

ISO/IEC 24739-1:2009-09 (E)

Information technology – AT attachment with packet interface-7 –

Part 1: Register delivered command set, logical register set (ATA/ATAPI-7 V1)

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references	12
3 Definitions, abbreviations and conventions	13
3.1 Definitions and abbreviations	13
3.2 Abbreviations	21
3.3 Conventions	22
4 General operational requirements.....	28
4.1 Command delivery.....	28
4.2 Register delivered data transfer command sector addressing	28
4.3 General feature set	29
4.4 PACKET Command feature set	31
4.5 Power Management feature set	32
4.6 Advanced Power Management feature set.....	35
4.7 Security Mode feature set.....	35
4.8 SMART (self-monitoring, analysis and reporting technology) feature set.....	42
4.9 Host Protected Area feature set	43
4.10 CompactFlash™ Association (CFA) feature set.....	47
4.11 Removable Media Status Notification and Removable Media feature sets	48
4.12 Power-Up in Standby feature set	50
4.13 Automatic Acoustic Management (AAM) feature set	50
4.14 48-bit Address feature set	51
4.15 Device Configuration Overlay feature set	53
4.16 Media Card Pass Through Command feature set.....	56
4.17 Streaming feature set.....	57
4.18 General Purpose Logging feature set	59
4.19 Overlapped feature set.....	59
4.20 Queued feature set.....	60
4.21 Long physical sector feature set for non-packet devices	61
4.22 Long logical Sector feature set for non-packet devices	62
4.23 Devices implementing the Long Physical Sector Feature Set and the Long Logical Feature Sector Set.....	65
5 I/O register descriptions	65
5.1 Overview	65
5.2 Alternate Status register.....	65
5.3 Command register	66
5.4 Data port.....	66
5.5 Data register	67
5.6 Device register	67
5.7 Device control register	68
5.8 Error register.....	69
5.9 Features register.....	69
5.10 LBA High/Byte Count High register.....	70

5.11	LBA Low register	70
5.12	LBA Mid/Byte Count Low register	71
5.13	Sector Count/Interrupt Reason register	71
5.14	Status register	71
5.15	Signature and persistence	74
5.16	Single device configurations	75
6	Command descriptions	76
6.1	Overview	76
6.2	CFA ERASE SECTORS	78
6.3	CFA REQUEST EXTENDED ERROR CODE	79
6.4	CFA TRANSLATE SECTOR	82
6.5	CFA WRITE MULTIPLE WITHOUT ERASE	84
6.6	CFA WRITE SECTORS WITHOUT ERASE	86
6.7	CHECK MEDIA CARD TYPE	88
6.8	CHECK POWER MODE	90
6.9	CONFIGURE STREAM	91
6.10	DEVICE CONFIGURATION	94
6.11	DEVICE RESET	108
6.12	DOWNLOAD MICROCODE	109
6.13	EXECUTE DEVICE DIAGNOSTIC	111
6.14	FLUSH CACHE	113
6.15	FLUSH CACHE EXT	115
6.16	GET MEDIA STATUS	118
6.17	IDENTIFY DEVICE	119
6.18	IDENTIFY PACKET DEVICE	144
6.19	IDLE	158
6.20	IDLE IMMEDIATE	160
6.21	MEDIA EJECT	163
6.22	MEDIA LOCK	164
6.23	MEDIA UNLOCK	166
6.24	NOP	168
6.25	PACKET	169
6.26	READ BUFFER	175
6.27	READ DMA	176
6.28	READ DMA EXT	178
6.29	READ DMA QUEUED	181
6.30	READ DMA QUEUED EXT	185
6.31	READ LOG EXT	191
6.32	READ MULTIPLE	204
6.33	READ MULTIPLE EXT	207
6.34	READ NATIVE MAX ADDRESS	210
6.35	READ NATIVE MAX ADDRESS EXT	211
6.36	READ SECTOR(S)	213
6.37	READ SECTOR(S) EXT	216
6.38	READ STREAM DMA EXT	218
6.39	READ STREAM EXT	223
6.40	READ VERIFY SECTOR(S)	227
6.41	READ VERIFY SECTOR(S) EXT	229
6.42	SECURITY DISABLE PASSWORD	232

6.43	SECURITY ERASE PREPARE	233
6.44	SECURITY ERASE UNIT.....	235
6.45	SECURITY FREEZE LOCK	237
6.46	SECURITY SET PASSWORD.....	239
6.47	SECURITY UNLOCK.....	241
6.48	SERVICE	243
6.49	SET FEATURES.....	244
6.50	SET MAX	251
6.51	SET MAX ADDRESS EXT	259
6.52	SET MULTIPLE MODE.....	262
6.53	SLEEP	264
6.54	SMART	266
6.55	STANDBY	297
6.56	STANDBY IMMEDIATE	299
6.57	WRITE BUFFER.....	300
6.58	WRITE DMA	302
6.59	WRITE DMA EXT	304
6.60	WRITE DMA FUA EXT	308
6.61	WRITE DMA QUEUED	311
6.62	WRITE DMA QUEUED EXT.....	315
6.63	WRITE DMA QUEUED FUA EXT.....	320
6.64	WRITE LOG EXT.....	326
6.65	WRITE MULTIPLE.....	329
6.66	WRITE MULTIPLE EXT	331
6.67	WRITE MULTIPLE FUA EXT	334
6.68	WRITE SECTOR(S).....	338
6.69	WRITE SECTOR(S) EXT	340
6.70	WRITE STREAM DMA EXT	342
6.71	WRITE STREAM EXT.....	346
7	Parallel interface physical and electrical requirements (see ISO/IEC 24739-2)	351
8	Parallel interface signal assignments and descriptions (see ISO/IEC 24739-2).....	351
9	Parallel interface general operating requirements of the physical, data link, and transport layers (see ISO/IEC 24739-2).....	351
10	Parallel interface register addressing (see ISO/IEC 24739-2)	351
11	Parallel interface transport Protocols (see ISO/IEC 24739-2).....	351
12	Parallel interface timing (see ISO/IEC 24739-2).....	351
13	Serial interface overview (see ISO/IEC 24739-).....	351
14	Serial interface physical layer (see ISO/IEC 24739-3)	351
15	Serial interface link layer (see ISO/IEC 24739-3).....	351
16	Serial interface transport layer (see ISO/IEC 24739-3)	351
17	Serial interface device command layer (see ISO/IEC 24739-3).....	351
18	Host command layer (see ISO/IEC 24739-3)	351
19	Serial interface host adapter register interface (see ISO/IEC 24739-3).....	351
20	Serial interface error handling (see ISO/IEC 24739-3).....	351
	Annex A (informative) Command Set summary	352
	Annex B (informative) Design and programming considerations for large physical sector devices	359

