SONY

A-EEP-100-**11**(1)

Color Camera Module

Technical Manual

FCB-EH6500

Table of Contents

Features

- This camera uses a 1/2.8" Exmor CMOS image sensor (approx. 3.27 million effective pixels) that supports FULL HD (high definition) to produce high-quality images.
- Using progressive scan, images with a wide dynamic range can be obtained with the newly developed image signal processor (Wide Dynamic Range mode). Furthermore, it is possible to automatically switch to this Wide Dynamic Range mode, which enables you to obtain optimal images ranging from the dark areas of a subject to the light areas.
- The camera is equipped with a bright zoom lens with 30× optical zoom and F1.6 aperture (optical zoom + digital zoom = 360×).
- Low-noise images can be obtained even in low-light environments using the Noise Reduction function.
- Video signals can be output as digital and analog Y/Pb/Pr outputs. Depending on register settings, you can select from a variety of digital output methods: 1080p/30, 1080p/29.97, 1080p/25, 1080i/60 (Frame out: 30PsF), 1080i/59.94 (Frame out: 29.97PsF), 1080i/50 (Frame out: 25PsF), 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/25.
- An infrared (IR) Cut-Filter can be disengaged from the image path for increased sensitivity in low light environments. The ICR will automatically engage depending on the ambient light, allowing the camera to be effective in day/night environment.
- VISCA is a communications protocol, which enables the camera to be controlled remotely from a host computer/controller.
- Six memory locations are provided to temporally save and recall up to six sets of camera settings.
- A Privacy Zone Masking function (max. 24 blocks) is available.
- A Motion Detection (MD) function is available.
- A title composed of up to 11 lines can be set for displaying on the screen. 20 characters can be used on one line.
- Adjustable AE response speed

With consideration given environmental protection, this module is designed to operate with low power consumption and also incorporates lead-free and halogen-free circuit boards.

Precautions

Software

Use of the demonstration software developed by Sony Corporation or use of the software with customer developed application software may damage hardware, the application program or the camera. Sony Corporation is not liable for any damages under these conditions.

Operation

Start the camera control software on your computer after you turn on the camera and the image is displayed.

Operation and storage locations

Do not shoot images that are extremely bright (e.g., light sources, the sun, etc.) for long periods of time. Do not use or store the camera in the following extreme conditions:

- Extremely hot or cold places (operating temperature –5 ˚C to +60 ˚C (23 ˚F to 140 ˚F))
- Close to generators of powerful electromagnetic radiation such as radio or TV transmitters
- Where it is subject to fluorescent light reflections
- Where it is subject to unstable (flickering, etc.) lighting conditions
- Where it is subject to strong vibration
- Where it is subject to radiation from laser beams

Care of the unit

Remove dust or dirt on the surface of the lens with a blower (commercially available).

Other

- Do not apply excessive voltage. (Use only the specified voltage.) Otherwise, you may get an electric shock or a fire may occur.
- The CMOS image sensor and IC included in this camera may break if exposed to static electricity. When directly handling this camera, wear an antistatic strap, spread a conductive sheet or similar item under your workbench, and take measures to eliminate static electricity.

In case of abnormal operation, contact your authorized Sony dealer or the store where you purchased the product.

Phenomena specific to CMOS image sensors

The following phenomena that may appear in images are specific to CMOS (complementary metal-oxide semiconductor) image sensors. They do not indicate malfunctions.

Rolling shutter

As CMOS image sensors use shutters that capture images line-by-line, there is a slight time difference between the top and bottom of an image. As a result, images may appear skewed if the camera is moved.

White flecks

Although the CMOS image sensors are produced with high-precision technologies, fine white flecks may be generated on the screen in rare cases, caused by cosmic rays, etc.
This is related to the principle of CMOS image sensors and is not a malfunction.

The white flecks especially tend to be seen in the following cases:

- when operating at a high environmental temperature
- when you have raised the master gain (sensitivity)
- when operating in Slow-Shutter mode

Aliasing

When fine patterns, stripes, or lines are shot, they may appear jagged or flicker.

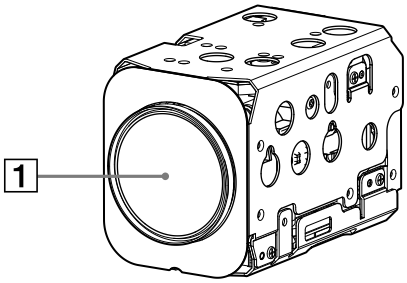
Phenomena Specific to Lenses

Ghosting

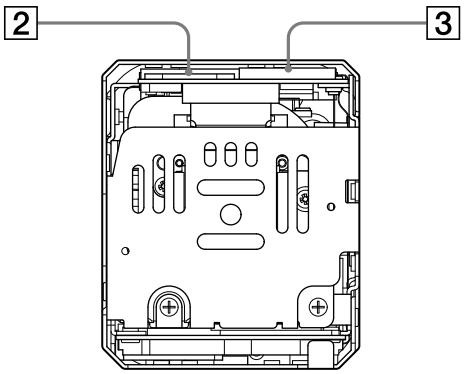
If a strong light source (e.g., the sun) exists near the incidence angle of the lens, bright spots may appear in the image due to diffuse reflection within the lens.

Locations of Controls

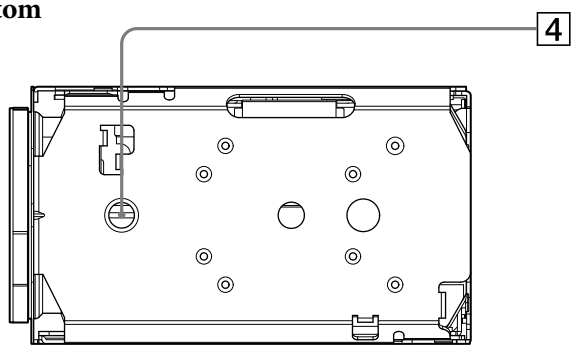
Front



Back



Bottom



1 **Lens**
2 **CN501 jack**
3 **CN601 jack**
4 **Tripod screw hole**

When a tripod is used, please use 7 mm ($^{9}/_{32}$ in.) or less screw to attach it to the camera.
Also, please be sure to attach the tripod securely.

Basic Functions

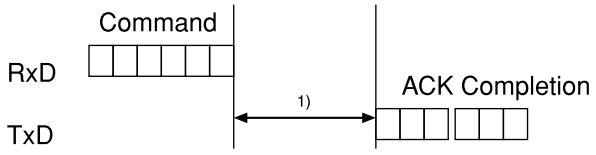
Overview of Functions

VISCA commands are the basis of camera control.

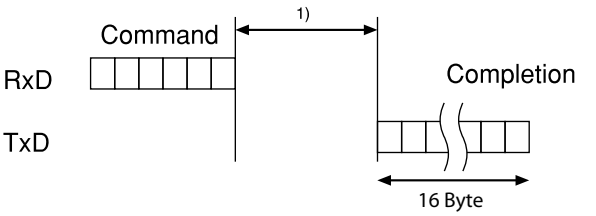
Timing Chart

As VISCA Command processing can only be carried out one time in a Vertical cycle, it takes the maximum 1V cycle time for an ACK/Completion to be returned. If the Command ACK/Completion communication time can be cut shorter than the 1V cycle time, then every 1V cycle can receive a Command.

General Commands



Query Commands



1) 1V cycle times on each Monitoring Mode and Shutter Speed.

Shutter Speed	Monitoring Mode	
	1080i/60/59.94 1080p/30/29.97 720p/30/29.97	720p/60/59.94
1/10000 sec to 1/60 sec	1/30 sec	1/60 sec
1/30 sec	1/30 sec	1/30 sec
1/15 sec	1/15 sec	1/15 sec
1/8 sec	1/8 sec	1/8 sec
1/4 sec to 1/1 sec	1/4 sec to 1/1 sec	1/4 sec to 1/1 sec
Shutter Speed	Monitoring Mode	
	1080i/50 1080p/25 720p/25	720p/50
1/10000 sec to 1/50 sec	1/25 sec	1/50 sec
1/25 sec	1/25 sec	1/25 sec
1/12 sec	1/12 sec	1/12 sec
1/6 sec	1/6 sec	1/6 sec
1/3 sec to 1/1 sec	1/3 sec to 1/1 sec	1/3 sec to 1/1 sec

In general

- **Power On/Off**
  Powers the camera on and off. When the power is off, the camera is able to accept only the lowest level of VISCA Commands; the display and other features are turned off.
- **I/F Clear**
  Clears the Command buffer of the FCB camera.
- **Address Set**
  VISCA is a protocol, which normally supports a daisy chain of up to seven connected cameras via RS-232C interface. In such cases, the address set command can be used to assign addresses from 1 to 7 to each of the seven cameras, allowing you to control the seven cameras with the same personal computer.
  Although the FCB camera does not support direct connection of cameras in a daisy chain, be sure to use the address set command to set the address whenever a camera is connected for the first time.
- **ID Write**
  Sets the camera ID.
- **Mute**
  Blanks the screen and sends out a synchronizing signal.
- **Lens Initialize**
  Initializes the zoom and focus of the lens. Even when power is already on, it initializes the zoom and the focus.

Zoom

The FCB camera employs a 30× optical zoom lens combined with a digital zoom function; this camera allows you to zoom up to 360×.

- **Optical 30×, f = 4.3 mm to 129 mm (F 1.6 to F 4.7)**

The horizontal angle of view (1080i mode) is approximately 59.5 degrees (wide end) to 2.1 degrees (tele end).
Digital Zoom enlarges the center of the subject by expanding each image in both the vertical and horizontal directions. When 360× zoom is used, the number of effective picture elements in each direction reduces to $^{1}/_{12}$ and the overall resolution deteriorates.

You can activate the zoom in the following ways with a VISCA command.

Using Standard Mode
Using Variable Mode
There are eight levels of zoom speed.
Direct Mode
Setting the zoom position enables quick movement to the designated position.
Digital Zoom ON/OFF

In these standard and variable Speed Modes, it is necessary to send Stop Command to stop the zoom operation.

The Zoom Mode supports a Combined Mode and a Separate Mode.

Combined Mode
This is the previously existing zoom method. After the optical zoom has reached its maximum level, the camera switches to Digital Zoom Mode.
Separate Mode
In this mode, Optical Zoom and Digital Zoom can be operated separately. You can use digital zoom magnification at any time from within any level of optical magnification.
About Continues Zoom position Reply
With ZoomDirect mode, or when zooming according to a preset, the camera outputs zoom position data when Continues Zoom position Reply is set to ON via a command.
Continues Zoom position Reply: y0 07 04 69 0p 0p 0q 0q 0q 0q FF
pp: D-Zoom position
qqqq: Zoom position

Focus

Focus has the following modes, all of which can be set using VISCA Commands.

- **Auto Focus Mode**
  The minimum focus distance is 10 mm at the optical wide end and 1200 mm at the optical tele end, and is independent of the digital zoom.
  The Auto Focus (AF) function automatically adjusts the focus position to maximise the high frequency content of the picture in a center measurement area, taking into consideration the high luminance and strong contrast components.

  - **Normal AF Mode**
    This is the normal mode for AF operations.
  - **Interval AF Mode**
    The mode used for AF movements carried out at particular intervals. The time intervals for AF movements and for the timing of the stops can be set in one-second increments using the Set Time Command. The initial value for both is set to five seconds.
  - **Zoom Trigger Mode**
    When the zoom is changed, the pre-set value (initially set at 5 seconds) becomes that for AF Mode. Then, it stops.

  AF sensitivity can be set to either Normal or LOW.

  - **Normal**
    Reaches the highest focus speed quickly. Use this when shooting a subject that moves frequently. Usually, this is the most appropriate mode.
  - **LOW**
    Improves the stability of the focus. When the lighting level is low, the AF function does not take effect, even though the brightness varies, contributing to a stable image.

- **Manual Focus Mode**
  Manual Focus has both a Standard Speed Mode and a Variable Speed Mode. Standard Speed Mode focuses at a fixed rate of speed. Variable Speed Mode has eight speed levels that can be set using a VISCA Command.

  In these standard and variable Speed Modes, it is necessary to send Stop Command to stop the zoom operation.

- **One Push Trigger Mode**
  When a Trigger Command is sent, the lens moves to adjust the focus for the subject. The focus lens then holds that position until the next Trigger Command is input.

- **Infinity Mode**
  The lens is forcibly moved to a position suitable for an unlimited distance.

- **Near Limit Mode**
  Can be set in a range from 1000 (∞) to F000 (10 mm).
  Default setting: D000h (30 cm)

White Balance

White Balance has the following modes, all of which can be set using VISCA Commands.

- **Auto White Balance**
  This mode computes the white balance value output using color information from the entire screen. It outputs the proper value using the color temperature radiating from a black subject based on a range of values from 3000 to 7500K.
  This mode is the factory setting.
- **ATW**
  Auto Tracing White balance (2000 to 10000K)
- **Indoor**
  3200K Base Mode
- **Outdoor**
  5800K Base Mode
- **One Push WB**
  The One Push White Balance mode is a fixed white balance mode that may be automatically readjusted only at the request of the user (One Push Trigger), assuming that a white subject, in correct lighting conditions, and occupying more than 1/2 of the image, is submitted to the camera.
  One Push White Balance data is lost when the power is turned off. If the power is turned off, reset One Push White Balance.
- **Manual WB**
  Manual control of R and B gain, 256 steps each
- **Outdoor Auto**
  This is an auto white balance mode specifically for outdoors. It allows you to capture images with natural white balance in the morning and evening.
- **Sodium Vapor Lamp Auto**
  This is an auto white balance mode that is compatible with sodium vapor lamps.
- **Sodium Vapor Lamp**
  This is a fixed white balance mode specifically for sodium vapor lamps.

Note

High-pressure sodium lamps are supported. Proper white balance may not be captured for some subjects when using low-pressure sodium lamps.

Automatic Exposure Mode

A variety of AE functions are available for optimal output of subjects in lighting conditions that range from low to high.

- **Full Auto**
  Iris, Gain and Shutter Speed can be set automatically.
- **Gain Limit Setting**
  The gain limit can be set at the Full Auto, Shutter Priority, Iris Priority, Bright, Spot Exposure and Manual in the AE mode. Use this setting when image signal-to-noise ratio is particularly important.
- **Shutter Priority** [1)]
  Variable Shutter Speed, Auto Iris and Gain
  (1/1 to 1/10,000 sec., 16 high-speed shutter speeds plus 6 low-speed shutter speeds)
  1) Flicker can be eliminated by setting shutter to
  →1/100s for NTSC models used in countries with a 50 Hz power supply frequency
  →1/120s for PAL models used in countries with a 60 Hz power supply frequency
- **Iris Priority**
  Variable Iris (F1.6 to Close, 14 steps), Auto Gain and Shutter speed
- **Manual**
  Variable Shutter, Iris and Gain
- **Bright**
  Variable Iris and Gain (Close to F1.6, 17 steps at 0 dB: F1.6, 15 steps from 0 to 28 dB)

AE – Shutter priority

The shutter speed can be set freely by the user to a total of 22 steps – 16 high speeds and 6 low speeds. When the slow shutter is set, the speed can be adjusted according to subject brightness. The picture output is read at a normal rate from the memory. The memory is updated at a low rate from the CMOS. AF capability is low.
In high speed mode, the shutter speed can be set up to 1/10,000s. The iris and gain are set automatically, according to the brightness of the subject.

