

# **DC50**

## **Digital Camera**

### **Version 1.0**

**HOST INTERFACE SPECIFICATION**

**November 17, 1995**

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**Digital Camera Products**

**Eastman Kodak Company**

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## **1. INTRODUCTION**

This document is the design specification of interface command of the DC50 digital camera. This document reflects the design required to meet the functionality requirements as specified in the ERS (Engineering Requirement Specification) and the Interaction Specification. This document addresses the software and firmware design of the DC50 digital camera only.

### **1.1. Purpose**

This document specifies the communications interface between a host computer and the DC50 digital camera. It includes all camera commands, data, and control flow between a host and the camera for designing the camera firmware and the host software.

### **1.2. Scope**

This document completely specifies the behavior of the product feature set and the concepts. Future changes to the design and/or future 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 the DC50 product. This document is also intended to assist future software/firmware developers involved in the support of this product.

## **2. OVERVIEW**

### **2.1. Camera Controls**

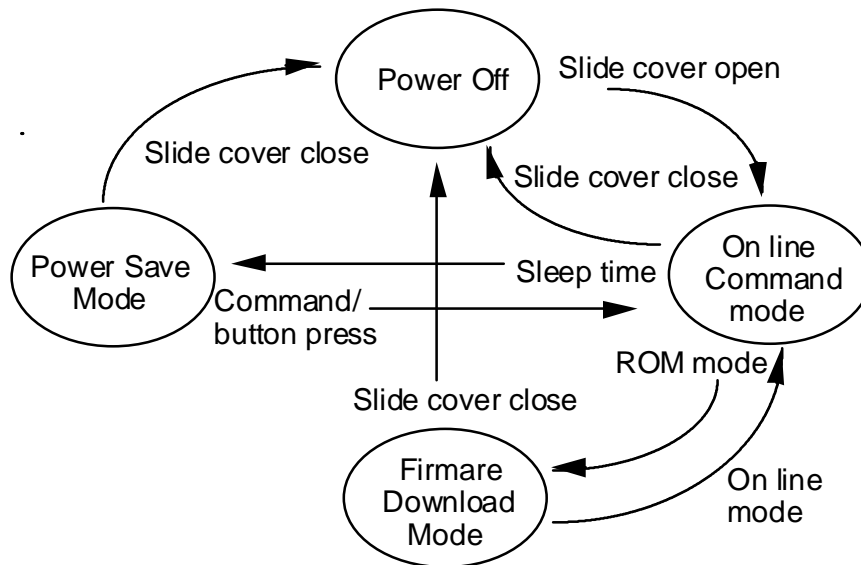
All functionality of the camera must be controlled by the host computer through the serial line when the camera is turned on. When the camera is turned off, the host computer should not be able to communicate with the camera. The camera will enter the power save mode if no command is sent for 60 seconds since it performed the last command. The camera should wake up when it receives an any command from the host or any button press. When the camera is connected with the host computer, the user can not operate the camera manually. Instead of displaying icons, three digits will be animating on the LCD panel.

### **2.2. Camera Mode**

The DC50 camera has three camera modes, the on-line mode, the firmware download mode, and the adjust mode when the camera is tethered use. When the camera is turned on, the camera will enter the on-line mode automatically. In this mode, the host computer can send on-line commands to control the camera. The adjust mode is reserved for use at the factory or the service center, and is not documented here. The host application program should not use any adjust commands. The firmware download mode is used for downloading the new firmware into the camera. Eleven commands can be used for downloading the firmware from the host. *There are two ways to switch the firmware download mode, a command or manual operation.* The "DC50 Interaction Specification" shows how to switch the firmware download mode *manually*.

*The following figure shows the transition of the camera status.*





*Note that the following states are affected by power save mode. Other settings are kept when the camera wakes up from the power save mode.*

*Preview image is erased.  
Opened card is canceled.*

## 2.3. Command Format

### 2.3.1. System Code

All system codes are 1 byte value and used for hand shaking between the camera and the host. There are 7 system codes as follows. The host should be able to know if the camera receives a command or a packet correctly or not by receiving these codes. Section 2.6 Serial Communication Flow Control will describe how these codes are used for the camera and the host to communicate and synchronize each other.

Code	Meanings
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

10h	Command ready
-----	---------------

#### Command completed

This code is sent just from the camera to the host when the camera has finished the sent command completely (without errors).

#### Command receive correctly (ACK)

This code is also sent from the camera when it receives a correct format of DC50 command from the host.

#### Correct packet

This code is used for both the camera and the host. If the checksum of the sent packet is correct, this code is sent.

#### Command received incorrectly (NAK)

This code is sent from the camera when it receives a invalid format of DC50 command from the host.

#### Command execution error

This code is sent from the camera to the host when the camera can not execute the sent command completely.

#### Illegal packet

This code is used for both the camera and the host. If the checksum error is occurred on the sent packet, this code is sent.

#### Cancel

This code is sent from just the host to specify the camera to cancel the command execution.

#### *Command ready*

*This code is sent to the host when the camera is ready to receive a command from the host after the power save mode.*

### 2.3.2. Interface Command

All 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 command 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.

## 2.4. Data

Most of data between the camera and the host are sent with packets. All data is sent with 8 bit, no parity bit, and 1 stop bit. Every packet contains a checksum byte in the bottom of the 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) contains a packet control byte at the top (first byte). There are several sizes of packet for input/output as follows.

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

1,025-byte	Image data only
513- byte	Data in the card
257-byte	Picture information, Camera color matrix, etc.
17-byte	Error status (Check condition code), card status, etc.

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

514-byte	Data for ATA card (program script)
257-byte	Firmware
60-byte	Command parameters

The following table shows required packet size for each on-line command. The unlisted commands does not need to send or receive any packets.

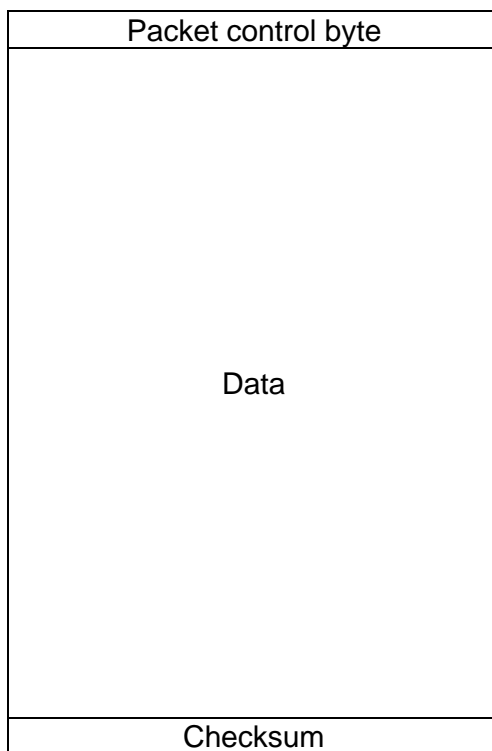
Section	Command	Packet size --> camera	Packet size --> host
4.1.2	Send data in EEPROM	-	257
4.1.4	Send picture in memory	-	1,025
4.1.5	Send picture information in memory	-	257
4.1.6	Send thumbnail picture in memory	-	1,025
4.1.7	Send picture in card	-	1,025
4.1.8	Send attribute data of card	-	513
4.1.10	Send TIFF/EP information in card	-	257
4.1.11	Send thumbnail picture in card	-	1,025
4.1.24	Send camera status table	-	257
4.1.30	Send camera color matrix data	-	257
4.1.31	Send compression table	-	257
4.1.36	Request sense	-	17
4.1.39	Initialize memory card	60	17
4.1.42	Get card status	-	17

4.1.43	Read directory	60	257
4.1.44	Read file	60	513
4.1.45	Write file information	60	-
4.1.46	Write file	60 / 514	-
4.1.47	Delete file	60	-
4.1.48	Write camera ID	60	-

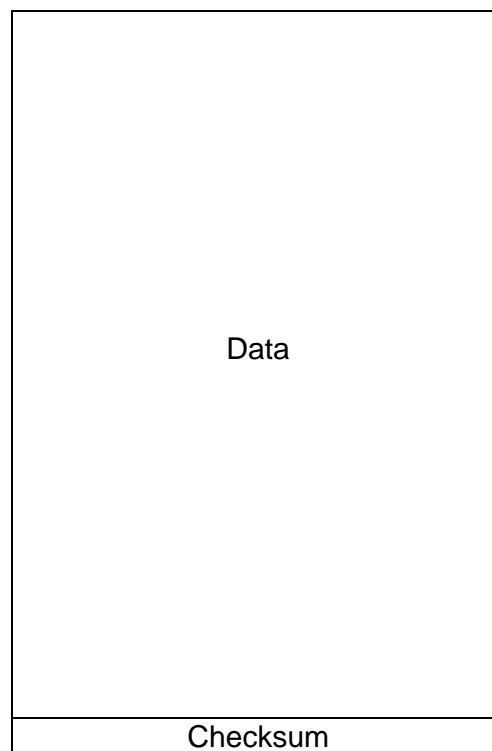
Special byte by byte transfer will be supported to shorten the image processing time for preview image on the SRAM. Serial communication protocol for the preview image will be described in section 2.6.5 "Preview Image Transfer".

The following shows layouts of packets.

Packet to the camera



Packet from the camera & Firmware



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.

