Firmware Specification for Laser Beam Scanning Pico Projector module

Ver.1.5.1

CXN0102

Description

The CXN0102 is a laser beam scanning Pico Projector module.

Features

- ◆ Output
  - ◆ Output picture data
    - ➢ 1920 x 720 (60 Hz)
  - ◆ Video Range
    - ➢ Full
  - ◆ Gamut
    - ➢ Original

- ◆ Input
  - ◆ Input information
    - ➢ Conforms to 1280 x 720 (60 Hz) Typical CEA-861-D
  - ◆ Imputable video range
    - ➢ Limited
  - ◆ Imputable RGB format
    - ➢ sRBG

- ◆ Output special functions
  - ◆ Keystone correction
    - ➢ When correction OFF is 0 deg, correction in 1-deg increments from -30 deg to +30 deg in the horizontal direction, and from -20 deg to +30 deg in the vertical direction
  - ◆ Flip
    - ➢ Flip OFF
    - ➢ Right/left flip
    - ➢ Up/down flip
    - ➢ Up/down and right/left flip

- ◆ Output picture quality adjustment functions
  - ◆ Contrast adjustment
    - ➢ Y component level adjustment from -15/16 to +15/16, 0 = equivalent
  - ◆ Brightness adjustment
    - ➢ Y component offset adjustment from -31 to +31
  - ◆ Hue adjustment
    - ➢ Hue U level adjustment from -15/16 to +15/16, 0 = equivalent
    - ➢ Hue V level adjustment from -15/16 to +15/16, 0 = equivalent
  - ◆ Saturation adjustment
    - ➢ Saturation U level adjustment from -15/16 to +15/16, 0 = equivalent
    - ➢ Saturation V level adjustment from -15/16 to +15/16, 0 = equivalent
  - ◆ Sharpness adjustment
    - ➢ Sharpness strength setting from 0 to 6, 0 = sharpness OFF

- ◆ Others
  - ◆ Update function
    - ➢ FW update
    - ➢ Opening picture data update
    - ➢ Division transmission update of only the firmware data or only the Opening picture data

- ◆ Mute function
- ◆ Test picture output function
- ◆ Get temperature
- ◆ Get cumulative operating time
- ◆ Get version information
- ◆ Adjustment function
  - ➢ Optical axis alignment adjustment
  - ➢ Biphase adjustment

Contents

Introduction

Definition of Terminology

The table below lists definitions of the terminology used in this document.

Definitions of Terminology

Terminology	Description
Flash	Abbreviation of flash memory. This indicates nonvolatile memory.
Param	Abbreviation of parameter.
MEMS	Abbreviation of micro electro mechanical systems. The MEMS mirror may also be referred to as MEMS in this document.
FW	Abbreviation of firmware.
Biphase	Common name for Scan Line Phase Delay.
FHD	Abbreviation of FullHD angle of view information. In the CXN0102, this signifies 1920 x 720 output.
HD	Abbreviation of HD angle of view information. In the CXN0102, this signifies 1280 x 720 output.
BMP	Abbreviation of bit map.
PQ	Abbreviation of Picture Quality.
CheckSum	32 bits of the data resulting from adding each byte of the subject data.

Reference Documents

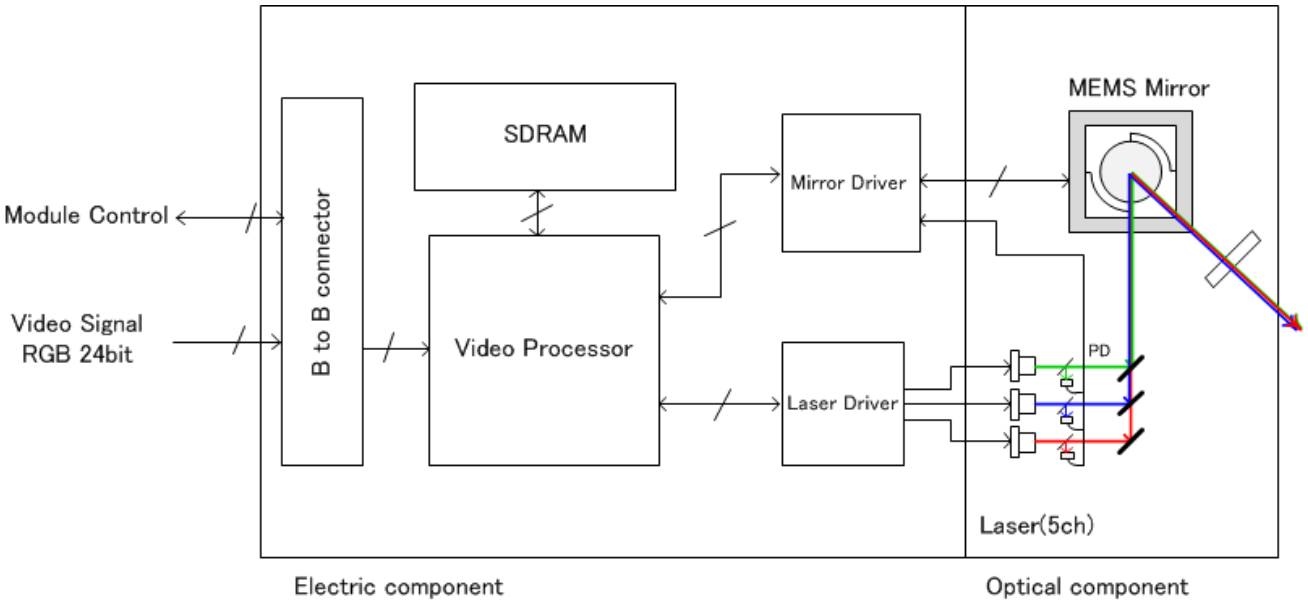
Description

Description

The CXN0102 Module is a Pico Projector that uses the laser beam scanning method. This document describes the function specifications and control specifications.

System Configuration and Hardware Configuration

The CXN0102 system configuration and hardware configuration are shown below.

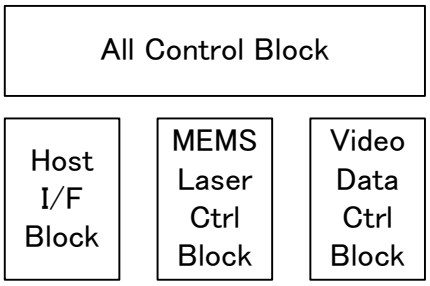


System Configuration and Hardware Configuration

The CXN0102 Module is broadly divided into electric component and optical component blocks. The electric component consists of a BtoB connector for external connection, the CXD4752 that performs video signal processing, the CXA4008 that controls the mirror, the CXA4007 that controls the laser, a Flash that stores the firmware program data and the setting parameters, and an SDRAM that temporarily stores the picture data. The optical component consists of the laser and the MEMS mirror.

Firmware Configuration

The CXN0102 Module contains firmware that controls the entire module. This firmware boots at power-on and performs operations in accordance with instructions from the HOST. The CXN0102 firmware configuration is shown below.

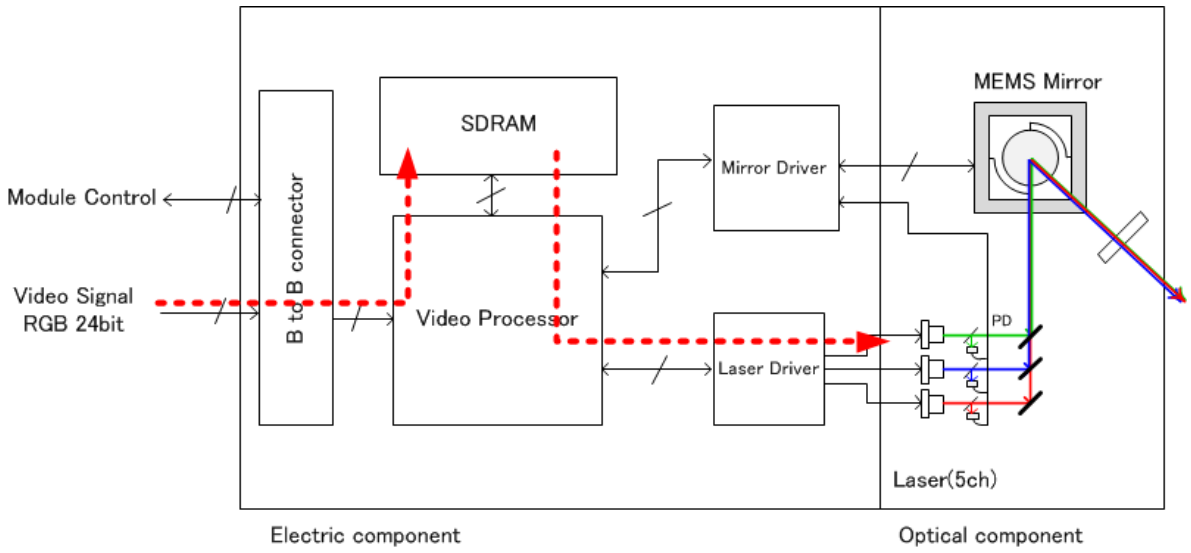


Firmware Block Diagram

The CXN0102 firmware consists of four blocks. These four blocks are the All Control Block that coordinates each block and performs overall control, the HOST I/F Block that performs communication with the HOST, the MEMS Laser Control Block that controls the MEMS mirror and MEMS mirror driver (CXA4008) and the laser and laser driver (CXA4007), and the Video Data Control Block that controls the video processor (CXD4752) and the video data.
This firmware is stored inside the Flash when the CXN0102 Module is shipped.

Data Flow

The CXN0102 Module receives RGB 24-bit digital video signals and writes them in the internal SDRAM. It then reads the signals from the SDRAM, converts them to laser signals, and outputs the signals by reflecting them with a MEMS mirror. As a result of this storage in the SDRAM, the CXN0102 Module output is delayed by 1 frame or more to less than 2 frames relative to the input. The data flow described here is shown below.



Data Flow

State Transitions

The CXN0102 Module automatically transitions to the Ready state at power-on. When the Start Input command is received from the HOST, the state transitions from the Ready state to the Active state. When the Stop Input command or Stop Input Specially command are received from the HOST, the state transitions from the Active state to the Ready state. The conditions for issuing the HOST to CXN0102 commands described hereafter depend on each Ready state and Active state. For details, see the description of commands hereafter.
When a temperature abnormality is detected, the CXN0102 Module automatically transitions to the Temperature Stop state and stops output, regardless of the Ready state or Active state. When the temperature abnormality is remedied from the Temperature Stop state, the CXN0102 Module automatically returns to the original state and restarts output. In addition, when a module abnormality is detected, the CXN0102 Module automatically transitions to the Safety Stop state and stops the system. In this case, automatic recovery is not possible. The tables below list the notification commands and the commands that can be issued in the Temperature Stop state and Safety Stop state.

Stop Notify

Command Subject	Summary	Temperature Stop Support	Safety Stop Support
Emergency Notify	Occurs when the module transitions to the Safety Stop state.		X
Temperature Emergency and Recovery Notify	Occurs when the module transitions to the Temperature Stop state and when the module recovers to the Ready state or Active state.	X	

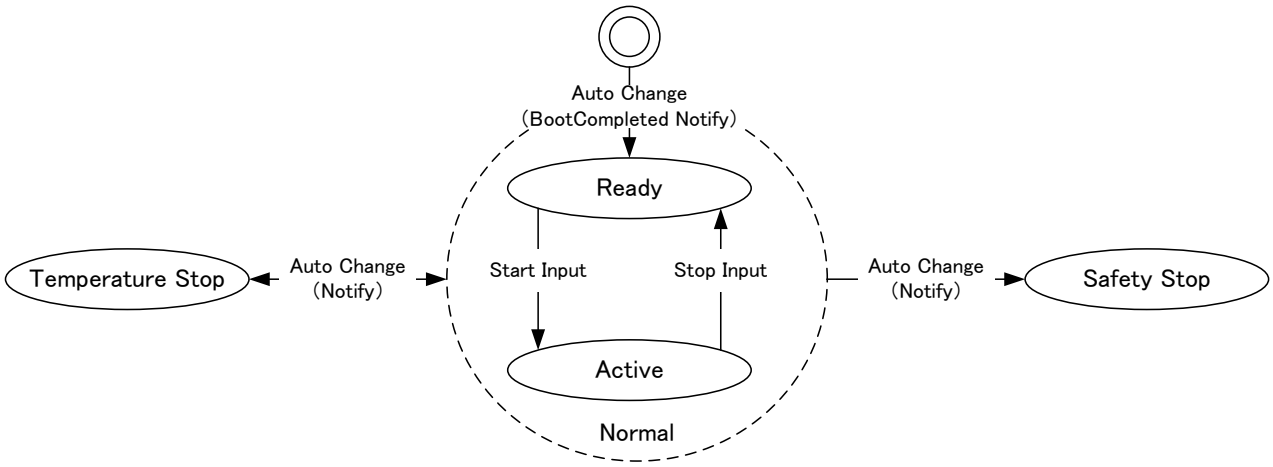
X: Valid (The command can be issued.)

Command in a Case of Stop State

Command Subject	Summary	Temperature Stop Support	Safety Stop Support
Shut Down・Reboot	Shutdown and reboot	X	X
Get Temperature	Gets the temperature.	X	
Get Time	Gets the time.	X	X
Get Version	Gets the version.	X	X
Get LOT Number	Gets the lot number.	X	X
Get Serial Number	Gets the serial number.	X	X

X: Valid (The command can be issued.)

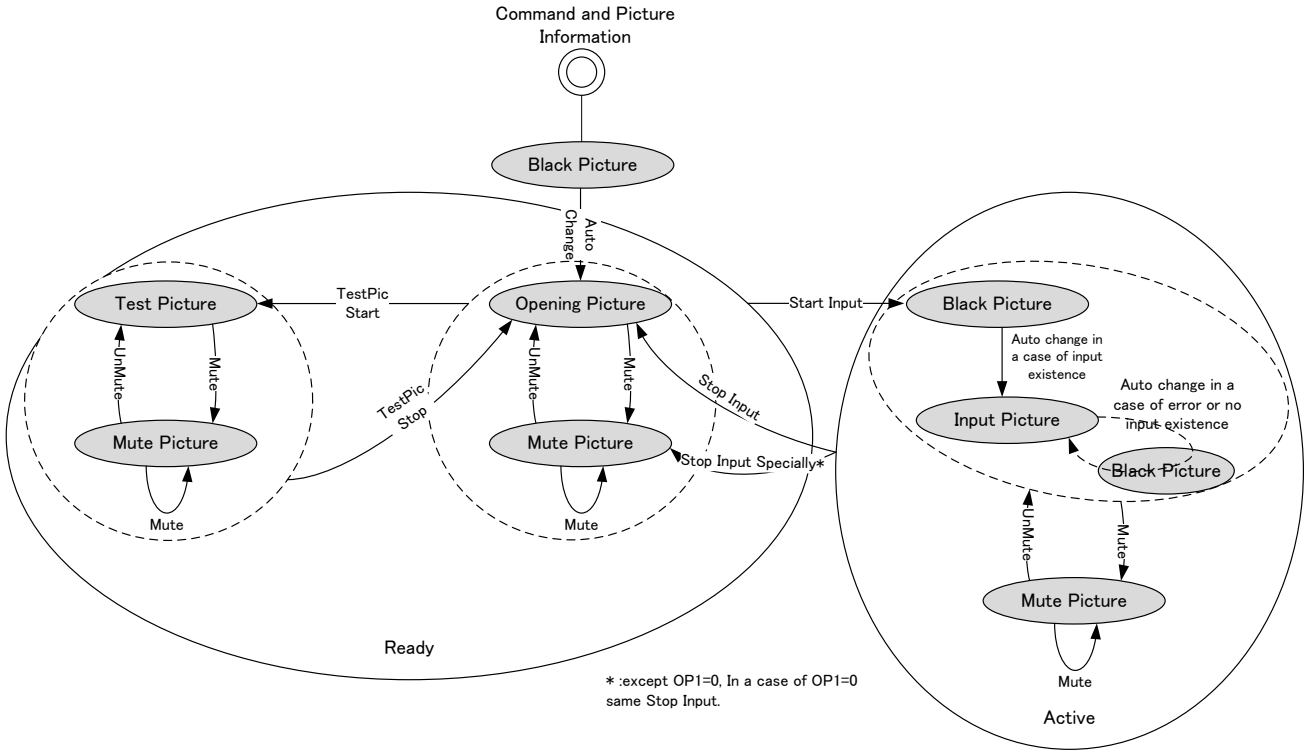
The CXN0102 Module state transitions are shown below.



CXN0102 Module State Transitions

Output Picture Information

The CXN0102 Module automatically outputs a Black picture when it transitions to the Ready state at power-on, and then automatically outputs the Opening picture. The CXN0102 Module outputs a Black picture when it transitions from the Ready state to the Active state due to the Start Input command from the HOST, and then outputs the input picture when available. The CXN0102 Module outputs the Opening picture or Mute picture when it transitions from the Active state to the Ready state due to the Stop Input command or Stop Input Specially command from the HOST. When the Output Test Picture command is received from the HOST in the Ready state, the CXN0102 Module outputs the Test picture. When test picture stop is selected by the Output Test Picture command from the HOST, the Opening picture is output. The output picture can be switched from the Test picture, Opening picture or input picture to the Mute picture and back by the Mute/UnMute/Change Output command from the HOST in any Ready or Active state. The CXN0102 Module state transitions and output picture information are shown below.



CXN0102 Module State Transitions and Output Picture Information

The table below lists the output pictures defined by the CXN0102 Module.

CXN0102 Module Output Picture Definitions

Subject	Summary
Opening Picture	This is the picture output when booted. It indicates the picture stored in the Data Binary area described in “Binary Data” hereafter.
Black Picture	This indicates that 0x00 is output as the data value, resulting in a picture in which nothing is visible.
Test Picture	This indicates the Test picture generated inside the CXN0102 Module. For details, see the Test image output function.
Mute Picture	This indicates the picture output by the Mute/UnMute/Change Output command or Stop Input Specially command described hereafter. For details, see the Mute function and Stop (Special) function.

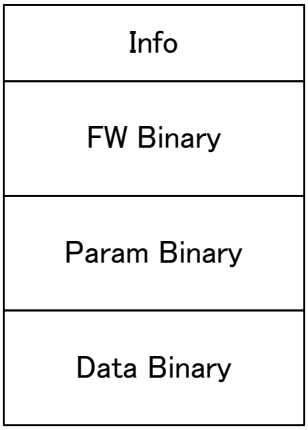
The Mute picture has multiple definitions. The table below lists the Mute picture definitions.

Mute Picture Definitions

Subject	Summary
Mute (Black picture)	This indicates that 0x00 is output as the data value, resulting in a picture in which nothing is visible. The result is the same as the Black picture described above, but this picture is defined separately as the output is changed intentionally.
Mute (Opening picture)	This is the picture output when booted. It indicates the picture stored in the Data Binary area described in “Binary Data” hereafter. The result is the same as the Opening picture described above, but this picture is defined separately as the output is changed intentionally.
Mute (Final Picture)	This indicates the Final picture. When an input picture is being output, the last output picture becomes the Final picture, and the picture appears to have paused. Mute command in Mute output state keeps that current Mute image. When the Test picture or Opening picture is being output, there is no change and Test picture or Opening picture output continues.

Binary Data

The binary data stored in the Flash of the CXN0102 Module consists of Info that contains the binary control information, FW Binary that contains the firmware binary data, Param Binary that contains the operation settings and other data, and Data Binary that contains the Opening picture data. The binary data configuration is shown below.



Data Flow

Each data is described below.

Info

Info stores the information required for operation, including the unique ID value of the binary data. The Info size is 64 bytes. The table below shows the Info format.

Info Format

Subject	Size	Summary
FW Sign	4 byte	Unique ID value: 0x000000F1
FW Version	4 byte	Firmware version information. This is the arrangement for each byte. It is the ASCII code when each digit of the 4-digit version number is treated as a character. Example) In case of G001, version [4] = {"G", "0", "0", "1"}.
Date	4 byte	Binary data creation date. This is the arrangement for each byte. It is the 8-digit binary data creation date (YYYYMMDD) converted to BCD format. Example) In case of 20140210, date [4] = {0x20, 0x14, 0x02, 0x10}.
FW Info	16 byte	FW-related information
Param Info	12 byte	Param-related information
Data Info	12 byte	Data-related information
Padding	12 byte	Reserved All 0x00

FW Binary

FW Binary stores the firmware binary data. The FW Binary size is a maximum of 384 Kbytes. The FW Binary format is shown below.

FW Binary Format

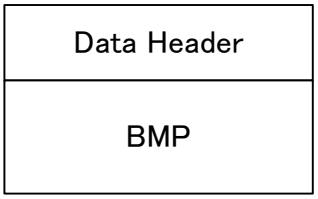
Subject	Size	Summary
FW Vector	64 byte	Firmware vector binary data
FW Body	Max 393152 byte	Firmware body binary data

Param Binary

Param Binary stores the parameter information and the body binary data. The Param Binary size is a maximum of 96 Kbytes.

Data Binary

Data Binary stores the data information and the binary data for the Opening picture body. The Data Binary size is a maximum of 20 Kbytes. The Opening picture body stored in Data Binary is BMP data. An structure of Data Binary is shown below.



Data Binary structure

The BMP data in Data Binary must conform to the BMP formats below.

- Supported BMP formats
  - Image height
    - Positive number
  - Data arrangement
    - Normal BMP format with the image data arranged from bottom to top
  - Data size per pixel
    - 4, 8, 24, 32 bit
  - Supported BMP data header
    - 40 Byte - Windows V3
    - 12 Byte - OS/2 V1
  - Compression format
    - RGB (Uncompressed)
    - RLE8 (Run Length 8 bit/pixel)
    - RLE4 (Run Length 4 bit/pixel)

* The Data Binary size that can be stored as the Opening picture is limited to 20 Kbytes (max.).
  Set the Opening picture so that it conforms to one of the above formats and is less than 20 Kbytes.

* The maximum size that can be set as the Opening picture is 1280x720.

In addition, the BMP data in Data Binary must be the output angle of view or less. The difference between the output angle of view and the BMP angle of view is filled by the background color.

The Data Binary format is shown below.

