

VC-C3

Communication Camera



Control Interface Manual

VC-C3 Communication Camera Control Interface Commands



Attention VC-C1 Developers!!

Please note, the commands used to control the VC-C3 have changed from the commands and structure used to control the VC-C1.



It is recommended that you read Appendix D – Developer Information for important information on the enclosed disk's contents and other important notes about programming for the VC-C3 camera.

Also, it is recommended that you read the VC-C3 Instruction Manual for general camera use and operation information.

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The information contained herein is subject to change at any time, without notice.

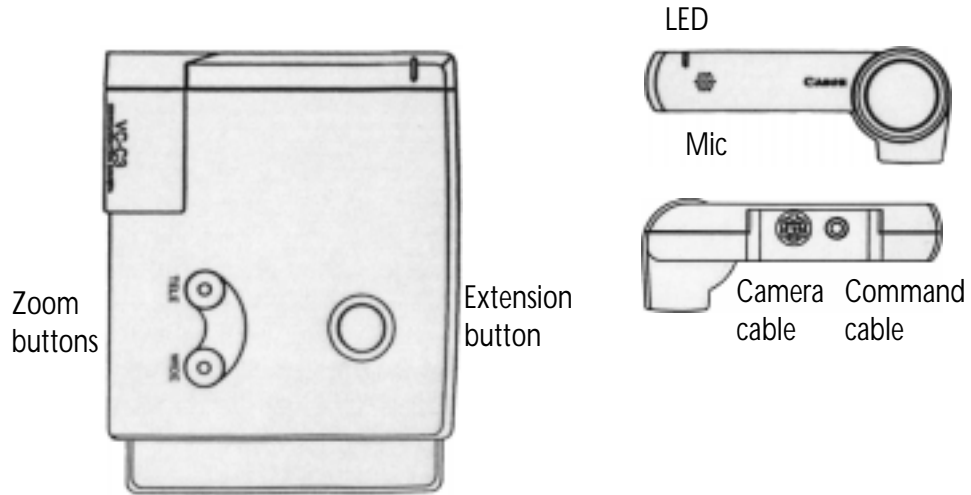
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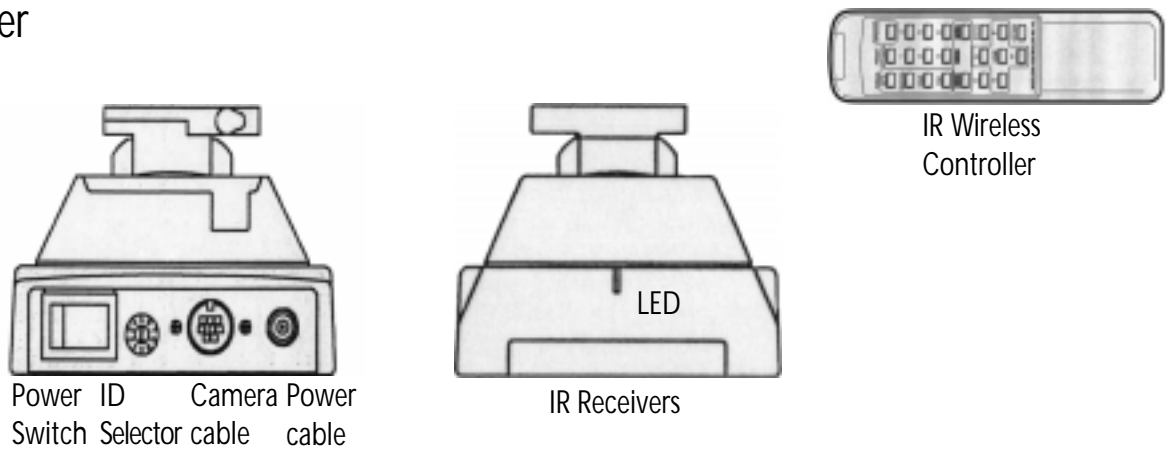
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VC-C3 Camera System: Components

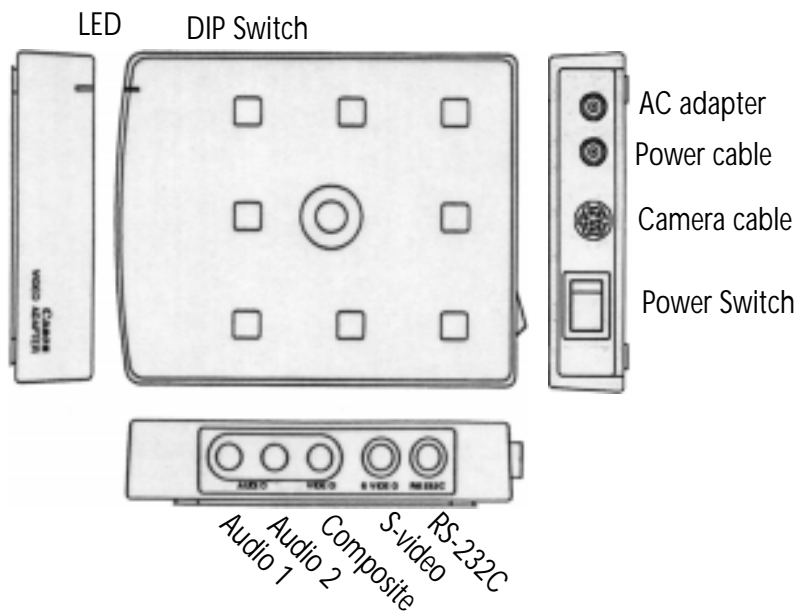
Zoom Head



Pan/Tilter



Camera Control Unit



RS-232 Communication Protocol

Transmission Mode	Full Duplex
Transfer Speed	4800bps, 9600bps, 14400bps (selected by DIP switch on video adapter)
Start Bit	1 bit
Data Bit	8 bit
Parity	None
Stop Bit	2 bit
Handshake	RTS/CTS Control
Others	One Acknowledge per Command

Note:

Hexadecimal data will be defined with an "h" following a number.

The Video Adapter is referred to as the Camera Control Unit (CCU) in the Instruction Manual.

Procedure for Handshake

1. The VC-C3 sets the RTS line in the RS-232C terminal. As long as the RTS line is on, the VC-C3 is ready to receive control commands from the PC.
2. Before the VC-C3 tries to send any data, the RTS line from the PC is checked. If the RTS line is on, the VC-C3 sends the data. If not, the data which the VC-C3 prepared to send will be ignored.
3. If the RTS line from the PC is off while the VC-C3 is sending or receiving data, the VC-C3 ignores the data and the communication status shifts to idle.
4. If the RTS line from the PC is off while the VC-C3 is receiving data, the VC-C3 ignores the received data and the communication status shifts to idle.
5. When the VC-C3 detects an Rx over run, noise error or framing error, the VC-C3 discards the data.
6. If the Frame Length byte value is different from the number of actual frames received by the VC-C3, the VC-C3 will be in a wait state for the remaining frames to be received. To cancel this wait state the PC has to set the RTS line OFF and On (Edge Trigger).



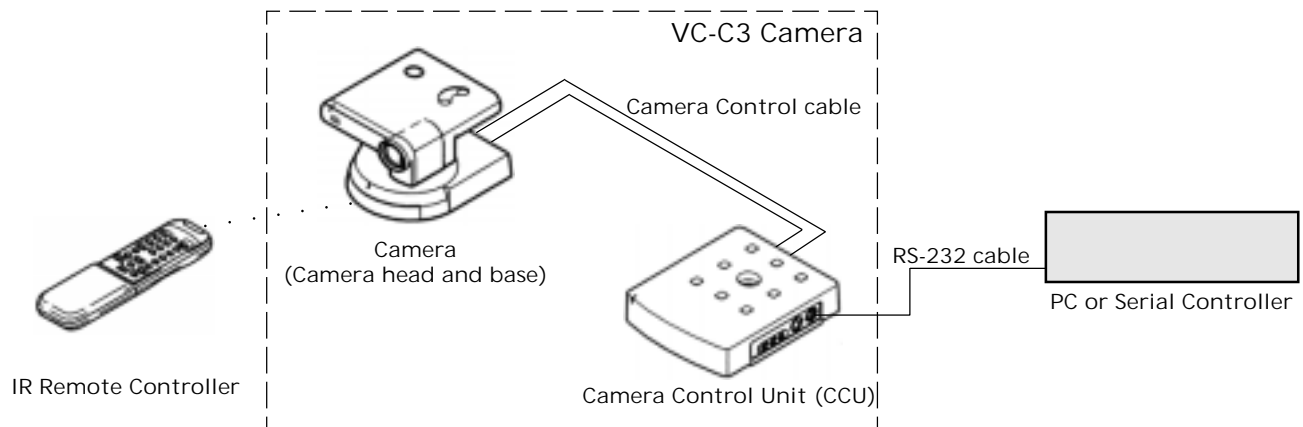
7. The VC-C3 will be automatically initialized when:

- The Frame Length data value is greater than 22.
- The VC-C3's Rx buffer is full.
- An ACK is sent to the VC-C3 when no Command was issued.

To determine if the VC-C3 was automatically initialized, monitor the CTS line. If the CTS line is off for 3.8 seconds and then on, an initialization occurred.

VC-C3 Camera System

This illustration shows the connections between a RS-232 Host and the components in the VC-C3 camera system.

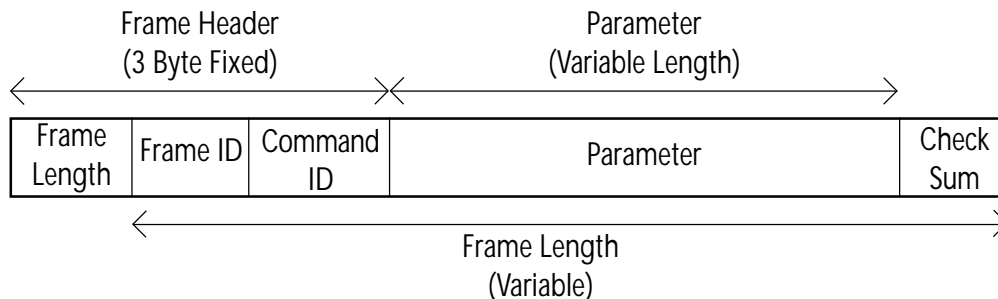


Frame Configurations

These frame configurations apply to the frames and commands exchanged between the RS-232 Host and the VC-C3 shown in the VC-C3 Camera System illustration. There are two kinds of frame formats used between the VC-C3 and the RS-232 Host: the Command Frame and the ACK/NACK Frame.

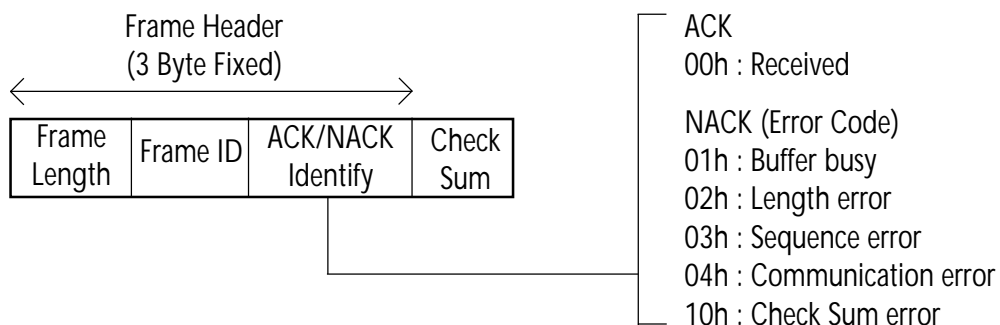
Command Frame

The Command Frame has a variable byte length consisting of a Frame Header, Parameter, and Check Sum. The Frame Header and Check Sum are described next. The Parameter is of variable length depending on the type of command.



ACK/NACK Frame

The ACK/NACK frame has a fixed 4 byte length consisting of the Frame Header and a Check Sum.



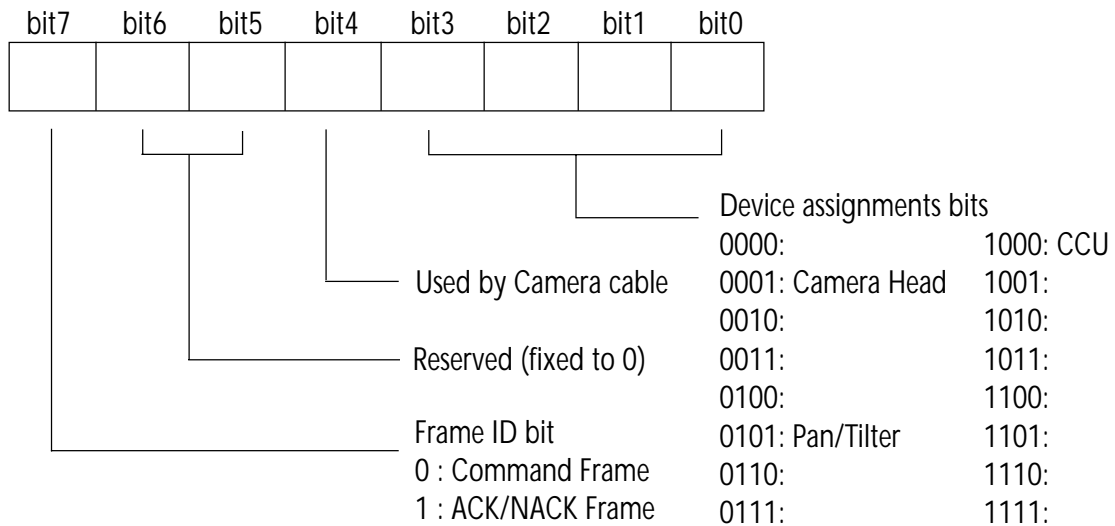
Frame Header Format

1. Frame Length

The Frame Length is the total number of bytes in the Command or ACK/NACK Frame minus 1 (for the Frame Length Byte itself). The Frame Length Byte is not included in the Frame Length value.

2. Frame ID

The Frame ID of the Command Frame is configured as shown below.



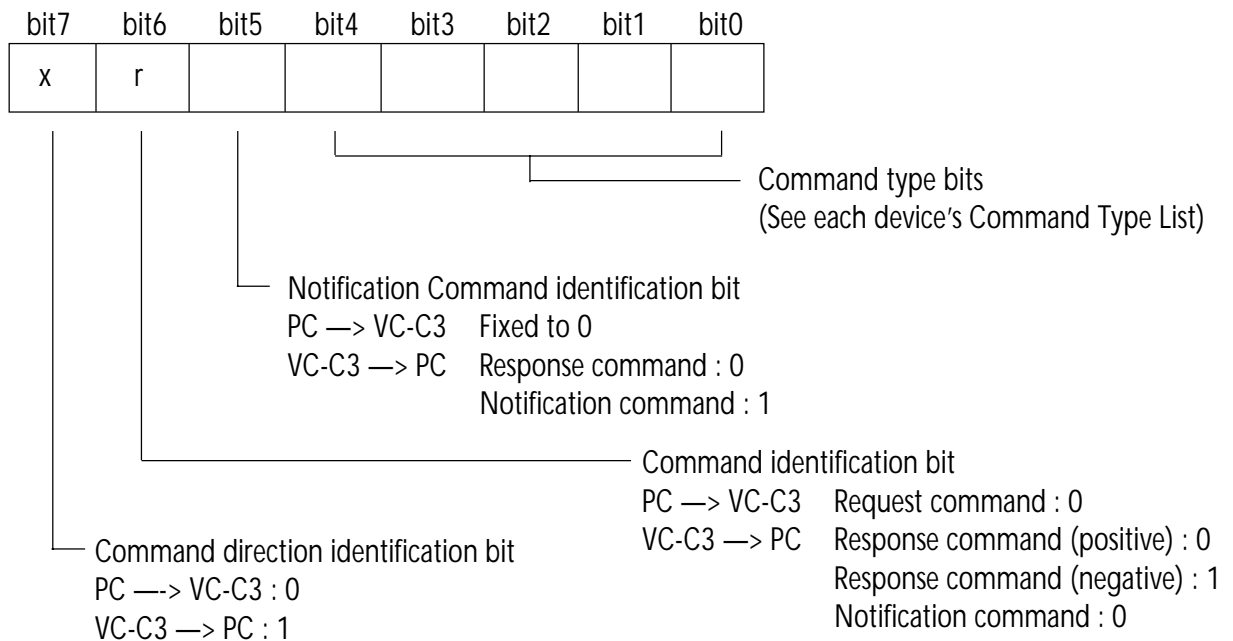
Device assignment bits

PC → VC-C3 direction : The PC identifies a destination VC-C3 component to send the frame.

