ACS-2

Extended Power Conditions (EPC)

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Revision 6

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Document Status

Revision History (part 1 of 1)		
Rev	**Date**	**Description**
0	June 10, 2008	1) Initial Revision
1	June 16, 2008	1) Initial revision posted was the wrong version. This is the 'real' initial revision
2	July 15, 2008	1) Address review comments from June 2008 T13 plenary 2) Added interactions with APM, IDLE IMMEDIATE with unload feature, IDLE command, NV Cache Power Management feature, background operations; 3) Minor formatting changes to tables; 4) Added editors notes to record open issues; 5) Changed 'recovery time' resolution to '1 msec' from '100 msec'; 6) Added more details about the power conditions log
3	Sept. 3, 2008	1) Address review comments from Aug. 2008 T13 plenary 2) Clarify the interaction with 'background activities' to only host-initiated activities, as defined by ATA8-ACS 3) Specify new DCO RESTORE behaviour
4	Nov. 13, 2008	1) Included Standby as an EPC power condition in all EPC subcommands 2) Added 'shall' and 'may' in appropriate places. 3) Removed mention of 'Intialized at time of manufacture' 4) Removed duplicate specifications of what log fields get changed by which command. 5) Added specification for reporting a Recovery time that is larger 65535 msec. 6) Changes for consistency and clarification.
5	Dec. 4, 2008	1) Allow non-zero value at poweron for the Standby timer 2) Minor grammar, spelling and clarification corrections. 3) Specify Power Conditions log contents if EPC feature is not supported.
6	Feb. 13, 2009	1) Synch with T10/09-054 a. Rename ‘Idle1’ to ‘Idle_A’, ‘idle2’ to ‘Idle_B’, ‘Idle3’ to ‘Idle_C’ 2) Clarify reset processing 3) Automatically enable non-zero timers after power-on reset and DCO RESTORE 4) Redesign of all of the subcommands to mat SAT translation easier 5) Minor typographical corrections 6) Removed power condition id from all log entries 7) Changed Standby units to milliseconds, and added reporting in legacy Standby timer units to the log.

1 Introduction

This proposal is an attempt to standardize fine grained power management controls. The industry currently has some vendor specific methods.

2 Scope

This is intended for incorporation into ACS-2.

References to sections, tables, etc are to ATA8-ACS revision 6a.

3 Overview

This adds substates (power conditions) to the PM1:Idle power management state, and methods to use and configure their use.

4 Changes to ACS-2

4.1 Changes to clause 2

(No changes)

4.2 Changes to clause 3

(No changes)

4.3 Changes to clause 4

4.3.1 Overview - Changes to the Feature Set Summary Table

Add: Extended Power Conditions (EPC) to the table as Optional for ATA and Prohibited for ATAPI

4.3.2 Security Mode feature fet - Changes to the Security Mode Command Actions Table

(No changes)

4.3.3 Long Logical Sector feature set - Block Size By Command Table

(No changes)

4.3.4 (new) Extended Power Conditions (EPC) feature set

The Extended Power Conditions feature set provides a host with additional methods to control the power condition of a device. These methods include:

a) defining power conditions within the PM1:Idle power management state: Idle_A, Idle_B and Idle_C.
b) specifying that the device transition to a power condition without delay;
c) enabling and initializing any of the power condition timers to specify that the device wait for a period of inactivity before transitioning to a specified power condition; and
d) allowing the host to determine the power condition parameters of the device.

The following command-related device properties are mandatory if this feature set is supported:

a) the SET FEATURES ‘Extended Power Conditions’ subcommand
b) the Power Conditions log
c) extensions to the CHECK POWER MODE command
d) IDENTIFY DEVICE fields
e) DCO controls

4.3.4.1 Power conditions

The Idle_A, Idle_B and Idle_C power conditions are within the PM1:Idle power management state. The power conditions shall be ordered from highest power consumption (and shortest recovery time) to lowest power consumption (and longest recovery time) as follows:

Idle_A power >= Idle_B power >= Idle_C power >= PM2:Standby power

Standby is also included as an EPC power condition. The traditional Standby timer may be manipulated using either the EPC subcommands or the IDLE and STANDBY commands. The EPC feature set also defines a default Standby timer value, which may be enabled, disabled, queried, etc. in the same manner as the other EPC power conditions.

