

**TITLE:** INTERFACE CONTROL DOCUMENTATION FOR  
CONTEX SCSI-2 COMPATIBLE  
MULTIPLATFORM SCANNERS

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## 1. Introduction

The scope of this document is to define how to interface on the logical level to CONTEX series of SCSI compatible scanners from generation 6 and onwards. This includes SCSI encapsulated FireWire (SPB-2) and USB. The implementation conforms as closely as possible to the SCSI-2 final revision (X3.131-1994).

On the hardware level the scanner performs as specified in the above-mentioned document. The driver/receiver is of the single-ended type.

A copy of the SCSI-2 documentation can be obtained from Global Engineering Documents, 2805 McGraw Ave., Irvine, CA 92714, (800) 854-7194. or (714) 216-1455.

### 1.1 General Notes

In all cases where more than one byte is used to describe a parameter, the most significant byte is send as the first byte and the least significant is send as the last byte.

All paper sizes is in 1/1200 inch unless otherwise noted

### 1.2 Scanner Types

This document covers the following scanner types:

Scanners	Generation
HD Ultra Series, SD3600, SD4400 Series, HD5400 Series IQ 2490 Series, IQ 4400 Series, IQ Quattro Scanner Series HD iFLEX, SD One+, SD One MF, IQ FLEX HD Ultra X Series	9

## 2. Message System

The Context scanners support the SCSI-2 message system. If the ATN bit is set at a phase shift the scanner will enter the message out phase in order to receive a message from initiator.

All commands are ended by the scanner entering the MESSAGE IN phase and sending COMMAND COMPLETE before the bus free phase is entered.

In the following the messages supported by the different generations of scanners is described and a brief description of each message is given. For a complete description see the SCSI-2 standard.

### 2.1 Supported messages

Context scanners implements all mandatory messages plus some optional messages as specified in the SCSI-2 standard:

Message name	Code	Direction	Type
ABORT	0x06	Out	M
BUS DEVICE RESET	0x0C	Out	M
COMMAND COMPLETE	0x00	In	M
DISCONNECT	0x04	In	O
IDENTIFY	0x80+	In/Out	M
INITIATOR DETECTED ERROR	0x05	Out	M
MESSAGE PARITY ERROR	0x09	Out	M
MESSAGE REJECT	0x07	In/ Out	M
NO OPERATION	0x08	In/ Out	M
SYNCHRONOUS DATA TRANSFER REQUEST	0x02	In/ Out	O

M = Mandatory, O = optional, V = Vendor specific

If messages not described in the above is send to the scanner, the scanner will respond with a MESSAGE REJECT.

### 2.2 Message descriptions

#### 2.2.1 ABORT

The ABORT message can be sent to the scanner to clear all I/O processes. The scanner goes to the BUS FREE phase immediately after the receipt of this message.

#### 2.2.2 BUS DEVICE RESET

This message creates a hard reset condition in the scanner. All I/O processes are cleared. The scanner goes to the BUS FREE phase immediately after the receipt of this message.

#### 2.2.3 COMMAND COMPLETE

This message is sent to the initiator to indicate that the I/O process has completed and a valid status has been sent to the initiator. After sending the message the scanner enters the BUS FREE phase. The I/O process might have been successful or unsuccessful as indicated in the status.

#### 2.2.4 DISCONNECT

This message is sent to the initiator to indicate that the present connection is going to be broken, but that a later reconnect will be required in order to complete the current I/O process. After successfully sending this message, the target enters the BUS FREE phase.

### 2.2.5 IDENTIFY

This message is sent by the initiator to establish a initiator-target connection. Send from target when reconnecting.

### 2.2.6 INITIATOR DETECTED ERROR

When the scanner receives this message the current SCSI command is aborted.

### 2.2.7 MESSAGE PARITY ERROR

This message is sent to the scanner to indicate that the last byte of the message had a parity error. In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal prior to its release of the ACK signal for the REQ/ACK handshake of the message byte that has the parity error. If the scanner receives this message under any other circumstance, it will immediately release the BSY signal.

The scanner will return to the MESSAGE IN phase before switching to some other phase, expecting the initiator to re-send the entire message.

### 2.2.8 MESSAGE REJECT

The scanner will send this message if a not implemented message is received.

### 2.2.9 NO OPERATION

The NO OPERATION is sent to the scanner if the MESSAGE OUT phase is entered and the initiator does not have a valid message to send.

### 2.2.10 SYNCHRONOUS DATA TRANSFER REQUEST

This message is both send by the initiator and the scanner after a reset. The message is used to negotiate the synchronous transfer rate used in the data in and out phases. This is the only extended message that is supported.

### 3. SCSI Commands

The following chapter describes each command understood by the CONTEX SCSI scanners in detail. The scanners implement all mandatory commands plus some optional commands.

List of commands implemented:

Command name	Code	Type	Supported on generation			
			6	7	8	9
INQUIRY	0x12	M	x	x	x	x
OBJECT POSITION	0x31	O	x	x	x	x
READ	0x28	M	x	x	x	x
READ BUFFER	0x3C	O	x	x	x	x
RECEIVE DIAGNOSTIC	0x1C	O	x	x	x	x
RELEASE UNIT	0x17	M	x	x	x	x
REQUEST SENSE	0x03	M	x	x	x	x
RESERVE UNIT	0x16	M	x	x	x	x
SCAN	0x1B	O	x	x	x	x
SEND	0x2A	O	x	x	x	x
SEND DIAGNOSTIC	0x1D	M	x	x	x	x
SET WINDOW	0x24	M	x	x	x	x
TEST UNIT READY	0x00	M	x	x	x	x
WRITE BUFFER	0x3B	O	x	x	x	x

M = Mandatory, O = optional, V = Vendor specific, x = supported, - = not supported

#### Command description:

For each command bits, fields and bytes that are optional according to SCSI-2 and which are not implemented are marked *Reserved*. *Reserved* also implies that the data should be filled with 0.

#### 3.1 INQUIRY (0x12)

The INQUIRY command requests that information regarding parameters of the scanner is returned to the initiator. This function is typically called each time a program controlling the scanner is initialized, to make the program self configuring.

##### 3.1.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x12)							
1	Logical unit number			Reserved				EVPD
2	Page code							
3	Reserved							
4	Allocation length							
5	Reserved							

#### Operational code

The operational code for this command is 0x12

#### Logical unit number

Only logical unit number 0 is supported in the way, that it returns data as described here. When an inquiry is made with any other logical unit number, only a device type value of 0x7F is returned.

#### EVPD

When 0 the standard INQUIRY data is returned.

When 1 the Page code is used to determine what data is returned.



**Page code**

Specifies which page of vital product data information the scanner will return (see **Error! Reference source not found.**).

**Allocation length**

The size of the data area reserved for the data returned by this command.

**Reserved**

Reserved for future use. Must be set to 0.

**3.1.2 Returned data format**

The scanner program is split into boot program and executable program. The executable is placed in re-programmable FLASH memory, while the boot code can never be changed. For various reasons the scanner can be running the boot code only:

- if there are no valid executable in the FLASH.
- if the “force startup in boot code” switch is set on the scanner.
- if the scanner application has send the SCSI command to place the scanner in programming mode.

When the boot program is running the normal INQUIRY data, plus vital product data pages 0x00 and 0xFF are supported. All other pages are not defined. When the executable program is running page 0xFF is not supported.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Reserved							
2	SCSI version							
3	Reserved					Response data format		
4	Additional length (0x1F)							
5-6	Reserved							
7					Sync			SftRe
8-15	Vendor Identification							
16-31	Product Identification							
32-35	Product revision level							

**Device type**

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

**SCSI version**

This field is set to 2 as this scanner complies to the SCSI-2 standard, as specified in ANSI X3.131-1994.

**Response data format**

This field is set to 2 as the INQUIRY return data complies to the SCSI-2 standard, as specified in ANSI X3.131-1994.

**Additional length**

The length of the subsequent data. The length is 0x1F.

**Sync**

If this bit is set the scanner supports synchronous data transfer.

Note: Boot code does never support synchronous data transfer; if the executable does, is decided by switch setting.

**SftRe**

This bit is set to indicate that the scanner responds to the RESET condition with the soft RESET alternative.

**Vendor identification**

A 8 byte text string with the contents “Contex”. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

### Product identification

A 16 byte text string with the name of the scanner. The bytes not used is filled with spaces (0x20) and the string is not zero terminated. If the boot code is running this field will always contain the string “*Scanner boot*”.

### Product revision level

The current scanner firmware release number. The bytes not used is filled with spaces (0x20) and the string is not zero terminated. If no valid executable exist, the boot code will be running and the *Product revision level* will be set to the string -1.

### 3.1.3 Vital product data parameters

‘Vital product data parameters’ pages is supported to get information about the scanner connected. When the boot code is running only page 0x00 and 0xFF is valid. When the executable is running page 0xFF is not valid.

### 3.1.4 Supported vital product data pages (0x00)

The page code for this page is 0x00.

This page can be called in order to get a list of the pages supported on the connected scanner. The pages reported depends on whether the boot program or the executable program is running.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0x00)							
2	Reserved							
3	Additional length (n-3)							
4-n	Support page list							

### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

### Supported page list

The supported page list field will contain a list of all vital product data page codes implemented for the scanner in ascending order beginning with page code 0x00 (this page).

### 3.1.5 Firmware and hardware product data page (0xC0)

The page code for this page is 0xC0.

This page can be called in order to get information about the hardware and software revision status of the scanner.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC0)							
2	Reserved							
3	Additional length							
4-7	Boot code release							
8-19	Date stamp of boot code							
20-27	Time stamp of boot code							
28-31	Executable build							
32-35	Hardware variant/revision							
36-47	Date stamp of executable							
48-55	Time stamp of executable							
56-59	Checksum of executable							
60-63	Scanner generation							
64	Reserved							
65	Keyboard switch							
66	Hardware variant switch							
67	Hardware revision switch							
68-71	Reserved							
72-75	FPGA build							
76-87	Date stamp of FPGA							
88-95	Time stamp of FPGA							
96-99	Reserved							
100	Reserved							
101-104	Firmware release							
105-116	Date stamp of firmware download							
117-124	Time stamp of firmware download							
125-128	Smart card scanner type							
129-140	Serial No.							
141-144	Camera board type and revision							
145	CCD color scheme							
146	Hardware SU board identifier							
147	Restore data type and function							
148-151	Used parameter block size							
152-155	Used FRAM block size							
156	LIE board type (Light type)							
157	LIE board variant							
158	LIE board revision							
159-178	ICC profile type name							
179	FPGA SU board identifier							
180-183	Used calibration parameter block size							
184	Reserved							
185-188	Reserved							
189	Reserved							
190	Reserved							
191-194	Reserved							
195	Reserved							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

**Additional length**

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

**Boot code release**

Release number of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of boot code**

Date stamp of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of boot code**

Time stamp of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Hardware variant/revision**

Variant/revision of the hardware in the scanner in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Executable build**

Build number of the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of executable**

Date stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of executable**

Time stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Checksum of executable**

CRC-32 checksum of executable.

**Scanner generation**

Generation of the scanner.

**Keyboard switch**

Setting of the keyboard switch at boot time.

**Hardware variant switch.**

Setting of the hardware variant switch at boot time.

**Hardware revision switch.**

Setting of the hardware release switch at boot time.

**FPGA build**

Build number of the FPGA code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of FPGA**

Date stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of FPGA**

Time stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Firmware release.**

Firmware release number in ASCII (same as “*Product revision level*”). The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of firmware download.**

Date stamp of last firmware download in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of firmware download.**

Time stamp of last firmware download in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Smart card scanner type**

Scanner type number read from the inserted smart card.

**Serial No.**

Scanner serial no. If no. is undefined, these bytes contain zeros.

**Camera board type and revision**

ASCII string with camera board type and revision (ex. ‘CBEA’)

**CCD color scheme**

The scheme used by the CCD:

Byte value	CCD color scheme
1	Only gray tone is supported (1 line on CCD)
2	3 Color lines on CCD
3	3 Color lines on CCD and 1 additional line for gray tone

**Hardware SU board identifier.**

The hardware SU board identifier setting.

**Restore data type and function.**

The type and function supported by SU-board restore of data.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Used parameter block size.**

The size in bytes used by the parameter block.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Used FRAM block size.**

The size in bytes used by the FRAM.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**LIE board type.**

The LIE board type:

Byte value	CCD color scheme
0	Fluorescent light tube
1	LED light

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**LIE board variant.**

The variant of the LIE board.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**LIE board revision.**

The revision of the LIE board.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**ICC profile type name**

The part of the ICC profile name that the scanner knows.

*Not used on 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### 3.1.6 Scanner application auto configuration product data page (0xC1)

The page code for this page is 0xC1.

This page can be called in order to get information about features supported by the connected scanner.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC1)							
2	Reserved							
3	Additional length							
4-7	Type							
8	Color							
9	Reserved							
10	Reserved							
11	Centered							
12	Variable DPI supported							
13	Independent X and Y DPI supported							
14	Reserved							
15	Reserved							
16-19	Number of cameras							
20-23	Maximum number of gray tones							
24-27	Buffer size							
28-31	Maximum scan width							
32-35	Reserved							
36-39	Reserved							
40-43	Reserved							
44-47	Line delay							
48	Reserved							
49	Reserved							
50	Reserved							
51-54	Threshold modes supported							
55	Minimum sharpen/soften value supported							
56	Maximum sharpen/soften value supported							
57-60	Maximum data rate supported							
61-64	Minimum scan width							
65	Minimum SET WINDOW length supported							
66	Maximum SET WINDOW length supported							
67	Maximum READ scanner status length supported							
68	Calibration support							
69	Auto buffer threshold support							
70	Auto camera alignment support							
71	Oscilloscope mode support							
72	Interpolation support							
73-76	Physical scan width							
77	Gamma slope limit method							
78-81	Gamma slope limit							
82	Supported paper handling							
83	Read scanner status support							
84	Read scanner status adjust mode support							
85	Read scanner color upgrade support							
86	Lens/CIS correction function support							
87	Gray tone match support							
88-91	Adjustment control support							
92	Hardware test setup support							
93	Data transfer support							
94	Number of gray tone match points							
95	Additional calibration features							
96-99	Maximum data rate							
100-103	Data rate granularity							
104	Number of hardware exposures							

105	Number of software exposures
106-109	Consumables supported (GOLF)
110-113	Gamma table size
114	Power features
115	Media offset
116-117	Supported calibrations
118-121	Maximum scan length
122	Custom stitching for thin/thick media
123	Batch mode enabled
124	Software scanner
125	Supported resolutions
126	Advanced features (low byte)
127	Scan line padding Boundary
128	SW Scanner Family Identification
129-132	Maximum fixed scan length
133	Graytone bit width support
134	Color bit width support
135-150	Supported resolution DPIs
151	Additional calibration features 2
152	Accounting features
153-156	SCSI command max data bytes (0 means 65535 bytes)
157-160	Advanced features
161	Book load
162	Paper edge adjustment support
163	Low resolution bit width support
164	Normal resolution bit width support
165	High resolution bit width support
166	Wake up support

### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

### Scanner type

This field defines the type of scanner:

- 0 E-Size/A0 scanners (Context)
- 1 A3 size scanners (Context)
- 2 Aperture card scanners (Context)
- 3 A2 Flatbed scanners (Context)
- 4 Reserved
- 5 Reserved
- 6 DNA Scanner (Star V-Ray Medical)
- 7 Large format scanner with CIS modules
- 8 Flatbed scanner with CIS modules

### Color

This field defines if the scanner supports color scanning. If it is 1 the *Color product data page* is defined and can be used to inquire about the color capabilities of the scanner.



- 0 The scanner supports only graytone scanning.
- 1 The scanner supports both color and graytone scanning.
- 2 The scanner supports only color scanning

### Centered

This field defines where the original is placed in the scanner:

Bit:	Centered
0-1	0 = The original can be placed at the first pixel 1 = The original can be placed at the center pixel 2 = The original can be placed at both the center and the first pixel
2	The original can be placed at the last pixel
3	Book load supported. See book load field for more info.

### Variable DPI supported

This field defines if variable DPI setting is supported.

- 0 variable DPI is not supported and page 0xC2 is not defined.
- 1 variable DPI is supported. Page 0xC2 can be used to inquire about the limitations of the variable DPI.

### Independent X and Y DPI supported

This field defines if the resolution can be set independently in the X and Y direction.

- 0 Independent X and Y DPI is not supported.
- 1 Independent X and Y DPI is supported.

### Number of cameras

The number of cameras in the scanner.

### Maximum number of gray-tones

Maximum number of gray-tones when scanning in gray-tone mode.

### Buffer size

Size of each of the scanners internal buffers. This number also indicates the maximum number of bytes that can be expected from the scanner in each transfer.

### Maximum scan width

The maximum scan width that can be used on the scanner (in 1/1200 inches).

### Line delay

Defines the number of lines that is read into the scanners internal buffers after one of the buffer threshold or line threshold conditions has been met. When calculating these thresholds this number should be taken into consideration.

### Threshold modes supported

Defines the threshold modes supported by this scanner:

Bit:	Threshold mode
0	B/W Threshold
1	B/W Adaptive
2	B/W Adaptive Gray
3	B/W Adaptive Photo
4	B/W Copy Normal
5	B/W Copy Photo
6	B/W Copy Adaptive
7	B/W Adaptive with Background Suppression

When the bit is set, the corresponding threshold mode is supported.