VC-C3 → PC direction : The PC identifies the source VC-C3 component of a received frame.

3. Command ID

The Command ID of the Command Frame is configured as shown below:



Check Sum

Used to validate each frame sent between the PC and the VC-C3.

To calculate the Check Sum:

1. Add all of the bytes in the Frame Header plus all of the bytes in the parameter.
2. The Check Sum is the value required to turn the above number to 0 MOD (modulus) 256.

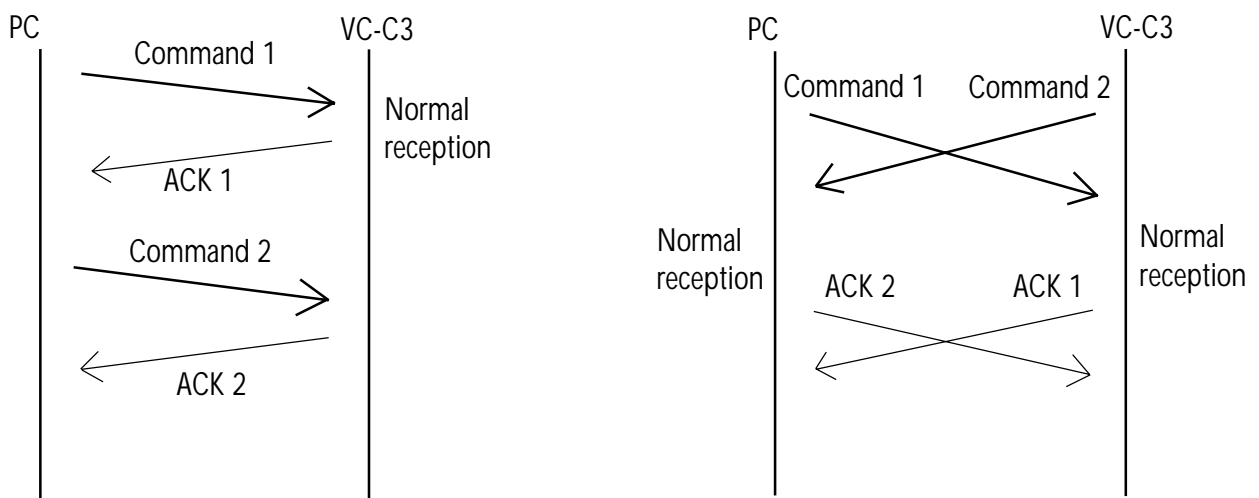
Command Frame and ACK/NACK Frame Sequence

The receiver of a Command Frame returns an ACK Frame when reception is normal (acknowledged). It returns a NACK Frame when reception is an error (not-acknowledged).

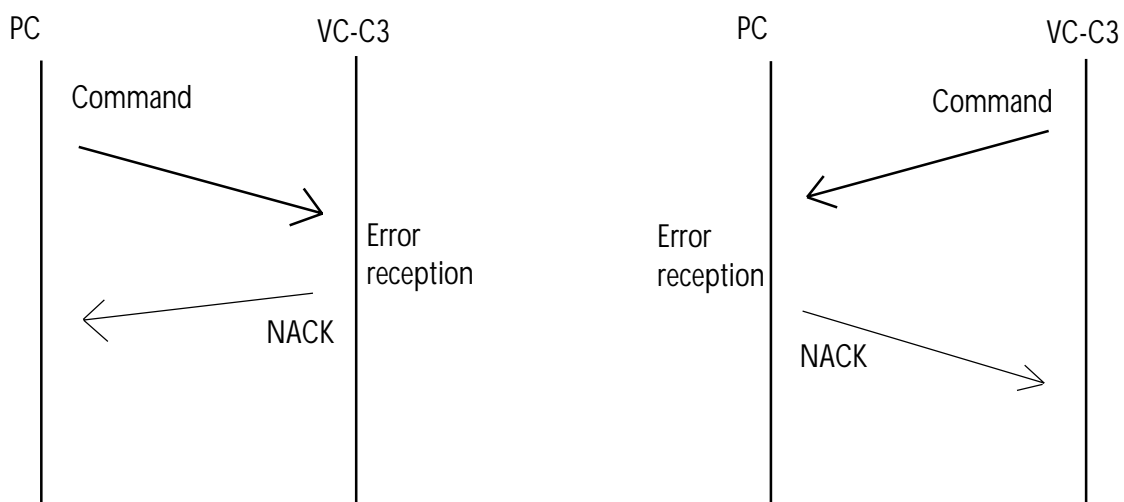
The sender of a Command Frame cannot transmit the next Command Frame until it receives an ACK/NACK Frame. Upon receiving a NACK, the sender decides whether or not to transmit the same frame again according to the accompanying error reason code.

When an ACK/NACK is not returned for a certain period of time following the transmission of a Command Frame, the sender starts the retransmission procedure for the specified number of times.

Typical request/response sequence for normal and duplex communication.



Typical request/response sequence for an error reception.



Command Types

Commands are classified into three types: Request, Response and Notification. Every command MUST be followed with the appropriate ACK/NACK Frame.

Request Command

The PC sends Request Commands to the VC-C3 to request each device to perform various operations.

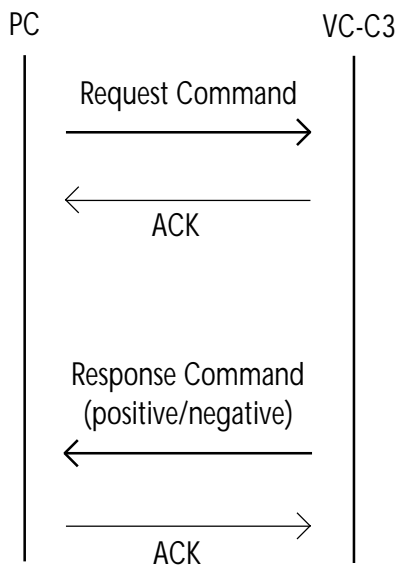
Response Command


The VC-C3 returns a Response Command in response to a Request Command sent by the PC. There are two types of response commands: positive and negative.

Positive - Completing the operation specified by the Request Command normally, the device returns the positive Response Command to the PC.

Negative - When the operation did not end normally, the VC-C3 returns a negative Response Command to the PC. In the case of a negative Response Command, the error type indicating the cause of the error is added to the end of the received frame. Refer to the table on the next page for the error types.

The VC-C3 returns the Response Command immediately after receiving the parameter setting Request Command. When the operation specified by the Request Command takes some time to complete (i.e. pan/tilter position setting), the VC-C3 takes some time to return the Response Command to the PC.



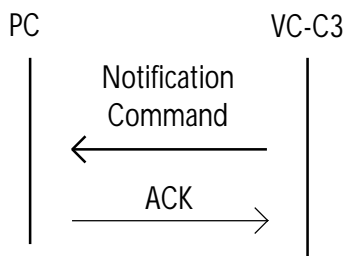
 Each Request/Response Command MUST be followed with an ACK/NACK Frame.

Notification Command

The VC-C3 sends a Notification Command to the PC to notify the PC of an event that has occurred in a device.

The PC does not send a Response Command to Notification Commands.

Errors detected by each device use the Notification Command to notify the PC.



Error Types

When the CCU, Pan/Tilter or Camera Head send a negative Response Command or an error Notification Command, the error type is added to the end of the Command Frame.

Error types added negative response.

Code	Contents of error	Code	Contents of error
00h	Camera cable is disconnected	18h	White balance correction error
01h	Camera communication error	19h	Pan/Tilt, Zoom, Focus limit
02h		1Ah	
03h	Pan/Tilter communication error	1Bh	
04h	RS-232C (PC-Video adapter) communication error	1Ch	
05h		1Dh	
06h		1Eh	
07h		1Fh	
08h		20h	
09h		21h	
0Ah		22h	
0Bh		23h	
0Ch		24h	
0Dh		25h	
0Eh		26h	
0Fh		27h	
10h	Command for unconnected device	28h	
11h	Undefined command	29h	
12h	Undefined parameter	2Ah	
13h	Status error (received command)	2Bh	
14h	Status error (received parameter)	2Ch	
15h		2Dh	
16h	Time-out	2Eh	
17h		2Fh	

Contents of Error Description

Camera cable is disconnected (00h) – When the cable from the Pan/Tilter to the Camera Head is disconnected.

Camera communication error (01h) – When the CCU sends “camera communication error”, the status register value of communication IC is added. The following is the meaning of the value.

- bit7 Tx buffer Ready
- bit6 Tx buffer full
- bit5 Tx end
- bit4 Rx data ready
- bit3 Rx buffer over flow 1L
- bit2 Rx buffer over flow
- bit1 Rx CRC error buffer over flow
- bit0 Rx CRC error

Pan/Tilter communication error (03h) – When the Camera Head detects a Pan/Tilter communication error, this error type is used. The error cause is added to the next byte. See the Communication Error Table below for the meaning of the value.

RS-232C communication error (PC – CCU) (04h) – When the CCU detects a RS-232C communication error, this error type is used to notify the PC of the error type. The error cause is added to the next byte. See the Communication Error Table below for the meaning of the value.

Communication Error Table (Pan/Tilter and RS-232C)

Code	Error cause
00h	NACK receive (Add nack cause to next byte)
01h	ACK receive time-out
02h	Check sum error
03h	Pan/Tilter is busy
04h	Fatal error occurred
05h	Sequence error occurred
06h	Length error occurred
07h	Buffer is busy

Command for unconnected device (10h) – When the device specified in the device assignment bits of the Frame ID is disconnected or not present.

Undefined command (11h) – When an undefined command of command type bits is specified.

Undefined parameter (12h) – When an undefined or out of range parameter is specified.

Status error (received command) (13h) – When a device can not accept the command specified in the command type bits because of the condition of the VC-C3.

Status error (received parameter) (14h) – When a device can not accept a parameter because of the condition of the VC-C3.

Time-out (16h) – The operation directed by the PC was not completed in the predicted time period.

White balance correction error (18h) – When the white balance mode changes from auto mode to correction mode, the color correction has not been done successfully.

Pan/Tilt, Zoom, Focus limit (19h) – When the Pan/Tilt, Zoom or Focus limit has been reached.

Request/Response Command Sequence

Frame transfer is performed full-duplex between the PC and the VC-C3 in the following sequences:

- When the VC-C3 receives a request command and the requested function ends normally, the VC-C3 returns the positive response command.
- When the VC-C3 receives a request command and the requested function did not operate normally, the VC-C3 returns the response command with its negative bit set to 1.
- Most commands, with a few exceptions, are mutually independent. Therefore, the host may transmit one request command then another before receiving the response command for the first one.
See APPENDIX C – Duplex Exceptions.

Control Mode Select Command



The VC-C3s default mode is CCU Control Mode 1 (01h).

For RS-232 communication, the VC-C3 MUST be placed in PC Control Mode (00h).

When an application is terminated and RS-232 communication is closed the VC-C3 MUST be placed in CCU Control Mode 1 (01h) for the Remote Controller to work.

1. Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mode select 17h (0001 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mode select 17h (1r01 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

Operation

01h : Control mode

Parameter

00h : PC Control Mode (Remote Controller notify enabled, PC control enabled)

When the CCU receives a Notification Command from the Remote Controller or Camera Head, the CCU DOES NOT analyze the command and sends the command directly to the PC.

If the CCU receives a command sent to the Pan/Tilter or Camera Head from the PC, the CCU sends the command to the Pan/Tilter or Camera Head. In this Mode the PC controls all devices (CCU, Camera Head and Pan/Tilter)

01h : CCU Control Mode 1 (Remote controller enabled, PC notify disabled) ***This is the DEFAULT***

When the CCU receives a Notification Command from the Remote Controller, the CCU analyzes the command and controls the Camera Head and the Pan/Tilter.

All Notification Commands are NOT sent to the PC.

02h : CCU Control Mode 2 (Remote controller enabled, PC notify enabled)

When the CCU receives a Notification Command from the Remote Controller, the CCU analyzes the command and controls the Camera Head and the Pan/Tilter.

All Notification Commands ARE sent to the PC.

Notification to the PC

Mode	IR Remote	PC
00h	NO	OK
01h	OK	NO
02h	OK	OK

DEFAULT →

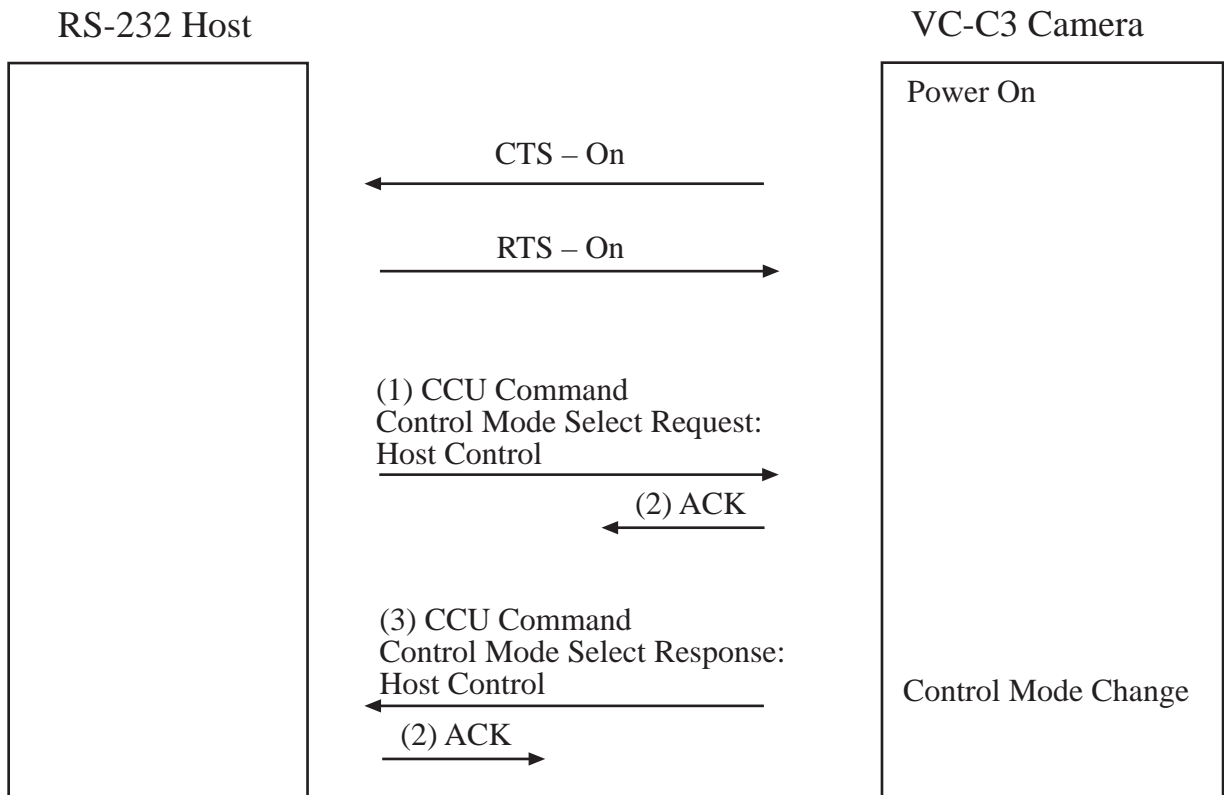
The information on this page also appears in the Camera Control Unit section of this manual.

