Eastman Kodak Company

DC280 Digital Camera
Host Interface Specification

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Revision History

Rev. #	Date	Name	Summary
0.10	8/4/99	H.Yamagata	Modified from the internal spec for DC280.
1.00	8/11/1999	H.Yamagata	Revised some minor editorial errors.

1. INTRODUCTION

DC280 is a 2x zoom TTL AF digital camera with 2M pixel CCD. This document describes the detailed host interface commands of the DC280 digital cameras. This document reflects the design required to meet the functionality requirements as specified in the Engineering Requirement Specification[1] and the User Interaction Specification[2]. This document addresses the software and firmware design of the DC280 digital camera Host I/F.

1.1 Purpose

This document specifies the communications interface between the host computer and DC280 digital camera. This includes all camera commands, data, and control flow between the host and the camera.

1.2 Scope

This document completely specifies the behavior of the product feature sets and the concepts. Future changes to the design and/or additional functionality to this product will be documented in future specifications.

1.3 Intended Audience

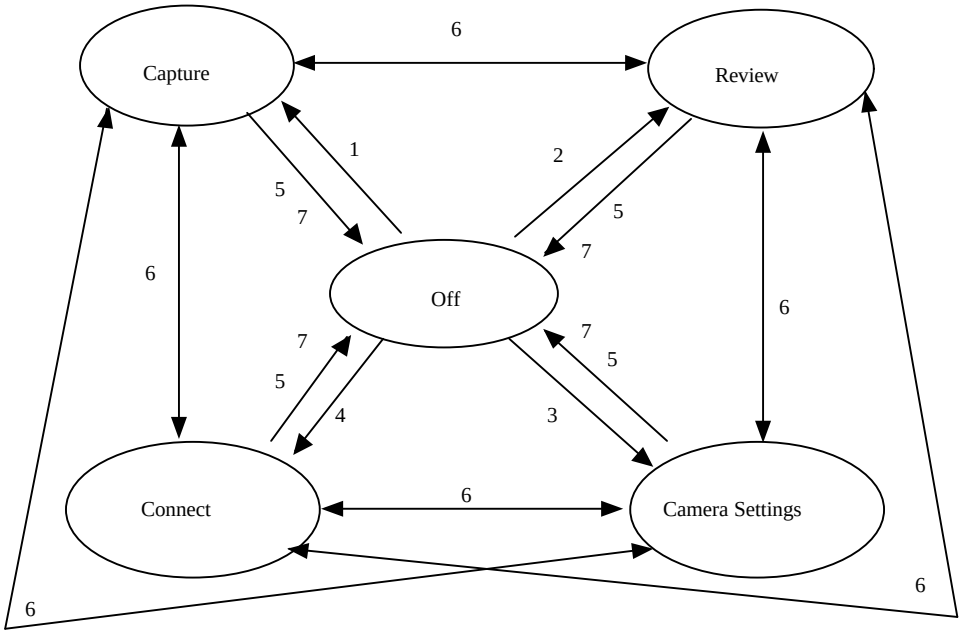
This document is intended for any individuals who are involved in the development of software and firmware of DC280 product. This document is also intended to assist future software/firmware developers involved in the support of this product.

2. Camera Behavior In Terms Of Host Interface

2.1 Camera State

The camera is always in one of the following modes.

- Off State
- Capture State
- Review State
- Camera Settings State
- Connect State



The transition among these modes is as follows. Host communication is available only in Connect State.

1 : Power on by button and Capture
2 : Power on by button and Review
3 : Power on by button and Connect
4 : Power on by button and Camera Settings
5 : Power off by button
6 : Mode dial change
7 : Time out (8 min for Normal, 4 min for Power Save, 10 min for AC)

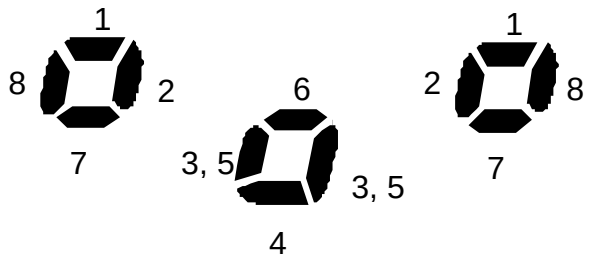
NOTE : See UI spec[2] for the time out for other modes than connect

2.2 Connect State

When the user turns the mode dial to Connect, the camera goes into this state. In this state, button operation except the mode dial and the power switch are ignored, color LCD is off, Status LCD is off except the animation below**.** To capture an image, the user has to use the host software. Lens cover is closed, and is opened only when the camera receives a command to capture form Host.

If the camera detects active serial cable inserted, the camera starts communicating through serial, and if the camera detects USB cable insertion, the camera starts communicating through USB. Once the camera establishes either serial or USB, the other I/F cable insertion will be ignored. If the camera detects none of them for more than 8 minutes for Normal, 4 minutes for Power Save, and 1 minute in case of AC adapter power supply, the camera automatically goes into Off State.

Once the mode dial is turned to “Connect”, the numeric display on the status LCD will display an animation on the status LCD instead of icons. The order of the animation is indicated in the figure below. When communication is lost, the animation stops.



If there is no card in the camera, Status LCD will display “---“ as shown below.

When the user moves the mode dial to other modes, the camera leaves Connect State. If the camera is under processing commands when the mode dial is moved, the camera completes the command processing and then moves to other modes.

When the user wants to change the communication means after communication is once established, the user has to either 1) go to other modes and come back connect, 2) disconnect a cable and reconnect, or 3) power off -> on the camera.

2.3 Modes in Connect State

DC280 camera has three internal modes in its Connect Mode, on-line mode, firmware download mode, adjust mode.

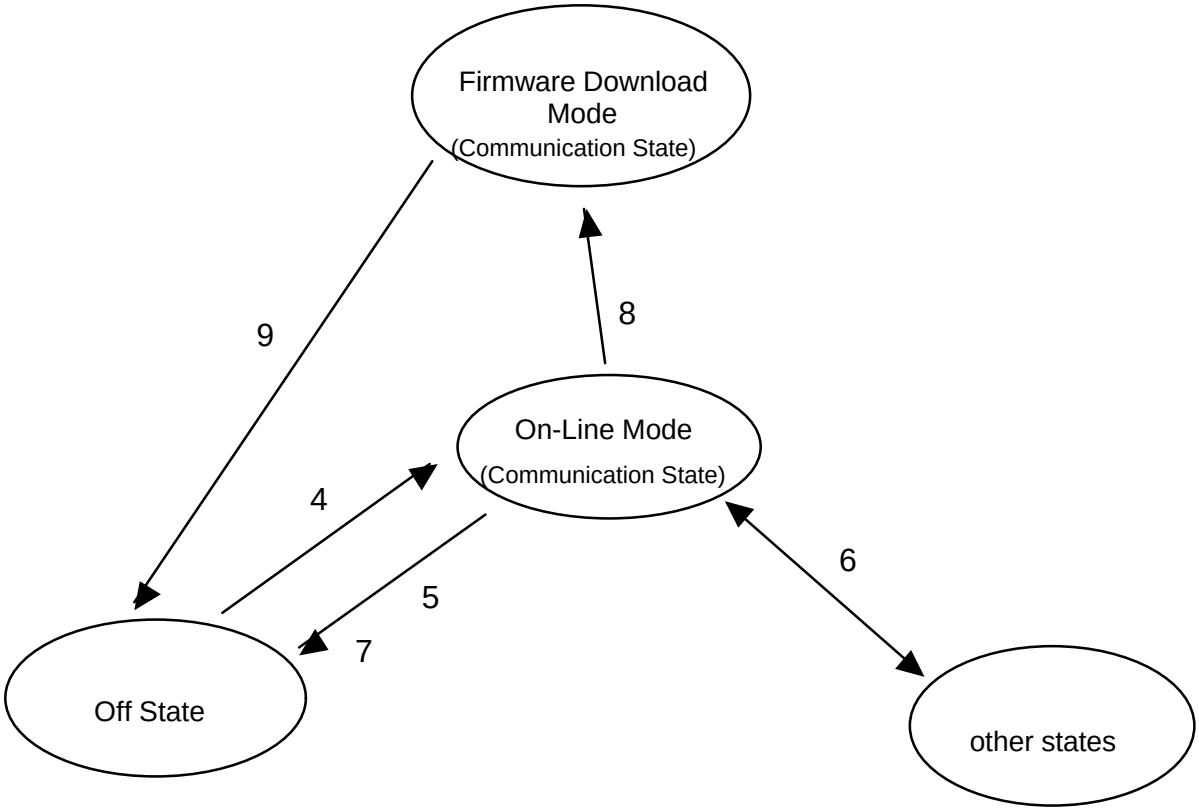
When the mode dial is turned on to Connect, the camera goes automatically to on-line mode. In this mode, the host computer can send on-line commands to control the camera.

Adjust mode is reserved for factory and service use, and is not documented here.

Firmware download mode is for downloading the new firmware into the camera and maintenance internal data in camera. This mode is available for serial or USB (In only case that camera is put into firmware download mode by “Switch to ROM mode” command). Once the camera goes to firmware download mode, the camera will ignore mode dial. Eleven commands are available for this purpose. There are two ways to switch the camera to firmware download mode, a command or manual operation. For how to switch the camera to firmware download mode manually, refer to the user interaction specification[2].

The camera goes to Off Mode when the user presses the power button (State Transition #5), or no communication gets time out (State Transition #7). From Off State, the camera wakes up when the camera detects power button press. It takes about 10 seconds maximum for the camera to be command ready. The camera returns BSY system code if camera wakes up but not ready to process commands. By going into Off State, Opened Card status is canceled. Refer to 6.2 for the setting.

Following is the transition diagram of Connect State and its relating states.



4 : Power on by button and Communication
5 : Power off by button
6 : Mode dial change
7 : Time out (8 min for Normal, 4 min for Power Save, 10 min for AC)
8 : ROM mode command
9 : ROM mode completed

NOTE : This chart is Connect State centric and does not fully describe about the relationship among all states.

2.4 Hardware

The camera supports two communication protocols, serial and USB.

2.4.1 Serial

DC280 uses RS-232C as the basis for serial communication with the host.

DC280 cameras support the baud rate of 9600, 19200, 38400, 57600, and 115200 bits per second. The power-up default is 9600 bits per second. All data is transferred in 8 bit, no parity, 1 stop bit format.

The PC has to hold DTR signal to high for at least 470 msecs before starting any communication.

Break signal, holding the RxD line of serial port low for more than 200 msec, causes the camera to reset the serial port. This should be equivalent to disconnecting and reconnecting cable. The baud rate goes back to 9,600 bps by this signal and HPBS (see 2.6 Data and Set Host Packet Buffer Size (2Ah) command), but the camera maintains all other settings.

2.4.2 USB

DC280 camera uses USB lines as other communication means. Since Image Device Class of USB is not fully defined yet and is premature to be implemented onto a camera, DC280 uses basically the same protocol as serial is using.

Following is the list of DC280 specific data/string for USB.

idVendor	0x040A
idProduct	0x0130
iManufacturer	"Eastman Kodak Company"
iProduct	"KODAK DC280 Zoom Digital Camera"

iSerialNumber is not used in this camera.

2.5 Command Format

2.5.1 System Code

System codes are one byte value for hand shaking between the camera and the host. The host should be able to know if the camera correctly receives a command or a packet from these codes. Section 2.7 Communication Flow Control describes how these codes are used for the camera and the host to communicate and synchronize each other. There are eight system codes as follows.

Code	Description
00h	Command Completed
d1h	Command Received Correctly (ACK)
d2h	Correct Packet
e1h	Command Received Incorrectly (NAK)
e2h	Command Execution Error
e3h	Illegal Packet
e4h	Cancel
f0h	Busy

- Command Complete (00h)

  The camera sends this code when the camera has completely the command without errors. The host can send the next commands 50 ms after receiving this code. This code is from the camera to the host direction only.

- Command receive correctly (ACK, d1h)

  When the camera sends this code when it receives a correct format of DC280 host interface command from the host. This code is from the camera to the host direction only.

- Correct packet (d2h)

  This code is sent if the checksum of the packet is correct This code is for both from the camera to the host and from the host to the camera direction.

- Command received incorrectly (NAK, e1h)

  The camera sends this code when it receives a invalid format of DC280 command from the host. This code is from the camera to the host direction only.

- Command execution error (e2h)

The camera sends this code to the host when the camera can not complete the received command. This code is from the camera to the host direction only. Camera may send this code when contents in command and parameter packet are wrong.

- Illegal packet (e3h)

  This code is sent in below condition. This code is for both from the camera to the host and from the host to the camera direction.
  The checksum error is detected on the packet.
  The head of data packet is not the value specified as control byte.

- Cancel (e4h)

  This code is to cancel the command execution. This code is from the host to the camera direction only.

- Busy (f0h)

  This code is for the camera to tell host it is in communication mode but not ready to execute commands yet. This code is from the camera to the host direction only. Also, camera might issue this system code during on-line mode only.

2.5.2 Interface Command

Host interface commands consist of 8 byte data. The first byte contains a command code. The second and sixth byte are always "00", and the last byte is always "1A". The other bytes contain parameter(s) for the commands or zero.

Offset	Host command
0	Command
1	00
2	Parameter or 00
3	Parameter or 00
4	Parameter or 00
5	Parameter or 00
6	00
7	1A

Some commands are followed by a packet that contains parameter(s) associated with the commands.

2.6 Data

Data (not system codes) are sent as a packet.

Every packet contains a checksum byte at the bottom of each packet. The checksum is calculated by serially XOR-ing together all the data bytes in the packet. When the data ends before the end of a packet, the remainder of the packet may be any value.

In addition, a packet sent from the host (except firmware download mode) contains a packet control byte at the top (the first byte)[7]. Also, a packet sent from the camera to the host contains a packet control byte on top of the packet.

There are several sizes of packet as shown below.

Packets sent from the camera (camera --> host)

- 11266 bytes Image data on card
- 258 bytes Picture information, etc.
- 18 bytes Error status, card status, etc.

Packets sent from the host (host --> camera)

- 257 bytes Data in Firmware Download mode
- 60 bytes Command parameters

The following table shows required packet size for each on-line command. Commands which are not listed below do not need any packets.

Code	Command	Packet size --> camera	Packet size --> host
13	Send data in flash memory	-	257(Serial) 4097(USB)
1D	Write data in flash memory	257(Serial) 4097(USB)	-
22	Send data in EEPROM	-	257
31	Write 256 byte data	257	-
32	Read 256 byte data	-	257
75	Set time	60	
7F	Send camera status table	-	258
8E	Execute diagnostic	--	18
91	Read picture information	60	258
93	Read thumbnail image	60	HPBS (*1)
95	Initialize memory card	60	18
98	Get card status	-	18
99	Read directory information	60	258

9A	Read file	60	HPBS (*1)
9C	Write file	60/HPBS (*1)	-
9D	Delete file	60	-
9E	Write camera ID	60	-

*1 : Set HPBS (Host Packet Buffer Size) with Set Host Packet Buffer Size Command (2Ah). The power-on default is 514, and the maximum size available is 32770. This is applicable to both serial and USB.

Packet from the host to the camera

byte 0 = Packet control byte except 1Dh & 31h commands
Data
Checksum

Packet from the camera to the host

packet control byte except 13h, 22h, & 32h commands
Data
Checksum

Packet <u>from the host to the camera</u>

Packet control byte 0x00 : Normal packet (followed by next packet)
0x80 : Final packet
0xFF : Cancel

Note If the camera detects 0xFF, the camera does not have to see remaining data of the packet.