Data Binary Format

Subject	Size	Summary
Data Sign	4 byte	Unique ID value: 0x000000F3
Data Version	4 byte	Data version information. This is the arrangement for each byte. It is the ASCII code when each digit of the 4-digit version number is treated as a character. Example) In case of G001, version [4] = {"G", "0", "0", "1"}.
Date	4 byte	Binary data creation date. This is the arrangement for each byte. It is the 8-digit binary data creation date (YYYYMMDD) converted to BCD format. Example) In case of 20140210, date[4] = {0x20, 0x14, 0x02, 0x10}.
Place	1 byte	Location reference position
BlankB	1 byte	Background color B component
BlankG	1 byte	Background color G component
BlankR	1 byte	Background color R component
Reserved	2 byte	Reserved
Reserved	2 byte	Reserved
OffsetH HD	2 byte	HD horizontal offset
OffsetV HD	2 byte	HD vertical offset
Reserved	4 byte	Reserved
Reserved	4 byte	Reserved
Reserved	4 byte	Reserved
Offset HD BMP	4 byte	HD BMP data offset within the file
Size HD BMP	4 byte	HD BMP data size
CheckSum HD BMP	4 byte	HD BMP data CheckSum
Reserved	12 byte	Reserved
CheckSum	4 byte	CheckSum value from start of header to immediately before CheckSum
HD BMP Body	Max 20 KB - 64 byte	HD BMP data

* The total data header (Data Sign to CheckSum) size is 64 bytes.

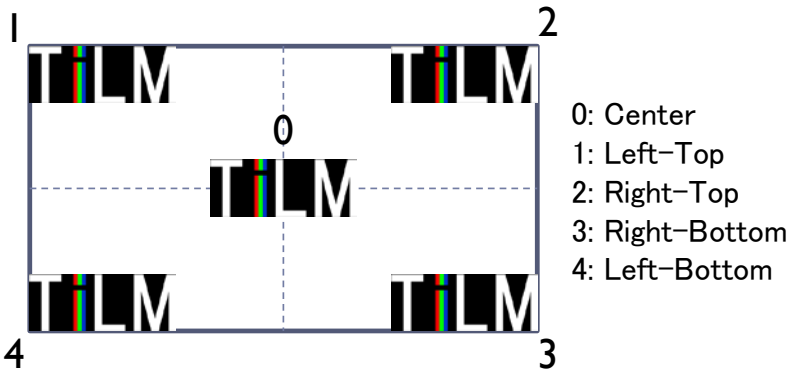
Sample code for the data header (Data Sign to CheckSum) described above is shown below.

```
struct {        // 64 bytes
        ULONG sign;
        ULONG version;
        ULONG date;
        UCHAR place;                    // Location
        UCHAR BlankB;                   // Background color
        UCHAR BlankG;
        UCHAR BlankR;
       SHORT reserved;
        SHORT reserved;
        SHORT offsetH_HD;                       // Offset
        SHORT offsetV_HD;
        ULONG reserved;
        ULONG reserved;
        ULONG reserved;
        ULONG offset_HD_BMP;            //HD BMP data offset within the file
        ULONG size_HD_BMP;                      // HD BMP data size
        ULONG checksum_HD_BMP;      // HD BMP data checksum
          ULONG reserved[3];
        ULONG checksum;  // CheckSum value from start of header to immediately before CheckSum
};
```

Each data is described below.

Place:

This indicates the reference position for the Opening picture data location. An example of each location reference position is shown below.



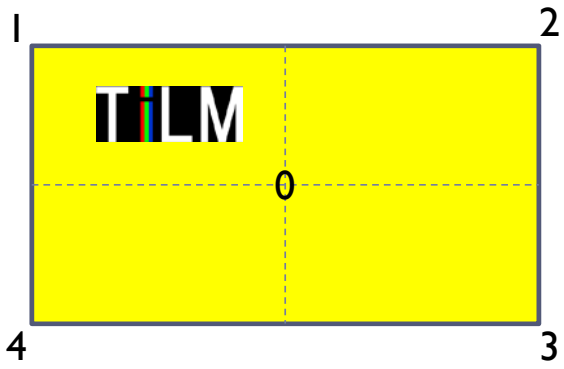
Example of Each Location Reference Position

The table below lists the value information that can be obtained.

Value	Description
0	Center display
1	Upper left display
2	Upper right display
3	Lower right display
4	Lower left display

BlankB, BlankG, BlankR:

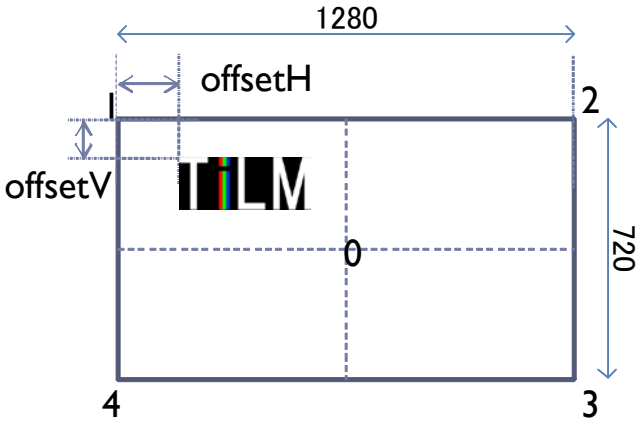
These indicate the B, G and R components, respectively, of the background color in excess areas that are not filled by the BMP data. An example of output for background color: yellow (B:0/G:255/R:255) is shown below.



Example of Output for Background Color: Yellow (B:0/G:255/R:255)

OffsetH HD, OffsetV HD:

These indicate the offset from the location reference position. An image of offsetH and offsetV when Place = 1 is shown below.



Example of offsetH and offsetV when Place = 1

Offset HD BMP, SizeHD BMP, CheckSumHD BMP:

These indicate the HD BMP storage location, size and CheckSum, respectively.

CheckSum:

This indicates the CheckSum of Data Header (Data Sign to CheckSum).

HD BMP Body:

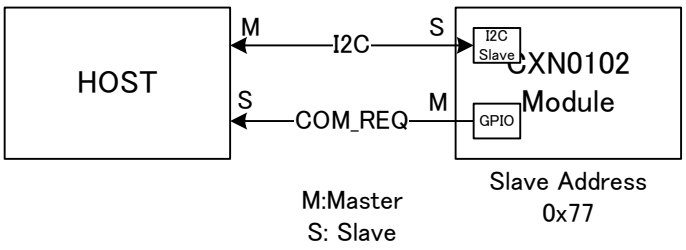
This indicates the HD BMP body.

Control Method

Description

The CXN0102 Module can be controlled by communication using an I2C and COM_REQ (GPIO) connected between the HOST and the CXN0102 Module. On the I2C, the HOST is the Master and the CXN0102 Module is the Slave. The I2C slave address of the CXN0102 Module is 0x77. On the COM_REQ (GPIO), the CXN0102 Module is the Master and the HOST is the Slave.

An structure of the hardware block between the HOST and the CXN0102 Module is shown below.



HW Block structure of HOST and CXN0102 Module

The communication formats between the HOST and the CXN0102 Module are broadly divided into three types as follows.

- HOST→CXN0102 Module communication: This is performed using only the I2C. This is used to transmit control instructions from the HOST.
- CXN0102 Module→HOST communication: This is performed using both the COM_REQ and I2C. This is used by the CXN0102 Module to respond to control commands from the HOST, and to transmit notifications from the CXN0102 Module.
- HOST→CXN0102 Module communication (Update): This is performed using only the I2C. This is used to update the CXN0102 Module firmware and data from the HOST. When the update is finished, the CXN0102 Module responds using CXN0102 Module→HOST communication.

Detailed Description of Communication

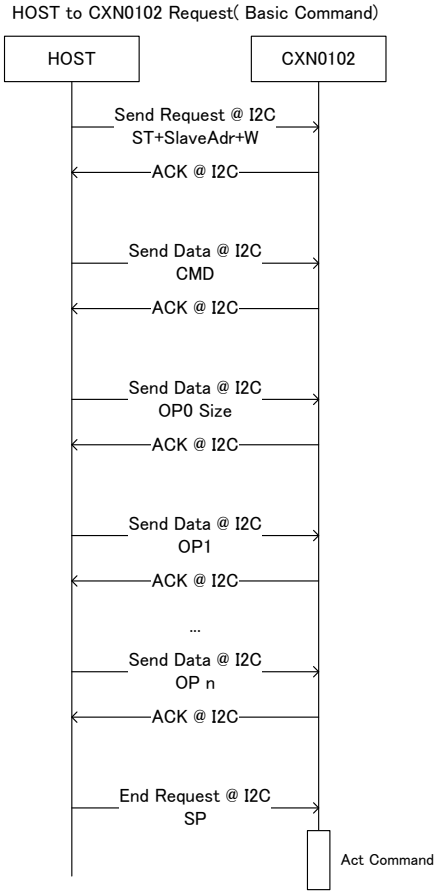
HOST→CXN0102 Module communication (Request)

Communication from the HOST to the CXN0102 Module is performed using the I2C. This communication is defined as a Request. For details on the I2C transmission data format, see “Command Format”. When Request communication stalls partway, a Time Out (allowable time 400 ms) may occur. When a Time Out occurs, a Command Emergency Notify Time Out is notified by CXN0102 Module→HOST communication.

The Request communication procedure is described below.

1. The HOST transmits an I2C ST (Start Condition)-Slave Address-W (Write) request to the CXN0102 Module.
2. When the CXN0102 Module receives the above transmission instruction, it sends back ACK.
3. The HOST transmits each data (CMD, OP0, OP1 to OPn) 1 byte at a time.
4. The CXN0102 Module sends back ACK each time it receives the above data.
5. When the HOST finishes transmitting the data, it transmits SP (Stop Condition) to the CXN0102 Module.
6. When the CXN0102 Module receives SP, it performs the processing requested by CMD.

A sequence that conforms to the Request communication procedure is shown below.



Sequence Conforming to the Request Communication Procedure

CXN0102 Module→HOST communication (Notify)

In order to communicate from the CXN0102 Module to the HOST, the CXN0102 Module uses the COM_REQ to notify the HOST that it wishes to start communication. When the HOST receives this notification and is ready, it communicates with the CXN0102 Module using the I2C. This communication is defined as Notify. COM_REQ changes to High level when communication starts, and to Low level when communication ends, so the HOST should determine whether there is communication based on the GPIO edge trigger (change from Low to High). For details on the communication data format, see “Command Format”.

The CXN0102 Module can only hold up to three notification contents. When more than three notification contents occur within the CXN0102 Module before the HOST receives the notifications from the CXN0102 Module, the excess notifications are discarded. Therefore, note that the HOST may miss needed notification contents from the CXN0102 Module.

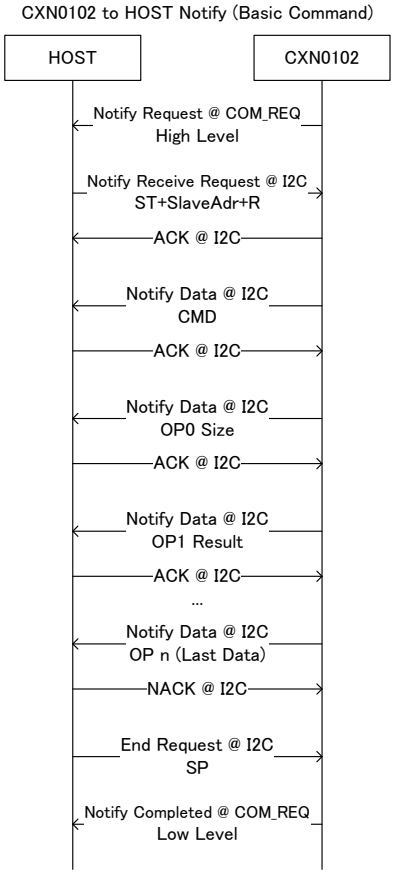
The Notify communication procedure is described below.

1. The CXN0102 Module sets COM_REQ to High level to notify the HOST that it wishes to start communication.
2. The HOST transmits the I2C ST (Start Condition)-Slave Address-R (Read) request to the CXN0102 Module at the timing when it is ready to communicate.
3. When the CXN0102 Module receives the above transmission instruction, it sends back ACK.
4. The CXN0102 Module transmits each data (CMD, OP0, OP1 to OPn) 1 byte at a time.
5. The HOST sends back an ACK each time it receives the above data.
6. When the HOST finishes receiving the data, or when communication becomes impossible, it transmits NACK.
7. When the CXN0102 Module receives NACK, it stops data transmission and waits for SP (Stop Condition).
8. The HOST transmits SP (Stop Condition) to the CXN0102 Module.
9. When the CXN0102 Module receives SP, it sets COM_REQ to Low level to notify that communication has ended.

* When the Notify command is received, the HOST should always transmit SP after 32 bytes (CMD+OP0-30) of data have been received. However, note that reception data in excess of the size specified by OP0 is treated as invalid data (dummy data).

* When the HOST requests to get data of a size larger than that indicated by OP0 in Notify communication (when the HOST continues to output ACK in the procedure above), the CXN0102 Module sends dummy data (0xFF).

A sequence that conforms to the Notify communication procedure is shown below.



Sequence Conforming to the Notify Communication Procedure

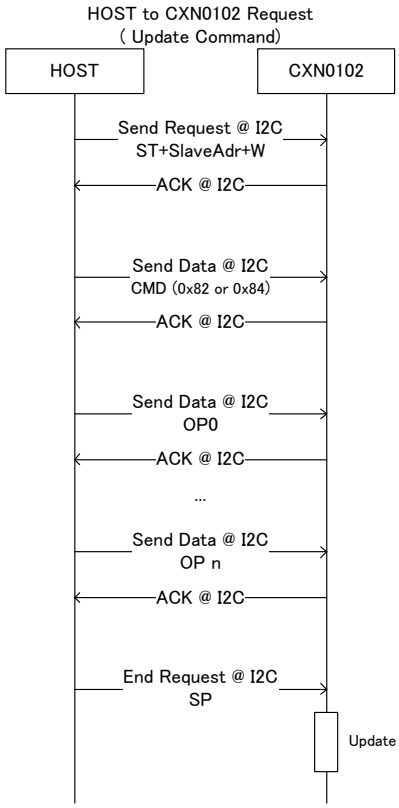
HOST→CXN0102 Module communication (Update Request)

Update is executed by using the I2C to communicate from the HOST to the CXN0102 Module. This communication is defined as an Update Request. For details on the I2C transmission data format, see “Command Format”.

The Update Request communication procedure is described below.

1. The HOST transmits an I2C ST (Start Condition)-Slave Address-W (Write) request to the CXN0102 Module.
2. When the CXN0102 Module receives the above transmission instruction, it sends back ACK.
3. The HOST transmits each data (CMD (0x82 or 0x84), OP0, OP1 to OPn) 1 byte at a time.
4. The CXN0102 Module sends back ACK each time it receives the above data.
5. When the HOST finishes transmitting the data, it transmits SP (Stop Condition) to the CXN0102 Module.
6. When the CXN0102 Module receives SP, it executes the update.
7. When the update is complete, the results are notified by CXN0102 Module→HOST communication.

A sequence that conforms to the Update Request communication procedure is shown below.



Sequence Conforming to the Update Request Communication Procedure

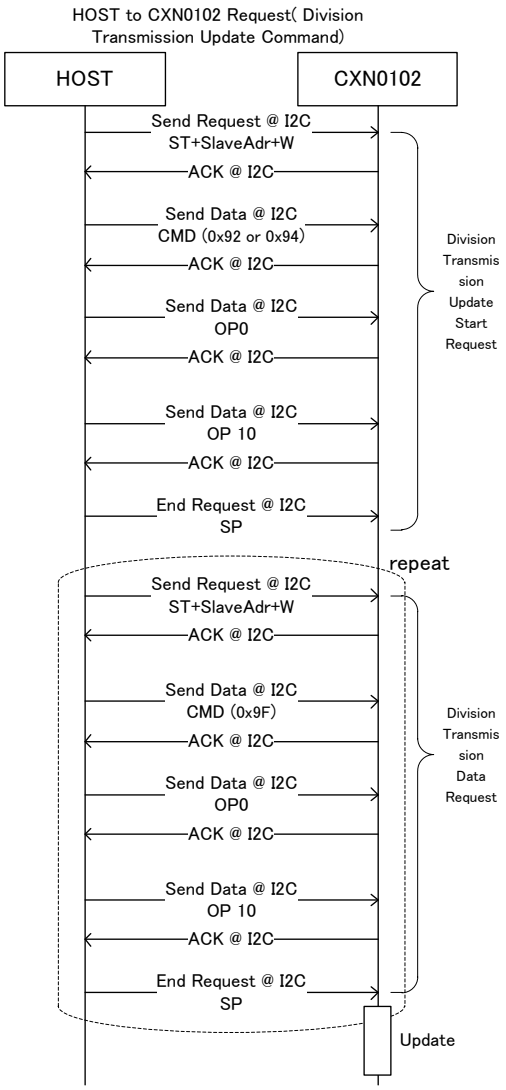
HOST→CXN0102 Module communication (Division transmission Update Request)

Division transmission update is executed by performing I2C communication multiple times to communicate from the HOST to the CXN0102 Module. This communication is defined as a Division Transmission Update Request. For details on the I2C transmission data format, see “Command Format”.

A sequence that conforms to the Division transmission Update Request communication procedure is shown below.

1. The HOST transmits an I2C ST (Start Condition)-Slave Address-W (Write) request to the CXN0102 Module.
2. When the CXN0102 Module receives the above transmission instruction, it sends back ACK.
3. The HOST transmits each data (CMD (0x92 or 0x94), OP0, OP1 to OP10) 1 byte at a time. The HOST transmits the command to start the division transmission update by the contents of this CMD and each data to the CXN0102 Module.
4. The CXN0102 Module sends back ACK each time it receives the above data.
5. When the HOST finishes transmitting the data, it transmits SP (Stop Condition) to the CXN0102 Module.
6. The HOST transmits an I2C ST (Start Condition)-Slave Address-W (Write) request to the CXN0102 Module.
7. When the CXN0102 Module receives the above transmission instruction, it sends back ACK.
8. The HOST transmits each data (CMD (0x9F), OP0, OP1 to OPn) 1 byte at a time. OP3 to OPn is the division transmission update data.
9. When the HOST finishes transmitting the data, it transmits SP (Stop Condition) to the CXN0102 Module.
10. Steps 8 and 9 are repeated until there is no more division transmission update data remaining to be sent.
11. When the CXN0102 Module receives all of the division transmission update data, it executes the update.
12. When the update is complete, the results are notified using CXN0102 Module→HOST communication.

A sequence that conforms to the Update Request communication procedure is shown below.



Sequence Conforming to the Division Transmission Update Request Communication Procedure

Command Format

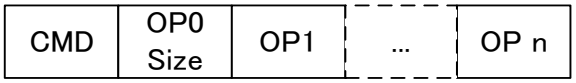
Data communicated by I2C is defined as commands. There are three types of command formats: the Request command (HOST→CXN0102 Module communication command) format, the Notify command (CXN0102 Module→HOST communication command) format, and the Update Request command (HOST→CXN0102 Module communication Update command) format. Each command format is described below.

Request Command Format

Request commands have a format that transmits and receives data 1 byte at a time in order of CMD→OP0→OP1...OPn. The maximum size from CMD to OPn is 128 bytes. The command rules are described below.

- ✓ The first byte sent is CMD.
- ✓ The next byte sent is OP0, and indicates the size information for the subsequent data.
- ✓ Thereafter, the number of bytes of data specified by OP0 is sent.
- ✓ Due to these rules, contents of 2 bytes (CMD+OP0) are required for any Request command.

The Request command format is shown below.



CMD: Command ID
OP0 Size: a number of OP1 − OP n
OP1,⋯,OP n: Operand
n=Max 126

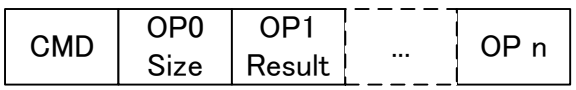
Request Command Format

Notify Command Format

Notify commands have a format that transmits and receives data 1 byte at a time in order of CMD→OP0→OP1...OPn. However, this is limited to CXN0102 Module→HOST communication, and the result (error contents) is stored in OP1. When the result is other than an error, OP1 is 0x00.

- ✓ The first byte sent is CMD.
- ✓ The next byte sent is OP0, and indicates the size information for the subsequent data.
- ✓ The next byte sent is OP1, and indicates the Result information.
- ✓ Thereafter, the number of bytes of data specified by OP0 (including OP1) is sent.
- ✓ Due to these rules, contents of 3 bytes (CMD+OP0+OP1) are required for any Request command.

The Notify command format is shown below.



CMD: Command ID
OP0 Size: a number of OP1 − OP n
OP1 Result: Error cord (OK = 0x0, Error = !0)
OP1,⋯,OP n: Operand
n=Max 30

Notify Command Format

Update Request Command Format

Update Request commands have a format that transmits and receives data 1 byte at a time in order of CMD→OP0→OP1...OPn.

- ✓ The first byte sent is CMD. This is limited to 0x82 or 0x84.
- ✓ The next 4 bytes sent are OP0 to OP3, and indicate the size of the data to be transmitted.
- ✓ The next 4 bytes sent are OP4 to OP7, and indicate the CheckSum value for all the data to be transmitted.
- ✓ Thereafter, the number of bytes of data specified by OP0 to OP4 is sent.
- ✓ Due to these rules, Update Request commands require contents of 9 bytes (CMD+OP0 to OP7).

The Update Request command format is shown below.

CMD	OP0 Size0	OP1 Size1	OP2 Size2	OP3 Size3	OP4 CheckSum0	OP5 CheckSum1	OP6 CheckSum2	OP7 CheckSum3	...	OP n

CMD: Command ID (0x82 or 0x84)
OP0 Size0: XX of Size 4byte 0x000000XX
OP1 Size1: XX of Size 4byte 0x0000XX00
OP2 Size2: XX of Size 4byte 0x00XX0000
OP3 Size3: XX of Size 4byte 0xXX000000

OP4 CheckSum0: XX of ChecSum 4byte 0x000000XX
OP5 CheckSum1: XX of CheckSum 4byte 0x0000XX00
OP6 CheckSum2: XX of CheckSum 4byte 0x00XX0000
OP7 CheckSum3: XX of CheckSum 4byte 0xXX000000
OP8,･･･,OP n: Update Data
n=Max 0xFFFFFFFF

Update Request Command Format

Division transmission Update Request Command Format

Division transmission Update Request command has Request command format to indicate the start of division transmission and Request command format to indicate the data of division transmission. The details of the Request command format to indicate the start of division transmission and the Request command format to indicate the data of division transmission are described below.