The scanner does not support BW scanning when all bits are zero; BW scanning should be implemented in the software.

### Minimum sharpen/soften value supported

Defines the minimum sharpen/soften value supported by this scanner (from -1 to 0).

### Maximum sharpen/soften value supported

Defines the maximum sharpen/soften value supported by this scanner (from 0 to 8).

### Maximum data rate supported

Defines the maximum data rate in bytes/sec supported by this scanner.

### Minimum scan width

The minimum scan width that can be used on the scanner (in 1/1200 inches).

### Minimum SET WINDOW length supported

The minimum SET WINDOW length that can be used on the scanner.

### Maximum SET WINDOW length supported

The maximum SET WINDOW length that can be used on the scanner.

### Maximum READ scanner status length supported

The maximum READ scanner status length that can be used on the scanner.

### Calibration support

When 0, only calibration start command SEND 0xFD, 0x07 is supported.

When 1, both calibration start command SEND 0xFD, 0x07 and SEND 0xFD, 0x20 are supported.

When 2, calibration start command SEND 0xFD, 0x20 and SEND 0xFD, 0x24 are supported.

When 3, only calibration start command SEND 0xFD, 0x24 is supported.

When 4, calibration start command SEND 0xFD, 0x24 and SEND 0xFD, 0x25 are supported.

### Auto buffer threshold support

When 1, both line threshold and buffer threshold in SET WINDOW may be set to 0 (zero). The scanner will then optimize the use of the image data buffers.

### Auto camera alignment support

Value indicates function support. If value is 0 no camera alignment function is supported.

Bit	Function
0	If set, this auto camera alignment is supported: (Camera B is fixed, e.g command not valid) (Send: 0xF8, 0)
1	If set, this auto camera alignment is supported: (Valid for all cameras) (Send: 0xF8, 0) (Send: 0xF8, 1) (Send: 0xF8, 2) (Send: 0xF8, 3)
2	If set, camera motor movement timeout is supported (timeout is supported on send 0xF8, 1 and 2)

### Oscilloscope mode support

When 1, scanning in oscilloscope mode (*window identifier* 0xFD) is supported.

### Interpolation support

When 1, extended interpolation is enabled.

### Physical scan width

Physical scan width of the scanner (in 1/1200 inch).

### Gamma slope limit method

Slope limit method used on gamma table values.

### Gamma slope limit

Slope limit of gamma table values [1/1000]. If zero, no limit.

## Supported paper handling

Defines the paper handling modes supported by this scanner:

Bit:	Threshold mode
0	Extended thickness
1	Fast load
2	Reserved
3	Reserved
4	Soft load
5	Short load
6	HW assisted paper size detection
7	External paper sensor

When the bit is set, the corresponding paper handling mode is supported.

## READ scanner status support

If 0, only READ scanner status with type qualifier 0 is supported.

If 1, READ scanner status with both qualifier 0 and 3 are supported.

## READ scanner status adjust mode support

If 1, READ scanner status adjust mode adjusted/stitched flags are supported.

## Read scanner color upgrade support

If 0, the scanner can't upgrade to color

If 1, the scanner can upgrade to color

## Lens/CIS correction function support

When the bit is set the corresponding lens/CIS correction is supported

See Send/Read (0x83) for use.

Bit:	Lens/CIS correction mode
0	ALE (lens) or EHA (CIS) correction function supported
1	
2	
3	
4	
5	
6	
7	

## Gray tone match support

If 0, the scanner doesn't support gray tone (mid-tone) matching of cameras.

If 1, the scanner does support gray tone (mid-tone) matching of cameras.

## Adjustment control support

DWORD that contains the supported adjustment controls

Byte 3	Byte 2	Byte 1	Byte 0
TBD	TBD	TBD	Adjustment

The following bits are set, if the scanner supports the corresponding function:

Bit:	Adjustment (Byte 0)
0	Linearize
1	Stitch
2	Stitch and leave adjustment unchanged
3	Unstitch and leave adjustment unchanged
4	Suspend cyclic adjustment
5	
6	
7	

## Hardware test setup support

Defines the hardware test modes supported by this scanner:

Bit:	Hardware test mode
0	Support for Hardware test in cold boot on/off
1	Motor test supports ramping
2	Temperature log available
3	
4	
5	
6	
7	

When the bit is set, the corresponding hardware test mode is supported.

## Data transfer support

Defines the data transfer functions supported by this scanner:

Bit:	Data transfer support
0	Support for setting the maximal transfer data rate.
1	Maximum data rate is multiplied by an interface factor.
2	Fast image transfer
3	One touch key reservation available
4	TCP/IP configuration supported
5	Fast TCP image transfer support
6	Fast UDP image transfer support
7	Support for Service only (Eth)

When the bit is set, the corresponding function is supported.

### Fast image transfer:

When set, the scanner will use the 'Error corrected streaming' protocol for transmitting scan data.

### One touch key reservation available:

When set, the scanner responds to One touch reservation requests via Read command 0x88. This feature is assumed ON, for all 7G and 8G scanners – even when this bit is not set.

## Number of gray tone match points

Defines the number of gray tones to be matched in the scanner

## Additional calibration features

Defines the special or altered functions supported by this scanner:

Bit:	Calibration features
0	Support for parameter 'save to flash' when setting the resolution function
1	If scanner type is FBS, then this bit indicates FBS position calibration support. Otherwise this bit indicates Automatic stitching is NOT supported
2	Automatic stitching can be turned off
3	ATAC support
4	SW controlled gain/offset calibration
5	CIS light level SW support (Exposure period)
6	CIS panchromatic light level SW support
7	Light level calibration support

When the bit is set, the corresponding function is supported.

### FBS position calibration support:

When this bit is set, the read/write buffer command ID 0x49 is valid, and the positions should be calibrated to preserve time when scanner is powering up (Calibration is done with Scanner Maintenance).

## Maximum data rate

Defines the maximum data rate for the device communication channel (in bytes/sec.).

## Data rate granularity

Defines the interface factor that the data rate will be multiplied with when received in the Set Window command.

### Number of hardware exposures

Defines the number of hardware exposures to choose between.

### Number of software exposures

Defines the number of software exposures to choose between.

### Consumables supported (GOLF)

Defines the consumables supported by this scanner:

Bit:	Calibration features
0	Glass plate
1	Original background
2	Lamp
3	Filter
4	Reserved
5	
6	
7	
...	
31	

When the bit is set, the corresponding consumable is supported.

### Gamma table size:

This field defines the size of each of the gamma correction tables in bytes.

*Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.*

### Power features

Defines the power features supported by this scanner:

Bit:	Power features
0	Power down timer
1	Automatic power down (time table)
2	Link Monday to Friday
3	Deep sleep power down
4	Scanner starts in safe mode
5	Reserved
6	Scanner in use function
7	Energy Star compliant

When the bit is set, the corresponding feature is supported.

### Media offset

?

### Supported calibrations

?

### Maximum scan length:

The maximum scan length that can be used on the scanner (in 1/1200 inches).

A value of 0 (zero) equals no limit.

### Custom stitching for thin/thick media:

Returns 0x01 if scanner supports custom stitching for thin and thick media, 0x00 if not.

### Batch mode features

Defines the batch mode features supported by this scanner:

Bit:	Batch mode features
0	Batch mode
1	
2	
3	

4	
5	
6	
7	

When the bit is set, the corresponding feature is supported.

*Not defined for 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Software scanner:

Returns 1 if scanner is a software scanner, 0 if not.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Supported resolutions:

Defines the camera resolutions supported by this scanner:

Bit:	Resolution
0	Low resolution mode 0
1	Resolution mode 1
2	Resolution mode 2
3	Resolution mode 3
4	Resolution mode 4
5	Resolution mode 5
6	Resolution mode 6
7	Resolution mode 7

When the bit is set, the corresponding mode is supported. For actual resolution DPIs see 'Supported resolution DPIs'

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Advanced features:

Defines the advanced features supported by this scanner:

Bit:	Feature
0	Password protected safety critical commands
1	Hostname changeable
2	Autoload always set to default value
3	Calibration backup support
4	XML configuration support
5	Special flash version 2 support
6	Reserved
7	Light direction selectable
8	Dual Light direction support
9	Reserved

When the bit is set, the corresponding feature is supported.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Scan line padding Boundary:

Defines the boundary that each line is synchronized to start at.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### SW Scanner Family Identification:

Defines the family type for software model handling.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Maximum fixed scan length:

The maximum scan length that can be set in the SetWindow command (in 1/1200 inches).

### Graytone bit width support:

Defines the supported image data bit width in graytone

Bit:	Bit width supported
0	8 bit
1	16 bit

2	
3	
4	
5	
6	
7	

Note: If a value of 0 is read on this byte location, then the reading application should assume a default of '8 bit data width supported'

### Color bit width support

Defines the supported image data bit width in color

Bit:	Bit width supported
0	24 bit
1	48 bit
2	
3	
4	
5	
6	
7	

Note: If a value of 0 is read on this byte location, then the reading application should assume a default of '24 bit data width supported'

### Supported resolution DPIs

Defines the DPI for the corresponding resolution mode

Byte:	Resolution mode DPIs
0 - 1	Resolution mode 0 DPI
2 - 3	Resolution mode 1 DPI
4 - 5	Resolution mode 2 DPI
6 - 7	Resolution mode 3 use
8 - 9	Resolution mode 4 use
10 - 11	Resolution mode 5 use
12 - 13	Resolution mode 6 use
14 - 16	Resolution mode 7 use

Note:

### Additional calibration features 2

Defines the special or altered functions supported by this scanner:

Bit:	Calibration features
0	CIS light level SW support (Current level)
1	Light level values for HQ mode are stored separately
2	Scan line calibration support
3	Dpi mode dependent Y scaling support
4	
5	
6	
7	

When the bit is set, the corresponding function is supported.

### Accounting features

Defines the accounting features supported by this scanner:

Bit:	Calibration features
0	Scanner stores account information (see SEND 0xC0)
1	
2	
3	
4	
5	
6	
7	

When the bit is set, the corresponding function is supported.

### SCSI command max data bytes:

The maximum number of bytes that can be transferred with the READ, SEND, READ BUFFER and WRITE BUFFER commands. Zero means 65535 bytes.

### Book load support

Defines book load functions supported by this scanner:

Bit:	Book load support
0	0: Book load not supported 1: Book load is supported
1-7	Reserved for future use: 0

### Paper edge adjustment support

Defines if one or more paper edge adjustment values are supported in WRITE BUFFER 0x08 / 0x48 (bit value 0 means supported):

Bit:	Paper edge adjustment support
0	1: Top edge adjustment is NOT supported
1	1: Bottom edge adjustment is NOT supported
2	1: Left edge adjustment is NOT supported
3	1: Right edge adjustment is NOT supported

### Low resolution bit width support

Defines low resolution bit width supported by this scanner:

Bit:	Low resolution bit width support
0-1	Gray mode: 00: 8 bits supported, optional 16 bits 01: Only 8 bits supported 10: Only 16 bits supported 11: Both 8 and 16 bits supported
2-3	Color mode: 00: 24 bits supported, optional 16 bits 01: Only 24 bits supported 10: Only 48 bits supported 11: Both 24 and 48 bits supported

### Normal resolution bit width support

Defines normal resolution bit width supported by this scanner, see table above.

### High resolution bit width support

Defines high resolution bit width supported by this scanner, see table above.

### Wake up support

Defines support of wake up from sleep mode on the current interface scanner:

Bit:	Wake up support
0	0: Wake up not supported 1: Wake up is supported
1-7	Reserved for future use: 0



### 3.1.7 Variable resolution product data page (0xC2)

The page code for this page is 0xC2.

This page can be called in order to get information about support for variable dpi setting. This page is only defined if the *Variable DPI supported* field is 1 in page 0xC1.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC2)							
2	Reserved							
3	Additional length							
4-7	X direction physical DPI							
8-11	X direction minimum DPI							
12-15	X direction maximum DPI							
16-19	X direction increment							
20-23	Y direction physical DPI							
24-27	Y direction minimum DPI							
28-31	Y direction maximum DPI							
32-35	Y direction increment							
36-39	Threshold modes with limited DPI range							
40-43	X direction limited range minimum DPI							
44-47	X direction limited range maximum DPI							
48-51	Y direction limited range minimum DPI							
52-55	Y direction limited range maximum DPI							
56-59	X direction interpolated maximum DPI							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### X direction physical DPI

The physical DPI in the X direction.

#### X direction minimum DPI

The minimum DPI that can be selected in the X direction.

#### X direction maximum DPI

The maximum DPI that can be selected in the X direction.

#### X direction increment

The increment between DPIs that can be selected in the X direction.

#### Y direction physical DPI

The physical DPI in the Y direction.

#### Y direction minimum DPI

The minimum DPI that can be selected in the Y direction.

#### Y direction maximum DPI

The maximum DPI that can be selected in the Y direction.

#### Y direction increment

The increment between DPIs that can be selected in the Y direction.

**Threshold modes with limited DPI range**

Bit mask giving the threshold modes that only work in a limited DPI range; please refer to **threshold modes supported** above for bit definition.

**X direction limited range minimum DPI**

The minimum DPI that can be selected in the X direction when scanning a threshold mode with limited DPI range.

**X direction limited range maximum DPI**

The maximum DPI that can be selected in the X direction when scanning a threshold mode with limited DPI range.

**Y direction limited range minimum DPI**

The minimum DPI that can be selected in the Y direction when scanning a threshold mode with limited DPI range.

**Y direction limited range maximum DPI**

The maximum DPI that can be selected in the Y direction when scanning a threshold mode with limited DPI range.

**X direction interpolated maximum DPI**

?

### 3.1.8 Fixed resolution product data page (0xC3)

The page code for this page is 0xC3.

This page can be called in order to get information about support for fixed dpi setting. This page is always defined. If the *Variable DPI supported* field in page 0xC1 is 1 the DPI defined in the page can be considered “recommended DPIs” to display in the scanning application. The selection of fixed resolutions is assumed always to be the same in X and Y directions. Some scanners are not able to deliver the same high resolution in both X and Y directions, so Inquiry page 0xC2 should be used to check the max. resolutions supported in each direction.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC3)							
2	Reserved							
3	Additional length (n)							
4-7	Number of resolutions							
8-11	Physical resolution							
12-15	Lowest resolution							
...	...							
(n-3) - (n)	Highest resolution							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### Number of resolutions

Number of fixed resolutions supported. *Note: Physical resolution is not included in this number.*

#### Physical resolution

Physical resolution of the CCD cameras in the scanner.

#### Lowest resolution

The lowest resolution supported.

#### Highest resolution

The highest resolution supported.

### 3.1.9 Color product data page (0xC4)

The page code for this page is 0xC4.

This page can be called in order to get information about color features if the connected scanner supports color. Otherwise this page is not defined.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC4)							
2	Reserved							
3	Additional length							
4	RGB mode							
5	RGB0 mode							
6	4 bit indexed mode							
7	8 bit indexed mode							
8	CMY mode							
9	CMY0 mode							
10	CMYK mode							
11	B/W fast mode							
12	Color Space Converter							
13-31	Reserved							
32-35	LUT size							
36-39	Gamma table size							
40-43	Index table size							
44-47	No. of gray tones							
48-51	Size (in bytes) of internal buffer							
52-55	Line delay							
56	RGB line distance							
57	BW line distance							
58-59	Coarse delay							
60-63	Max. B/W scan speed							
64-67	Max. index scan speed							
68-71	Max. color scan speed							
72-75	Max. vertical adjustment factor							
76	Scan speed flags							
77	RAW 16 bits							
78	Multiple Color Spaces							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### RGB mode

This field defines if 24 bit RGB mode is supported:

0 RGB mode is not supported.

1 RGB mode is supported.

#### RGB0 mode

This field defines if RGB0 mode is supported:

0 RGB0 mode is not supported.

1 RGB0 mode is supported.

#### **4 bit indexed mode**

This field defines if 4 bit indexed mode is supported:

0 4bit indexed mode is not supported.

1 4bit indexed mode is supported.

#### **8 bit indexed mode**

This field defines if 8 bit indexed mode is supported:

0 8bit indexed mode is not supported.

1 8bit indexed mode is supported.

#### **CMY mode**

This field defines if CMY mode is supported:

0 CMY mode is not supported.

1 CMY mode is supported.

#### **CMY0 mode**

This field defines if CMY0 mode is supported:

0 CMY0 mode is not supported.

1 CMY0 mode is supported.

#### **CMYK mode**

This field defines if CMYK mode is supported:

0 CMYK mode is not supported.

1 CMYK mode is supported.

#### **B/W fast mode**

This field defines if black and white fast mode is supported:

0 black and white fast mode is not supported.

1 black and white fast mode is supported.

#### **Color Space Converter**

This field defines if color space converting is supported:

0 Color Space Converter is not present.

1 Color Space Converter is present.

#### **LUT size**

This field defines the size of the color look up table in bytes.

#### **Gamma table size**

This field defines the size of each of the gamma correction tables in bytes.

#### **Index table size**

This field defines the size of the index table in bytes.

#### **No. of gray tones**

This field defines the no. of gray tones supported.

#### **Size of internal buffer**

This field defines the size of the internal image buffer in bytes.

#### **Line delay**

This field defines the no. of lines scanned after a stop condition is met.