Packet <u>from the camera to the host</u>

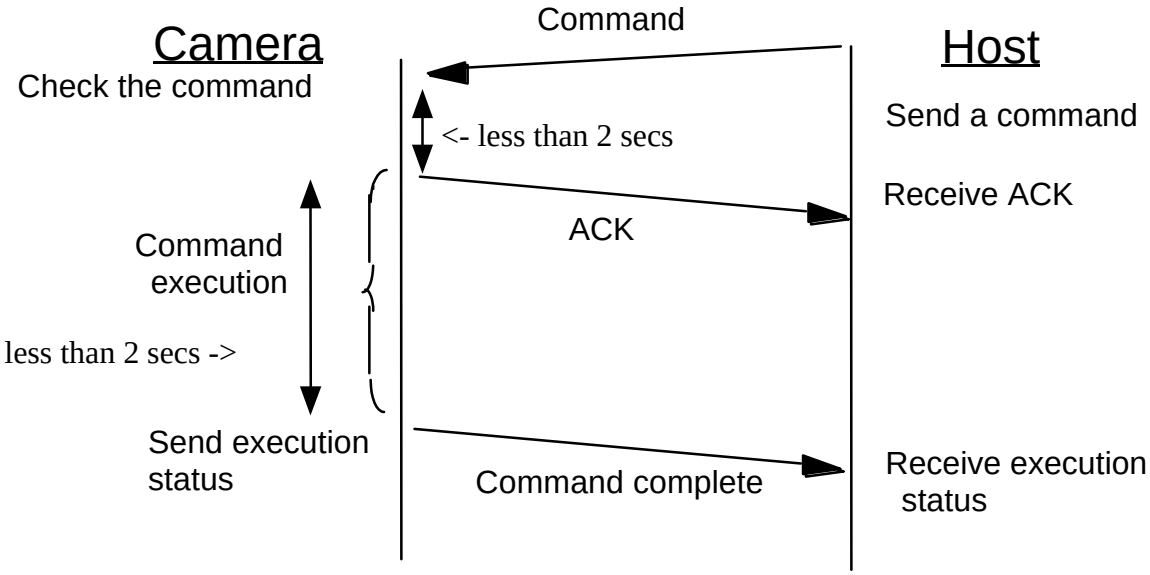
Packet control byte 0x01 : Normal packet (followed by next packet)
All other : illegal

2.7 Communication Flow Control

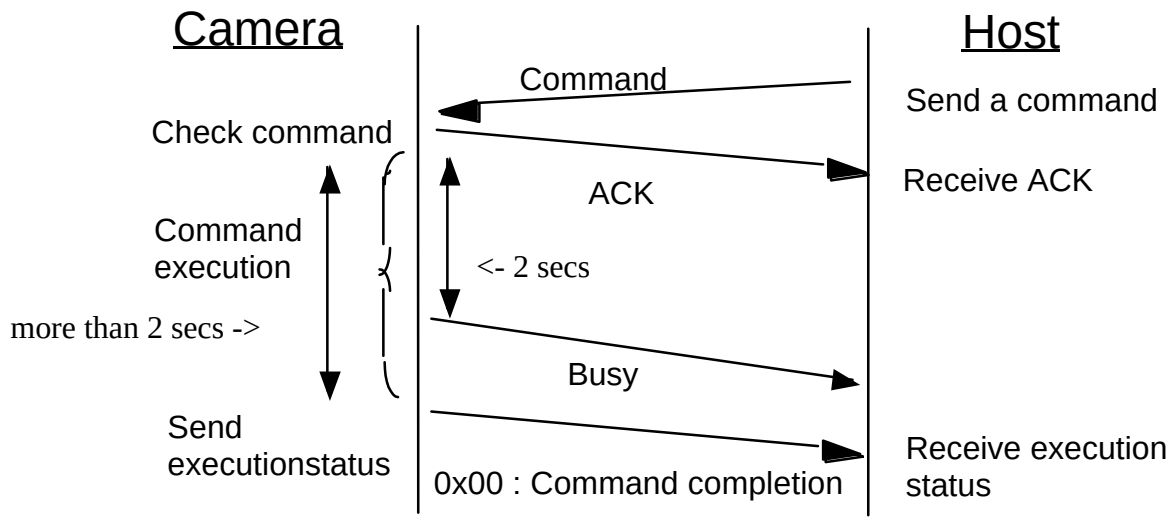
It is always the host which issues commands. The camera responds to the host against the received command with system code within 2 secs. If the camera can not reply in normal sequence within 2 secs, it returns Busy (f0h) system code[7].

The camera does not discontinue communication in the middle of processing commands unless the camera does not receive any expected respond from the host more than 200 secs.

2.7.1 Command without Send/Receive Packet (normal case)



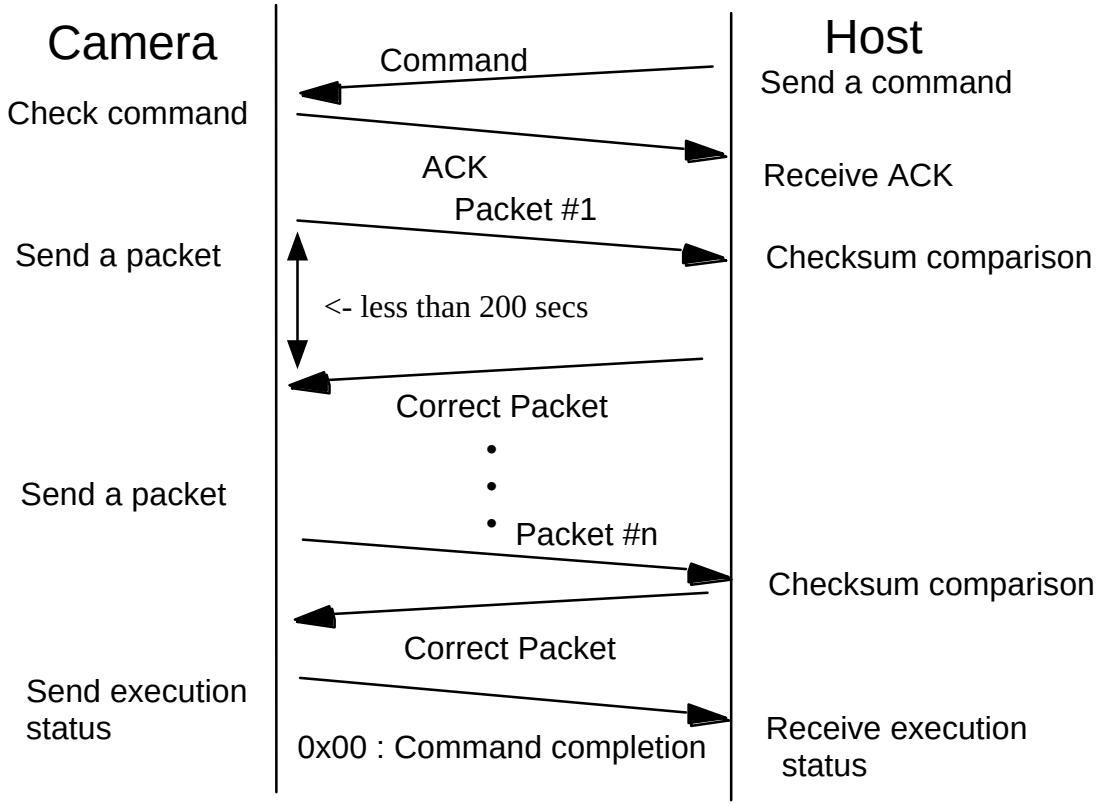
2.7.2 Command without Send/Receive Packet (busy case)



2.7.3 Command for Receive Packet (from Camera)

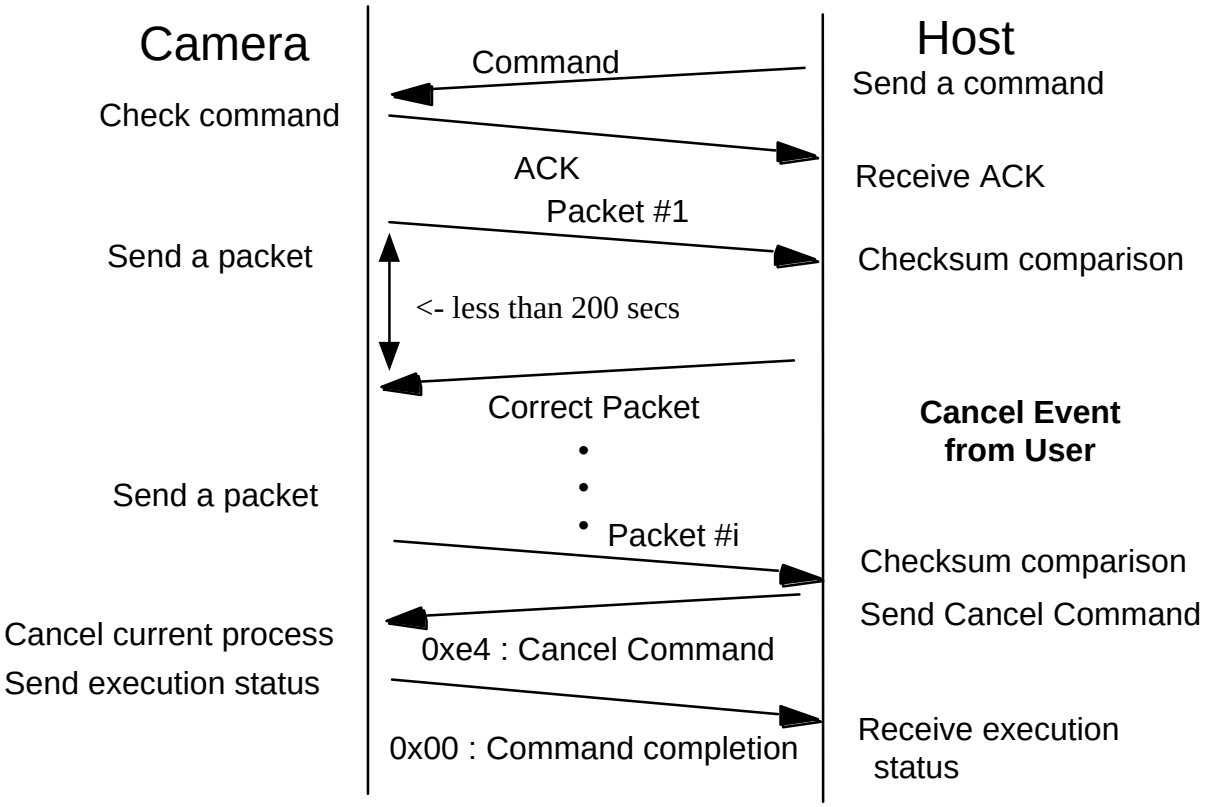
Some commands instruct the camera to send internal data in the camera or on Compact Flash card to the host. Packets will be sent from the camera after the camera recognized these commands. The camera will send a packet after it recognized the sent command immediately. The host should always know the number of packets from the camera before sending the command. The host always takes the initiative in receiving and sending packets.

2.7.3.1 Normal Case

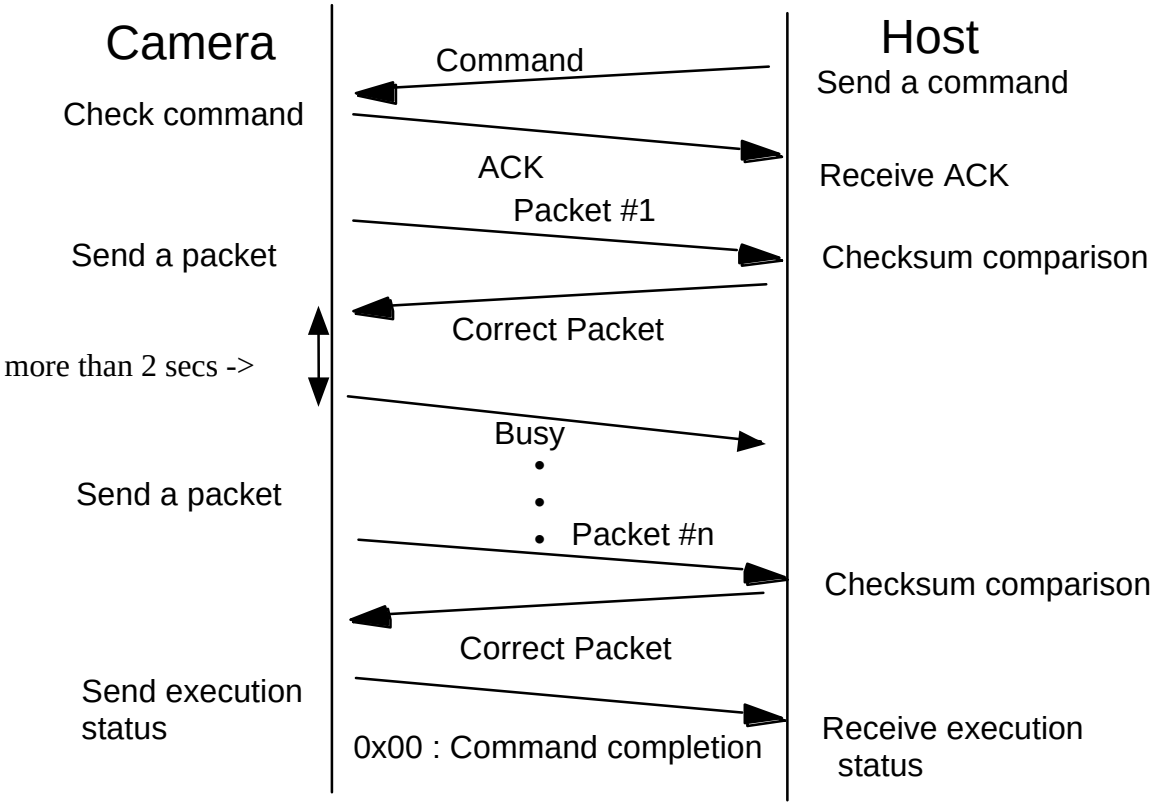


2.7.3.2 Cancel Case

Host can cancel the current process by sending the Cancel code (0xe4). After Host sent cancel code, Host can send next command after receiving command completion code (0x0) from camera.



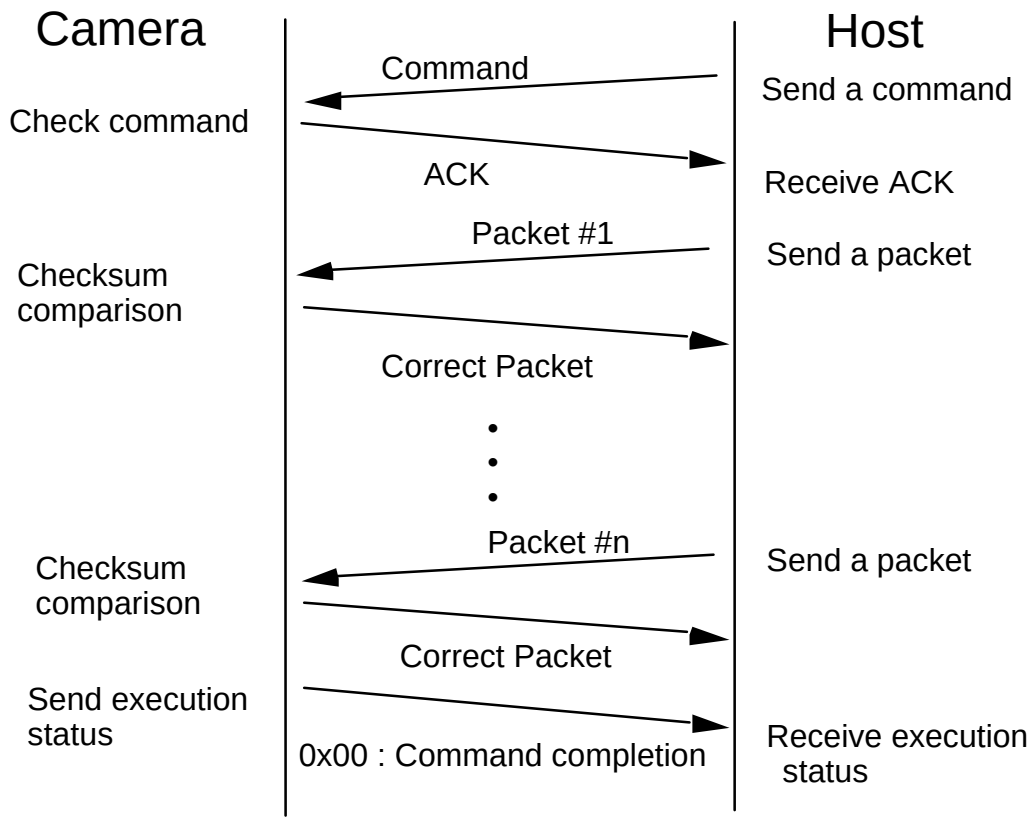
2.7.3.3 “busy” case



2.7.4 Command for Send Packet (to Camera)

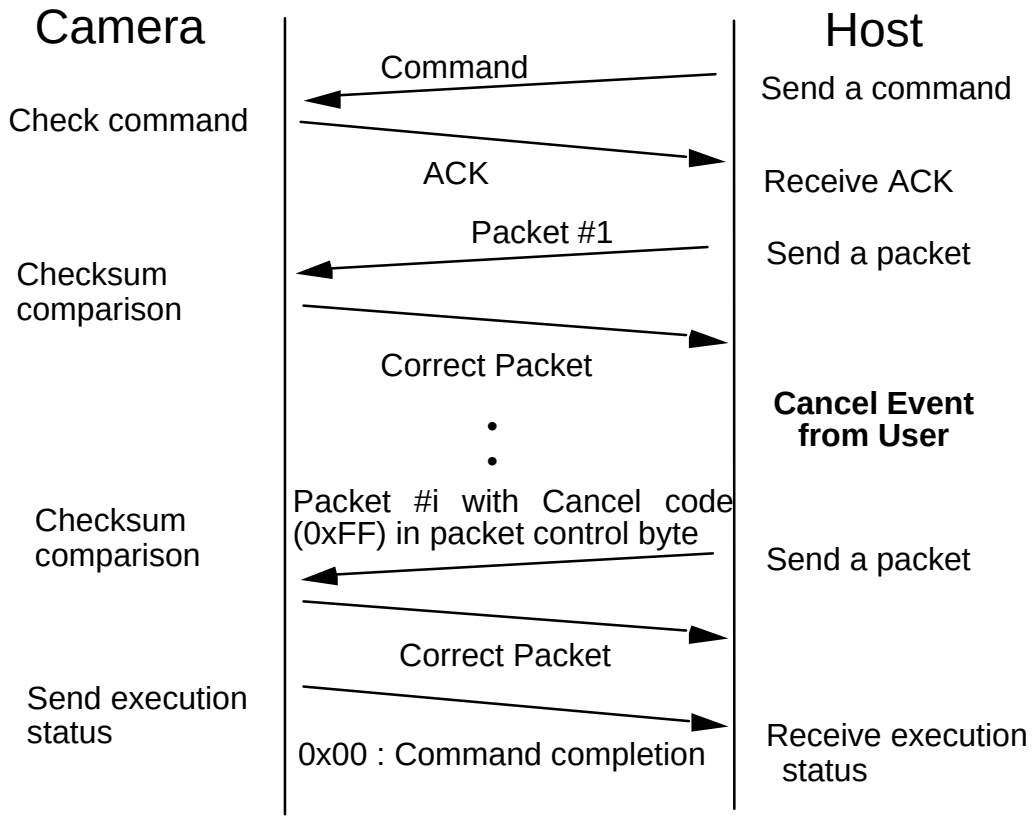
Some commands need to send packets that contain additional parameters for the command or data after sending the command. The camera should always check the top byte of the received packet to know the final packet or cancel is sent. The top byte contains packet control information (see section 2.6).