Sample Code Sequences

The following Sample code sequences show how communication is accomplished between a RS-232 Host and the VC-C3 Camera. Provided are a graphical representation of the command sequences as well as the actual hex codes that are sent and received.

1. Setting the VC-C3 to Host Mode

The VC-C3 will require the Control Mode Select command to start communication with the PC whenever the VC-C3 power is recycled.



Communication Data Strings*

	FL	FID	CID	Parameter	CS
(1)	05	08	17	01 00	DB
(2)	03	88	00		75
(3)	05	08	97	01 00	5B

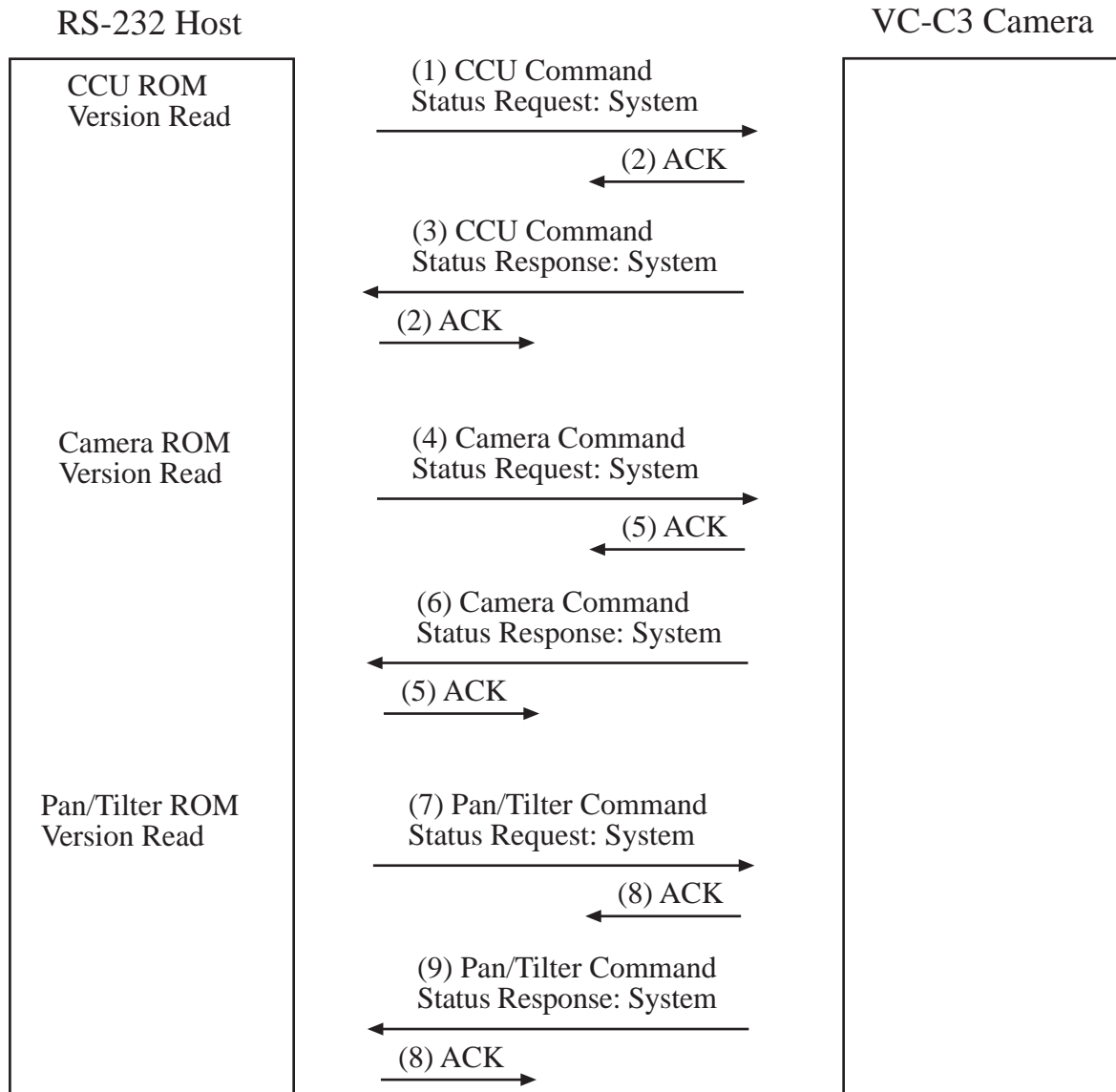
*Key to the Data String Table:

- (x) Corresponding number between the Sequence diagram and the Comm. Data String Table
- FL Frame Length
- FID Frame ID
- CID Command ID
- CS Check Sum

2. VC-C3 ROM Version Read

The read out of the CCU, Camera Head, and Pan/Tilter ROM version information.

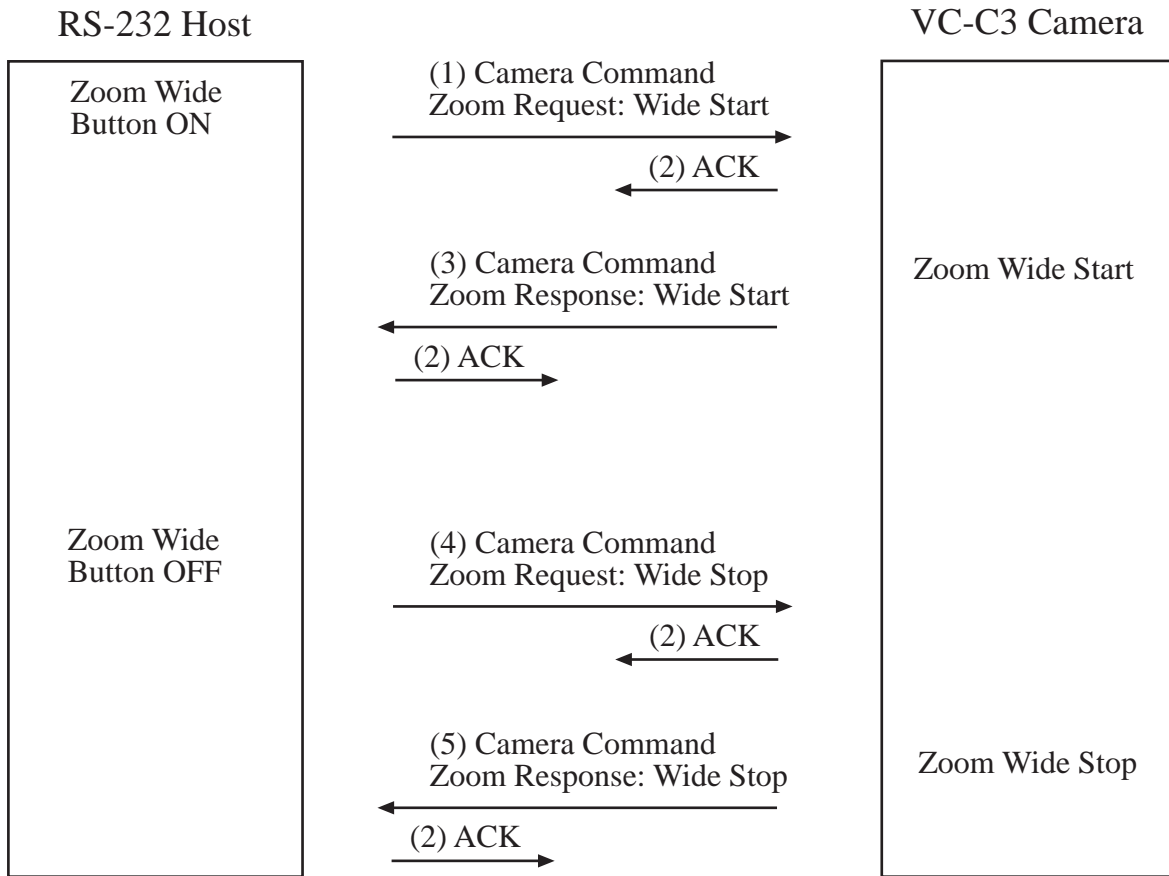
Example: CCU: ver1.0, Camera Head: ver1.0, Pan/Tilter: ver1.0



Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	04	08	04	00	F0
(2)	03	88	00		75
(3)	06	08	84	00 10 10	4E
(4)	04	01	04	00	F7
(5)	03	81	00		7C
(6)	06	01	84	00 03 10	62
(7)	04	05	04	00	F3
(8)	03	85	00		78
(9)	06	05	84	00 00 01	61

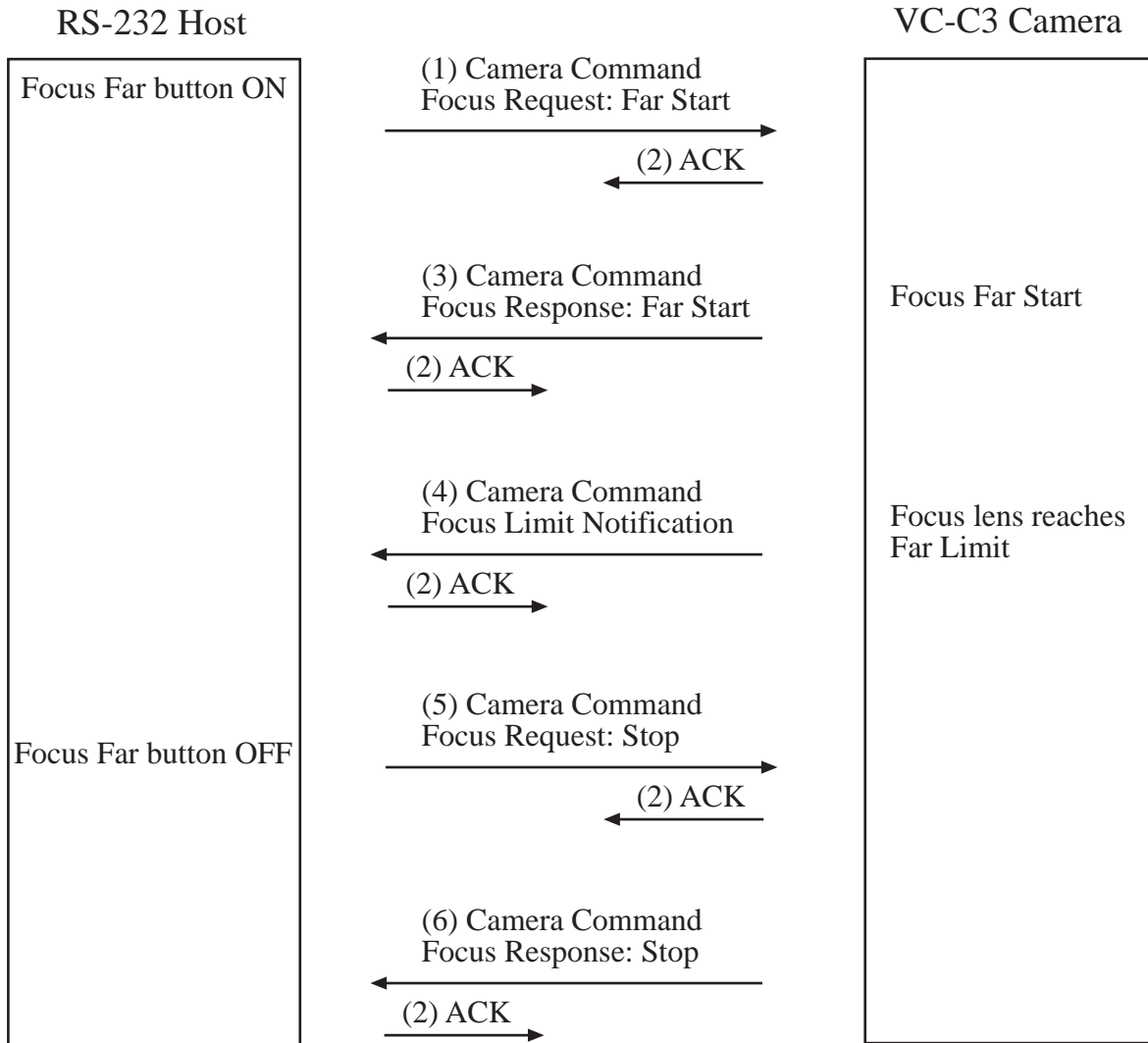
3. Zoom Wide Start/Stop
 Sequence for controlling the Zoom command.



Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	05	01	12	01 01	E6
(2)	03	81	00		7C
(3)	05	01	92	01 01	66
(4)	04	01	12	03	E6
(5)	04	01	92	03	66

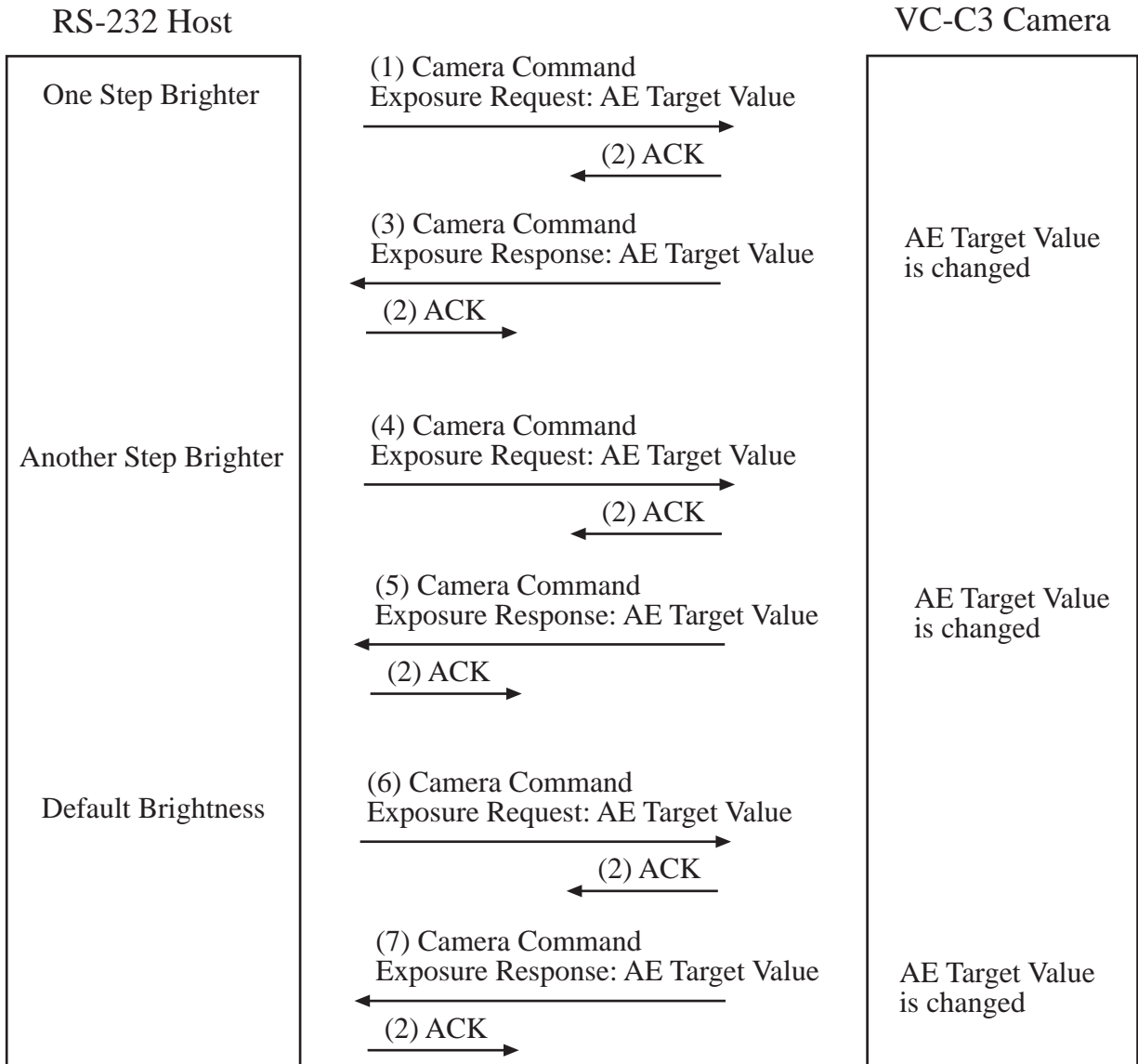
4. Focus Limit Notification
Sequence for the Focus lens reaching its limit.



Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	05	01	10	02 00	E8
(2)	03	81	00		7C
(3)	05	01	90	02 00	68
(4)	04	B1	00	20 29	E6
(5)	04	01	10	04	E7
(6)	04	01	90	04	67

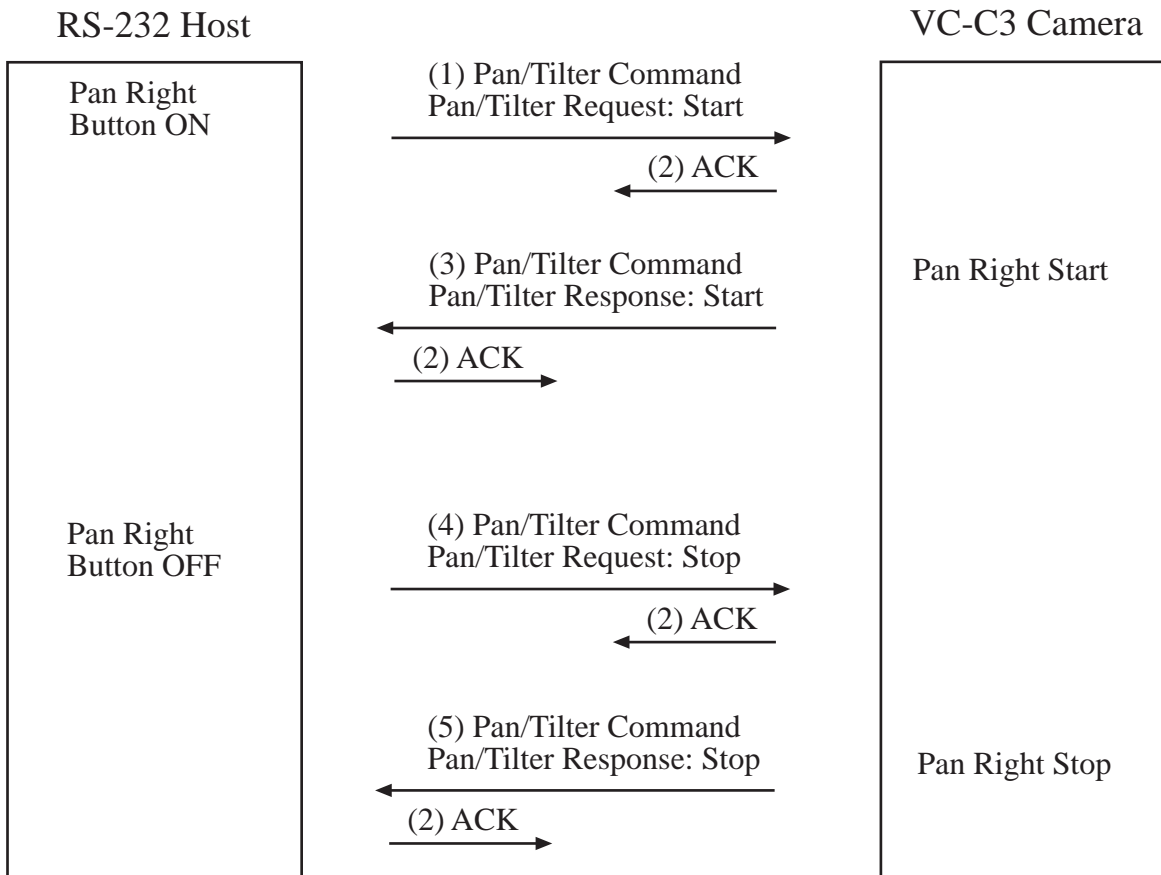
5. Changing the Brightness (AE control)
 Make one step brighter -> more bright -> default brightness



Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	05	01	14	04 60	82
(2)	03	81	00		7C
(3)	05	01	94	04 60	02
(4)	05	01	14	04 90	52
(5)	05	01	94	04 90	D2
(6)	05	01	14	04 48	9A
(7)	05	01	94	04 48	1A

6. Camera Head: Pan Right Start/Stop
 Sequence to move the VC-C3's camera head to the right.



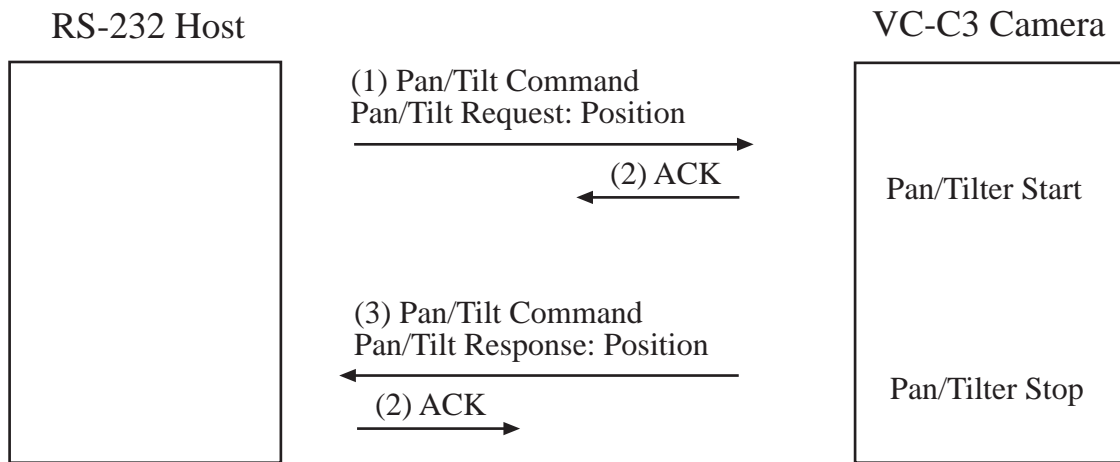
Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	06	05	12	01 01 00	E1
(2)	03	85	00		78
(3)	06	05	92	01 01 00	61
(4)	04	05	12	02	E3
(5)	04	05	92	02	63

7. Positioning the Pan/Tilt Base

Sequence to move the Camera Head in a designated direction.

Example: 80E7h is the target position for Pan, 7F42h is the target position for Tilt.

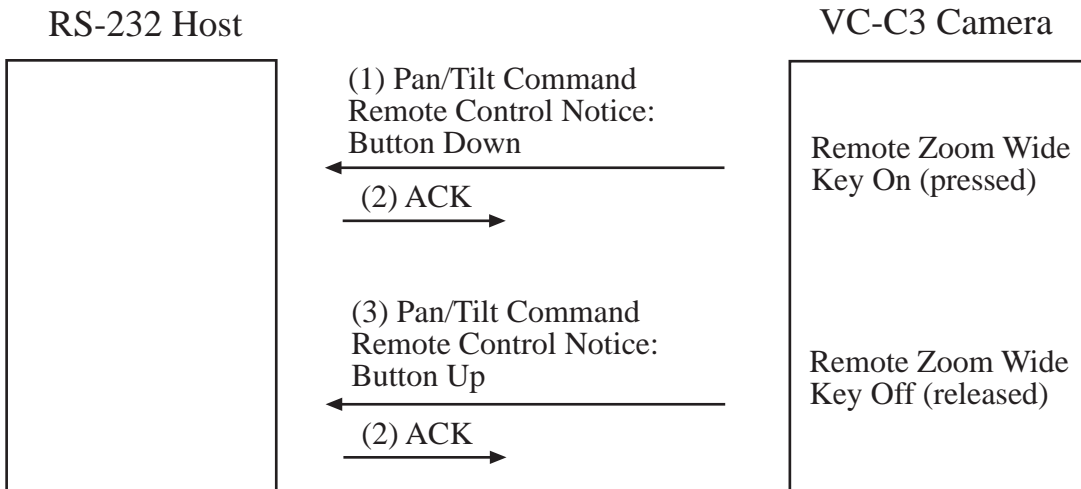


Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	09	05	12	05 02 80 E7 7F 42	B1
(2)	03	85	00		78
(3)	09	05	92	05 02 80 E7 7F 42	31

8. Notification String for the Remote Controller

Sequence when the Wide key on the Remote Controller is pressed and released.



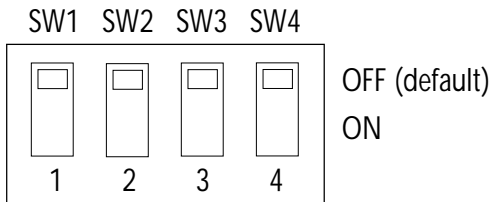
Communication Data Strings

	FL	FID	CID	Parameter	CS
(1)	05	05	B8	01 A0	9D
(2)	03	85	00		78
(3)	05	05	B8	00 A0	9E

Camera Control Unit

DIP Switch Settings

- SW1 Sets the bit rate of the RS-232C communication speed.
- SW2 Sets the bit rate of the RS-232C communication speed.
- SW3 Sync Delay – Increases the Time Out time for communication between the CCU and Pan/Tilter.
- SW4 Debug Mode – *Used by service only.*



SW1, SW2 – RS-232 Bits Rate

SW1	SW2	BPS
Off	Off	9600bps
On	Off	4800bps
Off	On	14400bps
On	On	9600bps

SW3 – Service Use Only
Should always be OFF

SW4 – Debug Mode

Off: Reboot Video Adapter when fatal error occurs.
On: Not reboot Video Adapter when fatal error occurs.

See the Pan/Tilter section for setting the ID Selector switch on the rear of the Pan/Tilter

LED Definitions Table

LED Indication	Meaning
Off	Power is Off.
On (Green)	Power is On.

Power Switch

This is a main power switch to supply power to the CCU.



There are power switches on both the CCU and the Pan/Tilter. Both must be ON for the VC-C3 to function correctly.

CCU Command Type List

When the device assignment bits of the Frame ID is 08h (CCU), the following table is used. This table shows the command type (bit 0-4 in the Command Frame). Refer to Frame Header Format.

PC → CCU		CCU → PC	
Code	Command Name	Code	Command Name
00h	Software reset request Status request	00h	Software reset response Error notification Status response
01h			
02h			
03h			
04h			
05h			
06h			
07h			
08h			
09h			
0Ah	White balance request Fade request Mute request	0Ah	White balance response Fade response Mute response
0Bh			
0Ch			
0Dh			
0Eh			
0Fh			
10h			
11h	Control mode select request Preset request	11h	Control mode select response Preset response
12h			
13h			
14h			
15h			
16h			
17h			
18h			
19h			
1Ah			
1Bh			
1Ch			
1Dh			
1Eh			
1Fh			

Software Reset

Receiving the Software Reset command, the CCU ends communication between the VC-C3 components, then cycles the power supplied to the camera head, off and on. After sending a request command, the PC should not transmit another request until it receives the Software Reset response command.

Note: This command will reset the VC-C3 back to CCU Control Mode 1 (See page 13).

1. Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Software Reset 01h (0000 0001)	Byte 2
Check Sum	Calculated	Byte 3

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Software Reset 01h (1r00 0001)	Byte 2
Check Sum	Calculated	Byte 3

Error Notification

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Error Notification 03h (1000 0011)	Byte 2
Parameter	Error Type*	Byte 3
	Error Cause	Byte 4
Check Sum	Calculated	Byte 5

*Error type (Byte 3) Refer to Error Types Table p.11.

Error Types

When the CCU, Pan/Tilter or Camera Head send a negative Response Command or an Error Notification Command, the error type is added to the Command Frame. (See p.11 for Error Type Table)

Note:

For all Command Type illustrations, the Hex value represents only bits 0-4 of the binary number listed in the Command ID.
See Frame Header Format in the RS-232 Protocol chapter for a full description.

Status Command

1. Status Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Status Request 04h (0000 0100)	Byte 2
Parameter	Status specification*	Byte 3
Check Sum	Calculated	Byte 4

*Status specification for Byte 3

00h : System state

01h : White balance state

02h : Fade state

03h : DIP Switch state

2. Status Response

System

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Status Response 04h (1000 0100)	Byte 2
Parameter	00h (System)	Byte 3
	Product Code	Byte 4
	Product Version	Byte 5
Check Sum	Calculated	Byte 6

White Balance (refer to White Balance Command)

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Status Response 04h (1000 0100)	Byte 2
Parameter	01h (white balance)	Byte 3
	Speed	Byte 4
	R gain	Byte 5
	B gain	Byte 6
Check Sum	Calculated	Byte 7

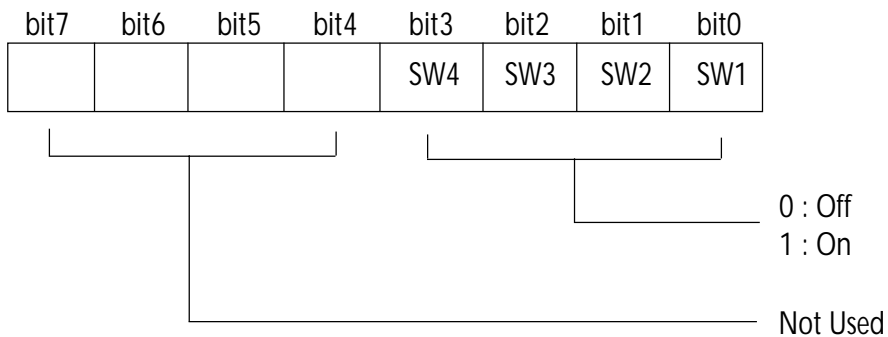
Fade (refer to Fade Command)

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Status Response 04h (1000 0100)	Byte 2
Parameter	02h (Fade)	Byte 3
	Speed (Hi)	Byte 4
	Speed (Low)	Byte 5
	Fade gain	Byte 6
	Fade level	Byte 7
Check Sum	Calculated	Byte 8

DIP Switch

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Status Response 04h (1000 0100)	Byte 2
Parameter	03h (Switch)	Byte 3
	Status*	Byte 4
Check Sum	Calculated	Byte 5

**Status parameter*



White Balance Command

When the CCU receives this command while in the process of fading (i.e. Fade gain is not 0), the CCU sends a negative response added error type 13h (command status error).

1. Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	White Balance 10h (0001 0000)	Byte 2
	Operation	Byte 3
Parameter*	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	White Balance 10h (1r01 0000)	Byte 2
	Operation	Byte 3
Parameter*	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

*Depending on the White Balance Command used, the Parameters may vary. See the chart below for specific command parameter requirements.

Operation		Parameter 1		Parameter 2		Parameter 3	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	White balance mode	00h	AUTO mode				
		01h	Correction mode				
		02h	Manual mode				
02h	Correction	xxh	00h (Red)-FFh (Blue)				
03h	Manual	01h	Read				
		02h	Write	xxh	B gain (See Table 1)	xxh	R gain (See Table 1)

White balance mode (01h)

Specifies the mode of the white balance operation.

- Auto mode : Automatic white balance.
- Correction mode : The user corrects white balance by this operation. When switching to this mode the CCU will try to initially adjust to a proper WB. If the adjustment is not possible, the CCU sends a negative response added error type 18h (WB correction failed) to the PC. However, in this case, the mode change is still executed.
- Manual mode : The user manually sets the white balance.