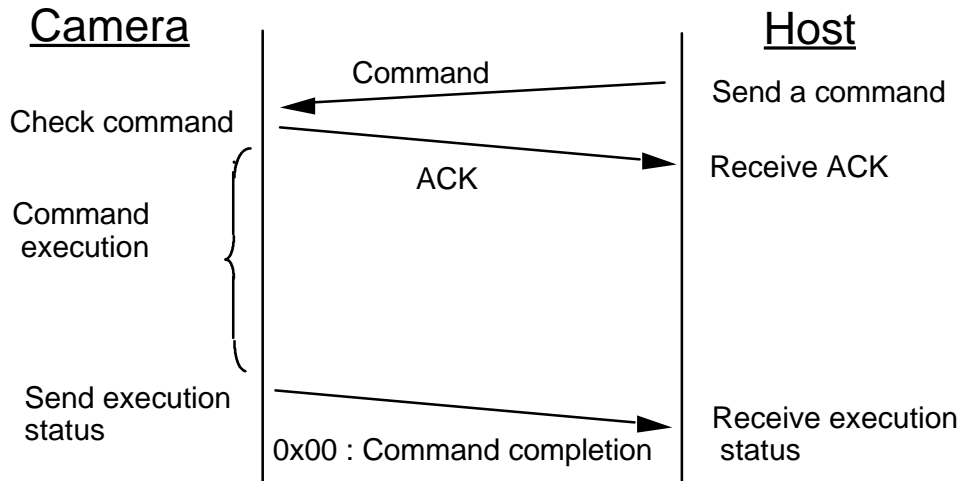
## 2.5. Break

The break signal causes the camera to reset the serial port regardless of the baud rate currently selected. The signal width should be more than 200 msec. This signal will be active when the host sets or the serial cable is plugged off. The baud rate of the serial communication is always set to 9,600 bps by this signal. *During the break signal is active, the camera is disconnected with the host, as a result icons will be displayed on the LCD.*

When the camera receives the Break On/Off

## 2.6. Serial Communication Flow Control

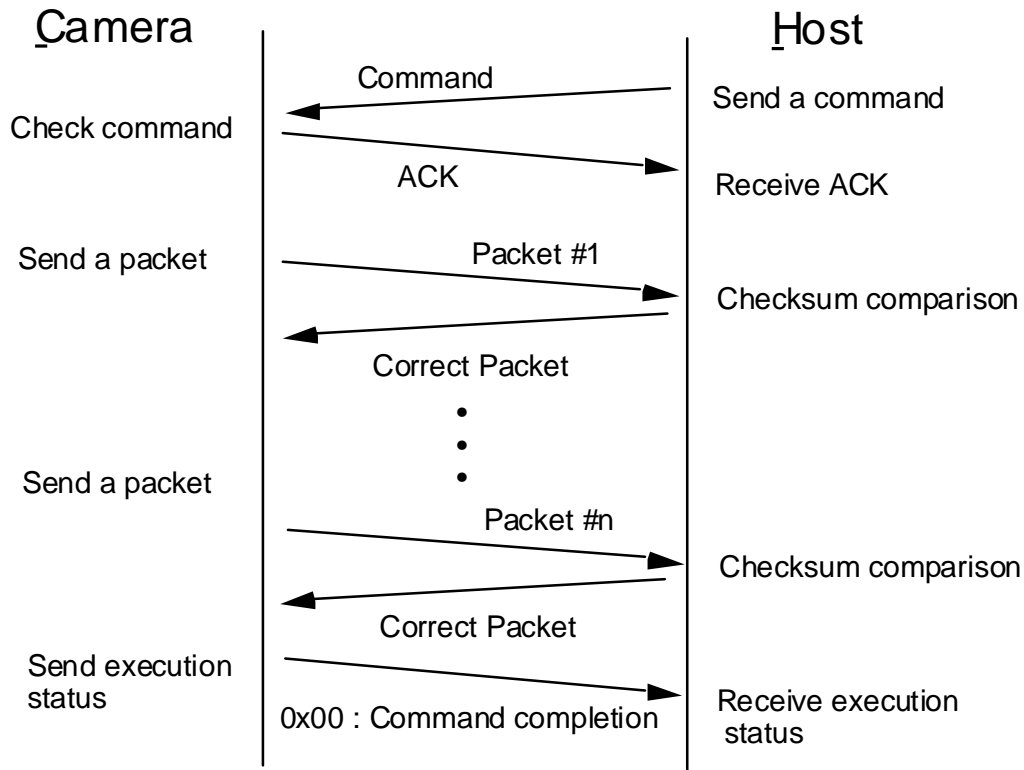
### 2.6.1. Command without Send/Receive Packet



### 2.6.2. Command for Receive Packet (from Camera)

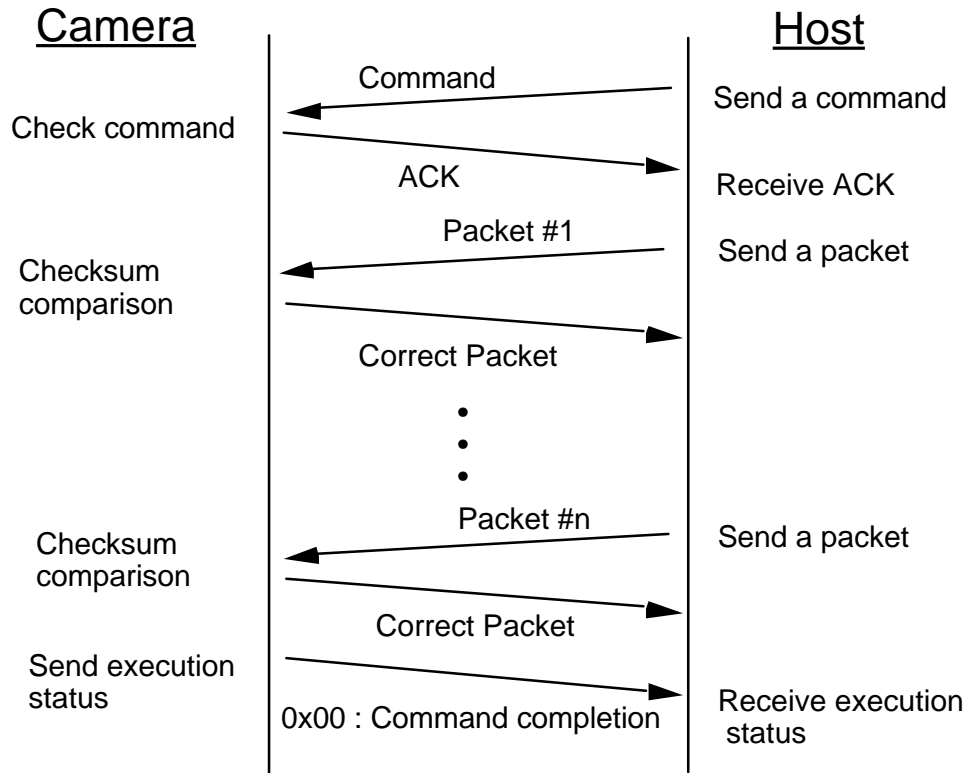
Some commands instruct the camera to send internal data in the camera or in the ATA

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.



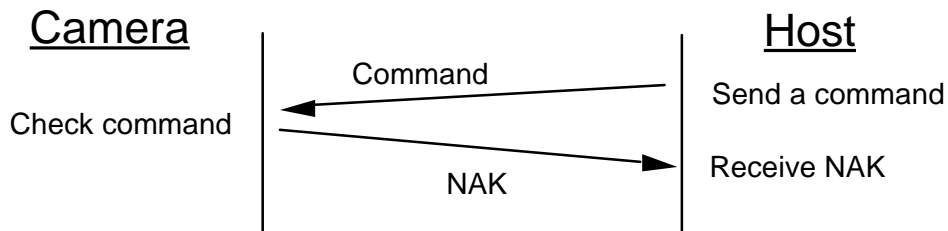
### 2.6.3. Command for Send Packet (to Camera)

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 2.4 ).



#### 2.6.4. Error Cases

##### (1) Illegal Command

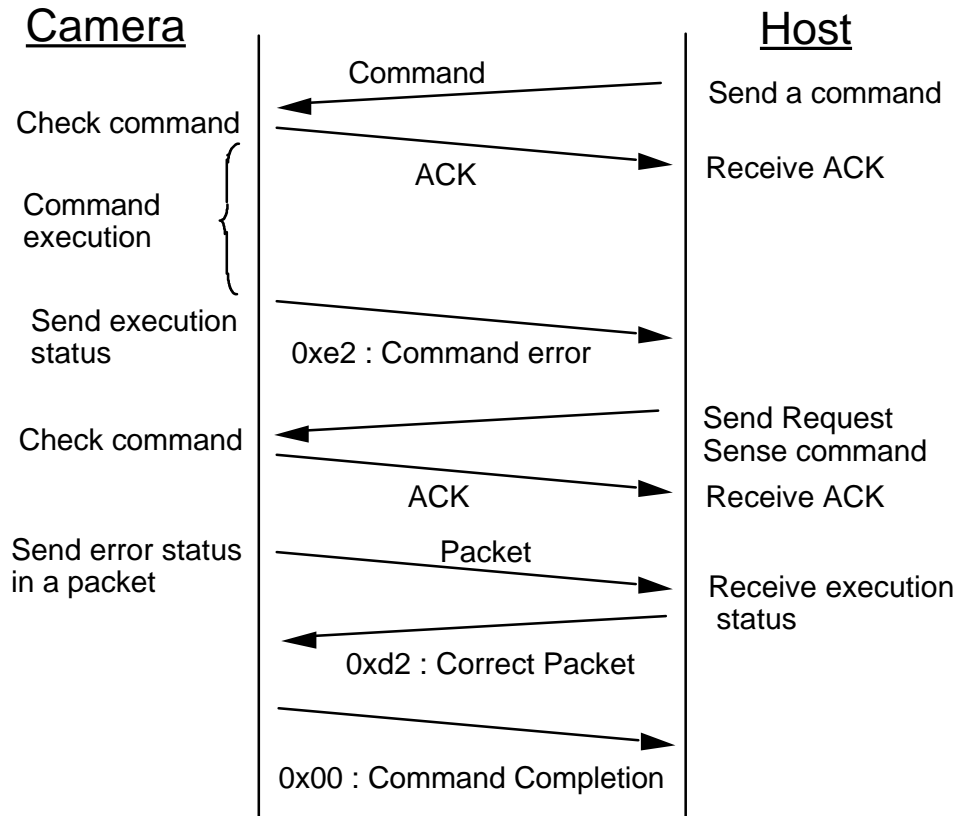


##### (2) Command Execution Error

The host can know what error is occurred when it receives a command error (e2h) from the host. To know the error status, the host should send a request sense command to the camera. When the camera receives this



command, it sends an error status table to the host as a packet. This table contains up to four error codes for a command. If a command is executed correctly except request sense command, this table will be filled with null codes.



