

TECHNICAL DOCUMENT

SCSI PROTOCOL

Version : X010

UMAX DATA SYSTEM INC.

HISTORY:

Editor	Date	Version	Event
JOHNSON	12/27/'93	X001	1.Update SCSI protocol from VS-600 2. Release X001 to F/W Member
JOHNSON	01/10/'94	X002	1.Include PS-2400X, VS-600,PS-1600LD to X001 version 2. Unsured part mark " ? " 3. H/W error code add 00H -> No Error 74H -> Black line error 4. Release X002
JOE	02/14/'94	X003	1.Update all features
CLAIRE	03/02/'94	X004	1.Add PS-1600XD protocol
JOE	03/07/'94		2. Modify ps-2400x width from 8" to 8.3 inch
JOE	04/01/'94	X005	1. Add warmup time in inquiry 2. Add warmup in request sense cmd 3. PS-2400X speed supports 1 and 2 4. Add error code (wrong CCD)
JOE	05/25/'94	X006	1. Add batch scan function
ZHENG	06/10/'94	X007	1. Add VISTA-T6 protocol
JOE	06/21/'94	X008	1. Modify SelectColor in SetWindow Cmd ,let it compatiabile with old model. 2. Modify batch scan function and add calibration bit to let driver control calibration or not.
JOHN	07/04/83	X009	1 Add on ADF-V protocol 2 Add on Vista-S8 protocol
JOE	07/08/'94	X009a	1. Modify ADF protocol (reserved 0x63 in Inq. cmd & add adf error in request sense) 2. Add statement in Reserve Unit Cmd , about sent Inquiry cmd by other initiator 3. Add Line count & Pixel count in SetWindow Cmd , send by Driver 4. modify GIB & GOB in Inquiry Command & Send Command
Claire	09/12/'94	X00b	1. Modify the Scan Capability, add the bit named Not support highlight function 2. Modify PS-1600XD, Not support highlight & Not support shadow function

ZHENG	11/4/94	X00c	1. Write Buffer Command. 2. Clear special model info.
True	11/14/94	X00d	1. Condition code / Message shading computing
Bill	8/16/94	X00f	1.Add analog gamma protocol
ZHENG	10/20/94	X00g	1.Add calibration by driver protocol
Darken	12/15/95	X00H	1.Add Adjust Exposure Time function
Bill	3/4/95	X010	1.Add color mode line arrangement can be selected by f/w or driver

Name Date Version Event

True	12/23/94	-	SER error code
True	01/09/95	-	Analog Gamma control (Vista-S12)
True	02/08/95	-	Optical,X,Y, Resolution residue(unit 1 dpi) (PL-III) X,Y coordinate base (pts/inch)
True	03/15/95	X00E	analog gamma upper/lower bound in Inquiry (Vista-S12)
Bill	08/16/95	X00F	Update Inquiry analog Gamma Upper/lower bound to analog gamma table define(Vista-S12)
ZHENG	10/20/95	X00G	Add calibration by driver function(PL-II,S12)
Darken	2/15/95	X00H	Add Adjust Exposure Time function
Bill	3/4	X010	Add Color mode line arrangement can select by f/w or driver

Contents:

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1 System Options

1. Single-Ended Connections -- 50 pins
2. No Parity
3. "HARD" Reset
4. Asynchronous Data Transfer
5. Terminator Power Option (in mother board)
6. Multi-Initiators
7. Reselection
8. MAC_Series SCSI Compatible

2 STATUS Bytes

00H --- GOOD

02H --- CHECK CONDITION

08H --- BUSY

18H --- RESERVATION CONFLICT

<Note>

(1) BUSY

Scanner is busy and initiator can try its attempt again later on.

(2) RESERVATION CONFLICT

Scanner is reserved by other initiator and the rejected initiator can try its action again later on.

3 MESSAGE Bytes

00H	--- COMMAND COMPLETE (I)
03H	--- RESTORE POINTERS (I)
? 04H	--- DISCONNECT (I)
05H	--- INITIATOR DETECTED ERROR (O)
06H	--- ABORT (O)
07H	--- MESSAGE REJECT (I/O)
08H	--- NO OPERATION (O)
0CH	--- BUS DEVICE RESET (O)
80H-FFH	--- IDENTIFY (O)

Other MESSAGE bytes will be rejected by MESSAGE REJECT.

4 SCSI Commands

Command	OP Code	Type
TEST UNIT READY	00H	M
REQUEST SENSE	03H	M
INQUIRY	12H	M
RESERVE UNIT	16H	M
RELEASE UNIT	17H	M
SCAN	1BH	M
SET WINDOW	24H	M
READ	28H	M
SEND	2AH	O
OBJECT POSITION	31H	M
GET DATA BUFFER STATUS	34H	O
WRITE BUFFER	3BH	O

Type:

M =Mandatory command shall be implemented in order to meet the minimum requirement.

O = Optional command if implemented shall be implemented as defined.

4-1 TEST UNIT READY (00H)

If the scanner is in "READY" status, GOOD status will be reported.

Otherwise, the command will terminate with CHECK CONDITION status and Sense Data is set to the cause of the error (refer REQUEST SENSE command).

? *The command will answer BUSY during calibration and chassis return.*

Delay 15-20 ms if the previous executed command is TEST UNIT READY.

TEST UNIT READY Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (00H)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				
2	0 x 0 2	Reserved (00H)							
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	Reserved (00H)							
5	0 x 0 5	Control Byte (00H)							

[0x01]

bit7 - bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the TEST UNIT READY command with CHECK CONDITION status while selecting an invalid logical unit.

power on sequence:

1.Inquiry.

2.Test Unit Ready

---- Check Condition

3.Request Sense

---- Unit Attention

4.Test Unit Ready

<Note> The target shall generate a **Unit Attention Condition** for each initiator whenever any following condition happens:

A. Power on reset

B. BUS DEVICE RESET message

C. "HARD" reset (-RST pin in SCSI port is active)

<Note> when scan & medium position command not complete, the status is "busy"

4-2 REQUEST SENSE (03H)

The REQUEST SENSE command requests that the target transfers sense data to the initiator.

The sense data is cleared by scanner in receipt of any other command from the same initiator. Do not clear the sense data in REQUEST SENSE command to reserve sense data for next REQUEST SENSE.

REQUEST SENSE Command Block

DEC		HEX		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (03H)									
1	0 x 0 1	Logical Unit Number				Reserved (00H)					
2	0 x 0 2	Reserved (00H)									
3	0 x 0 3	Reserved (00H)									
4	0 x 0 4	Allocation Length									
5	0 x 0 5	Control Byte (00H)									

[0x01]

bit 7 - bit5 : Logical Unit Number :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall return sense data for REQUEST SENSE command while selecting an invalid logical unit. The sense key shall be set to ILLEGAL REQUEST and the additional sense code shall be set to LOGICAL UNIT NOT SUPPORTED.

[0x04] Allocation length :

It specifies the maximum number of bytes that the initiator has returned sense data.

<Note> 1.The allocation length = 14H when defined 00H.

2.The target shall terminate the DATA IN phase when allocation length bytes have been transferred or when all available sense data have been transferred to the initiator, whichever is less.

The REQUEST SENSE command shall return CHECK CONDITION status to report fatal errors for the REQUEST SENSE command.