2.7.4.1 Normal Case



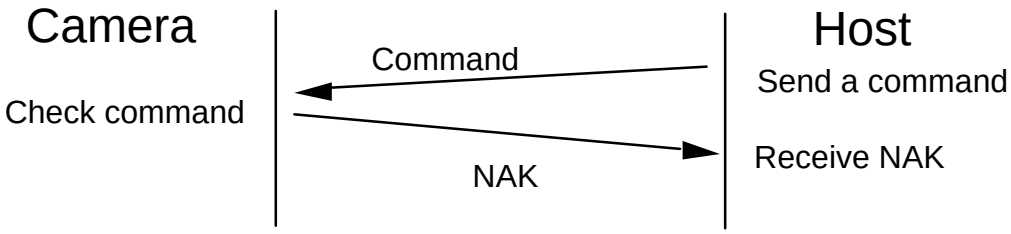
2.7.4.2 Cancel Case

Host can cancel the current process by sending the packet with cancel code (0xff) in packet control byte. Host can send next command after receiving command completion code (0x0) from camera. If camera detects checksum error after receiving the packet with cancel code, then it will respond illegal packet code (0xe3).



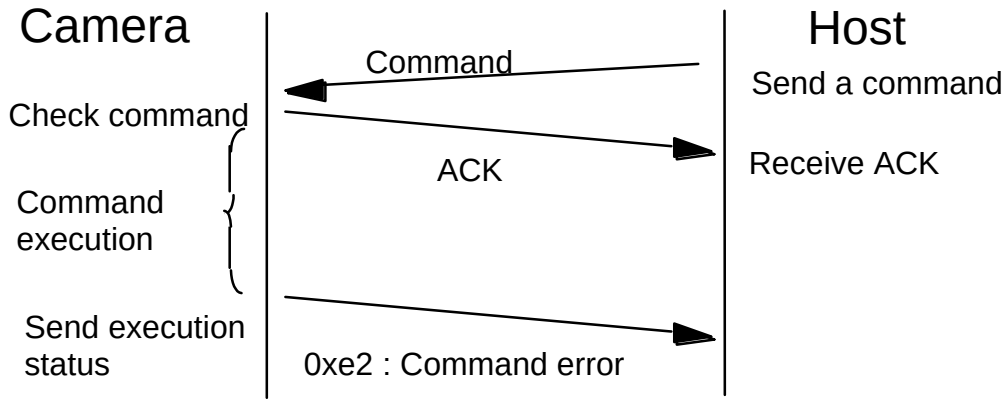
2.7.5 Error Cases

(1) Illegal Command



(2) Command Execution Error

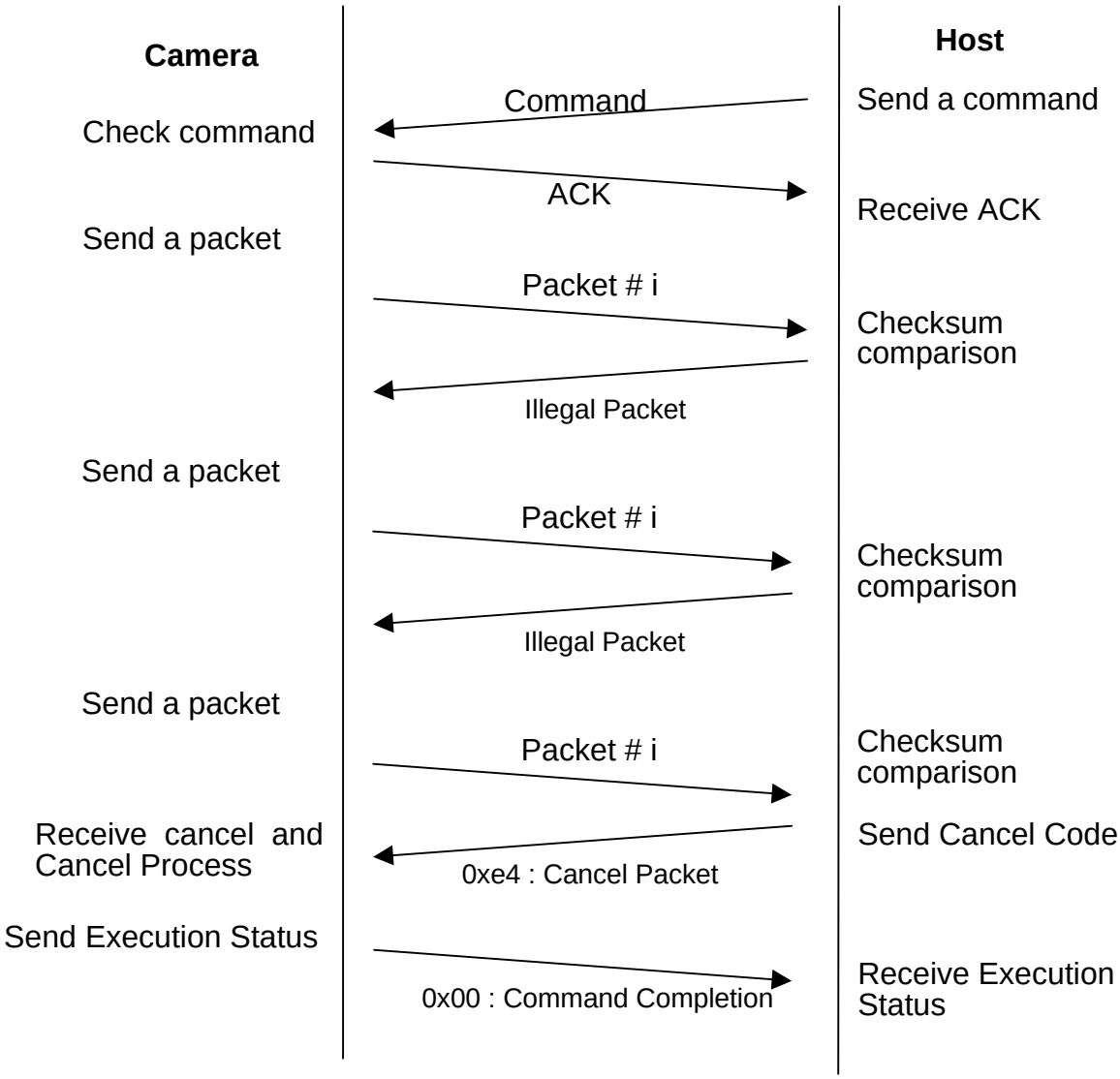
The host can know what error is occurred when it receives a command error (e2h) from the host. See the possible command error causes at each command description (5.1).



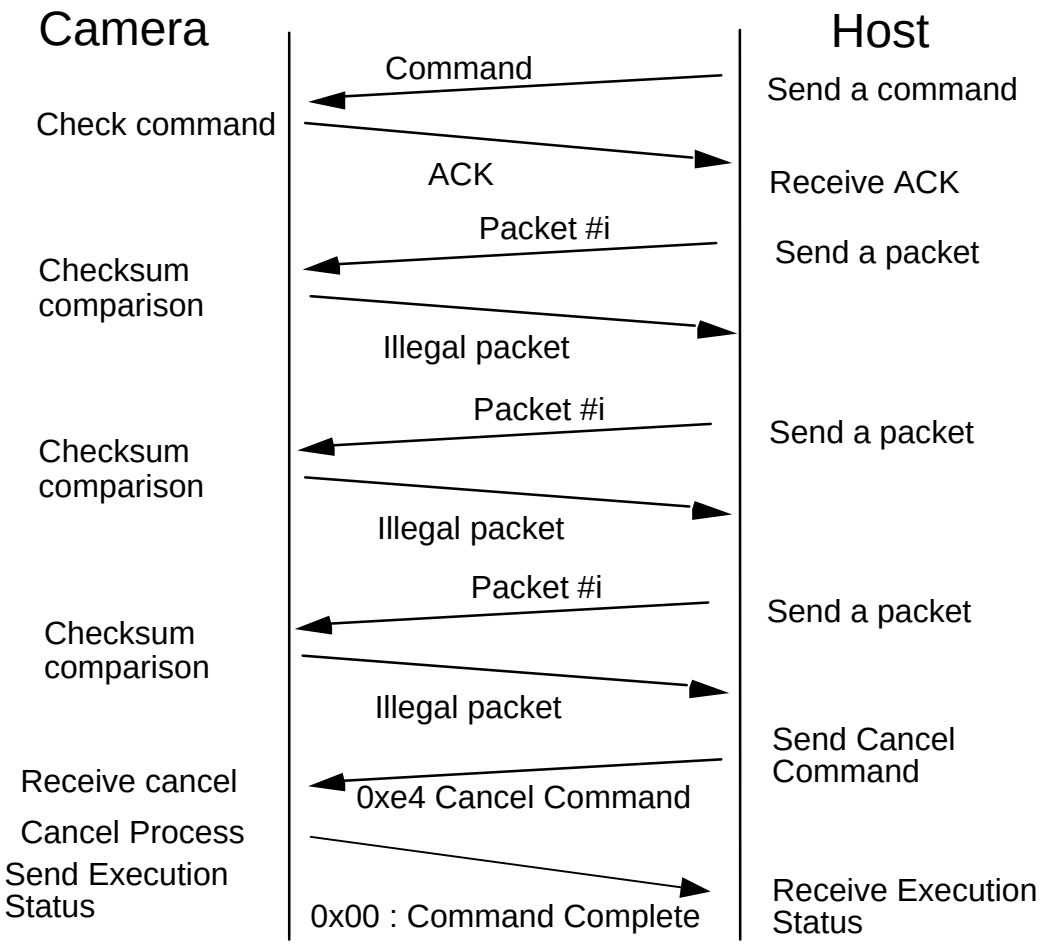
(3) Packet Error

- If the host (or the camera) receives an illegal packet code (e3h) after sending a packet, the host (or the camera) will send the same packet again.
- Only the host can decide to cancel the communication process when a packet communication error is not recovered.
- If the camera receives a cancel code (e4h) or a cancel packet, then it cancels current process and prepare for next command. Next it responds command complete (0x0) to the host.

Camera --> Host

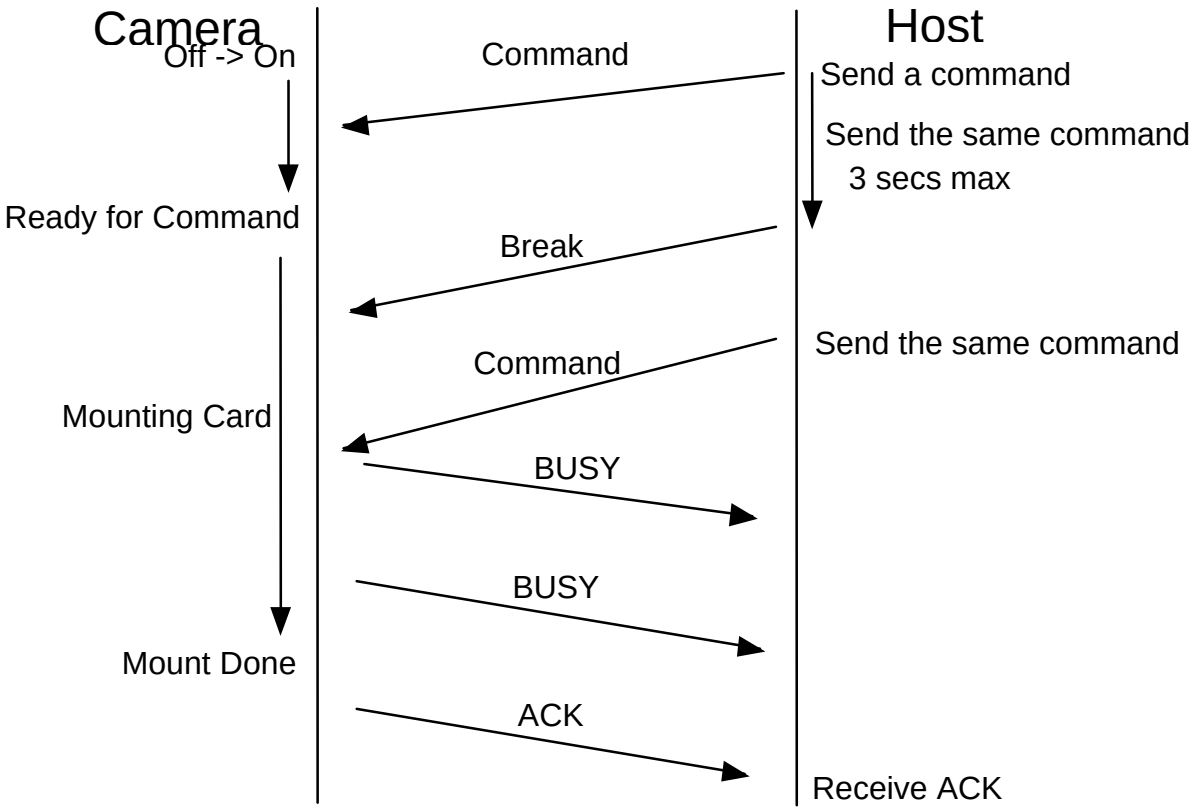


Host --> Camera


Camera
Host
Command
Send a command
Check command
ACK
Receive ACK
Packet #i
Send a packet
Checksum comparison
Illegal packet
Packet #i
Send a packet
Checksum comparison
Illegal packet
Packet #i
Send a packet
Checksum comparison
Illegal packet
Send Cancel Command
Receive cancel
0xe4 Cancel Command
Cancel Process
Send Execution Status
0x00 : Command Complete
Receive Execution Status

2.7.6 Communication Immediately After Power Up The Camera

When the camera receives the command immediately after the power-up, the camera may require about 10 secs maximum to be ready, and it will reply BSY if the camera is not ready to process commands. If the camera does not respond more than 2 secs after the host sends the same command or the camera returns NAK, the host should send break signal to the camera to reset the serial port.



3. DATA FORMAT

3.1 Camera Status Table

Byte offset	Description
0	Data Type (01h for camera status table)
1	Camera Type (6:DC280)
2	Firmware version (Integer part : 0 - 255)
3	Firmware version (Hex interpretation: 00 to ff)
4	ROM Version for 32-bit µ (Integer part : 0 - 255)
5	ROM Version for 32-bit µ (two decimal places)
6	ROM Version for 8 bit µ (Integer part)
7	ROM Version for 8 bit µ (two decimal places)
8	Battery status (0 : OK, 1 : Weak, 2 : Empty)
9	AC adapter flag (0 : Not Used, 1 : In Use)
10	Strobe Status (0 : Not Charged, 1 : Charged)
11	Memory Card Status (*1)
12	Video Format (0 : NTSC, 1 : PAL)
13	Quick View Mode (0: Disable, 1: Enable)
14	# of Picture Taken in Card (MSB)
15	# of Picture Taken in Card (LSB)
16 ● ● 26	Volume ID of CF Card (11 characters)
27	Power Save Mode (0: Disable, 1: Enable)
28 ● ● 59	Camera ID (32-byte ASCII) (*2)
60	Remaining Pictures at Low Quality (MSB)
61	Remaining Pictures at Low Quality (LSB)
62	Remaining Pictures at Medium Quality (MSB)
63	Remaining Pictures at Medium Quality (LSB)
64	Remaining Pictures at High Quality (MSB)
65	Remaining Pictures at High Quality (LSB)
66	Total Number of Picture Taken (MSB) (*3)
67	Total number of Picture Taken (LSB)

68	Total number of Strobe Fired (MSB)
69	Total number of Strobe Fired (LSB)
70	Language Type (*9)
71	Beep (0 : Off, 1 : Limited, 2 : On)
72 ● ● 77	Reserved
78	File Type (3 : EXIF)
79	Picture Size (0 : 896x592, 1 : 1760x1168)
80	Image Quality (1 : High, 2 : Medium 3: Low)
81	Reserved
82	Image Incomplete Flag (0 : complete)
83	Timer Mode (0 ; Off, 1 : On)
84 ● ● 87	Reserved
88	Year (MSB)
89	Year (LSB)
90	Month
91	Day
92	Hour
93	Minute
94	Second
95	TenM Second (unit in 10 msecs)
96	Reserved
97	Strobe Mode (0 : Auto, 1 : Fill, 2 : Off, 3 : Auto Red-eye)
98	Exposure Compensation (MSB) (x100, -200 to 200)
99	Exposure Compensation (LSB)
100	AE Mode (0 : Auto, 1 : Center Weight)
101	Focus Mode (0 : Auto, 2: Close-up, 3: Infinity)
102	AF Mode (2 : Spot)
103	AWB Mode (0 : Auto, 1 : Fluorescent, 2 : Tungsten, 3 : Daylight/Strobe)
104	Zoom Magnification (MSB) (100 - 600)
105	Zoom Magnification
106	Zoom Magnification
107	Zoom Magnification (LSB) (more than 210 in case of digital zoom)

108	Reserved
109	Reserved
110	Reserved
111	Reserved
112	Reserved
113	Reserved
114	Reserved
115	Reserved
116	Reserved
117	Reserved
118	Reserved
119	Reserved
120	Reserved
121	Reserved
122	Reserved
123	Reserved
124	Reserved
125	Reserved
126	Reserved
127	Reserved
128	Reserved
129	Exposure Mode (*7)
130	Reserved
131	Sharpness Control (-1(soft), 0(normal), 1(sharp))
132	Exposure Time (MSB) (*4)(in 10 µ sec unit)
133	Exposure Time
134	Exposure Time
135	Exposure Time (LSB)
136	F Value (MSB) (f x 100; 280 – 2300)
137	F Value (LSB)
138	Image Effect (*5)
139	Date & Time Stamp (*8)
140	Border File Name (8.3 chars) (*6) ● xxxxxxxx.BDR ● This field is invalid if bit 3 of Image Effect is not set
151	
152	Exposure Lock (0 : Off 1 : On)
153	ISO Mode (0: Fixed 1: Auto)

154 ● ● 255	Reserved

*1 : Memory card status (Byte 11)

Bit 7 1 : Compact Flash Card is inserted
0 : Compact Flash Card is not inserted
Bit 6 Reserved
Bit 5 Reserved
Bit 4 1 : Card is not formatted
0 : Card is formatted
Bit 3 1 : Card is opened
0 : Card is not opened
Bit 2 Reserved
Bit 1 Reserved
Bit 0 Reserved

Bit 3 (open flag) is set when an open command is executed. In the following cases, bit 3 will be reset.