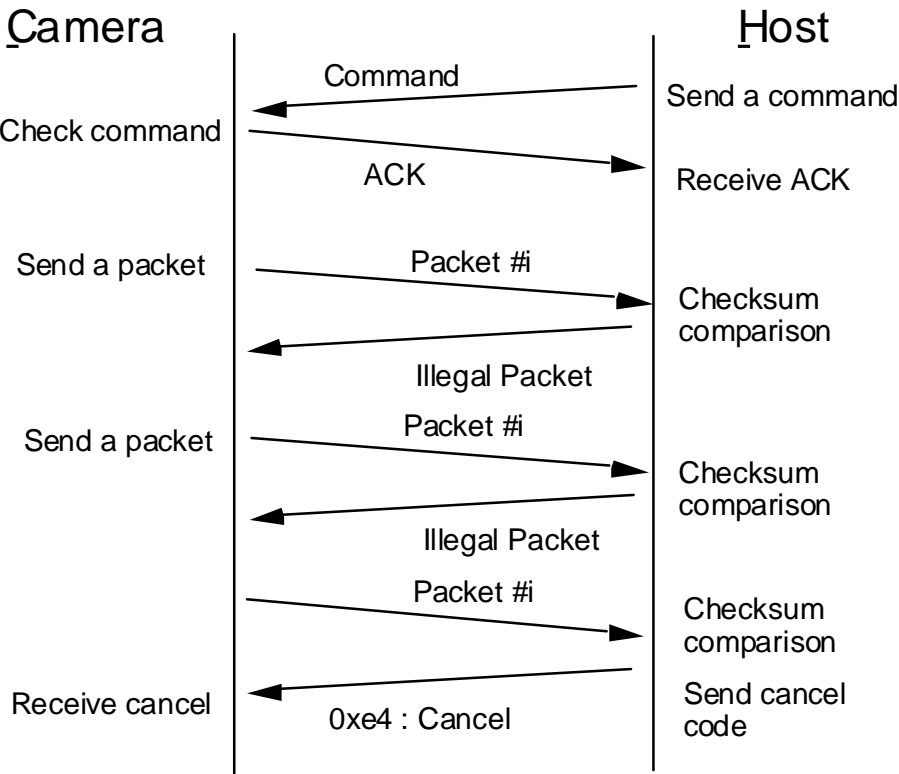
### (3) Packet Error

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.

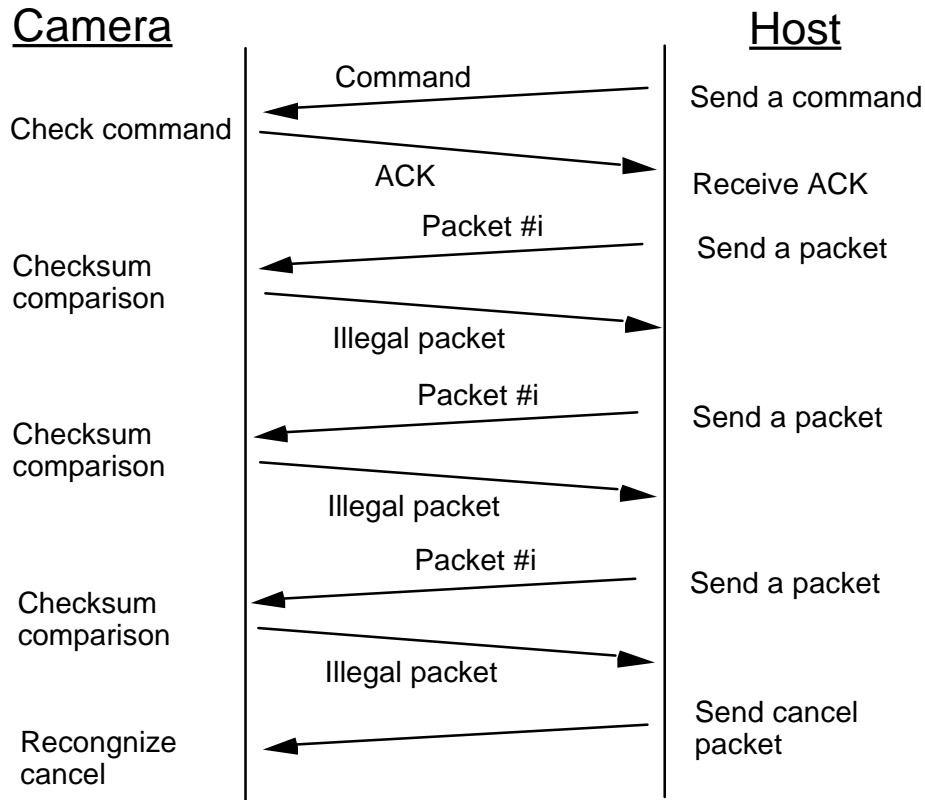
Only the host can decide to cancel the communication process when a packet communication error is not recovered.

If the camera receives a cancel code (e4h) or a cancel packet, it responds nothing to the host and will prepare for next command after canceling the current process.

Host --> Camera



Camera --> Host

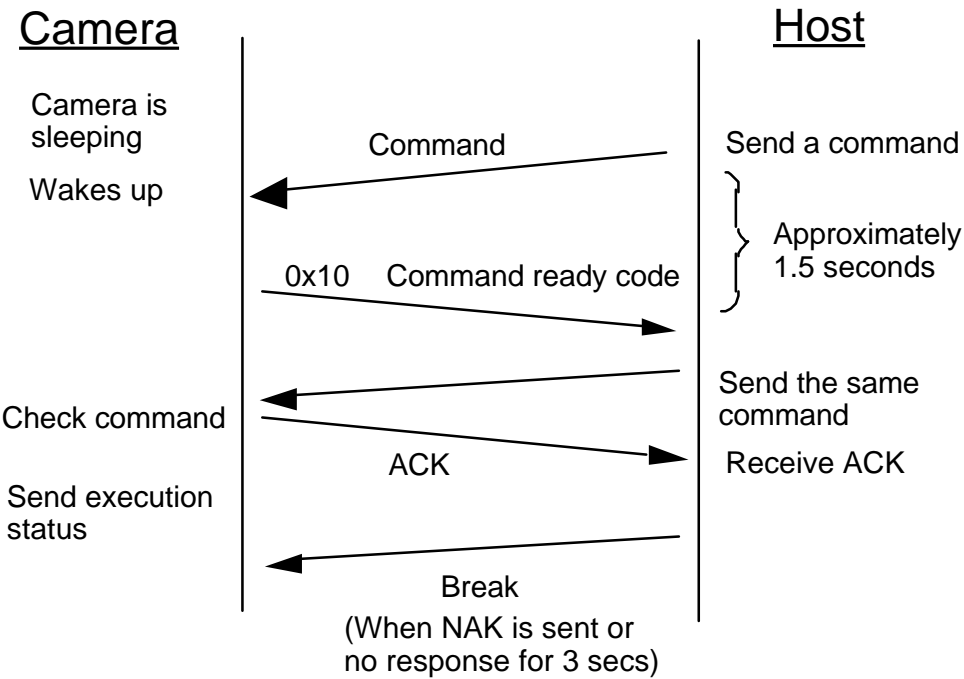


### 2.6.5. Camera is Sleeping

When the camera is in the power save mode, the first command from the host will just have the camera wake up. The host should send the same command again.

*Camera requires about 1.3 seconds to be ready. When the camera becomes ready to accept a command, the camera responds the command ready code (0x10).*

If the camera responds NAK or nothing for 3 seconds after the host sends the same command, the host should send break signal to the camera to reset the communication port.



### **3. DATA FORMAT**

#### **3.1. Camera Status Table**

Byte offset	Description
0	Data type (0x01 for camera status table)
1	Camera type (0x01 for DC50)
2	Firmware version (Integer part : 0 - 255)
3	Firmware version (two decimal places : 0 to 99)
4	ROM Version (Integer part : 0 - 255) for 16 bit
5	ROM Version (two decimal places : 0 to 99)
6	ROM Version for 4 bit (Integer part)
7	ROM Version for 4 bit (two decimal places)
8	Battery status ((0 : OK, 1 : Weak, 2 : Empty)
9	AC adapter flag (0 : No use, 1 : In use)
10	Sleep duration (60 - 255 seconds)
11	Reserved
12	Elapsed time (MSB)
13	Elapsed time
14	Elapsed time
15	Elapsed time (LSB)
16	Zoom position
17	<i>Manual exposure U/I inactive flag</i>
18	Reserved
19	I.Q. : Image quality (0 : Best, 1 : Better, 2 : Good)
20	Flash mode (0 : Auto, 1 : Fill-in, 2 : Off)
21	Exposure compensation value
22	LV value (measured light data)
23	Manual exposure (0 : Off, 1 : Manual)
24	Manual exposure time (MSB)
25	Manual exposure time
26	Manual exposure time
27	Manual exposure time (LSB)

