Sequential Systems

RamFAST

Programmer's Specifications

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Note: These calls are only valid for V3.xx roms.

SmartPort Commands

The majority of this document explains the various SmartPort commands that the RamFAST firmware implements. There are the required commands (STATUS, READBLOCK, WRITEBLOCK, FORMAT, and CONTROL) as well as a number of 'extended' commands (INIT, OPEN/REWIND, CLOSE, READ, and WRITE). The required commands operate according to the description of the basic SmartPort calls in the Apple IIGS Firmware Reference Manual, but are also described below for convenience. The extended calls offer low-level control of SCSI devices on the bus, allowing the caller to send actual SCSI commands to a device.

These commands are made in the same way SmartPort calls are normally made (as per the IIGS Firmware Reference). However, for those programming solely for the IIGS's 16-bit programming environment, this method is difficult to use because SmartPort calls must be made from emulation mode in bank 0. There is a way to send SmartPort calls directly to the RamFAST from GS/OS without entering native mode; see the sample source code file "rfscsi.asm".
STATUS

The Status call returns status information about a specific device or a summary of information concerning the devices connected to the RamFAST/SCSI. On return from a Status call, the X and Y registers contain a count of the number of bytes transferred to the host. X contains the low byte of the count and Y contains the high byte of the count.

CMDNUM	$00
CMDLIST	Parameter count
	SCSI unit number
	Status list pointer (low byte)
	Status list pointer (high byte)
	Status code
	Page count (Code = $04 only)
	RamFAST address (low byte) "
	RamFAST address (middle byte) "

RamFAST address (high byte) "

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Scsi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Status list pointer	Word pointer to the buffer to receive the status list
Status code	Byte value in the range $00 - $FF
Page count	Byte value in the range $01 - $7F

Status code — Status returned

- $00 Returns a summary of the devices controlled by the RamFAST
- $01 Returns the current RamFAST configuration data
- $02 Returns a summary of current/pending background operations
- $03 Returns the RamFAST's most recent sense data (after an error)
  If the Scsi unit is a tape drive then the sense data obtained before the last REWIND command is returned.
- $04 Returns a specified portion of the RamFAST's memory space, pointed to by the "RamFAST Address" field.
- $05 Returns a compressed partition map of the specified device
- $06 Returns a compressed volume/partition map of active partitions
- $07 Returns device info portion of compressed volume/partition map
- $08 Returns RamFAST.System regardless of RomDISK status
- $09 Returns RamFAST.Driver regardless of RomDISK status

Code = $00
STSLST $100 Device Summary Block (see Appendix A for detailed info)

Code = $01
STSLST $100 RamFAST Configuration Block (see Appendix B for detailed info)

Code = $02
STSLST Status byte (see below)
Blocks copied (low byte)
Blocks copied (middle byte)
Blocks copied (high byte)
Blocks pending (low byte)
Blocks pending (middle byte)
Blocks pending (high byte)
Error count (low byte)
Error count (high byte)

Status byte definition:

7	6	5	4	3	2	1	0
ACT	FIN						

ACT - Background operations are currently in progress
FIN - All pending background operations have been completed

Code = $03
STSLST Device specific sense data (up to $30 bytes in length)

Code = $04
STSLST $100-$10000 bytes of memory from the RamFAST's internal memory

Code = $05
STSLST $200 Compressed Volume/Partition Map (see Appendix C. for detailed info)

Code = $06
STSLST $200 Compressed Volume/Partition Map (see Appendix C. for detailed info)

Code = $07
STSLST $80 Device Information Block (see Appendix D. for detailed info)

Code = $08
STSLST RamFAST/SCSI Utility Program (Allow at least 14k)

Code = $09
STSLST RamFAST/SCSI GS/OS Driver (Allow at least 2k)

READBLOCK

The Read call reads one 512-byte block from the block device specified by the SCSI unit number passed in the parameter list. The specified device must already be Open. The block is read into memory starting at the adress specified by the data buffer pointer passed in the parameter list.

