

# CMS SCSI CONTROLLER CARD

APPLE II USERS GUIDE (APPLE IIe and APPLE IIgs only)

## Features:

1. 8160 Megabytes Control (8.16 Gigabytes)
2. Easy Plug & Play Operation
3. Controls 1-7 Attached SCSI Devices
4. Fixed & Removable Format SCSI Device Compatible
5. Fully ProDOS and GS/OS Compatible.
6. 1 Year Warranty.

## Package Includes:

1. CMS SCSI Controller Card
2. Connecting cable for SCSI devices:
  - a. Header 26Female/Female for internal 2.5" SCSI Expander  
OR
  - b. Header 26Female to DB25Male for External SCSI Devices.
3. 5.25" & 3.5" Utilities Diskettes

## LIMITED WARRANTY & LIABILITY!

Your CMS SCSI Controller comes with a limited one year warranty including parts and labor. The warranty is for the CMS SCSI Controller only, and does not cover direct, indirect, incidental, consequential, or special damages to any other part of your computer system that may be caused from the use of the CMS SCSI Controller. All liability for such damages, as mentioned above, are at the risk of the purchaser.

Should your CMS SCSI Controller malfunction within one year from the date of purchase, return the CMS SCSI Controller, with proof of purchase, to your authorized dealer. Your dealer will repair or replace (dealers option) your CMS SCSI Controller.

## OVERVIEW

The CMS SCSI controller has been factory set to 'plug & play' for most Apple II SCSI devices. The controller will work in any rear 50 pin expansion slot of the Apple IIe or Apple IIgs computer. We recommend you read over this entire guide before installing the controller in your computer, then once you are familiar with the operation of the CMS SCSI controller, install same into your computer system.

## APPLE II & SCSI HARDWARE

When connecting SCSI devices to an Apple II, you need to be aware of the following:

1. The SCSI chain requires termination at the start and last link in the SCSI chain. If you are attaching only one SCSI device (hard drive, CD ROM drive, Etc.), the one device is the last link. The CMS Controller has self termination for the start of the chain. Insure your SCSI device has a SCSI terminator on the cable line, if the SCSI device is not self terminating.
2. SCSI hard drives are much faster than 5.25" or 3.5" drive operations. Removable SCSI devices (Zip, Jaz, Syquest, CD-ROM) are much slower on Apple II systems.
3. All SCSI devices require a unique SCSI ID number 0 thru 7. No two SCSI devices in one chain can have the same number. When using the CMS controller card DO NOT use SCSI #7 for any SCSI devices in the chain. Only seven SCSI devices can be connected to one CMS controller card.

## SLOT SELECTION

The CMS SCSI controller is designed to work in any slot of the Apple IIe or IIGS. However, Apple slot protocol (a convention of slot usage developed over the years) may prevent using the controller in certain slots, as follows:

### Apple IIe:

Slot 1	- slot protocol	- Printer Interface
Slot 2	- slot protocol	- Communication Interface
Slot 3	- slot protocol	- 80 Columns
Slot 4	- slot protocol	- none
Slot 5	- slot protocol	- none
Slot 6	- slot protocol	- 5.25" Disk Controller
Slot 7	- slot protocol	- none

### Apple IIGS:

Slot 1	- slot protocol	- Printer Interface
Slot 2	- slot protocol	- Communication Interface
Slot 3	- slot protocol	- 80 Columns
Slot 4	- slot protocol	- Mouse
Slot 5	- slot protocol	- 3.5" Drive Controller
Slot 6	- slot protocol	- 5.25" Drive Controller
Slot 7	- slot protocol	- none