28	Program Mode (0 : Normal, n: Program number)
29	Shutter delay mode (0 : Off, 1 : On)
30	Memory card status
31	Program status #1
32	Program status #2
33	Reserved
34	# of pictures taken in memory (MSB)
35	# of pictures taken in memory (LSB)
36	# of pictures taken at best I.Q. in memory (MSB)
37	# of pictures taken at best I.Q. in memory (LSB)
38	# of pictures taken at better I.Q. in memory (MSB)
39	# of pictures taken at better I.Q. in memory (LSB)
40	# of pictures taken at good I.Q. in memory (MSB)
41	# of pictures taken at good I.Q. in memory (LSB)
42	Remaining pictures at best I.Q. for memory (MSB)
43	Remaining pictures at best I.Q. for memory (LSB)
44	Remaining pictures at better I.Q. for memory (MSB)
45	Remaining pictures at better I.Q. for memory (LSB)
46	Remaining pictures at good I.Q. for memory (MSB)
47	Remaining pictures at good I.Q. for memory (LSB)
48	Reserved
49	Reserved
50	# of pictures taken in card (MSB)
51	# of pictures taken in card (LSB)
52	# of pictures taken at best I.Q. in card (MSB)
53	# of pictures taken at best I.Q. in card (LSB)
54	# of pictures taken at better I.Q. in card (MSB)
55	# of pictures taken at better I.Q. in card (LSB)
56	# of pictures taken at good I.Q. in card (MSB)
57	# of pictures taken at good I.Q. in card (LSB)
58	Remaining pictures at best I.Q. for card (MSB)
59	Remaining pictures at best I.Q. for card (LSB)
60	Remaining pictures at better I.Q. for card (MSB)
61	Remaining pictures at better I.Q. for card (LSB)

62	Remaining pictures at good I.Q. for card (MSB)
63	Remaining pictures at good I.Q. for card (LSB)
64	Reserved
65	Reserved
66	Reserved
67	Volume ID of the ATA Card  (11 characters)
78	
79	
80	Camera ID (32 byte ASCII characters)
111	
112	
	Reserved

Zoom position (Byte 16)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
------	-------	-------	-------	-------	-------	-------	-------	-------

16	N/A	AF mode	Zoom data (7 steps)
----	-----	---------	---------------------

AF mode :   00    Multi spot  
               01    Single spot  
               10    Close up

Zoom data  0 : 37 mm (35 mm equivalent)  
               1 : Approximately 46 mm (35 mm equivalent)  
               2 : Approximately 61 mm (35 mm equivalent)  
               3 : Approximately 77 mm (35 mm equivalent)  
               4 : Approximately 92 mm (35 mm equivalent)  
               5 : Approximately 100 mm (35 mm equivalent)  
               6 : 111 mm (35 mm equivalent)

*Note that if the close up is selected, 6 is set to the zoom data.*

Exposure compensation value (Byte 21)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20	Sign	Value						

Sign     0 : + (Plus value)  
           1 : - (Minus value)  
 Value :     The range of the value is 0 to 15

Manual exposure time (Byte 24 - 27)

32 bit value in 10 micro seconds increments specified by "Set manual exposure" command.

Memory card status (Byte 30)

Bit 7   1 : ATA Card is inserted  
           0 : ATA Card is not inserted  
 Bit 6   1 : Write protect switch is ON  
           0 : Write protect switch is OFF  
 Bit 5   1 : Illegal card is inserted  
           0 : Correct card is inserted  
 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 power save mode.

#### Program Status #1,#2 (Byte 31,32)

##### Byte 31

Bit 7 Program 1 status  
Bit 6 Program 2 status  
Bit 5 Program 3 status  
Bit 4 Program 4 status  
Bit 3 Program 5 status  
Bit 2 Program 6 status  
Bit 1 Program 7 status  
Bit 0 Program 8 status

##### Byte 32

Bit 7 Program 9 status  
Bit 6 Program 10 status  
Bit 5 Program 11 status  
Bit 4 Program 12 status  
Bit 3 Program 13 status  
Bit 2 Program 14 status  
Bit 1 Program 15 status  
Bit 0 Program 16 status

1 : Program exists in a memory card  
0 : Program does not exist in a card

#### Camera ID (Byte 80-111)

32-byte camera ID is defined in the EEPROM 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.

### 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 (0x01 for picture information)
1	Picture data type (0x01 for RADC)
2	Picture number (MSB)
3	Picture number (LSB)
4	Image quality (0 : Best, 1 : Better, 2 : Good)
5	Reserved
6	Reserved
7	Reserved
8	Data size (MSB)
9	Data size
10	Data size
11	Data size (LSB)
12	Elapsed time(MSB) *1
13	Elapsed time
14	Elapsed time
15	Elapsed time (LSB)
16	Flash flag (0 : Off, 1 : On)
17	Flash mode (0 : Auto, 1 : Fill-in, 2 : Off)
18	LV value (measured light data)
19	AF step
20	AF mode (0 : Multi, 1 : Single, 2 : Close-up)
21	Zoom step
22	Image incomplete flag (0 : OK, 1 : NG)
23	Reserved
24	EV data (Exposure control data)

25	AV data (Flash-matic data)
26	Reserved
27	Timer Mode (0: Off, 1 : On)
28	Exposure time (MSB) *2
29	Exposure time
30	Exposure time
31	Exposure time (LSB)
32	Reserved
33	Aperture (F-Number) value
34	Battery level (0: OK, 1: Weak, 2: Empty)
35	Manual exposure (0: Off, 1: On)
36	Program Mode (0: Off, n: program number)
37	Image name *3
38	
39	
40	
41	
42	
43	
44	
49	Reserved
50	Reserved
51	Reserved
254	Reserved
255	

\*1 Elapsed time in 0.5 seconds since 00:00 on 1/1/1994  
\*2 32 bit value in 10 microseconds increments

- \*3 Image name consists of 8 ASCII characters. This name will be leading 8 characters of file name of this image.

#### LV value (Byte 18)

LV value shows light value measured with Cds. The measured value is shown in 1 byte value from 0 to 54. Actual LV data is calculated as below.

$$\text{LV value} = 6.5 + 0.125 \times n \quad \text{where } n \text{ is content of LV value (0 to 54)}$$

The following shows the relationship between LV data and actual LV value.

LV data (hex)	Value (LV)	
0	6.5	
1	6.625	
.	.	0.125 increments
.	.	
53	16.875	
54	17.0	

#### AF step (Byte 19)

AF step shows the measured distance between the camera and the object. The relationship between AF step data and measured distance is shown below.

AF data (hex)	Distance (m)	
0-77	8.2	
78	6.7	
.	.	See appendix 3
.	.	
D9	0.7	
DA-FF	0.7	

#### EV value (Byte 24)

This value is used just for development. Application does not need this data.

#### AV value (Byte 25)

This value is used just for development. Application does not need this data.

3.3. Image Data

3.3.1. Data in Internal Memory

The image data in the camera memory consists of a 256 byte picture information, a 3072 byte compressed thumbnail image, and a compressed image. The image size of a compressed image is *fixed as below*. When the image data is sent to the host or stored in the ATA card, it will be converted to TIFF/EP format. All compressed images are displayed with 512(V) X 768(H) rectangle regardless of image quality.

Good image	37,632 bytes (0.72 bpp)
Better image	78,592 bytes (1.52 bpp)
Best image	127,744 bytes (2.43 bpp)

Each image in the internal flash memory can be read as a file. If the camera is defined d drive, following directory is assigned for flash memory.

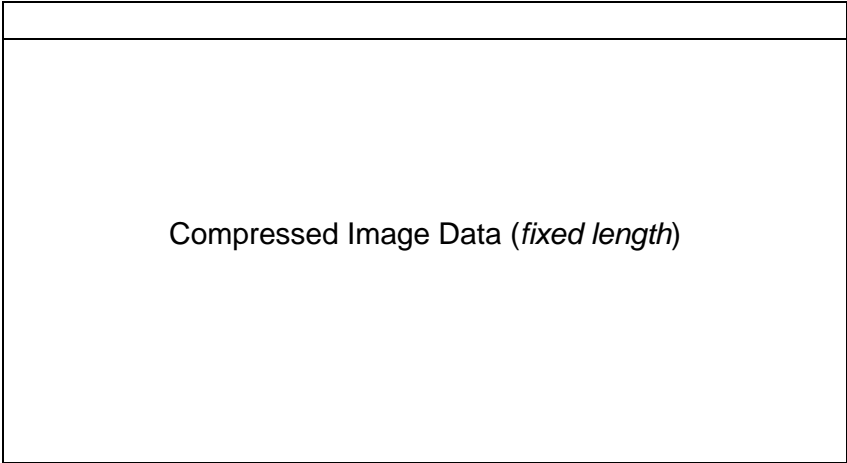
d:\MEMORY\image file name

File name

KDIInns.KDC		
where	nnn :	Image number that corresponds to the number on the LCD when captured
	s :	L specifies best image quality M specifies better image quality S specifies good image quality
	KDC :	File type

Image data format

Picture Information (256 bytes)
Compressed Thumbnail Image (3,072 bytes)



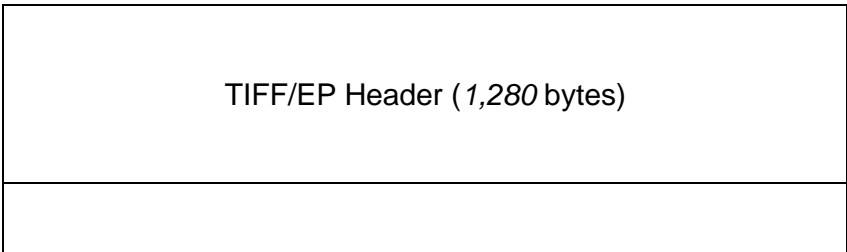
3.3.2. Image Data in ATA Card

The image data in a memory is stored in TIFF/EP format. The 1,280 byte TIFF/EP header that format is defined in the TIFF/EP specification contains pointers to compressed image data or thumbnail image data, a color matrix table, a compression table, etc. Then the compressed image data and uncompressed thumbnail image data follow. Each image data is stored as a DOS file in the ATA card with unique file name assigned automatically as follows. An image files will be stored under the root directory when a picture is captured.