- ✓ Request command format to indicate the start of division transmission
  - ➢ The first byte sent is CMD. This is limited to 0x92 or 0x94.
  - ➢ The next 4 bytes sent are OP0 to OP3, and indicate the size of the data to be transmitted.
  - ➢ The next 4 bytes sent are OP4 to OP7, and indicate the CheckSum value for all the data to be transmitted.
  - ➢ The next byte sent is OP8, and indicates the division transmission data length format. This is limited to a value of 0x00 to 0x04.
  - ➢ The next 2 bytes sent are OP9 to OP10, and indicate the number of Request command formats that indicate division transmission data. (The number actually starts from 0, so this is the number of division transmission times - 1.)
  - ➢ Due to these rules, Update Request commands require contents of 11 bytes (CMD+OP0 to OP10).

The Request command format is shown below.

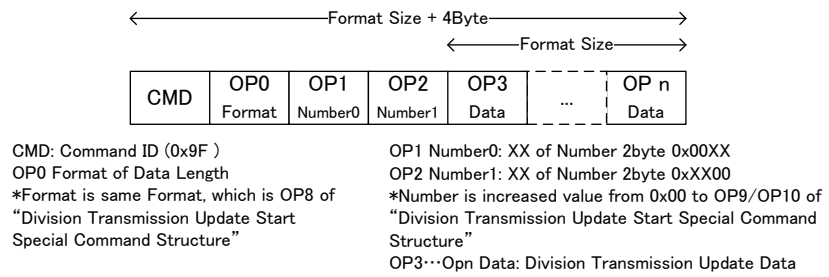
CMD	OP0 Size0	OP1 Size1	OP2 Size2	OP3 Size3	OP4 CheckSum0	OP5 CheckSum1	OP6 CheckSum2	OP7 CheckSum3	OP8 Format	OP9 Number0	OP10 Number1

CMD: Command ID (0x92 or 0x94)
OP0 Size0: XX of Size 4byte 0x000000XX
OP1 Size1: XX of Size 4byte 0x0000XX00
OP2 Size2: XX of Size 4byte 0x00XX0000
OP3 Size3: XX of Size 4byte 0xXX000000
OP4 CheckSum0: XX of ChecSum 4byte 0x000000XX
OP5 CheckSum1: XX of CheckSum 4byte 0x0000XX00
OP6 CheckSum2: XX of CheckSum 4byte 0x00XX0000
OP7 CheckSum3: XX of CheckSum 4byte 0xXX000000
OP8 Format of Data Length
0x00:64 Byte, 0x01:256 Byte, 0x02:1K Byte,
0x03:4K Byte, 0x04:16K Byte
OP9 Number0: XX of Number 2byte 0x00XX
OP10 Number1: XX of Number 2byte 0xXX00

Division Transmission Start Request Command Format

- ✓ Request command format to indicate the data of division transmission
  - ➢ The first byte sent is CMD. This is limited to 0x9F.
  - ➢ The next byte sent is OP0, and indicates the division transmission data length format. This is the same value as the division transmission data length format set by the Request command format that indicates the start of division transmission.
  - ➢ The next 2 bytes sent are OP1 to OP2, and indicate the size of the data to be transmitted.
  - ➢ The bytes OP3 to OPn sent thereafter are the division transmission update data. The length to be transmitted is the division transmission data length format. When the division transmission update data is less than the division transmission data length format, 0x00 must be transmitted to fill the remainder.
  - ➢ Due to these rules, Division Transmission Update Request commands require contents of 4 bytes (CMD+OP0 to OP2) + the division transmission data length format byte.

The Request command format is shown below.

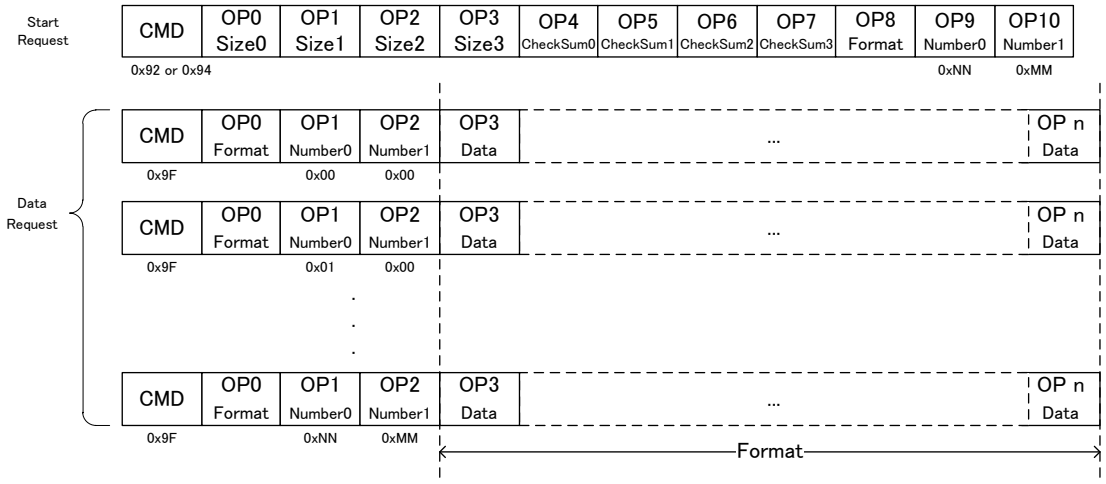


CMD: Command ID (0x9F)
OP0 Format of Data Length
*Format is same Format, which is OP8 of "Division Transmission Update Start Special Command Structure"

OP1 Number0: XX of Number 2byte 0x00XX
OP2 Number1: XX of Number 2byte 0xXX00
*Number is increased value from 0x00 to OP9/OP10 of "Division Transmission Update Start Special Command Structure"
OP3…Opn Data: Division Transmission Update Data

Division Transmission Data Request Command Format

An structure of the contents transmitted by the Division Transmission Update Request command is shown below.



Division Transmission Request Command structure

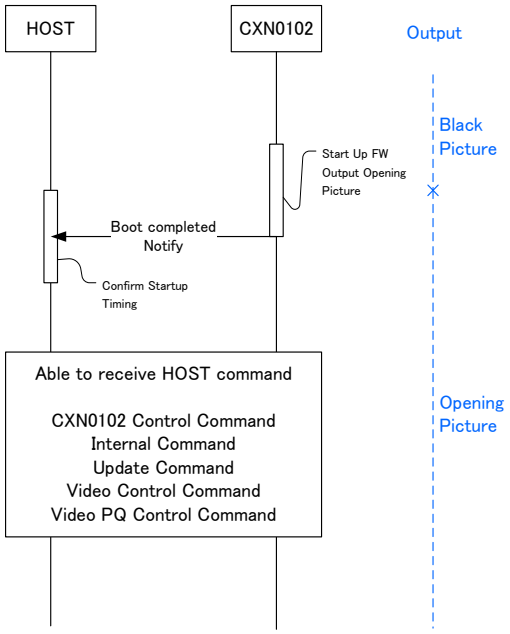
Recommended Control

Boot

When the CXN0102 Module power is turned on, the firmware boots automatically. When boot is complete, Boot Completed Notify is notified to the HOST. The output switches from the Black picture to the Opening picture at this notification timing.

The time required after CXN0102 Module power-on until the Opening picture is output and Boot Completed Notify is notified is approximately 5 s.

The Boot Control sequence and output are shown below.

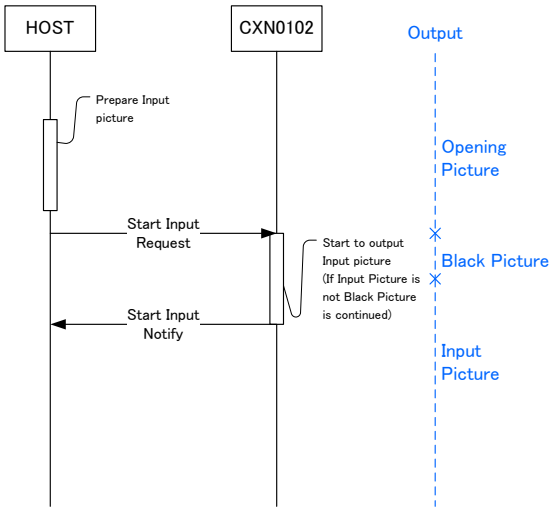


Boot Control Sequence and Output

Start and Stop

When the HOST completes the input picture preparation after CXN0102 Module start-up, input picture output can be started by the HOST issuing the Start Input command. If the HOST issues the Start Input command before the input picture is ready, Black picture output continues until the input picture is ready. When the HOST issues the Start Input command in the condition with the input picture ready, the CXN0102 Module can output the input picture within 33.3 ms.

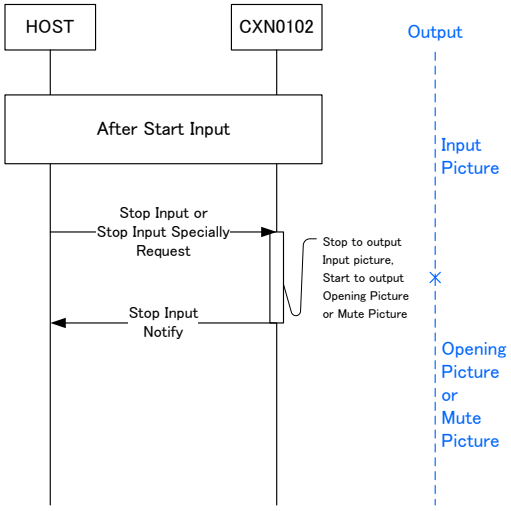
The Output Start sequence and output are shown below.



Input Picture Start Sequence and Output

After the CXN0102 Module starts to output the input picture, input picture output can be stopped by the HOST issuing the Stop Input command or Stop Input Specially command.

The Output Stop sequence and output are shown below.

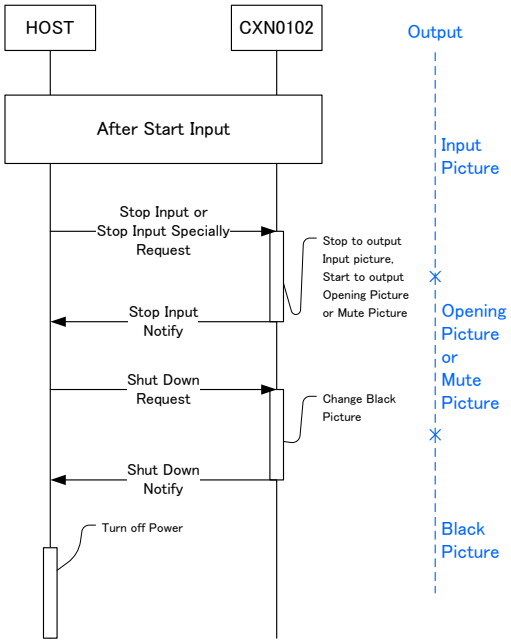


Input Picture Stop Sequence and Output

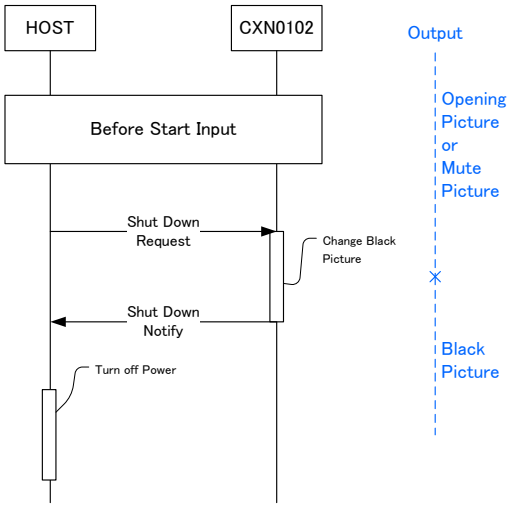
Shutdown

The CXN0102 Module can be shut down by the HOST issuing the Shut Down・Reboot command (Shut Down option). Stop the CXN0102 Module power supply after the HOST issues the Shut Down・Reboot command. When input picture output has started, the HOST must first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Shut Down・Reboot command.

The Shutdown sequence and output (when input picture output has started) and the Shutdown sequence and output (when input picture output is stopped) are shown below.



Shutdown Sequence and Output (When Input Picture Output has started)

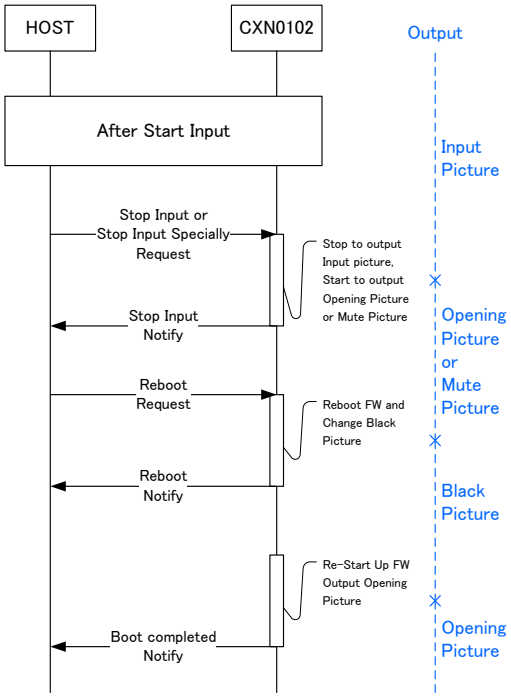


Shutdown Sequence and Output (When Input Picture Output is stopped)

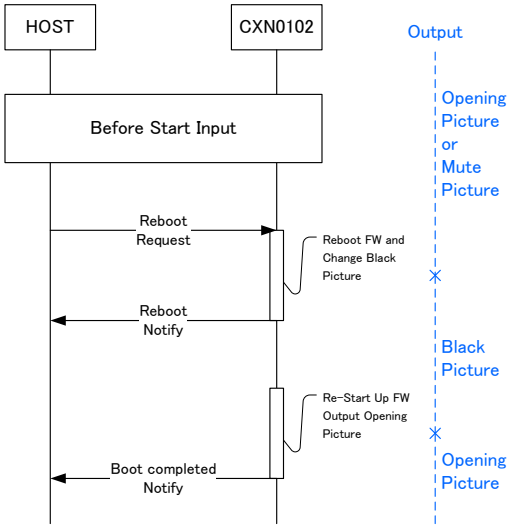
Reboot-Related Control

The CXN0102 Module can be rebooted by the HOST issuing the Shut Down・Reboot command (Reboot option). The HOST should perform the same processing as the Boot sequence after issuing the Shut Down・Reboot command. When input picture output has started, the HOST must first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Shut Down・Reboot command.

The Reboot sequence and output (when input picture output has started) and the Reboot sequence and output (when input picture output is stopped) are shown below.



Reboot Sequence and Output (When Input Picture Output has started)

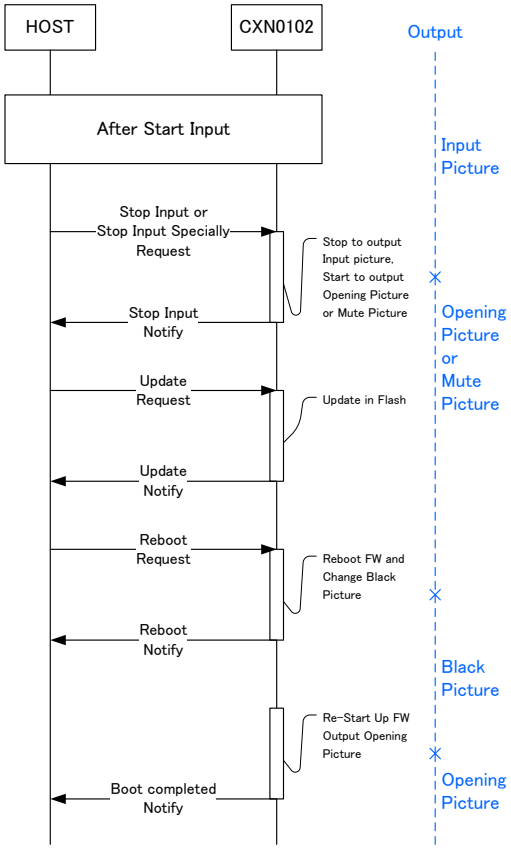


Reboot Sequence and Output (When Input Picture Output is stopped)

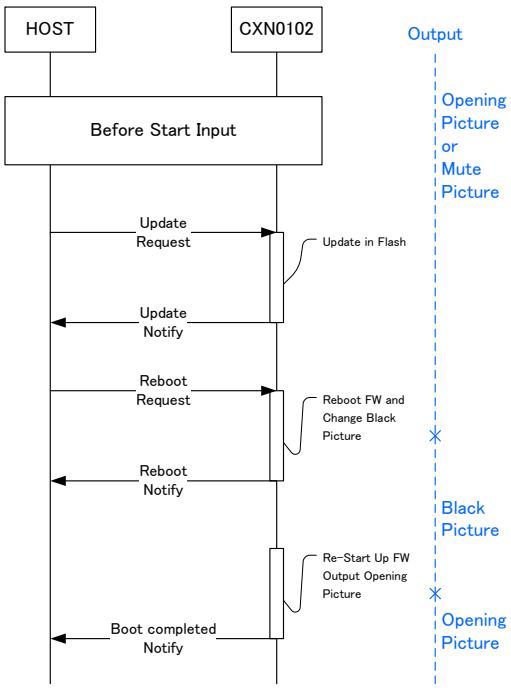
Update Related Control

Update of the CXN0102 Module can be executed by the HOST issuing an Update Command type command. The HOST should perform the same processing as the Reboot sequence after issuing the Update Command type command. When input picture output has started, it is recommended that the HOST first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Update Command type command.

The Update sequence and output (when input picture output has started) and the Update sequence and output (when input picture output is stopped) are shown below.



Update Sequence and Output (When Input Picture Output has Started (Recommended))



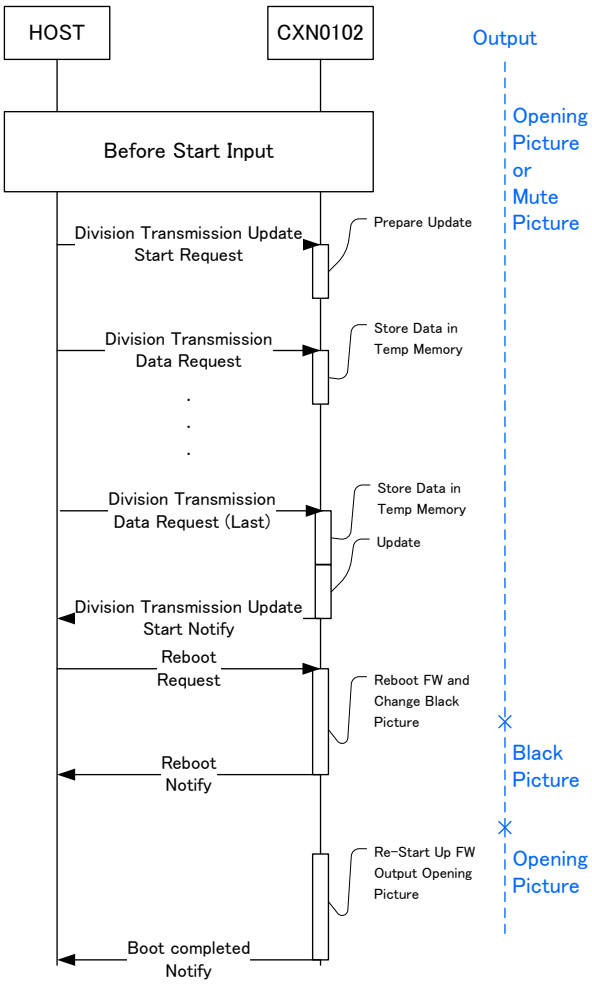
Update Sequence and Output (When Input Picture Output is stopped)

* If communication stalls for 400 ms or more, Time Out processing is performed. When a Time Out occurs, this is notified as an error by the Command Emergency Notify Time Out using CXN0102 Module→HOST communication.

Division transmission Update Related Control

Division transmission update of the CXN0102 Module can be executed by the HOST issuing the Update Command type Division Transmission Start command and the Division Transmission Data command (multiple times). After the update is complete, the HOST should perform the same processing as the Reboot sequence. When input picture output has started, it is recommended that the HOST first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Division Transmission Update Command type command.

The Division Transmission Update sequence and output (recommended) is shown below.

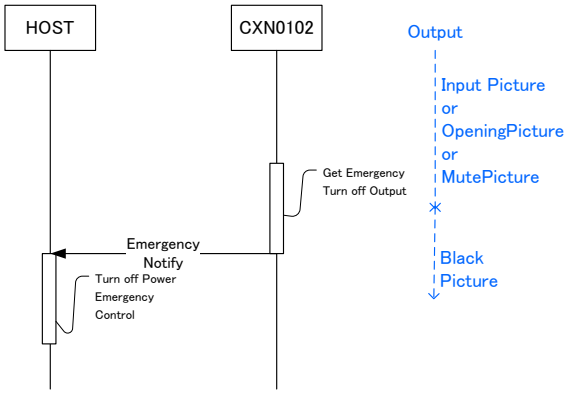


Division Transmission Update Sequence and Output (Recommended)

Emergency Related Control

When an abnormality is detected inside the CXN0102 Module, the Output Stop process (switch to Black picture output) is performed inside the CXN0102 Module, and the Emergency Notify command is notified to the HOST. When the HOST receives the Emergency Notify command notification, it should stop power supply to the CXN0102 Module and execute the error processing.

The Abnormality Emergency Notify sequence and output is shown below.