REQUEST SENSE Return Block

DEC	HEX	7	6	5	4	3	2	1	0
-----	-----	---	---	---	---	---	---	---	---

0	0x00	Valid	Error Code (70H)						
1	0x01	Segment Number							
2	0x02	FM	EOM	ILI	R	Sense Key			
3	0x03	MSB Information LSB							
6	0x06								
7	0x07	Additional Sense Length (0EH)							
8	0x08	MSB Command-Specified Information LSB							
11	0x0B								
12	0x0C	ASC : Additional Sense Code							
13	0x0D	ASCQ: Additional Sense Code Qualifier							
14	0x0E	Field Replaceable Unit Code							
15	0x0F	SKSV	MSB Sense-Key Specific LSB						
17	0x11								
18	0x12	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
19	0x13	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
20	0x14	Reserved (00H)							
21	0x15	Scanner Error Code							
22	0x16	Reserved							
23	0x17	Scanner condition code							
24	0x18	MSB Scanner condition messages							
30	0x1E	LSB							

[0x00]

bit7 : **Valid bit** A valid bit of one indicates that the Information field contains valid information.

bit6 - bit0 : **Error Code**: 70H

[0x01] Segment Number: Reserved : 00H

[0x02]

bit7 : **FM (FileMark)** : Reserved : 0B

bit6 : **EOM (End of Medium)** : Reserved : 0B

bit5 : **ILI**: The Incorrect Length Indicator bit of one indicates that the requested data length is larger than the actual length on the medium.

bit4 : **R** : Reserved : 0B

bit3 - bit2 & [0x0C]-[0x0D]

Sense Key	Description	ASC	ASCQ	Description
-----------	-------------	-----	------	-------------

00H	NO SENSE	00H 00H	No Additional Sense Information
03H	MEDIUM ERROR	14H 00H	Misfeed/Paper jam (used in ADF or roller system)
		14H 01H	ADF not ready (no paper, cover not closed, ADF not connected)
04H	HARDWARE ERROR	40H 00H	Diagnostic Error
05H	ILLEGAL REQUEST	20H 00H	Invalid command operation code
		24H 00H	Illegal field in CDB
		25H 00H	Logical unit not supported
		26H 00H	Invalid field in parameter list
		2CH 01H	Too many windows specified
		2CH 02H	Invalid combination of windows specified
06H	UNIT ATTENTION	29H 00H	Power On/ Reset/ BUS DEVICE RESET occurred
		3FH 01H	Miscrocode has been changed
09H	VENDER SPECIFIC	80H 01H	Lamp Warmup
		80H 02H	Calibration By Driver

The additional sense bytes 12H and 13H and 15H in return block offer detail informations about **HARDWARE ERROR** sense key.

[0x03]-[0x06] Information:

The difference of the requested data length minus the actual data length (in either bytes or blocks). If the valid bit is zero, the information field is reserved. It is used for EAD command. ILI, Information and Valid are all reserved for other commands.

[0x07] Additional Sense Length :

It indicates the number of additional sense bytes to follow.

[0x08]-[0x0B] Command-Specified Information : Reserved :00H

[0x0E] Field Replaceable Unit Code : Reserved :00H

[0x0F]

bit7 : **SKSV**

1 = The Sense Key Specific field is defined by this standard.

[0x0F]-[0x11] Sense-Key Specific :

If the sense key field is set to ILLEGAL REQUEST and the SKSV bit is set to one,

the sense-key field shall be defined as following table.

DEC HEX		7	6	5	4	3	2	1	0
15	0x0F	SKSV	C/D	Reserved		BPV	Bit Pointer		
16	0x10	MSB Field Pointer							
17	0x11								
		LSB							

[0x0F]

bit6 : **C/D**

1 = The illegal parameter is in CDB.

0 = The illegal parameter is in the data parameters which sent by the initiator during the DATA OUT phase.

[0x0F]

bit3 : **BPV** : Reserved : 0B

bit2 - bit0 : **Bit Pointer** : Reserved : 000B

[0x10]-[0x11] Field Pointer :

It indicates which byte of the CDB or of the parameter was in error.

[0x12]-[0x13] Additional Sense Bytes : (For HARDWARE ERROR sense key)

- (a) dim light
- (b) no light
- (c) sensor or motor error
- (d) too light
- (e) calibration error (10 unsuccessful attempts)
- (f) ROM error
- (g) RAM error
- (h) CPU error (internal RAM error)
- (i) 5380(SCSI) error
- (j) 8253(TIMER) error
- (k) filter motor error
- (l) reserved
- (m) reserved
- (o) DC adjust error
- (p) transparent adaptor home sensor or motor error

[0x15] Scanner Error Code:

ErrCode	Error Message

	00 No Error
01-04	CPU
	01 CPU
	02-03 Reserved
	04 ROM
05-09	Reserved
10-19	Buffer
	10 Buffer
	11 System Buffer
	12 Shading Buffer
	13 Video Buffer
	14 Stack Buffer
	15 Control Buffer
	16 Gamma Buffer
	17-19 Reserved
20-24	Lamp
	20 Lamp
	21 Dark
	22 Dim
	23 Light
	24 Lamp Adjust Control error (by Darken)
25-29	Reserved
30-34	Cal,DC offset
	30 Calibration
	31 DC offset
	32 Gain
	33-34 Reserved
35-39	Reserved
40-49	Key Component
	40 SCSI
	41 reserved
	42 ASIC

43	Timer
44	CCD
45-49	Reserved
50-59	Transparency
50	UTA
51	UTA home sensor, Motor
52-59	Reserved
60-69	ADF
60	ADF
61	ADF paper jam
62	ADF no paper
63	ADF cover open
64-69	Reserved
70-79	FB Sensor
70	FB Sensor
71	FB home or Motor, sensor
72	FB Filter or Motor, sensor
73	Lens or Motor, sensor
74	First line position error (LER error, vertical)
75	First pixel position error (SER error, horizontal)
76	First pixel position error for lens 2 (SER2 error, horizontal)
77-79	Reserved
80-89	Reserved
90-99	Reserved

[0x16] Reserved

[0x17-0x1D] Scanner Condition Code & Message

Condition code(0x17)	Condition Message(0x18-0x1D)

1. Calibration curve computing	[0x18- 0x1B] Calibration Width (0x18 MSB)
	[0x1C-0x1D] Calibration Lines (0x1C MSB)
	[0x1E] Calibration bytes per pixel
	It is calculating unit.

2~255. reserved

4-3 INQUIRY (12H)

INQUIRY Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (12H)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				EVPD
2	0 x 0 2	Reserved (00H)				Desired Data Format			
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	Allocation Length							
5	0 x 0 5	Control Byte (00H)							

[0x01]

bit7 - bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall return the INQUIRY data with the peripheral qualifier set to be 011b and the peripheral device type set to be 1Fh for INQUIRY command while selecting an invalid logical unit. Also, this command return CHECK CONDITION status.

[0x01]

bit0 : **EVPD** (Enable Vital Product Data) :

0 = The target shall return the standard INQUIRY data.

[0x02]

bit3 - bit0 : **Desired data format**: 02H

The INQUIRY command shall return standard INQUIRY data while received other data format.

INQUIRY Return Block

<i>DEC</i>		<i>H E X</i>		7	6	5	4	3	2	1	0
0	0x00	Peripheral Qualifier				Peripheral Device Type					
1	0x01	RMB	Device Type Modifier								
2	0x02	ISO Version			ECMA Version			ANSI-Approved Ver.			
3	0x03	AENC	TrmlOP	Reserved			Response Data Format (02H)				
4	0x04	Additional Length (8FH)									
5	0x05	Reserved (00H)									
6	0x06										