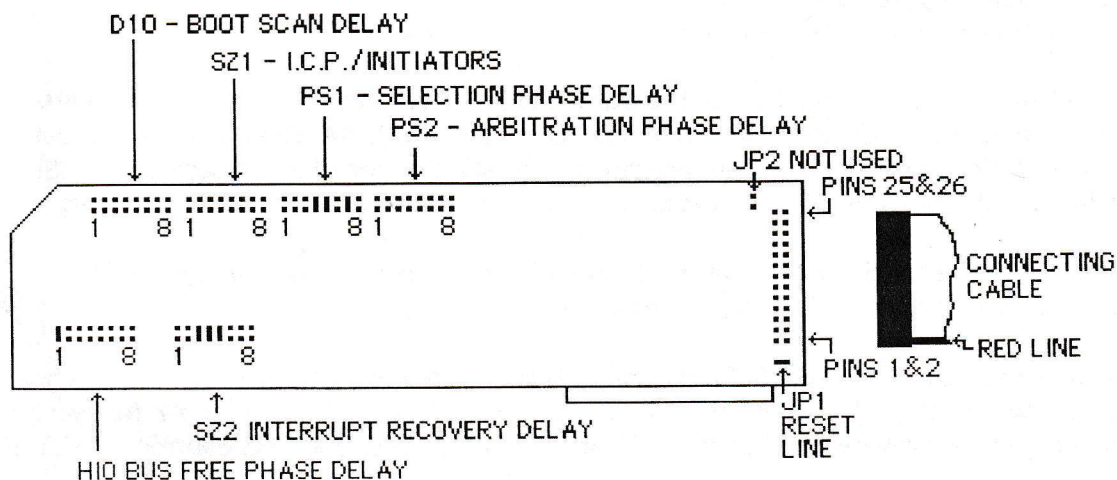
### Recommendations:

1. If you want to boot from the hard drive, install the CMS SCSI controller in a slot higher than any other drives connected to the computer. Use slot 7.
2. If you want to use the hard drive as just data storage, booting from another drive, install the CMS SCSI controller in a slot lower than the boot drive. IIGS owners may not have this option, depending on the system configuration. Use slot 2, 4, or 5.

## CONTROLLER CARD JUMPERS

The CMS SCSI controller card jumpers have been factory set and should not require any changes for most applications. The following information is given for users that have extensive knowledge of SCSI & Apple II.

Figure 1.0





### BINARY JUMPER SETTINGS

The jumper blocks are designed for setting binary 0 to 255 as follows:

1 = 1, 2 = 2, 3 = 4, 4 = 8, 5 = 16, 6 = 32, 7 = 64, 8 = 128.

Examples:

For a value of 0 - set no jumpers.

For a value of 100 - set jumpers 3, 6, & 7.

For a value of 255 - set all jumpers 1 thru 8.

D10 - (Boot Scan Delay) defines the time that the controller will wait before looking for attached hard drives. If at power up, the computer should scan for drives before some/all become ready, those that are not read seem not to exist. The boot scan delay gives time for the hard drives to timeout into their ready mode.

Each count of 1 thru 255 represents about .25 second delay.

(Example - jumper 3 for a total 1 second delay)

SZ1 - Jumper 1 = I.C.P. (Integrated Control Panel) Program.

Jumpers 2 thru 7 not used.

Jumper 8 = Multiple Initiators.

Jumper 1 (normally not jumpered) can be used to auto start the I.C.P. program (explained later) at boot. If Jumper 1 is not jumpered, the I.C.P. will auto start if you hold down the open-apple key at boot.

Jumper 8 (normally not jumpered) is used for multiple initiators in the computer system. If jumper 8 is not jumpered, the CMS SCSI controller assumes it is the only initiator connected in the system. If any unusual activity or a communication error with the drive is detected, a reset will be issued by the CMS controller in an attempt to clear the bus and reset the connected drives.

If jumper 8 is jumpered, the CMS SCSI controller assumes other initiators are in the system and/or present in the chain at its slot. This indicates that drives and/or bus might be kept busy by those. In case of a bus condition, the CMS controller will wait endlessly for the bus to become free in order to perform its task. If the bus does not become free (system lock-up) due to an error condition, the computer will have to be rebooted.

PS1 - (4, 5, & 7 normally jumpered) is used for Selection Phase Time Out Delay. The time that the CMS controller will wait for devices to respond before posting a message 'No Device Connected'.

Each count of 1 represents approx 3 milliseconds. The default setting of 88 (264 milliseconds) exceeds ANSI recommendation (250 milliseconds), but some slow drives may require an even longer setting.

PS2 - (normal setting - no jumpers) is used for Arbitration Phase Time Out Delay. The time that the CMS controller will wait to ensure no other device has taken control of the bus. This only becomes important if multiple initiators are connected in the SCSI chain at the slot of the CMS controller.