Data	60/30 mode	50/25 mode
15	1/10000	1/10000
14	1/6000	1/6000
13	1/4000	1/3500
12	1/3000	1/2500
11	1/2000	1/1750
10	1/1500	1/1250
0F	1/1000	1/1000
0E	1/725	1/600
0D	1/500	1/425
0C	1/350	1/300
0B	1/250	1/215
0A	1/180	1/150
09	1/125	1/120
08	1/100	1/100
07	1/90	1/75
06	1/60	1/50
05	1/30	1/25
04	1/15	1/12
03	1/8	1/6
02	1/4	1/3
01	1/2	1/2
00	1/1	1/1

AE – Iris priority

The iris can be set freely by the user to 14 steps between F1.6 and Close.
The gain and shutter speed are set automatically, according to the brightness of the subject.

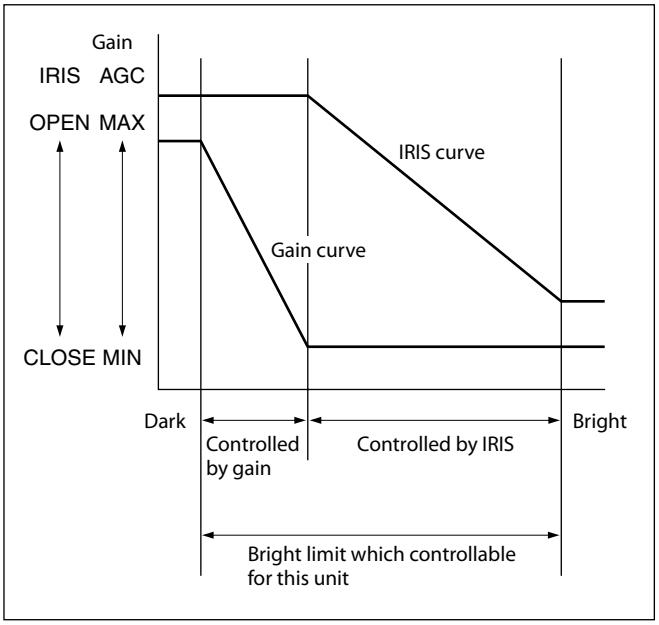
Data	Setting value	Data	Setting value
11	F1.6	0A	F5.6
10	F2	09	F6.8
0F	F2.4	08	F8
0E	F2.8	07	F9.6
0D	F3.4	06	F11
0C	F4	05	F14
0B	F4.8	00	CLOSE

AE – Manual

The shutter speed (22 steps), iris (14 steps) and gain (16 steps) can be set freely by the user.

AE – Bright

The bright control function adjusts both gain and iris using an internal algorithm, according to a brightness level freely set by the user. Exposure is controlled by gain when dark, and by iris when bright.
As both gain and iris are fixed, this mode is used when exposing at a fixed camera sensitivity. When switching from Full Auto or Shutter Priority Mode to Bright Mode, the current status will be retained for a short period of time.
Only when the AE mode is set to "Full Auto" or "Shutter Priority," can you switch it to "Bright."

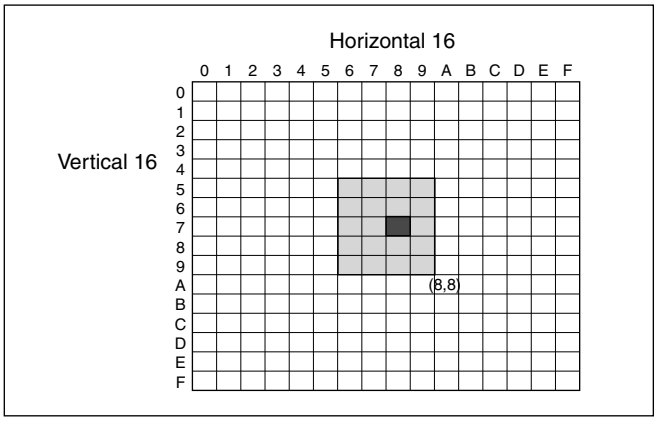


Data	Iris	Gain	Data	Iris	Gain
1F	F1.6	28 dB	11	F1.6	0 dB
1E	F1.6	26 dB	10	F2	0 dB
1D	F1.6	24 dB	0F	F2.4	0 dB
1C	F1.6	22 dB	0E	F2.8	0 dB
1B	F1.6	20 dB	0D	F3.4	0 dB
1A	F1.6	18 dB	0C	F4	0 dB
19	F1.6	16 dB	0B	F4.8	0 dB
18	F1.6	14 dB	0A	F5.6	0 dB
17	F1.6	12 dB	09	F6.8	0 dB
16	F1.6	10 dB	08	F8	0 dB
15	F1.6	8 dB	07	F9.6	0 dB
14	F1.6	6 dB	06	F11	0 dB
13	F1.6	4 dB	05	F14	0 dB
12	F1.6	2 dB	00	CLOSE	0 dB

When switching from the Shutter Priority mode to the Bright mode, the shutter speed set in the Shutter Priority mode is maintained.

Spot Exposure Mode

In Full Auto AE, the level for the entire screen is computed and the optimum Auto Iris and Gain levels are determined. In Spot AE, a particular section of the subject can be designated, and then that portion of the image can be weighted and a value computed so that Iris and Gain can be optimized to obtain an image.
For example, in an image with a lot of movement and with varying levels of brightness, portions without much change can be designated as such a "spot," and changes to the screen can be minimized in that area.
As shown in the diagram below, a range of 16 blocks vertically and 16 blocks horizontally can be designated. In the case where the center is designated (shown in black), the level is computed along with a weighted value for the surrounding block (shaded), including the specified portions; and then the Gain and Iris are set.
The value of the designated portions and the surrounding areas should be calculated as 100%, the rest should be set to 20%. The range of the Spot AE frame is fixed to 5 blocks vertically and 4 blocks horizontally.



Exposure Compensation

Exposure compensation is a function which offsets the internal reference brightness level used in the AE mode, by steps of 1.5 dB.

Data	Step	Setting value
0E	+7	+10.5 dB
0D	+6	+9 dB
0C	+5	+7.5 dB
0B	+4	+6 dB
0A	+3	+4.5 dB
09	+2	+3 dB
08	+1	+1.5 dB
07	0	0 dB
06	−1	−1.5 dB
05	−2	−3 dB
04	−3	−4.5 dB
03	−4	−6 dB
02	−5	−7.5 dB
01	−6	−9 dB
00	−7	−10.5 dB

Slow AE (Automatic Exposure)

The slow AE Response (automatic exposure) function allows you to reduce the exposure response speed. Usually the camera is set up so that the optimum exposure can be obtained automatically within about 1 second. However, using the slow AE response function allows you to lengthen the automatic exposure response speed from the factory setup speed (01 (hex) up to approx. 10 minutes (30 (hex)).
For example, with the normal setting (about 1 second), if the headlights of a car are caught by the camera, the camera automatically adjusts the exposure so that it can shoot a high-intensity subject (in this case, the headlights). As a result, images around the headlights, that is, the rest of the subject, except the headlights, becomes relatively dark, and poorly distinguished. However, using the slow AE function means the AE response speed will be slower, and response time will be longer. As a result, even if the camera catches a high-intensity subject (e.g., the headlights) for a moment, you can still easily distinguish the portions of the image surrounding the headlights.

High Resolution Mode

This mode enhances edges and produces higher definition images.

Aperture Control

Aperture control is a function which adjusts the enhancement of the edges of objects in the picture. There are 16 levels of adjustment, starting from “no enhancement.” When shooting text, this control may help by making them sharper.

Back Light Compensation

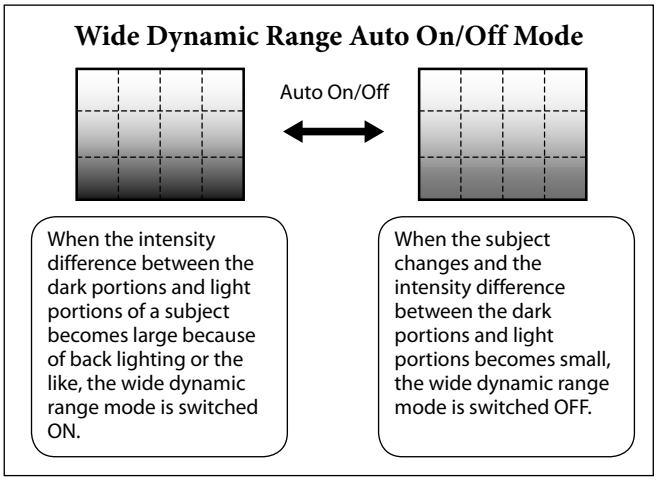
When the background of the subject is too bright, or when the subject is too dark due to shooting in the AE mode, back light compensation will make the subject appear clearer.

Wide Dynamic Range Mode (WD)

The Wide Dynamic Range mode is a function for dividing an image into several blocks and correcting blocked-up shadows and blown-out highlights in accordance with the intensity difference. It enables you to obtain images in which portions ranging from dark to light can be recognized, even when capturing a subject with a large intensity difference that is backlit or includes extremely light portions.
Images with wide dynamic range are produced by combining long-exposure signals (normal shutter) with the signals of the high-intensity portions obtained with a short exposure (high-speed shutter).

Wide Dynamic Range Auto On/Off Mode

The wide dynamic range can be set to be automatically switched ON/OFF in accordance with the intensity difference obtained by dividing an image into several blocks and then averaging the intensity of each block.



The wide dynamic range mode includes the following operation modes.

- **WD Mode**
  This mode corrects blocked-up shadows and blown-out highlights in accordance with the intensity difference.
- **WD Auto ON/OFF Mode**
  This mode switches WD ON/OFF automatically in accordance with the intensity difference of the subject. Configure the sensitivity for when WD is switched from OFF to ON with the detection sensitivity parameter.
- **Exposure Ratio Mode**
  This mode fixes the shutter speed of a long exposure. Configure the shutter speed of a short exposure by setting the ratio with regards to a long exposure with the exposure ratio parameter.
  Blown-out highlight correction is not performed in this mode.
- **Histogram Mode**
  This mode uses a histogram to correct blocked-up shadows and blown-out highlights. (The operation is similar to that of FCB-EX1010/P Dver.)
- **About WD Set Parameter**
  (Command: 8x 01 04 2D 0p 0q 0r 0s 0t 0u 00 00 FF)
  p: Screen display (0: Combined image, 2: Long-time, 3: Short-time)
  Set the screen display to the combined image, a long exposure image or short exposure image.
  q: Detection sensitivity (0: Low, 1: Mid, 2: Hi)
  Select from three levels for detecting the intensity within the image for when switching Auto WD from OFF to ON.
  r: Blocked-up shadow correction level can be set to one of four levels. (0:L 1:M 2:H 3:S)
  s: Blown-out highlight correction level can be set to one of three levels. (0:L 1:M 2:H)
  tu: Parameter to use in the exposure ratio mode. Specify the short exposure time by setting the magnification ratio (×1 to ×64) with regards to a long exposure time.

Notes

- When the wide dynamic range mode is ON, solarization may be observed in the images of some subjects. This phenomenon is unique to wide dynamic range mode, and is not an indication of a camera malfunction.
- The frame rate during Wide Dynamic Range mode will be half of that during standard mode.
  Example: When Wide Dynamic Range mode is ON in 1080/30P mode, the frame rate is 15 fps.
- When switching WD ON/OFF, skipping of 3 frames may result.

Noise Reduction

The NR (Noise Reduction) function removes noise (both random and non-random) to provide clearer images.
This function has six steps: levels 1 to 5, plus off.
The NR effect is applied in levels based on the gain, and this setting value determines the limit of the effect. In bright conditions, changing the NR level will not have an effect.

High Sensitivity Mode

In this mode, higher sensitivity gain is applied as standard gain increases, reaching a gain level at MAX gain of up to 4x the standard gain. In such cases, however, there will be a high volume noise in the image.

Custom Gamma Mode

Gamma correction can be changed in this mode. The following five options are available.

0: Standard
1: Straight gamma
2: S-curve - Low
3: S-curve - Mid
4: S-curve - High

Tip

Blocked-up shadows in images will be more noticeable than usual.

Color Enhancement

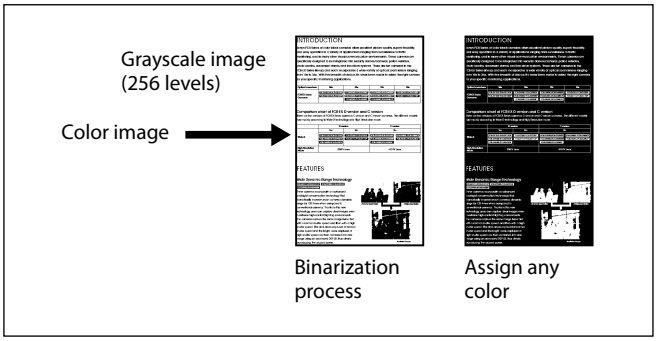
A captured color image is converted to 256 levels of gray, and you can set a color to all levels brighter than the threshold value, and another color to all levels darker than the threshold value.

Color specifications

- You can select from nine colors to specify for the high-intensity and low-intensity colors.
  Color options: Yellow, cyan, green, white, magenta, red, blue, black, gray
- The default settings for color specification are “green” for high-intensity and “white” for low-intensity.

Threshold values

- You can set the threshold value that determines high or low intensity.
- The minimum threshold value is 1h (decimal: 1), and the maximum threshold value is FE1h (decimal: 4065).
- The default setting for the threshold value is 200h (decimal: 512).



Temperature Reading Function

The conversion value (hex) of the temperature sensor built into to the camera can be read by using a query command. The conversion value has an error of ±3 C, and because the temperature sensor is inside the camera, this value is not the ambient temperature. Use it as a reference value.

StableZoom™

StableZoom is a function for performing correction using the Image Stabilizer function in accordance with the zoom ratio, and smoothly zooming up to approximately ×36 using a combination of the optical zoom and digital zoom. The digital zoom can be further used to zoom up to ×360. At the wide end, you can obtain images without any reduction in the angle of view and resolution because the digital zoom is not switched ON. On the other hand, at the Tele end, the correction effect by the Image Stabilizer function is at its maximum so blurring is reduced. The StableZoom function can be switched ON/OFF in the register settings.

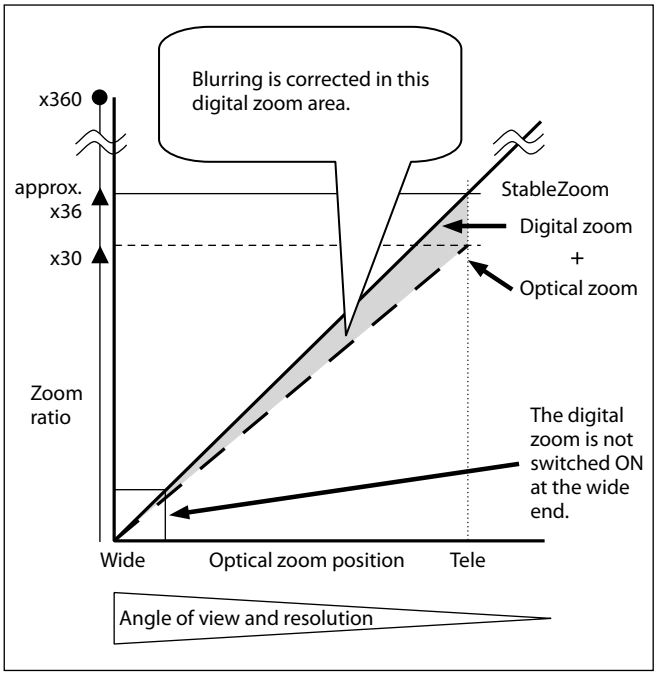


Image Stabilizer

Switching ON the Image Stabilizer function reduces image blurring caused by, for example, vibration, which allows you to obtain images without much blurring. A correction effect of approximately 90% is possible for a vibration frequency of around 10 Hz. The Image Stabilizer function employs the digital zoom system, so the angle of view and resolution are changed, but the sensitivity is maintained.

