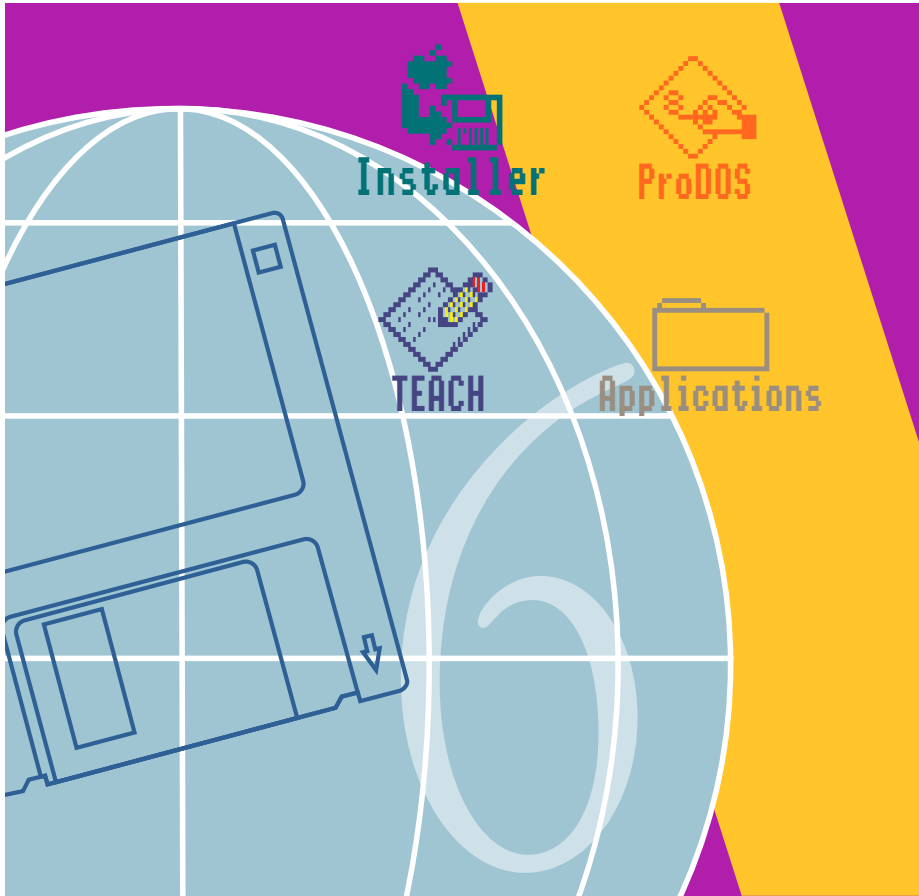




GS/OS® AppleDisk 5.25 Driver ERS

Ver. 2.05



System 6 IIGS

Apple® IIgs® System Software 6.0 — Release Notes
Golden Master 3 Release — March 5, 1992
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Overview

This document is intended to describe the GS/OS® AppleDisk5.25 driver calls. Included is a brief description of how each call is implemented with respect to the AppleDisk5.25. Also included is a description of the physical and logical formats used with the AppleDisk5.25 media.

