SONY

CAMERA SYSTEM-700 CONTROL PROTOCOL

PROTOCOL AND COMMAND SPECIFICATIONS
1st Edition

Serial No. 0022

Table of Contents

Manual Structure

1. Outline

2. Fundamental Structure of the Protocol

3. IDs

4. Commands

5. Details of Address Lists

6. Local Commands

7. Rules for Creating New Commands

8. Communication Procedure of Applications

9. Others

Manual Structure

Outline

The Camera System-700 Control Protocol is developed uniquely for Sony broadcast application camera system. This protocol is designed to control the camera systems that are connected by the unique multi-conductor cable or the triaxial cable or the fiber cable, and by establishing communication between them.

Name of this protocol shall be as follows :
Official name of the protocol: Sony Camera System-700 Control Protocol
Abbreviated name : 700 Protocol

Section 1
Outline

1-1. History

- 1st edition 9-967-815-01 1999/5
  The first edition carries the description up to the command revision 4.0.

1-2. Abbreviations and Terminology

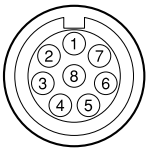
• ABS	ABSOLUTE
• CA	Camera Adapter
• CCU	Camera Control Unit
• CHKSUM	PACKET CHECKSUM
• CHU	Camera Head Unit
• CMD_GP	COMMAND GROUP
• CNU	Camera command Network Unit
• CP	CCU Panel
• DCCU_ID	DEFAULT CCU ID
• DCHU_ID	DEFAULT CHU ID
• DCNU_ID	DEFAULT CNU ID
• DCP_ID	DEFAULT CCU PANEL ID
• DEC	Decrement
• DESTID	DESTINATION ID
• DIP_ID	DEFAULT IRIS PANEL ID
• DMSU_ID	DEFAULT MSU ID
• DRCP_ID	DEFAULT RCP ID
• DRM_ID	DEFAULT RM ID
• ECS	Extended Clear Scan
• EVS	Enhanced Vertical Definition System
• INC	Increment
• IP	Iris Control Panel
• G_ID	GLOBAL ID
• GALL_ID	GLOBAL ALL ID
• GCAM_ID	GLOBAL CAMERA ID
• GCNU_ID	GLOBAL CNU ID
• GPNL_ID	GLOBAL PANEL ID
• MSU	Master Setup Unit
• NOBODY_ID	NOBODY ID
• PACLEN	PACKET LENGTH
• PANEL	CONTROL PANEL
• PARAMn	COMMAND PARAMETER n
• RCP	Remote Control Panel
• REL	RELATIVE
• RM	Remote Control Unit
• SCCU_ID	SPECIFIC CCU ID
• SCHU_ID	SPECIFIC CHU ID
• SCNU_ID	SPECIFIC CNU ID
• SCP_ID	SPECIFIC CCU PANEL ID
• SIP_ID	SPECIFIC IRIS PANEL ID
• SMSU_ID	SPECIFIC MSU ID
• SRCID	SOURCE ID
• SRCP_ID	SPECIFIC RCP ID
• SRM_ID	SPECIFIC RM ID
• S-EVS	Super-Enhanced Vertical Definition System
• VCS	Video Selector
• Transmitter device	The device that transmits the command first.
• Receiver device	The device that receives the command and processes its contents.
• Adjacent devices	The two pieces of devices between which direct communication is established.
• Transfer	It means to send the commands to other devices when communication is established among the three pieces of devices.
• Block size	It indicates that the data is repeated at the interval of how many bytes, in the command of the “n” byte pattern.
• DTLEN	It indicates the total number of bytes of the command data of the “n” byte pattern.

Section 2
Fundamental Structure of the Protocol

2-1. Communication System

		(Only TRIAX transmission between CHU ↔ CCU)
• Protocol	Start-stop synchronization system	Start-stop synchronization system
• Packet detection	Parity bit identification system	Parity bit identification system
• Coding system	Base band	Biphase coding
• Transmission speed	562.5 kbps	35.2 kbps
• Output	Conforms to the RS-422 driver	.....
• Input	Current loop using photocoupler	.....
• Transmission distance	200 m (When the CCA-5 cable is used)	.....
• Connector	Receptacle 8 pin 1-766-696-11	.....
	Plug 8 pin 1-766-848-11	.....

REMOTE (8P FEMALE)



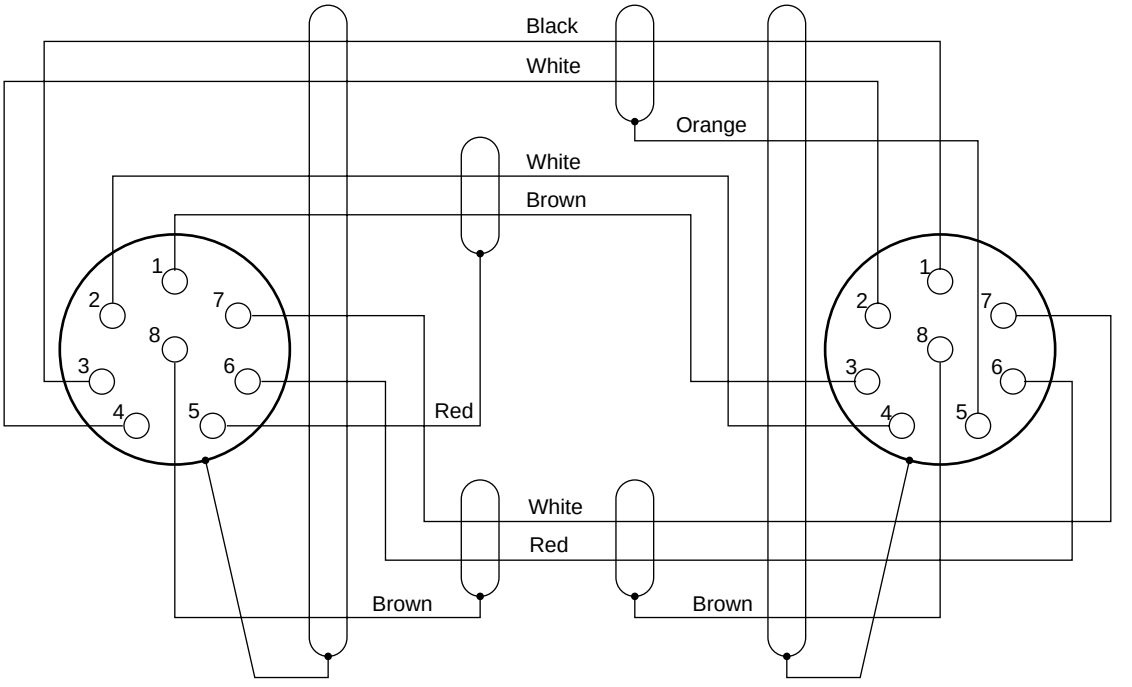
(External View)

No.	Signal	Specifications
1	TX (+)	Transmitted SERIAL DATA
2	TX (–)	
3	RX (+)	Received SERIAL DATA
4	RX (–)	
5	TX (G)	GND for Transmitted SERIAL DATA
	VIDEO (G)	GND for VIDEO Note 1
6	POWER (+) IN	+10.5 to 30 V Note 2
7	POWER (–) IN	GND for POWER
8	SPARE	
	VIDEO (X) OUT	VBS 1.0 Vp-p, Zo = 75 Ω Note 1
	CHASSIS GND	CHASSIS GND

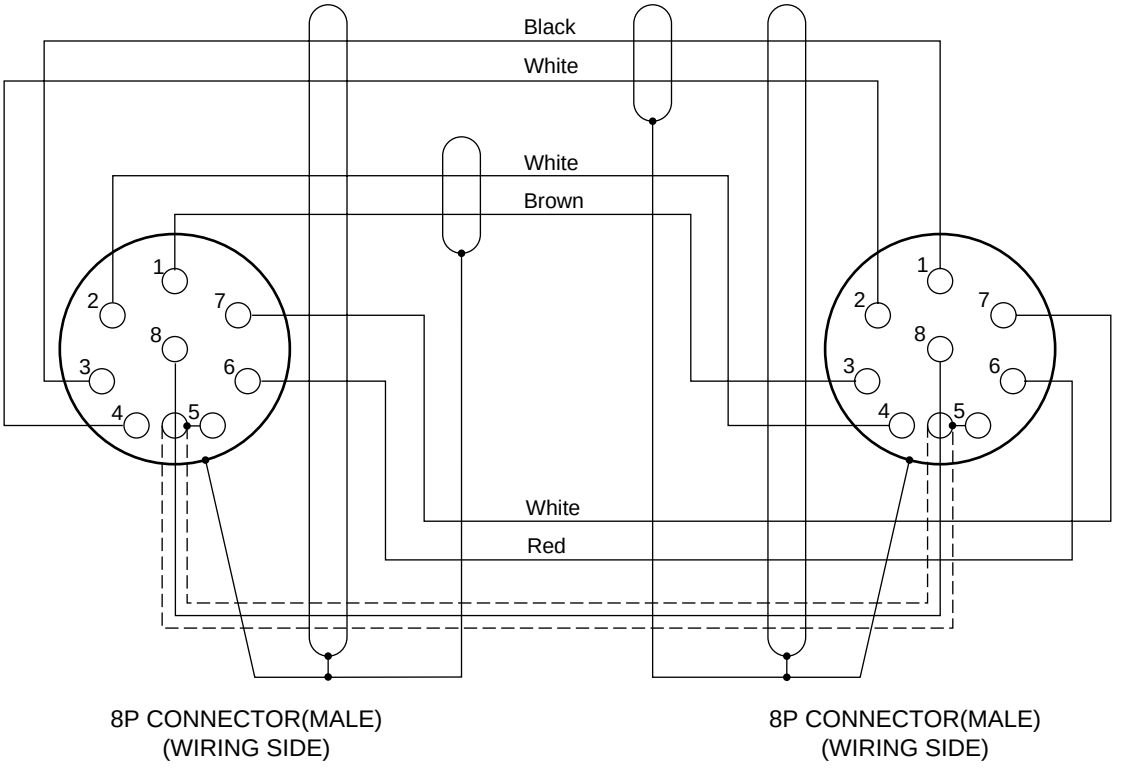
Note 1 : Specifications that are described under the dotted line of the items Nos. 5 and 8 apply when the remote cable (supplied with RM-B150) is used.

Note 2 : The maximum load of the power supplied of the items Nos. 6 and 7 is 5 W. The power is supplied from CHU/CA/CCU/CNU.

CCA-5 cable
(Sheath : white)

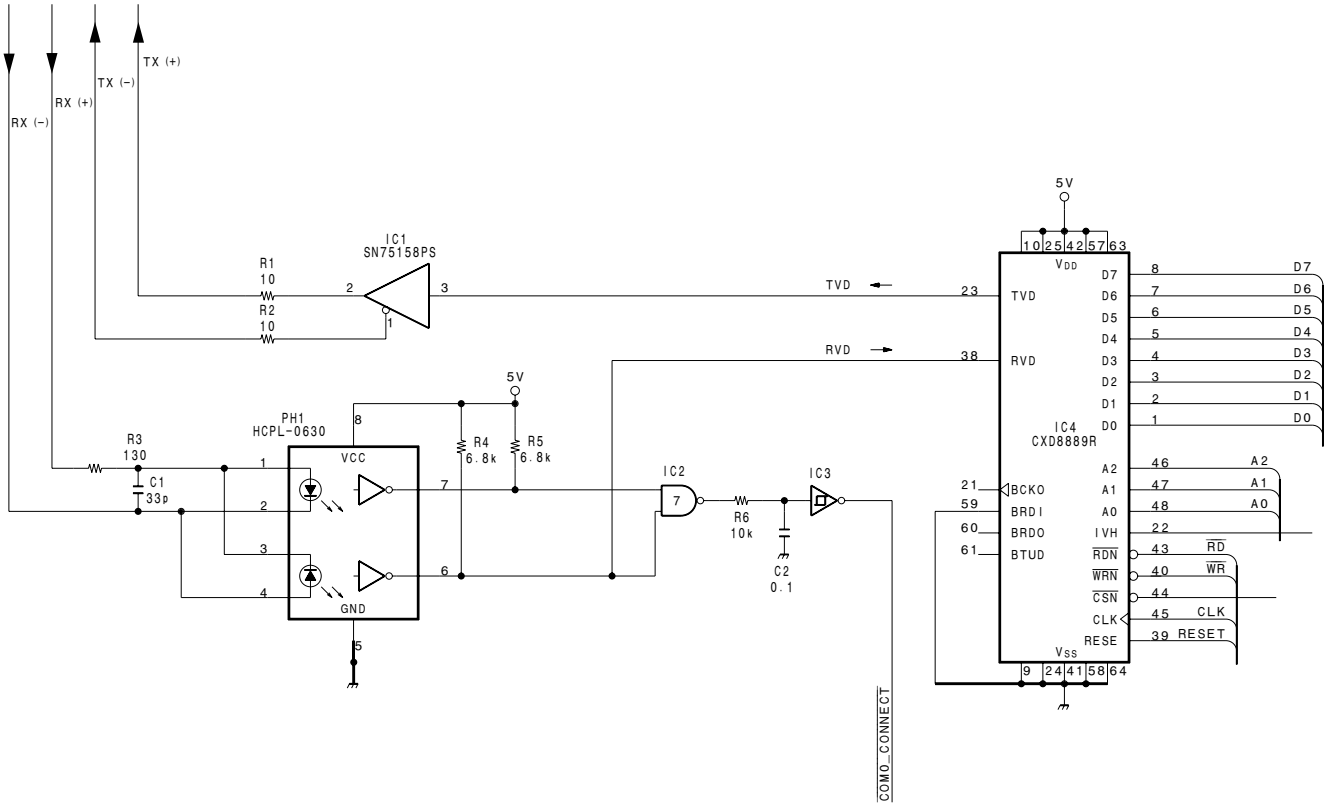


REMOTE cable (supplied with RM-B150)
(Sheath: black)

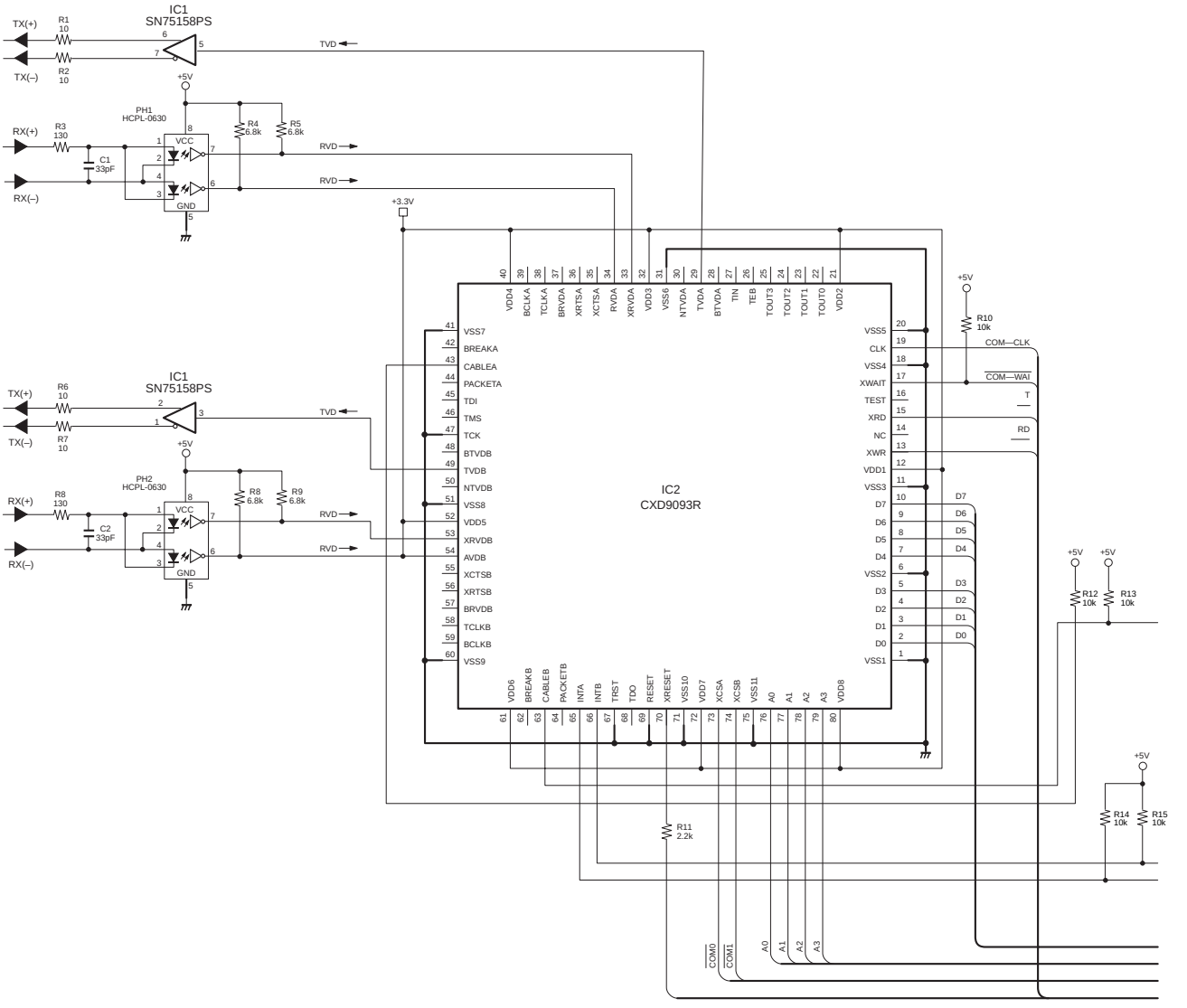


Example of input/output hardware configuration

Example 1

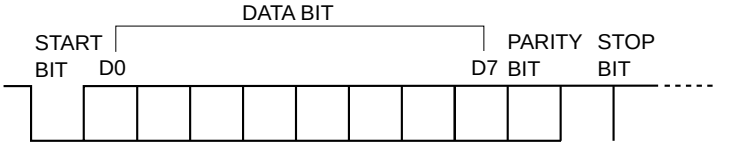


Example 2


IC1
SN75158PS
TX(+)
TX(–)
R1 10
R2 10
TVD
+5V
PH1
HCPL-0630
RX(+)
RX(–)
R3 130
C1 33pF
R4 6.8k
R5 6.8k
RVD
VCC
GND
+3.3V
IC2
CXD9093R
VDD4
BCLKA
TCLKA
BRVDA
XRTSA
XCTSA
RVDA
XRVDA
VDD3
VSS6
NTVDA
TVDA
BTVDA
TIN
TEB
TOUT3
TOUT2
TOUT1
TOUT0
VDD2
VSS7
BREAKA
CABLEA
PACKETA
TDI
TMS
TCK
BTVDB
TVDB
NTVDB
VSS8
VDD5
XRVDB
AVDB
XCTSB
XRTSB
BRVDB
TCLKB
BCLKB
VSS9
VSS5
CLK
VSS4
XWAIT
TEST
XRD
NC
XWR
VDD1
VSS3
D7
D6
D5
D4
VSS2
D3
D2
D1
D0
VSS1
VDD6
BREAKB
CABLEB
PACKETB
INTA
INTB
TRST
TDO
RESET
XRESET
VSS10
VDD7
XCSA
XCSB
VSS11
A0
A1
A2
A3
VDD8
R10 10k
COM—CLK
COM—WAI
T
RD
R12 10k
R13 10k
R14 10k
R15 10k
R11 2.2k
COM0
COM1
R6 10
R7 10
R8 130
C2 33pF
R8 6.8k
R9 6.8k
PH2
HCPL-0630

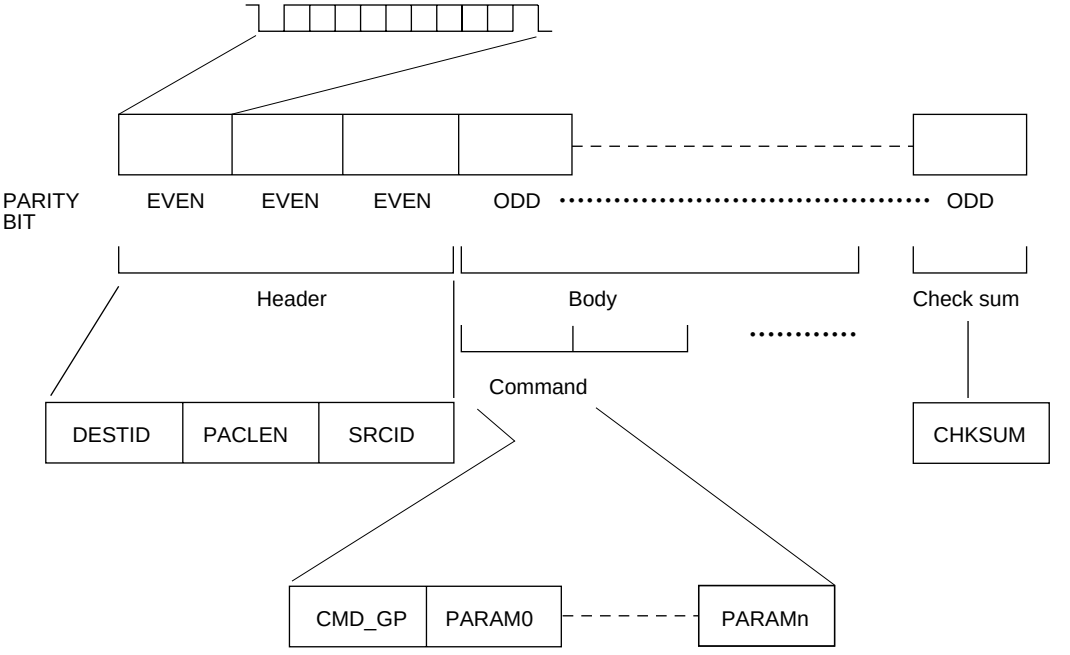
2-2. Definition of Data

2-2-1. Definition of Byte



START BIT		1 bit
DATA BIT	D0 – D7	8 bit
PARITY BIT	EVEN or ODD	1 bit
STOP BIT		1 bit

2-2-2. Definition of Packet



- Packet consists of header, body and check sum.
- Header consists of the three bytes: DESTID, PACLEN and SRCID. Parity bit of these bytes that form top of a packet, is even parity.
- Body consists of the n commands where n is 0 or more. Parity bit of these bytes is odd parity. Command consists of CMD_GP and PARAM of n bytes.
- Check sum is one byte. Parity bit is odd parity.

Note

Time in between bytes is not specified, but the shortest period is desirable. There are cases that a transmission becomes invalid at the receiver end if transmission of a packet is not completed within 100 ms.

Header

DESTID, SRCID

DESTID	PACLEN	SRCID	Body	CHKSUM

The DESTID (DESTINATION ID) is the ID of the target of communication. Range of transmission can be restricted using the types of ID, or the processing method of the receiving device can be specified using the types of ID.
SRCID (SOURCE ID) is the ID of the transmitting device. Unique ID is assigned depending upon the type of device. (Refer to section “3. IDs” for the rules of communication.

Types of ID

00H	G_ID (GLOBAL ID) The DESTID that all devices must read.
01H	GPNL_ID (GLOBAL PANEL ID) The DESTID that is used when sending a packet to the control panel (RM, RCP, MSU, IP)
02H	GCAM_ID (GLOBAL CAMERA ID) The DESTID is used to send a packet to the controlled side (CHU, CCU).
03H	GCNU_ID (GLOBAL CNU ID) The DESTID that all CNUs must read.
04H	GALL_ID (GLOBAL ALL ID) The DESTID that is used to transmit message to all devices that are being connected.
05H to 1EH	Reserved for extension
1FH	NOBODY_ID The DESTID that all devices must receive.
20H	DCHU_ID (DEFAULT CHU ID) The ID is unique to each CHU. When this ID is used as DESTID, it signifies that the packet is destined for CHU only.
21H to 2FH	SCHU_ID (SPECIFIC CHU ID) 21H to 2FH are not used at present.
30H to 3FH	Reserved for extension
40H	DCCU_ID (DEFAULT CCU ID) The ID is unique to each CCU. When this ID is used as DESTID, it signifies that the packet is destined for CCU only.
41H to 4FH	SCCU_ID (SPECIFIC CCU ID) 41H to 4FH are not used at present.
50H to 5FH	Reserved for extension
60H	DCNU_ID (DEFALUT CNU ID) The ID is unique to each CNU. When this ID is used as DESTID, it signifies that the packet is destined for CNU only.
60H ~ 6FH	SCNU_ID (SPECIFIC CNU ID) The ID of CNU (60H + CNU GROUP NO) that is determined by the CNU GROUP NO. When this ID is used as DESTID, it signifies that the packet is destined for CNU only.
70H	DMSU_ID (DEFAULT MSU ID) The ID is unique to each MNU. When this ID is used as DESTID, it signifies that the packet is destined for MNU only.

71H to 7FH	SMSU_ID (SPECIFIC MSU ID) 71H to 7FH are not used at present.
80H	DVCS_ID (SPECIFIC MSU ID) The ID is unique to each VCS. When this ID is used as DESTID, it signifies that the packet is destined for VCS only.
81H to 8FH	SVCS_ID (SPECIFIC VCS ID) 81H to 8FH are not used at present.
90H	DRCP_ID (DEFAULT RCP ID) The ID is unique to each RCP. When this ID is used as DESTID, it signifies that the packet is destined for RCP only.
91H to 9FH	SVCS_ID (SPECIFIC VCS ID) The ID is used when RCPs are connected in series. 92H to 9FH are not used at present.
A0H	DIP_ID (DEFAULT IRIS PANEL ID) The ID is unique to each IRIS PANEL. When this ID is used as DESTID, it signifies that the packet is destined for IRIS PANEL only.
A1H to AFH	SIP_ID (SPECIFIC IRIS PANEL ID) A1H to AFH are not used at present.
B0H	DRM_ID (DEFAULT RM ID) The ID is unique to each RM. When this ID is used as DESTID, it signifies that the packet is destined for RM only.
B1H to BFH	SRM_ID (SPECIFIC RM ID) B1H to BFH are not used at present.
C0H	DCP_ID (DEFAULT CCU PANEL ID) The ID is unique to each CCU PANEL. When this ID is used as DESTID, it signifies that the packet is destined for CCU PANEL only.
C1H to CFH	SCP_ID (SPECIFIC CCU PANLE ID) C1H to CFH are not used at present.
D0H to FDH	Reserved for extension
FEH	Unique ID for debug. (Use of the ID is normally prohibited.)
FFH	Use of the ID is prohibited.

PACLEN

DESTID	PACLEN	SRCID	Body	CHKSUM

PACLEN is the total number of bytes that constitute the body and check sum. The maximum number is 57 at present. (However, the maximum number of communication between CNUs is 61.)

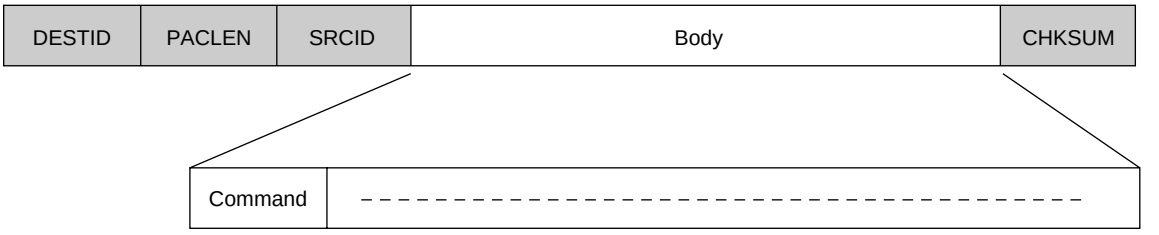
Check sum

CHKSUM

DESTID	PACLEN	SRCID	Body	CHKSUM

CHECK SUM (PACKET CHECKSUM) is two's complement of the total sum of the data of all bytes that constitute the header and body. (The total sum of the data of all bytes becomes 0 when the packet has no error. If the total sum is other than 0 during reception, it means the check sum error.)

Body



In the body, as many commands as you want can be multiplexed in the range not exceeding the maximum value of PACLEN.

Note 1 : The commands that are multiplexed in a body, must have the same destination in principle.

Note 2 : The newly added command must be multiplexed at the end of the existing commands.

Existing command (Rev1.0)	Existing command (Rev1.0)	New command (Rev3.0)

Order of the commands starts from the lower versions of Rev. that are described in Section “2-2-2. Command List” and Section “4. Commands”.

Note 3 : When a command is received, the top command of the received body is started of analysis and is processed in this order. When the command “Reserved for extension” whose pattern is not defined appears, the command and the subsequent commands are disabled. However, the command “Reserved for extension” whose pattern is already defined, must be read and skipped correctly and the subsequent commands must be analyzed.

Command	Command	Undefined command	– – – –
Valid	Valid	Invalid	Subsequent commands are invalid.

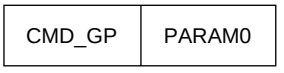
Note 4 : The ACK (CMD_GP 00H)/NAK (CMD_GP 01H)/WAIT (CMD_GP 02H) and the RECOVERY (CMD_GP 0AH) command must be multiplexed.

Command

The command consists of CMD_GP (COMMAND GROUP) and the “i” pieces of PARAM (COMMAND PARAMETER).
There are five command patterns as shown below.

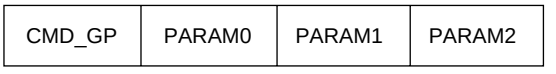
- 1 byte pattern

- 2 byte pattern

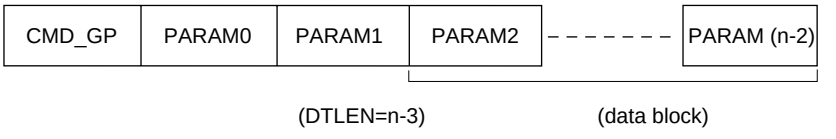


- 3 byte pattern

- 4 byte pattern



- n byte pattern
  The “n” byte command can be constituted by writing into PARAM1 “n-3” as DTLEN where “n-3” is the total number of bytes from PARAM2 to PARAM (n-2).



CMD_GP

The CMD_GP (COMMAND GROUP) determines the contents of control for each type of device.

The CMD_GP is classified into the types of device as shown below:

CMD_GP	Contents
00H to 1FH	General purpose commands
20H to 3FH	Commands for CHU
40H to 5FH	Commands for CCU
60H to 6FH	Commands for CNU
70H to 7FH	Commands for MSU
80H to 8FH	Commands for VCS
90H to 9FH	Commands for RCP
A0H to AFH	Commands for IP
B0H to BFH	Commands for RM
C0H to CFH	Commands for other types of device (such as VTR, etc.)
D0H to DFH	Reserved for extension
E0H to EFH	Reserved for extension
F0H to F9H	Local commands
FAH to FDH	Reserved for extension
FEH to FFH	Commands for special applications

Command List

General purpose commands

CMD_GP	Contents	Rev.	Pattern (bytes)
00H	ACK	1.0	1
01H	NAK	1.0	1
02H	WAIT (Reserved)	–	1
03H	ACTIVE_SENSING	1.0	1
04H		–	–
05H		–	–
06H	LINK	1.0	n
07H	MATRIX_SELECT	4.0	n
08H	SYSTEM_SWITCH (REL)	1.0	3
09H	SYSTEM_SWITCH (ABS)	1.0	3
0AH	RECOVERY	3.0	2
0BH	SWITCH_WITH_SENDER	1.0	4
0CH	SYSTEM_STATUS_REQUEST_TRANSMIT	1.0	n
0DH	CHARACTOR_PATTERN_REQUEST_TRANSMIT	2.0	n
0EH		–	n
0FH	FILE TRANSFER	1.0	n
10H	INFORMATION	1.0	n
11H	OTHER_SYSTEM_COMMAND_DATA_TRANSFER	4.0	n
12H	PROTOCOL_LEVEL	3.0	3
13H		–	–
14H		–	–
15H		–	–
16H		–	–
17H		–	–
18H		–	–
19H		–	–
1AH		–	–
1BH		–	–
1CH	NOP	1.0	1
1DH	WHO_ARE_YOU	1.0	1
1EH	I_AM_HERE	1.0	1
1FH	ARE_YOU_THERE	1.0	1

- The commands whose contents column are left blank, are reserved for extension or use of the command is prohibited at present.
- The commands whose “Rev.” and Pattern (byte) columns are left blank, are not defined yet.

Commands for CHU

CMD_GP	Contents	Rev.	Pattern (bytes)
20H	CHU_SWITCH (REL)	1.0	3
21H	CHU_SWITCH (ABS)	1.0	3
22H	CHU_ANALOG (REL)	1.0	3
23H	CHU_ANALOG (ABS)	1.0	3
24H	CHU_DIAGNOSIS_INFORMATION	1.0	4
25H	CHU_AUTO_SETUP_CONTROL	1.0	3
26H	CHU_AUTO_SETUP_INFORMATION	1.0	4
27H	CHU_FILE_CONTROL	1.0	4
28H	CHU_FILE_NAME_CONTROL	2.0	n
29H	CHU_SWITCH_WITH_MASK	1.0	4
2AH	CHU_ANALOG_FOR_MASTER_SLAVE	1.0	4
2BH	CHU_MASTER_SETUP	2.0	4
2CH	CHU_SEQUENCE_CONTROL	2.0	n
2DH		–	–
2EH		–	–
2FH		–	n
30H	CHU_MULTI_SWITCH	1.0	n
31H	CHU_MULTI_ANALOG	1.0	n
32H	CHU_MULTI_SWITCH_STATUS (Reserved)	–	n
33H	CHU_MULTI_ANALOG_STATUS	2.5	n
34H		–	n
35H		–	n
36H		–	–
37H		–	–
38H		–	–
39H		–	–
3AH	CHU_ANALOG_TRIMMING (REL)	2.5	4
3BH	CHU_ANALOG_TRIMMING (ABS)	2.5	4
3CH	CHU_EXT_ANALOG (REL)	3.0	4
3DH	CHU_EXT_ANALOG (ABS)	3.0	4
3EH		–	–
3FH		–	–

Commands for CCU

CMD_GP	Contents	Rev.	Pattern (bytes)
40H	CCU_SWITCH (REL)	1.0	3
41H	CCU_SWITCH (ABS)	1.0	3
42H	CCU_ANALOG (REL)	1.0	3
43H	CCU_ANALOG (ABS)	1.0	3
44H	CCU_DIAGNOSIS_INFORMATION	1.0	4
45H	CCU_AUTO_SETUP_CONTROL (Reserved)	–	3
46H	CCU_AUTO_SETUP_INFORMATION (Reserved)	–	4
47H	CCU_FILE_CONTROL (Reserved)	–	4
48H		–	n
49H	CCU_SWITCH_WITH_MASK	1.0	4
4AH		–	4
4BH		–	4
4CH		–	–
4DH		–	–
4EH		–	–
4FH		–	n
50H	CCU_MULTI_SWITCH	1.0	n
51H	CCU_MULTI_ANALOG	1.0	n
52H	CCU_MULTI_SWITCH_STATUS (Reserved)	–	n
53H	CCU_MULTI_ANALOG_STATUS	2.5	n
54H		–	n
55H		–	n
56H		–	–
57H		–	–
58H		–	–
59H		–	–
5AH	CCU_ANALOG_TRIMMING (REL)	2.5	4
5BH	CCU_ANALOG_TRIMMING (ABS)	2.5	4
5CH	CCU_EXT_ANALOG (REL) (Reserved)	–	4
5DH	CCU_EXT_ANALOG (ABS) (Reserved)	–	4
5EH		–	–
5FH		–	–

Commands for CNU

CMD_GP	Contents	Rev.	Pattern (bytes)
60H	CNU_SWITCH (REL)	1.0	3
61H	CNU_SWITCH (ABS)	1.0	3
62H	CNU_ANALOG (REL)	1.0	4
63H	CNU_ANALOG (ABS)	1.0	4
64H	CNU_DIAGNOSIS_INFORMATION (Reserved)	–	4
65H	CNU_MULTI_SYSTEM	1.0	2
66H		–	–
67H		–	–
68H	CNU_MULTI_SWITCH	1.0	n
69H	CNU_MULTI_ANALOG	1.0	n
6AH		–	n
6BH		–	n
6CH	CNU_ADDRESS SELECTOR	1.0	3
6DH		–	–
6EH		–	–
6FH		–	–

Commands for MSU

CMD_GP	Contents	Rev.	Pattern (bytes)
70H	MSU_SWITCH (REL) (Reserved)	–	3
71H	MSU_SWITCH (ABS) (Reserved)	–	3
72H	MSU_ANALOG (REL) (Reserved)	–	4
73H	MSU_ANALOG (ABS) (Reserved)	–	4
74H	MSU_DIAGNOSIS_INFORMATION (Reserved)	–	4
75H	MSU_SWITCH_WITH_MASK (Reserved)	–	4
76H		–	–
77H		–	–
78H	MSU_MULTI_SWITCH (Reserved)	–	n
79H	MSU_MULTI_ANALOG (Reserved)	–	n
7AH		–	n
7BH		–	n
7CH		–	–
7DH		–	–
7EH		–	–
7FH		–	–

Commands for VCS

CMD_GP	Contents	Rev.	Pattern (bytes)
80H	VCS_SWITCH (REL)	1.0	3
81H	VCS_SWITCH (ABS)	1.0	3
82H	VCS_ANALOG (REL)	1.0	4
83H	VCS_ANALOG (ABS)	1.0	4
84H	VCS_DIAGNOSIS_INFORMATION	1.0	4
85H	VCS_SWITCH_WITH_MASK	1.0	4
86H		–	–
87H		–	–
88H	VCS_MULTI_SWITCH	1.0	n
89H	VCS_MULTI_ANALOG	1.0	n
8AH		–	n
8BH		–	n
8CH		–	–
8DH		–	–
8EH		–	–
8FH		–	n

Commands for RCP

CMD_GP	Contents	Rev.	Pattern (bytes)
90H	RCP_SWITCH (REL)	4.0	3
91H	RCP_SWITCH (ABS)	4.0	3
92H	RCP_ANALOG (REL) (Reserved)	–	4
93H	RCP_ANALOG (ABS) (Reserved)	–	4
94H	RCP_DIAGNOSIS_INFORMATION (Reserved)	–	4
95H	RCP_SWITCH_WITH_MASK	4.0	4
96H		–	–
97H		–	–
98H	RCP_MULTI_SWITCH	4.0	n
99H	RCP_MULTI_ANALOG (Reserved)	–	n
9AH		–	n
9BH		–	n
9CH		–	–
9DH		–	–
9EH		–	–
9FH		–	n

Commands for IP (Reserved)

Commands for RM (Reserved)

Commands for other types of device (such as VTR, etc.)

CMD_GP	Contents	Rev.	Pattern (bytes)
C0H	VTR_CONTROL	3.0	n
C1H		–	–
C2H		–	–
C3H		–	–
C4H		–	–
C5H		–	–
C6H		–	–
C7H		–	–
C8H		–	–
C9H		–	–
CAH		–	–
CBH		–	–
CCH		–	–
CDH		–	–
CEH		–	–
CFH		–	–

Local commands

CMD_GP	Contents	Rev.	Pattern (bytes)
F0H	LOCAL_SWITCH (REL)		3
F1H	LOCAL_SWITCH (ABS)		3
F2H	LOCAL_ANALOG (REL)		3
F3H	LOCAL_ANALOG (ABS)		3
F4H	LOCAL_DIAGNOSIS_INFORMATION		4
F5H	LOCAL_SWITCH_WITH_MASK		4
F6H			
F7H			
F8H	LOCAL_MULTI_SWITCH		n
F9H	LOCAL_MULTI_ANALOG		n
FAH			
FBH			
FCH			
FDH			

Commands for special applications

CMD_GP	Contents	Rev.	Pattern (bytes)
FEH	Command test	3.0	n
FFH		–	–

2-3. Definition of ACK and NAK

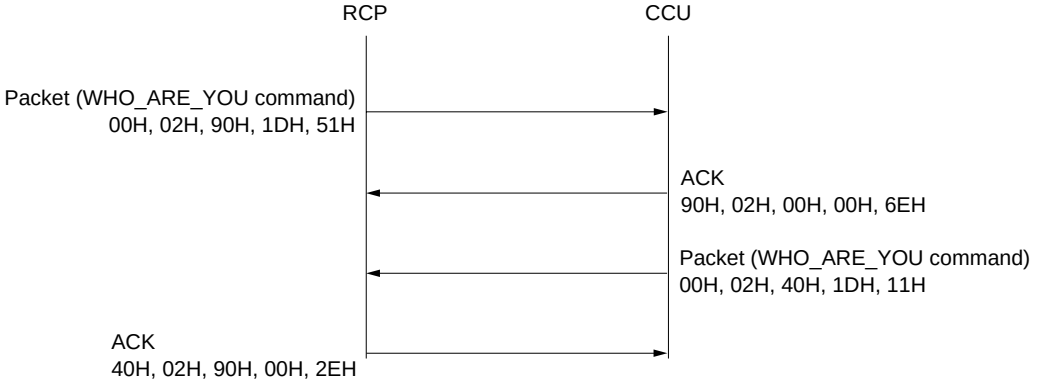
Since this protocol is based on full duplex communication, all devices can serve as either master or slave device.
This means that, between adjacent devices, the device that receives a packet must return ACK or NAK.
The recovery method in case ACK is not returned is described in Section 2-3-5.
(Both ACK and NAK are types of packet, and are discussed separately.)

2-3-1. ACK

When an adjacent receiver device receives a packet that is transmitted from an adjacent transmitter device and when the adjacent receiver device can correctly process the contents of the packet, DESTID in the header of the received packet must be replaced by SRCID, and the packet ACK in which only the ACK command (CMD_GP 00H) is stored must be returned.
The adjacent transmitter device must not transmit the next packet until ACK is returned after it has transmitted a packet. (TIMEOUT is excluded in some special processing.)

When the received packet is IDA, PACLEN, IDB, ——:
The ACK packet is IDB, 02H, IDA, ACK, CHKSUM.
Regarding ACK, every device must receive ACK regardless of what its DESTID is. No device must transfer ACK.

Example : Procedure of returning ACK between adjacent devices RCP and CCU

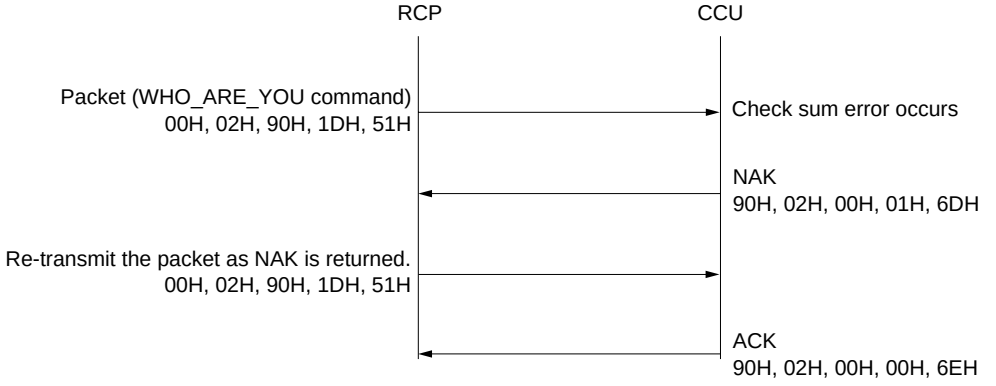


2-3-2. NAK

When an adjacent receiver device receives a packet that is transmitted from an adjacent transmitter device and when the received packet has errors (such as check sum error or other errors), DESTID in the header of the received packet must be replaced by SRCID, and the packet NAK in which only the NAK command (CMD_GP 01H) is stored must be returned.
When NAK is returned, the adjacent transmitter device must re-transmit the packet that was transmitted previously.

When the received packet is IDA, PACLEN, IDB, ——:
The ACK packet is IDB, 02H, IDA, NAK, CHKSUM.
Regarding NAK, every device must receive NAK regardless of what its DESTID is. No device must transfer NAK.

Example : Procedure of returning NAK between adjacent device RCP and CCU



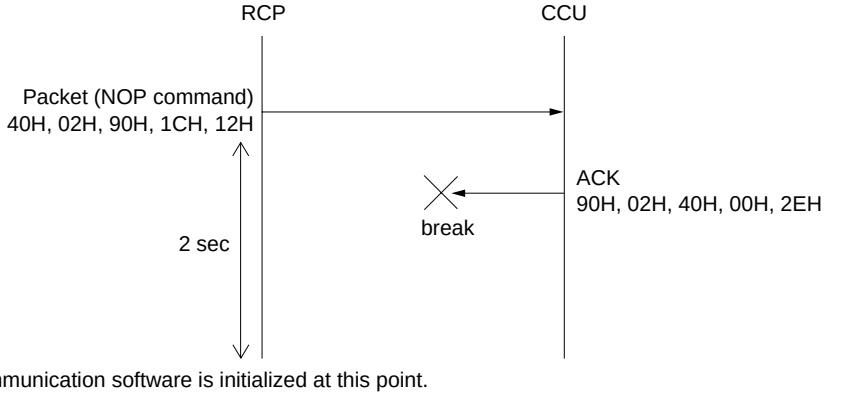
2-3-3. WAIT

This command cannot be used at present.

2-3-4. TIME OUT

If either ACK or NAK is not returned for two seconds after a packet is transmitted, the communication is judged to be disconnected, the communication software is initialized and the communication returns to the initial sequence.

Example :



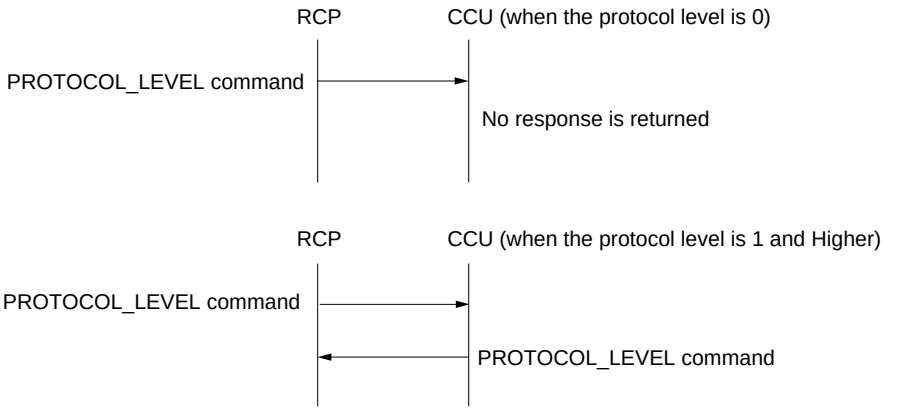
The communication software is initialized at this point.

2-3-5. Recovery from Communication Error and Protocol Level

When packets are dropped or lost, the communication procedure to recover the function of the communication link instantaneously is as follows. The device that supports protocol level 1 has this function.

1. When the main power is turned on, or when the cable is connected, the device must start up in the state in which the RECOVERY command (CMD_GP 0AH) is not transmitted.
2. When the main power is turned on or when the communication protocol is complete or in progress at the time of cable connection, the device must inform its own protocol level by transmitting a packet containing PROTOCOL_LEVEL to the adjacent receiver device.
3. When the adjacent receiver device receives the packet containing PROTOCOL_LEVEL, it returns the protocol level of the receiver device. When the protocol level is 0, no response need be returned. In other words, when a device supports protocol level 1, and when it has confirmed that the adjacent device also supports protocol level 1 or higher, it switches the state in which the RECOVERY command (CMD_GP 0AH) can be transmitted.
4. When communication is disconnected for two seconds or longer and communication software is initialized, the sequence starting from step 1 must be executed.

Example :



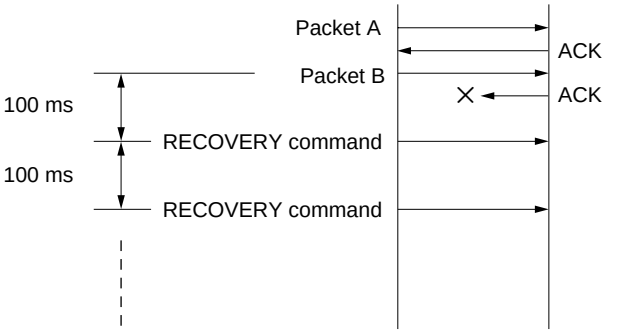
RECOVERY command (2 byte pattern)

DESTID = 1FH
PACLEN = 03H
SRCID = Transmitter device's unique ID
CMD_GP = 0AH
PARAM0 = CHKSUM of the packet that is sent immediately before the RECOVERY command is transmitted
CHKSUM

PROTOCOL_LEVEL command (3 byte pattern)

DESTID = 00H (G_ID)
PACLEN = 03H
SRCID = Transmitter device's unique ID
CMD_GP = 12H
PARAM0 = 01H (LEVEL)
PARAM1 = 00H (SUB_LEVEL)
CHKSUM

5. Transmission of the packet containing the RECOVERY command (CMD_GP 0AH) must be executed when either ACK or NAK is not returned within 100 ms after a packet is sent. Transmission of the packet containing the RECOVERY command (CMD_GP 0AH) must be performed once every 100 ms and be repeated for a maximum of 2 seconds. If the communication link does not recover even after 2 seconds, the communication software is initialized.



6. The status transition of the function to recover the communication link is as follows.

Transmission status transition matrix

		Event						
Status No.	Send status / Status	ACK	ACK (RECOVERY)	NAK	NAK (RECOVERY)	Time Out (100 ms)	Packets other than a ACK and NAK	Error occurrence
0	Idel (0)	–	–	–	–		To "Response transmission status (1)"	NAK transmission
1	Waiting for ACK	To status (0)	–	To "Packet re-transmission status (1)"	–	To "RECOVERY transmission status (2)"		NAK transmis-sion
2	ACK (Waiting for RECOV-ERY)	To status (0)	To status (0)	To "Packet re-transmission status (1)"	To status (1)	To "RECOVERY transmission status (2)"		NAK transmis-sion

- ACK whose SRCID is other than 1FH (Normal ACK)
- ACK (RECOVERY) whose SRCID is 1FH (Example: **, 02H, 1FH, 00H, CHKSUM)
- NAK whose SRCID is other than 1FH (Normal NAK). Any DESTID and SRCID will suffice.
- NAK (RECOVERY) whose SRCID is 1FH (Example: **, 02H, 1FH, 01H, CHKSUM)
- Packet of the RECOVERY command (Example: 1FH, 03H, **, 0AH, CHKSUM)
- Re-transmission is performed to transmit again the packet that was transmitted immediately before.

Note 1 : When NAK is received, DESTID and SRCID are not judged, and the packet that was transmitted immediately before is re-transmitted simply.

Note 2 : When ACK and NAK causes a check sum error, NAK must not be sent.

Reception status transition matrix

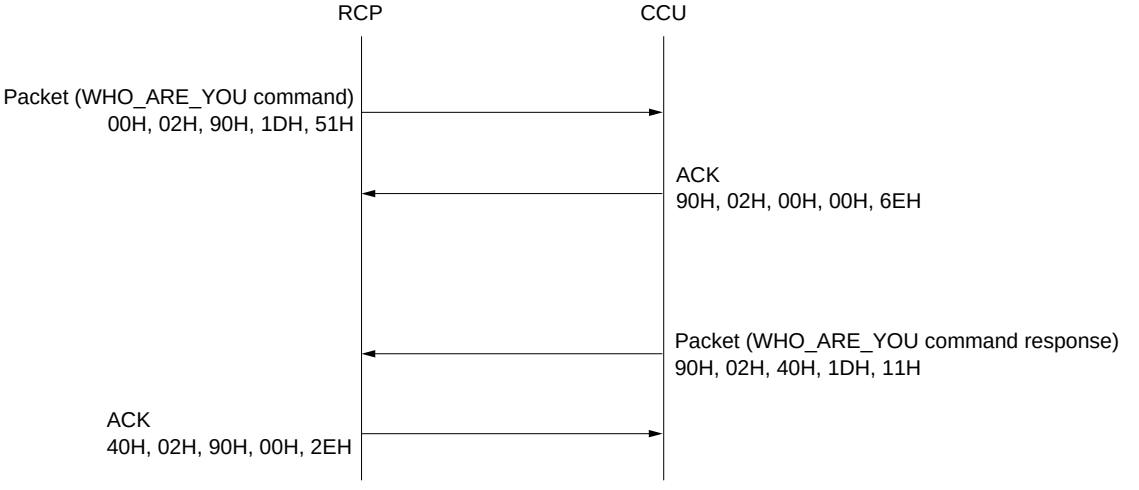
		Event			
Status No.	Send status / Status	Packet reception	NAK transmission	ACK is already sent	RECOVERY command reception
0	Idel (0)	To status (1)	To "Packet re-transmis-sion status (1)"		When the CHKSUM of the packet that is received in the previous reception agrees with the transmis-sion CHKSUM that is located in PARAM0 of the RECOVERY command, ACK (RECOVERY) must be transmitted. If it does not agree, NAK must be transmitted.
1	Packet analysis in progress	ACK of the packet that is received in the previous reception is disabled, and moves to the "Preparation status (1)" of ACK of this reception.		To status (0)	–

2-4. Communication Procedure (between Devices)

2-4-1. Communication Procedure between Adjacent Devices

In the communication procedure between adjacent devices, after a packet is transmitted, the next packet must not be transmitted before ACK is returned. (TIMEOUT is excluded in some special processing.)
The device that has received a packet must return ACK when it can process correctly the contents of the packet.
When a response needs to be returned to the command in the packet, the device must transmit a packet including the response immediately. Refer to Section "4. Commands" for the types of response.
The time to return a response after receipt of a command is not specified, but 20 ms or less is desirable.

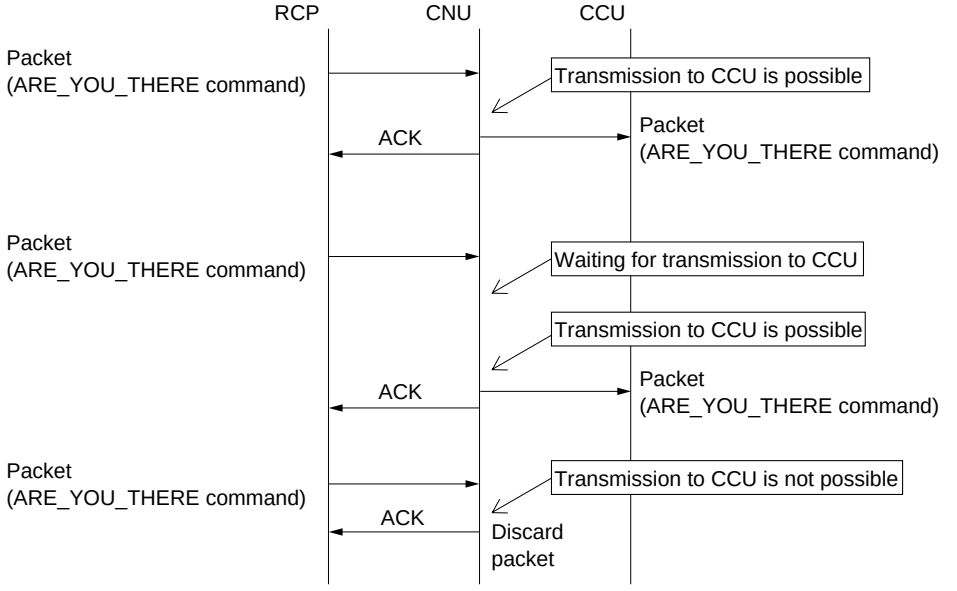
Example : Communication procedure between adjacent device RCP and CCU



2-4-2. Communication Procedure among Three or More Devices

In the communication procedure among three or more devices, packets must be transferred.
When the device is connected in the form device A ↔ device B ↔ device C, device B must perform the communication procedure as follows:
When device B receives packet “a” from device A, it first judges whether transmission of packet “a” to device C is possible or not. If transmission is judged to be possible, it transmits packet “a” to device C, and at the same time returns ACK to device A.
If it cannot transmit packet “a” immediately for some reason even though transmission is possible, it does not return ACK to device A and waits until the status becomes ready for transmission by checking the communication status with device C periodically.
If transmission is impossible (such as the main power of device C is turned off, etc.) device B returns ACK to device A and discards packet “a”.

Example : Communication procedure for CNU



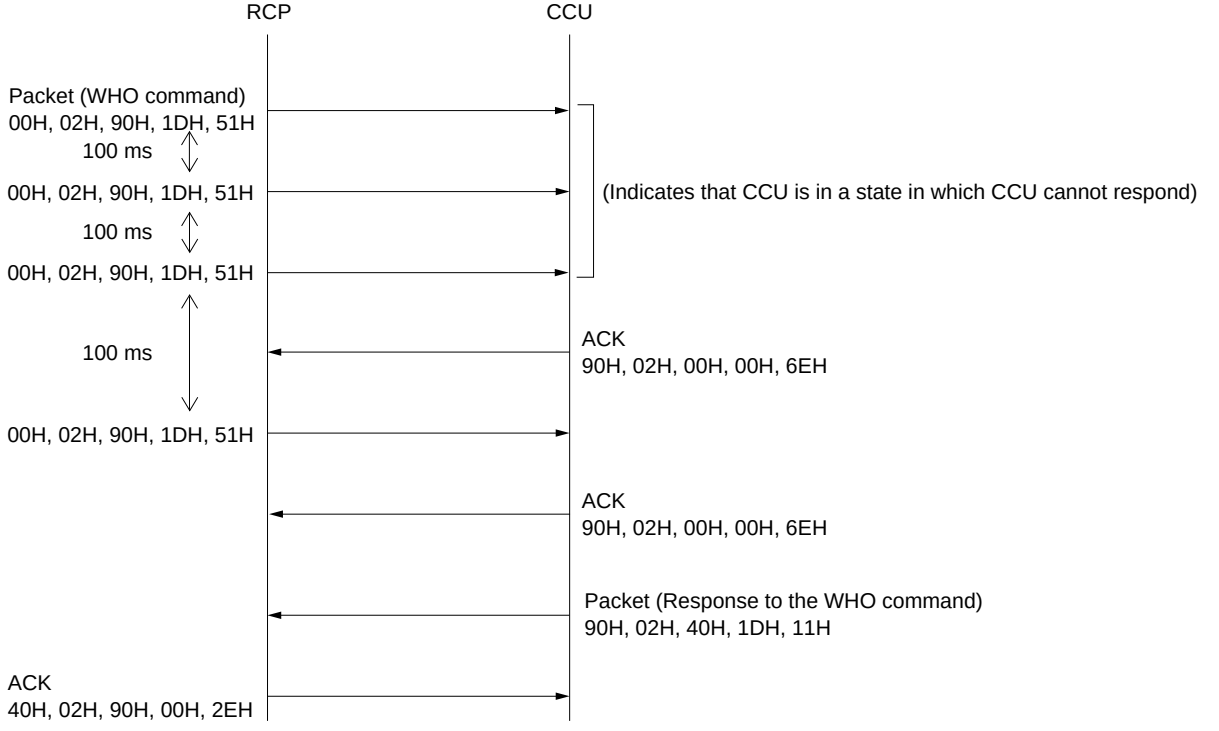
2-5. Communication Procedure (Specific Processing)

2-5-1. Establishing Communication between Adjacent Devices

1. Before communication is established

When communication is not yet established such as before the main power is turned on or before the cable is connected, the device must keep transmitting the WHO_ARE_YOU command at the interval of 100 ms.
When a response to the WHO_ARE_YOU command is returned, the communication link is judged to be established and enters sequence (1) of the next step “2. When communication is established”.
All commands other than the WHO_ARE_YOU command and the PROTOCOL_LEVEL command are ignored even if they are received, until the communication link is established.

Example : Communication procedure for RCP



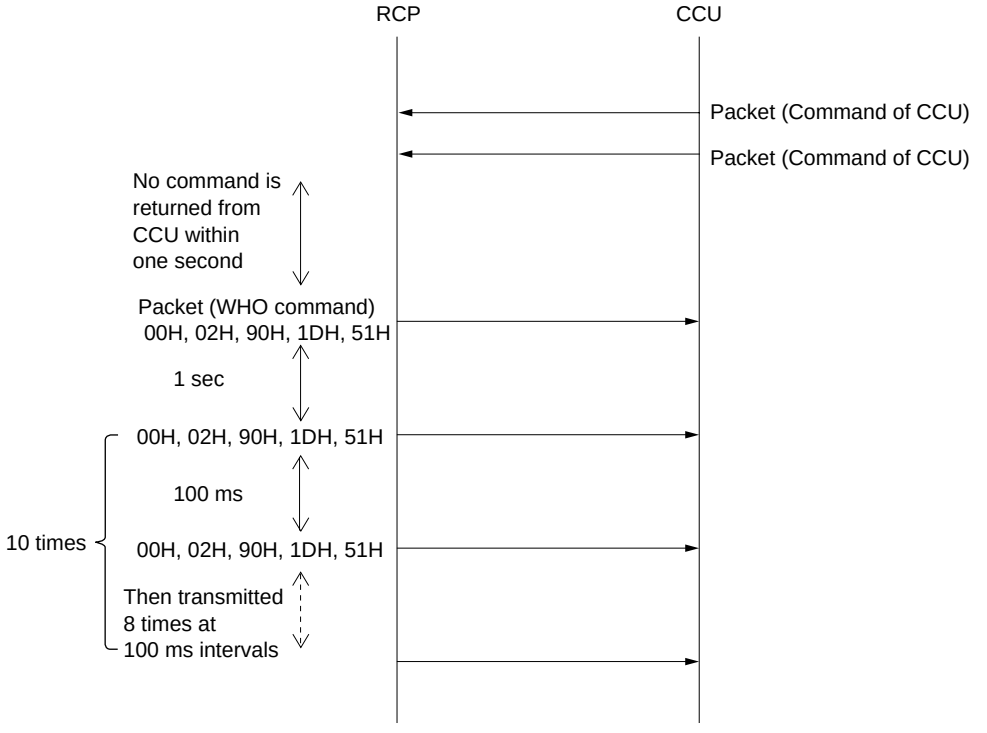
The communication link between RCP and CCU is established at this point.

2. When communication is established

(1) As long as a device keeps receiving a command within each second, the communication link with an adjacent device is judged to be maintained.
If a command does not arrive within one second, the device enters the following sequence (2).

(2) The device transmits the WHO_ARE_YOU command and waits for one second.
If a command is not returned from the adjacent device, the device keeps transmitting the WHO_ARE_YOU command 10 times at 100 ms intervals.
If a command is still not returned, the adjacent device is judged not to exist.
The device then enters the sequence “1. Before communication is established” since the adjacent device does not exist.

Example : Communication procedure for RCP (ACK and NAK are omitted)



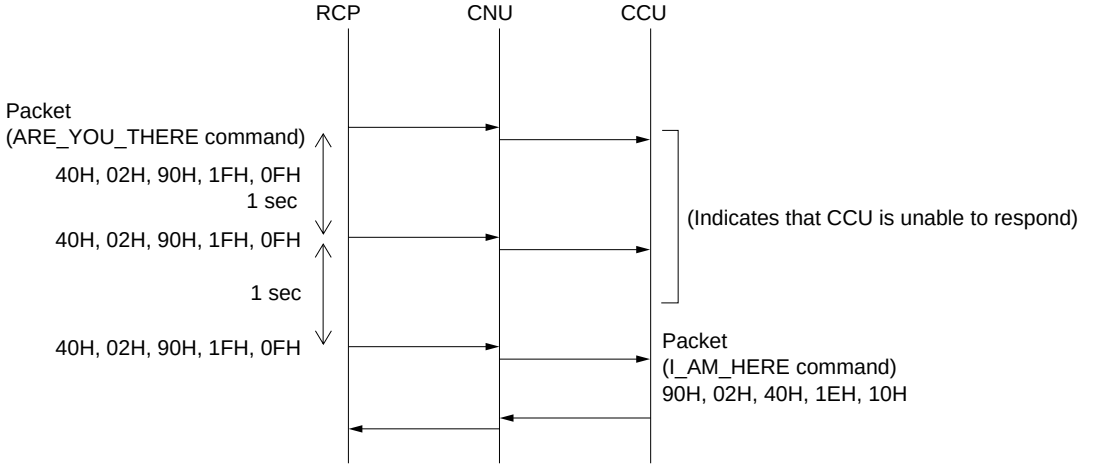
If no response to the WHO command is not up to this point, CCU is judged not to exist, and the communication link between RCP and CCU is not established.