CMDNUM	$01
CMDLST	Parameter count
	SCSI unit number
	Data buffer pointer (low byte)
	Data buffer pointer (high byte)
	Block number (low byte)
	Block number (middle byte)
	Block number (high byte)

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Scsi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Data buffer pointer	Word pointer to the buffer to receive the data
Block number	3-byte value is the physical address of block to be read

WRITEBLOCK

The write call Writes one 512-byte block to the block device specified by the SCSI unit number passed in the parameter list. The specified device must already be Open. The block is read from memory starting at the adress specified by the data buffer pointer passed in the parameter list.

CMDNUM	$02
CMDLST	Parameter count
	Scsi unit number
	Data buffer pointer (low byte)
	Data buffer pointer (high byte)
	Block number (low byte)
	Block number (middle byte)
	Block number (high byte)

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Scsi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Data buffer pointer	Word pointer to the buffer containing the data
Block number	3-byte value is the physical address of block to write

FORMAT

The Format command is used to perform a low-level format of the block device specified by the SCSI unit number passed in the parameter list. The call optionally returns a compressed volume/partition map of the default partitions that have been created.

CMDNUM	$03
CMDLST	Parameter count
	Scsi unit number
	Buffer pointer (low byte)
	Buffer pointer (high byte)
	Interleave
	Format code

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
SCSI unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Buffer pointer	Word pointer to buffer for Compressed Partition Map
Interleave	Byte value in the range $00 - $FF
Format code	Byte value in the range $00 - $FF

Format code	Function
$00	No-frills, plain-jane SCSI format
$01	Special format command for the Sider D4 and D4T drives
$02	Special format command for the Sider D2 drives
$03	Special format command for the old Sider and Sider 2 drives
$04	SASI tape format command (uses the ERASE_UNIT command)
$05	Semi-normal SCSI format that frees the blocks in the defect list

CONTROL

The Control command is used to initiate, manipulate, and/or setup special features of the RamFAST/SCSI. On return from a Control call, the X and Y registers contain a count of the number of bytes transferred from the host. X contains the low byte of the count and Y contains the high byte of the count.

CMDNUM	$04		
CMDLST	Parameter count		
	Scsi unit number	Source ID (Code = $07)	
	Control list pointer (low byte)		
	Control list pointer (high byte)		
	Control code		
	(Code = $04)	(Code = $07)	(Code = $08)
	Page count	Source offset	
	Address (low byte)	Destination offset	Tape block (low)
	Address (middle byte)		Tape block (mid)
	Address (high byte)		Tape block (high)

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Scsi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Control list pointer	Word pointer to the buffer containing the control info
Control code	Byte value in the range $00 - $FF
Page count	Byte value (Code = $04 only) = number of $100 byte pages of data to return Address3-Byte value (Code = $04,$08 only) = 20-bit address in the RamFAST's physical address space or current block for tape device after SCSI commands
Source offset	Byte value (Code = $07 only) = 0-based offset of the source partition to be restored
Destination offset	Byte value (Code = $07 only) = 0-based offset of the destination partition to be restored

Control code	Function
$00	Background copy
$01	Update the RamFAST's configuration data
$02	Validate a user password
$03	Set a new user password
$04	Modifies a specified portion of the RamFAST's memory space
$05	Partition a drive using a compressed partition map
$06	Built-in image backup using compressed device list
$07	Built-in image restore
$08(V3.00i)	Set tape position

Code = $00 NOTE: Either the source or the destination must be Opened.

CTRLST	Internal flag byte (Byte value should be $00)
	SCSI unit number (source)
	SCSI unit number (destination)
	Block count (low byte)

Block count (middle byte)
Block count (high byte)
Source block number (low byte)
Source block number (middle byte)
Source block number (high byte) ($000000 = Autoincrement)
Destination block number (low byte)
Destination block number (middle byte)
Destination block number (high byte) ($000000 = Autoincrement)

Code = $01
CTRLST $100 RamFAST Configuration Block

Code = $02
CTRLST Password length (byte value)
Password (up to 15 bytes)

Code = $03
CTRLST Password length (byte value)
Password (up to 15 bytes)

Code = $04
CTRLST $100-$10000 bytes of data to write to the RamFAST's internal memory

Code = $05
CTRLST $200 Compressed Volume/Partition Map

Code = $06
CTRLST $200 Compressed Volume/Partition Map

Code = $07
CTRLST <empty>

Code = $08
CTRLST <empty>

INIT

The Init command is used to clear the RamFAST's cache memory and rebuild it's internal drive table. It will also deallocate any buffers associated with the Read/Write or Open commands. This call should not be made with any devices still OPEN (they will be closed but NOT flushed in the process!)