#### **RGB line distance**

This field defines the no. of lines scanned between the R, G and B lines on the CCD.

**BW line distance**

This field defines the no. of lines scanned between line B and the BW line on the CCD.

**Coarse delay:**

This field defines the distance between the CIS elements in 1/100mm in the scanning direction.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Max. B/W scan speed**

Max. scan speed in 1/1200 inch per sec. at 200 DPI, when scanning B/W or graytone.

**Max. index scan speed**

Max. scan speed in 1/1200 inch per sec. at 200 DPI, when scanning indexed color.

**Max. color scan speed**

Max. scan speed in 1/1200 inch per sec. at 200 DPI, when scanning 24-bit color.

**Max. vertical adjustment factor**

Max. absolute value of the max. vertical adjustment (Y scale) factor can be set to.

**Scan speed flags**

Bit:	Device features
0	If 1 scan speeds are to be corrected by software scanner.

**RAW 16 bits files**

This field defines if RAW 16 bits files are supported:

0 RAW 16 bits files are not supported.

1 RAW 16 bits files are supported.

**Multiple color spaces**

This field defines if multiple color spaces are supported:

0 multiple color spaces are not supported.

1 multiple color spaces are supported.

### 3.1.10 Camera position product data page (0xC5)

The page code for this page is 0xC5.

This page can be called in order to get information about physical camera positions.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC5)							
2	Reserved							
3	Additional length (4 * number of cameras + 2 * number of cameras)							
4-7	Number of cameras							
8 + (4 * Camera no.) (4 bytes)	Center position of camera N [1/1200inch]							
...	Center position of Camera N+1 [1/1200inch]							
8 + (4 * number of cameras) + (2 * Camera no.) (2 bytes)	Number of Real Pixels for Camera N ^^							
...	Number of Real Pixels for Camera N+1 ^^							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### Number of cameras

Number of cameras in this scanner.

#### Center position of camera x

Center position of camera x in 1/1200 inch with respect to the original ruler (if zero, camera is not present).

#### Number of Real Pixels for camera x:

The maximum number of visible pixels on camera x.

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### 3.1.11 Calibration support product data page (0xC6)

The page code for this page is 0xC6.

This page can be called in order to get information need for color calibration. This page is only defined in latest firmware releases.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC6)							
2	Reserved							
3	Additional length							
4	Calibration support							
5	Common basic calibration method							
6	Pixel basic calibration method							
7	Color calibration method							
8	Bits used in white reference profile							
9	Bits used in black reference profile							
10	Bits used in white background profile							
11	Bits used in white reference profile (gray tone)							
12	Bits used in black reference profile (gray tone)							
13	Bits used in white background profile (gray tone)							
14	Number of cameras							
15-16	Real pixels in camera A							
17-18	Real pixels in camera B							
19-20	Real pixels in camera C							
21-22	Real pixels in camera D							
23-26	Physical scan width [1/1200 inch]							
27-28	Default RGB (NTSC) white point							
29-30	Default sRGB white point							
31-42	Reserved							
43	Light profile displacement support							
44-47	Profile types							
48-51	Reserved, not to be used							
52-83	Calibration time stamp							
84-87	Patch pre-lines distance [1/1200 inch]							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### Calibration support

Returns 3: Only new calibration scheme is supported.

#### Common basic calibration method

Reserved. Returns 0.

#### Pixel basic calibration method

Reserved. Returns 2.

#### Color calibration method

Reserved. Returns 0.

#### Bits used in white reference profile



Number of bits used to represent one pixel in the white reference light profile. The light profile is used during calibration.

#### **Bits used in black reference profile**

Number of bits used to represent one pixel in the black reference light profile. The light profile is used during calibration.

#### **Bits used in white background profile**

Number of bits used to represent one pixel in the white background light profile. The light profile is used during calibration.

#### **Bits used in white reference profile (gray tone)**

Number of bits used to represent one pixel in the white reference light profile (gray tone). The light profile is used during calibration.

#### **Bits used in black reference profile (gray tone)**

Number of bits used to represent one pixel in the black reference light profile (gray tone). The light profile is used during calibration.

#### **Bits used in white background profile (gray tone)**

Number of bits used to represent one pixel in the white background light profile (gray tone). The light profile is used during calibration.

#### **Number of cameras**

Number of cameras in this scanner.

#### **Real pixels in camera A**

The maximum number of visible pixels on camera A.

*Not defined for 9<sup>th</sup> generation scanners - use inquiry page 0xC5.*

#### **Real pixels in camera B**

The maximum number of visible pixels on camera B.

*Not defined for 9<sup>th</sup> generation scanners - use inquiry page 0xC5.*

#### **Real pixels in camera C**

The maximum number of visible pixels on camera C.

*Not defined for 9<sup>th</sup> generation scanners - use inquiry page 0xC5.*

#### **Real pixels in camera D**

The maximum number of visible pixels on camera D.

*Not defined for 9<sup>th</sup> generation scanners - use inquiry page 0xC5.*

#### **Physical scan width**

Physical scan width of this scanner (in 1/1200 inches).

#### **Default RGB (NTSC) white point**

Default (i.e. neutral) RGB white point in NTSC mode.

#### **Default sRGB white point**

Default (i.e. neutral) RGB white point in sRGB mode.

#### **Light profile displacement support**

If 0, light profile displacement is not supported.

If 1, light profile displacement is supported (used in calibration).

#### **Profile types**

DWORD that contains the profile types

Byte 3	Byte 2	Byte 1	Byte 0
TBD	TBD	Profile features	Offset profile type

**Patch pre-lines distance [1/1200 inch]**

Distance scanned before first scanline to capture patch information.

### 3.1.12 Device information data page (0xC7)

The page code for this page is 0xC7.

This page can be called in order to get device information.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC7)							
2	Reserved							
3	Additional length							
4-13	FW build number							
14-29	IP address							
30-43	Reserved for future use							
44-59	Product ID Code (HW type/variant/revision)							
60-99	Release identification							
100-117	MAC address							
118-149	Vendor ID Text							
150-181	Product ID Text							
182-246	Hostname							
247-248	Device features							
249-255	Reserved for future use							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page information fields, the Additional length will be adjusted to reflect the actual number of bytes returned.

#### FW build number

Firmware build number. This number is unique for all firmware releases.

#### IP address

IP address.

*Not defined for 6<sup>th</sup> generation scanners.*

#### Product ID Code

Text string containing Product ID Code specifying model id, hardware type, hardware variant and hardware revision.

#### Release Identification

Text string containing release number.

#### MAC address

MAC address.

*Not defined for 6<sup>th</sup> generation scanners.*

#### Vendor ID Text

Text string containing Vendor ID.

#### Product ID Text

Text string containing Product ID.

#### Hostname

Text string containing Product name as presented for users.

### Device features

Devices feature flags.

Bit:	Device features
0	Time support
1	Storage support (USB2 HD)
2	Reboot not required to enter download mode
2-15	Reserved

### 3.1.13 Display information data page (0xC8)

The page code for this page is 0xC8.

This page can be called in order to get display information.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xC8)							
2	Reserved							
3	Additional length							
4	SKx board Revision							
5	SKx board Variant							
6	Display Bits Per Pixel							
7-8	Display Width (pixels)							
9-10	Display Height (pixels)							
11-12	Number of lines							
13-14	Line Width							
15-16	Line Height							
17	Scanner Menu Language							
18	Application key 1 default function							
19	Application key 2 default function							
20	Application key 3 default function							
21-24	Keys mask							
25-28	Sensors mask							
29-32	LEDs mask							
33	Application key 4 default function							

#### Device type:

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code:

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block.

#### Additional length:

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page information fields, the Additional length will be adjusted to reflect the actual number of bytes returned.

#### SKx board Revision:

Scanner keyboard revision number.

#### SKx board Variant:

Scanner keyboard variant number.

#### Display Bits Per Pixel:

Bits per pixel used in the display.

- 0 No display present.
- 1 BW monochrome.
- 8 Gray tone.
- 24 RGB.

#### Display Width:

Scanner display width in pixels.

#### Display Height:

Scanner display height in pixels.

#### Number of lines:

Number of lines in display.

### Line Width:

The width of a single display line.

### Line Height:

The height of a single display line.

### Scanner Menu Language:

The language currently used in the scanner menu.

- 0 English
- 1 Japanese

### Application key 1 default function

The default function of Application key 1. This is a specification of the Icon or text on the application key, identified as Application key 1.

Value	Icon	Description
31h	'1'	Text on key is '1'
32h	'2'	Text on key is '2'
33h	'3'	Text on key is '3'
40h	'@'	Text on key is '@'
80h	Scan to folder	Icon used on key
81h	Copy	Icon used on key
82h	Scan to mail	Icon used on key
83h	Start scan	Icon used on key

### Application key 2 default function

The default function of Application key 2. See description of application key 1.

### Application key 3 default function

The default function of Application key 3. See description of application key 1.

### Keys Mask

Mask of bits reflecting keys on this scanner:

- Bit 0: Stop key
- Bit 1: Reverse key
- Bit 2: Forward key
- Bit 3: Application key 1
- Bit 4: Application key 2
- Bit 5: Application key 3
- Bit 6: Power key
- Bit 7: Media key
- Bit 8: Media up key
- Bit 9: Media down key
- Bit 10: Reserved
- Bit 11: Application key 4
- Bit 12: Speed up key
- Bit 13: Speed down key

### Sensors Mask

Mask of bits reflecting sensors on this scanner:

- Bit 0: Output sensor
- Bit 1: Input sensor (on scanners with side and/or center input sensor, this is not a real sensor)
- Bit 2: Thickness sensor
- Bit 3: Extern sensor
- Bit 4: Ready sensor (on scanners with side and/or center ready sensor, this is not a real sensor)

On ACS scanners:

Bit 5: Input rollers sensor

On LFS scanners:

Bit 5: Scanner closed sensor

Bit 6: Reserved

Bit 7: Auto guide lower sensor

Bit 8: Auto guide upper sensor

Bit 9: Auto guide roller sensor

Bit 10: Reject bin sensor

Bit 11: Reject bin sensors installed sensor

Bit 12: Side input sensor

Bit 13: Side ready sensor

Bit 14: Center input sensor

Bit 15: Center ready sensor

Bit 16: Paper size sensor 1

Bit 17: Paper size sensor 2

Bit 18: Paper size sensor 3

Bit 19: Paper size sensor 4

Bit 20: Paper size sensor 5

Bit 21: Paper size sensor 6

Bit 22: Paper size sensor 7

Bit23: Paper size sensor 8

## **LEDs Mask**

Mask of bits reflecting LEDs on this scanner:

Bit 1: Wait LED

Bit 2: Diagnostics LED

Bit 3: Paper green LED

Bit 4: Paper red LED

Bit 5: Power green LED

Bit 6: Power red LED

Bit 7: Media LED

Bit 14: Ready LED

Bit 15: Error LED

## **Application key 4 default function**

The default function of Application key 4. See description of application key 1.

### 3.1.14 Boot program product data page (0xFF)

The page code for this page is 0xFF.

This page can be called when the boot program is running in order to get information about the hardware and software revision status of the scanner.

Bit Byte	7	6	5	4	3	2	1	0
0	Device type							
1	Page code (0xFF)							
2	Reserved							
3	Additional length							
4-7	Boot code release							
8-19	Date stamp of boot code							
20-27	Time stamp of boot code							
28-31	Executable build							
32-35	Hardware variant/revision							
36-47	Date stamp of executable							
48-55	Time stamp of executable							
56-59	Checksum of executable							
60-63	Scanner generation							
64	Reserved							
65	Keyboard switch							
66	Hardware variant switch							
67	Hardware revision switch							
68-71	FPGA build							
72-83	Date stamp of FPGA							
84-91	Time stamp of FPGA							
92-95	Firmware release							
96-107	Date stamp of firmware download							
108-115	Time stamp of firmware download							
116-119	Size of programmable FLASH							
120-123	Total size of FLASH							
124-127	Profile block flash start address							
128-131	Profile block max. size							
132-143	Serial No.							
144-147	FLASH stamp top address							
148	Hardware SU board identifier							

#### Device type

If logical unit number is 0, device type = 6.

If non-zero logical unit number, device type = 0x7F.

#### Page code

The page code field is set to the value of the page in the code field in the INQUIRY command descriptor block (see **Error! Reference source not found.**).

#### Additional length

The Additional length field specifies the length of the supported page list. If the allocation length is too small to transfer all of the page, the Additional length will not be adjusted to reflect the truncation.

#### Boot code release

Release number of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

#### Date stamp of boot code

Date stamp of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

#### Time stamp of boot code

Time stamp of the boot code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.



**Hardware variant/revision**

Variant/revision of the hardware in the scanner in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Executable build**

Build number of the executable in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of executable**

Date stamp of the executable in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of executable**

Time stamp of the executable in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Checksum of executable**

CRC-32 checksum of executable. If no valid executable exist this field is set to 0xFFFFFFFF.

**Scanner generation**

Generation of the scanner. Is always 5 on fifth generation scanners, and 6 on sixth generation.

**Keyboard switch**

Setting of the keyboard switch at boot time.

**Hardware variant switch.**

Setting of the hardware variant switch at boot time.

**Hardware revision switch.**

Setting of the hardware release switch at boot time.

**FPGA build**

Build number of the FPGA code in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Date stamp of FPGA**

Date stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of FPGA**

Time stamp the executable in ASCII. The bytes not used is filled with spaces (0x20) and the string is not zero terminated.

**Firmware release.**

Firmware release number.

**Date stamp of firmware download.**

Date stamp of last firmware download in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used are filled with spaces (0x20) and the string is not zero terminated.

**Time stamp of firmware download.**

Time stamp of last firmware download in ASCII. If no valid executable exist this field is set to the string -1. The bytes not used are filled with spaces (0x20) and the string is not zero terminated.

**Size of programmable FLASH.**

Number of bytes in FLASH that can be reprogrammed with firmware. This is also the start address of the boot code.

**Total size of FLASH.**

Size of FLASH in bytes.

**Profile block start address.**

FLASH address of start of profile block.

**Profile block max. size.**

Number of bytes allocated in FLASH for profile blocks.

**Serial no.**

Scanner serial number.

**FLASH stamp top address.**

FLASH top address of FLASH stamp.

**Hardware SU board identifier.**

The hardware SU board identifier setting.

### 3.2 OBJECT POSITION (0x31)

The OBJECT POSITION command provides a positioning function. Both absolute as well as relative positioning are provided.

#### 3.2.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x31)							
1	Position function							
2-4	Count							
5-9	Reserved							

#### Operational code:

The operational code for this function is 0x31

#### Positioning function:

Value	Function	Description
0:	Unload object.	This will make the scanner eject the original to the eject rollers. If no original is loaded the scanner will return a GOOD status.
1:	Load object.	The original is returned to the start of the window. To resume scanning a new SCAN command must be send. A SET WINDOW command must be send before the SCAN command
2:	Absolute positioning.	The original is positioned at the absolute position specified by Count (the offset previously set by SET WINDOW is origin). A SCAN command is needed before the scanner resumes scanning.
3:	Relative positioning.	The original is positioned at the relative position specified by Count (new position is actual position + Count). A SCAN command is needed before the scanner resumes scanning.

#### Count:

Can be used in connection with *Positioning function 2* to specify a new scanning position in 1/1200 inch (only when scanning is in progress). Can also be used in connection with *Positioning function 0* to eject the paper all the way out of the scanner, by setting count to 0xFFFFFFFF (as opposed to *Unload object* where the original is still held by the eject rollers).

In connection with *Positioning function 0* the count value can be set to 0xFFFFFE to eject the paper all the way out at the front of the scanner.

Summary of the Object position command:

Function number	Count	Function name	Description
0	0xFFFFFFFF	Eject Back	'drops' the paper all the way out the BACK of the scanner
	0xFFFFFE	Eject Front (Unload)	'drops' the paper all the way out the FRONT of the scanner
	0	'To-End'	Forward to back rollers! Not dropped!

1	Not used	Load (reload)	Loads a paper if it is ready at the rollers or Reloads an already loaded paper.
2	Absolute positioning	(inch/1200 resolution position)	The original is positioned at the absolute position specified by Count (the offset previously set by SET WINDOW is origin). A SCAN command is needed before the scanner resumes scanning.
3	Relative positioning	(inch/1200 resolution position)	The original is positioned at the relative position specified by Count (new position is actual position + Count). A SCAN command is needed before the scanner resumes scanning.

### 3.3 READ (0x28)

This command is used by the host computer to read data from the scanner.

