For forensic validation, the device must absolutely, positively provide protection against changes to the data on the drive under ANY circumstances (regardless of which drivers are used, loaded, or how it represents itself to the Operating System. There is no margin for error on this account.

In order for a device to be forensically certified it MUST block ANY AND ALL writes to the attached drive regardless of Operating System or Access Mechanisms.

Description of the Read Only firmware for the FW-i345MR-WP

There is a main ASIC inside the FW-i345MR-WP. This main ASIC acts as an I/O bridge between AT Attachment (ATA) storage devices and the 1394 Bus.

The FW-i345MR-WP firmware accepts Reduced Block Commands (RBC) through the standard 1394/SBP-2 (Serial Bus Protocol 2) mechanisms and translates it into ATA6 commands and sends it to the hard disk. After the ATA command is executed by the hard disk, the firmware of FW-i345MR-WP will read status information from the hard disk, translate it to request sense information, and forward it back to the 1394 Host through 1394/SBP2 protocols.

Table 1 provides a summary of Reduced Block Command set (RBC), which is support by FW-i345MR-WP for block device.

Table 2 provides a summary of all ATA6 commands with the protocol, required use, and command code.

Table 3 defines the command Translation Table from RBC commands to ATA6 commands for both FW-i345MR-WP normal firmware and read-only firmware. The only RBC Write related command that the read-only firmware blocks that does not return an error is the "WRITE" command. FW-i345MR-WP just sends a good status back to the host/system and it thinks the command completed (That's why on some Operating Systems like Windows and Macintosh you will see an icon of the file, like it was copied, but if you refresh or re-mount, the file is not there).

The other RBC commands are not write to the drive related in this case, since read-only firmware blocks the WRITE command. For example, the "Synchronize Cache" won't write anything as the "WRITE" command is blocked. The "WRITE BUFFER" command is not used in our code for the ATA hard drive, only for FW-i345MR-WP firmware flash updating.

We do not accept ATA commands from the host/system with the Read Only firmware. Therefore with FW-i345MR-WP Read-only firmware, any ATA hard disk can be read through 1394 bus without the risk of any writing contamination from Host/System.

Table 1 - Reduced Block Command set

Command name	OpCode	Command Support		Reference
		Fixed	Removable	
FORMAT UNIT	04h	O	O	RBC
INQUIRY	12h	M	M	SPC-2[1]
MODE SELECT (6)	15h	M	M	SPC-2[1]
MODE SENSE (6)	1Ah	M	M	SPC-2[1]
PERSISTENT RESERVE IN	5Eh	O	O	SPC-2[1]
PERSISTENT RESERVE OUT	5Fh	O	O	SPC-2[1]
PREVENT/ALLOW MEDIUM REMOVAL	1Eh	N/A	M	SPC-2[1]
READ (10)	28h	M	M	RBC
READ CAPACITY	25h	M	M	RBC
RELEASE (6)	17h	O	O	SPC-2[1]
REQUEST SENSE	03h	O	O	SPC-2[1]
RESERVE (6)	16h	O	O	SPC-2[1]
START STOP UNIT	1Bh	M	M	RBC
SYNCHRONIZE CACHE	35h	O	O	RBC
TEST UNIT READY	00h	M	M	SPC-2[1]
VERIFY (10)	2Fh	M	M	RBC
WRITE (10)	2Ah	M	M	RBC
WRITE BUFFER	3Bh	M	O	SPC-2[1]

1 – See clause 6, SPC-2 Implementation Requirements for RBC Devices.

Command Support keys:
M = support is mandatory;
N/A = not applicable;
O = support is optional.

Table 2 – ATA 6 Command codes

Protocol	Command	Devices not implement PACKET Command	Command Code
ND	CFA ERASE SECTORS	O	C0h
ND	CFA REQUEST EXTENDED ERROR	O	03h
PI	CFA TRANSLATE SECTOR	O	87h
PO	CFA WRITE MULTIPLE W/OUT ERASE	O	CDh
PO	CFA WRITE SECTORS W/OUT ERASE	O	38h
ND	CHECK MEDIA CARD TYPE	O	D1h
ND	CHECK POWER MODE	M	E5h
ND	DEVICE CONFIGURATION FREEZE LOCK	O	B1h
PI	DEVICE CONFIGURATION IDENTIFY	O	B1h
ND	DEVICE CONFIGURATION RESTORE	O	B1h
PO	DEVICE CONFIGURATION SET	O	B1h
DR	DEVICE RESET	O	08h
PO	DOWNLOAD MICROCODE	O	92h
DD	EXECUTE DEVICE DIAGNOSTIC	M	90h
ND	FLUSH CACHE	M	E7h
ND	FLUSH CACHE EXT	O	EAh
ND	GET MEDIA STATUS	O	DAh
PI	IDENTIFY DEVICE	M	ECh
PI	IDENTIFY PACKET DEVICE	N	A1h
ND	IDLE	M	E3h
ND	IDLE IMMEDIATE	M	E1h
ND	MEDIA EJECT	O	EDh
ND	MEDIA LOCK	O	DEh
ND	MEDIA UNLOCK	O	DFh
ND	NOP	O	00h
P	PACKET	N	A0h
PI	READ BUFFER	O	E4h
DM	READ DMA	M	C8h
DM	READ DMA EXT	O	25h
DMO	READ DMA QUEUED	O	C7h
DMO	READ DMA QUEUED EXT	O	26h
PI	READ LOG EXT	O	2Fh
PI	READ MULTIPLE	M	C4h
PI	READ MULTIPLE EXT	O	29h
ND	READ NATIVE MAX ADDRESS	O	F8h
ND	READ NATIVE MAX ADDRESS EXT	O	27h
PI	READ SECTOR(S)	M	20h
PI	READ SECTOR(S) EXT	O	24h
ND	READ VERIFY SECTOR(S)	M	40h
ND	READ VERIFY SECTOR(S) EXT	O	42h

