Ernie van der Meer

Hi netters,
A few days ago some kind soul sent me the secrets on a hardware modification that will make a non-DLC aware motherboard flush the internal cache after a DMA transfer. I tried the modification (total cost a few bucks) and it works perfectly. My motherboard now passes the Cyrix DMA test. Before I share my secrets I would first like to thank the author of the original article, Mark Thompson, for the info given. Next I would like to caution anyone who want to try this modification. Please remember that you are dealing with expensive and sensitive hardware. Take the neccesary static precautions and if you are in doubt about your ability to perform the modification succesfully then just forget about it or ask someone who is qualified to assist you.
This article is normally included with a program from Mark Thompson. This program is not included here, but I will submit it for uploading to garbo.uwasa.fi.

DISCLAIMER: The fact that I post this article does not imply that I or Mark Thompson give any guarantee that the suggested modifications will actually function for your setup. All possible care has been taken to avoid incorrect information. Using this info is therefore completely at your own risk.

Article:

486DLC/DRx2 Microprocessor Installation (V 1.1)

Written By: Mark Thompson
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Modifications made by Ernie van der Meer (me...@fys.ruu.nl)
concerning connections to ISA bus 25 April 1994.

Well first of all you will need a 386DX computer. I strongly recommend that if you have a 33MHz or less machine, you use the Cyrix 486DRx2 microprocessor. They require no hardware modifications and is a direct replacement for the 386DX chip. It contains a clock doubler curcuit which turns a 33MHz machine into a 486SX running at 66MHz internally! Only use the DLC if you have no choice like myself having a 40MHz machine. My program is very useful for people running UNIX, WINDOWS NT, or even MS-DOS. It sets up the DLC/DRx2 CPU before any operating system loads. Due to the fact that some time was spent on this program, I am asking for donations for my research and development cost.

I have a Compuserve Address 70053,3702 but I won't guarentee that I call very often.

Now to continue on.

You do not have to make any hardware modifications but you should. You will get alot more speed from the very simple modifications at only under $5.00. You may/will need the following:

One Multimeter (Resistance Readings)
One 7400 Quad 2-Input Positive Nand Gate
Three Feet of #30 wire-wrap wire
One Soldering Iron
Some Solder
Two 20K Ohm 1/4 watt Resistors

To affix the 7400, I used a hot glue gun, you may use the same or epoxy, or even thin double-sided tape. Using epoxy means you won't be able to remove the chip once it hardens.
Optional CPU Fan. (~$12.00)

Note:

The following list the instructions to follow.Please take your time, a good slow job will pay off within an hour or so.The instructions assume you are somewhat familiar with test equipment and electro-static-electricity, and some electronics.

Step 1. Remove the computer case, remove all the boards on the motherboard, then remove the motherboard it'self.

Step 2. Using a chip puller (if you have the right one) or a thin-wide flat bladed screwdriver, gently pry out the original CPU chip. Take Your Time!!!!Be Gentle!!!! If this step takes you under 2 minutes, your probably going too fast.

Step 3. Refer to Figure 1, Locate all the pins labled below and verify the resistance from Ground to the pin is infinate, and from Positive 5VDC to the pin is the same.These pins can be tied high through a resistor (usually 4.7K to 20K Ohms). Use and fill out the sheet below at the same time.There are two pins which must be tied high, ADS# and LOCK. If these lines are not tied high you must install a resistor across that pin to VCC (+5VDC).

NOTE: The pin labeled NC must NOT BE CONNECTED!
And HLDA Must not be altered!

Step 4. If the NC pin was connected, you must either cut the NC pin on the 486DLC chip (Be careful!) or somehow disconnect that pin from the motherboard.I would recommend the first if you must do either.

Step 5. You may install the curcuit anywhere you want but the best place is as close to the CPU as possible.I took the IC chip and cut the leads down to where they were barely exposed,

just enough to solder to, and then mounted it upside-down on the bottom of the motherboard, directly under the CPU socket.Remember that if you mount it upside-down, keep the pin numbers straight!