7	0x07	RelAdr	WBus32	Wbus16	Sync	Linked	R	CmdQue	SftRe
8	0x08	Vendor Identification UMAX (55 4D 41 58 20 20 20 20)							
15	0x0F								
16	0x10	Product Identification							
31	0x1F								
32	0x20	Product Revision Level VX.X (56 XX 2E XX)							
35	0x23								
36	0x24	F/W Support Function							
37	0x25	Exposure Time Step Unit (us)							
38	0x26	Exposure Time Maximun (MSB)							
39	0x27	Exposure Time Maximun (LSB)							
40	0x28	Reserved							
41	0x29	Reserved							
42	0x2A	Lineart/HalfTone/Gray Exposure Time Minimun							
43	0x2B	Color Exposure Time Minimun							
44	0x2C	Lineart/HalfTone Exposure Time Default (FB/ADF)							
45	0x2D	Lineart/HalfTone Exposure Time Default (UTA)							
46	0x2E	Gray Exposure Time Default (FB/ADF)							
47	0x2F	Gray Exposure Time Default (UTA)							
48	0x30	Color : R Exposure Time Default (FB/ADF)							
49	0x31	Color : G Exposure Time Default (FB/ADF)							
50	0x32	Color : B Exposure Time Default (FB/ADF)							
51	0x33	Color : R Exposure Time Default (UTA)							
52	0x34	Color : G Exposure Time Default (UTA)							
53	0x35	Color : B Exposure Time Default (UTA)							
54	0x36	Reserved							
55	0x37	Reserved							
56	0x38	Reserved by SCSI							
95	0x5F								
96	0x60	Scanner Capability							
97	0x61	Scanner Capability							
98	0x62	Scanner Capability							
99	0x63	Reserved							
100	0x64	GDA	X	GDT	Reserved			GL	
101	0x65	Reserved							
102	0x66	GIB: Gamma Input Bits/Pixel Support							
103	0x67	Reserved							
104	0x68	GOB: Gamma Output Bits/Pixel Support							

105	0x69	HDA	Halftone Pattern Download Max Matrix, n
106	0x6A	Built-In Halftone Pattern Support	
107	0x6B	Reserved	
108	0x6C		
109	0x6D	Color Sequence	Color Ordering Support
110	0x6E	MSB	Maximum Video Memory (Bytes)
113	0x71		LSB
114	0x72	Reserved (00)	
115	0x73	Maximum Optical Resolution (100 dpi)	
116	0x74	Maximum X Resolution (100 dpi)	
117	0x75	Maximum Y Resolution (100 dpi)	
118	0x76	MSB	FB Maximum Scan Width
119	0x77		LSB
120	0x78	MSB	FB Maximum Scan Length
121	0x79		LSB
122	0x7A	MSB	UTA X Original Point
123	0x7B		LSB
124	0x7C	MSB	UTA Y Original Point
125	0x7D		LSB
126	0x7E	MSB	UTA Maximum Scan Width
127	0x7F		LSB
128	0x80	MSB	UTA Maximum Scan Length
129	0x81		LSB
130	0x82	Reserved	
131	0x85		
134	0x86	MSB	DOR X Original Point
135	0x87		LSB
136	0x88	MSB	DOR Y Original Point
137	0x89		LSB
138	0x8A	MSB	DOR Maximum Scan Width
139	0x8B		LSB
140	0x8C	MSB	DOR Maximum Scan Length
141	0x8D		LSB
142	0x8E	Reserved (0 0)	
143	0x8F	LAST CALIBRATION LAMP DENSITY (LCLD)	
144	0x90	Reserved (0 0)	
145	0x91	(LWMT) Lamp Warmup Max Time	
146	0x92	MSB	WDBL(WINDOW DESCRIPTOR BLOCK LENGTH)

147	0x93	LSB
148	0x94	Optical Resolution Residue (1 dpi)
149	0x95	X Resolution Residue(1 dpi)
150	0x96	Y Resolution Residue(1 dpi)
151	0x97	Analog Gamma Table
152	0x98	Reserved
153	0x99	Reserved
154	0x9A	Max calibration data lines

[0x00]

Bit7 - Bit5 : **Peripheral Qualifier**

000B = The specified peripheral device type is currently connected to this logical unit.

011B = The target is not capable of supporting a physical device on this logical unit. For this peripheral qualifier the peripheral device type shall be set to 1FH.

Bit4 - Bit0 : **Peripheral Device Type:**

06H = scanner device

1FH = Unknown or no device type

[0x01]

Bit7 : **RMB**: Reserved

Bit6 - Bit0 : **Device Type Modifier**

Bit6 - Bit5 : Reserved

Bit4 - Bit3 :

0 0 CBHS 0 - 50

0 1 CBHS 0 - 255

1 0 CBHS 0-255 + Autoexposure

1 1 Reserved

< note > CBHS: Contrast, Brightness, Highlight, Shadow

Bit2 : Lamp status for TRANSPARENCY scanning mode

1 = On

0 = Off

Bit1 : TRANSPARENCY available(1:True,0:False)

Bit0 : 1 = ADF scanning mode

0 = FLATBED scanning mode

[0x02] ISO Version and ECMA Version: Reserved

[0x03]

Bit7 - Bit6 : **AENC** and **TrmIOP** : Reserved

Bit3 - Bit0 : **Response Data Format**

02H = The data shall be in the format specified in this standard.

[0x04] Additional Length :

It specifies the length in bytes of the parameters.

[0x07] RelAdr, WBus32, WBus16, Sync, Linked, R, CmdQue, and SftRe :

Reserved

[0x08]-[0x0F] Vendor Identification :

It identifies the vendor of the product. (UMAX)

[0x10]-[0x1F] Product Identification :

It identifies the model name of the product.

[0x20]-[0x23] Product Revision Level :

It contains 4 bytes of ASCII data that indicate the F/W version.

[0x24] F/W Support Function : (1 = True, 0 = False)

- Bit0 : QUALITY calibration
- Bit1 : FAST PREVIEW function
- Bit2 : SHADOW compensation by F/W
- Bit3 : RESELECTION phase
- Bit4 : Lamp Intensity Control
- Bit5 : Batch scan function
- Bit6 : Calibration mode Control by Driver
- Bit7 : **Adjust Exposure Time Function bit**

[0x25] -[0x36] Adjust Exposure Time Function (by Darken)

[0x25] Exposure Time Step Unit (us)

Exposure Time = Step Unit * Exposure Level (In Set Window Command)

[0x26]-[0x27] Exposure Time Maximun

Maximun Exposure Time = Exposure Time Maximun * Step Unit (us)

[0x28]-[0x29] Reserved

[0x2A]-[0x2B] Exposure Time Minimum

Minimum Exposure Time = Exposure Time Minimum * Step Unit (us)

[0x2c]-[0x35] Exposure Time Default

Default Exposure Time = Exposure Time Default * Step Unit (us)

[0x36] Reserved

[0x60] Scanner Capability : (1 = True, 0 = False)

Bit0 : Three passes color mode

Bit1 : Single pass color mode

Bit2 : LINEART mode

Bit3 : HALFTONE mode

Bit4 : GRAY mode

Bit5 : COLOR mode

Bit6 : UTA

Bit7 : ADF

[0x61] Scanner Capability : (1 = True, 0 = False)

Bit0 : double resolution

Bit1 : send high byte first when each pixel greater than 1 byte.

Bit2 : Bi-level image reverse

Bit3 : Multi-level image reverse

Bit4 : *Not* support shadow function

Bit5 : *Not* support highlight function

Bit6 : F/W Downloadable

Bit7 : Paper length can reach to 14 inch

[0x62] Scanner Capability : (1 = True, 0 = False)

Bit0 : Shading data /Gain Uploadable

Bit1 : F/W support FB color mode line arrangement can be select by f/w or driver.

Bit2 : Analog Gamma

Bit3 : X,Y coordinate base

Bit4- Bit7: Reserved.

[0x63] Scanner Capability : (1 = True, 0 = False)

Reserved

[0x64]

Bit7 : **GDA (Gamma Download Avaliable)** : (1 = True,0 = False)

Bit5 : **GDT (Gamma Download Type)** : download curve format type 2
,reference send command(1 = True ,0 = False)

Bit1 Bit0 : **GL (Lines of Gamma Curve)** :

0 0 B : Reserve

0 1 B : 1 line (gray), 3 pass color download

1 0 B : Reserved

1 1 B : 1 line (gray), 3 lines (color) download

[0x66] Gamma Input Bits/Pixel Support (GIB) : (1 = True,0 = False)

Bit0 : 8 bits

Bit1 : 9 bits : reserved.

Bit2 : 10 bits

Bit3 : 12 bits : reserved.

Bit4 : 14 bits : reserved.

