

Proposal for Updating SMART Commands and References

To: X3T13 Technical committee
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Subj: Proposal for updating SMART commands and
references based on SFF-8035 Revision 2

Introduction:

Since the inclusion of the optional SMART feature set in ATA-3 there has been a new revision of the original document that described this feature. The new document is SFF-8035i Revision 2. Also during this time an ad hoc industry working group (the SMART Working Group) has been formed to provide recommendations for the implementation of this feature. The following proposal includes information from SFF-8035i Revision 2 taken into account with input from the SWG. This proposal is constructed as and intended to be a "drop-in" replacement for all clauses pertaining to SMART in X3T13/1153D.

Editorial comments are in brackets and underlined.

7.8 Self-monitoring, analysis and reporting technology [There are no changes recommended to the text of this clause.]

[7.8.1 Attributes -- Delete this entire clause.]

[7.8.2 Attribute values -- Delete this entire clause.]

[7.8.3 Attribute thresholds -- Delete this entire clause.]

7.8.1 Device attribute data structure[This is a new clause]

SMART capability and status information for the device are stored in the Device attribute data structure. The off-line data collection capability and status data stored herein may be useful to the host if the SMART EXECUTE OFF-LINE IMMEDIATE command is implemented. (see clause 8.35.5)

7.8.2 Off-line data collection[This is a new clause]

Collection of SMART data in an “off-line” mode shall have an impact on device performance if the device is required to respond to commands from the host while performing its off-line data collection routine. This impact on performance may vary from device to device. The data which is collected or the methods by which the data is collected in this mode may be different than those in the on-line data collection mode for any particular device and may vary from one device to another.

7.8.3 On-line data collection[This is a new clause]

Collection of attribute data in an “on-line” mode shall have no impact on device performance. The SMART data which is collected or the methods by which data is collected in this mode may be different than those in the off-line data collection mode for any particular device and may vary from one device to another.

7.8.4 Threshold exceeded condition[The new text for this clause follows.]

This condition occurs when the device's SMART reliability status indicates an impending degrading or fault condition.

7.8.5 SMART commands[The new text for this clause follows.]

These commands use a single command code and are differentiated from one another by the value placed in the Features register. See Clause 8.35.

If the SMART feature set is implemented, the following commands shall be implemented.

- SMART DISABLE OPERATIONS
- SMART ENABLE/DISABLE AUTOSAVE
- SMART ENABLE OPERATIONS
- SMART RETURN STATUS

If the SMART feature set is implemented, the following commands may be implemented.

- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ ATTRIBUTE DATA

7.8.6 SMART operation with power management modes The new text for this clause follows.

When used with a host that has implemented the Power management feature set, it is recommended that a SMART enabled device should automatically save its accumulated SMART data upon receipt of an IDLE IMMEDIATE, STANDBY IMMEDIATE or SLEEP command or upon return to an active or idle power saving mode from a standby power saving mode. mode (see the S.M.A.R.T. capability bits in the device attribute data structure in Clause 8.35.5).

If a SMART enabled device has been set to utilize its Standby timer, it is recommended that the device automatically save its accumulated SMART data prior to going from an idle power saving mode to the standby power saving mode or upon return to an active or idle power saving mode from a standby power saving mode.

A device shall not execute any routine to automatically save its accumulated SMART data while the device is in a standby or sleep power saving mode.

8.35 SMART [The new text for this clause follows.]

8.35.1 SMART DISABLE OPERATIONS

COMMAND CODE - B0h

TYPE - Optional - SMART feature set. If the SMART feature set is implemented, this command shall be implemented.

PROTOCOL - Non-data command

INPUTS - The Features register shall be set to D9h. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h.

Register	7	6	5	4	3	2	1	0
Features	D9h							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

ERROR OUTPUTS - If the device does not support the SMART feature set, if SMART is not enabled or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	na	na	na	na	ABRT	na	na
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

ABRT if this command is not supported, if SMART is not enabled, or if register values are invalid.

