Amiga®

Flicker Free Video

Display Enhancer for Amiga Computers

ICD

Owners Manual

For further information on this system contact ICD, Inc. at 815-968-2228 voice or 815-968-2229 BBS.

We may also be reached on GEnie (ICDINC) and CompuServe (76004,1600).

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Flicker Free Video

Before You Begin

To install Flicker Free Video, you will need a T10 Torx(Amiga 500) or #2 Phillips (Amiga 1000 or 2000) screwdriver and a small flat-bladed screwdriver or IC extraction tool. It is recommended that you also have an anti-static wrist strap.

To install Flicker Free Video in an Amiga 1000, you will also need a 74LS04 Hex Inverter integrated circuit, some 30 gauge wire, rosin core solder, side cutters, and a 15 watt or less soldering iron.

Installing Flicker Free Video will void the warranty of your computer and does require some technical skill, so do not do this yourself if you do not feel comfortable with it. Have your dealer or ICD perform the installation if you have any doubts.

Introduction

Flicker Free Video is a display enhancer for all Amiga computers[1] (except the 3000, which has its own). With Flicker Free Video and a standard multi-sync or VGA monitor, you can have a clear, solid display, free of interlace flicker and visible scan lines. Flicker Free Video can operate in either NTSC or PAL mode (the latter requires a multi-sync monitor).

What Is Interlace Flicker?

To discuss interlace flicker and the operation of Flicker Free Video, a few terms must be defined. A *frame* is a complete displayed image. An NTSC frame on the Amiga is 910 pixels across and either 263 or 525 scan lines down. A PAL frame on the Amiga is 908 pixels across and either 313 or 625 scan lines down. A *field* is the image shown in one vertical scan. An NTSC field is 910 pixels across and 262.5 or 263 scan lines down. A PAL field is 908 pixels across and 312.5 or 313 scan lines down.

[1] Flicker Free Video will not fit correctly in old "German" A2000 series A computers. Only a few thousand of these computers were made. They can be identified by a small, single connector for the video slot (later models have two connectors) and a "Made In Germany" label on the circuit board. An adapter could be made for these computers if ICD receives enough requests

The normal Amiga video displays are smaller than these dimensions because on standard monitors some of the generated display extends off the edges or the screen. The Amiga is still generating this *overscan* area, but it is not normally used for information.

Two display techniques are used to display frames using fields. *Interlacing* uses two consecutive 910 by 262.5 NTSC or 908 by 312.5 PAL fields to display one 910 by 525 NTSC or 908 by 625 PAL frame. *Progressive scanning* uses one 910 by 263 NTSC or 908 by 313 PAL field to display one frame.

The video output of the Amiga is designed to be shown on standard RGB monitors, composite monitors, or television screens. These monitors use a horizontal scan frequency of 15.75 kilohertz (KHz) and a vertical scan frequency of about 60 Hz (50 Hz for PAL). This limits a field (and, consequently, a progressive scanning display) on these monitors to a maximum of 263 scan lines (313 PAL).

To display a frame with more than 263 or 313 scan lines, it is necessary to use interlacing. The first field of an interlaced frame, consisting of every other line of the frame, is shown during one vertical scan. The second field, consisting of the remaining lines, is shown one half scan line down during the next vertical scan. The effect is an update of the full frame every two vertical scans.

Flicker is produced because the phosphor on the monitor's screen from the first field starts to fade before the next field. This causes visible flicker when there is high contrast between adjacent scan lines.

Flicker can be reduced in several ways. Adjacent scan lines can be made closer to the same brightness (lightening the background and darkening text, for example). This is not satisfactory in many applications. An expensive, high-persistence monitor can be used. With this type of monitor, the phosphor fades more slowly. Unfortunately, scrolling text or moving objects can smear. Dimming the room lights, putting a darkened filter over the monitor, or wearing sunglasses can also help, since this increases the persistence of your *eye*, but these methods just reduce flicker; they do not eliminate it.

None of these methods are without problems. They still use an interlaced display, which is the source of the problem.

The best solution is to use progressive scanning. As was explained earlier, this cannot be done with a horizontal scan frequency of 15.75 KHz. To double the number of scan lines for each field, you must send each line to the monitor twice as fast. There are monitors available that can use a horizontal scan

frequency of 31.5 KHz, twice that used by the Amiga video output, that can accept this faster output.