Bit5 : 16 bits : reserved.

Bit6 - Bit7 : reserved.

<Note> GIB should >= GOB

[0x68] Gamma Output Bits/Pixel Support (GOB) : (1 = True,0 = False)

Bit0 : 8 bits

Bit1 : 9 bits : reserved.

Bit2 : 10 bits

Bit3 : 12 bits : reserved.

Bit4 : 14 bits : reserved.

Bit5 : 16 bits : reserved.

Bit6 - Bit7 : reserved.

[0x69]

Bit7 : **HDA (Halftone Download Available) : (1 = True,0 = False)**

Bit6 - Bit0 : **Halftone Pattern Download Max Matrix:**

1 < n < 128 (n x n halftone matrix) if n=8 it means 8x8 matrix halftone pattern.

[0x6A] Built-In Halftone Pattern Support : (1 = True,0 = False)

Bit0 : 2x2

Bit1 : 4x4

Bit2 : 6x6

Bit3 : 8x8

Bit4 : Reserved

Bit5 : 12x12

Bit6 : Reserved

Bit7 : Reserved

[0x6D]

Bit7 Bit6 Bit5 : **Color sequence**

0 0 0 B : R-G-B (R first)

0 0 1 B : R-B-G

0 1 0 B : G-B-R

0 1 1 B : G-R-B

1 0 0 B : B-R-G

1 0 1 B : B-G-R

1 1 0 B : Reserved

1 1 1 B : ABOVE ALL SUPPORT

Bit4 - Bit0 : **Color Ordering Support**:(1 = True,0 = False)

Bit4 : reserved

Bit3 : line with CCD distance

Bit2 : plane

Bit1 : line without CCD distance

Bit0 : pixel

<Note> Vista-S6 and Vista-S8 support pixel ordering . But they support only line ordering for ADF as y resolution greater than 300 dpi.

Vista-S12 support line ordering for ADF as y resolution greater than 500 dpi.

(R1,R2.....R8,B1,R9,.....B9,G1,R17)

[0x6E]-[0x71] **Maximum Video Memory** : (unit = bytes)

[0x73] **Maximum Optical Resolution** : (unit = 100 dpi)

[0x74] **Maximum X Resolution** : (unit = 100 dpi)

[0x75] **Maximum Y Resolution** : (unit = 100 dpi)

Optical resolutions = 100{ Optical Resolution[0x73] }+ Optical Resolution Residue[0x94]

Maximum X resolutions = 100{Maximum X Resolution} + X Resolution Residue

Maximum Y resolutions = 100{Maximum Y Resolution}+ Y Resolution Residue

[0x76]-[0x77] **FB Maximum Scan Width** : (unit = 0.01 inch)

[0x78]-[0x79] **FB Maximum Scan Length** : (unit = 0.01 inch)

[0x7A]-[0x7B] **UTA X Original Point** : (unit = 0.01 inch)

[0x7C]-[0x7D] **UTA Y Original Point** : (unit = 0.01 inch)

[0x7E]-[0x7F] UTA Maximum Scan Width : (unit = 0.01 inch)

[0x80]-[0x81] UTA Maximum Scan Length : (unit = 0.01 inch)

[0x86]-[0x87] DOR X Original Point (DOuble Resolution) (unit = 0.01 inch)

[0x88]-[0x89] DOR Y Original Point (DOuble Resolution) (unit = 0.01 inch)

[0x8A]-[0x8B] DOR Maximum Scan Width (DOuble Resolution) (unit = 0.01 inch)

[0x8C]-[0x8D] DOR Maximum Scan Length (DOuble Resolution) (unit = 0.01 inch)

[0x8F] Last Calibration Lamp Density(LCLD)

01H the min density of lamp

0FFH the max density of lamp

[0x91] LWMT(Lamp Warmup Maximun Time) : (unit: 2 sec)

warm up time = 0	warm up time != 0
<div>DRIVER</div> <div>F/W</div> <div>(1)SetWindow</div> <div>(2)TestUnitReady --> BUSY</div> <div>(3)Request Sense --> WarmUp bit ON</div> <div>do (2) (3) till warm up OK</div> <div>(4)Scan</div>	<div>DRIVER</div> <div>F/W</div> <div>(1)SetWindow</div> <div>(2)Scan</div> <div>(3)TestUnitReady --> BUSY</div> <div>(4)Request Sense --> WarmUp bit ON</div> <div>do (3) (4) till warm up OK</div>

[0x92]-[0x93] WDBL(WINDOW DESCRIPTOR BLOCK LENGTH)

One frame length of window descriptor block in set window command.

[0x94] Optical Resolution Residue : (unit = 1 dpi)

[0x95] X Resolution Residue : (unit = 1 dpi)

[0x96] Y Resolution Residue : (unit = 1 dpi)

Optical resolutions = 100{ Optical Resolution[0x73]} + Optical Resolution Residue[0x94]

Maximum X resolutions = 100{ Maximum X Resolution} + X Resolution Residue

Maximum Y resolutions = 100{ Maximum Y Resolution} + Y Resolution Residue

[0x97] Analog Gamma Table

It specifies which analog gamma table scanner use.

00H No analog gamma function

01H MP 8832 analog gamma table

02H-FFH reserved

[note]

MP8832 analog gamma table

Gamma code(hex)	Gamma value
0	1.0000
1	1.0434
2	1.0887
3	1.1361
4	1.1859
5	1.2382
6	1.2933
7	1.3516
8	1.4134
9	1.4792
A	1.5495
B	1.6251
C	1.7067
D	1.7954
E	1.8926
F	2.0000

[0x9A] Max calibration data lines

The max image data F/W can support for Driver calculate shading curve .

0 : means F/W NOT support calibration by Driver.

[] Reserved

4-4 RESERVE UNIT (17H)

Before sending SCAN command, the host must send RESERVE UNIT command to prevent contentions from other initiators. While finished scanning, the host sends OBJECT POSITION command to park the chassis and releases the scanner by sending RELEASE UNIT command.

The reservation shall remain in effect untill:

- (1) Superseded by another RESERVE UNIT command from the same initiator.
- (2) Released by a RELEASE UNIT command from the same initiator.
- (3) A BUS DEVICE RESET message from any initiator.
- (4) A "HARD" reset condition happened.

RESERVE UNIT Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (16H)							
1	0 x 0 1	Logical Unit Number			3rdPty	3rd Party Device ID			R
2	0 x 0 2	Reserved (00H)							
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	Reserved (00H)							
5	0 x 0 5	Control Byte (00H)							

[0x01]

bit7 - bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

bit4 -bit0 : **3rdPty, 3rd Party Device ID, and R** : reserved

<Note> The target shall terminate the RESERVE UNIT command with CHECK CONDITION status while selecting an invalid logical unit.

<Note> If , after honouring the reservation, any other initiator attempts to perform any command on the reserved logical unit other than an INQUIRY, REQUEST SENSE or a RELEASE UNIT command, the command shall be rejected with RESERVATION CONFLICT status.

4-5 RELEASE UNIT (17H)

RELEASE UNIT Command Block

<i>DEC</i>		<i>HEX</i>	7	6	5	4	3	2	1	0
0		0 x 0 0	Operation Code (17H)							
1		0 x 0 1	Logical Unit Number			3rdPty	3rd Party Device ID			R
2		0 x 0 2	Reserved (00H)							
3		0 x 0 3	Reserved (00H)							
4		0 x 0 4	Reserved (00H)							
5		0 x 0 5	Control Byte (00H)							

[0x01]

bit7 - bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the RELEASE UNIT command with CHECK
CONDITION status while selecting an invalid logical unit.

bit3 -bit0 : 3rdPty, 3rd Party Device ID, and R : reserved

4-6 SCAN (1BH)

Scan Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (1BH)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				
2	0 x 0 2	Reserved (00H)							
3	0 x 0 3								
4	0 x 0 4	Transfer Length							
5	0 x 0 5	PRE	ADF	QB	Control Byte (00H)				

[0x01]

bit7 - bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the SCAN command with CHECK CONDITION status while selecting an invalid logical unit.

