

TRANSWARP

The logo consists of the letters 'A' and 'E' in a stylized, bold, blocky font. The 'A' and 'E' are connected at the top and bottom, with a small gap between them in the middle. A trademark symbol (TM) is located to the upper right of the 'E'.

User's Manual

 **APPLIED ENGINEERING®**

A DIVISION OF AE RESEARCH CORPORATION

v1.0

Applied Engineering

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9 AM to 12:30 PM & 1:35 to 5 PM (CST)

Monday through Friday

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TRANSWARP



User's Manual

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INTRODUCTION

Welcome to the TransWarp II

- ❖ *Note:* This manual often refers to the TransWarp II™ as TWII for short.

About the TransWarp II

The heart of the Apple® II, II Plus, and IIe™ is the 6502 microprocessor. It runs all the programs in the computer at a speed of 1 MHz. The TransWarp II replaces the 6502 microprocessor with a 65C02 microprocessor that makes your Apple run seven times faster.

If you want to know more about *how* TWII works, refer to Chapter 3.

TransWarp II's features:

- Easy to install slot card can be installed in any 1-7 slot of Apple II, II+, IIe, or Enhanced IIe.
- Does not override 80 column function of slot 3 in IIe.
- 65C02 microprocessor running at a clock rate of more than 7 MHz.
- 8K of fast caching memory.
- Low power design for cool operation.
- Lightning quick power-up diagnostics test the TransWarp card and ROM every time computer is turned on.
- Incorporates latest ASIC technology for improved reliability and efficiency.
- Acceleration of programs running in both main and auxiliary memory including RamWorks-style bank-switched auxiliary memory (up to 1.5 Megabytes).
- Compatible with most interface and expansion cards for the Apple.
- Transparent operation with all Apple software.
- Other than obviously increased speed, operation is transparent to user.
- An easily accessed built-in control panel which lets you control processor, slot, joystick, and speaker speeds.
- Wait/delay feature allows for ROM timing delays, permitting them to work correctly -- even when computer is set to the fastest speed.

- Three speed settings, Slow, Medium, and Fast and Off.
- Non-volatile memory preserves all settings when the computer is turned off.
- Can be controlled from hardware or software. (No preboot disk is needed.)
- 5 year warranty for parts and labor.

Hardware Compatibility

TransWarp will work with all standard peripheral cards, such as expanded memory cards, printer and modem interfaces, clock cards, 80 column cards, mouse cards, and most disk drive controllers. Some of these cards, though, may not operate as expected at the higher TransWarp speeds. By setting the speed from the TransWarp II's built-in Control Panel, you can tell the TransWarp's circuitry which cards, in which slots, require the 1 MHz clock rate. This will allow TransWarp to slow down to the Apple's clock speed momentarily when those cards are accessed by the software. This has a very small effect on the overall TransWarp speed, since these interfaces are accessed for very short periods of the computer's time.

Due to the number and variety of expansion and interface cards available, it is impossible to list which cards require the 1 MHz clock rate. Without a great deal of technical information, it is also impossible to determine which cards will or won't work at TransWarp speed. Generally, most floppy disk controllers, and clock cards do require the 1 MHz timing signal. Parallel printer interfaces, serial printer, communications interfaces, hard disk controllers, 80 column cards, and mouse cards usually will operate correctly at full TransWarp speed.

The simplest method of determining the timing signal requirement of a card is to try it at TransWarp speed. If it doesn't work properly, set the appropriate slot speed to slow TransWarp II down for that expansion card slot. The instructions for choosing the speed settings are in the next section.

DMA Cards

TransWarp II is a DMA (Direct Memory Access) card. You can only have one DMA card running at a time. Therefore, you will need to turn off any other DMA cards to run at TransWarp II speed and you'll need to turn off the TransWarp to run any other DMA card.

Two specific cases are \mathcal{A} E's Z-80 Plus card and Ohio Cache's Multi-Cache card. When using the Z-80 to run CP/M, you need to turn off the TransWarp II from the built-in control panel. Multi-Cache users need to set the Multi-Cache card to non-DMA mode.

Software Compatibility

It works with virtually all software for the II Plus and //e and runs the programs at 7 times the standard speed.

About the Manual

This manual tells you all about installing and using the Applied Engineering TransWarp II accelerator card. The manual was written under the assumption that you are at least familiar with the operation of your computer. For more information on the basic operation and setup of your system, please refer to the Apple Owner's Manual for your particular computer.

We have tried to make this manual as informative, understandable, and error-free as possible. Any comments or suggestions regarding this manual or any other \mathcal{A} E manual will be greatly appreciated both by \mathcal{A} E and by others who use our product.