General Information

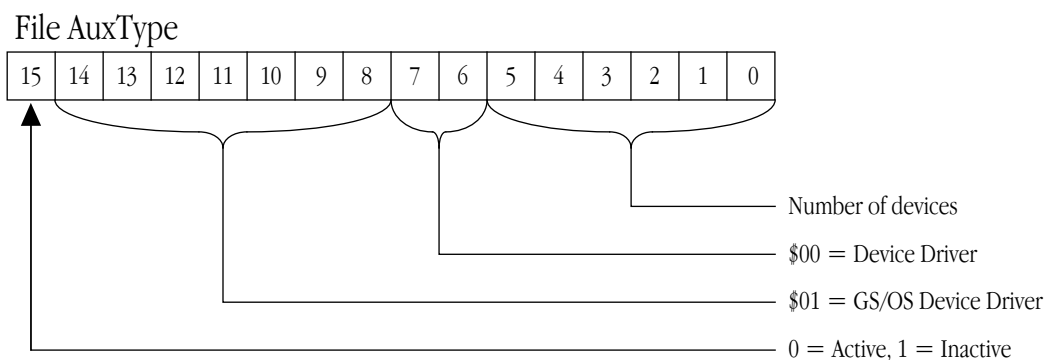
The AppleDisk5.25 driver is a loaded driver which does not require a supervisory driver to conduct I/O transactions with the AppleDisk5.25 device. It supports up to fourteen Disk II devices and should operate equally well with a AppleDisk5.25 Interface Card or IWM interface. The AppleDisk5.25 driver operates independent of the system speed and does not have the resident slot limitation inherent in the Apple IIGS. (The Apple IIGS normally only allows Disk II devices in slots 4 through 7 in fast mode. This driver operates with Disk II devices in slots 1 through 7 in fast mode with either one or two Disk II devices per slot.)

Disk II Limitations

The Disk II device provides no means for detection of disk switched errors. A simulation of disk switched is provided that will force any file system translator interfacing to the Disk II to identify the volume currently online. Simulation of disk switched errors is adequate to force volume identification but is not adequate to validate the integrity of the cache. For this reason, the AppleDisk5.25 driver does not implement caching. Additionally, a status call will never return a disk switched status.

AppleDisk5.25 Driver FileType and AuxType

The AppleDisk5.25 driver is compacted and has a filetype of \$BB as do all GS drivers. The AuxType for the AppleDisk5.25 driver has been set to \$010E indicating that the driver is a GS/OS driver supporting a maximum of 14 (\$0E) devices.



Device Driver Structure

The AppleDisk5.25 driver consists of a driver header, configuration parameter list, device information block and the driver code segment. No scripts exist for the AppleDisk5.25 driver, therefore, no script segment has been provided. No configuration parameters exist for the AppleDisk5.25 driver. The configuration parameter list for each Disk II device has a length word of NIL.

About the Driver Header

The header is used when loading the driver. It indicates where the configuration parameter lists and DIBs are located. The device dispatcher loads only the driver, DIBs and configuration parameter lists using an initial_ load call to the system loader.

The header contains the following information:

Word	Offset to 1st DIB
Word	Count of number of devices = 14
Word	Offset to 1st configuration parameter list for device #1
Word	Offset to 1st configuration parameter list for device #2
Word	Offset to 1st configuration parameter list for device #3
Word	Offset to 1st configuration parameter list for device #4
Word	Offset to 1st configuration parameter list for device #5
Word	Offset to 1st configuration parameter list for device #6
Word	Offset to 1st configuration parameter list for device #7
Word	Offset to 1st configuration parameter list for device #8
Word	Offset to 1st configuration parameter list for device #9
Word	Offset to 1st configuration parameter list for device #10
Word	Offset to 1st configuration parameter list for device #11
Word	Offset to 1st configuration parameter list for device #12
Word	Offset to 1st configuration parameter list for device #12
Word	Offset to 1st configuration parameter list for device #14