Correction (02h) – balanced adjustment

When the WB is set to Correction mode, Parameter 1 specifies the direction of correction. The set value can be from 00h (emphasis red) to FFh (emphasis blue). This operation request is valid only for this mode. Receiving this operation in any other mode, the CCU will return a negative response command. Time to complete Correction Mode – 2 Seconds.

Manual setting (03h)

When the WB is set to Manual mode, Parameters 2 and 3 set hues B and R, respectively. Refer to Table 1 for the relation between the set values of parameters 2 and 3 and color signal gain. This operation request is valid only for this mode. Receiving this operation in any other mode, the CCU will return a negative response command.

Note: Hue G gain is set to 80h always.

Table 1

Set value	Color signal gain
0h	0
40h	0.5
80h	1.0
C0h	1.5
FFh	2.0

Response to request in each mode

Operation	White balance mode		
	Auto	Manual	Correction
AUTO mode	0	0	0
Manual mode	0	0	X
Correction mode	0	X	X
Correction	X	X	0
read	0	0	0
write	X	0	X

0 = The CCU accepts request commands and sends positive response to the PC.

X = The CCU sends negative response added error type 14h (parameter status error) to the PC.

Fade Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Fade 11h (0001 0001)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Fade 11h (1r01 0001)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

*Depending on the Fade Command used, the Parameters may vary. See the charts below for specific command parameter requirements.

1. Fade request

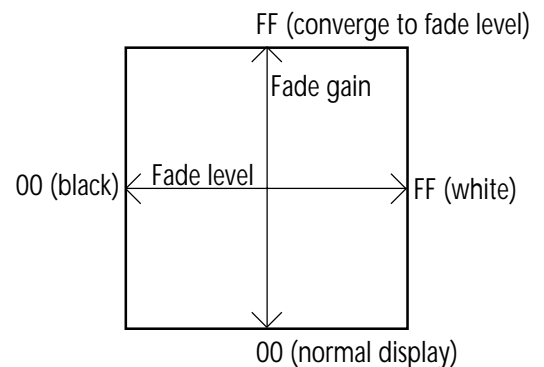
Operation		Parameter 1		Parameter 2		Parameter 3	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Default display	01h	Read				
		02h	Write	xxh	Fade gain	xxh	Fade level
02h	Fade start	00h	Fade-in				
		01h	Fade-out				
04h	Fade speed	01h	Read				
		02h	Write	xxh	Fade Speed	xxh	Fade speed

Default Display (01h)

The status of the display screen is set with parameter 2 and parameter 3. When the Fade-gain of parameter 2 is 00h, the normal screen is obtained, and when it is FFh, the fade level specified by parameter 3 is obtained. When this operation is received during fading, a negative response is transmitted.

Parameter 2 : Fade gain
 00h : normal display
 FFh : Converge to fade level

Parameter 3 : Fade level
 00h : black display
 FFh : white display



Fade start (02h)

Fading specified by parameter 1 is started. The response command for this operation is issued when the fading operation has been completed.

When the CCU receives a fade-in (fade-out) operation in the middle of a fade-out (fade-in), the fade-out (fade-in) is canceled and the fade-in (fade-out) is executed. A Response command to the fade-in (fade-out) operation is not returned.

Parameter 1

Fade-in : Fade-in is executed from the present gain position to the normal screen.

Fade-out : Fade-out is executed from the present gain position.

Fade speed (04h)

Value : 0 - FFFF (unit : 1/60 sec)

This parameter is used to set Fade-in or Fade-out time. Default value is 012Ch (5 sec.).

2. Fade response

Operation		Parameter 1		Parameter 2		Parameter 3	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Default display	01h	Read	xxh	Fade gain	xxh	Fade level
		02h	Write	xxh	Fade gain	xxh	Fade level
02h	Fade start	00h	Fade-in				
		01h	Fade-out				
04h	Fade speed	01h	Read	xxh	Fade Speed	xxh	Fade speed
		02h	Write	xxh	Fade Speed	xxh	Fade speed

Mute Command

1. Requesse

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mute 12h (0001 0010)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mute 12h (1r01 0010)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

Operation		Parameter 1	
Code	Meaning	Code	Meaning
01h	Video mute	00h	Mute off
		01h	Mute on
02h	Audio mute	00h	Mute off
		01h	Mute on

Control Mode Select Command



The VC-C3s default mode is CCU Control Mode 1 (01h).

For RS-232 communication, the VC-C3 MUST be placed in PC Control Mode (00h).

When an application is terminated and RS-232 communication is closed the VC-C3 MUST be placed in CCU Control Mode 1 (01h) for the Remote Controller to work.

1. Request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mode select 17h (0001 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

2. Response

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Mode select 17h (1r01 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

Operation

01h : Control mode

Parameter

00h : PC Control Mode (Remote Controller notify enabled, PC control enabled)

When the CCU receives a Notification Command from the Remote Controller or Camera Head, the CCU DOES NOT analyze the command and sends the command directly to the PC.

If the CCU receives a command sent to the Pan/Tilter or Camera Head from the PC, the CCU sends the command to the Pan/Tilter or Camera Head. In this Mode the PC controls all devices (CCU, Camera Head and Pan/Tilter)

01h : CCU Control Mode 1 (Remote controller enabled, PC notify disabled) ***This is the DEFAULT***

When the CCU receives a Notification Command from the Remote Controller, the CCU analyzes the command and controls the Camera Head and the Pan/Tilter.

All Notification Commands are NOT sent to the PC.

02h : CCU Control Mode 2 (Remote controller enabled, PC notify enabled)

When the CCU receives a Notification Command from the Remote Controller, the CCU analyzes the command and controls the Camera Head and the Pan/Tilter.

All Notification Commands ARE sent to the PC.

Notification to the PC

Mode	IR Remote	PC
00h	NO	OK
01h	OK	NO
02h	OK	OK

DEFAULT →

This information also appears in the RS-232 Communication Protocol section of this manual.

Preset Command

See respective sections for information on Pan, Tilt (p53-54) and Zoom (p40) position.

1. Preset request

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Preset request 18h (0001 1000)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
	Parameter 4	Byte 7
	Parameter 5	Byte 8
	Parameter 6	Byte 9
	Parameter 7	Byte 10
	Parameter 8	Byte 11
Check Sum	Parameter 9	Byte 12
	Calculated	Byte 13

*Depending on the Preset Command used, the Parameters may vary. See the chart below for specific command parameter requirements.

Operation		Parameter 1		Parameter 2		Parameter 3		Parameter 4		Parameter 5	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Read	1-6	Preset position								
02h	Write	1-6	Preset position	1-6	Preset status	xxh	AE reference	xxh	Pan Position Hi byte	xxh	Pan Position Low byte

Parameter 6		Parameter 7		Parameter 8		Parameter 9	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
xxh	Tilt Position Hi byte	xxh	Tilt Position Low byte	xxh	Zoom Position Hi byte	xxh	Zoom Position Low byte

Operation

Read

This parameter is used to read a preset value which is specified by the Preset position parameter.

Write

This parameter is used to write to EEPROM a preset value which is specified by parameters 2 – 9. To set the preset position, the preset status parameter MUST be 01h (set). To clear the EEPROM of any value use 00h (erase) for the preset status parameter.

2. Preset Response

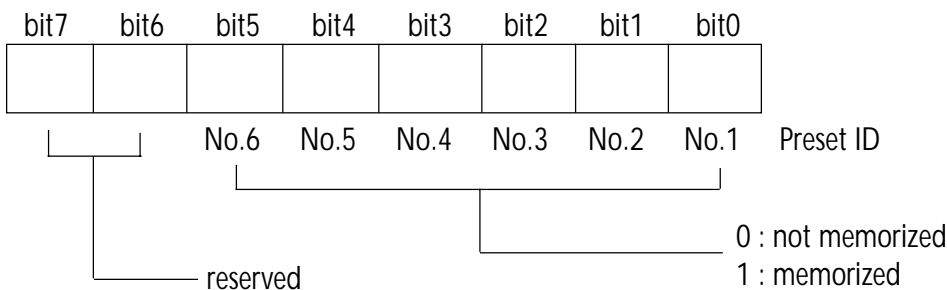
Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Preset response 18h (1r01 1000)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
	Parameter 4	Byte 7
	Parameter 5	Byte 8
	Parameter 6	Byte 9
	Parameter 7	Byte 10
	Parameter 8	Byte 11
Check Sum	Parameter 9	Byte 13
	Calculated	Byte 14

*Depending on the Preset Command used, the Parameters may vary. See the chart below for specific command parameter requirements.

Operation		Parameter 1		Parameter 2		Parameter 3		Parameter 4		Parameter 5	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Read	1-6	Preset position	xxh	Preset status	xxh	AE reference	xxh	Pan Position Hi byte	xxh	Pan Position Low byte
02h	Write	1-6	Preset position	xxh	Preset status	xxh	AE reference	xxh	Pan Position Hi byte	xxh	Pan Position Low byte

Parameter 6		Parameter 7		Parameter 8		Parameter 9	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
xxh	Tilt Position Hi byte	xxh	Tilt Position Low byte	xxh	Zoom Position Hi byte	xxh	Zoom Position Low byte
xxh	Tilt Position Hi byte	xxh	Tilt Position Low byte	xxh	Zoom Position Hi byte	xxh	Zoom Position Low byte

Status read



Zoom Camera Head

LED Definitions Table

LED Indication	Meaning
Off	Power is off on the zoom head.
Blink (1Hz)	Zoom head initialization is in progress.
On	Zoom head initialization was completed.
Off	Extension button is pressed.

Button Definitions

Wide button

The Zoom lens would be moved in the zoom-wide direction while this switch is pressed.

Tele button

The Zoom lens would be moved in the zoom-tele direction while this switch is pressed.

Extension button

The PC can recognize if this button is pressed through the switch operation notification command (18h).

Zoom Camera Head Command Type List

When the device assignment bits of the Frame ID is 01h (Camera Head), the following table is used. This table shows the command type (bit 0-4 in the Command Frame). Refer to Frame Header Format.

PC → VC-C3		VC-C3 → PC	
Code	Command Name	Code	Command Name
00h	Status request	00h	Error notification
01h		01h	
02h		02h	
03h		03h	
04h		04h	
05h		05h	
06h		06h	
07h		07h	
08h		08h	
09h		09h	
0Ah	Focus request	0Ah	Focus response
0Bh		0Bh	
0Ch		0Ch	
0Dh		0Dh	
0Eh	Zoom request	0Eh	Focus limit notification
0Fh		0Fh	
10h		10h	
11h		11h	
12h	Exposure request	12h	Zoom response
13h		13h	
14h		14h	
15h		15h	
16h	Button operation notification	16h	Zoom limit notification
17h		17h	
18h		18h	
19h		19h	
1Ah		1Ah	
1Bh		1Bh	
1Ch		1Ch	
1Dh		1Dh	
1Eh		1Eh	
1Fh		1Fh	

Error Notification

Frame Length	Variable	Byte 0
Frame ID	08h (CCU)	Byte 1
Command ID	Error Notification 03h (1000 0011)	Byte 2
Parameter	Error Type*	Byte 3
	Error Cause	Byte 4
Check Sum	Calculated	Byte 5

*Error type (Byte 3) Refer to Error Types Table p.11.

Error Types

When the CCU, Pan/Tilter or Camera Head send a negative Response Command or an Error Notification Command, the error type is added to the Command Frame. (See p.11 for Error Type Table)

Note:

For all Command Type illustrations, the Hex value represents only bits 0-4 of the binary number listed in the Command ID.
See Frame Header Format in the RS-232 Protocol chapter for a full description.

Status Command

1. Status request

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Status Request 04h (0000 0100)	Byte 2
Parameter	Specification of status*	Byte 3
Check Sum	Calculated	Byte 4

*Specification of status Byte 3
 00h System status
 01h Focus status
 02h Zoom status
 03h Exposure status

2. Status response

System

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Status response 04h (1000 0100)	Byte 2
Parameter	00h (System)	Byte 3
	Product code	Byte 4
	Product version	Byte 5
Check Sum	Calculated	Byte 6

Focus System (refer to Focus command)

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Status response 04h (1000 0100)	Byte 2
Parameter	01h (Focus)	Byte 3
	Speed	Byte 4
	Focus position (Hi)	Byte 5
	Focus position (Lo)	Byte 6
Check Sum	Calculated	Byte 7

Zoom System (refer to Zoom command)

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Status response 04h (1000 0100)	Byte 2
Parameter	02h (Zoom)	Byte 3
	Speed	Byte 4
	Zoom position (Hi)	Byte 5
	Zoom position (Lo)	Byte 6
Check Sum	Calculated	Byte 7

Exposure System (refer to Exposure command)

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Status response 04h (1000 0100)	Byte 2
Parameter	03h (Exposure)	Byte 3
	Speed	Byte 4
	AE reference	Byte 5
	Iris	Byte 6
	Shutter speed	Byte 7
	Gain	Byte 8
Check Sum	Calculated	Byte 9

Focus Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Focus 10h (0001 0000)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Parameter 4	Byte 7
	Calculated	Byte 8

*Depending on the Focus Command used, the Parameters may vary. See the chart below for specific command parameter requirements.

2. Response

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Focus 10h (1r01 0000)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Parameter 4	Byte 7
	Calculated	Byte 8

Operation		Parameter 1		Parameter 2		Parameter 3		Parameter 4		Parameter 5	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Focus mode specification	00h	AF mode								
		01h	MF mode								
02h	MF start	00h	FAR								
		01h	NEAR								
03h	Position specification	01h	Read	xxh	Position Hi	xxh	Position Lo				
		02h	Set	xxh	Position Hi	xxh	Position Lo				
		03h	Scope read	xxh	Min position Hi	xxh	Min pos. Lo	xxh	Max pos. Hi	xxh	Max pos. Lo
04h	MF stop										
05h	Speed	01h	Read	xxh	Value						
		02h	Write	xxh	Value						
06h	One-push AF										

Operation

Focus mode specification (01h)

Parameter 1 - specifies the focus mode.

AUTO focus

Manual focus

MF start (02h)

When the focus mode is MF, the user starts the focus operation specified by Parameter 1. When the Camera Head receives this operation request in the AF mode, it returns a negative response command.

Parameter 1

FAR Lengthens the focal distance.

NEAR Shortens the focal distance.

Position specification (03h)

Read - This parameter is used to read the present focus ring position.

Set - This parameter is used to move the focus ring to the position specified by Parameter 2 & 3. The response command for this operation is issued after the focus ring has reached the specified position. When the Camera Head receives this operation request in AF mode, it returns a negative response command.

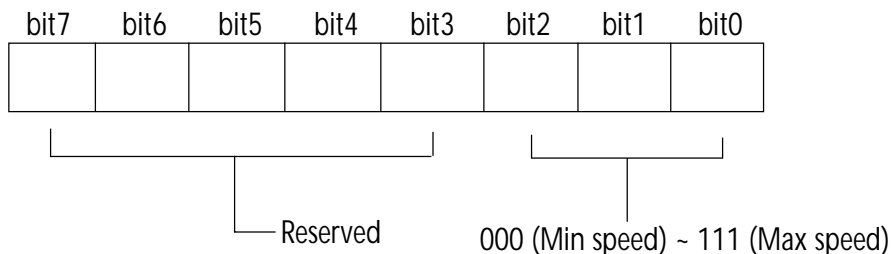
Scope read - This parameter is used to read the minimum and the maximum position of the focus ring.

MF stop (04h)

Stops the MF operation. When the Camera Head receives this operation request in the AF mode, it returns a negative response command.

Speed (05h)

Parameter 2 specifies focus speed. 8 step setting is enabled. Default value is 04h.



One-push AF (06h)

When the Camera Head receives this parameter, auto focus is started, when finished, the Response Command is returned. The maximum time to complete AF is 6 seconds, if longer, a Negative Response is sent.