Flicker Free Video removes flicker by producing a video signal with a 31.5 KHz horizontal scan rate and converting a two field interlaced frame in to a one field progressively scanned one (on monitors capable of that scan rate).

How Flicker Free Video Works

Flicker Free Video fits under the Denise chip of your computer and gets the necessary video lines and power from this connection. It does not affect the operation of the Denise chip in any way; it just taps the necessary signals at this point. Denise is the custom chip responsible for generating the digital video signal for your Amiga.

A three megabit buffer is used to store the current field. As the next field is generated, Flicker Free Video alternates horizontal scan lines from the buffer with scan lines from the computer and sends these to the monitor as one field at twice the horizontal scan rate. The field coming from the computer replaces the one currently in the buffer, a line at a time, to be used for the next frame.

When using an interlaced display mode, Flicker Free Video buffers the first field of the current frame and combines it with the second field when sending it to the monitor. This second field is then stored in the buffer to be combined with the first field of the next frame.

When using a non-interlaced display, Flicker Free Video buffers one complete frame and combines it with the next. You then end up with a double resolution display with no visible black gaps between scan lines.

Motion artifacting, the apparent splitting of images that are changing screen positions rapidly, can occur due to the operation of Flicker Free Video, but it is only observable in extreme cases. When using an interlaced display mode, motion artifacting can occur during odd frames when the second field of one generated frame is combined with the first field of the next. When using a non-interlaced display mode, it can occur at any time. In either of these situations, if an object on the screen changes position drastically from one frame to the next, it will appear in both places for 1/60th of a second. This is unavoidable without doubling the amount of video RAM on Flicker Free Video, which would substantially increase its cost.

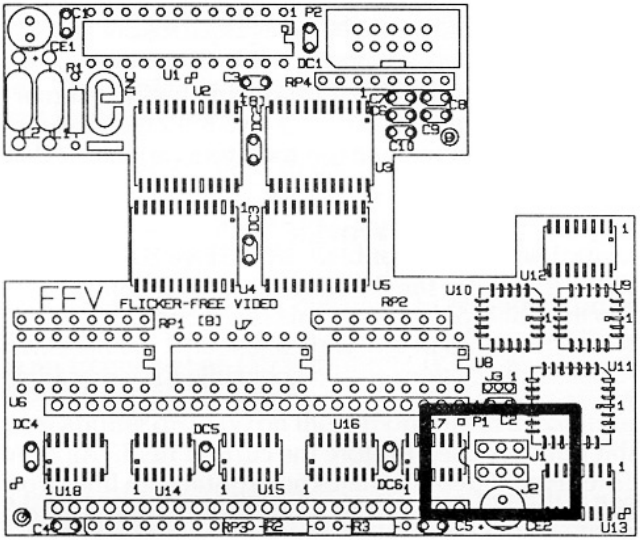

Figure 1

Configuration

The jumpers **J1** and **J2** (figure 1) should be changed if you have the **Enhanced Chip Set (ECS)** Denise chip. If you are not sure which Denise you have, you can check the number after you have opened your computer as described later.

The older Denise chips we have seen are labeled **8362R5** (from an old 1000 without Extra HalfBrite) and **8362R8** (from 500s and 2000s). The ECS Denise chips are labeled **8373**. If yours is labeled **8373**, change these jumpers so that the plugs cover the center and left pins (toward **U17**). If it is not, leave the plugs covering the center and right pins.

At the time this manual was written, only the Amiga 3000 was shipping with the ECS Denise.

Amiga 500 Installation

Installation of Flicker Free Video is simple. The hardest part is opening your computer.

Opening Your Computer

Disconnect your monitor, mouse, power cord, and anything else connected to your computer. Remove the three screws along the front edge of your computer and the three along the rear edge with the Torx screwdriver. Turn the computer right side up and lift the cover off.

Note the orientation of the cable going from the keyboard to the main board of your computer. Either record the colors or mark the connector so that you will be able to replace it correctly. Unplug this cable and the ground strap that connects the keyboard to the shield around the floppy drive. Then lift the keyboard slightly backward and off.