Hold Function of Image Stabilizer

With the Image Stabilizer function, suddenly stopping high-speed movement (pan, tilt, etc.) of the camera produces a blur sensor counteraction that may cause image movement. In such a case, you can use a command setting (hold) to maintain the correction of the Image Stabilizer function. In this case the image stabilizer is off, but there is no change in the angle of view.

Notes

- When image stabilizer is activated, residual movement may appear on the top and bottom of the image.
- The hand shake correction function may not work correctly under the condition that high-frequency vibration component exits. In such a case, set the hand shake correction function to OFF.

Slow shutter – Auto/Manual

When set to "Auto," ensures that the slow shutter is set automatically when the brightness drops. Effective only when the AE mode is set to "Full Auto."
Set to "Slow Shutter Manual" at shipment.

Note

The Slow Shutter Auto function is not available in WD mode.

Low-Illumination Chroma Suppress Mode

You can configure a chroma suppress mode for low-illumination conditions. This can be useful when color noise is particularly noticeable in such conditions. Four levels (disabled and three levels) are available for the low-illumination chroma suppress mode. Set the effect to be applied at approximately 15 dB. Higher setting values produce stronger chroma suppressing effects.

ICR (IR Cut-Removable) Mode

An infrared (IR) Cut-Filter can be disengaged from the image path for increased sensitivity in low light environments. The ICR will automatically engage depending on the ambient light, allowing the camera to be effective in day/night environments.
When the auto ICR mode is set to ON, the image becomes black and white.

Custom Color Gain

You can customize and configure the color gain. Use this setting when bright color is particularly important. The initial setting 100% (4h) can be set to range from approx. 60% (Oh) to 200% (Eh) with 15 stages.

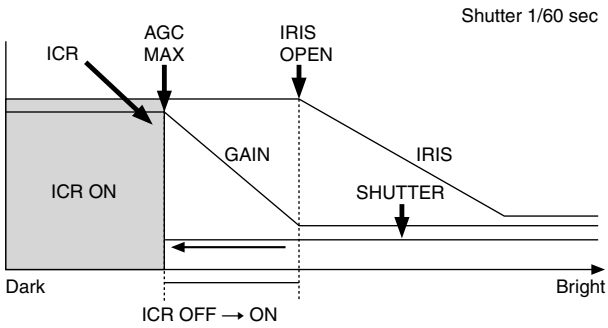
Custom Color Phase

You can customize and configure the color phase. The initial setting 0 degrees (7h) is adjustable between approx. –14 degrees (0h) and +14 degrees (Eh), in 15 increments.

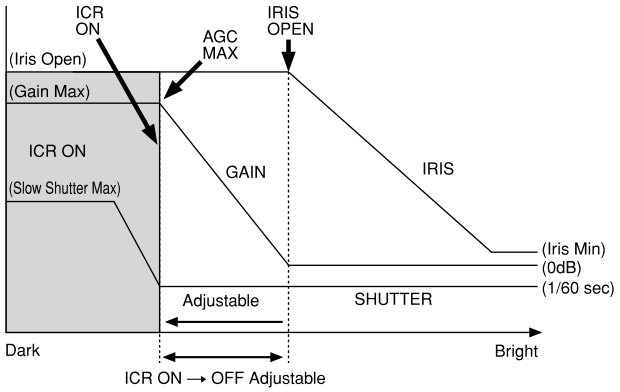
Auto ICR Mode

Auto ICR Mode automatically switches the settings needed for attaching or removing the IR Cut Filter. With a set level of darkness, the IR Cut Filter is automatically disabled (ICR ON), and the infrared sensitivity is increased. With a set level of brightness, the IR Cut Filter is automatically enabled (ICR OFF). Also, on systems equipped with an IR light, the internal data of the camera is used to make the proper decisions to avoid malfunctions.
Auto ICR Mode operates with the AE Full Auto setting.

When Auto Slow Shutter is OFF (initial setting)



When Auto Slow Shutter is ON



Note

When in Auto_ICR_OFF state and WB data is added (default), a malfunction may occur when the subjects largely consisting of blue and green colors are taken.

Camera ID

The ID can be set up to 65,536 (0000 to FFFF). As this will be memorized in the nonvolatile memory inside, data will be saved regardless of whether it has been backed up.

Effect

It consists of the following functions.
- **Neg. Art:** Negative/Positive Reversal
- **Black White:** Monochrome Image

Others

E-FLIP

This function turns the video output from the camera upside down.

Mirror Image

This function reverses the video output from the camera horizontally.

Freeze

This function captures an image in the field memory of the camera so that this image can be output continuously.

Because communication inside the camera is based on V cycle, the captured image is always the one 3V to 4Vs after the sending of a Command. Thus, you can not specify a time period after sending EVEN, ODD or a Command.

Memory (Position preset)

Using the position preset function, 6 sets of camera shooting conditions can be stored and recalled.
This function allows you to achieve the desired status instantly, even without adjusting the following items each time.

- **Zoom Position**
- **Digital Zoom On/Off**
- **Focus Auto/Manual**
- **Focus Position**
- **AE Mode**
- **Shutter control parameters**
- **Bright Control**
- **Iris control parameters**
- **Gain control parameters**
- **Exposure Compensation On/Off**
- **Exposure Level**
- **Backlight Compensation On/Off**
- **Slow Shutter Auto/Manual**
- **Slow AE Response speed**
- **White Balance Mode**
- **R/B Gain**
- **Aperture**
- **ICR Shoot On/Off**
- **WD On/Off**

Custom Preset

As with the position preset function, the camera shooting conditions can be stored and recalled. The settings are recalled when the power is turned on.
For setting items, see the "Initial Settings, Custom Preset and Backup" section on page 23.

User Memory Area

A user area of 16 bytes allows you to write data, such as an ID for each customer, data for each system, and so on, freely.

Note

Rewriting of memory is not unlimited. Be careful to avoid using the memory area for such as unnecessary tasks as rewriting the contents of the memory for every operation.

Register Setting

The camera's default settings can be changed by the register setting command.
Register Setting Command:
8x 01 04 24 mm 0p 0q FF
mm: Register No. (=00 to 7F)
pq: Register Value (=00 to FF)

Register Inquiry Command:
8x 09 04 24 mm FF
mm: Register No.
y0 50 0p 0p FF
pp: Register Value
(returned from the camera)
Example: To set communication speed to 38400 bps
8x 01 04 24 00 00 02 FF
After sending this command, turn power off and back on (power reset) to resume communication control at 38400 bps.
Example: Sending to confirm settings
8x 09 04 24 00 FF
y0 50 00 03 FF is returned from the camera

The register setting items and No. are as follows.
Baud Rate: 00
Communication speed can be changed.
Monitoring Mode: 72
This register "72" allows digital output mode configuration.
For details on each output mode and parameter, see "Register Setting" on page 51.
Output Enable: 73
"Analog Output", "Digital Output", or "Both" can be set.
For details on parameters, see "Register Setting" on page 51.
Zoom Limit: 50 (Wide end), 51 (Tele end)
The Wide and Tele zoom limits can be set.
E-Zoom Max: 52
The maximum digital zoom limit can be specified (default is ×12).
FocusTrace: 54
When you want to prioritize zoom speed, set FocusTrace to OFF to minimize the transition time between Wide and Tele zoom (although the image may be blurred because focus is not tracked). For example, the focus transition time from Wide to Tele ends, which typically takes 2.3 seconds, can be reduced to 1.6 seconds.
FocusOffset: 55
Placing a dome cover in front of the camera may cause the focal distance of the camera to change. Especially at the Tele end, this effect exceeds the AF range, so focus cannot track, although it responds to changes in this value.
For details, see "Register Setting" on page 51.

Privacy Zone Masking Settings

For details, see page 16.

Motion detection

For details, see page 20.

Title Display

- You can set a title composed of up to 11 lines. One line can contain up to 20 characters.
- You can set display on/off, the horizontal position of the first character, blinking state and color for each line.
- The camera gives priority to lines of a title when the camera status is displayed on the relevant line. On the lines where a title is not set, the camera status is displayed.

Line Number	00 to 0A	
H-position	00 to 1F	
Blink	00: Does not blink	
	01: Blinks	
Color	00	White
	01	Yellow
	02	Violet
	03	Red
	04	Cyan
	05	Green
	06	Blue

00	01	02	03	04	05	06	07
A	B	C	D	E	F	G	H
08	09	0a	0b	0c	0d	0e	0f
I	J	K	L	M	N	O	P
10	11	12	13	14	15	16	17
Q	R	S	T	U	V	W	X
18	19	1a	1b	1c	1d	1e	1f
Y	Z	&		?	!	1	2
20	21	22	23	24	25	26	27
3	4	5	6	7	8	9	0
28	29	2a	2b	2c	2d	2e	2f
À	È	Ì	Ò	Ù	Á	É	Í
30	31	32	33	34	35	36	37
Ó	Ú	Â	Ê	Ô	Æ		Ã
38	39	3a	3b	3c	3d	3e	3f
Õ	Ñ	Ç	ß	Ä	Ï	Ö	Ü
40	41	42	43	44	45	46	47
Å	$		¥		£	¿	¡
48	49	4a	4b	4c	4d	4e	4f
ø	”	:	’	.	,	/	-

Privacy Zone Masking Function

Privacy Zone masking protects private objects and areas such as house windows, entrances, and exits which are within the camera's range of vision but not subject to surveillance.
Privacy zone masking can be masked on the monitor to protect privacy.

Features

- Mask can be set on up to 24 places according to Pan/Tilt positions.
- Mask can be displayed on 8 places per screen simultaneously.
- Privacy Zones are displayed according to priority in alphabetical order.
- Individual on/off zone masking settings.
- Two colors can be individually set for each of 24 privacy zones.
- Interlocking control with zooming.
- Interlocking control with Pan/Tilt.
- Non-interlocking control with Pan/Tilt.

Privacy Zone Setting Command List

Command Set	Command	Command Packet	Comments
CAM_PrivacyZone	SetMask	8x 01 04 76 mm nn 0r 0r 0s 0s FF	Setting Mask(Size) See "mm: Mask setting list", "nn: Setting", and "rr: w, ss: h" in "Parameters" on page 18.
	Display	8x 01 04 77 pp pp pp pp FF	Setting Mask Display On/Off See "pp pp pp pp: Mask bit" in "Parameters" on page 18. pp pp pp pp: Mask setting (0: OFF, 1: ON)
	SetMaskColor	8x 01 04 78 pp pp pp pp qq rr FF	Setting Color of Mask See "pp pp pp pp: Mask bit" and "qq, rr: Color code" in "Parameters" on page 18. qq: Color setting when setting the Mask bit to 0 rr: Color setting when setting the Mask bit to 1
	SetPanTiltAngle	8x 01 04 79 0p 0p 0p 0q 0q 0q FF	Setting Pan/Tilt Angle See "Setting pan/tilt angle" in "Parameters" on page 18. ppp: Pan angle, qqq: Tilt angle
	SetPTZMask	8x 01 04 7B mm 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF	Setting the direct position of PTZ See "mm: Mask setting list" and "Setting pan/tilt angle" in "Parameters" on page 18. ppp: Pan , qqq: Tilt , rrrr: Zoom
	Non_InterlockMask	8x 01 04 6F mm 0p 0p 0q 0q 0r 0r 0s 0s FF	Setting non-interlocking the mask to pan/till See "mm: Mack setting list" and "pp:x,qq:y, rr:w, ss: h" in "Parameters" on page 18.
	Grid On	8x 01 04 7C 02 FF	Setting Grid Display On/Off
	Grid Off	8x 01 04 7C 03 FF	
	CenterLineOn	8x 01 04 7C 04 FF	Setting the center line On

Privacy Zone Inquiry Command List

Inquiry Command	Command Packet	Inwuiry Packet	Comments
CAM_Privacy DisplayInq	8x 09 04 77 FF	y0 50 pp pp pp pp FF	Inquiry about the status of Setting Mask Display On/Off See "pp pp pp pp: Mask bit" in "Parameters" on page 18. 1:On, 0:Off
CAM_PrivacyPan TiltInq	8x 09 04 79 FF	y0 50 0p 0p 0p 0q 0q 0q FF	Inquiry about the pan/tilt position currently set See "Setting pan/tilt angle" in "Parameters" on page 18. ppp: Pan, qqq: Tilt
CAM_PrivacyPTZInq	8x 09 04 7B mm FF	y0 50 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF	Inquiry about pan/tilt/zoom position at the mm Mask setting See "mm: Mask setting list" and "Setting pan/tilt angle" in "Parameters" on page 18. ppp: Pan Position, qqq: Tilt Position rrrr: Zoom Position
CAM_Privacy MonitorInq	8x 09 04 6F FF	y0 50 pp pp pp pp FF	Inquiry about the mask currently displayed See "pp pp pp pp: Mask bit" in "Parameters" on page 18.

Parameters

mm: Mask setting list

Mask Name	mm (Hex)
Mask_A	00h
Mask_B	01h
Mask_C	02h
Mask_D	03h
Mask_E	04h
Mask_F	05h
Mask_G	06h
Mask_H	07h
Mask_I	08h
Mask_J	09h
Mask_K	0Ah
Mask_L	0Bh

Mask Name	mm (Hex)
Mask_M	0Ch
Mask_N	0Dh
Mask_O	0Eh
Mask_P	0Fh
Mask_Q	10h
Mask_R	11h
Mask_S	12h
Mask_T	13h
Mask_U	14h
Mask_V	15h
Mask_W	16h
Mask_X	17h

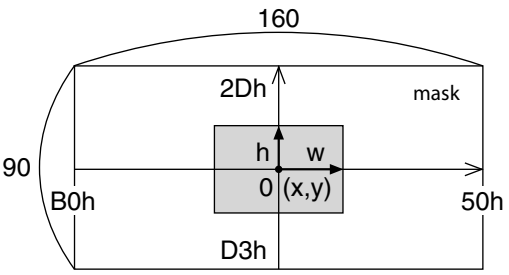
Note

The priority order of the mask display is in the sequence from A (highest) to X (lowest).
When you set the parameters of masks non-sequentially, it is recommended that you set the mask whose priority order is higher, first.

nn:Setting

nn	Setting
00	Resetting the zone size (the value of w,h) for the existing mask.
01	Setting newly the zone size (the value of w,h).

pp: x, qq: y, rr: w, ss: h



Effective display area

pp pp pp pp: Mask bit

	pp								pp								pp								pp							
bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Mask	-	-	X	W	V	U	T	S	-	-	R	Q	P	O	N	M	-	-	L	K	J	I	H	G	-	-	F	E	D	C	B	A

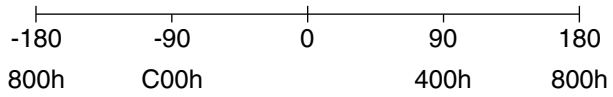
The "-" must be "0".

qq, rr: Color code

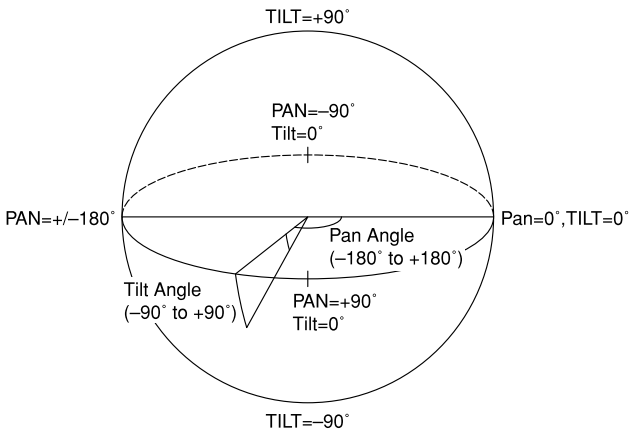
Mask (Color)	Code (qq, rr)
Black	00h
Gray1	01h
Gray2	02h
Gray3	03h
Gray4	04h
Gray5	05h
Gray6	06h
White	07h
Red	08h
Green	09h
Blue	0Ah
Cyan	0Bh
Yellow	0Ch
Magenta	0Dh

Setting pan/tilt angle

Angle/Parameter of Angle (ppp, qqq)



Set the angle resolution to 360 (degree)/4096 (1000h).