#### 3.3.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x28)							
1	Reserved							
2	Data type code							
3	Reserved							
4-5	Data type qualifier							
6-8	Transfer length							
9	Reserved							

#### Operational code:

The operational code for this function is 0x28

#### Data type code:

The data type code distinguishes between the different types of data that are transferred between the target and the initiator:

Code	Qualifier	Description	Read/ Send
0x00	0x00	Image data. The image data is read as RLC code or uncompressed data as specified by the SET WINDOW command.	R
0x01	0x10	Palette data burst for small palette RAM.	S
0x03	0x00	Gamma data	S
0x06	0x00	SEND: Use stitch set 0 READ: Get current stitch set	R/S
0x06	0x01	SEND: Use stitch set 1 READ: Get current stitch set	R/S
0x06	0x02	SEND: Use stitch set x READ: Get current stitch set	R/S
0x06	0x03	Custom stitch method	R/S
0x80	0x00	Scanner status.	R
0x80	0x01	Stop scanning.	S
0x80	0x02	Reset scan system.	S

0x80	0x03	Scanner status. <i>To be used by STI only.</i>	R
0x80	0x04	Scanner ethernet status	R
0x80	0x0B	Max. original move speed.	R/S
0x81	0x01	Week timer value	R/S
0x81	0x02	Timer settings for power up and power down.	R/S
0x81	0x03	Power status (Powered up or down)	R/S
0x81	0x04	Power down timer (activates when scanner is not used)	R/S
0x81	0x05	Scanner In Use	S
0x81	0x06	Power down if no active Ethernet connections	S
0x82	0x00	Scanner statistics	R
0x83	0x00	Lens/CIS correction	R/S
0x83	0x01	Displacement factor for lens correction	R/S
0x83	0x02	Lens/CIS correction data	R/S
0x83	0x03	Number of lens/CIS correction areas	R
0x83	0x04	Pixel masking function	R/S
0x83	0x10	Light test data	R
0x84	0x00	Batch mode	R/S
0x85	0x00	SEND: Set ghost key READ: Get real keys	R/S
0x85	0x01	Clear ghost key	S
0x85	0x02	SEND: Set ghost sensor READ: Get real sensors and LEDs	R/S
0x85	0x03	Clear ghost sensor	S
0x85	0x04	Use ghost sensors	R/S
0x85	0x05	Use only ghost keys	R/S
0x85	0x06	Use sensor less scanning	R/S
0x85	0x07	Turn scan ready LED on	S
0x85	0x08	Turn scan ready LED off	S
0x86	0x00	High quality mode	R/S
0x87	0x00	Validation time	R/S
0x87	0x01	Consumables status (GOLF)	R/S
0x87	0x02	Remaining lifetime of lamp.	R
0x87	0x03	Current lamp light intensity level (percentage).	R
0x87	0x04	Current scanner temperature	R
0x87	0x05	Remaining lifetime of filter	R/S
0x88	0x00	Subscribe/Unsubscribe to One Touch Events <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	R/S
0x88	0x01	Validate Client for One Touch Events <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	R
0x88	0x02	Client bitmap to show instead of client name string <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x00	SERVICE: Position carriage at lamp replacement position <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x01	SERVICE: Position carriage at optical adjustment pattern position <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x02	SERVICE: Position carriage at position to ease mechanical disassembly of scanner. <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x03	SERVICE: Position carriage at default parking position. <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x04	Reserved	
0x89	0x05	Turn lamp on <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x06	Turn lamp off <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x89	0x07	Reserved	
0x89	0x08	Position carriage at transport position <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	S
0x8A	0x00	Number of stops before reduction of speed	R/S

		<i>Not defined for 6<sup>th</sup> generation scanners.</i>	
0x8A	0x01	Force stop in scan on MB boundary <i>Not defined for 6<sup>th</sup> generation scanners.</i>	S
0x8A	0x02	Force stop in scan on scanline interval	S
0x8B	0x00	Activate IP settings	S
0x8B	0x01	IP settings: Address and subnet mask	R/S
0x8B	0x02	IP settings: Network name	R/S
0x8B	0x03	IP settings : Scanning IP ports	R/S
0x8B	0x04	IP settings : DHCP on/off	R/S
0x8B	0x05	Ethernet interface on/off	R/S
0x8B	0x06	IP settings: Gateway address	R/S
0x8B	0x07	IP settings: Domain name	R/S
0x8B	0x08	IP settings: DNS servers	R/S
0x8B	0x09	Reserved	
0x8B	0x0A	Reserved	
0x8B	0x0B	Reserved	
0x8B	0x0C	Reserved	
0x8C	0x00	Reserved	
0x8C	0x01	Reserved	
0x91	0x00	Remote Auto Scan Configuration <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	R
0x92	multi	SEND: Convert old error code READ: Get list of error codes <i>Not defined for 6<sup>th</sup> generation scanners. 7<sup>th</sup> and 8<sup>th</sup> generation scanners are READ only.</i>	R/S
0x93	0x00	Storage info <i>Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.</i>	R
0xC0	0x00	XML string for scan accounting	S
0xC0	0x01	XML string for print accounting	S
0xE0	multi	Stored profile values	R
0xF0	0x00	Trace buffer	R
0xF2		Reserved	
0xF8	0x00	Vertical camera alignment.	S
0xF8	0x01	Vertical camera alignment (Forward)	S
0xF8	0x02	Vertical camera alignment.(Reverse)	S
0xF8	0x03	Vertical camera alignment.(Stop)	S
0xFA	0x02	Set black/white point and readjust	S
0xFD	0x02 or 0x21	Abort calibration. All values are reset to FLASH values.	S
0xFD	0x05 or 0x22	SEND: End calibration; save all calibration values with calibration date/time stamp to FLASH. READ: Retrieve calibration date/time stamp (0x05 only).	R/S
0xFD	0x10	Ignore calibration values. All values are reset to default values.	S
0xFD	0x11	Use default (unity) CSC matrix.	S
0xFD	0x12	Reset profiles. Enable download of new profiles.	S
0xFD	0x24	SEND: Start new calibration. Doesn't wait for basic calibration to complete. READ: Read calibration sheet barcode.	R/S
0xFD	0x26	Black/White reference values (from barcode)	R/S
0xFD	0x30	Lamp status	R
0xFD	0x31	Lamp ON	S
0xFD	0x32	Lamp OFF	S
0xFD	0x33	Reserved	S
0xFF	0x00	Adjustment control.	S
0xFF	0x01	Stitch limits.	R
0xFF	0x02	Get no. of pixels used for each camera.	R
0xFF	0x03	Light profile displacement.	R

**Transfer length:**

The number of data to be transferred from the scanner. Dependent on the kind of data to transfer:

Image data	Should be set to the buffer size reported by the INQUIRY command. The scanner will then return what ever is in the current output buffer and return a CHECK CONDITION. The following REQUEST SENSE will have the ILI bit set and the INFORMATION field set to the residue.
Palette data	The transfer length should be set to 32768 (0x8000).
Gamma data	The transfer length should be set to 3*512 (0x600).
Feature RAM	The transfer length should be set to 256 (0x100).
Gray tone Contrast/Brightness LUT	The transfer length should be set to 256 (0x100).
Calibration control	The transfer length should be set to 0 (0x0).
Adjustment control	The transfer length should be set to 4 (0x4).
Stitch limits	The transfer length should be set to 8 (0x8).
Get no. of pixels used for each camera.	The transfer length should be set to 2* <i>Number of cameras</i> ; see byte 14 on Inquiry page 0xC6.

### 3.3.2 Image data formats (code 0x00, qualifier 0x00)

Image data can be either run length encoded data, gray tone data or color data. This is determined by the **Image composition** field in the SET WINDOW command. In case of gray tone data each pixel is represented by one or two byte(s) describing the gray tone level of the pixel. For color data each pixel is represented by one or three bytes depending on the color mode.

If the data is run length encoded data each buffer contains a number of lines. Each line is terminated by a 0. All bytes that are not 0 describes a run. If the most significant bit is 1 it is a white run if it is 0 it is a black run. The remaining 7 bits describes the number of pixels in the run.

### 3.3.3 Example (black and white data):

0xD0	50 whites
0x4E	78 blacks
0xFF	127 whites
0x85	5 whites
0x00	line terminator
0x05	5 blacks
0xFF	127 whites
0xFF	127 whites
0x01	1 black
0x00	line terminator

### 3.3.4 Gamma RAM data format:

*Fourth generation scanners:*

The Red, Green and Blue gamma curves are downloaded as one block in 9-bit resolution:

Byte:	Description:
0-511	: Red gamma curve
512-1023	: Green gamma curve
1024-1535	: Blue gamma curve

A neutral gamma curve is constructed by loading the values 0-255 into the Red part (byte 0-511), the Green part (byte 512-1023) and the blue part (byte 1024-1535) respectively.

*Fifth and sixth generation scanners:*

The Red, Green and Blue gamma curves are downloaded as one block in 12-bit resolution:

Byte:	Description:
0-4095	: Red gamma curve
4096-8191	: Green gamma curve

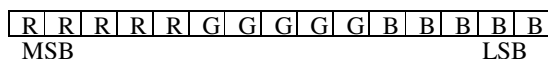
8192-12287 : Blue gamma curve

A neutral gamma curve is constructed by loading the values 0-255 into the Red part (byte 0-4095), the Green part (byte 4096-8191) and the blue part (byte 8192-12287) respectively.

### 3.3.5 Palette RAM data format:

*Fourth and sixth generation scanners:*

On scanners with a small Palette RAM, the entire palette is downloaded in a single burst using dataTypeQualifier 0x10. The size of the Palette RAM is 32768 bytes addressed as:



The burst is expected to contain palette values (RGB-combinations) corresponding to the 32768 addresses starting with address 0 and ending with address 32767, where each address is interpreted as the RGB input values as shown above.

Example:

Burst:	Binary value:	RGB input:
0	(0000000000000000)	R=0, G=0, B=0
...		
22222	(101011011001110)	R=21, G=22, B=14
...		
32767	(111111111111111)	R=31, G=31, B=31

*Fifth generation scanners only:*

On scanners with a larger Palette RAM, the palette is downloaded in adjacent bursts due to SCSI limitations. The palette is organized as three independent palettes, one for each input color. In this way all 24-bit colors can be created in the palette and the entire color space can be remapped, compared to the limit of 32768 colors output with a small Palette RAM.

The bursts could be 32768 bytes each as in the example with the small Palette RAM, but the size is left open to the programmer.

The palette is downloaded by issuing an initial burst to a specific palette 'color'. Use dataTypeQualifier 0x16 for the 'red' palette, 0x17 for the 'green' palette and 0x18 for the 'blue' palette. After the initial burst, all bursts to the same palette 'color' is downloaded using the dataTypeQualifier 0x15. When one palette 'color' is full, an initial burst is issued to the next palette 'color' followed by consecutive bursts using dataTypeQualifier 0x15.

### 3.3.6 Black/White point format:

Color scanners only. The Black/White points are send as the RGB values for black and white.

BYTE format (Code = 0xFA, Qualifier = 0x00 or 0x01):

Byte no	
0	Red part of requested white point
1	Green part of requested white point
2	Blue part of requested white point
3	Red part of requested black point
4	Green part of requested black point
5	Blue part of requested black point

When using BYTE format, the highest white point is (255, 255, 255).

DWORD format (Code = 0xFA, Qualifier = 0x02 or 0x03):



Byte no	
0-3	Red part of requested white point
4-7	Green part of requested white point
8-11	Blue part of requested white point
12-15	Red part of requested black point
16-19	Green part of requested black point
20-23	Blue part of requested black point

When using DWORD format , a white point higher than (255, 255, 255) can be set. Only supported by FSC x010 scanners. As a noteworthy exception the byte order is Intel instead of the normal Motorola byte order.

### 3.3.7 Calibration control:

Sending this code initiates a basic calibration in the scanner or saves the found calibration values in the scanner.

### 3.3.8 Adjustment control:

Double word containing flags that control the linearization and stitching process in the scanner:

0x00000000	Disable adjustment (unadjust)
0x00000001	Adjust once and unstitch
0x00000003	Adjust once and stitch
0x00000004	Stitch and leave adjustment unchanged
0x00000008	Unstitch and leave adjustment unchanged
0x00000010	Adjust analog offset (RGB+GRAY). Leave pixel adjustment unchanged.
0x00000020	Adjust analog offset (only RGB). Leave pixel adjustment unchanged.
0x00000040	Adjust analog offset (only GRAY). Leave pixel adjustment unchanged.
0xFFFFFFE	Suspend cyclic adjustment
0xFFFFFFF	Normal adjustment (resume cyclic adjustment)

### 3.3.9 Stitch limits:

Byte no	
0-3	iMin
4-7	iMax

Minimum and maximum values the stitch correction can have.

### 3.3.10 No. of pixels used for each camera:

Byte no	
0-1	No. of bytes from camera A
2-3	No. of bytes from camera B
4-5	No. of bytes from camera C
6-7	No. of bytes from camera D
8-9	No. of bytes from camera ...
10-11	No. of bytes from camera ...

As the scanner returns the no. of bytes (not pixels) for each camera, the result should be divided by 3 when scanning in 24 bit color. The no. of bytes parameters are valid when the scanner has performed the correct setup (after a SCAN command). Until then, the command will return 0 for all cameras.

Make sure the transfer length is adequate – see Transfer length in paragraph 3.3.1.

## 3.3.11 Scanner status:

Byte no	
0:	<p>Scanner Mode:</p> <p>0x01: Programming mode, firmware may be downloaded, or scanner must be rebooted to start executable.</p> <p>The following codes indicate the mode of the running executable:</p> <p>0x02: Initializing</p> <p>0x03: Warming up</p> <p>0x04: Ready</p> <p>0x05: Not ready (an error was detected)</p> <p>0x06: Test mode</p> <p>0x07: Continuous self-test mode</p> <p>0x08: Calibrating</p> <p>0x09: Adjusting</p> <p>0x0A: Standby mode</p> <p>0x0B: Firmware update</p>
1:	<p>Original Status:</p> <p>0x00: No media; no original in scanner</p> <p>0x10: Not ready; original ejected (can be loaded with a load command)</p> <p>0x11: Not ready; original inserted (can be loaded with a load command)</p> <p>0x12: Not ready; original position unknown (can be loaded with a load command)</p> <p>0x13: Not ready; paper jam (should be re-inserted by user)</p> <p>0x14: Not ready; original lid is open</p> <p>0x20: Busy; loading original</p> <p>0x21: Busy; moving original</p> <p>0x22: Busy; positioning original</p> <p>0x23: Busy; ejecting original</p> <p>0x24: Busy; scanning original</p> <p>0x25: Busy; basic calibrating</p> <p>0x30: Ready; original has just been loaded</p> <p>0x31: Ready; original has been moved since load.</p>
2-5	<p>Original position [1/1200 inch]</p> <p>Distance from beginning of original.</p>
6	<p>Adjust status:</p> <p>Bit 0: Set if currently adjusting</p> <p>Bit 1: Set if at least one adjustment has been completed successfully</p> <p>Bit 2: Set if latest adjustment has been completed successfully</p> <p>Bit 3: Set if the white background is not present (ext. thickness enabled)</p> <p>Bit 4: Set if currently stitching</p> <p>If signaled by INQUIRY page 0xC1 field 84 the following bits are valid (otherwise they are always zero):</p> <p>Bit 5: Set if adjusted (otherwise next scan will be unadjusted).</p> <p>Bit 6: Set if stitched (otherwise next scan will be unstitched).</p>
7	<p>Adjust errors (shows status of latest adjustment that failed):</p> <p>Bit 0: Set if camera A adjustment failed</p> <p>Bit 1: Set if camera B adjustment failed</p> <p>Bit 2: Set if camera C adjustment failed</p> <p>Bit 3: Set if camera D adjustment failed</p>
8	<p>Stitch errors (shows status of latest stitching that failed):</p> <p>Bit 0: Set if camera AB stitching failed</p> <p>Bit 1: Set if camera BC stitching failed</p> <p>Bit 2: Set if camera CD stitching failed</p>
9-12:	Time since last adjustment [sec] (0xFFFFFFFF if no adjustment has yet been completed).
13-16:	Time since scanner boot [sec]
17-20:	Warm-up time remaining [sec]
21-24:	Number of pixels in next lines scanned (0 if value is unavailable)
25:	Progress indication when <i>Original Status</i> is 'busy' {0..100%}.
26:	Keyboard status.
27:	<p>Sensor status:</p> <p>Bit 0: Output sensor</p> <p>Bit 1: Input sensor</p> <p>Bit 2: Thickness sensor</p> <p>Bit 3: Extern sensor</p>

	Bit 4: Leading edge sensor (Ready) On ACS scanners: Bit 5: Input rollers sensor On LFS scanners Bit 5: Scanner closed sensor Bit 6: Reserved Bit 7: Auto guide lower sensor
28:	Maximum READ scanner status length supported
29:	Function keys (all bits are cleared when read): Bit 0: Set if key function (reported in inquiry page 0xC8 byte 18) has been pressed. Bit 1: Set if key function (reported in inquiry page 0xC8 byte 19) has been pressed. Bit 2: Set if key function (reported in inquiry page 0xC8 byte 20) has been pressed. Bit 3: Set if key function (reported in inquiry page 0xC8 byte 33) has been pressed.
30:	Calibration profiles status: Bit 0: Set if all needed profiles are valid. Bit 1: Set if B/W profiles are valid. Bit 2: Set if color profiles are valid. Bit 3: Set if fast B/W profiles are valid.
31:	Sensor status: Bit 0: Auto guide upper sensor Bit 1: Auto guide roller sensor Bit 2: Reject bin sensor Bit 3: Reject bin sensors installed sensor Bit 4: Reserved Bit 5: Reserved Bit 6: Reserved Bit 7: Reserved
32-33	Remaining power down delay due to scanner active (in sec.). 0 equals not active.
34-37	Sec. to power down due to scanner not active. 0 equals not active.
38	Current CPU running, 1=Normal, 0=Safe
39	Reserved for future use
40-43	Point of time since scanner boot, when scanner was last reserved. [sec]
44-49	Current reserve unit key, all zeros if scanner isn't reserved.
50:	Sensor status: Bit 0: Paper size sensor 1 Bit 1: Paper size sensor 2 Bit 2: Paper size sensor 3 Bit 3: Paper size sensor 4 Bit 4: Paper size sensor 5 Bit 5: Paper size sensor 6 Bit 6: Paper size sensor 7 Bit 7: Paper size sensor 8
51-54:	Maximum width of inserted original [1/1200 inch] (0 equals invalid detection or no original)
55:	Reserved
56-59	Reserved
60-63	Keyboard status (for bit definition see inquiry page 0xC8 [21..24])
64-67	Sensor status (for bit definition see inquiry page 0xC8 [25..29])
68-69	Number of free connections (number of additional connections that can be accepted on this interface).
70-73	Minimum width of inserted original [1/1200 inch]
74-77	IP address of PC holding reserve unit
78	Current connection type: 0: Unknown 1: USB full speed 2: USB high speed 3: USB super speed 4: 1394/firewire 5: Ethernet 6: Ethernet 10 Mbit

	7: Ethernet 100 Mbit 8: Ethernet 1 Gbit 9: Ethernet 10 Gbit
79	JIG mode
80-83	Paper size detection: Minimum start offset [1/1200 inch]
84-87	Paper size detection: Maximum start offset [1/1200 inch]
88-91	Paper size detection: Minimum end offset [1/1200 inch]
92-95	Paper size detection: Maximum end offset [1/1200 inch]
96	Paper load position: 0: Center loaded 1: Side loaded

*Note: This is a READ only command.*

### 3.3.12 Stop scanning:

Stops scanning. The action cannot be resumed, but a new SCAN command is allowed.