Step 6. Now you must wire the NAND gate.
First - solder from pin 6 of the NAND gate to the FLUSH# pin E13.
Second - solder from pin 5 of the NAND gate to the HLDA pin ~~N14~~ M14.
Third - solder from pin 3 to pin 4 on the NAND gate.
Fourth - solder from pin 1 to pin 2 on the NAND gate.
Fifth - solder from pin 1 of the NAND gate to the -SMEMW pin B11 (on the bottom of the motherboard). The SMEMW pin on the ISA bus will go low on a DMA transfer between 0 and 1 Mb. If you have more than 1 Mb of memory installed on your system you may want to solder from pin 1 of the NAND gate to the MEMW pin C10 on the shorter half of the ISA bus. This signal will go low on a DMA transfer between 0 and 16 Mb.
Sixth - solder from pin 7 (GND) of the NAND gate to one of the VSS points (GND)
Seventh - solder from pin 14 (+5 VDC) of the NAND gate to one of the VCC points (+5 VDC)

Optional - If you positivly know which pin is the A20 Mask or the Keyboard Controller A20 Gate line, you may wire in the A20M# line. If you are not possitive, don't mess with it. (You must enable the NC0 bit if you don't connect it!) This will not improve the cache very much.

Step 7. Now you should re-verify all your connections. If your sure that they are correct, using the hot glue gun (or whatever), secure the wires so they don't move (don't use tape).

Step 8. You are ready to install your new 486DLC CPU. Align the CPU with pin one oriented correctly. Pin one has a mark in the corner or is not square on the corner. If you are unsure, don't guess, call Cyrix Tech Support (800) GO CYRIX.

Step 9. You now have an option, although to me it was necessary for me, install a small fan and/or heat sink if you don't have good ventilation. You can buy a fan from Radio Shack. I put some small flat-head screws through the mounting holes, creating a stand-off and placed some hot glue on the heads to act as rubber feet, which will eliminate any excess noise and abration against the chip surface. I then wired it directly to the power input connector (Pin 3 = +12 VDC, Pin 5 = GND). The fan is held in place with a strong rubberband.

Step 10. Install your motherboard and cards, close up your machine.

Step 11. Turn on the power. The Cyrix CPU will disable all cache processing upon the reset signal. You now perform the software installation if your BIOS don't support the Cyrix Internal Cache.

Step 12. Copy this diskette and make it bootable by typing the following:

To Copy the Diskette: DISKCOPY A: A:
To Make it Bootable: SYS A:
(you must be on the C: drive)

Step 13. Now you need to run my program which will set up the CPU. If at any time you change your CPU configuration, simply run my program to update the boot code. Run CX.EXE This program will write the original boot code onto the floppy should it not work properly. If the system always hangs and you can't get it to boot past the DLC Processor Setup message, then you will have to run the RECOVER.EXE program to restore the boot code to it's original state. (This program will work on IDE, MFM, and RLL drives, it has not been tested with SCSI drives although it should work just fine)

Step 14. Ensure the new diskette is in the A: drive and reboot.

Step 15. First a DMA Test will run. If this test fails then the Flush curcuit is not working properly. Recheck your curcuit!

Step 16. If the DMA passed, your good to go. Enjoy your new CPU!

The only error message I ever encountered was when I enabled the A20M# line and left the FAST A20 option in my BIOS setup On. Turn it off and try again. Oh, the error was the HIMEM.SYS could not gain controll of the A20 line.

For setups without hardware changes:

You must still complete steps all steps except 5, 6, and 7. The CPU pins must be correct. You may still need to install a resistor to properly tie a line high. If your motherboard checks out and you follow the steps as written, you should be up and running within an hour, but plaese take your time.

PIN SIDE VIEW

VCC = +5VDC
VSS = GND

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	SUSP	SUSPA	X									X	X	X
5	X	X	X									X	X	X
6	X	NC	RPLSET									X	X	X
7	X	X	RPLVAL									X	X	X
8	X	X	X									X	X	X
9	X	X	X									X	X	X
10	X	X	LOCK									X	X	X
11	X	VSS	VSS									X	X	X
12	X	KEN	VCC	VCC	X	X	X	X	X	X	X	X	X	X
13	X	X	X	X	FLUSH	A20M	X	X	X	X	X	X	X	X
14	X	X	X	ADS	X	X	X	X	X	X	X	HLDA	X	X

CYRIX 486DLC
PIN SIDE VIEW

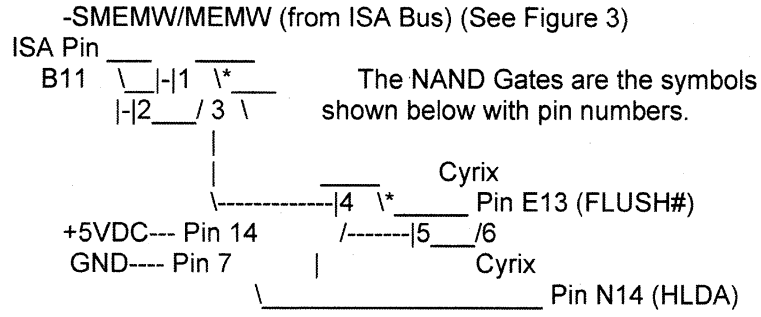
(Do not test
HLDA pin)