CMDNUM	$05
CMDLST	Parameter count
	Unit number
	Address (low byte)
	Address (high byte)
	Cache-only flag

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Unit number	Byte value = $80
Address	Word value (reserved)
CacheOnly flag (V3.00i)	Byte value: $00 = As described, $FF = Only clear cache

OPEN/REWIND

The Open command is used before beginning R/W operations involving a tape drive. It allocates a R/W buffer in memory and issues a REWIND command to the specified unit. Only one device can be open at a time since it is mainly meant to be used for tape drives. If you need to read or write to a device that is not open you should use READ and/or WRITE (using SCSI read/write commands) instead of the READBLOCK/WRITEBLOCK commands.

If the device is already open then the command is interpreted as a REWIND command. After flushing the R/W buffer, if necessary, the tape is rewound to the beginning. Note that you can not switch modes on the fly with a second Open command. If the specified mode does not match the current mode then an offline error will be returned.

If a sense data pointer is specified then control will be held until the rewind is complete at which time the sense data obtained prior to the rewind command will be transferred into the buffer at the specified address and the X and Y registers will contain a count of the number of bytes transferred to the host. X contains the low byte of the count and Y contains the high byte of the count.

CMDNUM	$06
CMDLST	Parameter count
	Scsi unit number
	Sense data pointer (low byte)
	Sense data pointer (high byte)
	Access mode
	Buffer size
	Rewind inhibit

Required Parameters

Parameter count	Byte value = $03 (We ignore this :))
Scsi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Sense data pointer	Word pointer to buffer to receive the sense data If this pointer is $0000 control is returned immediately and the rewind is done after all other background operations have been processed. The sense data can then be retrieved using the Status call with Status code = $03.
Access mode	Byte value: $7F = Read, $FF = Write
Buffer size	Byte value: $01 = 8k, $02 = 16k, $04 = 32k
Rewind inhibit (V3.00i)	Byte value: $00 = Auto-rewinds, $FF = NO Auto-rewinds

CLOSE

The Close command is used at the end of tape operations to flush any data still being held in the R/W buffer, deallocate the R/W buffer, and REWIND the device. It also (optionally) returns the SCSI sense data obtained prior to issuing the REWIND command.

If a sense data pointer is specified then control will be held until the rewind is complete at which time the sense data obtained prior to the rewind command will be transferred into the buffer at the specified address and the X and Y registers will contain a count of the number of bytes transferred to the host. X contains the low byte of the count and Y contains the high byte of the count.

CMDNUM	$07
CMDLST	Parameter count
	Scsi unit number
	Sense data pointer (low byte)
	Sense data pointer (high byte)

Required Parameters

Parameter count	Byte value = $02 (We ignore this :))
SCSIi unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
Sense data pointer	Word pointer to buffer to receive the sense data If this pointer is $0000 control is returned immediately and the rewind is done after all other background operations have been processed. The sense data can then be retrieved using the Status call with Status code = $03.

READ

The Read command is used to execute any SCSI command that returns data to the initiator.

On return from a Read call, the X and Y registers contain a count of the number of bytes transferred to the host. X contains the low byte of the count and Y contains the high byte of the count. If an error occured then this count is the number of bytes of sense data returned.

NOTE: You should avoid issuing commands that move the read/write head on an open device. If you feel you must then you should issue another Open command to REWIND the device to a known position. Failure to do so may cause erratic results and/or loss of data.