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

DF if drive fault

DRQ shall be cleared to zero

ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command disables all SMART capabilities within the device including any and all timer and event count functions related exclusively to this feature. After receipt of this command the device shall disable all SMART operations. SMART data shall no longer be monitored or saved by the device. The state of SMART (either enabled or disabled) shall be preserved by the device across power cycles.

Upon receipt of the SMART DISABLE OPERATIONS command from the host, the device sets BSY, disables SMART capabilities and functions, clears BSY and asserts INTRQ.

After receipt of this command by the device, all other SMART commands (including SMART DISABLE OPERATIONS commands), with the exception of SMART ENABLE OPERATIONS, are disabled and invalid and shall be aborted by the device, returning the Aborted command error.

8.35.2 SMART ENABLE/DISABLE AUTOSAVE

COMMAND CODE - B0h

TYPE - Optional - SMART feature set. If the SMART feature set is implemented, this command shall be implemented.

PROTOCOL - Non-data command

INPUTS - The Features register shall be set to D2h. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h. The Sector Count register is set to 00h to disable autosave or F1h to enable autosave.

Register	7	6	5	4	3	2	1	0
Features	D2h							
Sector Count	00 or F1h							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS -

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Status register

BSY shall be cleared to zero indicating the command is complete
DRDY shall be set to one

ERROR OUTPUTS - If the device does not support this command, if SMART is disabled or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	na	na	na	na	ABRT	na	na
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

ABRT if this command is not supported, if SMART is not enabled, or if register values are invalid.

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

DF if drive fault

DRQ shall be cleared to zero

ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command enables and disables the autosave feature of the device. Depending upon the implementation, this command may either allow the device, after some vendor specified event, to automatically save its updated SMART data to non-volatile memory; or this command may cause the autosave feature to be disabled. The state of the autosave feature (either enabled or disabled) shall be preserved by the device across power cycles.

A value of zero written by the host to the device's Sector Count register before issuing this command shall cause this feature to be disabled. Disabling this feature does not preclude the device from saving SMART data to non-volatile memory during some other normal operation such as during a power-on or power-off sequence or during an error recovery sequence.

A value of F1h written by the host to the device's Sector Count register before issuing this command shall cause the feature to be enabled. Any other meaning of this value or any other non-zero value written by the host to this register before issuing this command may differ from device to device. The meaning of any non-zero value written to this register at this time shall be preserved by the device across power cycles.

Upon receipt of SMART ENABLE/DISABLE AUTOSAVE from the host, the device sets BSY, enables or disables autosave (depending upon the implementation), clears BSY and asserts INTRQ.

During execution of its autosave routine the device shall not set BSY nor clear DRDY. If the device receives a command from the host while executing its autosave routine it shall respond to the host within two seconds.

8.35.3 SMART ENABLE OPERATIONS

COMMAND CODE - B0h

TYPE - Optional - SMART feature set. If the SMART feature set is implemented, this command shall be implemented.

PROTOCOL - Non-data command

INPUTS - The Features register shall be set to D8h. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h.

Register	7	6	5	4	3	2	1	0
Features	D8h							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS -

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

ERROR OUTPUTS - If the device does not support this command, or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	na	na	na	na	ABRT	na	na
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

ABRT if this command is not supported, or if register values are invalid.

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

DF if drive fault

DRQ shall be cleared to zero

ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command enables access to all SMART capabilities within the device. Prior to receipt of this command SMART data may be neither monitored nor saved by the device. The state of SMART (either enabled or disabled) shall be preserved by the device across power cycles. Once enabled, the receipt of subsequent SMART ENABLE OPERATIONS commands shall not affect any SMART data or functions.

Upon receipt of the SMART ENABLE OPERATIONS command from the host, the device sets BSY, enables SMART capabilities and functions, clears BSY and asserts INTRQ.

8.35.4 SMART EXECUTE OFF-LINE IMMEDIATE

COMMAND CODE - B0h

TYPE - Optional - SMART feature set. If the SMART feature set is implemented, this command may be implemented.

PROTOCOL - Non-data command

INPUTS - The Features register shall be set to D4h. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h.