Please address any comments or suggestions to:

Applied Engineering

P.O. Box 5100

Carrollton, TX 75011

Attention: Manager, Tech. Publications.

What Now?

Turn the page and get your computer up to speed!



CHAPTER ONE

Getting Started

Required

To use TransWarp II, you must have either an Apple II, an Apple II Plus, or Apple //e computer.

Install It!

1. **TURN OFF THE APPLE'S POWER SWITCH.**

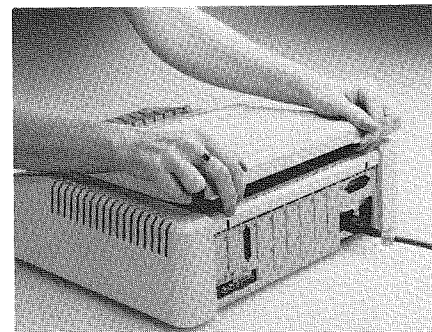
Never install or remove a card while the computer is on. However, leave the computer plugged in throughout the installation to allow the power supply to discharge static electricity from your body.

2. **Remove the cover from the Apple.**

Pull up on the two tabs at the rear of the case with your forefingers while pulling the lid up and towards you. (See picture following.)

3. **Touch the power supply** to remove any static electricity from your body. (Don't worry, it's safe!)

Do not skip this step! A static shock can damage the chips on your boards and/or the chips on your computer's motherboard.



Remove the Cover



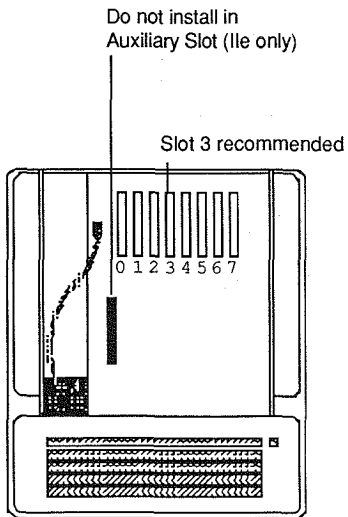
Touch the Power Supply Case

4. **Remove the TWII from its anti-static bag.**

Hold the card by its edges, like a photograph.

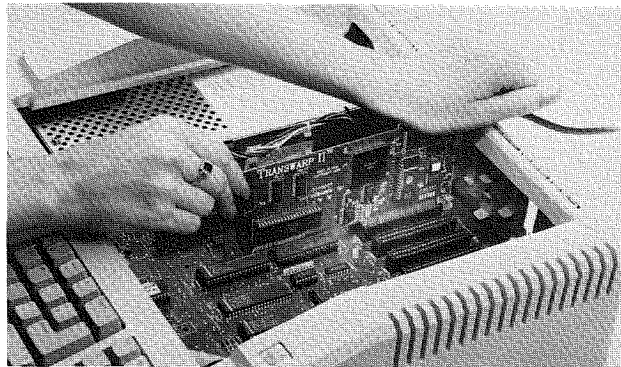
5. **Insert the TWII into the slot of your choice (except the //e's Auxiliary Slot and the II Plus' Slot 0).**

We recommend slot 3. The TWII will not override the //e's 80 column port accessed through slot 3.



Inside the][,][Plus, and //e

Align the gold "fingers" of the TWII's edge connector with the slot; then use the heel of one hand to push the card down into the slot and seat it firmly.



Insert TWII Into Slot

6. Replace the Apple's cover.

Hardware installation is complete. Congratulations!

What Now?

The TransWarp II is automatically tested every time you boot (unless you turn off the test option through the control panel. Read the next chapter to find out about controlling TransWarp II through the built-in control panel. Then...

Enjoy the Speed!



CHAPTER TWO




The TransWarp II Control Panel

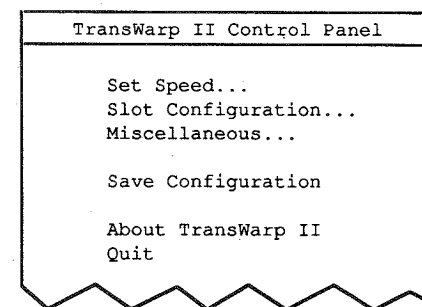
About the Control Panel

In order to fully understand and take advantage of TWII's features, read through this chapter and display the menus on your screen as they're being described.





The Control Panel allows you to control the speed of the TWII and test its operation.

Accessing the Desk Accessory

- 1.) Access the Control Panel menu by pressing the <Esc> key and then holding down the <Control> key while pressing <Reset> ( then  - .