Details of Setting Commands

Set Mask

Command: 8x 01 04 76 mm nn 0r 0r 0s 0s FF
Parameters:

mm	Setting Mask See “mm: Mask setting list” in “Parameters” on page 18.
nn	Selects new setting or resetting for the zone. See “nn: Setting” in “Parameters” on page 18.
rr	Sets the half value “w” of the Mask Width.
ss	Sets the half value “h” of the Mask Height. See “pp: x, qq: y, rr: w, ss: h” in “Parameters” on page 18.

Comments: To set the mask, first display the object at the center of the screen. When “nn” is set to 1, the current Pan/Tilt/Zoom position is recorded in internal memory.
When “nn” is set to 0, the Pan/Tilt/Zoom position in memory is not changed.

Notes

- The tilt angle at which you can set the mask is between –70 to +70 degrees.
- It is recommended that you set the size to at least twice the size of the object (height and width).

Set Display

Command: 8x 01 04 77 pp pp pp pp FF
Parameter:

pp pp pp pp	Each 24 Privacy Zones corresponds to 1 bit. See “pp pp pp pp: Mask bit” in “Parameters” on page 18.

Comments: Each of 24 Privacy zones can be switched on and off individually by a single VISCA command. If you want to display a Privacy zone, you must set its bit to 1. If you do not want to display a Privacy zone, you must set its bit to 0.

Set Mask Color

Command: 8x 01 04 78 pp pp pp pp qq rr FF
Parameter:

pp pp pp pp	Each 24 Privacy Zones correspond with the BIT. See “pp pp pp pp: Mask bit” in “Parameters” on page 18.
qq	Set the color code
rr	Set the color code. See “qq, rr: Color code” in “Parameters” on page 18.

Comments: Two different color masks can be chosen.
Two colors can be individually set for each of 24 privacy zones.
If the bit of parameter (pp pp pp pp) is set to “0”, mask color will be “qq” color (Color code). If the bit of parameter (pp pp pp pp) is set to “1”, the mask color will be “rr” color (Color code).

Example: 8x 01 04 78 00 00 00 03 00 07 FF
The mask color of Mask_A and Mask_B is White (color code 07h), and the mask color of the other Mask (C to X) is Black (color code 00h).

Set Pan Tilt Angle

Command: 8x 01 04 79 0p 0p 0p 0q 0q 0q FF
Parameter:

ppp	Pan Angle
qqq	Tilt Angle See “Setting pan/tilt angle” in “Parameters” on page 18.

Comments: Pan/Tilt angle settings are hexadecimal data.
The resolution of Pan/Tilt angle is 0.088 degrees.

Notes

- When you set the pan/tilt angle, locate the pan/tilt position at the center point of the FCB camera’s position.
- If you set the pan/tilt angle or zoom the camera, a bigger mask will be displayed for about one second.

Set PTZ Mask

Command: 8x 01 04 7B mm 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF
Parameter:

mm	Setting Mask See “mm: Mask setting list” in “Parameters” on page 18.
ppp	Pan Angle (000 to FFF) See “Setting pan/tilt angle” in “Parameters” on page 18.
qqq	Tilt Angle (000 to FFF) See “Setting pan/tilt angle” in “Parameters” on page 18.
rrrr	Zoom Position (000 to 4000) See “Zoom Ratio and Zoom Position (for reference)” on page 49.

Comments: Mask can be set at the desired position by setting the pan tilt angle and zoom position using this command. The set value can be input by hexadecimal number.

Non Interlock Mask

Command: 8x 01 04 6F mm 0p 0p 0q 0q 0r 0r 0s 0s FF

Parameters:

mm	Setting Mask See “mm: Mask setting list” in “Parameters” on page 18.
pp	Sets the center position “x” of the Mask on screen.
qq	Sets the center position “y” of the Mask on screen.
rr	Sets the half value “w” of the Mask Width.
ss	Sets the half value “h” of the Mask Height. See “pp: x, qq: y, rr: w, ss: h” in “Parameters” on page 18.

Commands: Mask does not interlock with pan/tilt. The limitations of parameters are as follows. (hexadecimal representation)

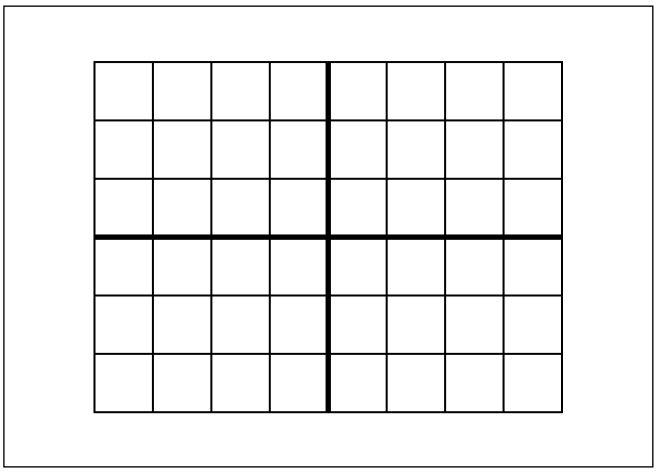
x: ±50h
w: ±50h
y: ±2Dh
h: ±2Dh

Note

When the Set Mask command and the Non Interlock Mask command are set to the same mask, the command set later becomes effective.

Grid

Use the grid displayed on the screen to set mask positions (see the figure below).
By executing the Center Line On command, only the x and y axes of the center are displayed. Grids lines disappear.



Motion Detection (MD) Function

This function instructs the camera to detect movement within the monitoring area and then send an alarm signal automatically.
The Detect signal goes out through the serial command (VISCA) communication line.

Features

- You can set a frame for the detection range of 16 (horizontally) × 8 (vertically) blocks.
- You can set up to four frames.
- When the motion is detected in the set frame, the Alarm Replay VISCA command is sent.
- The threshold level for detection can be set (common to four frames).
- The interval of alarm detection can be set up to 255 seconds in units of one second.
- You can set on/off for each frame.
- The frame number is also sent with Alarm Replay to report in which frame the motion has been detected.

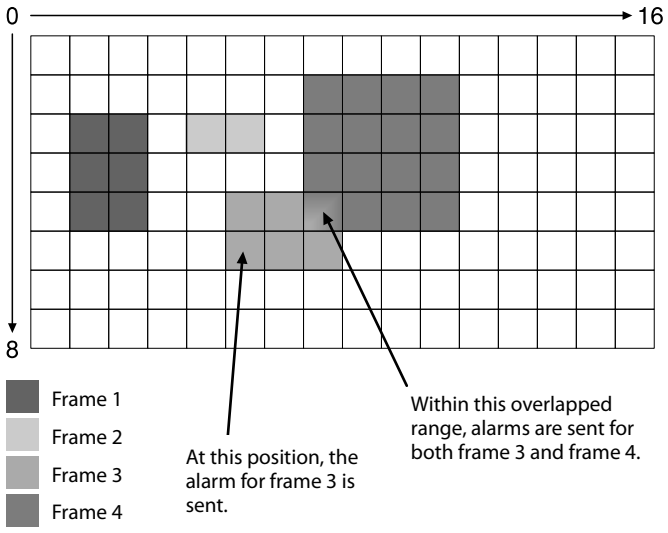
Frames

Setting frames

You can set the frame by assigning the starting point and terminating point vertically and horizontally. You can set up to four frames.

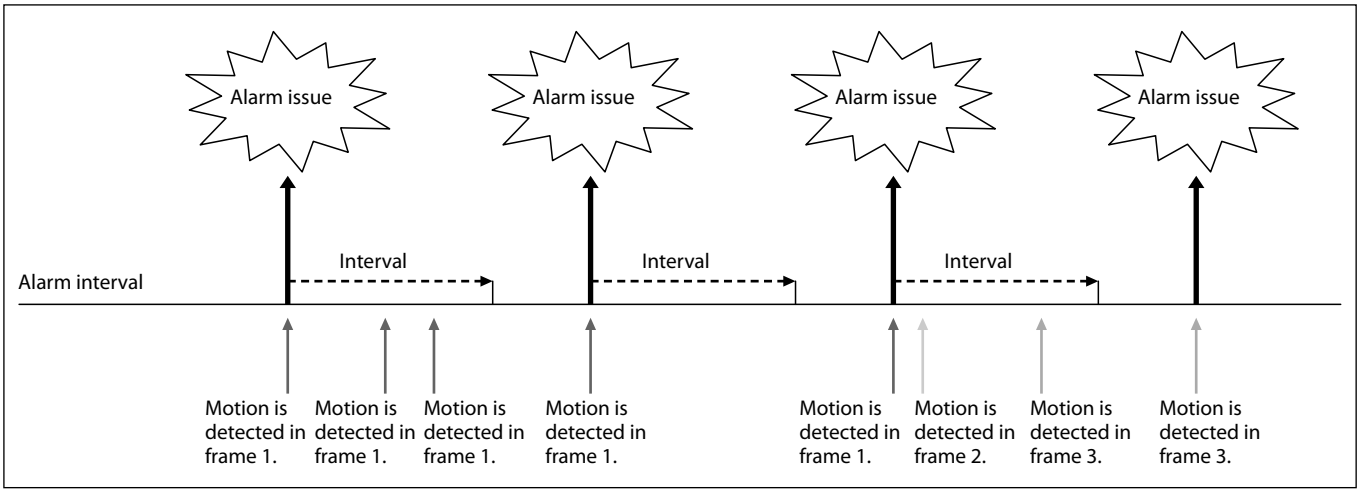
When motion is detected within the rage where frames overlap

The alarms are sent for both frames.



Sending Alarms

- When motion is detected, the Alarm Replay command is issued via the serial command (VISCA) communication line.
- When multiple motions are detected or motion is detected in another frame within the set interval following the original time the alarm was issued, another alarm command is not issued.
- When motion is detected after the interval time elapsed, the alarm is issued again.



Setting Commands

- **MD On/Off**
  The Display mode is selected by the Function Set command and frames are set by the Frame Set command. By sending an MD On command, the frame is displayed when motion is detected in the set frame. The Alarm Reply command is set via the serial command (VISCA) communication line.

8x 01 04 1B 02 FF --- On
8x 01 04 1B 03 FF --- Off

- **Function Set**
  Select the detected frame, and set the Threshold Level and the Interval Time.

8x 01 04 1C 0m 0n 0p 0q 0r 0s FF
m: Display Mode on/off (bit0: Frame)
n: Detection Frame set on/off (bit0:Frame0, bit1: Frame1, bit2:Frame2, bit3:Frame3)
-- (0 to F)
pq: Threshold -- (00 to FF)
rs: Interval time set -- (00 to FF)
(When pq and rs are 0, the command is received, but the setting is disabled.)

- **Frame Set**
  You can set up to four frames by assigning the starting and terminating points.

Note

Set a terminating point higher vertically and horizontally than the starting point. If you set the wrong value, the command yields an error.

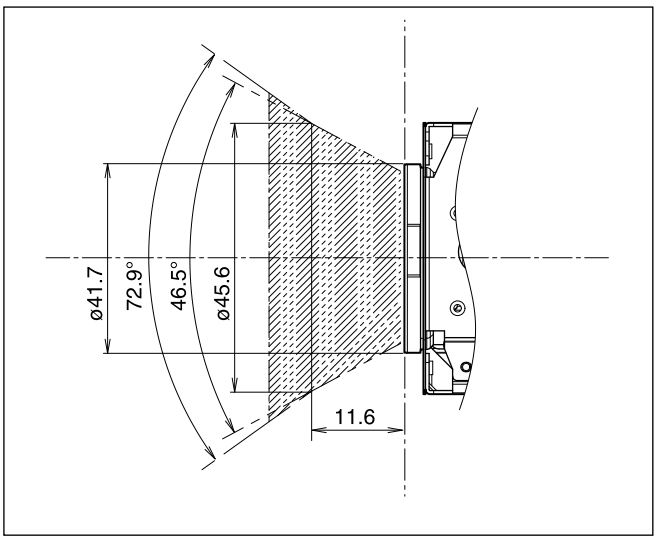
8x 01 04 1D 0m 0p 0q rr 0s FF
m: Select Detection Frame (0: Frame0, 1: Frame1, 2: Frame2, 3: Frame3) -- (0, 1, 2, 3)
p: Frame set Start Horizontal Position -- (00 to 0F)
q: Frame set Start Vertical Position -- (00 to 07)
r: Frame set End Horizontal Position -- (01 to 10)
s: Frame set End Vertical Position -- (01 to 08)

- **Alarm Reply**
  When motion is detected in the set frame, the camera issues this command. This command includes the information on the number of the detected frame.

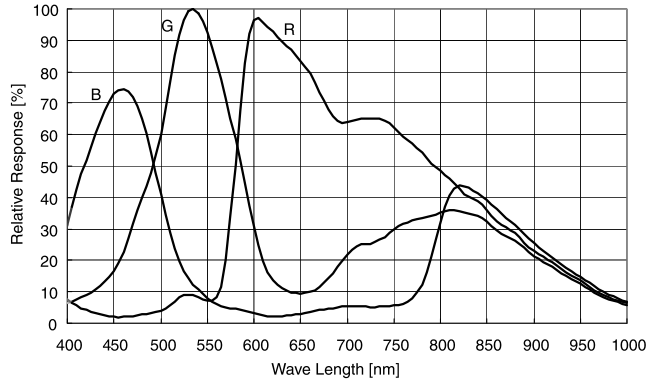
y0 07 04 1B 0p FF
p: Frame Number (bit0: Frame0, bit1: Frame1, bit2: Frame2, bit3: Frame3)

Eclipse

When designing the housing, refer to the dimensional allowance as shown in the figure below.



Spectral Sensitivity Characteristics



Use the graph as a reference value. (We can not guarantee these values.)
This data is measured when the IR cut filter is removed and the characteristics of the lens and optical source characteristics are ignored.

Initial Settings, Custom Preset and Backup

Initial settings for the various functions of the FCB camera are indicated in the “Initial settings” column. The “Custom preset” column indicates whether the custom preset function can be used to store the settings. The function enables the stored settings to be recalled automatically when the camera is turned on. The “Back up at standby” column indicates whether the data is preserved even when the camera is powered OFF.