Each of these power conditions has a set of current, saved and default properties (See [editors note: Extended Power Conditions log]). The current properties do not persist across power-on resets.

4.3.4.2 Power condition timers

The device may have manufacturer specified power-on default settings for the power condition timers. Power condition timers are changeable with the SET FEATURES “Extended Power Conditions” subcommand (see [editors note: set features subcommand]). Configured settings for the timers shall be readable in the Power Conditions log (see [editors note: log]).

A power condition timer set to zero indicates that the associated power condition is disabled.

The IDENTIFY DEVICE command indicates when this feature set is supported, and when there are EPC idle timers enabled.

The value of each timer specifies the inactivity time that the device shall wait before transitioning to the power condition if the power condition is enabled. All enabled power condition timers are active and run concurrently.

If a device processes a command while in a power condition, the device may change to a new power management state. If any power condition timer has been enabled, then they shall be stopped on receipt of the command. On command completion for all commands, except for EPC Go To Power Condition, the enabled timers shall be reinitialized with the saved values and started.

A power condition timer expires when the time specified by the value in the timer field has elapsed since the last activity completed.

When an enabled timer expires, the device shall transition to the power condition associated with that timer. Timer expirations shall only cause the device to transition from higher power conditions to lower power conditions (e.g., if the standby timer is set to a smaller interval than the Idle_B timer, the device shall remain in the standby condition when the Idle_B timer expires).

4.3.4.3 Interaction with resets, commands and other features

On successful processing of a power-on reset, the device shall:

1) stop all EPC timers;
2) copy all saved EPC properties to current properties; and
3) reinitialize and restart all enabled EPC timers with current values.

On successful processing of a hardware reset, then: [Editors note: coordinate this with SATA-IO]

a) if Software Settings Preservation is enabled, then the device shall
    1. stop all EPC timers; and
    2. reinitialize and restart all enabled EPC timers with current values.

b) if Software Settings Preservation is disabled, then the device shall
    1. stop all EPC timers;
    2. copy all saved EPC properties to current properties; and
    3. reinitialize and restart all enabled EPC timers with current values.

On successful processing of a software reset or a DEVICE RESET command, the device shall:
1) stop all EPC timers; and
2) reinitialize and restart all enabled EPC timers with current values.

On successful processing of the IDLE command and if the EPC feature set is supported:
1. in the Standby section of the Power Conditions log, the device shall:
    a. save the specified Standby timer value as the Current Standby timer; and
    b. set the Current Enabled bit to one;
2. if the device contains cache memory, the device shall write all cached data to the medium for the device (e.g., as a device does in response to a flush command) prior to entering into any power condition that prevents accessing the media (e.g., before a hard drive stops its spindle motor during transition to the standby power condition);
3. the device shall immediately enter the PM1:Idle state and then:
    i. if the Idle_A timer is enabled, the device shall immediately enter the Idle_A power condition;
    ii. if the Idle_A timer is disabled and the Idle_B timer is enabled, the device shall immediately enter the Idle_B power condition; or
    iii. if the Idle_A timer is disabled and the Idle_B timer is disabled and the Idle_C timer is enabled, the device shall immediately enter the Idle_C power condition;

    and
4. on completion of the IDLE command, all enabled EPC timers shall be initialized and started.

On successful processing of the IDLE IMMEDIATE command and if the EPC feature set is supported:
1. if the unload feature was selected, the device shall protect itself (see 7.19.2.2). The device shall retain data in the write cache and resume writing the cached data onto the media after receiving a Software Reset, a Hardware Reset, or any new command except IDLE IMMEDIATE with unload feature;
2. if the unload feature was not selected and the device contains cache memory, the device shall write all cached data to the medium for the device (e.g., as a device does in response to a flush command) prior to entering into any power condition that prevents accessing the media (e.g., before a hard drive stops its spindle motor during transition to the standby power condition).
3. the device shall immediately enter the PM1:Idle state and then
    i. if the Idle_A timer is enabled, the device shall immediately enter the Idle_A power condition;
    ii. if the Idle_A timer is disabled and the Idle_B timer is enabled, the device shall immediately enter the Idle_B power condition; or
    iii. if the Idle_A timer is disabled and the Idle_B timer is disabled and the Idle_C timer is enabled, the device shall immediately enter the Idle_C power condition;

    and
4. on completion of the IDLE IMMEDIATE command, all enabled EPC timers shall be initialized and started.