KDnnnns.KDC

where	nnnn :	Image number that corresponds to the number on the LCD when captured
	s :	L specifies best image quality M specifies better image quality S specifies good image quality
	KDC :	File type

Image data format



Thumbnail Image Data(18,432 bytes) 96H x 64V x 3 (RGB)
Compressed Image Data (variable)

3.4. Camera Color Matrix Table

The camera matrix is used by the host software for image processing. The camera color matrix uses *four* bytes for the version number and 96 bytes for the matrix followed by one checksum byte. The matrix consists of 12 values (4 x 3) of eight bytes each, in row sequence.

Data format

Version number (4 bytes) (2 bytes for integer part and 2 bytes for fraction part)
Value 1 (8 bytes)
Value 2 (8 bytes)

Value 11 (8 bytes)
Value 12 (8 bytes)
Checksum

- Version number

A four bytes *ASCII characters* stands for the version number as follows.  
  
nn.mm (where the "." is implied)
- Value

A eight ASCII characters stands for five digits decimal number including sign as follows.  
  
 $[+/-] [N] [N] [N] [N] [N] \times 10^{\ [+/-] [M]}$   
  
Sign bytes indicate 1 for negative values and 0 for positive values. NNNNN is the value which is multiplied by  $10^{\ [M]}$  magnitude.

3.5.    **Compression Table**

The compression table is used by the host software to decompress the image data sent from the camera. There are three compression tables for each image quality. Each table has the same table length (174 bytes) and structure. The format of the compression table is defined as below. The version number is identical with the firmware version number.

Data format



Version number (2 bytes) (same as color matrix table)
Compression Table for Good Image Quality (174 bytes)
Compression Table for Better Image Quality (174 bytes)
Compression Table for Best Image Quality (174 bytes)

Following shows the layout of each compression table.

Compression Data Layout

Algorithm ID / Table ID (2 bytes)
Reserved (8 bytes)
Residual Values (41 bytes)

Residual Huffman Length (41 bytes)
Overhead Huffman Length (81 bytes)
Algorithm 3 bit/pixel (1 byte)

## 3.6. ATA Card

### 3.6.1. Organization of the ATA Card

The ATA card works as a storage device that supports simple DOS interface. ATA card has an attribute memory of 512 bytes in which BIOS parameters for the card are defined. The ATA card consists of 512-byte blocks. Like other DOS file systems, the ATA card has the root directory and directory files and files under it. These directories and files are full compatible with conventional DOS system. Up to 11 characters of volume ID can be defined for each ATA card. To save images and program scripts, the ATA card is assumed to have the following directories if the camera is defined as "d" device. *If the card does not have these directory, the firmware will write automatically when the card is inserted in the camera.*

d:\PCCARD\DC50IMG\	for image files
d:\PCCARD\DC50PROG\	program script files

### 3.6.2. Program Script

The program script will be created as a script file with a special editor on the host computer. The script files have the following file convention and should be stored under the specific directory. To access the script files, the caller always need to specify its full file name including the path name. There is no limitation in size of a script file.

\PCCARD\DC50PROG\scriptFileName (see below)

DC50PROG.NNN

where

XX :

Two digits number

NNN :

Script number (001 - 016)

### 3.7. Error Code

One-byte error code is stored in the error status table. Up to four error codes for a command can be stored in the table. This table will be *initialized with null codes* when a command *except for* the "Request Sense" is executed correctly. The contents of the table will be read by "Request Sense" command. The following shows the layout of this error status table.

<i>Error code or Null code</i>
<i>Error code or Null code</i>
<i>Error code or Null code</i>
<i>Error code or Null code</i>

*The error codes will be stored from the top of this table. If a command produces two errors, error codes will be stored in the first and the second byte in this table. This table is sent with a 17-byte packet to the host.*

Appendix 4 lists all error codes .

## 4. COMMANDS

The following lists the commands that are recognized by the camera. If the camera receives a command that is not listed in this table, the camera will assume an error and will respond 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.

- Image is storing in the flash memory
- Camera is accessing the ATA card
- Camera is executing a program
- Camera is in power save mode
- Camera is erasing images
- Camera is copying images

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.

Code	Description	Mode
21	Write word data to EEPROM	O/F
22	Send data in EEPROM	O/F
41	Set baud rate	O/F
51	Send picture in memory	O
55	Send picture information in memory	O
56	Send thumbnail picture in memory	O
61	Send picture in card	O
62	Send attribute data of card ( <i>not supported</i> )	O
63	Write word data to attribute data of card ( <i>not supported</i> )	O
65	Send TIFF/EP information in card	O
66	Send thumbnail picture in card	O
71	Set image quality	O
72	Set flash mode	O
73	Set focus mode	O
74	Set shutter delay	O
75	Set time	O
76	Card copy	O
77	Take a picture to flash memory	O
78	Zoom	O
7A	Erase all images in flash memory	O

7B	Erase all images in memory card	O
7C	Take a picture to card	O
7E	Check camera battery	O
7F	Send camera color status table	O
	Enter on-line adjust mode	O
8A	Reset	O
80	Set exposure compensation	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
87	Store preview image in memory	O
88	Store preview image in card	O
89	Erase preview image	O
86	Request sense	O/F
90	Set program mode	O
94	Wait ( <i>not supported</i> )	O
95	Initialize memory card	O
96	Open card	O
97	Close card	O
98	Get card status	O
99	Read directory information	O
9A	Read file	O
9B	Write file information	O
9C	Write file	O
9D	Delete file	O
9E	Write camera ID	O
8B	Set exposure mode	O
8C	Execute program ( <i>not supported</i> )	O
8D	Switch to ROM mode	O
13	Send data in flash memory	F
1D	Write data to flash memory	F
1E	Erase flash memory	F
31	Write 256 byte data	F
32	Read 256 byte data	F
3D	Execute program	F
AE	Completion of download mode	F

## 4.1. On-line Command

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.

### 4.1.1. Write Word Data to EEPROM

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.

### 4.1.2. Send Data in EEPROM

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" 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.

#### 4.1.3.      Set Baud Rate

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	2nd byte	3rd byte
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

230.4 k	23	04
---------	----	----

This command changes the current baud rate of the serial communication line. The default (factory setting) baud rate of the camera is 9,600 bps (bit per second). *When the camera receives the break on/off signal, baud rate is changed to 9,600 bps. The current baud rate is not affected by camera turn off or camera sleep.*

If this command is executed correctly, the camera will respond just an ACK.

**Note:** The camera will not respond a command completion code for this command like other commands. The camera will return just an ACK for this command. *The camera requires at least 20 msec to changes the baud rate after sending an ACK. The host should consider this time before sending next command.*

#### 4.1.4. Send Picture in Memory

Offset	Host command
0	51
1	00
2	Picture No. (Upper)
3	Picture No. (Lower)
4	00
5	00
6	00
7	1A

This command sends a compressed picture data in the flash memory to the host with 1,025-byte packets..

*Picture No.* The number of a picture to be sent to the host in the flash memory. This number starts with 1 for the first picture.

If specified picture number exceeds the maximum picture number in the flash memory, the camera will return a command execution error (e2h).

#### 4.1.5. Send Picture Information in Memory

Offset	Host command
0	55



1	00
2	Picture No. (Upper)
3	Picture No. (Lower)
4	00
5	00
6	00
7	1A

This command sends the picture information table (see section 3.2) of a specified picture in the flash memory to the host.

*Picture No.* The picture number of the picture information to be sent to the host in the flash memory. This number starts with 1 for the first picture.

If specified picture number exceeds the maximum picture number in the flash memory, the camera will return a command execution error (e2h).

#### 4.1.6. Send Thumbnail Picture in Memory

Offset	Host command
0	56
1	00
2	Picture No. (Upper)
3	Picture No. (Lower)
4	00
5	00
6	00
7	1A

This command sends a thumbnail picture in the flash memory to the host.

*Picture No.* The picture number of a thumbnail picture to be sent to the host in the flash memory. This number starts with 1 for the first picture.

If specified picture number exceeds the maximum picture number in the flash memory, the camera will return a command execution error (e2h).

**4.1.7. Send Picture in Card**

Offset	Host command
0	61
1	00
2	Picture No. (Upper)
3	Picture No. (Lower)
4	00
5	00
6	00
7	1A

This command sends a compressed picture data in a memory card to the host.

*Picture No.* The number of a picture to be sent to the host in a memory card. This number starts with 1 for the first picture.

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

Memory card is not inserted in the camera.  
Specified picture number exceeds the maximum picture number in a memory card.

**4.1.8. Send Attribute Data of Card (not supported)**

Offset	Host command
0	62
1	00
2	Attribute memory start address (Upper)
3	Attribute memory start address (Lower)
4	Attribute memory end address (Upper)
5	Attribute memory end address (Lower)
6	00
7	1A

This command sends the attribute data (type, capacity, etc.) of a memory card to the host.

*Attribute memory start address* Start address of data area to be sent.

*Attribute memory end address* End address of data area to be sent.

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

Memory card is not inserted in the camera.

The start address exceeds the maximum memory address of the card.

The end address is equal or less than the start address.

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

#### 4.1.9. Write Word Data to Attribute Data of Card (not supported)

Offset	Host command
0	63
1	00
2	Attribute memory address (Upper)
3	Attribute memory address (Lower)
4	Data to write (Upper)
5	Data to write (Lower)
6	00
7	1A

This command specifies to write a word data to specified address of a memory card.

*Attribute memory address* Memory address of a card to be written word data.

*Data to write* 16 bit data to written to a memory card.

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

Memory card is not inserted in the camera.

The memory address exceeds the maximum memory address of the card.

**Note:** This command should be used for firmware debugging only. Otherwise, the

host program should not use this command.