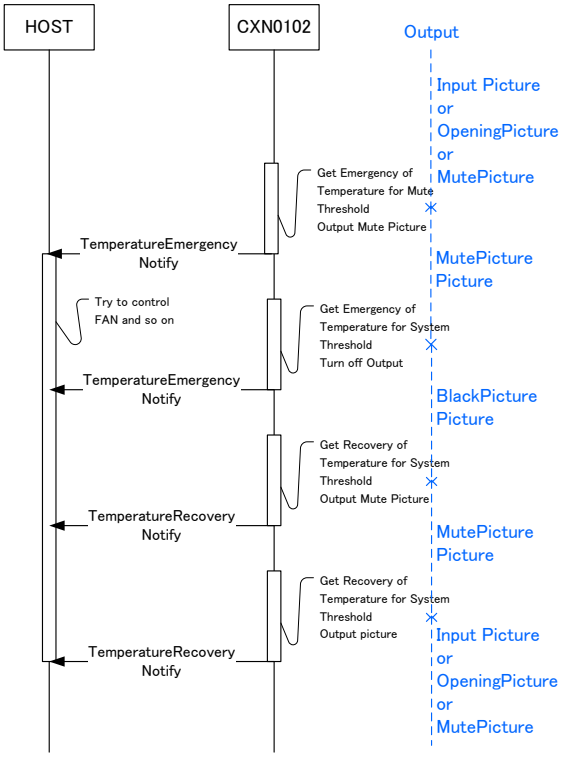


Abnormality Emergency Notify sequence and Output

When a temperature abnormality is detected inside the CXN0102 Module, the Mute process (switch to Mute output) is performed inside the CXN0102 Module, and the Temperature Emergency and Recovery Notify command (temperature abnormality due to Mute switching threshold temperature exceeded) is notified to the HOST. When the HOST receives the Temperature Emergency and Recovery Notify command (temperature abnormality due to Mute switching threshold temperature exceeded) notification, it is expected to use the product fan or other measures to attempt to lower the CXN0102 Module temperature. If the temperature does not drop and instead rises further, the System Stop process (switch to Black picture output) is performed inside the CXN0102 Module, and the Temperature Emergency and Recovery Notify command (temperature abnormality due to System switching threshold temperature exceeded) is notified to the HOST. When the HOST receives the Temperature Emergency and Recovery Notify command (temperature abnormality due to System switching threshold temperature exceeded) notification, it is expected to use the product fan or other measures to attempt to lower the CXN0102 Module temperature.

When the CXN0102 Module temperature drops after notification of the Temperature Emergency and Recovery Notify command (temperature abnormality due to System switching threshold temperature exceeded), the Temperature Emergency and Recovery Notify command (recovery from temperature abnormality due to System switching threshold temperature exceeded) is notified to the HOST. When the CXN0102 Module temperature drops after notification of the Temperature Emergency and Recovery Notify command (temperature abnormality due to Mute switching threshold temperature exceeded), the Temperature Emergency and Recovery Notify command (recovery from temperature abnormality due to Mute switching threshold temperature exceeded) is notified to the HOST. When the CXN0102 Module temperature drops all the way to below the Mute threshold temperature after notification of the Temperature Emergency and Recovery Notify command (temperature abnormality due to System switching threshold temperature exceeded), both the Temperature Emergency and Recovery Notify command (recovery from temperature abnormality due to Mute switching threshold temperature exceeded) and the Temperature Emergency and Recovery Notify command (recovery from temperature abnormality due to System switching threshold temperature exceeded) are notified to the HOST.

The Temperature Emergency Notify and Recovery sequence and output is shown below.



Temperature Emergency Notify and Recovery Sequence and Output

Adjustment Control (Optical axis offset)

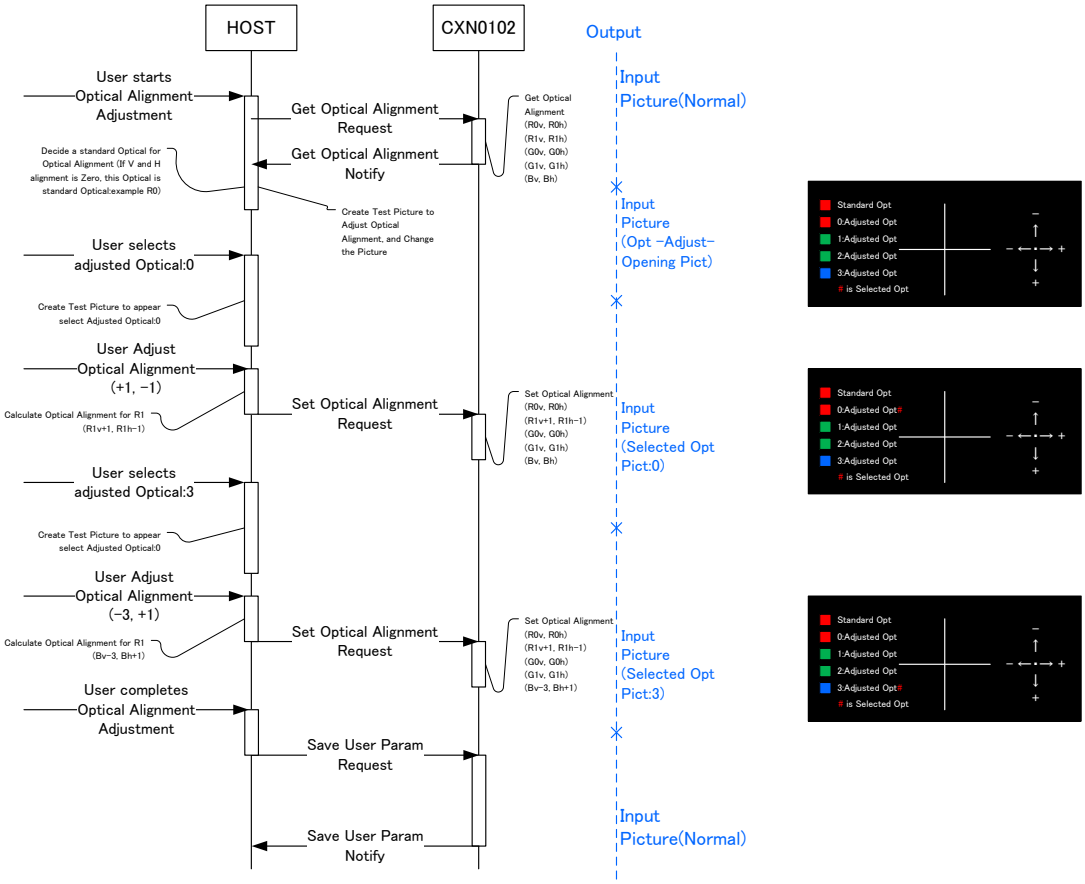
Optical axis offset may occur in the CXN0102 Module due to temperature change or degradation over time. To adjust the optical axis offset, the HOST must generate and output an adjustment picture, and adjust the optical axis offset together with the CXN0102 Module. When optical axis offset adjustment start is selected by the HOST, the HOST issues the Get Optical Alignment command to the CXN0102 Module and gets the current optical axis offset data. The reference laser for optical axis offset adjustment is R0. The HOST generates and outputs the optical axis offset adjustment start picture based on this reference laser data.

When a target laser (other than the reference laser) for adjusting the optical axis offset by the HOST is selected, the HOST generates and outputs the adjustment picture in accordance with the selected target laser.

When the adjustment value of the selected target laser is determined by the HOST, the HOST adds this value to the optical axis offset data acquired by the Get Optical Alignment command, and issues the Set Optical Alignment command to the CXN0102 Module to set this added optical axis offset data. This process is repeated until the adjustment is complete.

When optical axis offset adjustment complete is selected by the HOST, the HOST issues the Save User Param command to the CXN0102 Module to save the setting contents. Saving the setting contents completes the adjustment, so the output switches from that for optical axis offset adjustment to the normal output.

The Optical Axis Offset Adjustment Sequence and Output is shown below.



Optical Axis Offset Adjustment Sequence and Output

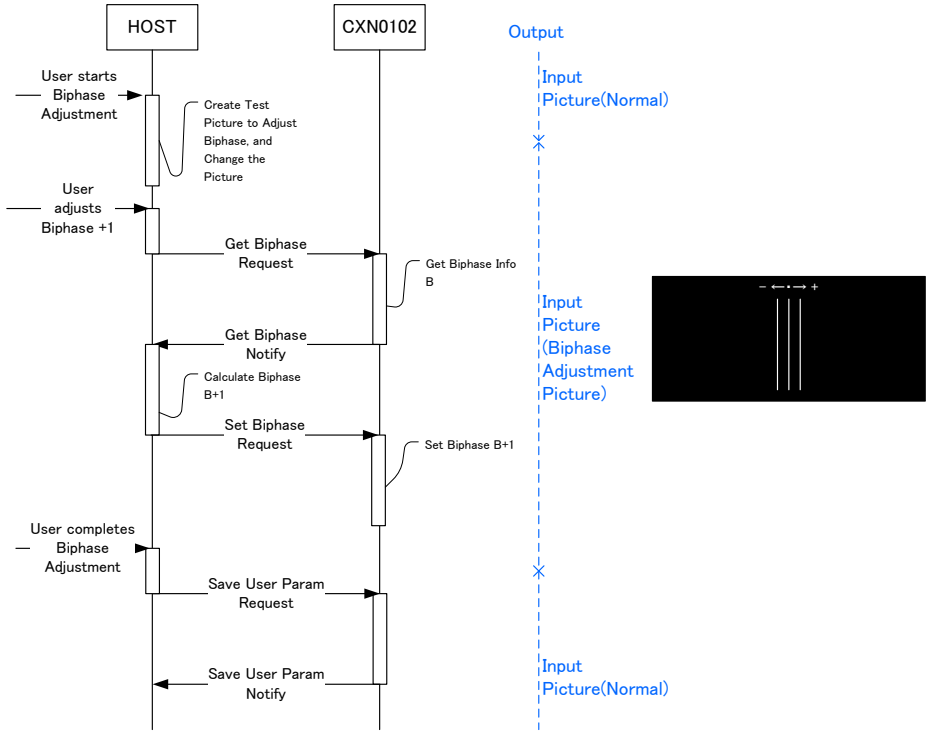
Adjustment Control (Biphase)

Biphase offset may occur in the CXN0102 Module due to temperature change or degradation over time. To adjust the biphase offset, the HOST must generate and output an adjustment picture, and adjust the biphase offset together with the CXN0102 Module. When biphase offset adjustment start is selected by the HOST, the HOST generates and outputs the biphase offset adjustment start picture.

When the biphase adjustment value is determined by the HOST, the HOST gets the biphase data with the Get Biphase command, adds the adjustment value, and issues the Set Biphase command to the CXN0102 Module to set this added biphase data. This process is repeated until the adjustment is complete.

When biphase adjustment complete is selected by the HOST, the HOST issues the Save User Param command to the CXN0102 Module to save the setting contents. Saving the setting contents completes the adjustment, so the output switches from that for biphase adjustment to the normal output.

The Biphase Adjustment Sequence and Output is shown below.



Biphase Adjustment Sequence and Output

Adjustment Control (Easy Optical Axis Offset)

The CXN0102 Module is equipped with a method of using simple control to adjust the optical axis offset that occurs due to temperature change or degradation over time. This is called easy optical axis offset adjustment. When easy optical axis offset adjustment is performed, the CXN0102 Module generates and outputs an adjustment picture in accordance with each phase, making it possible to proceed with the adjustment. Easy optical axis offset adjustment uses a continuous streamlined system whereby all processes are executed in succession when easy optical axis offset adjustment is started.

Easy optical axis offset adjustment is started by the HOST issuing the Set EasyOpticalAdjustmentControl command to the CXN0102 Module. The CXN0102 Module receives the command, and generates and outputs the easy optical axis offset adjustment picture to enable execution of the R1 adjustment phase relative to R0, G1 adjustment phase relative to G0, G0 and G1 adjustment phases relative to R0, and B adjustment phase relative to R0. When adjustment of each phase is finished, easy optical axis offset adjustment can be ended by the HOST issuing the Set EasyOpticalAdjustmentControl command to the CXN0102 Module. The adjustment values are automatically saved at this time.

The R1 adjustment phase relative to R0 adjusts the vertical and horizontal optical axis offset of R1 relative to R0. Issue the Set EasyOpticalAdjustmentPlus and Set EasyOpticalAdjustmentMinus commands to adjust the offset. Issue the Set EasyOpticalAdjustmentControl command to switch from vertical to horizontal adjustment and to switch to the following G1 adjustment phase relative to G0.

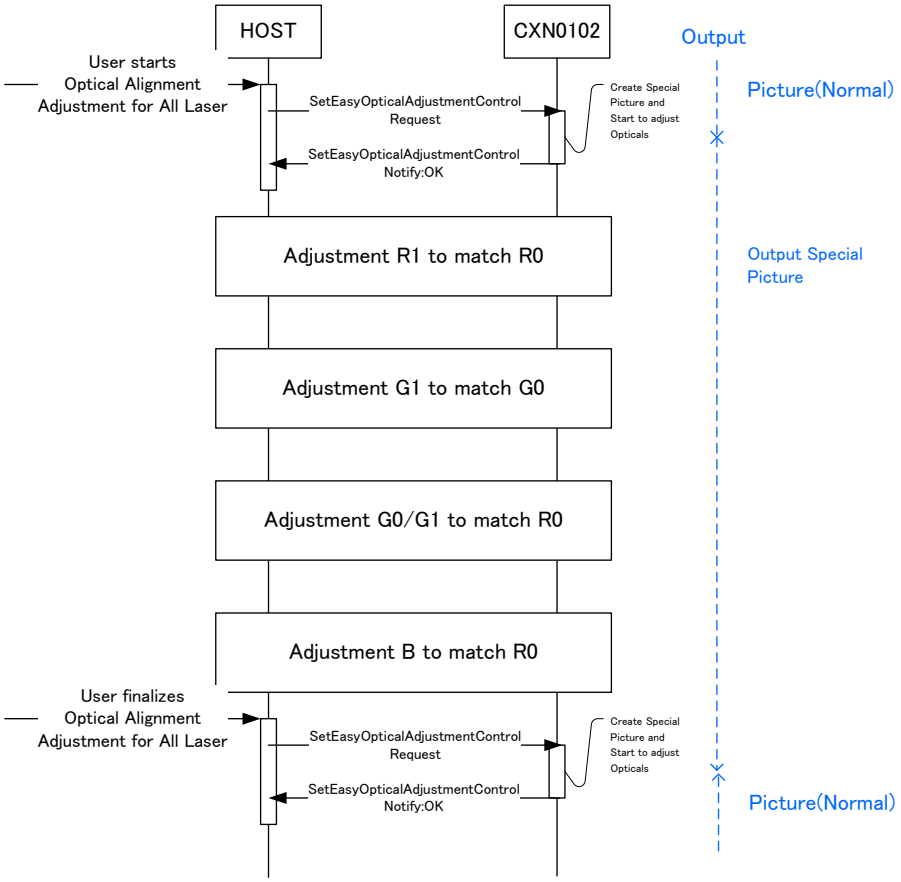
The G1 adjustment phase relative to G0 adjusts the vertical and horizontal optical axis offset of G1 relative to G0. Issue the Set EasyOpticalAdjustmentPlus and Set EasyOpticalAdjustmentMinus commands to adjust the offset. Issue the Set EasyOpticalAdjustmentControl command to switch from vertical to horizontal adjustment and to switch to the following G0 and G1 adjustment phases relative to R0.

The G0 and G1 adjustment phases relative to R0 adjust the vertical and horizontal optical axis offset of G0 and G1 relative to R0. The G0 and G1 adjustments are linked. Issue the Set EasyOpticalAdjustmentPlus and Set EasyOpticalAdjustmentMinus commands to adjust the offset. Issue the Set EasyOpticalAdjustmentControl command to switch from vertical to horizontal adjustment and to switch to the following B adjustment phase relative to R0.

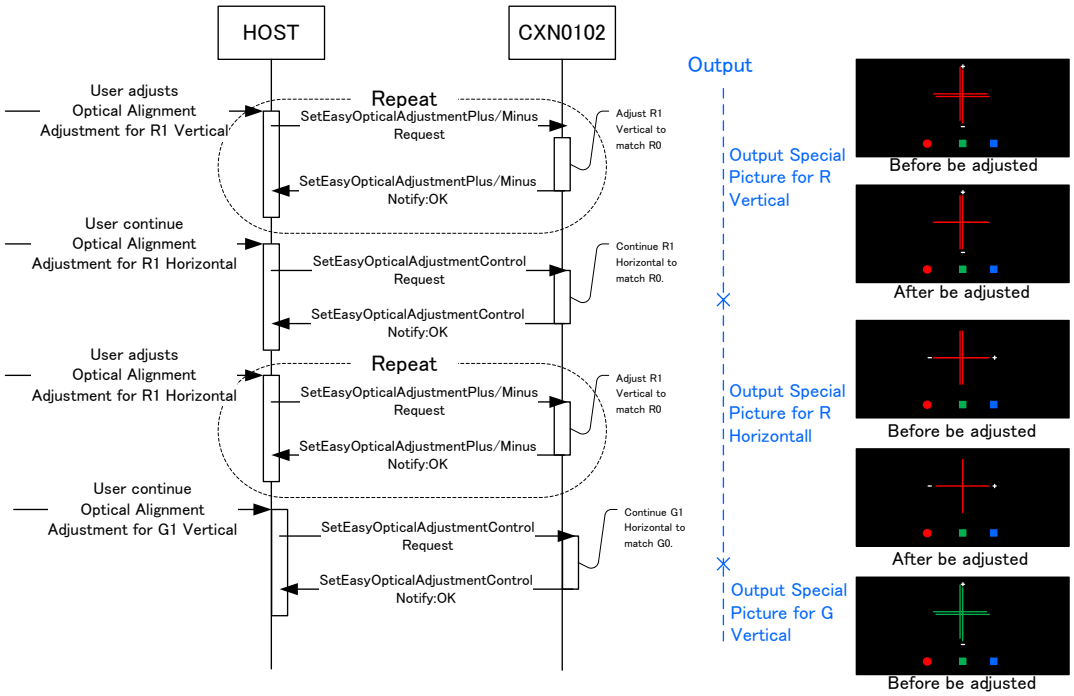
The B adjustment phase relative to R0 adjusts the vertical and horizontal optical axis offset of B relative to R0. Issue the Set EasyOpticalAdjustmentPlus and Set EasyOpticalAdjustmentMinus commands to adjust the offset. Issue the Set EasyOpticalAdjustmentControl command to switch from vertical to horizontal adjustment.

To end the adjustment partway through each phase or to end the adjustment without saving the easy optical axis offset adjustment values after ending each phase, the HOST should issue the Set EasyOpticalAdjustmentExit command to the CXN0102 Module.

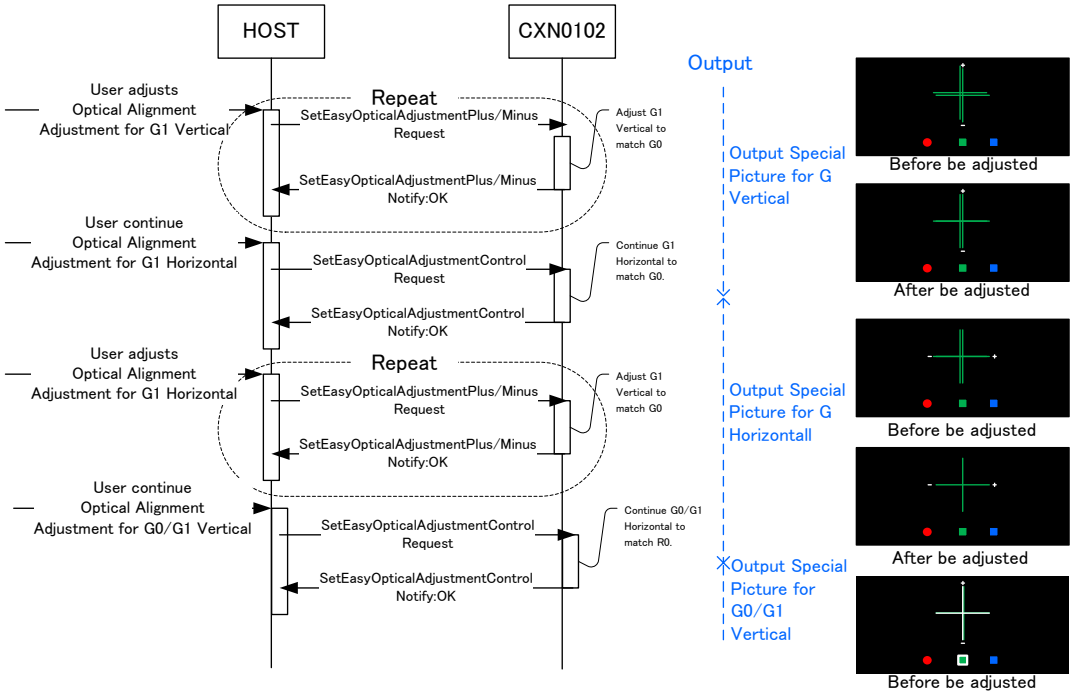
The Easy Optical Axis Offset Adjustment sequences and outputs are shown below.