On successful processing of the STANDBY command and if the EPC feature set is supported:
1. in the Standby section of the Power Conditions log, the device shall:
    a) save the specified Standby timer value as the Current Standby timer; and
    b) set the Current Enabled bit to one;

2. when the timer value specified by the STANDBY command expires then:
   i. if the device contains cache memory, the device shall write all cached data to the medium for the device (e.g., as a device does in response to a flush command) prior to entering into any power condition that prevents accessing the media (e.g., before a hard drive stops its spindle motor during transition to the standby power condition); and
   ii. the device shall enter the PM2:Standby state; and
3. on completion of the STANDBY command, all enabled EPC timers shall be initialized and started.

On successful processing of the STANDBY IMMEDIATE command and if the EPC feature set is supported:

1. the Standby section of the Power Conditions log shall not be changed;
2. if the device contains cache memory, the device shall write all cached data to the medium for the device (e.g., as a device does in response to a flush command) prior to entering into any power condition that prevents accessing the media (e.g., before a hard drive stops its spindle motor during transition to the standby power condition);
3. the device shall enter the PM2:Standby state; and
4. on completion of the STANDBY IMMEDIATE command, all enabled EPC timers shall be initialized and started.

The Extended Power Conditions and the Advanced Power Management features are mutually exclusive of each other. All EPC subcommands shall return command aborted if APM is enabled. The SET FEATURES Enable/Disable APM subcommands shall abort if IDENTIFY DEVICE word TBDIDB bit TBD1 is set to one.

If the NV Cache Power Management feature is enabled, the expiration of an EPC timer shall not cause the device to transition to a lower power state until the NV Cache power mode timer expires.

During background activities, all EPC timers shall be stopped. On completion of the activity, the EPC timers shall be reinitialized and started.

5 Changes to clause 5

(No changes)

6 Changes to clause 6

(No changes)

7 Changes to clause 7

7.1.1 SET FEATURES - EFh, Non-Data

7.1.1.1 Feature Set

7.1.1.2 Description

Table 53 - SET FEATURES Feature field definitions (part X of 3)

Value	Description
TBDSF	Extended Power conditions (See 7.1.1.3)

7.1.1.3 Extended Power Conditions (EPC)

Subcommand code TBDSF enables, disables, and configures the use of the Extended Power Conditions feature set (see 4.3.4). If the EPC feature is not supported, then the device shall return command aborted.

7.1.1.4 Inputs for SET FEATURES - Extended Power Conditions

Name	Description
Feature	TBDSF (set features subcommand code)
Count	EPC subcommand dependent
LBA	**Bit** **Description** 23:4 EPC subcommand dependent 3:0 EPC subcommand (See Table 1)
Device	Bit **Description** 7 Obsolete 6 Shall be set to one 5 Obsolete 4 Transport Dependent - See 3:0 Reserved
Command	7:0 EFh

Table 1 - Extended Power Conditions Subcommands

EPC Subcommand	EPC Subcommand
0h	Restore Power Condition Settings
1h	Go to Power Condition
2h	Set Power Condition Timer
3h	Set Power Condition State
4h .. Fh	Reserved

Table 2 - Power Condition IDs

Power Condition ID	Power Condition Name	Description
00h	Standby	PM2:Standby state
01h..80h		Reserved
81h	Idle_A	A substate of the PM1:Idle state
82h	Idle_B	A substate of the PM1:Idle state
83h	Idle_C	A substate of the PM1:Idle state
84h .. FEh		Reserved
FFh	All	All EPC power conditions

7.48.new.1 Restore Power Condition Settings subcommand

On successful completion of this EPC subcommand, the device shall update the Power Conditions log (see [Editors note: section head in Annex A for TBDLOG]) for the selected Power Condition ID(s) as follows:

1. if the Default bit is set to one, then copy the Default timer value and enabled bit to the Current settings; otherwise copy the Saved timer field to the Current settings;
2. if the Enable bit is set to one, then enable the Current timer; otherwise disable the Current timer; and
3. if the Save bit is set to one, then copy the Current timer value and enabled bit to the Saved settings.

