

T10/05-245r1 SAT - SEND DIAGNOSTIC command and Self-Test Results

To: T10 Technical Committee
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Subject: T10/05-245r1 SAT - SEND DIAGNOSTIC command and Self-Test Results

Revision History

Revision 0 (September 8, 2005) first revision

Revision 1 (November 7, 2005) second revision

Change details:

- 1) Removed “strikeouts” for clarity. (Note: “r0” has them for ref. if needed)
- 2) Removed the additional SMART READ LOG and READ LOG EXT text from the SELF-TEST RESULTS field of the Self-Test Results log page parameters.
- 3) “Set to a value of ” changed to “set to” throughout the document.
- 4) Check for 48-bit Address feature set for the SELF-TEST RESULTS, TIMESTAMP, and ADDRESS OF FIRST FAILURE fields of log page (10h).
- 5) Build translation table for the SENSE KEY, ADDITIONAL SENSE CODE, and ADDITIONAL SENSE CODE QUALIFIER fields.

Related Documents

(T10) sat-r06 – SCSI to ATA Translation (SAT), Revision 6

(T10) sbc-2r16 – SCSI Block Commands -2, Revision 16

(T10) spc-3r23 – SCSI Primary Commands -3, Revision 23

(T10) spc-4r01 – SCSI Primary Commands -4, Revision 01

(T13) ata7v1r4b – AT Attachment with Packet Interface -7 Volume1, Revision 4b

Overview

1. The SEND DIAGNOSTIC command is a mandatory SCSI command per SBC-2.
2. The “self-test” feature of this command must be supported per SPC-3 if the command is supported.
3. Complexity of the emulation is estimated to be “minimal” to support the SEND DIAGNOSTIC “SELFTEST” bit for the “default self-test” feature.
4. Complexity of the emulation is estimated to be “medium” to support the SEND DIAGNOSTIC “SELF-TEST CODE” field for additional self-tests and report results in the Self-Test Results log page.

Suggested Changes

8.11 SEND DIAGNOSTIC command

The SEND DIAGNOSTIC command provides a mechanism for an application client to request diagnostic operations be performed on the target, logical unit or both. The SATL shall implement the default self-test feature (see SPC-3).

Table 27 - SEND DIAGNOSTIC command CDB fields

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Field	Description or reference
OPERATION CODE	Set to 1Dh. This field value is specific to the SEND DIAGNOSTIC command.
SELF-TEST CODE	<p>1) If the SELFTEST field is set to 1b, the SATL shall disregard the content of this field.</p> <p>2) If the SELFTEST field is set to 0b, the SATL shall determine if the ATA SMART EXECUTE OFF-LINE IMMEDIATE command is supported and enabled from the non-packet device ATA IDENTIFY DEVICE data word 84, bit 1, and word 85, bit 0. If the ATA SMART EXECUTE OFF-LINE IMMEDIATE command is supported and enabled the SATL shall perform the appropriate action with the non-packet device as defined in Table 28. If the ATA SMART EXECUTE OFF-LINE IMMEDIATE command is not supported the SATL shall return a CHECK CONDITION status with SENSE KEY set to ILLEGAL REQUEST and ADDITIONAL SENSE CODE set to INVALID FIELD IN CDB. If the ATA SMART EXECUTE OFF-LINE IMMEDIATE command is supported, but not enabled, the SATL shall return a CHECK CONDITION status with SENSE KEY set to ABORTED COMMAND and ADDITIONAL SENSE CODE set to ATA DEVICE FEATURE NOT ENABLED.</p> <p>[NOTE to SAT W.G. – Please check 2) above closely to determine if there is a better way to do this.]</p>
PF	Shall be set to 0b.
SELFTEST	<p>1) If set to 0b the SATL shall take the appropriate action as defined in Table 28.</p> <p>2) If set to 1b (default self-test feature) the SATL shall issue an ATA Execute Device Diagnostic (90h) command to the non-packet device. If the command completes without error the SATL shall return GOOD STATUS. If the command fails (see ATA/ATAPI-7 V1), the SATL shall return a CHECK CONDITION status with SENSE KEY set to HARDWARE ERROR and and ADDITIONAL SENSE CODE set to INTERNAL TARGET FAILURE.</p> <p>[NOTE to SAT W.G. – Please check 2) above closely to determine if this is the proper fault to report.]</p>
DEVOFFL	Shall be set to 0b.
UNITOFFL	Shall be set to 0b.
PARAMETER LIST LENGTH	Shall be set to 0b.
CONTROL	(see 6.4)

Table 28 - SELF-TEST CODE field

Code	Name of Test	Description of Test
000b		Default self-test. Used when SELFTEST bit is set to 1.
001b	Background short self-test	<p>The SATL shall perform the following:</p> <p>1) return status for the command as soon as the CDB has been validated and initialize the Self-Test Results log page (see 10.2.2 and SPC-3), and</p>