*Note: This is a SEND only command.*

### 3.3.13 Reset scan system:

Stops scanning and resets gamma, black and white points to default values.

*Note: This is a SEND only command.*

### 3.3.14 Scanner Ethernet status

This status page reports current scanner Ethernet state:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Additional length of this status page (216)							
2-66	Hostname							
67-131	Domain name							
132-147	Scanner IP address							
148-149	UDP scan port							
150-151	UDP discovery port							
152-167	Gateway address							
168-183	Subnet mask							
184-199	Primary DNS address							
200-215	Secondary DNS address							

*Note: This is a READ only command.*

### 3.3.15 Max. original move speed:

Gets/sets max. speed original is moved with [inch/1200/sec].

Bit Byte	7	6	5	4	3	2	1	0
0-3	Max. move speed.							

### 3.3.16 Vertical camera alignment:

Used to move cameras in order to auto align vertically. This function is only supported if reported in inquiry page 0xC1.

Byte no	
0	Camera number (0=A, 1=B, 2=C, 3=D .. ect.)
1-4	Time to move [usec]. Sign selects direction.

*Note: This is a SEND only command.*

### 3.3.17 Vertical camera alignment (Forward):

Used to move cameras in order to auto align vertically. This function is only supported if reported in inquiry page 0xC1.

Byte no	
0	Camera number (0=A, 1=B, 2=C, 3=D .. ect.)
1	Timeout: 0: Camera motor may run forever 1: All camera motors stop after 5 sec. if this command isn't repeated.

*Note: This is a SEND only command.*

### 3.3.18 Vertical camera alignment (Reverse):

Used to move cameras in order to auto align vertically. This function is only supported if reported in inquiry page 0xC1.

Byte no	
0	Camera number (0=A, 1=B, 2=C, 3=D .. ect.)
1	Timeout: 0: Camera motor may run forever 1: All camera motors stop after 5 sec. if this command isn't repeated.

*Note: This is a SEND only command.*

### 3.3.19 Vertical camera alignment (Stop):

Used to move cameras in order to auto align vertically. This function is only supported if reported in inquiry page 0xC1.

Byte no	
0	Camera number (0=A, 1=B, 2=C, 3=D .. ect.)

*Note: This is a SEND only command.*

### 3.3.20 Current week timer value:

Used to get the current time in the scanner.

Byte no	
0-3	Current time in minutes from midnight Monday.

### 3.3.21 Timer settings:

Used to enable and disable timer functions and to get the current timer settings in the scanner.

Byte no	
0	Number of bytes in this structure.
1	General configuration: Bit 0: Enable (1) / disable (0) Power up function. Bit 1: Enable (1) / disable (0) Power down function.
2-5	Monday power up time. (Most significant bit enables the use of this timer)
6-9	Monday power down time. (Most significant bit enables the use of this timer)
10-13	Tuesday power up time. (Most significant bit enables the use of this timer)
14-17	Tuesday power down time. (Most significant bit enables the use of this timer)
18-21	Wednesday power up time. (Most significant bit enables the use of this timer)
22-25	Wednesday power down time. (Most significant bit enables the use of this timer)
26-29	Thursday power up time. (Most significant bit

	enables the use of this timer)
30-33	Thursday power down time. (Most significant bit enables the use of this timer)
34-37	Friday power up time. (Most significant bit enables the use of this timer)
38-41	Friday power down time. (Most significant bit enables the use of this timer)
42-45	Saturday power up time. (Most significant bit enables the use of this timer)
46-49	Saturday power down time. (Most significant bit enables the use of this timer)
50-53	Sunday power up time. (Most significant bit enables the use of this timer)
54-57	Sunday power down time. (Most significant bit enables the use of this timer)
58	Time (in minutes) to wait for inactivity before powering down, if the scanner is in use when a power down time is reached.

*Note: Time is measured in minutes from midnight Monday*

### 3.3.22 Power status:

Used to get the power status of the scanner.

Byte no	
0	Power status 0x00: Powered down 0x01: Powered Up

### 3.3.23 Power down timer:

Used to get the power status of the scanner.

Bit	15	14 - 0
	0: Use timer 1: Timer not used	Timer value in minutes

### 3.3.24 Scanner In Use

Call this function to update the 'Scanner In Use' timer. This function is used for keeping the scanner from going into power down when an application is open. By calling this function at intervals shorter than the 'Power down timer' settings, the application can keep the scanner from going into power down.

### 3.3.25 Power down if no active Ethernet connections

Call this function to do a conditional power down of the scanner. The scanner will only power down if there are no active Ethernet connections (i.e. the scanner must not be in use by remote users).

### 3.3.26 Scanner statistics

Used to get the scanner statistics.

Byte no	
0	Number of bytes in this structure.
1-4	Number of scans (total)
5-8	Number of scans with extended thickness
9-12	Total length of scanned documents (in inch)
13-16	Total length of document movement in the scanner (in inch)
17-20	Total time of 'current on the motor' (in seconds)
21-24	Total time of light on (in seconds)
25-28	Total time of Power up state (in seconds)
29-32	Total time of Power down state (in seconds)

33-36	Number of errors
37-38	Number of writes to flash parameter blocks
39-40	Number of calibrations
41-72	Time stamp of last calibration
73-76	Number of document loads.
77-80	Number of 'cold' boots
81-84	Number of 'warm' boots
85-88	Total number of boots
89-120	Born on date
121-124	OOB Time left
125-150	Temperature log
151-154	Selftest temperature accumulated
155-156	No of Selftest temperature adds
157-160	Number of flash block erasures
161-164	Number of flash block writes
165-166	Number of flash block failures

*Note: This is a READ only command.*

### 3.3.27 Lens/CIS correction

Used to get the resolution correction function used by the scanner.

When using the READ command:

Byte no	
0	Resolution correction mode Bit 0: Lens/CIS correction enable bit. (ALE/EHA) Bit 1: Reserved for future use ...

When using the WRITE command:

(Inquiry page 0xC1 'Additional calibration features' indicates if 'Save to flash' parameter is supported)

Byte no	
0	Resolution correction mode Bit 0: Lens/CIS correction enable bit. (ALE/EHA) Bit 1: Reserved for future use ...
1	Save to flash (ALE only): 0x00: Save 0x01: Do not save

### 3.3.28 Displacement factor for lens correction (ALE)

Used to get the displacement of the lens correction curve.

Byte no	
0-3	Displacement factor value

### 3.3.29 Lens/CIS correction data (ALE/EHA)

Used to get the lens correction data used by the scanner.

The array size is dependent of the number of correction areas used in the scanner. There are one entry for lens correction factor and one entry for start pixel for each correction area on each camera.

Byte no	
0-3	Lens/CIS correction factor area 1 camera A
4-7	Start pixel for area 1 camera A
8-11	Lens/CIS correction factor area 2 camera A
12-15	Start pixel for area 2 camera A
....	
	Lens/CIS correction factor last area camera A
	Start pixel for last area camera A

	Lens/CIS correction factor area 1 camera B
	Start pixel for area 1 camera B
...	
	Lens/CIS correction factor last area camera D
	Start pixel for last area camera D

### 3.3.30 Number of lens/CIS correction areas (ALE/EHA)

Used to get the number of correction areas supported by the scanner for each camera.

Byte no	
0	Number of correction areas pr. Camera

*Note: This is READ only*

### 3.3.31 Pixel masking function

Used to get the pixel masking function used by the scanner.

Byte no	
0	0x00: Normal pixel mask used 0x01: Extended pixel mask used (needed for lens correction)

### 3.3.32 Light test data

Used to get the test result from the light test.

Byte no	
0 – 2	R, G, B test limit
3 – 5	CB A, Light OFF test result R, G, B
6 – 8	CB A, Light ON test result R, G, B
9 – 11	CB B, Light OFF test result R, G, B
12 – 14	CB B, Light ON test result R, G, B
...	...
	Last CB, Light OFF test result R, G, B
	Last CB, Light ON test result R, G, B

### 3.3.33 Batch mode

This function is used to speed up time between scans.

When this function is enabled the scanner will not adjust – so after some time of scanning the scanner will request to be able to adjust. To allow this turn off this function and wait for adjustment to finish.

If a new Set Window, gamma ram, black/white point, CSC or scan reset is issued to the scanner – a setup of the next scan will be performed. This can also be requested by setting the batch mode (this function) again.

Byte no	
0	0x00: Normal operation 0x01: Batch mode (Scanner is not re-setup between scans)

### 3.3.34 Set ghost key

Command used to set ghost keys. For use, see appendix 5.2

Byte no	
0-3	Keys to be set (See appendix for bit definitions) Data type integer.



**3.3.35 Clear ghost key**

Command used to clear ghost keys. For use, see appendix 5.2

Byte no	
0-3	Keys to clear (See appendix for bit definitions) Data type integer.

**3.3.36 Set ghost sensor**

Command used to set ghost sensors. For use, see appendix 5.2

Byte no	
0-3	Sensors to be set (See appendix for bit definitions) Data type integer.

**3.3.37 Clear ghost sensor**

Command used to clear ghost sensors. For use, see appendix 5.2

Byte no	
0-3	Sensors to clear (See appendix for bit definitions) Data type integer.

**3.3.38 Set use ghost sensors**

Command used to enable ghost sensors. For use, see appendix 5.2

Byte no	
0	Enable ghost sensors (1=TRUE / 0=FALSE)

**3.3.39 Set use only ghost keys**

Command used to enable the use of ghost keys only. The real keys are disabled. For use, see appendix 5.2

Byte no	
0	Enable ghost keys (1=TRUE / 0=FALSE)

**3.3.40 Use sensor less scanning**

Command used to enable the use of ghost keys only. The real keys are disabled. For use, see appendix 5.2

Byte no	
0	Enable sensor less scanning (1=TRUE / 0=FALSE)

**3.3.41 Turn scan ready LED on**

Command is used to turn on the scan ready LED on the keyboard.

Byte no	
0-1	0
2	0x40
3	0

**3.3.42 Turn scan ready LED off**

Command is used to turn off the scan ready LED on the keyboard.

Byte no	
0-1	0
2	0x40
3	0

### 3.3.43 Quality mode

Read/write of used quality mode.

Byte no	
0	Quality mode (1=High quality / 0=Normal)

### 3.3.44 Validation time

Read/write of latest validation time.

Byte no	
0-7	Validation time (Seconds from 1-1-1970)

### 3.3.45 Consumables status (GOLF)

Read/write of latest consumable status.

Bit no	
0	Glass plate
1	Original background
2	Lamp (Automatically updated, read only)
3	Filter
...	
31	

### 3.3.46 Remaining life of lamp

Read the remaining life of the lamp. The timer starts to count down when the saturation warning flag in the GOLF status (bit 2) is set. If the timer is set to -1 the counting has not started yet. When the timer runs out, a fatal error occurs.

Byte no	
0-7	Remaining life of lamp (Seconds)

### 3.3.47 Remaining life of Filter

Read the remaining life of the filter. The timer starts to count down when the scanner is powered on. When the timer runs out, a warning is displayed.

The corresponding Send command will reset the counter. To be used when the filter is replaced.

Byte no	
0-7	Remaining life of filter (Seconds)

### 3.3.48 Subscribe/Unsubscribe to One Touch Events

Command used to enable/disable the use of One Touch Events for a Client.

For 7G and 8G scanners:

Return ILLEGAL REQUEST in sense buffer if client name already exists.

Byte no	Description
0	Subscribe=1 / Unsubscribe=0
1-13	Name of Client

### 3.3.49 Number of stops before reduction of speed

Sets the limit for number of scan stops before speed is reduced.

Byte no	Description
0	Limit

## 3.3.50 Force stop in scan on MB boundary

Byte no	Description
0-3	MB boundary for generating a stop (Bytes) A value of 0 disables the function.

## 3.3.51 Force stop in scan on scanline interval

Byte no	Description
0-3	Number of scanlines between stop/start. A value of 0 disables the function.

## 3.3.52 Activate IP settings (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x00: Activate IP settings

1. First configure IP addr, hostname etc. with data qualifier 0x01-0x04 and 0x06-0x08
2. Test settings i.e. activate with bit0=1.
3. When reconnected using the new settings, store them permanently in the scanner by activating with bit1=1.

Bit Byte	7	6	5	4	3	2	1	0
0							Store settings	Test settings

## 3.3.53 IP settings: Address and subnet mask (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x01: Set IP address & subnet mask

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-31	IP address (IPv4 uses 28-31)							
32-47	Subnet address							

READ: Data type code 0x8B and Data qualifier 0x01: Get IP address and subnet mask

Bit Byte	7	6	5	4	3	2	1	0
0-15	IP address (IPv4 uses 28-31)							
16-31	Subnet address							

### 3.3.54 IP settings: host name i.e. scanner name (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x02: Set scanner name

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-79	Scanner name (host name)							

READ: Data type code 0x8B and Data qualifier 0x02: Get scanner name

Bit Byte	7	6	5	4	3	2	1	0
0-63	Scanner name (host name)							

### 3.3.55 IP settings: Scanning IP ports (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x03: Set scanner ports

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-17	Port used for scanning							
18-19	Port used for detection							

READ: Data type code 0x8B and Data qualifier 0x03: Get scanner ports

Only Ethernet scanners

Bit Byte	7	6	5	4	3	2	1	0
0-1	Port used for scanning							
2-3	Port used for detection							

### 3.3.56 IP settings: DHCP on/off (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x04: Set DHCP and AUTODNS state

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16	DHCP settings (1=on, 0=off)							
17	AutoDNS (1=on, 0=off)							

READ: Data type code 0x8B and Data qualifier 0x04: Get DHCP and AUTODNS state

Bit Byte	7	6	5	4	3	2	1	0
0	DHCP settings (1=on, 0=off)							
1	AutoDNS (1=on, 0=off)							

### 3.3.57 Ethernet interface on/off (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x05: Set Eth interface state

Note: No activation required. This setting takes effect immediately.

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16	Ethernet interface state (1=on, 0=off)							

READ: Data type code 0x8B and Data qualifier 0x05: Get Eth interface state

Bit Byte	7	6	5	4	3	2	1	0
0	Ethernet interface state (1=on, 0=off)							

### 3.3.58 IP settings: Gateway address (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x06: Set gateway address

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-31	Gateway address (IPv4 uses 28-31)							

READ: Data type code 0x8B and Data qualifier 0x06: Get gateway address

Bit Byte	7	6	5	4	3	2	1	0
0-15	Gateway address (IPv4 uses 28-31)							

### 3.3.59 IP settings: Domain name – DNS (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x07: Set scanner domain name

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-79	Scanner domain name							

READ: Data type code 0x8B and Data qualifier 0x07: Get scanner domain name

Bit Byte	7	6	5	4	3	2	1	0
0-63	Scanner domain name							

### 3.3.60 IP settings: DNS server addresses (Ethernet scanners only)

SEND: Data type code 0x8B and Data qualifier 0x08: Set DNS server addresses

Bit Byte	7	6	5	4	3	2	1	0
0-15	Password							
16-31	Primary DNS server address (IPv4 uses 28-31)							
32-47	Secondary DNS server address (IPv4 uses 28-31)							

READ: Data type code 0x8B and Data qualifier 0x08: Get DNS server addresses

Bit Byte	7	6	5	4	3	2	1	0
0-15	Primary DNS server address (IPv4 uses 28-31)							
16-31	Secondary DNS server address (IPv4 uses 28-31)							

### 3.3.61 Start new calibration scheme with new calibration sheet

Only supported when reported by INQUIRY page 0xC1. The Black/White points of the calibration sheet (the barcode values) must be send as follows.

BYTE format (Code = 0xFD, Qualifier = 0x24):

Byte no	
0	Red part of barcode white point
1	Green part of barcode white point
2	Blue part of barcode white point
3	Red part of barcode black point
4	Green part of barcode black point
5	Blue part of barcode black point

When using BYTE format, the highest black/white point is (255, 255, 255).