Mode/Position setting	Initial settings	Custom preset	Back up at standby
Zoom Position	Wide end	○	○
D-Zoom On/Off	On	○	○
D-Zoom Separate/Combine	Combine	○	○
D-Zoom Position	00h	○	○
Focus Position	—	○	○
Focus Auto/Manual	Auto	○	○
Near Limit Setting	D000h (30 cm)	○	○
AF Sensitivity	Normal	○	○
AF Mode	Normal	○	○
AF Run Time	5 sec	○	○
AF Interval	5 sec	○	○
WB Mode	Auto	○	○
WB Data (Rgain, Bgain)	—	○	○
One Push WB Data	—	○	○
AE Mode	Full Auto	○	○
AE Response	01	○	○
WD On/Off/Auto	Off	○	○
Slow Shutter Mode	Manual	○	○
Shutter Position	1/30 sec	○	○
Iris Position	—	○	○
Gain Position	—	○	○
Bright Position	—	○	○
Exposure Compensation On/Off	Off	○	○
Exposure Compensation Amount	±0	○	○
BackLight On/Off	Off	○	○
Spot AE On/Off	Off	○	○
Spot AE Position Setting	X=8, Y=8	○	○
Aperture Level	0Ah	○	○
High Resolution Mode On/Off	Off	○	○
LR Reverse On/Off	Off	○	○
Freeze On/Off	Off	×	×
Picture Effect	Off	○	○
ICR On/Off	Off	○	○
Auto ICR On/Off	Off	○	○
Auto ICR Threshold Level	0Eh	○	○

A circle “○” in this column signifies that the data is preserved.

A cross “×” signifies that the data IS NOT preserved.

Mode/Position setting	Initial settings	Custom preset	Back up at standby
Camera Memory	Same as the initial value setting	○	○
Display On/Off	Off	○	○
Mute On/Off	Off	×	×
WD Alarm On/Off	Off	×	○
Auto ICR Alarm On/Off	Off	○	○
Image Stabilizer On/Off/Hold	Off	○	○
High Sensitivity Mode On/Off	Off	×	○
GAMMA	0:standard	×	○
NR Level	3	○	○
Gain Limit	—	○	○
Color Enhancement On/Off	Off	○	○
Color Enhancement Threshold Level	200h	○	○
Color Enhancement High Luminance Color Setting	2h (Green)	○	○
Color Enhancement Low Luminance Color Setting	3h (White)	○	○
Low-Illumination Chroma Suppress	2h (Middle)	○	○
Color Gain	4h (100%)	○	○
Color Hue	7h (0degrees)	○	○
Title Display On/Off	Off	○	○
Title Setting	—	○	○
Mask Setting	—	○	○
Mask Display On/Off	Off	○	○
Mask Color Setting	—	○	○
Grid/Center Line Display On/Off	Off	○	○
Picture Flip On/Off	Off	○	○
Privacy Zone On/Off	Off	○	○
Privacy Zone Setting	—	○	○
Camera ID	0000h	×	○
MD On/Off	Off	○	○
MD Display Setting	Off	○	○
MD Threshold Level	10h	○	○
MD Interval	1 sec	○	○
MD Window Setting	—	○	○
ZoomPos Continuous Output On/Off	Off	×	○
ZoomPos Continuous Output Interval	3Ch	×	○
Stabilizer	Off	○	○

A circle "○" in this column signifies that the data is preserved.
A cross "×" signifies that the data IS NOT preserved.

Notes

- The number of times written to EEPROM (when Custom Preset is executed) is limited.
- Privacy Zone Setting while digital zooming is not preserved by Custom Preset.

Mode Condition

Condition

Mode	Power Off	Initializing	Power On	Freeze On	MemRecall
Address Set	○	○	○	○	○
IF_Clear	○	○	○	○	○
Command Cancel	○	○	○	○	○
Power On/Off	○	○	○	○	○

Lens

Mode	Power Off	Initializing	Power On	Freeze On	MemRecall	Zoom Direct	Focus Direct	ZmFo Direct	Focus Auto
Zoom Tele/Wide/Stop	×	×	○	○	×	×	○	×	○
Zoom Direct	×	×	○	○	×	○	○	×	○
Zoom Focus Direct	×	×	○	○	×	×	×	○	×
D-Zoom On/Off	×	×	○	○	×	×	○	×	○
D-Zoom Separate/Combine	×	×	○	○	×	×	○	×	○
D-Zoom Tele/Wide/Stop	×	×	○	○	×	○	○	○	○
D-Zoom ×1/Max	×	×	○	○	×	○	○	○	○
D-Zoom Direct	×	×	○	○	×	○	○	○	○
Focus Far/Near/Stop	×	×	○	○	×	○	×	×	×
Focus Direct	×	×	○	○	×	○	○	×	×
Focus Auto/Manual	×	×	○	○	×	○	×	×	○
One Push AF	×	×	○	○	×	○	×	×	×
Focus Infinity	×	×	○	○	×	○	×	×	○
Focus Near Limit	×	×	○	○	×	○	×	×	○
AF Sensitivity Normal/Low	×	×	○	○	×	○	○	○	○
AF Mode Norm/Interval/Zoom	×	×	○	○	×	○	○	○	○
AF Activation Time/Interval Setting	×	×	○	○	×	○	○	○	○
Camera Memory Set/Reset	×	×	○	○	×	×	×	×	○
Camera Memory Recall	×	×	○	○	○*	×	×	×	○
Lens Initialize	×	×	○	○	×	×	×	×	○

White Balance

Mode	Power Off	Initializing	Power On	Freeze On	MemRecall	WB AUTO	Indoor	outdoor	Outdoor AUTO	Sodium Lamp	Sodium Lamp AUTO	OnePush	ATW	Manual
WB Mode Switchover	×	×	○	○	×	○	○	○	○	○	○	○	○	○
One Push WB	×	×	○	○	×	×	×	×	×	×	×	○	×	×
RGain Setting	×	×	○	○	×	×	×	×	×	×	×	×	×	○
BGain Setting	×	×	○	○	×	×	×	×	×	×	×	×	×	○

Exposure

Mode	Power Off	Initializing	Power On	Freeze On	MemRecall	AE Full Auto	AE Manual	ShutterPri	Iris Priority	Bright	WD
AE Full Auto	×	×	○	○	×	○	○	○	○	○	○
AE Manual	×	×	○	○	×	○	○	○	○	○	○
Shutter Priority	×	×	○	○	×	○	○	○	○	○	○
Iris Priority	×	×	○	○	×	○	○	○	○	○	○
Bright	×	×	○	○	×	○	×	○	×	○	○
Shutter Setting	×	×	○	○	×	×	○	○	×	×	○
Iris Setting	×	×	○	○	×	×	○	×	○	×	○
Gain Setting	×	×	○	○	×	×	○	×	×	×	○
Bright Setting	×	×	○	○	×	×	×	×	×	○	○
Slow Shutter Auto/Manual	×	×	○	○	×	○	○	○	○	○	×
Exposure Compensation On/Off	×	×	○	○	×	○	○	○	○	○	×
Exposure Compensation Setting	×	×	○	○	×	○	○	○	○	○	×
BackLight On/Off	×	×	○	○	×	○	×	×	×	×	×
SpotAE On/Off	×	×	○	○	×	○	○	○	○	○	×
SpotAE Setting	×	×	○	○	×	○	○	○	○	○	×
WD On/Off	×	×	○	○	○	○	○	○	○	○	○

Others

Mode	Power Off	Initializing	Power On	Freeze On	MemRecall
WD Alarm On/Off	×	×	○	×	×
Aperture Setting	×	×	○	×	×
High Resolution Mode On/Off	×	×	○	○	○
LR_Reverse On/Off	×	×	○	×	×
Freeze On/Off	×	×	○	○	×
Picture Effect Setting	×	×	○	×	×
ICR On/Off	×	×	○	×	×
Auto ICR On/Off	×	×	○	×	×
Auto ICR Threshold Level Setting	×	×	○	○	○
Auto ICR Alarm On/Off	×	×	○	×	×
Display On/Off	×	×	○	○	○
Mute On/Off	×	×	○	○	○
Title Setting	×	×	○	○	○
Mask On/Off	×	×	○	○	○
Mask Setting	×	×	○	○	○
Key Lock On/Off	×	×	○	○	○
MD On/Off	×	×	○	○	○
MD Function Setting	×	×	○	○	○
MD Window Setting	×	×	○	○	○
ID Write	×	×	○	○	○
Memory Save	×	×	○	○	○
Register Value Setting	×	○	○	○	○
Color Enhancement On/Off	×	×	○	×	×
NR Level Setting	×	×	○	○	○
Chroma Suppress	×	×	○	×	×
Color Gain	×	×	○	×	×
Color Hue	×	×	○	×	×

Command List

VISCA[1)]/RS-232C Commands

This Manual outlines an RS-232 control protocol and command list for certain Sony cameras from which control software can be developed.
THIS CONTROL PROTOCOL AND COMMAND LIST IS PROVIDED BY SONY ON AN "AS-IS BASIS" WITHOUT WARRANTY OF ANY KIND. SONY DOES NOT WARRANT ANY PARTICULAR RESULT FROM THE USE OF THIS CONTROL PROTOCOL AND COMMAND LIST AND DISCLAIMS AND EXCLUDES ALL WARRANTIES. EXPRESS OR IMPLIED, WITH RESPECT TO THAT CONTROL PROTOCOL AND COMMAND LIST, INCLUDING, BUT NOT LIMITED TO, ANY OR ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN FACT, SONY SPECIFICALLY ACKNOWLEDGES THAT SOFTWARE DEVELOPED BASED ON THIS CONTROL PROTOCOL AND COMMAND LIST MAY CAUSE MALFUNCTION OR DAMAGE TO HARDWARE AND SOFTWARE USED WITH IT (INCLUDING SONY HARDWARE AND SOFTWARE) AND SPECIFICALLY DISCLAIMS ANY LIABILITY FOR ANY SUCH MALFUNCTION OR DAMAGE. THIS CONTROL PROTOCOL AND COMMAND LIST SHOULD BE USED WITH CAUTION.

Overview of VISCA

In VISCA, the device outputting commands, for example, a computer, is called the controller. The device receiving the commands, an FCB camera is called the peripheral device. In VISCA, up to seven peripheral devices like the FCB camera can be connected to one controller using communication conforming to the RS-232C standard. The parameters of RS-232C are as follows.

- Communication speed: 9.6 kbps/19.2 kbps/ 38.4 kbps
- Data bits : 8
- Start bit : 1
- Stop bit : 1
- Non parity

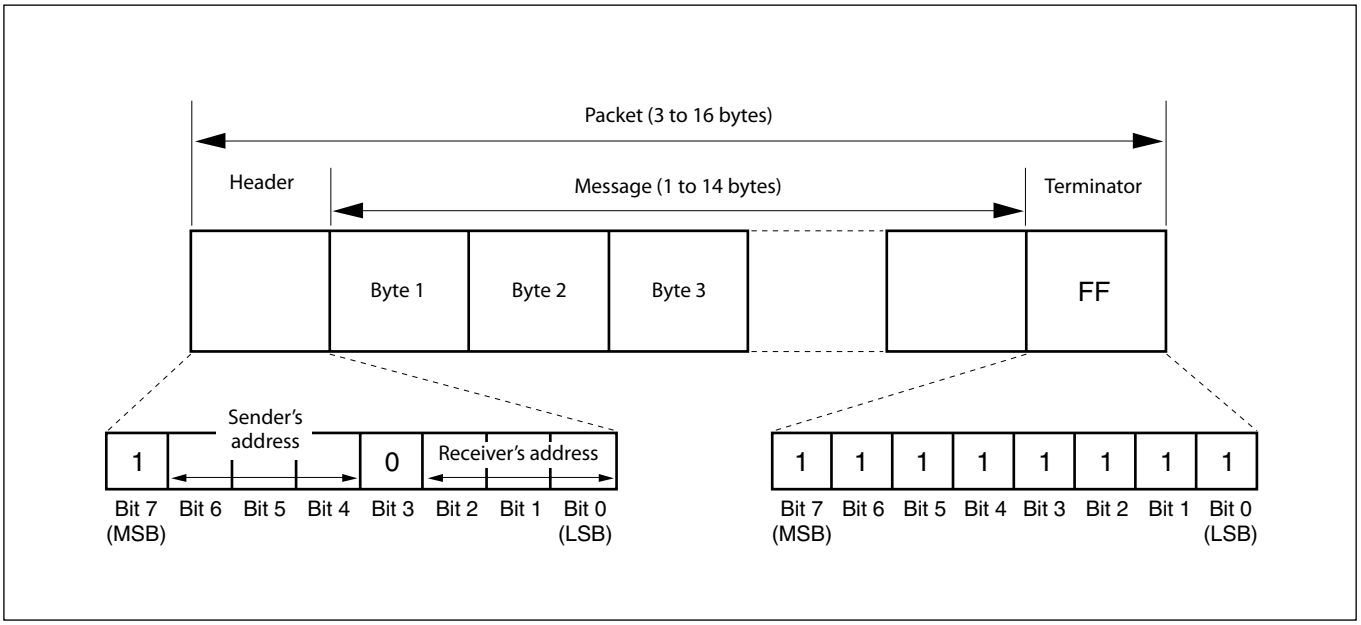
Flow control using XON/XOFF and RTS/CTS, etc., is not supported.

1) VISCA is a protocol which controls consumer camcorders developed by Sony. "VISCA" is a trademark of Sony Corporation.

VISCA Communication Specifications

VISCA packet structure

The basic unit of VISCA communication is called a packet. The first byte of the packet is called the header and comprises the sender's and receiver's addresses. For example, the header of the packet sent to the FCB camera assigned address 1 from the controller (address 0) is hexadecimal 81H. The packet sent to the camera assigned address 2 is 82H. In the command list, as the header is 8X, input the address of the camera at X. The header of the reply packet from the camera assigned address 1 is 90H. The packet from the camera assigned address 2 is A0H.
Some of the commands for setting cameras can be sent to all devices at one time (broadcast). In the case of broadcast, the header should be hexadecimal 88H.
When the terminator is FFH, it signifies the end of the packet.



Command and inquiry

● **Command**
Sends operational commands to the FCB camera.

● **Inquiry**
Used for inquiring about the current state of the FCB camera.

	Command Packet	Note
Inquiry	8X QQ RR ... FF	QQ[1] = Command/Inquiry, RR[2] = category code

[1] QQ = 01 (Command), 09 (Inquiry)

[2] RR = 00 (Interface), 04 (camera 1), 06 (Pan/Tilter), 07 (camera 2)

X = 1 to 7: FCB camera address

Responses for commands and inquiries

● **ACK message**
Returned by the FCB camera when it receives a command. No ACK message is returned for inquiries.

● **Completion message**
Returned by the FCB camera when execution of commands or inquiries is completed. In the case of inquiry commands, it will contain reply data for the inquiry after the 3rd byte of the packet. If the ACK message is omitted, the socket number will contain 0.

	Reply Packet	Note
Ack	X0 4Y FF	Y = socket number
Completion (commands)	X0 5Y FF	Y = socket number
Completion (Inquiries)	X0 5Y ... FF	Y = socket number

X = 9 to F: FCB camera address + 8

● **Error message**
When a command or inquiry command could not be executed or failed, an error message is returned instead of the completion message.