Focus Limit Notification

After the manual focus operation is started, this command notifies that the focus ring has reached the FAR or NEAR end.

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Focus limit Notification 11h (1001 0001)	Byte 2
Parameter	Device Type	Byte 3
	Position(Hi)	Byte 4
	Position (Lo)	Byte 5
Check Sum	Calculated	Byte 6

Zoom Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Zoom 12h (0001 0010)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

2. Response

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Zoom 12h (1r01 0010)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
	Parameter 3	Byte 6
Check Sum	Calculated	Byte 7

Operation		Parameter 1		Parameter 2		Parameter 3	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Start	00h	TELE				
		01h	WIDE				
02h	Position specification	01h	Read				
		02h	Set	xxh	Position Hi	xxh	Position Low
		03h	Scope read	xxh	Max position Hi	xxh	Max position Low
03h	Stop						
04h	Speed	01h	Read				
		02h	Write	xxh	Value		
05h	Switch	00h	Enable				
		01h	Disable				

Operation

Start (01h)

The user starts the zoom operation specified by Parameter 1.

Parameter 1

TELE Moves the zoom ring in the TELE direction.

WIDE Moves the zoom ring in the WIDE direction.

Position Specification (02h)

Read - This parameter is used to read the zoom ring position.

Set - This parameter is used to move the zoom ring to the position specified by Parameter 2,3. The response command for this operation is issued after the zoom ring has reached the specified position.

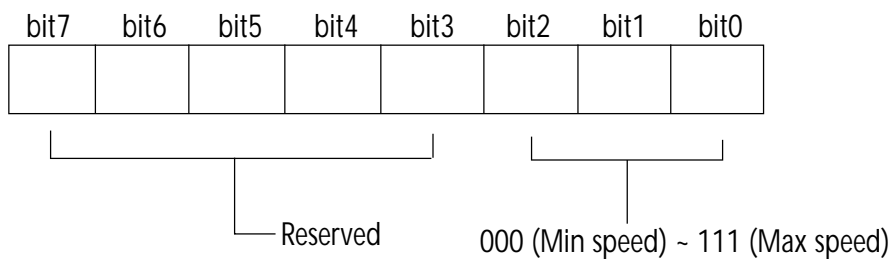
Scope read - This parameter is used to read the minimum and the maximum position of the zoom ring.

Stop (03h)

Stops the zoom operation started by the start operation or the position specification operation.

Speed (04h)

8 step setting is enabled. Default value is 04h.



Switch (05h)

This parameter is used to enable or disable the manual zoom switches on the zoom head.

Zoom Limit Notification

After the zoom operation is started, this command notifies that the zoom ring has reached the TELE or WIDE limit.

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Zoom limit notification 13h (1001 0011)	Byte 2
Parameter	Position	Byte 3
Check Sum	Calculated	Byte 4

Button Operation Notification

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Button operation notification 18h (1001 1000)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

Operation		Parameter 1	
Code	Meaning	Code	Meaning
01h	Freeze button	00h	off
		01h	on
02h	Zoom button (tele)	00h	off
		01h	on
03h	Zoom button (wide)	00h	off
		01h	on

Note: When one of the buttons is operated this notification is sent to the PC.
Also, the operation for the zoom buttons ARE executed.

Exposure Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Exposure 14h (1001 0100)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

2. Response

Frame Length	Variable	Byte 0
Frame ID	01h (camera head)	Byte 1
Command ID	Exposure 14h (1001 0100)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

When the operation is completed normally, the Camera Head returns the received Byte 2 and subsequent codes by the Exposure Response command without making any changes. When the operation is not completed normally, the Camera Head sends an Error Notification.

Operation		Parameter 1		Parameter 2	
Code	Meaning	Code	Meaning	Code	Meaning
01h	Exposure mode	00h	AE mode		
		01h	Manual mode		
02h	AE type	00h	Full AUTO AE		
		01h	Shutter speed priority AE	xxh	Shutter speed (See p47)
		02h	Iris priority AE	xxh	Iris ratio*
03h	AE lock	00h	Off		
		01h	On	00h	fixed
04h	AE reference correction	xxh	reference value		
06h	Shutter speed	00h	Conversion mode	xxh	Shutter speed (See p47)
07h	AGC gain	00h	Conversion mode	xxh	AGC (See p48)
08h	Iris	00h	Conversion mode	xxh	Iris ratio*

*The Iris ratio value can be adjusted from 54h (low) to A9h (high).

Operation

Exposure mode

Specifies the mode of the exposure operation.

Parameter 1

AE mode - Automatic exposure mode. This mode can be selected by the AE type operation.

Manual mode - The user controls exposure by adjusting the shutter speed, iris and gain.

AE type

Specifies the type of AE when the exposure operation is set to the AE mode or the correction (balanced adjustment) mode. The setting is valid only in the AE mode, but this operation request is accepted also in the manual mode.

Parameter 1

Full AUTO AE - Full-auto AE

Shutter speed priority AE - AE control is performed with the shutter speed fixed to the value specified by Parameter 2. Refer to the Shutter Speed Table for the correspondence between codes and shutter speeds.

Iris priority AE - AE control is performed with the iris ratio fixed to the value specified by Parameter 2. The Iris ratio value can be adjusted from 54h (low) to A9h (high).

AE lock

Locks the exposure control when the exposure mode is set to AE. When the exposure control is locked, the user is able to adjust the exposure by the AE reference correction operation.

AE reference correction (balanced adjustment)

This parameter is used to set an AE reference value. This parameter is valid in the AE mode. The default value of the AE reference is 48h (zoom head). Set a greater value if more brightness is needed, and set a lesser value if more darkness is needed.

Shutter speed

Sets the shutter speed. When the device receives this operation request in any mode other than the manual exposure mode, it returns the negative response command. The camera unit converts Parameter 2 according to the Shutter Speed Table and sets the value in the Timing Generator.

AGC (Automatic Gain Control)

Sets AGC. When the device receives this operation request in any mode other than the manual exposure mode, it returns the negative response command. The camera unit converts Parameter 2 according to the AGC Table and sets the value in AGC.

Iris

Sets the iris ratio. When the device receives this operation request in any mode other than the manual exposure mode, it returns the negative response command. The Iris ratio value can be adjusted from 54h (low) to A9h (high) and sets the value as the target iris value.

Relation between operation and AE mode

Operation	AE mode		
	AE on	Manual	AE lock
Exposure mode	0	0	X
AE mode	0	X	X
AE lock	0	X	0
AE reference	0	X	X
Shutter speed	X	0	X
AGC	X	0	X
Iris	X	0	X

0 = Accept operation

X = Negative response with error code 14h (parameter status error) is sent to the PC.

Shutter Speed Table

Hex	1/sec.	Hex	1/sec.	Hex	1/sec.	Hex	1/sec.	Hex	1/sec.
00	60.4	1E	115	3C	214	5A	362	78	1175
01	61.4	1F	118	3D	217	5B	371	79	1269
02	62.8	20	120	3E	220	5C	380	7A	1381
03	64.1	21	123	3F	223	5D	389	7B	1514
04	65.4	22	125	40	226	5E	399	7C	1675
05	67.1	23	128	41	230	5F	409	7D	1874
06	68.6	24	131	42	233	60	420	7E	2128
07	70.1	25	134	43	237	61	432	7F	2460
08	71.4	26	137	44	240	62	444	80	2916
09	73.0	27	140	45	244	63	457	81	3579
0A	74.8	28	143	46	248	64	471	82	4633
0B	76.2	29	146	47	252	65	485	83	6565
0C	78.1	2A	149	48	256	66	501	84	11261
0D	79.7	2B	153	49	260	67	517		
0E	81.4	2C	156	4A	265	68	535		
0F	83.1	2D	159	4B	269	69	554		
10	85.3	2E	163	4C	274	6A	574		
11	87.2	2F	166	4D	279	6B	596		
12	88.7	30	170	4E	284	6C	619		
13	90.7	31	174	4F	289	6D	645		
14	92.9	32	178	50	294	6E	672		
15	95.1	33	182	51	300	6F	702		
16	97.5	34	186	52	306	70	735		
17	100	35	191	53	312	71	771		
18	101	36	195	54	318	72	811		
19	103	37	198	55	325	73	855		
1A	106	38	200	56	332	74	904		
1B	108	39	203	57	339	75	960		
1C	110	3A	208	58	346	76	1022		
1D	112	3B	211	59	354	77	1093		

AGC Table

Hex	dB	Hex	dB	Hex	dB	Hex	dB	Hex	dB
03	0.00	21	5.08	3F	10.1	5D	15.2	7B	20.3
04	0.16	22	5.25	40	10.3	5E	15.4	7C	20.4
05	0.33	23	5.41	41	10.5	5F	15.5	7D	20.6
06	0.50	24	5.58	42	10.6	60	15.7	7E	20.8
07	0.67	25	5.75	43	10.8	61	15.9	7F	21.0
08	0.84	26	5.92	44	11.0	62	16.0		
09	1.01	27	6.09	45	11.1	63	16.2		
0A	1.18	28	6.26	46	11.3	64	16.4		
0B	1.35	29	6.43	47	11.5	65	16.5		
0C	1.52	2A	6.60	48	11.6	66	16.7		
0D	1.69	2B	6.77	49	11.8	67	16.9		
0E	1.86	2C	6.94	4A	12.0	68	17.1		
0F	2.03	2D	7.11	4B	12.1	69	17.2		
10	2.20	2E	7.28	4C	12.3	6A	17.4		
11	2.37	2F	7.45	4D	12.5	6B	17.6		
12	2.54	30	7.62	4E	12.7	6C	17.7		
13	2.70	31	7.79	4F	12.8	6D	17.9		
14	2.87	32	7.95	50	13.0	6E	18.1		
15	3.04	33	8.12	51	13.2	6F	18.2		
16	3.21	34	8.29	52	13.3	70	18.4		
17	3.38	35	8.46	53	13.5	71	18.6		
18	3.55	36	8.63	54	13.7	72	18.7		
19	3.72	37	8.80	55	13.8	73	18.9		
1A	3.89	38	8.97	56	14.0	74	19.1		
1B	4.06	39	9.14	57	14.2	75	19.3		
1C	4.23	3A	9.31	58	14.3	76	19.4		
1D	4.40	3B	9.48	59	14.5	77	19.6		
1E	4.57	3C	9.65	5A	14.7	78	19.8		
1F	4.74	3D	9.82	5B	14.9	79	19.9		
20	4.91	3E	9.99	5C	15.0	7A	20.1		

Pan/Tilter

LED

The Pan/Tilter has three color LEDs. The PC can control these three LEDs through the RS-232C commands. However, when the Pan/Tilter is controlled by the IR remote controller the indication of these LEDs mean as follows:

LED Definitions Table

LED Indication	Meaning
Green LED	
Off	Power is off on the Pan/Tilter.
Blink (1Hz)	Pan/Tilter head initialization is in progress.
On	Pan/Tilter head initialization was completed.
Blink (10 Hz)	IR remote key codes are being detected.
Blink (2 Hz)	Pan/Tilter is in Preset mode.
Blink (1 Hz)	Pan/Tilter is in operate Off mode.
Red LED	
On	Different units would be activated.
Blink (2 Hz)	Pan/Tilter is in ID mode.
Off	Pan/Tilter is out of ID mode.

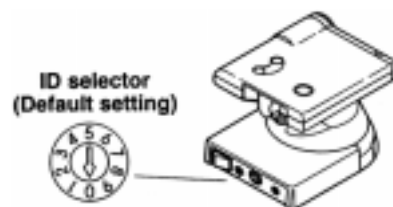
Note: Whenever the Red LED is on or is blinking, the Green LED also will be on. Therefore, when the Red LED is on, the color of the LED window on the Pan/Tilter looks orange.

Power Switch

This is the Power switch to supply 12 volts of power to the Pan/Tilter unit. The main power switch on the CCU must also be on.

ID Selector Switch

The ID Selector switch has ten positions. Positions 1-6 are assigned for the ID number selection of each VC-C3 when you want to control up to six VC-C3s using one IR remote controller. If the setting of this rotary switch is 0, 7-9, the VC-C3 would respond to the IR remote key operations regardless of ID selection by the IR remote.



Pan/Tilter Command Type List

When the device assignment bits of the Frame ID is 05h (Pan/Tilter), the following table is used. This table shows the command type (bit 0-4 in the Command Frame). Refer to Frame Header Format.

PC → VC-C3		VC-C3 → PC			
Code	Command Name	Code	Command Name		
00h	Status request	00h	Error notification		
01h		01h			
02h		02h			
03h		03h			
04h		04h		Status response	
05h		05h			
06h		06h			
07h		07h			
08h		08h			
09h		09h			
0Ah	Set-up request	0Ah	Set-up response		
0Bh		0Bh			
0Ch		0Ch			
0Dh		0Dh			
0Eh		0Eh			
0Fh	Home position request	0Fh	Home position response		
10h		10h			
11h		11h			
12h	Pan/tilt request	12h	Pan/tilt response		
13h		13h			
14h	Remote controller request	14h	Limit notification		
15h		15h			
16h		16h			
17h		17h		Remote controller response	
18h		18h		Remote controller notification	
19h		LED request		19h	LED response
1Ah				1Ah	
1Bh		Power notification		1Bh	Power notification
1Ch				1Ch	
1Dh				1Dh	
1Eh	1Eh				
1Fh	1Fh				

Error Notification

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Error Notification 03h (1000 0011)	Byte 2
Parameter	Error Type*	Byte 3
	Error Cause	Byte 4
Check Sum	Calculated	Byte 5

*Error type (Byte 3) Refer to Error Types Table p.11.

Error Types

When the Video Adapter, Pan/Tilter or Camera Head send a negative Response Command or an Error Notification Command, the error type is added to the Command Frame. (See p.11 for Error Type Table)

Note:

For all Command Type illustrations, the Hex value represents only bits 0-4 of the binary number listed in the Command ID.

See Frame Header Format in the RS-232 Protocol chapter for a full description.

Status Command

1. Status request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Status request 04h (0000 0100)	Byte 2
Parameter	Status specification*	Byte 3
Check Sum	Calculated	Byte 4

*Status specification parameter (Byte 3)
 00h : System status
 01h : ID Selector Switch status
 02h : Pan/Tilt status
 03h : Remote controller ID status

2. Status response

System

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Status Response 04h (1r00 0100)	Byte 2
Parameter	00h (System)	Byte 3
	Product Code	Byte 4
	Product Version	Byte 5
Check Sum	Calculated	Byte 6

Pan/tilt

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Status Response 04h (1r00 0100)	Byte 2
Parameter	02h (Pan/tilt)	Byte 3
	Pan speed	Byte 4
	Pan position 1	Byte 5
	Pan position 2	Byte 6
	Tilt speed	Byte 7
	Tilt position 1	Byte 8
	Tilt position 2	Byte 9
Check Sum	Calculated	Byte 10

ID Selector Switch

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Status Response 04h (1r00 0100)	Byte 2
Parameter	01h (Switch)	Byte 3
	Switch number	Byte 4
Check Sum	Calculated	Byte 5

Remote Controller ID

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Status Response 04h (1r00 0100)	Byte 2
Parameter	03h	Byte 3
	Remote controller ID	Byte 3
	ID	Byte 4
Check Sum	Calculated	Byte 5

Set-up Command

1. Set-up request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Set-up request 10h (0001 0000)	Byte 2
Check Sum	Calculated	Byte 3

This command is used to detect home position. When the Pan/Tilter receives this command, it detects home position, returns the original position and sends the PC response with an absolute position.

The PC should not send another pan/tilt request command until it receives the set-up response.

The maximum time to complete this command is 4 seconds.