About the DIB

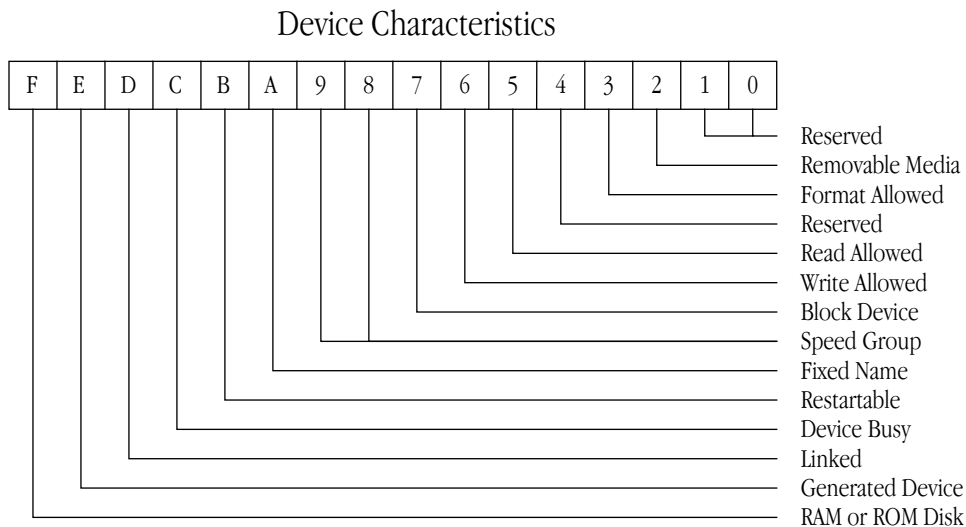
The DIB must contain the following information:

The link pointer is a longword pointing to the next DIB for device drivers supporting multiple DIBs. If the device driver supports only a single DIB then the link pointer should be set to NIL. This is used to install the device drivers into the device list. This pointer does not imply any links between devices.

The entry pointer is a longword pointer to the device driver's entry point. The AppleDisk5.25 driver has a

common entry point referenced by the DIB for each Disk II device.

The device characteristics word parameter describes features that may or may not be supported by the device. The AppleDisk5.25 driver's device characteristics are set to \$03EC indicating that the Disk II is not speed dependent, is a block device and supports removable media, formatting, read and write operations. A pictorial representation of the device characteristics word is shown below:



Definition of the Speed Group bits are as follows:

- 00 1 MHz Device
- 01 2.6 MHz Device
- 10 >2.6 MHz Device
- 11 Device is not speed dependent

Speed independence is achieved through use of the system service call “set_speed” prior to executing time critical sections of the code.

The Block Count is a longword parameter which is only used with block devices. It indicates the total number of blocks accessible on the device. The AppleDisk5.25 driver indicates the number of 512 byte blocks in the DIB as 280 blocks.

Device Name is a 32-byte field which contains a count byte followed by a device name encoded in up to 31 bytes of ASCII. Note that the initial ‘?’ is not included in the device name. The device name must be in upper case with the MSB off. The AppleDisk5.25 driver returns a seven-character name “AppleDisk5.25x” where “x” is a unique character for each Disk II device.

Slot Number is the number of the slot where the device hardware resides. Bits 0 through 2 indicate the slot while bit 3 indicates that the slot is internal or external.

Unit Number is the device number within the slot. This is not a global unit number relating to the device list.

Device Version Number is a word parameter which indicates the version number of either a loaded or generated driver. Generated drivers may use the version number obtained from the slot resident firmware interface. The most significant nibble of the version indicates the major release version while the next two most significant nibbles indicate the minor release version.

The least significant nibble indicates:

- E=Experimental
- A=Alpha
- B=Beta
- 0=Final

The first release of the AppleDisk5.25 driver has a version of \$001A indicating a first alpha phase release. Device ID Number is a word specifying the type of device. The AppleDisk5.25 driver has a device id of \$0000.

The AppleDisk5.25 driver does not support linked devices. Both the Head and Forward links in the DIB are set to a NIL value.

Two additional words have been reserved in the DIB for future expansion. These words are set to NIL.

Disk II Media

The AppleDisk5.25 driver supports only 35 track 16 sector media. Media is formatted with a physical 1:1 interleave. Logical interleave is achieved by using one of two interleave translation tables. DOS operates on 256 byte sectors. ProDOS and Pascal operate on 512 byte blocks consisting of two contiguous logical sectors. Both ProDOS and Pascal use a common logical sector interleave of 2:1 while DOS uses a logical sector interleave of 14:1. Interleave translation table selection is based on the block size set as input to a media access call. Logical to physical sector translations are shown in the figures below:

Disk II Interleave as used by ProDOS:

LOGICAL SECTOR ADDRESS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PHYSICAL SECTOR ADDRESS	0	2	4	6	8	A	C	E	1	3	5	7	9	B	D	F

Disk II Interleave as used by Pascal:

LOGICAL SECTOR ADDRESS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PHYSICAL SECTOR ADDRESS	0	2	4	6	8	A	C	E	1	3	5	7	9	B	D	F

Disk II Interleave as used by DOS 3.3:

LOGICAL SECTOR ADDRESS	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PHYSICAL SECTOR ADDRESS	0	D	B	9	7	5	3	1	E	C	A	B	6	4	2	F

AppleDisk5.25 Driver Calls

All drivers will accept a standard set of calls. AppleDisk5.25 driver calls accessible to an FST or the Device Manager will include:

- DRIVER_OPEN (FST only)
- DRIVER_READ
- DRIVER_WRITE
- DRIVER_CLOSE (FST only)
- DRIVER_STATUS
- DRIVER_CONTROL
- DRIVER_FLUSH (FST only)

The details of each driver call will be described individually. Each of these calls will be described in detail on the following pages.

Driver_Open

Call Parameters: Device Number \neq \$0000
Call Number = \$0001
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

DIB Pointer: This longword points to the device information block for the device being accessed.

This call has no function with block devices. The AppleDisk5.25 driver will return with no error.

Driver_Read

Call Parameters: Device Number \neq \$0000
Call Number = \$0002
Buffer Pointer
Request Count
Transfer Count
Block Size \neq \$0000
FST Number
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

Buffer Pointer: This is a longword pointer to memory where the data is to be written to after being read from the device.

Request Count: This is a longword specifying the number of bytes that the driver is being requested to transfer from the device to the buffer specified by buffer pointer.

Transfer Count: This is a longword returned by the call that indicates the number of bytes actually transferred.

Block Number: This longword parameter specifies the logical address within the block device from which data is to be transferred from. This parameter has no application in character device drivers.

Block Size: This word parameter specifies the size of the block addressed by the block number. This parameter must be a non-zero value for block devices. This parameter must be set to a value of zero for character devices.

FST Number: This word parameter specifies the File System Translator that owns the volume for which the block is being transferred.

DIB Pointer: This longword points to the device information block for the device being accessed.

This call returns the requested number of bytes from the disk starting at the block number specified. The request count must be an integral multiple of the block size. If during a multiple block transaction, the block address exceeds the block address range for the Disk II then a bad block error will be returned with the transfer count indicating the number of bytes read successfully from the Disk II device.

◆ **Note** The AppleDisk5.25 driver supports a block size of 256 bytes or 512 bytes and block counts of 560 and 280 blocks respectively. Logical interleaving on the disk varies with the block size. It should also be noted that if the Disk II has not had a media access call in the one second previous to issuing this call then a disk switched error will be returned except if the call is issued through the device manager. ◆

Driver_Write

Call Parameters: Device Number ≠ \$0000
Call Number = \$0003
Buffer Pointer
Request Count
Transfer Count
Block Size ≠ \$0000
FST Number
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

Buffer Pointer: This is a longword pointer to memory where the data is to be written to after being read from the device.

Request Count: This is a longword specifying the number of bytes that the driver is being requested to transfer from the device to the buffer specified by buffer pointer.

Transfer Count: This is a longword returned by the call that indicates the number of bytes actually transferred.

Block Number: This longword parameter specifies the logical address within the block device from which data is to be transferred from. This parameter has no application in character device drivers.

Block Size: This word parameter specifies the size of the block addressed by the block number. This parameter must be a non-zero value for block devices. This parameter must be set to a value of zero for character devices.

FST Number: This word parameter specifies the File System Translator that owns the volume for which the block is being transferred.

DIB Pointer: This longword points to the device information block for the device being accessed.

This call writes the requested number of bytes to the disk starting at the block number specified. The request count must be an integral multiple of the block size. If during a multiple block transaction, the block address exceeds the block address range for the Disk II then a bad block error will be returned with the transfer count indicating the number of bytes read successfully from the Disk II device.