Table 3 - Inputs for Restore Power Condition Settings subcommand

Name	Description	
Feature	TBDSF (set features subcommand code)	
Count	Power Condition (see Table 2)	
LBA	**Bit**	**Description**
	23:7	Reserved
	6	Defaults 0 = Restore from Default settings 1 = Restore from Saved settings
	5	Enable 0 = Disable the selected power condition 1 = Enable the selected power condition
	4	Save 0 = Do not save settings on completion 1 = Save settings on completion
	3:0	Subcommand 0h = Restore power management to default timers
Device	Bit	**Description**
	15	Obsolete
	14	Shall be set to one
	13	Obsolete
	12	Transport Dependent - See 6.2.12
	11:8	Reserved
Command	7:0	EFh

Normal Outputs

See [Editors note: Table 7 in this proposal]

Error Outputs

If the selected Power Condition is not supported, then the device shall return command aborted. See [Editors note table 122].

7.48.new.2 Go To Power Condition subcommand

On successful completion of this EPC subcommand, the device shall:

1) stop all enabled EPC timers;
2) enter the selected EPC power condition after command completion without having to wait for any timers to expire; and
3) the device shall remain in the selected power condition until the device processes the next command or reset.

Table 4 - Inputs for Go To Power Condition subcommand

Name	Description
Feature	TBDSF (set features subcommand code)
Count	Power Condition ID (see Table 2)
LBA	**Bit** **Description** 23:4 Reserved 3:0 Subcommand 1h = Go To Power Condition
Device	Bit **Description** 15 Obsolete 14 Shall be set to one 13 Obsolete 12 Transport Dependent - See 6.2.12 11:8 Reserved
Command	7:0 EFh

Normal Outputs

See [Editors note Table 8 in this proposal].

Error Outputs

If the Power condition ID is FFh, a reserved value or is not supported, then the device shall return command aborted. See [Editors note: Table 122].

7.48.new.3 Set Power Condition Timer subcommand

On successful completion of this EPC subcommand, the device shall update the Power Conditions log for the selected Power Condition(s) as follows:

1. Copy the Timer field to the Current timer value;
2. If the Enable bit is set to one, then enable the Current timer; otherwise disable the Current timer; and
3. If the Save bit is set to one and the Power Condition settings are saveable, then copy the Current timer value and enabled bit to the Saved settings.

Table 5 - Inputs for Set Power Condition Timer subcommand

Name	Description
Feature	TBDSF (set features subcommand code)
Count	Power Condition ID (see Table 2)
LBA	**Bit** **Description**
	23:8 Timer (15:0)
	7:6 Reserved
	5 Enable 0 = Disable the selected power condition 1 = Enable the selected power condition
	4 Save 0 = Do not save settings on completion 1 = Save settings on completion
	3:0 Subcommand 1h = Go To Power Condition
	7:0 2h = Set Power Condition Timer
Device	Bit **Description** 15 Obsolete 14 Shall be set to one 13 Obsolete 12 Transport Dependent – See 6.2.12 11:8 Reserved
Command	7:0 EFh

Timer Value

The Timer (15:0) shall be specified in units of 100 milliseconds.

Normal Outputs

See [Editors note Table 9 in this proposal].

Error Outputs

If the Power Condition is invalid or not supported then the device shall return command aborted. If Save is set to one and the selected power condition is not saveable, then the device shall return command aborted. If the new timer value is not supported, the device shall either set the timer with a modified value or return command aborted. See [Editors note Table 122].

7.48.new.3 Set Power Condition State subcommand

On successful completion of this EPC subcommand, the device shall update the Power Conditions log for the Power Condition(s) as follows:

1. If the Enable bit is set to one, then enable the Current timer; otherwise disable the Current timer; and
2. If the Save bit is set to one, then copy the Current timer and enabled bit to the Saved settings.

Table 6 - Inputs for Set Power Condition State subcommand

Name	Description	
Feature	TBDSF (set features subcommand code)	
Count	Power Condition (see Table 2)	
LBA	**Bit**	**Description**
	23:6	Reserved
	5	Enable 0 = Disable the selected power condition 1 = Enable the selected power condition
	4	Save 0 = Do not save settings on completion 1 = Save settings on completion
	3:0	Subcommand 3h = Set Power Condition State
Device	Bit **Description** 15 Obsolete 14 Shall be set to one 13 Obsolete 12 Transport Dependent – See 6.2.12 11:8 Reserved	
Command	7:0 EFh	

Normal Outputs

See [Editors note: Table 7 in this proposal].