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		2) shall issue an ATA SMART EXECUTE OFF-LINE IMMEDIATE command to the non-packet device to perform the ATA "Execute SMART Short self-test routine immediately in off-line mode" (see Table 29).
010b	Background extended self- test	The SATL shall perform the following: 1) return status for the command as soon as the CDB has been validated and initialize the Self-Test Results log page (see 10.2.2 and SPC-3), and 2) shall issue an ATA SMART EXECUTE OFF-LINE IMMEDIATE command to the non-packet device to perform the ATA "Execute SMART Extended self-test routine immediately in off-line mode" (see Table 29).
011b	Reserved.	unspecified.
100b	Abort background self-test	The SATL shall issue an ATA SMART EXECUTE OFF-LINE IMMEDIATE command to the non-packet device to perform the ATA "Abort off-line mode self-test routine" (see Table 29). If the command completes successfully, the SATL shall return GOOD status. If the command fails the SATL shall perform the appropriate action as defined in SPC-3.
101b	Foreground short self-test	The SATL shall issue an ATA SMART EXECUTE OFF-LINE IMMEDIATE command to the non-packet device to perform the ATA "Execute SMART Short self-test routine immediately in captive mode" (see Table 29). If the command completes successfully, the SATL shall update the Self-Test Results log page prior to returning GOOD status. If the command fails the SATL shall first update the Self-Test Results log page (if capable, see SPC-3) then return a CHECK CONDITION status with SENSE KEY set to HARDWARE ERROR and ADDITIONAL SENSE CODE set to LOGICAL UNIT FAILED SELF-TEST.
110b	Foreground extended self-test	The SATL shall issue an ATA SMART EXECUTE OFF-LINE IMMEDIATE command to the non-packet device to perform the ATA "Execute SMART Extended self-test routine immediately in captive mode" (see Table 29). If the command completes successfully, the SATL shall update the Self-Test Results log page prior to returning GOOD status. If the command fails the SATL shall first update the Self-Test Results log page (if capable, see SPC-3) then return a CHECK CONDITION status with SENSE KEY set to HARDWARE ERROR and ADDITIONAL SENSE CODE set to LOGICAL UNIT FAILED SELF-TEST.-
111b	Reserved	unspecified.

Table 29 – SMART EXECUTE OFF-LINE IMMEDIATE commands

Subcommand	Register	Register value
Execute SMART Short self-test routine immediately in off-line mode	Features	D4h
	LBA Low	01h
	LBA Mid	4Fh
	LBA High	C2h
	Command	B0h
Execute SMART Extended self-test routine immediately in off-line mode	Features	D4h
	LBA Low	02h
	LBA Mid	4Fh
	LBA High	C2h
	Command	B0h
Abort off-line mode self-test routine	Features	D4h
	LBA Low	7Fh
	LBA Mid	4Fh
	LBA High	C2h
	Command	B0h
Execute SMART Short self-test routine immediately in captive mode	Features	D4h
	LBA Low	81h
	LBA Mid	4Fh
	LBA High	C2h
	Command	B0h
Execute SMART Extended self-test routine immediately in captive mode	Features	D4h
	LBA Low	82h
	LBA Mid	4Fh
	LBA High	C2h
	Command	B0h

[Note to Editor: The following is the Self-Test Results log page translation to be added to section 10.2. (The subclause and table numbering will probably be incorrect due to document changes.)]

10.2 Log Pages

10.2.4 Self-Test Results log page

The Self-Test Results log page (see Table 69) provides the results from the most recent self-tests (see SPC-3).

Table 69- Self-Test Results log page fields

Field	Description or reference
PAGE CODE	Set to 10h. This field value is specific to the Self-Test Results log page.
PAGE LENGTH	(see SPC-3).
Self-test results log parameters (see SPC-3)	

Table 70 - Self-test results log parameters

Field	Description or reference
PARAMETER CODE	unspecified.
DU	Shall be set to 0b (see SPC-3).
DS	Shall be set to 0b (see SPC-3).
TSD	Shall be set to 0b (see SPC-3).
ETC	Shall be set to 0b (see SPC-3).
TMC	Shall be set to 0h (see SPC-3).
LBIN	Shall be set to 1b (see SPC-3).
LP	Shall be set to 1b (see SPC-3).
PARAMETER LENGTH	(see SPC-3).
SELF-TEST CODE	(see SPC-3).
SELF-TEST RESULTS	<p>The SATL shall determine if the non-packet device supports the 48-bit Address feature set from word 83, bit 10 of the data returned from an ATA IDENTIFY DEVICE command. If word 83, bit 10 =1 the SATL shall issue an ATA READ LOG EXT command (2Fh with Log address 07h for the “Extended SMART self-test log”) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select byte n+1, bits 4 -7 of the Extended Self-test log descriptor entry to return to the application client for this field. If word 83, bit 10 = 0 the SATL shall issue an ATA SMART READ LOG command (B0h with Features register set to D5h, LBA Mid set to 4Fh, LBA High set to C2h, and Log address set to 06h for the SMART self-test log) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select byte n+1, bits 4 -7 of the Self-test log descriptor entry to return to the application client for this field.</p> <p>The SATL shall issue an ATA SMART READ DATA command (B0h with Features register set to D0h, LBA Mid set to 4Fh, and LBA High set to C2h) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select byte 363, bits 4 - 7 to return to the application client for this field.</p>
SELF-TEST NUMBER	<p>unspecified.</p> <p>[NOTE to W.G.: This information appears to be the same as the “SELF-TEST RESULTS” field (per SPC-3) or vendor specific. Also, there is a statement in SPC-3 (below table 219) as follows... “When the segment in which the failure occurred is not able to be identified or need not be identified, the SELF-TEST NUMBER field shall contain 00h.” Therefore, it is recommended that this field be unspecified.]</p>
TIMESTAMP	<p>The SATL shall determine if the non-packet device supports the 48-bit Address feature set from word 83, bit 10 of the data returned from an ATA IDENTIFY DEVICE command. If word 83, bit 10 =1 the SATL shall issue an ATA READ LOG EXT command (2Fh with Log address 07h for the “Extended SMART self-test log”) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select bytes n+3 and n+2 (in that order) of the Extended Self-test log descriptor entry to return to the application client for this field. If word 83, bit 10 = 0 the SATL shall issue an ATA SMART READ LOG command (B0h with Features register set to D5h, LBA Mid set to 4Fh, LBA High set to C2h, and Log address set to 06h for the SMART self-test log) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select bytes n+3 and n+2 (in that order) of the Self-test log descriptor entry to return to the application client for this field.</p>