TransWarp II Control Panel

- 2.) Use the arrow keys (  or  ) , as instructed at the bottom of the menu, to highlight the different options.
- 3.) Press <Return> to select a highlighted option.

Set Speed

Press the spacebar to toggle the TransWarp II speed between Off (1 MHz), Slow (1 MHz), Medium (3.5 MHz), and Fast (7 MHz).

Off and Slow are both the normal Apple speed. The difference is, when set to Off, the TWII is ignored and the speed is derived from the CPU on the Apple motherboard. Use the Off setting when using another DMA device. When set to Slow, the speed is taken from the TransWarp's CPU. If you are having a problem running a particular program, try turning the speed Off to determine if the program is having a compatibility problem with the TWII.

Slot Configuration

The Slot Configuration option allows you to determine the TWII speed setting for each slot. If you have a peripheral board that cannot run at accelerated speed, select the slot that that card occupies and press the spacebar to set the TWII to Normal for the slot.

Sample Configuration

Slot	Setting	Board
Slot 1	Fast	Parallel Printer Interface Card
Slot 2	Normal	Serial Interface Card
Slot 3	Fast	TransWarp II
Slot 4	Normal	Clock Card
Slot 5	Fast	Slot 1-7 Memory Card
Slot 6	Normal	Floppy Disk Controller
Slot 7	Fast	Empty

Applied Engineering Cards

Board	Slot Setting
Vulcan	Fast
Serial Pro	Normal
RamFactor	Fast
PC Transporter	Normal
RamWorks	N/A (in Aux. Mem. Slot)
Timemaster	Fast
Z-80 Plus	Must Be Off
Drive Controller	Normal

Miscellaneous

Startup Graphics

If you don't want the TWII logo to appear each time you boot your computer, toggle the graphics off by highlighting Startup Graphics and pressing the spacebar to set the option to Off. You will notice a slight decrease in boot time with the graphics turned off. You must use the "Save Configuration" option to put this option into affect.

Startup Diagnostics

When you boot your computer, the TransWarp puts itself through a very quick diagnostics test. You should leave this option On. Turning the option Off will only save about a half second during boot. You must use the "Save Configuration" option to put this option into affect.

Sound

Your choices here are Off, 0 ms, 1 ms, 5 ms, and 50 ms.

- Off Setting the Sound option to Off is effectively the same as unplugging the speaker. This is a great advantage to late-night game players and those who live with them.
- 0 The "0" setting will give you an accelerated beep or "chirp" at startup. At the "0" setting, the sound will be distorted if WAIT Delay is set to off.
- 1 The 1 ms setting is the default setting giving you the normal beep sound.
- 5 Some music programs require that the sound be slowed down a bit. If your music program doesn't sound right try setting the Sound to 5 or 50 ms.
- 50 Required by a few music programs. Try this setting if the sound is still too accelerated at 5 ms.

Joystick Delay

Leave the Joystick Delay option set to "1 ms" in most cases. Many games that use joysticks are timing sensitive. Either setting will work, however, some programs can work with less delay and may run faster at the 32 us setting.

NMI Delay

An NMI (Non-Maskable Interrupt) is a rarely used option that tells the computer to slow down upon receiving an NMI. NMI requires special hardware and can interfere with other devices such as disk drives. The option is included for programmers who need to work with NMI's.

WAIT Delay

Leave the WAIT Delay set to "32 us" in most cases. WAIT is a firmware routine called by software to make the computer pause for a specified period of time. If the WAIT Delay is Off, some programs' internal time constants may be distorted and the program will not work.

Save Configuration

When you have the system configured like you want, highlight the Save Configuration option and press <Return> to save the settings. If you don't save the configuration before powering down, the setting changes will be temporary.

About TransWarp II...

This screen gives credit to the masterminds behind the TWII. It also lists Applied Engineering's address and phone numbers for Sales and Technical Support.

While in the "About" Menu, press 1 to see the Technical Info. Screen.

Quit

When you're finished selecting your options, choose Quit. This passes the <Control>-<Reset> you sent to the computer when entering the control panel and your computer resets.