[0x04] Transfer Length :

It specifies the length in bytes of the window identifier list that shall be sent during the DATA OUT phase. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error.

[0x05]

bit7 : **PRE** : preview bit

[0x05] bit6 : **ADF**

1 = ADF scanning mode

0 = FB or TRANSPARENCY scanning mode

[0x05] bit5 : **QB (Quality Bit)** :

1 = do quality calibration

0 = do speed calibration.

4-7 SET WINDOW (24H)

SET WINDOW Command Block

		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (24H)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				
2	0 x 0 2	Reserved (00H)							
5	0 x 0 5								
6	0 x 0 6	MSB Transfer Length LSB							
8	0 x 0 8								
9	0 x 0 9	Control Byte (00H)							

[0x01]

Bit7 Bit6 Bit5 : **Logical Unit Number** :

0 0 0 B = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the SET WINDOW command with CHECK
CONDITION status while selecting an invalid logical unit.

[0x06]-[0x08] **Transfer Length**:

It specifies the length in bytes of the window parameters data that shall be sent during
the DATA OUT phase.

Window Parameter Data Block

<i>DEC</i>	<i>HEX</i>	7	6	5	4	3	2	1	0
0	0 x 0 0	Reserved (00H)							
1	0 x 0 1	Reserved (00H)							
2	0 x 0 2	Reserved (00H)							
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	Reserved (00H)							
5	0 x 0 5	Reserved (00H)							
6	0 x 0 6	MSB Window Descriptor Length LSB							
7	0 x 0 7								

[0x06]-[0x07] **Window Descriptor Length**:

Window Descriptor Block(s)

DEC	H E X	7	6	5	4	3	2	1	0
0	0x00	Window Identifier							
1	0x01	Reserved (00H)							Auto
2	0x02	MSB X Resolution (in dpi) LSB							
3	0x03								
4	0x04	MSB Y Resolution (in dpi) LSB							
5	0x05								
6	0x06	MSB Upper Left X LSB							
9	0x09								
10	0x0A	MSB Upper Left Y LSB							
13	0x0D								
14	0x0E	MSB Width LSB							
17	0x11								
18	0x12	MSB Length LSB							
21	0x15								
22	0x16	Brightness							
23	0x17	Threshold							
24	0x18	Contrast							
25	0x19	Image Composition							
26	0x1A	Bits/Pixel							
27	0x1B	MSB Halftone Pattern LSB							
28	0x1C								
29	0x1D	RIF	Reserved				Padding Type		
30	0x1E	MSB Bit Ordering (00H, from left to right) LSB							
31	0x1F								
32	0x20	Compression Type (00H)							
33	0x21	Compression Argument (00H)							
34	0x22	Reserved							
39	0x27								
40	0x28	Speed							
41	0x29	Select Color							
42	0x2A	Highlight							
43	0x2B	Shadow							
44	0x2C	MSB Paper Length LSB							
45	0x2D								
46	0x2E	Gamma Function							
47	0x2F	Scan Module							

48	0x30	HBT	DOR	Reserved		RMIF	CBHS Type
49	0x31	Scan Exposure Level (MSB)					
50	0x32	Scan Exposure Level (LSB)					
51	0x33	Calibration Exposure Level (MSB)					
52	0x34	Calibration Exposure Level (LSB)					
53	0x35	Reserved					
54	0x36	Reserved					
55	0x37	Reserved					
56	0x38	Reserved					
57	0x39	BS	LA	Reserved	WU	Calibration Mode	
58	0x3A	Color Sequence			Color Ordering Support		
59	0x3B	Analog Gamma Code					
60	0x3C	Reserved					
61	0x3D	Next Calibration Lamp Density					
62	0x3E	Reserved					
63	0x3F	Next Scan Lamp Density					
64	0x40	MSB	Next Upper Left Y				
67	0x43	LSB					
68	0x44	MSB	Pixel Count				
71	0x47	LSB					
72	0x48	MSB	Line Count				
75	0x4B	LSB					
76	0x4C	MSB	X Coordinate Base (pts/inch)				
77	0x4D	LSB					
78	0x4E	MSB	Y Coordinate Base (pts/inch)				
79	0x4F	LSB					
80	0x50	Reserved					
81	0x51	Driver Calibration need image data lines					

<Note> In 1 pass mode you should send SET WINDOW command with 3 window frames for each color. That is,

1 pass : window R - window G - window B then SCAN command

3 pass : window R - SCAN - ...; window G - SCAN - ...; window B - SCAN - ...

<Note> The scan modes have:

- (1) single bit mode - lineart or halftone
- (2) gray scale mode
- (3) color mode - 1 pass or 3 passes

There could be only one scan mode for each scan. The parameters for one scan mode

cannot conflict with each other.

[0x00] Window Identifier :

It specifies the window defined by the window descriptor.

one pass : 00H :b/w

01H :red

02H :green

03H :blue

three pass & single color :00H for all

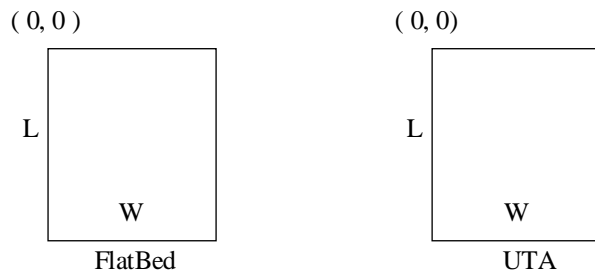
[0x01]

Bit0 : **Auto** : Reserved

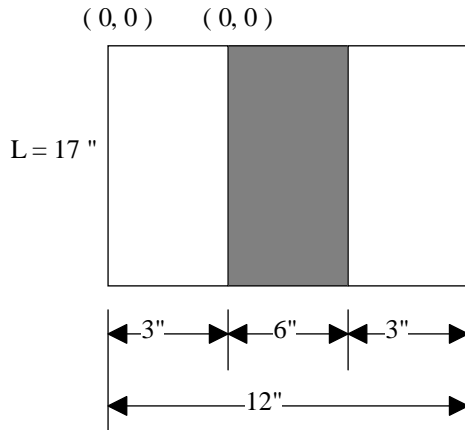
[0x02]-[0x03] X Resolution :

[0x04]-[0x05] Y Resolution :

The following two diagrams describe FB and UTA maximum scan area of scanner engine. The original points of FB and UTA are the same. For detail, please refer to Optical/Mechanical design.



< Fig 1 >



< Fig 2 >

[0x06]-[0x09] Upper Left X :

[0x0A]-[0x0D] Upper Left Y :

[0x0E]-[0x11] Width :

[0x12]-[0x15] Length :

How many points/inch depend on the X,Y coordinate base (0x4C~0x4F)

If in setwindow descriptor blocks do not have the X,Y coordinate base(pts/inch)
then the defaults was 1200 points/inch.

[0x16] Brightness :

It specifies the image brightness while IMAGE COMPOSITION is 01H (HALFTONE mode).255 is the highest setting ,128 is the nominal setting ,and 1 is the lowest setting indicates more darkness.

<Note> In CBHS 0 - 50 mode,178 is the highest setting ,128 is the nominal setting,78 is the lowest setting.

[0x17] Threshold :

It specifies the threshold value when the Image Composition byte is 00H (lineart

mode).255 is the highest setting,128 is the nominal setting,1 is the lowest setting.
Higher setting indicate more darkness.A value of zero indicates that the scanner is use automatic threshold control.

<Note> In CBHS 0 - 50 mode ,178 is the highest setting,128 is the nominal setting,153 is the lowest setting.

[0x18] Contrast:

It specifies the image contrast while IMAGE COMPOSITION is 01H (HALFTONE mode).or the virtual gray byte is 01h.255 is the highest setting,128 is the nominal setting, 1 is the lowest setting.Highter setting results in "shapper" image.