Remove the four Torx screws holding the upper shielding in place. These are around the front left side.

Bend up the four tabs holding the shielding in place. Three are near the floppy diskette drive and one is at the back left corner. Lift the shielding off.

Installing Flicker Free Video

Locate the Denise chip. It is a 48 pin chip toward the left rear of your computer. "DENISE" is written on the circuit board next to the chip. Note the orientation of the chip. When you face your computer from the front, the writing on Denise is probably upside down and the notched end of the chip points to your right.

Using a small flat-bladed screwdriver, remove the Denise chip by gently prying it up, alternating ends, until it comes free, or use an IC extraction tool. Be careful not to bend any legs.

Install the Denise chip into Flicker Free Video, making sure the notch in the chip matches the drawing of the notch on the Flicker Free Video board.

Plug Flicker Free Video into the Denise socket in your computer, keeping the same orientation of the Denise chip. The body of the board will extend toward the back of the computer in the 500. The writing on Denise will again be upside down and the notch will be to your right.

Connecting the Cable

The shorter supplied ribbon cable has a DB-9 connector on one end and a 10 pin ribbon connector on the other. Plug the ribbon connector into Flicker Free Video. This is a keyed connector, but you should still make sure you are plugging it in with the proper orientation.

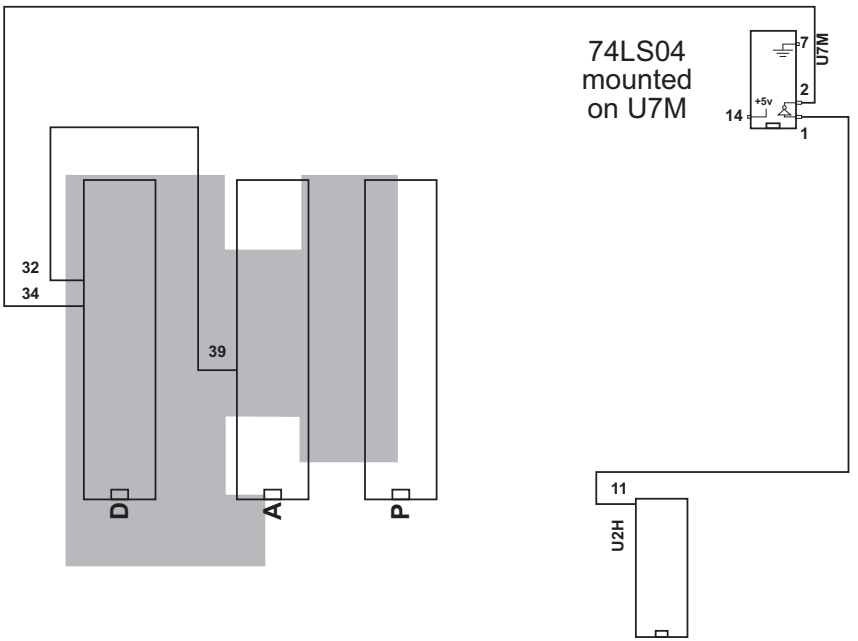

Figure 2

You can just place the ribbon cable so that the end hangs out the back of the case, extend it out the expansion connector, or find a blank space on the case and mount it. You can use the longer cable if you wish.

Reassemble your computer. If you have the ribbon cable hanging from the case, make sure that you don't pinch it with the shielding or case. If necessary, use a rasp or file to make a small notch in your computer's case.

Amiga 1000 Installation

The Amiga 1000 lacks two signals at the Denise socket necessary for Flicker Free Video to operate. These can be supplied with the parts listed at the beginning of this manual and some minor soldering. If you have any reservations about performing this modification yourself, seek qualified help or contact ICD. ICD will perform the complete installation for $40 plus shipping and handling.

Opening an Amiga 1000

Disconnect the keyboard, monitor, mouse, power cord, and anything else connected to your computer. Open the panel on the front, loosen the screws holding the 512K RAM expansion, and remove the expansion.

Turn your computer upside down. Remove the five screws in the deep holes on the bottom which hold the case together. Turn the computer right side up and remove the top. If this is the first time you have had your computer open, be sure to admire the signatures inside the top of the case. Loosely put the screws into the holes in the top so that you don't lose them.