Error Outputs

If the Power Condition is not valid or not supported, then the device shall return command aborted. If Save is set to one and the selected Power Condition is not saveable, then the device shall return command aborted. See [Editors note Table 122].

7.1.2 Changes to DCO IDENTIFY

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Word	Content
TBDDCO	Command set/feature set supported TBD1 1 = Reporting support for Extended Power Conditions is changeable

If bit TBD1 of word TBDDCO is set to one, then support for the Extended Power Conditions feature set is changeable.

7.1.3 Changes to DCO SET

Word	Content
TBDDCO	Command set/feature set supported TBD1 1 = Reporting support for Extended Power Conditions is allowed

If bit TBD1 of word TBDDCO is cleared to zero, the device shall

a) disable support for the Extended Power Conditions feature;

b) clear the Idle_A, Idle_B and Idle_C sections of the Power Conditions log to all zeroes;

c) clear bit TBD1 of word TBDIDA in the IDENTIFY DEVICE data to zero;

d) clear bit TBD1 of word TBDIDB in the IDENTIFY DEVICE data to zero.

7.1.4 Changes to DCO RESTORE

(add this new paragraph to the Description section of DCO RESTORE)

If a DEVICE CONFIGURATION RESTORE command changes reporting of support for the EPC feature set from not supported to supported then the device shall

a) set IDENTIFY DEVICE data word TBDIDA bit TBD1 to one;

b) clear IDENTIFY DEVICE data word TBDIDB bit TBD1 to zero;

c) copy the EPC Default settings to the EPC Saved and Current settings for all EPC power conditions.

7.1.5 Changes to IDENTIFY DEVICE data

If the proposal adds a feature set or command, there should be an addition to the IDENTIFY DEVICE data to indicate both supported and enabled descriptions. Fill in the description in the table and place a description of each bit or word underneath the table.

Word	O/M	S/P	F/V	Description
TBDIDA	M		F	Supported Settings TBD1 1 = Extended Power Conditions feature set is supported
TBDIDB	M		V	Enabled Settings TBD1 1 = At least one Extended Power Conditions Idle timer is enabled

Key:

O/M Mandatory/optional requirement.
- M Support of the word is mandatory.
- O Support of the word is optional.

F/V Fixed/variable content
- F The content of the field is fixed and does not change. The DCO command may change the value of a fixed field. For removable media devices, these values may change when media is removed or changed.
- V The contents of the field is variable and may change depending on the state of the device or the commands executed by the device.
- X The content of the field may be fixed or variable

S/P Content applies to Serial or Parallel transport
- S Serial Transport
- P Parallel Transport
- B Both Serial and Parallel Transports
- N Belongs to a transport other than Serial or Parallel

Word TBDIDA, bit TBD 1 shall be set to one if the Extended Power Conditions feature is supported. (See 7.1.1.3)

Word TBDIDB, bit TBD 1 shall be set to one if the Idle_A timer, Idle_B timer or Idle_C timers are enabled. If none of these EPC timers are enabled, then word TBDIDB bit TBD1 shall be cleared to zero. (See 7.1.1.3)

7.2 Changes to Normal and Error Outputs

7.2.1 Changes to Normal Outputs

Table 103 - Check Power Mode Normal Output

Name	Description	
Error	N/A	
Count	Value	Description
	00h	Device is in the PM2:Standby state.
	40h	Device is in the PM0:Active state, and the NV Cache power mode is enabled and the spindle is spun down or spinning down.
	41h	Device is in the PM0:Active state and the NV Cache power mode is enabled and the spindle is spun up or spinning up.
	80h	Device is in the PM1:Idle state and Extended Power Conditions feature set is not supported or not enabled
	81h	Device is in the PM1:Idle State, and Extended Power Conditions feature set is supported and enabled, and the device is in the Idle_A power condition.
	82h	Device is in the PM1:Idle State, and Extended Power Conditions feature set is supported and enabled, and the device is in the Idle_B power condition.
	83h	Device is in the PM1:Idle State, and Extended Power Conditions feature set is supported and enabled, and the device is in the Idle_C power condition.
	FFh	Device is in the PM0:Active state or PM1:Idle State.
LBA	N/A	
Device	**Bit Description** 15 Obsolete 14 N/A 13 Obsolete 12 Transport Dependent - See 11:8 Reserved	
Status	7:6 Transport Dependent - See . 5 Device Fault - See 4 N/A 3 Transport Dependent - See . 2:1 N/A 0 Error - See	