CMDNUM	$08
CMDLST	Parameter count
	SCSI unit number
	SCSI command pointer (low byte)
	SCSI command pointer (high byte)
	Buffer disposition flag
	Allocation length (low byte)
	Allocation length (high byte)
	SCSI data pointer (low byte)
	SCSI data pointer (high byte)

Required Parameters

Parameter count	Byte value = $04 (We ignore this :))
SCSI unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
SCSI command pointer	Word pointer to a 12 byte SCSI command buffer. This should be followed immediately by a $30 byte buffer to receive the sense data in case of an error.
Buffer disposition flag	Byte flag: $00 = Keep, $FF = Ditch, buffer after command
Allocation length	Word value limiting amount of data that will be returned
SCSI data pointer	2-byte pointer to the buffer to receive any data

WRITE

The Write command is used to execute any SCSI command that sends data to the target device (or has no data at all).

On return from a Write call, the X and Y registers contain a count of the number of bytes transferred to the host. X contains the low byte of the count and Y contains the high byte of the count. If an error occurred then this count is the number of bytes of sense data returned.

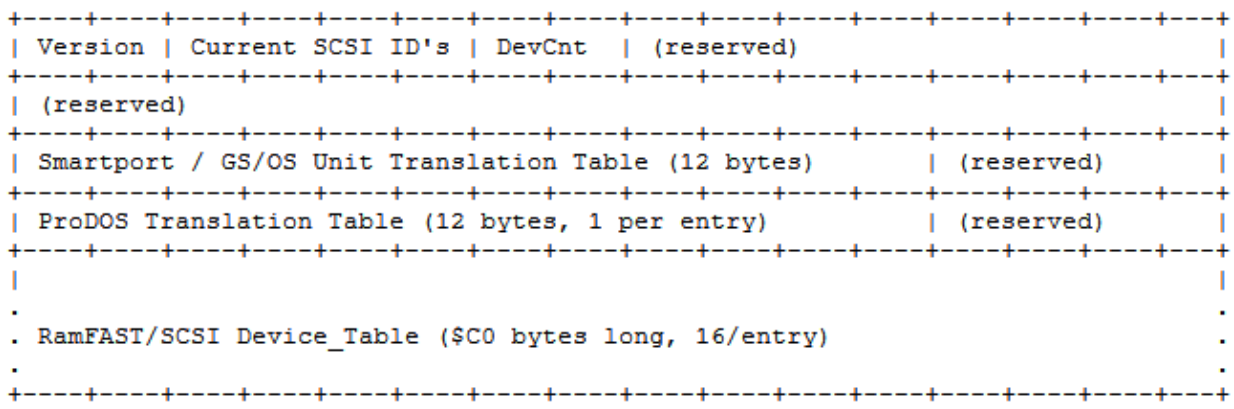
NOTE: You should avoid issuing commands that move the read/write head on an open device. If you feel you must then you should issue another Open command to REWIND the device to a known position. Failure to do so may cause erratic results and/or loss of data.

CMDNUM	$09
CMDLST	Parameter count
	SCSI unit number
	SCSI command pointer (low byte)
	SCSI command pointer (high byte)
	Buffer disposition flag
	Byte count (low byte)
	Byte count (high byte)
	SCSI data pointer (low byte)
	SCSI data pointer (high byte)

Required Parameters

Parameter count	Byte value = $04 (We ignore this :))
SCSI unit number	Byte value in the range $80 to $87 (SCSI ID 0 - 7)
SCSI command pointer	Word pointer to a 12 byte SCSI command buffer. This should be followed immediately by a $30 byte buffer to receive the sense data in case of an error.
Buffer disposition flag	Byte flag != $00 to deallocate buffer after command
Byte count	Word value giving number of bytes to transfer
SCSI data pointer	2-byte pointer to the buffer containing data to send