### 3.3.62 Start new calibration scheme with old calibration sheet

Only supported when reported by INQUIRY page 0xC1. The Black/White points of the IP address of PC holding reserve unit calibration sheet (the barcode values) must be send as follows.

BYTE format (Code = 0xFD, Qualifier = 0x25):

Byte no	
0	Red part of barcode white point
1	Green part of barcode white point
2	Blue part of barcode white point
3	Red part of barcode black point
4	Green part of barcode black point
5	Blue part of barcode black point

When using BYTE format, the highest black/white point is (255, 255, 255).

### 3.3.63 IP address of PC holding reserve unit

When a PC has unit reserved the scanner, these 4 bytes contains the IP address of the PC.

If the scanner is not currently reserved, 255.255.255.255 is returned.

If the scanner is reserved on an interface without IP address (e.g. USB, 0.0.0.1 is returned.

If the scanner doesn't support this field, 0.0.0.0 is returned.

## 3.4 READ BUFFER (0x3C)

The WRITE BUFFER and READ BUFFER commands together provide means for the initiator to access information in the scanners non volatile memory.

### 3.4.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x3C)							
1	Reserved					Mode		
2	Buffer ID							
3-5	Buffer offset							
6-8	Allocation length							
9	Reserved							

#### Operational Code:

The operational code for this command is 0x3C.

#### Mode:

The only mode supported is 001b: Vendor specific.

#### Buffer ID:

Buffer ID	Description	Read/Write
0x00	Vertical adjustment factor	R/W
0x01	Stitch values	R/W
0x02	Paper auto load	R/W
0x03	Horizontal adjustment factor	R/W
0x04	**)Color space matrices (FLASH)	R/W
0x06	Calibration reference values	R/W
0x07	**)Color space matrices (RAM)	R/W
0x08	Paper edge adjustment	R/W
0x09	Paper handling	R/W
0x0A	Data rate	R/W
0x0B	Maximum original move speed	R/W
0x0C	EMC test mode	R/W
0x0D	Calibration functions	R/W
0x0F	Scan line calibration	R/W
0x10	Read FLASH	R
0x12	Read/Write RAM	R/W
0x13	Read communication buffer	R
0x14	Read communication buffer through Double Buffer	R
0x15	Read/Write Double Buffer	R/W
0x16	Read/Write Configuration Parameter Block	R/W
0x18	Read/Write the CIS light levels.	RW
0x19	Read/Write the BW panchromatic light levels.	RW
0x1A	Read/Write Calibration Parameter Block	RW
0x1B	Write live CIS light levels (Exposure period)	W
0x1C	Write CIS light levels (Current level)	W
0x22	Camera delay	R/W
0x38	Basic calibration	R/W
0x3A	Calibration profiles	R/W
0x3C	Gray tone match	R/W
0x3D	Gray tone match mode	R/W
0x3E	Stored profile method	R/W
0x3F	Erase parameter and/or profile blocks	W
0x43	Reduction of normal speed	R/W
0x44	Reduction of reduced speed	R/W
0x45	Hardware test setup	R/W
0x46	High quality exposure select	R/W
0x49	FBS Scan line positions	
0x50	*)Access camera A	
0x51	*)Access camera B	
0x52	*)Access camera C	
0x53	*)Access camera D	
0x54	Reserved	
0x68	Reserved	R/W
0x8X	Firmware download	R/W

0x90	Product Identification	R
0x92	Physical start and stop	R/W
0x93	Logical start and stop	R
0x94	Get CIS coarse delay	R
0x95	Boundary for random stitching	R
0x96	Lost pixels	R
0x97	White Patch position	R/W
0x9C	CCD/CIS characteristics	R
0x9D	Pipelines and offsets	R
0x9E	CIS segment data	R
0xA0	Size of special flash	R/W
0xA1	Special flash data	R/W
0xA2	Set Resolution Mode	W
0xE0-E9	Reserved for driver communication	
0xEA	Internal scanner resolution	R/W
0xEB-EF	Reserved for driver communication	

*\*)This command can only be used when the scanner is using a generic camera. Otherwise DO NOT use these commands.*

*\*\*)Buffer ID 4 and 7 is identical for a WRITE BUFFER. For a READ BUFFER, buffer ID 4 is FLASH read and buffer ID 7 is RAM read.*

### Buffer offset:

See Buffer ID description below. If Buffer offset is not declared it should be set to zero.

### Allocation length:

Number of bytes read from the scanner.

## 3.4.2 Buffer description

### Buffer ID = 0 Vertical adjustment factor:

Bit Byte	7	6	5	4	3	2	1	0
0-3	Vertical adjustment factor							

The vertical adjustment factor sets the adjustment in steps of 0.001%. The factor must be between +1000 and -1000, if inquiry page 0xC4 returns 0 (zero) as the max. vertical adjustment factor value. Otherwise the factor can be set between +/- the max. vertical adjustment factor value.

The accuracy of the adjustment is app. 0.005%.

### Buffer ID = 1 Stitch Values

Bit Byte	7	6	5	4	3	2	1	0
0	Stitch value between camera A and B							
1	Stitch value between camera B and C							
2	Stitch value between camera C and D							
3	Stitch value between camera D and E							
4	Stitch value between camera E and F							
5-9	(Repeat for next stitch set, if any)							
...	...							
...	(Repeat for last stitch set)							

Stitch values can be set in the range defined by READ 0xFF, 0x01 (stitch limits).

Two sets of stitch values are supported.

The first set stitch values is used when scanning none-extended thickness, and the second scanning extended thickness; stitch set is usually changed by the scanner when changing the guide plate position, but may also be changed with a SEND 0x06 command.

The stitch values written will be stored as the values for the currently selected stitch set.

Each set contains stitch values belonging to the corresponding cameras. A 2 camera scanner needs values for A-B, a 3 camera scanner needs values for A-B and B-C, etc.



The values represent changes from the default mechanical adjustment of the cameras (measured in physical pixels). Values may be positive or negative.

The values are used in the scanner to calculate the last physical pixel to use on one camera, and the first to use on the adjacent camera. The total no. of pixels on a line is maintained, it is only the mutual 'viewing area' for the cameras that changes.

Example:

A stitch value of 10 between camera A and B means, that the no. of the last physical pixel used on camera A is reduced by 5 pixels compared to the default value, and the no. of the first physical pixel used on camera B is incremented by 5 pixels.

### Buffer ID = 2 Paper auto load

Bit Byte	7	6	5	4	3	2	1	0
0	Paper load time-out							
1	Paper load type							

This buffer ID can be used to enable the auto load feature. The *Paper load type* specifies how the auto load is performed:

Value	Description
0:	Auto load is disabled (default)
1:	Fixed auto load. The feed motor is forwarding the paper a fixed distance.
2:	Flex auto load. The feed motor is forwarded continuously until the lower paper detector switch is on then the paper is reversed to the correct start position.

The *Paper load time-out* specifies the time from when the load switch is seen until the motor is started. The unit is 1/10 sec. Acceptable values is 0 - 100.

### Buffer ID = 3 Horizontal adjustment factor

Bit Byte	7	6	5	4	3	2	1	0
0-3	Horizontal adjustment factor							

Used/provided by software driver.

The horizontal adjustment factor sets the adjustment in steps of 0.001%. The factor must be between +1000 and -1000. The accuracy of the adjustment is app. 0.005%.

### Buffer ID = 4 Color Space Matrices (FLASH)

Color Space Matrices are arranged as 9 consecutive values (coefficients) for each 3x3 matrix:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Row 1, Column 1 (RGB)							
2-3	- 1, - 2 (RGB)							
4-5	- 1, - 3 (RGB)							
6-7	Row 2, Column 1 (RGB)							
8-9	- 2, - 2 (RGB)							
10-11	- 2, - 3 (RGB)							
12-13	Row 3, Column 1 (RGB)							
14-15	- 3, - 2 (RGB)							
16-17	- 3, - 3 (RGB)							
18-35	(sRGB)							

Acceptable values for each coefficient is -512 - 511. A value of 256 represents the coefficient 1.0.

When reading values from FLASH are read. When writing values are written to RAM and used in scanner, but not written to FLASH (use SEND command code=0xFD, qualifier=0x05 to store all calibration values to FLASH).

### Buffer ID = 6 Calibration Reference Values

Used for calibration.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Red part of background reference field							
2-3	Green part of background reference field							
4-5	Blue part of background reference field							
6-7	Red part of reference white point							
8-9	Green part of reference white point							
10-11	Blue part of reference white point							
12-13	Red part of reference black point							
14-15	Green part of reference black point							
16-17	Blue part of reference black point							
18	Selected camera							

### ID = 7 Color Space Matrices (RAM)

Color Space Matrices are arranged as 9 consecutive values (coefficients) for each 3x3 matrix (Same as Buffer ID 4):

Bit Byte	7	6	5	4	3	2	1	0
0-1	Row 1, Column 1 (RGB)							
2-3	- 1, - 2 (RGB)							
4-5	- 1, - 3 (RGB)							
6-7	Row 2, Column 1 (RGB)							
8-9	- 2, - 2 (RGB)							
10-11	- 2, - 3 (RGB)							
12-13	Row 3, Column 1 (RGB)							
14-15	- 3, - 2 (RGB)							
16-17	- 3, - 3 (RGB)							
18-35	(sRGB)							

Acceptable values for each coefficient is -512 - 511. A value of 256 represents the coefficient 1.0.

Values are used in scanner, but are not written to FLASH.

If the values of a matrix is either {256,0,0,0,256,0,0,0,256} or {0,128,128,128,0,128,128,128,0} it indicates that the scanner has not yet been calibrated, and therefore scanning with that matrix will not give a valid result.

### Buffer ID = 8 / 0x48 Paper edge adjustment

Begin and end of scan may be adjusted relatively to the paper edges.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Top of paper							
2-3	Bottom of paper							
4-5	Left start of paper							
6-7	Right end of paper							

Acceptable values for each coefficient are -600 to 600, which represent -0.5 to 0.5 inch; negative values moves scan area upwards/to the left.

If buffer ID 8 is used, values are stored in FLASH; if buffer ID 0x48 is used, values are store in RAM only.

### Buffer ID = 9 Paper handling

Bit Byte	7	6	5	4	3	2	1	0
0	Ext. paper sensor	HW paper detect	Short load	Soft load	Not Used	Res.	Fast load	Ext. Thick.

This buffer ID can be used to enable the extended thickness and other paper handling methods.

The supported bits for actual scanner can be read in Inquiry page 0xC1

Ext. Thick.	Description
0:	Extended thickness paper handling method is disabled.
1:	Extended thickness paper handling method is enabled when scanning extended thickness (default).

Fast load	Description
0:	Fast load paper handling method is disabled (default).
1:	Fast load paper handling method is enabled. Original is loaded to a fixed position. The accuracy of this type of load is low.

Soft load	Description
0:	Soft load paper handling method is disabled (default).
1:	Soft load paper handling method is enabled.

Short load	Description
0:	Short load paper handling method is disabled (default).
1:	Short load paper handling method is enabled. Moves the parked original position to the lowest possible position. Used together with 'fast load' will create the shortest load distance possible.

HW paper detect	Description
0:	HW detection of paper is disabled (default).
1:	HW detection of paper is enabled. HW sensors are present.

Ext paper sensor	Description
0:	External paper sensor handling method is disabled (default, if normally not present on scanner).
1:	External paper sensor handling method is enabled. (default, if normally present on scanner) An external signal represents a sensor that detects paper in an external path. If signal is missing (according to model length), a Jam error is generated.

### Buffer ID = 0x0A Set data rate

*Not defined for 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

Sets the four data rate settings [bytes/sec].

Bit Byte	7	6	5	4	3	2	1	0
0-3	Data rate setting 1							
4-7	Data rate setting 2							
8-11	Data rate setting 3							
12-15	Data rate setting 4							

If any and which of the data rate settings is used at scan time, is selected with SET WINDOW.

This command is supported only, if max. SET WINDOW length is 79 or above.

**Buffer ID = 0x0B Set max. original move speed.**

Sets maximum speed original is moved with [inch/1200/sec].

Bit Byte	7	6	5	4	3	2	1	0
0-3	Max. move speed.							

**Buffer ID = 0x0C Set EMC test mode**

Sets EMC test mode.

Bit Byte	7	6	5	4	3	2	1	0
0-3	EMC test mode							

0 means disabled.

**Buffer ID = 0x0F Scan line calibration**

Sets offset for scan line calibration. Value must be in interval [-600; 600] (1/1200 inch)

Bit Byte	7	6	5	4	3	2	1	0
0-3	Scan line calibration							

0 is default.

**Buffer ID=0x10 Download micro code**

*Not defined for 9<sup>th</sup> generation scanners.*

The *buffer offset* is the address of the first byte to read/write and it must be within the range 0x80000 to 0xFBFFF.

The *transfer length* is the number of bytes to read/write in the range 1 to 0x8000.

WRITE BUFFER:

Mode must be set to 101b. On the first WRITE BUFFER command to write the micro code, the entire micro code is erased.

READ BUFFER:

Mode must be set to 101b.

**Buffer ID = 0x12 Read/Write RAM****Buffer ID = 0x13 Read Communication Buffer**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x14 Read Communication Buffer through Double Buffer**

*Not defined for 9<sup>th</sup> generation scanners.*

**Buffer ID = 0x15 Read/Write Double Buffer**

*Not defined for 9<sup>th</sup> generation scanners.*

**Buffer ID = 0x16 Read/Write Parameter Block**

*Not defined for 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x18 Read/Write CIS Light Levels**

Read/write the CIS light level values.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Camera 0:			Light level for R				
2-3				Light level for G				
4-5				Light level for B				
6-7				Light level for BW				
8-9	Camera 1:			Light level for R				
10-11				Light level for G				
12-13				Light level for B				
14-15				Light level for BW				
16-17	Camera 2:			Light level for R				
18-19				Light level for B				
20-21				Light level for G				
22-23				Light level for BW				
24-25	Camera 3:			Light level for R				
26-27				Light level for B				
28-29				Light level for G				
30-31				Light level for BW				
32-33	Camera 4:			Light level for R				
34-35				Light level for B				
36-37				Light level for G				
38-39				Light level for BW				
40-41	Camera 5:			Light level for R				
42-43				Light level for B				
44-45				Light level for G				
46-47				Light level for BW				
48-49	Camera 6:			Light level for R				
50-51				Light level for B				
52-53				Light level for G				
54-55				Light level for BW				
56-57	Camera 7:			Light level for R				
58-59				Light level for B				
60-61				Light level for G				
62-63				Light level for BW				

### Buffer ID = 0x19 Read/Write BW Panchromatic Light Levels

Read/write the BW panchromatic light level values.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Camera 0:			Light level for R				
2-3				Light level for G				
4-5				Light level for B				
6-7	Camera 1:			Light level for R				
8-9				Light level for G				
10-11				Light level for B				
12-13	Camera 2:			Light level for R				
14-15				Light level for B				
16-17				Light level for G				
18-19	Camera 3:			Light level for R				
20-21				Light level for B				
22-23				Light level for G				
24-25	Camera 4:			Light level for R				
26-27				Light level for B				
28-29				Light level for G				
30-31	Camera 5:			Light level for R				
32-33				Light level for B				
34-35				Light level for G				
36-37	Camera 6:			Light level for R				
38-39				Light level for B				
40-41				Light level for G				
42-43	Camera 7:			Light level for R				
44-45				Light level for B				
46-47				Light level for G				

### Buffer ID = 0x1B Write live CIS light levels (Exposure period)

Write live values to CIS light level. If an offset is present, the live function is turned on.  
Remember to turn this function off when the levels written are not to be used.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Camera 0:			Light level for R				
2-3				Light level for G				
4-5				Light level for B				
6-7	Camera 1:			Light level for R				
8-9				Light level for G				
10-11				Light level for B				
12-13	Camera 2:			Light level for R				
14-15				Light level for B				
16-17				Light level for G				
18-19	Camera 3:			Light level for R				
20-21				Light level for B				
22-23				Light level for G				
24-25	Camera 4:			Light level for R				
26-27				Light level for B				
28-29				Light level for G				
30-31	Camera 5:			Light level for R				
32-33				Light level for B				
34-35				Light level for G				
36-37	Camera 6:			Light level for R				
38-39				Light level for B				
40-41				Light level for G				
42-43	Camera 7:			Light level for R				
44-45				Light level for B				
46-47				Light level for G				

### Buffer ID = 0x1C Write CIS light levels (Current level)

Note: In the first implementation, the Live part is not working and only one light source is supported (Dual will come later).