2. Set-up response

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Set-up Response 10h (1r01 0000)	Byte 2
Parameter	Pan position 1	Byte 3
	Pan position 2	Byte 4
	Tilt position 1	Byte 5
	Tilt position 2	Byte 6
Check Sum	Calculated	Byte 7

Home Position Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Home position 11h (0001 0001)	Byte 2
Check Sum	Calculated	Byte 3

2. Response

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Home position 11h (1r01 0001)	Byte 2
Check Sum	Calculated	Byte 3

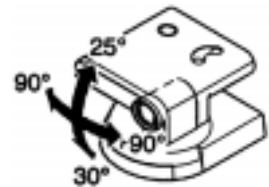
This command is used to detect home position and move the Pan/Tilter to home position.
The maximum time to complete this command is 3 seconds.

The Accessible Area of the Pan/Tilter

	+25 deg 8000h+D9h (+217)	
-90 deg 8000h-30Eh (-782)	0 deg 8000h (home position)	+90 deg 8000h+30Eh (+782)
	-30 deg 8000h-10Ah (-266)	

The detection of the camera head position:

The Pan/Tilter has two types of positioning modes; relative positioning and absolute positioning.



Relative positioning

In this mode, the Pan/Tilter does not keep track of its position. The Pan/Tilter only rotates as much as is described in the command given to it from the PC. The Pan/Tilter will try to rotate its camera head although the Pan/Tilter angle may reach its limit. (The pulse motor for Pan or Tilt will continue to be driven.)

Absolute positioning

In this mode, the Pan/Tilter keeps track of its mechanical absolute position with a photo detector. Therefore the Pan/Tilter can cease giving the drive pulse to the pulse motors when the Pan/Tilter reaches its limit.

To use the Pan/Tilter in the absolute positioning mode, the home key on the IR remote controller has to be pressed or the "Set-up request" command or the "Home Position" command has to be given from PC.

After the power to the Pan/Tilter is turned on, the Pan/Tilter operates in the relative positioning mode because its absolute position has not been detected. The above IR remote controller operation or command has to be given to the Pan/Tilter. Once the Pan/Tilter detects the absolute position, the Pan/Tilter operates in the absolute positioning mode.

Pan/Tilt Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Pan/tilt 12h (0001 0010)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

*Depending on the Pan/Tilt Command used, the Parameters may vary. See the chart below for specific command parameter requirements.

2. Response

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Pan/tilt 12h (1r01 0010)	Byte 2
Parameter*	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

Operation		Parameter 1		Parameter 2		Parameter 3		Parameter 4		Parameter 5	
Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning	Code	Meaning
01h	Start	00h	Pan, fixed	00h	Tilt, fixed						
				01h	Tilt, upper						
				02h	Tilt, lower						
		01h	Pan, right	00h	Tilt, fixed						
				01h	Tilt, upper						
				02h	Tilt, lower						
		02h	Pan, left	00h	Tilt, fixed						
				01h	Tilt, upper						
				02h	Tilt, lower						
02h	Stop										
03h	Speed	01h	Read								
		02h	Write	xxh	Pan speed	xxh	Tilt speed				
04h	Relative position	01h	Read								
		02h	Write	xxh	Pan position Hi	xxh	Pan position Lo	xxh	Tilt position Hi	xxh	Tilt position Lo
05h	Absolute position	01h	Read								
		02h	Write	xxh	Pan position Hi	xxh	Pan position Lo	xxh	Tilt position HI	xxh	Tilt position Lo

Start

Starts the pan/tilt operation.

Stop

Stops the pan/tilt operation.

Speed

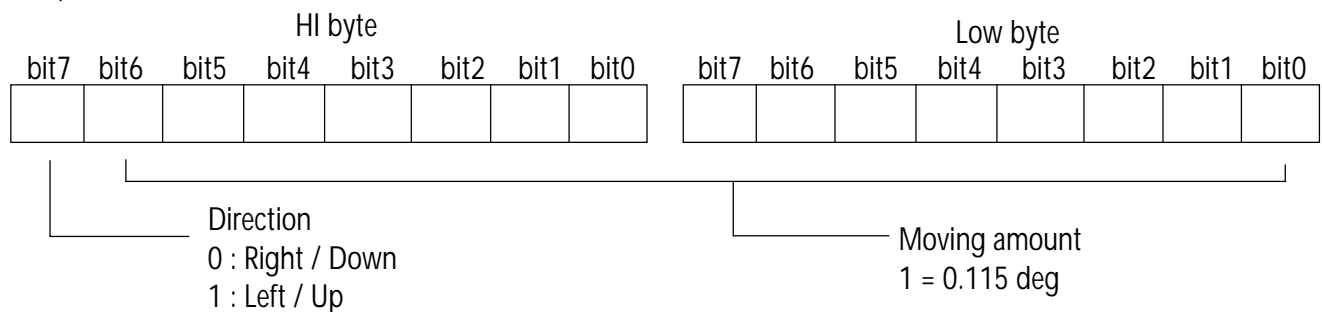
Pan: 01h – 4Ch (1°/sec – 76°/sec)

Tilt: 01h – 46h (1°/sec – 70°/sec)

Relative position specification

Moves the Pan/Tilter in the direction and amount specified by Parameters 2, 3, 4 and 5. If the Limit Notification command is issued during movement, the Pan/Tilter sends a negative response with error code 14h (parameter status error).

Note: The response command for this operation request is issued after the Pan/Tilter has reached the specified position.



Absolute position specification

Moves the Pan/Tilter to the position specified by Parameters 2, 3, 4 and 5. If the home position is not detected, the Pan/Tilter should detect home position. When the PC specifies an out of limit position, the Pan/Tilter sends a negative response with error code 12h (Undefined parameter).

Note: The response command for this operation request is issued after the Pan/Tilter has reached the specified position.

Limit Notification

After the pan/tilt operation is started, this command notifies that the Pan/Tilter has reached the pan/tilt limit position.

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Limit notification 16h (1001 0110)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
Check Sum	Calculated	Byte 5

Operation		Parameter 1	
Code	Meaning	Code	Meaning
00h	Pan limit	01h	Right end
		02h	Left end
01h	Tilt limit	01h	Upper end
		02h	Lower end

Remote Controller Command

1. Request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Remote controller 17h (0001 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

2. Response

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Remote controller 17h (1r01 0111)	Byte 2
Parameter	Operation	Byte 3
	Parameter 1	Byte 4
	Parameter 2	Byte 5
Check Sum	Calculated	Byte 6

Operation		Parameter 1		Parameter 2	
Code	Meaning	Code	Meaning	Code	Meaning
01h	Pass-Through	xxh	Modes		
02h	ID specification	01h	Read	0-6	ID value (response)
		02h	Write	0-6	ID value

IR Pass-Through (01h)

00h : Remote controller normal operation (default)

When the VC-C3 receives a code from the remote controller, the Pan/Tilter notifies the PC of the code after an ID check. To notify the PC, the PC's CTS line has to be on.

01h : Remote controller pass through

When the VC-C3 receives a code from the remote controller, the VC-C3 notifies the PC of the code without an ID check. To notify the PC, the PC's CTS line has to be on.

02h : No Pass-Through

When the VC-C3 receives a code from the remote controller, regardless of ID setting, no code is passed through to the PC.

IR Code Pass-Through

Parameter	IR Control	Pass-Through
00h	OK	NO
01h	NO	OK
02h	NO	NO

ID specification (02h)

This operation is used to read or write the remote controller ID. ID 0 means global ID.

Remote Controller Notification

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Remote controller notification 18h (1011 1000)	Byte 2
Parameter	Operation*	Byte 3
	Code**	Byte 4
Check Sum	Calculated	Byte 5

*Operation

00h : Switch up
01h : Switch down

**Code

SW No	Code(h)	Function	SW No	Code(h)	Function	SW No	Code(h)	Function
1	70	AUTO	9	51	PRESET	17	41	OPERATE
2	00	MANUAL	10	10	1	18	40	4
3	80	NEAR	11	20	2	19	50	5
4	90	FAR	12	30	3	20	60	6
5	A0	WIDE	13			21	B0	TELE
6			14	C0	UP	22		
7	E0	LEFT	15	01	HOME	23	F0	RIGHT
8			16	D0	DOWN	24		

LED Command

This command is used to control the LED of the Pan/Tilter.

1. Request

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	LED 19h (0001 1001)	Byte 2
Parameter	Operation*	Byte 3
	Parameter 1**	Byte 4
	Parameter 2***	Byte 5
Check Sum	Calculated	Byte 6

2. Response

Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	LED 19h (1r01 1001)	Byte 2
Parameter	Operation*	Byte 3
	Parameter 1**	Byte 4
	Parameter 2***	Byte 5
Check Sum	Calculated	Byte 6

*Operation

00h : Pan/Tilter blinks LED while remote controller switch is down.

01h : Lighting out

02h : Lighting

03h : Pan/Tilter blinks LED by period which specified parameter 2.

**Parameter 1

LED specification

00h : All LED

01h : LED1 (green)

02h : LED2 (red)

***Parameter 2 – Blinking period

value (h)	Period (sec)	value (h)	Period (sec)
00	1	80	0.8
01	1.5	81	0.6
02	2	82	0.5
03	3	83	0.4
04	4	84	0.3
05	5	85	0.2
06	6	86	0.1

Power Notification

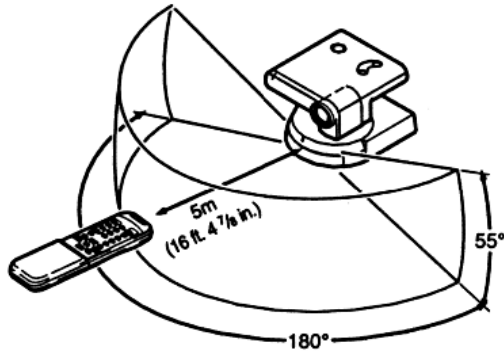
Frame Length	Variable	Byte 0
Frame ID	05h (pan-tilter)	Byte 1
Command ID	Power notification 1Bh (1001 1011)	Byte 2
Parameter	Operation	Byte 3
Check Sum	Calculated	Byte 4

Operation

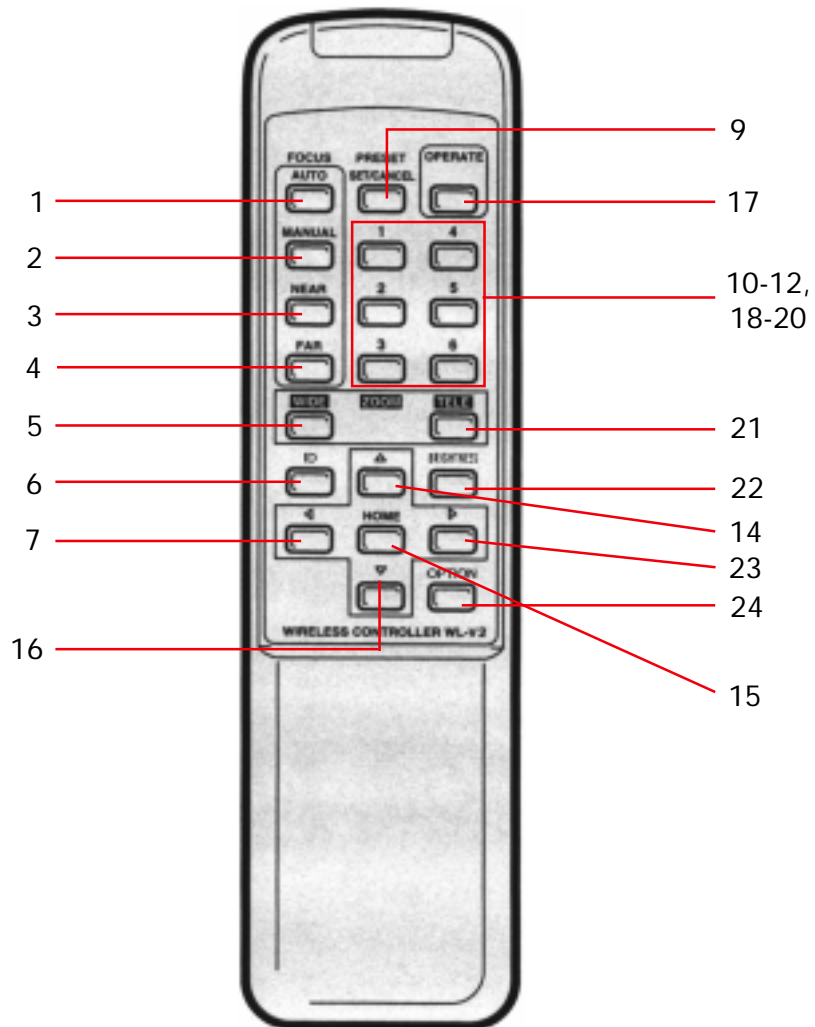
01h : Switch on

Remote Controller

IR Remote Operating Range



IR Remote Controller Key Layout



IR Controller Key Functions (IR key #)

FOCUS

- AUTO (1) Sets automatic focusing mode.
- MANUAL (2) Sets manual focusing mode.
- NEAR (3) Selects manual mode, shortens the focal distance while this key is pressed.
- FAR (4) Selects manual mode, lengthens the focal distance while this key is pressed.

ZOOM

- WIDE (5) Moves the Zoom lens to view a wider image area while this key is pressed. Zoom speed would be accelerated by keeping this key pressed. (560pps high and 112pps low)
- TELE (21) Moves the Zoom lens in the TELE direction while this key is pressed. Zoom speed would be accelerated by keeping this key pressed. (560pps high and 112pps low)

PAN/TILTER

- HOME (15) Moves the Camera Head to the center position of both horizontal and vertical axis.
- UP (14) Tilts the Camera head upwards. This operation will continue while the key pressed. Tilt speed would be accelerated by keeping this key pressed. (568pps high and 204pps low)
- DOWN (16) Tilts the Camera head downwards. This operation will continue while the key pressed. Tilt speed would be accelerated by keeping this key pressed. (568pps high and 204pps low)
- LEFT (7) Pans the Camera head face to leftward. This operation will continue while the key pressed. Pan speed would be accelerated by keeping this key pressed. (568pps high and 204pps low)
- RIGHT (23) Pans the Camera head face to rightward. This operation will continue while the key pressed. Pan speed would be accelerated by keeping this key pressed. (568pps high and 204pps low)

BRIGHTNESS (22)

When the image seen by the VC-C3 is dark, the brightness of the image can be increased by pressing this key on the IR remote controller. The three steps of the brightness will be available as follows; Default → First step brighter → Second step brighter → Default (from 48h to 60h to 90h, 3-step toggle)

OPERATE (17) *(available through the IR remote ONLY)*

The OPERATE key is for switching the camera in or out of OPERATE mode. When the camera is in OPERATE mode the LED is lit (default) and when the camera goes out of OPERATE mode (sleep), the LED blinks at 1 Hz. When the camera is out of OPERATE mode, the keys on the IR remote controller, except the OPERATE key, are neglected and the video signal from its composite video and Y/C output terminals are muted as is the audio.

PRESET SET/CANCEL (9)

The Pan/Tilt/zoom position and the brightness of the target object at the time are saved in the memory of the Pan/Tilt unit. Pressing the PRESET key sets the Pan/Tilt status to PRESET mode and the LED on the Pan/Tilt base blinks at 1 Hz. See Number Keys 1~6 (preset).

Note: In PRESET mode, pressing the PRESET key again interrupts the PRESET mode and changes the Pan/Tilter back to NORMAL mode.

Preset: Number Keys (10-12,18-20)

In PRESET mode, pressing the number keys 1 ~ 6 will store the pan/tilt/zoom position and the brightness of the target object at the time into the EEPROM chip in the Pan/Tilter. This preset data is kept in the EEPROM after the main power is turned off.

ID (6)

When controlling more than one VC-C3 in a room, this key is used to direct the IR signal to the appropriate VC-C3 up to a total of 6 cameras. (See Pan/Tilt section for setting the ID Selector switch). When the ID key is pressed once, the LED on the Pan/Tilter blinks orange at 1 Hz.