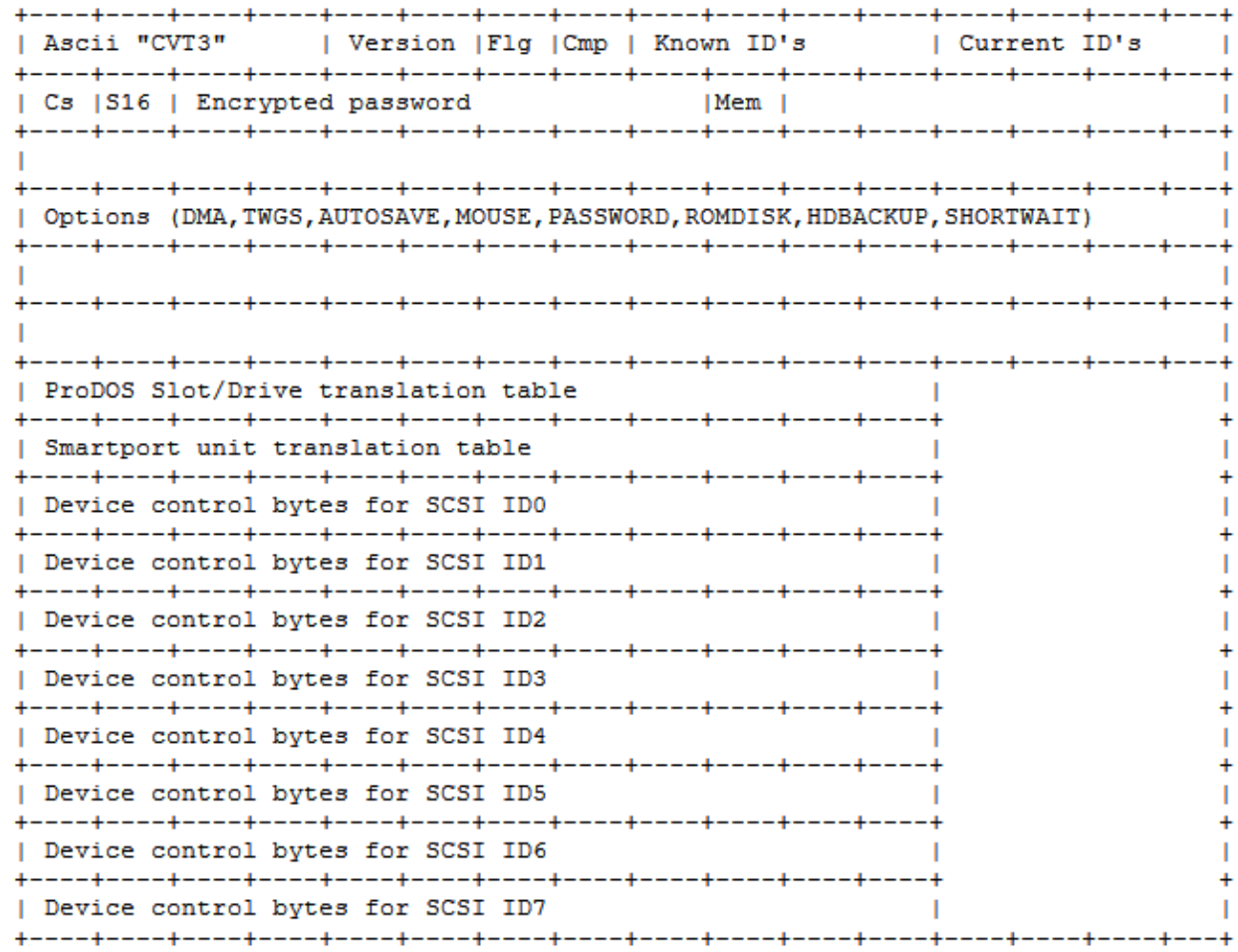
Appendix A: Format of the Device Summary Block



Version	Version of the ROM installed in the board
Current SCSI IDs	Bytes containing (in order) ALL, HDS, TAPES, REMOVABLES
DevCount	Count of valid entries in the RamFAST/SCSI Device Table
Smartport /GS-OS Translations	Smartport / GS/OS Units for entries in the Device Table
ProDOS Translations	ProDOS Slot/Drives (ssssdddd) for entries in the
Device_Table	RamFAST/SCSI Device Table
	12 entries consisting of 16 bytes each (see offsets below)