- Camera is turned off
- Close command is executed
- Card is ejected

Note that bit 3 is not reset when the camera returns from sleep mode.

*2 : Camera ID (Byte 28-59)

32-byte camera ID is defined in the Flash memory and the ID will be written in the camera status table at the camera initialization. This ID can be written with "Write Camera ID" command. Camera has a default strings “KODAK DC280 ZOOM DIGITAL CAMERA”.

*3 : Total number of picture taken (Byte 66-69)

This is the camera life-time statistics.

* 5 : Image Effect (Byte 138)

The on (1) or off(0) of each bit represents each effect respectively

0 = disable image effect,

bit0 = Gray scale,

bit1 = Sepia,

bit2 = Document,

bit3 = Border composition

* 6 : Border File Name (Byte 144-155)

The file name in this field is currently selected file name. This will be a null string if no file is selected and CF is removed.

* 7 : Exposure Mode (Byte 131)

Upper 4bits(bit7-4)
0:Auto (TTL-On)
Lower 4bits(bit3-0)
0:Normal

*8 : The display format is described below.

0x0	Off		
0x1	YYYY MM DD	0x4	YYYY MM DD hh:mm
0x2	DD MM YYYY	0x5	DD MM YYYY hh:mm
0x3	MM DD YYYY	0x6	MM DD YYYY hh:mm

*9: The language type is described below.

If this type is Japanese fixed camera, then user can't change this with "Set Camera Parameter" (subcommand is Language Type) command.

0x0: English
0x1: Japanese 0x81: Japanese (Fixed Camera)
0x2: French
0x3: German
0x4: Spanish
0x5: Italian
0x6: Portuguese

3.2 Picture Information Table

Picture information for each image consists of 256 byte data as follows. The host software can know the information of each picture to read this table.

Byte offset	Description
0	Data Type (01h for picture information)
1	Camera Type (6 : DC280)
2	File Type (3 : EXIF)
3	Picture Size (0 : 896x592, 1 : 1760x1168)
4	Image Quality (1 : High, 2 : Medium 3: Low)
5	Reserved
6	Image Incomplete Flag (0 : complete)
7	Timer Mode (0 ; Off, 1 : On)
8 ● ● 11	Reserved
12	Year (MSB)
13	Year (LSB)
14	Month
15	Day
16	Hour
17	Minute
18	Second
19	TenM Second (unit in 10 msecs)
20	Strobe Flag (0 : Not Fired, 1 : Fired)
21	Strobe Mode (0 : Auto, 1 : Fill, 2 : Off, 3 : Red-eye)
22	Exposure Compensation (MSB) (x100, -200 to +350(*6))
23	Exposure Compensation (LSB)
24	AE Mode (0 : Auto, 1 : Center Weight)
25	Focus Mode(0 : Auto, 2: Close-up, 3: Infinity)
26	AF Mode (2 : Spot)
27	AWB Mode (0 : Auto, 1 : Fluorescent, 2 : Tungsten, 3 : Daylight/Strobe)
28	Zoom Magnification (MSB) (100 – 600)
29	Zoom Magnification
30	Zoom Magnification

31	Zoom Magnification (LSB) (more than 210 in case of digital zoom)
32	Reserved
33	Reserved
34	Reserved
35	Reserved
36	Reserved
37	Reserved
38	Reserved
39	Reserved
40	Reserved
41	Reserved
42	Reserved
43	Reserved
44	EV(MSB) (EV x 1000, 5000 – 17000)
45	EV
46	EV
47	EV (LSB)
48	Reserved
49	Reserved
50	Reserved
51	Reserved
52	Battery Level (0 : OK, 1 : Weak , 2 : Empty)
53	Exposure Mode (See Camera Status Table)
54	Reserved
55	Sharpness Control (-1(soft), 0(normal), 1(Sharp))
56	Exposure Time (MSB) (in 10 μ sec unit)
57	Exposure Time
58	Exposure Time
59	Exposure Time (LSB)
60	F Value (MSB) (f x 100; 280 – 2300)
61	F Value (LSB)
62	Image Effect (*4)
63	Date & Time Stamp (*5)
64	Border File Name (8.3 chars) ● xxxxxxxx.JPG ● This field is invalid if bit 3 of Image Effect is not set
75	
76	Exposure Lock (0 : Off 1 : On)

77	ISO Mode (0: Fixed 1:Auto)
78 ● 91	Reserved
92	Thumbnail Data Size (MSB)
93	Thumbnail Data Size
94	Thumbnail Data Size
95	Thumbnail Data Size (LSB)
96	Thumbnail Height (MSB)
97	Thumbnail Height (LSB)
98	Thumbnail Width (MSB)
99	Thumbnail Width (LSB)
100	Protect Status (0 : not protected, 1 : read only)
101 102 103	Reserved
104	File Size (MSB)
	File Size
	File Size
107	File Size (LSB)
108 ● ● 255	Reserved

*4 : The on (1) or off(0) of each bit represents each effect respectively

0 = disable image effect
bit0 = Gray scale
bit1 = Sepia
bit2 = Document
bit3 = Border composition

*5 : The display format is described below.

0x0	Off		
0x1	YYYY MM DD	0x4	YYYY MM DD hh:mm
0x2	DD MM YYYY	0x5	DD MM YYYY hh:mm
0x3	MM DD YYYY	0x6	MM DD YYYY hh:mm

*6 : If Effects is Document, then Exposure Compensation value is add the base value to 1.5 EV.

4. File Organization

This chapter describes file organization for the internal control and the Compact Flash card and naming rules for the image files. All images on the Compact Flash card are stored as DOS files. The camera does not handle long file name and VFAT defined for Windows 95/98.

4.1 Image Data

DC280 camera does not have internal image storage, therefore, all images are stored as DOS files on Compact Flash cards. The image data is stored in EXIF 2. Each file contains a header, thumbnail image data and full size compressed image data. Each image data is stored with unique file name assigned automatically. An image files will be stored under “\DCIM\xxxDC280” directory, where the xxx is a three-digit value starting from 100. The number “xxx” will be a smallest three-digit decimal among the all directories starting with “xxx” naming on the “\DCIM” directory on the card.

Refer to JEIDA-49-1998 Digital Still Camera Image File Format Standard (Exchangeable image file format for Digital Still Camera: EXIF) Version 2.1 [3] document for the detail. Also, JEIDA-49-2-1998 DCF (Design rule for Camera File system) Version1.0 [4] should be referred to.

4.2 File Name

4.2.1 Directory Name on Card

All image files are stored in a DOS directory with following naming convention.

\DCIM\xxxDC280\

xxx : Directory name number that starts with 100

The xxx is an image directory number, starting from 100.

If there is no image directory on card, the camera generates

\DCIM\100DC280\

If there are multiple Kodak camera directories on card, the camera stores new images under the directory with the highest number. For example, if there are

\DCIM\100 DC280\
\DCIM\103 DC280\
\DCIM\124 DC280\

directories on the card, the camera stores new images under the 124 directory.

If the directory with the highest number is not a Kodak camera directory, then the camera finds the highest numbered Kodak camera directory and stores any new images there. For example, if there are

\DCIM\100DC280\
\DCIM\103CANON\
\DCIM\124RICOH\

directories on the card, then the camera will store new images in

\DCIM\100DC280\

Similarly, if there are

\DCIM\100DC280\
\DCIM\103CANON\
\DCIM\124DC240\

directories on the card and the camera is a Kodak DC280, then the camera will also store new images in

\DCIM\100DC280\

If the memory card contains an image number of 9999 and cannot find a higher-numbered directory for the next capture, then the camera will prevent any further capture of images and display an appropriate warning message. One scenario that will cause the warning message is after creating file \DCIM\999DC280\DCP_9999.JPG. In this rare situation, it is expected that the user will delete the 999 directory and/or other image files and directories before re-inserting the card.

Similarly, if a non-Kodak camera directory 999 exists, then the warning message will be displayed after image file \DCIM\998DC280/DCP_9999.JPG is created.

4.2.2 Image File Name

All image files are stored with the following naming convention.

DCP_nnnn.ttt

nnnn : image number with range 0001-9999

ttt : JPG for compressed files

The image number starts at 0001 and increases by 1 for each picture taken, and is stored into the camera EEPROM (The folder number is not stored in the EEPROM). Thus, the maximum number of images per native directory is 9999. Onto the Compact Flash card, for example, the camera's first images would be stored as follows:

\DCIM\100DC280\DCP_0001.JPG

\DCIM\100DC280\DCP_0002.JPG

\DCIM\100DC280\DCP_0003.JPG

etc.

Upon power-up or when a new Compact Flash card is inserted (mounted), the image number for the next captured image will be determined based on the contents of the new card and the image number value within the EEPROM, per the flowchart below.

For example, if the new card contains the following files and directories:

\DCIM\100DC280\DCP_0001.JPG

\DCIM\104DC280\DCP_0015.JPG

\DCIM\107DC280\DCP_0009.JPG

\DCIM\124CANON\

\DCIM\129JAPAN\

and the EEPROM value for the last image number is 0009, then the next image file would be

\DCIM\107DC280\DCP_0010.JPG.

However, for the exact same card structure and an EEPROM value of 0025, then the next image file would be \DCIM\107DCmmm\DCP_0026.JPG, and the EEPROM would be updated to show 0026 as the last image captured. The reason to adopt this image numbering behavior is to avoid duplicate file names and inconvenience when copying images from the camera to the PC.

The only exception to the above case is if the "capture to album" feature is enabled. In that case, the camera firmware will determine the current album directory and store new images there.

In the wraparound case where the camera creates image number 9999, the next image will be stored in a new directory and the EEPROM will be updated accordingly. For example on the card with images such as

\DCIM\101DC280\DCP_9998.JPG

\DCIM\101DC280\DCP_9999.JPG

the next image would be

\DCIM\102DC280\DCP_0001.JPG.

In the case where the current native directory is not the highest numbered directory on the card, the camera will increment the current number until a free directory number is found. For example, on the card with images such as

\DCIM\100DC280\DCP_0001.JPG
\DCIM\107DC280\DCP_0009.JPG
…
\DCIM\107DC280\DCP_9999.JPG - Last picture taken
\DCIM\108JAPAN\ - Next 2 directory numbers are used
\DCIM\109RICOH\
\DCIM\124CANON\ - Non-native directory
\DCIM\129NAGAN\ - Highest directory number is album

the new directory will have number 110 and the next image would be stored as

\DCIM\110DC280\DCP_0001.JPG

When an image is erased through the user interface on the camera or through the host PC interface, the file names of the remaining files are not affected.

4.2.3 Border File Name on Card

Borders as implemented in the DC280 camera may be supported in other future Kodak cameras. Borders are stored as DOS files with following naming convention.

xxxxxxxx .BDR

xxxxxxxx : 8-character filename, only legal DOS characters.

Border files are to be located in the \SYSTEM\BDR3X2\ directory on the Compact Flash card. Border files located in other directories will be ignored.

4.3 File Access

The host has a way to access image data as well as border file on Compact Flash card.

4.3.1 File Name Access

The contents of Compact Flash card is visible as DOS files from the host though commands. The access is limited to read and delete for all files, and writing for border files only. Any moving, copying, renaming, or writing operation except border files is not supported.

For an image file, the path name to be passed through the host command should have “\PCCARD” string on top of the actual full path from the card’s root as listed below.

\PCCARD\DCIM\xxxDC280\Image File Name

In other word, on the card an image file exists as.

\DCIM\xxxDC280\Image File Name

For a border file, the path name to be passed through the host command should have “\PCCARD” string on top of the actual full path from the card’s root as listed below.

\PCCARD\SYSTEM\BDR3X2\ Border File Name

In other word, on the card a border file exists as.

\SYSTEM\BDR3X2\ Border File Name

4.4 File Format

4.4.1 Image File Format

The camera supports EXIF ver 2.1 file format. Refer to the detailed implementation on [5].

5. COMMANDS

The following is a list of the commands that are recognized by three different models of DC cameras. ‘x’ mark indicates that the command is supported by each camera. If the camera receives a command that is not supported, the camera will handle this as an error and respond with an NAK to the host. If the camera receives a command listed here when the camera is one of the following state (camera is busy) , the command will be ignored.

- Camera is accessing the Compact Flash card
- Camera is in sleep mode

These commands can be categorized into two modes, on-line mode and firmware download mode. Most commands of each mode can not be executed in other mode, however some commands can. Note that the word "send" in this list means send data from the camera to the host.

In the Mode column below, ‘O’ means on-line command and ‘F’ means firmware download command.

* : Mode only applies to DC240/DC280 cameras.

Code	Description	DC120	DC200 DC210	DC240/ DC280	Mode(*)
13	Send data in flash memory	x	x	x	F
1D	Write data to flash memory	x	x	x	F
1E	Erase flash memory	x	x	x	F
21	Write word data to EEPROM	x	x	x	O/F
22	Send Data in EEPROM	x	x	x	O/F
2A	Set Host Packet Buffer Size			x	O
31	Write 256 byte data	x	x	x (Only Serial)	O/F
32	Read 256 byte data	x	x	x (Only Serial)	O/F
33	Set Date/Time Format	x			O
34	Set Distance Format	x			O
35	Set Default Setting	x			O
36	Set Resolution		x	x	O
37	Set File Format		x	x	O
38	Set AWB			x	O
39	Set Exposure Lock			x	O
3B	Set Sharpness Control			x	O
3C	Set Date/Time Stamp			x	O
3D	Execute program	x			F
3E	Set Effect			x	O
3F	Set Border File			x	O
41	Set Baud Rate	x	x	x	O/F
42	Set available Album	x			O

43	Send available Album	x			O
44	Send stored Album	x			O
45	Send number of pictures in Album	x			O
46	Erase Album	x			O
47	Change Album name	x			O
48	Move image to another Album	x			O
49	Set Active Album	x			O
4A	Send file name in Album	x	x		O
4B	Send last reviewed image name			x	O
4C	Send last taken image name			x	O
4D	Set Camera Parameter			x (Only DC280)	O
4F	Print Order command				O
50	Send Power Off Default Setting			x	O
51	Send picture in memory	x			O
52	Send TIFF/EP information in memory	x			O
54	Send TIFF/EP file in memory	x			O
55	Send picture information in memory	x			O
56	Send thumbnail information in memory	x			O
61	Send image on card	x			O
62	Send attribute data of card				O
63	Write word data to attribute data of card				O
64	Send image file on card	x	x		O
65	Send picture information on card	x	x		O
66	Send thumbnail image on card	x	x		O
71	Set image quality	x	x	x	O
72	Set strobe mode	x	x	x	O
73	Set focus mode	x		x	O
74	Set shutter delay	x	x	x	O
75	Set time	x	x	x	O
76	Card copy	x			O
77	Take a picture to flash memory	x			O
78	Set Zoom	x	x	x	O
79	Set AE			x	O
7A	Erase images in flash memory	x			O
7B	Erase images in memory card	x			O
7C	Take a picture to card	x	x	x	O
7E	Check camera battery	x	x	x	O

7F	Send camera status table	x	x	x	O
80	Set exposure compensation	x	x	x	O
81	Set manual exposure	x			O
82	Set sleep time	x			O
83	Send camera matrix data	x			O
84	Send compression table				O
85	Take and send preview image				O
86	Request sense	x			O/F
87	Store preview image in memory				O
88	Store preview image in card				O
89	Erase preview image				O
8A	Reset Camera	x	x	x	O
8B	Set Exposure Mode	x			O
8C	Execute Program				O
8E	Execute Diagnostic			x	O
8D	Switch to ROM mode	x	x	x	O
90	Set program mode				O
91	Read picture information		x	x	O
92	Read summary information		x		O
93	Read Thumbnail		x	x	O
94	Wait				O
95	Initialize memory card		x	x	O
96	Open card	x	x	x	O
97	Close card	x	x	x	O
98	Get card status	x	x	x	O
99	Read directory information	x	x	x	O
9A	Read file	x	x	x	O
9B	Write file information				O
9C	Write file			x (*1)	O
9D	Delete file		x	x	O
9E	Write camera ID	x	x	x	O
9F	Set Protect			x	O
AD	Enter adjust mode	x	x	x	O
AE	Completion of download mode	x	x	x	F

*1 : This command is intended to be used only for Border file download.