<Note> In CBHS 0 - 50 mode, 153 is the highest setting,128 is the nominal setting,103 is the lowest setting.

[0x19] Image Composition :

It specifies the type of scan operation requested.

00H = Bi-level black & white (lineart mode)

01H = Dithered/halftone black & white (halftone mode)

02H = Multi-level black & white (gray scale mode)

03H = Bi-level RGB Color

04H = Dithered/halftone RGB Color

05H = Multi-level RGB Color

<Note> Bi-level RGB Color: this means Black & White lineart mode , also you can select red or green or blue channel to scan.

Dither/halftone RGB Color: this means Black & White halftone mode , also you can select red or green or blue channel to scan.

Multi-level RGB Color: this means Black & White gray scale mode , also you can select red or green or blue channel to scan.

<Note> Vista-S6, Vista-S8: don't support halftone mode,01H,04H illegal request,
VISTA-T6: don't support halftone mode,01H,04H illegal request.

[0x1A] Bits/Pixel :

It specifies the number of bits used to represent the intensity of a single color.

01H = 1 bit per pixel

08H = 8 bits per pixel

0AH = 10 bits per pixel.data of a pixel has 2 bytes.Send high byte first.Only

bit15(MSB)-bit6(LSB) are valid in a data. {high byte (bit15 - bit 8);low byte (bit7 - bit 0)}

The number of bits used to specify the intensity of one color is specify by the byte per pixel field.

[0x1B]-[0x1C] Halftone Pattern :

00H:	Download pattern
01H:	Built In12x12 pattern
02H:	Built In12x12 pattern
03H:	Built In 8x8 pattern
04H:	Built In 8x8 pattern
05H:	Built In 8x8 pattern
06H:	Built In 8x8 pattern
07H:	Built In 8x8 pattern
08H:	Built In 6x6 pattern
09H:	Built In 6x6 pattern
0AH:	Built In 6x6 pattern
0BH:	Built In 4x4 pattern
0CH:	Built In 4x4 pattern
0DH:	Built In 4x4 pattern
0EH:	Built In 2x2 pattern
0FH:	Built In 2x2 pattern

When in multi_bit or lineart mode,this parameter is ignored by scanner.

[0x1D]

bit7 : **RIF** (Reverse Image Format) : (1:True,0:False)

1 : (0 :black,1:white)

0 : (0 :white,1:black)

bit2 - bit0 : **Padding type**

It specifies how the target shall pad the image data transmitted to the initiator if it is not an integral number of bytes.

03H = Truncate to byte boundary

07H = Truncate to even-byte (word) boundary

[0x1E]-[0x1F] Bit Ordering :

It specifies the order in which data is transferred to the host from the window.the bit ordering specified the direction of pixels in a scan lines, the direction of scan lines

within a window and the image data packing within a byte.

00H = from left to right

[0x20] **Compression type** : reserved.

00H = No compression

[0x21] **Compression Argument** : reserved.

[0x28] **Speed**:

81h - 82h : Don't care image smearing problem

81h is the fastest speed, and 82h is the slowest speed.

01h - 02h : Solve image smearing problem

01h is the fastest speed, and 02h is the slowest speed.

[0x29] **Select Color**:

It specifies which color this window descriptor parameters describe for color mode and which signal source for gray or lineart or halftone mode.

Bit 7 Bit 6 Bit 5

1 0 0 B For RED channel

0 1 0 B For GREEN channel

0 0 1 B For BLUE channel

0 0 0 B For GRAY channel

[0x2A] **Highlight**:

It is used for detail enhancement in all scanning mode. 255 is the highest setting, and 1 is the lowest setting, default condition and the lower setting means some levels of light area are discarded and the dark area are enhanced.

[0x2B] **Shadow** :

The Shadow value is used for detail enhancement for all setting mode. 254 is the highest setting, and 0 is the lowest setting, 0 is the nominal condition. High value indicate some levels of darkness are discarded, so the light area is enhanced. By adjusting highlight and shadow value any area can be enhanced

<Note> 1: The Shadow value is never larger than Highlight value and the default condition is: Highlight = 255 and Shadow = 0.

[0x2C]-[0x2D] Paper Length :

This parameter is used for ADF model. It specifies the length of scan document but an accurate value isn't necessary. It is used only for reference of paper jam. A value of 0 indicates that the scanner uses its default setting (14 inches). The minimum document length equals 4.5 inches

[0x2E] Gamma Function:

00H = Download curve
01H - 04H = Built-in curves 1, 2, 3, 4
0FH = Normal curve

[0x2F] Scan Module:

This parameter is used for turning on and off TRANSPARENCY mode when INQUIRY command indicates it exists.

00H = Reserved
11H = FLATBED scan mode
FFH = TRANSPARENCY scan mode

[0x30]

bit1 bit0 : **CBHS Type** :

0 0 B CBHS 0 - 50
0 1 B CBHS 0 - 255
1 0 B Reserved
1 1 B Reserved

bit2 : **RMIF**(reverse multi_level image format)(1:True,0:False)

bit6 : **DOR** (Double Optical Resolution)

0 : False
1 : True

bit7 : **HBT**(high byte transfer)

0 : high byte transfer first when each pixel larger one byte.
1 : low byte transfer first when each pixel larger one byte.

<Note> Byte 28H - 30H are vendor unique in SCSI protocol.They may be neglected by S/W (check the Window Descriptor Block Length) if not necessary.

For example:

(1) Gamma Function byte may be neglected (WDBL = 2EH).

- (2) Gamma Function and Paper Length bytes are neglected (WDBL = 2CH).
- (3) Paper Length bytes are neglected. But Gamma Function byte isn't allowed to be neglected in this case.

[0x31]-[0x38] Adjust Exposure Time Function (by Darken)

[0x31]-[0x32] Scan Exposure Level

if(Min Exposure <= Scan Exposure <= Max Exposure)

 Scan Exposure Time = Scan Exposure Level * Step Unit (In Inquiry Command) us

else

 Use Default Exposure Time

[0x33]-[0x34] Calibration Exposure Level

if(Min Exposure <= Calibration Exposure <= Max Exposure)

 Calibration Exposure Time = Calibration Exposure Level * Step Unit (In Inquiry Command) us

else

 Use Special Exposure Time for Start Density

Exp : Mirage D-16L

UTA Start Density = 0.15D => Calibration = Scan * 10 ^ (- 0.15) = 0.71 * Scan

FB Start Density = 0.05D => Calibration = Scan * 10 ^ (- 0.05) = 0.89 * Scan

[0x35]-[0x38] Reserved

[0x39]

bit 7 : BS(Batch scan)

 1 : True

 0 : False

< note > when batch scan bit is True, it will program [0x40-0x43] Next

 Upper Left Y. And the sequence is

 (1) set window command

 (2) scan command

 (3) read command

 repeat (1) (2) (3) till end of batch scan

 (4) Objection Position command

< note > When Batch Scan is true, Highlight is adjusted by driver .

bit 5: FB color mode line arrangement bit

 1: Line arrangement by driver

 0: Line arrangement by F/W

(ADF mode don't care)

bit 4: Warm up bit

Driver request scanner warm up.

1: Do warm up

0: Do'nt do warm up

bit 3- bit 0 : Calibration mode

0 0 0 0 : Use Image Composition(0x19 in Set Window Command) to decide
calibration mode (same as UC1200SE, UC1260)

1 1 1 1 : Bi-level black & white (lineart mode)

1 1 1 0 : Dithered/halftone black & white (Halftone mode)

1 1 0 1 : Multi-level black & white(Gray scale Mode)

1 0 1 0 : Multi-level RGB color(One Pass Color)

1 0 0 1 : ignore calibration

others : reserved

bit6 - bit 4 : reserved

[0x3A]

bit7 bit6 bit5 : **Color Sequence** :

0 0 0 B R-G-B (R first) (default sequence)

0 0 1 B R-B-G

0 1 0 B G-B-R

0 1 1 B G-R-B

1 0 0 B B-R-G

1 0 1 B B-G-R

1 1 0 B Reserved

1 1 1 B Reserved

bit0 - bit4 : **Color ordering**:

bit0 : pixel

bit1 : line without CCD distance

bit2 : plane

bit3 : line with CCD distance

bit4 : reserved

[0x3B] Analog Gamma Code

00H(default)-0FFH It depend on the analog gamma table definition.