CHAPTER THREE

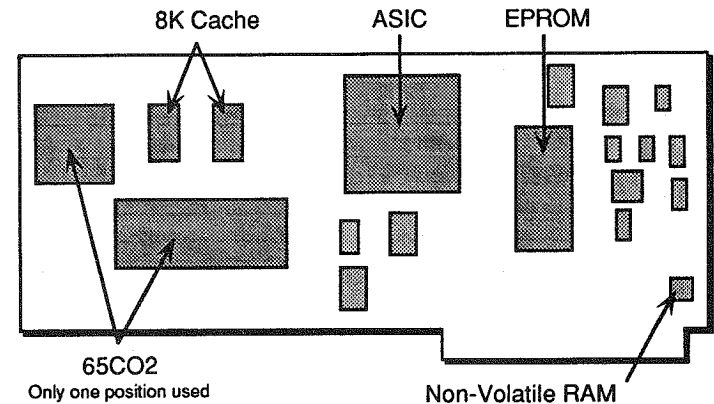
The TransWarp II Hardware

About the Components

While the original TransWarp board contained 30 chips, and 2 switch blocks of 8 switches each, the TWII board is composed of about half as many chips and no switch blocks.

- ❑ The cache chips give you 8K of caching memory for super-fast data access.
- ❑ TWII's non-volatile RAM stores the Control Panel settings.
- ❑ The Control Panel program and diagnostics test are kept in the EPROM.
- ❑ The large square chip on the board is the ASIC, the heart of TWII. It performs the duties of many chips.
- ❑ Replacing the 6502 chip of the II Plus and //e, the high-speed 65C02 is the brain of TWII.

The surface mounted chips, provides the most performance in the smallest space and give the board a thin profile.



TWII Main Components

General Theory of Operation

The TWII accelerates the Apple II Plus and //E by replacing the on-board micro-processor with a much faster one. Because the memory on the II Plus and //E can only run at a 1 MHz speed maximum, faster memory must be provided to increase performance. To do this, the TWII contains a small amount of accelerated memory on it called caching memory.

Almost all programs are made up of small program pieces that loop around many times, running themselves again and again until they have finished what they are trying to do and then going on to the next piece of code. Caching takes the small pieces of programs that loop around and puts them into fast memory so that the loops don't take as long to loop.

When the program is in the cache memory, the TWII can run it at TWII speed. When it is not in the cache, the TWII must slow down and get it at the 1 MHz speed. When one part of the program is finished, the TWII copies in the next piece of program to run it fast and, at the same time, gets rid of the old program piece. In this way, the small cache memory makes the computer run much faster.

Programmers' Note

If you are an assembly language programmer and are interested in writing programs that directly access the TransWarp II, call Applied Engineering Technical Support, (214) 241-6069, for the *TWII Programmer's Reference*.

APPENDIX A

Trouble Shooting

Error Message at Startup

If the power-up diagnostic test encounters an error, follow the directions displayed on the screen.

```
TransWarp II failure
(error code = 2)
```

```
Follow these steps:
```

- 1) Turn off the computer
- 2) Wait 20 seconds
- 3) Turn on the computer

```
If this screen re-appears,
note the error code and
contact technical support at:
```

```
(214) 241-6069
9am to 12:30pm & 1:35pm to 5pm (CST)
Monday Through Friday
```

Error Codes

Because the chips on the board are surface mount chips, they cannot be replaced by the user. However, so you'll know more about where the encountered problem lies, here are the error code meanings:

- 0 EPROM
- 1 Non-Volatile RAM
- 2 Cache
- 3 Cache
- 4 Speed

Checkerboard Pattern at Startup

This may occur when the TWII connector is not seated securely or when it has been damaged by static electricity.

- ◇ Turn off power to the computer.
- ◇ Remove the computer's cover.

- ◇ Touch the power supply to discharge static electricity.
- ◇ Make sure the card's edge connector is firmly seated in the slot.
- ◇ Turn the computer on again.
- ◇ If the computer still will not boot, refer to the "Getting Help" section in the Appendices.
- ◇ If the computer boots properly, turn the power back off then replace the computer's cover.

APPENDIX B

Getting Help

If you have a technical question relating to your TransWarp II card or any other Applied Engineering product that is not covered in the manual, please contact the dealer from whom you purchased the product. If you are experiencing difficulties with one particular program, contact the program's author or publisher.

In the event that the dealer or the publisher's support personnel cannot answer your question, call Applied Engineering Technical Support. The support representatives are experienced in the applications and uses of Applied Engineering products, but in order to provide a quick and effective answer to your question, they will need to know as much as possible about the hardware and software specifically related to your question. Please provide the technical support representative with the following information:

- ◇ The Applied Engineering product related to your question and its revision number.
- ◇ The original and current memory configuration of the card (if applicable).
- ◇ The model and revision of your computer.
- ◇ What peripherals are being used and what cards are in each slot.
- ◇ The name, version, and revision level of the software with which you are experiencing problems.
- ◇ The results of any test programs, diagnostics, or troubleshooting done by you, your dealer, or your software publisher's support department.