5.1 Command Description

This section describes commands supported by DC280 cameras only. ‘O’ and ‘F’ at each title means on-line and firmware download respectively.

On-line command is used to control the camera remotely. If the camera receives a firmware download specific command in on-line mode, the camera will respond a NAK to the host.

Firmware download command is used to download the camera firmware into the flash memory. If the camera receives a on-line mode specific command in firmware download mode, the camera will respond a NAK to the host. **Firmware download mode is supported through both serial and USB.**
Page size of 256 bytes in case of serial, 4096bytes in case of USB. Therefore the address shown by page number in serial environment is different from the address shown by same page number in USB.

5.1.1 Send Data In Flash Memory (13h, F)

Offset	Host command
0	13
1	00
2	Page number of flash memory (MSB)
3	Page number of flash memory (LSB)
4	00
5	00
6	00
7	1A

Page number of flash memory
The sequential page number of flash memory
(Page number is Zero Origin.)

This command sends specified page data of the flash memory to the host.

5.1.2 Write Data To Flash Memory (1Dh, F)

Offset	Host command
0	1D
1	00
2	Page number of flash memory (MSB)
3	Page number of flash memory (LSB)
4	00
5	Verify Flag
6	00
7	1A

Page number of flash memory
The sequential page number of flash memory
(Page number is Zero Origin.)

Verify function Flag The flag to request to verify in camera.
00h: Disable
01h: Enable

This command writes the data sent from the host to specified page of the flash memory. If Verify Flag is set to 0x1, then camera will verify whether the written data is correct.

5.1.3 Erase Flash Memory (1Eh, F)

Offset	Host command
0	1E
1	00
2	Data Block
3	00
4	Page number of flash memory (MSB)
5	Page number of flash memory (LSB)
6	00
7	1A

This command erases the block data specified page in the flash memory.

Data Block 00h: All
01h: Program
02h: Reserved
03h: Error
04h: Data
10h: Immediate
Erase the block including the page specified by follow page number.

Page number of flash memory (Available this in case of Data Block is 0x10)
The sequential page number of flash memory (Page number is Zero Origin.). Host should set 0x0 in case of Data Block field is not 0x10.

5.1.4 Write Word Data to EEPROM (21h, O/F)

Offset	Host command
0	21
1	00
2	Address of EEPROM (MSB)
3	Address of EEPROM (LSB)
4	Word data (MSB)
5	Word data (LSB)
6	00
7	1A

This command writes a word data to specified address of EEPROM in the camera.

Address of EEPROM The address of EEPROM to be stored.
Word data 16 bit data to store to EEPROM.

If the "End address" equals or less than the "Start address" will cause a command execution error code (e2h).

Note: This command should be used for firmware debugging and downloading. Otherwise, the host program should not use this command.

5.1.5 Send Data in EEPROM (22h, O/F)

Offset	Host command
0	22
1	00
2	Start address of EEPROM (MSB)
3	Start address of EEPROM (LSB)
4	End address of EEPROM (MSB)
5	End address of EEPROM (LSB)
6	00
7	1A

This command sends specified data area in EEPROM to the host. The camera will send data with 257-byte packet(s) to the host.

Start address of EEPROM The start address of data area to be sent.

End address of EEPROM The end address of data area to be sent.

If the "End address" less than the "Start address" will cause a command execution error code (e2h).

Note: This command should be used for firmware debugging *and downloading*. Otherwise, the host program should not use this command.

5.1.6 Set Host Packet Buffer Size (2Ah, O)

Offset	Host command
0	2A
1	00
2	HPBS (host packet buffer size, MSB)
3	HPBS (LSB)
4	00
5	00
6	00
7	1A

This command is to change the host packet buffer size only for .

Read Thumbnail Image (93h)

Read File (9Ah)

Write File (9Ch)

Commands in both Serial and USB communication. The power-on default value is the minimum (514 byte). The HPBS value is maintained until the camera turned off.

HPBS *202,402, 802, 1002, 2002, 4002, 8002* in Hex

If an illegal value is set in the HPBS field, the camera will return a command execution error (e2h) to the host.

5.1.7 Write 256 Byte Data (31h, O/F)

Offset	Host command
0	31
1	00
2	Start address of specified memory (MSB)
3	Start address of specified memory
4	Start address of specified memory
5	Start address of specified memory (LSB)
6	00
7	1A

This command writes 256 byte data sent from the host to specified address of the flash memory.

Start address Start address should be set the area below.

	Address Cache Area	Cache through Area
SH Internal ROM/RAM	0x00000000 to 0x01FFFF00	0x00000000 to 0x01FFFF00
Flash Memory (**Supported Read Only**)	0x02000000 to 0x020FFF00	0x22000000 to 0x220FFF00
JPEG	0x04000000 to 0x04001F00	0x24000000 to 0x24001F00
USB	0x04002000 to 0x04002F00	0x24002000 to 0x24002F00
ASIC	0x04003000 to 0x04003F00	0x24003000 to 0x24003F00
DRAM 0	0x06000000 to 0x0601FF00	0x26000000 to 0x2601FF00
DRAM 1	0x06040000 to 0x0605FF00	0x26040000 to 0x2605FF00
DRAM 2	0x06080000 to 0x0609FF00	0x26080000 to 0x2609FF00
DRAM 3	0x060C0000 to 0x060DFFF00	0x260C0000 to 0x260DFF00
CF	0x08000000 to 0x09FFFF00	0x28000000 to 0x29FFFF00
Exception Vector	0x10000000 to 0x10000300	N/A
Internal XROM	0x10000400 to 0x10007700	N/A
Internal XRAM	0x1000E000 to 0x1000FF00	N/A
Internal YROM	0x10010000 to 0x10017700	N/A
Internal YRAM	0x1001E000 to 0x1001FF00	N/A
Associative Purge	0x40000000 to 0x47FFFF00	N/A
Address Array R/W	0x60000000 to 0x7FFFFF00	N/A
Data Array R/W	0xC0000000 to 0xC0000F00	N/A
Peripheral Module Area	0xFFFFFC00 to 0xFFFFFF00	N/A

Note: This command is strictly for firmware debugging. Otherwise, the host program should not use this command.

5.1.8 Read 256 Byte Data (32h, O/F)

Offset	Host command
0	32
1	00
2	Start address of specified memory (MSB)
3	Start address of specified memory
4	Start address of specified memory
5	Start address of specified memory (LSB)
6	00
7	1A

This command writes 256 byte data sent from the host to specified address of the flash memory.

Start address See 5.1.7 Write 256 bytes Data Command

Note: This command is strictly for firmware debugging. Otherwise, the host program should not use this command.

5.1.9 Set Resolution (36h, O)

Offset	Host command
0	36
1	00
2	Resolution
3	00
4	00
5	00
6	00
7	1A

This command is to change the resolution of image file.

Resolution 0 : 896 x 592
1 : 1760 x 1168

If an undefined value is set in the Resolution field, the camera will return a command execution error (e2h) to the host.

5.1.10 Set File Format (37h, O)

Offset	Host command
0	37
1	00
2	Format
3	00
4	00
5	00
6	00
7	1A

This command is to change the file format of image files.

Format

3 : EXIF

If an undefined value is set in the Format field, the camera will return a command execution error (e2h) to the host.

5.1.11 Set AWB (38h, O)

Offset	Host command
0	38
1	00
2	AWB Mode
3	00
4	Power Off Default Flag
5	00
6	00
7	1A

This command is to change the current for power off default AWB mode. If Power Off Default Flag is not set (0x0), then camera will be the current setting specified by this command. If Power Off Default Flag is set (0x1), then camera always becomes the setting specified by this command when camera powers on.

Note: Camera does not change the current setting by the command with Power Off Default Flag.

AWB Mode
0 : Auto
1 : Fluorescent
2 : Tungsten
3 : Daylight/Strobe

Power Off default Flag
00 : set current parameter
01 : set power off default parameter.

If an undefined value is set in the mode field, the camera will return a command execution error (e2h) to the host.

5.1.12 Set Exposure Lock (39h, O)

Offset	Host command
0	39
1	00
2	Exposure Lock
3	00
4	00
5	00
6	00
7	1A

This command is to change Exposure Lock feature.

Exposure Lock 0 : Off
1 : On

If an undefined value is set in Exposure Lock field, the camera will return a command execution error (e2h) to the host.

5.1.13 Set Sharpness Control (3Bh, O)

Offset	Host command
0	3B
1	00
2	Sharpness
3	00
4	00
5	00
6	00
7	1A

This command is to change the Sharpness level of images.

Sharpness *-1(Soft), 0 (normal), 1(Sharp)*

If an undefined value is set in the sharpness mode field, the camera will return a command execution error (e2h) to the host.

5.1.14 Set Date/Time Stamp (3Ch, O)

Offset	Host command
0	3C
1	00
2	Date/Time Stamp
3	00
4	00
5	00
6	00
7	1A

This command is to choose the superimpose the current date.

Date/Time Stamp

0x0	*Off*		
0x1	*YYYY MM DD*	*0x4*	*YYYY MM DD hh:mm*
0x2	*DD MM YYYY*	*0x5*	*DD MM YYYY hh:mm*
0x3	*MM DD YYYY*	*0x6*	*MM DD YYYY hh:mm*

If an undefined value is set in the Date/Time Stamp field, the camera will return a command execution error (e2h) to the host.

5.1.15 Set Effect (3Eh, O)

Offset	Host command
0	3E
1	00
2	Effect
3	00
4	Power Off Default Flag
5	00
6	00
7	1A

This command is to change the current for power off default effect mode of the camera. If Power Off Default Flag is not set (0x0), then camera will be the current setting specified by this command. To be available for Border function, host should set the Border file string with “Set Border File” command without Power Off Default after sending this. If host does not set this, then the border function will not be enable.

If Power Off Default Flag is set (0x1), then camera always becomes the setting specified by this command when camera powers on. To be available for Border function with Power Off Default, host should set the Border file string with “Set Border File” command with Power Off Default after sending this. If host does not set this, then camera only stores Border composition setting flag to EEPROM, the border function will not be automatically enable in next power on.

Note: Camera does not change the current setting by the command with Power Off Default Flag.

Effect
0 : All off
1 : Gray scale
2 : Sepia
4 : Document
8 : Border composition
9 : Gray scale and Border composition
10 : Sepia and Border composition
12 : Document and Border composition

Power Off default Flag
00 : set current parameter
01 : set power off default parameter.

If an undefined value is set in Effect field, the camera will return a command execution error (e2h) to the host.

If Border composition bit is set and Border file name is not set by “Set Border File” command, then Camera will take a picture without Border data.

5.1.16 Set Border File (3Fh, O)

Offset	Host command
0	3F
1	00
2	00
3	00
4	Power Off Default Flag
5	00
6	00
7	1A

Power Off default Flag 00 : set current parameter
01 : set power off default parameter.

This command is to specify the border file to be used when Effect is set to Border Composition, and to specify the power off default border file. This command is followed by a 60-byte packet described below that contains a file name, start block and number of block to write. If Power Off Default Flag is not set (0x0), then camera will be the current setting specified by this command. To be available for Border function, host should set the Border composition setting with “Set Effect” command without Power Off Default after sending this. If host does not set this, then the border function will not be enable. If camera recognizes that the specified border file is illegal, then the border function camera will not be enable.

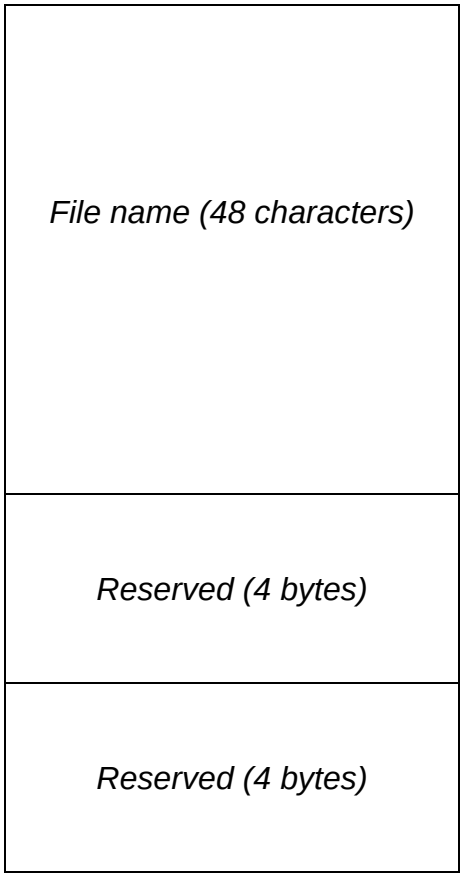
If Power Off Default Flag is set (0x1), then camera always becomes the setting specified by this command when camera powers on. To be available for Border function with Power Off Default, host should set the Border composition setting with “Set Effect” command with Power Off Default before sending this. If host does not set this, then camera only store Border file string to EEPROM, the border function will not be automatically enable in next power on.

Note: Camera does not change the current setting by the command with Power Off Default Flag.

- *File name (up to 48 characters)*

NOTE: Do not input long file/directory name. The camera does not guarantee the result of the file operation.

- *Reserved (4 bytes)*
- *Reserved (4 bytes)*



The border file has the following file name from host computer viewpoint.

\PCCARD\SYSTEM\BDR3X2\ Border file name border file in the card

Note that a command execution error (e2h) is returned from the camera when this command is sent to the camera if the card is not opened, or if the specified file does not exist on the card.

.

5.1.17 Set Baud Rate (41h, O/F, Serial Only)

Offset	Host command
0	41
1	00
2	See below
3	See below
4	00
5	00
6	00
7	1A

Baud rate definitions

Baud rate	Offset 2	Offset 3
9.6 k	96	00
19.2 k	19	20
38.4 k	38	40
57.6 k	57	60
115.2 k	11	52

This command changes the current baud rate of **serial communication only**. The camera will return NAK when it receives this command during USB communication. The power-up default baud rate of the camera is 9,600 bps. When the camera receives the break on/off signal, the baud rate is changed to 9,600 bps. The baud rate set by this command will not be affected by moving to sleep mode. If this command is executed correctly, the camera will respond with an ACK.

Note: The camera will not respond a command completion code for this command like other commands will. The camera will return an ACK for this command. The camera requires 100 msec for serial to changes the baud rate after sending an ACK. The host should consider this time before sending next command.

5.1.18 Send Last Reviewed Image Name (4Bh, O)

Offset	Host command
0	4B
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

The camera will send file information in 258-byte packet form of the full path image name on CF card which displayed on the Color LCD or Video in Review Mode. The file name will be in DOS file system full path format starting with \PCCARD\DCIM\. If camera have not been to review mode, CF is removed and camera has been taken picture, then the camera will be return NULL path strings and command complete (00h). Null path string means that the 0x0 is set to the data field in 258-byte packet.

Note that a command execution error (e2h) will be returned from the camera when this command is sent to the camera if there is no card.

5.1.19 Send Last Taken Image Name (4Ch, O)

Offset	Host command
0	4C
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

The camera will send file information in 258-byte packet form of the full path image name on CF card which taken last. The file name will be in DOS file system full path format starting with \PCCARD\DCIM\. If the camera isn’t still taken a picture, then the camera will be return NULL path strings and command complete (00h). Null path string means that the 0x0 is set to the data field in 258-byte packet.

Note that a command execution error (e2h) will be returned from the camera when this command is sent to the camera if there is no card.

5.1.20 Set Camera Parameter (4Dh, O)

Offset	Host command
0	4D
1	00
2	Parameter Type
3	Power Off Default Flag
4	Parameter Value (MSB)
5	Parameter Value (LSB)
6	00
7	1A

This command is to change some camera parameters below.

Parameter Type (Hex)	Parameter	Parameter Value	Content
01h	Video out Mode	00h	NTSC
		01h	PAL
02h	Quick View Mode	00h	Disable
		01h	Enable
03h	Beep Mode	00h	Disable
		01h	Select
		02h	All
04h	Power Save Mode	00h	Disable
		01h	Enable
05h	Language Type	00h	English
		01h	Japanese
		02h	French
		03h	German
		04h	Spanish
		05h	Italian
		06h	Portuguese
06h	ISO Mode	00h	Fixed
		01h	Auto

Note: Power Off Default flag is available for only ISO Mode Parameter. If the parameters except this send, then camera will response execution error (e2h).

Video out Mode

This is to set Video out type to display images in Review Mode. Host can select either NTSC or PAL. Note that video out does not work without video cable. See 7.3 in DC280 User Interaction Specification in detail.

Quick View Mode

This is to set Quick View Mode. This function allows the user to see the

captured picture immediately after the shutter is released. This is available in only Capture Mode.

Beep Mode

This is to set Beep Mode. This function is that camera generates beep sound when user perform some operation. There are three types, which are All Off, Selected on, and All on. The each case which beep sounds is described below.

All Off

- No beeps for any button press or in any situation.

Selected on

- Picture is captured - short sound once.
- Digital zoom starts - short sound once.
- AF/AE lock – short sound twice.
- Warning (flash not charged, cannot take another picture because DRAM full) - short sound 3 times.
- Error - long sound once.