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ADDRESS OF FIRST FAILURE	The SATL shall determine if the non-packet device supports the 48-bit Address feature set from word 83, bit 10 of the data returned from an ATA IDENTIFY DEVICE command. If word 83, bit 10 = 1 the SATL shall issue an ATA READ LOG EXT command (2Fh with Log address 07h for the “Extended SMART self-test log”) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select bytes n+8, n+ 7, n+6, and n+5 (in that order) of the Extended Self-test log descriptor entry to return to the application client for this field. If word 83, bit 10 = 0 the SATL shall issue an ATA SMART READ LOG command (B0h with Features register set to D5h, LBA Mid set to 4Fh, LBA High set to C2h, and Log address set to 06h for the SMART self-test log) to the non-packet device. Of the 512 bytes returned from the non-packet device the SATL shall select bytes n+8, n+ 7, n+6, and n+5 (in that order) of the Self-test log descriptor entry to return to the application client for this field.
SENSE KEY	10.2.5
ADDITIONAL SENSE CODE	10.2.5
ADDITIONAL SENSE CODE QUALIFIER	10.2.5

10.2.5 Sense key, additional sense code, and additional sense code qualifier

The SATL shall determine the values for the SENSE KEY, ADDITIONAL SENSE CODE, and ADDITIONAL SENSE CODE QUALIFIER fields from the Self-test execution status byte returned from an ATA SMART READ DATA command issued to the non-packet device. The values returned shall be translated into sense data for the SENSE KEY, ADDITIONAL SENSE CODE, and ADDITIONAL SENSE CODE QUALIFIER fields as shown in Table 71.

Table 71: ATA Self-test execution status values translated to SCSI sense keys and sense codes

ATA	SCSI	
Self-test execution status value	SENSE KEY	ADDITIONAL SENSE CODE
0	NO SENSE	NO ADDITIONAL SENSE INFORMATION
1	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
2	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
3	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
4	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
5	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
6	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
7	MEDIUM ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
8	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)
9-14	NO SENSE	NO ADDITIONAL SENSE INFORMATION
15	NOT READY or NO SENSE	LOGICAL UNIT NOT READY, SELF-TEST IN PROGRESS

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or

Table 71: ATA Self-test execution status values translated to SCSI sense keys and sense codes

ATA	SCSI	
Self-test execution status value	SENSE KEY	ADDITIONAL SENSE CODE
0	NO SENSE	NO ADDITIONAL SENSE INFORMATION
1	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (81h)
2	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (82h)
3	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (83h)
4	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (84h)
5	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (85h)
6	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (86h)
7	MEDIUM ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (87h)
8	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (88h)
9-14	NO SENSE	NO ADDITIONAL SENSE INFORMATION
15	NOT READY or NO SENSE	LOGICAL UNIT NOT READY, SELF-TEST IN PROGRESS

or

Table 71: ATA Self-test execution status values translated to SCSI sense keys and sense codes

ATA	SCSI		
Self-test execution status value	SENSE KEY	ADDITIONAL SENSE CODE	ADDITIONAL SENSE CODE QUALIFIER NN
0	NO SENSE	NO ADDITIONAL SENSE INFORMATION	00h
1	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	81h
2	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	82h
3	ABORTED COMMAND	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	83h
4	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	84h
5	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	85h
6	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	86h
7	MEDIUM ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	87h
8	HARDWARE ERROR	DIAGNOSTIC FAILURE ON COMPONENT NN (80h – FFh)	88h
9-14	NO SENSE	NO ADDITIONAL SENSE INFORMATION	00h
15	NOT READY or NO SENSE	LOGICAL UNIT NOT READY, SELF-TEST IN PROGRESS	09h