Device	Table offsets:	
DRV_STATUS	$00	Entry status byte (see equates below)
DRV_PAGE_SIZE	$01	Number of pages/physical block
DRV_TYPE	$02	GS/OS drive type (see equates below)
DRV_CLASS_ZERO	$03	Number of bytes for a Class 0 SCSI command
DRV_UNIT	$04	SCSI id ($80,$40,...,$01) ($00 for RomDISK)
DRV_OFFSET	$05	Partition offset on device ($00..$0B)
DRV_SIZE	$06	Address of last valid block on drive (3bytes)
DRV_BASE_BLK	$09	Base block number of partition on drive (3bytes)
DRV_PENDING	$0C	Number of blocks waiting to be written to drive (2bytes)
DRV_LOOKAHEAD	$0E	Current lookahead ($00-$07:Number of 4k segments)
DRV_RESERVED	$0F	($08-$0F:AutoLookahead is active)
DRVSTS_ONLINE	$80	(0/1) (NO/YES)
DRVSTS_LINKED	$40	(NO/YES)
DRVSTS_WRPROT	$20	(NO/YES)
DRVSTS_BACKGROUND	$10	(NO/BACKGROUND OPERATIONS PENDING)
DRVSTS_DISKSW	$08	(NO/YES)
DRVSTS_SASI	$04	(SCSI/SASI)
DRVSTS_BLOCK_SIZE	$02	(INVALID/VALID)
DRVSTS_REMOVABLE	$01	(NO/YES)
DRV_TYPE_NODRIVE	$00	
DRV_TYPE_HARD_DRIVE	$05	
DRV_TYPE_TAPE_DRIVE	$06	(SCSI Tape Drive)
DRV_TYPE_CD_ROM	$07	
DRV_TYPE_ROMDISK	$0F	
DRV_TYPE_GENERIC_TAPE	$15	(SASI Tape Drive)

Appendix B: Format of the RamFAST Configuration Block



Offset	Label	Description
$00	IDENT	Ascii ID String "CVTr" where "r" is: "1" for Version 1.xx "2" for Version 2.xx "3" for Version 3.xx
$04	VERSION	RamFAST ROM Version Number in the Format $VRRP where: V is the Major Version Number (1,2,3) RR is the Minor Revision (.00,.01,...) P is the Patch Level (a,b,c,...) So, V5.12c would be represented as $5122
$06	FLAGS	Bit mask of flags used by the RamFAST/SCSI Utilities Bit 0 set - No configuration data found Bit 1 set - Outdated configuration data found Bit 2 set - Card has been moved to another slot Bit 3 set - A new SCSI device has been connected Bits 4 - 6 are not currently used Bit 7 is set before a Set Configuration Block control call to signal the RamFAST to save the changes to the disk, thus making the changes permanent
$07	COMPUTER	Byte value that differentiates the type of computer that the RamFAST is