All on

- All the cases listed for “Selected On”.
- When any available button is pressed – short sound once.

See 7.2 in DC280 User Interaction Specification in detail.

Power Save Mode

This is to set Power Save Mode. This function is that camera automatically powers off and turns off color LCD in case that there is no operation from user in specified time. Note that this is available not only without AC Cable but also with AC Cable because it is possible to connect to external battery. See 7.4 in DC280 User Interaction Specification in detail.

Language Type

This is to select character type displayed on LCD.

ISO Mode

This is to set Auto ISO. This function is that camera takes a picture after holding up CCD gain if strobe mode is only off. If this is Auto, then this function becomes enable.

In case of Japanese fixed camera, the camera will return a command execution error (e2h) to the host when the host sends this including Language Type parameter.

5.1.21 Set Image Quality (71h, O)

Offset	Host command
0	71
1	00
2	Image Quality
3	00
4	00
5	00
6	00
7	1A

This command sets the current image quality for pictures.

Image quality 01 : High
02 : Medium
03 : Low

If an undefined value is set in the image quality field, the camera will return a command execution error (e2h) to the host.

5.1.22 Send Power Off Default Setting (50h, O)

Offset	Host command
0	50
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command is to read the current power off default setting information in camera. The camera will send 258-byte packets described below to the host.

0	Strobe Mode
1	AWB Mode
2	Exposure Compensation (MSB)
3	Exposure Compensation (LSB)
4	Effects
5	ISO Mode
6 15	Reserved
16 63	Border File name (48 bytes)
64 255	Reserved

Each parameter value is defined in below section.

Strobe Mode	See 5.1.23
AWB Mode	See 5.1.11
Exposure Compensation	See 5.1.32
Effects	See 5.1.15
ISO Mode	See 5.1.20
Border File name	See 5.1.16

5.1.23 Set Strobe Mode (72h, O)

Offset	Host command
0	72
1	00
2	Strobe Mode
3	00
4	Power Off Default Flag
5	00
6	00
7	1A

This command sets the current or power off default strobe mode. If Power Off Default Flag is not set (0x0), then camera will be the current setting specified by this command. If Power Off Default Flag is set (0x1), then camera always becomes the setting specified by this command when camera powers on.

Note: Camera does not change the current setting by the command with Power Off Default Flag.

Strobe Mode 00 : Auto
01 : Fill
02 : Off
03 : Auto Red-eye

Power Off default Flag 00 : set current parameter
01 : set power off default parameter.

If an undefined value is set in the strobe mode field, the camera will return a command execution error (e2h) to the host.

5.1.24 Set Focus Mode (73h, O)

Offset	Host command	
0	73	
1	00	
2	Focus Mode (bit 7-4)	AF Mode (bit 3-0)
3	Distance (MSB)	
4	Distance (LSB)	
5	00	
6	00	
7	1A	

This command sets the current focus mode.

Focus Mode 0 : Auto
2 : Close-up
3 : Infinity (Landscape)

AF Mode
2 : Spot

“AF Mode” field is valid only when “Focus Mode” is either “Auto.”

If an illegal value is set in the focus mode / AF mode field, the camera will return a command execution error (e2h) to the host.

5.1.25 Set Shutter Delay (74h, O)

Offset	Host command
0	74
1	00
2	shutter delay
3	00
4	00
5	00
6	00
7	1A

This command sets the shutter delay mode. Shutter Delay is always 10 secs[2].

If the timer is set, this feature will be canceled in the following cases.

(1) After a picture is taken.

(2) The mode is changed via the mode dial.

Shutter Delay 00 : Shutter delay is disabled (off)
01 : Shutter delay is enabled (on)

If an undefined value is set in the shutter delay field, the camera will return a command execution error (e2h) to the host.

5.1.26 Set Time (75h, O)

Offset	Host command
0	75
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command sets the time and date to the camera.

This command is followed by a 60-byte packet that contains date and time data which corresponds to Picture Information format.

0	Year (MSB)
1	Year (LSB)
2	Month (1 byte)
3	Day (1 byte)
4	Hour (1 byte)
5	Minute (1 byte)
6	Second (1 bytes)
7	TenM Second (unit of 10 msecs)

If the data contains unsupported or invalid data after 2025/12/31 23:59, the camera will return a command execution error (e2h) to the host. If the data contains before 1999/5/31 11:59, the camera will set the seed time 1999/5/31 12:00, and return a command complete (00h).

5.1.27 Set Zoom (78h, O)

Offset	Host command
0	78
1	00
2	Zoom Magnification (MSB)
3	Zoom Magnification
4	Zoom Magnification
5	Zoom Magnification (LSB)
6	00
7	1A

This command specifies to set the zoom position in corresponding format of Picture Information.

Zoom Magnification 100 - 600

Note: **100-200 is optical zoom range.** Mechanically available zoom step is 100, 110, 120, 140, 160, 180 and 200. Within this range, any intermediate value would be round up/down to the closer step. 35mm equivalent focal length is described below.

Zoom Magnification (x100)	35mm equivalent focal length (unit : mm)
100	30
110	33
120	36
140	42
160	48
180	54
200	60

Note: **210-600 is digital zoom range.** Available zoom step is 10.

In the following cases, the camera will return a command execution error (e2h) to the host.

An undefined value is set in the zoom value field
In Macro mode

5.1.28 Set AE (79h, O)

Offset	Host command
0	79
1	00
2	AE Mode
3	00
4	00

5	00
6	00
7	1A

This command specifies the AE mode.

AE Mode 0 : Auto
1 : Center Weighted

The camera will return a command execution error (e2h) if AE Mode field has invalid data.

5.1.29 Take a Picture to Card (7Ch, O)

Offset	Host command
0	7C
1	00
2	Synchronous Flag (0x0: Sync, 0x1:Async)
3	00
4	00
5	00
6	00
7	1A

This command specifies to take a picture to save that image on Compact Flash card. This command has two types, synchronous and asynchronous. In case of synchronous type, camera response this after storing the image data into CF. In case of asynchronous type, camera response this after getting image data from CCD (Note that camera replies after 10sec from receiving this command if host sets Timer Delay). So host can send another command while camera is storing process. In latter case, the way to know whether camera is storing the previous take still image into CF is to send "Send Last Taken Image" command to camera. If this command is done normally, then it means camera finish storing process. If not so, then it means camera is storing.
In the following cases, the camera will return a command execution error (e2h).

- Compact Flash card is already full.
- Compact Flash card is not inserted in the camera.
- Camera is storing the previous take still image data into CF.

The commands which host can send during storing image are described below. Camera doesn't grantee behavior after sending inhibit commands.

Code	Description	DC240/ DC280	**Available command**	Mode(*)
13	Send data in flash memory	x		F
1D	Write data to flash memory	x		F
1E	Erase flash memory	x		F
21	Write word data to EEPROM	x		O/F
22	Send Data in EEPROM	x		O/F
2A	Set Host Packet Buffer Size	x		O
31	Write 256 byte data	x (Only Serial)		O/F
32	Read 256 byte data	x (Only Serial)		O/F
33	Set Date/Time Format			O
34	Set Distance Format			O
35	Set Default Setting			O
36	**Set Resolution**	**x**	**x**	**O**

37	**Set File Format**	**x**	**x**	**O**
38	**Set AWB**	**x**	**x**	**O**
39	**Set Exposure Lock**	**x**	**x**	**O**
3B	**Set Sharpness Control**	**x**	**x**	**O**
3C	**Set Date/Time Stamp**	**x**	**x**	**O**
3D	Execute program			F
3E	**Set Effect**	**x**	**x**	**O**
3F	**Set Border File**	**x**	**x**	**O**
41	Set Baud Rate	x		O/F
42	Set available Album			O
43	Send available Album			O
44	Send stored Album			O
45	Send number of pictures in Album			O
46	Erase Album			O
47	Change Album name			O
48	Move image to another Album			O
49	Set Active Album			O
4A	Send file name in Album			O
4B	**Send last reviewed image nam**	**x**	**x**	**O**
4C	**Send last taken image name**	**x**	**x**	**O**
4D	**Set Camera Parameter**	**x (Only DC280)**	**x**	**O**
4F	Print Order command			O
51	Send picture in memory			O
52	Send TIFF/EP information in memory			O
54	Send TIFF/EP file in memory			O
55	Send picture information in memory			O
56	Send thumbnail information in memory			O
61	Send image on card			O
62	Send attribute data of card			O
63	Write word data to attribute data of card			O
64	Send image file on card			O
65	Send picture information on card			O
66	Send thumbnail image on card			O
71	**Set image quality**	**x**	**x**	**O**
72	**Set strobe mode**	**x**	**x**	**O**
73	**Set focus mode**	**x**	**x**	**O**

74	**Set shutter delay**	**x**	**x**	**O**
75	Set time	x		O
76	Card copy			O
77	Take a picture to flash memory			O
78	**Set Zoom**	**x**	**x**	**O**
79	**Set AE**	**x**	**x**	**O**
7A	Erase images in flash memory			O
7B	Erase images in memory card			O
7C	Take a picture to card	x		O
7E	Check camera battery	x		O
7F	**Send camera status table**	**x**	**x**	**O**
80	**Set exposure compensation**	**x**	**x**	**O**
81	Set manual exposure			O
82	Set sleep time			O
83	Send camera matrix data			O
84	Send compression table			O
85	Take and send preview image			O
86	Request sense			O/F
87	Store preview image in memory			O
88	Store preview image in card			O
89	Erase preview image			O
8A	**Reset Camera**	**x**	**x**	**O**
8B	Set Exposure Mode			O
8C	Execute Program			O
8E	Execute Diagnostic	x		O
8D	Switch to ROM mode	x		O
90	Set program mode			O
91	Read picture information	x		O
92	Read summary information			O
93	Read Thumbnail	x		O
94	Wait			O
95	Initialize memory card	x		O
96	Open card	x		O
97	Close card	x		O
98	Get card status	**x**	**x**	**O**
99	Read directory information	x		O
9A	Read file	x		O
9B	Write file information			O
9C	Write file	x (*1)		O
9D	Delete file	x		O
9E	Write camera ID	x		O
9F	Set Protect	x		O
AD	Enter adjust mode	x		O
AE	Completion of download mode	x		F

5.1.30 Check Camera Battery (7Eh, O)

Offset	Host command
0	7E
1	00
2	Overload Type
3	00
4	00
5	00
6	00
7	1A

This command checks the battery level of the camera with overload or not. The result will be written in the camera status. The host program should read the written value from the camera status. Host should send this command before sending “Take a Picture to Card” command.

Overload Type *0x0: Normal (No load)*
0x1: For take still process

Note: The battery level in the camera status table is updated in the following cases except this command.

- The camera is turned on.
- The camera wakes up from the sleep mode.

If the camera is in Communication State, the battery level is updated only this command. Note that this command execution will consume a lot of battery power.

5.1.31 Send Camera Status Table (7Fh, O)

Offset	Host command
0	7F
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command sends the current camera status table (see section 3.1) to the host.

5.1.32 Set Exposure Compensation (80h, O)

Offset	Host command
0	80
1	00
2	Exposure compensation (MSB)
3	Exposure compensation (LSB)
4	Power Off Default Flag
5	00
6	00
7	1A

This command sets an exposure compensation value against the measured EV value electrically in corresponding format of Picture Information. The camera will capture an image with specified compensate electric value. For DC280 camera, the range of EV value is from 5.0 EV to 16 EV. Compensation value can be specified within this range. If the measured EV value is 12 EV, the compensation value could be one of the value from 10.0 to 14.0. This command has two types. One is to set current parameter, and the other is to set power off default parameter. If Power Off Default Flag is not set (0x0), then camera will be the current setting specified by this command. If Power Off Default Flag is set (0x1), then camera always becomes the setting specified by this command when camera powers on.

Note: Camera does not change the current setting by the command with Power Off Default Flag.

Exposure compensation value *-200 to +200 (signed short format)*
(Available step are –200, -150, -100, -50, 0, +50,+100,+150 and +200)

Power Off default Flag 00 : set current parameter
01 : set power off default parameter.

Examples 0x0000 (decimal 0) stands for Auto exposure
0x0100 (decimal +100) stands for Auto exposure + 1.0 E.V.
0xff6a (decimal -150) stands for Auto exposure - 1.5 E.V.

If an illegal value is set in the exposure compensation value field, the camera will return a command execution error (e2h) to the host.

5.1.33 Reset Camera (8Ah, O)

Offset	Host command
0	8A
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command reset the camera setting to the Factory default listed on Appendix 1 3.Camera Setting.

5.1.34 Switch to ROM Mode (8Dh, O)

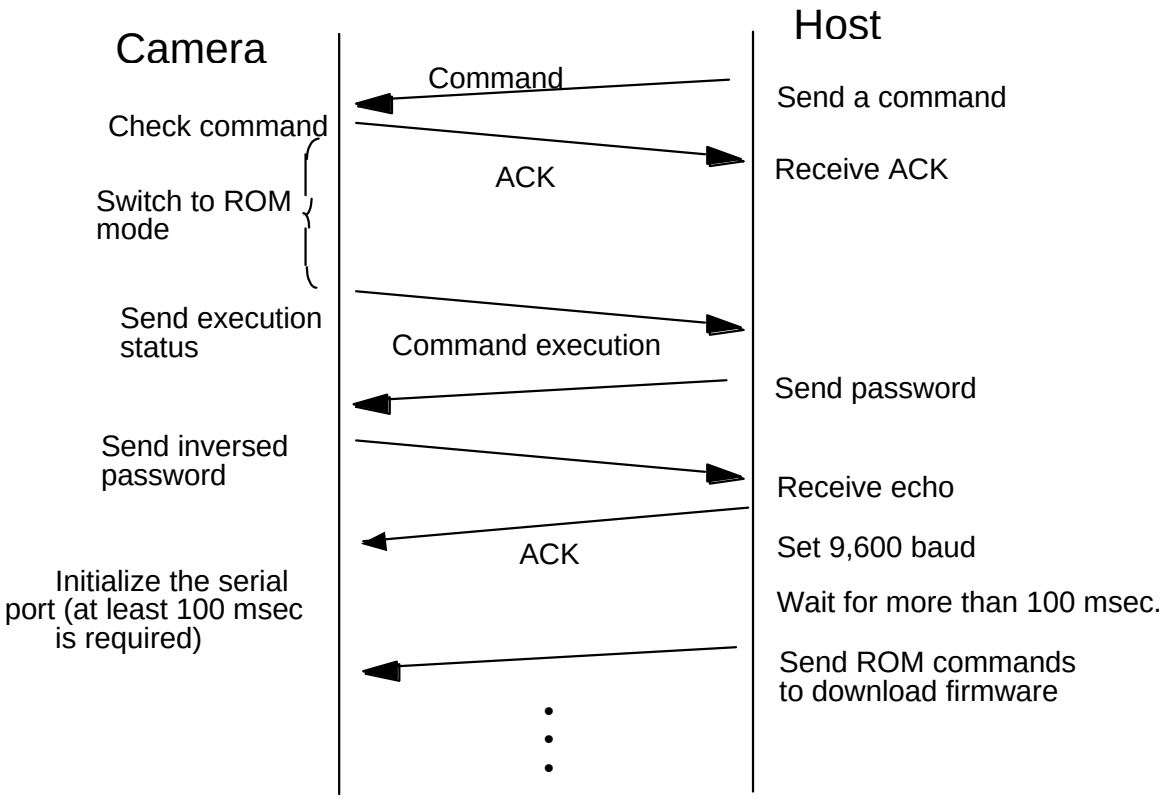
Offset	Host command
0	8D
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command switches from on-line mode to ROM mode with the current baud rate setting to download the camera firmware. The following figure shows the initial command sequence to download the firmware.

1. The host sends this command to the camera.
2. The camera enters ROM mode when it receives this command.
3. The camera responds the command completion code when switching is over.
4. The host sends a password “PgDxWmLcNrKq” to the camera.
5. The camera sends a password “ZxDfJaQwErGa” to the host.
6. In case of serial, the host should change the baud rate 9,600 bps. At this time, the host does not have to send any baud rate change command to the camera.
7. In case of serial, the camera requires at least 100 msec to initialize the serial port. The host should wait for more than 100 msec.
8. Then the host can send any ROM commands, including baud rate command to the camera.
9. When the firmware download is finished, the control will switch to RAM mode automatically. At this time, old firmware is working in the camera. To run the new firmware, the user should power off/on the camera.

Note that the password camera send to host is not “ZxDfJaQwErGa”, but “qKsMaOiVyCjP” when camera goes into firmware download mode manually.