If multiple initiators are present in the SCSI chain, the recommended setting is 128 (jumper #8).

HIO - (normal setting, jumper #1) is used for Bus Free Phase Time Out Delay. The time that the CMS controller will wait for the bus to become free before posting an I/O error.

SZ2 - (normal setting, 3, 4, & 5 jumpered) is used for Interrupt Recovery delay. At boot or after some errors, the CMS controller issues a SCSI reset command to the SCSI chain. Some drives require a longer recovery time than others, at this command. This jumper block determines the time the CMS controller will wait after this reset command, before sending more instructions down the SCSI chain.

Each count of 1 represents approx 1/8th of a second. Some drives may need a longer delay, some drives do not need any delay.

JP1 - (normally jumpered). Allows the CMS controller to use the SCSI reset line to clear error conditions.

### INSTALLATION

Installation of the CMS SCSI Controller card is a relatively simple procedure. Please read over the steps before installing the card into your computer.

#### A FEW WORDS ABOUT STATIC ELECTRICITY!

Static electricity is stored basic energy that anyone can build up by walking across carpeted areas. This static charge can cause damage to your computer. Before installing any new board or peripheral inside your computer, once you have taken the lid off the computer, discharge any static electricity charge you may be carrying by touching the power supply (the large metal box at the inside left of the computer) box.

The following is a step by step procedure for installing your CMS Controller card.

1. TURN OFF THE POWER TO YOUR COMPUTER SYSTEM!
2. Remove the housing lid to allow access to the inside of your computer and access to the slots.
3. Discharge any static electricity by touching the power supply.
4. We recommend installing the CMS SCSI controller into slot 7 (the most right hand rear slot), for both the Apple IIe & IIGS computers.

Depending on your internal computer configuration, you may need to disconnect the attached cable, install the card, then re-attach the cable. If this is required, insure the cable is re-attached correctly.

Figure 1.0 on page 2 shows the proper orientation for the cable with the RED-LINE of the cable at the bottom of the CMS controller card.

Apple IIGS owners:

You will need to set slot 7 to YOUR CARD under the control hardware configuration at boot. Hold the OPTION key down at boot, select 1 (control panel), arrow key to SLOTS and toggle slot 7 to YOUR CARD with the arrow keys.

5. Re-install lid to the computer housing.
6. Connect your SCSI device to the connector of the CMS controller cable. Insure you use an in-line terminator if your SCSI device does not have built in termination.
7. Restore power to the computer system.



## OPERATION - THE UTILITIES

### APPLE II & SCSI SOFTWARE

If you have never worked with SCSI and the Apple II, you need to be aware of the following:

1. ProDOS can only see TWO maximum 32 Megabyte partitions in ONE slot at one time. This means that the maximum hard drive size that can be used under ProDOS at one time with the CMS SCSI controller is 64 megabytes. (The I.C.P. program, described further, allows switching of different partitions, to a maximum of 8.16 gigabytes).
2. All SCSI devices, with the exception of CD ROM drives, require formatting and partitioning before you can store programs and data on the SCSI device. The enclosed 'Utility' diskettes are used for this purpose.

#### PLEASE READ THIS CAREFULLY!

True FORMATTING writes consecutive blocks on a SCSI device for use with ProDOS.

True PARTITIONING (also called INITIALIZING) allocates the formatted blocks to a ProDOS directory and assigns the directory a ProDOS name (e.g. /HD1).

The CMS utilities will FORMAT a SCSI device but NOT partition or initialize the SCSI device. The FILER utilities under VOLUME COMMANDS gives the option of 'FORMAT A VOLUME'. This is NOT true formatting, this is PARTITIONING or INITIALIZING. (In our opinion, Apple should have named this PARTITION A VOLUME versus FORMAT A VOLUME).

With your new SCSI device, you will need to perform FORMATTING with the CMS utilities, then FORMAT A VOLUME (Partition/Initialize) with the FILER utilities.

For IIGS owners using GS/OS, you will need to perform FORMATTING with the CMS utilities, then you can FORMAT A VOLUME (Partition/Initialize) with the FILER utilities, or allow GS/OS to INITIALIZE the volume(s).