If analog gamma code beyond analog gamma table definition , f/w consider

analog gamma code as 00H

[note 1] Vista S12 use MP8832 analog gamma table, analog gamma code can be 00H(gamma value =1.0) to 0FH(gamma value = 2.0)

MP8832 analog gamma table

Gamma code(hex)	Gamma value
0	1.0000
1	1.0434
2	1.0887
3	1.1361
4	1.1859
5	1.2382
6	1.2933
7	1.3516
8	1.4134
9	1.4792
A	1.5495
B	1.6251
C	1.7067
D	1.7954
E	1.8926
F	2.0000

[note 2] If use analog gamma function , Hilight and Shadow must adjust by the following formula :

Hilight(new) = [Hilight(old) / 255]^(1/r) * (255)

Shadow (new) = [Shadow(old) / 255]^(1/r)*(255)

r = gamma value.

[0x3C] Reserved

[0x3D] Next Calibration Lamp Density

00H : for auto lamp density

01H : is min lamp density

FFH : is max lamp density

[0x3F] Next Scan Lamp Density

00H : use the same density as calibration

01H : is min lamp density

FFH : is max lamp density

[0x40 - 0x43] Next Upper Left Y:

When In Batch Scan , this will point out the next frame start address of Y-axis.

[0x44 - 0x47] Pixel Count : (unit: pixel)

Pixel count: total pixels in one line of the scan width

[0x48 - 0x4B] Line Count: (unit: line)

Line count : total lines of the scan length

[0x4C - 0x4D] X Coordinate Base

[0x4E - 0x4F] Y Coordinate Base

Variable points/inch

[0x50] Reserved

[0x51] Driver Calibration request image data lines

The image lines that driver request for calculate shading curve

0 : means driver do NOT calculate shading curve

4-8 READ (28H)

READ Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (28H)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				
2	0 x 0 2	Data Type Code (00H)							
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	MSB	Data Type Qualifier						LSB
5	0 x 0 5								
6	0 x 0 6	MSB	Transfer Length						LSB
8	0 x 0 8								
9	0 x 0 9	Control Byte (00H)							

[0x01]

bit7 bit6 bit5 : **Logical Unit Number:**

0 0 0 B = Default logical unit number

others = Invalid logical unit number

<Note> The target shall terminate the READ command with CHECK CONDITION status while selecting an invalid logical unit.

[0x02] Data Type Code:

It distinguishes between the different types of data which may be transferred between the initiator and the target.

00H = Image data

01H = Vendor-specific

02H = Halftone mask

03H = Gamma function

04-7FH reserved

80H = Shading data

81H = Gain (image channel)

notes:

- shading data information is depend on set window color sequence and color ordering, if shading data more than the image mode minimum request data that means the driver layer should process(compute) it and use send command back to scanner
- gain is same as shading data conditions

[0x04]-[0x05] Data Type Qualifier:

Byte 4 is reserved.

Byte 5 specifies the window identifier of the outer window that was defined in the SET WINDOW command.

[0x06]-[0x08] Transfer Length:

These bytes specify the number of bytes that initiator has allocated for the returned data. It's permitted to use several READ commands to retrieve all data in one scan for improving the S/W performance. The specified transfer length may not match the actual data in the scanner, but if the total specified transfer length in one scan is larger than actual data length, error occurred. In the meanwhile, a CHECK CONDITION status shall be sent to the initiator. ILI and Valid bit in REQUEST SENSE returned block shall be sent to one, and Information field shall be valid.

4-9 SEND (2AH)

SEND Command Block

<i>DEC</i> <i>HEX</i>		7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (2AH)							
1	0 x 0 1	Logical Unit Number			Reserved (00H)				
2	0 x 0 2	Data Type Code							
3	0 x 0 3	Reserved (00H)							
4	0 x 0 4	MSB	Data Type Qualifier						
5	0 x 0 5								
6	0 x 0 6	MSB	Transfer Length						
8	0 x 0 8								
9	0 x 0 9	Control Byte (00H)							

Data Type Code and Data Type Qualifier are defined as READ command.

[0x01]

bit7 bit6 bit5 : **Logical Unit Number** :

000 = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the SEND command with CHECK CONDITION status while selecting an invalid logical unit.

[0x02] Data Type Code :

It is same as READ command data type

<Note> Vista-S6, Vista-S8, VISTA-T6 don't support gamma and halftone mode.

[0x04]-[0x05] Data Type Qualifier : Reserved

[0x06]-[0x08] Transfer Length :

Transfer Length = [Gamma Curve lines * (1K + 1)] + 1.

1 line = 1026 = 0402H

2 line = 2051 = 0803H

3 line = 3076 = 0C04H

Halftone Pattern:

This function is used to download halftone pattern to scanner.

Download pattern format

a11 a12 a13... a1m

a21 a22 a23... a2m

.....

am1 am2 am3 amm

The download sequence is a11 --> a1m --> a21 --> a2m --> ... -->

am1 --> amm

The transfer length is m x m, and m <= 0FH.

Type 0 download curve format (ARCUS PLUS & UC1200SE)

<i>DEC</i>	<i>HEX</i>	7	6	5	4	3	2	1	0
0	0 x 0 0	Reserved						GL	
1	0 x 0 1	Color Identifier							
2	0 x 0 2	LSB							
:	:	Download Curve Data (1K)							
:	:	Color Identifier							
:	:	LSB							
:	:	Download Curve Data (1K)							
:	:	Color Identifier							
:	:	LSB							
:	:	Download Curve Data (1K)							

<Note> This type can only use in input 10 bits and output 8 bits mode.

[0x00]

bit1 - bit0 : **GL** : Gamma Curve lines (1-3 lines)

[0x01] **Color Identifier** : 00H=gray, 01H=red, 02H=green, 03H=blue

Type 1 download curve format (UC1260)

DEC	HEX	7	6	5	4	3	2	1	0
0	0 x 0 0	Reserved							
1	0 x 0 1	Color Identifier							
2	0 x 0 2	LSB							
:	:	Download Curve Data (256 bytes)							

<Note> This type is used for 8 bits input and 8 bits output mode only.

Type 2 download curve format

DEC	HEX	7	6	5	4	3	2	1	0
0	0 x 0 0	Reserved		GDT	R	GC		GL	

1	0 x 0 1	Reserved
2	0 x 0 2	Gamma Input Bits, n
3	0 x 0 3	Reserved
4	0 x 0 4	Gamma Output Bits, n
5	0 x 0 5	Reserved (00)
6	0 x 0 6	LSB
:	:	Download Curve-1 Data
:	:	LSB
:	:	Download Curve-2 Data
:	:	LSB
:	:	Download Curve-3 Data

[0x00]

bit5 : **GDT (Gamma Download Type)** : gamma download type 2
(1:True,0:False;Type 0 or 1, check model name)

bit3 bit2 : **GC (Color Identifier)** :

- 0 0 B Gray
- 0 1 B Red
- 1 0 B Green
- 1 1 B Blue

<Note> GC will be ignored when GL = 3.

bit1 bit0 : **GL (Gamma Curve Lines)** :

- 0 1 B 1 line (gray), three pass color download support
- 1 1 B 3 lines (color), single pass color download support
- 0 0 B Reserved
- 1 0 B Reserved

<Note> download sequence :R ->G ->B

[0x02] Gamma Input Bits/Pixel (GIB) :

- Bit0 : 8 bits
- Bit1 : 9 bits (Reserved)
- Bit2 : 10 bits
- Bit3 : 12 bits (Reserved)
- Bit4 : 14 bits (Reserved)
- Bit5 : 16 bits (Reserved)
- Bit6 - Bit7 : reserved.