2-5-2. Confirming Opposite Ends of Communication

1. Before confirming the existence of an opposite end of communication

A device keeps transmitting the ARE_YOU_THERE command once every second.
When the command I_AM_HERE is returned during such transmission, an opposite end of communication is judged to exist.
After confirming that an opposite end exists, the device enters the subsequent sequence “2. After confirming the existence of an opposite end of communication”.

Example : Communication procedure for RCP (ACK and NAK are omitted)



The RCP has confirmed the existence of CCU.

2. After confirming the existence of an opposite end of communication

(1) While command communication is in progress

As long as a device keeps receiving commands within each second, an opposite end of a communication link is confirmed to exist.

If no command arrives within one second, the device enters the following sequence (2).

(2) Confirming the existence of an opposite end of communication

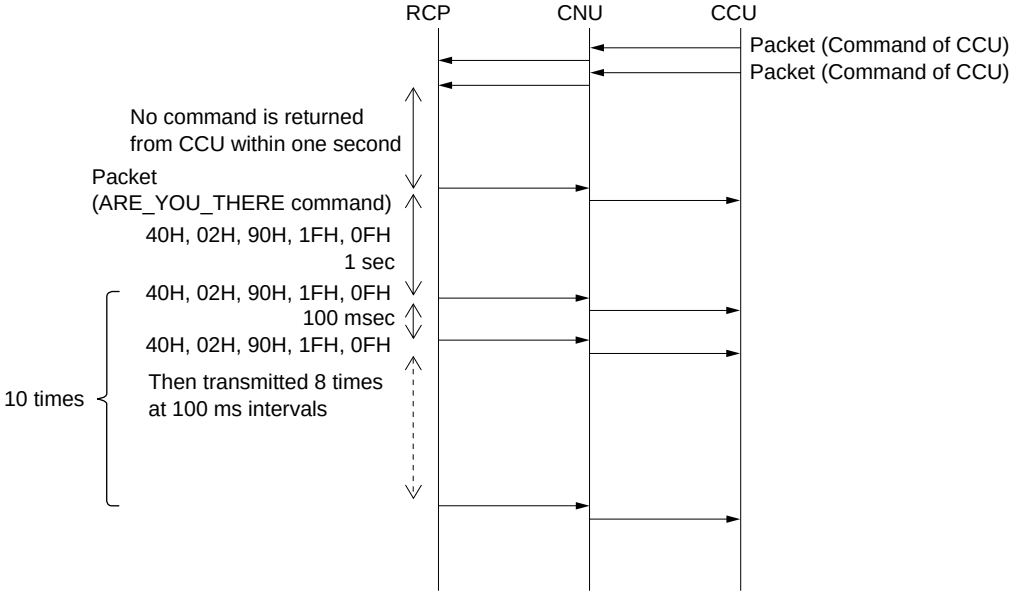
A device transmits the command ARE_YOU_THERE to the opposite end of communication and waits for one second.

If no command is returned from the adjacent device, the device keeps transmitting the command ARE_YOU_THERE 10 times at 100 ms intervals.

If no command is returned, the adjacent device is judged not to exist.

Then the device enters the sequence “1. Before confirming the existence of an opposite end of communication” since the adjacent device does not exist.

Example : Communication procedure for RCP (ACK and NAK are omitted)



If no response to the I_AM_HERE command is returned up to this point, CCU is judged not to exist.

Section 3
IDs

This section describes the rules for using IDs in this communication. Refer to Section "2-3. Definition of ACK and NAK" for the rules on using ACK and NAK.

G_ID (GLOBAL ID)

Use the G_ID when an adjacent device is unknown. (This ID is not transferred.)
The G_ID is used with the WHO_ARE_YOU command and the PROTOCOL_LEVEL command.

GPNL_ID (GLOBAL PANEL ID) and GCAM_ID (GLOBAL CAMERA ID)

Packet communication from a control panel to a camera must be transmitted using CAM_ID as DESTID and specifying a unique ID for the control panel as SRCID.
At the same time, packet communication from a camera to a control panel must be transmitted using GPNL_ID as DESTID and specifying a unique ID for the camera as SRCID.

When a camera receives a packet in which GCAM_ID is used as DESTID, the camera returns the response GPNL_ID.
The packet of GCAM_ID is processed mainly by a camera CHU and CCU. When CCU and CHU are connected as shown in Fig. 1 and Fig. 2, the packet is processed by the CCU itself and at the same time the packet is transferred to CHU.
The packet of GPNL_ID is processed mainly by a control panel such as RCP and MSU. If the control panel is connected with other control panels, the packet is transferred to the other control panels.

Fig. 1 When a camera system is configured as CHU ◄- - -► CCU ◄- - -► RCP:

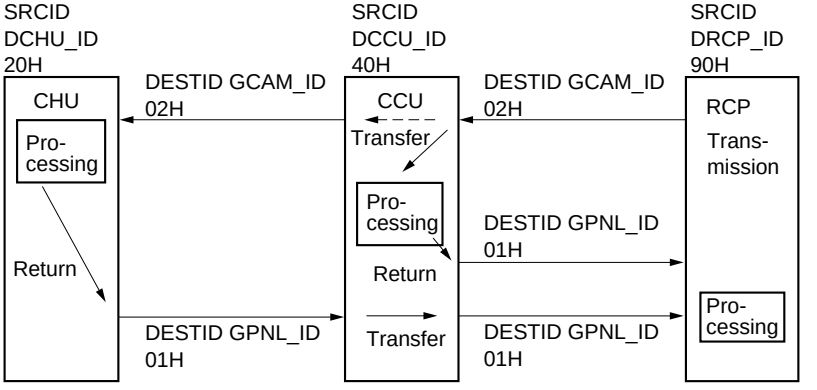
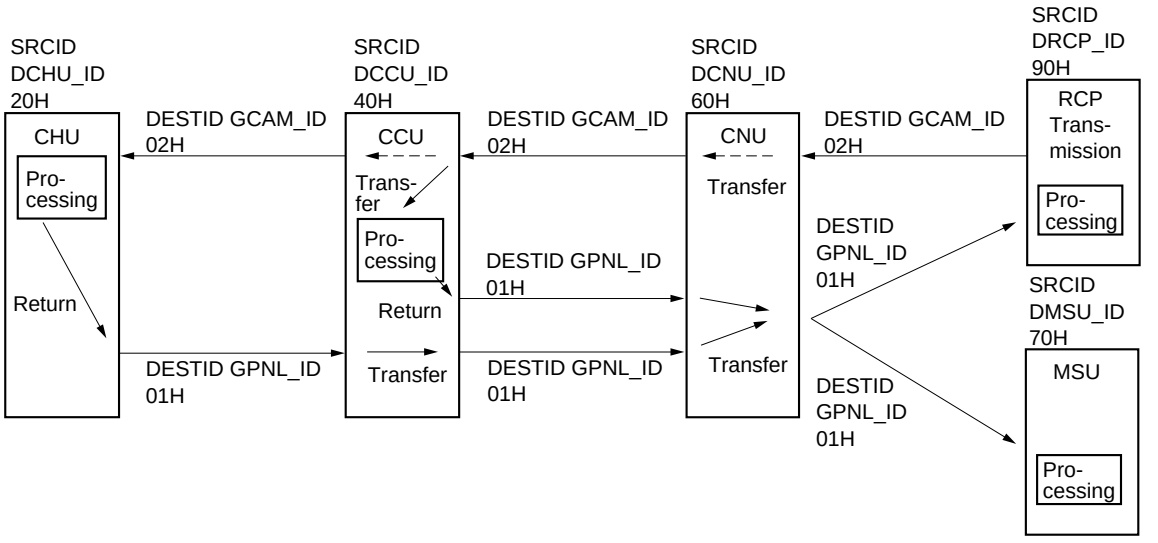


Fig. 2 When a camera system is configured as CHU ◄- - -► CCU ◄- - -► CNU ◄- - -► RCP and selected MSU:



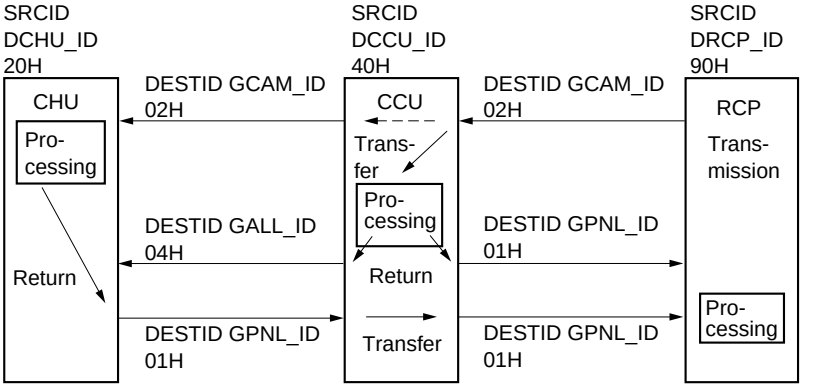
Note

The CNU sends the same packet to the RCP which controls both the CHU and CCU, and to the MSU which selects the CHU and CCU using a camera selector.

Exceptional processing of CCU

The CCU returns the response for the packet that is transmitted with GCAM_ID as DESTID in both directions as shown in Fig. 3. The CCU then returns the response to CHU with GALL_ID as DESTID.

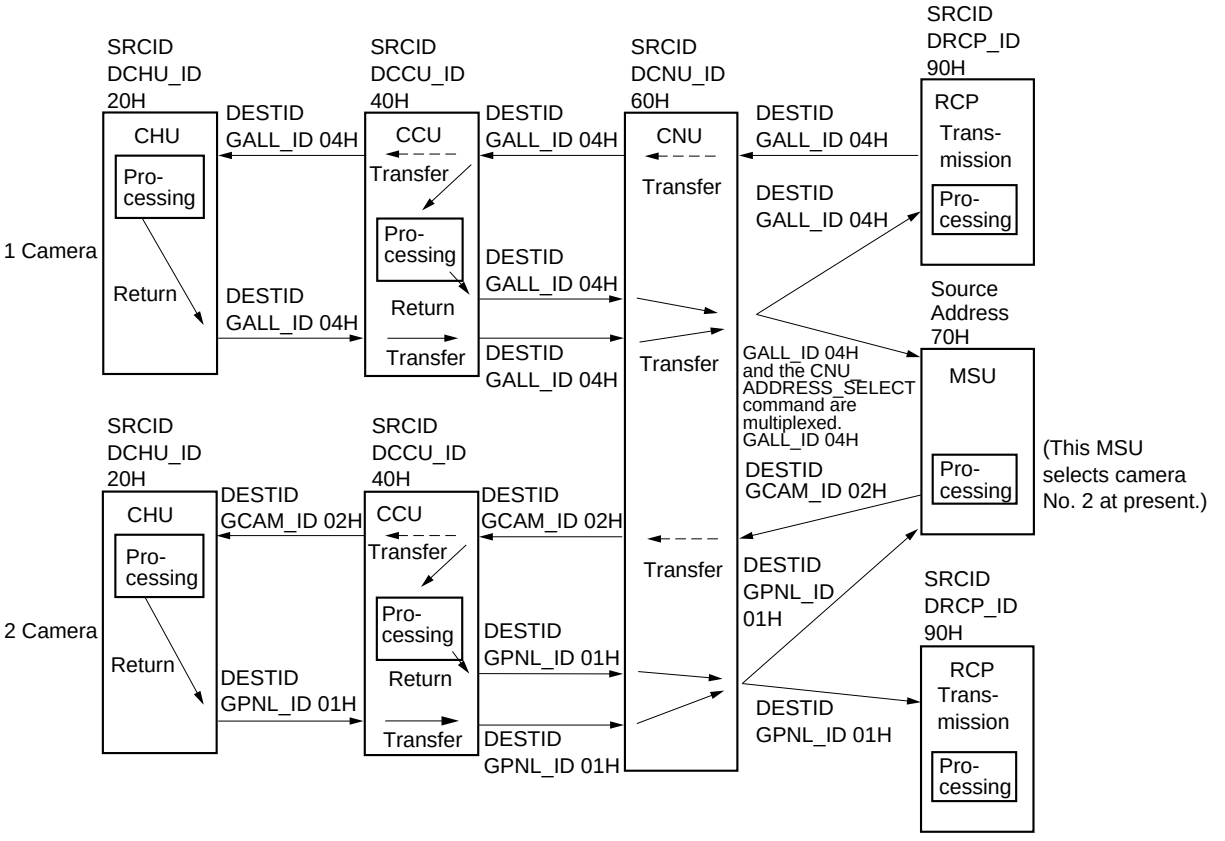
Fig. 3 When a camera system is configured as CHU ◄- - -► CCU ◄- - -► RCP :



GALL_ID (GLOBAL ALL ID)

GALL_ID is the DESTID that every device must receive. MSU receives the information of even the cameras that are not selected. GALL_ID must not be used in the commands that are not specified for use thereof.

Fig. 4 When a camera system is configured as CHU ◄- - -► CCU ◄- - -► CNU ◄- - -► RCP and MSU:



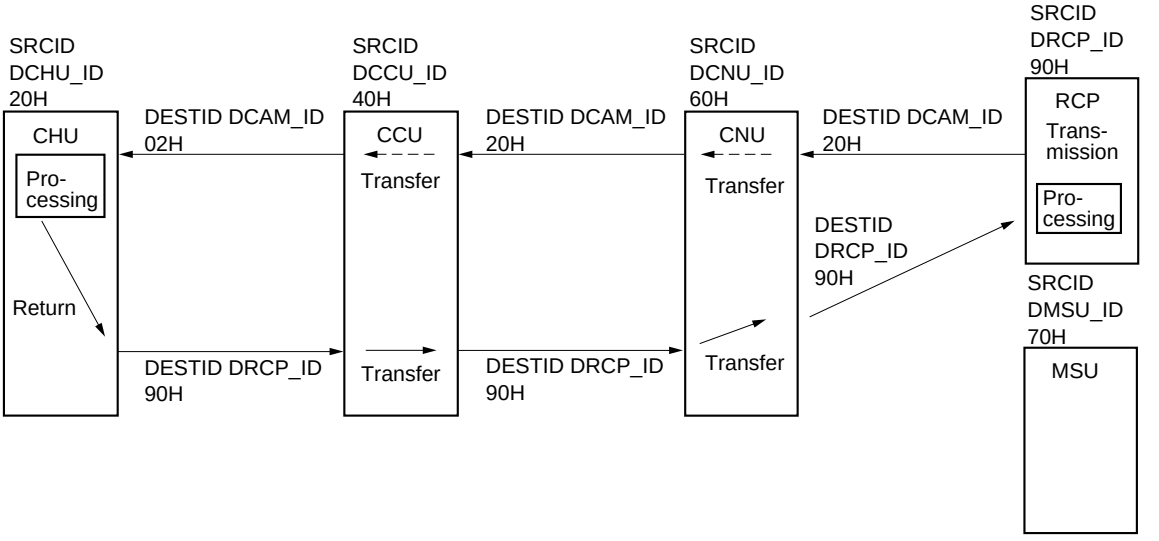
Note

The GALL_ID that is transmitted from CHU and CCU themselves is also transferred in the same manner.

Unique device ID (DEFAULT∗∗∗ID)

Regarding packets that are transmitted using a unique device ID, only the device having the matching ID processes the packet and returns the response to SRCID.

Fig. 5 When a camera system is configured as CHU ◄- - -► CCU ◄- - -► CNU ◄- - -► RCP and selected MSU:



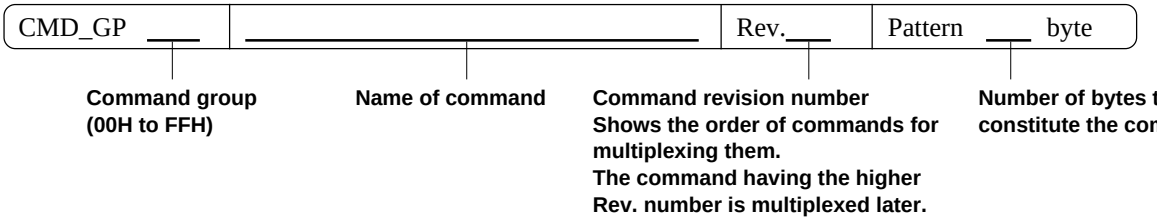
GCNU_ID (GLOBAL CNU ID)

When CNUs are connected together, GCNU_ID is read and processed by all the CNUs. This ID is used when transferring a command.

Section 4
Commands

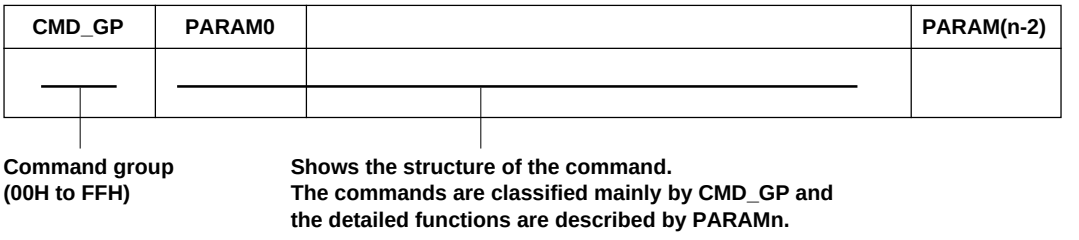
Examples of content descriptions

This section describes the detailed contents of commands according to the following items.



Outline : Gives an outline of the command.

Command structure:



PARAM: Describes the details of parameters.

Operation: Describes the operation of the command.

Note : Gives notes on using the command.

Example of using the command:

Shows a typical example of using the command.

CMD_GP **00** H	**ACK**	Rev. **1.0**	Pattern **1** byte

Outline:

- This command is returned when a device receives a packet.
- When an adjacent receiving device receives a packet and the received packet is a normal packet, the receiving device must return to the adjacent transmitting device a packet containing this command.

Command structure:

CMD_GP
00H

PARAM:

None

Notes

- This command must not be multiplexed with other commands within the same body.
- This command must not be transferred to other devices.

Operation:

Refer to Section “2-3-1. ACK.”

CMD_GP **01** H	**NAK**	Rev. **1.0**	Pattern **1** byte

Outline:

- This command is returned when the received packet is abnormal.
- When an adjacent receiving device receives a packet that has an abnormality (such as check sum error, etc.) or when an adjacent receiving device cannot perform the decoding processing correctly, the receiving device must return to the adjacent transmitting device a packet containing this command.
- The adjacent transmitting device re-transmits the packet that was previously transmitted, immediately the adjacent transmitting device receives this command.

Command structure:

CMD_GP
01H

PARAM:

None

Notes

- This command must not be multiplexed with other commands within the same body.
- This command must not be transferred to other devices.

Operation:

Refer to Section “2-3-2. NAK.”

CMD_GP **02** H	**WAIT (Reserved)**	Rev. **–**	Pattern **1** byte

Outline:

- This command is used to suspend transmission of data.
- An adjacent receiving device can transmit this command to the adjacent transmitting device to stop transmission of subsequent packets from the transmitting device due to some reason when an adjacent receiving device receives a packet. The WAIT command can be canceled by ACK.

Command structure:

CMD_GP
02H

PARAM:

None

Note

This command must not be transferred to other devices.

CMD_GP **03** H	**ACTIVE_SENSING**	Rev. **1.0**	Pattern **1** byte

Outline:

This command is used to confirm that communication is operating normally between adjacent devices during normal operation.

Command structure:

CMD_GP
03H

PARAM:

None

Notes

- Do not change the setup of the operation modes of RCP, MSU and other devices using this command. Use this command for communication check only.
- To check SRCID of adjacent devices, use the WHO_ARE_YOU command (CMD_GP 1DH). To check for the presence of adjacent devices, use the ARE_YOU_THERE command (CMD_GP 1FH).

CMD_GP **06** H	**LINK**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used for acquiring and re-writing SRCID during communication among three or more devices.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	• • •	• • •	PARAM(n-2)
06H	FUNCTION	DTLEN	DATA	• • •	• • •	DATA

PARAM:

FUNCTION: 00H Acquisition of SRCID (for CNU)
01H Re-writing SRCID (for CNU)
02H and higher are reserved for extension.
DTLEN: Number of bytes of data
DATA: SRCID

Acquisition of SRCID (for CNU)

The command is issued from CNU, in which DTLEN is set to "1", SCNU_ID is entered in PARAM2, and G_ID is set to DESTID. This command passes through all the devices that are connected in a system sequentially. Whenever this command passes through a device, SRCID of the device is added to DATA. When this command arrives at the last device from which the command is not sent to any other device, a response is returned in which DCNU_ID (60H) is set to DESTID.
(Example: When the devices are connected from CNU → CCU → CHU, the response data returned to CNU is DTLEN = 3, DATA = 60H, 40H, 20H.)

Re-writing SRCID (for CNU)

When the CNU wants to change SRCID, set as many "new SRCIDs" as required to DATA and issue the command. This command passes through all the devices that are connected in a system sequentially. Whenever this command passes through a device, the DATA that is stored in PARAM2 of the command is removed as the SRCID of the device. PARAM3 to PARAMn-2 are shifted to PARAM2 to PARAMn-3, then the command is sent to the next device. When this command arrives at the terminal device from which the command is not sent to any other device, a response is returned in which DCNU_ID (60H) is set to DESTID.
(Example: When the devices are connected from CNU → CCU → CHU, the re-written data is DTLEN = 3, DATA = C0H, C1H, 60H.)

Notes

- The FUNCTION 00H/01H is a command that only the CNU can transmit. Other devices must not transmit this command.
- Re-writing the SRCID is prohibited at present.

Operation:

CNU requests SRCID.
CNU transmission command (06H, 00H, 01H, 60H) → CCU transmission command (06H, 00H, 02H, 60H, 40H) → CHU transmission command (06H, 00H, 03H, 60H, 40H, 20H) → CCU CNU (SRCID) acquisition.

CMD_GP **07** H	**MATRIX_SELECT**	Rev. **4.0**	Pattern **n** byte

Outline:

- This command is used to switch multiple inputs and multiple outputs.
- This command is used to control the matrix switch.
- The matrix input is entered into SRC_NO. and the matrix output is entered into DEST_NO., the present status of the matrix switch is requested, an instruction to drive the switch is issued, a response indicating the switch status is returned, the input number is requested, and a response is returned.

Command structure:

CMD_GP	PARAM0	PARAM1
07H	FUNCTION	DTLEN

(BLOCK-A)

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-3)	PARAM(n-2)
07H	FUNCTION	DTLEN	NO-1		• • •	NO-N	

(BLOCK-B)

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	• • •
07H	FUNCTION	DTLEN	DEST_NO-1		SRC_NO-1		• • •

(BLOCK-C)

PARAM(n-5)	PARAM(n-4)	PARAM(n-3)	PARAM(n-2)
DEST_NO-N		SRC_NO-N	

PARAM:

FUNCTION: 00H = Requests the status of all matrix switches that the model (model specified by DESTID) has. DTLEN is 0. (BLOCK-A)
01H = Requests the status of the DEST_NO matrix switch. (BLOCK-B) block size: 2 bytes
02H = Issues an instruction to drive the matrix switch (BLOCK-C) block size: 4 bytes
03H = Response indicating the status of the matrix switch (BLOCK-C) block size: 4 bytes
04H = Requests the input SRC_NO of all the matrix switches that the model (model specified by DESTID) has. DTLEN is 0. (BLOCK-A)
05H = Response indicating the input SRC_NO of all the matrix switches that the model (model specified by DESTID) has. (BLOCK-B) block size: 2 bytes
Higher than the above are reserved for extension.

DTLEN: Total number of bytes of DEST_NO and SRC_NO

DEST_NO: Output number of the matrix switch (2 bytes)

0001H - 1FFFH	General-purpose matrix	(0000H cannot be used.)
2001H - 3FFFH	Matrix for CHU	(2000H cannot be used.)
4001H - 5FFFH	Matrix for CCU	(4000H cannot be used.)
6001H - 6FFFH	Matrix for CNU	(6000H cannot be used.)
7001H - 7FFFH	Matrix for MSU	(7000H cannot be used.)
8001H - 8FFFH	Matrix for VCS	(8000H cannot be used.)

Higher than the above are reserved for extension.

SRC_NO: Input number of the matrix switch (2 bytes)

0001H - 1FFFH	General-purpose matrix	(0000H indicates there is no input.)
2001H - 3FFFH	Matrix for CHU	(2000H indicates there is no input.)
4001H - 5FFFH	Matrix for CCU	(4000H indicates there is no input.)
6001H - 6FFFH	Matrix for CNU	(6000H indicates there is no input.)
7001H - 7FFFH	Matrix for MSU	(7000H indicates there is no input.)
8001H - 8FFFH	Matrix for VCS	(8000H indicates there is no input.)

Higher than the above are reserved for extension.

Operation:

- When FUNCTION 00H is selected
  This command is used to request the entire status of the matrix switches of the models at the same time.
  The response to this command is FUNCTION 03H.
- When FUNCTION 01H is selected
  This command is used to request the status of the matrix switches that are specified by the DEST_NOs by sending only the DEST_NOs at the same time.
  The devices that receive this command ignore it when the DEST_NO does not specify a local device, and return a response only for a command whose DEST_NO specifies a local device.
  The response to this command is FUNCTION 03H.
- When FUNCTION 02H is selected
  This command is used to issue an instruction to drive the matrix switch by sending a combination of DEST_NO and SRC_NO.
  The devices that receive this command ignore it when the DEST_NO does not specify a local device, and return a response after driving the matrix switch to connect DEST_NO and SRC_NO, only for a command whose DEST_NO specifies a local device.
  If SRC_NO contains a number that indicates no input such as 0000H, no devices are connected to the output that is specified by DEST_NO.
  The response to this command is FUNCTION 03H.
- When FUNCTION 03H is selected
  This command is used to return the present status of the matrix switch.
  The combination of DEST_NO and SRC_NO where the SRC_NO is connected to the DEST_NO, is returned. When no inputs are selected, the SRC_NO that indicates no input is used. The device that receives this response can determine the present status of the matrix switch of the transmitting device that has returned the response.
  When a response cannot be contained within a single packet due to many requests such as FUNCTION 00H, 01H, etc., the response is divided into two or more packets and returned.
- When FUNCTION 04H is selected
  The DEST_NO of a model can be obtained together with the matrix switch status when a request is issued using FUNCTION 00H. However, not all the SRC_NOs can be obtained, so a request for the SRC_NO of a model is issued using FUNCTION 04H.
  he response to this command is FUNCTION 05H.
- When FUNCTION 05H is selected
  FUNCTION 05H is used as the response for FUNCTION 04H. Only the SRC_NOs are returned all together. The SRC NO that indicates no input need not be returned.
  When a response cannot be contained within a single packet, the response is divided into two or more packets and returned.

DESTID

The default IDs such as DCHU_ID or DCCU_ID are used to send this command to a specific model. When a model number is not specified, use GCAM_ID and GPNL_ID. Use of the GALL_ID is prohibited for this command.

Example of using the command:

In this example, the matrix switch selects the CCU input sources for RET1 to RET4 for CHU. The relation between DEST_NO and SRC_NO is as follows.

RET 1 for CHU = DEST_NO 4001
RET 2 for CHU = DEST_NO 4002
RET 3 for CHU = DEST_NO 4003
RET 4 for CHU = DEST_NO 4004

Source of CCU input	RET VIDEO 1	=	SRC_NO 4001
Source of CCU input	RET VIDEO 2	=	SRC_NO 4002
Source of CCU input	RET VIDEO 3	=	SRC_NO 4003
Source of CCU input	RET VIDEO 4	=	SRC_NO 4004
Source of CCU input	LINE	=	SRC_NO 4005
Source of CCU input	CAMERA	=	SRC_NO 4006

(1) The command to drive the matrix switch when assigning the following sources to each of RET 1 for CHU to RET 4 for CHU is as follows.

RET 1 for CHU	←	CAMERA
RET 2 for CHU	←	LINE
RET 3 for CHU	←	RET VIDEO 4
RET 4 for CHU	←	RET VIDEO 3

Transmitting device

DESIID	=	DCCU_ID
PACLEN	=	14H
SRCID	=	DMSU_ID
CMD_GP	=	07H
FUNCTION	=	02H
DTLEN	=	10H
DEST_NO	=	40,01
SRC_NO	=	40,06
DEST_NO	=	40,02
SRC_NO	=	40,05
DEST_NO	=	40,03
SRC_NO	=	40,04
DEST_NO	=	40,04
SRC_NO	=	40,03
CHKSUM		

(2) All SRC_NOs of the CCU are requested here. The response is shown, too.

Transmitting device	→	Receiving device
DESIID	=	DCCU_ID
PACLEN	=	14H
SRCID	=	DMSU_ID
CMD_GP	=	07H
FUNCTION	=	04H
DTLEN	=	0H
CHKSUM		

Receiving device	→	Transmitting device (response)
DESIID	=	DMSU_ID
PACLEN	=	10H
SRCID	=	DCCU_ID
CMD_GP	=	07H
FUNCTION	=	05H
DTLENT	=	0CH
SRC_NO	=	40,01
SRC_NO	=	40,02
SRC_NO	=	40,03
SRC_NO	=	40,04
SRC_NO	=	40,05
SRC_NO	=	40,06
CHKSUM		

CMD_GP **08** H	**SYSTEM_SWITCH (REL)**	Rev. **1.0**	Pattern **3** byte

Outline:

This command is used to relatively control the item that is specified by the SYSTEM_SWITCH address. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
08H	SW_ADDRESS	SW_DATA

PARAM:

SW_ADDRESS: Refer to Section "5-1-1. SYSTEM_SWITCH Address."
SW_DATA: Refer to Section "5-1-1. SYSTEM_SWITCH Address."

Operation:

There are three types of SYSTEM_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-1. SYSTEM_SWITCH Address."

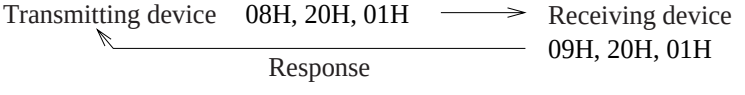
UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the SYSTEM_SWITCH (ABS) command.

Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the SYSTEM_SWITCH (ABS) command.

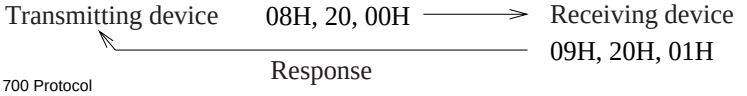
Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the SYSTEM_SWITCH (ABS) command.

Example of using the command:

To invert SW_ADDRESS = 20H, SW_DATA bit0, R TALLY from the present OFF value:



SW_ADDRESS = Requesting the present status of 20H



CMD_GP **09** H	**SYSTEM_SWITCH (ABS)**	Rev. **1.0**	Pattern **3** byte

Outline:

This command is used to absolutely control the item that is specified by the SYSTEM_SWITCH address.

Command structure:

CMD_GP	PARAM0	PARAM1
09H	SW_ADDRESS	SW_DATA

PARAM:

SW_ADDRESS: Refer to Section “5-1-1. SYSTEM_SWITCH Address.”
SW_DATA: Refer to Section “5-1-1. SYSTEM_SWITCH Address.”

Operation:

There are three types of SYSTEM_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section “5-1-1. SYSTEM_SWITCH Address.”

UP/DOWN step type command:

- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:

To set SW_ADDRESS = 20H, SW_DATA bit0, R TALLY to ON, and SW_DATA bit1, G TALLY to ON:

Transmitting device 09H, 20H, 03H ⟶ Receiving device
Response ⟵ 09H, 20H, 3H

CMD_GP **0A** H	**RECOVERY**	Rev. **3.0**	Pattern **2** byte

Protocol level
1

Outline:

- This command is used to perform recovery of the communication link instantaneously when a packet is missing or disappears, etc.
- This command can be used with protocol levels of higher than 1.

Command structure:

CMD_GP	PARAM0
0AH	LAST_CHKSUM

PARAM:

CHKSUM of the packet that has been transmitted immediately before sending the LAST_CHKSUM: RECOVERY command.

Operation:

Refer to Section “2-3-5. Recovery from Communication Error and Protocol Level” for details.

Notes

- This command must not be multiplexed with other commands within the same body.
- NOBODY_ID must be used as the DESTID of the packet for this command.

CMD_GP **0B** H	**SWITCH_WITH_SENDER**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used when the ID of the command transmitting device is required in the switch items. This command is used in CALL, ACTIVE, etc.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
0BH	SENDER_SRCID	DATA_1	DATA_2

PARAM:

SENDER_SRCID: SRCID of the device that has transmitted this command. (ID of the transmitting device)

DATA_1	00H CALL control	
DATA_2	bit7	Transmission direction flag 0 CALL transmitter → CCU (Transmission mode) 1 CCU → CALL transmitter (Return mode)
	bit6 to bit2	Reserved
	bit1, bit0	0, 0 Requesting the present status of CALL 0, 1 CALL OFF 1, 0 CALL ON 1, 1 Use is prohibited

∗ : CCU is the administrator of CALL.

DATA_1	01H ACTIVE control	
DATA_2	bit7	Transmission direction flag 0 ACTIVE transmitter → ACTIVE administrator (Transmission mode) 1 ACTIVE administrator → ACTIVE transmitter (Return mode)
	bit6 to bit2	Reserved
	bit1, bit0	0, 0 Requesting the present status of ACTIVE 0, 1 ACTIVE OFF 1, 0 ACTIVE ON 1, 1 Use is prohibited

∗ : When CNU is used, the CNU is the administrator of ACTIVE. When CNU is not used, the transmitter (MSU or RCP, etc.) is the administrator of ACTIVE.

DATA_1	02H IRIS ACTIVE control
DATA_2	Bit7 to bit0 are the same as ACTIVE and are replaced by IRIS ACTIVE.

DATA_1	03H PARA control	
DATA_2	bit7	Transmission direction flag 0 PARA transmitter → PARA administrator (Transmission mode) 1 PARA administrator → PARA transmitter (Return mode)
	bit6 to bit2	Reserved
	bit1, bit0	0, 0 Requesting the present status of PARA 0, 1 PARA OFF 1, 0 PARA ON 1, 1 Use is prohibited

∗ : When CNU is used, the CNU is the administrator of PARA. When CNU is not used, the transmitter (MSU or RCP, etc.) is the administrator of PARA.

Higher than this command are reserved for extension.

Operation:

Operation of this command is described as follows using DATA_1 00H CALL control processing as an example.

Processing of the command (When CCU is used)

1. This command is handled as one of the CCU commands. CCU is the administrator of this command. However, this command is monitored by all devices.

2. The CALL transmits the command using the following procedure.
   The CALL sets its own SRCID into the SENDER_SRCID, sets bit0 to bit7 of DATA_2, establishes the bit1 and bit0 statuses as shown in the following table, then transmits the command. DCCU_ID is used as the DEST_ID when transmitting the command. For CALL OFF, to bit0 of DATA_2 to 1. For CALL ON, set bit1 of DATA_2 to 1 and transmit the command. To request the status of the CALL, set both bit1 and bit0 to 0 and transmit the command. When both bit1 and bit0 are set to 1, it indicates inhibit.

DATA_2	bit0 = 0	bit0 = 1
bit1 = 0	Request of present status	CALL OFF
bit1 = 1	CALL ON	Inhibit

   The CALL transmitter immediately transmits this command when the CALL switch is pressed. It continues transmitting this command at intervals of 0.5 seconds for as long as the CALL switch is pressed. IT transmits CALL OFF immediately when the switch is inactivated.

3. The CCU performs the following processing when it receives this command.
   When the CCU receives the CALL ON command, the CCU registers the SRCID of the transmitter and set the CALL status to ON. Then it sets the transmitter's SRCID to the SENDER_SRCID, sets bit1 to bit7 of DATA_2 and transmits the CALL ON (bit1 = 1). Transmission is performed to all the communication ports of the CCU with GALL_ID specified as the DESTID.
   When the CCU receives the CALL OFF command, the CCU compares the SRCID of the transmitter with that of the transmitter (the registered SENDER_SRCID) that transmitted the CALL ON command last. If these SRCIDs agree, the status is turned OFF and is returned. If these SRCIDs do not agree, the ON status is returned as it is.
   When the CCU receives a command requesting the present status, the present status is returned.

   When the status is OFF, G_ID is entered and transmitted.
   When the CCU does not receive the CALL ON for two seconds or more after the status is turned ON, it turns the status to OFF and transmits the status.

4. When a device other than CCU receives the CALL command, the device performs the following processing.
   When bit7 of DATA_2 is 1, a response is returned by CCU. Whether the CALL command is either CALL ON or CALL OFF is detected from the status of bit1 and bit0 and so the lamp is turned on or the buzzer sounds. If the device's own CALL button is pressed, the device can determine if a response has been returned for the command that the device itself issued, by looking at SENDER_SRCID. It is possible not to turn on the CALL lamp for a CALL ON that is issued from the device. In all cases, the command is transferred to all the communication ports other than the receiving port because GALL_ID is specified as DESTID.

Example of using the command

1. Transmission processing

   When MSU transmits the CALL ON command:

   OBH, 70H, 00H, 02H

   When MSU transmits the CALL OFF command:

   OBH, 70H, 00H, 01H

   When MSU wants to know the present status of CALL:

   OBH, 70H, 00H, 00H

   The return command when CCU receives the CALL ON command from MSU:

   OBH, 70H, 00H, 82H (SENDER_SRCID of 70H is registered)

   The return command when CCU receives the CALL ON command from RCP afterward:

   OBH, 90H, 00H, 82H (SENDER_SRCID of 90H is registered)

   The return command when CCU receives the CALL OFF command from MSU afterward:

   OBH, 90H, 00H, 82H (It is ignored because RCP was the last to transmit the ON command.)

   The return command when CCU receives the CALL OFF command from RCP afterward:

   OBH, 00H, 00H, 81H (G_ID is the SENDER_SRCID when it is the OFF command.)

2. Reception processing

   When MSU receives the following command:

   OBH, 90H, 00H, 82H (Return from CCU for the CALL ON command that is issued from RCP)
   MSU turns on the CALL lamp.

   When CHU receives the following command:

   OBH, 20H, 00H, 82H (Return from CCU for the CALL ON command that is issued from CHU)
   CHU does not turn on the CALL lamp because this is the return for the CALL ON command that was issued from it.

CMD_GP **0C** H	**SYSTEM_STATUS_REQUEST_TRANSMIT**	Rev. **1.0**	Pattern **n** byte

Outline:

- This command is used to request or transmit basic information about each device.
- To display the version of the programs, use this command to acquire the device information.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	• • •	• • •	PARAM(n-2)
0CH	FUNCTION	DTLEN	DATA_0	• • •	• • •	DATA_N

PARAM:

DTLEN: Number of bytes of DATA_0 to DATA_N (n-3)

FUNCTION

00H Requesting ID of the model
01H Transmitting ID of the model
02H Writing ID of the model
03H Reserved for extension of ID of a model as a spare

Note

ID of the model indicates the SYSTEM name such as 1CAM, 1CCU and so on.

04H Requesting the software version (including date information) (DTLEN = 0)
05H Transmitting the software version (including date)
The 48 bytes from the top of the ROM model information area (refer to Section “9-1. ROM Model Information Area”) that is described in the end of ROM, is transmitted.
06H Writing the software version (including date)
07H Reserved for extension of the software version (including date) as a spare

08H Requesting the LOT number of the board on which the CPU is installed (DTLEN = 0)
09H Transmitting the LOT number of the board on which the CPU is installed
0AH Writing the LOT number of the board on which the CPU is installed
0BH Reserved for extension of the LOT number of the board on which the CPU is installed as a spare

0CH Requesting the software comment (DTLEN = 0)
0DH Transmitting the software comment
The contents of the comment area of the ROM model information area (refer to Section “9-1. ROM Model Information Area”) that is described in the end of ROM, are transmitted.
0EH Writing the software comment
0FH Reserved for extension of the software comment as a spare

DATA_0 to DATA_N: ASCII code character string

Example of using the command:

When the following information is described in the ROM model information area of CHU, an example in which CNU acquires this information is shown below.

ROM model information area

"BVP-700/750"

"27C010-BVP700"

"1.00AAA 19941107"

"COMMENT NONE "

Requests the software version (including date).

Transmitting device (CNU) 0CH, 04H, 00H → Receiving device CHU

Response

0CH, 05H, 30H,
42H, 56H, 50H, 2DH, 37H, 30H, 30H, 2FH, 37H, 35H, 30H, 20H, 20H, 20H, 20H, 20H
32H, 37H, 43H, 30H, 31H, 30H, 2DH, 42H, 56H, 50H, 37H, 30H, 30H, 20H, 20H, 20H
31H, 2EH, 30H, 30H, 41H, 41H, 41H, 20H, 31H, 39H, 39H, 34H, 31H, 31H, 30H, 37H

Requests the software comment.

Transmitting device (CNU) 0CH, 0CH, 00H → Receiving device CHU

Response

0CH, 0DH, 0FH,
43H, 4FH, 4DH, 4DH, 45H, 4EH, 54H, 20H, 4EH, 4FH, 4EH, 45H, 20H, 20H, 20H

CMD_GP **0D** H	**CHARACTER_PATTERN_REQUEST_TRANSMIT**	Rev. **2.0**	Pattern **n** byte

Outline:

This command is used to transmit and receive character pattern data.
In principle, cube type text data is transmitted and received in units of row.
The command format of this command is almost the same as that of the CHU_FILE_NAME_CONTROL command CMD_GP28H.
However, data of one row can be subdivided into different blocks and transmitted in order to increase the number of characters per row.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
0DH	FUNCTION	DTLEN	KIND_OF_DATA	ROW	BLOCK_NO	COLUMN_MAX	ROW_MAX

PARAM5	• • •	PARAM(n-2)
DATA_0	• • •	DATA_N

PARAM:

FUNCTION: (Types of operating the filename)
- 00H = Requesting the row data
- 01H = Transmitting the row data
- 02H = Modifying the row data
- 03H = Reserved
- 04H = Requesting the maximum number of data rows
- 05H = Transmitting the maximum number of data rows
- 06H = Higher than this command are reserved.

KIND_OF_DATA (Data types)
Data types of character screen
- 40H = CCU color bar screen data
  (The CCU color bar screen data alone is defined.)

Other commands are reserved.

ROW: (Row number)
The row number of the data to be transmitted and received is specified.
When FUNCTION is 00H, 01H or 02H, it is 1 ≦ row ≦ row_max.
When FUNCTION is 04H or 05H, it is ignored.
(It is fixed to 0.)

BLOCK_NO: (Number of blocks number)
The total number of blocks in a row and its block number are specified.
The higher order 4 bits are used to specify the total number of data of all and block blocks and the lower order 4 bits are used to specify the block number.
Data of one row can be divided into different blocks. However, the number of divisions must be the minimum number required to transmit the data of the row.
For example, when data of a row is 50 bytes or less, use only one block. When data of a row is 51 to 100 bytes, divide the data into two blocks.

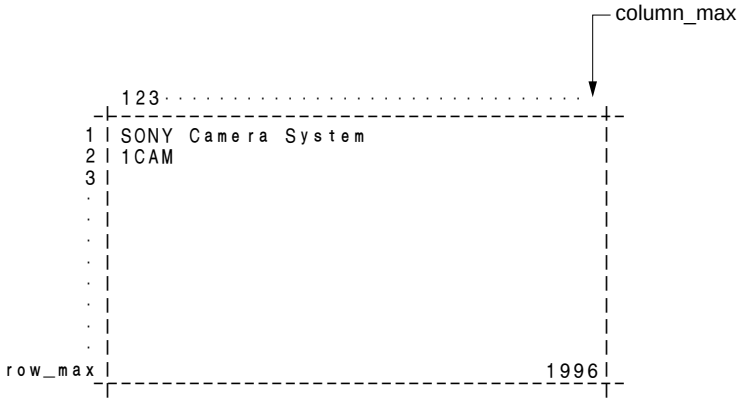
Note

The number of data in this description means the number of actual data contained in the row, and does not mean the maximum number of digits of the data.
For example, the total number of blocks is one block when the actual number of data of the row is 40 bytes even though the maximum number of digits of the data is 100 bytes.

DATA_0 to DATA_N: (Data of each row)

Data of the specified row is transmitted and received as ASCII code.
In principle, character codes (20H to 7EH) that can be printed out are used.
00H at the end of a character string is not needed (because the data length is specified).

For example, data of each row is shown as follows.
1st line "SONY Camera System"
2nd line "1CAM"
3rd line
row_max-th line "1996"
In all cases, if any black character (20H) is included at the end, it is also transmitted and received.



COLUMN_MAX (Maximum number of digits of data):
0 to 250 (251 to 255 are reserved for extension.)
ROW_MAX (Maximum number of rows of data):
0 to 250 (251 to 255 are reserved for extension.)
When either column_max or row_max is 0, it is judged that the device does not have the screen display function.

DTLEN:

This is normally 3 bytes as a minimum. (However, because this command is the "n" byte pattern, smaller bytes than the "n" byte pattern must be accepted, but the command becomes invalid.)

The relation between FUNCTION, command length and DTLEN is shown below.

FUNCTION	Total command length	DTLEN
00H, 04H	6 bytes	3
01H, 02H	6 to 50 bytes	3 to 53
05H	8 bytes	5

Example of using the command (Command format of each FUNCTION):

- When requesting the data of the fifth line of the CCU color bar screen data:
  0DH, 00H, 03H, 40H, 05H, 00H
  Usually, set 00H to the number of blocks and to the block number when requesting data.
  If the number of blocks is already known, and when requesting data of a specific block number (such as in the case of requesting re-transmission of data), specify the known number of blocks and the specific block number.
  The following example shows the case when requesting the data of the second block and when the total number of blocks is 4.
  0DH, 00H, 03H, 40H, 05H, 42H

- When transmitting the data of the seventh line of the CCU color bar screen data:
  (Assuming that the number of data bytes is 120 bytes.)
  The total number of blocks is 3.
  The first and second blocks are 50 bytes = 32H.
  The third block is 20 bytes = 14H.
  Therefore, the data is divided into the following three blocks and is transmitted.
  0DH, 01H, 35H, 40H, 07H, 31H, data string (the first 50 bytes)
  0DH, 01H, 35H, 40H, 07H, 32H, data string (the next 50 bytes)
  0DH, 01H, 17H, 40H, 07H, 33H, data string (the last 20 bytes)

- When modifying the data of the second line of the CCU color bar screen data:
  In order to modify the CCU data from the panel, set FUNCTION to 02H using the same format as described above for data transmission.
  Requesting the maximum number of data rows:
  0DH, 04H, 03H, 40H, 00H, 00H
  When requesting the number of rows, set the row number, block number and number of blocks to 00H.
  Transmitting the maximum number of rows and columns:
  (Number of rows and columns: 80 columns = 50H, number of rows: 25 rows = 19H)
  0DH, 05H, 05H, 40H, 00H, 00H, 50H, 19H
  When transmitting the number of columns and rows, set the row number, block number and number of blocks to 00H.

CMD_GP **0E** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **0F** H	**FILE_TRANSFER**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request, transmit and transfer CHU and CCU data files such as scene files and reference files, and also binary data files such as ROM data.
This command consists of the FUNCTION_FRAME command and two or more DATA_FRAME commands.

Command structure:

(1) Command structure when handling files other than binary data files
FUNCTION_FRAME (FRAME_NO = 0)

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
0FH	FRAME_NO 0	DTLEN	LAST_ FRAME_NO	BLOCK_ FLAG_H	BLOCK FLAG_L	FUNCTION _1	FUNCTION _2

PARAM7	PARAM8	PARAM9	PARAM10	PARAM11	PARAM12	PARAM13	PARAM14
FILE_NAME	FILENO_3	FILENO_2	FILENO_1	FILENO_0	MODEL_ID	MODEL_NO	SENDER_ID

PARAM15	PARAM16	PARAM17
SENDER_NO	RECEIVER _ID	RECEIVER _NO

DATA_FRAME

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4
0FH	Other than FRAME_NO	DTLEN	LAST_ FRAME_NO	BLOCK_ FLAG_H	BLOCK FLAG_L

PARAM5	PARAM6	PARAM7	PARAM8	• • •	PARAM(n-5)	PARAM(n-4)	PARAM(n-3)
FILE_ ADDRESS_H	FILE_ ADDRESS_L	FILE_ DATA_H	FILE_ DATA_L	• • •	FILE_ ADDRESS_H	FILE_ ADDRESS_L	FILE_ DATA_H

Block 0 Block M

PARAM(n-2)
FILE_ DATA_L

Block M

(2) Command structure when handling binary data files

FUNCTION_FRAME

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
0FH	FRAME_NO 0	DTLEN	LAST_ FRAME_NO	BLOCK_ FLAG_H	BLOCK FLAG_L	FUNCTION _1	FUNCTION _2

PARAM7	PARAM8	PARAM9	PARAM10	PARAM11	PARAM12	PARAM13	PARAM14
FILE_NAME	TOP_ADDRESS				MODEL_ID	MODEL_NO	SENDER_ID

PARAM15	PARAM16	PARAM17
SENDER_NO	RECEIVER _ID	RECEIVER _NO

DATA_FRAME

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4
0FH	Other than FRAME_NO	DTLEN	LAST_ FRAME_NO	BLOCK_ FLAG_H	BLOCK FLAG_L

PARAM5	PARAM6	PARAM7	PARAM8	• • •	PARAM(n-2)
BIN_ DATA_0	BIN_ DATA_1	BIN_ DATA_2	BIN_ DATA_3	• • •	BIN_ DATA_i

PARAM

∗ PARAMs that are common between FUNCTION_FRAME and DATA_FRAME.

FRAME_NO: 0 to N (N is up to maximum FFH.)
FRAME_NO = 0 FUNCTION_FRAME
Other than FRAME_NO = 0 DATA_FRAME

DTLEN: Number of bytes from the LAST_FRAME_NO to the last DATA (n-3)
(During FUNCTION_FRAME, DTLEN = 10H fixed)

LAST_FRAME_NO: N (N is up to maximum FFH) number of DATA_FRAME

BLOCK_FLAG_H: 1 to X (X is up to maximum FFFFH.)

BLOCK_FLAG_L: There is a tentative ID number that the transmitting device controls. (0 is reserved for extension.)
FUNCTION_FRAME and DATA_FRAME use the same BLOCK_FLAG which indicates that these two FRAMEs are mutually related to each other.

∗ PARAMs that are unique to FUNCTION_FRAME

FUNCTION_1
- 00H Request — Command structure A
- 01H Transmission — Command structure B
- 02H Request for transfer — Command structure A
  (This is merely a request when CNU is not used.)
- 03H Request for transmission — Command structure B
  (This is merely a request when CNU is not used.)
- 04H Inquiry if all data has already been received? — Command structure A
  (This inquiry is issued when the FUNCTION_FRAME including FUNCTION_1 = 05H indicating receipt of all data, is not returned even after a certain time has elapsed after the transmitting device has completed all of its transmission.)
- 05H Received all data
  Command structure A
  (This is returned from the receiving device when the receiving device has received all data up to FRAME of LAST_FRAME_NO.)
- 06H Requesting BLOCK_FLAG — Command structure A
- 07H Transmitting BLOCK_FLAG — Command structure A
- 08H BLOCK_FLAG_ERROR
  Command structure A
  (This is returned by CNU when the BLOCK_FLAG of the FUNCTION_FRAME that is transmitted from the transmitting device, has already been used.)
- 09H Unable to transfer the present file. — Command structure A
  (This is returned by the receiving device when the receiving device cannot transfer the received file for some reason at the moment when the receiving device has received FUNCTION_1 = 00H or 01H.)
- 0AH ERROR
  (This is returned upon receipt of a command that does not observe the rules of the FILE_TRANSFER command.)
- 0BH FILE ERROR
  (This is returned by the receiving device when the receiving device receives requests such as a request for a non-existent file.)

Higher than this command are reserved for extension.

Command structure B: A command that consists of FUNCTION_FRAME only
Command structure B: A command that consists of FUNCTION_FRAME and DATA_FRAME

FUNCTION_2 00H to FFH Specifying the FRAME_NO.
This command is used to issue a request or to transmit a FRAME of a specified FRAME_NO.
FUNCTION_2 = 00H Transmitting the request for all FRAMEs
FUNCTION_2 = 00H Transmitting the request for a specified FRAME

00H must be kept set because this command is not used in any cases other than request and transmission (FUNCTION_1 = 00H, 10H, 02H, 03H).

FILE_NAME: FILE_NAME is used to identify the device's model name and type of file as shown below.

Structure Higher order 3 bits Identification of device's model name
Lower order 5 bits Identification of type of file

Identification of device's model name

bit7,	bit6,	bit5,	bit4,	bit3,	bit2,	bit1,	bit0		
0,	0,	0,	∗,	∗,	∗,	∗,	∗	Old format (BVP-700 version 1.2 and before)	(A)
0,	0,	1,	∗,	∗,	∗,	∗,	∗	BVP-500 series	
0,	1,	0,	∗,	∗,	∗,	∗,	∗	CCU/HDCU	
0,	1,	1,	∗,	∗,	∗,	∗,	∗	HDC-700 series	
1,	0,	0,	∗,	∗,	∗,	∗,	∗	BVP-700 series	
1,	0,	1,	∗,	∗,	∗,	∗,	∗	Models included by extension	
1,	1,	0,	∗,	∗,	∗,	∗,	∗	(Reserved)	(B)
1,	1,	1,	∗,	∗,	∗,	∗,	∗	Binary data file	

Identification of type of file (A)

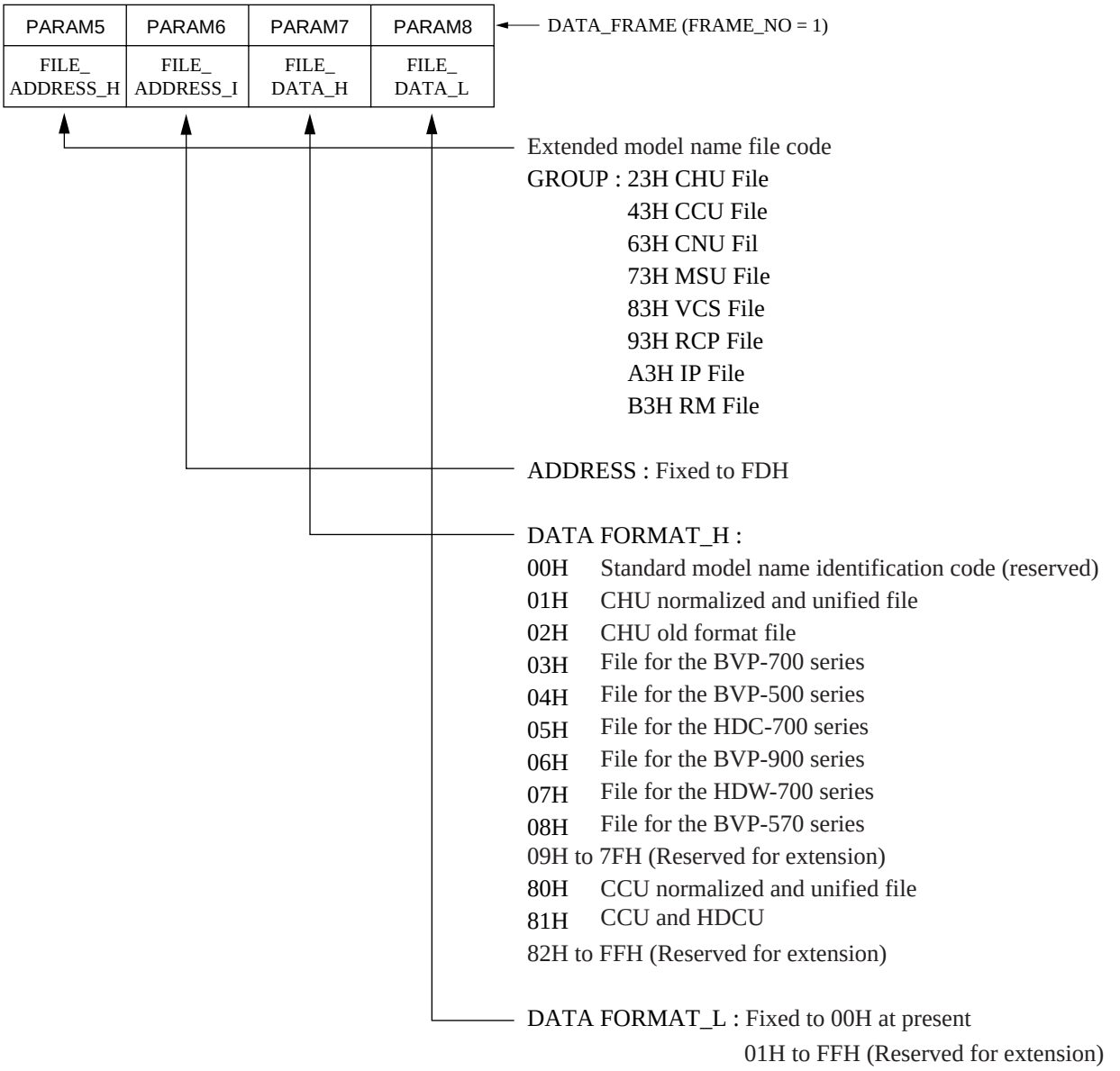
bit7,	bit6,	bit5,	bit4,	bit3,	bit2,	bit1,	bit0	
∗,	∗,	∗,	0,	0,	0,	0,	0	(Reserved)
∗,	∗,	∗,	0,	0,	0,	0,	1	Standard File
∗,	∗,	∗,	0,	0,	0,	1,	0	Setup File (Use is not permitted.)
∗,	∗,	∗,	0,	0,	0,	1,	1	Scene File
∗,	∗,	∗,	0,	0,	1,	0,	0	Reference File
∗,	∗,	∗,	0,	0,	1,	0,	1	Master Setup File
∗,	∗,	∗,	0,	0,	1,	1,	0	AWB File (Use is not permitted.)
∗,	∗,	∗,	0,	0,	1,	1,	1	Lens File
∗,	∗,	∗,	0,	1,	0,	0,	0	Iris File (Use is not permitted.)
∗,	∗,	∗,	0,	1,	0,	0,	1	OHB File
∗,	∗,	∗,	0,	1,	0,	1,	0	Triming File
∗,	∗,	∗,	0,	1,	0,	1,	1	Color Reference File

Identification of type of file (B)

(Reserved)	(Reserved)

When “Identification of device’s model name” of FILENAME is any of “Models included by extension”:

From the model BVP-900 series and higher, this format is used as the standard format.
When “Identification of device’s model name” of FILENAME is any of “Models included by extension”, the following extension model name file code must be entered into PARAM2 to PARAM8 at the top DATA_FRAME (FRAME_NO = 1).



The “extended model name file code” has been added to the analog address FDH of each model.

FILENO_3: Fixed to 00H at present
FILENO_2: Fixed to 00H at present
FILENO_1: Fixed to 00H at present
FILENO_0: File number of 01H to FFH (00H is reserved.)
TOP_ADDRESS: Indicates the top address of the binary data file. (32-bit structure)
MODEL_ID: Not used for a specified purpose at present, but the ID of the device that transmits the file is located here.

20H CHU
40H CCU
60H CNU
70H MSU
80H VCS
90H RCP
A0H IP
B0H RM

Others are reserved for extension.

MODEL_NO: Not used for a specified purpose at present, but number of the device that transmits the file is located here.
01H to FFH (00H is reserved.)
SENDER_ID: Fixed to 00H at present
SENDER_NO: Fixed to 00H at present
RECEIVER_ID: Fixed to 00H at present
RECEIVER_NO: Fixed to 00H at present

*** PARAMs that are unique to DATA_FRAME**

(1) When handling files other than binary files

FILE_ADDRESS_H: CMD_GP is located here.
Specifically, the following are used among the files:
23H CHU_ANALOG (ABS) is used to indicate the analog items of CHU.
29H CHU_SWITCH_WITH_MASK is used to indicate the switch items of CHU.
43H CCU_ANALOG (ABS) is used to indicate the analog items of CCU.
49H CCU_SWITCH_WITH_MASK is used to indicate the switch items of CCU.

FILE_ADDRESS_L: The ANALOG address and the SWITCH address that correspond to CMD_GP are located here.
Specifically, the following are used among the files:
CHU_ANALOG address list is used for the analog items of CHU.
CHU_SWITCH address list is used for the switch items of CHU.
CCU_ANALOG address list is used for the analog items of CCU.
CCU_SWITCH address list is used for the switch items of CCU.

FILE_DATA_H:
FILE_DATA_L: When an analog item is selected by the FILE_ADDRESS_H/_L, the 16-bit data that corresponds to the ANALOG address is placed by the FILE_DATA_H/_L.
When a switch item is selected by the FILE_ADDRESS_H/_L, the 8-bit data that corresponds to the SWITCH address is placed by the FILE_DATA_H/_L.

Example:

- When you want to indicate the White (R) file with data 0200H that is an analog item CHU:
  FILE_ADDRESS_H = 23H
  FILE_ADDRESS_L = 01H (Refer to the CHU_SWITCH address.)
  FILE_DATA_H = 02H
  FILE_DATA_L = 00H

- When you want to indicate that AUTO KNEE and KNEE that are the switch items of CHU, are turned ON, using a file:
  FILE_ADDRESS_H = 29H
  FILE_ADDRESS_L = 81H (Refer to SWAddress81H of the CHU_SWITCH address.)
  FILE_DATA_H = 78H
  FILE_DATA_L = 60H (In order to mask AUTO KNEE bit6 and KNEE bit5)

(2) When handling binary data files

BIN_DATA_i: The binary data is placed in units of byte, with the TOP_ADDRESS that is indicated by FUNCTION_FRAME as its top address.
Inside the DATA_FRAME in which the FRAME_NO is in the range of 1 to FFH, addresses of the BIN_DATA_i must be consecutively continuous.

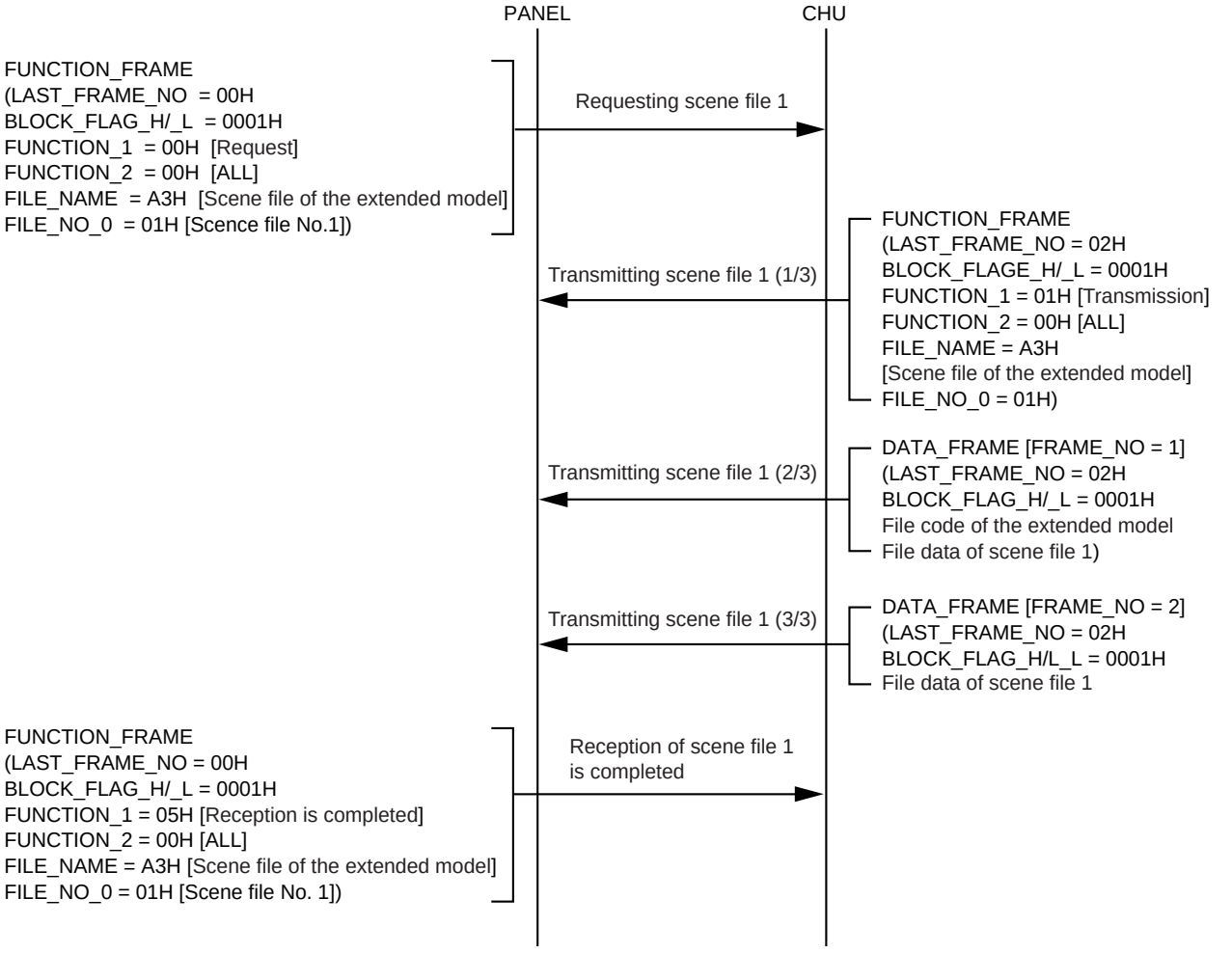
Notes

- The FILE_ADDRESS_H, FILE_ADDRESS_L, FILE_DATA_H and FILE_DATA_L must be transmitted after grouping these four bytes as a set of bytes, and with as many groups all together as permitted by DTLEN.
- When the type of file is Reference file,
  32 bits that is the total sum of FILE_DATA_H and FILE_DATA_L must be added after inserting the contents of the file for transmitting all the contents of the Reference file.
  Reference file check sum
  FILE_ADDRESS_H = 23H
  FILE_ADDRESS_L = FEH
  FILE_DATA_H/_L = Higher order 16 bits of check sum

  FILE_ADDRESS_H = 23H
  FILE_ADDRESS_L = FEH
  FILE_DATA_H/_L = Lower order 16 bits of check sum

Operation:

The procedure to issue a request for a file from panel to CHU, and that of file transfer from CHU to panel are shown as follows.(ACK is omitted.)