3. SCSI ID is a number assigned to SCSI devices attached to a SCSI controller. Each SCSI device must be given a unique ID from 0 thru 7. With the CMS SCSI controller you are limited to 0 thru 6, as you can only attach 7 devices at one time to the CMS SCSI controller card.

The CMS SCSI controller will see and use the highest ID numbers first. Example: You connect a 40 Meg hard drive with a SCSI ID 2 and a 20 Meg hard drive with a SCSI ID 4. The CMS controller will see and use the 20 Meg hard drive first.

### UTILITIES DISKETTES

You have been supplied with two utilities diskettes. A 5.25" diskette and a 3.5" diskette. The CMS utilities are the same on both, and both will self boot into a 'MASTER MENU'. We suggest making a backup of these diskettes before using them, as they are not copy protected.

Each diskette has an HD1 sub directory with a STARTUP. The only difference between this STARTUP & the CMS diskette STARTUP is the volume name /HD1. Once you have formatted and partitioned your SCSI device, we suggest the following:

1. Name your startup volume HD1.
2. Using the FILER program (or other ProDOS copy utility), copy the files from the CMS directory of the CMS utilities diskette to the HD1 volume on your SCSI device, except STARTUP & HD1.
3. Copy the file STARTUP in the HD1 directory to the HD1 root directory of your SCSI device.
4. Your SCSI device will then boot into a 'MASTER MENU' just like the CMS utilities diskette(s).

## MASTER MENU

The Master Menu provides the following option:

1. BackupII - a hard drive backup utility by Apple Computer, Inc.
2. Filer - a ProDOS volume & files control utility by Apple Computer, Inc.
3. CMS Utilities - utilities for new hard drives by CMS.
4. Exit to ProDOS.
5. Exit to Basic.

Use the arrow keys to scroll to your selection or just press the number desired.

### 1. BACKUP II

The 'BackupII' utility program allows you to backup & restore your hard drive onto diskettes, 5.25" or 3.5". The utility will prompt and format the diskettes as necessary.

Selecting this program from the menu will exit to ProDOS where you then select 'BackupII' from the ProDOS menu.

Note1: A small quirk by the writer of this program, exits the program to /RAM versus the /HD1 partition. When this happens, just press the TAB key until you see the /HD1 partition and menu, then press the RETURN key at PRODOS.

Note2: For Ile owners, when you enter the Backup II program you must enter the date, even if you enter the program by mistake. The format is MM/DD/YY.

Once the date is entered, you then follow the prompts to either backup or restore your partitions.

### 2. FILER

Filer is a utility program used to copy files and/or volumes to and from ProDOS partitions. These partitions can be on any media including 5.25" diskettes, 3.5" diskettes, and hard drives. If you have no other ProDOS utility program for copying files, this will be the main program you will use to copy programs and data to and from the hard drive or other SCSI device.

Apple IIGS users can also use filer under ProDOS, but copying data to and from the hard drive is much easier using the click drag option of GS/OS, with your mouse.

The program has a built in tutor for those unfamiliar with ProDOS.

### 3. CMS UTILITIES

The CMS utilities includes an ICP (Integrated Control Panel) for switching multiple ProDOS partitions, as well as a FORMAT program for intermediate and low level formatting of SCSI devices. Use the CMS utilities the first time you connect your SCSI devices to the CMS controller to:

- A. Verify all hardware is connected properly.
- B. Format your SCSI device(s) connected.

If you are connecting a 64 megabyte or smaller hard drive to the CMS SCSI controller, you will format your hard drive and probably never use the CMS utilities again.

If you are connecting more than one SCSI device and/or your SCSI device is larger than 64 megs, you will want to format all the SCSI devices, and then use the ICP program to select the volumes for ProDOS to see and use.



#### 4. EXIT TO PRODOS & 5. EXIT TO BASIC

Both are self explanatory

#### CMS UTILITIES IN DEPTH

##### STARTUP SCREEN

Selecting the CMS UTILITIES from the 'Main Menu' will start into a title then you should see a startup screen as follows (note: CMS controller in slot 7):

##### SCSI HARD DISK INTERFACES IN SLOT

#01 No Card or Unknown Interface  
#02 No Card or Unknown Interface  
#03 No Card or Unknown Interface  
#04 No Card or Unknown Interface  
#05 No Card or Unknown Interface  
#06 No Card or Unknown Interface  
#07 CMS Card with Version 3/1/90 Eprom

-----  
OPTIONS:        ARROW KEYS = Select Slot  
Q = Quit

Use the arrow keys to scroll down to slot 7 (or the slot you have the CMS controller installed).  
At slot 7 you should see the SCSI devices attached to the CMS controller card.