The main shielding for your computer is the large silver metal casing covering the circuit board. Remove it. It is held in place by fourteen screws and two twisted tabs.

Locate the Kickstart daughterboard. This is an "L" shaped circuit board located near the front of the computer. It is mounted with the components down and the solder connections up. Remove the three screws holding it in place and remove it by carefully pulling straight up.

Amiga 1000 Modification

A block diagram of this modification is shown in figure 2. This diagram is not to scale and is intended to show the relative positions of the components involved.

The pins on the 74LS04 are numbered 1 to 14 counterclockwise from the notch at the end of the chip (see figure 2). Clip pins 3, 4, 5, 6, 8, 9, 10, 11, 12, and 13 from the new 74LS04, leaving only pins 1, 2, 7, and 14. Bend pins 1 and 2 so that they stick straight out. Then clip off the narrow bottom half of pins 1 and 2, leaving only the wider upper half.

Locate chip **U7M** on your computer's motherboard. It is near the connector for the floppy drive ribbon cable. This chip is also a 74LS04. Orient the new chip the same as the old one (so that the notch ends are in the same direction) and place the new one on top of the old. Carefully solder pin 7 of the new 74LS04 to pin 7 of **U7M** and pin 14 of the new chip to pin 14 of **U7M**.

Locate IC **U2H** on your computer's motherboard. It is near the front of the computer and is normally covered by the Kickstart daughterboard. Solder a length of wire between pin 11 of **U2H** and pin 1 of the new 74LS04.

Locate the Denise chip of your computer. It is a 48 pin chip just behind the Kickstart daughterboard. "D" is written on the circuit board just below the

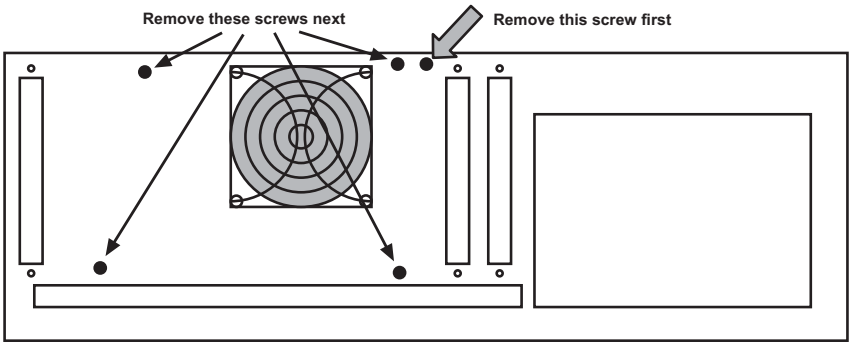

Figure 3

chip. Note the orientation of the chip. The notch on the chip points toward the front of your computer.

Locate your Agnus chip. It is located beside the Denise chip and is identified by an "A" on the motherboard. Connect a wire to pin 39 of Agnus. You may either solder the wire to the top of the pin or remove Agnus from its socket, stick the wire in the socket, and reinsert the chip.

Using a small flat-bladed screwdriver, remove the Denise chip by gently prying it up, alternating ends, until it comes free, or use an IC extraction tool. Be careful not to bend any legs.

Install the Denise chip into Flicker Free Video, making sure the notch in the chip matches the drawing of the notch on the Flicker Free Video board.

Plug Flicker Free Video into the Denise socket in your computer, keeping the same orientation of the Denise chip.

Connect the wire added to pin 39 of Agnus to pin 32 of Denise. As before, you may either solder this wire to the pin or remove the chip, insert it in the hole, and replace the chip.

Connect another wire between pin 2 of the new 74LS04 and pin 34 of Denise. You must solder the wire to the 74LS04, but you may install the other end of the wire as described above.

Once all connections have been made, replace the Kickstart daughterboard.

Connecting the Cable

The longer supplied ribbon cable has a DB-9 connector on one end and a 10 pin ribbon connector on the other. Remove the mounting plate attached to the DB-9 connector. Plug the ribbon connector into Flicker Free Video. This is a keyed connector, but you should still make sure you are plugging it in with the proper orientation.

You can just place the ribbon cable so that the end hangs out the back of the case, extend it out the expansion connector, or find a blank space on the case and mount it.