Example of using the command:

1) When the MSU issues a request scene file 1 of the extended model, to CHU 1.
   FUNCTION_FRAME only
   0FH, 00H, 10H, 00H, 00H, 01H, 00H, 00H, A3H, 00H, 00H, 00H, 01H, 20H, 01H, 00H, 00H, 00H, 00H

2) When the CHU transmits scene file 1 of the extended model, to MSU.
   FUNCTION_FRAME
   0FH, 00H, 10H, 02H, 00H, 01H, 01H, 00H, A3H, 00H, 00H, 00H, 01H, 20H, 01H, 00H, 00H, 00H, 00H
   DATA_FRAME (FRAME_NO =1)
   0FH, 01H, 0FH, 02H, 00H, 01H, 23H, FDH, 06H, 00H, 23H, 01H, 02H, 00H,29H, 81H, 78H, 60H
   DATA_FRAME (FRAME_NO = 2)
   0FH, 01H, 0FH, 02H, 00H, 01H, 23H, 02H, 06H, 00H, 23H, 03H, 02H, 00H,29H,82H, 01H, 01H

3) MSU transmits “Reception is completed” as it has received all of the Scene file 1 of the extended model that are supplied from the CHU1.
   FUNCTION_FRAME only
   0FH, 00H, 10H, 00H, 00H, 01H, 05H, 00H, A3H, 00H, 00H, 00H, 01H, 20H, 01H, 00H, 00H, 00H, 00H

CMD_GP **10** H	**MODEL_INFORMATION**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request information that is unique to the model such as model name, broadcasting standard that the model conforms to, information on special specifications ordered, use of option boards, etc.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	• • •	PARAM(n-2)	
10H	FUNCTION	DTLEN	INF_ ADDRESS	INF_ DATA_H	INF_ DATA_L	• • •	• • •	(BLOCK-A)

PARAM2	PARAM3	• • •	• • •	PARAM(n-2)	
INF_ ADDRESS	INF_ ADDRESS	• • •	• • •	• • •	(BLOCK-B)

PARAM:

DTLEN: n-3

During transmission: The DTLEN 3 bytes are transmitted because it is a repetition of INF_ADDRESS, INF_DATA_H and INF_DATA_L.

Request: One byte is transmitted because it is a repetition of INFL_ADDRESS.

FUNCTION:

00H = Requesting two or more individual information data, Blocksize = 1 byte (BLOCK-B)
01H = Transmitting two or more individual information data, Blocksize = 3 bytes (BLOCK -A)
02H = Requesting all of the individual information data, DTLEN = 0
03H = Writing two or more individual information data, Blocksize = 3 bytes (BLOCK-A)
Higher than this command are reserved for extension.

INF_ADDRESS:

Address of the data such as model name, broadcasting standard that the model conforms to, etc.

INF_DATA_H/_L:

When INF_ADDRESS is in the range of 01H to 7FH, the bit has meaning.
Also, when INF_ADDRESS is in the range of 80H to FEH, the bit has meaning after coding (0000H to FFFFH).

INF_ADDRESS :

80H	**Model name**	**0000H**		
		20**H	CHU	2000H = BVP700
				2001H = BVP750
				2002H = BVP500
				2003H = BVP550
				2004H = HDC700
				2005H = HDC750
				2006H = BVP900
				2007H = BVP950
				2008H = BVP-570
				2009H = BVP-500U
				200AH = BVP-9500
				↕ Reserved for extension
				3000H = DVW-700
				3001H = DVW-700WS
				3002H = DNW-7
				3003H = DVW-90
				3004H = DVW-90WS
				3005H = DVW-9WS
				3006H = HDW-700
				3007H = DVW-709WS
				3008H = DVW-790WS
				3009H = DVW-707
				300AH = DVW-790
				↕ Reserved for CAMCORDER
				301FH
				↕ Reserved for extension
				3FF8H = CAMCORDER
				3FF9H = BVP-9000
				3FFAH = BVP-270
				3FFBH = BVP-370
				3FFCH = BVP-375
				3FFDH = BVP-7
				3FFEH = BVP-70
				3FFFH = BVP-90

80H	Model name	40∗∗H	CCU	4000H = CCU700
				4001H = CCU550
				4002H = HDCU700
				4003H = CCU900
				4004H = HDCU900
				5FFBH = CCU-9000
				5FFCH = CCU-350
				5FFDH = CCU-355
				5FFEH = CCU-371
				5FFFH = CCU-370
		60∗∗H CNU		6000H = CNU700, 6001H=CNU500
		70∗∗H MSU		7000H = MSU700, 7001H = MSU700A,
				7002H = MSU750
		80∗∗H VCS		8000H = VCS700
		90∗∗H RCP		9000H = RCP74∗, 9001H = RCP72∗
				9002H = RCP7930, 9003H = RCP73 ∗
				9010H = BZP100
		A0∗∗H	IRIS PANEL	A000H = RCP70∗
		B0∗∗H	RM	B000H = RMB150
		C0∗∗H	CCU Panel	C000H = CCU550 Panel
81H	Model history	0 = standard 1 = /1 2 = /2		
82H	BKP name	0000H	BKP is not used	
		20∗∗H	BKP for CHU	2000H = BKP7910 ENC board
		40∗∗H	BKP for CCU	4000H = BKP7931 YC board
				4001H = AD board
		60∗∗H	BKP for CNU	6000H = BKP7930 IF board
				6001H = BKP7932 conversion board
				6002H = BKP7933 sbus I/F baord
		70∗∗H	BKP for MSU	
		80∗∗H	BKP for VCS	
		90∗∗H	BKP for RCP	
		A0∗∗H	BKP for IRIS PANEL	
		B0∗∗H	BKP for RM	
83H	Contents of the “order of special specifications” (TOKUREN)			
		0 = No data for the “order of special specifications” (TOKUREN) 1 to FFFFH		
	Contents of the “order of special specifications” (TOKUREN) correspond to the custom codes as follows:			
		bit15	Reserved (must be always 0)	
		bit14 to 10	Custom code 1st digit	
		bit9 to 5	Custom code 2st digit	
		bit4 to 0	Custom code 3st digit	
		For each digit, 0: not used, 1 to 26: A to Z, 27 to 31: reserved		
		When the custom code is either a 2-digit or 1-digit number, the numbers must be aligned to the lower order digit.		
		Example: Custom code “order of special specifications” (TOKUREN) data		
		AAA 0421H (0 00001 00001 00001)		
		SZF 4F46H (0 10011 11010 00110)		
		QA 0221H (0 00000 10001 00001)		
		X 0018H (0 00000 00000 11000)		

84H	History of the “order of special specifications” (TOKUREN)	
		0 = Version of 1st shipment.
		Version number is incremented after the 1st shipment.
85H	Date of “order of special specifications” (TOKUREN)	
		Bit 15 to bit 9. Year data, with year 1990 set to 0.
		Bit 8 to bit 5: Month data. Bit 4 to bit 0: Day data
		(Example 97/01/20 = 0000111 0001 10100B (0e34H))
86H	Present date	Bit 15 to bit 9. Year data, with year 1990 set to 0. Bit 8 to bit 5: Month data.
87H	Present hour/minute	Higher order 8 bits: Hour; Lower order 8 bits: Minute
88H	Present second/frame	Higher order 8 bits: Second; Lower order 8 bits: Frame
89H	Protocol level	0 = Level of fundamental protocol, 1 or higher = Extended protocol level
		Indicates level of the protocol.
		When no reply is returned, it is judged as protocol level 0.
8AH	Accumulated timer (Higher order 16 bits)	
8BH	Accumulated timer (Lower order 16 bits)	

INF_ADDRESS: (Upper column: bit 15 to bit 8), (Lower column: bit 7 to bit 0)

	bit 15/7	**bit 14/6**	**bit 13/5**	**bit 12/4**	**bit 11/3**	**bit 10/2**	**bit 9/1**	**bit 8/0**	
01H	Broadcast standard				Non-interlaced	Interlaced	3time scan	normal scan	(15 to 8)
	1125line	625line	525line	HD	SECAM	PAL_M	PAL	NTSC	(7 to 0)
02H	CCD type						16:9	4:3	(15 to 8)
		2000K	600K	500K	400K	FT	FIT	IT	(7 to 0)
03H	CHU category								(15 to 8)
					with VTR	2 pieces	1 piece	OB	(7 to 0)
04H	CCU type								(15 to 8)
					DC	AC	9.5 inch	19 inch	(7 to 0)
05H	RCP type								(15 to 8)
							Dial	joy stick	(7 to 0)
06H	CA category								(15 to 8)
						FIBER	TRIAX	COAX	(7 to 0)
07H	VF type								(15 to 8)
							Color	B/W	(7 to 0)
08H	SETUP card type							card is used	(15 to 8)
									(7 to 0)
Subsequent bits are reserved for extension.									

Note

When INF_DATA_H/_L that corresponds to INF_ADDRESS is not specified, data is returned as 0000H. However, when all of the INF_DATA are requested, only the data that corresponds to your local device is returned.

Example of using the command:

When all of the INF_DATA are requested
10H, 02H, 00H

When camera requests data (model name, broadcast standard, CCD type)
10H, 00H, 03H, 80H, 01H, 03H

Transmitting the camera data (BVP700 NTSC 16:9 FIT 500k pixels)
10H, 01H, 09H, 80H, 2000H, 01H, 0521H, 03H, 0212H

CMD_GP **11** H	**OTHER_SYSTEM_COMMAND_DATA_TRANSFER**	Rev. **4.0**	Pattern **n** byte

Outline:

This command is used to transmit and receive the command data of other system protocols.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	• • •	• • •	• • •	PARAM(n-2)
11H	FUNCTION	DTLEN	DATA_0	• • •	• • •	• • •	DATA_N

PARAM:

FUNCTION: 00H Reserved
01H CHU → CCU, CNU, etc… transmission (RS-232C output)
02H and higher are reserved for extension.

DTLEN: Number of DATA_N (n-3)

Operation:

- CHU transmits the data that the CHU has received through RS-232C, with GPNL_ID set as DEST_ID, and DCHU_ID set as SRC_ID.
  CHU feeds the RS-232C output of the CHU with the command data that is supplied with DCHU_ID set as DEST_ID.
- CCU, CNU and other devices transmits the data that CCU, CNU and other devices have received through RS-232C, with DCHU_ID set as DEST_ID, and DCCU_ID set as SRC_ID.CCU, CNU and other devices feed the RS-232C output with the command that is supplied with GPNL_ID set as DEST_ID. Feeding the RS-232C output is performed with GPNL_ID set as DEST_ID.
- The devices that are connected to the RS-232C line can control the amount of data using hard flow control. However, the devices (such as communication from CHU -> CCU) that are connected to the 700 Protocol command have no means of controlling the amount of data. This means that flow control must be performed by adjusting the communication speed. In such a case, the functions such as reception ready, reception prohibited, status request and others must be assigned to 02H and higher bits.

CMD_GP **12** H	**PROTOCOL_LEVEL**	Rev. **3.0**	Pattern **3** byte

Outline:

This command is used to maintain compatibility between the former communication procedure and the new communication procedure when the communication procedure is changed.

Command structure:

CMD_GP	PARAM0	PARAM1
12H	LEVEL	SUB_LEVEL

PARAM:

EVEL : Protocol level

LEVEL	SUB_LEVEL	Contents
0	0	————
1	0	Corresponding to the RECOVERY command
Higher than this command are reserved for extension.		

Operation:

Refer to the Protocol level 1, “Section 2-3-5. Communication Recovery and Protocol Level”.

CMD_GP **1C** H	**NOP**	Rev. **1.0**	Pattern **1** byte

Outline:

No operation

No controls are performed. Every device reads, but executes nothing.

Command structure:

CMD_GP
1CH

CMD_GP **1D** H	**WHO_ARE_YOU**	Rev. **1.0**	Pattern **1** byte

Outline:

- This command is used to start communication when the main power is turned on or when the cable is connected, or in other events.
- This command is transmitted with the G_ID set as DEST_ID when the main power is turned on or when the cable is connected, or in other events.
  When a device receives this command, it sets the ID of the adjacent transmitting device as DEST_ID, sets its own ID as SRC_ID, and returns this command.

Command structure:

CMD_GP
1DH

Operation:

Operation modes of RCP, MSU and others are set using this command.
Refer to Section “2-5-1. Establishing Communication between Adjustment Devices.

CMD_GP **1E** H	**I_AM_HERE**	Rev. **1.0**	Pattern **1** byte

Outline:

- This command is used to prove existence of your own device.
- This command tells the counter-part “I exist”. In principle, this command must be returned when a device receives the existence confirmation command (ARE_YOU_THERE command, 1FH). When a device receives this command, the receiving device judges that the transmitting device that transmitted this command exists.

Command structure:

CMD_GP
1EH

Operation:

Refer to Section “2-5-2. Confirming Opposite Ends of Communication”.

CMD_GP **1F** H	**ARE_YOU_THERE**	Rev. **1.0**	Pattern **1** byte

Outline:

- This command is used to prove existence of your communication counter-part.
- This command is transmitted to inquire existence of the model specified by DEST_ID. In other words, when a device wishes to transmit a command, the transmitting device sends this command to check whether the counter-part target of the command exists.
  When a device receives this command, it must transmit the command that proves existence (I_AM_HERE command, 1EH) to the transmitting device.
  In principle, data is transmitted after confirming the counter-part using the ARE_YOU_THERE command as described.

Command structure:

CMD_GP
1FH

Command structure:

Refer to Section “2-5-2. Confirming Opposite Ends of Communication”.

CMD_GP **20** H	**CHU_SWITCH (REL)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to relatively control the CHU switch items. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
20H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-2. CHU_SWITCH Address."
SW_DATA: Refer to Section "5-1-2. CHU_SWITCH Address."

Operation:
There are three types of CHU_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-2. CHU_SWITCH Address."

UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the CHU_SWITCH (ABS) command.

Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the CHU_SWITCH (ABS) command.

Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the CHU_SWITCH (ABS) command.

Example of using the command:
1. SW_ADDRESS = 00H. To request the maximum value of shutter select and return the maximum value as the response:
   Transmitting device 20H, 00H, 00H → Receiving device
   ← 21H, 00H, CAH
   Response
2. SW_ADDRESS = 00H. To request the present value of shutter select and return the present value 1/250 as the response:
   Transmitting device 20H, 00H, 00H → Receiving device
   ← 21H, 00H, 03H
   Response
3. SW_ADDRESS = 40H. To request the present value of camera number and return the camera number 1 as the response:
   Transmitting device 20H, 40H, 00H → Receiving device
   ← 21H, 40H, 01H
   Response

CMD_GP **21** H	**CHU_SWITCH (ABS)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to absolutely control the CHU switch items.

Command structure:

CMD_GP	PARAM0	PARAM1
21H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section “5-1-2 CHU_SWITCH Address.”
SW_DATA: Refer to Section “5-1-2 CHU_SWITCH Address.”

Operation:
TThere are three types of CHU_SWITCH (ABS) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section “5-1-2 CHU_SWITCH Address.”

UP/DOWN step type command:
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:
1. To set SW_ADDRESS = 00H, and increment the shutter select value by +1 over the present value. (Assuming that the present shutter select is 1/125.):
   Transmitting device 21H, 00H, 80H → Receiving device
   Response ← 21H, 00H, 03H (1/250 shutter select is selectecd)
2. To set SW_ADDRESS = 00H and set the shutter select value of 1/125. Because the receiving device has only one speed of 1/250, the present value 1/125 is returned as the response:
   Transmitting device 21H, 00H, 03H → Receiving device
   Response ← 21H, 00H, 02H

CMD_GP **22** H	**CHU_ANALOG (REL)**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the relative values of CHU with analog control.
(Analog control means to vary the data continuously.)

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
22H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section “5-2-1. CHU_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.
Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two’s complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the CHU_ANALOG (ABS) command.
When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

Example of using the command:

1. The transmitting device requests the present analog value of ANALOG_ADDRESS = 01H “R white”. The receiving device returns 0 as the response.
   Transmitting device 22H, 01H, 00H, 00H → Receiving device
   ← 23H, 00H, 00H, 00H
   Response

2. The transmitting device changes the present analog value of the ANALOG_ADDRESS = 01H “R white” by +50H from the present value.
   Transmitting device 22H, 01H, 00H, 50H → Receiving device
   ← 23H, 00H, 00H, 50H
   Response

CMD_GP **23** H	**CHU_ANALOG (ABS)**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the relative values of CHU with analog control for the controllable and uncontrollable items. (relative value control)

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
23H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

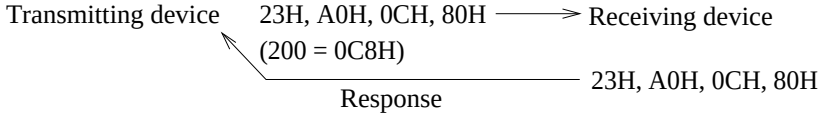
ANALOG_ADDRESS: Refer to Section "5-2-1. CHU_ANALOG Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ** H, ANALOG_DATA_L * 0H)

Operation:

ANALOG_ADDRESS contains 256 types of command ranging from 00H to FFH. Different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.
Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

Example of using the command:

To vary the analog value of ANALOG_ADDRESS = A0H to 200 (in case of 12-bit data)



CMD_GP **24** H	**CHU_DIAGNOSTICS_INFORMATION**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to request or transmit the result of CHU self-diagnostics.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
24H	DIAGNOSITC_ STATUS	BOARD_ NAME	BOARD_ INF

PARAM:

DIAGNOSIS_STATUS:

Higher order 4bit	0H	OK
	1H	NG
	2H	Don't care/Measurement is not possible
	3H	Requesting the result of all self-diagnostics
	4H	Requesting the result of individual self-diagnostics
	5H	CARE (Alarm LED on panel flashes slowly)
	6H	WARNING (Alarm LED on panel flashes quickly)
	7H	Still (Auto Iris LED flashes at a slow speed when the circuit board name is IRIS)
	8H to FH	Reserved for extension
Lower order 4bit	0H	Priority is high
	•	
	•	
	FH	Priority is low

Priority is used to prioritize the items in the order of high priority starting from 0H to FH when the result of self-diagnostics is NG.

BOARD NAME:

00H	ALL	08H	FL	10H	AT	18H	AD
01H	VA	09H	SH	11H	DA	19H	RC
02H	IE	0AH	MX	12H	IF	1AH	Reserved for extension
03H	PR	0BH	PS	13H	MB		
04H	MS	0CH	TR	14H	RX		
05H	SG&EN	0DH	OHB	15H	DL		
06H	MD	0EH	SG	16H	VDA		
07H	AU	0FH	EN	17H	DAP	FFH	

BOARD_INF:

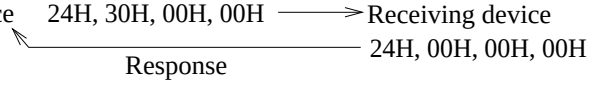
00H	Information inside the board is not available.
01H to 0FF	Reserved for extension

Note

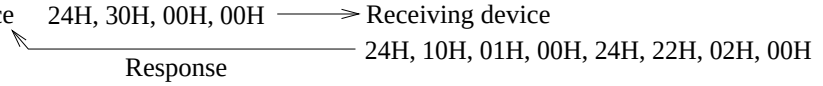
The panel issues this request using the command with GALL_ID set as DEST_ID. When CHU transmits this command voluntarily by itself, it transmits the command with GALL_ID set as DEST_ID. When the panel receives this command, it receives the command only when DCHU_ID is set as SRC_ID.

Example of using the command:

1. When the transmitting device requests the result of all self-diagnostics of CHU, and the receiving device (CHU) returns the response that all are OK.



2. When the transmitting device requests the result of all self-diagnostics of CHU, and the receiving device (CHU) returns the response that BOARD_NAME VA and IE are NG.



CMD_GP **25** H	**CHU_AUTO_SETUP_CONTROL**	Rev. **1.0**	Pattern **3** byte

Outline:

This is the control command for executing the auto setup and related items.

Command structure:

CMD_GP	PARAM0	PARAM1
25H	Type of auto setup	Execution status

PARAM:

Type of auto setup:

00H	Request. Nothing has been done yet.
01H	AWB
02H	ABB
03H	Level Auto Setup
04H	Reference Store
05H	Auto Black Shading
06H	Auto White Shading
07H	Skin Detail Auto Hue (ch1)
08H	Auto Color Setup
09H	Color Reference Store
0AH	Skin Detail Auto Hue (ch2)
0BH	Skin Detail Auto Hue (ch3)
0CH	Skin Tone Auto Iris Hue
	Subsequent commands up to FFH are reserved (for extension).

Execution status:

00H	Auto Setup Status Request
01H	Start
02H	Break
03H	OK
04H	NG
05H	Under execution
06H	Standby
07H	Cancel Standby (Returns to the original status by canceling standby.)
08H	Reset Status (All statuses are reset and 00H is returned.)
09H	Busy
	Subsequent commands up to FFH are reserved (for extension).

Note

The panel issues this request using the command with GALL_ID set as DEST_ID. When CHU transmits this command voluntarily by itself, it transmits the command with GALL_ID set as DEST_ID. When the panel receives this command, it receives the command only when DCHU_ID is set as SRC_ID.

Example of using the command:

1. To execute the Level Auto Setup — Command — 25H, 03H, 01H (Start)
2. To suspend the Level Auto Setup — Command — 25H, 03H, 02H (Break)

CMD_GP **26** H	**CHU_AUTO_SETUP_INFORMATION**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to transmit the execution status of AUTO_SETUP.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
26H	Item under_ execution	Channel under_ execution/status	Execution counter

PARAM:

Item under execution: Item actually being executed
From 00H to 0FFH
CHU_AUTO_SETUP execution item list

Channel under execution/status:	Higher order 3bit	0	(000) Items other than R. G. B.
		1	(001) RED
		2	(010) GREEN
		4	(100) BLUE
			Other commands are combinations of the above commands.
	Lower order 5bit	0H	Normal
		1H	Overflow
		2H	Low Level
		3H	Time Limit
		4H	Not Close
		5H	Low Saturation
		6H	Over Level
		7H	No Reference
		8H	Color Temperature High
		9H	Color Temperature Low
		AH	Preset Error
		From 0BH to 1FH	Reserved for extension

Execution counter: This counter indicates the extent of execution of auto setup.

Note

This command is used also as the response of AUTO_SETUP_REQUEST for the CHU_CALL_AUTO_SETUP_CONTROL command (CMD_GP25H).

CHU_AUTO_SETUP execution item list

Data	Execute Item
00H	Nop
	Auto White Balance
01H	Auto white balance
	Auto Black Balance
02H	Auto black set
03H	Auto black balance
	Auto Level Setup
04H	Reference reading
05H	Setup master black
06H	Setup knee point balance
07H	Setup white clip
09H	Setup white balance
0AH	Setup black set
0BH	Setup black balance
0CH	Setup knee slope balance
0DH	Setup gamma balance
0EH	Setup flare balance
0FH	Setup black gamma balance
	Skin Detail Auto Hue
20H	Skin detail auto hue initialize
21H	Skin detail auto hue reference reading
22H	Skin detail auto hue level reading
23H	Skin detail auto hue phase
24H	Skin detail auto hue end
	Auto Black Shading
2AH	ABS initialize
2BH	ABS level check
2CH	ABS master black
2DH	ABS black set
2EH	ABS reading center
2FH	ABS reading left
30H	ABS reading right
31H	ABS reading top
32H	ABS reading bottom
33H	ABS correct shading
34H	ABS end

Data	Execute Item
	Auto White Shading
3AH	AWS initialize
3BH	AWS level check
3CH	AWS reading center
3DH	AWS reading left
3EH	AWS reading right
3FH	AWS reading top
40H	AWS reading bottom
41H	AWS correct Shading
42H	AWS end
	Color Reference Store
4AH	CRS initialize
4BH	CRS black balance
4CH	CRS white balance
4DH	CRS gamma balance
4EH	CRS reference reading
4FH	CRS window data reading
50H	CRS write to reference file
51H	CRS end
	Auto Color Setup
5AH	ACS initialize
5BH	ACS black balance
5CH	ACS white balance
5DH	ACS gamma balance
5EH	ACS reference reading
5FH	ACS window data reading
60H	ACS disparity check
61H	ACS adjust matrix
62H	ACS move to next constant
63H	ACS end

CMD_GP **27** H	**CHU_FILE_CONTROL**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the CHU files.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
27H	Processing item	Type of file	File number

PARAM:

Processing item:

00H	Canceling the operation (Cancel)
01H	Initialization (Formatting)
02H	Calling
03H	Saving
04H	Erasing
05H	Canceling the call
06H	Status request
07H	File call in progress
08H	This file contains data that is not called
09H	There is a file but no data
0AH	The corresponding file does not exist
0BH	Transmission of number of files
0CH	File operation is not possible at present. Or, this command was transmitted while file operation was not possible for some reason.

Subsequent commands up to FFH are reserved for extension.

Type of file:

00H	All Files (This command cannot be used)
01H	Standard File
02H	
03H	Scence File
04H	Reference File
05H	Master Setup File
06H	AWB File (This command cannot be used)
07H	Lens File
08H	Iris File
09H	OHB File
0AH	Offset File (This command cannot be used)
0BH	Color Reference File
0CH	Trimming File
0DH	Master Black File
0EH	Preset Scene File

Subsequent commands up to FFH are reserved for extension.

File number: 00H to FFH

The file numbers can be specified in the range of 1 to 255 (FFH). 0 is reserved for a special number. When the present file number is 0, no files are called.

Example of using the command:

1.	To delete scene file 5 of the present status:	Commands 27H, 04H, 03H, 05H
2.	To return the standard file to the default status (initialize) :	Commands 27H, 01H, 01H, 01H
3.	To execute Reference Store:	Commands 27H, 03H, 04H, 01H
4.	To delete the file operation command that was executed immediately before:	Commands 27H, 00H, 00H, xxH (The file number is ignored)
5.	To cancel the calling of scene file:	Commands 27H, 02H, 02H, 00H (Scence File 0 Recall)

CMD_GP **28** H	**CHU_FILE_NAME_CONTROL**	Rev. **2.0**	Pattern **n** byte

Outline:

This command is used to control the CHU files.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM5	• • •	PARAM (n-2)
28H	FUNCTION	DTLEN	Type of file	File number	Filename-1	Filename-2	• • •	Filename-n

CMD_GP
Maximum number of files

PARAM:

FUNCTION:
- 00H Requesting filename (PANNEL → CHU) 5 bytes
- 01H Transmitting filename (CHU → PANEL) 5 bytes + number of file characters
- 02H Modifying filename (PANEL → CHU) 5 bytes + number of file characters
- 03H Reserved
- 04H Requesting number of characters of the longest filename (PANEL → CHU) 5 bytes + number of file characters
- 05H Transmitting number of characters of the longest filename (PANEL → CHU) 5 bytes + number of file characters
- 06H Subsequent commands are reserved

DTLEN: When FUNCTION is 00H or 04H, DTLEN is 2.
When FUNCTION is 01H or 02H, PARAM4 and subsequent parameters become the filename. Therefore, the maximum number of filename characters is 51 characters, and DTLEN becomes 2 + number of characters.
When FUNCTION is 05H, DTLEN is 3 and PARAM4 becomes the maximum number of filename characters.

Type of file:
- 00H All Files (This command cannot be used)
- 01H Standard File
- 02H
- 03H Scence File
- 04H Reference File
- 05H MasterSetup File
- 06H AWB File (This command cannot be used)
- 07H Lens File
- 08H Iris File
- 09H OHB FIle
- 0AH Offset File (This command cannot be used)
- 0BH Color Reference File
- 0CH Trimming File
- 0DH Master Black File
- 0EH Preset Screen File

Subsequent commands up to FFH are reserved for extension.

File number: 00H to FFH
The file numbers can be specified in the range of 1 to 255 (FFH). 0 is reserved for a special number. When the present file number is 0, no files are called.

Filename: ASCII code shall be used. In principle, characters must be the printable letter codes (20H to 7EH). 00H at the end of a character string is not necessary.

Operation:

- The response to the FUNCTION of 00H or 04H that is supplied from the transmitting device (control panel), shall be 01H.
- The response to the FUNCTION of 04H that is supplied from the transmitting device (control panel), shall be 05H. Transmission and response shall be performed with the file number 0.

Example of using the command:

- Requesting the filename of lens file 3: 28H, 00H, 02H, 07H, 03H
  PANEL → CHU 28H, 01H, 11H, 07H, 03H, 43H, 61H, 6EH, 6EH, 6FH, 6EH,
  Its response: 6FH, 6EH, 20H, 58H, 32H, 30H, 20H, 4CH, 65H, 6EH, 73H
  ("Canon X20 lens")

- Modifying the filename of lens file 2:
  PANEL → CHU 28H, 02H, 0EH, 07H, 02H, 46H, 75H, 6AH, 69H, 6EH, 6FH,
  6EH, 20H, 4CH, 65H, 6EH, 73H
  Its response: 28H, 01H, 0EH, 07H, 02H, 46H, 75H, 6AH, 69H, 6EH, 6FH,
  6EH, 20H, 4CH, 65H, 6EH, 73H

- Requesting the maximum character numbers of the lens file name:
  (When the file number is not specified)
  PANEL → CHU 28H, 04H, 02H, 07H, 00H (File number is set to 0.)
  Its response: 28H, 05H, 03H, 07H, 00H, 10H
  (Length of character string is 16 characters.)

- Requesting the maximum character numbers of the lens file name:
  (When a specific file number is specified)
  PANEL → CHU 28H, 04H, 02H, 07H, 04H
  (Requesting length of character string of file 4.)
  Its response: 28H, 05H, 03H, 07H, 04H, 10H
  (Length of character string is 16 characters.)

CMD_GP **29** H	**CHU_SWITCH_WITH_MASK**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to absolutely control the value of the CHU_SWITCH items in units of 1 bit to 8 bits.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
2AH	SW_ADDRESS	SW_DATA	MASK_DATA

PARAM:

SW_ADDRESS: Refer to Section “5-1-2. CHU_SWITCH Address.”
SW_DATA: Refer to Section “5-1-2. CHU_SWITCH Address.”
MASK_DATA: Set 1 to the bit that you want to turn ON or OFF.

Operation:

This command is used to absolutely control the value of the CHU_SWITCH items of the bit-data type in units of bit.
Set 1 to the bit that you want to turn ON, of the item that is specified by SW_ADDRESS. Set 1 to the bit that you want to turn OFF. Set these bits to the SW_DATA. Set 1 to the bit of the MASK_DATA that you want to turn ON or OFF.
When a receiving device receives this command, it over-writes the item that is specified by the SWITCH_ADDRESS, with only the bit data of the SWITCH_DATA that corresponds to the bit which has been set to 1 of the MASK_DATA. The resultant value is returned as the response using the CHU_SWITCH (ABS) command.

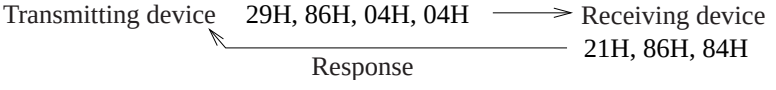
Be sure to use this command when the ALL operation is performed.

Example of using the command:

SW_ADDRESS = 81H

81H	Knee Saturation ON	Auto Knee ON	Knee ON	Gamma ON	Flare ON	S-EVS ON	ECS ON	Shutter ON

When the bit 2 S-EVS only among the above command is turned on while the other bits remain unchanged, example of the command is shown below.



CMD_GP **2A** H	**CHU_ANALOG_FOR_MASTER_SLAVE**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the relative values of CHU with analog control for the controllable and uncontrollable items. (relative value control)

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
29H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section "5-2-1. CHU_ANALOG Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.

Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two's complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. This CHU_ANALOG_FOR_MASTER_SLAVE command is the analog value that is sent from the transmitting device (control panel) to CHU when controllable/uncontrollable items are handled. CHU handles the data with 32 bits and should perform the overflow processing.

The receiving device returns the present value after the value has been varied, using the CHU_ANALOG (ABS) command.

Note

CHU must not operate when it receives this command in any modes other than the pre-determined ANALOG_ADDRESS.

Example of using the command:

An example of using the command is shown when the R White data is changed by +100H then −100H using this command from the present R White data of 7FF0H, and the R White data returns to the original setup because of the overflow processing assuming ANALOG_ADDRESS 01H, R white:

Transmitting device 2AH, 01H, 01H, 00H ⟶ Receiving device (+100H)
⟵ 23H, 01H, 7FH, FFH
Response

Transmitting device 2AH, 01H, FEH, B0H ⟶ Receiving device (−100H)
⟵ 23H, 01H, 7FH, F0H
Response

CMD_GP **2B** H	**CHU_MASTER_SETUP**	Rev. **2.0**	Pattern **4** byte

Outline:

This command is used to request and transmit the Master Setup values of the controlling side of the CHU ANALOG_DATA

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
2BH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section "5-2-1. CHU_ANALOG Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.

This command is used to issue a request of the Master Setup values (standard value and the return value when cleared) of the controlling side for the CHU. Set the ANALOG_ADDRESS to PARAM0 and transmit the command. On this occasion, the ANALOG_DATA_H and ANALOG_DATA_L are ignored, but 0000H is set normally and the command is transmitted.
When a CHU receives this command, it sets the controlling side's Master Setup value to the ANALOG_DATA_H, ANALOG_DATA_L, and returns it.

This command is used typically to know the return value when clearing the analog value of the camera of the controlling side in the event of the controllable/uncontrollable items.

Example of using the command:

1. When you want to know the Master Setup value of the controlling side of ANALOG_ADDRESS = 16H (PANEL → CHU)
   Command 2BH, 16H, 00H, 00H
2. To transmit the Master Setup value (32A0H) of the controlling side of ANALOG_ADDRESS = D5H (CHU → PANEL)
   Command 2BH, D5H, 32H, A0H

CMD_GP **2C** H	**CHU_SEQUENCE_CONTROL**	Rev. **2.0**	Pattern **n** byte

Outline:

This command is used when a series of operating procedures is required.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	PARAM4	PARAM(n-2)
2CH	Type of sequence	DTLEN	FUNCTION	STATUS	MESSAGE	

PARAM:

DTLEN: Basically, DTLEN = 3 is used having the command length of 6 bytes. However, the DTLEN changed depending upon the type of sequence, function and direction of transmission.

Type of sequence: It specifies what type of sequence is used. Contents of the following FUNCTION, STATUS and MESSAGE changes depending upon the type of sequence. The following types of sequence are defined at present.
00H = (reserved)
01H = RPN compensation processing sequence
02H = Subsequent bits are reserved

FUNCTION: This is the operating command function. Contents of the FUNCTION changes depending upon the type of sequence. FUNCTION alone is enough to control camera from panel. The following STATUS and MESSAGE can be omitted. (They are ignored even if they are attached.)

FUNCTIONs of the RPN compensation processing sequence are shown below.

00H	Status request	Requests the present sequence status
01H	Compensation start	Enters the compensation selection mode.
02H	Compensation point determination	Determines the compensation points and enters the compensation mode.
03H	Save	Saves the result of compensation. An error is issued in the modes other than the compensation mode.
04H	Delete	Deletes the compensation data.
05H	Tentative compensation cancel	Cancels the compensation tentatively.
06H	New compensation point selection	Deletes the older compensation points nearby and compensates the new compensation points.
07H	Cancel	Cancels the former compensation operations that have been used, and enters the compensation point selection mode.
08H	End	Ends the RPN compensation and returns to the normal operating condition.
09H	Subsequent bits are reserved	

STATUS: It indicates the present status of sequence. Its contents change depending on type of sequence. STATUS can be normally omitted when controlling camera from panel. (It is ignored even if they are attached.)

When this command is transmitted from CHU to panel, be sure to return the reply with the present status attached to this field.
STATUSes of the RPN compensation processing sequence are shown as follows.

00H	Normal status RPN	It indicates the status that the system has not entered the compensation status yet. In this status, the RPN compensation operations cannot be performed except for the cursor on/off and the FUNCTION 00H and 01H operations. When any commands other than FUNCTION 00H and 01H are transmitted, error is returned.

01H	Compensation point selecting status	This is the mode in which the compensation points can be selected. When the FUNCTION 01H is transmitted, the device enters this state. In this status, operations such as channel selection, cursor on/off, cursor movement and FUNCTION 02H, 04H and 08H can be performed.
02H	Proximity point status	When the Compensation point determination (02H) is transmitted in the Compensation point selecting status (01H), and when the already-compensated point exists in its proximity, the device enters this status. In this status, FUNCTION 05H, 07H and 08H can be accepted. The other FUCNTIONs result in error.
03H	Tentative cancel status	When the FUNCTION 05H is selected in the 02H (Proximity point) status, compensation of proximity point is tentatively canceled and the device enters this status. In this status, FUNCTION 06H, 07H and 08H can be accepted. The other FUCNTIONs result in error.
04H	Compensation mode	This is the mode in which the compensation points are determined and the compensation level is determined. When the already-compensated point or proximity point cannot be found when the FUNCTION 02H is transmitted in the 01H status, a device enters this status when the FUNCTION 06H is transmitted in the 03H status. The FUNCTION 03H, 07H and 08H can be accepted in this status but the other FUCNTIONs result in error.
05H	Re-compensation mode	This is the mode in which the re-compensation is applied to the already-compensated points. A device enters this mode when the FUNCTION 02H is transmitted in the 01H status, and the already-compensated point is selected. The FUNCTION 03H, 04H, 07H and 08H can be accepted in this status but the other FUCNTIONs result in error.
06H	Wait status	This is the status of waiting for status transition. When a device cannot move to the next status due to communication with OHB when FUNTCION is transmitted, this status is returned from the device. When a device has moved to the next status upon completion of the processing after this command be returned, the CHU must surely return the status to panel.
07H	Subsequent bits are reserved	

MESSAGE: It indicates the response message for the command function. Contents of the messages differ depending on the type of sequence. The MESSAGE can be omitted normally when a camera is controlled from panel. (It is ignored even if they are attached.) The MESSAGE can be omitted when the new FUNCTION is accepted and processed normally, and when reply is going to be returned from CHU.
When this command is transmitted from CHU to panel, be sure to return the reply with the present status attached to this field.

MESSAGEs of the RPN compensation processing sequence are shown as follows.

00H	OK	The processing has completed in normal end. This field can be omitted in this case.
01H	Command Error	An illegal command is transmitted. This message is returned when the undefined FUNCTION is transmitted.
02H	OHB Error	This message is returned when a processing cannot be performed because of communication with OHB cannot be established due to some reasons.
03H	Multiple proximity points	This message is returned when the compensation point could not be determined because two or more proximity points exist when determining the compensation point (FUNCTION 02H).
04H	Subsequent bits are reserved	

CMD_GP **2F** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **30** H	**CHU_MULTI_SWITCH**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of CHU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
30H	FUNCTION	DATA_N	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N-1	SW_ DATA_N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more switch data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more switch data (RELATIVE)	Block size = 2 bytes (BLOCK-B)
	02H	Transmits the two or more switch data (ABSOLUTE)	Block size = 2 bytes (BLOCK-B)

Note

Response for this command is 02H.

DTLEN:	Number of total bytes of SW_ADDRESS and SW_DATA of PARAM2 up to (n-2)
SW_ADDRESS_N:	Refer to Section “5-1-2. CHU_SWITCH Address”.
SW_DATA_N:	Refer to Section “5-1-2. CHU_SWITCH Address”.

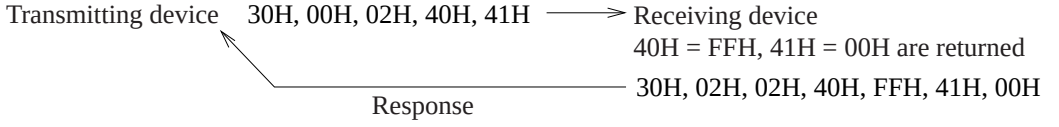
Operation:

For the operation to each SW_ADDRESS, refer to the CHU_SWITCH (REL) command and the CHU_SWITCH (ABS) command.

Example of using the command:

Request the switch data and its return

Requests the present switch status of SW_ADDRESS 40H and 41H.



CMD_GP **31** H	**CHU_MULTI_ANALOG (REL)**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more analog data of CHU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
31H	FUNCTION	DTLEN	ANALOG_ ADDRESS_1	ANALOG_ ADDRESS_2	• • •	ANALOG_ ADDRESS_N-1	ANALOG_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	PARAM4	• • •	PARAM(n-2)	
ANALOG_ ADDRESS_1	ANALOG_ DATA_H-1	ANALOG_ ADDRESS_L-1	• • •	ANALOG_ DATA_L-N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more analog data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more analog data (RELATIVE)	Block size = 3 bytes (BLOCK-B)
	02H	Transmits the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	03H	Clears the two or more analog data	Block size = 1 byte (BLOCK-A)
	04H	Requests the absolute output value of the two or more analog data	Block size = 1 byte (BLOCK-A)
	05H	Reserved	
	06H	Transmits the absolute output value of the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	07H	Reserved	
	20H	Requests two or more analog trimming data	Block size = 1 byte (BLOCK-A)
	21H	Transmits two or more analog trimming data (RELATIVE)	Block size = 3 bytes (BLOCK-B)
	22H	Transmits two or more analog trimming data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	23H	Clears two or more analog trimming data	Block size = 1 byte (BLOCK-A)
	24H	Requests the absolute value output data of two or more analog data	Block size = 1 byte (BLOCK-A)
	25H	Reserved	
	26H	Transmits the absolute value output data of two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	27H	Reserved	
	40H	Requests the two or more of the extended analog data	Block size = 1 byte (BLOCK-A)
	41H	Transmits the two or more of the extended analog data (RELATIVE)	Block size = 3 bytes (BLOCK-B)

42H	Transmits the two or more of the extended analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
43H	Clears two or more extended analog data	Block size = 1 byte (BLOCK-A)
44H	Requests the absolute output value of two or more extended analog data	Block size = 1 byte (BLOCK-A)
45H	Reserved	
46H	Transmits the absolute output value of two or more extended analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
47H	Reserved	

- The FUNCTIONs of 00H to 1fH are the FUNCTIONs for the normal analog data (22H, 23H).
- The FUNCTIONs of 20H to 3fH are the FUNCTIONs for the analog trimming data (3AH, 3BH).
- The FUNCTIONs of 40H to 5fH are the FUNCTIONs for the extended analog data (3CH, 3DH).

Notes

- The response for the above described command is returned using the ABSOLUTE transmission.
  Example: Response for 00H, 01H, 02H, 03H is 02H.
- Clearing means to return the value to the standard value.

DTLEN: Number of total bytes of ANALOG_ADDRESS, ANALOG_DATA_H and ANALOG_DATA_L of PARAM2 up to n-2.

ANALOG_ADDRESS_N:

ANALOG_DATA_N: In case of FUNCTION 00H to 1FH,
refer to Section “5-2-1. CHU_ANALOG Address”.
In case of FUNCTION 20H to 3FH,
refer to Section “5-3-1. CHU_ANALOG_TRIMMING Address”.
In case of FUNCTION 40H to 5FH,
refer to Section “5-2-2. CHU_EXT_ANALOG Address”.

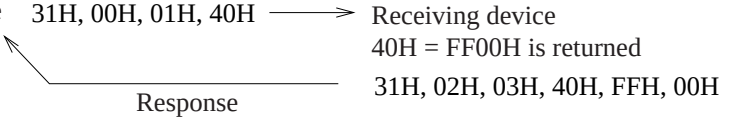
Operation:

Refer to the following commands for the operation of each ANALOG_ADDRESS.

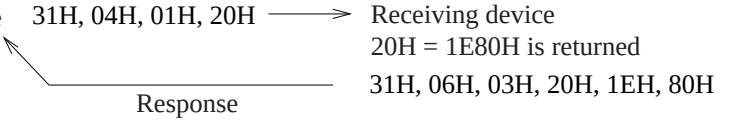
CHU_ANALOG (REL) command	(CMD_GP 22H)
CHU_ANALOG (ABS) command	(CMD_GP 23H)
CHU_ANALOG_TRIMMING (REL) command	(CMD_GP 3AH)
CHU_ANALOG_TRIMMING (ABS) command	(CMD_GP 3BH)
CHU_EXT_ANALOG (REL) command	(CMD_GP 3CH)
CHU_EXT_ANALOG (ABS) command	(CMD_GP 3DH)

Example of using the command:

1. Request the ANALOG_DATA and its return
   Requests the present analog data of ANALOG_DATA 40H.



2. Request and transmission of absolute output value of ANALOG_DATA
   Request of the present output value of ANALOG_ADDRESS 20H.



CMD_GP **32** H	**CHU_MULTI_SWITCH_STATUS (REL)**	Rev. **–**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of CHU at one time.

Command structure:

CMD_GP	**PARAM0**	**PARAM1**	**PARAM2**	**PARAM3**	**• • •**	**PARAM(n-1)**	**PARAM(n-2)**	
32H	FUNCTION	DTLEN	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	**PARAM3**	**• • •**	**PARAM(n-1)**	**PARAM(n-2)**	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N	SW_STATUS DATA_N	(BLOCK-B)

PARAM:

DTLEN: Number of total bytes of PARA2 up to n-2
FUNCTION: Reserved
SW_ADDRESS_N: Reserved
SW_DATA_N: Reserved

CMD_GP **33** H	**CHU_MULTI_ANALOG_STATUS**	Rev. 2.5	Pattern **n** bytes

Outline:

This command is used to request or transmit statuses of the two or more analog data of CHU at one time.

Command structure:

CMD_GP	**PARAM0**	**PARAM1**	**PARAM2**	**PARAM3**	**• • •**	**PARAM (n-3)**	**PARAM (n-2)**	
30H	FUNCTION	DTLEN	ANALOG_ ADDRESS_1	ANALOG_ ADDRESS_2	• • •	ANALOG_ ADDRESS_N-1	ANALOG_ ADDRESS_N	(BLOCK-A)

PARAM2	**PARAM3**	**• • •**	**PARAM (n-1)**	**PARAM (n-2)**	
ANALOG_ ADDRESS_1	ANALOG_ STATUS_ DATA_1	• • •	ANALOG_ ADDRESS_N	ANALOG_ STATUS_ DATA_N	(BLOCK-B)

PARAM2	**PARAM3**	**PARAM4**	**PARAM5**	**PARAM6**	
ANALOG_ ADDRESS_1	ANALOG_ UPPER_ LIMIT_H-1	ANALOG_ UPPER_ LIMIT_L-1	ANALOG_ LOWER_ LIMIT_H-1	ANALOG_ LOWER_ LIMIT_L-1	(BLOCK-C)
PARAM7					
ACCURACY 1					

PARAM2	**PARAM3**	**PARAM4**	**• • •**	**PARAM (n-2)**	
ANALOG_ ADDRESS_1	ANALOG_ RATE_H-1	ANALOG_ RATE_L-1	• • •	ANALOG_ RATE_H-N	(BLOCK-D)

PARAM2	**PARAM3**	**PARAM4**	**PARAM5**	**PARAM6**	
ANALOG_ ADDRESS_1	ANALOG_ RATE_H-1	ANALOG_ RATE_L-1	ANALOG_ OFFSET_H-1	ANALOG_ RATE_L-1	(BLOCK-E)

PARAM:

FUNCTION:

00H	Requests the two or more analog statuses 1	Block size = 1 byte	(BLOCK-A)
01H	Transmits the two or more analog statuses 1	Block size = 2 bytes	(BLOCK-B)
02H	Requests the two or more analog statuses 2	Block size = 1 byte	(BLOCK-A)
03H	Transmits the two or more analog statuses 2	Block size = 6 bytes	(BLOCK-C)
04H	Requests the two or more analog statuses 3 (old) (Kept used to maintain compatibility with the former models)	Block size = 1 byte	(BLOCK-A)
05H	Transmits the two or more analog statuses 3 (old) (Kept used to maintain compatibility with the former models)	Block size = 3 bytes	(BLOCK-D)
06H	Requests the two or more analog statuses 3 (new) (Use this command from now on.)	Block size = 1 byte	(BLOCK-A)
07H	Transmits the two or more analog statuses 3 (new) (Use this command from now on.)	Block size = 5 bytes	(BLOCK-E)

DTLEN: Number of total bytes of ANALOG_ADDRESS, ANALOG_STATUS of PARAM2 to PARAM (n-2).

ANALOG_ADDRESS_N: Address of CHU_ANALOG that is being requested. Refer to ANALOG command address list for ANALOG_ADDRESS_1 to ANALOG_ADDRESS_N. Data display for each ANALOG_ADDRESS is shown as status of analog data.

Outline:

1) Transmission of the two or more analog statuses 1
   ANALOG_ADDRESS, ANALOG_STATUS1, ANALOG_ADDRESS, ANALOG_STATUS1,…
   ANALOG_STATUS1 = 00H Uncontrollable
   = 01H ± 99 indication
   = 02H + 99 indication
   = 03H − 99 indication
   = 04H ± 180 degree indication
   = 05H F value indication

2) Transmission of analog status 2
   ANALOG_ADDRESS, ANALOG_UPPER_LIMIT (2 bytes), ANALOG_LOWER_LIMIT (2 bytes), ACCURACY (1 byte), …
   ANALOG_UPPER_LIMIT = Upper limit of analog data (16-bit display)
   ANALOG_LOWER_LIMIT = Lower limit of analog data (16-bit display)
   ACCURACY = Accuracy of analog data (resolution power)
   Example 10bit 0AH
   12bit 0CH

3) Transmission of analog status 3
   ANALOG_ADDRESS, ANALOG_RATE (2 bytes) (old format 04H, 05H)
   ANALOG_ADDRESS, ANALOG_RATE (2 bytes), ANALOG_OFFSET (2 bytes) (new format 06H, 07H)
   ANALOG_RATE = Conversion value per one bit of analog data (16-bit display)
   ANALOG_OFFSET = Offset value of analog data (16-bit display)
   Conversion is performed as follows.
   Conversion value = ANALOG_DATA × ANALOG_RATE + OFFSET
   Unit ([m] and [psec] etc.,) conversion value and unit of offset value are fixed by the ANALOG_ADDRESS at this time.

Example of using the command:

Requests the analog status 3 (analog converted value) of Master Black (ANALOG_ADDRESS: A9H) of the controlling device.

53H, 06H, 01H, A9H

Transmits the analog converted value 0.0018 [IRE] = 18000 [mIRE] (4650H), offset value 5.0 [IRE] = 5000 [mIRE] (1388H) of Master Black of the controlling device.

(Conversion unit of the Black level of the controlling device is [mIRE], and the offset unit is [mIRE].

53H, 07H, 05H, A9H, 46H, 50H, 13H, 88H

CMD_GP **34** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **35** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **3A** H	**CHU_ANALOG_TRIMMING (REL)**	Rev. **2.5**	Pattern **4** byte

Outline:

This command is used to control the relative values of analog trimming items of CHU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
3AH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section "5-3-1. CHU_ANALOG_TRIMMING Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

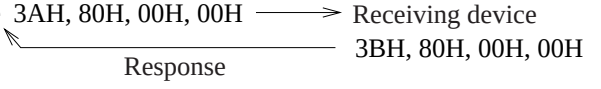
Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH. Since this command controls the relative values with analog control, the transmitting device selects and sets the analog trimming item to be controlled, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two's complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog trimming control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the CHU_ANALOG_TRIMMING (ABS) command.
When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

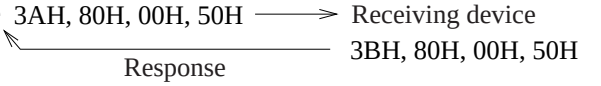
This command is used to fine-adjust (to trim) the control items of CHU before the CHU circuit boards are assembled in the final production factory. Despite that the CHU_ANALOG (REL) command (CMD_GP 22H) is a group of analog adjustment items that can be handled in common to all CHUs, this command handles the items that are unique to each CHU.
The adjustments that are enabled by this command, are normally performed when circuit board is replaced in addition to the board level adjustment and the final adjustment in the factory. Scene files are not included in the adjustment items enabled by this command.
Use the CHU_ANALOG (REL) command (CMD_GP 22H) to adjust the items that are stored in scene file.

Example of using the command:

1. The transmitting device requests the present analog value of the Pre White Clip R, ANALOG_ADDRESS (CHU_ANALOG_TRIMMING Address) = 80H, The receiving device returns 0 as the response.



2. The transmitting device changes the present analog value of the Pre White Clip R, ANALOG_ADDRESS (CHU_ANALOG_TRIMMING Address) = 80H by +50H from the present value.



CMD_GP **3B** H	**CHU_ANALOG_TRIMMING (ABS)**	Rev. **2.5**	Pattern **4** byte

Outline:

This command is used to control the absolute values of analog trimming items of CHU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
3BH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section "5-3-1. CHU_ANALOG_TRIMMING Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ∗∗ H,
ANALOG_DATA_L ∗ 0H)

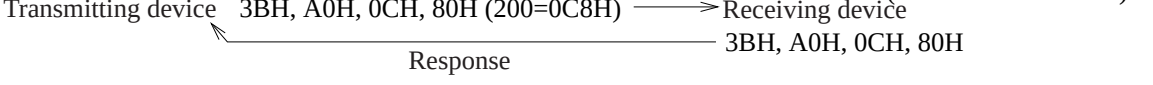
Operation:

ANALOG_ADDRESS contains 256 types of command ranging from 00H to FFH. Different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH. Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

This command is used to fine-adjust (to trim) the control items of CHU before the CHU circuit boards are assembled in the final production factory. Despite that the CHU_ANALOG (ABS) command (CMD_GP 23H) is a group of analog adjustment items that can be handled in common to all CHUs, this command handles the items that are unique to each CHU.
The adjustments that are enabled by this command, are normally performed when circuit board is replaced in addition to the board level adjustment and the final adjustment in the factory. Scene files are not included in the adjustment items enabled by this command.
Use the CHU_ANALOG (ABS) command (CMD_GP 23H) to adjust the items that are stored in scene file.

Example of using the command:

To vary the analog value of ANALOG_ADDRESS (CHU_ANALOG_TRIMMING Address) = A0H to 200 (in case of 12-bit data).



CMD_GP **3C** H	**CHU_EXT_ANALOG (REL)**	Rev. **3.0**	Pattern **4** byte

Outline:

This is the relative values control command for the extended analog related items of CHU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
3CH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section "5-2-2. CHU_EXT_ANALOG Address".
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

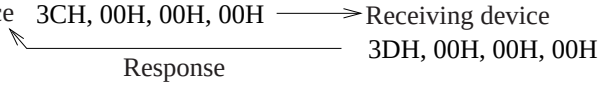
ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.

Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two's complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the CHU_ANALOG (ABS) command.

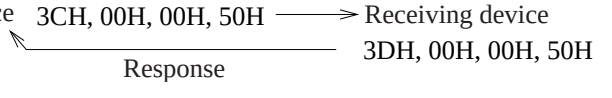
When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

Example of using the command:

1. The transmitting device requests the present analog value of ANALOG_ADDRESS (CHU_EXT_ANALOG address) = 00H, Multi Matrix 1 Phase.
   The receiving device returns 0 as the response.



2. The transmitting device changes the present analog value of ANALOG_ADDRESS (CHU_EXT_ANALOG address) = 00H, Multi Matrix 1 Phase by +50H from the present value (0).



CMD_GP **3D** H	**CHU_EXT_ANALOG (ABS)**	Rev. **3.0**	Pattern **4** byte

Outline:

This is the absolute values control command for the extended analog related items of CHU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
3DH	EXT_ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

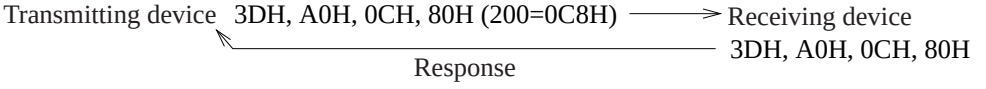
ANALOG_ADDRESS: Refer to Section “5-2-2. CHU_EXT_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ∗∗ H,
ANALOG_DATA_L ∗ 0H)

Operation:

assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH. Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

Example of using the command:

To vary the analog value of ANALOG_ADDRESS (CHU_EXT_ANALOG address) =
A0H to 200 (in case of 12-bit data).



CMD_GP **40** H	**CCU_SWITCH (REL)**	Rev. **1.0**	Pattern **3** byte

Outline:

This command is used to relatively control the CCU switch items. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
40H	SW_ADDRESS	SW_DATA

PARAM:

SW_ADDRESS: Refer to Section "5-1-3. CCU_SWITCH Address."
SW_DATA: Refer to Section "5-1-3. CCU_SWITCH Address."

Operation:

There are three types of CCU_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-3. CCU_SWITCH Address."

UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the CCU_SWITCH (ABS) command.

Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the CCU_SWITCH (ABS) command.

Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the CCU_SWITCH (ABS) command.

Example of using the command:

1. SW_ADDRESS = 00H. To request the maximum value of character display page and return the maximum value page 10 as the response:
   Transmitting device 40H, 00H, 00H → Receiving device
   Response ← 41H, 00H, CAH
2. SW_ADDRESS = 00H. To request the present value of character display page and return the present value page 3 as the response:
   Transmitting device 40H, 00H, 00H → Receiving device
   Response ← 41H, 00H, 03H
3. SW_ADDRESS = 81H. To request the present value of CCU number and return the CCU number 1 as the response:
   Transmitting device 40H, 81H, 00H → Receiving device
   Response ← 41H, 81H, 01H

CMD_GP **41** H	**CCU_SWITCH (ABS)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to absolutely control the item that is specified by the CCU_SWITCH address.

Command structure:

CMD_GP	PARAM0	PARAM1
41H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-3. CCU_SWITCH Address."
SW_DATA: Refer to Section "5-1-3. CCU_SWITCH Address."

Operation:
There are three types of CCU_SWITCH (ABS) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-3. CCU_SWITCH Address."

UP/DOWN step type command:
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:
1. SW_ADDRESS = 00H. To increment the value of character display page by +1 over the present value. (Assuming that the character display page is page 2):
   Transmitting device 41H, 00H, 80H → Receiving device
   Response ← 41H, 00H, 03H (The shutter select becomes page 3.)
2. SW_ADDRESS = 00H. To set 3 to the character display. However, because the receiving device does not have page 3, the present value page 2 is returned as the response:
   Transmitting device 41H, 00H, 03H → Receiving device
   Response ← 41H, 00H, 02H

CMD_GP **42** H	**CCU_ANALOG (REL)**	Rev. **1.0**	Pattern **4** byte

Outline:

This is the relative values control command for the analog related items of CHU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
42H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Refer to Section “5-2-3. CCU_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

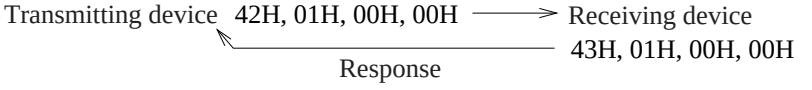
ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.

Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two’s complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the CHU_ANALOG (ABS) command.

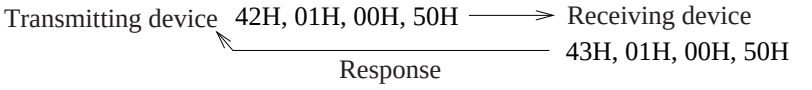
When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

Example of using the command:

1. The transmitting device requests the present analog value of ANALOG_ADDRESS = 01H, “Camera Y Black”. The receiving device returns 0 as the response.



2. The transmitting device changes the present analog value of the ANALOG_ADDRESS = 01H, “Camera Y Black” by +50H from the present value.



CMD_GP **43** H	**CCU_ANALOG (ABS)**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the absolute values of CCU with analog control.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
43H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

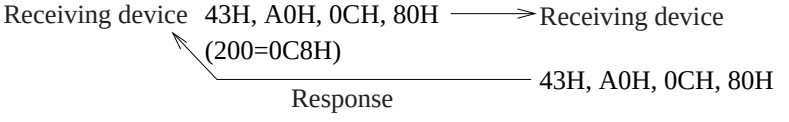
ANALOG_ADDRESS: Refer to Section “5-2-3. CCU_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ∗∗ H,
ANALOG_DATA_L ∗ 0H)

Operation:

ANALOG_ADDRESS contains 256 types of command ranging from 00H to FFH. Different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH. Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

Example of using the command:

To vary the analog value of ANALOG_ADDRESS = A0H to 200 (in case of 12-bit data)



CMD_GP **44** H	**CCU_DIAGNOSTICS_INFORMATION**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to request or transmit the result of CCU self-diagnostics.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
44H	DIAGNOSTIC_ STATUS	BOARD_ NAME	BOARD_ INF

PARAM:

DIAGNOSTIC_STATUS:

Higher order 4bit	0H	OK
	1H	NG
	2H	Don't care/Measurement is not possibles
	3H	Requesting the result of all self-diagnostics
	4H	Requesting the result of individual self-diagnostics
	5H	CARE (Alarm LED on panel flashes slowly)
	6H	WARNING (Alarm LED on panel flashes quickly)
	7H to FH	Reserved for extension
Lower order 4bit	0H	Priority is high
	•	
	•	
	FH	Priority is low

Priority is used to prioritize the items in the order of high priority starting from 0H to FH when the result of self-diagnostics is NG.

BOARD NAME:

00H	ALL	08H	SG
01H	DM	09H	Power
02H	VA	0AH	ADA
03H	AT	0BH	DPR
04H	YC	0CH	SDI
05H	AD	0DH	RC
06H	AU	0EH	IF
07H	EN	0FH	PS
Reserved for extension up to 0FFH			

BOARD_INF: 00H Information inside the board is not available.
Specified for each BOARD_NAME.

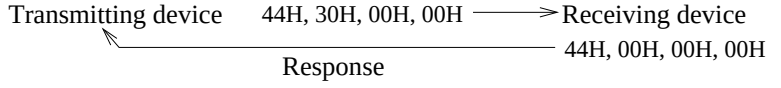
BOARD_NAME		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
01H	DM				9V NG	−5V NG	B-Y NG	R-Y NG	Y NG
02H	VA	+5V NG	−5V NG	+12V NG	−12V NG	CHU UNLOCK	EXT UNLOG	VIDEO NG	
03H	AT				Power Supply NG	Tone NG	CHU DATA NG		
0FH	PS					RCP Supply NG	Fan NG	Cable Short	Cable Open
04H	YC					−12V NG	+12V NG	−5V NG	+5V NG
05H	AD						SDI OUT	Digital Power	Analog Power

Note

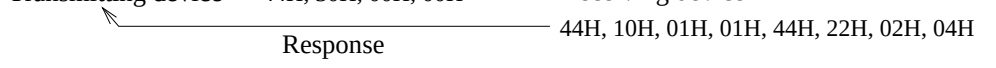
The panel issues this request using the command with GALL_ID set as DEST_ID. When CCU transmits this command voluntarily by itself, it transmits the command with GALL_ID set as DEST_ID. When the panel receives this command, it receives the command only when DCHU_ID is set as SRC_ID.