◆ **Note** The AppleDisk5.25 driver supports a block size of 256 bytes or 512 bytes and block counts of 560 and 280 blocks respectively. Logical interleaving on the disk varies with the block size. It should also be noted that if the Disk II has not had a media access call in the one second previous to issuing this call then a disk switched error will be returned except if the call is issued through the device manager. ◆

Driver_Close

Call Parameters: Device Number ≠ \$0000
Call Number = \$0004
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

DIB Pointer: This longword points to the device information block for the device being accessed.

This call has no function with block devices. The AppleDisk5.25 driver will return with no error.

Driver_Status

Call Parameters: Device Number \neq \$0000
Call Number = \$0005
Status List Pointer
Request Count
Transfer Count
Status Code
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

Status List Pointer: This is a longword pointer to memory where the status list is to be written into.

Request Count: This longword parameter passed to the call indicates the number of bytes to be transferred. If the request count is smaller than the minimum buffer size required by the call, an error will be returned.

Transfer Count: This is a longword returned by the call that indicates the number of bytes actually transferred.

Status Code: This is a word parameter specifying the type of status request. Status codes of \$0000 through \$7FFF are standard status calls that must be supported by device drivers. Devices supporting device specific status calls should use status codes in the range of \$8000 through \$FFFF. A list of standard status calls is shown below:

\$0000	Device Status
\$0001	Return Configuration Parameters
\$0002	Return Wait / No Wait Status
\$0003	Get Format Options
\$0004 - \$7FFF	Reserved - these status codes to be assigned by Apple Computer, Inc.
\$8000 - \$FFFF	Device Specific

DIB Pointer: This longword points to the device information block for the device being accessed.

This call is used to obtain current status information from the device or the driver. Extensions to the standard set of calls which transfer data or status information from the device or device driver are supported as a subset of this call. The device driver is responsible for validating the status code prior to executing the requested status call. If an invalid status code is passed to the driver, the driver should return a 'BAD CODE' error. The

device dispatcher will set the transfer count to zero prior to calling the device driver. The device driver should set the transfer count to the number of bytes returned as a result of the status call.

Device Status

This call returns a general status followed by a longword specifying the number of blocks supported by the device. Write protect reflects the state of the write protect sense line on the previous media access.

Bit 15 0 = Block count certain, 1 = Block count uncertain for block size

Bit 14 0

Bit 5-13 Reserved (currently read as zero)

Bit 4 1 = Disk in drive, 0 = Disk not in drive

Bit 3 Reserved (currently read as zero)

Bit 2 1 = Write protected, 0 = Write enabled

Bit 1 1 = Device currently interrupting

Bit 0 1 = Disk has been switched

◆ **Note** There is no way to validate media insertion on a Disk II. Bit 4 of the device status word will always be set to a '1'. ◆

Status List: Word General status word
 Long Number of blocks supported by device

Return Configuration Parameters

This call returns a byte count as the first word in the status list which indicates the length of the configuration parameter list in bytes. The configuration parameters will be placed into the status list contiguous to the byte count. The Disk II has no parameters in its configuration parameter list and will return with a length word of zero and transfer count of \$00000002.

Status List: Word Length of configuration parameter list
 Data Data returned from configuration parameter list

Wait / No Wait Status

Block devices only operate in WAIT mode. This call always returns a word of \$0000 and a transfer count of \$00000002 for Disk II devices.