Protocol	Command	Devices not implement PACKET Command	Command Code
PO	SECURITY DISABLE PASSWORD	O	F6h
ND	SECURITY ERASE PREPARE	O	F3h
PO	SECURITY ERASE UNIT	O	F4h
ND	SECURITY FREEZE LOCK	O	F5h
PO	SECURITY SET PASSWORD	O	F1h
PO	SECURITY UNLOCK	O	F2h
ND	SEEK	M	70h
P	SERVICE	O	A2h
ND	SET FEATURES	M	EFh
ND	SET MAX ADDRESS	O	F9h
ND	SET MAX ADDRESS EXT	O	37h
ND	SET MULTIPLE MODE	M	C6h
ND	SLEEP	M	E6h
ND	SMART DISABLE OPERATIONS	O	B0h
ND	SMART ENABLE/DISABLE AUTOSAVE	O	B0h
ND	SMART ENABLE OPERATIONS	O	B0h
ND	SMART EXECUTE OFF_LINE	O	B0h
PI	SMART READ DATA	O	B0h
PI	SMART READ LOG SECTOR	O	B0h
ND	SMART RETURN STATUS	O	B0h
PO	SMART WRITE LOG SECTOR	O	B0h
ND	STANDBY	M	E2h
ND	STANDBY IMMEDIATE	M	E0h
PO	WRITE BUFFER	O	E8h
DM	WRITE DMA	M	CAh
DM	WRITE DMA EXT	O	35h
DMO	WRITE DMA QUEUED	O	CCh
DMO	WRITE DMA QUEUED EXT	O	36h
PO	WRITE LOG EXT	O	3Fh
PO	WRITE MULTIPLE	M	C5h
PO	WRITE MULTIPLE EXT	O	39h
PO	WRITE SECTOR(S)	M	30h
PO	WRITE SECTOR(S) EXT	O	34h

KEYS:

ND = Non-data command
M = Mandatory
PI = PIO data-in command
O = Optional
PO = PIO data-out command
N = Use prohibited
DM = DMA command
V = Vendor specific implementation
DMO = DMA QUEUED command
E = Retired
DR = DEVICE RESET command
B = Obsolete
DD = EXECUTE DEVICE DIAGNOSTIC command
R = Reserved
P = PACKET command

Table 3 – Command Translation Table from RBC command to ATA6 command

RBC/SBPC-2 Command Supported by FW-i345MR-WP	ATA6 Command	
	Normal Firmware	***Read-Only Firmware***
INQUIRY - 12h	IDENTIFY DEVICE - ECh	IDENTIFY DEVICE - ECh
MODE SELECT (6) - 15h	None	None
MODE SENSE (6) - 1Ah	IDENTIFY DEVICE - ECh	IDENTIFY DEVICE - ECh
PREVENT/ALLOW MEDIUM REMOVAL-1Eh	MEDIA LOCK –DEh/ MEDIA UNLOCK –DFh	MEDIA LOCK –DEh/ MEDIA UNLOCK –DFh
READ (10) – 28h	READ DMA – C8h/ READ DMA EXT - 25h	READ DMA – C8h/ READ DMA EXT - 25h
READ BUFFER – 3Ch	None	None
READ CAPACITY – 25h	IDENTIFY DEVICE - ECh	IDENTIFY DEVICE - ECh
REQUEST SENSE - 03h	None	None
REZERO (6) - 01h	None	None
START STOP UNIT - 1Bh	STANDBY IMMEDIATE - E0h/ READ VERIFY SECTOR - 40h/ READ VERIFY SECTOR EXT - 42h/ MEDIA EJECT - EDh	STANDBY IMMEDIATE - E0h/ READ VERIFY SECTOR - 40h/ READ VERIFY SECTOR EXT - 42h/ MEDIA EJECT - EDh
SYNCHRONIZE CACHE - 35h	FLUSH CACHE - E7h FLUSH CACHE - EAh	FLUSH CACHE - E7h FLUSH CACHE - EAh
TEST UNIT READY –- 00h	None	None
VERIFY (10) - 2Fh	READ VERIFY SECTOR - 40h/ READ VERIFY SECTOR EXT - 42h	READ VERIFY SECTOR - 40h/ READ VERIFY SECTOR EXT - 42h
WRITE (10) - 2Ah	WRITE DMA – CAh/ WRITE DMA EXT – 35h	None
WRITE BUFFER - 3Bh	None	None