Write live values to CIS light level. If an offset is present, the live function is turned on. Remember to turn this function off when the levels written are not to be used.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Camera 0: Light level for R							
2-3	Light level for G							
4-5	Light level for B							
6-7	Camera 1: Light level for R							
8-9	Light level for G							
10-11	Light level for B							
12-13	Camera 2: Light level for R							
14-15	Light level for B							
16-17	Light level for G							
18-19	Camera 3: Light level for R							
20-21	Light level for B							
22-23	Light level for G							
24-25	Camera 4: Light level for R							
26-27	Light level for B							
28-29	Light level for G							
30-31	Camera 5: Light level for R							
32-33	Light level for B							
34-35	Light level for G							
36-37	Camera 6: Light level for R							
38-39	Light level for B							
40-41	Light level for G							
42-43	Camera 7: Light level for R							
44-45	Light level for B							
46-47	Light level for G							

### Buffer ID = 0x22 Camera Delay

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

### Buffer ID = 0x38 Basic calibration

Bit Byte	7	6	5	4	3	2	1	0
0-1	Camera A, red, even, offset							
2-3	Camera A, red, even, gain							
4-5	Camera A, red, odd, offset							
6-7	Camera A, red, odd, gain							
8-9	Camera A, green, even, offset							
10-11	Camera A, green, even, gain							
12-13	Camera A, green, odd, offset							
14-15	Camera A, green, odd, gain							
16-17	Camera A, blue, even, offset							
18-19	Camera A, blue, even, gain							
20-21	Camera A, blue, odd, offset							
22-23	Camera A, blue, odd, gain							
24-47	Camera B ditto							
48-71	Camera C ditto							
72-95	Camera D ditto							

Acceptable values for offset values are -255..255.

Acceptable values for gain values are 0..31.

Values are used in scanner, but are not written to FLASH.

### Buffer ID = 0x3A Calibration profiles

### Buffer ID = 0x3C Gray tone match

### Buffer ID = 0x3D Gray tone match mode

### Buffer ID = 0x3E Stored profile method

*Not defined for 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

Bit Byte	7	6	5	4	3	2	1	0
0-3	Profile method stored during calibration							

### Buffer ID = 0x3F Erase Parameter and/or Profile Blocks

*Not defined for 9<sup>th</sup> generation scanners.*

### Buffer ID = 0x43 Reduction of normal speed

Bit Byte	7	6	5	4	3	2	1	0
0	Reduction factor							
1	Reserved for future use, must always be set to 0							
2	Store in flash							

Reduction factor: 0-100%

Store in flash: Store in RAM and flash=1 / Store only in RAM=0

Buffer read note: Only one byte returned: Reduction factor

### Buffer ID = 0x44 Reduction of reduced speed

Bit Byte	7	6	5	4	3	2	1	0
0	Reduction factor							
1	Reserved for future use, must always be set to 0							
2	Store in flash							

Reduction factor: 0-100%

Store in flash: Store in RAM and flash=1 / Store only in RAM=0

Buffer read note: Only one byte returned: Reduction factor

### Buffer ID = 0x45 Hardware test setup

Bit Byte	7	6	5	4	3	2	1	0
0	Hardware test on Cold boot (1=Do test / 0=Do not test)							

### Buffer ID = 0x46 High quality exposure select

Bit Byte	7	6	5	4	3	2	1	0
0	High quality hardware exposure							
1	High quality software/virtual exposure							

The number of exposures to choose between, can be read in inquiry page 0xC1

A value of '0' corresponds to the normal mode.



High quality hardware exposure:

Selection of physical exposure in hardware. When changing this parameter the scanner needs to adjust because of changed characteristics.

Valid values are:  $0 \leq \text{'High quality hardware exposure selection'} < \text{'number of exposures to choose between'}$

High quality software/virtual exposure:

Selection of number of physical exposures to be combined in software to one exposure.

Valid values are:  $0 \leq \text{'High quality software exposure selection'} < \text{'number of exposures to choose between'}$

**Buffer ID = 0x49 FBS scan line positions**

*Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners*

**Buffer ID = 0x80-0x8F Firmware download**

*Not defined for 6<sup>th</sup> and 9<sup>th</sup> generation scanners.*

Reserved.

**Buffer ID = 0x90 Product identification**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x92 Physical start and stop**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x93 Logical start and stop**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x94 Get CIS coarse delay**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x95 Boundary for random stitching**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x96 Lost pixels**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x97 White patch position**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x9C CCD/CIS characteristics**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x9D Pipelines and offsets**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0x9E CIS segment data**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0xA0 Size of Special Flash**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0xA1 Special Flash data**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0xA2 Set resolution mode**

*Not defined for 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> generation scanners.*

**Buffer ID = 0xEA Internal scanner resolution**

Some of the 9<sup>th</sup> generation scanners can internally operate with a higher resolution. The actual Color and Graytone bit width supported by the scanner are found in Inquiry page 0xC1.

Bit Byte	7	6	5	4	3	2	1	0
0-1	Mode							
2	Width support (8,16,24 or 48)							

Mode:        0    Color scan  
               1    Graytone scan.

### 3.5 RECEIVE DIAGNOSTIC

This command can be used to read data produced by a test mode set up by the SEND DIAGNOSTICS command.

#### 3.5.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x1C)							
1-2	Reserved							
3-4	Allocation length							
5	Reserved							

#### Operational code:

The operational code for this command is 0x1C.

#### Allocation length:

Specifies the number of bytes to be received from the scanner. This number is different for each individual test. See chapter 5 for a specification of each individual test.

#### 3.5.2 Returned data format

If no test is currently active RECEIVE DIAGNOSTICS will return the following data:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Test code (0)							
2-3	Parameter length (n-4)							
4-5	Error number of first error							
6-67	Error text of first error							
68-69	Error number of second error							
70-131	Error text of second error							
...	...							
(n-63)-(n-62)	Error number of last error							
(n-61)-n	Error text of last error							

### 3.6 RELEASE UNIT (0x17)

The RESERVE UNIT and RELEASE UNIT commands together provides the basic mechanism for contention resolution in a multiple initiator system. The RELEASE UNIT command releases the scanner from a reservation previously made by the same initiator.

If a valid reservation exists the scanner releases the reservation and returns a GOOD status.

#### 3.6.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x17)							
1-5	Reserved							

### 3.7 REQUEST SENSE (0x03)

Requests that the target transfers sense data to the initiator.

Sense data are available when:

- the previous command to the scanner was terminated with CHECK CONDITION or COMMAND TERMINATED
- the previous command was ended with an unexpected BUS FREE error

If the scanner has no data to return, the sense key is set to NO SENSE and the additional sense code to NO ADDITIONAL SENSE INFORMATION

The contents of the sense data are cleared on the receipt of any subsequent command (including REQUEST SENSE).

If the EOM bit is set the ASC/ASCQ is set to *Media Not Present* or *Read Past End of media* or *Read Past Beginning of Media*. In this case the sense key is set to NO SENSE.

This command always returns status GOOD no matter what the status of the scanner is.

#### 3.7.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x03)							
1-3	Reserved							
4	Allocation length (0x12)							
5	Reserved							

#### Operational code:

The operational code for this command is 0x03.

#### Allocation length:

Should always be 0x12.

#### 3.7.2 Returned data format

Bit Byte	7	6	5	4	3	2	1	0
0	Valid	Error code (0x70)						
1	Reserved							
2	Reser- ved	EOM	ILI	Reser- ved	Sense key			
3-6	Information							
7	Additional sense length (0x0F)							
8-11	Reserved							
12	Additional sense code							
13	Additional sense code qualifier							
14-17	Reserved							

#### Valid:

Is always 1 to indicate that the format is as specified in the SCSI-2 standard.

#### Error code:

Is always 0x70 = current error.

#### EOM:

This bit is set when the ASC/ASCQ is set to *Media Not Present* or *Read Past End of media* or *Read Past Beginning of Media*. In this case the sense key is set to *No Sense*.

#### ILI:

Incorrect length indicator. Is set to 1 when the number of bytes read by a READ command does not correspond to the request number of bytes.

#### Sense key:

Value	Name	Description
0:	NO SENSE	Indicates that there is no sense information available. This sense key is also used with all ASC's set to 0x3A and 0x3B. This might be a bit strange, but was necessary to make the scanners run on HP workstations.
2:	NOT READY	Indicates that the scanner cannot be accessed. May need user intervention.
4:	HARDWARE ERROR	An unrecoverable hardware error has occurred in the scanner. The nature of the error can be read in ASC and ASCQ.
5:	ILLEGAL REQUEST	Indicates that there was illegal parameters in the command descriptor block or in additional parameters supplied as data for some commands.
B:	ABORTED COMMAND	Indicates that the scanner aborted the command. The initiator may be able to recover by trying the command again.

**Information:**

If the ILI bit is set to 1, this field contains the difference between the number of bytes requested and the number of bytes send.

**Additional sense length:**

Indicates the number of bytes to follow. If the allocation length of the command is too small this number is not truncated.

**Additional sense code (ASC):**

Indicates further information related to the sense key field. If no information is available it is set to NO ADDITIONAL SENSE INFORMATION (0). For further information see list below.

**Additional sense code qualifier (ASCQ):**

Gives additional information related to the Additional Sense Code. If no information is available it is set to 0. For further information see list below.

## 3.7.3 List of Sense key/ASC/ASCQ combinations

Sense Key	ASC	ASC Q		Returned after	Comment
04	xx	xx	Any hardware error (fatal error)	All commands except INQUIRY and REQUEST_SENSE.	
00	00	00	No additional sense information	READ	In this case the ILI bit is set and the information bytes is set to the difference between the number of bytes requested and the number of bytes returned.
00	3A	00	Media not present	GET BUFFER STATUS, OBJECT POSITION and SCAN	EOM bit is set.
00	3A	80	Media not present, but can be loaded with an object position.	GET BUFFER STATUS, OBJECT POSITION and SCAN	EOM bit is set.
00	3A	81	Media is present, but command was aborted by user.	GET BUFFER STATUS, OBJECT POSITION, READ and SCAN	EOM bit is set.
00	3A	82	Media is present, but it is currently being loaded.	GET BUFFER STATUS, OBJECT POSITION and SCAN	EOM bit is set.
00	3A	83	Object position in progress	GET BUFFER STATUS, OBJECT POSITION and SCAN	
00	3A	84	Media positioning stopped due to paper jam.	GET BUFFER STATUS, OBJECT POSITION and SCAN	EOM bit is set.
00	3A	85	Media is present, but can not be scanned until it has been reloaded manually.	GET BUFFER STATUS, OBJECT POSITION and SCAN	EOM bit is set.
00	3A	86	Basic calibration in progress	GET BUFFER STATUS, OBJECT POSITION, READ, READ BUFFER, SCAN, SEND and WRITE BUFFER	
00	3A	88	Lid is open	GET BUFFER STATUS, OBJECT POSITION, SCAN	
00	3A	89	Scan stop/start occurred	READ	
00	3B	09	Read past end of medium	GET BUFFER STATUS, OBJECT POSITION, READ and SCAN	EOM bit is set.
00	3B	0A	Read past beginning of medium	GET BUFFER STATUS, OBJECT POSITION, READ and SCAN	EOM bit is set.
02	29	00	Power on or reset occurred	All commands except TEST UNIT READY, INQUIRY and REQUEST_SENSE.	
02	2C	00	COMMAND SEQUENCE error	READ, READ BUFFER, SCAN, SEND and WRITE BUFFER	In case that image data is requested but scanning has not been properly started.
02	A0	00	Scanner not in test mode	SEND DIAGNOSTIC	
02	A0	01	Scanner in test mode	All commands except INQUIRY, REQUEST_SENSE, RECEIVE DIAGNOSTIC and SEND DIAGNOSTIC	

Sense Key	ASC	ASC Q		Returned after	Comment
02	A0	03	Time-out on request	All commands except INQUIRY and REQUEST_SENSE.	In case request cannot be fulfilled with 30 seconds.
05	1A	00	Parameter list length error	SCAN, SEND DIAGNOSTIC and SET WINDOW	Is cleared after a REQUEST_SENSE
05	20	00	Invalid command operation code	All commands that are not implemented	Is cleared after a REQUEST_SENSE
05	24	00	Invalid value in CDB	All commands	
05	25	00	Logical unit not supported		
05	26	01	An unsupported field in the parameter list was set to a value.	SET WINDOW	
05	26	02	A field in the parameter list was set to an invalid value.	SCAN, SEND, SEND DIAGNOSTIC, SET WINDOW and WRITE BUFFER	
05	3D	00	Invalid bits in identify message		
0B	4A	00	Command phase error	All commands	When the scanner was selected, but the SCSI controller hardware detected that something went wrong
0B	4E	00	Overlapped commands attempted	All commands except INQUIRY and REQUEST_SENSE.	

### 3.7.4 List of specific Additional sense codes and qualifiers

The following codes are hardware (fatal) errors that can be returned on any SCSI command except INQUIRY and REQUEST SENSE.

ASC	ASCQ	Description
0C	00	Invalid firmware CRC
90	01	Unknown error
91	01	Unable to adjust camera A up
91	02	Unable to adjust camera B up
91	03	Unable to adjust camera C up
91	04	Unable to adjust camera D up
91	05	Unable to adjust camera E up
91	06	Unable to adjust camera F up
91	11	Unable to adjust camera A down
91	12	Unable to adjust camera B down
91	13	Unable to adjust camera C down
91	14	Unable to adjust camera D down
91	15	Unable to adjust camera E down
91	16	Unable to adjust camera F down
91	21	Unable to stitch cameras A and B
91	22	Unable to stitch cameras B and C
91	23	Unable to stitch cameras C and D
91	24	Unable to stitch cameras D and E
91	25	Unable to stitch cameras E and F
91	30	Error calibrating
91	31	Error calibrating camera A, red
91	32	Error calibrating camera A, green
91	33	Error calibrating camera A, blue
91	34	Error calibrating camera B, red
91	35	Error calibrating camera B, green
91	36	Error calibrating camera B, blue
91	37	Error calibrating camera C, red
91	38	Error calibrating camera C, green
91	39	Error calibrating camera C, blue
91	3A	Error calibrating camera D, red
91	3B	Error calibrating camera D, green
91	3C	Error calibrating camera D, blue
91	3D	Error calibrating camera E, red
91	3E	Error calibrating camera E, green
91	3F	Error calibrating camera E, blue
91	40	Error calibrating camera F, red
91	41	Error calibrating camera F, green
91	42	Error calibrating camera F, blue
91	50	Error programming multiplier FLASH
92	01	Controller error: Dither RAM R/W error
92	02	Controller error: Amp. RAM R/W error
93	01	Controller error: Unexpected external interrupt
93	02	Controller error: Unexpected serial port interrupt
93	03	Controller error: Unexpected software timer interrupt
93	04	Controller error: Unexpected HSO interrupt
93	05	Controller error: Unexpected HSI DATA interrupt
93	06	Controller error: Unexpected ad interrupt
93	07	Controller error: Unexpected timer overflow interrupt
93	08	Controller error: Unexpected shftfull interrupt
93	09	Controller error: Program terminated
93	09	MCB error: Program terminated
93	0A	Controller error: In main state machine
A0	00	Scanner not in test mode
A0	01	Scanner in test mode
A0	02	Read past end of tile
A0	03	Time-out on request
A0	10	Fatal error in OS
A0	11	Fatal error in SCSI-system

ASC	ASCQ	Description
A0	12	Fatal error in firmware
A0	13	No smart card found
A0	14	Invalid smart card for this scanner type
A0	15	Scanner in power down mode
A0	16	Scanner in programming mode
B0	00	Keyboard switch error
B0	01	SCB board error
B0	02	CCB/CCE board error
B0	03	Unable to write to EEPROM/FLASH
B0	04	Flash error: Vpp low
B0	05	Flash error: Unable to erase
B0	06	Flash error: Unable to program
B0	07	SCU/SU board error
B0	08	CCF/CB board error
B0	09	PPU board error
B0	0A	SFD board error
B0	0B	IM board error
B0	0C	FAN error
B0	0D	Lamp detached
B0	0E	LMx board error
B0	0F	MDA board error
B0	11	Lamp needs replacement
C0	00	Unable to use DSP
C0	01	DSP hardware error

### 3.8 RESERVE UNIT (0x16)

The RESERVE UNIT and RELEASE UNIT commands together provides the basic mechanism for contention resolution in a multiple initiator system. The RESERVE UNIT command reserves the scanner for the exclusive use by the reserving initiator, or if the third-party bit is set, to another specific SCSI device.

The scanner remains reserved until:

- it is superseded by another valid RESERVE UNIT command (from the same initiator that made the previous reservation)
- it is released by a RELEASE UNIT command (from the same initiator that made the reservation)

If the scanner is reserved for another initiator, the scanner returns RESERVATION CONFLICT status.

#### 3.8.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x16)							
1-5	Reserved							

### 3.9 SCAN (0x1B)

This command instructs the scanner to initiate a scan. This means that the scanner will empty the current contents of its buffers and start filling up the buffers while moving the paper in the forward direction.

#### 3.9.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x1B)							
1-3	Reserved							
4	Transfer length							
5	Reserved							

#### Transfer length:

Specifies the length in bytes of the data that will be send during the data out phase.



### 3.9.2 Parameter block

Bit Byte	7	6	5	4	3	2	1	0
0	Window identifier							

#### Window identifier:

Identifies the window to scan. Must always be 0 when starting a scan.

If set to 0xFD scan will be made in oscilloscope mode.

If set to 0xFF the light profile reference can be read with READ IMAGE command.

After a pause in scanning (e.g. due to data transfer buffer full) a scan command with window identifier 1, must be send to resume the scan.

## 3.10 SEND (0x2A)

The SEND command transfers data from the initiator to the target.

### 3.10.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x2A)							
1	Reserved							
2	Data type code							
3	Reserved							
4-5	Data type qualifier							
6-8	Transfer length							
9	Reserved							

#### Operational code:

The operational code for this command is 0x2A.

