

Proposal for a Selective Self-test

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Current self-tests provides for a short self-test and an extended self-test. The short self-test does read scan of a small area of the media in a short time. The area of the media scanned is vendor specific. The extended self-test does read scan of the entire media. As the capacity of disk drives increases, the time to complete the extended self-test becomes exceedingly long. This proposal defines a Selective self-test that allows the read scan portion of the self-test to test areas of the media specified by the user. This allows the time to complete the self-test to be altered and allows those areas deemed critical by the user to be scanned.

Modifications to ATA/ATAPI-6 revision 2:

Table 59 – SMART EXECUTE OFF-LINE IMMEDIATE LBA Low register values

Value	Description of subcommand to be executed
0	Execute SMART offline routine immediately in off-line mode
1	Execute SMART Short self-test routine immediately in off-line mode
2	Execute SMART Extended self-test routine immediately in off-line mode
3	Reserved
4	Execute SMART Selective self-test routine immediately in off-line mode
5-63	Reserved
64-126	Vendor specific
127	Abort off-line mode self-test routine
128	Reserved
129	Execute SMART Short self-test routine immediately in captive mode
130	Execute SMART Extended self-test routine immediately in captive mode
131	Reserved
132	Execute SMART Selective self-test routine immediately in captive mode
133-191	Reserved
192-255	Vendor specific

8.54.4.8.6 SMART Selective self-test routine

When the value in the LBA Low register is 4 or 132, the Selective self-test routine shall be performed. This self-test routine shall include the initial tests performed by the Extended self-test routine plus a selectable read scan. This read scan may take a number of forms.

The user may choose to do read scan only on specific areas of the media and not limit the time to complete the test. To do this, user shall set the test spans desired in the Selective self-test log and set the flags in the Feature flags field of the Selective self-test log to indicate do not use skip length, do not perform off-lone scan, and do not terminate test if maximum allowable execution time is reached. In this case, the test spans defined shall be read scanned in their entirety regardless of how long it takes and ending status shall be placed into the self-test log upon completion. Figure xx shows an example of a Selective self-test definition with three test spans defined. In this example, the test terminates when all three test spans have been scanned.

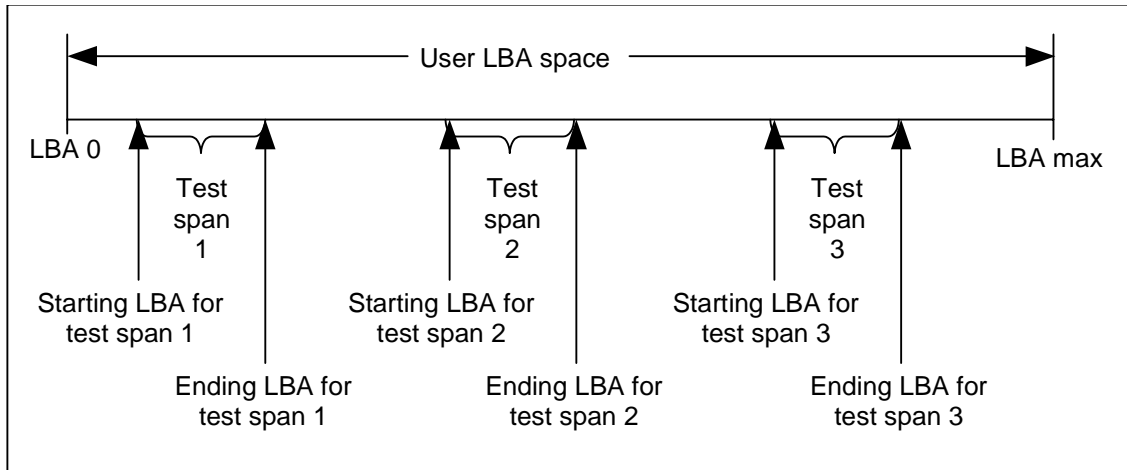


Figure xx – Selective self-test test span example

The user may choose to do read scan only on specific areas of the media but limit the time to complete the test. To do this, user shall set the test spans desired in the Selective self-test log, set the maximum allowable execution time in the Selective self-test log, and set the flags in the Feature flags field of the Selective self-test log to indicate do not use skip length, do not perform off-lone scan, and enable terminate test if maximum allowable execution time is reached. In this case, the test spans defined shall be read scanned in their entirety if it is possible to do so within the specified time. The test shall be terminated at the maximum allowable execution time if that time is reached before completing test of all defined test spans. In either case, the ending status shall be placed into the self-test log when the test terminates. Figure xx shows an example of a Selective self-test definition with three test spans defined. In this example, the test terminates when all three test spans have been scanned or the maximum allowable execution time has been reached.