(The A20M# line is not very important, if you can find it readily, great, if not, it won't matter that much)

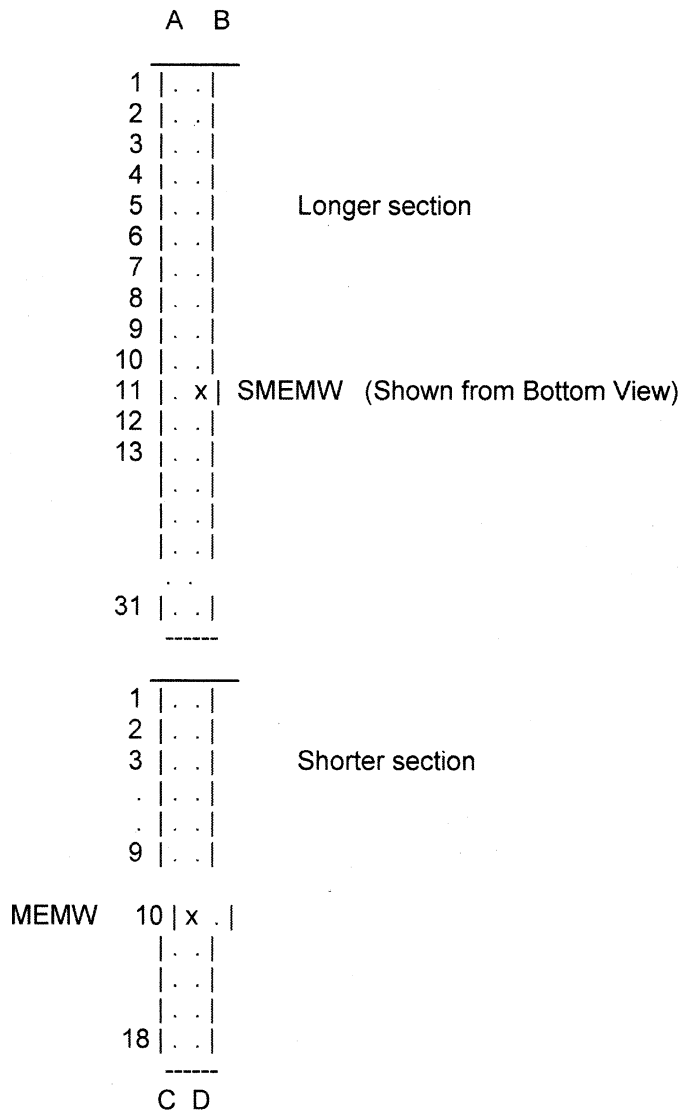
A20M# (from chipset or
A20GATE# from Keyboard Controller) Cyrix DLC Processor

|
\---------- Pin F13 (A20M#)

(This curcuit is the most important thing)



(ISA Bus Pinout)



Pins Data Sheet

Verify these pins are Not Connected

Pin	Name	Res. to VCC	Res. to VSS	Should Be
F13	A20M#			Infinate
E13	FLUSH#			Infanate
B12	KEN#			Infinate
A4	SUSP#			Infinate
B4	SUSPA#			Infinate
C6	RPLSET			Infinate
C7	RPLVAL#			Infinate
B6	NC			Infinate

The following pins should be tied high. To verify these pins, you can connect the power supply to the motherboard and turn it on, then check the voltage on these pins with respect to GND (VSS). The voltage should be almost exactly 5 VDC, not 4.85, but near 4.9 to 5.1 or so.

Pin	Name	Voltage to VCC	Voltage to VSS	Should Be
C10	LOCK#			Tied High (VCC) thru resistor
E14	ADS#			Tied High (VCC) thru resistor

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David English

In article <meer.76...@ruunat.fys.ruu.nl>

me...@fys.ruu.nl "Ernie van der Meer" writes:
>Hi netters,
>A few days ago some kind soul sent me the secrets on a hardware modification
>that will make a non-DLC aware motherboard flush the internal cache after
>a DMA transfer. I tried the modification (total cost a few bucks) and it
>works perfectly. My motherboard now passes the Cyrix DMA test. Before I
>
> ..... details deleted
>

This has worked for me too! I have used the ISA C10 -MEMW connection.

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My other computer's a brain