Error Packet	Description
X0 6Y 01 FF	Message length error (>14 bytes)
X0 6Y 02 FF	Syntax Error
X0 6Y 03 FF	Command buffer full
X0 6Y 04 FF	Command cancelled
X0 6Y 05 FF	No socket (to be cancelled)
X0 6Y 41 FF	Command not executable

X = 9 to F: FCB camera address + 8, Y = socket number

Socket number

When command messages are sent to the FCB camera, it is normal to send the next command message after waiting for the completion message or error message to return. However to deal with advanced uses, the FCB camera has two buffers (memories) for commands, so that up to two commands including the commands currently being executed can be received. When the FCB camera receives commands, it notifies the sender which command buffer was used using the socket number of the ACK message. As the completion message or error message also has a socket number, it indicates which command has ended. Even when two command buffers are being used at any one time, an FCB camera management command and some inquiry messages can be executed.
The ACK message is not returned for these commands and inquiries, and only the completion message of socket number 0 is returned.

Command execution cancel

To cancel a command which has already been sent, send the Cancel command as the next command. To cancel one of any two commands which have been sent, use the cancel message.

	Cancel Packet	Note
Cancel	8X 2Y FF	Y = socket number

X = 1 to 7: FCB camera address, Y = socket number

An error message will be returned for this command, but this is not a fault. It indicates that the command has been canceled.

VISCA Device Setting Command

Before starting control of the FCB camera, be sure to send the Address command and the IF_Clear command using the broadcast function.

For VISCA network administration

● **Address**
Sets an address of a peripheral device. Use when initializing the network, and receiving the following network change message.

● **Network Change**
Sent from the peripheral device to the controller when a device is removed from or added to the network. The address must be re-set when this message is received.

	Packet	Note
Address	88 30 01 FF	Always broadcasted.
Network Change	X0 38 FF	

X = 9 to F: FCB camera address + 8

VISCA interface command

● **IF_Clear**
Clears the command buffers in the FCB camera and cancels the command currently being executed.

	Command Packet	Reply Packet	Note
IF_Clear	8X 01 00 01 FF	X0 50 FF	
IF_Clear (broadcast)	88 01 00 01 FF	88 01 00 01 FF	

X = 1 to 7: FCB camera address (For inquiry packet)
X = 9 to F: FCB camera address +8 (For reply packet)

VISCA interface and inquiry

● **CAM_VersionInq**
Returns information on the VISCA interface.

Inquiry	Inquiry Packet	Reply Packet	Description
CAM_VersionInq	8X 09 00 02 FF	Y0 50 GG GG HH HH JJ JJ KK FF	GGGG = Vender ID (0020: Sony) HHHH = Model ID 0466: FCB-EH6500 JJJJ = ROM revision KK = Maximum socket #(02)

X = 1 to 7: FCB camera address (For inquiry packet)
X = 9 to F: FCB camera address +8 (For reply packet)

VISCA Command/ACK Protocol

Command	Command Message	Reply Message	Comments
General Command	81 01 04 38 02 FF (Example)	90 41 FF (ACK)+90 51 FF (Completion) 90 42 FF 90 52 FF	Returns ACK when a command has been accepted, and Completion when a command has been executed.
	81 01 04 38 FF (Example)	90 60 02 FF (Syntax Error)	Accepted a command which is not supported or a command lacking parameters.
	81 01 04 38 02 FF (Example)	90 60 03 FF (Command Buffer Full)	There are two commands currently being executed, and the command could not be accepted.
	81 01 04 08 02 FF (Example)	90 61 41 FF (Command Not Executable) 90 62 41 FF	Could not execute the command in the current mode.
Inquiry Command	81 09 04 38 FF (Example)	90 50 02 FF (Completion)	ACK is not returned for the inquiry command.
	81 09 05 38 FF (Example)	90 60 02 FF (Syntax Error)	Accepted an incompatible command.
Address Set	88 30 01 FF	88 30 02 FF	Returned the device address to +1.
IF_Clear(Broadcast)	88 01 00 01 FF	88 01 00 01 FF	Returned the same command.
IF_Clear (For x)	8x 01 00 01 FF	z0 50 FF (Completion)	ACK is not returned for this command.
Command Cancel	8x 2y FF	z0 6y 04 FF (Command Canceled)	Returned when the command of the socket specified is canceled. Completion for the command canceled is not returned.
		z0 6y 05 FF (No Socket)	Returned when the command of the specified socket has already been completed or when the socket number specified is wrong.

VISCA Camera-Issued Messages

ACK/Completion Messages

	Command Messages	Comments
ACK	z0 4y FF (y:Socket No.)	Returned when the command is accepted.
Completion	z0 5y FF (y:Socket No.)	Returned when the command has been executed.

z = Device address + 8

Error Messages

	Command Messages	Comments
Syntax Error	z0 60 02 FF	Returned when the command format is different or when a command with illegal command parameters is accepted.
Command Buffer Full	z0 60 03 FF	Indicates that two sockets are already being used (executing two commands) and the command could not be accepted when received.
Command Canceled	z0 6y 04 FF (y:Socket No.)	Returned when a command which is being executed in a socket specified by the cancel command is canceled. The completion message for the command is not returned.
No Socket	z0 6y 05 FF (y:Socket No.)	Returned when no command is executed in a socket specified by the cancel command, or when an invalid socket number is specified.
Command Not Executable	z0 6y 41 FF (y:Socket No.)	Returned when a command cannot be executed due to current conditions. For example, when commands controlling the focus manually are received during auto focus.

Network Change Message

	Command Message	Comments
Network Change	z0 38 FF	Issued when power is being routed.

FCB Camera Commands

Command List (1/5)

Command Set	Command	Command Packet	Comments
AddressSet	Broadcast	88 30 01 FF	Address setting
IF_Clear	–	8x 01 00 01 FF	I/F Clear
	Broadcast	88 01 00 01 FF	
CommandCancel	–	8x 2p FF	p: Socket No. (=1 or 2)
CAM_Power	On	8x 01 04 00 02 FF	Power ON/OFF
	Off (Standby)	8x 01 04 00 03 FF	
CAM_Zoom	Stop	8x 01 04 07 00 FF	
	Tele (Standard)	8x 01 04 07 02 FF	
	Wide (Standard)	8x 01 04 07 03 FF	
	Tele (Variable)	8x 01 04 07 2p FF	p=0 (Low) to 7 (High)
	Wide (Variable)	8x 01 04 07 3p FF	
	Direct	8x 01 04 47 0p 0q 0r 0s FF	pqrs: Zoom Position
CAM_DZoom	On	8x 01 04 06 02 FF	Digital zoom ON/OFF
	Off	8x 01 04 06 03 FF	
	Combine Mode	8x 01 04 36 00 FF	Optical/Digital Zoom Combined
	Separate Mode	8x 01 04 36 01 FF	Optical/Digital Zoom Separate
	Stop	8x 01 04 06 00 FF	
	Tele (Variable)	8x 01 04 06 2p FF	p=0 (Low) to 7 (High) * Enabled during Separate Mode
	Wide (Variable)	8x 01 04 06 3p FF	
	x1/Max	8x 01 04 06 10 FF	x1/MAX Magnification Switchover * Enabled during Separate Mode
	Direct	8x 01 04 46 00 00 0p 0q FF	pq: D-Zoom Position * Enabled during Separate Mode
CAM_Focus	Stop	8x 01 04 08 00 FF	
	Far (Standard)	8x 01 04 08 02 FF	
	Near (Standard)	8x 01 04 08 03 FF	
	Far (Variable)	8x 01 04 08 2p FF	p=0 (Low) to 7 (High)
	Near (Variable)	8x 01 04 08 3p FF	
	Direct	8x 01 04 48 0p 0q 0r 0s FF	pqrs: Focus Position
	Auto Focus	8x 01 04 38 02 FF	AF ON/OFF
	Manual Focus	8x 01 04 38 03 FF	
	Auto/Manual	8x 01 04 38 10 FF	
	One Push Trigger	8x 01 04 18 01 FF	One Push AF Trigger
	Infinity	8x 01 04 18 02 FF	Forced infinity
	Near Limit	8x 01 04 28 0p 0q 0r 0s FF	pqrs: Focus Near Limit Position
AF Sensitivity	Normal	8x 01 04 58 02 FF	AF Sensitivity High/Low
	Low	8x 01 04 58 03 FF	
CAM_AFMode	Normal AF	8x 01 04 57 00 FF	AF Movement Mode
	Interval AF	8x 01 04 57 01 FF	
	Zoom Trigger AF	8x 01 04 57 02 FF	
	Active/Interval Time	8x 01 04 27 0p 0q 0r 0s FF	pq: Movement Time, rs: Interval
CAM_IRCorrection	Standard	8x 01 04 11 00 FF	FOCUS IR compensation data switching
	IR Light	8x 01 04 11 01 FF	
CAM_ZoomFocus	Direct	8x 01 04 47 0p 0q 0r 0s 0t 0u 0v 0w	pqrs: Zoom Position tuvw: Focus Position
CAM_Initialize	Lens	8x 01 04 19 01 FF	Lens Initialization Start
	Camera	8x 01 04 19 03 FF	Camera reset

Command List (2/5)

Command Set	Command	Command Packet	Comments
CAM_WB	Auto	8x 01 04 35 00 FF	Normal Auto
	Indoor	8x 01 04 35 01 FF	Indoor mode
	Outdoor	8x 01 04 35 02 FF	Outdoor mode
	One Push WB	8x 01 04 35 03 FF	One Push WB mode
	ATW	8x 01 04 35 04 FF	Auto Tracing White Balance
	Manual	8x 01 04 35 05 FF	Manual Control mode
	One Push Trigger	8x 01 04 10 05 FF	One Push WB Trigger
	Outdoor Auto	8x 01 04 35 06 FF	Outdoor auto
	Sodium Lamp Auto	8x 01 04 35 07 FF	Auto including sodium lamp source
	Sodium Lamp	8x 01 04 35 08 FF	Sodium lamp source fixed mode
CAM_RGain	Reset	8x 01 04 03 00 FF	Manual Control of R Gain
	Up	8x 01 04 03 02 FF	
	Down	8x 01 04 03 03 FF	
	Direct	8x 01 04 43 00 00 0p 0q FF	pq: R Gain
CAM_BGain	Reset	8x 01 04 04 00 FF	Manual Control of B Gain
	Up	8x 01 04 04 02 FF	
	Down	8x 01 04 04 03 FF	
	Direct	8x 01 04 44 00 00 0p 0q FF	pq: B Gain
CAM_AE	Full Auto	8x 01 04 39 00 FF	Automatic Exposure mode
	Manual	8x 01 04 39 03 FF	Manual Control mode
	Shutter Priority	8x 01 04 39 0A FF	Shutter Priority Automatic Exposure mode
	Iris Priority	8x 01 04 39 0B FF	Iris Priority Automatic Exposure mode
	Bright	8x 01 04 39 0D FF	Bright Mode (Manual control)
CAM_SlowShutter	Auto	8x 01 04 5A 02 FF	Auto Slow Shutter ON/OFF
	Manual	8x 01 04 5A 03 FF	
CAM_Shutter	Reset	8x 01 04 0A 00 FF	Shutter Setting
	Up	8x 01 04 0A 02 FF	
	Down	8x 01 04 0A 03 FF	
	Direct	8x 01 04 4A 00 00 0p 0q FF	pq: Shutter Position
CAM_Iris	Reset	8x 01 04 0B 00 FF	Iris Setting
	Up	8x 01 04 0B 02 FF	
	Down	8x 01 04 0B 03 FF	
	Direct	8x 01 04 4B 00 00 0p 0q FF	pq: Iris Position
CAM_Gain	Reset	8x 01 04 0C 00 FF	Gain Setting
	Up	8x 01 04 0C 02 FF	
	Down	8x 01 04 0C 03 FF	
	Direct	8x 01 04 4C 00 00 0p 0q FF	pq: Gain Position
	Gain Limit	8x 01 04 2C 0p FF	p: Gain Position
CAM_Bright	Reset	8x 01 04 0D 00 FF	Bright Setting
	Up	8x 01 04 0D 02 FF	
	Down	8x 01 04 0D 03 FF	
	Direct	8x 01 04 4D 00 00 0p 0q FF	pq: Bright Position
CAM_Stabilizer	On	8x 01 04 34 02 FF	Image Stabilizer On/Off
	Off	8x 01 04 34 03 FF	
	Off	8x 01 04 34 00 FF	Image Stabilizer Hold

Command List (3/5)

Command Set	Command	Command Packet	Comments
CAM_ExpComp	On	8x 01 04 3E 02 FF	Exposure Compensation ON/OFF
	Off	8x 01 04 3E 03 FF	
	Reset	8x 01 04 0E 00 FF	Exposure Compensation Amount Setting
	Up	8x 01 04 0E 02 FF	
	Down	8x 01 04 0E 03 FF	
	Direct	8x 01 04 4E 00 00 0p 0q FF	pq: ExpComp Position
CAM_BackLight	On	8x 01 04 33 02 FF	Back Light Compensation ON/OFF
	Off	8x 01 04 33 03 FF	
CAM_SpotAE	On	8x 01 04 59 02 FF	Spot Automatic Exposure Setting
	Off	8x 01 04 59 03 FF	
	Position	8x 01 04 29 0p 0q 0r 0s FF	pq: X (0 to F), rs: Y (0 to F)
CAM_AE_Response	Direct	8x 01 04 5D pp FF	pp: Automatic Exposure Response Setting (01 to 30), default value: 01
CAM_WD	On	8x 01 04 3D 02 FF	Wide-D ON/OFF
	Off	8x 01 04 3D 03 FF	
	AutoOnOff	8x 01 04 3D 00 FF	Wide dynamic ON/OF auto switching
	On (RatioFix)	8x 01 04 3D 01 FF	Wide dynamic ON (Fixed exposure ratio mode)
	On (Dver Compati)	8x 01 04 3D 04 FF	Wide dynamic ON (Dver operation)
	Refresh	8x 01 04 70 00 FF	Wide dynamic restart
	Set Parameter	8x 01 04 2D 0p 0q 0r 0s 0t 0u 00 00 FF	p: Screen display 0: Combined image, 2: Long-time, 3: Short-time q: Detection sensitivity (0: L 1: M 2: H) r: Blocked-up shadow correction level (0: L 1: M 2: H 3: S) s: Blown-out highlight correction level (0: L 1: M 2: H) tu: Exposure ratio of short exposure (x1 to x64)
CAM_WDAlarmReply	On	8x 01 04 3B 02 FF	Wide dynamic auto switching alarm ON/OFF
	Off	8x 01 04 3B 03 FF	
	(Reply)	y0 07 04 3B 02 FF	Wide dynamic OFF → ON
		y0 07 04 3B 03 FF	Wide dynamic ON → OFF
CAM_Aperture	Reset	8x 01 04 02 00 FF	Aperture Control
	Up	8x 01 04 02 02 FF	
	Down	8x 01 04 02 03 FF	
	Direct	8x 01 04 42 00 00 0p 0q FF	pq: Aperture Gain
CAM_HR	On	8x 01 04 52 02 FF	High-Resolusion Mode ON/OFF
	Off	8x 01 04 52 03 FF	
CAM_NR	—	8x 01 04 53 0p FF	p: NR Setting (0: OFF, level 1 to 5)
CAM_Gamma	—	8x 01 04 5B 0p FF	p: Gamma setting (0: Standard, 1 to 4)
CAM_HighSensitivity	On	8x 01 04 5E 02 FF	High Sensitivity mode ON/OFF
	Off	8x 01 04 5E 03 FF	
CAM_LR_Reverse	On	8x 01 04 61 02 FF	Mirror Image ON/OFF
	Off	8x 01 04 61 03 FF	
CAM_Freeze	On	8x 01 04 62 02 FF	Still Image ON/OFF
	Off	8x 01 04 62 03 FF	
CAM_PictureEffect	Off	8x 01 04 63 00 FF	Picture Effect Setting
	Neg.Art	8x 01 04 63 02 FF	
	B&W	8x 01 04 63 04 FF	
CAM_PictureFlip	On	8x 01 04 66 02 FF	Picture flip ON/OFF
	Off	8x 01 04 66 03 FF	