Example of using the command:

1. When the transmitting device requests the result of all self-diagnostics of CCU, and the receiving device (CCU) returns the response that all are OK.



2. When the transmitting device requests the result of all self-diagnostics of CCU, and the receiving device (CCU) returns the response that BOARD_NAME VA and IE are NG.



CMD_GP **45** H	**CCU_AUTO_SETUP_CONTROL (Reserved)**	Rev. **–**	Pattern **3** byte

Outline:

This is the control command for executing the auto setup and related items.

Command structure:

CMD_GP	PARAM0	PARAM1
45H	Type of auto setup	Execution status

PARAM:

Type of auto setup: Reserved for extension
Execution status: Reserved for extension

CMD_GP **46** H	**CCU_AUTO_SETUP_INFORMATION (Reserved)**	Rev. **–**	Pattern **3** byte

Outline:

This control is used to transmit the execution status of the auto setup.

Command structure:

CMD_GP	PARAM0	PARAM1
46H	Item under execution	Execution channel/status

PARAM:

Item under execution: Item that is under execution, reserved

Execution channel/status: Reserved for extension

CMD_GP **47** H	**CCU_FILE_CONTROL (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

This control is used to control the CCU files.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
46H	Processing item	Type of file	File number

PARAM:

Processing item: Reserved
Type of file: Reserved
File number: Reserved

CMD_GP **48** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **49** H	**CCU_SWITCH_WITH_MASK**	Rev. **–**	Pattern **4** byte

Outline:

This command is used to absolutely control the value of the CCU_SWITCH items in units of 1 bit to 8 bits.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
49H	SW_ADDRESS	SW_DATA	MASK_DATA

PARAM:

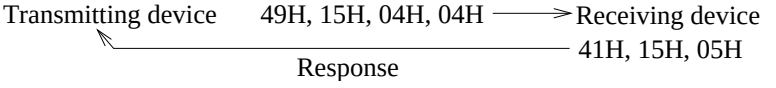
SWITCH_ADDRESS: Refer to Section “5-1-3. CCU_SWITCH Address.”
SWITCH_DATA: Refer to Section “5-1-3. CCU_SWITCH Address.”
MASK_DATA: Set 1 to the bit that you want to turn ON or OFF.

Operation:

This command is used to absolutely control the value of the CCU_SWITCH items of the bit-data type in units of bit.
Set 1 to the bit that you want to turn ON, of the item that is specified by SW_ADDRESS. Set 1 to the bit that you want to turn OFF. Set these bits to the SW_DATA. Set 1 to the bit of the MASK_DATA that you want to turn ON or OFF.
When a receiving device receives this command, it over-writes the item that is specified by the SWITCH_ADDRESS, with only the bit data of the SWITCH_DATA that corresponds to the bit which has been set to 1 of the MASK_DATA. The resultant value is returned as the response using the CCU_SWITCH (ABS) command.
Be sure to use this command when the ALL operation is performed.

Example of using the command:

SW_ADDRESS = 1.5H
bit4 PIX1 ENC ON, bit3 PIX1 –G ON, bit2 PIX1 B ON, bit1 PIX1 G ON, bit0 PIX1 R ON
When the PIX1 B only among the above command is turned on while the other bits remain unchanged, example of the command is shown below.
(The present value of PIX1 R only is turned on.)



CMD_GP **4A** H		Rev. **–**	Pattern **4** byte

This command is reserved for the 4 byte pattern.

CMD_GP **4B** H		Rev. –	Pattern **4** byte

This command is reserved for the 4 byte pattern.

CMD_GP **4F** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **50** H	**CCU_MULTI_SWITCH**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of CCU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
50H	FUNCTION	DTLEN	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N-1	SW_ DATA_N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more switch data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more switch data (RELATIVE)	Block size = 2 bytes (BLOCK-B)
	02H	Transmits the two or more switch data (ABSOLUTE)	Block size = 2 bytes (BLOCK-B)

Note

The response for the above described command is 02H.

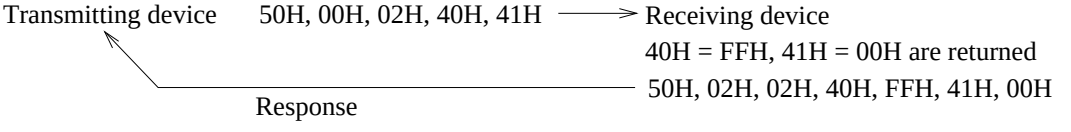
DTLEN: Number of total bytes of SW_ADDRESS, SW_DATA
SW_ADDRESS_N: Refer to Section “5-1-3. CCU_SWITCH Address”.
SW_DATA_N: Refer to Section “5-1-3. CCU_SWITCH Address”.

Operation

Refer to the following commands for the operation of each SW_ADDRESS.
CCU_SWITCH (REL) command, CCU_SWITCH (ABS) command.

Example of using the command:

Request the switch data and its return
Requests the present switch status of SW_ADDRESS 40H, 41H.



CMD_GP **51** H	**CCU_MULTI_ANALOG**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more analog data of CCU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
51H	FUNCTION	DTLEN	ANALOG_ ADDRESS-1	ANALOG_ ADDRESS-2	• • •	ANALOG_ ADDRESS-N-1	ANALOG_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	PARAM4	• • •	PARAM(n-2)	
ANALOG_ ADDRESS-1	ANALOG_ DATA-1	ANALOG_ ADDRESS_L-1	• • •	ANALOG_ ADDRESS_L-1	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more analog data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more analog data (RELATIVE)	Block size = 3 bytes (BLOCK-B)
	02H	Transmits the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	03H	Clears the two or more analog data	Block size = 1 byte (BLOCK-A)
	04H	Requests the absolute output value of the two or more analog data	Block size = 3 bytes (BLOCK-B)
	05H	Reserved	
	06H	Transmits the absolute output value of the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	07H	Reserved	
	20H	Requests two or more analog trimming data	Block size = 1 byte (reserved)
	21H	Transmits two or more analog trimming data (RELATIVE)	Block size = 3 bytes (reserved)
	22H	Transmits two or more analog trimming data (ABSOLUTE)	Block size = 3 bytes (reserved)
	23H	Clears two or more analog trimming data	Block size = 1 byte (reserved)
	24H	Requests the absolute value output data of two or more analog data	Block size = 1 byte (reserved)
	25H	Reserved	
	26H	Transmits the absolute value output data of two or more analog data (ABSOLUTE)	Block size = 3 bytes (reserved)
	27H	Reserved	

40H	Requests the two or more of the extended analog data	Block size = 1 byte (reserved)
41H	Transmits the two or more of the extended analog data (RELATIVE)	Block size = 3 bytes (reserved)
42H	Transmits the two or more of the extended analog data (ABSOLUTE)	Block size = 3 bytes (reserved)
43H	Clears two or more extended analog data	Block size = 1 byte (reserved)
44H	Requests the absolute output value of two or more extended analog data	Block size = 1 byte (reserved)
45H	Reserved	
46H	Transmits the absolute output value of two or more extended analog data (ABSOLUTE)	Block size = 3 bytes (reserved)
47H	Reserved	

- The FUNCTIONs of 00H to 1fH are the FUNCTIONs for the normal analog data (22H, 23H).
- The FUNCTIONs of 20H to 3fH are the FUNCTIONs for the analog trimming data (3AH, 3BH).

Notes

- The response for the above described command is 02H.
- Clearing means to return the value to the standard value.

DTLEN: Number of total bytes of ANALOG_ADDRESS, ANALOG_DATA_H and ANALOG_DATA_L of PARAM2 up to n-2.

ANALOG_ADDRESS_N:

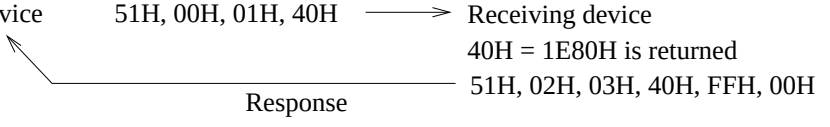
ANALOG_DATA_N: In case of FUNCTION 00H to 1FH, refer to Section “5-2-3. CCU_ANALOG Address”.

Operation

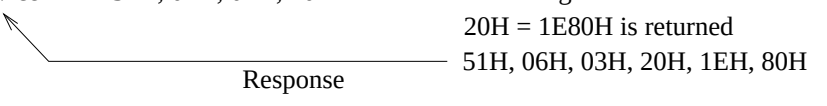
Refer to the following commands for the operation of each ANALOG_ADDRESS.
CHU_ANALOG (REL) command (CMD_GP 42H), CCU_ANALOG (ABS) (CMD_GP 43H).

Example of using the command:

1. Request the ANALOG_DATA and its return
   Requests the present analog data of ANALOG_DATA 40H.



2. Request and transmission of absolute output value of ANALOG_DATA
   Request the present output value of ANALOG_DATA



CMD_GP **52** H	**CCU_MULTI_SWITCH_STATUS (Reserved)**	Rev. **–**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of CCU at one time.

Command structure:

CMD_GP	**PARAM0**	**PARAM1**	**PARAM2**	**PARAM3**	**• • •**	**PARAM(n-1)**	**PARAM(n-2)**	
52H	FUNCTION	DTLEN	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	**PARAM3**	**• • •**	**PARAM(n-1)**	**PARAM(n-2)**	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N-1	SW_ DATA_N	(BLOCK-B)

PARAM:

FUNCTION: Reserved
DTLEN: Number of total bytes of PARA2 up to n-2
SW_ADDRESS-N: Reserved
SW_DATA-N: Reserved

CMD_GP **53** H	**CCU_MULTI_ANALOG_STATUS**	Rev. **2.5**	Pattern **n** byte

Outline:

This command is used to request or transmit statuses of the two or more analog data of CCU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM (n-1)	PARAM (n-2)
53H	FUNCTION	DTLEN	ANALOG_ ADDRESS_1	ANALOG_ ADDRESS_2	• • •	ANALOG_ ADDRESS_N-1	ANALOG_ ADDRESS_N

PARAM2	PARAM3	• • •	PARAM (n-1)	PARAM (n-2)
ANALOG_ ADDRESS_1	ANALLOG_ STATUS_ DATA_1	• • •	ANALOG_ ADDRESS_N	ANALOG_ STATUS_ DATA_N

PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
ANALOG_ ADDRESS_1	ANALLOG_ UPPER_ LIMIT_H-1	ANALLOG_ UPPER_ LIMIT_L-1	ANALLOG_ LOWER_ LIMIT_H-1	ANALLOG_ LOWER_ LIMIT_L-1

PARAM7
ACCURACY 1

PARAM2	PARAM3	PARAM4	• • •	PARAM (n-2)
ANALOG_ ADDRESS-1	ANALOG_ RATE_H-1	ANALOG_ RATE_L-1	• • •	ANALOG_ RATE_H-N

PARAM2	PARAM3	PARAM4	PARAM5	PARAM6
ANALOG_ ADDRESS-1	ANALOG_ RATE_H-1	ANALOG_ RATE_L-1	ANALOG_ OFFSET_H-1	ANALOG_ OFFSET_L-1

PARAM:

FUNCTION:
- 00H Requests the two or more analog statuses 1 — Block size = 1 byte
- 01H Transmits the two or more analog statuses 1 — Block size = 2 bytes
- 02H Requests the two or more analog statuses 2 — Block size = 1 byte
- 03H Transmits the two or more analog statuses 2 — Block size = 6 bytes
- 04H Requests the two or more analog statuses 3 (old) — Block size = 1 byte
  (Kept used to maintain compatibility with the former models)
- 05H Transmits the two or more analog statuses 3 (old) — Block size = 3 bytes
  (Kept used to maintain compatibility with the former models)
- 06H Requests the two or more analog statuses 3 (new) — Block size = 1 byte
  (Use this command from now on.)
- 07H Transmits the two or more analog statuses 3 (new) — Block size = 5 bytes
  (Use this command from now on.)

DTLEN: Number of total bytes of ANALOG_ADDRESS, ANALOG_STATUS_DATA of Data-2 and higher.

ANALOG_ADDRESS_N: Address of CCU_ANALOG that is being requested.

Status of analog data: Data display for each ANALOG_ADDRESS

Operation:

1. Transmission of the two or more analog statuses 1
   ANALOG_STATUS1 = 00H Uncontrollable
   = 01H ±99 indication
   = 02H +99 indication
   = 03H −99 indication
   = 04H ±180 degree indication
   = 05H F value indication
   Subsequent commands up to FFH are reserved. (for extention)

2. Transmission of analog status 2 ANALOG_ADDRESS, ANALOG_UPPER_LIMIT (2 bytes), ANALOG_LOWER LIMIT (2 bytes), ACCURACY (1 byte), ...
   ANALOG_UPPER_LIMIT = Upper limit of analog data (16-bit display)
   ANALOG_LOWER_LIMIT = Lower limit of analog data (16-bit display)
   ACCURACY = Accuracy of analog data (resolution power)
   Example 10bit 0AH
   12bit 0CH

3. Transmission of analog status 3
   ANALOG_ADDRESS, ANALOG_RATE (2 bytes) (old format 04H, 05H)
   ANALOG_ADDRESS, ANALOG_RATE (2 bytes), ANALOG_OFFSET (2 bytes)
   (new format 06H, 07H)
   ANALOG_RATE = Conversion value per one bit of analog data (16-bit display)
   ANALOG_OFFSET = Offset value of analog data (16-bit display)

Conversion is performed as follows.
Conversion value = ANALOG_DATA × ANALOG_RATE + OFFSET
Unit ([m] and [psec] etc.,) conversion value and unit of offset value are fixed by the ANALOG_ADDRESS at this time.

Example of using the command:

Requests the analog status 3 (analog converted value) of Phase H Step (ANALOG_ADDRESS: 1bH).
53H, 04H, 01H, 1bH
Transmits the analog converted value 3.4 [nsec] = 3400 [psec] (0d48H).
(Conversion unit of the Phase H Step [psec].
53H, 05H, 03H, 1bH, 0dH, 48H

CMD_GP **54** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **55** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **5A** H	**CCU_ANALOG_TRIMMING (REL) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

The control command that controls the analog trimming-related relative values of CCU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
5AH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Reserved
ANALOG_DATA_L: Reserved

CMD_GP **5B** H	**CCU_ANALOG_TRIMMING (ABS) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

The control command that controls the analog trimming-related absolute values of CCU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
5BH	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Reserved
ANALOG_DATA_L: Reserved

CMD_GP **5C** H	**CCU_EXT_ANALOG (REL) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

The control command that controls the extended analog related relative values of CCU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
5CH	EXT_ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

EXT_ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Reserved
ANALOG_DATA_L: Reserved

CMD_GP **5D** H	**CCU_EXT_ANALOG (ABS) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

The control command that controls the extended analog related absolute values of CCU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
5DH	EXT_ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

EXT_ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Reserved
ANALOG_DATA_L: Reserved

CMD_GP **60** H	**CNU_SWITCH (REL)**	Rev. **1.0**	Pattern **3** byte

Outline:

This command is used to relatively control the CNU switch items. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
60H	SW_ADDRESS	SW_DATA

PARAM:

SW_ADDRESS: Refer to Section "5-1-4. CNU_SWITCH Address."
SW_DATA: Refer to Section "5-1-4. CNU_SWITCH Address."

Operation:

There are three types of CNU_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-4. CNU_SWITCH Address."

UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the CNU_SWITCH (ABS) command.

Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the CNU_SWITCH (ABS) command.

Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the CNU_SWITCH (ABS) command.

Example of using the command:

1. SW_ADDRESS = 20H. To request the present value of character display page:
   Transmitting device 60H, 20H, 00H ⟶ Receiving device
   Response ⟵ 61H, 20H, 01H (present page 1)

2. SW_ADDRESS = 20H. To request the maximum value of character display page:
   Transmitting device 60H, 20H, 00H ⟶ Receiving device
   Response ⟵ 61H, 20H, CBH (Maximum page 0BH)

CMD_GP **61** H	**CNU_SWITCH (ABS)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to absolutely control the item that is specified by the CNU_SWITCH address.

Command structure:

CMD_GP	PARAM0	PARAM1
61H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section “5-1-4. CNU_SWITCH Address.”
SW_DATA: Refer to Section “5-1-4. CNU_SWITCH Address.”

Operation:
There are three types of CNU_SWITCH (ABS) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section “5-1-4. CNU_SWITCH address.”

UP/DOWN step type command:
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by CNU_SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:
SW_ADDRESS = 20H. To increment the value of character display page by +1 over the present value. (The present character display is page 1.):

Transmitting device 61H, 20H, 81H ⟶ Receiving device

Response ⟵ 61H, 20H, 02H (The character display page becomes page 1.)

CMD_GP **62** H	**CNU_ANALOG (REL) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

This is the relative values control command for the extended analog related items of CNU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
62H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.

Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two's complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the CNU_ANALOG (ABS) command.

When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

CMD_GP **63** H	**CNU_ANALOG (ABS) (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

This is the absolute values control command for the extended analog related items of CNU.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
63H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

ANALOG_ADDRESS: Reserved
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ＊＊ H,
ANALOG_DATA_L ＊ 0 H)

Operation:

ANALOG_ADDRESS contains 256 types of command ranging from 00H to FFH. Different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.
Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

CMD_GP **64** H	**CNU_DIAGNOSTICS_INFORMATION (Reserved)**	Rev. **–**	Pattern **4** byte

Outline:

This command is used to request or transmit the result of CNU self-diagnostics.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
64H	DIAGNOSTICS_ STATUS	BOARD_ NAME	BOARD_ INF

PARAM:

Reserved for extension

CMD_GP **65** H	**CNU_MULTI_SYSTEM**	Rev. **1.0**	Pattern **2** byte

Outline:

This command is used to select the specific group such as ALL or MASTER in which the specified ITEMs of the selected cameras are unanimously controlled by the MULTI CAMERA SYSTEM operation. For this purpose, this CMD_GP is multiplexed and transmitted to CNU before the CHU_SWITCH command. CNU reads out this CMD_GP and distributes it to the appropriate devices as required by ALL, MASTER/SLAVE, etc.

Command structure:

CMD_GP	PARAM0
65H	FUNCTION

PARAM:

FUNCTION:
- 00H ALL {Controls all cameras (CHU, CCU) that are controlled by the MSU, and let them operate in the ALL mode of operation}
- 01H ALL {Controls all cameras (CHU, CCU) that are controlled by the MSU except for RCP, and let these cameras operate in the ALL mode of operation}
- 02H ALL (reserved)
- 03H ALL (reserved)
- 04H MASTER
- 05H ALL (VCS)
- 06H ALL (RCP)
- 07H IRIS MASTER

Example of using the command:

The MSU transmits the switch data (CHU test on) of ALL, to CNU.
65H, 00H, 29H, 86H, 01H, 01H

CMD_GP **66** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **67** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **68** H	**CNU_MULTI_SWITCH**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of CNU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
68H	FUNCTION	DATA_N	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N-1	SW_ DATA_N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more switch data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more switch data (RELATIVE)	Block size = 2 bytes (BLOCK-B)
	02H	Transmits the two or more switch data (ABSOLUTE)	Block size = 2 bytes (BLOCK-B)

Note

The response for the above described command is 02H.

DTLEN: Number of total bytes of SW_ADDRESS, SW_DATA
SW_ADDRESS_N: Refer to Section “5-1-4. CNU_SWITCH Address”.
SW_DATA_N: Refer to Section “5-1-4. CNU_SWITCH Address”.

Operation

Refer to the following commands for the operation of each SW_ADDRESS.
CHU_SWITCH (REL) command, CHU_SWITCH (ABS) command.

Example of using the command:

Request the switch data and its return
Requests the present switch status of SW_ADDRESS 40H, 41H.

Transmitting device	40H = FFH, 41H = 00H are returned	⟶	Receiving device
	68H, 00H, 02H, 40H, 41H	⟵	68H, 02H, 40H, FFH, 41H, 00H
		Response	

CMD_GP **69** H	**CNU_MULTI_ANALOG (REL) (Reserved)**	Rev. **–**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more analog data of CNU at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
69H	FUNCTION	DTLEN	ANALOG_ ADDRESS_1	ANALOG_ ADDRESS_2	• • •	ANALOG_ ADDRESS-N-1	ANALOG_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
ANALOG_ ADDRESS_1	ANALOG_ DATA_1	• • •	ANALOG_ ADDRESS_L-1	ANALOG_ ADDRESS_L-N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more analog data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more analog data (RELATIVE)	Block size = 3 bytes (BLOCK-B)
	02H	Transmits the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	03H	Clears the two or more analog data	Block size = 1 byte (BLOCK-A)
	04H	Requests the absolute output value of the two or more analog data	Block size = 1 byte (BLOCK-A)
	05H	Reserved	
	06H	Transmits the absolute output value of the two or more analog data (ABSOLUTE)	Block size = 3 bytes (BLOCK-B)
	07H	Reserved	

The FUNCTIONs of 00H to 1FH are the FUNCTIONs for the normal analog data (22H, 23H).

Notes

- The response for the above described command is 02H.
- Clearing means to return the value to the standard value.

DTLEN:	Number of total bytes of ANALOG_ADDRESS, ANALOG_DATA_H and ANALOG_DATA_L of PARAM2 up to n-2.
ANALOG_ADDRESS_N:	Reserved
ANALOG_DATA_N:	Reserved in case of FUNCTION 00H to 1FH.

CMD_GP **6A** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **6B** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **6C** H	**ADDRESS_SELECTOR**	Rev. **1.0**	Pattern **3** byte

Outline:

This command is used to transmit the single command record only to the specified device. The CMD_GP that you want to transmit, is multiplexed after this CMD_GP and is transmitted to CNU. The CNU transfers this command to the specified targeted devices.

Command structure:

CMD_GP	PARAM0	PARAM1
6CH	Specified device DEFAULT_ADDRESS	Device NUMBER

PARAM:

Specified device DEFAULT_ADDRESS: Address (02H to 09H) on the CNU_SWITCH address table) of the destination device

02H	Camera (CHU + CCU)
03H	CCU
04H	CNU
05H	MSU
06H	VCS
07H	RCP
08H	IRIS PANEL
09H	RM

Subsequent commands are reserved

Device NUMBER: 01H to FFH, 00H are prohibited from use

Example of using the command:

Requests the No. 2 camera information when the MSU selects the No. 1 camera.

CMD_GP **80** H	**VCS_SWITCH (REL)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to relatively control the VCS switch items. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
80H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-5. VCS_SWITCH Address."
SW_DATA: Refer to Section "5-1-5. VCS_SWITCH Address."

Operation:
There are three types of VCS_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-5. VCS_SWITCH Address."

UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the VCS_SWITCH (ABS) command.

Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the VCS_SWITCH (ABS) command.

Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the VCS_SWITCH (ABS) command.

Example of using the command:
1. SW_ADDRESS = 00H. To request the maximum value of character level and return the maximum character 100% as the response:
   Transmitting device 80H, 00H, 00H ⟶ Receiving device
   81H, 00H, D4H ⟵ Response

2. SW_ADDRESS = 00H. To request the present value of character level and return the present character 0% as the response:
   Transmitting device 80H, 00H, 00H ⟶ Receiving device
   81H, 00H, 00H ⟵ Response

3. SW_ADDRESS = 10H. To request the present value of PIX OUT and return CPIX OUT Enable ON, PIX (ON) as the response:
   Transmitting device 80H, 10H, 00H ⟶ Receiving device
   81H, 10H, 81H ⟵ Response

CMD_GP **81** H	**VCS_SWITCH (ABS)**	Rev. **1.0**	Pattern **3** byte

Outline:
This command is used to absolutely control the item that is specified by the VCS_SWITCH address.

Command structure:

CMD_GP	PARAM0	PARAM1
81H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-5. VCS_SWITCH Address."
SW_DATA: Refer to Section "5-1-5 VCS._SWITCH Address."

Operation:
There are three types of VCS_SWITCH (ABS) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-5. VCS_SWITCH Address."

UP/DOWN step type command:
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:
1. SW_ADDRESS = 00H. To increment the value of character level by +1 over the present value. (Assuming that the character level is 0%):
   Transmitting device 81H, 00H, 80H → Receiving device
   Response ← 81H, 00H, 02H (The character 10 becomes 10%.)
2. SW_ADDRESS = 00H. To increase the character level to 100% or more. However, because the upper limit of the receiving device is 100%, 100% is returned as the response:
   Transmitting device 81H, 00H, 15H → Receiving device
   Response ← 81H, 00H, 14H

CMD_GP **82** H	**VCS_ANALOG (REL)**	Rev. **1.0**	Pattern **4** byte

Outline:

This is the relative values control command for the analog related items of VCS.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
82H	ANALOG_ ADDRESS	ANALOG_ DATA_L	ANALOG_ DATA_H

PARAM:

ANALOG_ADDRESS: Refer to Section “5-2-4. VCS_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data

Operation:

ANALOG_ADDRESS contains the 256 types of command ranging from 00H to FFH. The different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.
Since this command controls the relative values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of relative change (two’s complement in the range of −32768 to +32767 [8000H to 7FFFH] centered around 0000H) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can vary the present value of the analog control item by as much as the amount specified by ANALOG_DATA. The receiving device returns the present value after the value has been varied, using the VCS_ANALOG (ABS) command.
When the transmitting device transmits 0000H as ANALOG_DATA, this command functions as the command requesting the present value.

Example of using the command:

1. The transmitting device requests the present analog value of ANALOG_ADDRESS = 01H “PIX2 LEVEL CTL”. The receiving device returns 0 as the response.
   Transmitting device 82H, 01H, 00H, 00H ⟶ Receiving device
   ⟵ 83H, 00H, 00H, 00H
   Response

2. The transmitting device changes the present analog value of the ANALOG_ADDRESS = 01H “PIX2 LEVEL CTL” by +50H from the present value.
   Transmitting device 82H, 01H, 00H, 50H ⟶ Receiving device
   ⟵ 83H, 00H, 00H, 50H
   Response

CMD_GP **83** H	**VCS_ANALOG (ABS)**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to control the absolute values of VCS with analog control.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
83H	ANALOG_ ADDRESS	ANALOG_ DATA_H	ANALOG_ DATA_L

PARAM:

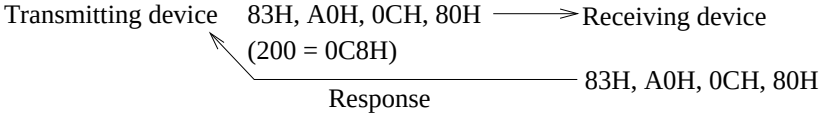
ANALOG_ADDRESS: Refer to Section “5-2-4. VCS_ANALOG Address”.
ANALOG_DATA_H: Higher order 8 bits of the 16-bit data
ANALOG_DATA_L: Lower order 8 bits of the 16-bit data
When the effective size of the data that is entered in the ANALOG address is less than 16 bits, the ANALOG_DATA must be aligned to the beginning.
(Example: In case of 12-bit data, ANALOG_DATA_H ∗∗ H,
ANALOG_DATA_L ∗ 0 H)

Operation:

ANALOG_ADDRESS contains 256 types of command ranging from 00H to FFH. Different analog control items are assigned to each of the 256 types of command. ANALOG_DATA (ANALOG_DATA_H and ANALOG_DATA_L) can handle a maximum of 16-bit signed integer data in the range of 8000H to 7FFFH.
Since this command controls the absolute values with analog control, the transmitting device selects and sets the item to be controlled with analog control, to ANALOG_ADDRESS. The transmitting device then sets the amount of absolute change (in the range of −32768 to +32767 [8000H to 7FFFH]) to ANALOG_DATA, and transmits the command. When the receiving device receives this command, it can modify the present value of the analog control item to the absolute value contained in ANALOG_DATA. The receiving device returns the present value after the value has been varied.

Example of using the command:

To vary the analog value of ANALOG_ADDRESS = A0H to 200 (in case of 12-bit data)



CMD_GP **84** H	**VCS_DIAGNOSTICS_INFORMATION**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to request or transmit the result of VCS self-diagnostics.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
84H	DIAGNOSTIC_ STATUS	BOARD_ NAME	BOARD_ INF

PARAM:

DIAGNOSTIC_STATUS: Higher order 4bit

0H	OK
1H	NG
2H	Don't care/Measurement is not possibles
3H	Requesting the result of all self-diagnostics
4H	Requesting the result of individual self-diagnostics
5H to FH	Reserved for extension

Lower order 4bit

0H	Priority is high
•	
•	
FH	Priority is low

Priority is used to prioritize the items in the order of high priority starting from 0H to FH when the result of self-diagnostics is NG.

BOARD_NAME:

00H	ALL
01H	VSW

Subsequent commands are reserved for extension.
This BOARD_NAME is already defined in ROM beforehand.

BOARD NAME:

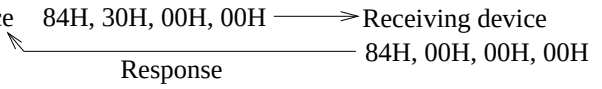
00H Information inside the board is not available.	07H WF1
01H PIX1	08H WF2
02H PIX2	09H WF3
03H PIX3	0AH WF4
04H PIX4	0BH WF5
05H PIX5	0CH WF6
06H PIX6	Subsequent commands up to 0FFH are reserved for extension.

Note

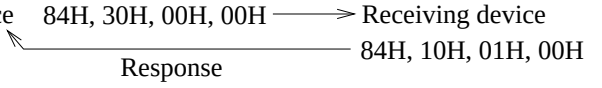
The panel issues this request using the command with GALL_ID set as DEST_ID. When CHU transmits this command voluntarily by itself, it transmits the command with GALL_ID set as DEST_ID. When the panel receives this command, it receives the command only when DCHU_ID is set as SRC_ID.

Example of using the command:

1. When the transmitting device requests the result of all self-diagnostics of VCS, and the receiving device (VCS) returns the response that all are OK.



2. When the transmitting device requests the result of all self-diagnostics of VCS, and the receiving device (VCS) returns the response that BOARD_NAME VA and IE are NG.



CMD_GP **85** H	**VSC_SWITCH_WITH_MASK**	Rev. **1.0**	Pattern **4** byte

Outline:

This command is used to absolutely control the value of the VCS_SWITCH items in units of 1 bit to 7 bits.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2
85H	SW_ADDRESS	SW_DATA	MASK_DATA

PARAM:

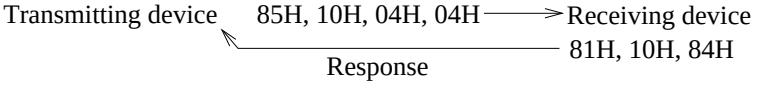
SWITCH_ADDRESS: Refer to Section “5-1-5. VCS_SWITCH Address.”
SWITCH_DATA: Refer to Section “5-1-5. VCS_SWITCH Address.”
MASK_DATA: Set 1 to the bit that you want to turn ON or OFF.

Operation:

This command is used to absolutely control the value of the VCS_SWITCH items of the bit-data type in units of bit.
Set 1 to the bit that you want to turn ON, of the item that is specified by SW_ADDRESS. Set 1 to the bit that you want to turn OFF. Set these bits to the SW_DATA. Set 1 to the bit of the MASK_DATA that you want to turn ON or OFF.
When a receiving device receives this command, it over-writes the item that is specified by the SWITCH_ADDRESS, with only the bit data of the SWITCH_DATA that corresponds to the bit which has been set to 1 of the MASK_DATA. The resultant value is returned as the response using the VCS_SWITCH (ABS) command.
Be sure to use this command when the ALL operation is performed.

Example of using the command:

When the PIX3 only among the above command is turned on while the other bits remain unchanged, example of the command is shown below.
(The present value of PIXOUTEnable only is turned on.)



CMD_GP **88** H	**VCU_MULTI_SWITCH**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more switch data of VCS at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
88H	FUNCTION	DTLEN	SW_ ADDRESS_1	SW_ ADDRESS_2	• • •	SW_ ADDRESS_N-1	SW_ ADDRESS_N	(BLOCK-A)

PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)	
SW_ ADDRESS_1	SW_ DATA_1	• • •	SW_ ADDRESS_N-1	SW_ DATA_N	(BLOCK-B)

PARAM:

FUNCTION:	00H	Requests the two or more switch data	Block size = 1 byte (BLOCK-A)
	01H	Transmits the two or more switch data (RELATIVE)	Block size = 2 bytes (BLOCK-B)
	02H	Transmits the two or more switch data (ABSOLUTE)	Block size = 2 bytes (BLOCK-B)

Note

The response for the above described command is 02H.

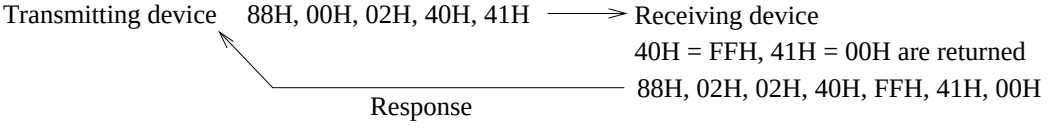
DTLEN: Number of total bytes of SW_ADDRESS, SW_DATA of PARAM2 up to n-2A.
SW_ADDRESS_N: Refer to Section “5-1-5. VCS_SWITCH Address”.
SW_DATA_N: Refer to Section “5-1-5. VCS_SWITCH Address”.

Operation

Refer to the following commands for the operation of each SW_ADDRESS.
VCS_SWITCH (REL) command, VCS_SWITCH (ABS) command.

Example of using the command:

Request the switch data and its return
Requests the present switch status of SW_ADDRESS 40H, 41H.



CMD_GP **89** H	**VCS_MULTI_ANALOG**	Rev. **1.0**	Pattern **n** byte

Outline:

This command is used to request or transmit the two or more analog data of VCS at one time.

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	PARAM3	• • •	PARAM(n-1)	PARAM(n-2)
89H	FUNCTION	DTLEN	ANALOG_ ADDRESS_1	ANALOG_ ADDRESS_2	• • •	ANALOG_ ADDRESS_N-1	ANALOG_ ADDRESS_N

(BLOCK-A)

PARAM2	PARAM3	PARAM4	• • •	PARAM(n-2)
ANALOG_ ADDRESS_1	ANALOG_ DATA_H-1	ANALOG_ ADDRESS_L-1	• • •	ANALOG_ ADDRESS_L-N

(BLOCK-B)

PARAM:

DTLEN: Number of total bytes of ANALOG_ADDRESS, ANALOG_DATA_H and ANALOG_DATA_L of PARAM2 up to n-2.

ANALOG_ADDRESS_N:

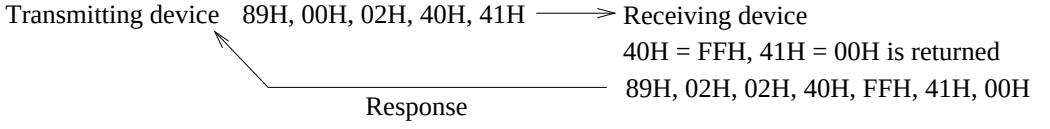
ANALOG_DATA_N: In case of FUNCTION 00H to 1FH, refer to Section “5-2-4. VCS_ANALOG Address”.

Operation

Refer to the following commands for the operation of each ANALOG_ADDRESS.
VCS_ANALOG (REL) command (CMD_GP 82H), VCS_ANALOG (ABS) (CMD_GP 83H).

Example of using the command:

Request the switch and its return
Requests the present switch status data of SW_ADDRESS 40H, 41H.



CMD_GP **8A** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **8F** H		Rev. **–**	Pattern **n** byte

This command is reserved for the n byte pattern.

CMD_GP **90** H	**RCP_SWITCH (REL)**	Rev. **4.0**	Pattern **3** byte

Outline:
This command is used to relatively control the RCP switch items. This command can also be used for requesting the present status of a switch.

Command structure:

CMD_GP	PARAM0	PARAM1
90H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-6. RCP_SWITCH Address."
SW_DATA: Refer to Section "5-1-6. RCP_SWITCH Address."

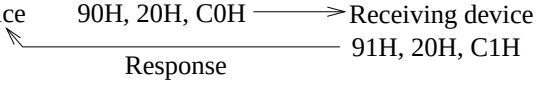
Operation:
There are three types of RCP_SWITCH (REL) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-6. RCP_SWITCH Address."

UP/DOWN step type command:
When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to request the maximum value of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. If they are any value other than [1, 1], this command is used to request the present value of bit5 to bit0. The receiving device returns either the maximum value or the present value as the response using the RCP_SWITCH (ABS) command.

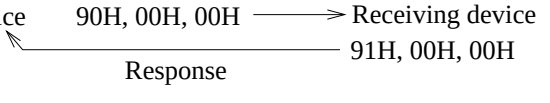
Byte data type command:
This command is used to request the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. The receiving device returns the present value as the response using the RCP_SWITCH (ABS) command.

Bit data type command:
The items to be turned on or off are assigned in units of bit. When this command is transmitted with all of bit7 to bit0 of SW_DATA set to 0, this command is requesting the present value of bit7 to bit0 of the item specified by SW_ADDRESS of the receiving device. When 1 is set to any bit of bit7 to bit0 of SW_DATA that is transmitted, the item specified by SW_ADDRESS of the receiving device goes 1, and hence the present value of the item corresponding to that bit is inverted, i.e., the desired item is turned on or off. The result is returned as the response using the RCP_SWITCH (ABS) command.

Example of using the command:
1. SW_ADDRESS = 00H. To request the present value of the iris control mode and return the maximum value 01H (Mode A) as the response:



2. SW_ADDRESS = 20H. To request the present value of iris control mode and return the present value 00H (Standard) as the response:



CMD_GP **91** H	**RCP_SWITCH (ABS)**	Rev. **4.0**	Pattern **3** byte

Outline:
This command is used to absolutely control the item that is specified by the RCP_SWITCH address.

Command structure:

CMD_GP	PARAM0	PARAM1
91H	SW_ADDRESS	SW_DATA

PARAM:
SW_ADDRESS: Refer to Section "5-1-6. RCP_SWITCH Address."
SW_DATA: Refer to Section "5-1-6. RCP_SWITCH Address."

Operation:
There are three types of RCP_SWITCH (ABS) commands depending upon the SW_DATA to which the switch items are assigned by SW_ADDRESS. The three types are the UP/DOWN step type command, the byte data type command and the bit data type command. Classification of the three types of command is described in Section "5-1-6. RCP_SWITCH Address."

UP/DOWN step type command:
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 0], this command is used to increment the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 1], this command is used to decrement the value by 1 of bit5 to bit0 of the item specified by SW_ADDRESS of the receiving device regardless of the transmitted SW_DATA bit5 to bit0. Note)
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [0, 0], this command is used to over-write the value of bit5 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit5 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.
- When INC (SW_DATA bit7) and DEC (SW_DATA bit6) are [1, 1], this command is used to send the maximum value of bit5 to bit0 of the item specified by SW_ADDRESS.

Note: If the value of bit5 to bit0 is not continuous, skip the non-continuous value and perform increment or decrement.

Byte data type command:
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Bit data type command:
The items to be turned on or off are assigned in units of bit.
This command is used to over-write the value of bit7 to bit0 of the receiving device specified by SW_ADDRESS with the value of bit7 to bit0 of the transmitted SW_DATA. This value is returned as the response using this command.

Example of using the command:
1. SW_ADDRESS = 00H. To increment the iris control mode by +1 over the present value.
   (The present value 00H is used as the standard.):
   Transmitting device 91H, 00H, 80H → Receiving device
   ← 91H, 00H, 01H (Iris control mode becomes 01H Mode A.)
   Response
2. SW_ADDRESS = 00H. To increase the iris control mode to 02H. However, because the receiving device does not have 02H, 01H is returned as the response:
   Transmitting device 91H, 00H, 02H → Receiving device
   ← 91H, 00H, 01H
   Response

CMD_GP **C0** H	**VTR**	Rev. **3.0**	Pattern **n** byte

Outline:

This command is used to exchange the control data and the status data with the Video Cassette Recorders (abbreviated as VTR).

Command structure:

CMD_GP	PARAM0	PARAM1	PARAM2	• • •	PARAM(n-2)
C0H	FUNCTION	DTLEN	DATA_0	• • •	DATA_N

PARAM:

FUNCTION: VTR command function
DTLEN: Byte counts of PARAM2 up to PARAM (n-2)
DATA_0 to DATA_N: Command data

Operation:

FUNCTION: 00H Transmission and reception of 9-pin protocol data
The command block of the 9-pin protocol is added to the data. Check sum is excluded.
ACK and NACK from the VTR are not transmitted.

Note

This function is prohibited from use in principle.

FUNCTION: 01H Transmission (DTLEN = 1: REMOTE → VTR) of the switches that are being pressed down.
The VTRs are controlled by the FUNCTION: 01H. As result of controlling, turning-on or flashing state of the switches are sent to the REMOTE using FUNCTION: 03H.

DATA_0							
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
OP SW2	SAVE	REC	FF REVIEW	REW	STOP	PLAY	REC

1: Being pressed down

- The switch status is indicated by the one byte data at present, but the its subsequent commands are reserved for extension so that no problem should arise even though DTLEN changes.
- The REMOTE (including CAM) transmits voluntarily by itself only when any change has occurred in the switch status (SW).
- OP SW2 is reserved for extension
- When a VTR wants to know the status that the switch (SW) is pressed down, use the FUNCTION: 04H as the status request.

FUNCTION: 02H Requests the status of turning-on or flashing controls of LED of the REMOTE switches (SW).
(DTLEN = 0 : REMOTE → VTR)

FUNCTION: 03H Transmits the status of turning-on or flashing controls of LED of the REMOTE switches (SW).
(DTLEN = variable length : VTR → REMOTE)

Status of turning-on or flashing controls of LED of the REMOTE switches (SW) (FUNCTION:03H, 04H)

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA_0	OP SW2	SAVE	REC REVIEW	FF	REW	STOP	PLAY	REC	(STATUS)
DATA_1	REC Blink Mode								(Blink Mode)
DATA_2	PLAY Blink Mode								
DATA_3	STOP Blink Mode								
DATA_4	REW Blink Mode								
DATA_5	FF Blink Mode								
DATA_6	REC REVIEW Blink Mode								
DATA_7	SAVE Blink Mode								
DATA_8	OP SW2 Blink Mode								

The subsequent commands are reserved for extension.

STATUS	0:	Turned off	(STATUS cannot be omitted)
	1:	Turned on or flashing	
Blink Mode	0:	Turned on	(Blink Mode can be omitted)
	1:	Flashing at 1 Hz	
	2:	Flashing at 4 Hz	

The Blink Mode can be omitted. When the Blink Mode is omitted, the Blink Mode is regarded as 0. It means that the Blink Mode is omitted when the LED is turned off (i.e., STATUS is 0) or turned on (i.e., STATUS is 1.) However, the bytes in the middle cannot be omitted.
(Example: When you want transmit the STOP Blink Mode, the Blink Mode of REC and PLAY cannot be omitted. The REW Blink Mode and the subsequent data can be omitted. (DTLEN must be 4.)

FUNCTION: 04H Requests status of the switches (SW) being pressed.
Use FUNCTION: 01H as the response to this command.

FUNCTION: 05H Not defined

FUNCTION: 06H Requests time code

DATA _0: Types of time code

0H: TCR 1
01H: UBR
02H: TCV
03H: UBV
04H: TCG
05H: UBG
06H: TM1
07H: EOS
08H: RT
FFH: The timer value that is selected by VTR

DATA_1: Specifies the minimum cycle of data transmission that is performed by VTR voluntarily by itself. (Actual time entry)
0 to 254 frames (It is not transmitted in case of FFH: Default value)

Note

The minimum cycle of data transmission of 30 frames or more is recommended. The time code display on the CAM or REMOTE device increments its counting automatically depending upon the FUNCTION: 09H (tape speed) data. Therefore, transmitting the time code data from the time code transmitting device in every frame is not necessary.

FUNCTION: 07H Transmission of time code

DATA _0: Types of time code (Same as FUNCTION: 06H)

DATA _1 to 4: Transmission of time code data

(1) Types of time code: In case of TCR, TCV, TCG, TM1, EOS, RT

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Data 1	CF	DF	10F(0 to 2)		1F(0 to 9)			
Data 2	*	10S(0 to 5)			1S(0 to 9)			
Data 3	*	10M(0 to 5)			1M(0 to 9)			
Data 4	SN		10H(0 to 2)		1H(0 to 9)			

CF: Color Frame
When DF: 1, Drop Frame (valid with TCR, TCV, TCG, TM1)
When SN: 1, it indicates the negative value. (valid with TM1 only)

(2) Types of time code: In case of UBR, UBV and UBG, the data 1 to 4 does not have meaning on each bit, but 0000H to FFFFH is entered.

FUNCTION: 08H Request of the tape speed data (DTLEN = 0 : REMOTE → VTR)

FUNCTION: 09H Transmission of the tape speed data (DTLEN = 2 : VTR → REMOTE)

DATA_0 : DIRECTION 0 : FWD 1 : REV

DATA_1 : Tape speed 0 to 254 : 0 to 25.4 times speed 255 : 50 times speed

Note

When the VTR status has any changed such as in the F. FWD mode or PLAY mode and tape speed has changed, the VTR transmits the tape speed data to REMOTE spontaneously. The time code display on the REMOTE device is used to increment its counting automatically. Transmission interval of the tape speed data is recommended to be 30 frames or more.

FUNCTION: 0AH Request of remaining amount of tape (DTLEN = 0 : REMOTE → VTR)

FUNCTION: 0BH Transmission of remaining amount of tape (DTLEN = 1 : VTR → RM/CAM)

DATA_0 : 0H to FDH : 0 to 253 minute

FEH: OVER 254

FFH: Don't care

Note

When any change occurs in the remaining amount of tape, VTR issues the command spontaneously.

FUNCTION: 0CH Request of battery voltage data (DTLEN = 0 : REMOTE → VTR)

FUNCTION: 0DH Transmission of battery voltage data (DTLEN = 1 : VTR → RM/CAM)

DATA_0 : 0H to FEH : 0 to 254 × 0.1V

FFH: Don't care

Note

When any change occurs in the battery voltage, VTR issues the command spontaneously. Transmission interval of the data is recommended to be 30 frames or more.

FUNCTION: 0EH Not defined

FUNCTION: 0FH Not defined

FUNCTION: 10H Full request of all VTR ERROR CODE (DTLEN = 0 : REMOTE → VTR)

FUNCTION: 11H Transmission of VTR ERROR CODE

This command consists of the two bytes. The first byte indicates operation and the second byte indicates error.

DATA_0 Operation

00H Error code set

10H Error code reset

Other commands are reserved for extension.

DATA_1 Error code

Error code	Type	Meaning
00H	–	Reserved (not used)
01H	HARD ERROR	Hardware has abnormality
02H	VTR STOPPED	VTR stopped of its operation
03H	BATTERY	Battery runs out
04H	TAPE END	Tape end
05H	TAPE SLACKED	Tape winding has abnormality
06H	HUMID	Dew condensation
07H	SERVO	Serve has abnormality
08H	HEAD CLOGGED	Head clogging
09H	Reserved for extension	

When any change occurs in the error status, VTR issues the command spontaneously. (Transmission interval of the data is recommended to be 30 frames or more.)

When two or more error occur at the same time, the errors that have occurred are transmitted in order.

The devices to which the error status is requested by FUNCTION: 10H, transmits all of the error statuses.

Example: Head clogging occurs 00H, 08H

Tape end is released 10H, 04H

Section 5
Details of Address Lists

5-1. SWITCH Command Address List

5-1-1. SYSTEM_SWITCH Address

Note : All the blank areas in the address lists are already reserved for extension.

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
20H							G Tally	R Tally

Others : Reserved for extension

5-1-2. CHU_SWITCH Address

UP/DOWN step type switch

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
00H	Shutter Select (Step)							
	0	0	Request, setup and transmission of value Shutter Data = 00H 1/60 01H 1/100 02H 1/125 03H 1/250 04H 1/500 05H 1/1000 06H 1/2000 07H 1/3000 08H 1/4000 09H 1/5000 0AH 1/10000 The remainders of 0BH to 3FH are reserved for extension. (The shutter value of a one step differs depending upon the circuit.)					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
01H	Master Gain Select							
	0	0	Request, setup and transmission of value Master Gain = 00H −6dB 01H −3dB 02H 0dB 03H 3dB 04H 6dB 05H 9dB 06H 12dB 07H 15dB 08H 18dB 09H 21dB 0AH 24dB 0BH 27dB 0CH 30dB 0DH 33dB 0EH 36dB 0FH 39dB 10H 42dB 11H 45dB 12H 48dB 13H 51dB 14H 54dB 15H 57dB 16H 60dB The remainders of 17H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
02H	Use of EVS (Step) is prohibited.							
	0	0	Request, setup and transmission of value EVS Data = 00H EVS1 01H EVS2 02H EVS3 03H EVS4 04H EVS5 05H EVS6 06H EVS7 The remainders of 07H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
03H	Filter 1(ND)							
	0	0	Request, setup and transmission of value Filter 1 Data = 00H Filter 1-1 (ND 1) 01H Filter 1-2 (ND 2) 02H Filter 1-3 (ND 3) 03H Filter 1-4 (ND 4) 04H Filter 1-5 (ND 5) The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
04H	Filter 2(CC)							
	0	0	Request, setup and transmission of value Filter 2 Data = 00H Filter 2-1 (CC A) 01H Filter 2-2 (CC B) 02H Filter 2-3 (CC C) 03H Filter 2-4 (CC D) 04H Filter 2-5 (CC E) The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
05H	Filter 3							
	0	0	Request, setup and transmission of value Filter 3 Data = 00H Filter 3-1 01H Filter 3-2 02H Filter 3-3 03H Filter 3-4 04H Filter 3-5 The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
06H	Master Gamma Select							
	0	0	Request, setup and transmission of value Master Gamma = 00H 1 01H 0.95 02H 0.90 03H 0.85 04H 0.80 05H 0.75 06H 0.70 07H 0.65 08H 0.60 09H 0.55 0AH 0.50 0BH 0.45 0CH 0.40 0DH 0.35 0EH 0.30 0FH 0.25 10H 0.20 11H 0.15 12H 0.10 The remainders of 13H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
07H	Lens Extender							
	0	0	Request, setup and transmission of value Lens Extender = 00H ×1 01H ×1.5 02H ×2.0 03H ×2.5 The remainders of 04H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
08H	Mic 1 Gain Select							
	0	0	Request, setup and transmission of value Mic 1 Gain = 1CH −60 dB 1DH −50 dB 1EH −40 dB 1FH −30 dB 20H −20 dB The remainders of 21H to 3FH are reserved for extension. (The amount of a one step Gain Up differs depending upon the circuit.)					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
09H	Mic 2 Gain Select							
	0	0	Request, setup and transmission of value Mic 2 Gain = 1CH −60 dB 1DH −50 dB 1EH −40 dB 1FH −30 dB 20H −20 dB The remainders of 21H to 3FH are reserved for extension. (The amount of a one step Gain Up differs depending upon the circuit.)					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
0AH	Auto Iris Window Pattern							
	0	0	Request, setup and transmission of value Pattern = 00H Cutting the top end 01H Cutting the top, bottom, left and right ends 02H Cutting the left and right ends 03H Cutting uniformly 04H Cutting the left and right ends of top 05H Cutting the bottom end The remainders of 06H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
0BH	White Memory Mode							
	0	0	Request, setup and transmission of value White Memory 00H OFF (•) 01H A 02H B The remainders of 03H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
0CH	RPN Channel							
	0	0	Request, setup and transmission of value RPN Channel 00H R ch 01H G ch 02H B ch The remainders of 03H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
0DH	Preset Matrix							
	0	0	Request, setup and transmission of value Preset Matrix= 00H Default 01H SMPTE-240M 02H REC-709 03H SMPTE-WIDE 04H NTSC 05H EBU The remainders of 06H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
0EH	CHU FAN Mode							
	0	0	Request, setup and transmission of value FAN Mode 00H CHU Fan Off 01H CHU Fan AUTO 1(Normal)Mode 02H CHU Fan AUTO 2(Slow)Mode 03H CHU Fan Minimum Mode 04H CHU Fan Maximum Mode The remainders of 04H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
0FH	V Detail Mode							
	0	0	Request, setup and transmission of value V Detail Mode = 00H (reserved) 01H MixNAM 02H G 03H R+G 04H R+G+B The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
10H	Low Gain Setting							
	0	0	Request, setup and transmission of value The Master Gain value conforms to the Master Gain Select data (01H).					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
11H	Mid Gain Setting							
	0	0	Request, setup and transmission of value The Master Gain value conforms to the Master Gain Select data (01H).					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
12H	High Gain Setting							
	0	0	Request, setup and transmission of value The Master Gain value conforms to the Master Gain Select data (01H).					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

Byte data type switch command

<table>
<tr><th rowspan="3">SW_Address</th><th colspan="8">SW DATA</th></tr>
<tr><th>bit7</th><th>bit6</th><th>bit5</th><th>bit4</th><th>bit3</th><th>bit2</th><th>bit1</th><th>bit0</th></tr>
<tr><th>INC</th><th>DEC</th><th colspan="6">Step Data (00H-3FH)</th></tr>
<tr><td>40H</td><td colspan="8">Camera Number</td></tr>
<tr><td></td><td>Flag bit</td><td colspan="7">Camera number</td></tr>
<tr><td></td><td colspan="8">Flag bit
0 : The camera numbers are displayed in the order of (nil), 1, 2, 3, . . . 96. (97 to 127 are reserved.)
1 : The camera numbers are displayed in the order of (nil), A, B, C, . . . Z. (27 to 127 are reserved.)

Camera number
0 : Nil
1 to 96 : Camera number
When it is displayed on the external device, the display can be changed using the flag bit.
When it is displayed inside the system, there are two cases: 01H and 81H are regarded as unity, or they are regarded as different data.</td></tr>
</table>

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
80H					TRIAX Long/ Wide	Return. No-video	Prompter CHU←CCU/ CHU→CCU	Prompter ON
81H	Knee Saturation ON	Auto Knee ON	Knee ON	Gamma ON	Flare ON	S-EVS ON	ECS ON	Shutter ON
82H	Level Depend ON	Detail ON	User Matrix ON	Preset Matrix ON	V Mod Shading ON	Black Gamma ON	White Clip ON	Knee Aperture ON
83H	Fine Detail ON	Multi Matirx ON	EVS ON	Matrix ON	Auto Iris ON	Skin Gate ON	Skin Detail ON	Close ON
84H							Super Motion ON	Skin Tone Iris Gate ON
85H			Super Motion Enable	CHU Crop Enable	FIT/IT	CCD 4:3/ 16:9	SD/HD	NTSC/ PAL
86H	CHU Bars ON		Test6ON (spare)	Test5 ON (spare)	Test4 ON (3 step)	Test3 ON (10 step)	Test2 ON (3 or 10 step)	Test1 ON (Saw)
87H	White Preset ON	CHU Crop ON	Zebra ON	Knee Max ON	Gain Bounce ON	5600K ON	VF power ON	Filter Remote/ Local
88H						APR Start	RPN V Cursor ON	RPN H Cursor ON
89H						Lens Heater ON	Shrinker ON	Projector ON
8AH					Triax Test ON	Triax B ON	Triax G ON	Triax R ON
8BH			Cross Color Reduce ON	Gamma Preset ON	White Shading ON	Black Shading ON	Super Skin Knee ON	Low Key Matrix ON
8CH								White & Flare Paint ON
8DH						Skin Detail CH3 ON	Skin Detail CH2 ON	Skin Detail CH1 ON
8EH						Skin Detail CH3 Gate ON	Skin Detail CH2 Gate ON	Skin Detail CH1 Gate ON
8FH	VF Menu Para ON	VF Menu Remote/ Local			VF Display ON	VF Menu ON	VF Cancel ON	VF Enter ON

Mode switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
A0H				OHB Matrix ON	AWS Mode RGB/ RB Only	White setup Mode AWB/Level	White Mode G/RGB	Gamma Mode G/RGB
A1H					EVS Iris Follow ON	Auto Iris Double Mode	Filter Local Enable	Iris Position Mode
A2H					V Detail Control Mode H/V/ V only	Skin Tone Auto Iris Mode	Adaptive High light Control Mode	Test 2 Mode 3 step/ 10 step
A3H								Dynamic Shading Compensation ON
A4H							V Detail Source G /MixNAM	59.94 Hz/ 60 Hz

5-1-3. CCU_SWITCH Address

UP/DOWN switch type command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
00H	Character Display Page							
	0	0	íRequest, setup and transmission of value Character Display Page = 00H page 0 01H page 1 02H page 2 The remainders of 03H to 3FH are reserved for extension. 3FH page 63					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
01H	SC STEP							
	0	0	Request, setup and transmission of value SC STEP = 00H SC PHASE0 01H SC PHASE1 02H SC PHASE2 03H SC PHASE3 The remainders of 04H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
02H	DIAG VIDEO SELECT							
	0	0	Request, setup and transmission of value DIAG VIDEO SELECT = 00H OFF 01H CAMERA Y 02H CAMERA R-Y 03H CAMERA B-Y 06H B 07H R 08H G 09H Y 0AH R-Y 0BH B-Y 0DH WF1 0EH WF2 0FH PIX1 10H PIX2 11H VBS1 12H VBS2 13H VBS3 19H RET1 1AH RET2 1BH RET3 1CH RET4 1DH PROMPTER CCU1 1EH PROMPTER CCU2 1FH PROMPTER CAMERA 21H COMPONENT Y 22H COMPONENT R-Y 23H COMPONENT B-Y 26H VBS Y 27H VBS R-Y 28H VBS B-Y The remainders of 29H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
03H	Color BARS Select							
	0	0	Request, setup and transmission of value Color BARS Select = 00H Default BARS 01H SMPTE 02H ETA 03H FULL 04H EBU 05H 85% The remainders of 06H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
04H	Color BARS Mode							
	0	0	Request, setup and transmission of value Color BARS Mode = 00H Normal BARS Mode 01H GATE BARS Mode 02H GATE/I BARS Mode The remainders of 03H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
08H	H Interpolation Coefficience							
	0	0	Request, setup and transmission of value H Interpolation Coefficience = 00H A 01H B 02H C 03H D 04H E The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
09H	V Interpolation Coefficience							
	0	0	Request, setup and transmission of value V Interpolation Coefficience = 00H A 01H B 02H C 03H D 04H E The remainders of 05H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
0AH	Gen Lock Mode							
	0	0	Request, setup and transmission of value Gen Lock Mode = 00H SD analog (standard CCU-700) 01H D1 mode 02H D2 mode 03H HD SDI mode 04H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
10H	Notch ON	CCU Skin Gate ON	Color Bars Gate ON	Skin Control ON	Contrast ON		Chroma ON	Bars ON
11H					Cable Open	Power Off Wait	Power On Wait	Camera Power On
12H						Mono On		Saturation ON
13H		WF1 SEQ4 ON	WF1SEQ3 ON	WF1 ENC ON	WF1 Y ON	WF1 B ON	WF1 G ON	WF1 R ON
14H		WF2 SEQ4 ON	WF2SEQ3 ON	WF2 ENC ON	WF2 Y ON	WF2 B ON	WF2 G ON	WF2 R ON
15H				PIX1 ENC ON	PIX1-G ON	PIX1 B ON	PIX1 G ON	PIX1 R ON
16H				PIX2 ENC ON	PIX2-G ON	PIX2 B ON	PIX2 G ON	PIX2 R ON
17H					Prompt CH1/CH2	Return Mix ON		
18H	Return 8	Return 7	Return 6	Return 5	Return 4	Return 3	Return 2	Return 1
19H				Mic & Incom Mix	Incom2 Eng/ Prod	Incom2 Mic ON	Incom1 Eng/ Prod	Incom1 Mic ON
1AH						Character Blanking ON	Bars Character ON	PIX1 Character ON
1BH					Color Correct B ON	Color Correct A ON	Color Correct ON	Comb ON
1Ch					Color Correct F ON	Color Correct E ON	Color Correct D ON	Color Correct C ON
1DH						S1 ON	Y3 ON	Color Correct Gate ON
2FH	Menu Para ON	Menu LOCAL/ REMOTE		DOWN	UP	CANCEL	ENTER	MENU ON
30H								Bars-I/Q Mix ON

Mode switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
80H			Triax/Fiber	Analog/ Digital	Triax Wide Mode	Return No-Video	Prompter Trans Mode	Prompter ON
82H						NORMAL/ HD	CCU Crop ON	NTSC/PAL

Byte data type switch command

<table>
<tr><th rowspan="3">SW_Address</th><th colspan="8">SW DATA</th></tr>
<tr><th>bit7</th><th>bit6</th><th>bit5</th><th>bit4</th><th>bit3</th><th>bit2</th><th>bit1</th><th>bit0</th></tr>
<tr><th>INC</th><th>DEC</th><th colspan="6">Step Data (00H-3FH)</th></tr>
<tr><td rowspan="3">40H</td><td colspan="8">Camera Number</td></tr>
<tr><td>Flag bit</td><td colspan="7">Camera number</td></tr>
<tr><td colspan="8">Flag bit
0 : The camera numbers are displayed in the order of (nil), 1, 2, 3, . . . 96. (97 to 127 are reserved.)
1 : The camera numbers are displayed in the order of (nil), A, B, C, . . . Z. (27 to 127 are reserved.)