Register	7	6	5	4	3	2	1	0
Features	D4h							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS -

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Status register

BSY shall be cleared to zero indicating the command is complete
DRDY shall be set to one

ERROR OUTPUTS - If the device does not support this command, if SMART is disabled or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	na	na	IDNF	na	ABRT	na	AMNF
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

IDNF if S.M.A.R.T. data sector's ID field could not be found or data structure checksum occurred.
 ABRT if this command is not supported, if S.M.A.R.T. is not enabled, or if register values are invalid.
 AMNF if data structure or data structure revision number error occurred.

Status register

BSY shall be cleared to zero indicating the command is complete
 DRDY shall be set to one
 DF if drive fault
 DRQ shall be cleared to zero
 ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command causes the device to immediately initiate the optional set of activities that collect SMART data in an off-line mode and then save this data to the device's non-volatile memory.

If the SMART EXECUTE OFF-LINE IMMEDIATE command is supported by the device: upon receipt of the command from the host, the device sets BSY, begins its set of off-line data collection activities, clears BSY and asserts INTRQ.

During execution of its off-line activities the device shall not set BSY nor clear DRDY.

If the device is in the process of performing its set of off-line data collection activities as a result of receiving a SMART EXECUTE OFF-LINE IMMEDIATE command from the host and is interrupted by any new command from the host except a SMART DISABLE OPERATIONS, SMART EXECUTE OFF-LINE IMMEDIATE or STANDBY IMMEDIATE command, the device shall suspend or abort its off-line data collection activities and service the host within two seconds after receipt of the new command. After servicing the interrupting command from the host the device may immediately re-initiate or resume its off-line data collection activities without any additional commands from the host (see the definition for Bit 2 in the Off-line data collection capability byte in Clause 8.35.5).

If the device is in the process of performing its off-line data collection activities and is interrupted by a STANDBY IMMEDIATE command from the host, the device shall suspend or abort its off-line data collection activities, and service the host within two seconds after receipt of the command. After receiving a new command that causes the device to exit a power saving mode, the device shall immediately re-initiate or resume off-line data collection activities without any additional commands from the host unless these activities were aborted by the device (see Table Tb - Off-line data collection status byte values). [The correct table number must be inserted here]

If the device is in the process of performing its off-line data collection activities and is interrupted by a SMART DISABLE OPERATIONS command from the host, the device shall suspend or abort its off-line data collection activities and service the host within two seconds after receipt of the command. Upon receipt of the next SMART ENABLE OPERATIONS command the device shall, after the next vendor specified event, either re-initiate its off-line data collection activities or resume those activities from where they had been previously suspended.

If the device is in the process of performing its off-line data collection activities and is interrupted by a SMART EXECUTE OFF-LINE IMMEDIATE command from the host, the device shall abort its off-line data collection activities and service the host within two seconds after receipt of the command. The device shall then re-initiate its off-line data collection activities in response to the new EXECUTE OFF-LINE IMMEDIATE command.

8.35.5 SMART READ DATA

COMMAND CODE - B0h

TYPE - Optional - SMART feature set. If the SMART feature set is implemented, this command may be implemented.

PROTOCOL - PIO data in

INPUTS - The Features register shall be set to D0h. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h.

Register	7	6	5	4	3	2	1	0
Features	D0h							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS -

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

ERROR OUTPUTS - If the device does not support this command, if SMART is disabled or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	UNC	na	IDNF	na	ABRT	na	AMNF
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

UNC if SMART data is uncorrectable.

IDNF if SMART data sector's ID field could not be found or data structure checksum occurred.

ABRT if this command is not supported, if SMART is not enabled, or if register values are invalid.

AMNF if data structure or data structure revision number error occurred.

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

DF if drive fault

DRQ shall be cleared to zero

CORR if a correctable data error was found

ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command returns the Device attribute data structure to the host. Upon receipt of this command from the host, the device sets BSY, saves any updated SMART data to non-volatile memory, sets DRQ, clears BSY, asserts INTRQ, and then waits for the host to transfer the 512 bytes of data from the device via the Data register.