Reassemble your computer. If you have the ribbon cable hanging from the case, make sure that you don't pinch it with the shielding or case. If necessary, use a rasp or file to make a small groove in your computer's case.

Amiga 2000 Installation

Installation of Flicker Free Video is simple. The hardest part is opening your computer.

Opening an Amiga 2000

Disconnect your keyboard, monitor, mouse, power cord, and anything else connected to your computer. Remove the two screws at the bottom of each side of your computer and the screw in the top middle of the back as shown in figure 3. Make sure you remove the correct screw from the rear of your computer.

Pull forward and lift off the top cover of your computer.

The power supply/disk drive subassembly is held into place by seven screws. Locate and remove the four screws on the rear of the computer also shown in figure 3. Then locate and remove the three screws on the front on the computer that hold this subassembly in place. Two of them are below the large (5¼") drive bay. The other one is just to the left of the large drive bay.

Locate the ribbon cable connecting your floppy diskette drive(s) to your computer's motherboard at connector **CN303**, just to the left of the power supply. Note that the red line on the cable is toward the back of the computer. Disconnect this cable at the motherboard by pulling straight up on the connector. Do not pull on the cable itself!

Signal	Pin Number
Red	1
Green	2
Blue	3
Horizontal Sync	4
Vertical Sync	5
Ground	6
Ground	7
Ground	8
Ground	9

Table 1

Locate the group of colored wires connecting the power supply to the motherboard at connector **CN400**, just in front of **CN303**. Disconnect the white connector from the motherboard.

Lift the front of the subassembly to free the front tab from the computer case. Pull the subassembly forward to clear the power connector and switch from rear of the case and then lift the entire assembly and place it out of the way.

Installing Flicker Free Video

Locate the Denise chip of your computer. It is a 48 pin chip to the left of the video slot. "DENISE" is written on the circuit board next to the chip. Note the orientation of the chip. As you face the computer from the front, the writing on Denise is probably right side up, and the notched end is to your left.

Using a small flat-bladed screwdriver, remove the Denise chip by gently prying it up, alternating ends, until it comes free, or use an IC extraction tool. Be careful not to bend any legs.

Install the Denise chip into Flicker Free Video, making sure the notch in the chip matches the drawing of the notch on the Flicker Free Video board.

Flicker Free Video

Plug Flicker Free Video into the Denise socket in your computer, keeping the same orientation of the Denise chip.

Connecting the Cable

The supplied longer ribbon cable has a DB-9 connector and mounting plate on one end and a 10 pin ribbon connector on the other. Plug the ribbon connector into Flicker Free Video. This is a keyed connector, but you should still make sure you are plugging it in with the proper orientation.

Remove one of the blank end plates on the left rear of your computer by removing the screw from the top and replace it with the end plate with the DB-9 connector. Replace and tighten the screw.

Reassemble your computer.

Selecting a Monitor

Any monitor that will use the output of Flicker Free Video should work. The monitor needs to be capable of using a 31.5 KHz horizontal scan rate and a 60 Hz (50 Hz for PAL) vertical scan rate. Common "VGA" monitors designed for use with "clone" computers will do the job very well for NTSC mode. Multi-sync monitors will work for both NTSC and PAL computers.

Connecting a Monitor

The connector on the ribbon cable coming from Flicker Free Video is compatible with the 9 pin cables of many multi-sync monitors and cables made for similar display enhancers. The provided adapter converts this to a standard 15 pin VGA or multi-sync monitor connector. If neither of these connectors will work with your monitor, custom cables can be made using the pin-out information in table 1.

Using Flicker Free Video

Once installation is complete and the monitor is connected, there is nothing more to do! Just use your computer as you normally would. Flicker Free Video does not affect the operation of your computer at all.

Other Amiga Products from ICD

ICD offers a variety of products for Amiga computers, and more are under development. Everything is designed and tested in-house, a fully integrated development and production system that leads to unsurpassed quality.

If you don't see what you want here, give us a call. We may already have such a product, but even if we don't we are always interested in hearing what you have to say.

AdRAM 505

AdRAM 505 is the easy way to give your Amiga 500 a total of 1 megabyte of RAM. It uses four standard 256K by 4 dynamic RAM chips (either already installed or added by you) to add 512K of RAM to your computer. AdRAM 505 also givers your computer a fully compatible real time clock/calendar. Installation couldn't be easier: just open the small door on the bottom of your computer and plug it in.