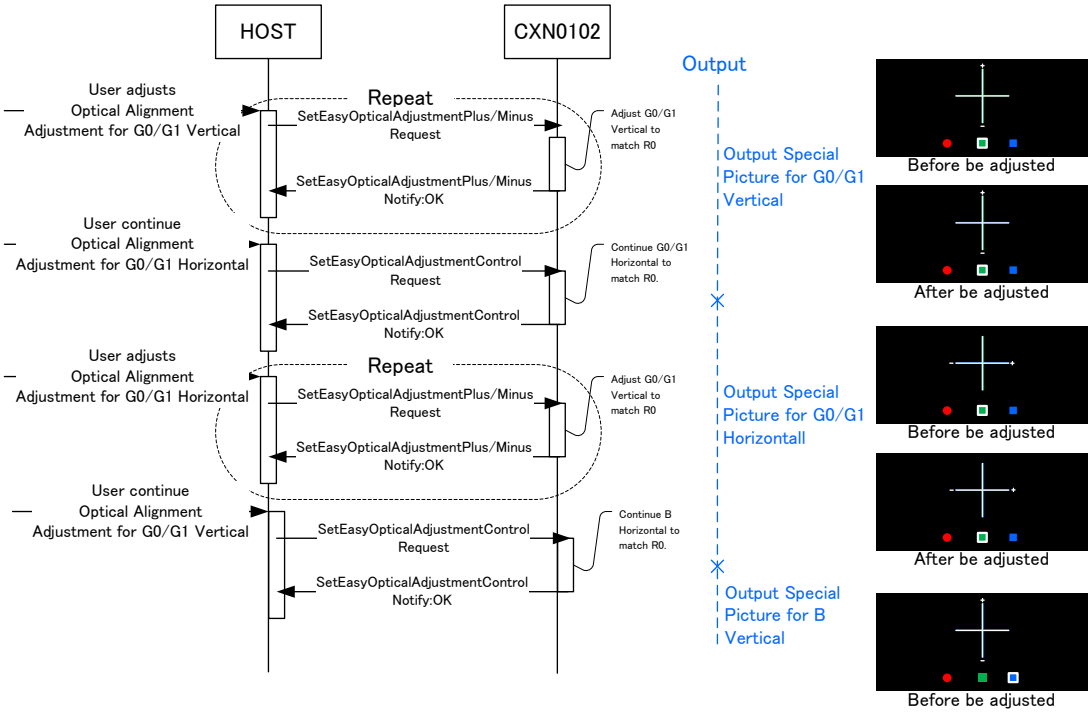
Easy Optical Axis Offset Adjustment Sequence (Overall) and Output



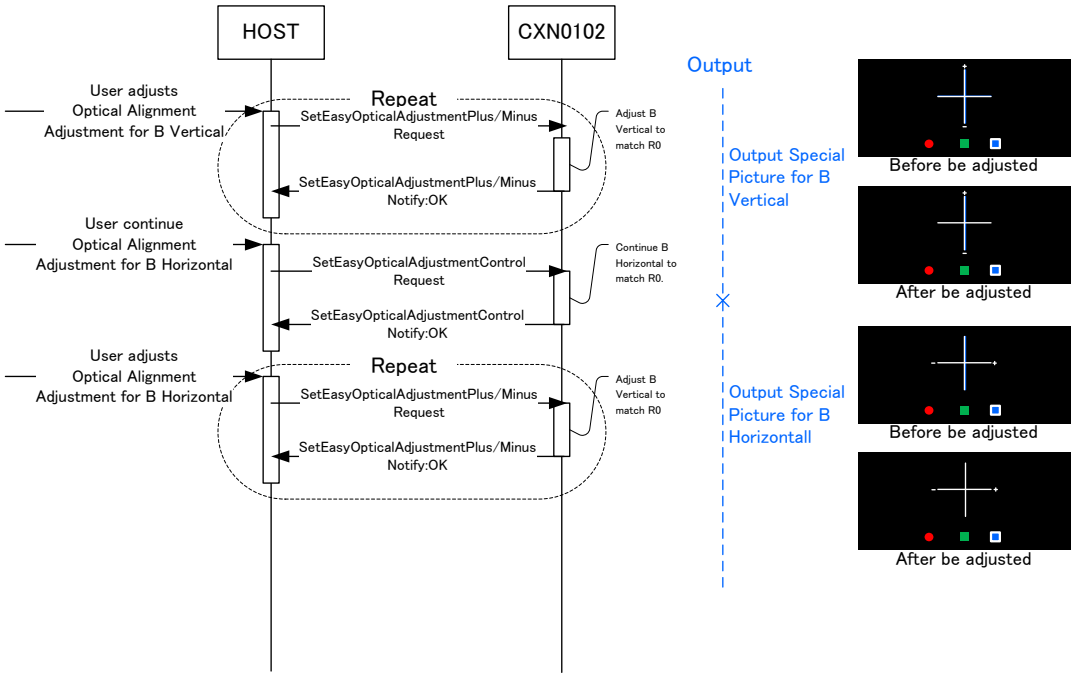
Easy Optical Axis Offset Adjustment Sequence (R1 Adjustment Phase Relative to R0) and Output



Easy Optical Axis Offset Adjustment Sequence (G1 Adjustment Phase Relative to G0) and Output



Easy Optical Axis Offset Adjustment Sequence (G0/G1 Adjustment Phase Relative to R0) and Output



Easy Optical Axis Offset Adjustment Sequence (B Adjustment Phase Relative to R0) and Output

Adjustment Control (Easy Biphase)

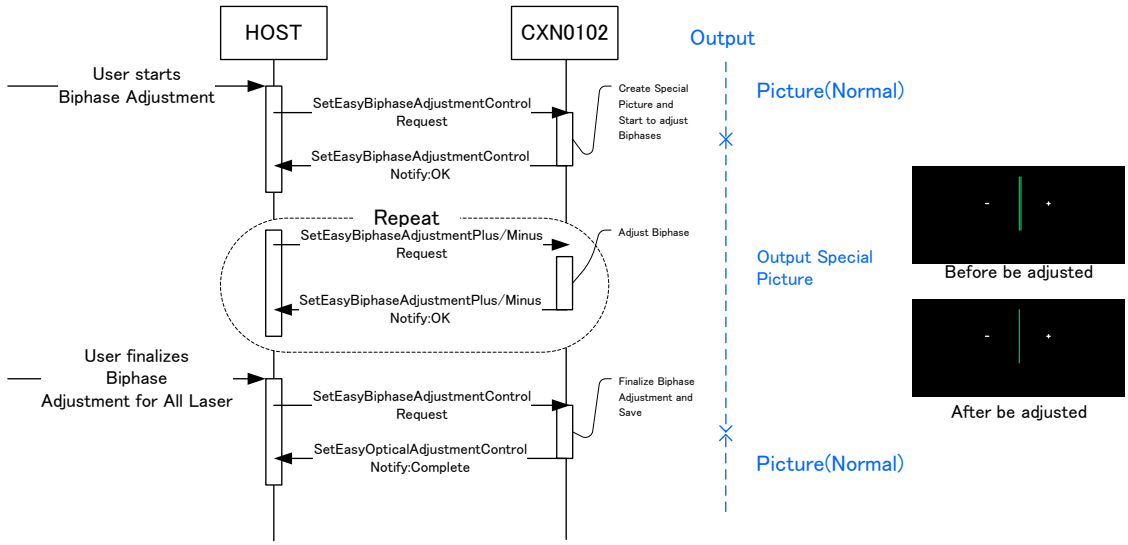
The CXN0102 Module is equipped with a method of using simple control to adjust the biphase offset that occurs due to temperature change or degradation over time. This is called easy biphase adjustment. When easy biphase adjustment is performed, the CXN0102 Module generates and outputs an adjustment picture, making it possible to proceed with the adjustment. Easy biphase adjustment uses a continuous streamlined system whereby all processes are executed in succession when easy biphase adjustment is started.

Easy biphase adjustment is started by the HOST issuing the Set EasyBiphaseAdjustmentControl command to the CXN0102 Module. The CXN0102 Module receives the command, and generates and outputs the easy biphase adjustment picture to enable execution of the adjustment phase. When the adjustment phase is finished, easy biphase adjustment can be ended by the HOST issuing the Set EasyBiphaseAdjustmentControl command to the CXN0102 Module. The adjustment values are automatically saved at this time.

The biphase offset is adjusted in the adjustment phase. Issue the Set EasyBiphaseAdjustmentPlus and Set EasyBiphaseAdjustmentMinus commands to adjust the biphase offset.

To end the adjustment partway through each phase or to end the adjustment without saving the easy biphase adjustment values after ending each phase, the HOST should issue the Set EasyBiphaseAdjustmentExit command to the CXN0102 Module.

The Easy Biphase Adjustment sequence and output are shown below.



Easy Biphase Adjustment sequence and output

Detailed Description of Functions

Output Control Functions

Output angle of view (Frame rate)

[Description]

Output angle of view and frame rate is fixed at 1920 x 720 (60Hz).

[Related Command]

There is no control command because it can not be changed.

Video Range

[Description]

Output image is processed and converted to laser emission in Full Range. This can not be changed.

[Related Command]

There is no control command because it can not be changed.

Gamut

[Description]

Output Gamut:

R: X = 0.64, Y = 0.33

G: X = 0.15, Y = 0.75

B: X = 0.164, Y = 0.06

[Related Command]

There is no control command because it can not be changed.

Input Control Functions

Input format

[Description]

Input image size and frame rate are shown below

Conforms to 1280 x 720 (60Hz) Typical CEA-861-D

[Related Command]

There is no control command because it can not be changed.

Video Range

[Description]

Video Range of input RGB signal is fixed at Limited (RGB 16 to 235).

[Related Command]

There is no control command because it can not be changed.

RGB format

[Description]

Input RGB format is fixed at sRGB.

[Related Command]

There is no control command because it can not be changed.

Output special functions

Keystone correction

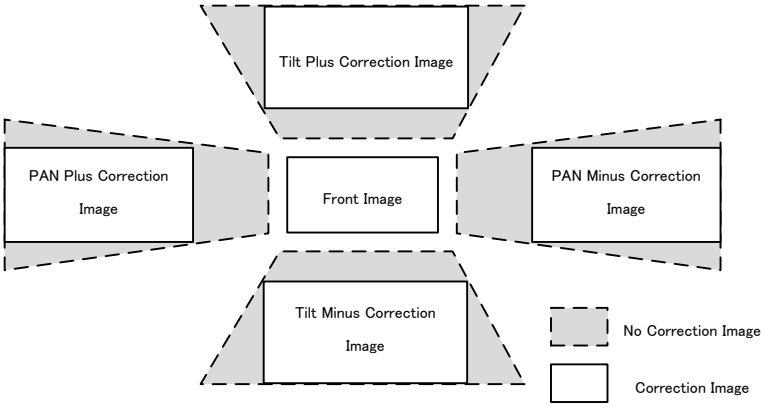
[Description]

This function sets and selects the keystone correction.

Set value of keystone correction

When correction OFF is 0 deg, correction in 1-deg increments from -30 deg to +30 deg in the horizontal direction (Pan), and from -20 deg to +30 deg in the vertical direction (Tilt)

Keystone correction example is shown below.



Keystone correction example

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Video Output Position Information
Set Video Output Position Information

Flip

[Description]

This function sets and selects image flip operation.

Flip operation

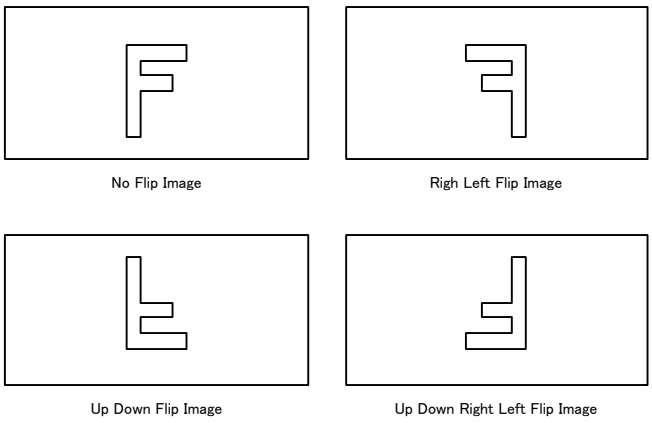
Flip OFF

Right/left flip

Up/down flip

Up/down and right/left flip

Example images of flip operation are shown below.



Flip operation example

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Video Output Position Information
Set Video Output Position Information

Output picture quality adjustment functions

Contrast adjustment

[Description]

This function adjusts the contrast. As based on equation below, this function adjusts Y factor of YUV data which is converted to Full Range format from input RGB data at Limited format. This function adjusts level factor only.

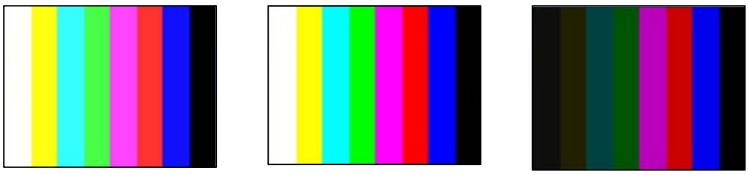
Yout = Yin (1 + C) + B

C: contrast level

B: brightness offset

C factor can be adjusted -15/16 to +15/16 and 0 for adjustment OFF.

Contrast adjustment examples are shown below.



Output image example of contrast adjustment

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Contrast
Set Contrast

Brightness adjustment

[Description]

This function adjusts the brightness. As based on equation below, this function adjusts Y factor of YUV data which is converted to Full Range format from input RGB data at Limited format. This function adjusts offset factor only.

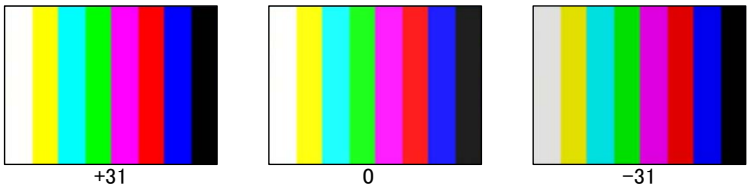
Yout = Yin (1 + C) + B

C: contrast level

B: brightness offset

B factor can be adjusted -31 to +31 and 0 for adjustment OFF.

Brightness adjustment examples are shown below.



Output image example of brightness adjustment

[Related commands]

The table below lists the commands related to this function.Related commands

Command Subject
Get Video All Information
Get Brightness
Set Brightness

Hue adjustment

[Description]

This function adjusts the hue. As based on equation below, this function adjusts UV factor of YUV data which is converted to Full Range format from input RGB data at Limited format.

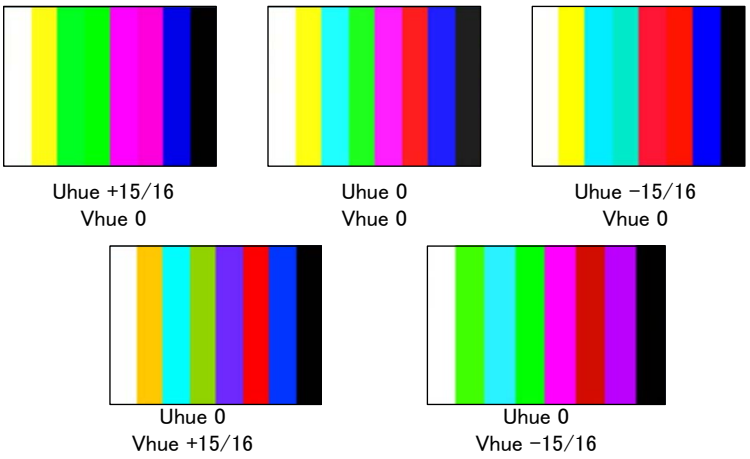
Uout = Uin + Vin * UhueVout = Vin - Uin * Vhue

Uhue: U factor of hue level

Vhue: V factor of hue level

Uhue and Vhue can be adjusted -15/16 to +15/16 and 0 for adjustment OFF.

Hue adjustment examples are shown below.



Output image example of hue adjustment

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Hue
Set Hue

Saturation adjustment

[Description]

This function adjusts the saturation. As based on equation below, this function adjusts UV factor of YUV data which is converted to Full Range format from input RGB data at Limited format.

Uout = Uin *(1 + Ugain)

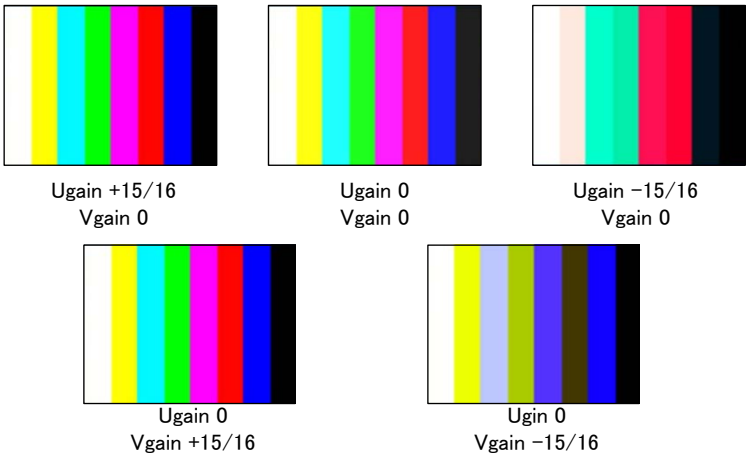
Vout = Vin *(1 + Vgain)

Ugain: U factor of saturation gain

Vgain: V factor of saturation gain

Ugain and Vgain of saturation can be adjusted -15/16 to +15/16 and 0 for adjustment OFF.

Saturation adjustment examples are shown below.



Output image example of saturation adjustment

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Saturation
Set Saturation

Sharpness adjustment

[Description]

This function adjusts the sharpness level.

Sharpness adjustment

Sharpness level can be adjusted 0 to 6 and 0 for adjustment OFF.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Video All Information
Get Sharpness
Set Sharpness

Other

Stop (Special) function

[Description]

This function selects the output when input picture output is stopped. The available output selections are the Opening picture, Black picture and Final picture. This output selection when stopped has the same result as the Mute function.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Stop Input Specially

Adjustment function (Optical axis offset)

[Description]

This function adjusts the optical axis offset that occurs due to degradation over time or temperature fluctuation. The adjustable range is up to ±15 pixels in 1/8-pixel units in the horizontal direction and up to +10 pixels in 1/2-pixel units in the vertical direction. However, the optical alignment is adjusted at the factory, and it is difficult to specify the adjustable range in consideration of the reference optical axis. Therefore, the adjustable range is up to the firmware internal limit. (When this range is exceeded, an error is notified.)

Reference information for vertical limit

Inter-color adjustable range：[0:20] (10 pixel)

Intra-color adjustable range：|R0-R1|≤14(7 pixel) or |G0-G1|≤14(7 pixel)

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Optical Alignment
Set Optical Alignment

Adjustment function (Easy optical axis offset adjustment)

[Description]

This optical axis offset adjustment function is a simplified version of the adjustment function (optical axis offset). This function enables output of the determined picture from the CXN0102 Module and adjustment of the optical axis of each laser as necessary. The adjustable range is the same as that of the adjustment function (optical axis offset). Therefore, when the limit is reached, the firmware changes the output picture to indicate to the user that the adjustment limit has been reached.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Set EasyOpticalAdjustmentControl
Set EasyOpticalAdjustmentPlus
Set EasyOpticalAdjustmentMinus
Set EasyOpticalAdjustmentExit

Adjustment function (Biphase)

[Description]

This function adjusts the biphase offset that occurs due to degradation over time or temperature fluctuation. The adjustable range is the offset adjustment relative to the factory adjustment. The biphase adjustment is an internal timing adjustment, so the accuracy cannot be specified.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Biphase
Set Biphase

Adjustment function (Easy biphase adjustment)

[Description]

This biphase adjustment function is a simplified version of the adjustment function (biphase). This function enables output of the determined picture from the CXN0102 Module and adjustment of the biphase. The adjustable range is the same as that of the adjustment function (biphase). Therefore, when the limit is reached, the firmware changes the output picture to indicate to the user that the adjustment limit has been reached.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Set EasyBiphaseAdjustmentControl
Set EasyBiphaseAdjustmentPlus
Set EasyBiphaseAdjustmentMinus
Set EasyBiphaseAdjustmentExit

Update function

[Description]

This function updates the data stored in the Flash of the CXN0102 Module. The contents that can be updated are the two types of only the firmware data and only the Opening picture data. Update can be executed by the HOST issuing an Update Command type command. After the HOST issues the Update Command type command, it should execute the same processing as Reboot. When input picture output has started, it is recommended that the HOST first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Update Command type command.

Care must be taken as the data format used by each update type differs. The data formats used by each update type are shown below. For details on the update data formats, see Binary Data.

- Firmware only update: This uses the overall binary data, but only the firmware part is updated.
- Opening picture data only update: This uses the Opening picture binary data.

For details on Update Command communication, see HOST→CXN0102 Module Communication (Update Request) and Update Request Command Format. In addition, for the recommended control during update, see Update Related Control.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Update FW Image
Update Picture Data

Division transmission update function

[Description]

This function performs division transmission of and updates the data stored in the Flash of the CXN0102 Module. The contents that can be updated are the two types of only the firmware data and only the Opening picture data. Update can be executed by the HOST issuing the Update Command type Division Transmission Start command and the Division Transmission Data command (multiple times). After the update is complete, the HOST should execute the same processing as Reboot. When input picture output has started, it is recommended that the HOST first issue the Stop Input command or Stop Input Specially command to stop input picture output, and then issue the Division Transmission Update Command type commands.

Care must be taken as the data format used by each update type differs. The data formats used by each update type are shown below. For details on the update data formats, see Binary Data.

- Firmware only update: This uses the overall binary data, but only the firmware part is updated.
- Opening picture data only update: This uses the Opening picture binary data.

For details on Division Transmission Update Command communication, see HOST→CXN0102 Module Communication (Division Transmission Update Request) and Division Transmission Update Request Command Format. In addition, for the recommended control during division transmission update, see Division Transmission Update Related Control.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Division Transmission Update FW Image
Division Transmission Update Picture Data
Division Transmission Update Data

Mute function

[Description]

This function mutes the output during input picture output and Opening picture output. The available output selections are the Opening picture, Black picture and Final picture. An image of Mute output is shown below.

Mute Picture (Opening Picture Sample) | Mute Picture (Black Picture) | Mute Picture (Final Picture Sample)

Image of Mute output

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Mute/UnMute/Change Output

Test image output function

[Description]

The CXN0102 Module has a function that outputs an internal Test picture. An image of Test picture operation is shown below.