Annex C Device determination of cable type (informative) (see ISO/IEC 24739-2)	361
Annex D Signal integrity and UDMA guide (informative) (see ISO/IEC 24739-2)	361
Annex E Register selection address summary (informative) (see ISO/IEC 24739-2).....	361
Annex F Sample code for CRC and scrambling (informative) (see ISO/IEC 24739-3).....	361
Annex G FIS type field value selection (informative) (see ISO/IEC 24739-3).....	361
Annex H Physical layer implementation examples (informative) (see ISO/IEC 24739-3).....	361
Annex I Command processing Example (informative) (see ISO/IEC 24739-3)	361
Bibliography.....	362
Figure 1 – ATA document relationships.....	11
Figure 2 – State diagram convention.....	24
Figure 3 – Byte, word and DWORD relationships	28
Figure 4 – Power management state diagram	33
Figure 5 – Security mode state diagram.....	37
Figure 6 – SET MAX security state diagram	46
Figure 7 – Device configuration overlay state diagram	54
Figure 8 – Long Logical and long Physical Sector Example.....	62
Figure 9 – Selective self-test test span example	277
Figure B.1 – Unaligned Write Example.....	360
Table 1 – PACKET delivered command sets	12
Table 2 – Byte order	26
Table 3 – Byte order	27
Table 4 – Security mode command actions	40
Table 5 – 48-bit addresses	52
Table 6 – 28-bit addresses	52
Table 7 – Media Card type references	56
Table 8 – Long logical sector function.....	63
Table 9 – I/O registers	65
Table 10 – Extended error codes	81
Table 11 – CFA TRANSLATE SECTOR Information.....	83
Table 12 – Device Configuration Overlay Features register values.....	94
Table 13 – Device Configuration Identify data structure	100
Table 14 – Device Configuration Overlay data structure.....	105
Table 16 – IDENTIFY DEVICE data	122
Table 17 - Minor version number	135
Table 18 – IDENTIFY PACKET DEVICE data.....	146
Table 19 – Automatic Standby timer periods	158
Table 20 – Log address definition	192
Table 21 – General Purpose Log Directory	194
Table 22 – Extended Comprehensive SMART error log.....	195
Table 23 – Extended Error log data structure.....	196
Table 24 – Command data structure	197

Table 25 – Error data structure	198
Table 26 – State field values.....	198
Table 27 – Extended Self-test log data structure.....	199
Table 28 – Extended Self-test log descriptor entry	200
Table 29 – Read Stream Error log.....	201
Table 30 – Error Log Entry.....	201
Table 31 – Write Stream Error log.....	202
Table 32 – Streaming Performance Parameters log	203
Table 33 – Sector Time Array Entry (Linearly Interpolated)	203
Table 34 – Position Array Entry (Linearly Interpolated)	203
Table 35 – Access Time Array Entry (Linearly Interpolated).....	203
Table 36 – Delayed LBA log.....	204
Table 37 – Security password content.....	233
Table 38 – SECURITY ERASE UNIT password.....	237
Table 39 – SECURITY SET PASSWORD data content.....	241
Table 40 – Identifier and security level bit interaction.....	241
Table 41 – SET FEATURES register definitions	246
Table 42 – Transfer mode values.....	247
Table 43 – Advanced power management levels.....	248
Table 44 – Automatic acoustic management levels	249
Table 45 – SET MAX Features register values	251
Table 46 – SET MAX SET PASSWORD data content.....	255
Table 47 – SMART Feature register values.....	267
Table 48 – SMART EXECUTE OFF-LINE IMMEDIATE LBA Low register values	275
Table 49 – Device SMART data structure	280
Table 50 – Off-line data collection status byte values.....	281
Table 51 – Self-test execution status values	281
Table 52 – Log address definition	284
Table 53 – SMART Log Directory.....	286
Table 54 – SMART summary error log sector.....	286
Table 55 – Error log data structure	287
Table 56 – Command data structure	288
Table 57 – Error data structure	288
Table 58 – State field values.....	289
Table 59 – Comprehensive error log	290
Table 60 – Self-test log data structure	291
Table 61 – Self-test log descriptor entry.....	291
Table 62 – Selective self-test log	292
Table 63 – Selective self-test feature flags	293
Table A.1 – Command matrix.....	352
Table A.2 – Command codes (sorted by command code).....	353
Table A.3 – Command codes (sorted by command)	356