Camera number
0 : Nil
1 to 96 : Camera number
When it is displayed on the external device, the display can be changed using the flag bit.</td></tr>
</table>

Bit data type switch command for SD control (Unique for HD camera)

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
C0H								
C1H				SD Master Gamma ON				
C2H		SD Detail ON	SD User Matrix ON	SD Preset Matrix ON				
C3H				SD Matrix ON				
CBH			SD Cross Color Reduce ON	SD Gamma Preset ON				
DFH								Paint SD Detail ON

Special bit data type switch command for SD control (Unique for HD camera)

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
E0H					16:9 Squeeze ON	Letter Box ON	4:3 Edge Crop ON	Crop Center Lock ON
E1H								SD SDI Signal D1/D2
E2H	RET1 HD SDI in	RET1 HD Analog in	RET1 SD SDI in	RET1 SD Analog in		RET1 Letter Box	RET1 4:3	RET1 16:9
E3H	RET2 HD SDI in	RET2 HD Analog in	RET2 SD SDI in	RET2 SD Analog in		RET2 Letter Box	RET2 4:3	RET2 16:9
E4H	RET3 HD SDI in	RET3 HD Analog in	RET3 SD SDI in	RET3 SD Analog in		RET3 Letter Box	RET3 4:3	RET3 16:9
E5H	RET4 HD SDI in	RET4 HD Analog in	RET4 SD SDI in	RET4 SD Analog in		RET4 Letter Box	RET4 4:3	RET4 16:9
E6H							HD 4:3 Marker ON	HD 4:3 Modulation ON

5-1-4. CNU_SWITCH Address

UP/DOWN step type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
20H	Character Display Page							
	0	0	Request, setup and transmission of value Character Display Page = 00H page 0 01H page 1 02H page 2 03H page 3 04H page 4 05H page 5 The remainders of 06H to 3FH are reserved for extension. 3FH page63					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
21H	Character Up/Down							
	0	0	Request, setup and transmission of value Character Up/Down = 00H sub page 0 01H sub page 1 02H sub page 2 03H sub page 3 04H sub page 4 05H sub page 5 The remainders of 06H to 3FH are reserved for extension. 3FH sub page63					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
22H	Config Mode							
	0	0	Request, setup and transmission of value Config Mode = 00H The character display page appears. 01H RCP assignment 02H MSU assignment 03H AUX Port assignment 04H to 06H S-bus I/O related • • • Use of this command anew is prohibited. The remainders of 07H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
23H	Config Cursor Up/Down							
	0	0	Request, setup and transmission of value Config Cursor Up/Down = 00H OFF 01H to 0CH Cursor position					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					
24H	Config Cursor L/R							
	0	0	Request, setup and transmission of value Config Cursor L/R 00H OFF 01H to 0CH Cursor position					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

Byte data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
02H	Camera Select							
	00H : In the case of no selection 01H to 60H : 1CAM to 96CAM Note)							
03H	CCU Select							
	00H : In the case of no selection 01H to 60H : 1CCU to 96CCU							
04H	CNU Select							
	00H : In the case of no selection 01H to 08H : 1CNU to 8CNU							
05H	MSU Select							
	00H : In the case of no selection 01H to 10H : 1MSU to 16MSU							
06H	VCS Select							
	00H : In the case of no selection 01H to 10H : 1VCS to 16VCS							
07H	RCP Select							
	00H : In the case of no selection 01H to C0H : 1RCP to 192RCP							
08H	IRIS PANEL Select							
	00H : In the case of no selection 01H to 60H : 1IP to 96IP							

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
RM Select								
	00H: In the case of no selection 01H to 60H: 1RM to 96RM							
0AH	Camera Number for RCP							
	Flag bit Camera number Flag bit 0 : The camera numbers are displayed in the order of (nil), 1, 2, 3, . . . 96. (97 to 127 are reserved.) 1 : The camera numbers are displayed in the order of (nil), A, B, C, . . . Z. (27 to 127 are reserved.) Camera number 0 : Nil 1 to 96 : Camera number When it is displayed on the external device, the display can be changed using the flag bit.							
0BH	Group Number for Slot 0							
	00H : Group 0 (1CAM to 6CAM) 01H : Group 1 (7CAM to 12CAM) 02H : Group 2 (13CAM to 18CAM) 03H : Group 3 (19CAM to 24CAM) 04H : Group 4 (25CAM to 30CAM) 05H : Group 5 (31CAM to 36CAM) 06H : Group 6 (37CAM to 42CAM) 07H : Group 7 (43CAM to 48CAM) 08H : Group 8 (49CAM to 54CAM) 09H : Group 9 (55CAM to 60CAM) 0AH : Group 10 (61CAM to 66CAM) 0BH : Group 11 (67CAM to 72CAM) 0CH : Group 12 (73CAM to 78CAM) 0DH : Group 13 (79CAM to 84CAM) 0EH : Group 14 (85CAM to 90CAM) 0FH : Group 15 (91CAM to 96CAM)							

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
0CH	Group Number for Slot 1							
	00H : Group 0 (1CAM to 6CAM) 01H : Group 1 (7CAM to 12CAM) 02H : Group 2 (13CAM to 18CAM) 03H : Group 3 (19CAM to 24CAM) 04H : Group 4 (25CAM to 30CAM) 05H : Group 5 (31CAM to 36CAM) 06H : Group 6 (37CAM to 42CAM) 07H : Group 7 (43CAM to 48CAM) 08H : Group 8 (49CAM to 54CAM) 09H : Group 9 (55CAM to 60CAM) 0AH : Group 10 (61CAM to 66CAM) 0BH : Group 11 (67CAM to 72CAM) 0CH : Group 12 (73CAM to 78CAM) 0DH : Group 13 (79CAM to 84CAM) 0EH : Group 14 (85CAM to 90CAM) 0FH : Group 15 (91CAM to 96CAM)							
0DH	Group Number for Slot 2							
	00H : Group 0 (1CAM to 6CAM) 01H : Group 1 (7CAM to 12CAM) 02H : Group 2 (13CAM to 18CAM) 03H : Group 3 (19CAM to 24CAM) 04H : Group 4 (25CAM to 30CAM) 05H : Group 5 (31CAM to 36CAM) 06H : Group 6 (37CAM to 42CAM) 07H : Group 7 (43CAM to 48CAM) 08H : Group 8 (49CAM to 54CAM) 09H : Group 9 (55CAM to 60CAM) 0AH : Group 10 (61CAM to 66CAM) 0BH : Group 11 (67CAM to 72CAM) 0CH : Group 12 (73CAM to 78CAM) 0DH : Group 13 (79CAM to 84CAM) 0EH : Group 14 (85CAM to 90CAM) 0FH : Group 15 (91CAM to 96CAM)							
0EH	Camera Number for MSU							
	Flag bit	Camera number						
	Flag bit 0 : The camera numbers are displayed in the order of (nil), 1, 2, 3, . . . 96. (97 to 127 are reserved.) 1 : The camera numbers are displayed in the order of (nil), A, B, C, . . . Z. (27 to 127 are reserved.) Camera number 0 : Nil 1 to 96 : Camera number When it is displayed on the external device, the display can be changed using the flag bit.							

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
10H	CCU Connect					SLAVE ON	MASTER ON	ALL ON
11H							Character-2 ON	Chracter-1 ON

Multi file transfer

12H	CCU Connect	File transfer Normally ends.	File transfer Error			SLAVE ON	MASTER ON	
13H	MSU Connect	File transfer Normally ends.	File transfer Error			SLAVE ON	MASTER ON	

Config mode

14H			Cancel	Defualt	LOAD	SAVE	NO ASSIGN	SET

RCP Preview

15H							Preview ON LED	Preview ON SW

MUS

16H								MSU LOCAL MODE

CNU option board type

18H						IF689	IF602	IF480

Iris M/S

1AH	CCU Connect					SLAVE ON	MASTER ON	
1BH	MSU Connect					SLAVE ON	MASTER ON	
1CH								Master.RCP TAKE

5-1-5. VCS_SWITCH Address

UP/DOWN step type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
00H	0	0	Request, setup and transmission of value					
			00H Chracter 0% 01H Character 5% 02H Character 10% 03H Character 15% 04H Character 20% 05H Character 25% 06H Character 30% 07H Character 35% 08H Character 40% 09H Character 45% 0AH Character 50% 0BH Character 55% 0CH Character 60% 0DH Character 65% 0EH Character 70% 0FH Character 75% 10H Character 80% 11H Character 85% 12H Character 90% 13H Character 95% 14H Character 100%					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
10H	PIX OUT Enable		PIX6 ON	PIX5 ON	PIX4 ON	PIX3 ON	PIX 2 ON	PIX1 ON
11H	WF OUT Enable		WF6 ON	WF5 ON	WF4 ON	WF3 ON	WF2 ON	WF1 ON
12H			SEQ 4CTL ON	SEQ3 CTL ON		SEQ4 ON	SEQ3B ON	SEQ3A ON
13H	PIX/WF Enable		PIX6/WF6 ON	PIX5/WF5 ON	PIX4/WF4 ON	PIX3/WF3 ON	PIX2/WF2 ON	PIX1/WF1 ON

5-1-6. RCP_SWITCH Address

UP/DOWN step type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	INC	DEC	Step Data (00H-3FH)					
00H	Iris Control Mode							
	0	0	Request, setup and transmission of value Iris Control Mode = 00H Standard Standard acceleration mode (Same as the MSU standard) 01H Mode A 12-bit constant velocity mode (4 rotations from open to close) The remainders of 02H to 3FH are reserved for extension.					
	0	1	One step DOWN control					
	1	0	One step UP control					
	1	1	Request and transmission of the maximum value					

Byte data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
40H								

Bit data type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
80H								

Control type switch command

SW_Address	SW DATA							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Step Data (00H-3FH)							
C0H								

5-2. ANALOG Command Address List

5-2-1. CHU_ANALOG Address

Analog Address	Function	Effective size	Remark
00H	Master White	10 bits	
01H	White-R	10 bits	
02H	White-G	10 bits	
03H	White-B	10 bits	
04H	Master V Mod Saw	10 bits	
05H	Mod Shading V Saw-R	10 bits	
06H	Mod Shading V Saw-G	10 bits	
07H	Mod Shading V Saw-B	10 bits	
08H	Master Flare	10 bits	
09H	Flare-R	10 bits	
0AH	Flare-G	10 bits	
0BH	Flare-B	10 bits	
0CH	Detail Limiter	10 bits	
0DH	Detail White Limiter	10 bits	
0EH	Detail Black Limiter	10 bits	
0FH			
10H	Master Black Gamma	10 bits	
11H	Black Gamma-R	10 bits	
12H	Black Gamma-G	10 bits	
13H	Black Gamma-B	10 bits	
14H	Master Knee Point	10 bits	
15H	Knee Point-R	10 bits	
16H	Knee Point-G	10 bits	
17H	Knee Point-B	10 bits	
18H	Master Knee Slope	10 bits	
19H	Knee Slope-R	10 bits	
1AH	Knee Slope-G	10 bits	
1BH	Knee Slope-B	10 bits	
1CH	Master Gamma	10 bits	
1DH	Gamma-R	10 bits	
1EH	Gamma-G	10 bits	
1FH	Gamma-B	10 bits	

Analog Address	Function	Effective size	Remark
20H	Master White Clip	10 bits	
21H	White Clip-R	10 bits	
22H	White Clip-G	10 bits	
23H	White Clip-B	10 bits	
24H			
25H			
26H			
27H			
28H			
29H			
2AH			
2BH			
2CH			
2DH			
2EH			
2FH			
30H			
31H			
32H			
33H			
34H			
35H			
36H			
37H			
38H			
39H			
3AH			
3BH			
3CH			
3DH			
3EH			
3FH			

Analog Address	Function	Effective size	Remark
40H	Iris Mix Ratio	10 bits	
41H	ECS Frequency	10 bits	
42H	S-EVS data	10 bits	
43H	Skin Detail 1 phase	10 bits	
44H	Skin Detail 1 width	10 bits	
45H	V Reset	10 bits	
46H	Triax Cable Length	10 bits	
47H	CHU Optical Level	15 bits positive, starts filling from the LSB	
48H	RPN Cursor H Position	15 bits positive, starts filling from the LSB	
49H	RPN Cursor V Position	15 bits positive, starts filling from the LSB	
4AH	RPN Level	10 bits	
4BH	Center Marker H Position	10 bits	
4CH	Center Marker V Position	10 bits	
4DH	Auto Iris Gain P	10 bits	
4EH	Auto Iris Gain I	10 bits	
4FH	Auto Iris Gain D	10 bits	
50H	Auto Iris Level	10 bits	
51H	Auto Iris Close Limit	10 bits	
52H	Auto Iris Insence	10 bits	
53H	Auto Iris Moduration	10 bits	
54H	Skin Detail 2 Phase	10 bits	
55H	Skin Detail 2 Width	10 bits	
56H	Skin Detail 3 Phase	10 bits	
57H	Skin Detail 3 Width	10 bits	
58H	Skin Tone Auto Iris Phase	10 bits	
59H	Skin Tone Auto Iris Width	10 bits	
5AH	Skin Tone Auto Iris APL Ratio	10 bits	
5BH	Skin Tone Auto Iris Level	10 bits	
5CH			
5DH			
5EH			
5FH			

Analog Address	Function	Effective size	Remark
60H	Iris	12 bits	
61H	Focus	10 bits	
62H	Fine Focus	10 bits	
63H	Zoom	10 bits	
64H	VF Menu Rotary Encoder	16 bits	
65H			
66H			
67H			
68H			
69H			
6AH			
6BH			
6CH			
6DH			
6EH			
6FH			
70H			
71H			
72H			
73H			
74H			
75H			
76H			
77H			
78H			
79H			
7AH			
7BH			
7CH			
7DH			
7EH			
7FH			

Analog Address	Function	Effective size	Remark
80H	Black Set-R	10 bits	
81H	Black Set-G	10 bits	
82H	Black Set-B	10 bits	
83H	Black Set(18dB)R	10 bits	
84H	Black Set(18dB)G	10 bits	
85H	Black Set(18dB)B	10 bits	
86H	Black Shading H Saw-R	10 bits	
87H	Black Shading H Saw-G	10 bits	
88H	Black Shading H Saw-B	10 bits	
89H	Black Shading H Para-R	10 bits	
8AH	Black Shading H Para-G	10 bits	
8BH	Black Shading H Para-B	10 bits	
8CH	Black Shading V Saw-R	10 bits	
8DH	Black Shading V Saw-G	10 bits	
8EH	Black Shading V Saw-B	10 bits	
8FH	Black Shading V Para-R	10 bits	
90H	Black Shading V Para-G	10 bits	
91H	Black Shading V Para-B	10 bits	
92H	White Shading H Saw-R	10 bits	
93H	White Shading H Saw-G	10 bits	
94H	White Shading H Saw-B	10 bits	
95H	White Shading H Para-R	10 bits	
96H	White Shading H Para-G	10 bits	
97H	White Shading H Para-B	10 bits	
98H	White Shading V Para-R	10 bits	
99H	White Shading V Para-G	10 bits	
9AH	White Shading V Para-B	10 bits	
9BH	Detail Level	10 bits	
9CH	Detail Crispening	10 bits	
9DH	Detail Mix Ratio	10 bits	
9EH	Detail H/V Ratio	10 bits	
9FH	H Detail Frequency	10 bits	

Analog Address	Function	Effective size	Remark
A0H	Detail Level Depend	10 bits	
A1H	Skin Detail 1 Level	10 bits	
A2H	Skin Detail 1 Saturation	10 bits	
A3H	Matrix(G-R)R	10 bits	
A4H	Matrix(B-R)R	10 bits	
A5H	Matrix(R-G)G	10 bits	
A6H	Matrix(B-G)G	10 bits	
A7H	Matrix(R-B)B	10 bits	
A8H	Matrix(G-B)B	10 bits	
A9H	Master Black	12 bits	
AAH	Black-R	10 bits	
ABH	Black-G	10 bits	
ACH	Black-B	10 bits	
ADH		10 bits	
AEH	Knee Saturation	10 bits	
AFH	Knee Aperture	10 bits	
B0H	Comb Filter	10 bits	
B1H	Up tally Dimmer	10 bits	
B2H	4:3 Phase	10 bits	
B3H	White Shading V Saw-R	10 bits	
B4H	White Shading V Saw-G	10 bits	
B5H	White Shading V Saw-B	10 bits	
B6H	Knee Aperture Gain	10 bits	
B7H	Low Key Clip Level	10 bits	
B8H	OHB Matrix(G-R)R	10 bits	
B9H	OHB Matrix(B-R)R	10 bits	
BAH	OHB Matrix(R-G)G	10 bits	
BBH	OHB Matrix(B-G)G	10 bits	
BCH	OHB Matrix(R-B)B	10 bits	
BDH	OHB Matrix (G-B)B	10 bits	
BEH	Paint White-R	10 bits	
BFH	Paint White-G	10 bits	

Analog Address	Function	Effective size	Remark
C0H	Paint White-B	10 bits	
C1H	Paint Flare-R	10 bits	
C2H	Paint Flare-G	10 bits	
C3H	Paint Flare-B	10 bits	
C4H	Auto Knee Point Limit	10 bits	
C5H	Auto Knee Slope	10 bits	
C6H	Fine Detail	10 bits	
C7H	Skin Detail2 Level	10 bits	
C8H	Skin Detail2 Saturation	10 bits	
C9H	Skin Detail3 Level	10 bits	
CAH	Skin Detail3 Saturation	10 bits	
CBH	Skin Tone Auto Iris Saturation	10 bits	
CCH			
CDH			
CEH			
CFH			
D0H			
D1H			
D2H			
D3H			
D4H			
D5H			
D6H			
D7H			
D8H			
D9H			
DAH			
DBH			
DCH			
DDH			
DEH			
DFH			

Analog Address	Function	Effective size	Remark
E0H			
E1H			
E2H			
E3H			
E4H			
E5H			
E6H			
E7H			
E8H			
E9H			
EAH			
EBH			
ECH			
EDH			
EEH			
EFH			
F0H			
F1H			
F2H			
F3H			
F4H			
F5H			
F6H			
F7H			
F8H			
F9H			
FAH			
FBH			
FCH			
FDH	Merchandise model code		
FEH	Ref File Check Sum H		
FFH	Ref File Check Sum L		

5-2-2. CHU_EXT_ANALOG Address

Analog Address	Function	Effective size	Remark
00H	Multi Matrix 1 Phase	10 bits	
01H	Multi Matrix 2 Phase	10 bits	
02H	Multi Matrix 3 Phase	10 bits	
03H	Multi Matrix 4 Phase	10 bits	
04H	Multi Matrix 5 Phase	10 bits	
05H	Multi Matrix 6 Phase	10 bits	
06H	Multi Matrix 7 Phase	10 bits	
07H	Multi Matrix 8 Phase	10 bits	
08H	Multi Matrix 9 Phase	10 bits	
09H	Multi Matrix 10 Phase	10 bits	
0AH	Multi Matrix 11 Phase	10 bits	
0BH	Multi Matrix 12 Phase	10 bits	
0CH	Multi Matrix 13 Phase	10 bits	
0DH	Multi Matrix 14 Phase	10 bits	
0EH	Multi Matrix 15 Phase	10 bits	
0FH	Multi Matrix 16 Phase	10 bits	
10H	Multi Matrix 1 Saturation	10 bits	
11H	Multi Matrix 2 Saturation	10 bits	
12H	Multi Matrix 3 Saturation	10 bits	
13H	Multi Matrix 4 Saturation	10 bits	
14H	Multi Matrix 5 Saturation	10 bits	
15H	Multi Matrix 6 Saturation	10 bits	
16H	Multi Matrix 7 Saturation	10 bits	
17H	Multi Matrix 8 Saturation	10 bits	
18H	Multi Matrix 9 Saturation	10 bits	
19H	Multi Matrix 10 Saturation	10 bits	
1AH	Multi Matrix 11 Saturation	10 bits	
1BH	Multi Matrix 12 Saturation	10 bits	
1CH	Multi Matrix 13 Saturation	10 bits	
1DH	Multi Matrix 14 Saturation	10 bits	
1EH	Multi Matrix 15 Saturation	10 bits	
1FH	Multi Matrix 16 Saturation	10 bits	

Analog Address	Function	Effective size	Remark
20H	OHB Multi Matrix 1 Phase	10 bits	
21H	OHB Multi Matrix 2 Phase	10 bits	
22H	OHB Multi Matrix 3 Phase	10 bits	
23H	OHB Multi Matrix 4 Phase	10 bits	
24H	OHB Multi Matrix 5 Phase	10 bits	
25H	OHB Multi Matrix 6 Phase	10 bits	
26H	OHB Multi Matrix 7 Phase	10 bits	
27H	OHB Multi Matrix 8 Phase	10 bits	
28H	OHB Multi Matrix 9 Phase	10 bits	
29H	OHB Multi Matrix 10 Phase	10 bits	
2AH	OHB Multi Matrix 11 Phase	10 bits	
2BH	OHB Multi Matrix 12 Phase	10 bits	
2CH	OHB Multi Matrix 13 Phase	10 bits	
2DH	OHB Multi Matrix 14 Phase	10 bits	
2EH	OHB Multi Matrix 15 Phase	10 bits	
2FH	OHB Multi Matrix 16 Phase	10 bits	
30H	OHB Multi Matrix 1 Saturation	10 bits	
31H	OHB Multi Matrix 2 Saturation	10 bits	
32H	OHB Multi Matrix 3 Saturation	10 bits	
33H	OHB Multi Matrix 4 Saturation	10 bits	
34H	OHB Multi Matrix 5 Saturation	10 bits	
35H	OHB Multi Matrix 6 Saturation	10 bits	
36H	OHB Multi Matrix 7 Saturation	10 bits	
37H	OHB Multi Matrix 8 Saturation	10 bits	
38H	OHB Multi Matrix 9 Saturation	10 bits	
39H	OHB Multi Matrix 10 Saturation	10 bits	
3AH	OHB Multi Matrix 11 Saturation	10 bits	
3BH	OHB Multi Matrix 12 Saturation	10 bits	
3CH	OHB Multi Matrix 13 Saturation	10 bits	
3DH	OHB Multi Matrix 14 Saturation	10 bits	
3EH	OHB Multi Matrix 15 Saturation	10 bits	
3FH	OHB Multi Matrix 16 Saturation	10 bits	

Analog Address	Function	Effective size	Remark
40H ・ ・ ・ FFH	Reserved		

5-2-3. CCU_ANALOG Address

Analog Address	Function	Effective size	Remark
00H	Camera Çx Level	10 bits	
01H	Camera Y Black	10 bits	
02H	Camera R-Y Level	10 bits	
03H	Camera R-Y Black	10 bits	
04H	Camera B-Y Level	10 bits	
05H	Camera B-Y Black	10 bits	
06H	Contrast	10 bits	
07H	Mono Saturation	10 bits	
08H	Mono Hue	10 bits	
09H	Saturation	10 bits	
0AH	Component R-Y Level	10 bits	
0BH	Component B-Y Level	10 bits	
0CH	Component Y Level	10 bits	
0DH	Burst Flag Phase	10 bits	
0EH	Enc Chroma Level	10 bits	
0FH	Q/V Level	10 bits	
10H	Q/V Black	10 bits	
11H	I/U Black	10 bits	
12H	SC Quad	10 bits	
13H	Enc Y Level	10 bits	
14H	Notch Frequency	10 bits	
15H	Notch Level	10 bits	
16H	Enc Burst Level	10 bits	
17H	Enc Sync Level	10 bits	
18H	Phase SC	10 bits	
19H	Phase H Coarse	16 bits	
1AH	Phase H Fine	10 bits	
1BH	Phase H Step	16 bits	System clock (13.5 to 18 MHz) x 16 must be one unit.
1CH			
1DH			
1EH			
1FH	SEQ V RESET	4 bits	

Analog Address	Function	Effective size	Remark
20H	VBS Y Level	10 bits	
21H	VBS Y Black	10 bits	
22H	Y Comb Level	10 bits	
23H	Y Comb Crisp	10 bits	
24H	Y Black	10 bits	
25H	R-Y Black	10 bits	
26H	B-Y Black	10 bits	
27H			
28H	VBS R-Y Level	10 bits	
29H	VBS R-Y Black	10 bits	
2AH	VBS B-Y Level	10 bits	
2BH	VBS B-Y Black	10 bits	
2CH	Color Correct A Width	10 bits	
2DH	Color Correct A Phase	10 bits	
2EH	Color Correct A Hue	10 bits	
2FH	Color Correct A Level	10 bits	
30H			
31H			
32H	Color Correct B Width	10 bits	
33H	Color Correct B Phase	10 bits	
34H	Color Correct B Hue	10 bits	
35H	Color Correct B Level	10 bits	
36H	Color Correct C Width	10 bits	
37H	Color Correct C Phase	10 bits	
38H	Color Correct C Hue	10 bits	
39H	Color Correct C Level	10 bits	
3AH			
3BH			
3CH	Color Correct D Width	10 bits	
3DH	Color Correct D Phase	10 bits	
3EH	Color Correct D Hue	10 bits	
3FH	Color Correct D Level	10 bits	

Analog Address	Function	Effective size	Remark
40H	Color Correct E Width	10 bits	
41H	Color Correct E Phase	10 bits	
42H	Color Correct E Hue	10 bits	
43H	Color Correct E Level	10 bits	
44H			
45H			
46H	Color Correct F Width	10 bits	
47H	Color Correct F Phase	10 bits	
48H	Color Correct F Hue	10 bits	
49H	Color Correct F Level	10 bits	
4AH	Y3 Level	10 bits	
4BH			
4CH	S1 Level	10 bits	
4DH			
4EH			
4FH			
50H	SDI Y Level	10 bits	
51H	SDI R-Y Level	10 bits	
52H	SDI B-Y Level	10 bits	
53H	SDI Y Black	10 bits	
54H	SDI R-Y Black	10 bits	
55H	SDI B-Y Black	10 bits	
56H			
60H	WF basic level data	10 bits	
61H	CCU Menu left		
62H	CCU Menu center		Max 16 bits
63H	CCU Menu right		
70H	Crop Position	10bits	

SD Camera Master/R/G/B Type (80H only is exceptional.)

Analog Address	Function	Effective size	Remark
80H	Triax Cable Length	16 bits	(0 to 7fff[herdware MAX])
81H			
82H			
83H			
84H			
85H			
86H			
87H			
88H			
89H			
8AH			
8BH			
8CH	SD Detail Limiter	10 bits	
8DH	SD Detail White Limiter	10 bits	
8EH	SD Detail Black Limiter	10 bits	
8FH			
90H			
91H			
92H			
93H			
94H			
95H			
96H			
97H			
98H			
99H			
9AH			
9BH			
9CH	SD Master Gamma	10 bits	
9DH			
9EH			
9FH			

Analog Address	Function	Effective size	Remark
A0H			
A1H			
A2H			
A3H			
A4H			
A5H			
A6H			
A7H			
A8H			
A9H			
AAH			
ABH			
ACH			
ADH			
AEH			
AFH			
B0H	SD Detail Comb	10 bits	
B1H			
B2H			
B3H			
B4H			
B5H			
B6H			
B7H			
B8H			
B9H			
BAH			
BBH			
BCH			
BDH			
BEH			
BFH			

SD Camera Standalone-type Controls

Analog Address	Function	Effective size	Remark
D0H			
D1H			
D2H			
D3H			
D4H			
D5H			
D6H			
D7H			
D8H			
D9H			
DAH			
DBH	SD Detail Level	10 bits	
DCH	SD Detail Crispening	10 bits	
DDH			
DEH	SD Detail H/V Ratio	10 bits	
DFH	SD Detail Frequency	10 bits	
E0H	SD Detail Level Depend	10 bits	
E1H	SD Level Depend Gain	10 bits	
E2H	Cross Color Cancel Level	10 bits	
E3H	Cross Color Cancel Coring	10 bits	
E4H			
E5H			
E6H			
E7H			
E8H			
E9H			
EAH			
EBH			
ECH			
EDH			
EEH			
EFH	Paint SD Detail Level	10 bits	

Read only status

Analog Address	Function	Effective size	Remark
F0H	CCU Optical Level	0000H-7FFFH	

5-2-4. VCS_ANALOG Address

Analog Address	Function	Effective size	Remark
00H	PIX1 LEVEL CTL	8 bits	
01H	PIX2 LEVEL CTL	8 bits	
02H	PIX3 LEVEL CTL	8 bits	
03H	PIX4 LEVEL CTL	8 bits	
04H	PIX5 LEVEL CTL	8 bits	
05H	PIX6 LEVEL CTL	8 bits	
06H	PIX1 CHROMA CTL	8 bits	
07H	PIX2 CHROMA CTL	8 bits	
08H	PIX3 CHROMA CTL	8 bits	
09H	PIX4 CHROMA CTL	8 bits	
0AH	PIX5 CHROMA CTL	8 bits	
0BH	PIX6 CHROMA CTL	8 bits	
0CH	WF1 LEVEL CTL	8 bits	
0DH	WF2 LEVEL CTL	8 bits	
0EH	WF3 LEVEL CTL	8 bits	
0FH	WF4 LEVEL CTL	8 bits	
10H	WF5 LEVEL CTL	8 bits	
11H	WF6 LEVEL CTL	8 bits	
12H	WF1 CHROMA CTL	8 bits	
13H	WF2 CHROMA CTL	8 bits	
14H	WF3 CHROMA CTL	8 bits	
15H	WF4 CHROMA CTL	8 bits	
16H	WF5 CHROMA CTL	8 bits	
17H	WF6 CHROMA CTL	8 bits	
18H	WF1 DC ADJ CTL	8 bits	
19H	WF2 DC ADJ CTL	8 bits	
1AH	WF3 DC ADJ CTL	8 bits	
1BH	WF4 DC ADJ CTL	8 bits	
1CH	WF5 DC ADJ CTL	8 bits	
1DH	WF6 DC ADJ CTL	8 bits	
1EH	PIX LEVEL CTL	8 bits	Pix level of the channel that is selected by the PIX select, is controlled.
1FH	PIX CHROMA CTL	8 bits	Pix chroma of the channel that is selected by the PIX select, is controlled.
20H	WF LEVEL CTL	8 bits	WF level of the channel that is selected by the WF select, is controlled.
21H	WF CHROMA CTL	8 bits	WF chroma of the channel that is selected by the WF select, is controlled.
22H	WF DC ADJ CTL	8 bits	WF DC of the channel that is selected by the WF select, is controlled.

5-3. ANALOG_TRIMMING Address List

5-3-1. CHU_ANALOG_TRIMMING Address

Analog Address	Function	Effective size	Remark
00H			
01H			
02H			
03H			
04H			
05H			
06H			
07H			
08H			
09H			
0AH			
0BH			
0CH			
0DH			
0EH			
0FH			
10H			
11H			
12H			
13H			
14H			
15H			
16H			
17H			
18H			
19H			
1AH			
1BH			
1CH			
1DH			
1EH			
1FH			

Analog Address	Function	Effective size	Remark
20H			
21H			
22H			
23H			
24H			
25H			
26H			
27H			
28H			
29H			
2AH			
2BH			
2CH			
2DH			
2EH			
2FH			
30H			
31H			
32H			
33H			
34H			
35H			
36H			
37H			
38H			
39H			
3AH			
3BH			
3CH			
3DH			
3EH			
3FH			

Analog Address	Function	Effective size	Remark
40H			
41H			
42H			
43H			
44H			
45H			
46H			
47H			
48H			
49H			
4AH			
4BH			
4CH			
4DH			
4EH			
4FH			
50H			
51H			
52H			
53H			
54H			
55H			
56H			
57H			
58H			
59H			
5AH			
5BH			
5CH			
5DH			
5EH			
5FH			

Analog Address	Function	Effective size	Remark
60H			
61H			
62H			
63H			
64H			
65H			
66H			
67H			
68H			
69H			
6AH			
6BH			
6CH			
6DH			
6EH			
6FH			
70H			
71H			
72H			
73H			
74H			
75H			
76H			
77H			
78H			
79H			
7AH			
7BH			
7CH			
7DH			
7EH			
7FH			

Analog Address	Function	Effective size	Remark
80H	Pre-White Clip R	10 bits	
81H	Pre-White Clip G	10 bits	
82H	Pre-White Clip B	10 bits	
83H	Clamp Level R	10 bits	
84H	Clamp Level G	10 bits	
85H	Clamp Level B	10 bits	
86H	White Shading Balance R	10 bits	
87H	White Shading Balance G	10 bits	
88H	White Shading Balance B	10 bits	
89H	Black Level Offset R	10 bits	
8AH	Black Level Offset G	10 bits	
8BH	Black Level Offset B	10 bits	
8CH	Substraight R	10 bits	
8DH	Substraight G	10 bits	
8EH	Substraight B	10 bits	
8FH	V Saw Compensation R	10 bits	
90H	V Saw Compensation G	10 bits	
91H	V Saw Compensation B	10 bits	
92H	Test Level	10 bits	
93H	DL Reference Level 1H R	10 bits	
94H	DL Reference Level 1H G	10 bits	
95H	DL Reference Level 1H B	10 bits	
96H	DL Reference Level 2H R	10 bits	
97H	DL Reference Level 2H G	10 bits	
98H	DL Reference Level 2H B	10 bits	
99H			
9AH			
9BH			
9CH			
9DH			
9EH			
9FH			

Analog Address	Function	Effective size	Remark
A0H			
A1H			
A2H			
A3H			
A4H			
A5H			
A6H			
A7H			
A8H			
A9H			
AAH			
ABH			
ACH			
ADH			
AEH			
AFH			
B0H			
B1H			
B2H			
B3H			
B4H			
B5H			
B6H			
B7H			
B8H			
B9H			
BAH			
BBH			
BCH			
BDH			
BEH			
BFH			

Analog Address	Function	Effective size	Remark
C0H			
C1H			
C2H			
C3H			
C4H			
C5H			
C6H			
C7H			
C8H			
C9H			
CAH			
CBH			
CCH			
CDH			
CEH			
CFH			
D0H			
D1H			
D2H			
D3H			
D4H			
D5H			
D6H			
D7H			
D8H			
D9H			
DAH			
DBH			
DCH			
DDH			
DEH			
DFH			

Analog Address	Function	Effective size	Remark
E0H			
E1H			
E2H			
E3H			
E4H			
E5H			
E6H			
E7H			
E8H			
E9H			
EAH			
EBH			
ECH			
EDH			
EEH			
EFH			
F0H			
F1H			
F2H			
F3H			
F4H			
F5H			
F6H			
F7H			
F8H			
F9H			
FAH			
FBH			
FCH			
FDH			
FEH			
FFH			

5-4. IRIS F Number Conversion List

5-4-1. IRIS F Number Display (8-bit)

Fundamental equation $132.8 \times 0.175 \frac{i}{0.325 \times 2^n}$

n : Bit accuracy, i: data

n = 8

Data	F No.	Data	F No.	Data	F No.	Data	F No.
00H	132.8	40H	38.2	80H	11.0	C0H	3.2
01H	130.2	41H	37.5	81H	10.8	C1H	3.1
02H	127.7	42H	36.8	82H	10.6	C2H	3.0
03H	125.3	43H	36.1	83H	10.4	C3H	3.0
04H	122.9	44H	35.4	84H	10.2	C4H	2.9
05H	120.5	45H	34.7	85H	10.0	C5H	2.9
06H	118.2	46H	34.0	86H	9.8	C6H	2.8
07H	115.9	47H	33.4	87H	9.6	C7H	2.8
08H	113.7	48H	32.7	88H	9.4	C8H	2.7
09H	111.5	49H	32.1	89H	9.2	C9H	2.7
0AH	109.3	4AH	31.5	8AH	9.1	CAH	2.6
0BH	107.2	4BH	30.9	8BH	8.9	CBH	2.6
0CH	105.2	4CH	30.3	8CH	8.7	CCH	2.5
0DH	103.1	4DH	29.7	8DH	8.6	CDH	2.5
0EH	101.1	4EH	29.1	8EH	8.4	CEH	2.4
0FH	99.2	4FH	28.6	8FH	8.2	CFH	2.4
10H	97.3	50H	28.0	90H	8.1	D0	2.3
11H	95.4	51H	27.5	91H	7.9	D1H	2.3
12H	93.6	52H	26.9	92H	7.8	D2H	2.2
13H	91.8	53H	26.4	93H	7.6	D3H	2.2
14H	90.0	54H	25.9	94H	7.5	D4H	2.1
15H	88.3	55H	25.4	95H	7.3	D5H	2.1
16H	86.6	56H	24.9	96H	7.2	D6H	2.1
17H	84.9	57H	24.4	97H	7.0	D7H	2.0
18H	83.3	58H	24.0	98H	6.9	D8H	2.0
19H	81.7	59H	23.5	99H	6.8	D9H	1.9
1AH	80.1	5AH	23.1	9AH	6.6	DAH	1.9
1BH	78.5	5BH	22.6	9BH	6.5	DBH	1.9
1CH	77.0	5CH	22.2	9CH	6.4	DCH	1.8
1DH	75.5	5DH	21.8	9DH	6.3	DDH	1.8
1EH	74.1	5EH	21.3	9EH	6.1	DEH	1.8
1FH	72.7	5FH	20.9	9FH	6.0	DFH	1.7
20H	71.3	60H	20.5	A0H	5.9	E0H	1.7
21H	69.9	61H	20.1	A1H	5.8	E1H	1.7
22H	68.5	62H	19.7	A2H	5.7	E2H	1.6
23H	67.2	63H	19.4	A3H	5.6	E3H	1.6
24H	65.9	64H	19.0	A4H	5.5	E4H	1.6
25H	64.7	65H	18.6	A5H	5.4	E5H	1.5
26H	63.4	66H	18.3	A6H	5.3	E6H	1.5
27H	62.2	67H	17.9	A7H	5.2	E7H	1.5
28H	61.0	68H	17.6	A8H	5.1	E8H	1.5
29H	59.8	69H	17.2	A9H	5.0	E9H	1.4
2AH	58.7	6AH	16.9	AAH	4.9	EAH	1.4
2BH	57.5	6BH	16.6	ABH	4.8	EBH	1.4
2CH	56.4	6CH	16.2	ACH	4.7	ECH	1.3
2DH	55.3	6DH	15.9	ADH	4.6	EDH	1.3
2EH	54.3	6EH	15.6	AEH	4.5	EEH	1.3
2FH	53.2	6FH	15.3	AFH	4.4	EFH	1.3
30H	52.2	70H	15.0	B0H	4.3	F0H	1.2
31H	51.2	71H	14.7	B1H	4.2	F1H	1.2
32H	50.2	72H	14.5	B2H	4.2	F2H	1.2
33H	49.2	73H	14.2	B3H	4.1	F3H	1.2
34H	48.3	74H	13.9	B4H	4.0	F4H	1.2
35H	47.4	75H	13.6	B5H	3.9	F5H	1.1
36H	46.5	76H	13.4	B6H	3.9	F6H	1.1
37H	45.6	77H	13.1	B7H	3.8	F7H	1.1
38H	44.7	78H	12.9	B8H	3.7	F8H	1.1
39H	43.8	79H	12.6	B9H	3.6	F9H	1.0
3AH	43.0	7AH	12.4	BAH	3.6	FAH	1.0
3BH	42.1	7BH	12.1	BBH	3.5	FBH	1.0
3CH	41.3	7CH	11.9	BCH	3.4	FCH	1.0
3DH	40.5	7DH	11.7	BDH	3.4	FDH	1.0
3EH	39.8	7EH	11.4	BEH	3.3	FEH	0.9
3FH	39.0	7FH	11.2	BFH	3.2	FFH	0.9

5-4-2. IRIS F Number Display (9-bit)

Fundamental equation $132.8 \times 0.175^{\frac{i}{0.325 \times 2^n}}$

n : Bit accuracy, i: data

n = 9

Data	F No.	Data	F No.	Data	F No.	Data	F No.
000H	132.8	040H	71.3	080H	38.2	0C0H	20.5
001H	131.5	041H	70.6	081H	37.9	0C1H	20.3
002H	130.2	042H	69.9	082H	37.5	0C2H	20.1
003H	129.0	043H	69.2	083H	37.1	0C3H	19.9
004H	127.7	044H	68.5	084H	36.8	0C4H	19.7
005H	126.5	045H	67.9	085H	36.4	0C5H	19.5
006H	125.3	046H	67.2	086H	36.1	0C6H	19.4
007H	124.1	047H	66.6	087H	35.7	0C7H	19.2
008H	122.9	048H	65.9	088H	35.4	0C8H	19.0
009H	121.7	049H	65.3	089H	35.0	0C9H	8.8
00AH	120.5	04AH	64.7	08AH	34.7	0CAH	18.6
00BH	119.3	04BH	64.0	08BH	34.4	0CBH	18.4
00CH	118.2	04CH	63.4	08CH	34.0	0CCH	18.3
00DH	117.0	04DH	62.8	08DH	33.7	0CDH	18.1
00EH	115.9	04EH	62.2	08EH	33.4	0CEH	17.9
00FH	114.8	04FH	61.6	08FH	33.0	0CFH	17.7
010H	113.7	050H	61.0	090H	32.7	0D0H	17.6
011H	112.6	051H	60.4	091H	32.4	0D1H	17.4
012H	111.5	052H	59.8	092H	32.1	0D2H	17.2
013H	110.4	053H	59.2	093H	31.8	0D3H	17.1
014H	109.3	054H	58.7	094H	31.5	0D4H	16.9
015H	108.3	055H	58.1	095H	31.2	0D5H	16.7
016H	107.2	056H	57.5	096H	30.9	0D6H	16.6
017H	106.2	057H	57.0	097H	30.6	0D7H	16.4
018H	105.2	058H	56.4	098H	30.3	0D8H	16.2
019H	104.1	059H	55.9	099H	30.0	0D9H	16.1
01AH	103.1	05AH	55.3	09AH	29.7	0DAH	15.9
01BH	102.1	05BH	54.8	09BH	29.4	0DBH	15.8
01CH	101.1	05CH	54.3	09CH	29.1	0DCH	15.6
01DH	100.2	05DH	53.7	09DH	28.8	0DDH	15.5
01EH	99.2	05EH	53.2	09EH	28.6	0DEH	15.3
01FH	98.2	05FH	52.7	09FH	28.3	0DFH	15.2
020H	97.3	060H	52.2	0A0H	28.0	0E0H	15.0
021H	96.3	061H	51.7	0A1H	27.7	0E1H	14.9
022H	95.4	062H	51.2	0A2H	27.5	0E2H	14.7
023H	94.5	063H	50.7	0A3H	27.2	0E3H	14.6
024H	93.6	064H	50.2	0A4H	26.9	0E4H	14.5
025H	92.7	065H	49.7	0A5H	26.7	0E5H	14.3
026H	91.8	066H	49.2	0A6H	26.4	0E6H	14.2
027H	90.9	067H	48.8	0A7H	26.2	0E7H	14.0
028H	90.0	068H	48.3	0A8H	25.9	0E8H	13.9
029H	89.1	069H	47.8	0A9H	25.7	0E9H	13.8
02AH	88.3	06AH	47.4	0AAH	25.4	0EAH	13.6
02BH	87.4	06BH	46.9	0ABH	25.2	0EBH	13.5
02CH	86.6	06CH	46.5	0ACH	24.9	0ECH	13.4
02DH	85.7	06DH	46.0	0ADH	24.7	0EDH	13.2
02EH	84.9	06EH	45.6	0AEH	24.4	0EEH	13.1
02FH	84.1	06FH	45.1	0AFH	24.2	0EFH	13.0
030H	83.3	070H	44.7	0B0H	24.0	0F0H	12.9
031H	82.5	071H	44.2	0B1H	23.7	0F1H	12.7
032H	81.7	072H	43.8	0B2H	23.5	0F2H	12.6
033H	80.9	073H	43.4	0B3H	23.3	0F3H	12.5
034H	80.1	074H	43.0	0B4H	23.1	0F4H	12.4
035H	79.3	075H	42.6	0B5H	22.8	0F5H	12.3
036H	78.5	076H	42.1	0B6H	22.6	0F6H	12.1
037H	77.8	077H	41.7	0B7H	22.4	0F7H	12.0
038H	77.0	078H	41.3	0B8H	22.2	0F8H	11.9
039H	76.3	079H	40.9	0B9H	22.0	0F9H	11.8
03AH	75.5	07AH	40.5	0BAH	21.8	0FAH	11.7
03BH	74.8	07BH	40.1	0BBH	21.5	0FBH	11.6
03CH	74.1	07CH	39.8	0BCH	21.3	0FCH	11.4
03DH	73.4	07DH	39.4	0BDH	21.1	0FDH	11.3
03EH	72.7	07EH	39.0	0BEH	20.9	0FEH	11.2
03FH	72.0	07FH	38.6	0BFH	20.7	0FFH	11.1

Data	F No.	Data	F No.	Data	F No.	Data	F No.
100H	11.0	140H	5.9	180H	3.2	1C0H	1.7
101H	10.9	141H	5.9	181H	3.1	1C1H	1.7
102H	10.8	142H	5.8	182H	3.1	1C2H	1.7
103H	10.7	143H	5.7	183H	3.1	1C3H	1.7
104H	10.6	144H	5.7	184H	3.0	1C4H	1.6
105H	10.5	145H	5.6	185H	3.0	1C5H	1.6
106H	10.4	146H	5.6	186H	3.0	1C6H	1.6
107H	10.3	147H	5.5	187H	3.0	1C7H	1.6
108H	10.2	148H	5.5	188H	2.9	1C8H	1.6
109H	10.1	149H	5.4	189H	2.9	1C9H	1.6
10AH	10.0	14AH	5.4	18AH	2.9	1CAH	1.5
10BH	9.9	14BH	5.3	18BH	2.8	1CBH	1.5
10CH	9.8	14CH	5.3	18CH	2.8	1CCH	1.5
10DH	9.7	14DH	5.2	18DH	2.8	1CDH	1.5
10EH	9.6	14EH	5.2	18EH	2.8	1CEH	1.5
10FH	9.5	14FH	5.1	18FH	2.7	1CFH	1.5
110H	9.4	150H	5.1	190H	2.7	1D0H	1.5
111H	9.3	151H	5.0	191H	2.7	1D1H	1.4
112H	9.2	152H	5.0	192H	2.7	1D2H	1.4
113H	9.2	153H	4.9	193H	2.6	1D3H	1.4
114H	9.1	154H	4.9	194H	2.6	1D4H	1.4
115H	9.0	155H	4.8	195H	2.6	1D5H	1.4
116H	8.9	156H	4.8	196H	2.6	1D6H	1.4
117H	8.8	157H	4.7	197H	2.5	1D7H	1.4
118H	8.7	158H	4.7	198H	2.5	1D8H	1.3
119H	8.6	159H	4.6	199H	2.5	1D9H	1.3
11AH	8.6	15AH	4.6	19AH	2.5	1DAH	1.3
11BH	8.5	15BH	4.5	19BH	2.4	1DBH	1.3
11CH	8.4	15CH	4.5	19CH	2.4	1DCH	1.3
11DH	8.3	15DH	4.5	19DH	2.4	1DDH	1.3
11EH	8.2	15EH	4.4	19EH	2.4	1DEH	1.3
11FH	8.1	15FH	4.4	19FH	2.3	1DFH	1.3
120H	8.1	160H	4.3	1A0H	2.3	1E0H	1.2
121H	8.0	161H	4.3	1A1H	2.3	1E1H	1.2
122H	7.9	162H	4.2	1A2H	2.3	1E2H	1.2
123H	7.8	163H	4.2	1A3H	2.3	1E3H	1.2
124H	7.8	164H	4.2	1A4H	2.2	1E4H	1.2
125H	7.7	165H	4.1	1A5H	2.2	1E5H	1.2
126H	7.6	166H	4.1	1A6H	2.2	1E6H	1.2
127H	7.5	167H	4.0	1A7H	2.2	1E7H	1.2
128H	7.5	168H	4.0	1A8H	2.1	1E8H	1.2
129H	7.4	169H	4.0	1A9H	2.1	1E9H	1.1
12AH	7.3	16AH	3.9	1AAH	2.1	1EAH	1.1
12BH	7.2	16BH	3.9	1ABH	2.1	1EBH	1.1
12CH	7.2	16CH	3.9	1ACH	2.1	1ECH	1.1
12DH	7.1	16DH	3.8	1ADH	2.0	1EDH	1.1
12EH	7.0	16EH	3.8	1AEH	2.0	1EEH	1.1
12FH	7.0	16FH	3.7	1AFH	2.0	1EFH	1.1
130H	6.9	170H	3.7	1B0H	2.0	1F0H	1.1
131H	6.8	171H	3.7	1B1H	2.0	1F1H	1.1
132H	6.8	172H	3.6	1B2H	1.9	1F2H	1.0
133H	6.7	173H	3.6	1B3H	1.9	1F3H	1.0
134H	6.6	174H	3.6	1B4H	1.9	1F4H	1.0
135H	6.6	175H	3.5	1B5H	1.9	1F5H	1.0
136H	6.5	176H	3.5	1B6H	1.9	1F6H	1.0
137H	6.4	177H	3.5	1B7H	1.9	1F7H	1.0
138H	6.4	178H	3.4	1B8H	1.8	1F8H	1.0
139H	6.3	179H	3.4	1B9H	1.8	1F9H	1.0
13AH	6.3	17AH	3.4	1BAH	1.8	1FAH	1.0
13BH	6.2	17BH	3.3	1BBH	1.8	1FBH	1.0
13CH	6.1	17CH	3.3	1BCH	1.8	1FCH	0.9
13DH	6.1	17DH	3.3	1BDH	1.8	1FDH	0.9
13EH	6.0	17EH	3.2	1BEH	1.7	1FEH	0.9
13FH	6.0	17FH	3.2	1BFH	1.7	1FFH	0.9

5-4-3. IRIS F Number Display (n-bit)

Fundamental equation $132.8 \times 0.175^{\frac{i}{0.325 \times 2^n}}$

n : Bit accuracy, i: data

n = 10

Data	F No.	Data	F No.	Data	F No.	Data	F No.
000H	132.8	040H	97.3	080H	71.3	0C0H	52.2
001H	132.2	041H	96.8	081H	70.9	0C1H	51.9
002H	131.5	042H	96.3	082H	70.6	0C2H	51.7
003H	130.9	043H	95.9	083H	70.2	0C3H	51.4
004H	130.2	044H	95.4	084H	69.9	0C4H	51.2
005H	129.6	045H	94.9	085H	69.5	0C5H	50.9
006H	129.0	046H	94.5	086H	69.2	0C6H	50.7
007H	128.4	047H	94.0	087H	68.9	0C7H	50.5
008H	127.7	048H	93.6	088H	68.5	0C8H	50.2
009H	127.1	049H	93.1	089H	68.2	0C9H	50.0
00AH	126.5	04AH	92.7	08AH	67.9	0CAH	49.7
00BH	125.9	04BH	92.2	08BH	67.5	0CBH	49.5
00CH	125.3	04CH	91.8	08CH	67.2	0CCH	49.2
00DH	124.7	04DH	91.3	08DH	66.9	0CDH	49.0
00EH	124.1	04EH	90.9	08EH	66.6	0CEH	48.8
00FH	123.5	04FH	90.4	08FH	66.2	0CFH	48.5
010H	122.9	050H	90.0	090H	65.9	0D0H	48.3
011H	122.3	051H	89.6	091H	65.6	0D1H	48.1
012H	121.7	052H	89.1	092H	65.3	0D2H	47.8
013H	121.1	053H	88.7	093H	65.0	0D3H	47.6
014H	120.5	054H	88.3	094H	64.7	0D4H	47.4
015H	119.9	055H	87.8	095H	64.3	0D5H	47.1
016H	119.3	056H	87.4	096H	64.0	0D6H	46.9
017H	118.7	057H	87.0	097H	63.7	0D7H	46.7
018H	118.2	058H	86.6	098H	63.4	0D8H	46.5
019H	117.6	059H	86.1	099H	63.1	0D9H	46.2
01AH	117.0	05AH	85.7	09AH	62.8	0DAH	46.0
01BH	116.5	05BH	85.3	09BH	62.5	0DBH	45.8
01CH	115.9	05CH	84.9	09CH	62.2	0DCH	45.6
01DH	115.3	05DH	84.5	09DH	61.9	0DDH	45.3
01EH	114.8	05EH	84.1	09EH	61.6	0DEH	45.1
01FH	114.2	05FH	83.7	09FH	61.3	0DFH	44.9
020H	113.7	060H	83.3	0A0H	61.0	0E0H	44.7
021H	113.1	061H	82.9	0A1H	60.7	0E1H	44.5
022H	112.6	062H	82.5	0A2H	60.4	0E2H	44.2
023H	112.0	063H	82.1	0A3H	60.1	0E3H	44.0
024H	111.5	064H	81.7	0A4H	59.8	0E4H	43.8
025H	110.9	065H	81.3	0A5H	59.5	0E5H	43.6
026H	110.4	066H	80.9	0A6H	59.2	0E6H	43.4
027H	109.9	067H	80.5	0A7H	59.0	0E7H	43.2
028H	109.3	068H	80.1	0A8H	58.7	0E8H	43.0
029H	108.8	069H	79.7	0A9H	58.4	0E9H	42.8
02AH	108.3	06AH	79.3	0AAH	58.1	0EAH	42.6
02BH	107.7	06BH	78.9	0ABH	57.8	0EBH	42.4
02CH	107.2	06CH	78.5	0ACH	57.5	0ECH	42.1
02DH	106.7	06DH	78.2	0ADH	57.3	0EDH	41.9
02EH	106.2	06EH	77.8	0AEH	57.0	0EEH	41.7
02FH	105.7	06FH	77.4	0AFH	56.7	0EFH	41.5
030H	105.2	070H	77.0	0B0H	56.4	0F0H	41.3
031H	104.6	071H	76.7	0B1H	56.2	0F1H	41.1
032H	104.1	072H	76.3	0B2H	55.9	0F2H	40.9
033H	103.6	073H	75.9	0B3H	55.6	0F3H	40.7
034H	103.1	074H	75.5	0B4H	55.3	0F4H	40.5
035H	102.6	075H	75.2	0B5H	55.1	0F5H	40.3
036H	102.1	076H	74.8	0B6H	54.8	0F6H	40.1
037H	101.6	077H	74.4	0B7H	54.5	0F7H	40.0
038H	101.1	078H	74.1	0B8H	54.3	0F8H	39.8
039H	100.6	079H	73.7	0B9H	54.0	0F9H	39.6
03AH	100.2	07AH	73.4	0BAH	53.7	0FAH	39.4
03BH	99.7	07BH	73.0	0BBH	53.5	0FBH	39.2
03CH	99.2	07CH	72.7	0BCH	53.2	0FCH	39.0
03DH	98.7	07DH	72.3	0BDH	53.0	0FDH	38.8
03EH	98.2	07EH	72.0	0BEH	52.7	0FEH	38.6
03FH	97.8	07FH	71.6	0BFH	52.5	0FFH	38.4

Data	F No.	Data	F No.	Data	F No.	Data	F No.
100H	38.2	140H	28.0	180H	20.5	1C0H	15.0
101H	38.1	141H	27.9	181H	20.4	1C1H	15.0
102H	37.9	142H	27.7	182H	20.3	1C2H	14.9
103H	37.7	143H	27.6	183H	20.2	1C3H	14.8
104H	37.5	144H	27.5	184H	20.1	1C4H	14.7
105H	37.3	145H	27.3	185H	20.0	1C5H	14.7
106H	37.1	146H	27.2	186H	19.9	1C6H	14.6
107H	37.0	147H	27.1	187H	19.8	1C7H	14.5
108H	36.8	148H	26.9	188H	19.7	1C8H	14.5
109H	36.6	149H	26.8	189H	19.6	1C9H	14.4
10AH	36.4	14AH	26.7	18AH	19.5	1CAH	14.3
10BH	36.2	14BH	26.6	18BH	19.5	1CBH	14.2
10CH	36.1	14CH	26.4	18CH	19.4	1CCH	14.2
10DH	35.9	14DH	26.3	18DH	19.3	1CDH	14.1
10EH	35.7	14EH	26.2	18EH	19.2	1CEH	14.0
10FH	35.5	14FH	26.0	18FH	19.1	1CFH	14.0
110H	35.4	150H	25.9	190H	19.0	1D0H	13.9
111H	35.2	151H	25.8	191H	18.9	1D1H	13.8
112H	35.0	152H	25.7	192H	18.8	1D2H	13.8
113H	34.9	153H	25.5	193H	18.7	1D3H	13.7
114H	34.7	154H	25.4	194H	18.6	1D4H	13.6
115H	34.5	155H	25.3	195H	18.5	1D5H	13.6
116H	34.4	156H	25.2	196H	18.4	1D6H	13.5
117H	34.2	157H	25.0	197H	18.3	1D7H	13.4
118H	34.0	158H	24.9	198H	18.3	1D8H	13.4
119H	33.9	159H	24.8	199H	18.2	1D9H	13.3
11AH	33.7	15AH	24.7	19AH	18.1	1DAH	13.2
11BH	33.5	15BH	24.6	19BH	18.0	1DBH	13.2
11CH	33.4	15CH	24.4	19CH	17.9	1DCH	13.1
11DH	33.2	15DH	24.3	19DH	17.8	1DDH	13.1
11EH	33.0	15EH	24.2	19EH	17.7	1DEH	13.0
11FH	32.9	15FH	24.1	19FH	17.6	1DFH	12.9
120H	32.7	160H	24.0	1A0H	17.6	1E0H	12.9
121H	32.6	161H	23.9	1A1H	17.5	1E1H	12.8
122H	32.4	162H	23.7	1A2H	17.4	1E2H	12.7
123H	32.3	163H	23.6	1A3H	17.3	1E3H	12.7
124H	32.1	164H	23.5	1A4H	17.2	1E4H	12.6
125H	31.9	165H	23.4	1A5H	17.1	1E5H	12.6
126H	31.8	166H	23.3	1A6H	17.1	1E6H	12.5
127H	31.6	167H	23.2	1A7H	17.0	1E7H	12.4
128H	31.5	168H	23.1	1A8H	16.9	1E8H	12.4
129H	31.3	169H	22.9	1A9H	16.8	1E9H	12.3
12AH	31.2	16AH	22.8	1AAH	16.7	1EAH	12.3
12BH	31.0	16BH	22.7	1ABH	16.6	1EBH	12.2
12CH	30.9	16CH	22.6	1ACH	16.6	1ECH	12.1
12DH	30.7	16DH	22.5	1ADH	16.5	1EDH	12.1
12EH	30.6	16EH	22.4	1AEH	16.4	1EEH	12.0
12FH	30.4	16FH	22.3	1AFH	16.3	1EFH	12.0
130H	30.3	170H	22.2	1B0H	16.2	1F0H	11.9
131H	30.1	171H	22.1	1B1H	16.2	1F1H	11.8
132H	30.0	172H	22.0	1B2H	16.1	1F2H	11.8
133H	29.8	173H	21.9	1B3H	16.0	1F3H	11.7
134H	29.7	174H	21.8	1B4H	15.9	1F4H	11.7
135H	29.6	175H	21.6	1B5H	15.9	1F5H	11.6
136H	29.4	176H	21.5	1B6H	15.8	1F6H	11.6
137H	29.3	177H	21.4	1B7H	15.7	1F7H	11.5
138H	29.1	178H	21.3	1B8H	15.6	1F8H	11.4
139H	29.0	179H	21.2	1B9H	15.6	1F9H	11.4
13AH	28.8	17AH	21.1	1BAH	15.5	1FAH	11.3
13BH	28.7	17BH	21.0	1BBH	15.4	1FBH	11.3
13CH	28.6	17CH	20.9	1BCH	15.3	1FCH	11.2
13DH	28.4	17DH	20.8	1BDH	15.3	1FDH	11.2
13EH	28.3	17EH	20.7	1BEH	15.2	1FEH	11.1
13FH	28.1	17FH	20.6	1BFH	15.1	1FFH	11.1

Data	F No.	Data	F No.	Data	F No.	Data	F No.
200H	11.0	240H	8.1	280H	5.9	2C0H	4.3
201H	11.0	241H	8.0	281H	5.9	2C1H	4.3
202H	10.9	242H	8.0	282H	5.9	2C2H	4.3
203H	10.9	243H	7.9	283H	5.8	2C3H	4.3
204H	10.8	244H	7.9	284H	5.8	2C4H	4.2
205H	10.7	245H	7.9	285H	5.8	2C5H	4.2
206H	10.7	246H	7.8	286H	5.7	2C6H	4.2
207H	10.6	247H	7.8	287H	5.7	2C7H	4.2
208H	10.6	248H	7.8	288H	5.7	2C8H	4.2
209H	10.5	249H	7.7	289H	5.7	2C9H	4.1
20AH	10.5	24AH	7.7	28AH	5.6	2CAH	4.1
20BH	10.4	24BH	7.6	28BH	5.6	2CBH	4.1
20CH	10.4	24CH	7.6	28CH	5.6	2CCH	4.1
20DH	10.3	24DH	7.6	28DH	5.5	2CDH	4.1
20EH	10.3	24EH	7.5	28EH	5.5	2CEH	4.0
20FH	10.2	24FH	7.5	28FH	5.5	2CFH	4.0
210H	10.2	250H	7.5	290H	5.5	2D0H	4.0
211H	10.1	251H	7.4	291H	5.4	2D1H	4.0
212H	10.1	252H	7.4	292H	5.4	2D2H	4.0
213H	10.0	253H	7.4	293H	5.4	2D3H	3.9
214H	10.0	254H	7.3	294H	5.4	2D4H	3.9
215H	9.9	255H	7.3	295H	5.3	2D5H	3.9
216H	9.9	256H	7.2	296H	5.3	2D6H	3.9
217H	9.8	257H	7.2	297H	5.3	2D7H	3.9
218H	9.8	258H	7.2	298H	5.3	2D8H	3.9
219H	9.8	259H	7.1	299H	5.2	2D9H	3.8
21AH	9.7	25AH	7.1	29AH	5.2	2DAH	3.8
21BH	9.7	25BH	7.1	29BH	5.2	2DBH	3.8
21CH	9.6	25CH	7.0	29CH	5.2	2DCH	3.8
21DH	9.6	25DH	7.0	29DH	5.1	2DDH	3.8
21EH	9.5	25EH	7.0	29EH	5.1	2DEH	3.7
21FH	9.5	25FH	6.9	29FH	5.1	2DFH	3.7
220H	9.4	260H	6.9	2A0H	5.1	2E0H	3.7
221H	9.4	261H	6.9	2A1H	5.0	2E1H	3.7
222H	9.3	262H	6.8	2A2H	5.0	2E2H	3.7
223H	9.3	263H	6.8	2A3H	5.0	2E3H	3.7
224H	9.2	264H	6.8	2A4H	5.0	2E4H	3.6
225H	9.2	265H	6.7	2A5H	4.9	2E5H	3.6
226H	9.2	266H	6.7	2A6H	4.9	2E6H	3.6
227H	9.1	267H	6.7	2A7H	4.9	2E7H	3.6
228H	9.1	268H	6.6	2A8H	4.9	2E8H	3.6
229H	9.0	269H	6.6	2A9H	4.8	2E9H	3.5
22AH	9.0	26AH	6.6	2AAH	4.8	2EAH	3.5
22BH	8.9	26BH	6.5	2ABH	4.8	2EBH	3.5
22CH	8.9	26CH	6.5	2ACH	4.8	2ECH	3.5
22DH	8.8	26DH	6.5	2ADH	4.7	2EDH	3.5
22EH	8.8	26EH	6.4	2AEH	4.7	2EEH	3.5
22FH	8.8	26FH	6.4	2AFH	4.7	2EFH	3.4
230H	8.7	270H	6.4	2B0H	4.7	2F0H	3.4
231H	8.7	271H	6.4	2B1H	4.7	2F1H	3.4
232H	8.6	272H	6.3	2B2H	4.6	2F2H	3.4
233H	8.6	273H	6.3	2B3H	4.6	2F3H	3.4
234H	8.6	274H	6.3	2B4H	4.6	2F4H	3.4
235H	8.5	275H	6.2	2B5H	4.6	2F5H	3.3
236H	8.5	276H	6.2	2B6H	4.5	2F6H	3.3
237H	8.4	277H	6.2	2B7H	4.5	2F7H	3.3
238H	8.4	278H	6.1	2B8H	4.5	2F8H	3.3
239H	8.3	279H	6.1	2B9H	4.5	2F9H	3.3
23AH	8.3	27AH	6.1	2BAH	4.5	2FAH	3.3
23BH	8.3	27BH	6.1	2BBH	4.4	2FBH	3.2
23CH	8.2	27CH	6.0	2BCH	4.4	2FCH	3.2
23DH	8.2	27DH	6.0	2BDH	4.4	2FDH	3.2
23EH	8.1	27EH	6.0	2BEH	4.4	2FEH	3.2
23FH	8.1	27FH	5.9	2BFH	4.3	2FFH	3.2