Status List: Word Wait status

Get Format Options

This call returns a list of formatting options that may be selected using a Set_Format_Options call prior to issuing a format call to a block device. These parameters may include such variables as format environment, number of blocks, block size, and interleave. Devices that do not support media variables will return with a transfer count of zero and no error. The format of the status list on return from this call when a device does support media variables is as follows:

Returned List: Word Number of entries in list
 Word Number of displayed entries in list
 Word Recommended Default Option
 Word Option that current online media is formatted with

Then each entry in the list consists of 16 bytes containing the following 5 fields:

Word Media variables reference number
Word Reference number of linked entry
Word Flags
Long Number of blocks supported by device
Word Block Size
Word Interleave Factor
Word Media size (block count * block size)

Flags word definition is as follows: Bits 0 – 1 Format Type
 Bits 2 – 3 Size Multiplier
 Bits 4 – 15 Reserved (must be zero)

Format Type definition is as follows: 00 Universal Format
 01 Apple Format
 10 Non Apple Format
 11 Not valid

Size Multiplier definition is as follows:
 00 Size in bytes
 01 Size in kilobytes

- 10 Size in megabytes
- 11 Size in gigabytes

The AppleDisk5.25 driver returns format options as follows:

Transfer count = \$00000028 (40 bytes returned in list)

Returned List: \$0002 Two entries in list

- \$0001 Only one display entries
- \$0001 Recommended default is option #1
- \$0000 Current media formatted is unknown
- \$0001 Refnum = Option #1
- \$0002 LinkRef = Option #2
- \$0004 Universal format / size in kilobytes
- \$00000118 Block count = 280
- \$0200 Block size = 512 bytes
- \$0000 Interleave factor = n/a (fixed physical interleave)
- \$008C Media size = 140 kilobytes
- \$0002 Refnum = Option #2
- \$0000 LinkRef = NIL
- \$0004 Universal format / size in kilobytes
- \$00000230 Block count = 560
- \$0100 Block size = 256 bytes
- \$0000 Interleave factor = n/a (fixed physical interleave)
- \$008C Media size = 140 kilobytes

Get Last Volnum (\$8001)

This is the only device-specific status call that the AppleDisk5.25 driver supports. It returns the volume number (read from the address field of a sector) of the last accessed disk in the status list. The RequestCount field of the parameter block must be 2. If no disk access has occurred prior to issuing this call, a volume number of 0 will be returned.

Status List: Word Volume number

Driver_Control

Call Parameters:

Device Number ≠ \$0000
Call Number = \$0006
Control List Pointer
Request Count
Transfer Count
Control Code
DIB Pointer

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

Control List

Pointer: This is a longword pointer to memory where the control list is to be read from.

Request Count: This longword parameter passed to the call indicates the number of bytes to be transferred. If the request count is smaller than the minimum buffer size required by the call, an error will be returned.

Transfer Count: This is a longword returned by the call that indicates the number of bytes actually transferred.

Control Code: This is a word parameter specifying the type of control request. Status codes of \$0000 through \$7FFF are standard control calls that must be supported by device drivers. Devices supporting device specific control calls should use control codes in the range of \$8000 through \$FFFF. A list of standard control calls is shown below:

\$0000	Reset Device
\$0001	Format Device
\$0002	Eject
\$0003	Set Configuration Parameters
\$0004	Set Wait / No Wait Mode
\$0005	Set Format Options
\$0006	Assign Partition Owner
\$0007	Arm Event
\$0008	Disarm Event

\$0009 - \$7FFF Reserved - these status codes to be assigned by Apple Computer, Inc.
\$8000 - \$FFFF Device Specific

DIB Pointer: This longword points to the device information block for the device being accessed.

This call is used to send control information to the device or the device driver. Extensions to the standard set of calls which transfer data or control information to the device or device driver are supported through the use of device specific control codes.

The device driver is responsible for validating the control code and control list length prior to executing the requested control call. If an invalid control code is passed to the driver, the driver should return a 'BAD CODE' error. If an invalid control list length is passed to the driver, the driver should return a 'BAD PARAMETER' error. The device driver should set the transfer count to the number of bytes processed as a result of a successful control call.

Reset Device

This control call is used to reset a particular device to its default settings. This call has no function with the AppleDisk 5.25 driver and returns with no error.

Control List: Word Length of control list (\$0000)

Format Device

This control call is used to format the media used by a block device. This call is not linked to any particular file system. It simply prepares all blocks on the media for reading and writing.