AdRAM 540

If you have an Amiga 500 computer and need much more RAM, AdRAM 540 is the answer. You can add up to four megabytes in the A501 bay. The RAM can be added a half meg at a time to suit your needs. With a Super Agnus, you can easily get one meg of chip RAM, too.

AdRAM 560D

If you have an Amiga 500 computer and have already installed an AdRAM 540, the AdRAM 560D will give you an additional two megs of RAM! This daughterboard simply and quickly plugs into the AdRAM 540. Installation couldn't be simpler. The AdRAM 560D is fully populated with a full two megabytes of RAM.

AdRAM 2080

Add two, four, six, or eight megabytes of auto-configured fast RAM to your Amiga 2000 with the AdRAM 2080 board from ICD. You can add the RAM in two megabyte groups at any time — no need to fill it up at once. And the six megabyte configuration is great if you have an accelerator card or bridge board, allowing you to add all the RAM possible. Standard 1 meg by 1 bit RAM chips are used.

AdSCSI 2000

ICD's AdSCSI host adapters (hard drive interfaces) for the Amiga 2000, 2500, and 3000 offer you performance, flexibility, and price that you won't find anywhere else. These are just a few of the features that set AdSCSI 2000 apart:

High data transfer rates. AdSCSI 2000's clean design and advanced intelligent buffering provide data transfer rates faster than anything else, DMA or not. In the all-important small block transfers, AdSCSI 2000 is up to three times as fast as the competition.

Removable media support. No host adapter gives you more power and flexibility. Disk changes are automatically performed. Any media cartridge can be partitioned as you wish. Removable media support is not limited to just a few drives. Any drive following the SCSI Common Command Set is supported.

Easy to use software. ICD's point-and-click program makes hard drive formatting and partitioning as easy as possible, while offering options to make it as flexible as possible. You won't have to edit a mountlist or remember the number of heads and cylinders.

Other features include Commodore SCSI Direct and Rigid Disk Block conformance for compatibility with third party products, auto-booting from Fast File System partitions, and full AmigaDOS 2.0 compatibility.

AdSCSI 2080

For applications where expansion slots in your Amiga 2000 computer are in high demand, the AdSCSI 2080 combines all the features of the AdSCSI 2000 (except the "hard drive card" option) and the AdRAM 2080. Standard 1 megabyte SIMMs allow you to add two, four, six, or eight megabytes of RAM to your computer. The SCSI host adapter is the same design as the AdSCSI 2000, providing the same high speed and removable media support.

AdIDE

AdIDE is a low-cost interface for connecting standard IDE (AT) hard drives to any Amiga computer. If your goal is to add one hard drive to your computer for as little money as possible, then AdIDE could be the answer.

AdIDE installs easily, connecting between the 68000 CPU and its socket. Then simply mount the drive and connect a ribbon cable to both devices and you are ready to go.

AdIDE uses the same advanced formatting program and driver software included with our AdSCSI host adapters, so you won't be sacrificing performance for price. Using one of the new 2-1/2" low power IDE drives, you can even install a drive inside your 500!

AdSpeed

Imagine a 68000 based accelerator that takes up the smallest amount of space possible, easily installs in any Amiga 500, 1000, or 2000, and gives you real performances increases of 80% to 100%! It may sound too good to be true, but AdSpeed does it.

AdSpeed uses a multi-layer circuit board with components mounted on both sides — 10 integrated circuits, 3 resistors, and 17 capacitors — that is barely larger than the 68000 is replaces. It runs at 14.3 MHz, twice as fast as the normal Amiga CPU, while maintaining full hardware compatibility.

Unlike previous 68000-based accelerators, AdSpeed has 32K of high speed static RAM on board to give you a 16K cache and 16K of cache tags. This means that the executable portions of programs can (and usually do) execute at twice the normal speed. All programs will show some improvement. Most, especially computation-intensive programs, will run 80% to 100% faster.

To retain compatibility with programs that are picky about timing, AdSpeed can be "turned off" through software or an optional hardware switch at any time, no matter what programs are running.

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