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Monday Through Friday

(Please call only the number above for technical support. Our sales office cannot transfer calls to the support lines.)

Returning a Product

RMA Number, "Attention" Sheet, and Invoice

If your product needs to be returned, the technical support representative will give you a Return Material Authorization (RMA) number.

- Record the RMA number for your own records.
- Write the RMA number on your package label.
- Fill out the Return Form on back of the yellow sheet marked "Attention!" A complete form will greatly reduce the time it takes to return your package.
- Attach a copy of your original invoice to the form.
- ❖ **Warning:** If you don't include an invoice, products will be treated as out of warranty products and will be returned to you C.O.D. for the amount of the service charge.

A completed form should look something like the one below:

Invoice

Return Address: Archie Monger
#413 Energy Square
Detroit, MI
 Display Phone: (312) 598-8793

↓
 All out and leave attached

If you should ever have to return your Æ product for repair, please complete this form and attach a copy of your original invoice.

RMA Number: <u>RUOK</u>		<div style="font-size: 0.7em; margin: 0;"> GS Slot Settings 1: <input type="checkbox"/> Your <input type="checkbox"/> Printer 2: <input type="checkbox"/> Your <input type="checkbox"/> Modem 3: <input type="checkbox"/> Your <input type="checkbox"/> Text 4: <input type="checkbox"/> Your <input type="checkbox"/> Mouse 5: <input type="checkbox"/> Your <input type="checkbox"/> Smart 6: <input type="checkbox"/> Your <input type="checkbox"/> Disk 7: <input type="checkbox"/> Your <input type="checkbox"/> A-Talk Startup: _____ </div>
Computer: <input type="checkbox"/> II <input type="checkbox"/> II Plus <input type="checkbox"/> //c <input type="checkbox"/> //e Non-Enhanced <input type="checkbox"/> //e Enhanced <input type="checkbox"/> IIGS ROM # _____ <input type="checkbox"/> Other (list) _____	Peripherals: <input type="checkbox"/> Monitor <u>Sony</u> <input type="checkbox"/> Printer <u>ImageWriter</u> <input type="checkbox"/> Modem _____ <input type="checkbox"/> Other (list) _____	

Slot 0 (if Plus): _____	Slot 5: _____
Slot 1: _____	Slot 6: <u>Disk Drive</u>
Slot 2: _____	Slot 7: <u>Controller</u>
Slot 3: <u>TransWarp II</u>	Aux. Slot (//e): _____
Slot 4: <u>RamFactor</u>	Mem. Exp. (IIGS): _____

Symptoms: I love the speed of the TransWarp II board. So much so that I wanted more speed. A quick trip to the local power plant got me a multi-1,000 Volt generator. Hooked it up to my TransWarp and Zillion! Man does it fly. Anyway, the problem is, the Zfl. arc that my machine now

Description of Software from vendor member, say enhancements, etc:
puts off is quite distracting. Not to mention, sort of dangerous. One day Shippy, my poodle, got too close and... well, it wasn't pretty. What I'd like is for you to incorporate the generator (enclosed) with the board to drive the power up to 100+ Mhz.

Steps to Duplicate Problem: Surface mount is preferable. Anything you can do I'll greatly appreciate. By the way, when working with the generator and board, keep the safety of animals and small children in mind. Good luck and let me know what happens. Send pictures if possible.

When You Ship

If you don't have the original packing material, wrap the board in anti-static material (preferably the anti-static bag in which the card was originally shipped; however, aluminum foil will work fine). Pack it in a sturdy box cushioned with wadded papers (i.e. used computer paper or newspaper).

- ❖ **Warning:** If your product is damaged due to inadequate packing, your warranty will be void.

Include the return form and invoice.

Send the package, shipping prepaid, to:

RMA# ?_
Applied Engineering
Technical Support
3210 Belt Line Road, Suite 154
Dallas TX 75234

You should insure your package. Æ will not assume any responsibility for inadequate packing or loss or damage during shipping.

When We Receive

Our service department will use your completed form in an attempt to duplicate the problem.

If it is determined that your product is defective due to a manufacturing defect, your card will be repaired or replaced at Æ's option.

Any misuse, abuse, or non-Æ authorized alteration, modification, and/or repair to the Applied Engineering product will void the warranty. This warranty will also be void if you use the Æ product for any purpose other than its intended use.

Your product will be fully tested before it is shipped back to you, transportation prepaid, via UPS regular delivery.

Once your product is received by Technical Support, it will be processed and delivered to our shipping department as soon as possible.

NOTES