The user may choose to do read scan with or without the maximum time enabled on specified areas and then continue on the read scan other areas if time permits. In this case, the user shall set the test spans desired in the Selective self-test log, set the maximum allowable execution time in the Selective self-test log if desired, set the skip length value in the Selective self-test log, and set the flags in the Feature flags field of the Selective self-test log to indicate use skip length, do not perform off-lone scan, and enable terminate test if maximum allowable execution time is reached. In this case, the test spans defined shall be read scanned in their entirety if it is possible to do so within the specified time. The device shall then proceed to read scan through the areas not included in the test spans by doing a read scan on 65,536 sectors, skipping an LBA distance equal to the value in the skip length field times 64, read scanning 65,536 sectors, etc until all the media has been tested on this sample basis if it is possible to do so within the specified time. If the value in the skip length field is zero, the entire area between test spans shall be read scanned. The test shall be terminated at the maximum allowable execution time if that time is reached before completing test of the media. The ending status shall be placed into the self-test log when the test terminates. Figure yy shows an example of a Selective self-test definition with three test spans defined and a sampled scan of the areas between test spans. In this example, the test terminates when all three test spans have been scanned and the sample scan of the areas between the test spans has been completed, or the maximum allowable execution time has been reached.

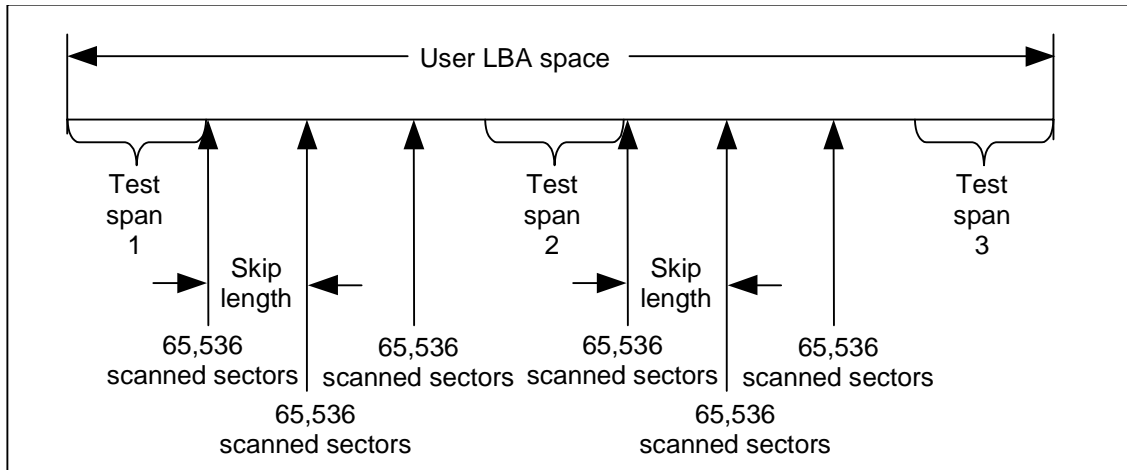


Figure yy – Test spans with sampled scan of other areas

Finally, a user may wish to have the entire media read scanned after scan of the Test spans has completed. Again, this may be done with or without the maximum test time enabled. In this case, the user shall set the test spans desired in the Selective self-test log, set the maximum allowable execution time in the Selective self-test log if desired, enable off-line scan, and enable terminate test if maximum allowable execution time is reached. The skip length flags shall be ignored. The test spans defined shall be read scanned in their entirety if it is possible to do so within the specified time. The device shall then set the off-line scan pending and active flags in the Selective self-test log to one and shall proceed to read scan through all areas not included in the test spans regardless of the time required to perform the scan. If the device is powered-down before the off-line scan is completed, the off-line scan shall resume when the device is again powered up. From power-up, the resumption of the scan shall be delayed the time indicated in the Selective self-test pending time field in the Selective self-test log. During this delay time the pending flag shall be set to one and the active flag shall be set to zero in the Selective self-test log. Once the time expires, the active flag shall be set to one, and the off-line scan shall resume.

A hardware or software reset shall abort the Selective self-test except when the pending bit is set to one in the Selective self-test log (see 8.54.8.6.5).

8.54.5.8.2 Self-test execution status byte

Table 62 – Self-test execution status values

Value	Description
0	The previous self-test routine completed without error or no self-test has ever been run.
1	The self-test routine was aborted by the host.
2	The self-test routine was interrupted by the host with a hardware or software reset.
3	A fatal error or unknown test error occurred while the device was executing its self-test routine and the device was unable to complete the self-test.
4	The previous self-test completed having a test element that failed and the test element the failed is not known.
5	The previous self-test completed having the electrical element of the test failed.
6	The previous self-test completed having the servo (and/or seek) element of the test failed.
7	The previous self-test completed having the read element of the test failed.
8	The previous self-test completed having reached the maximum allowable execution time specified.
9-14	Reserved.
15	Self-test routine in progress.