Data	F No.	Data	F No.	Data	F No.	Data	F No.
200H	3.2	240H	2.3	280H	1.7	2C0H	1.2
201H	3.2	241H	2.3	281H	1.7	2C1H	1.2
202H	3.1	242H	2.3	282H	1.7	2C2H	1.2
203H	3.1	243H	2.3	283H	1.7	2C3H	1.2
204H	3.1	244H	2.3	284H	1.7	2C4H	1.2
205H	3.1	245H	2.3	285H	1.7	2C5H	1.2
206H	3.1	246H	2.3	286H	1.7	2C6H	1.2
207H	3.1	247H	2.2	287H	1.6	2C7H	1.2
208H	3.0	248H	2.2	288H	1.6	2C8H	1.2
209H	3.0	249H	2.2	289H	1.6	2C9H	1.2
20AH	3.0	24AH	2.2	28AH	1.6	2CAH	1.2
20BH	3.0	24BH	2.2	28BH	1.6	2CBH	1.2
20CH	3.0	24CH	2.2	28CH	1.6	2CCH	1.2
20DH	3.0	24DH	2.2	28DH	1.6	2CDH	1.2
20EH	3.0	24EH	2.2	28EH	1.6	2CEH	1.2
20FH	2.9	24FH	2.2	28FH	1.6	2CFH	1.2
210H	2.9	250H	2.1	290H	1.6	2D0H	1.2
211H	2.9	251H	2.1	291H	1.6	2D1H	1.1
212H	2.9	252H	2.1	292H	1.6	2D2H	1.1
213H	2.9	253H	2.1	293H	1.6	2D3H	1.1
214H	2.9	254H	2.1	294H	1.5	2D4H	1.1
215H	2.9	255H	2.1	295H	1.5	2D5H	1.1
216H	2.8	256H	2.1	296H	1.5	2D6H	1.1
217H	2.8	257H	2.1	297H	1.5	2D7H	1.1
218H	2.8	258H	2.1	298H	1.5	2D8H	1.1
219H	2.8	259H	2.1	299H	1.5	2D9H	1.1
21AH	2.8	25AH	2.0	29AH	1.5	2DAH	1.1
21BH	2.8	25BH	2.0	29BH	1.5	2DBH	1.1
21CH	2.8	25CH	2.0	29CH	1.5	2DCH	1.1
21DH	2.8	25DH	2.0	29DH	1.5	2DDH	1.1
21EH	2.7	25EH	2.0	29EH	1.5	2DEH	1.1
21FH	2.7	25FH	2.0	29FH	1.5	2DFH	1.1
220H	2.7	260H	2.0	2A0H	1.5	2E0H	1.1
221H	2.7	261H	2.0	2A1H	1.4	2E1H	1.1
222H	2.7	262H	2.0	2A2H	1.4	2E2H	1.1
223H	2.7	263H	2.0	2A3H	1.4	2E3H	1.1
224H	2.7	264H	1.9	2A4H	1.4	2E4H	1.0
225H	2.6	265H	1.9	2A5H	1.4	2E5H	1.0
226H	2.6	266H	1.9	2A6H	1.4	2E6H	1.0
227H	2.6	267H	1.9	2A7H	1.4	2E7H	1.0
228H	2.6	268H	1.9	2A8H	1.4	2E8H	1.0
229H	2.6	269H	1.9	2A9H	1.4	2E9H	1.0
22AH	2.6	26AH	1.9	2AAH	1.4	2EAH	1.0
22BH	2.6	26BH	1.9	2ABH	1.4	2EBH	1.0
22CH	2.6	26CH	1.9	2ACH	1.4	2ECH	1.0
22DH	2.5	26DH	1.9	2ADH	1.4	2EDH	1.0
22EH	2.5	26EH	1.9	2AEH	1.4	2EEH	1.0
22FH	2.5	26FH	1.8	2AFH	1.4	2EFH	1.0
230H	2.5	270H	1.8	2B0H	1.3	2F0H	1.0
231H	2.5	271H	1.8	2B1H	1.3	2F1H	1.0
232H	2.5	272H	1.8	2B2H	1.3	2F2H	1.0
233H	2.5	273H	1.8	2B3H	1.3	2F3H	1.0
234H	2.5	274H	1.8	2B4H	1.3	2F4H	1.0
235H	2.5	275H	1.8	2B5H	1.3	2F5H	1.0
236H	2.4	276H	1.8	2B6H	1.3	2F6H	1.0
237H	2.4	277H	1.8	2B7H	1.3	2F7H	1.0
238H	2.4	278H	1.8	2B8H	1.3	2F8H	0.9
239H	2.4	279H	1.8	2B9H	1.3	2F9H	0.9
23AH	2.4	27AH	1.8	2BAH	1.3	2FAH	0.9
23BH	2.4	27BH	1.7	2BBH	1.3	2FBH	0.9
23CH	2.4	27CH	1.7	2BCH	1.3	2FCH	0.9
23DH	2.4	27DH	1.7	2BDH	1.3	2FDH	0.9
23EH	2.3	27EH	1.7	2BEH	1.3	2FEH	0.9
23FH	2.3	27FH	1.7	2BFH	1.3	2FFH	0.9

5-5. ECS Frequency Display Data Table

5-5-1. For NTSC

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
000H	30.0	040H	34.2	080H	39.7	0C0H	47.4
001H	–	041H	34.2	081H	39.8	0C1H	47.5
002H	–	042H	34.3	082H	39.9	0C2H	47.6
003H	–	043H	34.4	083H	40.0	0C3H	47.8
004H	–	044H	34.5	084H	40.1	0C4H	47.9
005H	–	045H	34.5	085H	40.2	0C5H	48.1
006H	–	046H	34.6	086H	40.3	0C6H	48.2
007H	30.4	047H	34.7	087H	40.4	0C7H	48.4
008H	30.4	048H	34.8	088H	40.5	0C8H	48.5
009H	30.5	049H	34.8	089H	40.6	0C9H	48.7
00AH	30.6	04AH	34.9	08AH	40.7	0CAH	48.8
00BH	30.6	04BH	35.0	08BH	40.8	0CBH	49.0
00CH	30.7	04CH	35.1	08CH	40.9	0CCH	49.1
00DH	30.7	04DH	35.2	08DH	41.0	0CDH	49.3
00EH	30.8	04EH	35.2	08EH	41.2	0CEH	49.4
00FH	30.9	04FH	35.3	08FH	41.3	0CFH	49.6
010H	30.9	050H	35.4	090H	41.4	0D0H	49.8
011H	31.0	051H	35.5	091H	41.5	0D1H	49.9
012H	31.1	052H	35.6	092H	41.6	0D2H	50.1
013H	31.1	053H	35.6	093H	41.7	0D3H	50.2
014H	31.2	054H	35.7	094H	41.8	0D4H	50.4
015H	31.2	055H	35.8	095H	41.9	0D5H	50.6
016H	31.3	056H	35.9	096H	42.0	0D6H	50.7
017H	31.4	057H	36.0	097H	42.1	0D7H	50.9
018H	31.4	058H	36.0	098H	42.3	0D8H	51.1
019H	31.5	059H	36.1	099H	42.4	0D9H	51.2
01AH	31.6	05AH	36.2	09AH	42.5	0DAH	51.4
01BH	31.6	05BH	36.3	09BH	42.6	0DBH	51.6
01CH	31.7	05CH	36.4	09CH	42.7	0DCH	51.7
01DH	31.7	05DH	36.5	09DH	42.8	0DDH	51.9
01EH	31.8	05EH	36.6	09EH	43.0	0DEH	52.1
01FH	31.9	05FH	36.6	09FH	43.1	0DFH	52.2
020H	31.9	060H	36.7	0A0H	43.2	0E0H	52.4
021H	32.0	061H	36.8	0A1H	43.3	0E1H	52.6
022H	32.1	062H	36.9	0A2H	43.4	0E2H	52.8
023H	32.1	063H	37.0	0A3H	43.5	0E3H	52.9
024H	32.2	064H	37.1	0A4H	43.7	0E4H	53.1
025H	32.3	065H	37.2	0A5H	43.8	0E5H	53.3
026H	32.3	066H	37.2	0A6H	43.9	0E6H	53.5
027H	32.4	067H	37.3	0A7H	44.0	0E7H	53.7
028H	32.5	068H	37.4	0A8H	44.2	0E8H	53.9
029H	32.5	069H	37.5	0A9H	44.3	0E9H	54.0
02AH	32.6	06AH	37.6	0AAH	44.4	0EAH	54.2
02BH	32.7	06BH	37.7	0ABH	44.5	0EBH	54.4
02CH	32.7	06CH	37.8	0ACH	44.7	0ECH	54.6
02DH	32.8	06DH	37.9	0ADH	44.8	0EDH	54.8
02EH	32.9	06EH	38.0	0AEH	44.9	0EEH	55.0
02FH	32.9	06FH	38.1	0AFH	45.0	0EFH	55.2
030H	33.0	070H	38.2	0B0H	45.2	0F0H	55.4
031H	33.1	071H	38.2	0B1H	45.3	0F1H	55.6
032H	33.2	072H	38.3	0B2H	45.4	0F2H	55.8
033H	33.2	073H	38.4	0B3H	45.6	0F3H	56.0
034H	33.3	074H	38.5	0B4H	45.7	0F4H	56.2
035H	33.4	075H	38.6	0B5H	45.8	0F5H	56.4
036H	33.4	076H	38.7	0B6H	46.0	0F6H	56.6
037H	33.5	077H	38.8	0B7H	46.1	0F7H	56.8
038H	33.6	078H	38.9	0B8H	46.2	0F8H	57.0
039H	33.7	079H	39.0	0B9H	46.4	0F9H	57.2
03AH	33.7	07AH	39.1	0BAH	46.5	0FAH	57.4
03BH	33.8	07BH	39.2	0BBH	46.7	0FBH	57.6
03CH	33.9	07CH	39.3	0BCH	46.8	0FCH	57.8
03DH	33.9	07DH	39.4	0BDH	46.9	0FDH	58.0
03EH	34.0	07EH	39.5	0BEH	47.1	0FEH	58.3
03FH	34.1	07FH	39.6	0BFH	47.2	0FFH	–

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
100H	–	140H	–	180H	–	1C0H	–
101H	–	141H	–	181H	–	1C1H	–
102H	–	142H	–	182H	–	1C2H	–
103H	–	143H	–	183H	–	1C3H	–
104H	–	144H	–	184H	–	1C4H	–
105H	–	145H	–	185H	–	1C5H	–
106H	–	146H	–	186H	–	1C6H	–
107H	–	147H	–	187H	–	1C7H	–
108H	–	148H	–	188H	–	1C8H	–
109H	–	149H	–	189H	–	1C9H	–
10AH	–	14AH	–	18AH	–	1CAH	–
10BH	–	14BH	–	18BH	–	1CBH	–
10CH	–	14CH	–	18CH	–	1CCH	–
10DH	–	14DH	–	18DH	–	1CDH	–
10EH	–	14EH	–	18EH	–	1CEH	–
10FH	–	14FH	–	18FH	–	1CFH	–
110H	–	150H	–	190H	–	1D0H	–
111H	–	151H	–	191H	–	1D1H	–
112H	–	152H	–	192H	–	1D2H	–
113H	–	153H	–	193H	–	1D3H	–
114H	–	154H	–	194H	–	1D4H	–
115H	–	155H	–	195H	–	1D5H	–
116H	–	156H	–	196H	–	1D6H	–
117H	–	157H	–	197H	–	1D7H	–
118H	–	158H	–	198H	–	1D8H	–
119H	–	159H	–	199H	–	1D9H	–
11AH	–	15AH	–	19AH	–	1DAH	–
11BH	–	15BH	–	19BH	–	1DBH	–
11CH	–	15CH	–	19CH	–	1DCH	–
11DH	–	15DH	–	19DH	–	1DDH	–
11EH	–	15EH	–	19EH	–	1DEH	–
11FH	–	15FH	–	19FH	–	1DFH	–
120H	–	160H	–	1A0H	–	1E0H	–
121H	–	161H	–	1A1H	–	1E1H	–
122H	–	162H	–	1A2H	–	1E2H	–
123H	–	163H	–	1A3H	–	1E3H	–
124H	–	164H	–	1A4H	–	1E4H	–
125H	–	165H	–	1A5H	–	1E5H	–
126H	–	166H	–	1A6H	–	1E6H	–
127H	–	167H	–	1A7H	–	1E7H	–
128H	–	168H	–	1A8H	–	1E8H	–
129H	–	169H	–	1A9H	–	1E9H	–
12AH	–	16AH	–	1AAH	–	1EAH	–
12BH	–	16BH	–	1ABH	–	1EBH	–
12CH	–	16CH	–	1ACH	–	1ECH	–
12DH	–	16DH	–	1ADH	–	1EDH	–
12EH	–	16EH	–	1AEH	–	1EEH	–
12FH	–	16FH	–	1AFH	–	1EFH	–
130H	–	170H	–	1B0H	–	1F0H	–
131H	–	171H	–	1B1H	–	1F1H	–
132H	–	172H	–	1B2H	–	1F2H	–
133H	–	173H	–	1B3H	–	1F3H	–
134H	–	174H	–	1B4H	–	1F4H	–
135H	–	175H	–	1B5H	–	1F5H	–
136H	–	176H	–	1B6H	–	1F6H	–
137H	–	177H	–	1B7H	–	1F7H	–
138H	–	178H	–	1B8H	–	1F8H	–
139H	–	179H	–	1B9H	–	1F9H	–
13AH	–	17AH	–	1BAH	–	1FAH	–
13BH	–	17BH	–	1BBH	–	1FBH	–
13CH	–	17CH	–	1BCH	–	1FCH	–
13DH	–	17DH	–	1BDH	–	1FDH	–
13EH	–	17EH	–	1BEH	–	1FEH	–
13FH	–	17FH	–	1BFH	–	1FFH	60.0

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
200H	60.1	240H	79.7	280H	118.0	2C0H	227.0
201H	60.4	241H	80.1	281H	119.0	2C1H	230.0
202H	60.6	242H	80.5	282H	120.0	2C2H	234.0
203H	60.8	243H	80.9	283H	121.0	2C3H	237.0
204H	61.1	244H	81.3	284H	122.0	2C4H	241.0
205H	61.3	245H	81.7	285H	123.0	2C5H	244.0
206H	61.6	246H	82.2	286H	124.0	2C6H	250.0
207H	61.8	247H	82.6	287H	125.0	2C7H	252.0
208H	62.1	248H	83.0	288H	126.0	2C8H	256.0
209H	62.3	249H	83.5	289H	127.0	2C9H	261.0
20AH	62.5	24AH	83.9	28AH	128.0	2CAH	265.0
20BH	62.8	24BH	84.4	28BH	129.0	2CBH	270.0
20CH	63.0	24CH	84.8	28CH	130.0	2CCH	274.0
20DH	63.3	24DH	85.3	28DH	131.0	2CDH	279.0
20EH	63.6	24EH	85.8	28EH	132.0	2CEH	284.0
20FH	63.8	24FH	86.2	28FH	133.0	2CFH	289.0
210H	64.1	250H	86.7	290H	134.0	2D0H	295.0
211H	64.3	251H	87.2	291H	135.0	2D1H	300.0
212H	64.6	252H	87.7	292H	136.0	2D2H	306.0
213H	64.9	253H	88.2	293H	138.0	2D3H	312.0
214H	65.1	254H	88.7	294H	139.0	2D4H	319.0
215H	65.4	255H	89.2	295H	140.0	2D5H	325.0
216H	65.7	256H	89.7	296H	141.0	2D6H	332.0
217H	66.0	257H	90.2	297H	143.0	2D7H	339.0
218H	66.2	258H	90.7	298H	144.0	2D8H	347.0
219H	66.5	259H	91.2	299H	145.0	2D9H	355.0
21AH	66.8	25AH	91.8	29AH	147.0	2DAH	363.0
21BH	67.1	25BH	92.3	29BH	148.0	2DBH	371.0
21CH	67.4	25CH	92.9	29CH	149.0	2DCH	380.0
21DH	67.7	25DH	93.4	29DH	151.0	2DDH	390.0
21EH	68.0	25EH	94.0	29EH	152.0	2DEH	400.0
21FH	68.3	25FH	94.5	29FH	154.0	2DFH	410.0
220H	68.5	260H	95.1	2A0H	155.0	2E0H	421.0
221H	68.8	261H	95.7	2A1H	157.0	2E1H	433.0
222H	69.2	262H	96.3	2A2H	158.0	2E2H	445.0
223H	69.5	263H	96.9	2A3H	160.0	2E3H	458.0
224H	69.8	264H	97.5	2A4H	162.0	2E4H	472.0
225H	70.1	265H	98.1	2A5H	163.0	2E5H	486.0
226H	70.4	266H	98.7	2A6H	165.0	2E6H	500.0
227H	70.7	267H	99.3	2A7H	167.0	2E7H	520.0
228H	71.0	268H	100.0	2A8H	169.0	2E8H	540.0
229H	71.3	269H	101.0	2A9H	170.0	2E9H	550.0
22AH	71.7	26AH	101.0	2AAH	172.0	2EAH	570.0
22BH	72.0	26BH	102.0	2ABH	174.0	2EBH	600.0
22CH	72.3	26CH	103.0	2ACH	176.0	2ECH	620.0
22DH	72.7	26DH	103.0	2ADH	178.0	2EDH	650.0
22EH	73.0	26EH	104.0	2AEH	180.0	2EEH	670.0
22FH	73.3	26FH	105.0	2AFH	182.0	2EFH	700.0
230H	73.7	270H	105.0	2B0H	184.0	2F0H	740.0
231H	74.0	271H	106.0	2B1H	187.0	2F1H	770.0
232H	74.4	272H	107.0	2B2H	189.0	2F2H	810.0
233H	74.7	273H	107.0	2B3H	191.0	2F3H	860.0
234H	75.1	274H	108.0	2B4H	193.0	2F4H	910.0
235H	75.5	275H	109.0	2B5H	196.0	2F5H	960.0
236H	75.8	276H	110.0	2B6H	198.0	2F6H	1000.0
237H	76.2	277H	111.0	2B7H	201.0	2F7H	1100.0
238H	76.6	278H	111.0	2B8H	203.0	2F8H	1200.0
239H	76.9	279H	112.0	2B9H	206.0	2F9H	1300.0
23AH	77.3	27AH	113.0	2BAH	209.0	2FAH	1400.0
23BH	77.7	27BH	114.0	2BBH	212.0	2FBH	1500.0
23CH	78.1	27CH	115.0	2BCH	214.0	2FCH	1700.0
23DH	78.5	27DH	115.0	2BDH	217.0	2FDH	2000.0
23EH	78.9	27EH	116.0	2BEH	220.0	2FEH	2100.0
23FH	79.3	27FH	117.0	2BFH	224.0	2FFH	2500.0

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
300H	3000.0	340H	–	380H	–	3C0H	–
301H	4000.0	341H	–	381H	–	3C1H	–
302H	5000.0	342H	–	382H	–	3C2H	–
303H	7000.0	343H	–	383H	–	3C3H	–
304H	–	344H	–	384H	–	3C4H	–
305H	–	345H	–	385H	–	3C5H	–
306H	–	346H	–	386H	–	3C6H	–
307H	–	347H	–	387H	–	3C7H	–
308H	–	348H	–	388H	–	3C8H	–
309H	–	349H	–	389H	–	3C9H	–
30AH	–	34AH	–	38AH	–	3CAH	–
30BH	–	34BH	–	38BH	–	3CBH	–
30CH	–	34CH	–	38CH	–	3CCH	–
30DH	–	34DH	–	38DH	–	3CDH	–
30EH	–	34EH	–	38EH	–	3CEH	–
30FH	–	34FH	–	38FH	–	3CFH	–
310H	–	350H	–	390H	–	3D0H	–
311H	–	351H	–	391H	–	3D1H	–
312H	–	352H	–	392H	–	3D2H	–
313H	–	353H	–	393H	–	3D3H	–
314H	–	354H	–	394H	–	3D4H	–
315H	–	355H	–	395H	–	3D5H	–
316H	–	356H	–	396H	–	3D6H	–
317H	–	357H	–	397H	–	3D7H	–
318H	–	358H	–	398H	–	3D8H	–
319H	–	359H	–	399H	–	3D9H	–
31AH	–	35AH	–	39AH	–	3DAH	–
31BH	–	35BH	–	39BH	–	3DBH	–
31CH	–	35CH	–	39CH	–	3DCH	–
31DH	–	35DH	–	39DH	–	3DDH	–
31EH	–	35EH	–	39EH	–	3DEH	–
31FH	–	35FH	–	39FH	–	3DFH	–
320H	–	360H	–	3A0H	–	3E0H	–
321H	–	361H	–	3A1H	–	3E1H	–
322H	–	362H	–	3A2H	–	3E2H	–
323H	–	363H	–	3A3H	–	3E3H	–
324H	–	364H	–	3A4H	–	3E4H	–
325H	–	365H	–	3A5H	–	3E5H	–
326H	–	366H	–	3A6H	–	3E6H	–
327H	–	367H	–	3A7H	–	3E7H	–
328H	–	368H	–	3A8H	–	3E8H	–
329H	–	369H	–	3A9H	–	3E9H	–
32AH	–	36AH	–	3AAH	–	3EAH	–
32BH	–	36BH	–	3ABH	–	3EBH	–
32CH	–	36CH	–	3ACH	–	3ECH	–
32DH	–	36DH	–	3ADH	–	3EDH	–
32EH	–	36EH	–	3AEH	–	3EEH	–
32FH	–	36FH	–	3AFH	–	3EFH	–
330H	–	370H	–	3B0H	–	3F0H	–
331H	–	371H	–	3B1H	–	3F1H	–
332H	–	372H	–	3B2H	–	3F2H	–
333H	–	373H	–	3B3H	–	3F3H	–
334H	–	374H	–	3B4H	–	3F4H	–
335H	–	375H	–	3B5H	–	3F5H	–
336H	–	376H	–	3B6H	–	3F6H	–
337H	–	377H	–	3B7H	–	3F7H	–
338H	–	378H	–	3B8H	–	3F8H	–
339H	–	379H	–	3B9H	–	3F9H	–
33AH	–	37AH	–	3BAH	–	3FAH	–
33BH	–	37BH	–	3BBH	–	3FBH	–
33CH	–	37CH	–	3BCH	–	3FCH	–
33DH	–	37DH	–	3BDH	–	3FDH	–
33EH	–	37EH	–	3BEH	–	3FEH	–
33FH	–	37FH	–	3BFH	–	3FFH	–

5-5-2. For PAL

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
000H	25.0	040H	27.9	080H	31.5	0C0H	36.2
001H	–	041H	27.9	081H	31.6	0C1H	36.3
002H	–	042H	28.0	082H	31.6	0C2H	36.3
003H	–	043H	28.0	083H	31.7	0C3H	36.4
004H	–	044H	28.1	084H	31.8	0C4H	36.5
005H	–	045H	28.1	085H	31.8	0C5H	36.6
006H	–	046H	28.2	086H	31.9	0C6H	36.7
007H	–	047H	28.2	087H	32.0	0C7H	36.8
008H	–	048H	28.3	088H	32.0	0C8H	36.9
009H	25.4	049H	28.3	089H	32.1	0C9H	37.0
00AH	25.4	04AH	28.4	08AH	32.1	0CAH	37.0
00BH	25.5	04BH	28.4	08BH	32.2	0CBH	37.1
00CH	25.5	04CH	28.5	08CH	32.3	0CCH	37.2
00DH	25.6	04DH	28.6	08DH	32.3	0CDH	37.3
00EH	25.6	04EH	28.6	08EH	32.4	0CEH	37.4
00FH	25.6	04FH	28.7	08FH	32.5	0CFH	37.5
010H	25.7	050H	28.7	090H	32.6	0D0H	37.6
011H	25.7	051H	28.8	091H	32.6	0D1H	37.7
012H	25.8	052H	28.8	092H	32.7	0D2H	37.8
013H	25.8	053H	28.9	093H	32.8	0D3H	37.9
014H	25.9	054H	28.9	094H	32.8	0D4H	37.9
015H	25.9	055H	29.0	095H	32.9	0D5H	38.0
016H	25.9	056H	29.0	096H	33.0	0D6H	38.1
017H	26.0	057H	29.1	097H	33.0	0D7H	38.2
018H	26.0	058H	29.1	098H	33.1	0D8H	38.3
019H	26.1	059H	29.2	099H	33.2	0D9H	38.4
01AH	26.1	05AH	29.3	09AH	33.2	0DAH	38.5
01BH	26.2	05BH	29.3	09BH	33.3	0DBH	38.6
01CH	26.2	05CH	29.4	09CH	33.4	0DCH	38.7
01DH	26.2	05DH	29.4	09DH	33.5	0DDH	38.8
01EH	26.3	05EH	29.5	09EH	33.5	0DEH	38.9
01FH	26.3	05FH	29.5	09FH	33.6	0DFH	39.0
020H	26.4	060H	29.6	0A0H	33.7	0E0H	39.1
021H	26.4	061H	29.6	0A1H	33.8	0E1H	39.2
022H	26.5	062H	29.7	0A2H	33.8	0E2H	39.3
023H	26.5	063H	29.8	0A3H	33.9	0E3H	39.4
024H	26.6	064H	29.8	0A4H	34.0	0E4H	39.5
025H	26.6	065H	29.9	0A5H	34.0	0E5H	39.6
026H	26.6	066H	29.9	0A6H	34.1	0E6H	39.7
027H	26.7	067H	30.0	0A7H	34.2	0E7H	39.8
028H	26.7	068H	30.0	0A8H	34.3	0E8H	39.9
029H	26.8	069H	30.1	0A9H	34.3	0E9H	40.0
02AH	26.8	06AH	30.2	0AAH	34.4	0EAH	40.1
02BH	26.9	06BH	30.2	0ABH	34.5	0EBH	40.2
02CH	26.9	06CH	30.3	0ACH	34.6	0ECH	40.3
02DH	27.0	06DH	30.3	0ADH	34.7	0EDH	40.4
02EH	27.0	06EH	30.4	0AEH	34.7	0EEH	40.5
02FH	27.1	06FH	30.5	0AFH	34.8	0EFH	40.6
030H	27.1	070H	30.5	0B0H	34.9	0F0H	40.7
031H	27.2	071H	30.6	0B1H	35.0	0F1H	40.8
032H	27.2	072H	30.6	0B2H	35.0	0F2H	40.9
033H	27.3	073H	30.7	0B3H	35.1	0F3H	41.0
034H	27.3	074H	30.8	0B4H	35.2	0F4H	41.1
035H	27.3	075H	30.8	0B5H	35.3	0F5H	41.3
036H	27.4	076H	30.9	0B6H	35.4	0F6H	41.4
037H	27.4	077H	30.9	0B7H	35.4	0F7H	41.5
038H	27.5	078H	31.0	0B8H	35.5	0F8H	41.6
039H	27.5	079H	31.1	0B9H	35.6	0F9H	41.7
03AH	27.6	07AH	31.1	0BAH	35.7	0FAH	41.8
03BH	27.6	07BH	31.2	0BBH	35.8	0FBH	41.9
03CH	27.7	07CH	31.2	0BCH	35.8	0FCH	42.0
03DH	27.7	07DH	31.3	0BDH	35.9	0FDH	42.1
03EH	27.8	07EH	31.4	0BEH	36.0	0FEH	42.3
03FH	27.8	07FH	31.4	0BFH	36.1	0FFH	42.4

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
100H	42.5	140H	–	180H	–	1C0H	–
101H	42.6	141H	–	181H	–	1C1H	–
102H	42.7	142H	–	182H	–	1C2H	–
103H	42.8	143H	–	183H	–	1C3H	–
104H	43.0	144H	–	184H	–	1C4H	–
105H	43.1	145H	–	185H	–	1C5H	–
106H	43.2	146H	–	186H	–	1C6H	–
107H	43.3	147H	–	187H	–	1C7H	–
108H	43.4	148H	–	188H	–	1C8H	–
109H	43.6	149H	–	189H	–	1C9H	–
10AH	43.7	14AH	–	18AH	–	1CAH	–
10BH	43.8	14BH	–	18BH	–	1CBH	–
10CH	43.9	14CH	–	18CH	–	1CCH	–
10DH	44.1	14DH	–	18DH	–	1CDH	–
10EH	44.2	14EH	–	18EH	–	1CEH	–
10FH	44.3	14FH	–	18FH	–	1CFH	–
110H	44.4	150H	–	190H	–	1D0H	–
111H	44.6	151H	–	191H	–	1D1H	–
112H	44.7	152H	–	192H	–	1D2H	–
113H	44.8	153H	–	193H	–	1D3H	–
114H	44.9	154H	–	194H	–	1D4H	–
115H	45.1	155H	–	195H	–	1D5H	–
116H	45.2	156H	–	196H	–	1D6H	–
117H	45.3	157H	–	197H	–	1D7H	–
118H	45.5	158H	–	198H	–	1D8H	–
119H	45.6	159H	–	199H	–	1D9H	–
11AH	45.7	15AH	–	19AH	–	1DAH	–
11BH	45.9	15BH	–	19BH	–	1DBH	–
11CH	46.0	15CH	–	19CH	–	1DCH	–
11DH	46.1	15DH	–	19DH	–	1DDH	–
11EH	46.3	15EH	–	19EH	–	1DEH	–
11FH	46.4	15FH	–	19FH	–	1DFH	–
120H	46.6	160H	–	1A0H	–	1E0H	–
121H	46.7	161H	–	1A1H	–	1E1H	–
122H	46.8	162H	–	1A2H	–	1E2H	–
123H	47.0	163H	–	1A3H	–	1E3H	–
124H	47.1	164H	–	1A4H	–	1E4H	–
125H	47.3	165H	–	1A5H	–	1E5H	–
126H	47.4	166H	–	1A6H	–	1E6H	–
127H	47.5	167H	–	1A7H	–	1E7H	–
128H	47.7	168H	–	1A8H	–	1E8H	–
129H	47.8	169H	–	1A9H	–	1E9H	–
12AH	48.0	16AH	–	1AAH	–	1EAH	–
12BH	48.1	16BH	–	1ABH	–	1EBH	–
12CH	48.3	16CH	–	1ACH	–	1ECH	–
12DH	48.4	16DH	–	1ADH	–	1EDH	–
12EH	48.6	16EH	–	1AEH	–	1EEH	–
12FH	48.7	16FH	–	1AFH	–	1EFH	–
130H	–	170H	–	1B0H	–	1F0H	–
131H	–	171H	–	1B1H	–	1F1H	–
132H	–	172H	–	1B2H	–	1F2H	–
133H	–	173H	–	1B3H	–	1F3H	–
134H	–	174H	–	1B4H	–	1F4H	–
135H	–	175H	–	1B5H	–	1F5H	–
136H	–	176H	–	1B6H	–	1F6H	–
137H	–	177H	–	1B7H	–	1F7H	–
138H	–	178H	–	1B8H	–	1F8H	–
139H	–	179H	–	1B9H	–	1F9H	–
13AH	–	17AH	–	1BAH	–	1FAH	–
13BH	–	17BH	–	1BBH	–	1FBH	–
13CH	–	17CH	–	1BCH	–	1FCH	–
13DH	–	17DH	–	1BDH	–	1FDH	–
13EH	–	17EH	–	1BEH	–	1FEH	–
13FH	–	17FH	–	1BFH	–	1FFH	50.0

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
200H	50.2	240H	63.3	280H	85.4	2C0H	132.0
201H	50.4	241H	63.5	281H	85.9	2C1H	133.0
202H	50.6	242H	63.8	282H	86.4	2C2H	134.0
203H	50.7	243H	64.1	283H	86.9	2C3H	135.0
204H	50.9	244H	64.3	284H	87.4	2C4H	136.0
205H	51.1	245H	64.6	285H	87.9	2C5H	137.0
206H	51.2	246H	64.8	286H	88.3	2C6H	139.0
207H	51.4	247H	65.1	287H	88.9	2C7H	140.0
208H	51.6	248H	65.4	288H	89.4	2C8H	141.0
209H	51.7	249H	65.7	289H	89.9	2C9H	142.0
20AH	51.9	24AH	65.9	28AH	90.4	2CAH	144.0
20BH	52.1	24BH	66.2	28BH	90.9	2CBH	145.0
20CH	52.2	24CH	66.5	28CH	91.5	2CCH	146.0
20DH	52.4	24DH	66.8	28DH	92.0	2CDH	148.0
20EH	52.6	24EH	67.1	28EH	92.5	2CEH	149.0
20FH	52.8	24FH	67.4	28FH	93.1	2CFH	151.0
210H	53.0	250H	67.7	290H	93.6	2D0H	152.0
211H	53.1	251H	68.0	291H	94.2	2D1H	154.0
212H	53.3	252H	68.3	292H	94.8	2D2H	155.0
213H	53.5	253H	68.6	293H	95.4	2D3H	157.0
214H	53.7	254H	68.9	294H	96.0	2D4H	158.0
215H	53.9	255H	69.2	295H	96.5	2D5H	160.0
216H	54.1	256H	69.5	296H	97.1	2D6H	161.0
217H	54.2	257H	69.8	297H	97.8	2D7H	163.0
218H	54.4	258H	70.1	298H	98.4	2D8H	165.0
219H	54.6	259H	70.4	299H	99.0	2D9H	167.0
21AH	54.8	25AH	70.7	29AH	99.6	2DAH	168.0
21BH	55.0	25BH	71.1	29BH	100.0	2DBH	170.0
21CH	55.2	25CH	71.4	29CH	101.0	2DCH	172.0
21DH	55.4	25DH	71.7	29DH	102.0	2DDH	174.0
21EH	55.6	25EH	72.0	29EH	102.0	2DEH	176.0
21FH	55.8	25FH	72.4	29FH	103.0	2DFH	178.0
220H	56.0	260H	72.7	2A0H	104.0	2E0H	180.0
221H	56.2	261H	73.0	2A1H	104.0	2E1H	182.0
222H	56.4	262H	73.4	2A2H	105.0	2E2H	184.0
223H	56.6	263H	73.7	2A3H	106.0	2E3H	187.0
224H	56.8	264H	74.1	2A4H	106.0	2E4H	189.0
225H	57.0	265H	74.4	2A5H	107.0	2E5H	191.0
226H	57.2	266H	74.8	2A6H	108.0	2E6H	193.0
227H	57.4	267H	75.2	2A7H	109.0	2E7H	196.0
228H	57.7	268H	75.5	2A8H	109.0	2E8H	198.0
229H	57.9	269H	75.9	2A9H	110.0	2E9H	201.0
22AH	58.1	26AH	76.3	2AAH	111.0	2EAH	204.0
22BH	58.3	26BH	76.6	2ABH	112.0	2EBH	206.0
22CH	58.5	26CH	77.0	2ACH	113.0	2ECH	209.0
22DH	58.7	26DH	77.4	2ADH	113.0	2EDH	212.0
22EH	59.0	26EH	77.8	2AEH	114.0	2EEH	215.0
22FH	59.2	26FH	78.2	2AFH	115.0	2EFH	218.0
230H	59.4	270H	78.6	2B0H	116.0	2F0H	221.0
231H	59.6	271H	79.0	2B1H	117.0	2F1H	224.0
232H	59.9	272H	79.4	2B2H	118.0	2F2H	227.0
233H	60.1	273H	79.8	2B3H	119.0	2F3H	231.0
234H	60.3	274H	80.2	2B4H	119.0	2F4H	234.0
235H	60.6	275H	80.6	2B5H	120.0	2F5H	238.0
236H	60.8	276H	81.0	2B6H	121.0	2F6H	241.0
237H	61.0	277H	81.4	2B7H	122.0	2F7H	245.0
238H	61.3	278H	81.9	2B8H	123.0	2F8H	250.0
239H	61.5	279H	82.3	2B9H	124.0	2F9H	253.0
23AH	61.8	27AH	82.7	2BAH	125.0	2FAH	257.0
23BH	62.0	27BH	83.2	2BBH	126.0	2FBH	261.0
23CH	62.3	27CH	83.6	2BCH	127.0	2FCH	266.0
23DH	62.5	27DH	84.1	2BDH	128.0	2FDH	271.0
23EH	62.8	27EH	84.5	2BEH	129.0	2FEH	275.0
23FH	63.0	27FH	85.0	2BFH	130.0	2FFH	280.0

Data	ECS frequency	Data	ECS frequency	Data	ECS frequency	Data	ECS frequency
300H	285.0	340H	–	380H	–	3C0H	–
301H	291.0	341H	–	381H	–	3C1H	–
302H	296.0	342H	–	382H	–	3C2H	–
303H	302.0	343H	–	383H	–	3C3H	–
304H	308.0	344H	–	384H	–	3C4H	–
305H	314.0	345H	–	385H	–	3C5H	–
306H	320.0	346H	–	386H	–	3C6H	–
307H	327.0	347H	–	387H	–	3C7H	–
308H	334.0	348H	–	388H	–	3C8H	–
309H	341.0	349H	–	389H	–	3C9H	–
30AH	349.0	34AH	–	38AH	–	3CAH	–
30BH	357.0	34BH	–	38BH	–	3CBH	–
30CH	365.0	34CH	–	38CH	–	3CCH	–
30DH	374.0	34DH	–	38DH	–	3CDH	–
30EH	383.0	34EH	–	38EH	–	3CEH	–
30FH	393.0	34FH	–	38FH	–	3CFH	–
310H	403.0	350H	–	390H	–	3D0H	–
311H	414.0	351H	–	391H	–	3D1H	–
312H	425.0	352H	–	392H	–	3D2H	–
313H	437.0	353H	–	393H	–	3D3H	–
314H	450.0	354H	–	394H	–	3D4H	–
315H	463.0	355H	–	395H	–	3D5H	–
316H	477.0	356H	–	396H	–	3D6H	–
317H	492.0	357H	–	397H	–	3D7H	–
318H	500.0	358H	–	398H	–	3D8H	–
319H	530.0	359H	–	399H	–	3D9H	–
31AH	540.0	35AH	–	39AH	–	3DAH	–
31BH	560.0	35BH	–	39BH	–	3DBH	–
31CH	580.0	35CH	–	39CH	–	3DCH	–
31DH	610.0	35DH	–	39DH	–	3DDH	–
31EH	630.0	35EH	–	39EH	–	3DEH	–
31FH	660.0	35FH	–	39FH	–	3DFH	–
320H	690.0	360H	–	3A0H	–	3E0H	–
321H	720.0	361H	–	3A1H	–	3E1H	–
322H	750.0	362H	–	3A2H	–	3E2H	–
323H	790.0	363H	–	3A3H	–	3E3H	–
324H	830.0	364H	–	3A4H	–	3E4H	–
325H	880.0	365H	–	3A5H	–	3E5H	–
326H	930.0	366H	–	3A6H	–	3E6H	–
327H	1000.0	367H	–	3A7H	–	3E7H	–
328H	1050.0	368H	–	3A8H	–	3E8H	–
329H	1100.0	369H	–	3A9H	–	3E9H	–
32AH	1200.0	36AH	–	3AAH	–	3EAH	–
32BH	1300.0	36BH	–	3ABH	–	3EBH	–
32CH	1500.0	36CH	–	3ACH	–	3ECH	–
32DH	1600.0	36DH	–	3ADH	–	3EDH	–
32EH	1800.0	36EH	–	3AEH	–	3EEH	–
32FH	2000.0	36FH	–	3AFH	–	3EFH	–
330H	2300.0	370H	–	3B0H	–	3F0H	–
331H	2700.0	371H	–	3B1H	–	3F1H	–
332H	3000.0	372H	–	3B2H	–	3F2H	–
333H	4000.0	373H	–	3B3H	–	3F3H	–
334H	6000.0	374H	–	3B4H	–	3F4H	–
335H	9000.0	375H	–	3B5H	–	3F5H	–
336H	–	376H	–	3B6H	–	3F6H	–
337H	–	377H	–	3B7H	–	3F7H	–
338H	–	378H	–	3B8H	–	3F8H	–
339H	–	379H	–	3B9H	–	3F9H	–
33AH	–	37AH	–	3BAH	–	3FAH	–
33BH	–	37BH	–	3BBH	–	3FBH	–
33CH	–	37CH	–	3BCH	–	3FCH	–
33DH	–	37DH	–	3BDH	–	3FDH	–
33EH	–	37EH	–	3BEH	–	3FEH	–
33FH	–	37FH	–	3BFH	–	3FFH	–

5-6. S-EVS Display Data Table

5-6-1. For NTSC

Data	SEVS display value	Data	SEVS display value	Data	SEVS display value	Data	SEVS display value
000H	0.0	040H	24.4	080H	48.8	0C0H	73.1
001H	–	041H	24.8	081H	49.1	0C1H	73.5
002H	–	042H	25.1	082H	49.5	0C2H	73.9
003H	–	043H	25.5	083H	49.9	0C3H	74.3
004H	–	044H	25.9	084H	50.3	0C4H	74.7
005H	–	045H	26.3	085H	50.7	0C5H	75.0
006H	–	046H	26.7	086H	51.0	0C6H	75.4
007H	2.7	047H	27.0	087H	51.4	0C7H	75.8
008H	3.0	048H	27.4	088H	51.8	0C8H	76.2
009H	3.4	049H	27.8	089H	52.2	0C9H	76.6
00AH	3.8	04AH	28.2	08AH	52.6	0CAH	77.0
00BH	4.2	04BH	28.6	08BH	53.0	0CBH	77.3
00CH	4.6	04CH	29.0	08CH	53.3	0CCH	77.7
00DH	5.0	04DH	29.3	08DH	53.7	0CDH	78.1
00EH	5.3	04EH	29.7	08EH	54.1	0CEH	78.5
00FH	5.7	04FH	30.1	08FH	54.5	0CFH	78.9
010H	6.1	050H	30.5	090H	54.9	0D0H	79.2
011H	6.5	051H	30.9	091H	55.2	0D1H	79.6
012H	6.9	052H	31.2	092H	55.6	0D2H	80.0
013H	7.2	053H	31.6	093H	56.0	0D3H	80.4
014H	7.6	054H	32.0	094H	56.4	0D4H	80.8
015H	8.0	055H	32.4	095H	56.8	0D5H	81.1
016H	8.4	056H	32.8	096H	57.1	0D6H	81.5
017H	8.8	057H	33.1	097H	57.5	0D7H	81.9
018H	9.1	058H	33.5	098H	57.9	0D8H	82.3
019H	9.5	059H	33.9	099H	58.3	0D9H	82.7
01AH	9.9	05AH	34.3	09AH	58.7	0DAH	83.0
01BH	10.3	05BH	34.7	09BH	59.0	0DBH	83.4
01CH	10.7	05CH	35.0	09CH	59.4	0DCH	83.8
01DH	11.0	05DH	35.4	09DH	59.8	0DDH	84.2
01EH	11.4	05EH	35.8	09EH	60.2	0DEH	84.6
01FH	11.8	05FH	36.2	09FH	60.6	0DFH	85.0
020H	12.2	060H	36.6	0A0H	61.0	0E0H	85.3
021H	12.6	061H	37.0	0A1H	61.3	0E1H	85.7
022H	13.0	062H	37.3	0A2H	61.7	0E2H	86.1
023H	13.3	063H	37.7	0A3H	62.1	0E3H	86.5
024H	13.7	064H	38.1	0A4H	62.5	0E4H	86.9
025H	14.1	065H	38.5	0A5H	62.9	0E5H	87.2
026H	14.5	066H	38.9	0A6H	63.2	0E6H	87.6
027H	14.9	067H	39.2	0A7H	63.6	0E7H	88.0
028H	15.2	068H	39.6	0A8H	64.0	0E8H	88.4
029H	15.6	069H	40.0	0A9H	64.4	0E9H	88.8
02AH	16.0	06AH	40.4	0AAH	64.8	0EAH	89.1
02BH	16.4	06BH	40.8	0ABH	65.1	0EBH	89.5
02CH	16.8	06CH	41.1	0ACH	65.5	0ECH	89.9
02DH	17.1	06DH	41.5	0ADH	65.9	0EDH	90.3
02EH	17.5	06EH	41.9	0AEH	66.3	0EEH	90.7
02FH	17.9	06FH	42.3	0AFH	66.7	0EFH	91.0
030H	18.3	070H	42.7	0B0H	67.0	0F0H	91.4
031H	18.7	071H	43.0	0B1H	67.4	0F1H	91.8
032H	19.0	072H	43.4	0B2H	67.8	0F2H	92.2
033H	19.4	073H	43.8	0B3H	68.2	0F3H	92.6
034H	19.8	074H	44.2	0B4H	68.6	0F4H	93.0
035H	20.2	075H	44.6	0B5H	69.0	0F5H	93.3
036H	20.6	076H	45.0	0B6H	69.3	0F6H	93.7
037H	21.0	077H	45.3	0B7H	69.7	0F7H	94.1
038H	21.3	078H	45.7	0B8H	70.1	0F8H	94.5
039H	21.7	079H	46.1	0B9H	70.5	0F9H	94.9
03AH	22.1	07AH	46.5	0BAH	70.9	0FAH	95.2
03BH	22.5	07BH	46.9	0BBH	71.2	0FBH	95.6
03CH	22.9	07CH	47.2	0BCH	71.6	0FCH	96.0
03DH	23.2	07DH	47.6	0BDH	72.0	0FDH	96.4
03EH	23.6	07EH	48.0	0BEH	72.4	0FEH	96.8
03FH	24.0	07FH	48.4	0BFH	72.8	0FFH	–

Data	SEVS display value	Data	SEVS display value	Data	SEVS display value	Data	SEVS display value
100H	–	140H	–	180H	–	1C0H	–
101H	–	141H	–	181H	–	1C1H	–
102H	–	142H	–	182H	–	1C2H	–
103H	–	143H	–	183H	–	1C3H	–
104H	–	144H	–	184H	–	1C4H	–
105H	–	145H	–	185H	–	1C5H	–
106H	–	146H	–	186H	–	1C6H	–
107H	–	147H	–	187H	–	1C7H	–
108H	–	148H	–	188H	–	1C8H	–
109H	–	149H	–	189H	–	1C9H	–
10AH	–	14AH	–	18AH	–	1CAH	–
10BH	–	14BH	–	18BH	–	1CBH	–
10CH	–	14CH	–	18CH	–	1CCH	–
10DH	–	14DH	–	18DH	–	1CDH	–
10EH	–	14EH	–	18EH	–	1CEH	–
10FH	–	14FH	–	18FH	–	1CFH	–
110H	–	150H	–	190H	–	1D0H	–
111H	–	151H	–	191H	–	1D1H	–
112H	–	152H	–	192H	–	1D2H	–
113H	–	153H	–	193H	–	1D3H	–
114H	–	154H	–	194H	–	1D4H	–
115H	–	155H	–	195H	–	1D5H	–
116H	–	156H	–	196H	–	1D6H	–
117H	–	157H	–	197H	–	1D7H	–
118H	–	158H	–	198H	–	1D8H	–
119H	–	159H	–	199H	–	1D9H	–
11AH	–	15AH	–	19AH	–	1DAH	–
11BH	–	15BH	–	19BH	–	1DBH	–
11CH	–	15CH	–	19CH	–	1DCH	–
11DH	–	15DH	–	19DH	–	1DDH	–
11EH	–	15EH	–	19EH	–	1DEH	–
11FH	–	15FH	–	19FH	–	1DFH	–
120H	–	160H	–	1A0H	–	1E0H	–
121H	–	161H	–	1A1H	–	1E1H	–
122H	–	162H	–	1A2H	–	1E2H	–
123H	–	163H	–	1A3H	–	1E3H	–
124H	–	164H	–	1A4H	–	1E4H	–
125H	–	165H	–	1A5H	–	1E5H	–
126H	–	166H	–	1A6H	–	1E6H	–
127H	–	167H	–	1A7H	–	1E7H	–
128H	–	168H	–	1A8H	–	1E8H	–
129H	–	169H	–	1A9H	–	1E9H	–
12AH	–	16AH	–	1AAH	–	1EAH	–
12BH	–	16BH	–	1ABH	–	1EBH	–
12CH	–	16CH	–	1ACH	–	1ECH	–
12DH	–	16DH	–	1ADH	–	1EDH	–
12EH	–	16EH	–	1AEH	–	1EEH	–
12FH	–	16FH	–	1AFH	–	1EFH	–
130H	–	170H	–	1B0H	–	1F0H	–
131H	–	171H	–	1B1H	–	1F1H	–
132H	–	172H	–	1B2H	–	1F2H	–
133H	–	173H	–	1B3H	–	1F3H	–
134H	–	174H	–	1B4H	–	1F4H	–
135H	–	175H	–	1B5H	–	1F5H	–
136H	–	176H	–	1B6H	–	1F6H	–
137H	–	177H	–	1B7H	–	1F7H	–
138H	–	178H	–	1B8H	–	1F8H	–
139H	–	179H	–	1B9H	–	1F9H	–
13AH	–	17AH	–	1BAH	–	1FAH	–
13BH	–	17BH	–	1BBH	–	1FBH	–
13CH	–	17CH	–	1BCH	–	1FCH	–
13DH	–	17DH	–	1BDH	–	1FDH	–
13EH	–	17EH	–	1BEH	–	1FEH	–
13FH	–	17FH	–	1BFH	–	1FFH	–
						200H	100.0

5-6-2. For PAL

Data	SEVS display value	Data	SEVS display value	Data	SEVS display value	Data	SEVS display value
000H	0.0	040H	20.5	080H	41.0	0C0H	61.4
001H	–	041H	20.8	081H	41.3	0C1H	61.8
002H	–	042H	21.1	082H	41.6	0C2H	62.1
003H	–	043H	21.4	083H	41.9	0C3H	62.4
004H	–	044H	21.8	084H	42.2	0C4H	62.7
005H	–	045H	22.1	085H	42.6	0C5H	63.0
006H	–	046H	22.4	086H	42.9	0C6H	63.4
007H	–	047H	22.7	087H	43.2	0C7H	63.7
008H	–	048H	23.0	088H	43.5	0C8H	64.0
009H	2.9	049H	23.4	089H	43.8	0C9H	64.3
00AH	3.2	04AH	23.7	08AH	44.2	0CAH	64.6
00BH	3.5	04BH	24.0	08BH	44.5	0CBH	65.0
00CH	3.8	04CH	24.3	08CH	44.8	0CCH	65.3
00DH	4.2	04DH	24.6	08DH	45.1	0CDH	65.6
00EH	4.5	04EH	25.0	08EH	45.4	0CEH	65.9
00FH	4.8	04FH	25.3	08FH	45.8	0CFH	66.2
010H	5.1	050H	25.6	090H	46.1	0D0H	66.6
011H	5.4	051H	25.9	091H	46.4	0D1H	66.9
012H	5.8	052H	26.2	092H	46.7	0D2H	67.2
013H	6.1	053H	26.6	093H	47.0	0D3H	67.5
014H	6.4	054H	26.9	094H	47.4	0D4H	67.8
015H	6.7	055H	27.2	095H	47.7	0D5H	68.2
016H	7.0	056H	27.5	096H	48.0	0D6H	68.5
017H	7.4	057H	27.8	097H	48.3	0D7H	68.8
018H	7.7	058H	28.2	098H	48.6	0D8H	69.1
019H	8.0	059H	28.5	099H	49.0	0D9H	69.4
01AH	8.3	05AH	28.8	09AH	49.3	0DAH	69.8
01BH	8.6	05BH	29.1	09BH	49.6	0DBH	70.1
01CH	9.0	05CH	29.4	09CH	49.9	0DCH	70.4
01DH	9.3	05DH	29.8	09DH	50.2	0DDH	70.7
01EH	9.6	05EH	30.1	09EH	50.6	0DEH	71.0
01FH	9.9	05FH	30.4	09FH	50.9	0DFH	71.4
020H	10.2	060H	30.7	0A0H	51.2	0E0H	71.7
021H	10.6	061H	31.0	0A1H	51.5	0E1H	72.0
022H	10.9	062H	31.4	0A2H	51.8	0E2H	72.3
023H	11.2	063H	31.7	0A3H	52.2	0E3H	72.6
024H	11.5	064H	32.0	0A4H	52.5	0E4H	73.0
025H	11.8	065H	32.3	0A5H	52.8	0E5H	73.3
026H	12.2	066H	32.6	0A6H	53.1	0E6H	73.6
027H	12.5	067H	33.0	0A7H	53.4	0E7H	73.9
028H	12.8	068H	33.3	0A8H	53.8	0E8H	74.2
029H	13.1	069H	33.6	0A9H	54.1	0E9H	74.6
02AH	13.4	06AH	33.9	0AAH	54.4	0EAH	74.9
02BH	13.8	06BH	34.2	0ABH	54.7	0EBH	75.2
02CH	14.1	06CH	34.6	0ACH	55.0	0ECH	75.5
02DH	14.4	06DH	34.9	0ADH	55.4	0EDH	75.8
02EH	14.7	06EH	35.2	0AEH	55.7	0EEH	76.2
02FH	15.0	06FH	35.5	0AFH	56.0	0EFH	76.5
030H	15.4	070H	35.8	0B0H	56.3	0F0H	76.8
031H	15.7	071H	36.2	0B1H	56.6	0F1H	77.1
032H	16.0	072H	36.5	0B2H	57.0	0F2H	77.4
033H	16.3	073H	36.8	0B3H	57.3	0F3H	77.8
034H	16.6	074H	37.1	0B4H	57.6	0F4H	78.1
035H	17.0	075H	37.4	0B5H	57.9	0F5H	78.4
036H	17.3	076H	37.8	0B6H	58.2	0F6H	78.7
037H	17.6	077H	38.1	0B7H	58.6	0F7H	79.0
038H	17.9	078H	38.4	0B8H	58.9	0F8H	79.4
039H	18.2	079H	38.7	0B9H	59.2	0F9H	79.7
03AH	18.6	07AH	39.0	0BAH	59.5	0FAH	80.0
03BH	18.9	07BH	39.4	0BBH	59.8	0FBH	80.3
03CH	19.2	07CH	39.7	0BCH	60.2	0FCH	80.6
03DH	19.5	07DH	40.0	0BDH	60.5	0FDH	81.0
03EH	19.8	07EH	40.3	0BEH	60.8	0FEH	81.3
03FH	20.2	07FH	40.6	0BFH	61.1	0FFH	81.6

Data	SEVS display value	Data	SEVS display value	Data	SEVS display value	Data	SEVS display value
100H	81.9	140H	–	180H	–	1C0H	–
101H	82.2	141H	–	181H	–	1C1H	–
102H	82.6	142H	–	182H	–	1C2H	–
103H	82.9	143H	–	183H	–	1C3H	–
104H	83.2	144H	–	184H	–	1C4H	–
105H	83.5	145H	–	185H	–	1C5H	–
106H	83.8	146H	–	186H	–	1C6H	–
107H	84.2	147H	–	187H	–	1C7H	–
108H	84.5	148H	–	188H	–	1C8H	–
109H	84.8	149H	–	189H	–	1C9H	–
10AH	85.1	14AH	–	18AH	–	1CAH	–
10BH	85.4	14BH	–	18BH	–	1CBH	–
10CH	85.8	14CH	–	18CH	–	1CCH	–
10DH	86.1	14DH	–	18DH	–	1CDH	–
10EH	86.4	14EH	–	18EH	–	1CEH	–
10FH	86.7	14FH	–	18FH	–	1CFH	–
110H	87.0	150H	–	190H	–	1D0H	–
111H	87.4	151H	–	191H	–	1D1H	–
112H	87.7	152H	–	192H	–	1D2H	–
113H	88.0	153H	–	193H	–	1D3H	–
114H	88.3	154H	–	194H	–	1D4H	–
115H	88.6	155H	–	195H	–	1D5H	–
116H	89.0	156H	–	196H	–	1D6H	–
117H	89.3	157H	–	197H	–	1D7H	–
118H	89.6	158H	–	198H	–	1D8H	–
119H	89.9	159H	–	199H	–	1D9H	–
11AH	90.2	15AH	–	19AH	–	1DAH	–
11BH	90.6	15BH	–	19BH	–	1DBH	–
11CH	90.9	15CH	–	19CH	–	1DCH	–
11DH	91.2	15DH	–	19DH	–	1DDH	–
11EH	91.5	15EH	–	19EH	–	1DEH	–
11FH	91.8	15FH	–	19FH	–	1DFH	–
120H	92.2	160H	–	1A0H	–	1E0H	–
121H	92.5	161H	–	1A1H	–	1E1H	–
122H	92.8	162H	–	1A2H	–	1E2H	–
123H	93.1	163H	–	1A3H	–	1E3H	–
124H	93.4	164H	–	1A4H	–	1E4H	–
125H	93.8	165H	–	1A5H	–	1E5H	–
126H	94.1	166H	–	1A6H	–	1E6H	–
127H	94.4	167H	–	1A7H	–	1E7H	–
128H	94.7	168H	–	1A8H	–	1E8H	–
129H	95.0	169H	–	1A9H	–	1E9H	–
12AH	95.4	16AH	–	1AAH	–	1EAH	–
12BH	95.7	16BH	–	1ABH	–	1EBH	–
12CH	96.0	16CH	–	1ACH	–	1ECH	–
12DH	96.3	16DH	–	1ADH	–	1EDH	–
12EH	96.6	16EH	–	1AEH	–	1EEH	–
12FH	97.0	16FH	–	1AFH	–	1EFH	–
130H	–	170H	–	1B0H	–	1F0H	–
131H	–	171H	–	1B1H	–	1F1H	–
132H	–	172H	–	1B2H	–	1F2H	–
133H	–	173H	–	1B3H	–	1F3H	–
134H	–	174H	–	1B4H	–	1F4H	–
135H	–	175H	–	1B5H	–	1F5H	–
136H	–	176H	–	1B6H	–	1F6H	–
137H	–	177H	–	1B7H	–	1F7H	–
138H	–	178H	–	1B8H	–	1F8H	–
139H	–	179H	–	1B9H	–	1F9H	–
13AH	–	17AH	–	1BAH	–	1FAH	–
13BH	–	17BH	–	1BBH	–	1FBH	–
13CH	–	17CH	–	1BCH	–	1FCH	–
13DH	–	17DH	–	1BDH	–	1FDH	–
13EH	–	17EH	–	1BEH	–	1FEH	–
13FH	–	17FH	–	1BFH	–	1FFH	–
						200H	100.0

Section 6
Local Commands

When the 700 Protocol is to be used for commands within a device, use the local area commands that are prepared for this purpose.
Contact Sony Corporation, B&P Company, Production Systems Department, Camera Division if you wish to use the local commands.

Section 7
Rules for Creating New Commands

Note

The creation and addition of new commands require the approval of Sony Corporation, B&P Company, Production Systems Department, Camera Division.

7-1. Rules for Determining a New Command

- For a command, select CMD_GP in accordance with the device type and function type so that the command string of the data format is self explanatory when reading CMD_GP. This means, for example, that CMD_GP shows whether the command is the 1 byte pattern, 2 byte pattern or n byte pattern. In addition, in the case of the n byte pattern the command string in which the top address is located every 3 bytes, must be known from the CMD_GP.

- The CMD_GP of each device type can be grouped into either independent processing or multi-processing. This is not an absolute rule, but commands must be identified when a new command is to be added.

- Reserved or undefined commands and addresses mean that they were not installed in the device at the time of this publication. Note that although they cannot be used at the time of publication, they may be changed at any time in the future.

- Some reserved commands have a fixed pattern, but the remaining commands have no fixed pattern yet.

- Ensure that no troubles occur when commands of an undefined pattern are received, by skipping to read the specified number of bytes.

7-2. Rules for Determining an Address

This section describes the rules for determining an address of the switch command and the analog command.
The addresses are assigned in accordance with the type of command, which is recommended even though there are some exceptions.

CHU_SWITCH address

00H to 3FH Up/Down type switch command (Step shutter, etc.)

40H to 7FH Byte data type switch command (Camera number, etc.)

80H to 9FH Bit data type switch command (Normal)

A0H to BFH Mode switch command (Test2 waveform select, etc.)

C0H to FFH Reserved at present

CHU_ANALOG address

00H to 0FH Master/R/G/B type analog command (Master/R/G/B gamma, etc.)

40H to 7FH Special type analog command (Iris, ECS, EVA, etc.)

80H to FCH Independent type, general analog command (Black set, Detail, Matrix, etc.)

FDH Device model code

FEH, FFH Reference file check sum

CHU_ANALOG_TRIMMING address

Conforms to CHU_ANALOG address.
CHU_EXT_ANALOG address

CCU_SWITCH address

00H to 0FH Up/Down type switch command (Character display page, etc.)

10H to 3FH Bit data type switch command (Normal)

40H to 7FH Reserved

80H to BFH Mode switch command (NTSC/PAL, etc.)
However, 81H: CCU number is included as an exception.

C0H to DFH Switch command for SD control (Unique for HD camera)
This address should be exclusively used for the HD camera. The bit assignment must agree with the address of 80H to 9FH of the CHU switch address.
Example: SD master gamma ON

E0H to FFH Special switch command for HD (4:3 Edge crop ON, RET select, etc.)

CCU_ANALOG address

00H to 5FH Independent type, general analog command (Contrast, Saturation, etc.)

60H to 6FH Special type analog command

70H to 7FH Special analog command for HD (Crop position, etc.)

80H to BFH Master/R/G/B analog command for SD control (Unique for HD camera)
This command address is used by the HD CCU when the HD CCU controls SD. The address assignment must agree with the address of 00H to 3FH of the CHU analog address.
Example : SD detail limiter (8CH)
Exception : Triax cable length (80H)

C0H to EFH Independent type analog command for SD control (Unique for HD CCU)
This command address is used by the HD CCU when the HD CCU controls SD. The address assignment must agree with the address of 80H to FDH of the CHU analog address.
Example : SD detail level (DBH)

F0H to FFH Read only analog command
This command address notifies the CCU status and fixed information to other devices. Other devices cannot change this value.

CCU_ANALOG_TRIMMING address

In principle, this conforms with the CCU_ANALOG address.

Section 8
Communication Procedure of Applications

This section describes the communication procedure which is unique to each device and that of each command.

8-1. CCU FILE

Among the control data of the CCU as listed below, only the REFERENCE FILE data that is stored in the CHU itself is used in the CCU FILE as it is because the REFERENCE FILE data is totally dependent on the data that is stored in the CHU.

1. CCU final data
   The CCU updates all the switch data and the analog data that are stored in it except the REFERENCE FILE data when the main power is turned off. Only the REFERENCE FILE data is updated when communication with CHU is established by inquiring the data that the CHU stores.
   1) Storing the CCU final data in CHU
      The CHU continuously updates the CCU switch status and its analog data.
   2) Data inquiry from CCU to CHU
      The data inquiry is issued from the CCU to CHU by using DCHU_ID (20H) as DEST_ID. The CHU confirms that the SRC_ID and the DEST_ID are the requests from the CCU, and returns the reply by using the DCCU_ID (40H) as SRC_ID.
      The CCU_SWITCH/ANALOG (REL) and CCU_MULTISWITCH/ANALOG are used to issue the request.

2. SCENE FILE
   1) STORE
      When a CCU receives the SCENE FILE STORE from the CHU, it creates the SCENE FILE and transfers it to the CHU.
   2) RECALL
      When a CHU receives the SCENE FILE RECALL, it transfers the CCU SCENE FILE that is stored to the CCU.
   3) CANCEL
      This must be processed internally inside the CCU.

3. REFERENCE FILE
   The CCU stores the CCU REFERENCE FILE and also transfers it to the CHU.
   1) When the main power is turned on
      The CCU issues a request to send the CCU REFERENCE FILE to the CHU.
   2) REFERENCE FILE STORE
      When a CCU receives AUTO SETUP OK from the CHU, it creates the CCU REFERENCE FILE and transfers it to the CHU.
   3) AUTO SETUP
      When a CCU receives AUTO SETUP OK from the CHU, it calls the REFERENCE FILE that the CCU stores in it. (Data transfer between CCU and CHU does not take place.)
   4) STANDARD, CLEAR
      These must be processed internally inside a CCU.

8-2. TALLY/CALL

In this protocol, the TALLY/CALL operations must be transmitted repeatedly.

RED TALLY, GREEN TALLY operations

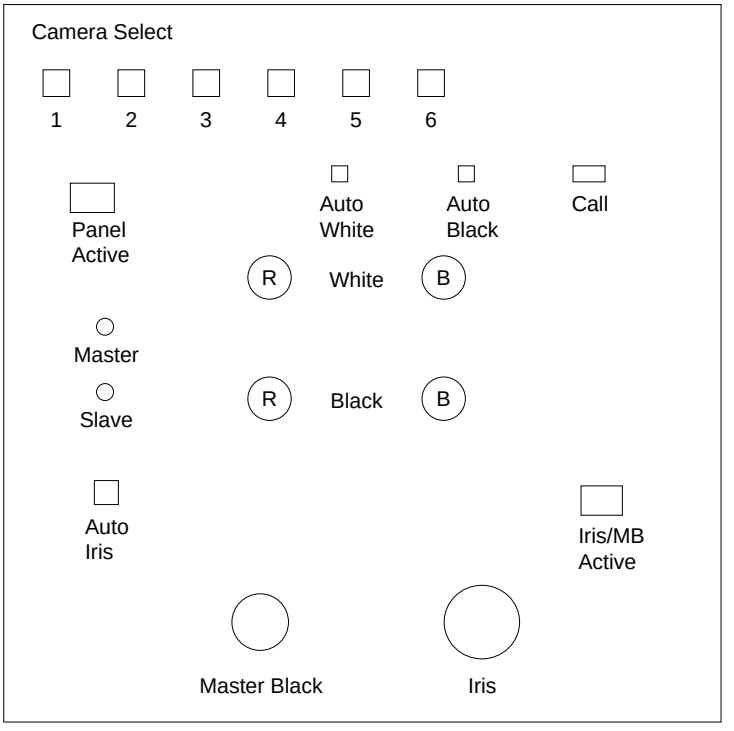
The device to which the TALLY signal is input from the switcher and other systems, must transmit the RED TALLY-GREEN TALLY ON command at the interval of 500 ms as long the RED TALLY-GREEN TALLY remains on. The device that receives this command turns off the RED TALLY-GREEN TALLY if it could not receive the RED TALLY-GREEN TALLY command for 2 seconds. (Refer to Section “4. Commands – SYSTEM_SWITCH Command (CMD_GP09H)”.)