5.1.34.1 Case of Serial

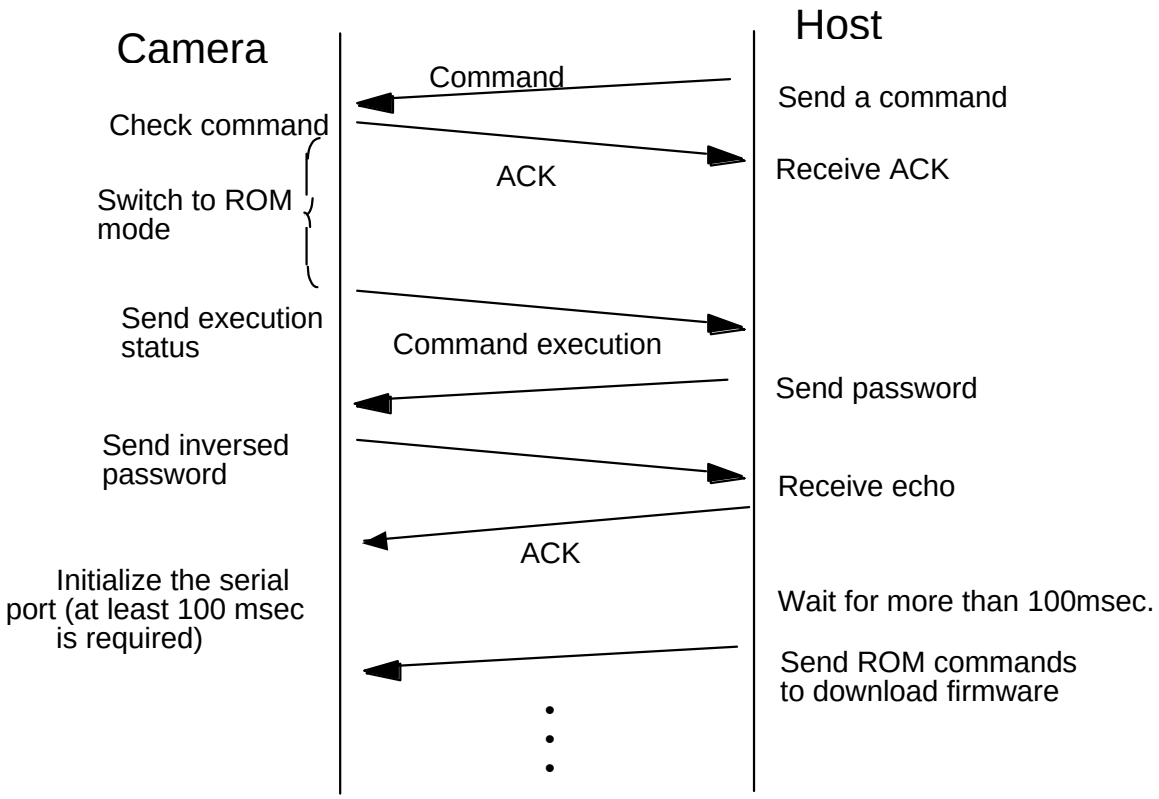


Note that power supply is cut or the serial cable is plugged off during firmware downloading, d1 error is displayed even the camera is turned on. To recover this status, the same step should be done as above.

When the camera is switched to ROM mode by manual operation, the firmware download procedure differs to the procedures described above.

1. Set the baud rate 9,600 bps.
2. Set the camera to ROM mode with manual operation.
3. The host sends the password to the camera.
4. The camera responds the same password to the host.
5. The host sends firmware packets to the camera.
6. When the firmware downloading is finished, the camera is still ROM mode. To run the new firmware, the user should power off/on the camera.

5.1.34.2 Case of USB



5.1.35 Execute Diagnostic (8Eh, O)

Offset	Host command
0	8E
1	00
2	Argument #1
3	Argument #2
4	00
5	00
6	00
7	1A

This command executes diagnostic functions according to the arguments, and return the execution status and/or diagnostic data.

The camera will send data within a 18-byte packet.

Note : The diagnostic functions and its behavior will be documented in a different specification.

Following is the list of diagnostic test defined as of this version of document. (‘x’ means Don’t Care)

Switch Monitor (Arg#1 = 1, Arg#2 = x)

On receiving the command, the camera will copy the 32-bit current button scan information onto the top four bytes of the data part of the 18-byte packet and send it back to the host.

18bytes packet

Switch Information (MSB) (4bytes)
Switch Information
Switch Information
Switch Information (LSB)
Not Used

Struct of Switch information data

Bit	Type of Switch
0	Strobe
01	Macro Mode
02	Self Timer Mode
03	Up
04	Down
05	Right
06	Left
07	S1
08	Menu
09	Mode Dial (Capture)
10	Mode Dial (Review)
11	Mode Dial (Connect)
12	Mode Dial (Setting)
13	Do It
14	Zoom (Tele)
15	Zoom (Wide)
16-26	Reserved
27	AC Cable (0x1 : Inserted 0x0 : Removed)
28	Serial / USB Cable (0x1 : Inserted 0x0 : Removed)
29	Video Cable (0x1 : Inserted 0x0 : Removed)
30	Compact Flash State Cable (0x1 : Inserted 0x0 : Removed)
31	Power

Motor Test (Arg#1 = 2, Arg#2 = x)

On receiving this command, the camera will check the motors of lens unit using the home position sensor, and return one-byte bit map to notify if there is a NG motor among them.

18byte packet

Result (1 byte)
Not used (17 bytes)

Struct of Result Data

Bit	Type of Motor
0	Zoom motor (0: Normal 1: Abnormal)
1	Focus motor (0: Normal 1: Abnormal)
2-7	Reserved

CdS Sensor Test (Arg#1 = 3, Arg#2 = x)

On receiving this command, the camera will measure the exposure using the CdS sensor, and return the only raw data. Users can get calibrated data to use Send Data in EEPROM Command(22h).

18byte packet

Cds measured time (MSB) (4Byte)
Cds measured time
Cds measured time
Cds measured time (LSB)
Not used (14 bytes)

(unit : 2 sec)

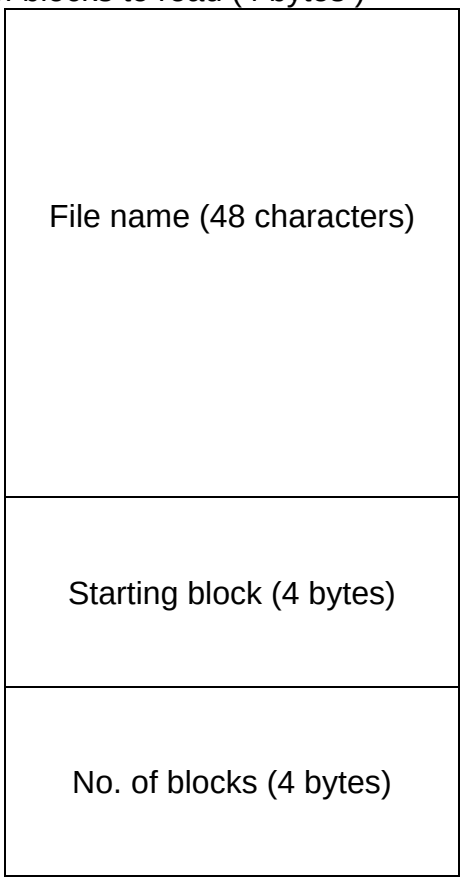
If an illegal combination of values are set in the argument field, the camera will return a command execution error (e2h) to the host.

5.1.36 Read Picture Information (91h, O)

Offset	Host command
0	91
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command is to read summary information of image files on the Compact Flash. This command is followed by a 60-byte packet which contains a file name under the root directory, offset block number from the file header and number of blocks as follows. The camera will send 258-byte packets for image file and program script file to the host.

- File name (Up to 48 characters)
- Offset block number (4 bytes)
- Number of blocks to read (4 bytes)



If "FFFFFFFF" is specified to all bytes in starting block and no. of blocks, the camera should read entire data in the file.

The image file will have the following file names from host computer viewpoint.

\PCCARD\DCIM\xxxDC280\file name Image file on the card

The content is guaranteed **only for DC280 Readable** files.

See 3.2 for Picture Information Table.

In the following cases, the camera will return a command execution error (e2h) to the host.

- Specified file does not exist on Compact Flash card.
- The card is not opened yet.
- Specified file is not a DC280 readable file.

5.1.37 Read Thumbnail Image (93h, O)

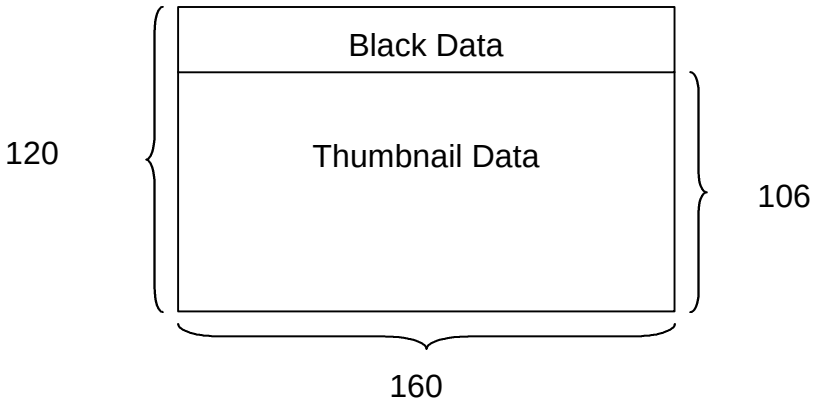
Offset	Host command
0	93
1	00
2	00
3	00
4	Format (0 : Small, 1 : Full Resolution, 2 : JPEG Compressed)
5	00
6	00
7	1A

This command is to read thumbnail image of image files on the Compact Flash card.

Note : **To use Format = 0 or 1, the image file should be DC200/210 camera generated. Check the Camera Type field of Picture Information.**

Note : To use Format = 2, the image file should be DC240/DC280 camera generated. Check the Camera Type field of Picture Information.

Note : The resolution of thumbnail created by DC280 is 160x120 which is specified by DCF specificaiton. But the aspect ratio of DC280 image is 3 by 2. So Black Data is set in the rows from 0th to 13th.

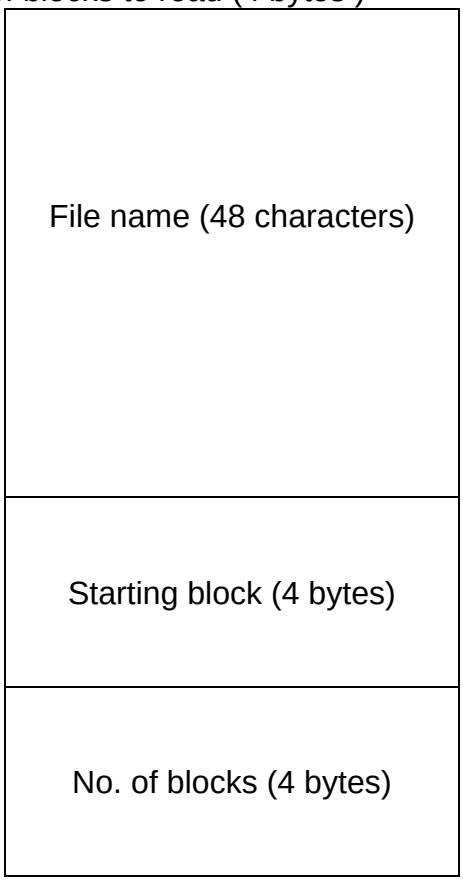


Format Format of Thumbnail Image.
0 : 96 x 72 x 4 bit = 3,456 bytes (Bayer Pattern CFA)
1 : 96 x 72 x 3 x 8 bit = 20,736 bytes
2 : JPEG compressed variable size.

Note : In case of JPEG compressed, the data is in EXIF format without any app field.

This command is followed by a 60-byte packet which contains a file name under the root directory, offset block number from the file header and number of blocks as follows.

- File name (Up to 48 characters)
- Offset block number (4 bytes)
- Number of blocks to read (4 bytes)



If "FFFFFFFF" is specified to all bytes in starting block and no. of blocks, the camera should read entire data in the file.

The image file will have the following file names from host computer viewpoint.

\PCCARD\DCIM\xxxDC280\file name Image file on the card

The camera will send HPBS-byte packets (see Set Host Packet Buffer Size (2Ah) command description)for image file to the host.

$G_{(1,1)}R_{(2,1)}$.....
$B_{(1,2)}G_{(2,2)}$.....
•
•
•
....$B_{(95,72)}G_{(96,72)}$

Thumbnail Image Format (Format = 0)

$RGB_{(1,1)}RGB_{(2,1)}$.....
$RGB_{(1,2)}RGB_{(2,2)}$.....
•
•
•
....$RGB_{(95,72)}RGB_{(96,72)}$

Thumbnail Image Format (Format = 1, 96 x 72)

In the following cases, the camera will return a command execution error (e2h) to the host.

- Compact Flash card is not opened.
- Specified file does not exist on Compact Flash card.
- Specified file is not a DC280 readable file.

5.1.38 Initialize Memory Card (95h, O)

Offset	Host command
0	95
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command is to format Compact Flash card. This command is followed by the 60-byte packet which includes a volume id for the card. The volume id consists of up to 11 characters. If null code is specified for the volume id, the card has no volume id. The camera will respond with a 18-byte packet which contains number of bytes available for the card if this command is executed correctly.

# of bytes available (4 bytes)

In the following cases, the camera will return a command execution error (e2h).

- Compact Flash card is not inserted in the camera.
- Card is not a compact flash card

5.1.39 Open Card (96h, O)

Offset	Host command
0	96
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command allows the camera to receive the following commands.

- Set Border File (3Fh)
- Read Picture Information (91h)
- Read Thumbnail Image (93h)
- Read File (9Ah)
- Write File (9Ch)
- Read Directory Information (99h)
- Set Protect(9Fh)
- Delete File (9Dh)

Note that "Get card status(98h)" command can be sent to the camera even if the Compact Flash card is not opened. An open command will be error if the card has already been opened.

Open status is kept even if the opened card is ejected. In this case, if a card is inserted to the camera again, the host should send a close command and then send this command again. If the camera goes to sleep mode, the host should send open command again.

5.1.40 Close Card (97h, O)

Offset	Host command
0	97
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command closes the Compact Flash card logically. Following Compact Flash commands can not be executed when the card is closed.

- Read Picture Information (91h)
- Read Thumbnail Image (93h)
- Read File (9Ah)
- Write File (9Ch)
- Read Directory Information (99h)
- Set Protect(9Fh)
- Delete File (9Dh)

A close command can be executed even if the card is not opened (nothing will be affected).

5.1.41 Get Card Status (98h, O)

Offset	Host command
0	98
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command gets the following card information. This command can be sent regardless of the card is opened or closed.

- Card status
- Number of bytes available

The camera will send the following data within a 18-byte packet.

Card status (1 byte)
Reserved (2 bytes)
# of bytes available (4 bytes)

Card status will be read from the camera status table.

5.1.42 Read Directory Information (99h, O)

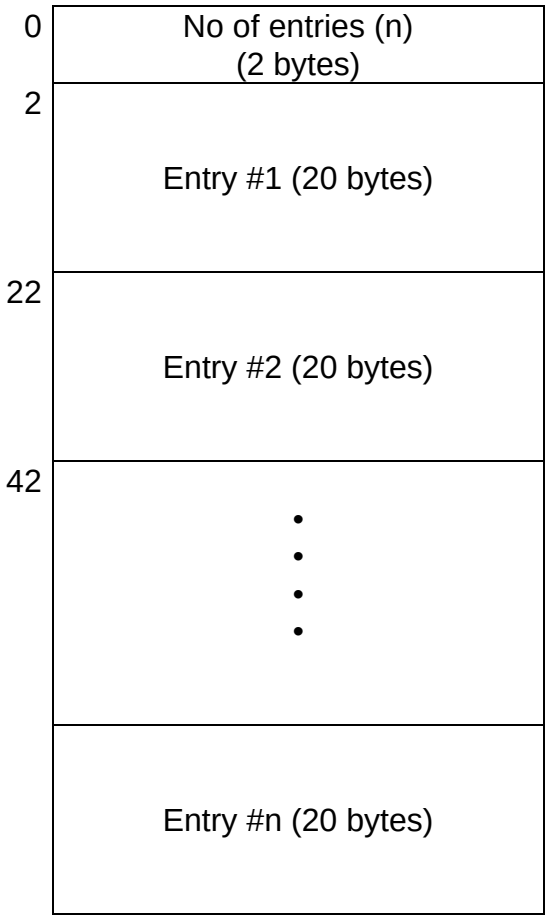
Offset	Host command
0	99
1	00
2	Entry Only
3	00
4	00
5	00
6	00
7	1A

This command is followed by a 60-byte packet that contains directory name with full path name. Wild card is available for this full path name.

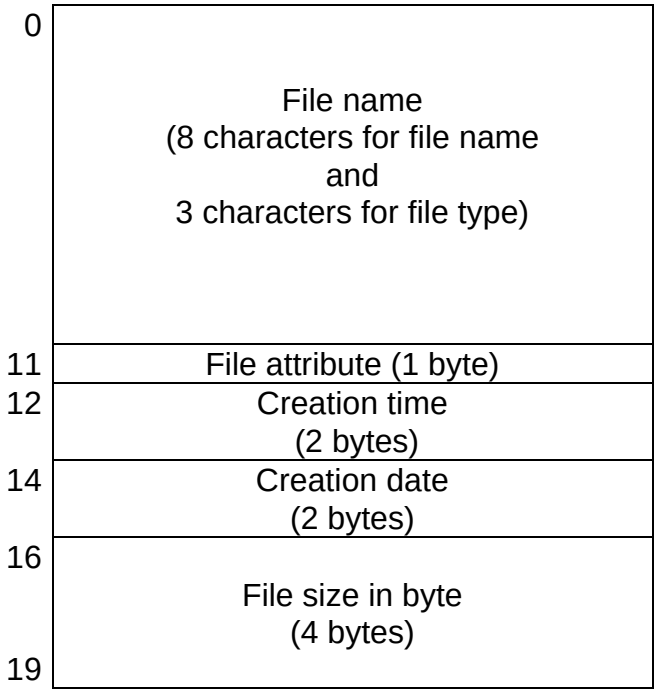
File name (48 characters)
Starting block (4 bytes)
No. of blocks (4 bytes)

The camera will send file information in 258-byte packet form for all entries of specified directory of the Compact Flash card in order of entry chain as follows.