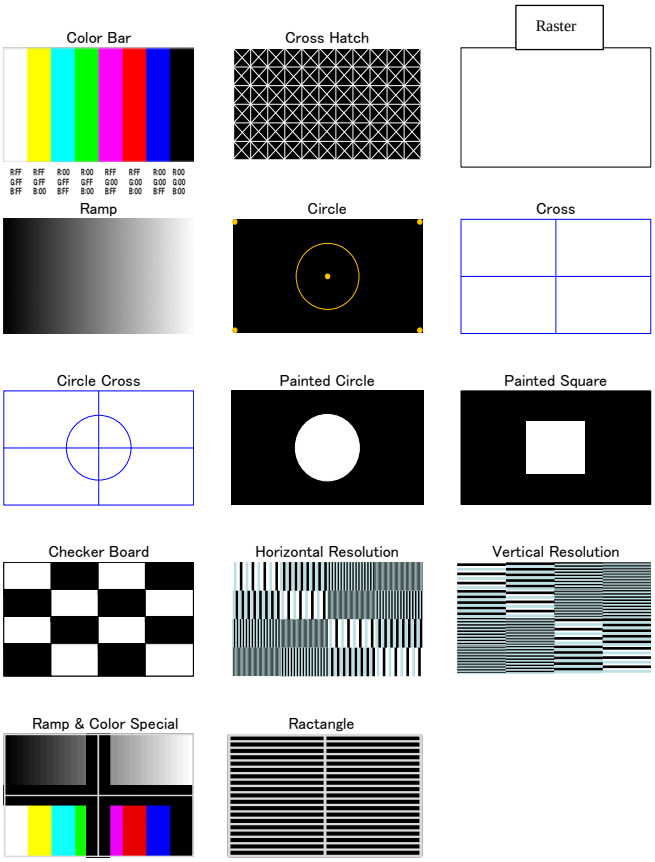


Image of Test Picture Output

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Output Test Picture

Temperature-related functions

[Description]

The CXN0102 Module has a function that gets the internal temperature and automatically switches the control when it detects a temperature abnormality (Mute temperature threshold exceeded or System temperature threshold exceeded), a function that switches these threshold values, and a function that gets the current temperature of the CXN0102 Module. In the condition where the temperature thresholds have not been changed (default), the Mute temperature threshold is 60°C and the System stop temperature threshold is 65°C. Occurrence of a temperature abnormality and recovery from a temperature abnormality are notified by the Temperature Emergency and Recovery Notify command.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Temperature
Temperature Emergency and Recovery Notify

Get cumulative operating time

[Description]

The CXN0102 Module has a function that measures the cumulative time after a program is placed in the Flash and the power is turned on, and a function that gets this cumulative time. The unit is [s].

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Time

Get Version information

[Description]

The CXN0102 Module has a function that gets the version information of the internally operating firmware, the parameters, and the data. This request can be issued and the response received at any time, so it can also be used to determine whether CXN0102 Module operation is possible.

[Related commands]

The table below lists the commands related to this function.

Related commands

Command Subject
Get Version

Command

Command list

The tables below list the commands.

CXN0102 to Host Command: Boot Notify Command

Command Subject	Command ID	Summary	Support
Boot Completed Notify	0x00	Notifies that CXN0102 Module boot is complete.	X

Host to CXN0102 Command: CXN0102 Control Command

Command Subject	Command ID	Summary	Support
Start Input	0x01	Starts input signal acceptance.	X
Stop Input	0x02	Stops input signal acceptance.	X
Stop Input Specially	0x0C	Stops input signal acceptance and outputs the desired picture.	X
Mute/UnMute/Change Output	0x03	Switches from the input signal to the Mute picture, or cancels Mute and switches to the Opening picture.	X
Save User Param	0x07	Saves the user-specified parameters.	X
Initialize User Param	0x08	Initializes the user-specified parameters to the factory settings (default).	X
Shut Down・Reboot	0x0B	Shuts down or reboots the CXN0102 Module.	X

Host to CXN0102 Command: Video Control Command

Command Subject	Command ID	Summary	Support Information
Get Video Output Position Information	0x25	Gets the output position information.	X
Set Video Output Position Information	0x26	Sets the output position information.	X
Get Optical Alignment	0x27	Gets the optical axis data.	X
Set Optical Alignment	0x28	Sets the optical axis data.	X
Get Biphase	0x29	Gets the biphase data.	X
Set Biphase	0x2A	Sets the biphase information.	X
Set EasyOpticalAdjustmentControl	0x32	Controls easy optical axis adjustment.	X
Set EasyOpticalAdjustmentPlus	0x33	Moves the optical axis subject to adjustment in the plus direction.	X
Set EasyOpticalAdjustmentMinus	0x34	Moves the optical axis subject to adjustment in the minus direction.	X
Set EasyOpticalAdjustmentExit	0x35	Forcibly ends easy optical axis adjustment.	X
Set EasyBiphaseAdjustmentControl	0x36	Controls easy biphase adjustment.	X
Set EasyBiphaseAdjustmentPlus	0x37	Moves the biphase in the plus direction.	X
Set EasyBiphaseAdjustmentMinus	0x38	Moves the biphase in the minus direction.	X
Set EasyBiphaseAdjustmentExit	0x39	Forcibly ends easy biphase adjustment.	X

Host to CXN0102 Command : Video PQ Control Command

Command Subject	Command ID	Summary	Support Information
Get All Picture Quality Information	0x40	Gets all of the picture quality settings.	X
Set All Picture Quality Information	0x41	Sets all of the picture quality settings.	X
Get Brightness	0x42	Gets the brightness information.	X
Set Brightness	0x43	Sets the brightness information.	X
Get Contrast	0x44	Gets the contrast information.	X
Set Contrast	0x45	Sets the contrast information.	X
Get Hue	0x46	Gets the hue information.	X
Set Hue	0x47	Sets the hue information.	X
Get Saturation	0x48	Gets the saturation information.	X
Set Saturation	0x49	Sets the saturation information.	X
Get Sharpness	0x4E	Gets the sharpness information.	X
Set Sharpness	0x4F	Sets the sharpness information.	X

Host to CXN0102 Command: Update Command

Command Subject	Command ID	Summary	Support
Update FW Image	0x82	Updates the firmware image in the Flash.	X
Update Picture Data	0x84	Updates the Opening picture data in the Flash.	X
Division Transmission Update FW Image	0x92	Starts division transmission update of the firmware image in the Flash.	X
Division Transmission Update Picture Data	0x94	Starts division transmission update of the picture data in the Flash.	X
Division Transmission Update Data	0x9F	Transmits the division transmission data.	X

Host to CXN0102 Command: Internal Command

Command Subject	Command ID	Summary	Support
Get Temperature	0xA0	Gets the CXN0102 Module temperature data.	X
Get Time	0xA1	Gets the total operating time from Module initialization.	X
Get Version	0xA2	Gets the version information.	X

Host to CXN0102 Command: Internal Command for Factory

Command Subject	Command ID	Summary	Support
Output Test Picture	0xA3	Outputs the Test picture.	X
Get LOT Number	0xB2	Gets the LOT number.	X
Get Serial Number	0xB4	Gets the serial number.	X

CXN0102 to Host Command: Notify Command

Command Subject	Command ID	Summary	Support
Emergency Notify	0x10	Emergency error notification	X
Temperature Emergency and Recovery Notify	0x11	Temperature abnormality notification and recovery notification	X
Command Emergency Notify	0x12	Command processing abnormality notification	X

Boot Notify Command

Boot Completed Notify

[Description]

This command notifies when CXN0102 boot is complete.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x00
Request OP0 [Size information]	-
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

This command is not a Request type.

[Detailed Description of Notify]

When CXN0102 boot is complete, the CXN0102 Boot Notify is sent back. The OP information sent by Notify is shown below.

OP	Description
OP1	Boot result

OP1:

This indicates the boot result. The possible value information is shown below.

Value	Description
0x00	Normal
0x80	Not operational due to internal malfunction
0x8X	Internal failure, X is 1 to 4.
0xFE	Failure of Param data transaction

CXN0102 Control Command

Start Input

[Description]

This command starts output of the input signal.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x01
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to start input signal output. When there is no input signal, this command is accepted, but a Black picture is output and the module waits for an input signal.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready state.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Stop Input

[Description]

This command stops output of the input signal.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x02
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to stop input signal output. After input picture output stops, the Opening picture is output.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Stop Input Specially

[Description]

This command designates the output picture when input picture output is stopped, and stops output of the input signal.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x0C
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

This command designates the output picture when input picture output is stopped. Issue this command to stop input signal output. After input picture output stops, the designated picture is output.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by the Request is shown below.

OP	Description
OP1	Output picture selection when stopped

OP1:

This indicates the output picture selection when input picture output is stopped. The possible value information is shown below.

Value	Description
0x00	Designates Opening picture output. This is the same result as the Stop Input command.
0x01	Designates Mute picture (Black picture) output.
0x02	Designates Mute picture (Opening picture) output.
0x03	Reserved
0x04	Designates Final picture output.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Mute/UnMute/Change Output

[Description]

This command switches the picture in accordance with the Mute/UnMute designation.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x03
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to switch the picture in accordance with the Mute/UnMute designation.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active state.

The OP information sent by the Request is shown below.

OP	Description
OP1	Mute/UnMute output picture selection

OP1:

This indicates the Mute/UnMute output picture selection when input picture output is stopped. The possible value information is shown below.

Value	Description
0x00	Designates UnMute output.
0x01	Designates Mute picture (Black picture) output.
0x02	Designates Mute picture (Opening picture) output.
0x03	Reserved
0x04	Designates Final picture output.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Save User Param

[Description]

This command saves the parameter contents changed by the user.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x07
Request OP0 [Size information]	0x05
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to save the parameter contents changed by the user. The parameters that can be saved by the user are the video output position information, the output picture quality information, the output optical axis data and the biphase data. Only parameters that have been changed are updated and saved. To return saved parameters to the defaults, issue the Initialize User Param command.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active state. When issued in the Active state, the output picture may stop momentarily (Pause).

The OP information sent by the Request is shown below.

OP	Description
OP1	0x00 (fixed value)
OP2	0x00 (fixed value)
OP3	Indicates whether to save the video output position information.
OP4	Indicates whether to save the output optical axis data and biphase data.
OP5	Indicates whether to save the output picture quality information.

OP1:

Set 0x00 (fixed value).

OP2:

Set 0x00 (fixed value).

OP3:

This indicates whether to save the video output position information. The possible value information is shown below.

Value	Description
0x00	Does not save the video output position information.
0x01	Saves all of the video output position information.
0x02	Saves only the flip information.

OP4:

This indicates whether to save the output optical axis data and biphase data. The possible value information is shown below.

Value	Description
0x00	Does not save the output optical axis data.
0x01	Saves all of the output optical axis data and biphase data.
0x02	Saves only the output optical axis data.
0x03	Saves only the biphase data.

OP5:

This indicates whether to save the output picture quality information. The possible value information is shown below.

Value	Description
0x00	Does not save the output picture quality information.
0x01	Saves the output picture quality information.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Initialize User Param

[Description]

This command initializes user-made setting (parameter) changes and returns to the factory setting (default) values.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x08
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to initialize user-made setting (parameter) changes and return to the factory setting (default) values.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready state.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Shut Down・Reboot

[Description]

This command shuts down or reboots the CXN0102 Module.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x0B
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to shut down or reboot the CXN0102 Module. Shutdown stops output and all other functions in preparation for power-off. Reboot stops output and all other functions, performs Module self-reboot, and returns to the state at power-on.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active state.

The OP information sent by the Request is shown below.

OP	Description
OP1	Shutdown option

OP1:

The shutdown options are listed below. The possible value information is shown below.

Value	Description
0x00	Stops all functions
0x01	Reboot

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Internal Command

Get Temperature

[Description]

This command gets the temperature data.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0xA0
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x04

[Detailed Description of Request]

Issue this command to execute a get temperature request. This makes it possible to get the temperature data by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the temperature data response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Module temperature data
OP3	Mute switching threshold temperature data
OP4	System stop threshold temperature data

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the temperature data gotten from the module. The possible value information is shown below.

Value	Description
0x00 to 0x64	Module temperature
0xFF	Data when get temperature fails

OP3:

This indicates the Mute switching threshold temperature data currently set by the module. This is the Mute switching threshold temperature data set by the Set Temperature Threshold command. The possible value information is shown below.

Value	Description
0x00 to 0x64	Mute switching threshold temperature data

OP4:

This indicates the System stop threshold temperature data currently set by the module. This is the System stop threshold temperature data set by the Set Temperature Threshold command. The possible value information is shown below.

Value	Description
0x00 to 0x64	System stop threshold temperature data

Get Time

[Description]

This command gets the cumulative operating time (s).

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0xA1
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x05

[Detailed Description of Request]

Issue this command to execute a get cumulative operating time (s) request. This makes it possible to get the cumulative operating time by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the cumulative operating time response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	1 byte of the 4-byte cumulative operating time (s). This is the DD part of 0xAABBCCDD.
OP3	1 byte of the 4-byte cumulative operating time (s). This is the CC part of 0xAABBCCDD.
OP4	1 byte of the 4-byte cumulative operating time (s). This is the BB part of 0xAABBCCDD.
OP5	1 byte of the 4-byte cumulative operating time (s). This is the AA part of 0xAABBCCDD.

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates 1 byte of the 4-byte cumulative operating time (s). When the cumulative operating time is expressed as 0xAABBCCDD, this is the DD part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte cumulative operating time (s). When the cumulative operating time is expressed as 0xAABBCCDD, this is the CC part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte cumulative operating time (s). When the cumulative operating time is expressed as 0xAABBCCDD, this is the BB part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte cumulative operating time (s). When the cumulative operating time is expressed as 0xAABBCCDD, this is the AA part. This value is an arbitrarily determined value, so there is no value information.

Get Version

[Description]

This command gets the CXN0102 Module internal firmware version information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0xA2
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x0D

[Detailed Description of Request]

Issue this command to execute a request to get the CXN0102 Module internal firmware version information.

This makes it possible to get the CXN0102 Module internal firmware version information by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the CXN0102 Module internal firmware version information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	1 byte of the 4-byte firmware version information. This is the version [0] value.
OP3	1 byte of the 4-byte firmware version information. This is the version [1] value.
OP4	1 byte of the 4-byte firmware version information. This is the version [2] value.
OP5	1 byte of the 4-byte firmware version information. This is the version [3] value.
OP6	1 byte of the 4-byte parameter version information. This is the version [0] value.
OP7	1 byte of the 4-byte parameter version information. This is the version [1] value.
OP8	1 byte of the 4-byte parameter version information. This is the version [2] value.
OP9	1 byte of the 4-byte parameter version information. This is the version [3] value.
OP10	1 byte of the 4-byte data version information. This is the version [0] value.
OP11	1 byte of the 4-byte data version information. This is the version [1] value.
OP12	1 byte of the 4-byte data version information. This is the version [2] value.
OP13	1 byte of the 4-byte data version information. This is the version [3] value.

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates 1 byte of the 4-byte firmware version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[0]="G". This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte firmware version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[1]="0". This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte firmware version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[2]="1". This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte firmware version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[3]="2". This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte parameter version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[0]="G". This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte parameter version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[1]="0". This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates 1 byte of the 4-byte parameter version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[2]="1". This value is an arbitrarily determined value, so there is no value information.

OP9:

This indicates 1 byte of the 4-byte parameter version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[3]="2". This value is an arbitrarily determined value, so there is no value information.

OP10:

This indicates 1 byte of the 4-byte data version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[0]="G". This value is an arbitrarily determined value, so there is no value information.

OP11:

This indicates 1 byte of the 4-byte data version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[1]="0". This value is an arbitrarily determined value, so there is no value information.

OP12:

This indicates 1 byte of the 4-byte data version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[2]="1". This value is an arbitrarily determined value, so there is no value information.

OP13:

This indicates 1 byte of the 4-byte data version information. When the version information is expressed as version[4] = {"G", "0", "1", "2"}, this is the ASCII data for version[3]="2". This value is an arbitrarily determined value, so there is no value information.

Internal Command for Factory

Output Test Picture

[Description]

This command sets and outputs the desired test pattern.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0xA3
Request OP0 [Size information]	0x11
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set and output the desired test pattern.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready state.

The OP information sent by the Request is shown below.

OP	Description
OP1	Test pattern
OP2	General-purpose setting
OP3	Background color R
OP4	Background color G
OP5	Background color B
OP6	Line, fill, and foreground color R
OP7	Line, fill, and foreground color G
OP8	Line, fill, and foreground color B
OP9	0x00 (fixed value)
OP10	0x00 (fixed value)
OP11	0x00 (fixed value)
OP12	0x00 (fixed value)
OP13	0x00 (fixed value)
OP14	0x00 (fixed value)
OP15	0x00 (fixed value)
OP16	0x00 (fixed value)
OP17	0x00 (fixed value)

OP1:

This indicates the test pattern. The possible value information is shown below.

Value	Description
0x00	Stops the test pattern (returns to the state before test pattern output).
0x01	Color bar
0x02	Cross hatching
0x03	Raster
0x04	Ramp
0x05	Circle
0x06	Cross
0x07	Circle + cross
0x08	Circle (filled)
0x09	Square (filled)
0x0A	Checkerboard
0x0B	Resolution checker (vertical lines)
0x0C	Resolution checker (horizontal lines)
0x0D	Resolution checker (square)
0x0E	Color bar ramp special
0x0F	Rectangular hatch, even
0x10	Rectangular hatch, equal cross-hatch interval

OP2:

This indicates the general-purpose setting. The interpretation of this general-purpose setting differs according to the OP1 value. The possible value information for each test pattern is shown below.

OP1 = Cross hatch

Value	Description
0x00	Number of horizontal hatches = 160
0x01	Number of horizontal hatches = 80
0x02	Number of horizontal hatches = 40
0x03	Number of horizontal hatches = 20
0x04	Number of horizontal hatches = 10

OP1 = Ramp

Value	Description
0x00	Vertical ramp (left)
0x01	Vertical ramp (right)
0x02	Horizontal ramp (upper)
0x03	Horizontal ramp (lower)

OP1 = Circle, Circle (filled), Square

Value	Description
0x00	Circle and square size Auto
0x01	Circle and square size vertical Full
0x02	Circle and square size vertical 3/4
0x03	Circle and square size vertical 1/2

OP1 = Cross

Value	Description
0x00	Normal (with frame)
0x01	Horizontal line only (without frame)
0x02	Vertical line only (without frame)

OP1 = Checkerboard

Value	Description
0x00	Foreground color monochrome
0x01	Foreground color monochrome
0x02	Divides both the horizontal and vertical directions into equal halves, displays the foreground color in the upper left section, and alternates foreground color and background color thereafter.
0x03	Divides both the horizontal and vertical directions into three equal parts, displays the foreground color in the upper left section, and alternates foreground color and background color thereafter.
0x04 to 0xFF	Divides both the horizontal and vertical directions into four to 255 equal parts, displays the foreground color in the upper left section, and alternates foreground color and background color thereafter.

OP1 = Resolution checker

Value	Description
0x00	Default (all patterns)
0x01	1-pixel pattern, full screen
0x02	2-pixel pattern, full screen
0x03	3-pixel pattern, full screen
0x04	4-pixel pattern, full screen

OP1 = Color bar ramp special

Value	Description
0x00	No black cross
0x01 to 0xC8	Black cross width setting 1 pixel to 200 pixel

OP1 = Rectangular hatch, even

Value	Description
0x00	20 vertical hatches (3-pixel lines) in vertical 36-line increments, with vertical lines only in the center and the edges. No crossing.
0x01	10 vertical hatches (3-pixel lines) in vertical 72-line increments, with vertical lines only in the center and the edges. No crossing.
0x02	20 vertical hatches (1-pixel line) in vertical 36-line increments, with vertical lines only in the center and the edges. No crossing.
0x03	10 vertical hatches (1-pixel line) in vertical 72-line increments, with vertical lines only in the center and the edges. No crossing.

OP1 = Rectangular hatch, equal cross-hatch interval

Value	Description
0x00	160 horizontal hatches (3-pixel lines), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x01	80 horizontal hatches (3-pixel lines), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x02	40 horizontal hatches (3-pixel lines), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x03	20 horizontal hatches (3-pixel lines), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x04	10 horizontal hatches (3-pixel lines), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x05	160 horizontal hatches (1-pixel line), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x06	80 horizontal hatches (1-pixel line), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x07	40 horizontal hatches (1-pixel line), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x08	20 horizontal hatches (1-pixel line), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.
0x09	10 horizontal hatches (1-pixel line), corresponding vertical increments, with vertical lines only in the center and the edges. No crossing.

OP3:

This indicates the background color R component of the cross hatch, raster, ramp, circle, cross, circle+cross, square, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	R 8-bit gradation value of the RGB component

OP4:

This indicates the background color G component of the cross hatch, raster, ramp, circle, cross, circle+cross, square, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	G 8-bit gradation value of the RGB component

OP5:

This indicates the background color B component of the cross hatch, raster, ramp, circle, cross, circle+cross, square, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	B 8-bit gradation value of the RGB component

OP6:

This indicates the foreground color R component of the cross hatch, circle, cross, circle+cross line color, circle+ square (filled) color, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	R 8-bit gradation value of the RGB component

OP7:

This indicates the foreground color G component of the cross hatch, circle, cross, circle+cross line color, circle+ square (filled) color, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	G 8-bit gradation value of the RGB component

OP8:

This indicates the foreground color B component of the cross hatch, circle, cross, circle+cross line color, circle+ square (filled) color, checkerboard, resolution checker, and rectangular hatch patterns. The possible value information is shown below.

Value	Description
0x00 to 0xFF	B 8-bit gradation value of the RGB component

OP9:

Set 0x00 (fixed value).

OP10:

Set 0x00 (fixed value).

OP11:

Set 0x00 (fixed value).

OP12:

Set 0x00 (fixed value).

OP13:

Set 0x00 (fixed value).

OP14:

Set 0x00 (fixed value).

OP15:

Set 0x00 (fixed value).

OP16:

Set 0x00 (fixed value).

OP17:

Set 0x00 (fixed value).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get LOT Number

[Description]

This command gets the LOT number.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0xB2
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x0D

[Detailed Description of Request]

Issue this command to execute a get CXN0102 Module internal LOT number request. This makes it possible to get the CXN0102 Module internal LOT number information by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always returned as the CXN0102 Module internal LOT number response of this command.

The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result
OP2	1 byte of the 4-byte LOT number 0 information. This is the YY part of 0xVVWWXXYY.
OP3	1 byte of the 4-byte LOT number 0 information. This is the XX part of 0xVVWWXXYY.
OP4	1 byte of the 4-byte LOT number 0 information. This is the WW part of 0xVVWWXXYY.
OP5	1 byte of the 4-byte LOT number 0 information. This is the VV part of 0xVVWWXXYY.
OP6	1 byte of the 4-byte LOT number 1 information. This is the YY part of 0xVVWWXXYY.
OP7	1 byte of the 4-byte LOT number 1 information. This is the XX part of 0xVVWWXXYY.
OP8	1 byte of the 4-byte LOT number 1 information. This is the WW part of 0xVVWWXXYY.
OP9	1 byte of the 4-byte LOT number 1 information. This is the VV part of 0xVVWWXXYY.
OP10	1 byte of the 4-byte LOT number 2 information. This is the YY part of 0xVVWWXXYY.
OP11	1 byte of the 4-byte LOT number 2 information. This is the XX part of 0xVVWWXXYY.
OP12	1 byte of the 4-byte LOT number 2 information. This is the WW part of 0xVVWWXXYY.
OP13	1 byte of the 4-byte LOT number 2 information. This is the VV part of 0xVVWWXXYY.