CALL operation

All the devices must transmit the CALL ON command at the interval of 500 ms as long as the CALL switch is turned on. The device that receives this command turns on its CALL indicator but turns off the CALL indicator when it could not receive the CALL command for 2 seconds.
(Refer to Section “4. Commands – SWITCH_WITH_SENDER Command (CMD_GP0BH)”.)

8-3. Example of Operating a Simple Control Panel

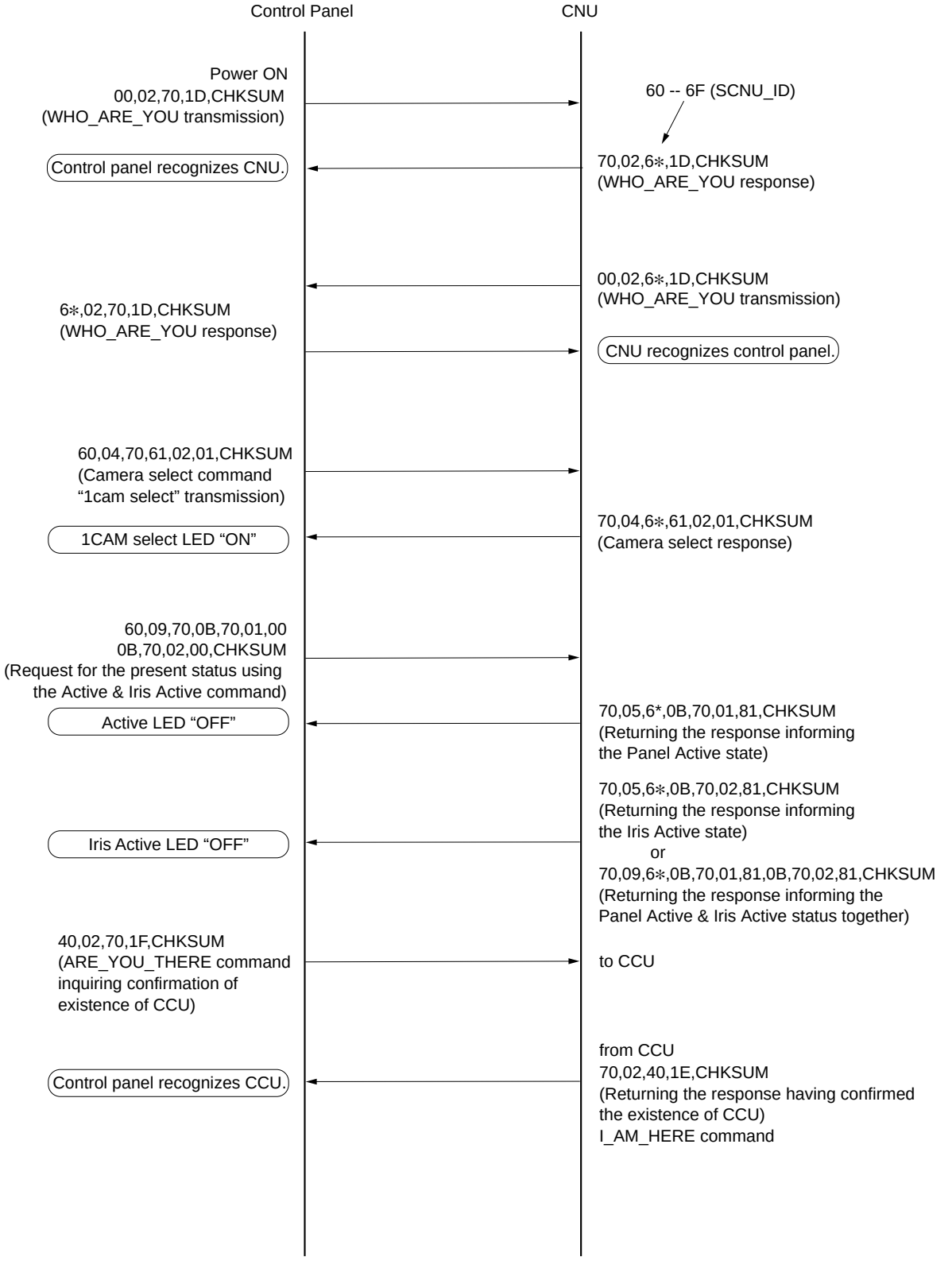
The communication procedure is described below using the MSU type simple control panel as an example.



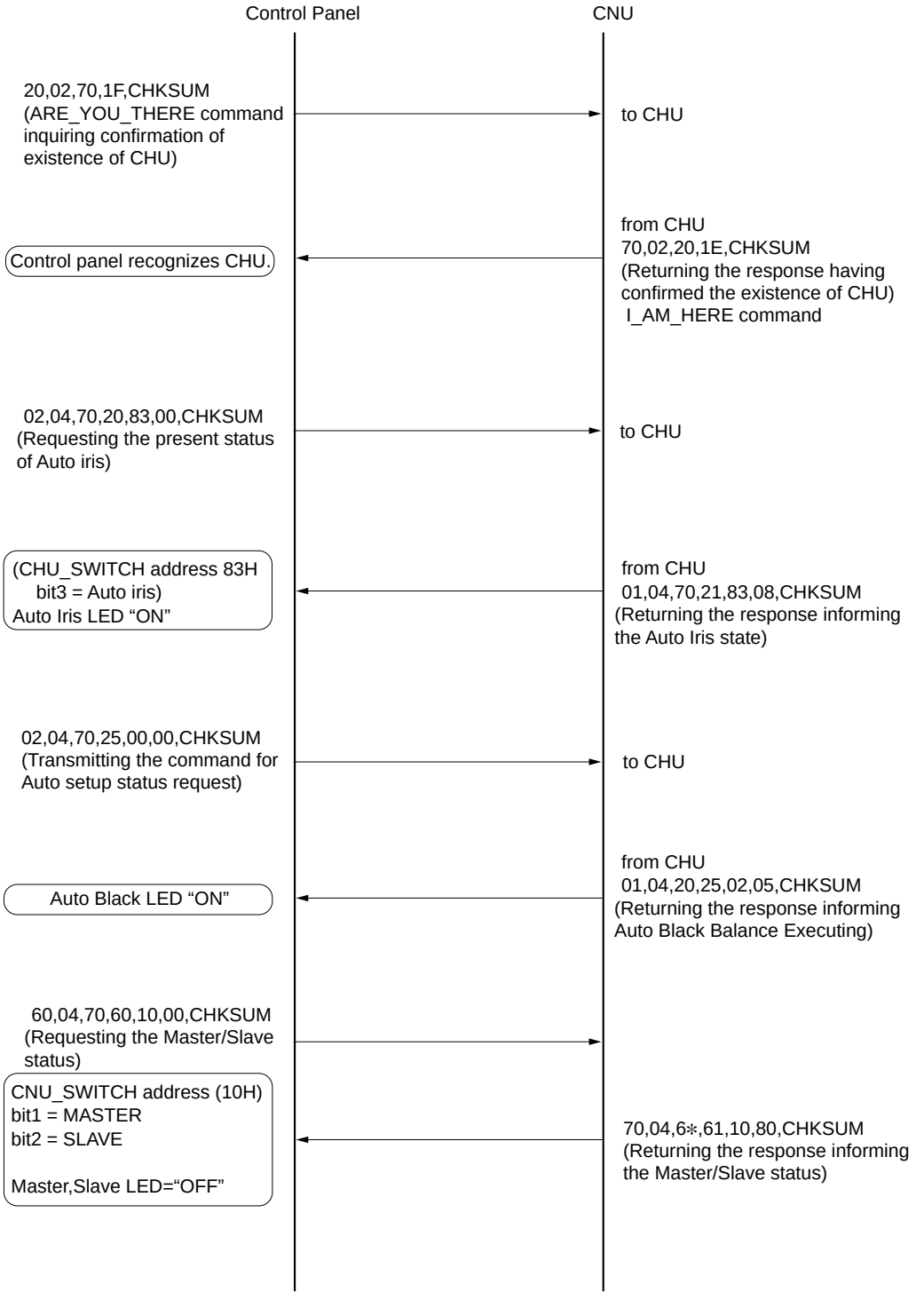
Items to be controlled
Iris
Master Black
Red/Blue Black
Red/Blue White
Camera Select SW
Panel Active SW
Iris/MB Active SW
AWB SW
ABB SW
Call SW
Auto Iris SW
Master/Slave(Display only)

Note 1 : ACK and NAK are omitted in the communication procedure chart.
Note 2 : The protocol level is 0.

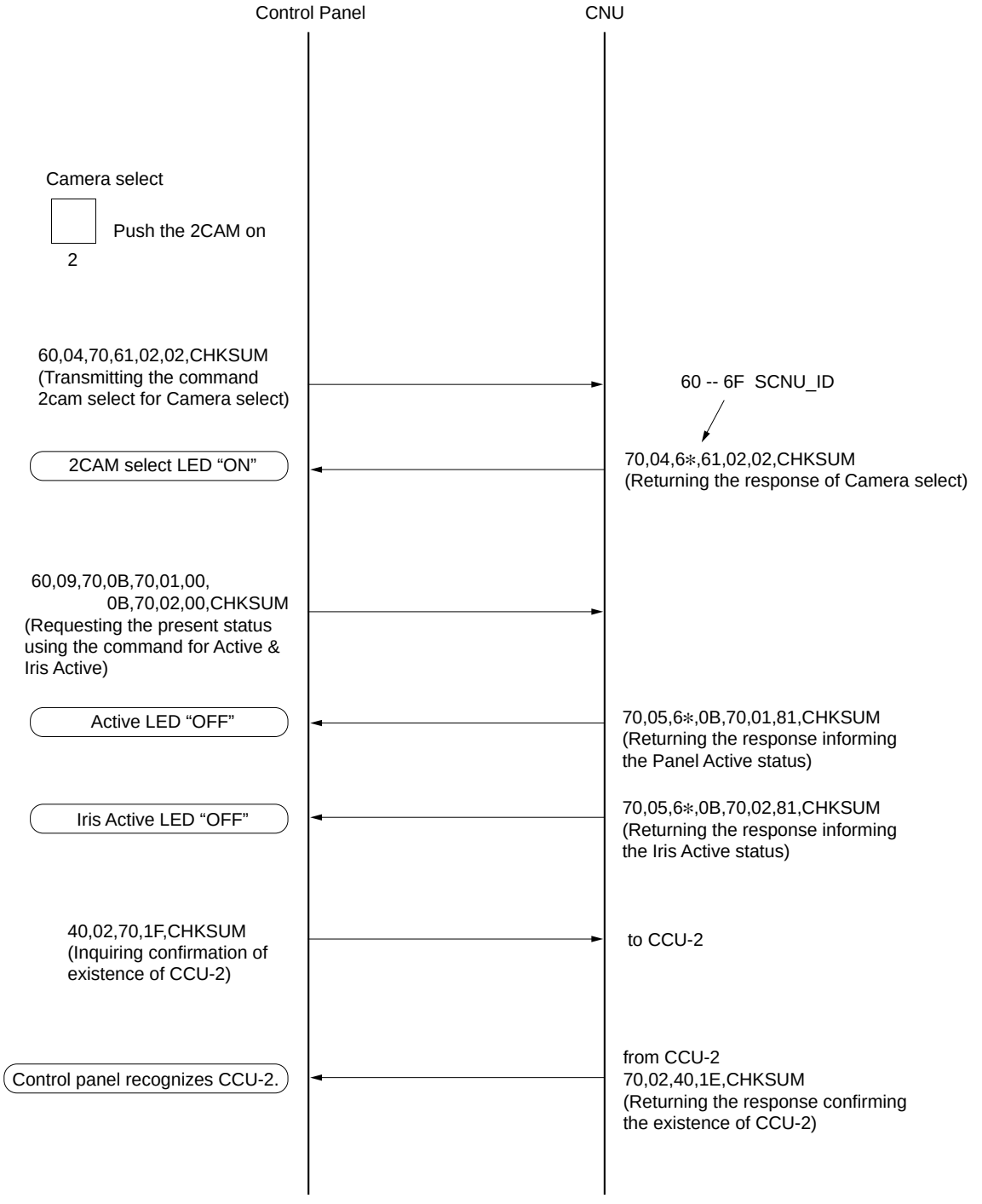
Procedure when the main power is turned on -1



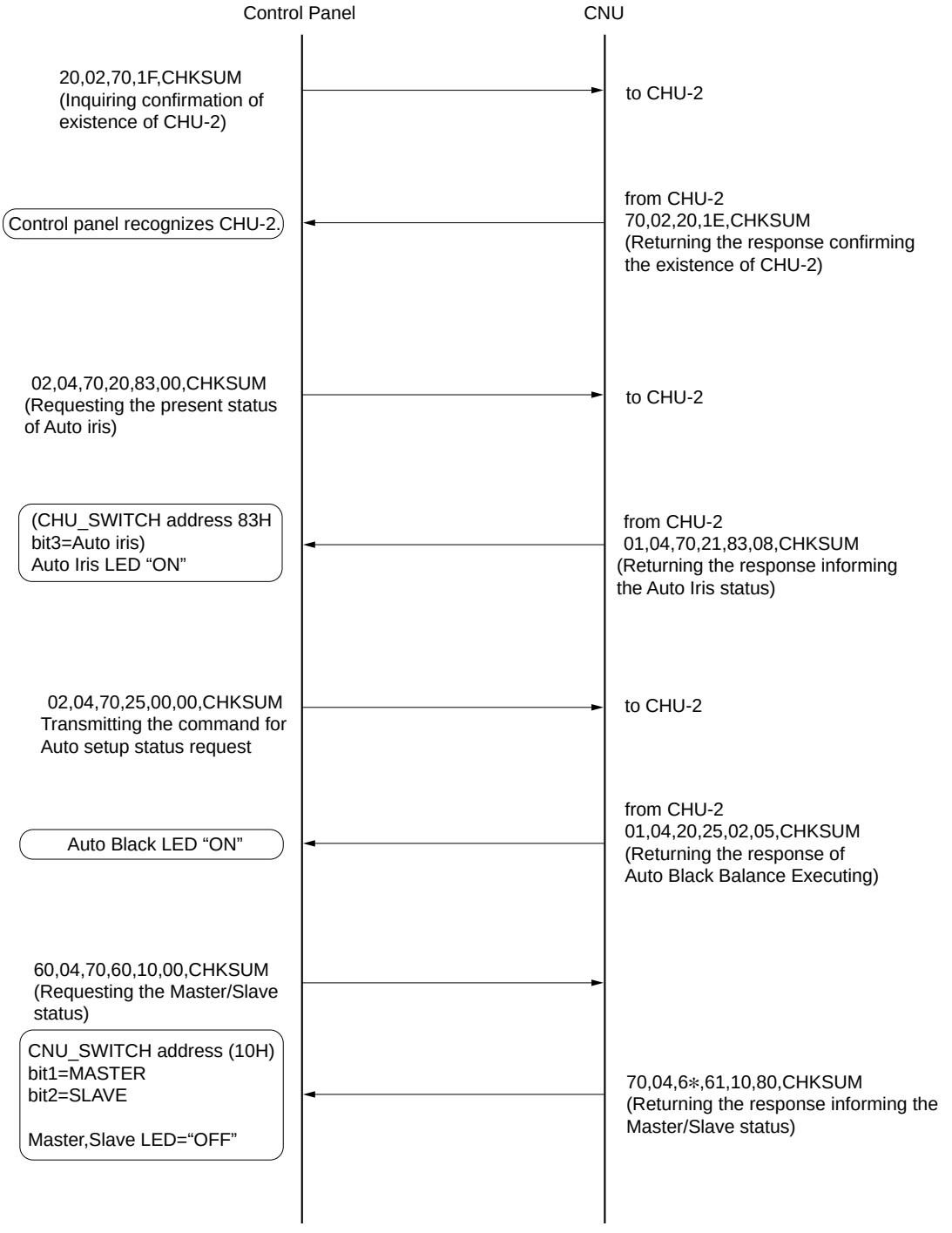
Procedure when the main power is turned on -2



Procedure to change the camera selection

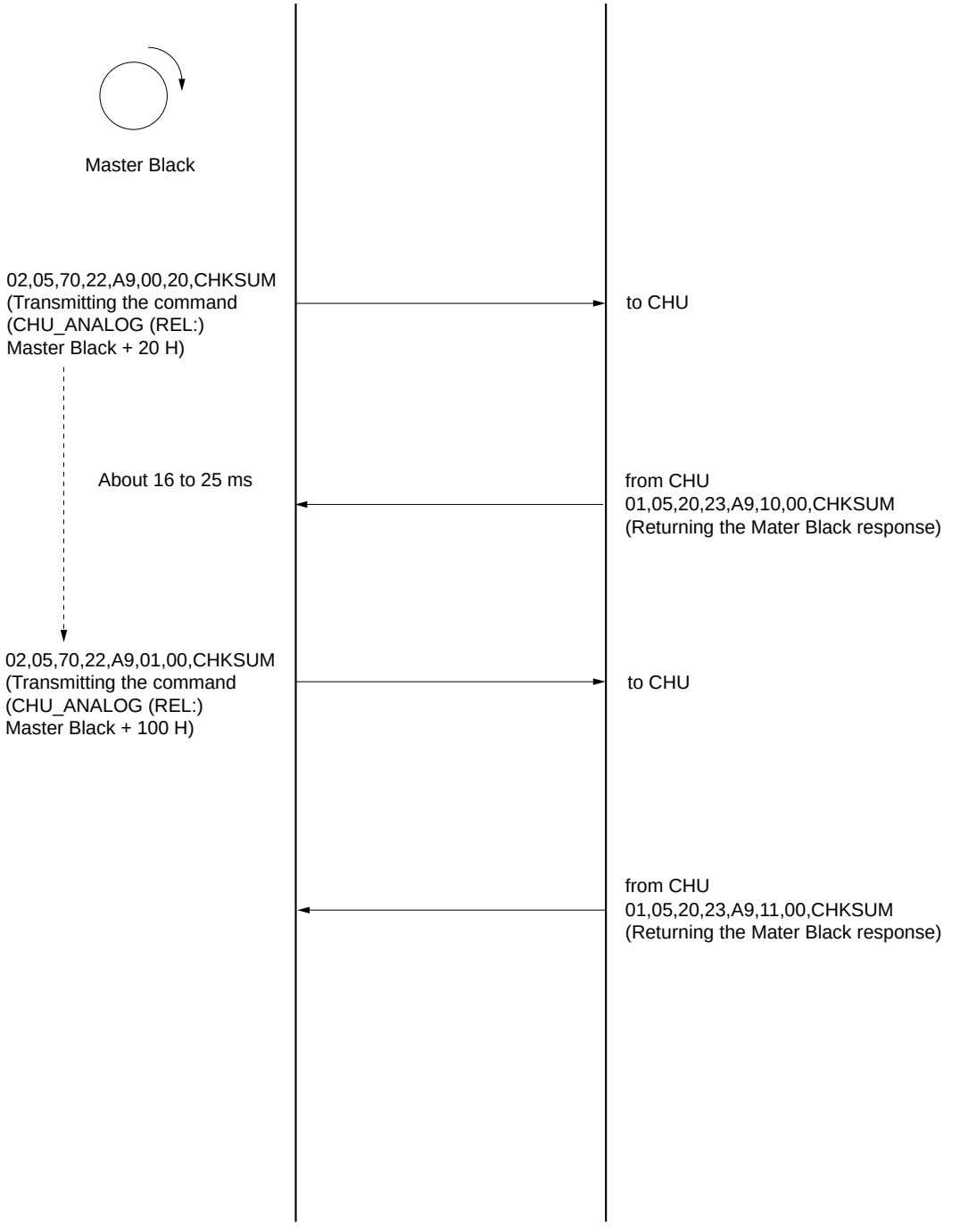


Procedure for analog control

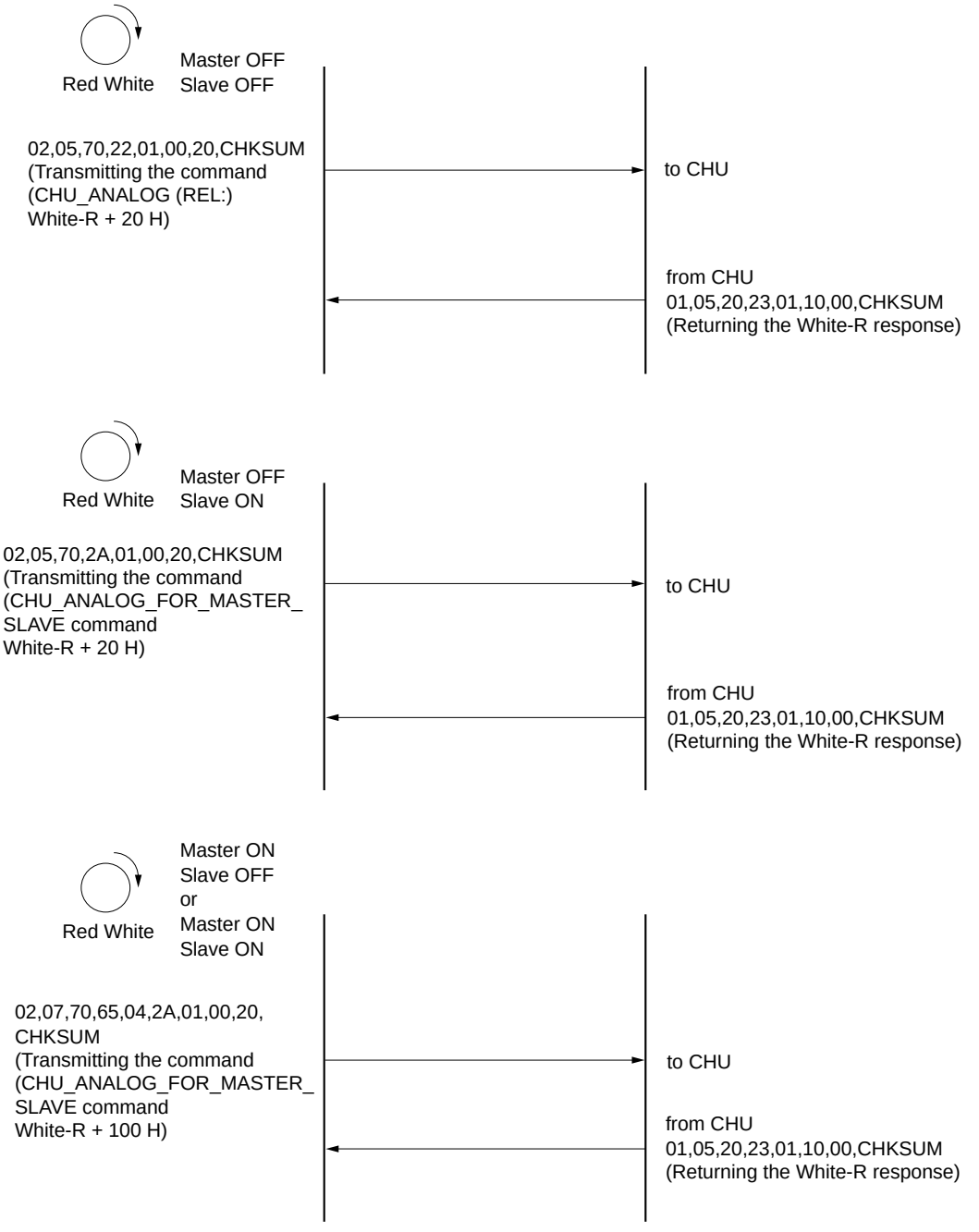


Procedure for analog control (Master Black, Iris, Red/Blue Black)

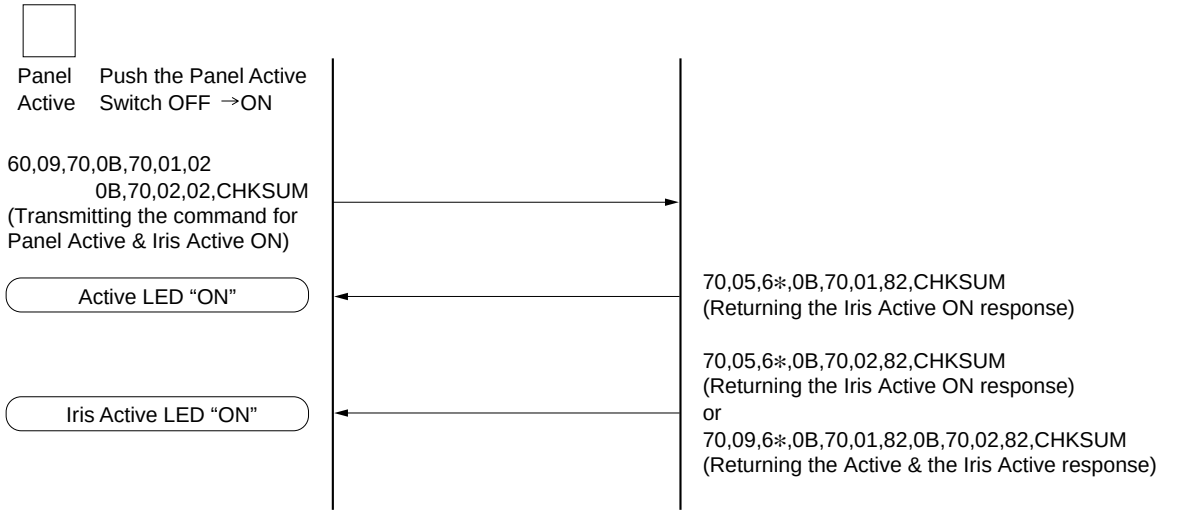
for Example Master Black control



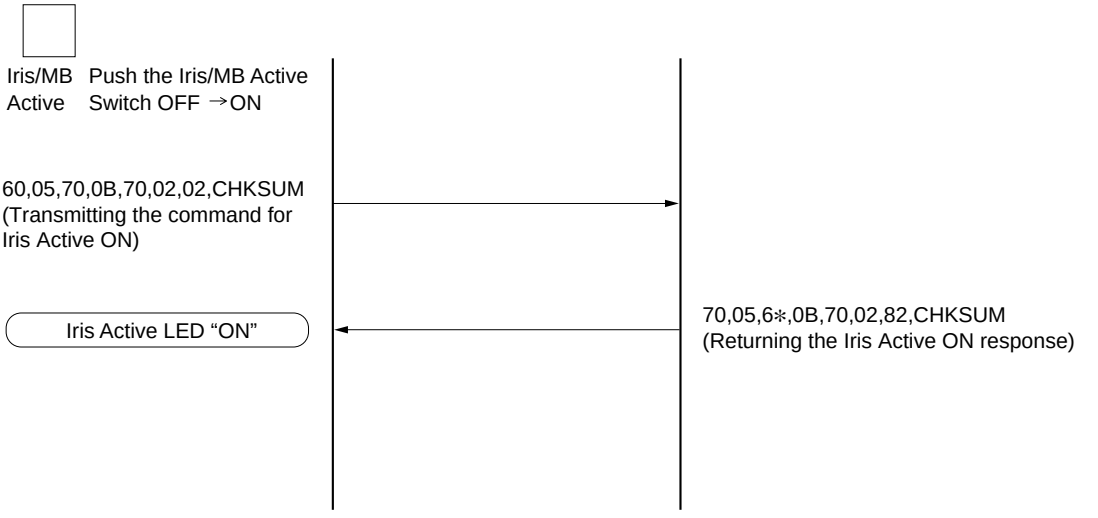
Procedure for analog control (Red/Blue White)



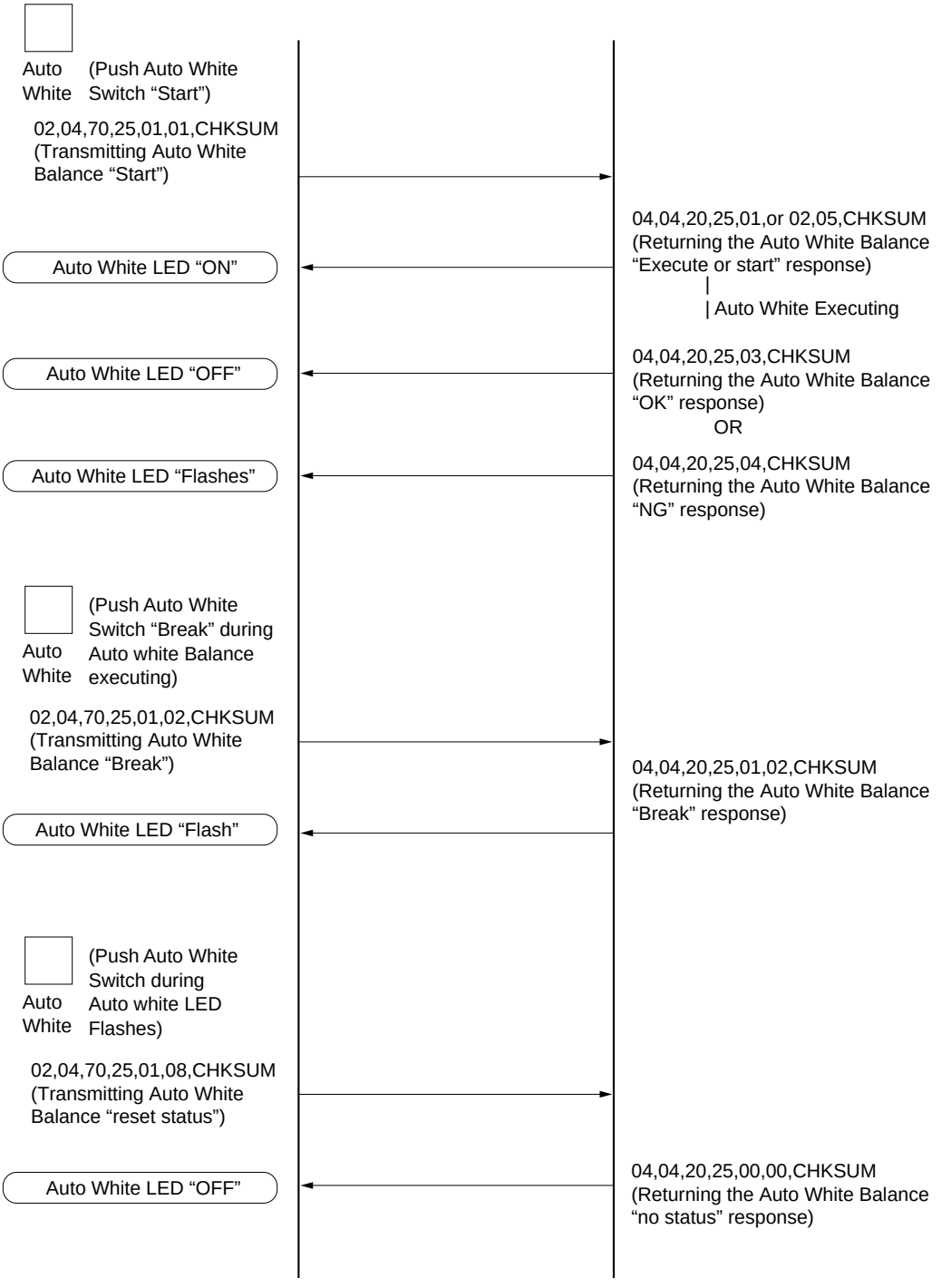
Procedure for Active



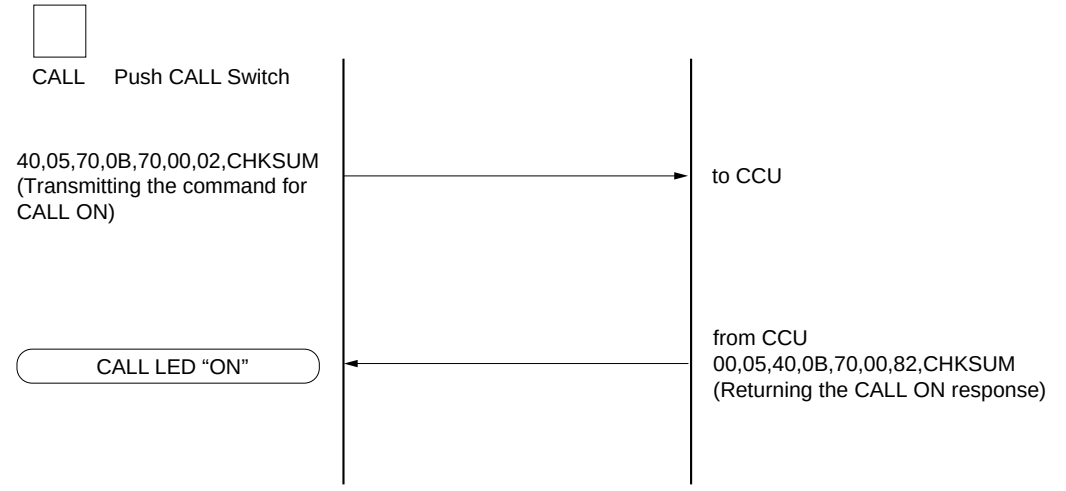
(When the Panel Active is turned on, both the Panel Active and Iris Active are turned on.)



Procedure for Auto setup control (Auto White Balance, Auto Black Balance)



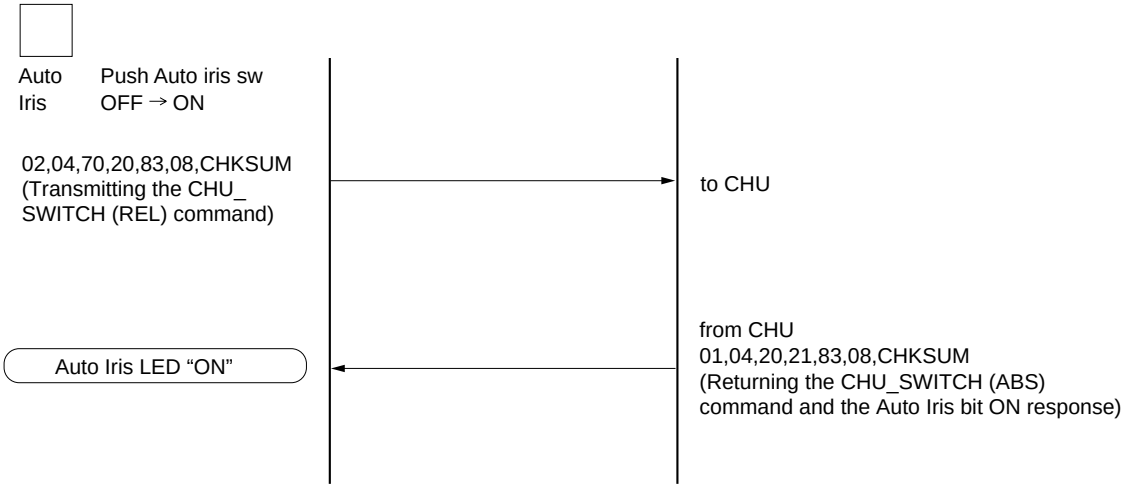
Procedure for Call



The device must transmit the command for CALL ON every 0.5 seconds while CALL is pressed.

Procedure for Switch items

For Example Auto iris on/off



Section 9
Others

9-1. ROM Model Information Area

The ROM model information area stores information about the ROM
such as model name, program name, version name and date, which can be viewed independently by using a ROM writer. This allows the ROM's contents to be checked even if there is no label attached.
The model information must be described using ASCII code in the following format.

	+0H	+1H	+2H	+3H	+4H	+5H	+6H	+7H	+8H	+9H	+aH	+bH	+cH	+dH	+eH	+fH
[ROM Last	B	V	P	–	7	0	0	/	7	5	0	∗1)	∗1)	∗1)	∗1)	∗1)
Address –63]	Model name															
[ROM Last	2	7	C	0	1	0	–	B	V	P	7	0	0	∗1)	∗1)	∗1)
Address –47]	Program name ∗2)															
[ROM Last	1	.	0	0	∗1)	∗1)	∗1)	∗1)	1	9	9	4	1	1∗4)	0	7∗4)
Address –31]	Version name ∗3)								Date ∗4)							
[ROM Last																ffH
Address –15]	Comment ∗3) ∗5)															∗5)

∗1) The model name, program name, version name and comment must be character strings that are padded with null characters (code 00H) or blank characters (code 20H). However, if padded with blank characters, the blank characters themselves will appear when displayed on the MSU, etc.
Example : When the model name is BVP-700/750
42H, 56H, 50H, 2DH, 37H, 30H, 30H, 2FH, 37H, 35H, 30H, 00H, 00H, 00H, 00H, .00H
or
42H, 56H, 50H, 2DH, 37H, 30H, 30H, 2FH, 37H, 35H, 30H, 20H, 20H, 20H, 20H, 20H
In the former case, the message "BVP-700/750" appears on the MSU, but in the latter case, "BVP-700/750@@@@ (@ indicates a blank character) appears.

∗2) The program name must be created using the format starting with "name of blank ROM" + "−" + "model name" as in ordinary computer entry.
Note that the name of the blank ROM must be a general classification name (the name must not be dependent on a specific manufacturer) and hyphens (−) must not be used in the model name.
Example : When the blank ROM name is TMS27C010A-10JL and the model name is CCU-700, enter "27C010-CCU700".

∗3) The version name must be created in order starting with "version number" + "suffix number". Do not put a hyphen (-) or the word "Ver" at the top, and do not insert a hyphen (−) between the version number and suffix number. The suffix number identifies special orders for the camera system, and consists of a three-digit custom code (alphabet letters) and an additional one digit (numeral) suffix (if necessary).
Example :
"1.00" OK
"1.00 AAA" OK
"V1.01" NG

∗4) When the month or day entry is a single digit, insert “0” before the numeral.
Example : January to September → “01” to “09”
October, November, December → “10”, “11”, “12”

∗5) The maximum length of the comment area is 15 bytes. The last byte is the check sum of the total information area. The check sum should be xx00H (where xx is a number other 0, i.e., the high order byte becomes non-zero and the low order byte becomes zero) when all of the 64 bytes in the information area are summed up. The check sum is used to judge whether the SRAM data is valid or not when the ROM is replaced. It is also used to judge whether the correct data has already been written when attempting to write a program into the flash-EEPROM.
Therefore, the value of the check sum byte must always be FFH in the last address of EPROM. (The reason for keeping the value at FFH is to enable the correct check sum value to be overwritten into the check sum area of the flash-EEPROM.) In the check sum area, the check sum must be calculated correctly and be written. (The upgrade process when replacing the flash EEPROM will be determined separately.)

9-2. Dedicated SIO

9-2-1. CXD8889R (Use of this IC anew is prohibited from January 1999)

Purpose

The CXD8889R is used as an interface between CCU, MSU, RCP and PANEL.

Outline of Structure

It consists of UART (Universal Asynchronous Receiver Transmitter), FIFO (Dual Port RAM), FIFO (256 byte×1), FIFO (Dual Port RAM) for transmit (46 byte), status registers and logic circuit.

Outline of Operation

Data from the UART (receiver) is written in FIFO1 (for receive). Reading and writing are performed independently. The data to read is written in FIFO3 (for INT data) and INT is output. The CPU reads data upon receipt of the INT.
Data from the CPU is written at the desired timing into FIFO2 (for transmission) after reading the writable amount of bytes from the status register.

System clock 9 MHz Master oscillator 18.000 MHz

Baud rate 2179 bits/s to 562.5 kbits/s

1 block data format Maximum 64 bytes

1	2	3	4 to 63	64
DESTID	PACLEN	SRCID	Data Area 60 bytes	CHKSUM

* PACLEN : A number in the range of 4 bytes to CHKSUM.

DESTID

00H to FFH User Address

1-byte format 11bit *DESTID
PACLEN
3 data of SRCID is even parity.

0	1 to 8	9	10
Start “L”	Data Bit	Parity “ODD”	Stop “H”

Register Map

	IC Address			Register
	A2	A1	A0	
00H	L	L	L	Receive Data
01H	L	L	H	Data Length
02H	L	H	L	Status Register-1
03H	L	H	H	Status Register-2
04H	H	L	L	Transmit Data
05H	H	L	H	–
06H	H	H	L	Status Register-3
07H	H	H	H	–

States Registers.

(Address 5H A0 = H, A1 = L, A2 = H Write Register) 1byte

Not used

ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0

Status Register-3(Address 6H A0 = L, A1 = H, A2 = H Read/Write Register)

Clock Select3	Clock Select2	Clock Select1			FIF01 Reset	Reset	Break
					Self Reset		

Select clock rate When 9.8304 MHz When 9 MHz

Clock Select3	Clock Select2	Clock Select1	kBit /sec		kBit /sec
L	L	L	614.4		562.5
L	L	H	153.6		140.625
L	H	L	76.8		70.3125
L	H	H	38.4		35.15625
H	L	L	19.2		17.578125
H	L	H	9.6		8.789063
H	H	L	4.8		4.394531
H	H	H	2.4		2.198266

* CCU ↔ CHU : 35.15625 kbps is the standard rate.
* Others : 562.5 kbps is the standard rate.

Transmit Data Register (Address 4H A0 = L, A1 = L, A2 = H Write Register) 1byte

ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0

Status Register-1(Address 2H A0 = L, A1 = H, A2 = L Read/Write Register)1byte

7	6	5	4	3	2	1	0
		Transmission INT approved	Break INT approved	Reception INT approved	Bypass		

Status Register-2 (Address 3H A0 = H, A1 = H, A2 = L Read/Write Register) 1byte

15	14	13	12	11	10	9	8
Break Interrupt	Overran Error	Transmission Interrupt	Reception Interrupt	Half full			Interrupt

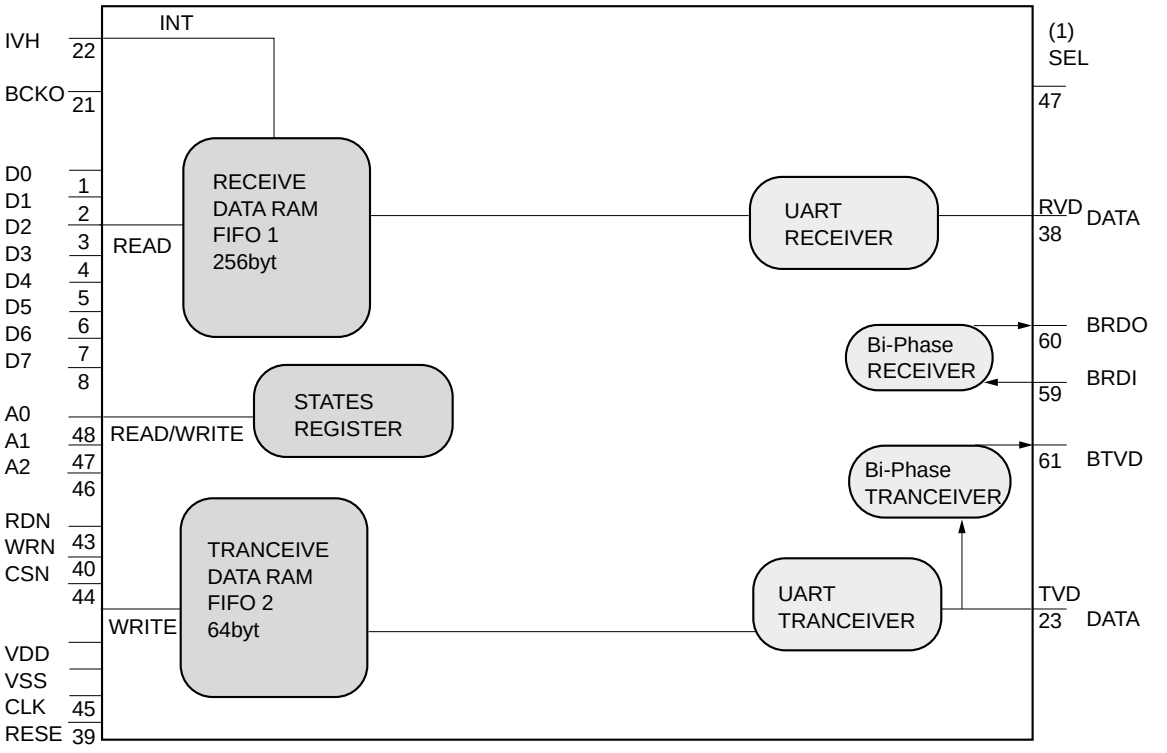
Write Enable Byte Register (Address 1H A0 = H, A1 = L, A2 = L Read/Write Register) 1byte

BA7	BA6	BA5	BA4	BA3	BA2	BA1	BA0

Receive Data (Address 0H A0 = L, A1 = L, A2 = L Read/Write Register) 1byte

RD7	RD6	RD5	RD4	RD3	RD2	RD1	RD0

Communication IC block diagram and pin assignment



9-2-2. CXD9093R (Serial Control Unit)

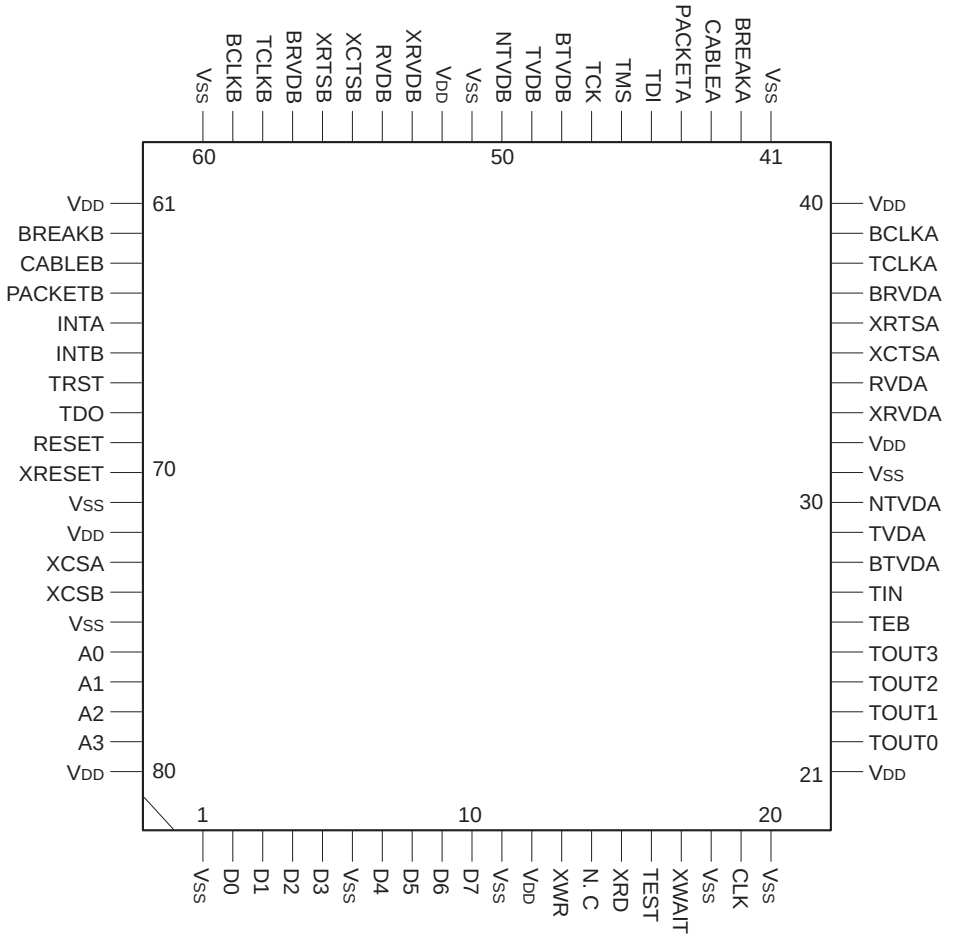
The CXD9093R is an intelligent control unit developed for serial data communication of the Sony broadcast-use camera system. The CXD9093R is regarded as a general device in the CPU system. It enables the start-stop synchronous communication that is unique to the Sony broadcast-use camera system, and also enables general-purpose start-stop synchronous communication, with both of them controlled by the CPU software.

Sony part code number : 8-759-594-17

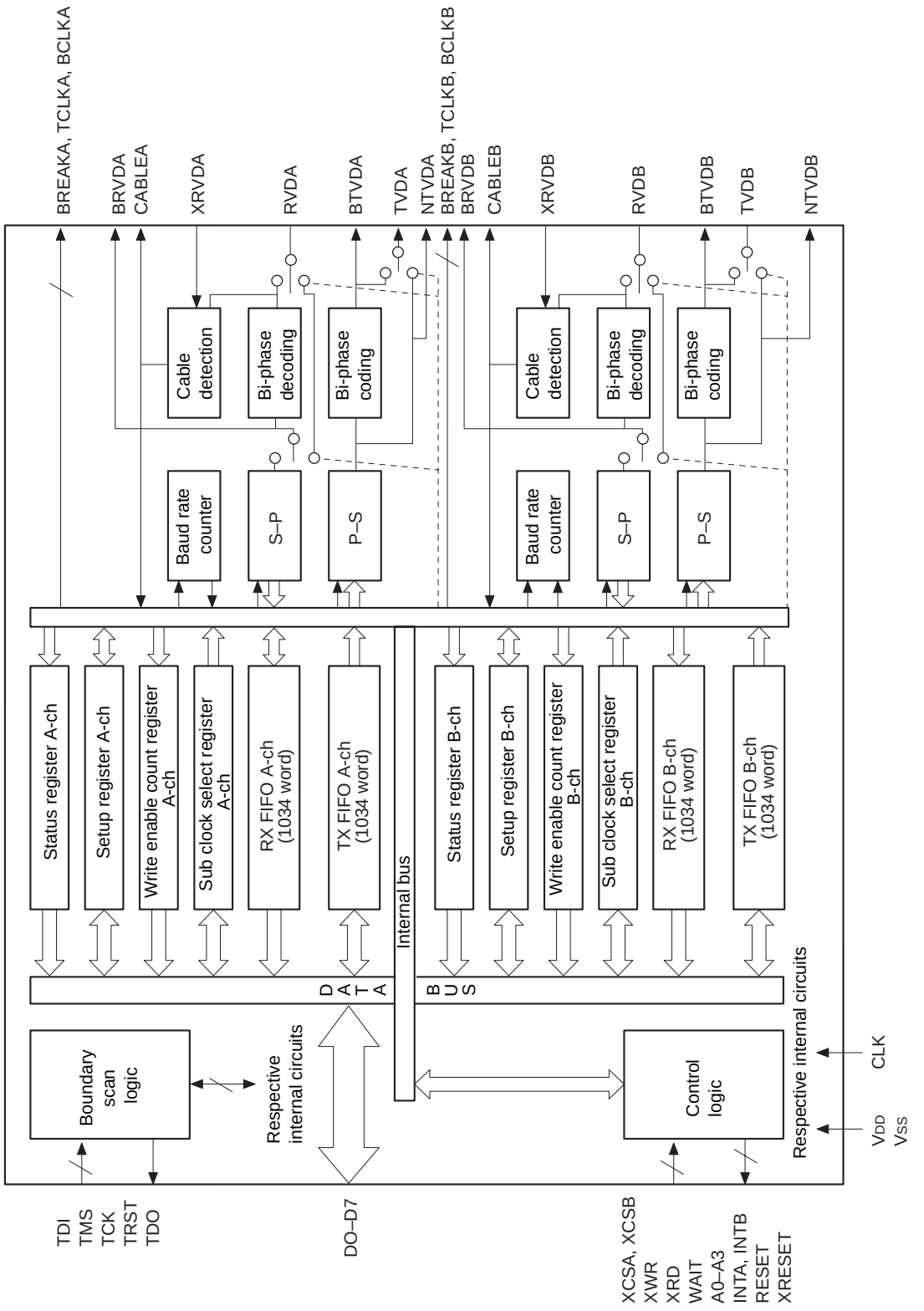
Features

1) Both the start-stop synchronous communication (called _700SIO mode_ hereafter) that is unique to the Sony broadcast-use camera system and the general-purpose start-stop synchronous communication (called _NORMAL SIO mode_ hereafter) are possible.
2) A two-channel serial control unit is built-in.
3) Because an FIFO buffer capable of storing 1034 data for transmission and reception respectively is built-in, even a low-speed CPU can perform high-speed data communication.
4) The maximum baud rate is 2.5 Mbps (at CLK of 40 MHz). Because there are two baud rate counters, the system supports various baud rate speeds.
5) The package size is 80-pin plastic TQFP (fine pitch) that is ideal for small packaging.
6) The operating power supply voltage is 3.3 V ± 0.3 V. Because all the pins that are used to interface with external devices are TTL input/output with a withstand voltage of 5 V, the CXD9093R can be connected to circuits operating on 5 V power as is. (Pull-up is necessary.)
7) The read and write timings with the CPU and CXD9093R are optimized by using wait signals.
8) RTS and CTS functions are built-in (and can be switched between enabled or disabled by software).
9) The communication error information is reflected on the status register. (Parity error, Framing error, Over run error, Cable open, Checksum error)
10) Initialization and error clearing can be performed by the setup register. (RX FIFO Reset, TX FIFO Reset, TX counter clear, RX error flag clear, IC Preset)
11) The format is fully compatible with the present format (upper compatibility with CXD8889R in the 700SIO mode).
12) Regarding the types of reception interrupt, either interrupt on each byte or interrupt on each packet can be selected (700SIO mode).
13) The top of a packet can be recognized during transmission, thus enabling automatic transmission regardless of the CPU after adding CHKSUM automatically (700SIO mode).
14) CHKSUM is automatically checked during reception (700SIO mode).
15) When the header is detected, the _Packet_ that indicates the time to end reception is set in the status register and the terminal (700SIO mode).
16) The number of data in one packet of transmission and reception can be expanded up to a maximum of 1024 (700SIO mode).

Pin connection diagram
(Top view)



Block diagram



Pin Description

Pin attribute	Pin symbol (Pin No.)	Description
Power supply	V_{DD} (12, 21, 32, 40, 52, 61, 72, 80)	Power supply voltage 3.3 V +/- 0.3 V (All VDD pins must be connected to the power supply line.)
GND	V_{SS} (1, 6, 11, 18, 20, 31, 41, 51, 60, 71, 75)	GND (All Vss pins must be connected to the GND line.)
Input/ output	D0, D1, D2, D3, D4, D5, D6, D7 (2) (3) (4) (5) (7) (8) (9) (10)	Data Bus
Input	A0, A1, A2, A3 (76) (77) (78) (79)	Address bus A3, A2, A1, A0 — Contents of registers — Attribute 0, 0, 0, 0 — RX DATA — read only 0, 0, 0, 1 — – — no use 0, 0, 1, 0 — Write Enable data count (High) — read only (High order byte must be read first.) 0, 0, 1, 1 — Write Enable data count (Low) — read only 0, 1, 0, 0 — STATUS-1 — read only 0, 1, 0, 1 — STATUS-2 — read only 0, 1, 1, 0 — – — no use 0, 1, 1, 1 — – — no use 1, 0, 0, 0 — TX DATA — read/write 1, 0, 0, 1 — – — no use 1, 0, 1, 0 — SETUP-1 — read/write 1, 0, 1, 1 — SETUP-1A — read/write 1, 1, 0, 0 — SETUP-2 — read/write 1, 1, 0, 1 — SETUP-3 — read/write 1, 1, 1, 0 — Sub Clock select — read/write 1, 1, 1, 1 — – — no use
Input	XCSA, XCSB (73) (74)	Chip select (on each channel) 0 : The chip is selected. 1 : No operation
Input	XWR (13)	Write 0 : Write cycle 1 : No operation
Input	XRD (15)	Read 0 : Read cycle 1 : No operation
Output	INTA, INTB (65) (66)	Interrupt output (on each channel) 0 : Interrupt has not occurred. 1 : Interrupt has occurred. (Causes of interrupt are TXready, RXready, RXBreak, Framing err, over run err, Parity err.) (The respective enable bits must be enabled.)
Input	CLK (19)	Fundamental operating clock of the IC (Maximum 40 MHz)
Output	BCLKA, BCLKB (39) (59)	16 times the communication clock is output (on each channel). (It is variable using the clock select.) (Phase is not synchronous with TVD and other outputs.) (Duty cycle is 50% ± 10%.)
Output	TCLKA, TCLKB (38) (58)	Communication clock output (on each channel) (It is variable using the clock select.) (Phase is not synchronous with TVD and other outputs.) (Duty cycle is 50%.)

Pin Description

Pin attribute	Pin symbol (Pin No.)	Description
Output	CABLEA, CABLEB (43) (63)	Indicates absence or existence of the data input (on each channel). 1 : connect 0 : open
Output	XRTSA, XRTSB (36) (56)	Outputs the value of the SETUP-1 b7 (RTS control) (on each channel). 1 : Issues transmission disapproval to the counterpart. 0 : ssues transmission approval to the counterpart.
Input	XCTSA, XCTSB (35) (55)	Performs transmission control using CTS. (When CTS is approved by the SETUP-1A b0 CTS enable) (on each channel). 1 : Transmission disable (Transmission is stopped after one byte is sent if transmission is in progress.) 0 : Transmission enable
Input	RVDA, RVDB (34) (54)	Serial data input (on each channel). The bi-phase signal is input or the positive (+) signal of the photo-coupler is input.
Input	XRVDA, XRVDB (33) (53)	Serial data input for detecting the data output (on each channel). The negative (–) signal of photo-coupler is input.
Output	TVDA, TVDB (29) (49)	Serial data output (on each channel)
Input	RESET (69)	Reset 1 : reset 0 : normal
Input	XRESET (70)	Reset 1 : normal 0 : reset (Be sure to pull up this pin when not used.)
Output	BTVDA, BTVDB (28)(48)	Dedicated output of the bi-phase serial data (on each channel).
Output	XWAIT (17)	Wait 1 : normal 0 : Set 0 to let CPU wait for R/W temporarily.
Output	BREAKA, BREAKB (42) (62)	Notifies that BREAK is received (on each channel). (same as STATUS-2 b5)
Output	PACKETA, PACKETB (44) (64)	This pin goes _1_ when header is found during 700SIO mode, and goes _0_ when data of PACLEN is received (on each channel). (same as STATUS-2 b4)
Output	NTVDA, NTVDB (30) (50)	Dedicated output of the serial data that is not bi-phase (on each channel)
Output	BRVDA, BRVDB (37) (57)	The decoded signal is output when the bi-phase signal is input (on each channel). (When the bi-phase signal is not used, this pin as TP is useful for checking signals.)
–	N.C (14)	Do not connect any signals to this pin.

Pin Description

Pin attribute	Pin symbol (Pin No.)	Description
Input	TEST (16)	Do not connect any signals to this pin (used for simulation). (Same as STATUS-2 b0)
Output	TOUT0 (22)	Do not connect any signals to this pin (used for IC inspection).
Output	TOUT1 (23)	Do not connect any signals to this pin (used for IC inspection).
Output	TOUT2 (24)	Do not connect any signals to this pin (used for IC inspection).
Output	TOUT3 (25)	Do not connect any signals to this pin (used for IC inspection).
Input	TEB (26)	Do not connect any signals to this pin (used for IC inspection).
Input	TIN (27)	Do not connect any signals to this pin (used for IC inspection).
Input	TDI (45)	Dedicated terminal for external boundary scan Serial data input to each register (Do not connect any signals to this pin when not used.)
Input	TMS (46)	Dedicated terminal for external boundary scan Determines status transition of the TAP controller. (Do not connect any signals to this pin when not used.)
Input	TCK (47)	Dedicated terminal for external boundary scan CLK terminal for testing the boundary scan (Connect this pin to GND when not used.)
Input	TRST (67)	Dedicated terminal for external boundary scan TAP controller reset terminal (Connect this pin to GND when not used.)
Output	TD0 (68)	Dedicated terminal for external boundary scan Serial data output to each register (Do not connect any signals to this pin when not used.)

Notes

1 : The symbol X*** in the Pin symbol column indicates the Active Low operation.

2 : The input, output and input/output terminals use the TTL buffer having withstand voltage of 5 V.
They can be used in the 5 V and 3 V circuits, but the pull-up resistor is necessary (except for the five dedicated terminals for external boundary scan).

3 : Be sure to use the dedicated terminals for external boundary scan, in the 3 V circuit.
Refer to the _BOUNDARY SCAN Version 1.0_ manual for details on how to use them.

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RX DATA (address 0H)	00H to FFH							
WRITE Enable Count (High) (address 2H)	0000H to 040AH							
WRITE Enable Count (Low) (address 3H)								
STATUS-1 (address 4H)	Rx ready 0 : none 1 : Received data exists.	Tx ready 0 : Blank available 1 : Transmission databuf	RX Break 0 : none 1 : break reception	Packet 0 : none 1 : Reception is in progress.	Checksum 0 : none 1 : error	Framing 0 : none 1 : error	Over run 0 : none 1 : error	Parity 0 : none 1 : error
STATUS-2 (address 5H)								Cable 0 : open 1 : connect
TX DATA (address 8H)	00H to FFH							
SETUP-1 (address AH)	RTS control 0 : Sets the RTS pin to 0. 1 : Sets the RTS pin to 1.	Send Break 0 : No operarion 1 : TX BREAK	RX FIFO reset flag clear 0 : No operarion 1 : reset	TX FIFO reset clear 0 : No operarion 1 : reset	Rxerror enable 0 : No operarion 1 : clear	TX counter enable 0 : No operarion 1 : clear	RX interrupt 0 : No operarion 1 : enable	TX interrupt 0: disable 1: enable
SETUP-1A (address BH)	0	0	0	0	0	0	Break interrupt enable 0 : disable 1 : enable	CTS enable 0 : Transmis-sion is enabled only when CTS is 0. 1 : Transmis-sion is enabled at all times.
SETUP-2 (address CH)	Main Clock Select 2	Main Clock Select 1	Main Clock Select 0	0	0	0	Modulation Mode 0 : Normal 1 : Bi-phase	SIO mode 0 : 700SIO 1 : Normal SIO
SETUP-3 (address DH)	IC Rreset 0 : No operation 1 : preset	Transmission interval 0 : Continuous without blank 1 : One communi-cation clock	700SIO TX sequence 0 : byte 1 : packet	700SIO RX interrupt 0 : byte 1 : packet	Normal SIO Stop bit 0 : 1bit 1 : 2bit	Normal SIO parity 1 0, 1:ODD 0, 1:EVEN	Normal SIO parity 0 0, 0 :none 1, 0 :none	Normal SIO data length 0 : 8bit 1 : 7bit
Sub Clock select (address EH)	00H to FFH							

Details of the Data Registers

(Both RX DATA and TX DATA go to 0 when the system is reset.)

RX DATA (address 0H)

This register is used to read data from RX FIFO in which the received serial data is stored (read only).

Note

Do not read the RX DATA without a specific purpose because reading RX DATA sets RX ready to 1 even though RX ready has been 0 during the 700SIO RX interrupt byte. You can read RX DATA without a specific purpose during the 700SIO RX interrupt packet.

TX DATA (address 8H)

This register is used to write data into RX FIFO where the serial data to be transmitted is temporarily stored.

Note

CHKSUM need not be written in the 700SIO mode because the CHKSUM byte is automatically added.

Details of the WRITE Enable Count (High, Low)

(The WRITE Enable Count (High) becomes 04H and the WRITE Enable Count (Low) becomes 0AH when the system is reset.) (read only)

WRITE Enable Count (High) (address 2H)

This register indicates the number of data that can be written into TX FIFO.

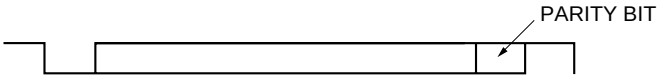
WRITE Enable Count (Low) (address 3H)

Note

Be sure to read the WRITE Enable Count (High) first when reading the WRITE Enable Count (High) because the WRITE Enable Count (Low) is latched. The WRITE Enable Count (Low) need not be read.

STATUS-1 (Address 4H)
(STATUS-1 goes to 0 when Parity error occurs.)

bit0 Parity : This bit goes to 1 when Parity error occurs.