The following example is with the QWIK RUNNER 40 attached to the CMS controller:

##### SCSI HARD DISK INTERFACES IN SLOT

#01 No Card or Unknown Interface  
#02 No Card or Unknown Interface  
#03 No Card or Unknown Interface  
#04 No Card or Unknown Interface  
#05 No Card or Unknown Interface  
#06 No Card or Unknown Interface  
#07 CMS Card with Version 3/1/90 Eprom

-----  
HARD DISK(S) PRESENT AT SLOT 07:

SCSI-ID #1    Size: 00040 MB + 01376 Blocks

-----  
OPTIONS:        ARROW KEYS = Select Slot  
Q = Quit    R = Rescan        V = Volume Manager  
F = Format

Format your SCSI device(s) by selecting F.

Rescan can be used to check a change of SCSI ID numbers on the fly.

Volume Manager and ICP program are accessible by selecting V.

(H) Option will appear if multiple SCSI devices are connected. Use this option to toggle the proper SCSI device for formatting.

If you do not see all SCSI devices at the slot you have installed the CMS controller, double check all connections and/or insure your last SCSI device in the chain has a SCSI terminator. Insure you TURN OFF ALL POWER TO YOUR COMPUTER SYSTEM when connecting or disconnecting SCSI devices to the CMS controller card.

## FORMAT

Selecting F as a menu option will first caution you in the event you select this option by mistake, then produce the following screen:

-----  
Sending Block Descriptors: - OK  
-----

Disabling Unit Attention: - OK  
-----

Disabling Error Correction: - OK  
-----

Select Interleave (0 = Default): 000

Arrow Keys = Select Value

Enter = Start Format            S = Skip Format

Your Choice

If you are not familiar with interleave of SCSI devices, do not change the default value of 000. 000 will format the SCSI device with the manufacture's default interleave.

Note: Only stock CMS hard drives from CMS should be interleave selected for 010.

To proceed with the format option press the ENTER (RETURN) key. The formatting procedure will auto run, and produce an intermediate level format on your SCSI device. You will see following message at the bottom of the screen when formatting is done:

-----  
Format Procedure Completed  
-----

Press Any Key To Continue

If you have multiple SCSI devices connected to the CMS controller card, you will need to perform the format procedure for each of the devices. Use the H command option at the startup screen to toggle thru each of the SCSI devices to format.

## VERIFY FORMAT (also known as LOW LEVEL FORMAT)

Note: Intermediate level formatting is sufficient for quick checking the SCSI device for use. Only if your SCSI device is questionable would you have to perform the following verify format.

Verification of format is explained as a message following the format procedure. It will slowly pass through the SCSI media and map out bad or questionable block on the media. This is done so that ProDOS or GS/OS does not use these bad blocks.

If you desire & want to take the time (some SCSI devices take hours for verification) select this option, and follow the screen prompts. During the verification you can abort the procedure by pressing the ESC key, or see how far along the verification is by pressing any other key.

The verification procedure will make three passes through the SCSI device(s). One pass is quite sufficient for full verification. Three are done to absolutely insure media block use.



### PARTITION (INITIALIZE)

After you format your SCSI device(s). You will need to partition (initialize) all volumes for use. The CMS utilities will NOT perform this procedure. You must use the FILER program or GS/OS to partition the volumes. Use the following procedure if you are not using GS/OS.

Enter the FILER program (exit the CMS utilities and select FILER from the ProDOS menu). Select V - Volume Commands, then select F - Format a Volume.

You will be prompted at this point for the Slot = CMS controller card slot and Drive = Volume to be partitioned.

You will then be asked to name the volume. Keep it simple and remember no two volumes can have the same name. (Example with two volumes, name them HD1 & HD2).

If you have multiple volumes in your SCSI chain, you will have to use the CMS I.C.P. program in conjunction with the FILER program to partition all the volumes in the SCSI chain. Toggle back and forth between the I.C.P. and FILER program until all volumes are partitioned.