Command List (4/5)

Command Set	Command	Command Packet	Comments
CAM_ICR	On	8x 01 04 01 02 FF	Infrared Mode ON/OFF
	Off	8x 01 04 01 03 FF	
CAM_AutoICR	On	8x 01 04 51 02 FF	Auto dark-field mode On/Off
	Off	8x 01 04 51 03 FF	
	Threshold	8x 01 04 21 00 00 0p 0q FF	pq: ICR ON → OFF Threshold Level
CAM _AutoICRAlarmReply	On	8x 01 04 31 02 FF	Auto ICR switching Alarm ON/OFF
	Off	8x 01 04 31 03 FF	
	(Reply)	y0 07 04 31 02 FF	ICR OFF → ON
		y0 07 04 31 03 FF	ICR ON → OFF
CAM_Memory	Reset	8x 01 04 3F 00 0p FF	p: Memory Number (=0 to 5)
	Set	8x 01 04 3F 01 0p FF	
	Recall	8x 01 04 3F 02 0p FF	
CAM_CUSTOM	Reset	8x 01 04 3F 00 7F FF	Starts up in this mode when the power is turned on.
	Set	8x 01 04 3F 01 7F FF	
	Recall	8x 01 04 3F 02 7F FF	
CAM_MemSave	Write	8x 01 04 23 0X 0p 0p 0q 0q FF	X: 00 to 07 (Address), total 16 byte ppqq: 0x0000 to 0xFFFF (Data)
CAM_Display	On	8x 01 04 15 02 FF (8x 01 06 06 02 FF)	Display ON/OFF
	Off	8x 01 04 15 03 FF (8x 01 06 06 03 FF)	
	On/Off	8x 01 04 15 10 FF (8x 01 06 06 10 FF)	
CAM_MultiLineTitle	Title Set1	8x 01 04 73 1L 00 nn pp qq 00 00 00 00 00 00 FF	L: Line Number, nn: H-position pp: Color, qq: Blink
	Title Set2	8x 01 04 73 2L mm nn pp qq rr ss tt uu vv ww FF	L: Line Number, mnpqrstuvw: Setting of characters (1 to 10)
	Title Set3	8x 01 04 73 3L mm nn pp qq rr ss tt uu vv ww FF	L: Line Number, mnpqrstuvw: Setting of characters (11 to 20)
	Title Clear	8x 01 04 74 1p FF	Title Setting clear (p: 0 to a, f= all lines)
	On	8x 01 04 74 2p FF	Title display On/Off (0 to a, f= all lines)
	Off	8x 01 04 74 3p FF	
CAM_Mute	On	8x 01 04 75 02 FF	Muting ON/OFF
	Off	8x 01 04 75 03 FF	
	On/Off	8x 01 04 75 10 FF	
CAM_PrivacyZone	SetMask	8x 01 04 76 mm nn 0r 0r 0s 0s FF	mm: Mask Settings nn 00: Modify, 01: New rr: W, ss: H
	Display	8x 01 04 77 pp pp pp pp FF	Mask Display ON/OFF pp pp pp pp: Mask Settings (0: OFF, 1: ON)
	SetMaskColor	8x 01 04 78 pp pp pp pp qq rr FF	pp pp pp pp: Mask Color Settings qq: Color Setting when 0 is selected rr: Color Setting when 1 is selected
	SetPanTiltAngle	8x 01 04 79 0p 0p 0p 0q 0q 0q FF	Pan/Tilt Angle Settings ppp: Pan qqq: Tilt
	SetPTZMask	8x 01 04 7B mm 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF	Pan/Tilt/Zoom Settings for Mask ppp: Pan, qqq: Tilt, rrrr: Zoom
	Non_InterlockMask	8x 01 04 6F mm 0p 0p 0q 0q 0r 0r 0s 0s FF	mm: Non_Interlock Mask Settings pp: X, q: Y, rr: W, ss: H
	GridOn	8x 01 04 7C 02 FF	Grid Display ON
	GridOff	8x 01 04 7C 03 FF	Grid/Center Line Display Off
	CenterLineOn	8x 01 04 7C 04 FF	Center Line Display On

Command List (5/5)

Command Set	Command	Command Packet	Comments
CAM_IDWrite	—	8x 01 04 22 0p 0q 0r 0s FF	pqrs: Camera ID (=0000 to FFFF)
CAM_MD	On	8x 01 04 1B 02 FF	Motion Detection (MD) On/Off
	Off	8x 01 04 1B 03 FF	
	Function Set	8x 01 04 1C 0m 0n 0p 0q 0r 0s FF	m: Display mode n: Detection Frame Set (0 to F) pq: Threshold Level (00 to FF) rs: Interval Time set (00 to FF)
	Window Set	8x 01 04 1D 0m 0p 0q rr 0s FF	m: Select Detection Frame (0, 1, 2, 3) p: Start Horizontal Position (00 to 0F) q: Start Vertical Position (00 to 07) r: Stop Horizontal Position (01 to 10) s: Stop Vertical Position (01 to 08)
	Alarm (Reply)	y0 07 04 1B 0p FF	p: Detection Frame Number
CAM_Continuous ZoomPosReply	On	8x 01 04 69 02 FF	ZoomPosition data Continuous Output On/Off
	Off	8x 01 04 69 03 FF	
	(Reply)	y0 07 04 69 0p 0p 0q 0q 0q 0q FF	pp: D-Zoom Position * 00: When Zoom Mode is Combine qqqq: Zoom Position
CAM_ ReplyIntervalTimeSet	—	8x 01 04 6A 00 00 0p 0p FF	pp: Interval Time [Vertical timing]
CAM_RegisterValue	—	8x 01 04 24 mm 0p 0p FF	mm: Register No. (=00-7F) pp: Register Value (=00-7F)
CAM_ColorEnhance	Parameter Set	8x 01 04 20 mm nn pp qq rr FF	mm: First byte from the top threshold value nn: Second byte from the top threshold value pp: Third byte from the top threshold value qq: Color specification for high-intensity rr: Color specification for low-intensity Range for mm, nn, and pp is 0 to F. Range for qq and rr is 0 to 8. Colors 0: Yellow, 1: Cyan, 2: Green, 3: White, 4: Magenta, 5: Red, 6: Blue, 7: Black, 8: Gray
	On	8x 01 04 50 02 FF	Color Enhancement ON/OFF
	Off	8x 01 04 50 03 FF	
CAM_ChromaSuppress		8x 01 04 5F pp FF	pp: Chroma Suppress setting level 00: OFF 1 to 3: ON (3 levels). Effect increases as the level number increases.
CAM_ColorGain	Direct	8x 01 04 49 00 00 00 0p FF	p: Color Gain setting 0h (60%) to Eh (200%)
CAM_ColorHue	Direct	8x 01 04 4F 00 00 00 0p FF	p: Color Hue setting 0h (– 14 dgrees) to Eh (+14 degrees)

Inquiry Command List (1/3)

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	On
		y0 50 03 FF	Off (Standby)
CAM_ZoomPosInq	8x 09 04 47 FF	y0 50 0p 0q 0r 0s FF	pqrs: Zoom Position
CAM_DZoomModeInq	8x 09 04 06 FF	y0 50 02 FF	D-Zoom On
		y0 50 03 FF	D-Zoom Off
CAM_DZoomC/SModeInq	8x 09 04 36 FF	y0 50 00 FF	Combine Mode
		y0 50 01 FF	Separate Mode
CAM_DZoomPosInq	8x 09 04 46 FF	y0 50 00 00 0p 0q FF	pq: D-Zoom Position
CAM_FocusModeInq	8x 09 04 38 FF	y0 50 02 FF	Auto Focus
		y0 50 03 FF	Manual Focus
CAM_FocusPosInq	8x 09 04 48 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Position
CAM_FocusNearLimitInq	8x 09 04 28 FF	y0 50 0p 0q 0r 0s FF	pqrs: Focus Near Limit Position
CAM_AFSensitivityInq	8x 09 04 58 FF	y0 50 02 FF	AF Sensitivity Normal
		y0 50 03 FF	AF Sensitivity Low
CAM_AFModeInq	8x 09 04 57 FF	y0 50 00 FF	Normal AF
		y0 50 01 FF	Interval AF
		y0 50 02 FF	Zoom Trigger AF
CAM_AFTimeSettingInq	8x 09 04 27 FF	y0 50 0p 0q 0r 0s FF	pq: Movement Time, rs: Interval
CAM_IRCorrectionInq	8x 09 04 11 FF	y0 50 00 FF	Standard
		y0 50 01 FF	IR Light
CAM_WBModeInq	8x 09 04 35 FF	y0 50 00 FF	Auto
		y0 50 01 FF	In Door
		y0 50 02 FF	Out Door
		y0 50 03 FF	One Push WB
		y0 50 04 FF	ATW
		y0 50 05 FF	Manual
		y0 50 06 FF	Outdoor Auto
		y0 50 07 FF	Sodium Lamp Auto
		y0 50 08 FF	Sodium Lamp
CAM_RGainInq	8x 09 04 43 FF	y0 50 00 00 0p 0q FF	pq: R Gain
CAM_BGainInq	8x 09 04 44 FF	y0 50 00 00 0p 0q FF	pq: B Gain
CAM_AEModeInq	8x 09 04 39 FF	y0 50 00 FF	Full Auto
		y0 50 03 FF	Manual
		y0 50 0A FF	Shutter Priority
		y0 50 0B FF	Iris Priority
		y0 50 0D FF	Bright
CAM_SlowShutterModeInq	8x 09 04 5A FF	y0 50 02 FF	Auto
		y0 50 03 FF	Manual
CAM_ShutterPosInq	8x 09 04 4A FF	y0 50 00 00 0p 0q FF	pq: Shutter Position
CAM_IrisPosInq	8x 09 04 4B FF	y0 50 00 00 0p 0q FF	pq: Iris Position
CAM_GainPosInq	8x 09 04 4C FF	y0 50 00 00 0p 0q FF	pq: Gain Position
CAM_GainLimitInq	8x 09 04 2C FF	y0 50 0q FF	p: Gain Limit
CAM_BrightPosInq	8x 09 04 4D FF	y0 50 00 00 0p 0q FF	pq: Bright Position
CAM_ExpCompModeInq	8x 09 04 3E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ExpCompPosInq	8x 09 04 4E FF	y0 50 00 00 0p 0q FF	pq: ExpComp Position
CAM_BackLightModeInq	8x 09 04 33 FF	y0 50 02 FF	On
		y0 50 03 FF	Off

Inquiry Command List (2/3)

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_SpotAEModeInq	8x 09 04 59 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_SpotAEPosInq	8x 09 04 29 FF	y0 50 0p 0q 0r 0s FF	pq: X position, rs: Y position
CAM_AE_ResponseInq	8x 09 04 5D FF	y0 50 pp FF	pp: 01 to 20 (hex)
CAM_WDModeInq	8x 09 04 3D FF	y0 50 02 FF	On
		y0 50 03 FF	Off
		y0 50 00 FF	AutoOnOff
		y0 50 01 FF	On (RatioFix)
		y0 50 04 FF	On (Dver operation)
CAM_WDParameterInq	8x 09 04 2D FF	y0 50 0p 0q 0r 0s 0t 0u 00 00 FF	p: Screen display q: Detection sensitivity r: Blocked-up shadow correction level s: Blown-out highlight correction level tu: Exposure ratio of short exposure
CAM_WDAlarmReplyInq	8x 09 04 3B FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ApertureInq	8x 09 04 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture Gain
CAM_HRModeInq	8x 09 04 52 FF	y0 50 02 FF	On (Hi-Resolution)
		y0 50 03 FF	Off
CAM_NRModeInq	8x 09 04 53 FF	y0 50 0p FF	Noise Reduction p: 0 to 5
CAM_GammaInq	8x 09 04 5B FF	y0 50 0p FF	Gamma p: 0 to 4
CAM_HighSensitivityInq	8x 09 04 5E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_LR_ReverseModeInq	8x 09 04 61 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_FreezeModeInq	8x 09 04 62 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_PictureEffectModeInq	8x 09 04 63 FF	y0 50 00 FF	Off
		y0 50 02 FF	Neg.Art
		y0 50 04 FF	B&W
CAM_PictureFlipModeInq	8x 09 04 66 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ICRModeInq	8x 09 04 01 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_AutoICRModeInq	8x 09 04 51 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_AutoICRThresholdInq	8x 09 04 21 FF	y0 50 00 00 0p 0q FF	pq: ICR ON → OFF Threshold Level
CAM_AutoICRAlarmReplyInq	8x 09 04 31 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_MemoryInq	8x 09 04 3F FF	y0 50 pp FF	pp: Memory number recalled last
CAM_MemSaveInq	8x 09 04 23 0X FF	y0 50 0p 0p 0q 0q FF	X: 00 to 07 (Address) ppqq: 0x0000 to 0xFFFF (Data)
CAM_DisplayModeInq	8x 09 04 15 FF (8x 09 06 06 FF)	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_Stabilize Mode Inq	8x 09 04 34 FF	y0 05 02 FF	On
		y0 05 03 FF	Off
		y0 05 00 FF	Hold

Inquiry Command List (3/3)

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_MuteModeInq	8x 09 04 75 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_PrivacyDisplayInq	8x 09 04 77 FF	y0 50 pp pp pp pp FF	pp pp pp pp: Mask Display (0: OFF, 1: ON)
CAM_PrivacyPanTiltInq	8x 09 04 79 FF	y0 50 0p 0p 0p 0q 0q 0q FF	ppp: Pan qqq: Tilt
CAM_PrivacyPTZInq	8x 09 04 7B mm FF	y0 50 0p 0p 0p 0q 0q 0q 0r 0r 0r 0r FF	mm: Mask Settings ppp: Pan qqq: Tilt rrr: Zoom
CAM_PrivacyMonitorInq	8x 09 04 6F FF	y0 50 pp pp pp pp FF	pp pp pp pp: Mask is displayed now.
CAM_IDInq	8x 09 04 22 FF	y0 50 0p 0q 0r 0s FF	pqrs: Camera ID
CAM_VersionInq	8x 09 00 02 FF	y0 50 00 20 mn pq rs tu vw FF	mnpq: Model Code (04xx) rstu: ROM version vw: Socket Number (=02)
CAM_MDModeInq	8x 09 04 1B FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_MDFunctionInq	8x 09 04 1C FF	y0 50 0m 0n 0p 0q 0r 0s FF	m: Display mode n: Detection Frame Set (0 to F) pq: Threshold Level (0 to FF) rs: Interval Time set (0 to FF)
CAM_MDWindowInq	8x 09 04 1D 0m FF	y0 50 0p 0q 0r 0s FF	m: Select Detection Frame (0, 1, 2, 3) p: Start Horizontal Position (00 to 0B) q: Start Vertical Position (00 to 07) r: Stop Horizontal Position (01 to 0C) s: Stop Vertical Position (01 to 08)
CAM_ContinuousZoomPos ReplyModeInq	8x 09 04 69 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ReplyIntervalTimeInq	8x 09 04 6A FF	y0 50 00 00 0p 0p FF	pp: Interval Time
CAM_RegisterValueInq	8x 09 04 24 mm FF	y0 50 0p 0p ff	mm: Register No. (00 to 7F) pp: Register Value (00 to FF)
CAM_ColorEnhanceInq	8x 09 04 20 FF	y0 50 mm nn pp qq rr FF	mm: First byte from the top threshold value nn: Second byte from the top threshold value pp: Third byte from the top threshold value qq: Color specification for high-intensity rr: Color specification for low-intensity Colors 0: Yellow, 1: Cyan, 2: Green, 3: White, 4: Magenta, 5: Red, 6: Blue, 7: Black, 8: Gray
	8x 09 04 50 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ChromaSuppressInq	8x 09 04 5F FF	y0 50 pp FF	pp: Chroma Suppress setting level
CAM_ColorGainInq	8x 09 04 49 FF	y0 50 00 00 00 0p FF	p: Color Gain setting 0h (60%) to Eh (200%)
CAM_ColorHueInq	8x 09 04 4F FF	y0 50 00 00 00 0p FF	p: Color Hue setting 0h (– 14 degrees) to Eh (+ 14 degrees)
CAM_TempInq	8x 09 04 68 FF	Y0 50 00 00 0p 0q FF	pq: Temperature *Lens temperature