#### 4.1.10. Send TIFF/EP Information in Card

Offset	Host command
0	65
1	00
2	Picture No.(Upper)
3	Picture No.(Lower)
4	00
5	00
6	00
7	1A

This command sends the picture information table (see section 3.2) of a specified picture in a memory card to the host.

*Picture No.* The picture number of the picture information to be sent to the host in a memory card. This number starts with 1 for the first picture.

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

Memory card is not inserted in the camera.  
Specified picture number exceeds the maximum picture number in a memory card.

**Note:** The picture information table is composed from the TIFF/EP header information. Some information for the picture information table are not defined in the TIFF/EP header. The value of zero will be written in the table instead of those undefined information.

#### 4.1.11. Send Thumbnail Picture in Card

Offset	Host command
0	66
1	00
2	Picture No.(Upper)

3	Picture No.(Lower)
4	00
5	00
6	00
7	1A

This command indicates the camera to send a thumbnail picture in a memory card to the host. The thumbnail image is compressed before sending to the host.

*Picture No.* The picture number of a thumbnail picture to be sent to the host in a card. This number starts with 1 for the first picture.

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

Memory card is not inserted in the camera.  
Specified picture number exceeds the maximum picture number in a memory card.

#### 4.1.12. Set Image Quality

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* 00 : Best image  
01 : Better image  
02 : Good image

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

**4.1.13. Set Flash Mode**

Offset	Host command
0	72
1	00
2	Flash Mode
3	00
4	00
5	00
6	00
7	1A

This command sets the current flash mode.

*Flash Mode*      00 : Auto flash  
                    01 : Fill-in (flash on)  
                    02 : Flash off

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

**4.1.14. Set Focus Mode**

Offset	Host command
0	73
1	00
2	Focus Mode
3	00
4	00
5	00
6	00
7	1A

This command sets the current focus mode.

*Focus Mode*      00 : Auto focus with multi-spot  
                    01 : Auto focus with single spot  
                    02 : Close up

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

#### 4.1.15. Set Shutter Delay

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.

**Flash Mode**      00 : Shutter delay is disabled (off)  
                         01 : Shutter delay is enabled (on)

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

#### 4.1.16. Set Time

Offset	Host command
0	75
1	00
2	Time data 0 (MSB)
3	Time data 1
4	Time data 2
5	Time data 3 (LSB)
6	00
7	1A

This command sets the time and date to the camera.

Time data (4 bytes value)      Elapsed time in 0.5 seconds since 00:00 on  
January 1, 1994.

**4.1.17. Card Copy**

Offset	Host command
0	76
1	00
2	Picture No. (Upper)
3	Picture No. (Lower)
4	00
5	00
6	00
7	1A

This command copies a specified image in the flash memory to a memory card. In the following cases, the camera will return a command execution error (e2h) to the host.

Memory card is not inserted in the camera.  
No images exist in the flash memory.  
Memory card becomes full.

**4.1.18. Take a Picture to Flash Memory**

Offset	Host command
0	77
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command specifies to take a picture to save that image in the flash memory. If the flash memory has no spaces to save the image, the camera will return a command execution error (e2h).

Note that if a non ATA memory card is inserted into the camera, this command will be canceled to avoid the card will be destroyed due to high voltage for the card may be supplied.



**4.1.19. Zoom**

Offset	Host command
0	78
1	00
2	Zoom value (7 steps)
3	00
4	00
5	00
6	00
7	1A

This command specifies to set the zoom position. The camera will respond a command execution error if close-up is specified by the "set focus mode" command.

*Zoom value*      0 : 37 mm (35 mm equivalent)  
                          1 : Approximately 46 mm (35 mm equivalent)  
                          2 : Approximately 61 mm (35 mm equivalent)  
                          3 : Approximately 77 mm (35 mm equivalent)  
                          4 : Approximately 92 mm (35 mm equivalent)  
                          5 : Approximately 100 mm (35 mm equivalent)  
                          6 : 111 mm (35 mm equivalent)

Note: When a picture is taken with close up, value 6 will be set to the picture information.

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

An illegal value is set in the zoom value field.

**4.1.20. Erase All Images in Flash Memory**

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

7	1A
---	----

This command specifies to erase all images in the flash memory. If no images exist in the flash memory, the camera will return a command execution error (e2h) to the host.

#### 4.1.21. Erase All Images in Memory Card

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

This command specifies to erase all images in a memory card. This command is executed even if no images exist in a memory card. In the following cases, the camera will return a command execution error (e2h).

Memory card is not inserted in the camera.  
Memory card is protected.

#### 4.1.22. Take a Picture to Card

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

This command specifies to take a picture to save that image in a memory card. In the following cases, the camera will return a command execution error (e2h).

Memory card is already full.

Memory card is not inserted in the camera.  
Memory card is protected.

#### 4.1.23. Check Camera Battery

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

This command checks the battery level of the camera. The result will be written in the camera status. The host program should read the written value from the camera status.

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 state.  
Just before a pictured is taken by shutter press.

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

#### 4.1.24. Send Camera Status Table

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.

#### 4.1.25. Enter On-line Adjust Mode

This command is reserved for factory use.

#### 4.1.26. Reset Camera

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

This command specifies the camera to reset the following settings.

Sleep time	60 seconds
Focus mode	Auto with 3 spots
Exposure mode	Auto with no offset
Flash	Auto
Timer	Off
Preview image	Will be canceled
Program mode	Will be canceled
Program number	The smallest number will be selected
Exposure time for manual mode	3,300 (default value)
Zoom value	0 (37 mm)

*Except for the above settings, this command reset the preview mode.*

*Note that the manual exposure user interface inactive flag is not affected by this command.*

#### 4.1.27. Set Exposure Compensation

Offset	Host command
0	80
1	00
2	Exposure compensation value
3	00
4	00
5	00
6	00
7	1A

This command sets an exposure compensation value against the measured EV value electrically. The camera will capture an image with specified compensate electric value. For DC50 camera, the range of EV value is from 6.5 EV to 18.5 EV roughly. 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 -7.5 to +7.5.

#### Exposure compensation value

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Sign	Value (0.5 EV. step)						

Sign 0 : Positive value  
1 : Negative value

Value 0 (no compensation) to 15. If the calculated EV value (measured value + compensation value) exceeds the effective EV range, the camera does not assure the image quality.

Examples Sign = 0, value = 0 stands for Auto exposure  
Sign = 0, value = 2 stands for Auto exposure + 1.0 E.V.  
Sign = 1, value = 1 stands for Auto exposure - 0.5 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.

#### 4.1.28. Set Manual Exposure

Offset	Host command
0	81
1	00

2	Exposure time 0 (MSB)
3	Exposure time 1
4	Exposure time 2
5	Exposure time 3 (LSB)
6	00
7	1A

This command sets an exposure control value to the camera. The camera will capture images with specified exposure time if manual exposure mode is specified by the "Set Exposure Mode" command. The aperture value depends on the exposure time automatically for DC50 camera. For example, if 1/250 sec. is specified, a picture will be taken with f11 when the maximum tele is used. (Please refer to the program chart in DC50 ERS). The camera will take pictures with the lightest aperture value if longer exposure time than about 1/100 sec is specified.

*Exposure time*                      32 bit values in 10 microsecond increments. The shortest allowable setting is 570 (~1/175 sec.). The longest allowable is 2,000,000 (20 sec.).

Factory default values are 3300 (~1/30 sec.) for exposure time.

*The camera user interface to select the manual exposure icon is disabled if FFFFFFFF is specified to the exposure time. FF is set to the manual exposure U/I inactive flag in the camera status table (byte 17). This flag is reset to 0 when a correct exposure time is specified. FFFFFFFF is applied just for user interface and the existence exposure time is not changed with this specification. Manual exposure U/I inactive flag is ignored when manual mode is specified with the Set exposure command.*

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

#### 4.1.29. Set Sleep Time

Offset	Host command
0	82
1	00
2	Sleep time
3	00
4	00
5	00
6	00

7	1A
---	----

This command sets the time-out value for sleep.

*Time out value* 60 - 255 (in second)

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

#### 4.1.30. Send Camera Color Matrix Data

Offset	Host command
0	83
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command sends the camera matrix data (see section 3.4) in the camera to the host.

#### 4.1.31. Send Compression Table

Offset	Host command
0	84
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command sends the compression table (see section 3.5) in the camera to the host.

**4.1.32. Take and Send Preview Image**

Offset	Host command
0	85
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command specifies the camera to take a picture and send the image data in the frame memory (SRAM) to the host with G-Compression. The compressed data is transferred with 1,025-byte packets. The limitation of the compressed preview image size is 34,816 bytes. The camera sends actual compressed image data and if its data size is less than 34,816 bytes, the camera will send a dummy data (0x00) until 34,816-byte data is sent. The preview image will be erased in the following cases.

- The camera is turned off
- The camera enters power save status
- Reset command is executed
- Store preview image in memory command is executed
- Store preview image in card command is executed
- Erase preview image command is executed
- Serial communication is canceled during preview image transfer*

This command should be followed by one of the following commands.

- Reset command
- Store preview image in memory
- Store preview image in card
- Erase preview image
- Set baud rate*
- Send camera status table*

If an other command is specified, the camera will respond a command execution error.

**4.1.33. Store Preview Image in Memory**



Offset	Host command
0	87
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command stores the preview image in the SRAM to the internal flash memory. As a result, the same image taken by the "take a picture to flash memory" command will be stored in the internal flash memory. The preview image in the SRAM will be erased if this command is executed correctly. If the flash memory is already full, this command will be a command execution error.

#### 4.1.34. Store Preview Image in Card

Offset	Host command
0	88
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command stores the preview image in the SRAM to the ATA card in TIFF/EP format. As a result, the same image taken by the "take a picture to card" command will be stored in the ATA card. The preview image in the SRAM will be erased if this command is executed correctly. If the memory card is already full, this command will be a command execution error.