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates 1 byte of the 4-byte LOT number 0 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the YY part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte LOT number 0 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the XX part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte LOT number 0 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the WW part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte LOT number 0 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte LOT number 1 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the YY part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte LOT number 1 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the XX part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates 1 byte of the 4-byte LOT number 1 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the WW part. This value is an arbitrarily determined value, so there is no value information.

OP9:

This indicates 1 byte of the 4-byte LOT number 1 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP10:

This indicates 1 byte of the 4-byte LOT number 2 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the YY part. This value is an arbitrarily determined value, so there is no value information.

OP11:

This indicates 1 byte of the 4-byte LOT number 2 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the XX part. This value is an arbitrarily determined value, so there is no value information.

OP12:

This indicates 1 byte of the 4-byte LOT number 2 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the WW part. This value is an arbitrarily determined value, so there is no value information.

OP13:

This indicates 1 byte of the 4-byte LOT number 2 information. When the LOT number information is expressed as 0xVVWWXXYY, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

Get Serial Number

[Description]

This command gets the serial number.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0xB4
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x09

[Detailed Description of Request]

Issue this command to execute the get CXN0102 Module internal serial number request. This makes it possible to get the CXN0102 Module internal serial number information by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the CXN0102 Module internal serial number response of this command.

The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result
OP2	1 byte of the 4-byte serial number 0 information. This is the YY part of 0xVVWWXXYY.
OP3	1 byte of the 4-byte serial number 0 information. This is the XX part of 0xVVWWXXYY.
OP4	1 byte of the 4-byte serial number 0 information. This is the WW part of 0xVVWWXXYY.
OP5	1 byte of the 4-byte serial number 0 information. This is the VV part of 0xVVWWXXYY.
OP6	1 byte of the 4-byte serial number 1 information. This is the YY part of 0xVVWWXXYY.
OP7	1 byte of the 4-byte serial number 1 information. This is the XX part of 0xVVWWXXYY.
OP8	1 byte of the 4-byte serial number 1 information. This is the WW part of 0xVVWWXXYY.
OP9	1 byte of the 4-byte serial number 1 information. This is the VV part of 0xVVWWXXYY.

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates 1 byte of the 4-byte serial number 0 information. When the serial number information is expressed as 0xVVWWXXYY, this is the YY part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte serial number 0 information. When the serial number information is expressed as 0xVVWWXXYY, this is the XX part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte serial number 0 information. When the serial number information is expressed as 0xVVWWXXYY, this is the WW part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte serial number 0 information. When the serial number information is expressed as 0xVVWWXXYY, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte serial number 1 information. When the serial number information is expressed as 0xVVWWXXYY, this is the YY part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte serial number 1 information. When the serial number information is expressed as 0xVVWWXXYY, this is the XX part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates 1 byte of the 4-byte serial number 1 information. When the serial number information is expressed as 0xVVWWXXYY, this is the WW part. This value is an arbitrarily determined value, so there is no value information.

OP9:

This indicates 1 byte of the 4-byte serial number 1 information. When the serial number information is expressed as 0xVVWWXXYY, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

Update Command

Update FW Image

[Description]

This command updates the firmware image.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x82
Request OP0 [Size information]	This is special, so it is described under Request details.
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to update only the firmware. The default adjustment parameters and other data are not changed.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states. In the Active state, the picture may be disturbed or other effects may occur, so issue in the Ready state is recommended.

The OP information sent by the Request is shown below.

OP	Description
OP0	1 byte of the 4-byte update data size information. This is the VV part of 0xSSTTUUVV.
OP1	1 byte of the 4-byte update data size information. This is the UU part of 0xSSTTUUVV.
OP2	1 byte of the 4-byte update data size information. This is the TT part of 0xSSTTUUVV.
OP3	1 byte of the 4-byte update data size information. This is the SS part of 0xSSTTUUVV.
OP4	1 byte of the 4-byte update data CheckSum information. This is the VV part of 0xSSTTUUVV.
OP5	1 byte of the 4-byte update data CheckSum information. This is the UU part of 0xSSTTUUVV.
OP6	1 byte of the 4-byte update data CheckSum information. This is the TT part of 0xSSTTUUVV.
OP7	1 byte of the 4-byte update data CheckSum information. This is the SS part of 0xSSTTUUVV.
from OP8	Update data body (firmware body)

OP0:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP1:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates update data body (firmware body). This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0xF0	CMD Format error
0xF1	Time Out error
0xF2	CheckSum error
0xF3	Number error
0xF4	Other error

Update Picture Data

[Description]

This command updates the picture data.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x84
Request OP0 [Size information]	This is special, so it is described under Request details.
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to update only the picture data. The default adjustment parameters and other data are not changed.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states. In the Active state, the picture may be disturbed or other effects may occur, so issue in the Ready state is recommended.

The OP information sent by the Request is shown below.

OP	Description
OP0	1 byte of the 4-byte update data size information. This is the VV part of 0xSSTTUUVV.
OP1	1 byte of the 4-byte update data size information. This is the UU part of 0xSSTTUUVV.
OP2	1 byte of the 4-byte update data size information. This is the TT part of 0xSSTTUUVV.
OP3	1 byte of the 4-byte update data size information. This is the SS part of 0xSSTTUUVV.
OP4	1 byte of the 4-byte update data CheckSum information. This is the VV part of 0xSSTTUUVV.
OP5	1 byte of the 4-byte update data CheckSum information. This is the UU part of 0xSSTTUUVV.
OP6	1 byte of the 4-byte update data CheckSum information. This is the TT part of 0xSSTTUUVV.
OP7	1 byte of the 4-byte update data CheckSum information. This is the SS part of 0xSSTTUUVV.
from OP8	Update data body (picture data body)

OP0:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP1:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates update data body (picture data body). This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0xF0	CMD Format error
0xF1	Time Out error
0xF2	CheckSum error
0xF3	Number error
0xF4	Other error

Division Transmission Update FW Image

[Description]

This command instructs the start of division transfer for firmware image update.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x92
Request OP0 [Size information]	This is special, so it is described under Request details.
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to instruct the start of division transfer for firmware update. After this command is issued, the divided data can be transmitted by issuing the Division Transmission Update Data command. The default adjustment parameters and other data are not changed.

When the Request communication of this command stalls partway or processing cannot be performed due to internal circumstances, Command Emergency Notify may be notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states. In the Active state, the picture may be disturbed or other effects may occur, so issue in the Ready state is recommended.

The OP information sent by the Request is shown below.

OP	Description
OP0	1 byte of the 4-byte update data size information. This is the VV part of 0xSSTTUUVV.
OP1	1 byte of the 4-byte update data size information. This is the UU part of 0xSSTTUUVV.
OP2	1 byte of the 4-byte update data size information. This is the TT part of 0xSSTTUUVV.
OP3	1 byte of the 4-byte update data size information. This is the SS part of 0xSSTTUUVV.
OP4	1 byte of the 4-byte update data CheckSum information. This is the VV part of 0xSSTTUUVV.
OP5	1 byte of the 4-byte update data CheckSum information. This is the UU part of 0xSSTTUUVV.
OP6	1 byte of the 4-byte update data CheckSum information. This is the TT part of 0xSSTTUUVV.
OP7	1 byte of the 4-byte update data CheckSum information. This is the SS part of 0xSSTTUUVV.
OP8	Division transmission format data
OP9	1 byte of the 2-byte division transmission number data. This is the NN part of 0xMMNN.
OP10	1 byte of the 2-byte division transmission number data. This is the MM part of 0xMMNN.

OP0:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP1:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates the division transmission format information. The possible value information is shown below.

Value	Description
0x00	Division transmission data size 64 Byte
0x01	Division transmission data size 256 Byte
0x02	Division transmission data size 1K Byte
0x03	Division transmission data size 4K Byte
0x04	Division transmission data size 16K Byte

OP9:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the NN part. The division transmission number information is the value obtained by subtracting 1 from the number of times the Division Transmission Update Data command, which transmits the division transmission information, is issued. The method of calculating the transmission number information is shown below.

Transmission number information = F(Update data size/Division transmission format) – 1

F( ) indicates that the decimal portion is rounded up.

This value is an arbitrarily determined value, so there is no value information.

OP10:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the MM part. This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

Notify is always sent back as the response of this command when reception of the data sent by the Division Transmission Update Data command is complete or an error is judged. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0xF0	CMD Format error
0xF1	Time Out error
0xF2	CheckSum error
0xF3	Number error
0xF4	Other error

Division Transmission Update Picture Data

[Description]

This command instructs the start of division transmission for picture data update.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x94
Request OP0 [Size information]	This is special, so it is described under Request details.
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to instruct the start of division transmission for picture data update. After this command is issued, the divided data can be transmitted by issuing the Division Transmission Update Data command. The default adjustment parameters and other data are not changed.

When the Request communication of this command stalls partway or processing cannot be performed due to internal circumstances, Command Emergency Notify may be notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states. In the Active state, the picture may be disturbed or other effects may occur, so issue in the Ready state is recommended.

The OP information sent by the Request is shown below.

OP	Description
OP0	1 byte of the 4-byte update data size information. This is the VV part of 0xSSTTUUVV.
OP1	1 byte of the 4-byte update data size information. This is the UU part of 0xSSTTUUVV.
OP2	1 byte of the 4-byte update data size information. This is the TT part of 0xSSTTUUVV.
OP3	1 byte of the 4-byte update data size information. This is the SS part of 0xSSTTUUVV.
OP4	1 byte of the 4-byte update data CheckSum information. This is the VV part of 0xSSTTUUVV.
OP5	1 byte of the 4-byte update data CheckSum information. This is the UU part of 0xSSTTUUVV.
OP6	1 byte of the 4-byte update data CheckSum information. This is the TT part of 0xSSTTUUVV.
OP7	1 byte of the 4-byte update data CheckSum information. This is the SS part of 0xSSTTUUVV.
OP8	Division transmission format data
OP9	1 byte of the 2-byte division transmission number data. This is the NN part of 0xMMNN.
OP10	1 byte of the 2-byte division transmission number data. This is the MM part of 0xMMNN.

OP0:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP1:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte update data size information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the VV part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the UU part. This value is an arbitrarily determined value, so there is no value information.

OP6:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the TT part. This value is an arbitrarily determined value, so there is no value information.

OP7:

This indicates 1 byte of the 4-byte update data CheckSum information. When the update data size information is expressed as 0xSSTTUUVV, this is the SS part. This value is an arbitrarily determined value, so there is no value information.

OP8:

This indicates the division transmission format information. The possible value information is shown below.

Value	Description
0x00	Division transmission data size 64 Byte
0x01	Division transmission data size 256 Byte
0x02	Division transmission data size 1K Byte
0x03	Division transmission data size 4K Byte
0x04	Division transmission data size 16K Byte

OP9:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the NN part. The division transmission number information is the value obtained by subtracting 1 from the number of times the Division Transmission Update Data command, which transmits the division transmission information, is issued. The method of calculating the transmission number information is shown below.

Transmission number information = F(Update data size/Division transmission format) – 1

F( ) indicates that the decimal portion is rounded up.

This value is an arbitrarily determined value, so there is no value information.

OP10:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the MM part. This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

Notify is always sent back as the response of this command when reception of the data sent by the Division Transmission Update Data command is complete or an error is judged. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0xF0	CMD Format error
0xF1	Time Out error
0xF2	CheckSum error
0xF3	Number error
0xF4	Other error

Division Transmission Update Data

[Description]

This command performs division transmission of the update data.

[Attributes]

Attribute	Information
Type	Request type
CMD	0x9F
Request OP0 [Size information]	This is special, so it is described under Request details.
Notify OP0 [Size information]	-

[Detailed Description of Request]

Issue this command to perform division transmission of the update data. The Division Transmission Update FW Image command or Division Transmission Update Picture Data command must be sent before transmitting this command. Division transmission of the update data must be performed in accordance with the contents indicated by OP8 (Format) and OP9 and OP10 (Number) of the Division Transmission Update FW Image command or Division Transmission Update Picture Data command. Therefore, the command size of this command, including CMD, is the Format size + 4 bytes. When the divided update data is smaller than the Format size, the remainder must be filled with 0x00 up to the Format size. The number of times that this command must be issued is Number + 1. When issuing this command multiple times, the interval must be within 1 s.

When division transmission of the update data by this command is complete, or when some error occurred, a response is sent back by CXN0102 Module→HOST communication as the Notify of the Division Transmission Update FW Image command or Division Transmission Update Picture Data command.

In addition, when the Request communication of this command stalls partway or processing cannot be performed due to internal circumstances, Command Emergency Notify may be notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states. In the Active state, the picture may be disturbed or other effects may occur, so issue in the Ready state is recommended.

The OP information sent by the Request is shown below.

OP	Description
OP0	Division transmission format data
OP1	1 byte of the 2-byte division transmission number data. This is the NN part of 0xMMNN.
OP2	1 byte of the 2-byte division transmission number data. This is the MM part of 0xMMNN.
OP3 to OPn	Division transmission update data body (size set by Format)

OP0:

This indicates the division transmission format information. The division transmission format information must be the same value as that set by OP8 (Format) of the Division Transmission Update FW Image or Division Transmission Update Picture Data command. The possible value information is shown below.

Value	Description
0x00	Division transmission data size 64 Byte
0x01	Division transmission data size 256 Byte
0x02	Division transmission data size 1K Byte
0x03	Division transmission data size 4K Byte
0x04	Division transmission data size 16K Byte

OP1:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the NN part. This value must be increased in +1 increments from 0x00. The maximum value is that set by OP9 (Number) of the Division Transmission Update FW Image command or Division Transmission Update Picture Data command. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 2-byte division transmission number information. When the division transmission number information is expressed as 0xMMNN, this is the MM part. This value must be increased in +1 increments from 0x00. The maximum value is that set by OP10 (Number) of the Division Transmission Update FW Image command or Division Transmission Update Picture Data command. This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

There is no Notify as the response of this command.

Video Control Command

Get Video Output Position Information

[Description]

This command gets the video output display position information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x25
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x0A

[Detailed Description of Request]

Issue this command to execute a get video output display position information request. This makes it possible to get the video output display position information by Notify communication. The video output display position information consists of the screen pan and tilt information and the flip information.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the get video output display position information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Screen pan information
OP3	Screen tilt information
OP4	Flip information
OP5	Reserved
OP6	Reserved
OP7	Reserved
OP8	Reserved
OP9	Reserved
OP10	Reserved

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the screen pan information. The possible value information is shown below.

Value	Description
0xE2 to 0xFF	Screen pan information: Correction angle assuming rightward projection -30 deg to -1 deg
0x00	Screen pan information: No pan adjustment
0x01 to 0x1E	Screen pan information: Correction angle assuming leftward projection 1 deg to 30 deg

OP3:

This indicates the screen tilt information. The possible value information is shown below.

Value	Description
0xEC to 0xFF	Screen tilt information: Downward angle -20 deg to -1 deg
0x00	Screen tilt information: No tilt adjustment
0x01 to 0x1E	Screen tilt information: Upward angle 1 deg to 30 deg

OP4:

This indicates the flip information. The possible value information is shown below.

Value	Description
0x00	Flip OFF
0x01	Right/left flip
0x02	Up/down flip
0x03	Up/down and right/left flip

OP5:

Reserved

OP6:

Reserved

OP7:

Reserved

OP8:

Reserved

OP9:

Reserved

OP10:

Reserved

Set Video Output Position Information

[Description]

This command sets the video output display position information.

[Attributes]

Attribute	Information
Type	Request・Error notify type
CMD	0x26
Request OP0 [Size information]	0x09
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the video output display position information. This makes it possible to switch the video output display position.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

The OP information sent by Request is shown below.

OP	Description
OP1	Screen pan information
OP2	Screen tilt information
OP3	Flip information
OP4	0x64 (Fixed value)
OP5	0x00 (Fixed value)
OP6	0x00 (Fixed value)
OP7	0x00 (Fixed value)
OP8	0x00 (Fixed value)
OP9	0x00 (Fixed value)

OP1:

This indicates the screen pan information. The possible value information is shown below.

Value	Description
0xE2 to 0xFF	Screen pan information: Correction angle assuming rightward projection -30 deg to -1 deg
0x00	Screen pan information: No pan adjustment
0x01 to 0x1E	Screen pan information: Correction angle assuming leftward projection 1deg to 30deg

OP2:

This indicates the screen tilt information. The possible value information is shown below.

Value	Description
0xEC to 0xFF	Screen tilt information: Downward angle -20 deg to -1 deg
0x00	Screen tilt information: No tilt adjustment
0x01 to 0x1E	Screen tilt information: Upward angle 1 deg to 30 deg

OP3:

This indicates the flip information. The possible value information is shown below.

Value	Description
0x00	Flip OFF
0x01	Right/left flip
0x02	Up/down flip
0x03	Up/down and right/left flip

OP4:

Set 0x64 (fixed value).

OP5:

Set 0x00 (fixed value).

OP6:

Set 0x00 (fixed value).

OP7:

Set 0x00 (fixed value).

OP8:

Set 0x00 (fixed value).

OP9:

Set 0x00 (fixed value).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Optical Alignment

[Description]

This command gets the optical axis offset data.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x27
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x0E

[Detailed Description of Request]

Issue this command to execute a get optical axis offset data request. This makes it possible to get the optical axis offset data by Notify communication.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the get optical axis offset data response of this command.

The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result
OP2	Optical axis offset R0 horizontal data
OP3	Optical axis offset R1 horizontal data
OP4	Optical axis offset G0 horizontal data
OP5	Optical axis offset G1 horizontal data
OP6	Optical axis offset B horizontal data
OP7	Optical axis offset R0 vertical data
OP8	Optical axis offset R1 vertical data
OP9	Optical axis offset G0 vertical data
OP10	Optical axis offset G1 vertical data
OP11	Optical axis offset B vertical data
OP12	Reserved
OP13	Reserved
OP14	Reserved

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the optical axis offset R0 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset R0 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset R0 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset R0 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP3:

This indicates the optical axis offset R1 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset R1 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset R1 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset R1 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP4:

This indicates the optical axis offset G0 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset G0 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset G0 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset G0 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP5:

This indicates the optical axis offset G1 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset G1 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset G1 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset G1 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP6:

This indicates the optical axis offset B horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units.

The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset B horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset B horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset B horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP7:

This indicates the optical axis offset R0 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset R0 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset R0 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP8:

This indicates the optical axis offset R1 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset R1 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset R1 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP9:

This indicates the optical axis offset G0 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset G0 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset G0 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP10:

This indicates the optical axis offset G1 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset G1 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset G1 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP11:

This indicates the optical axis offset B vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset B vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset B vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP12:

Reserved

OP13:

Reserved

OP14:

Reserved

Set Optical Alignment

[Description]

This command sets the optical axis offset data.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x28
Request OP0 [Size information]	0x0D
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the optical axis offset data. This makes it possible to adjust the optical axis offset.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

The OP information sent by the Request is shown below.

OP	Description
OP1	Optical axis offset R0 horizontal data
OP2	Optical axis offset R1 horizontal data
OP3	Optical axis offset G0 horizontal data
OP4	Optical axis offset G1 horizontal data
OP5	Optical axis offset B horizontal data
OP6	Optical axis offset R0 vertical data
OP7	Optical axis offset R1 vertical data
OP8	Optical axis offset G0 vertical data
OP9	Optical axis offset G1 vertical data
OP10	Optical axis offset B vertical data
OP11	Reserved
OP12	Reserved
OP13	Reserved

OP1:

This indicates the optical axis offset R0 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset R0 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset R0 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset R0 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP2:

This indicates the optical axis offset R1 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset R1 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset R1 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset R1 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP3:

This indicates the optical axis offset G0 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset G0 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset G0 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset G0 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP4:

This indicates the optical axis offset G1 horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset G1 horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset G1 horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset G1 horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP5:

This indicates the optical axis offset B horizontal data. An offset of up to ±15 pixels can be set in 1/8-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x88 to 0xFF	Optical axis offset B horizontal data -120 to -1, offset adjustment unit: 1/8 pixel
0x00	Optical axis offset B horizontal data 0, no adjustment value, offset adjustment unit: 1/8 pixel
0x01 to 0x78	Optical axis offset B horizontal data 1 to 120, offset adjustment unit: 1/8 pixel

OP6:

This indicates the optical axis offset R0 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset R0 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset R0 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP7:

This indicates the optical axis offset R1 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset R1 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset R1 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP8:

This indicates the optical axis offset G0 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset G0 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset G0 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP9:

This indicates the optical axis offset G1 vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset G1 vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset G1 vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP10:

This indicates the optical axis offset B vertical data. An offset of up to +10 pixels (downward) can be set in 1/2-pixel units. The table below lists the value information that can be obtained.

Value	Description
0x00	Optical axis offset B vertical data 0, no adjustment value, offset adjustment unit: 1/2 pixel
0x01 to 0x14	Optical axis offset B vertical data 1 to 20, offset adjustment unit: 1/2 pixel

OP11:

Reserved

OP12:

Reserved

OP13:

Reserved

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Biphase

[Description]

This command gets the biphase data.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x29
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x05

[Detailed Description of Request]

Issue this command to execute a get biphase data request. This makes it possible to get the biphase data by Notify communication. The biphase data (Biphase) range is -100 to +100.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the get biphase information response of this command.

The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result
OP2	1 byte of the 4-byte biphase correction amount. This is the DD part of 0xAABBCCDD.
OP3	1 byte of the 4-byte biphase correction amount. This is the CC part of 0xAABBCCDD.
OP4	1 byte of the 4-byte biphase correction amount. This is the BB part of 0xAABBCCDD.
OP5	1 byte of the 4-byte biphase correction amount. This is the AA part of 0xAABBCCDD.

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the DD part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the CC part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the BB part. This value is an arbitrarily determined value, so there is no value information.

OP5:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the AA part. This value is an arbitrarily determined value, so there is no value information.

Set Biphase

[Description]

This command sets the biphase data.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x2A
Request OP0 [Size information]	0x04
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the biphase data. This makes it possible to perform biphase adjustment. The biphase data (Biphase) range is -100 to +100.