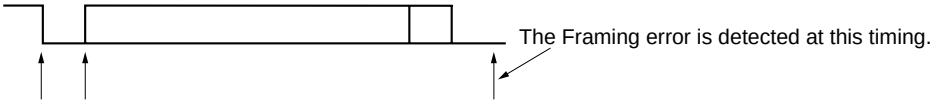


- 700SIO mode
  When the parity bit becomes any output other than even while receiving serial data of PACLEN after detection of the header of 3 bytes (5 bytes in the extension-2 format), the error is detected at that timing. Then RX ready goes to 1 and this parity bit goes to 1 at the same time, even if the packet is not completed yet at that timing.
  This Parity error is cleared as follows :
  During the 700SIO interrupt packet : Parity error is automatically cleared when the header of 3 bytes is read out. It is also cleared by RX FIFO reset, IC preset or reset.
  During the 700SIO interrupt byte : Parity error is automatically cleared when the error data of 1 byte is read out from the RX data.
  It is also cleared by RX FIFO reset, IC preset or reset.

- NORMAL SIO mode
  When the parity bit does not agree with the parity bit that is set by the Normal SIO parity 0, 1, the parity output goes to 1.
  This parity bit is cleared when the error data of 1 byte is read out from the RX data and when the RXerror flag clear is set to 1. This parity bit is also cleared by RX FIFO reset, IC preset or reset.

bit1 Over run : This bit goes to 1 when an Over run error occurs.
The RX FIFO is a ring buffer, which means in some cases received data that has not been read yet, may be erased by overwriting. If this overwriting occurs, the Over run bit goes to 1. This bit is cleared by RX FIFO reset, IC preset or reset.

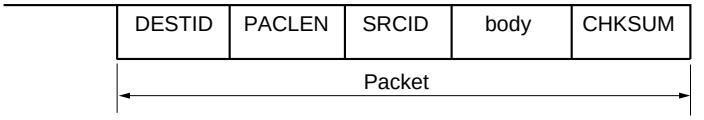
bit2 Framing : This bit goes to 1 when a Framing error occurs.



- 700SIO mode
  When “1” cannot be found in the STOPBIT that is sampled from the START BIT while receiving serial data of PACLEN after detection of the header of 3 bytes (even parity) (5 bytes in the extension-2 format), the error is detected at that timing. Then RX ready goes to 1 and the framing bit goes to 1 at the same time even when the packet is not completed yet at that timing.
  This framing error is cleared as follows:
  During the 700SIO interrupt packet : The framing error is automatically cleared when the header of 3 bytes is read out. It is also cleared by RX FIFO reset, IC preset or reset.
  During the 700SIO interrupt byte : The framing error is automatically cleared when the error data of 1 byte is read out from the RX data.
  It is also cleared by RX FIFO reset, IC preset or reset.

- NORMAL SIO mode
  The framing bit goes to 1 when “1” cannot be found in the STOPBIT that is sampled from the START BIT. This framing bit is cleared when the error data of 1 byte is read out from the RX data and when the RXerror flag clear is set to 1. This parity bit is also cleared by RX FIFO reset, IC preset or reset.

bit3 Check sum : This bit goes to 1 when a Check sum error occurs.

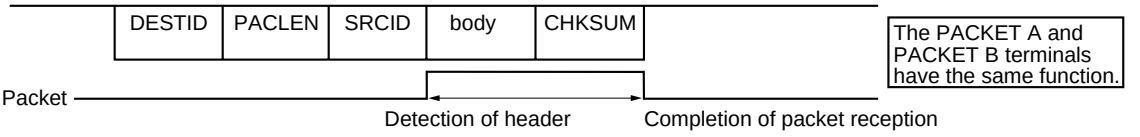


Valid only during the 700 SIO mode
This Check sum goes to 1 when the lower-order one byte of the total sum of DESTID to CHKSUM is calculated and is not "0", when serial data of PACLEN is received (one packet reception) after detection of the header of 3 bytes (5 bytes in the extension-2 format).
The Check sum error bit is cleared as follows :

During the 700SIO RX interrupt packet : The Check sum error bit is automatically cleared when the header of 3 bytes is read out. It is also cleared by RX FIFO reset, IC preset or reset.

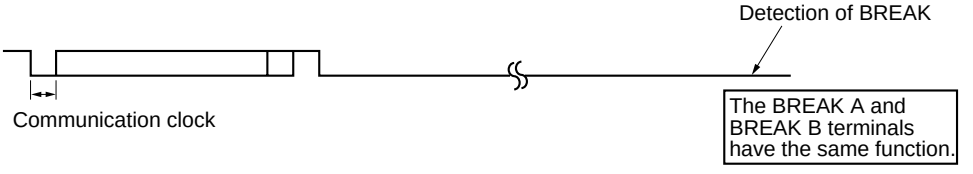
During the 700SIO RX interrupt byte : The Check sum error bit is automatically cleared when the CHKSUM is read out from the RX data, and the RXerror flag clear is set to 1.
It is also cleared by RX FIFO reset, IC preset or reset.

bit4 Packet : This bit goes to 1 while receiving packets.



Valid only during the 700 SIO mode
This packet remains 1 from when the header is detected up to completion of packet reception.
This packet is used to find out the status in which packets cannot be completed due to an error after the header is found.
This packet goes to 0 when the serial data of PACLEN is received, and is also cleared by RX FIFO reset, IC preset or reset.

bit5 RX Break : This bit goes to 1 when BREAK is detected.



Valid only during the 700 SIO mode
When the Break interrupt is enabled
RX Break is set to 1 when the 0 state (BREAK) of serial data continues for 21 or more consecutive communication clocks.
RX Break goes to 0 by RX FIFO reset, IC preset or reset.

TX ready goes to 1 when TX FIFO has even one empty byte. TX ready goes to 0 when TX FIFO has no empty byte.
The TX ready remains 0 always when the CTS enable is 0 and when the CTSA and CTSB terminals are 1. At the same time, the TX ready state is output to the INTA and INTB terminals.

bit7 RX ready : In the 700SIO mode

- During the 700SIO interrupt packet
  RX ready goes to 1 when one packet is completed.
  When Parity error, Framing error or Checksum error occurs, only the header enters RX FIFO. When each error flag goes to 1, RX ready goes to 1.
  RX ready becomes 0 when all of the packets (header in the various errors) are read out.
- During the 700SIO interrupt byte
  When the header of 3 bytes (5 bytes in the extension-2 format), RX ready goes to 1.
  RX ready becomes 0 when RX FIFO is completely read out and no more data is left. (The error data also must be read out.)
  Note
  Reading RX DATA without a specific purpose sets RX ready to 1 even though RX ready has been 0 while in the 700SIO RX interrupt word data.

- In the NORMAL SIO mode
  RX ready goes to 1 when one byte or more of the received enters RX FIFO.
  RX ready becomes 0 when RX FIFO is completely read out and no more data is left. (The error data also must be read out.)

The RX ready state is output to the INTA and INTB terminals when RX interrupt is enabled.

Details of STATUS-2 (address 5H)

(STATUS-2 goes to all 0 when reset.) (read only)

bit0 Cable : The input signal is checked as to whether the Bi-phase signal is input or a signal that is not the Bi-phase signal is input. When the Bi-phase signal is input, the Cable terminal goes to 1. (The CABLEA and CABLEB terminals have the same function.)

Detection method
When the input signal is the Bi-phase signal, existence of the input data is judged by counting the number of input clocks. When the input signal is not the Bi-phase signal, existence of the input data is judged by checking the input signals to the RVDA/B and XRVDA/B which have different polarity. (Existence “on” is judged by checking 12 communication clocks. When data is not input for 440 communication clocks or more, existence “off” is judged.)

Details of SETUP-1 (address AH)

(All bits of SETUP-1 go to 0 when the system is reset, or when IC preset of SETUP-3 is executed.)

bit0 TX interrupt enabled enable (approval)

0 : disable (Disabled, but the data that has already been written into TX FIFO is transmitted in the disabled state.)

bit1 RX interrupt enabled enable (approval)

0 : disable (Disabled, but the serial data is normally received in the disabled state.)

bit2 TX counter clear (valid only during the 700SIO mode)

1 : Clear
The packets that have already written in TX FIFO are left as they are, but the Checksum calculating counter that is used for the data to be written in TX FIFO, is reset. (It returns to 0 automatically after clearing.)

0 : No Operation

bit3 RX error flag clear

1 : Clear
The various errors that have occurred during serial data reception are cleared. (This bit returns to 0 automatically after clearing.)

0 : No Operation

Note

The RXerror flag clear has the function of clearing the various error flags only and does not erase RX FIFO data.

bit4 RX FIFO reset

1 : All of RX FIFO in which the received data is stored, the header detection circuit and the Checksum calculation circuit are cleared. (This bit returns to 0 automatically after clearing.)
The various errors that have occurred during serial data reception are cleared.

0 : No Operation

bit5 TX FIFO reset

1: All of TX FIFO in which the received data is stored and the Checksum calculation circuit are cleared. (This bit returns to 0 automatically after clearing.)

0 : No Operation

bit6 TX Send Break (valid only during the NORMAL SIO mode)

1 : The serial data to be transmitted is set to 0 for the duration of 21 communication clocks or more. (Setting BREAK)

0 : No Operation

bit7 RTS control (Setting the RTS terminal to 1/0)

(This bit is used to perform the hardware flow control when connected with the CTS terminal of the communication counterpart.)

1 : Sets the XRTSA/XRTSB terminals to 1. (Instructs the communication counterpart to disable transmission.)

0 : Sets the XRTSA/XRTSB terminals to 0. (Instructs the communication counterpart to enable transmission.)

Details of SETUP-1A (address BH)

(All bits of SETUP-1A go to 0 when the system is reset, or when IC preset of SETUP-3 is executed.)

bit0 CTS enable

1 : This bit disables the status CTS of the external inputs (XCTSA and XCTSB), and enables transmission all the time regardless of CTS.

0 : This bit enables the status CTS of the external inputs (XCTSA and XCTSB).

Example of operation : Transmission is enabled when the external input (XCTS*) is 0 with the CTS enable being 0.

When the external input (XCTS*) becomes 1, transmission is not started from the data that is going to be output next.

bit1 Break interrupt enable. Valid in the NORMAL SIO mode only

1 : enable

RX Break goes to 1 when BREAK is input.

0 : disable

RX Break does not change even when BREAK is input.

Details of SETUP-2 (address CH)

(All bits of SETUP-2 go to 0 when the system is reset.)

bit0 SIO mode

1 : NORMAL SIO mode (The system works as SIO operating under general-purpose start-stop synchronous communication.)

0 : 700SIO mode (The system works as a unique SIO performing the header (3- or 5-byte) addition and detection, and CHECKSUM addition and detection.)

bit1 Modulation mode

1 : This position is selected when inputting and outputting the Bi-phase signal to and from the RVDA/RVDB and TVDA/TVDB terminals.

0 : This position is selected when inputting and outputting the signals other than the Bi-phase signal using the RVDA/RVDB and TVDA/TVDB terminals.

bit5/6/7 Main clock select 2, 1, 0

The input CLK is frequency-divided by the following setting and is sent to the sub clock select circuit.

Main clock select2	Main clock select1	Main clock select	Frequency-dividing ratio	Reference communication rate (kbps)	
0	0	0	1	562.5	
0	0	1	1/4	140.625	*Standard
0	1	0	1/8	70.3125	
0	1	1	1/16	35.15625	
1	0	0	1/32	17.578125	*CHU ↔ CCU standard
1	0	1	1/64	8.789063	
1	1	0	1/128	4.394531	
1	1	1	1/256	2.197266	

Conditions of the reference communication rate

CLK 9 MHz, Sub clock select 0

Details of SETUP-3 (address DH)

(All bits of SETUP-3 go to 0 when the system is reset.)

bit0 Normal SIO data length (Valid in the Normal SIO mode only)

1 : 7bit

0 : 8bit

bit1 to bit2 Normal SIO STOP bit (Valid in the Normal SIO mode only)

bit1	Parity 0	0	0	1	1
bit2	Parity 1	0	1	0	1
		No parity	No parity	ODD	EVEN

bit3 Normal SIO STOP bit (Valid in the Normal SIO mode only)

1 : 2bit

0 : 1bit

bit4 700SIO RX interrupt (Valid in the 700SIO mode only)

1 : packet

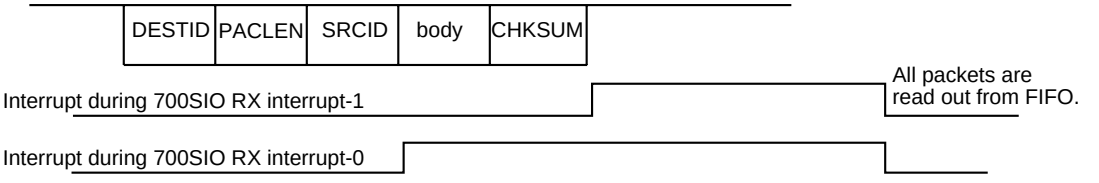
RX ready goes to 1 when a packet is received. (Same as INTA and INTB)

0 : byte

RX ready goes to 1 when a byte is received. (Same as INTA and INTB)

Note : In the Normal SIO mode,

RX ready goes to 1 even when data of 1 byte is received.



bit5 700SIO TXsequence (Valid in the 700SIO mode only)

1 : packet

When the entire data of one packet is written in TX FIFO, the data is transmitted altogether.

0 : byte

When data is written one byte after another, it is transmitted one byte after another.

In the Normal SIO mode,

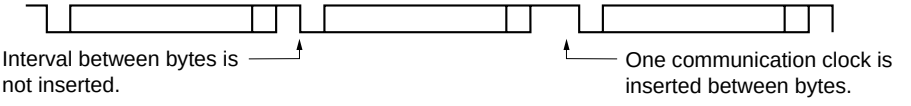
When even one byte of data is written, it is always transmitted immediately.

bit6 Transmission interval

1: One communication clock is inserted between every byte as the transmission interval.

0: No intervals are inserted.

Example :



bit7 IC Preset

1 : This position enables the communication clock and sets the SETUP-1 and SETUP-1A to 0.

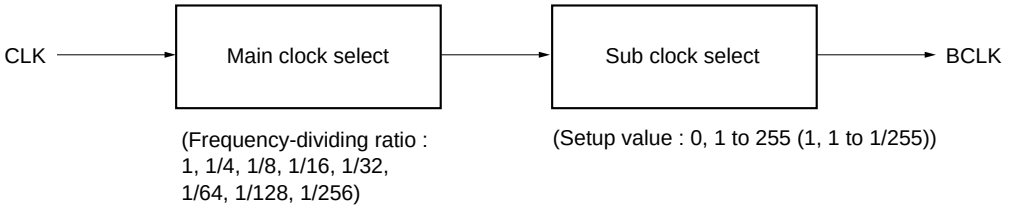
0 : No operation

Be sure to perform the SETUP-2 and the Sub Clock select setting before executing this IC Preset.

The other bits of SETUP-3 can be set when IC Preset is set to 1.

Details of Sub Clock select (address EH)

Frequency-division is performed in order to create BCLK. When the Sub Clock select is either 0 or 1, the Main Clock select output is output as it is.



Method of calculating the communication rate

Baud rate (bps) = CLK × Main Clock select's Frequency-dividing ratio × Sub Clock select's Frequency-dividing ratio

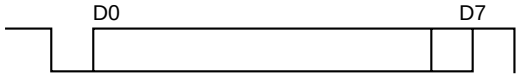
Note

The error of the baud rate must be 1.5% or less.

Fundamental Format of Serial Data

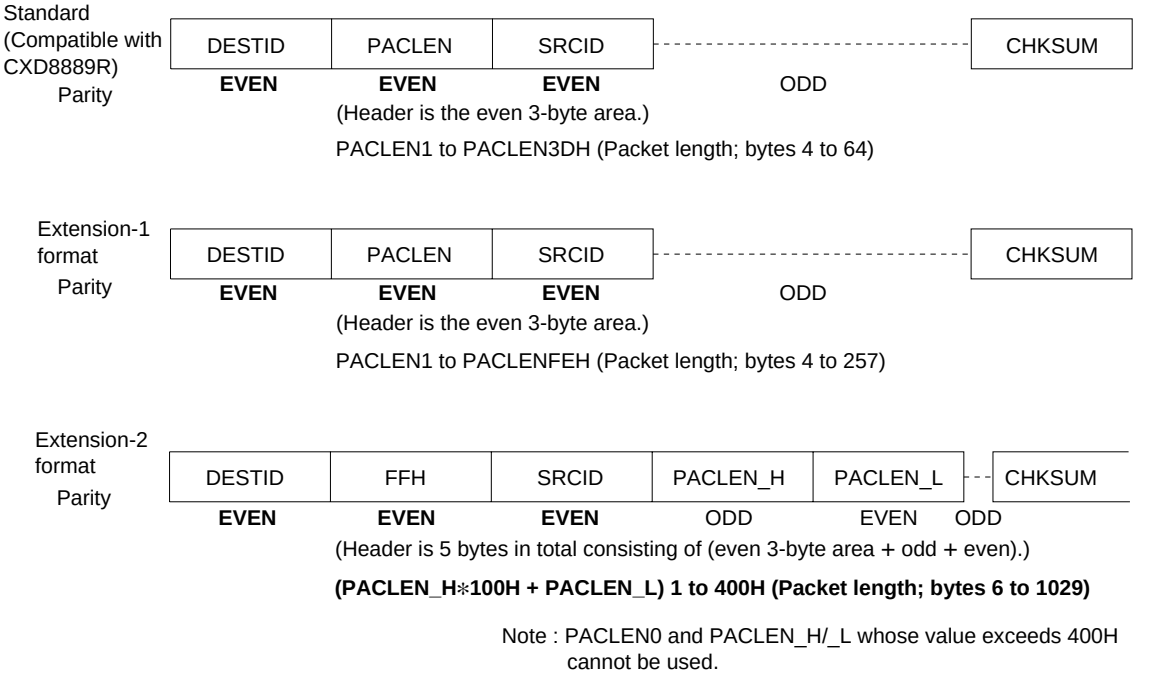
700SIO Mode

700SIO byte format



START BIT 1, DATA 8, PARITY (EVEN or ODD), STOP BIT 1

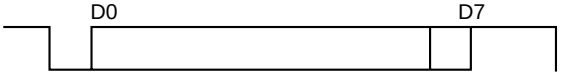
700SIO packet format



Note : PACLEN0 and PACLEN_H/_L whose value exceeds 400H cannot be used.

Normal SIO Mode

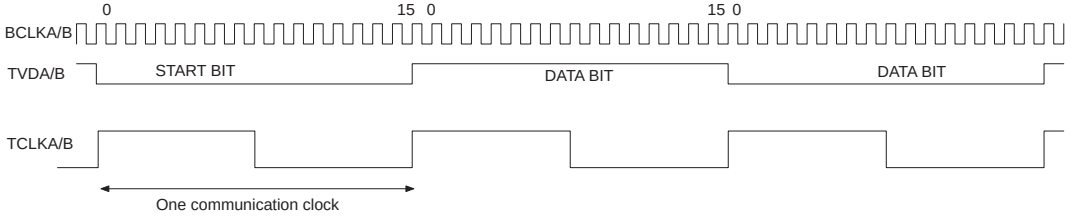
Normal SIO byte format



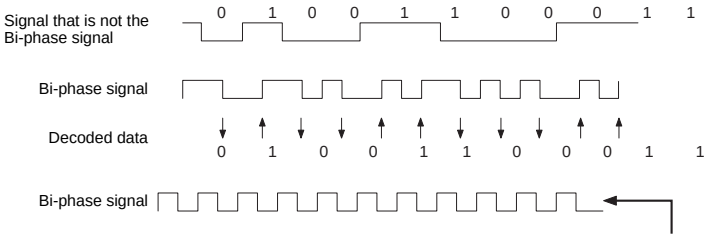
START BIT 1, DATA 7 or 8 selectable, PARITY selectable (NONE or EVEN or ODD), STOP BIT 1 or 2 selectable

Serial Data and Communication Clock System Timing Chart

1) Relation between TVD and BCLK/TCLK



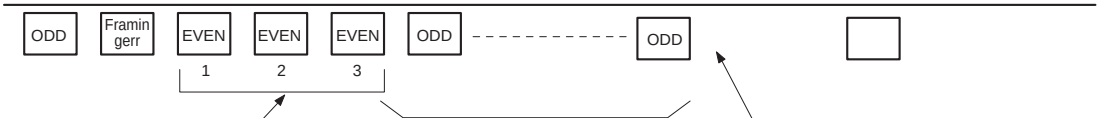
2) Bi-phase coding



The Bi-phase signal as shown becomes always “H” or always “L” after decoding. Therefore, this IC has the function of setting the decoded signal to “H” when the decoded signal keeps “L” for 22 TCLKs or more.

Header Detection in the 700SIO Mode

1) Standard and extension-1 format

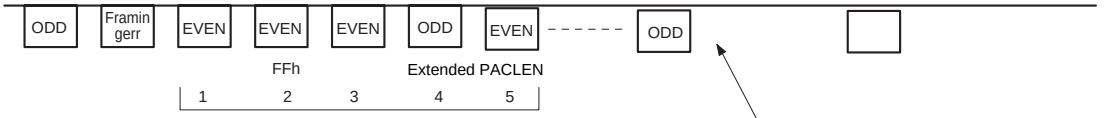


The even parity data of 3 bytes is detected here. This detected area is the header. Area 2 of the header is regarded as PACLEN.

Data of as many bytes as PACLEN is read into FIFO.

The header detection is cleared at this timing. Detection of the next header is started until the new even parity of 3 bytes is detected. Errors are not detected until the header is detected.

2) Extension-2 format



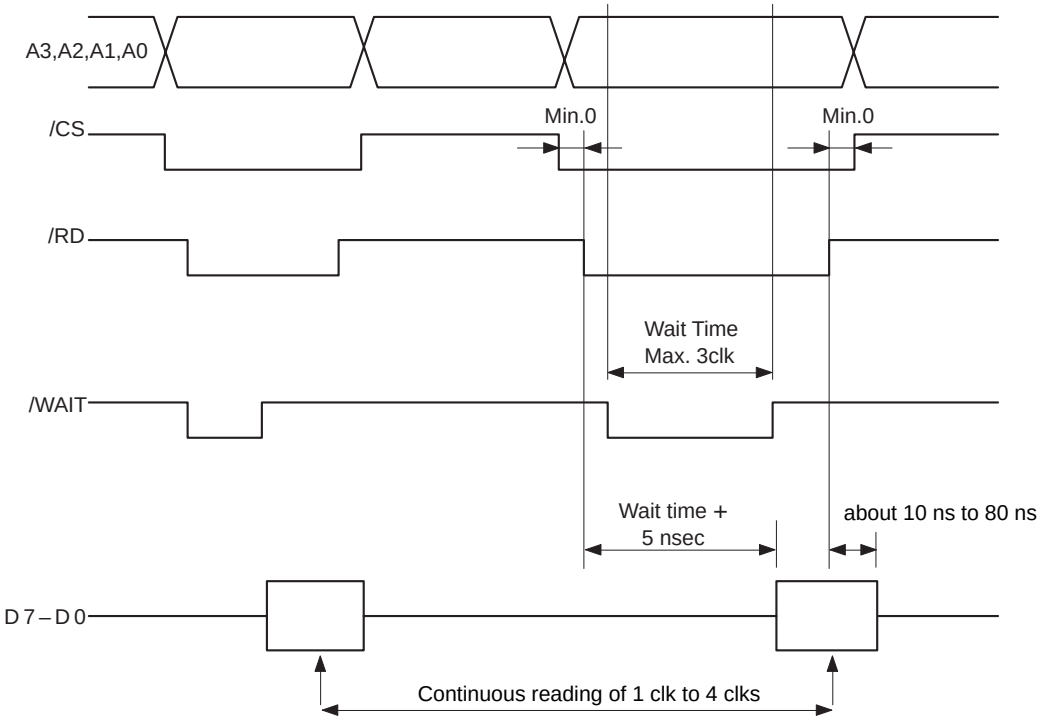
As the even parity of 3 bytes is detected, data 2 is then checked. If data 2 is FFH, the format is the extension format 2 so data 4 and 5 are also checked. When data 4 and 5 are odd and even, the header of 5 bytes of the extension format is assumed to have been detected so PACLEN_H and PACLEN_L (extended PACLEN) are read out.

Data of as many bytes as the extended PACLEN, is read into FIFO.

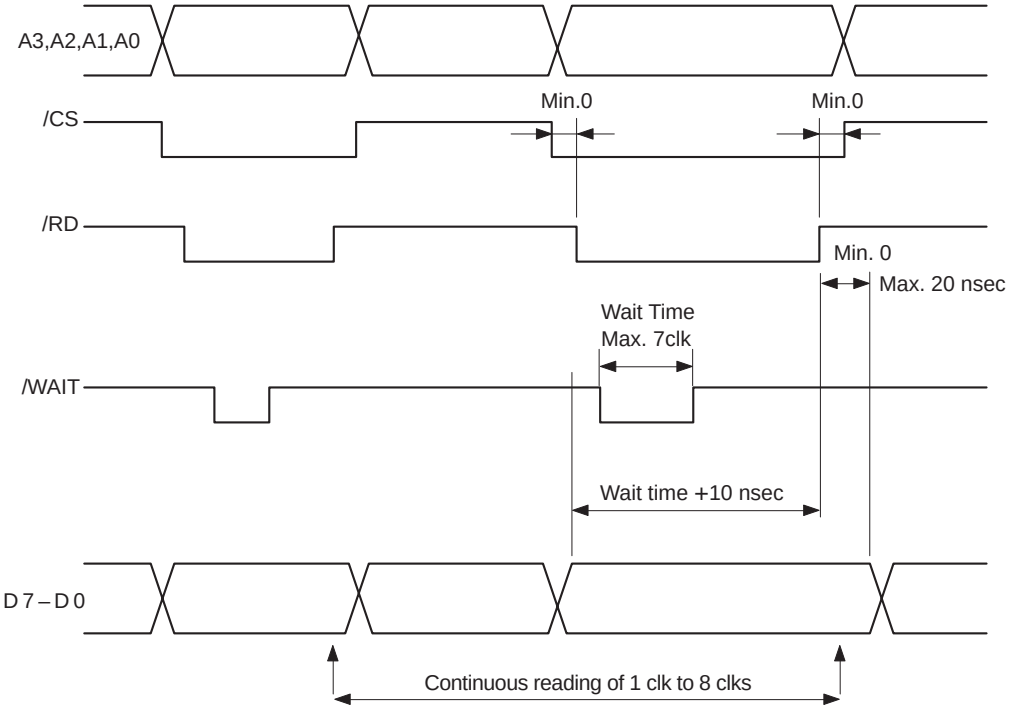
The header detection is cleared at this timing. Detection of the next header is started until the new even parity of 3 bytes is detected. Errors are not detected until the header is detected.

CPU System Timing Chart

1) Read Cycle Timing When Viewed from CPU



2) Write Cycle Timing When Viewed from CPU



1 clk = CLK (when 10 MHz) 100 ns
= CLK (when 20 MHz) 50 ns

Note

WAIT occurs when /CS is '0' without fail.

CXD9093R Pin Electrical Specifications

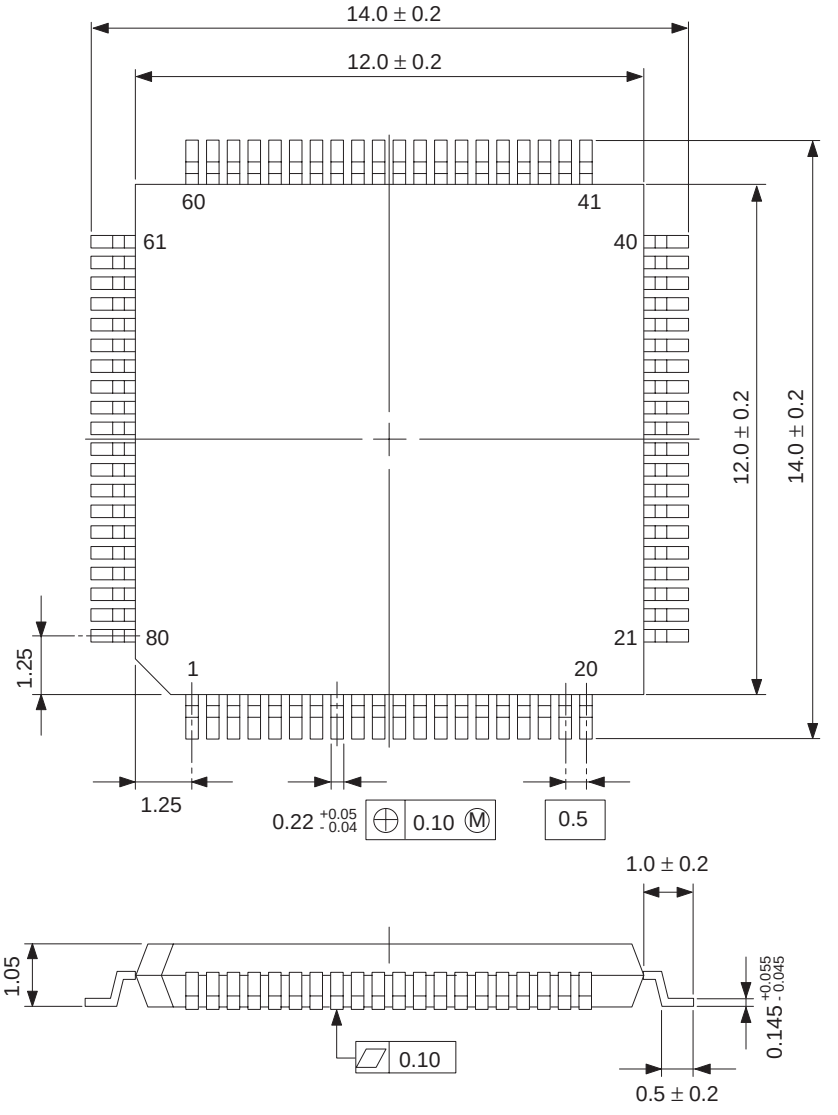
Pin No.	I/O	Pin Symbol	Pin Description	Pin Electrical Specifications	IOL (mA)	Standard Operating Frequency	Standard CL (PF)	Remarks (Notes on using the IC)
1		V_{SS}	GND					
2	IO	D0	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
3	IO	D1	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
4	IO	D2	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
5	IO	D3	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
6		V_{SS}	GND					
7	IO	D4	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
8	IO	D5	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
9	IO	D6	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
10	IO	D7	Data bus	I/O buffer, TTL w/withstand voltage 5V	6	to 20 MHz	30	
11		V_{SS}	GND					
12		V_{DD}	3.3 V±0.3 V					
13	I	XWR	$\overline{\text{WRITE}}$	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
14		N.C						
15	I	XRD	$\overline{\text{READ}}$	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
16	I	TEST	(for simulation)	Input Buff 50k pull down				Be sure to open when mounted on a circuit board.
17	O	XWAIT	$\overline{\text{WAIT}}$	Output buffer, TTL w/withstand voltage 5V		to 20 MHz	6	
18		V_{SS}	GND					
19		CLK	Main Clock	Input buffer, TTLf w/withstand voltage 5V		to 40 MHz		
20		V_{SS}	GND					
21		V_{DD}	3.3 V±0.3 V					
22	O	TOUT0	(for IC inspection)	Output	3			Be sure to open when mounted on a circuit board.
23	O	TOUT1	(for IC inspection)	Output	3			Be sure to open when mounted on a circuit board.
24	O	TOUT2	(for IC inspection)	Output	3			Be sure to open when mounted on a circuit board.
25	O	TOUT3	(for IC inspection)	Output	3			Be sure to open when mounted on a circuit board.
26	I	TEB	(for IC inspection)	Input Buff 50k pull up				Be sure to open when mounted on a circuit board.
27	I	TIN	(for IC inspection)	Input Buff 50k pull down				Be sure to open when mounted on a circuit board.
28	O	BTVDA	Dedicated for channel-A Bi-phase serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
29	O	TVDA	Channel-A serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
30	O	NTVDA	Channel-A Normal dedicated serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 1.25 MHz	6	
31		V_{SS}	GND					
32		V_{DD}	3.3 V±0.3 V					
33	I	XRVDA	Channel-A serial data inverted input	Input buffer, TTLf w/withstand voltage 5V		to 1.25 MHz		
34	I	RVDA	Channel-A serial data input	Input buffer, TTLf w/withstand voltage 5V		to 2.5 MHz		
35	I	XCTSA	Channel-A $\overline{\text{CTS}}$ input	Input buffer, TTLf w/withstand voltage 5V				
36	O	XRTSA	Channel-A $\overline{\text{RTS}}$ output	Output buffer, TTL w/withstand voltage 5V	3		6	
37	O	BRVDA	Dedicated for channel-A Bi-phase decoded data output	Output buffer, TTL w/withstand voltage 5V	3	to 1.25 MHz	6	
38	O	TCLKA	Channel-A TCLK output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
39	O	BCLKA	Channel-B TCLK output	Output buffer, TTL w/withstand voltage 5V	6	to 40 MHz	6	
40		V_{DD}	3.3 V±0.3 V					

Pin No.	I/O	Pin Symbol	Pin Description	Pin Electrical Specifications	IOL (mA)	Standard Operating Frequency	Standard CL (PF)	Remarks (Notes on using the IC)
41		V_{SS}	GND					
42	O	BREAKA	Channel-A BREAK detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
43	O	CABLEA	Channel-A CABLE detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
44	O	PACKETA	Channel-A PACKET detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
45	I	TDI	For boundary scan	Input Buff 50k pull up				Fixed to 'H' when not in use.
46	I	TMS	For boundary scan	Input Buff 50k pull up				Fixed to 'H' when not in use.
47	I	TCK	For boundary scan	Input Buff				Fixed to 'L' when not in use.
48	O	BTVDB	Dedicated for channel-B Bi-phase serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
49	O	TVDB	Channel-B serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
50	O	NTVDB	Dedicated for channel-B Normal serial data output	Output buffer, TTL w/withstand voltage 5V	3	to 1.25 MHz	6	
51		V_{SS}	GND					
52		V_{DD}	3.3 V±0.3 V					
53	I	XRVDB	Channel-B serial data inverted input	Input buffer, TTL w/withstand voltage 5V		to 1.25 MHz		
54	I	RVDB	Channel-B serial data input	Input buffer, TTL w/withstand voltage 5V		to 2.5 MHz		
55	I	XCTSB	Channel-B $\overline{CTS}$ input	Input buffer, TTL w/withstand voltage 5V				
56	O	XRTSB	Channel-B $\overline{RTS}$ output	Output buffer, TTL w/withstand voltage 5V	3		6	
57	O	BRVDB	Dedicated for channel-B Bi-phase decoded data output	Output buffer, TTL w/withstand voltage 5V	3	to 1.25 MHz	6	
58	O	TCLKB	Channel-B TCLK output	Output buffer, TTL w/withstand voltage 5V	3	to 2.5 MHz	6	
59	O	BCLKB	Channel-B BCLK output	Output buffer, TTL w/withstand voltage 5V	6	to 40 MHz	6	
60		V_{SS}	GND					
61		V_{DD}	3.3 V±0.3 V					
62	O	BREAKB	Channel-B BREAK detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
63	O	CABLEB	Channel-B CABLE detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
64	O	PACKETB	Channel-B PACKET detection output	Output buffer, TTL w/withstand voltage 5V	3		6	
65	O	INTA	Channel-A interrupt output	Output buffer, TTL w/withstand voltage 5V	3		6	
66	O	INTB	Channel-B interrupt output	Output buffer, TTL w/withstand	3		6	
67		TRST	For boundary scan	Input Buff 50k pull up				Fixed to 'L' when not in use.
68		TDO	For boundary scan	3State Out buff	3			Be sure to open when mounted on a circuit board.
69	I	RESET	Reset input	Input buffer, TTL w/withstand voltage 5V 50k pull down				
70	I	XRESET	$\overline{Reset}$ input	Input buffer, TTL w/withstand voltage 5V				Be sure to pull this pin up when not in use. pull up
71		V_{SS}	GND					
72		V_{DD}	3.3 V±0.3 V					
73	I	XCSA	Channel-A $\overline{CS}$ input	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
74	I	XCSB	Channel-B $\overline{CS}$ input	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
75		V_{SS}	GND					
76	I	A0	Address bus	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
77	I	A1	Address bus	Input buffer, TTL w/withstandf voltage 5V		to 20 MHz		
78	I	A2	Address bus	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
79	I	A3	Address bus	Input buffer, TTL w/withstand voltage 5V		to 20 MHz		
80		V_{DD}	3.3 V±0.3 V					

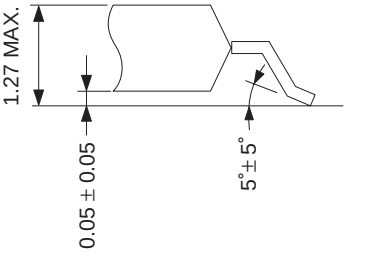
Reference

1) Current consumption About 16 mA at 3.3 V : Conditions of: external I/O 5 V is connected, CLK 18 MHz, 562.5 kbps in both Ch-A and Ch-B in both transmission and reception.
   About 10 mA at 3.3 V : Conditions of external I/O 5 V is connected, CLK 18 MHz, 4800 kbps in both Ch-A and Ch-B in both transmission and reception.
2) When either channel-A or channel-B alone is used, the current consumption can be reduced by selecting the maximum frequency-division ratio using the Main clock select and the Sub clock select.

80-pin plastic TQFP (fine pitch)
(12 × 12) Package Outline (unit : mm)



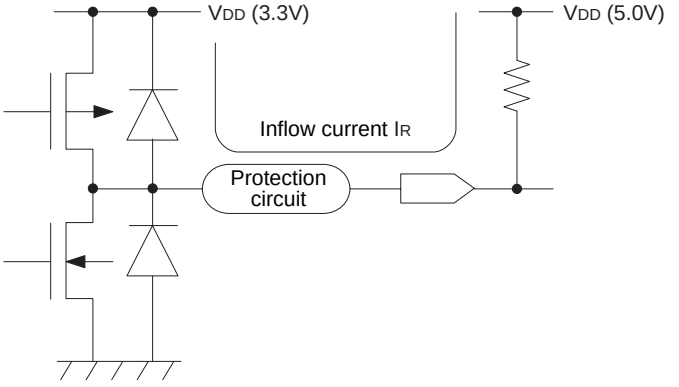
Detailed drawing of shape of pin tip



Pull-up Resistors of Output Buffer

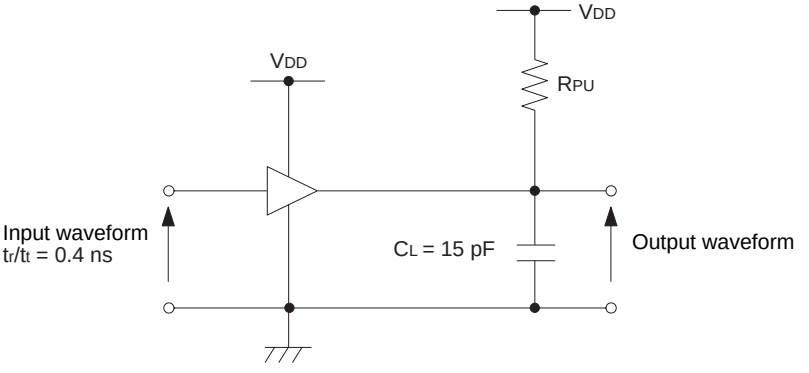
When the CXD9093R is used in the 5 V circuit, an appropriate pull-up resistor is needed depending on the operating frequency.
The inflow current IR that flows into the IC internal circuit from the pull-up resistor and the output waveform on each pull-up resistor are as follows:

1) TTL output buffer with withstand voltage of 5 V



The inflow current IR that is determined by the pull-up resistor is shown in item 3). The output waveforms using the typical pull-up resistor values are shown in (a) and (b) of item 4).

2) Measurement circuit

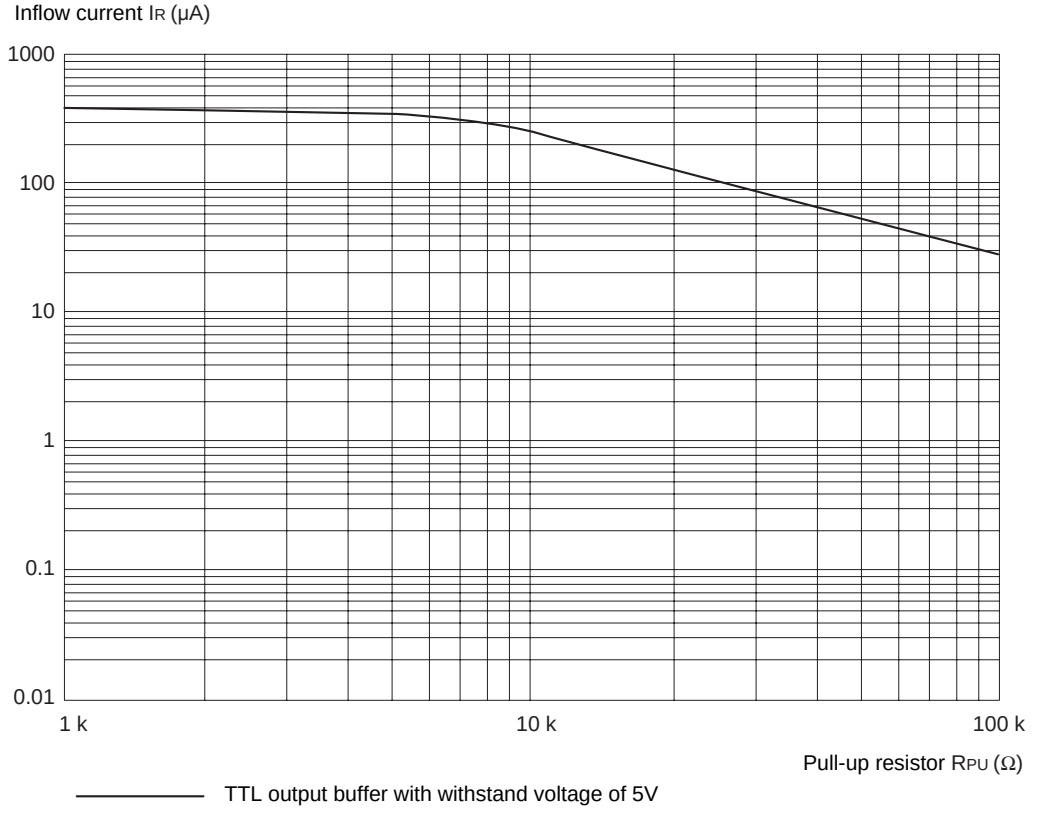


Measurement conditions

VDD = 3.0 V TJ = 125 °C

VPU = 5.5 V

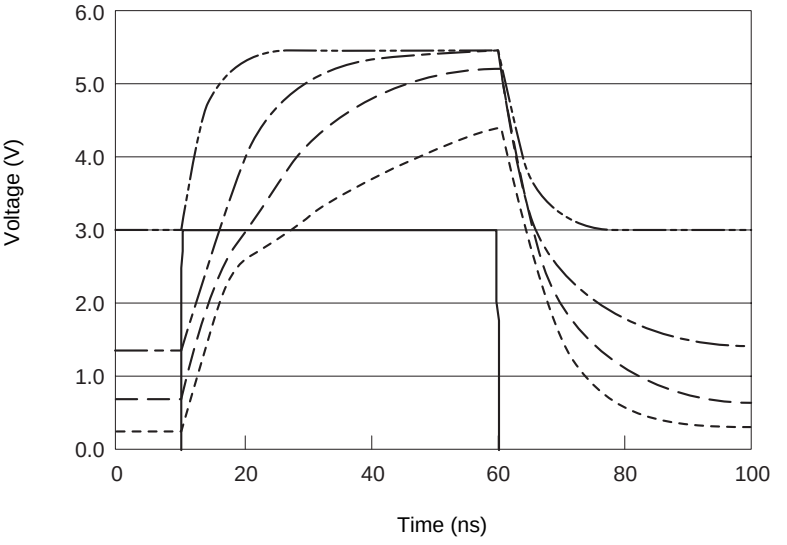
3) Inflow current into the output pin



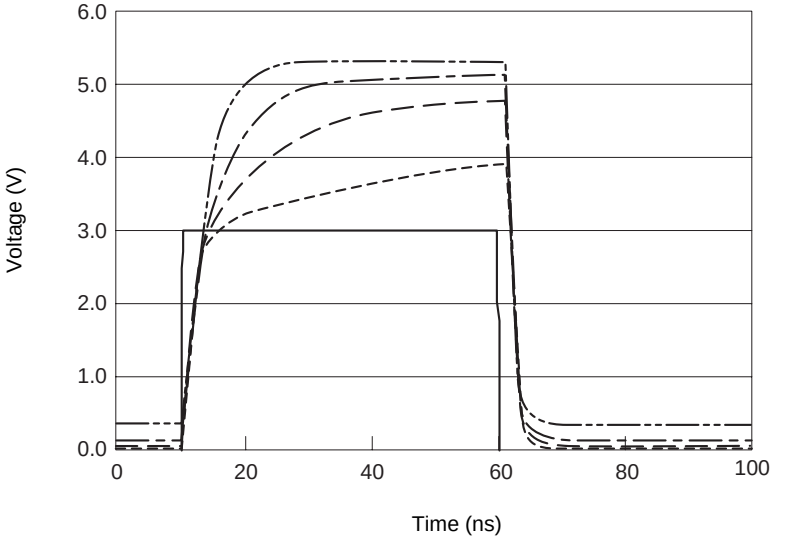
Conditions
V_{DD} = 3.0 V, V_{PU} = 5.5 V
T_J = 125°C
Worst case

4) Output waveform of the TTL output buffer with withstand voltage of 5 V

(a) TTL 1 mA buffer



(b) TTL 9 mA buffer



Remark 1

——— input waveform

—·—·— R_{PU} = 0.5 kΩ

—·—·—·— R_{PU} = 1.0 kΩ

— — — — R_{PU} = 2.0 kΩ

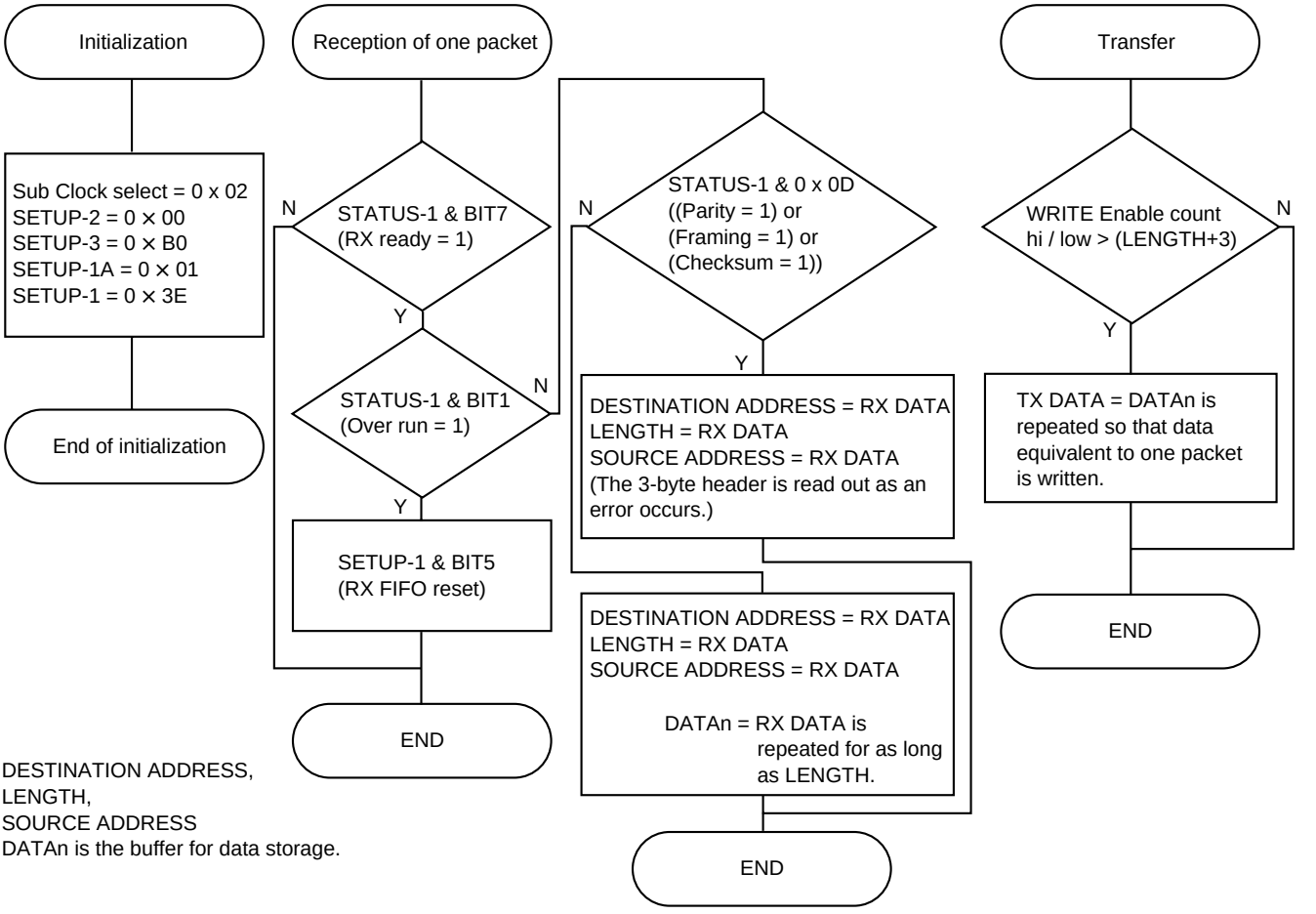
---------- R_{PU} = 5.0 kΩ

2. Measurement conditions

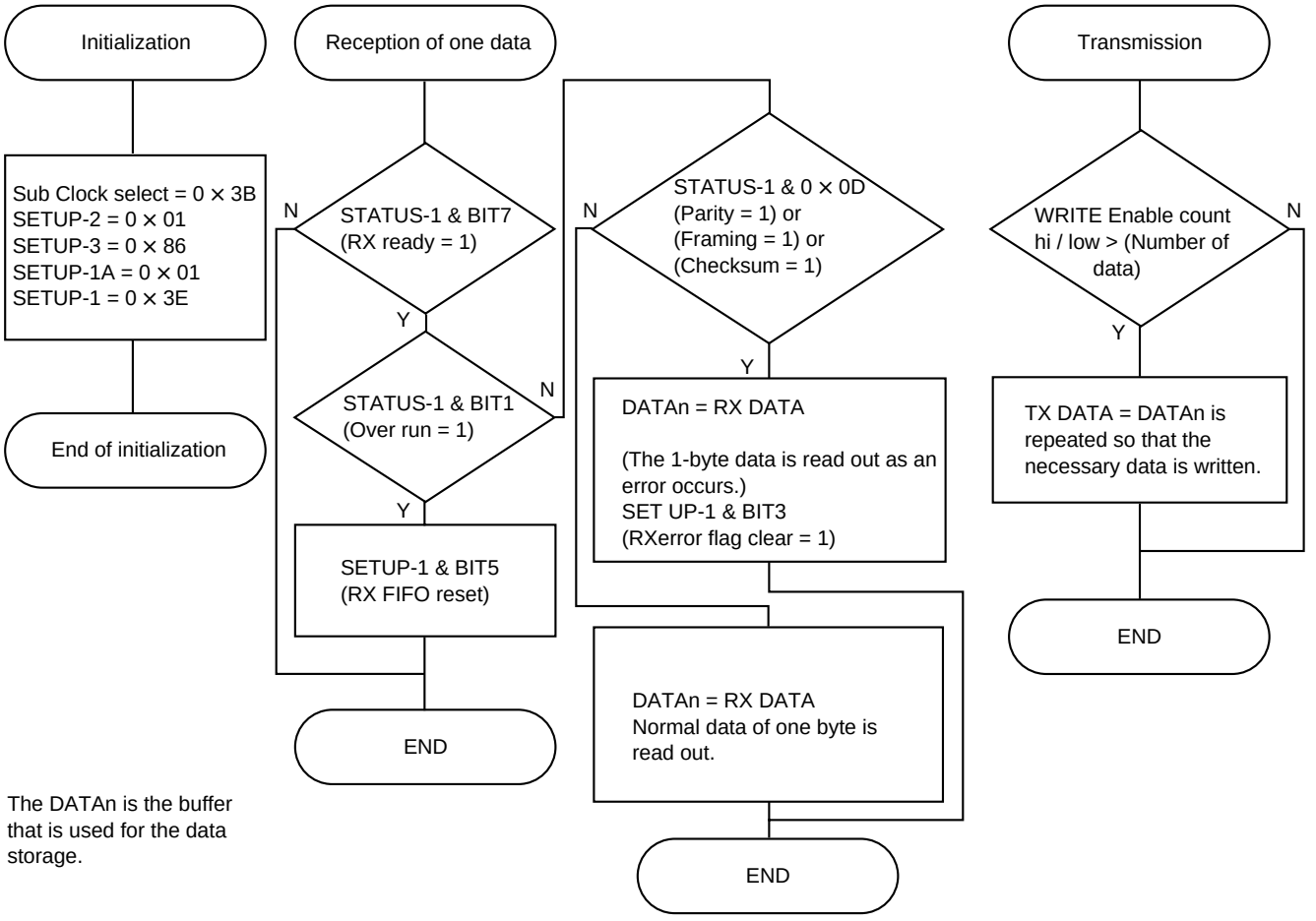
V_{DD} = 3.0 V, T_J = 125 ˚C

V_{PU} = 5.5 V

NCS RX interrupt-packet



DESTINATION ADDRESS,
LENGTH,
SOURCE ADDRESS
DATAn is the buffer for data storage.



The DATAn is the buffer that is used for the data storage.

9-3. Sub-Microprocessor HD6435328R48F for Panel I/O

1. Structure
   The functions that are required for the panel I/O sub microprocessor (abbreviated as panel microprocessor hereafter), are the switch scan, LED output and A/D conversion. However, the functions of the panel I/O that are required by the MSU/RCP and those by the CHU rear panel are different in certain details. The respective required functions are listed in Table 1.
   Because the functions required by MSU/RCP and the CHU rear panel are different as shown in Table 1, two operating modes are provided, which can be selected by switching the mode pin.
   Sony part code number : 8-759-388-15

2. Port assignment
   The assignment of functions to each port of H8/532 is shown in Table 2. When Low is set to the functional mode pin (port 2, bit 4), the operating mode enters mode A (CHU rear panel mode). When High is set to the functional mode pin (port 2, bit 4), the operating mode enters mode B (MSU/RCP mode).

3. Function
   Functions of each terminal are summarized in Table 3

Table 1 Structure list for each mode

	CHU rear panel	**MSU/RCP**
SW scan	• 8 bits x 16 lines = 128 keys (maximum) • Number of ports Switch input: 8 (SWIN0 to 7) Line scanning output: 16 (SWL0 to 15) • Number of lines can be programmed using the commands. (0 to 16 lines) • Line is selected by the Decode output. (pin-16)	• 8 bits × 16 lines = 128 keys (maximum) • Number of ports Switch input: 8 (SWIN0 to 7) Line scanning output: 4 (SWL0 to 15) • Number of lines can be programmed using the commands. (0 to 16 lines) • Line is selected by the Encode output. (pin-4)
LED output	• 8 bits × 16 lines = 128 LEDs (maximum) • Number of ports Data output: 8 (LEDOUT0 to 7) Line scanning output: 16 (LEDL0 to 15) • Number of lines can be programmed using the commands. (0 to 16 lines) • Line is selected by the Decode output. (pin-16) • The display method is the static drive (i.e., the display data is output only when the display data is input.)	• 32 bits × 16 lines = 512 LEDs (maximum) • Number of ports Data output: 32 (LEDOUT0 to 31) Line scanning output: 4 (LEDL0 to 3) • Number of lines can be programmed using the commands. (0 to 16 lines) • Line is selected by the encode output. (pin-4) • The display method is the dynamic drive (i.e., the display data is output by scanning periodically.)
A/D conversion	• 8 ports (maximum) • Number of ports A/D input: 8 (AN0 to 7) • Number of A/D ports can be programmed using the commands. (0 to 8 ports)	• 8 ports × 2 = 16 channels (maximum) • Number of ports A/D input: 8 (AN0 to 7) A/D input selection output: 1 (ANSEL0) • Number of A/D ports can be programmed using the commands. (0 to 16 ports) • The port that controls the multiplexer is provided.
Others	• The serial port (data, load, clock) output for the D/A converter control is provided. • Number of ports D/A output : 3 (DADATA, DALOAD, DACLOCK) • Either A/D converter output or the data from the main can be D/A converted and output using a command. • The D/A output timing can be synchronized with the external signal.	• Three PWM output systems for the LED brightness control are prepared. • Number of ports PWM output : 3 (PWMO, PWM1, PWM2) • Among the PWM outputs, 0 and 1 are synchronized with the dynamic scan.
Mode selection	• The mode selector port; one pin is provided.	• The mode selector port; one pin is provided.

Table 2. Port assignment list for each mode

	Mode A (CHU rear panel mode)	Mode B (MSU/RCP mode)
Port 1 (8bit)	• bit7: D/A output DADATA • bit6: D/A timing sync input DALOCKIN • bit5: D/A output DALOAD • bit4: D/A output DALOCK • bits2, 3: Switch line scanning output SWL13,14	• bits4 to 7: LED line scan output LEDL0 to 3 • bits2, 3: PWM output for luminance adjustment PWM0, PWM1 (LED line scanning sync output)
Port 2 (5bit)	• bit4: Function mode selection (input) IOMODE Low : Mode A High : Mode B • bits0 to 3: Switch line scanning output SWL0 to 3	• bit4: Function mode selection (input) IOMODE Low: Mode A High: Mode B • bits0 to 3: LED data output LEDOUT28 to 31
Port 3 (8bit)	• LED data output LEDOUT0 to 7	• LED data output LEDOUT0 to 7
Port 4 (8bit)	• LED line scanning output LEDL0 to 7	• LED data output LEDOUT8 to 15
Port 5 (8bit)	• LED line scanning output LEDL8 to 15	• LED data output LEDOUT16 to 23
Port 6 (4bit)	• SW line scanning output SWL4 to 7	• LED data output LEDOUT24 to 27
Port 7 (8bit)	• Switch scan data input SDIN0 to 7	• Switch scan data input SDIN0 to 7
Port 8 (8bit)	• A/D conversion input port AN0 to 7	• A/D conversion input port AN0 to 7
Port 9 (8bit)	• bit7: Switch line scanning output SWL15 • bit6: SCI reception RXD • bit5: SCI transmission TXD • bits0 to 4: Switch line scanning outputs SWL8 to 12	• bit7: A/D conversion input selection output ANSEL0 • bit6: SCI reception RXD • bit5: SCI transmission TXD • bit4: PWM output for luminance adjustment PWM2 (LED line scanning synchronous output) • bits3 to 0: Switch line scanning output SWL0 to 3

Table 3. Pin description list

Pin symbol	Number of pins	Input/ output	Description
SDIN0 to SDIN7	8	Input	Switch data input pin. The switch data of the line that is selected by the SWL pin is read. Connect a pull-up resistor because this is turned off at High and turned on at Low in mode A. Connect a pull-up resistor in accordance with the decoding method because this pin can be selected by the decoding method of SWL in mode B.
SWL0 to 15/ SWL0 to 3	16/4	Output	Switch data line scan output pin. The decoded output of the 16 pins (Low active) is output in mode A. Connect a pull-up resistor to the SDIN pin when using a decoder of Low active. Connect a pull-down resistor to the SDIN pin when using a decoder of High active because the encoded signal of 4 pins is output in mode B.
LEDOUT0 to 7/ LEDOUT0 to 31	8/32	Output	LED data output pin. The LED data of the line that is selected by LEDL is output. In mode A, LED of a maximum of 8 bits × 16 lines = 128 can be controlled by the 8-bit width output pin. In mode B, LED of a maximum of 32 bits × 16 lines = 512 can be controlled using the 4 channel output pin, each of which has 8-bit width.
LEDL0 to 15/ LEDL0 to 3	16/4	Output	LED data line scan output pin. In mode A, the decoded output of the 16 pins (High active) is output. In this mode, the signal is output only when the LED output command is transmitted from the communication line. In mode B, a decoder must be used because the encoded signal of 4 pins is output. At the same time, the data is supplied in the time-division display (dynamic scan) in this mode.
IOMODE	1	Input	This pin is used to select either mode A (CHU rear panel mode) or mode B (MSU/RCP mode) for the sub microprocessor mode. Mode A is selected when this pin is Low, and mode B is selected when this pin is High. This mode setting can be accepted only immediately after reset. (This mode cannot be changed during usage.)
AN0 to 7	8	Input	A/D conversion data input pin. A/D conversion of a maximum of 16 channels is possible in mode B when the A/D input select pin is used together.
ANSEL	1	Output	Multiplexer control pin for the input data to be A/D converted (Mode B only)
RXD	1	Input	SCI reception pin. This pin receives commands from the main microprocessor.
TXD	1	Output	SCI transmission pin. This pin transmits commands to the main microprocessor.
DADATA	1	Output	Data output pin to the D/A converter (Mode A only)
DALOAD	1	Output	Load output pin to the D/A converter (Mode A only)
DALOCK	1	Output	Clock output pin to the D/A converter (Mode A only)
DALOCKIN	1	Input	The pin to which the signal to synchronize the data output timing with the D/A converter is input. The data output timing to the D/A converter is controlled to be synchronized with the rise-up of the input signal to this pin by setting the command (Mode A only).
PWM0,1	2	Output	PWM output pin for adjusting the luminance of the LED. These signals are output in synchronization with the dynamic scan (Mode B only).
PWM2	1	Output	PWM output pin for adjusting the luminance of the LED illuminator. These signals are output without synchronization with the dynamic scan (Mode B only).

Serial command of the panel microprocessor

Main → Sub			**Data (2byte)**				**Sub → Main**
Inhibit			0000	0000	xxxx	xxxx	Inhibit
Communication reset			0000	0001	0000	0000	Response to communi-cation reset
NOP			0000	0010	0000	0000	NOP response
All scan			0000	0011	0000	0000	Not used
Software reset			0000	0100	0000	0000	
Not used			0000	0101	000d	dddd	Reception error (error code: 5 bits)
D/A mode	1 : A/D data	0 : Serial data	0001	0000	0000	000d	Not used
Switch scan mode	1 : enable	0 : disable	0001	0000	0001	000d	
A/D scan mode	1 : enable	0 : disable	0001	0000	0010	000d	
D/A scan mode	1 : enable	0 : disable	0001	0000	0011	000d	
All LED OFF	1 : OFF	0 : ON	0001	0000	0100	000d	
LED scan cycle	(aaaa+1) ×4 msec aaa = 0 to 7		0001	0000	0101	0aaa	
Switch scan last address		aaaa = 0 to 15	0001	0000	1000	aaaa	
A/D scan last address		aaaa = 0 to 15	0001	0000	1001	aaaa	
Switch scan		aaaa = 0 to 15	0001	0000	1010	aaaa	
A/D scan		aaaa = 0 to 15	0001	0000	1011	aaaa	
Switch, A/D scan cycle (dddd×2+6) msec			0001	0000	1100	dddd	
Luminance adjustment	aa = ports 0 to 2 D = luminance 0 to 255		0001	04aa	dddd	dddd	
Not used			0100	aaaa	dddd	dddd	Switch data A = 0 to 15: Line number D = 0 to 255: Switch data
LED output*1)	C = 0 to 3 channels aaa = 0 to 15: Line number d = 1 : ON (Fast) 0 : OFF (Slow)		01cc	aaaa	dddd	dddd	Not used
LED mode*1)	C = 0 to 3 channels aaa = 0 to 15: Line number d = 1 : Blink 0 : Normal		10cc	aaaa	dddd	dddd	
D/A output			11aa	aadd	dddd	dddd	A/D data aaaa = 0 to 15: 4 channels D = 0 to 1023: A/D data

Start-stop synchronous bit serial signal
Full duplex communication
Transfer rate
(OSC/960) bps
(When OSC = 18 MHz, 18750 bps)
Bit structure
1start+8data+1parity+1stop
parity : even

∗1) LED output mode display

mode	**output**	**display**
0	0	Turns off
0	1	Turns on
1	0	Slow flashing (2 Hz)
1	1	Fast flashing (4 Hz)

700 Protocol E
9-967-816-01

Sony Corporation
Broadcasting & Professional Systems Company

Printed in Japan
1999. 7 16