#### Data type code and qualifier:

The data type code and the data type qualifier are defined in the READ command.

#### Transfer length:

The number of data to be transferred from the scanner. Dependent on the kind of data to transfer. The length is defined in the READ command.

## 3.11 SET WINDOW (0x24)

Before starting the scanning process the scanning parameters must be set-up using the SET WINDOW command. The scanners only support 1 window to be defined during each scan.

This command can also be used during scanning to change some of the scanning parameters. Parameters that cannot be changed will not be affected.

The set window structure that is used has the same format for all scanners, as shown in the following. However some fields might not be supported on some scanners or be interpreted differently on different scanners. These differences are noted under each parameter.

### 3.11.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x24)							
1-5	Reserved							
6-8	Transfer length							
9	Reserved							

#### Operational code:

The operational code for this command is 0x24.

**Transfer length:**

Specifies the number of bytes to be send during the DATA OUT phase.

**3.11.2 SET WINDOW parameter list**

The window parameter list consists of one parameter list header and one window descriptor.

**3.11.3 Parameter list header**

Bit Byte	7	6	5	4	3	2	1	0
0-5	Reserved							
6-7	Parameter list length							

**Parameter list length:**

The parameter list length specifies in bytes the length of a window descriptor.

## 3.11.4 Window descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	Window identifier							
1	Reserved							
2-3	X-axis resolution							
4-5	Y-axis resolution							
6-9	X-axis upper left							
10-13	Y-axis upper left							
14-17	Window width							
18-21	Window length							
22	Reserved							
23	Threshold							
24	Reserved							
25	Image composition							
26	Bits pr. pixel							
27-28	Reserved							
29	RIF	Reserved						
30-31	Reserved							
32	Compression type							
33-39	Reserved							
40	Reserved							
41	Reserved							
42	Scan direction							
43	Reserved							
44-47	Line threshold							
48-51	Buffer threshold							
52	Color composition							
53-55	Reserved							
56	Reserved							
57	Reserved							
58	Reserved							
59	Reserved							
60	Scan speed							
61	Use feature RAM							
62	Blur filter							
63	No motor movement							
64	Threshold mode							
65	Level							
66	Sharpen/Soften							
67	Background level							
68	Color space							
69	Color saturation							
70	Data rate selector							
71-72	Software Control Parameters							
73	No of pre-scan lines							
74	Post scan original handling							

NOTE: All reserved fields must be set to 0.

**Window Identifier:**

The window identifier specifies the window defined by the window descriptor. In the current implementation the scanners only supports 1 window and this parameter should always be set to 0.

**X-axis Resolution:**

Specifies the resolution in the scan line direction. The resolutions supported by the scanner can be read with the INQUIRY command.

**Y-axis Resolution:**

Specifies the resolution in the moving direction. The resolutions supported by the scanner can be read with the INQUIRY command.

**X-axis Upper Left:**

This field specifies the x-axis coordinate of the upper left corner of the window. This coordinate is measured in 1/1200 inch. Must never be set higher than the *Max. scan width* parameter returned by the INQUIRY command.

### Y-axis Upper Left:

This field specifies the y-axis coordinate of the upper left corner of the window. This coordinate is measured in 1/1200 inch.

### Window Width:

This field specifies the width of the window in the scan direction. The window width is measured in 1/1200 inch. Must never be set higher than the *Max. scan width* parameter returned by the INQUIRY command.

### Window Length:

This field specifies the length of the window in the scan direction. The window length is measured in 1/1200 inch. If this parameter is set to 0 scanning is continued to end of paper.

### Threshold:

Specifies the threshold used to convert gray tone data to binary data. The threshold can be set to any value between 0 and 255. A higher value results in a darker image.

### Image Composition:

Specifies the scanning operation requested:

Value	Image Composition	Notes
0	Bi-level B/W	
2	Gray tone	
5	Multilevel RGB color	Further information about the image composition must be given in the Color Composition field.

### Bits Per Pixel:

The number of bits used to represent each pixel.

Bits pr. pixel	Image Composition
1	Bi-level B/W
8	Gray tone
16	Gray tone
4 or 8	Index color
24	RGB color
48	RGB color

### RIF:

This is the Reverse Image Format bit. A 0 indicates that white pixels are represented as zeros and black pixels as ones. A 1 indicates the opposite representation.

### Compression type:

Specifies the compression technique applied to the image data:

Value:	Compression type:	Use with:
0x00:	No compression	Gray tone or color
0x80:	Contex run-length format	Bi-level B/W

### Scan direction:

The scan direction can be set in order to e.g. implement pre-scan. REVERSE is not possible in color modes.

Value:	Direction:
0	Forward
1	Reverse

### Line threshold and Buffer threshold:

These two parameters in connection limits the amount of data scanned into the scanners internal buffers before the scanner will stop. The scanner will stop when at least one of these conditions is met.

*Line threshold* can be used to ensure concurrence between the scanner and a visual display of the scanned image in modes where the user is allowed to change scanning parameters during scanning. This parameter must not be set higher than 0x7FFF. A reasonable value is 1000.

*Buffer threshold* can be used to ensure that no overflow will occur in the scanners internal buffers. Note that unless the *Line threshold* condition is met before the *Buffer threshold* condition there will be **at least** the number of bytes in the buffer specified by this parameter.

Due to mechanical latency a number of extra lines is read into the buffers after the stop condition is met. The *Line delay* parameter in the INQUIRY command can be used to get the number of lines. If *Buffer threshold* is set *buffer size* parameter in the INQUIRY command the scanner selects the optimal value of *Buffer threshold* (less than *buffer size*).

If auto buffer threshold is supported (see INQUIRY page 0xC1), both line threshold and buffer threshold may be set to zero, letting the scanner optimize the use of the image data buffers.

### Color Composition:

Specifies the color mode, when the Image Composition field is set to "Multilevel RGB color".

Value	Color Composition
3	Indexed color
4	RGB color

### Scan speed:

Sets the scanning speed in % of the maximum speed, so max. speed is 100.

If 'Data transfer support' on inquiry page 0xC1 byte 93 is disabled, scan speed is controlled as following :

Scan speed range 0..100.

Sets the data rate in % of maximum data rate {1..100}; 0 sets scan speed to 100% of maximum data rate.

If 'Data transfer support' on inquiry page 0xC1 byte 93 is enabled, scan speed is controlled as following :

Bit:	7	6	5	4	3	2	1	0
Scan speed:	Function select	Speed value						

When 'Function select' is 0:

Sets the data rate to 'Speed value' in % of maximum data rate.

'Speed value' range {1..100}; 0 equals 100 (maximum data rate).

When 'Function select' is 1:

Sets the maximum data rate to 'Speed value' Mbytes/sec.

'Speed value' range {0..126}. 0 sets the maximum data rate to the default maximum data rate for the scanner.

### Use feature RAM:

Determines if the feature RAM should be used.

Value:	Mode:
0:	Don't use the feature RAM (the feature RAM will be loaded with a linear function).
1:	Use the feature RAM (The feature RAM must previously have been loaded using the SEND command).

### Blur filter

Selects a blur filter. The number defines the width (in optical pixels) of the blurring.

Can be set between 0 and 16.

### No motor movement:

Turn off motor movement during scan.

Value:	Direction:
0	Motor on (default)
1	Turn off motor

## Threshold mode

Selects the threshold when the Image Composition field is set to 0. When this parameter is 0 the Threshold field is used to set the threshold, otherwise the Level field is used to set the level.

Value:	Mode:
0	B/W Threshold
1	B/W Adaptive
2	B/W Adaptive Gray
3	B/W Adaptive Photo
4	B/W Copy Normal
5	B/W Copy Photo
6	B/W Copy Adaptive
7	B/W Adaptive with Background Suppression

Note: Not all scanner models support all modes, inquiry page 0xC1 gives valid modes.

## Level

Selects the threshold level when one of the B/W adaptive modes is used.

Range:

From -3 to 6.

## Sharpen/Soften

Selects the sharpening/softening.

Value:	Mode:
-1	Soften
0	None
1-8	Sharpen (In B/W modes 1 is maximum value)

Note: Not all scanner models support all values, inquiry page 0xC1 gives valid value range.

## Background Level

Selects the threshold background suppression level when B/W Adaptive with Background Suppression mode is used.

Range:

From -3 to 6.

## Color space

Selects the color space. This parameter is only valid in color modes.

Value:	Mode:
0	RGB (NTSC)
1	sRGB

## Color saturation

Sets the saturation parameter. Saturation is valid in color modes.

Range:

From 0 to 255 (100 is neutral).

## Data rate selector

Selects data rate setting to be used.

From 0 to 4. 0 means no data rate setting is used.

## Software Control Parameters

Used by the software scanner to disable/enable different features on the scanner. Up to 16 bit is supported.

Bit	Function
0	Bypass Amp RAM 1: bypassed 0: not bypassed
1	Bypass CSC 1: bypassed 0: not bypassed
2	Bypass Linearity RAM 1: bypassed 0: not bypassed
3	RGB delay 1: bypassed 0: not bypassed
4	Coarse delay 1: bypassed 0: not bypassed. For more info see inquiry page 0xC4
5	Force LED row 1 OFF (The default light source if only one source)

6	Force LED row 2 OFF
7	Large buffers only
8	
9	
10	
11	
12	
13	
14	
15	Internal scan (Reserved for firmware)

### No of pre-scan lines

Selects the number of scan lines to include in the scan before the actual first scan line.

### Post scan original handling

Byte value	Function
0	Do nothing
1	Eject to rollers (original will be hanging in the rollers)
2	Eject (Original will be ejected in the back of the scanner)
3	Reload (Original will be moved to load position)
4	Unload (Original will be ejected in the front of the scanner)

## 3.12 SEND DIAGNOSTICS (0x1D)

This command enters the scanner into a diagnostics mode, makes it run it's self test procedure or switches the scanner into a mode where new firmware can be downloaded. The test and diagnostics programs is described in a separate document.

### 3.12.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x1D)							
1	Reserved					Self Test	Reserved	
2	Reserved							
3-4	Parameter length							
5	Reserved							

### Operational code:

The operational code for this command is 0x1D.

### Self Test:

This is the self test bit. When set the scanner will perform it's self test procedure. If the result is OK it will return a GOOD status. If it is not it will return with a CHECK CONDITION status and the sense key will be set to HARDWARE ERROR.

### Parameter length:

Specifies the number of bytes to be send in the DATAOUT phase.

### 3.12.2 Switching to programming mode (safe mode)

The scanner is switched to programming mode (safe mode) with a SEND DIAGNOSTICS command with the following parameter format:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Functional code (0x02)							
2	Parameter length (0)							
3	Reserved							

This command jumps the scanners code to it's programming address, so the scanner enters programming mode.

### 3.12.3 End programming mode

This function is used to get the scanner out of the programming mode.

#### Parameter format:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Functional code (0x00)							
2	Parameter length (1)							
3	Reserved							
4	Operation							

#### Parameter description:

Value	Operation:
0:	Reserved
	When this function is called the scanner resets and boots up in normal scanning mode.

### 3.12.4 Switching to normal mode using cold boot (i.e. doing hardware tests)

The scanner is switched to normal mode (using cold boot) with a SEND DIAGNOSTICS command with the following parameter format:

Bit Byte	7	6	5	4	3	2	1	0
0-1	Functional code (0x03)							
2	Parameter length (0)							
3	Reserved							

## 3.13 TEST UNIT READY (0x00)

This command provides means for testing if the scanner is ready. It is not a request for self test.

This command returns a CHECK CONDITION after power on/reset. It returns a CHECK CONDITION with the EOM bit set and ASC/ASCQ set to Media Not Present if there are no paper in the scanner.

The scanner is now defined to be ready whenever no hardware or fatal software malfunction is detected; i.e. this command cannot be used for checking media status.

#### 3.13.1 Command format

Bit Byte	7	6	5	4	3	2	1	0
0	Operational Code (0x00)							
1-5	Reserved							

#### Operational code:

The operational code for this command is 0x00.

## 3.14 WRITE BUFFER (0x3B)

The WRITE BUFFER and READ BUFFER commands together provides means for the initiator to access information in the scanners non volatile memory.

WRITE BUFFER must only be used when the scanner is not scanning, i. e. before a SCAN command or after an OBJECT POSITION to eject the media.



### 3.14.1 Command format

Bit Byte	7	6	5	4	3	2	1	0			
0	Operational Code (0x3B)										
1	Reserved					Mode					
2	Buffer ID										
3-5	Buffer offset										
6-8	Transfer length										
9	Reserved										

#### Operational Code:

The operational code for this command is 0x3B.

#### Mode:

The following modes is supported is 001b.

Mode	Description
001b	Vendor specific.
101b	Download micro-code and save

#### Buffer ID:

The Buffer ID for WRITE BUFFER is the same as for a READ BUFFER. For buffer ID see READ BUFFER Buffer ID description.

#### Buffer offset:

See READ BUFFER Buffer ID description.

#### Transfer length:

Number of bytes send to the scanner.

## 4. Appendix

### 4.1 Description of ghost system

#### 4.1.1 Description

The ghost sensor system is to be used for remote control of the sensor and key switches. The ghost sensor system works in parallel with the normal key system, so both apply at the same time.

The ghost sensor system works instead of the normal sensor system, so the normal sensor system is switched off when using the ghost sensor system (you have to enable the use of ghost sensors).

When using the ghost system you don't have to worry about which sensors or keys that are already activated. You only affect the bits that you set in the command. So if you don't want a bit to change, then don't set the bit in the command and it will not be affected. (Remember to initialize the ghost sensors to the value that you prefer, before switching the system on)

Sensor and key status are reported by the read command (0x28) qualifier 0x00 'Scanner status'.

The keys reported here are:

- The real keys and the ghost keys that is activated in the system (both at the same time) if 'Use only ghost keys' is NOT activated (e.g. FALSE).
- The ghost keys if 'Use only ghost keys' is activated (e.g. TRUE). (In this situation use the function below to get the real keys)

The sensors reported here are:

- The real sensors if the ghost sensors are NOT in use
- The ghost sensors if the ghost sensors are in use. (In this situation use the function below to get the real sensors)

An option on newer scanners, is to use sensor less scanning. If you enable this feature, then the ghost system is activated and controlled by the scanner. You will not be able to set or clear any ghost sensors.

The sensor less scanning feature, enables you to scan any shape and for as long as you like. The scanner will always report that it has an original loaded, regardless of the real sensor status.

#### 4.1.2 Commands

Send(0x2A) code = 0x85

- Qualifier = 0      Set ghost key
- Qualifier = 1      Clear ghost key
- Qualifier = 2      Set ghost sensor
- Qualifier = 3      Clear ghost sensor
- Qualifier = 4      Set 'use ghost sensors'
- Qualifier = 5      Set 'use only ghost keys'
- Qualifier = 6      Set 'use sensor less scanning'

Read (0x28) code = 0x85

- Qualifier = 0      Get real (not ghost) keys.
- Qualifier = 2      Get real (not ghost) sensor and LEDs.
- Qualifier = 4      Get 'use ghost sensors'
- Qualifier = 5      Get 'use only ghost keys'
- Qualifier = 6      Get 'use sensor less scanning'

### 4.1.3 Bit definitions

**Sensor bit definitions** ( (msb) BYTE3 – BYTE2 – BYTE1 – BYTE0 (lsb)):

- OUTPUT bit 0
- INPUT bit 1
- THICKNESS bit 2 (see note 1)
- EXTERN bit 3
- READY bit 4 (not all scanners has a ready sensor – see note 2)
- CLOSED bit 5 (not all scanners has a closed sensor – see note 3)

**Note 1:** On Hawkeye scanners (both CX and MX models), the Extended Thickness sensor is connected to bit 3 and has reverse polarity. This means that developers should

1. Set/reset the Extended Thickness sensor by using bit 3.
2. Synchronize the Ghost sensor with its mechanical counterpart's value **before** the Ghost Control system is enabled (i.e. set bit 3 if the real Extended Thickness sensor is OFF when the Ghost Control system is enabled).

**Note 2:** Starting with the SD scanner series, a ready sensor is introduced. This sensor is used to end the original load sequence. This sensor enables us to perform the 'fast load' sequence from previous scanners with more precision. If this sensor is present in the scanner, it will be placed between the input rollers and the scan line.

**Note 3:** Starting with the SD scanner series, a closed sensor is introduced. This sensor is used to detect if the scanner lid is open or not, and this sensor has to be activated (lid closed) for the scanner to function correctly. Activating this sensor on scanners that doesn't have the sensor (HD scanners) will not effect the function of the scanner.

**Key bit definitions** ( (msb) BYTE3 – BYTE2 – BYTE1 – BYTE0 (lsb)):

(keys are IDLE when all bits are 0)

- STOP bit 0
- REVERSE bit 1
- FORWARD bit 2
- APP1 bit 3
- APP2 bit 4
- APP3 bit 5
- POWER bit 6
- MEDIA bit 7

**LED bit definitions** ( (msb) BYTE3 – BYTE2 – BYTE1 – BYTE0 (lsb)):

- ERROR bit 0
- WAIT bit 1
- READY bit 2
- DIANOSTICS bit 3
- PAPER\_GREEN bit 4 // If both red and green is lit, the color is yellow

- PAPER\_RED bit 5
- POWER\_GREEN bit 6 // If both red and green is lit, the color is yellow
- POWER\_RED bit 7