Note : If Entry Only field is set to 1, the camera returns No. of Entries only, meaning the first two byte data is valid and the camera returns only one packet.



Each entry has the following information.



File attribute Bit (Specified in DOS)

bit 0 : Read-Only
bit 1 : Hidden file
bit 2 : System file.
bit 3 : Volume label.
bit 4 : Directory.
bit 5 : Archive bit
bit 6 : Reserved.
bit 7 : Reserved.

Creation time (Specified in DOS)

Bits 00h-04h : Binary number of 2-second increments (0-29, corresponding to 0-58 seconds)
Bits 05h-0Ah : Binary number of minutes (0-59)
Bits 0Bh-0Fh : Binary number of hours (0.23)

Creation date (Specified in DOS)

Bits 00h-04h : Day of mount (1-31)
Bits 05h-08h : Month (1-12)
Bits 09h-0Fh : Year (relative to 1980)

Note that a command execution error is returned from the camera when this command is sent to the camera if the card is not opened.

5.1.43 Read File (9Ah, O)

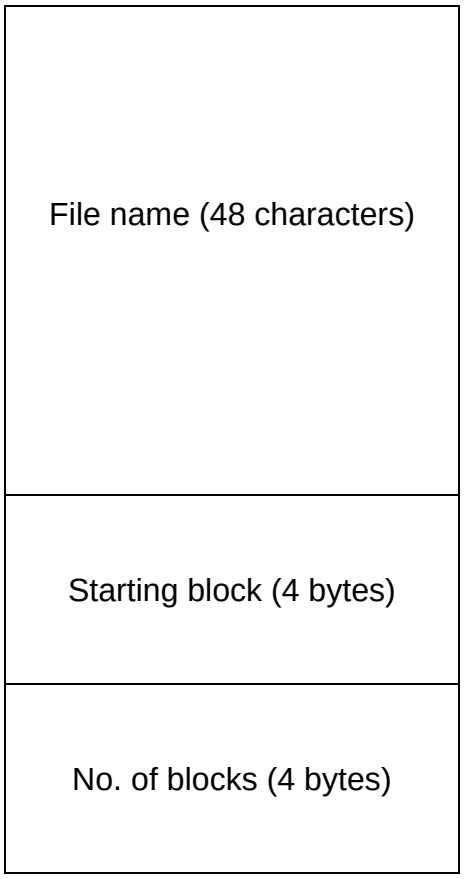
Offset	Host command
0	9A
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

Image files on the Compact Flash card can be read with this command. This command is followed by a 60-byte packet that contains a file name under the root directory, offset block number from the file header and number of blocks as follows. The camera will send HPBS-byte packets (see Set Host Packet Buffer Size (2Ah) command description)for image file to the host. If host stops receiving read file data, System Cancel code(0xe4) specified in 2.5.1 need to be send

- File name (Up to 48 characters)

NOTE: Do not input long file/directory name. The camera does not guarantee the result of the file operation.

- Offset block number (4 bytes)
- Number of blocks to read (4 bytes)



If "FFFFFFFF" is specified to all bytes in starting block and no. of blocks, the camera should read entire data in the file.

The file will have the following file names from host computer viewpoint.

\PCCARD\DCIM\xxxDC280\ file name	Image file in the card
\PCCARD\SYSTEM\BDR3X2\ file name	Border file in the card

Note that a command execution error (e2h) is returned from the camera when this command is sent to the camera if the card is not opened, or the camera can not find the specified file on the card.

5.1.44 Write File (9Ch, O)

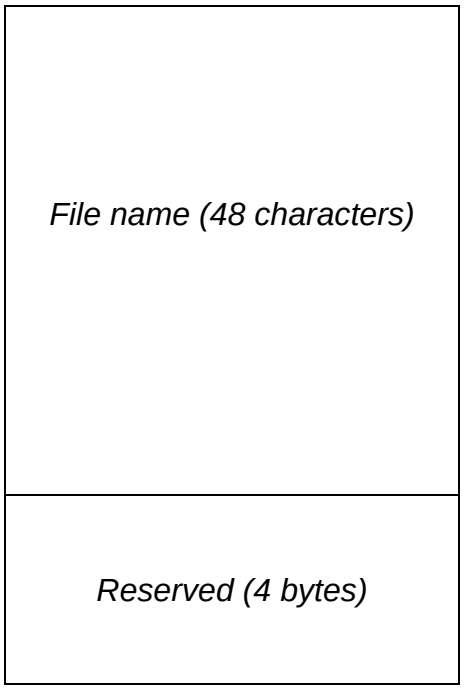
Offset	Host command
0	9C
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

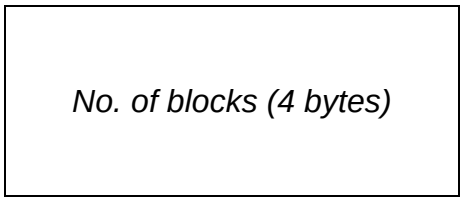
This command is intended **only to write border files**. This command is followed by a 60-byte packet described blow that contains a file name, start block and number of block to write, then HPBS-byte packet (See Set Host Packet Buffer Size (2Ah) command description) of the data will follow. If the folder in the File name doesn't exist, then Camera create the new folder and create the new file. If host stops sending write file data, Cancel byte (0xff) specified in 2.6 need to be set to Packet control byte.

- *File name (up to 48 characters)*

NOTE: Do not input long file/directory name. The camera does not guarantee the result of the file operation.

- *Reserved (should be zero, 4bytes)*
- *Size of the file to be written (4 bytes)*





The border file has the following file name from host computer viewpoint.

\PCCARD\SYSTEM\BDR3X2\ file name border file in the card

Note that a command execution error (e2h) is returned from the camera when this command is sent to the camera if the card is not opened.

5.1.45 Delete File (9Dh, O)

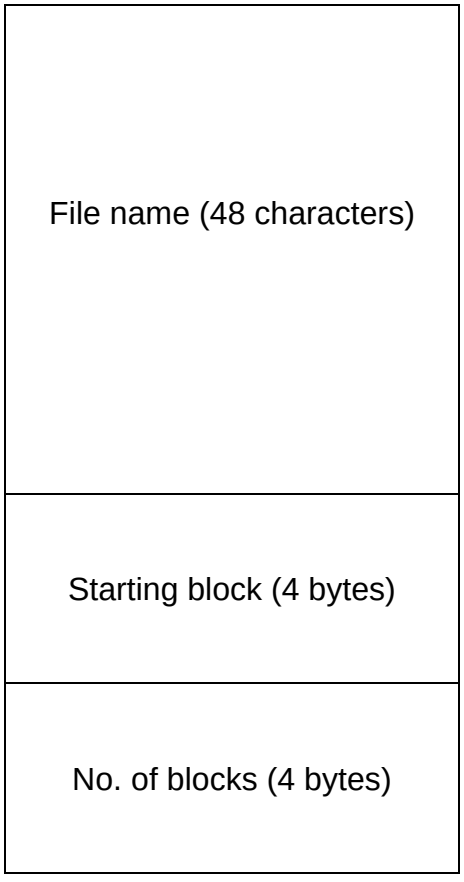
Offset	Host command
0	9D
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

Image files on the Compact Flash card can be erased with this command. This command is followed by a 60-byte packet that contains a file name under the root directory, offset block number from the file header and number of blocks as follows.

- File name (Up to 48 characters)

NOTE: Do not input long file/directory name. The camera does not guarantee the result of the file operation. And do not use some wild card string ('?','*').

- Offset block number (4 bytes)
- Number of blocks to read (4 bytes)



The file will have the following file names from host computer viewpoint.

\PCCARD\DCIM\xxxDC280\file name image file in the card
\PCCARD\SYSTEM\BDR3X2\ file name border file in the card

If host sends DC280 Native folder (\PCCARD\DCIM\xxxDC280) path string to camera, then camera will delete all files without protection in specified folder, and remove specified folder. And If host sends others folder path string, then camera also delete all files without protection in specified folder, but not remove the specified folder.

Note that a command execution error (e2h) is returned from the camera when this command is sent to the camera if the card is not opened, the specified file is protected, or the camera can not find the specified file on card.

5.1.46 Write Camera ID (9Eh, O)

Offset	Host command
0	9E
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command is followed by a 60-byte packet that contains a camera ID. The camera should re-write the camera ID in the EEPROM when a new camera ID is sent from the host.

5.1.47 Set Protect (9Fh, O)

Offset	Host command
0	9F
1	00
2	Protect Status
3	00
4	00
5	00
6	00
7	1A

The read only attribute of image files on the Compact Flash card can be set with this command.

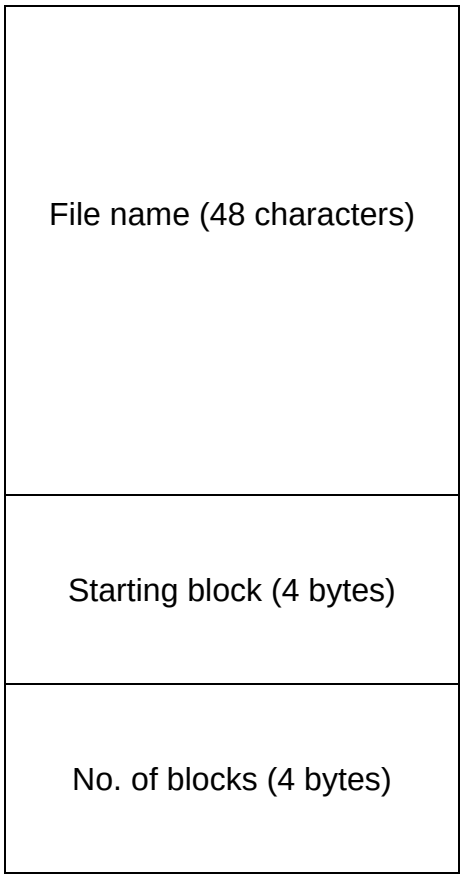
Protect Status 0 : not protected
1 : read only

This command is followed by a 60-byte packet that contains a file name under the root directory, offset block number from the file header and number of blocks as follows.

- File name (Up to 48 characters)

NOTE: Do not input long file/directory name. The camera does not guarantee the result of the file operation.

- Offset block number (4 bytes)
- Number of blocks to read (4 bytes)



The file will have the following file names from host computer viewpoint.

\PCCARD\DCIM\xxxDC280\file name image file in the card

Note that a command execution error (e2h) is returned from the camera when this command is sent to the camera if the card is not opened, or the camera can not find the specified file on card.

5.1.48 Completion of Download Mode (AEh, F)

Offset	Host command
0	AE
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command informs the camera that firmware download is finished. The camera will check whether the firmware is downloaded completely and respond a command completion code (00h) or a command execution error code (e2h) to the host. After this command, **the camera powers itself off**.

The camera will return NAK when it receives this command during USB communication.

APPENDIX 1

1. REFERENCES

[1] : “DC280 Engineering Requirements Specification”, Version 1.00

[2] : "DC280 User Interaction Specification" Version 1.02

[3] : JEIDA-49-1998 Digital Still Camera Image File Format Standard (Exchangeable image file format for Digital Still Camera : EXIF) Version 2.1

[4] : JEIDA—49-2-1998 DCF(Design rule for Camera File system) Version1.0

[5] : “EKJ Proposal for Digital Camera File Organization (Version 0.7)”

2. Difference from DC240

DC280 is same series camera as DC240. Therefore the architecture is almost same. Show the different point of Host Interface Spec from DC240 below to clarify DC280 spec.

2.1 ID

USB product ID and Serial P&P ID are changed. (See 2.4.2)

2.2 Cancel Protocol

Cancel Protocol is changed. (See 2.7.3.2)

2.3 Camera Status Table

Some new features are added to table. New features are shown below.

- QuickView Mode
- Power Save Mode
- Language Type
- ISO Mode

Some Parameters are changed. The changed parameters are shown below.

- Camera Type
- Picture Size

See 3.1.

2.4 Picture Information Table

ISO Mode is added to table. And some parameters are changed. The changed parameters are shown below.

- Camera Type
- Picture Size

See 3.2.

2.5 DCF Folder Name

The name of folder which images are stored is changed to “\DCIM\xxxDC280”.(See 4)

2.6 Border File Folder Name

The name of folder which border images are stored in is changed to “\SYSTEM\BDR3X2”.(See 4.2.3)

2.7 FW Download function with USB

Host can download the firmware data with USB. (See 2.3, 5.1.34.2)

2.8 Power Off Default Function

Host can set some camera default parameters when camera powers on. The parameters which host can set are described below.

Strobe Mode (5.1.23)
Exposure Compensation (5.1.32)
Auto White Balance Mode (5.1.11)
Effect Setting (5.1.15)
Border Setting 5.1.16)
Auto ISO (5.1.20)

2.9 New Commands

2.9.1 Set Camera Parameter (4Dh)

This command is to set the new feature parameters. The new feature is shown below.

Video Out
Quick View Mode
Beep Mode
Power Save Mode
Language Type
ISO Mode

See 5.1.20.

2.9.2 Asynchronous Take a Picture

Host can send some command during storing image. See 5.1.29.

2.9.3 Send Power Off Default Setting (50h)

This command is to get the current power off default setting in camera. See 5.1.22

2.10 Changed Parameters

2.10.1 Write Data to Flash Memory (1Dh)

Add the function to verify the flash memory data. See 5.1.2.

2.10.2 Erase Flash Memory

Add the function to flash the block specified by host. See 5.1.3.

2.10.3 Set Resolution (36h)

Resolution is changed from 640x480 to 896x592, and from 1280x960 to 1760x1168. See 5.1.9.

2.10.4 Set Zoom (78h)

The range of optical zoom is change to 100 – 200. See 5.1.27.

2.10.5 Check Camera Battery (7Eh)

Add the function which host can select overload types for battery check. See 5.1.30

2.10.6 Switch to ROM Mode (8Dh)

Changed the echo password data from DC240. See 5.1.34.

2.11 Changed Behavior

2.11.1 Send Last Reviewed Image Name

Camera return Null string if there is no image which camera recognized as Last Reviewed image. For example, Camera powers on in connect mode. See 5.1.18.

2.11.2 Send Last Taken Image Name

Camera return Null string if there is no image which camera recognized as Last Taken Image. For example, Camera still does not take a picture. See 5.1.19.

2.11.3 Check Camera Battery

Camera does not work battery check in “Take a Picture” process from Host. See 5.1.30.

3. Camera Settings[2]

Camera Setting	Factory Default	Power Off/On	Change mode	After exposure	Wake from Sleep
Hardware Controls					
Zoom	Wide angle	<-----	<-----	Maintained	Maintained
Digital Zoom	Off	<-----	<-----	Maintained	Maintained
Flash	Auto*	<-----* **	Maintained	Maintained	Maintained
Infinity	Off	<-----	Maintained	Maintained	Maintained
Close-Up	Off	<-----	Maintained	Maintained	Maintained
Self Timer	Off	<-----	<-----	<-----	<-----
Capture mode					
Preview	Off	<-----	Maintained	Maintained	Maintained
Exposure Compensation	0.0	<-----**	Maintained	Maintained	Maintained
Quality	Best	Maintained	Maintained	Maintained	Maintained
Resolution	High	Maintained	Maintained	Maintained	Maintained
QuickView	On	Maintained	Maintained	Maintained	Maintained
Date/Time stamp	Off	Maintained	Maintained	Maintained	Maintained
White Balance	Auto	Maintained**	Maintained	Maintained	Maintained
AE Mode	Multi pattern	Maintained	Maintained	Maintained	Maintained
Exposure lock mode	Off	<-----	Maintained	Maintained	Maintained
Borders	Off	Off**	Maintained	Maintained	Maintained
Effects	Off	Off**	Maintained	Maintained	Maintained

* The redeye state is saved at power off. If the flash was set to Auto, Fill, or Off at power off, the flash is set to Auto at power on. If the flash was set to Redeye at power off, the flash is set to Redeye at power on.

** depends on Power off default setting (section 7.5)

Camera Setting	Factory Default	Power Off/On	Change mode	After exposure	Wake from Sleep
Review mode					
Picture Information	Off	<-----	<-----	N/A	Maintained
Magnify mode	Off	<-----	<-----	N/A	Maintained
Protect mode	Off	<-----	<-----	N/A	Maintained
Delete mode	Off	<-----	<-----	N/A	Maintained
Print order	Off	<-----	<-----	N/A	Maintained
Slide show	Off	<-----	<-----	N/A	N/A
Camera Setting mode					
Beep	On (shutter release/warning only)	Maintained	Maintained	Maintained	Maintained
Video Out	NTSC	Maintained	Maintained	Maintained	Maintained
Power save mode	Off	Maintained	Maintained	Maintained	Maintained
Date/Time	1999/5/31; 12:00	Maintained	Maintained	Maintained	Maintained
Language	English (Note1)	Maintained	Maintained	Maintained	Maintained
About…	Off	<-----	<-----	<-----	<-----
Format memory card	Off	<-----	<-----	N/A	<-----

Note the system default means factory settings. The term “Maintained” means that selected feature of the icon is not changed.

Note1: If camera is Japanese fixed, then language type will not be changed even if camera receive reset camera command.