8.54.5.8.4 Off-line data collection capabilities

Bit 5 (Selective self-test implemented bit) – If this bit is cleared to zero, the device does not implement the Selective self-test routine. If this bit is set to one, the device implements the Selective self-test routine.

Bits (7:6) (Reserved).

8.6.4 SMART READ LOG

8.54.6.4 Inputs

Table 63 – Log address definition

Log address	Content	R/W
00h	Log directory	RO
01h	Summary SMART error log	RO
02h	Comprehensive SMART error log	RO
03h	Extended Comprehensive SMART error log	See note
04h-05h	Reserved	Reserved
06h	SMART self-test log	RO
07h	Extended self-test error log	See note
08h	Selective self-test log	R/W
09h-1Fh	Reserved	Reserved
20h	Streaming performance log	See note
21h	Write stream error log	See note
22h	Read stream error log	See note
23h	Delayed sector log	See note
24h-7Fh	Reserved	Reserved
80h-9Fh	Host vendor specific	R/W
A0h-BFh	Device vendor specific	VS
C0h-FFh	Reserved	Reserved

Key –
 RO – Log is read only by the host.
 R/W – Log is read or written by the host.
 VS – Log is vendor specific thus read/write ability is vendor specific.

NOTE –

8.54.8.6.5 Selective self-test log

The Selective self-test log is a log that may be both written and read by the host. This log allows the host to select the parameters for the self-test and to monitor the progress of the self-test. Table nn defines the content of the Selective self-test log.

Table nn – Selective self-test log

Byte	Description	Read/write
0-1	Data structure revision number	R/W
2-9	Starting LBA for test span 1	R/W
10-17	Ending LBA for test span 1	R/W
18-25	Starting LBA for test span 2	R/W
26-33	Ending LBA for test span 2	R/W
34-41	Starting LBA for test span 3	R/W
42-49	Ending LBA for test span 3	R/W
50-57	Starting LBA for test span 4	R/W
58-65	Ending LBA for test span 4	R/W
66-73	Starting LBA for test span 5	R/W
74-81	Ending LBA for test span 5	R/W
82-337	Reserved	Reserved
338-491	Vendor specific	Vendor specific
492-499	Current LBA under test	Read
500-501	Current span under test	Read
502-503	Feature flags	R/W
504-505	Skip length	R/W
506-507	Maximum allowable execution time	R/W
508-509	Selective self-test pending time	R/W
510-511	Data structure checksum	R/W

8.54.8.6.5.1 Data structure revision number

The value of the data structure revision number filed shall be 01h. This value shall be written by the host and returned unmodified by the device.

8.54.8.6.5.2 Test span definition

The Selective self-test log provides for the definition of up to five test spans. The starting LBA for each test span is the LBA of the first sector tested in the test span and the ending LBA for each test span is the last LBA tested in the test span. If the starting and ending LBA values for a test span are both zero, a test span is not defined and not tested. These values shall be written by the host and returned unmodified by the device.

8.54.8.6.5.3 Current LBA under test

The Current LBA under test field shall be written with a value of zero by the host. As the self-test progresses, the device shall modify this value to contain the beginning LBA of the 65,536 sector block currently being tested within the test span.

8.54.8.6.5.4 Current span under test

The Current span under test field shall be written with a value of zero by the host. As the self-test progresses, the device shall modify this value to contain the test span number of the current span being tested.

8.54.8.6.5.5 Feature flags

The Feature flags define the features of Selective self-test to be executed (see table mm).

Table mm – Selective self-test feature flags

Bit	Description
0	When set to one, use skip length defined in bytes (505:504) in none test span areas.
1	When set to one, perform off-line scan after selective test.
2	When set to one, terminate selective test when maximum allowable execution time is reached.
3	When set to one, off-line scan after selective test is pending.
4	When set to one, off-line scan after selective test is active.
5-15	Reserved.

Bits (2:0) shall be written by the host and returned unmodified by the device. Bits (4:3) shall be written as zeros by the host and the device shall modify them as the test progresses.

8.54.8.6.5.6 Skip length

The value of the Skip length field shall be written by the host and returned unmodified by the device. The value of this field times 64 is the number of sectors to be skipped when read scan skipping is enabled. If the value in the Skip length field is zero and read scan skipping is enabled, the device shall read scan all sectors in the areas between test spans.

8.54.8.6.5.7 Maximum allowable execution time

The value of the Maximum allowable execution time field shall be written by the host and returned unmodified by the device. The value in this field is the maximum allowable execution time in minutes. The self-test shall be terminated and ending status placed in the Self-test log when this time is reached if bit 2 of the self-test feature flags field is set.

8.54.8.6.5.8 Selective self-test pending time

The selective self-test pending time is the time in minutes from power-on to the resumption of the off-line testing if the pending bit is set. At the expiration of this time, sets the active bit to one, and resumes the off-line scan that had begun before power-down.

8.54.8.6.5.9 Data structure checksum

The data structure checksum is defined in 8.54.6.8.2.4.