Table 7 - Normal outputs for SET FEATURES EPC - General

Name	Description	
Error	Description	
Count	Reserved	
LBA	Bit	Description
	23:4	Reserved
	3:0	Extended Power Conditions subcommand (See Table 1)
Device	**Bit Description** 15 Obsolete 14 N/A 13 Obsolete 12 Transport Dependent - See 11:8 Reserved	
Status	7:6 Transport Dependent - See . 5 Device Fault - See 4 N/A 3 Transport Dependent - See . 2:1 N/A 0 Error - See	

Table 8 - Normal outputs for SET FEATURES EPC - Go To Power Condition

Name	Description	
Error	Description	
Count	Power condition ID (see Table 2)	
LBA	Bit	Description
	23:4	Reserved
	3:0	Extended Power Conditions subcommand (See Table 1)
Device	**Bit Description** 15 Obsolete 14 N/A 13 Obsolete 12 Transport Dependent - See 11:8 Reserved	
Status	7:6 Transport Dependent - See . 5 Device Fault - See 4 N/A 3 Transport Dependent - See . 2:1 N/A 0 Error - See	

Table 9 - Normal outputs for SET FEATURES Extended EPC - Set Power Condition Timer

Name	Description	
Error	Description	
Count	Power condition ID (see Table 2)	
LBA	Bit	Description
	23:8	Timer (see [editors note: 7.48.new.4])
	7:6	Reserved
	5	Enable 0 = Disable the selected power condition 1 = Enable the selected power condition
	4	Save 0 = Do not save settings on completion 1 = Save settings on completion
	3:0	Subcommand 1h = Go To Power Condition
	7:0	2h = Set Power Condition Timer
Device	**Bit Description** 15 Obsolete 14 N/A 13 Obsolete 12 Transport Dependent - See 11:8 Reserved	
Status	7:6 Transport Dependent - See . 5 Device Fault - See 4 N/A 3 Transport Dependent - See . 2:1 N/A 0 Error - See	

7.2.2 Changes to Error Outputs

None.

Changes to Annex A – Log Definitions

Changes to Table A.2

Add new row:

Log Number	Log Name	Feature set	R/W	Access
TBDLOG	Power Conditions	Extended Power Conditions	RO	GPL

7.2.3 (new log) Power Conditions Log (TBDLOG)

If the Extended Power Conditions feature set is supported, then this non-volatile log shall be supported. This log may be supported if the Extended Power Conditions feature set is not supported. If this log is supported and the Extended Power Conditions feature set is not supported, then the Idle_A, Idle_B and Idle_C sections shall be cleared to zero.

Table 10 - Extended Power Conditions Log

Word Offset	DataType	Description
00h	word	Nominal Recovery time from Idle_A to PM0:Active This is the nominal time required to transition from Idle_A to PM0:Active. This time does not include processing time for the command that caused this transition to occur . A value of zero indicates that the nominal recovery time is not specified. A value of FFFFh indicates that the recovery time is greater than or equal to 65535 milliseconds. Measurement Units: 1 millisecond This value shall be preserved over all resets
01h	word	Reserved
02h	word	Default Idle_A Flags Bits: Description 15:2: Reserved 1: Enabled 1= Default Idle_A timer is enabled 0= Default Idle_A timer is disabled 0: Supported 1= Default Idle_A timer is supported 0= Default Idle_A timer is not supported
03h	word	Default Idle_A timer setting This is the time that the device shall wait after command completion before entering the Idle_A power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds.