The 512 bytes that make up the Device attribute data structure are defined in Table **Ta**. All multi-byte fields shown in this structure follow the byte ordering described in **Cx**. [This was Clause 3.2.5 in 1153 Rev 1.]

Table Ta - Device attributes data structure

Byte	F/V	Descriptions
0-361	X	Vendor specific
362	V	Off-line data collection status
363	X	Vendor specific
364-365	V	Total time in seconds to complete off-line data collection activity
366	X	Vendor specific
367	F	Off-line data collection capability
368-369	F	SMART capability
370-385	R	Reserved
386-510	X	Vendor specific
511	V	Data structure checksum
Key: F=the content of the byte is fixed and does not change. V=the content of the byte is variable and may change depending on the state of the device or the commands executed by the device. X=the content of the byte is vendor specific and may be fixed or variable. R=the content of the byte is reserved and shall be zero.		

The value of the off-line data collection status byte defines the current status of the off-line activities of the device. The values and their respective definitions are listed in Table **Tb** [This is a new table].

Table Tb - Off-line data collection status byte values

Value	Definition
00h or 80h	Off-line data collection activity was never started.
01h	Reserved
02h or 82h	Off-line data collection activity was completed without error.
03h	Reserved
04h or 84h	Off-line data collection activity was suspended by an interrupting command from host.
05h or 85h	Off-line data collection activity was aborted by an interrupting command from host.
06h or 86h	Off-line data collection activity was aborted by the device with a fatal error.
07h-3Fh	Reserved
40h-7Fh	Vendor specific
81h	Reserved
83h	Reserved
87h-BFh	Reserved
C0h-FFh	Vendor specific

The total time in seconds to complete off-line data collection activity word specifies how many seconds the device requires to complete its sequence of off-line data collection activity. Valid values for this word are from 0001h to FFFFh.

Off-line data collection capability

The following describes the definition for the off-line data collection capability bits. If the value of all of these bits is equal to zero, then no off-line data collection is implemented by this device.

- **Bit 0 (EXECUTE OFF-LINE IMMEDIATE implemented bit)** - If the value of this bit equals one, then the SMART EXECUTE OFF-LINE IMMEDIATE command is implemented by this device. If the value of this bit equals zero, then the SMART EXECUTE OFF-LINE IMMEDIATE command is not implemented by this device.
- **Bit 1 (vendor specific bit)** -The value of this bit is vendor specific.
- **Bit 2 (abort/restart off-line by host bit)** - If the value of this bit equals one, then the device shall abort all off-line data collection activity initiated by an SMART EXECUTE OFF-LINE IMMEDIATE command upon receipt of a new command. Off-line data collection activity must be restarted by a new SMART EXECUTE OFF-LINE IMMEDIATE command from the host. If the value of this bit equals zero, the device shall suspend off-line data collection activity after an interrupting command and resume off-line data collection activity after some vendor-specified event.
- **Bits 3-7 (reserved bits)** -All bits not defined in this section are reserved for future use.

SMART capability

The following describes the definition for the SMART capabilities bits. If the value of all of these bits is equal to zero, then automatic saving of SMART data is not implemented by this device.

- **Bit 0 (power mode attribute saving capability bit)** - If the value of this bit equals one, the device shall save its attribute values prior to going into a power saving mode (idle, standby or sleep) or immediately upon return to active or idle power saving mode from a standby power saving mode. If the value of this bit equals zero, the device shall not save its attribute values prior to going into a power saving mode (idle, standby or sleep) or immediately upon return to active or idle power saving mode from a standby power saving mode.

- **Bit 1 (attribute autosave after event capability bit)** - If the value of this bit equals one, the device shall support the SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE command. If the value of this bit equals zero, the device shall not support the SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE command.
- **Bits 2-15 (reserved bits)** - All bits not defined in this section are reserved for future use.

The data structure checksum is the two's complement of the result of a simple eight-bit addition of the first 511 bytes in the data structure.