When the Request communication of this command stalls partway and a Time Out occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

The OP information sent by the Request is shown below.

OP	Description
OP1	1 byte of the 4-byte biphase correction amount. This is the DD part of 0xAABBCCDD.
OP2	1 byte of the 4-byte biphase correction amount. This is the CC part of 0xAABBCCDD.
OP3	1 byte of the 4-byte biphase correction amount. This is the BB part of 0xAABBCCDD.
OP4	1 byte of the 4-byte biphase correction amount. This is the AA part of 0xAABBCCDD.

OP1:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the DD part. This value is an arbitrarily determined value, so there is no value information.

OP2:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the CC part. This value is an arbitrarily determined value, so there is no value information.

OP3:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the BB part. This value is an arbitrarily determined value, so there is no value information.

OP4:

This indicates 1 byte of the 4-byte biphase data. When the biphase data is expressed as 0xAABBCCDD, this is the AA part. This value is an arbitrarily determined value, so there is no value information.

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by the Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Set EasyOpticalAdjustmentControl

[Description]

This command controls easy optical axis adjustment.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x32
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to start easy optical axis adjustment. After adjustment starts, this command switches between vertical and horizontal adjustment, changes the type of optical axis to be adjusted, and then ends easy optical axis adjustment after adjustment is finished. The adjustment contents are automatically saved when adjustment ends. The effects obtained by issuing this command relative to the reference red (R0) are shown below. The reference red (R0) does not change.

1st time: Starts easy optical axis adjustment and switches to the vertical optical axis adjustment picture and control for two red lines.

2nd time: Switches to the horizontal optical axis adjustment picture and control for two red lines.

3rd time: Switches to the vertical optical axis adjustment picture and control for two green lines.

4th time: Switches to the horizontal optical axis adjustment picture and control for two green lines.

5th time: Switches to the vertical optical axis adjustment picture and control for the reference red and the adjusted green (two lines).

6th time: Switches to the horizontal optical axis adjustment picture and control for the reference red and the adjusted green (two lines).

7th time: Switches to the vertical optical axis adjustment picture and control for the reference red and the blue.

8th time: Switches to the horizontal optical axis adjustment picture and control for the reference red and the blue.

9th time: Saves the change contents and ends control.

The only commands that can be issued during the period while this command is issued from the 1st time to the 9th time are the Set EasyOpticalAdjustmentPlus, Set EasyOpticalAdjustmentMinus, Set EasyOpticalAdjustmentExit, and Get Optical Alignment commands. When the Set EasyOpticalAdjustmentExit command is issued partway through the sequence, the effect is the same as that when this command is issued for the 9th time.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102

Module→HOST communication.

This command can be issued in the Ready state.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Command executed normally
0x01	Adjustment control completed (end)
0x8X	Abnormal

Set EasyOpticalAdjustmentPlus

[Description]

This command moves the optical axis subject to adjustment in the plus direction.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x33
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to adjust the optical axis currently subject to easy optical axis adjustment by moving it upward during vertical adjustment or toward the right during horizontal adjustment. This command can be issued only during the period after the Set EasyOpticalAdjustmentControl command is issued and easy optical axis adjustment starts until easy optical axis adjustment ends. The vertical adjustment accuracy is 1/2 pixel, and the horizontal adjustment accuracy is 1/8 pixel. The “+” character in the adjustment output picture disappears when the adjustment limit is reached or when the position is already at the adjustment limit.
When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.
This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal
0xFE	Adjustment limit exceeded error

Set EasyOpticalAdjustmentMinus

[Description]

Moves the optical axis subject to adjustment in the minus direction.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x34
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to adjust the optical axis currently subject to easy optical axis adjustment by moving it downward during vertical adjustment or toward the left during horizontal adjustment. This command can be issued only during the period after the Set EasyOpticalAdjustmentControl command is issued and easy optical axis adjustment starts until easy optical axis adjustment ends. The vertical adjustment accuracy is 1/2 pixel, and the horizontal adjustment accuracy is 1/8 pixel. The "-" character in the adjustment output picture disappears when the adjustment limit is reached or when the position is already at the adjustment limit.
When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.
This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal
0xFE	Adjustment limit exceeded error

Set EasyOpticalAdjustmentExit

[Description]

This command forcibly ends easy optical axis adjustment.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x35
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to forcibly end easy optical axis adjustment. This command can be issued only during the period after the Set EasyOpticalAdjustmentControl command is issued and easy optical axis adjustment starts until easy optical axis adjustment ends.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

The OP information sent by Request is shown below.

OP	Description
OP1	Indicates whether to save the optical axis adjustments.

OP1:

This indicates whether to save the optical axis adjustments.

Value	Description
0x00	Ends without saving the optical axis adjustment contents.
0x01	Saves the optical axis adjustment contents and ends.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Set EasyBiphaseAdjustmentControl

[Description]

This command controls easy biphase adjustment.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x36
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to start easy biphase adjustment and then to end easy biphase adjustment after adjustment is finished. The adjustment contents are automatically saved when the adjustment ends. The effects obtained by issuing this command are shown below.

1st time: Starts easy biphase adjustment and switches to the biphase adjustment picture and control.

2nd time: Saves the change contents and ends control.

The only commands that can be issued during the period while this command is issued from the 1st time to the 2nd time are the Set EasyBiphaseAdjustmentPlus, Set EasyBiphaseAdjustmentMinus, Set EasyBiphaseAdjustmentExit, and Get Biphase commands. When the Set EasyBiphaseAdjustmentExit command is issued partway through the sequence, the effect is the same as that when this command is issued for the 2nd time.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready state.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Command executed normally
0x01	Adjustment control completed (end)
0x8X	Abnormal

Set EasyBiphaseAdjustmentPlus

[Description]

This command moves the biphase in the plus direction.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x37
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to adjust the biphase currently subject to easy biphase adjustment by moving it toward the right. This command can be issued only during the period after the Set EasyBiphaseAdjustmentControl command is issued and easy biphase adjustment starts until easy biphase adjustment ends.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal
0xFE	Adjustment limit exceeded error

Set EasyBiphaseAdjustmentMinus

[Description]

Moves the biphase in the minus direction.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x38
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to adjust the biphase currently subject to easy biphase adjustment by moving it toward the left. This command can be issued only during the period after the Set EasyBiphaseAdjustmentControl command is issued and easy biphase adjustment starts until easy biphase adjustment ends.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal
0xFE	Adjustment limit exceeded error

Set EasyBiphaseAdjustmentExit

[Description]

Forcibly ends easy biphase adjustment.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x39
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to forcibly end easy biphase adjustment. This command can be issued only during the period after the Set EasyBiphaseAdjustmentControl command is issued and easy biphase adjustment starts until easy biphase adjustment ends.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

The OP information sent by Request is shown below.

OP	Description
OP1	Indicates whether to save the biphase adjustment.

OP1:

This indicates whether to save the biphase adjustments.

Value	Description
0x00	Ends without saving the biphase adjustment contents.
0x01	Saves the biphase adjustment contents and ends.

[Detailed Description of Notify]

Notify is always sent back as the response of this command. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

Video PQ Control Command

Get All Picture Quality Information

[Description]

This command gets all of the picture quality settings.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x40
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x0A

[Detailed Description of Request]

Issue this command to execute a get all picture quality settings request. This makes it possible to get all of the picture quality setting information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the all picture quality setting information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Contrast setting information
OP3	Brightness setting information
OP4	Hue U setting information
OP5	Hue V setting information
OP6	Saturation U setting information
OP7	Saturation V setting information
OP8	Reserved
OP9	Sharpness setting information
OP10	Reserved

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the Module contrast setting information. The possible value information is shown below.

Value	Description
-15 to 15	Contrast setting information. 0 indicates equivalent (no change).

OP3:

This indicates the Module brightness setting information. The possible value information is shown below.

Value	Description
-31 to 31	Brightness setting information. 0 indicates equivalent (no change).

OP4:

This indicates the Module hue U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue U setting information. 0 indicates equivalent (no change).

OP5:

This indicates the Module hue V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue V setting information. 0 indicates equivalent (no change).

OP6:

This indicates the Module saturation U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation U setting information. 0 indicates equivalent (no change).

OP7:

This indicates the Module saturation V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation V setting information. 0 indicates equivalent (no change).

OP8:

Reserved

OP9:

This indicates the Module sharpness setting information. The possible value information is shown below.

Value	Description
0 to 6	Sharpness setting information. 0 indicates equivalent (no change).

OP10:

Reserved

Set All Picture Quality Information

[Description]

This command sets all of the picture quality information.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x41
Request OP0 [Size information]	0x09
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set all of the picture quality information. This makes it possible to switch the picture quality setting.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active states**.**

The OP information sent by Request is shown below.

OP	Description
OP1	Contrast setting information
OP2	Brightness setting information
OP3	Hue U setting information
OP4	Hue V setting information
OP5	Saturation U setting information
OP6	Saturation V setting information
OP7	0x00 (fixed value)
OP8	Sharpness setting information
OP9	0x00 (fixed value)

OP1:

This indicates the Module contrast setting information. The possible value information is shown below.

Value	Description
-15 to 15	Contrast setting information. 0 indicates equivalent (no change).

OP2:

This indicates the Module brightness setting information. The possible value information is shown below.

Value	Description
-31 to 31	Brightness setting information. 0 indicates equivalent (no change).

OP3:

This indicates the Module hue U setting information. The possible value information is shown below.

Value	Description
-31 to 31	Hue U setting information. 0 indicates equivalent (no change).

OP4:

This indicates the Module hue V setting information. The possible value information is shown below.

Value	Description
-31 to 31	Hue V setting information. 0 indicates equivalent (no change).

OP5:

This indicates the Module saturation U setting information. The possible value information is shown below.

Value	Description
-31 to 31	Saturation U setting information. 0 indicates equivalent (no change).

OP6:

This indicates the Module saturation V setting information. The possible value information is shown below.

Value	Description
-31 to 31	Saturation V setting information. 0 indicates equivalent (no change).

OP7:

Set 0x00 (fixed value).

OP8:

This indicates the Module sharpness setting information. The possible value information is shown below.

Value	Description
0 to 6	Sharpness setting information. 0 indicates equivalent (no change).

OP9:

Set 0x00 (fixed value).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Brightness

[Description]

Gets the brightness information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x42
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x02

[Detailed Description of Request]

Issue this command to execute a get the brightness information request. This makes it possible to get brightness information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the brightness information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Brightness setting information

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates Module brightness setting information. The possible value information is shown below.

Value	Description
-31 to 31	Brightness setting information. 0 indicates equivalent (no change).

Set Brightness

[Description]

This command sets the brightness information.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x43
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set brightness information. This makes it possible to switch the brightness.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by Request is shown below.

OP	Description
OP1	Brightness setting information

OP1:

This indicates the Module brightness setting information. The possible value information is shown below.

Value	Description
-31 to 31	Brightness setting information. 0 indicates equivalent (no change).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Contrast

[Description]

This command gets the contrast information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x44
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x02

[Detailed Description of Request]

Issue this command to execute a get the contrast information request. This makes it possible to get the contrast information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the contrast information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Contrast setting information

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the Module contrast setting information. The possible value information is shown below.

Value	Description
-15 to 15	Contrast setting information. 0 indicates equivalent (no change).

Set Contrast

[Description]

This command sets the contrast information.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x45
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set contrast information. This makes it possible to switch the contrast.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by Request is shown below.

OP	Description
OP1	Contrast setting information

OP1:

This indicates the Module contrast setting information. The possible value information is shown below.

Value	Description
-15 to 15	Contrast setting information. 0 indicates equivalent (no change).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Hue

[Description]

This command gets the hue information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x46
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x03

[Detailed Description of Request]

Issue this command to execute a get the hue information request. This makes it possible to get the hue information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the hue information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Hue U setting information
OP3	Hue V setting information

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the Module hue U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue U setting information. 0 indicates equivalent (no change).

OP3:

This indicates the Module hue V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue V setting information. 0 indicates equivalent (no change).

Set Hue

[Description]

This command sets the hue information.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x47
Request OP0 [Size information]	0x02
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the hue information. This makes it possible to switch the hue.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by Request is shown below.

OP	Description
OP1	Hue U setting information
OP2	Hue V setting information

OP1:

This indicates the Module hue U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue U setting information. 0 indicates equivalent (no change).

OP2:

This indicates the Module hue V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Hue V setting information. 0 indicates equivalent (no change).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Saturation

[Description]

This command gets the saturation information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x48
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x03

[Detailed Description of Request]

Issue this command to execute a get the saturation information request. This makes it possible to get the saturation information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the saturation information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Saturation U setting information
OP3	Saturation V setting information

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the Module saturation U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation U setting information. 0 indicates equivalent (no change).

OP3:

This indicates the Module saturation V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation V setting information. 0 indicates equivalent (no change).

Set Saturation

[Description]

This command sets the saturation information.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x49
Request OP0 [Size information]	0x02
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the saturation information. This makes it possible to switch the saturation.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by Request is shown below.

OP	Description
OP1	Saturation U setting information
OP2	Saturation V setting information

OP1:

This indicates the Module saturation U setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation U setting information. 0 indicates equivalent (no change).

OP2:

This indicates the Module saturation V setting information. The possible value information is shown below.

Value	Description
-15 to 15	Saturation V setting information. 0 indicates equivalent (no change).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Get Sharpness

[Description]

This command gets the sharpness information.

[Attributes]

Attribute	Information
Type	Request・Notify type
CMD	0x4E
Request OP0 [Size information]	0x00
Notify OP0 [Size information]	0x02

[Detailed Description of Request]

Issue this command to execute a get the sharpness information request. This makes it possible to get the sharpness information by Notify communication.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Ready and Active states.

This command does not require OP1 or subsequent data.

[Detailed Description of Notify]

Notify is always sent back as the sharpness information response of this command.

The OP information sent by Notify is shown below.

OP	Description
OP1	Command result
OP2	Sharpness setting information

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x00	Normal
0x8X	Abnormal

OP2:

This indicates the Module sharpness setting information. The possible value information is shown below.

Value	Description
0 to 6	Sharpness setting information. 0 indicates equivalent (no change).

Set Sharpness

[Description]

This command sets the sharpness information.

[Attributes]

Attribute	Information
Type	Request・Error Notify type
CMD	0x4F
Request OP0 [Size information]	0x01
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

Issue this command to set the sharpness information. This makes it possible to switch the sharpness.

When the Request communication of this command stalls partway and a TimeOut occurs, or when processing cannot be performed due to internal circumstances, Command Emergency Notify is notified by CXN0102 Module→HOST communication.

This command can be issued in the Active state.

The OP information sent by Request is shown below.

OP	Description
OP1	Sharpness setting information

OP1:

This indicates the Module sharpness setting information. The possible value information is shown below.

Value	Description
0 to 6	Sharpness setting information. 0 indicates equivalent (no change).

[Detailed Description of Notify]

Notify is sent back as the response of this command only when an error occurs. The OP information sent by Notify is shown below.

OP	Description
OP1	Command result

OP1:

This indicates the command result. The possible value information is shown below.

Value	Description
0x8X	Abnormal

Notify Command

Emergency Notify

[Description]

This command notifies of emergency stop.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x10
Request OP0 [Size information]	-
Notify OP0 [Size information]	0x03

[Detailed Description of Request]

This command is not a Request type.

[Detailed Description of Notify]

When the CXN0102 Module detects an abnormality and performs emergency stop, it sends back Emergency Notify. After the CXN0102 Module sends back this notification, it stops all output. The OP information sent by the Notify is shown below.

OP	Description
OP1	Emergency stop result
OP2	Reserved
OP3	Reserved

OP1:

This indicates the emergency stop result. The table below lists the value information that can be obtained.

Value	Description
0x80	Laser Safety Module abnormality detected and emergency stop performed.
0x81	Abort occurred inside the firmware and emergency stop performed.
0x82	MEMS/Laser abnormality occurred and emergency stop performed.
0x83	UnderFlow occurred and recovery processing performed. If no problem with recovery, output continues.

OP2:

Reserved

OP3:

Reserved

Temperature Emergency and Recovery Notify

[Description]

This command notifies of a temperature abnormality and recovery from a temperature abnormality.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x11
Request OP0 [Size information]	-
Notify OP0 [Size information]	0x01

[Detailed Description of Request]

This command is not a Request type.

[Detailed Description of Notify]

When the CXN0102 Module detects a temperature abnormality and performs the temperature abnormality processing, it sends back Emergency Notify. In addition, when the CXN0102 Module recovers from a temperature abnormality, it sends back Recovery Notify. After the CXN0102 Module sends back Emergency Notify, it stops all output. After the CXN0102 Module sends back Recovery Notify, it restarts the output.
The temperature thresholds used to judge temperature abnormality and recovery are the temperature thresholds set by the Set Temperature Threshold command. When the temperature thresholds are not set by the Set Temperature Threshold command, the default temperature thresholds are used. See the Temperature-related functions for the default temperature thresholds.
When a temperature abnormality occurs and the temperature exceeds both the Mute switching threshold temperature and System switching threshold temperature before notification can be performed, both notifications are sent separately. Likewise, when the temperature recovers to below both the Mute switching threshold temperature and System switching threshold temperature before notification can be performed, both recovery notifications are sent separately.
The OP information sent by the Notify is shown below.

OP	Description
OP1	Temperature abnormality result or temperature recovery result

OP1:

This indicates the temperature abnormality stop result and temperature recovery result from temperature abnormality emergency stop.

Value	Description
0x80	Temperature abnormality due to Mute switching threshold temperature exceeded
0x81	Temperature abnormality due to System switching threshold temperature exceeded
0x00	Recovery from temperature abnormality due to Mute switching threshold temperature exceeded
0x01	Recovery from temperature abnormality due to System switching threshold temperature exceeded

Command Emergency Notify

[Description]

This command notifies of a command processing abnormality.

[Attributes]

Attribute	Information
Type	Notify type
CMD	0x12
Request OP0 [Size information]	-
Notify OP0 [Size information]	0x02

[Detailed Description of Request]

This command is not a Request type.

[Detailed Description of Notify]

When a command received from the HOST could not be processed inside the CXN0102 Module, Emergency Notify is sent back. Normal command reception, command processing and command result notification is FIFO, but this Emergency Notify is issued immediately in place of the command result notification. For example, after receiving the Start Input command, if processing could not be performed due to some problem inside the CXN0102 Module, this Emergency Notify may be sent back in place of the Start Input command result notification.

The OP information sent by the Notify is shown below.

OP	Description
OP1	Command processing abnormality result
OP2	Reference information

OP1:

This indicates the command processing abnormality result.

Value	Description
0xFB	Too many commands, so could not process abnormality
0xF0	Command reception Time Out abnormality

OP2:

This indicates the reference information when an abnormality occurs. When OP1 is 0xFB, this is the CMD data of the processing abnormality.

Value	Description
0xXX	CMD data of the processing abnormality when OP1 is 0xFB

Revision History

Version	Date	Description
1.0.0	12 May, 2014	1st release
1.0.1	22 May, 2014	• Added Introduction, Description, Control Method, and Detailed Description of Functions. • Added biphase data to Save User Param (0x07). • Deleted HW Test Pattern of the Output Test Picture (0xA3) • Corrected part of detailed description of Notify for Temperature Emergency and Recovery Notify (0x11).
1.1.0	23 June, 2014	• Corrected errors. • Added CheckSum to Terminology. • Added description of version and date information to Binary Data. • Added BMP header formats supported by Data Binary and maximum picture size to Binary Data. Deleted RGBT from Binary Data. • Deleted Parameter Binary Format table from Binary Data. • Added note on Notify communication to Detailed Description of Communication. • Changed maximum number of bytes of Request command format to 128 bytes. • Added descriptions of adjustment function (optical axis offset), adjustment function (biphase) and update function to Detailed Description of Functions. • Corrected description of OP1 of Mute/UnMute/Change Output command. • Corrected descriptions of OP2 to OP13 of Get Version command. • Added settable value ranges to Get Biphase and Set Biphase commands. • Corrected part of OP contents of Output Test Picture command. • Changed Notify to “always” send back specification for Update FW Image and Update Picture Data commands. • Deleted Save Factory Param command. • Deleted Set Temperature Threshold command.
1.2.0	12 September, 2014	• Corrected errors. • Added description of command execution in Temperature Stop state and Safety Stop state to State Transitions. • Corrected figure “CXN0102 Module State Transitions” and figure “CXN0102 Module State Transitions and Output Picture Information”. • Added description of Time Out processing during Request communication. • Added Description of Save User Param command. • Changed Update command to enable execution even in the Active state. (However, execution in the Ready state is recommended.) • Newly added Command Emergency Notify (0x12) command.
1.3.0	3 October, 2014	• Corrected errors. • Added division transmission update function for firmware image and Opening picture data.
1.3.1	25 November,2014	• Corrected errors in the description of Save User Param Command.

1.4.0	26 November, 2014	・Corrected errors. ・Added easy optical axis adjustment and easy biphase adjustment. ・Added geometric correction function.
1.4.1	22 December, 2014	• Corrected errors in Data Binary Format. • Added Description of Save User Param command.
1.5.0	13 January, 2015	• Corrected errors • Added explanation of Detailed Description of Functions • Added OP1 (Boot result) information of Boot Completed Notify
1.5.1	9 Feburary, 2015	• Corrected errors (Save User Param command)

Note

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- Customer shall comply with all applicable laws, ordinances, rules and regulations in connection with the usage of the Products, including the export control laws or regulations of various countries and shall be fully responsible for obtaining approvals in connection with the export of the Products in accordance with such said laws, ordinances, rules and/or regulations.

Governing Law:

- This specification and the terms and conditions contained herein shall be governed by and construed in accordance with the laws of Japan, without reference to principles of conflict of laws or choice of laws. All controversies and disputes arising out of or relating to this specification and the terms and conditions contained herein shall be submitted to the exclusive jurisdiction of the Tokyo District Court in Japan as the court of first instance.

Notes:

- The product specifications, circuit examples, technical information and any and all other information and content relating to the Products contained in this specification may be revised or updated by Sony at Sony's sole discretion without prior notice to the Customer and Customer shall abide by their latest versions. Such revisions or updates will be made available to Customer in a way as Sony deems appropriate.
- Ensure that you have read and reviewed the notices contained in our delivery specification as well as this specification when purchasing and using the Products.