will be happy to notify you by mail when these updates become available, but will only be able to do so if you have completed a customer registration card and sent it to us.

If you are unable to successfully complete this modification, Creative Microsystems can perform the conversion for you. Call the customer service number listed at the beginning of this manual for details on this service. However, we anticipate that many local Amiga dealers will be performing this installation as a service to their customers, and we encourage you to seek local dealer support for help with technical problems you may be experiencing.