<Note> GIB should >= GOB

[0x04] Gamma Output Bits/Pixel (GOB) :

Bit0 : 8 bits

Bit1 : 9 bits (Reserved)

Bit2 : 10 bits

Bit3 : 12 bits (Reserved)

Bit4 : 14 bits (Reserved)

Bit5 : 16 bits (Reserved)

Bit6 - Bit7 : reserved.

Length of each curve: (unit = BYTE)

length of each curve = $(2^I) * O$

where I = input bits

O = output bytes

(O = 1 for output bits ≤ 8 , O = 2 for $8 < \text{output bits} \leq 16$)

In a download gamma curve data, valid bits start from the least significant bit. For example,

For output bits = 8, the valid bits are bit7 - bit0.

For output bits = 10, the valid bits are bit9 - bit0.

4-10 OBJECT POSITION (31H)

OBJECT POSITION command block

<i>DEC</i>		<i>HEX</i>	7	6	5	4	3	2	1	0
0		0 x 0 0	Operation Code (31H)							
1		0 x 0 1	Logical Unit Number			Reserved		Position Function		
2		0 x 0 2	MSB Count LSB							
3		0 x 0 3								
4		0 x 0 4								
5		0 x 0 5	Reserved							
6		0 x 0 6	Reserved							
7		0 x 0 7	Reserved							
8		0 x 0 8	Reserved							
9		0 x 0 9	Control Byte (00H)							

[0x01]

bit7 - bit5 : **Logical Unit Number** :

0 0 0 H = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the OBJECT POSITION command with CHECK CONDITION status while selecting an invalid logical unit.

bit2 - bit0 : **Position Function** :

0 0 0 H = Unload Object

It specifies that the object shall be positioned for removal.

4-11 GET DATA BUFFER STATUS (34H)

GET DATA BUFFER STATUS command block

<i>DEC</i>		<i>HEX</i>	7	6	5	4	3	2	1	0
0		0 x 0 0	Operation Code (34H)							
1		0 x 0 1	Logical Unit Number			Reserved				Wait
2		0 x 0 2	Reserved							
6		0 x 0 6								
7		0 x 0 7								
8		0 x 0 8	MSB			Allocation Length				LSB
9		0 x 0 9	Control Byte							

[0x01]

bit7 bit6 bit5 : **Logical Unit Number:**

0 0 0 H = Default logical unit number

Others = Invalid logical unit number

<Note> The target shall terminate the GET DATA BUFFER STATUS command with CHECK CONDITION status while selecting an invalid logical unit.

[0x01]

bit0 : **Wait :**

1 = The target should wait for image data to be available before returning scan status data.

0 = The target should respond immediately.

Data Buffer Status Format

DEC	HEX	7	6	5	4	3	2	1	0
0	0 x 0 0	MSB Data Buffer Status Length LSB							
1	0 x 0 1								
2	0 x 0 2								
3	0 x 0 3	Reserved							Block
		Data Buffer Status Descriptor(s)							
0	0 x 0 0	Window Identifier							
1	0 x 0 1	Reserved							
2	0 x 0 2	MSB Available DataBuffer LSB							
3	0 x 0 3								
4	0 x 0 4								
5	0 x 0 5								

6	0 x 0 6	Filled Data Buffer	LSB
7	0 x 0 7		

[0x00]-[0x02]

The data buffer status length indicates the length in bytes of the following scan status data that is available to be transferred during the DATA IN phase. The data buffer status length doesn't include itself. The data buffer status data transferred to the initiator include zero or more data buffer status descriptors. Each descriptor returns information for the window specified by the window identifier.

[0x03]

bit0 : **Block bit**

When this bit set, it specifies the data buffer is full.

[0x02]-[0x04] Available Data Buffer:

The available data buffer field indicates in bytes, the amount of buffer available for transfers from the initiator. The field is valid only in scanners with the ability to accept data from an initiator for processing.

[0x05]-[0x07] Filled Data Buffer:

The filled data buffer field indicates the amount of image data in bytes available for transfer to the initiator.

4-12 WRITE BUFFER COMMAND(3BH)

WRITE DATA BUFFER STATUS command block

<i>DEC</i>	<i>HEX</i>	7	6	5	4	3	2	1	0
0	0 x 0 0	Operation Code (3BH)							
1	0 x 0 1	Logical unit number			Reserved		Mode		
2	0 x 0 2	Buffer I D							
3	0 x 0 3	MSB Buffer offset LSB							
4	0 x 0 4								
5	0 x 0 5								
6	0 x 0 6	MSB Parameter list Length LSB							
7	0 x 0 7								
8	0 x 0 8								
9	0 x 0 9	Control							

[0x01]

bit7 bit6 bit5 : **Logical Unit Number:**

0 0 0 H = Default logical unit number

Others = Invalid logical unit number

[0x01]

bit2 bit1 bit0 : **Mode :**

Mode	Description	Implementation requirements
000b	Write combined header and data	Optional
001b	Vendor-specific	Vendor-specific
010b	Write data	Optional
011b	Reserved	Reserved
100b	Download microcode	Optional
101b	Download microcode and save	Optional
110b	Reserved	Reserved
111b	Reserved	Reserved

[0x02] Buffer ID :

Default is 0 .

[0x03-05] Buffer Offset :

Default is 0 .

[0x06-08] Parameter list Length :

Default is 0X010000.

5 Command Sequence Example

Using Test Unit Ready command test scanner if good(ready) then next command

(1) INQUIRY

GOOD

(2) TEST UNIT READY

CHECK CONDITION

(3) REQUEST SENSE

UNIT ATTENTION

(4) RESERVE UNIT

GOOD

(5) SET WINDOW PARAMETER

GOOD

(6) SCAN

GOOD

(7) GET DATA BUFFER STATUS

GOOD

(8) READ

GOOD

.

(7)

(8)

.

(9) OBJECT POSITION

GOOD

(10) RELEASE UNIT

GOOD

..... End of Scan

6 Scaling Criterion

(1) Symbol Description

<u>Symbol</u>	<u>Description</u>
Sx	Specified X-axis resolution (dpi) in Window Descriptor Block
Sy	Specified Y-axis resolution (dpi) in Window Descriptor Block
Ox	Original X-axis resolution (dpi)
Oy	Original Y-axis resolution (dpi)
Dx	Unwanted X-axis elements (per inch)
Dy	Unwanted Y-axis elements (per inch)

where $Dx = Ox - Sx$ and $Dy = Oy - Sy$.

For Vista-S6:

$Ox = 300$ for all $1 \leq Sx \leq 300$

$Oy = 300$ while $1 \leq Sy \leq 300$

$Oy = 600$ while $300 < Sy \leq 600$

For Vista-S8:

$Ox = 400$ for all $1 \leq Sx \leq 400$

$Oy = 400$ while $1 \leq Sy \leq 400$

$Oy = 800$ while $400 < Sy \leq 800$

(2) Scaling Table

The scaling table records location of wanted and unwanted pixel/line per inch. There are two scaling tables, one for X-axis and the other for Y-axis. Location of unwanted pixel/line per inch are specified by the following scaling algorithm:

1st pixel/line	$\text{INT} [O/D]$
2nd pixel/line	$\text{INT} [2*O/D]$
3rd pixel/line	$\text{INT} [3*O/D]$
:	
:	
:	
Dth pixel/line	$\text{INT} [D*O/D]$

(3) Byte Count & Line Count

According to the X-axis scaling table and the scan window specified in Window Descriptor Block, we can calculate the byte count in a line. Similarly, we can obtain the line count of the scan area according to the Y-axis scaling table.