8.35.6 SMART RETURN STATUS

COMMAND CODE - B0h

PROTOCOL - Non-data command

INPUTS - The Features register shall be set to DAh. The Cylinder Low register shall be set to 4Fh. The Cylinder High register shall be set to C2h.

Register	7	6	5	4	3	2	1	0
Features	DAh							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh							
Cylinder High	C2h							
Device/Head	1	na	1	DEV	na			
Command	B0h							

NORMAL OUTPUTS -

Register	7	6	5	4	3	2	1	0
Features	na							
Sector Count	na							
Sector Number	na							
Cylinder Low	4Fh or C2h							
Cylinder High	C2h or 4Fh							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	na	na	na	na	na	na
Note: na indicates the content of a bit field is not applicable to the particular command.								

Cylinder Low - 4Fh if threshold not exceeded, C2h if threshold exceeded

Cylinder High - C3h if threshold not exceeded, 4Fh is threshold exceeded

Status register

BSY shall be cleared to zero indicating the command is complete

DRDY shall be set to one

ERROR OUTPUTS - If the device does not support this command, if SMART is disabled or if the values in the Features, Cylinder Low or Cylinder High registers are invalid, an Aborted command error is posted.

Register	7	6	5	4	3	2	1	0
Error	na	na	na	IDNF	na	ABRT	na	AMNF
Sector Count	na							
Sector Number	na							
Cylinder Low	na							
Cylinder High	na							
Device/Head	1	na	1	DEV	na			
Status	BSY	DRDY	DF	na	DRQ	na	na	ERR
Note: na indicates the content of a bit field is not applicable to the particular command.								

Error register

IDNF if S.M.A.R.T. data sector's ID field could not be found or data structure checksum occurred.
ABRT if this command is not supported, if S.M.A.R.T. is not enabled, or if register values are invalid.
AMNF if data structure or data structure revision number error occurred.

Status register

BSY shall be cleared to zero indicating the command is complete
DRDY shall be set to one
DF if drive fault
DRQ shall be cleared to zero
ERR shall be set if Error register bit set

PREREQUISITES - DRDY set to one. SMART enabled.

DESCRIPTION - This command is used to communicate the reliability status of the device to the host at the host's request. Upon receipt of this command the device shall set BSY; save its updated SMART data to non-volatile memory and determines if a threshold exceeded condition has occurred. If a threshold exceeded condition is not detected by the device, the device shall set the Cylinder Low register to 4Fh and the Cylinder High register to C2h. If a threshold exceeded condition is detected by the device, the device shall set the Cylinder Low register to F4h and the Cylinder High register to 2Ch. After setting the Cylinder Low and Cylinder High registers the device shall clear BSY and assert INTRQ.

Table E.3 - Command codes and parameters(continued)

proto	Command	typ	Command code	Parameters used				
				FR	SC	SN	CY	DH
	[commands before in the table]							
ND	SMART DISABLE OPERATIONS	O	0B0h	y			y	D
ND	SMART ENABLE/DISABLE AUTOSAV	O	0B0h	y	y		y	D
ND	SMART ENABLE OPERATIONS	O	0B0h	y			y	D
ND	SMART EXECUTE OFF-LINE	O	0B0h	y			y	D
PI	SMART READ ATTRIBUTE DATA	O	0B0h	y			y	D
ND	SMART RETURN STATUS	O	0B0h	y			y	D
	[commands after in the table]							

Table E.4 - Status and error usage(continued)

[NOTE: BBK should be removed from this table]

	Status register				Error register					
	DRDY	DF	CORR	ERR	BBK	UNC	IDNF	ABRT	TKONF	AMNF
[cmds before in the table]										
SMART DISABLE OPS	V			V				V		
SMART EN/DIS AUTOSAVE	V			V				V		
SMART ENABLE OPS	V			V				V		
SMART EXECUTE OFF-LINE	V			V			V	V		V
SMART READ DATA	V			V		V	V	V		V
SMART RETURN STATUS	V			V			V	V		V
[cmds after in the table]										