		installed in: 00 - Apple IIe 01 - Apple IIgs ROM01 03 - Apple IIgs ROM03
$08	KNOWN-IDS	Byte masks containing a summary of all devices that are known to be (or to have been) connected to the RamFAST where Bit 0 set indicates that a device with SCSI ID0 is known. Bit 1 set indicates that a device with SCSI ID1 is known. And so forth. Byte 0 - Composite mask of all known devices Byte 1 - Mask of all known Hard Drive type devices Byte 2 - Mask of all known Tape Drive type devices Byte 3 - Not currently used
$09	CURR-IDS	Byte masks containing a summary of the current devices that are connected to the RamFAST (this field uses the same conventions and offsets as KNOWN-IDS).
$10	CSLOT	The slot in the computer that the RamFAST is installed in logically or'd with $C0 giving a value from $C1 to $C7
$11	SLOT16	The slot in the computer that the RamFAST is installed in logically shifted 4 times giving a value from $10 to $70
$12	PASSWORD	The encrypted user password (if one has been specified)
$19	MEM	Flag indicating the amount of cache memory installed in the RamFAST. $00 – 256k $FF - 1meg
$30	OPTIONS	These are flag bytes indicating the current state of the options settings for the RamFAST. $00 - No $FF - Yes DMA - Controls whether or not to DMA to expansion memory (or at all in a IIe). If the TWGS setting is "No" then this setting is ignored in a IIgs. TWGS – Set to indicate whether there is an AE TWGS installed in the system. An incorrect setting of this option can cause erratic system behavior. AUTOSAVE - Set to indicate that the Configuration Data Block should automatically be saved when exiting the RamFAST Utilities. MOUSE - Set to indicate that a mouse is available for use by the RamFAST Utilities. PASSWORD - Set to indicate that the RamFAST Utilities should ask for the User Password before allowing entry into the program. ROMDISK - Set to indicate whether or not CVTech.ROM should be mapped into the RamFAST's device table. HDBACKUP - Set to indicate that devices other than Tape Drives should be allowed to be selected as the destination/source when using the RamFAST Utilities built-in Backup and Restore commands. SHORTWAIT - Set to indicate that the RamFAST should not wait for offline devices to come up to speed at power up. If this byte is set the RamFAST will stop searching for SCSI devices as soon as it finds a valid Configuration Data Block.
$60	PRODOS	This is a 12 byte table containing ProDOS Slot/Drive values for the 12 entries in the RamFAST device table. The values have the format $SD where S is the Slot and D is the Drive. So $71 would be Slot7, Drive1.
$70	SMARTPORT	This is a 12 byte table containing the Smartport/GS/OS unit numbers that

correspond to the 12 entries in the RamFAST device table. The values are $01 thru $0C.

$80 CTRL-BYTES This is a 128 byte table with 8 entries (1 per SCSI ID). Each entry is 16 bytes long (the last 4 bytes are not used). The first 12 bytes in each entry are the default control bytes for the partitions stored on the Hard Drive at that SCSI ID:

- Bits 0-2 - Number of 4k segments for lookahead
- Bit 3 set - Set to indicate Auto Lookahead
- Bit 5 set - Set to indicate Write Protected
- Bit 7 set - Set to indicate Active

Appendices C & D purposefully omitted from this document

Appendix E: Example Code Fragments

These code fragments assume the RamFAST is installed in Slot7 and that the CD-ROM's SCSI ID is 2.

1) Play music on a NEC CD-ROM player (Note: this example doesn't actually play music on an NEC CD-ROM, but it does properly show how to make RamFAST SmartPort calls).

```
RamFAST       equ     $C70D
ScsiUnit      equ     $82
              org     $2000
ReadTOC       jsr     RamFAST          * Get MIN and MAX TrackNO
        db    $08
        dw    TOCParms
SkipFWD       lda     #$03
              sta     SkipCommand+5
              jsr     RamFAST          * Start playing on Track 3
              db      $08
              dw      SkipParms
PlayCD        lda     TOCData+1
              sta     PlayCommand+5       * Play to the end of the CD
              jsr     RamFAST
              db      $08
              dw      PlayParms
              rts
TOCParms      db      $04
              db      ScsiUnit
              dw      TOCCommand
              dw      4
              dw      TOCData
TOCCommand    db      $DE,0,0,0,0,0,0,0,0,0,0
              blkb    $30,0
TOCData       blkb    4,0     * Byte0 is MIN Track NO;  Byte 1 in MAX (both in BCD)
SkipParms     db      $04
              db      ScsiUnit
              dw      SkipCommand
              dw      0
              dw      0
SkipCommand   db      $D8,$00,0,0,0,0,0,0,0,$80,0,0
              blkb    $30,0
PlayParms     db      $04
              db      ScsiUnit
              dw      PlayCommand
              dw      0
              dw      0
PlayCommand   db      $D9,$03,0,0,0,0,0,0,0,$80,0,0
              blkb    $30,0
```

2) Make RamFAST SmartPort call from GS/OS

The sample code file "rfscsi.asm" shows how to send one of the SmartPort commands directly to the RamFAST via the RamFAST I/O registers. Use this source code as a library; i.e., call the SmartPort command routine but do not attempt to access the RamFAST registers directly.