#### 4.1.35. Erase Preview Image

Offset	Host command
0	89
1	00

2	00
3	00
4	00
5	00
6	00
7	1A

This command erases the preview image in the SRAM.

#### 4.1.36. Request Sense

Offset	Host command
0	86
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

This command specifies the camera to send the command execution status with a 17-byte packet to the host. Appendix 4 lists all execution status.

#### 4.1.37. Set Program Mode

Offset	Host command
0	90
1	00
2	Program number
3	00
4	00
5	00
6	00
7	1A

This command instructs the camera to set the program mode or cancel the program mode. If the camera is in the program mode by this command, the "execute program" command instructs the camera to read and execute the specified program script from

the card. If a program number that value should be between 1 to 16 is specified in the "Program number" field, program mode will be active. If 0 is specified in the "Program number" field, program mode will be canceled. The content of the "Program number" field will be written in the camera status table (byte 28). When the camera is executing specified program, any button press will be ignored.

*Program number*

<i>where</i>	<i>0</i>	: Cancel program mode
	<i>1 - 16</i>	: Program number

In the following cases, the camera will quit program execution and return command execution error (e2h).

The battery level becomes low.  
I/O error is detected.  
Memory becomes full.  
Syntax error or unexecutable error is detected.

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

Memory card is not inserted in the camera.  
Specified programs does not exist in a memory card.  
Illegal value is set in the program number field.  
No programs exist in a memory card.

#### 4.1.38. Wait (not supported)

Offset	Host command
0	94
1	00
2	Interval time
3	Interval time
4	00
5	00
6	00
7	1A

This command specifies the camera to wait for specified time. The camera should wake by itself even it is in the sleep mode when specified interval time has passed. When the camera is waiting state, any button press will be ignored.

*Interval Time value*      0 - 65535 (in second)

Note that this command should be used for program script. However if this command is sent from the host *computer*, the camera will work as defined here with following conditions.

- Wait will be canceled if a ATA card is ejected or main switch is turned off
- Any button pressed will be ignored
- If a serial cable is plugged off, the camera will ignore it.

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

The battery level becomes low.  
I/O error is detected.

#### 4.1.39. Initialize Memory Card

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

This command specifies the camera to initialize the memory card. The 60-byte packet that contains a volume id for the ATA card will follow. Volume id consist of up to 11 characters. If null code is specified for the volume id, the ATA card has no volume id. The host will respond a 17-byte packet that contains number of bytes available for the card if this command is executed correctly.

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

Memory card is not inserted in the camera.  
Card is not ATA memory card.  
Memory card is protected.

**4.1.40. Open Card**

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 ATA commands.

Read directory  
Read file  
Write file information  
Write file  
Delete file  
Close

Note that "Get card status" command can be sent to the camera even if the ATA 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.*

**4.1.41. Close Card**

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

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

- Read directory
- Read file
- Write file information
- Write file
- Delete file

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

#### 4.1.42. Get Card Status

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
- Program status
- Number of bytes available

The camera will send the following data with a 17-byte packet.

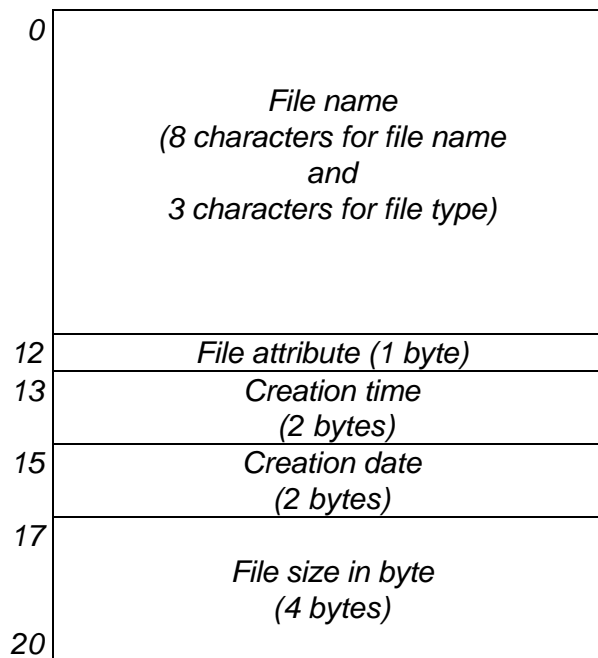
Card status (1 byte)
Program status (2 bytes)
# of bytes available (4 bytes)

Card status and program status will be read from the camera status table.

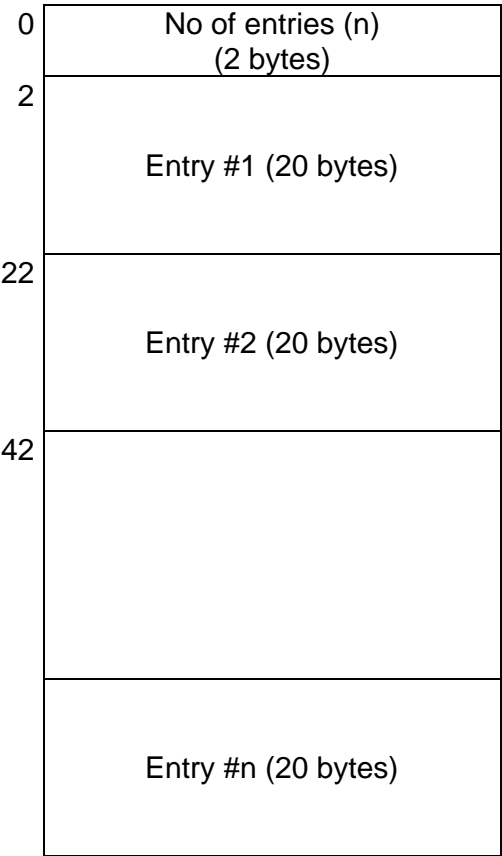
#### 4.1.43. Read Directory Information

Offset	Host command
0	99
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 directory name with full path name. The camera will send file information for all entries of specified directory of the ATA card as follows. Each entry has the following information.



The following data will be sent with 257-byte packets from the camera.



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.

**4.1.44. Read File**

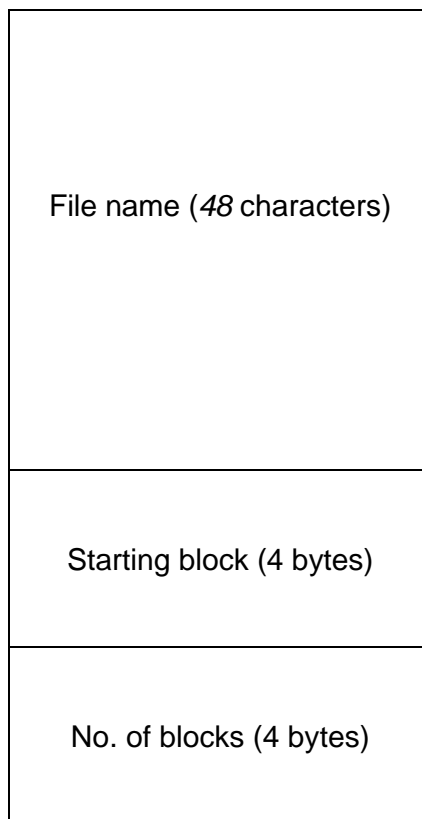
Offset	Host command
0	9A
1	00
2	00
3	00
4	00
5	00



6	00
7	1A

*Image files (in the ATA card and camera flash memory) and program script files can be read with command. This command is followed by a 60-byte packet that contains a file name under certain directories, offset block number from the file header and number of blocks as follows. The camera will send 513-byte packets for image file and program script file to the host. All image files are read in TIFF/EP format with this command.*

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 or program script file will have the following file names if d is assigned to the camera.*

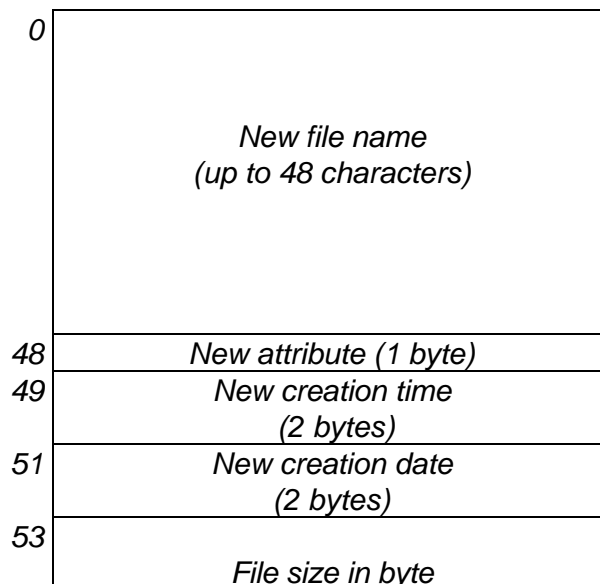
<i>d:\MEMORY\file name</i>	<i>Image file in the internal memory</i>
<i>d:\PCCARD\DC50IMG\file name</i>	<i>Image file in the card</i>
<i>d:\PCCARD\DC50PROG\file name</i>	<i>Program script file</i>

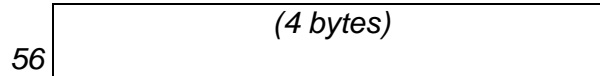
Note that a command execution error is returned from the camera when this command is sent to the camera if the card is not opened.

#### 4.1.45. Write File Information

Offset	Host command
0	9B
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 file name of program script with full path name. Then a 60-byte packet that contains information to be updated is sent to the camera. This packet contains the following information.





The camera will update the file information of specified program script file name in the first packet with the contents of the second packet. This command is used to rename the existing program script file name or its file information.