### VOLUME MANAGER & I.C.P. (Integrated Control Panel)

The volume manager shows all the volumes presently available and connected to the CMS controller card. In addition the manager displays the SCSI ID, volume ID, and size of the volumes.

The only option from the Volume Manager (other than ESC/done) is I.C.P. If you are using a SCSI device 64 megabytes or smaller, you will not need to use the I.C.P. program.

If your SCSI device is larger than 64 megabytes, the CMS controller, thru the Volume Manager assigns volumes to all SCSI devices in the chain in 32 megabyte sections (the maximum volume size ProDOS can see and use). SCSI devices larger than 64 megabytes would produce more than two volumes. However, at previously stated, ProDOS can only see and use two volumes in one slot at one time.

You can use the I.C.P. program to turn on and off the two volumes you want ProDOS to see and use. Using this convention, the maximum volumes allowed on one CMS controller is 255 ( $255 * 32 \text{ MB} = 8160 \text{ MB}$ ).

The I.C.P. can be selected in one of three ways:

1. Enter the CMS utilities, toggle arrow keys to CMS card slot, select V = Volume Manager, then select I = I.C.P.
2. Hold down the (open)Apple key at startup. The CMS controller will startup into the I.C.P.
3. Jumper SZ1 #1. At startup the CMS controller will startup into the I.C.P.

Note: 2 & 3 are only available if the CMS controller card is the startup card in the computer.

The I.C.P. is simple to use. Just enter the program and use the arrow keys to toggle which two volumes you want to use at one time.

The following messages may appear after Status =:

Not Initialized (needs to be partitioned).

Initialized (ready to use)

Ejected or Not Ready (removable media not inserted or drive not ready)

Sense Key Error \$X,\$Y (see Appendix TROUBLE SHOOTING - SOFTWARE PROBLEMS)

Fatal Communication Error (check connections, hardware, terminator)

### APPLE IIGS OWNER ONLY

Located on both the CMS Utilities diskettes in a directory named CMS.UTILITIES is a special CMS DRIVER Extension for GS/OS v5.0 or higher. The purpose of the extension is to enhance operation of SCSI devices with GS/OS using the CMS controller card.

Enhancements include an increased speed with some SCSI devices of 200% over standard ProDOS, access of all volumes connected to the CMS controller card, and full support for removable media SCSI devices.

Before you install the driver for use, you must perform Format & Partition the SCSI device attached to the CMS controller card, and install GS/OS v5.0 or higher onto the SCSI device.

To install the CMS DRIVER, perform the following:

1. Start up your system with GS/OS.
2. Insert the CMS Utilities diskette into a disk drive.
3. Double click the SYSTEM folder on your SCSI device & locate the DRIVERS folder.
4. Double click the CMS Utilities diskette icon and CMS.UTILITIES folder.
5. Copy the CMS DRIVER from the diskette to the DRIVERS folder in the SYSTEM folder.
6. Reboot your computer system.

### APPENDIX - TROUBLE SHOOTING

When trouble shooting SCSI problems there are two categories to check. Hardware problems and Software problems.

#### HARDWARE PROBLEMS

1. Check to insure all jumpers on the CMS controller card are installed in the default values.
2. Verify that all cables are connected properly and a terminator is installed in the last SCSI link.
3. If the SCSI device was used with another SCSI controller (none CMS) re-format and re-partition the SCSI device with the CMS utilities and FILER.
4. If your SCSI device uses removable media, insure the media is inserted into the SCSI device, and you have performed the format and partition procedures for the media.

#### SOFTWARE PROBLEMS

The following is a list of Sense Key Errors (This is not a complete list) of most commonly found errors:

- \$00: No Error.
- \$01: Recovered Error - Last command needed recovery action (could be future bad block).
- \$02: Not Ready - The SCSI device is not ready for access (slow device or removed media).
- \$03: Medium Error - Command terminated due to flaw in media (most likely bad blocks).
- \$04: Hardware Error - Check all hardware connections & termination.
- \$05: Illegal Request - The SCSI device has been given an illegal or not supported command.
- \$06: Unit Attention - The device has been reset, powered on & off, or the media has been changed.
- \$07: Data Protected - The SCSI device is write protected.