Word Offset	DataType	Description
04h	word	Saved Idle_A Flags
		Bits: Description
		15:3: Reserved
		2: Saveable 1= Idle_A timer is saveable 0= Idle_A timer is saveable
		1: Enabled 1= Saved Idle_A timer is enabled 0= Saved Idle_A timer is disabled
		0: Supported 1= Saved Idle_A timer is supported 0= Saved Idle_A timer is not supported
05h	word	Saved Idle_A timer setting This is the time that the device shall wait after command completion before entering the Idle_A power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
06h	word	Current Idle_A Flags
		Bits: Description
		15:2: Reserved
		1: Enabled 1= Current Idle_A timer is enabled 0= Current Idle_A timer is disabled
		0: Supported 1= Current Idle_A timer is supported 0= Current Idle_A timer is not supported
07h	word	Current Idle_A timer setting This is the time that the device shall wait after command completion before entering the Idle_A power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
08h..0Fh		Reserved for Idle_A parameters
10h	word	Nominal Recovery time from Idle_B to PM0:Active This is the nominal time required to transition from Idle_B to PM0:Active. This time does not include processing time for the command that caused this transition to occur . A value of zero indicates that the nominal recovery time is not specified. A value of FFFFh indicates that the recovery time is greater than or equal to 65535 milliseconds. Measurement Units: 1 millisecond This value shall be preserved over all resets

Word Offset	DataType	Description	
11h	word	Reserved	
12h	word	Default Idle_B Flags	
		Bits	Description
		15:2	Reserved
		1	Enabled 1= Default Idle_B timer is enabled 0= Default Idle_B timer is disabled
		0	Supported 1= Default Idle_B timer is supported 0= Default Idle_B timer is not supported
13h	word	Default Idle_B timer setting This is the time that the device shall wait after command completion before entering the Idle_B power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds.	
14h	word	Saved Idle_B Flags	
		Bits	Description
		15:3	Reserved
		2	Saveable 1= Idle_B timer is saveable 0= Idle_B timer is saveable
		1	Enabled 1= Saved Idle_B timer is enabled 0= Saved Idle_B timer is disabled
		0	Supported 1= Saved Idle_B timer is supported 0= Saved Idle_B timer is not supported
15h	word	Saved Idle_B timer setting This is the time that the device shall wait after command completion before entering the Idle_B power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds	
16h	word	Current Idle_B Flags	
		Bits	Description
		15:2	Reserved
		1	Enabled 1= Current Idle_B timer is enabled 0= Current Idle_B timer is disabled
		0	Supported 1= Current Idle_B timer is supported 0= Current Idle_B timer is not supported
17h	word	Current Idle_B timer setting This is the time that the device shall wait after command completion before entering the Idle_B power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds	
18h..1Fh		Reserved for Idle_B parameters	

Word Offset	DataType	Description
20h	word	Nominal Recovery time from Idle_C to PM0:Active This is the nominal time required to transition from Idle_C to PM0:Active. This time does not include processing time for the command that caused this transition to occur . A value of zero indicates that the nominal recovery time is not specified. A value of FFFFh indicates that the recovery time is greater than or equal to 65535 milliseconds. Measurement Units: 1 millisecond This value shall be preserved over all resets
21h	word	Reserved
22h	word	Default Idle_C Flags Bits: Description 15:2: Reserved 1: Enabled 1= Default Idle_C timer is enabled 0= Default Idle_C timer is disabled 0: Supported 1= Default Idle_C timer is supported 0= Default Idle_C timer is not supported
23h	word	Default Idle_C timer setting This is the time that the device shall wait after command completion before entering the Idle_C power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds.
24h	word	Saved Idle_C Flags Bits: Description 15:3: Reserved 2: Saveable 1= Idle_C timer is saveable 0= Idle_C timer is saveable 1: Enabled 1= Saved Idle_C timer is enabled 0= Saved Idle_C timer is disabled 0: Supported 1= Saved Idle_C timer is supported 0= Saved Idle_C timer is not supported
25h	word	Saved Idle_C timer setting This is the time that the device shall wait after command completion before entering the Idle_C power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds

Word Offset	DataType	Description
26h	word	Current Idle_C Flags
		Bits: Description
		15:2: Reserved
		1: Enabled 1= Current Idle_C timer is enabled 0= Current Idle_C timer is disabled
		0: Supported 1= Current Idle_C timer is supported 0= Current Idle_C timer is not supported
24h	word	Saved Idle_C Flags
		Bits: Description
		15:2: Reserved
		1: Saveable 1= Idle_C timer is saveable 0= Idle_C timer is not saveable
		0: Enabled 1= Saved Idle_C timer is enabled 0= Saved Idle_C timer is disabled
25h	word	Saved Idle_C timer setting This is the time that the device shall wait after command completion before entering the Idle_C power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
26h	word	Current Idle_C Flags
		Bits: Description
		15:1: Reserved
		0: Enabled 1= Current Idle_C timer is enabled 0= Current Idle_C timer is disabled
27h	word	Current Idle_C timer setting This is the time that the device shall wait after command completion before entering the Idle_C power condition of the PM1:Idle power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
28h..2Fh		Reserved for Idle_C parameters
30h	word	Nominal Recovery time from Standby to PM0:Active This is the nominal time required to transition from Standby to PM0:Active. This time does not include processing time for the command that caused this transition to occur . A value of zero indicates that the nominal recovery time is not specified. A value of FFFFh indicates that the recovery time is greater than or equal to 65535 milliseconds. Measurement Units: 1 millisecond This value shall be preserved over all resets

Word Offset	DataType	Description
31h	word	Reserved
32h	word	Default Standby Flags
		Bits: Description
		15:2: Reserved
		1: Enabled 1= Default Standby timer is enabled 0= Default Standby timer is disabled
		0: Supported 1= Default Standby timer is supported 0= Default Standby timer is not supported
33h	word	Default Standby timer setting This is the time that the device shall wait after command completion before entering the PM2:Standby power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds.
34h	word	Saved Standby Flags
		Bits: Description
		15:3: Reserved
		2: Saveable 1= Standby timer is saveable 0= Standby timer is saveable
		1: Enabled 1= Saved Standby timer is enabled 0= Saved Standby timer is disabled
		0: Supported 1= Saved Standby timer is supported 0= Saved Standby timer is not supported
35h	word	Saved Standby timer setting This is the time that the device shall wait after command completion before entering the PM2:Standby power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
36h	word	Current Standby Flags
		Bits: Description
		15:2: Reserved
		1: Enabled 1= Current Standby timer is enabled 0= Current Standby timer is disabled
		0: Supported 1= Current Standby timer is supported 0= Current Standby timer is not supported
37h	word	Current Standby timer setting This is the time that the device shall wait after command completion before entering the PM2:Standby power management state. A value of zero indicates that this power condition is disabled. Measurement Units: 100 milliseconds
38h	word	Bits: Description

Word Offset	DataType	Description	
		15:8	Saved standby timer setting in units specified in ATA8-ACS table 41
		7:0	Current standby timer setting in units specified in ATA8-ACS table 41
39h..3Fh		Reserved for Standby parameters	
40h..FFh		Reserved (to the end of page 00h)	

7.3 Changes to Annex B - Command Set Summary

7.3.1 Changes to the Command Matrix Table

None.

7.3.2 Changes to the Command Codes Table

None.

7.3.3 Changes to the Historical Command Assignments Table

(suggested change to column labeling/formatting only)

Op Code	Command	ATA/ATAPI-							ATA8 - ACS	ACS - 2
		1	2	3	4	5	6	7		
TBD	Your Command Name	C	C	C	C	C	C	C	C	
TBD	Your Command Name	R	R	R	R	R	R	R	R	

Key:
C = a defined command.
E = a retired command.
O = Obsolete.
R = Reserved, undefined in current specifications.
V = Vendor specific commands.
A = Reserved for assignment by the CompactFlash Association
F = If the device does not implement the CFA feature set, this command code is Vendor specific.
M = Reserved for the Media Card Pass Through Command feature set.
S = Reserved for Serial ATA
*Indicates this definition is new to ATA8

7.3.4 Changes to the Historical Set Feature Code Assignments Table

(suggested change to column labeling/formatting, plus adding EPC feature)

Feature Code	Description	ATA/ATAPI-							ATA8 - ACS	ACS - 2
		1	2	3	4	5	6	7		
TBDSF	Extended Power Conditions	R	R	R	R	R	R	R	R	C

Key:
C = a defined command.
E = a retired command.
O = Obsolete.
R = Reserved, undefined in current specifications.
V = Vendor specific commands.
A = Reserved for assignment by the CompactFlash? Association.
F = If the device does not implement the CFA feature set, this command code is Vendor specific.
M = Reserved for the Media Card Pass Through Command feature set.
S = Reserved for Serial ATA.
T = Reserved for Technical Report T13/DT1696 (Time-Limited Commands).