ID: Number Keys (10-12,18-20)

After pressing the ID button, pressing one of the numbered keys will select the VC-C3 with the same ID Selector switch number on its Pan/Tilter and the LED of the Pan/Tilter changes to green and responds to the IR remote controller. The other VC-C3's which have different ID Selector switch numbers keep their LED color orange and will reject the IR remote controller signal (except for the ID key).

Note: The default ID setting is zero. Therefore one or more VC-C3s with this ID setting will all respond to the IR remote signal at the same time.

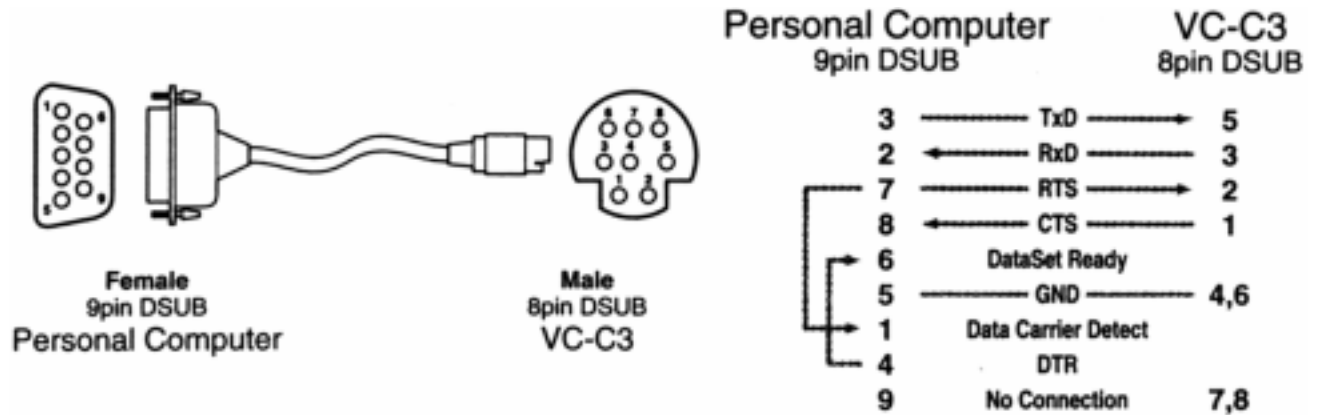
OPTION (24)

This key only issues a trigger notification (button up/down) to the PC. It is not used otherwise.

Appendix A – RS-232 Pin-Outs

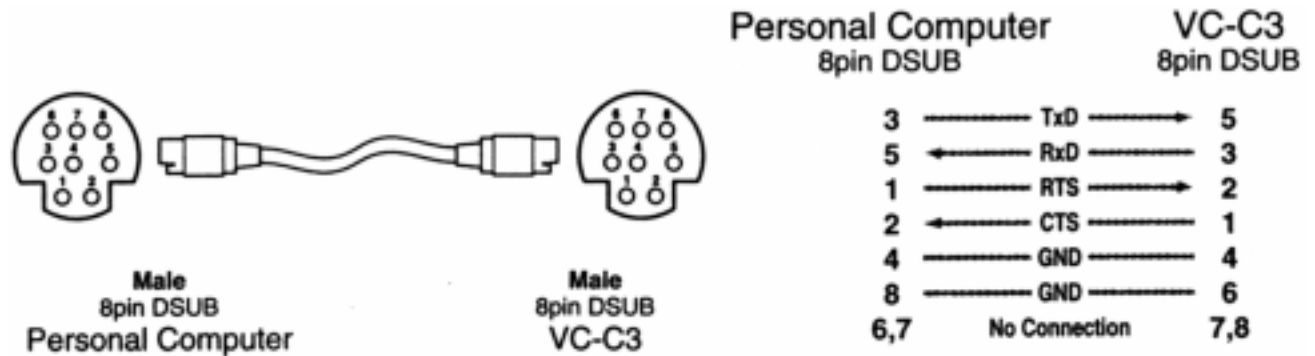
9 pin DSUB to 8 pin (VC-C3) Connection

Below is a cable pin out of the cable required to control the Canon VC-C3 camera from an computer with a 9 pin serial control port.



8 pin DIN to 8 pin (VC-C3) Connection

Below is a cable pin out of the cable required to control the Canon VC-C3 camera from an computer with a 8 pin serial control port.



Appendix B – Contact Information

For technical assistance, contact Canon Visual Communication Systems or send a fax to:

Canon USA, Inc.
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Appendix C – Duplex Exceptions

Most commands, with a few exceptions, are mutually independent. Therefore, the host may transmit one request command then another before receiving the response command for the first one. Below are the exceptions.

When the VC-C3 receives a "B" Command but has NOT sent a Response to an "A" Command, the VC-C3 will send a Negative Response to the "B" Command.

Values for "A" and "B" are below:

Command A: White Balance Command/White Balance Mode/Correction Mode

Command B: White Balance Command/White Balance Mode/(any)

Command A: Fade Command/Fade Start

Command B: White Balance Command/(any)

Command B: Fade Command/Fade Speed

Command A: One-Push AF Request

Command B: Focus Command/MF Start

Command B: Zoom Command/Start

Command A: Zoom Command/Position Specification

Command B: Zoom Command/Start

Command A: Focus Command/Position Specification

Command B: Focus Command/MF Start

Command B: Focus Command/Focus Mode Specification

Command B: Focus Command/One-Push AF

Command A: (Pan/Tilt) Set-up Command

Command B: Pan/Tilt Command/(any)

Command A: (Pan/Tilt) Home Position Command

Command B: Pan/Tilt Command/(any)

Appendix D – Developer Information

Canon VC-C3 SDK Example Application

This example application and driver were written and compiled with Microsoft C/C++ 32 Bit SDK Version 4.1. Open the EXAMPLE project in Microsoft Visual C/C++ to edit and recompile.

The VC-C3 driver (VCC3.DLL) has been set up as a sub-project of EXAMPLE in the EXAMPLE\VCC3 directory. It will be automatically updated if EXAMPLE is selected as the project. The output is directed to the EXAMPLE\RELEASE directory so any changes made to the DLL will be automatically loaded by the application next time it is run. EXAMPLE explicitly loads and unloads the DLL using LoadLibrary and FreeLibrary to facilitate this (see EXAMPLE.C).

EXAMPLE.C is a simple application which demonstrates the operation of the driver.

COMMAND.C and COMMAND.H contain example VC-C3 commands.

BUTTON.C and BUTTON.H contain a simple button handler used by EXAMPLE.

VCC3.C and VCC3.H constitute the basic driver (VCC3.DLL) and are generalized to work with any application. All of the functions return an error code defined in VCC3.H to indicate whether the operation was successful.

VCC3.DLL Driver Overview

The library functions can be accessed from any Windows '95 program through a Dynamic Link Library (DLL) interface. All function definitions are contained in VCC3.H.

The VC-C3 driver depends on the multitasking capability of Windows '95 to handle asynchronous notifications from the VC-C3 and changes in the CTS RS-232C line. ComEventThread is created when the driver is initialized and continuously monitors received character and CTS events.

After the CONTROL MODE SELECT command is issued to the VC-C3 to enable notification, the VC-C3 processes asynchronous notification requests. The host is required to respond with an ACK frame within a specified time period. The VC-C3 driver handles this automatically and notifies the calling application by sending a message to it (using SendMessage) if specified when VCC3_Open function is called. Although the host is not required to act on the notification, the acknowledgment is required.

The host is also required to return ACK frames after receiving a response. This is also handled automatically by the driver.

Driver Initialization

In order to communicate with the VC-C3 through its RS-232C interface, the host issues a CONTROL MODE SELECT command after establishing the communications parameters with the Windows '95 serial driver. This effectively causes the VC-C3 to accept commands from the PC instead of the remote control. The VC-C3 passes remote control button presses and releases to the PC without taking action.

When the VC-C3 driver terminates, the host issues a CONTROL MODE SELECT command to disable notification which causes the VC-C3 to respond to remote control commands. This is the default mode when the VC-C3 is powered.

Preset Commands

The VC-C3 does not have specific commands for PRESET SET like the remote control has. It provides the ability to read and write PAN, TILT, ZOOM and EXPOSURE values into 6 preset positions. The following procedures are used by the EXAMPLE program to implement the PRESET SET and MOVE functions. Refer to the DoPresetSet and DoPresetMove commands in COMMAND.C.

SET:

1. Read current ZOOM.
2. Read current EXPOSURE.
3. Read current PAN and TILT.
4. Send PRESET WRITE for position 1-6 with these values.

MOVE:

1. Send PRESET READ to position 1-6 to retrieve ZOOM, EXPOSURE, PAN and TILT values.
2. Send ZOOM command.
3. Send EXPOSURE command.
4. Send PAN and TILT command.

IR Remote Control Pass Through

Once the host has enabled notification with the CONTROL MODE SELECT command, the VC-C3 sends remote control button press/release notifications to the host. EXAMPLE.C demonstrates concurrent operation of host and remote control by sending the command corresponding to each button pressed (and/or released) when notifications are received.

Notification Messages

Notification messages are sent to the window specified by the hWndNotify and uMsgNotify parameters of the VCC3_Open function. SendMessage is used to send the following messages specified by the wParam parameter:

VCC3_MSG_CTSLO

This message indicates that the CTS line has changed from high to low. The VC-C3 is either disconnected, turned off or unable to communicate.

VCC3_MSG_CTSHI

This message indicates that the CTS line has changed from low to high. The VC-C3 is ready for communication. The host should respond by issuing a CONTROL MODE SELECT command (VCC3_HOST_ENABLE) to ensure that the RS-232C interface is enabled.

VCC3_MSG_RECV

This message indicates that a notification frame has been received. The lParam parameter points to the message which is valid only during the SendMessage call. The application should make a copy of it before issuing other requests.

VCC3_Open

DllExport int WINAPI VCC3_Open (lpVCC3, hWndNotify, uMsgNotify, iPort, iBaud)

LPVCC3INFO lpVCC3;
HWND hWndNotify;
UINT uMsgNotify;
int iPort;
int iBaud;

Description

Initializes communications with the VC-C3. This function must be called before any other library functions can be used.

Parameters

lpVCC3

Pointer to a VCC3INFO structure that is initialized if VCC3_Open is successful.

hWndNotify

Window handle where notification messages are sent. If this parameter is NULL, notification events will be acknowledged but otherwise ignored by the driver.

uMsgNotify

Message ID sent to hWndNotify if specified.

iPort

Communications Channel: VCC3_COM1, VCC3_COM2, VCC3_COM3, or VCC3_COM4.

iBaud

Baud rates: VCC3_BAUD4800, VCC3_BAUD9600 or VCC3_BAUD14400

Return Value:

Returns VCC3_ERR_NONE if successful.

VCC3_Close

DllExport int WINAPI VCC3_Close (lpVCC3)

LPVCC3INFO lpVCC3;

Description

Closes communications with the VC-C3 and driver operation.

Parameters

lpVCC3

Pointer to a VCC3INFO structure.

Return Value:

Returns VCC3_ERR_NONE if successful.

VCC3_Command

DllExport int WINAPI VCC3_Command (lpVCC3, lpCmd, lpResp, lpiRespLen)

LPVCC3INFO lpVCC3;

LPBYTE lpCmd;

LPBYTE lpResp;

LPINT lpiRespLen;

Description

Send an VC-C3 command. Wait For Response. Notifications received during this call are sent to caller if specified in the VCC3_Open function.

Parameters

lpVCC3

Pointer to a VCC3INFO structure.

lpCmd

Pointer to complete command string as defined in the VC-C3 Programmers Manual. The string should include Length, Frame Id, Command Id and Parameter fields. The checksum is calculated automatically and appended to the command.

lpResp

Pointer to a buffer to receive the response. If this parameter is NULL, the response will not be returned.

lpiRespLen

Pointer to an integer which receives the length of the received response if specified. The length includes Length, Frame Id, Command Id and parameter fields.

Return Value:

Returns VCC3_ERR_NONE if successful.

VCC3_Send

DllExport int WINAPI VCC3_Send (lpVCC3, lpCmd)

LPVCC3INFO lpVCC3;

LPBYTE lpCmd;

Description

Send an VC-C3 command only.

Parameters

lpVCC3

Pointer to a VCC3INFO structure.

lpCmd

Pointer to complete command string as defined in the VC-C3 Programmers Manual. The string should include Length, Frame ID, Command ID and Parameter fields. The checksum is calculated automatically and appended to the command.

Return Value:

Returns VCC3_ERR_NONE if successful.

VCC3_Recv

DllExport int WINAPI VCC3_Recv (lpVCC3, lpResp, lpiRespLen, dwTimeout)

LPVCC3INFO lpVCC3;

LPBYTE lpResp;

LPINT lpiRespLen;

DWORD dwTimeout;

Description

Wait For VC-C3 Response or Notification

Parameters

lpVCC3

Pointer to a VCC3INFO structure.

lpResp

Pointer to a buffer to receive the response. If this parameter is NULL, the response will not be returned.

lpiRespLen

Pointer to an integer which receives the length of the received response if specified. The length includes Length, Frame ID, Command ID and parameter fields.

dwTimeout

Number of milliseconds to wait for response after sending request.

Return Value:

Returns VCC3_ERR_NONE if successful.

VCC3_RecvCount

DllExport int WINAPI VCC3_RecvCount (lpVCC3)

LPVCC3INFO lpVCC3;

Description

Returns the number of bytes available in the receive queue.

Parameters

lpVCC3

Pointer to a VCC3INFO structure.

Return Value:

Returns the number of bytes available in the receive queue.

Appendix E – Changes History

v1.0 – Original printing

v1.1 – October 1997

Page 16 – Parameter for DIP Switch was incorrectly stated, proper hex is 03h.

Page 21 – Preset Request: The Write command for parameter 2 has been corrected. Now, when sending the Write command Parameter 1 and 2 will have the same hex.

Also, the AE reference value (parameter 3) was incorrectly stated it is a one byte value NOT two.

Page 22 - Preset Response: The AE reference value (parameter 3) was incorrectly stated, it is a one byte value NOT two bytes.

Page 27 – The Zoom command:

- for Position Specification: Read, parameter 2 & 3 are not used
- for Speed: Read parameter 2 & 3 are not used

v1.2 – January 1998

The entire manual has been reformatted to help in reducing confusion between commands. (note it is now 73 pages vs. 47)

A special thanks to those early developers that helped us out with suggestions and fixes!

- added an entire section on Sample Code Sequences. This will provide you with a step by step diagram of the command flow for a few common tasks.
- added Request and Response pics for all applicable commands.
- the Video Adapter is now referred to as the CCU (Camera Control Unit).
- updated index and page references.
- fixed many grammatical errors throughout.
- White Balance: Manual setting description corrected to reference parameter 2 & 3.
- Preset Request: Parameter 2: Preset Position was corrected to Preset Status.
- Preset Request: Write description corrected to reference parameters 2-9.
- Focus: corrected table to show 2-byte position specifications.
- Exposure: binary number corrected to proper value 1001 0100 (req.), 1r01 0100 (resp.).
- Exposure: corrected table to show proper parameters (1,2 only).
- Updated all binary references to reflect known variables for each request/response pic.
- Preset, Focus, Zoom, Pan/Tilt: expanded table to properly show all parameters and hi/lo bytes.
- Set Up: response hex value corrected to 10h.
- Home: binary number in pic corrected to 1001 0001.
- Zoom: scope read corrected to show max value.
- Limit Notification: corrected to 16h.
- Error Types: error 20h was not a valid error and has been removed.
- Error Types: added error codes to RS-232 Communication Error response.
- changed SW3 to be always OFF. (should not be moved to the ON position)
- CCU: added Software Reset (01h) command.
- Error Types: time out error description added.