Control List: Word Length of control list (\$0000)

Eject

The Disk II device does not have any mechanism apart from the user's hand for ejecting media. This call has no function with the AppleDisk5.25 driver and returns with no error.

Control List: Word Length of control list (\$0000)

Set Configuration Parameters

This call has no function with the AppleDisk5.25 driver and returns with no error.

Control List: Word Length of configuration parameter list (\$0000)
 Data Configuration Parameter List Data

Wait / No Wait Mode

All block devices including the Disk II operate in WAIT mode only. Setting the AppleDisk5.25 driver to wait mode results in no error. If a call is issued to set the AppleDisk5.25 driver to no wait mode, then a bad parameter error will be returned.

Control List: Word Length of control list (\$0002)
 Word Wait / No Wait Mode

Set Format Options

This call has no function with the AppleDisk5.25 driver since only a single fixed physical interleave is supported. This call returns with no error.

Control List: Word Length of control list (\$0004)
 Word Format_RefNum
 Word Interleave_Factor

Assign Partition Owner

This call has no function with the AppleDisk5.25 driver and returns with no error.

Control List: String Class 1 string specifying partition owner

Arm Signal

This call has no function with the AppleDisk5.25 driver and returns with no error.

Control List:	Word	Signal Code
	Word	Priority
	Longword	Signal Handler Address

Disarm Signal

This call has no function with the AppleDisk5.25 driver and returns with no error.

Control List:	Word	Signal Code
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Set Next Volnum (\$8001)

This device specific control call allows the caller to specify the volume number to use the next time the Format control call is made. The volume number specified must be in the range 0-254. If 0, it will default to 254. The Format call will reset this to zero after performing the format. Therefore, the volume number must be set explicitly each time a disk is to be formatted if the volume number is not to be defaulted.

Control List:	Word	Volume number
---------------	------	---------------

Driver_Flush

Call Parameters:	Device Number	≠ \$0000
	Call Number	= \$0007
	DIB Pointer	

Device Number: This word parameter specifies which device is to be accessed by the call. This parameter must be a non-zero value.

Call Number: This word parameter specifies which type of call is to be issued to the device.

DIB Pointer: This longword points to the device information block for the device being accessed.

This call has no function with the AppleDisk5.25 driver and returns with no error.

Device Driver Error Codes

All error codes listed below must be supported by device drivers wherever applicable. All block device drivers must support disk switched errors without exception. Please take note that the error codes are returned from a device driver must have the high byte cleared. The device dispatcher maintains certain error codes under certain conditions. Device dispatcher error codes are passed in the upper byte of the accumulator.

Error Code	Description	Mnemonic
\$0000	No error occurred	NO_ERROR
\$0010	Device not found	DEV_NOT_FOUND
\$0011	Invalid Device Number	INVALID_DEV_NUM
\$0020	Invalid request	DRVR_BAD_REQ
\$0021	Invalid control or status code	DRVR_BAD_CODE
\$0022	Invalid parameter	DRVR_BAD_PARM
\$0023	Device not open (character driver only)	DRVR_NOT_OPEN
\$0024	Device already open (character driver only)	DRVR_PRIOR_OPEN
\$0026	Resource not available	DRVR_NO_RESRC
\$0027	I/O error	DRVR_IO_ERROR
\$0028	Device not connected	DRVR_NO_DEV
\$0029	Device is busy	DRVR_BUSY
\$002B	Write Protected (block driver only)	DRVR_WR_PROT
\$002C	Invalid Byte Count	DRVR_BAD_COUNT
\$002D	Invalid Block Number (block driver only)	DRVR_BAD_BLOCK
\$002E	Disk Switched (block driver only)	DRVR_DISK_SW
\$002F	Device Off Line or No Media Present	DRVR_OFF_LINE
\$004E	Invalid access or access not allowed	INVALID_ACCESS
\$0058	Not a block device	NOT_BLOCK_DEV
\$0060	Data is unavailable	DATA_UNAVAIL