Note that if null codes are specified for the new file name, the camera assumes the same file name in the first packet is specified. If "0xFFFF" or "0xFF" is specified for the new creation date/time or new attribute, the camera will not update those information.

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.

#### 4.1.46. Write File

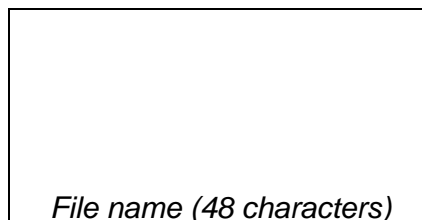
Offset	Host command
0	9C
1	00
2	00
3	00
4	00
5	00
6	00
7	1A

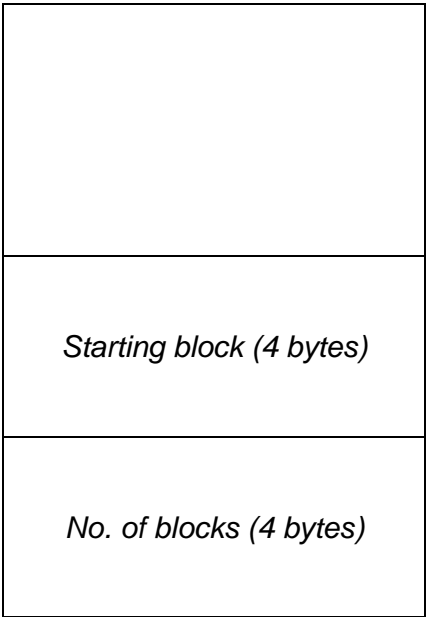
This command is used to write program script files and is followed by a 60-byte packet described below that contains a file name, start block and number of block to write. Then 514-byte packet of the program script will follow.

*File name (Up to 48 characters)*

*Offset block number (4 bytes) to write*

*Number of blocks to write (4 bytes)*





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.

**4.1.47. Delete File**

Offset	Host command
0	9D
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 file name of program script with full path name.  
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.

**4.1.48. Write Camera ID**

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.

**4.1.49. Set Exposure Mode**

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

This command specifies the camera to set the exposure mode, auto or manual. The content of the "Exposure mode" field will be written in the byte 23 of the camera status table. If auto exposure is set, a picture will be taken with the current exposure compensation value when the "take a picture" command is executed. If manual exposure is set, a picture will be taken with the current exposure time when the "take a picture" command is executed.

*Exposure mode*            0 : Auto exposure mode  
                                  1 : Manual exposure mode

*The combination of setting of this command and the set manual exposure command*

affects the camera user interface as follows.

<i>Setting of set exposure command</i>	<i>Setting of manual exposure command</i>	
	<i>Correct exposure time</i>	<i>manual mode inactive</i>
<i>Auto mode</i>	<i>Auto and manual icons are selectable</i>	<i>Just auto icon is selectable</i>
<i>Manual mode</i>	<i>Just manual icon is selectable</i>	<i>Just manual icon is selectable</i>

Note that the host should set auto mode for the offline use of the camera.

#### 4.1.50. Execute Program (not supported)

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

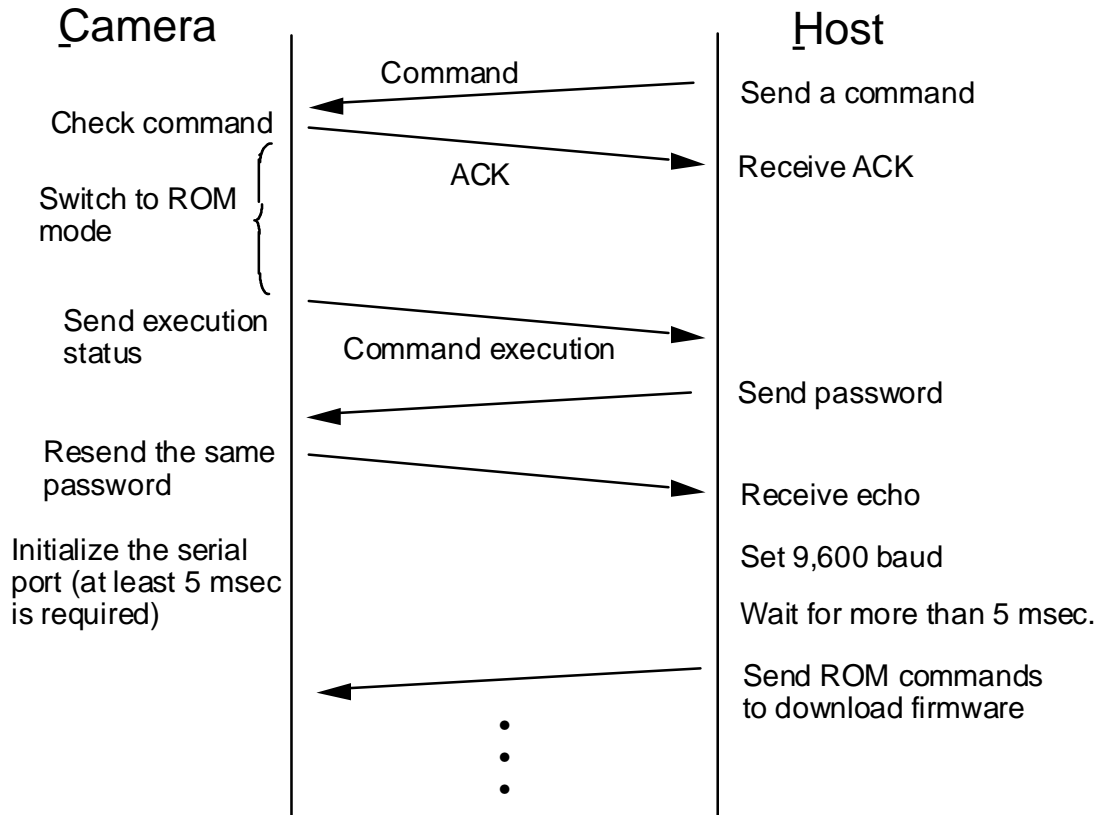
This command instructs the camera to execute a program specified by the "set program mode" command. Prior to this command, camera should be in the program mode by the "set program mode" command. Otherwise the camera will respond a command execution error.

#### 4.1.51. Switch to ROM Mode

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. The camera does not display "ajd" at the numeric display 2 on the LCD when the camera enters ROM mode with this command.*
- 3. The camera responds the command completion code when switching is over.*
- 4. The host sends a password to the camera.*
- 5. The camera resends the same password to the host.*
- 6. 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. The camera requires at least 5 msec. to initialize the serial port. The host should wait for more than 5 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 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 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 "ajd" is displayed at the numeric display 2 on the LCD.
6. The host sends firmware packets to the camera.
7. When the firmware downloading is finished, the camera switches to RAM mode and new firmware is working at that time.





## **APPENDIX 1**

### **REFERENCES**

DC50 Engineering Requirements Specification, Version 0.2

DC50 Interaction Specification, Version 0.9

**APPENDIX 2****CHANGE HISTORY**

Version 0.1	April 14, 1995	First draft
Version 0.2	May 14, 1995	Second edition
Version 0.3	Jun 13, 1995	Third edition
Version 0.4	July 12, 1995	Fourth edition
Version 0.5	July 25, 1995	Fifth edition
Version 0.6	Sep 8, 1995	Sixth edition
Version 0.9	Nov. 17, 1995	Seventh edition
Version 1.0	Oct. 1, 1997	External edition

**APPENDIX 3****AF STEP**

Picture info data	AF data (m)
0 ~ 77	8.2 ~
78	6.7
79	6.2
7A	5.7
7B	5.4
7C	5.0
7D	4.8
7E	4.5
7F	4.2
80	4.0
81	3.8
82	3.7
83	3.6
84	3.4
85	3.2
86	3.1
87	3.0
88	2.9
89	2.8
8A	2.7
8B	2.6
8C	2.5
8D	2.4
8E	2.4
8F	2.3
90	2.2
91	2.2
92	2.1
93	2.0
94	2.0
95	1.9
96	1.9
97	1.9

Picture info data	AF data (m)
98	1.8
99	1.8
9A	1.7
9B	1.7
9C	1.7
9D	1.6
9E	1.6
9F	1.6
A0	1.5
A1	1.5
A2	1.5
A3	1.5
A4	1.4
A5	1.4
A6	1.4
A7	1.4
A8	1.3
A9	1.3
AA	1.3
AB	1.3
AC	1.3
AD	1.2
AE	1.2
AF	1.2
B0	1.2
B1	1.2
B2	1.1
B3	1.1
B4	1.1
B5	1.1
B6	1.1
B7	1.1
B8	1.0

Picture info data	AF data (m)
B9	1.0
BA	1.0
BB	1.0
BC	1.0
BD	1.0
BE	1.0
BF	1.0
C0	0.9
C1	0.9
C2	0.9
C3	0.9
C4	0.9
C5	0.9
C6	0.9
C7	0.9
C8	0.9
C9	0.9
CA	0.8
CB	0.8
CC	0.8
CD	0.8
CE	0.8
CF	0.8
D0	0.8
D1	0.8
D2	0.8
D3	0.8
D4	0.8
D5	0.7
D6	0.7
D7	0.7
D8~FF	0.7
Telemacro	0.5



**APPENDIX 4****ERROR CODE**

Code	Description
10	Illegal command parameter
11	Specified address exceeds the maximum address of card
12	Specified picture number exceeds the max. image number
13	No images in the flash memory
14	No images in the card
15	Flash memory is full
16	Zoom is specified when close-up is selected
17	Non preview related command is specified
20	Card I/O error
21	Card is not ATA card
22	Memory card is not inserted
23	Memory card is protected
24	Memory card is full
25	Card is not opened
30	No program exists on the card
31	Specified program does not exist
32	Program mode is not specified

Note that code 10 (illegal command parameter) is always set when the host sends a command with illegal parameter values.