Block Inquiry Command List

Lens Control System Inquiry Commands .....Command Packet 8x 09 7E 7E 00 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	Zoom Position (HH)
	2	
	1	
	0	
3	7	0
	6	0
	5	0
	4	0
	3	Zoom Position (HL)
	2	
	1	
	0	
4	7	0
	6	0
	5	0
	4	0
	3	Zoom Position (LH)
	2	
	1	
	0	
5	7	0
	6	0
	5	0
	4	0
	3	Zoom Position (LL)
	2	
	1	
	0	

Byte	Bit	Comments
6	7	0
	6	0
	5	0
	4	0
	3	Focus Near Limit (H)
	2	
	1	
	0	
7	7	0
	6	0
	5	0
	4	0
	3	Focus Near Limit (L)
	2	
	1	
	0	
8	7	0
	6	0
	5	0
	4	0
	3	Focus Position (HH)
	2	
	1	
	0	
9	7	0
	6	0
	5	0
	4	0
	3	Focus Position (HL)
	2	
	1	
	0	
10	7	0
	6	0
	5	0
	4	0
	3	Focus Position (LH)
	2	
	1	
	0	
11	7	0
	6	0
	5	0
	4	0
	3	Focus Position (LL)
	2	
	1	
	0	

Byte	Bit	Comments
12	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
13	7	0
	6	0
	5	DZoomMode 0: Combine 1: Separate
	4 3	0: Normal 1: Interval 2: Zoom Trigger
	2	AF Sensitivity 0: Slow 1: Normal
	1	Digital Zoom 1: On 0: Off
	0	Focus Mode 0: Manual 1: Auto
14	7	0
	6	0
	5	0
	4	0
	3	Low Contrast Detection 1: Yes 0: No
	2	Camera Memory Recall 1: Executing 0: Stopped
	1	Focus Command 1: Executing 0: Stopped
	0	Zoom Command 1: Executing 0: Stopped
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

Camera Control System Inquiry Commands .....Command Packet 8x 09 7E 7E 01 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	R Gain (H)
	2	
	1	
	0	
3	7	0
	6	0
	5	0
	4	0
	3	R Gain (L)
	2	
	1	
	0	
4	7	0
	6	0
	5	0
	4	0
	3	B Gain (H)
	2	
	1	
	0	
5	7	0
	6	0
	5	0
	4	0
	3	B Gain (L)
	2	
	1	
	0	

Byte	Bit	Comments
6	7	0
	6	0
	5	0
	4	0
	3	WB Mode
	2	
	1	
	0	
7	7	0
	6	0
	5	0
	4	0
	3	Aperture Gain
	2	
	1	
	0	
8	7	0
	6	0
	5	0
	4	Exposure Mode
	3	
	2	
	1	
	0	
9	7	0
	6	0
	5	High-Resolution 1: On 0: Off
	4	WD (1: Other than Off, 0: Off)
	3	Spot AE 1: On 0: Off
	2	Back Light 1: On 0: Off
	1	Exposure Comp. 1: On 0: Off
	0	Slow Shutter 1: Auto 0: Manual
10	7	0
	6	0
	5	0
	4	Shutter Position
	3	
	2	
	1	
	0	
11	7	0
	6	0
	5	0
	4	Iris Position
	3	
	2	
	1	
	0	

Byte	Bit	Comments
12	7	0
	6	0
	5	0
	4	0
	3	Gain Position
	2	
	1	
	0	
13	7	0
	6	0
	5	0
	4	Bright Position
	3	
	2	
	1	
	0	
14	7	0
	6	0
	5	0
	4	0
	3	Exposure Comp. Position
	2	
	1	
	0	
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

Other Inquiry Commands .....Command Packet 8x 09 7E 7E 02 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	Auto ICR Alarm (1: On, 0: Off)
	2	Auto ICR 1: On 0: Off
	1	0
	0	Power 1: On 0: Off
3	7	0
	6	0
	5	0
	4	ICR 1: On 0: Off
	3	Freeze 1: On 0: Off
	2	LR Reverse 1: On 0: Off
	1	0
	0	0
4	7	0
	6	0
	5	Privacy Zone 1: On 0: Off
	4	Mute 1: On 0: Off
	3	Title Display 1: On 0: Off
	2	Display 1: On 0: Off
	1	0
	0	0
5	7	0
	6	0
	5	0
	4	0
	3	Picture Effect Mode
	2	
	1	
	0	

Byte	Bit	Comments
6	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
7	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
8	7	0
	6	0
	5	0
	4	0
	3	Camera ID (HH)
	2	
	1	
	0	
9	7	0
	6	0
	5	0
	4	0
	3	Camera ID (HL)
	2	
	1	
	0	
10	7	0
	6	0
	5	0
	4	0
	3	Camera ID (LH)
	2	
	1	
	0	
11	7	0
	6	0
	5	0
	4	0
	3	Camera ID (LL)
	2	
	1	
	0	

Byte	Bit	Comments
12	7	0
	6	0
	5	0
	4	Memory 1: Provided 0: Not provided
	3	0
	2	ICR 1: Provided 0: Not provided
	1	0
	0	1: 1/50, 1/25 0: 1/60, 1/30
13	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
14	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

Enlargement Function1 Query Command.....Command Packet 8x 09 7E 7E 03 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	Digital Zoom Position (H)
	2	
	1	
	0	
3	7	0
	6	0
	5	0
	4	0
	3	Digital Zoom Position (L)
	2	
	1	
	0	
4	7	0
	6	0
	5	0
	4	0
	3	AF Activation Time (H)
	2	
	1	
	0	
5	7	0
	6	0
	5	0
	4	0
	3	AF Activation Time (L)
	2	
	1	
	0	

Byte	Bit	Comments
6	7	0
	6	0
	5	0
	4	0
	3	AF Interval Time (H)
	2	
	1	
	0	
7	7	0
	6	0
	5	0
	4	0
	3	AF Interval Time (L)
	2	
	1	
	0	
8	7	0
	6	0
	5	0
	4	0
	3	SpotAE Position (X)
	2	
	1	
	0	
9	7	0
	6	0
	5	0
	4	0
	3	SpotAE Position (Y)
	2	
	1	
	0	
10	7	0
	6	0
	5	0
	4	0
	3	0
	2	MD (1: On, 0: Off)
	1	Reserved
	0	Picture flip (1: On, 0: Off)

Byte	Bit	Comments
11	7	0
	6	Color Gain (0h (60%) to Eh (200%))
	5	
	4	
	3	
	2	Advanced Privacy (1: Provided, 0: Not provided)
	1	Alarm (1: Provided, 0: Not provided)
	0	Picture flip (1: Provided, 0: Not provided)
12	7	0
	6	0
	5	0
	4	AE Response
	3	
	2	
	1	
	0	
13	7	0
	6	Gamma
	5	
	4	
	3	High Sensitivity mode (1: ON, 0: OFF)
	2	NR Level
	1	
	0	
14	7	0
	6	Chroma Suppress
	5	
	4	
	3	Gain Limit
	2	
	1	
	0	
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

Enlargement Function2 Query Command.....Command Packet 8x 09 7E 7E 04 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	0
	2	WD mode (0: OFF, 1: ON,
	1	2: Auto ON/OFF, 3: ON
	0	(RatioFIx), 4: ON (Dver))
3	7	0
	6	0
	5	0
	4	0
	3	WD screen display
	2	0: Combined image 2: Long-time 3: Short-time
	1	WD detection sensitivity
	0	0: L 1: M 2: H
4	7	0
	6	0
	5	0
	4	0
	3	WD blocked-up shadow
	2	correction level 0: L 1: M 2: H 3: S
	1	WD blown-out highlight
	0	correction level 0: L 1: M 2: H
5	7	0
	6	0
	5	0
	4	0
	3	
	2	WD short exposure
	1	Exposure ratio (H)
	0	

Byte	Bit	Comments
6	7	0
	6	0
	5	0
	4	0
	3	
	2	WD short exposure
	1	Exposure ratio (L)
	0	
7	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
8	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
9	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
10	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0

Byte	Bit	Comments
11	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
12	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
13	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
14	7	0
	6	0
	5	0
	4	0
	3	0
	2	0
	1	0
	0	0
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

Enlargement Function3 Query Command.....Command Packet 8x 09 7E 7E 05 FF

Byte	Bit	Comments
0	7	Destination Address
	6	
	5	
	4	
	3	Source Address
	2	
	1	
	0	
1	7	0 Completion Message (50h)
	6	1
	5	0
	4	1
	3	0
	2	0
	1	0
	0	0
2	7	0
	6	0
	5	0
	4	0
	3	Color Hue
	2	(0h(– 14 degrees) to Eh(+ 14 degrees))
	1	
	0	
3	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
4	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
5	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	

Byte	Bit	Comments
6	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
7	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
8	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
9	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
10	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	

Byte	Bit	Comments
11	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
12	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
13	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
14	7	0
	6	Reserved
	5	
	4	
	3	
	2	
	1	
	0	
15	7	1 Terminator (FFh)
	6	1
	5	1
	4	1
	3	1
	2	1
	1	1
	0	1

VISCA Command Setting Values

Exposure control (1/2)

		60/30 mode	50/25 mode
Shutter Speed	15	1/10000	1/10000
	14	1/6000	1/6000
	13	1/4000	1/3500
	12	1/3000	1/2500
	11	1/2000	1/1750
	10	1/1500	1/1250
	0F	1/1000	1/1000
	0E	1/725	1/600
	0D	1/500	1/425
	0C	1/350	1/300
	0B	1/250	1/215
	0A	1/180	1/150
	09	1/125	1/120
	08	1/100	1/100
	07	1/90	1/75
	06	1/60	1/50
	05	1/30	1/25
	04	1/15	1/12
	03	1/8	1/6
	02	1/4	1/3
	01	1/2	1/2
	00	1/1	1/1
Iris	11	F1.6	
	10	F2	
	0F	F2.4	
	0E	F2.8	
	0D	F3.4	
	0C	F4	
	0B	F4.8	
	0A	F5.6	
	09	F6.8	
	08	F8	
	07	F9.6	
	06	F11	
	05	F14	
	00	CLOSE	

Gain	0F	+28 dB
	0E	+26 dB
	0D	+24 dB
	0C	+22 dB
	0B	+20 dB
	0A	+18 dB
	09	+16 dB
	08	+14 dB
	07	+12 dB
	06	+10 dB
	05	+8 dB
	04	+6 dB
	03	+4 dB
	02	+2 dB
	01	0 dB
	00	–3 dB
Gain Limit	0F	+28 dB
	0E	+26 dB
	0D	+24 dB
	0C	+22 dB
	0B	+20 dB
	0A	+18 dB
	09	+16 dB
	08	+14 dB
	07	+12 dB
	06	+10 dB
	05	+8 dB
	04	+6 dB

Exposure control (2/2)

		IRIS	GAIN
Bright	1F	F1.6	+28 dB
	1E	F1.6	+26 dB
	1D	F1.6	+24 dB
	1C	F1.6	+22 dB
	1B	F1.6	+20 dB
	1A	F1.6	+18 dB
	19	F1.6	+16 dB
	18	F1.6	+14 dB
	17	F1.6	+12 dB
	16	F1.6	+10 dB
	15	F1.6	+8 dB
	14	F1.6	+6 dB
	13	F1.6	+4 dB
	12	F1.6	+2 dB
	11	F1.6	0 dB
	10	F2	0 dB
	0F	F2.4	0 dB
	0E	F2.8	0 dB
	0D	F3.4	0 dB
	0C	F4	0 dB
	0B	F4.8	0 dB
	0A	F5.6	0 dB
	09	F6.8	0 dB
	08	F8	0 dB
	07	F9.6	0 dB
	06	F11	0 dB
	05	F14	0 dB
	00	CLOSE	0 dB
Exposure Comp.	0E	+7	+10.5 dB
	0D	+6	+9 dB
	0C	+5	+7.5 dB
	0B	+4	+6 dB
	0A	+3	+4.5 dB
	09	+2	+3 dB
	08	+1	+1.5 dB
	07	0	0 dB
	06	−1	−1.5 dB
	05	−2	−3 dB
	04	−3	−4.5 dB
	03	−4	−6 dB
	02	−5	−7.5 dB
	01	−6	−9 dB
	00	−7	−10.5 dB

Zoom Ratio and Zoom Position (for reference)

Zoom Ratio ×30 Lens	Optical Zoom Position Data
×1	0000
×2	16A1
×3	2063
×4	2628
×5	2A1D
×6	2D13
×7	2F6D
×8	3161
×9	330D
×10	3486
×11	35D7
×12	3709
×13	3820
×14	3920
×15	3ACA
×16	3ADD
×17	3B9C
×18	3C46
×19	3CDC
×20	3D60
×21	3DD4
×22	3E39
×23	3E90
×24	3EDC
×25	3F1E
×26	3F57
×27	3F8A
×28	3FB6
×29	3FDC
×30	4000

Digital Zoom Combine mode

X12

Digital Zoom Ratio	Digital Zoom Position Data
×1	4000
×2	6000
×3	6A80
×4	7000
×5	7300
×6	7540
×7	76C0
×8	7800
×9	78C0
×10	7980
×11	7A00
×12	7AC0

Digital Zoom Separate mode

X12

Digital Zoom Ratio	Digital Zoom Position Data
×1	00
×2	80
×3	AA
×4	C0
×5	CC
×6	D5
×7	DB
×8	E0
×9	E3
×10	E6
×11	E8
×12	EB

Lens control

Zoom Position	0000 to 4000 to 7AC0 Wide end Optical Digital Tele end Tele end	
Focus Position	1000 to C000 Far end Near end	
Focus Near Limit	1000: Over Inf 2000: 20 m 3000: 10 m 4000: 6 m 5000: 4.2 m 6000: 3.1 m 7000: 2.5 m 8000: 2.0 m 9000: 1.65 m A000: 1.4 m B000: 1.2 m C000: 0.8 m D000: 30 cm (initial setting) E000: 11 cm F000: 1 cm	As the distance on the left will differ due to temperature characteristics, etc., use as approximate values. *The lower 1 byte is fixed at 00.

Wide/Tele Limit Setting

Wide/Tele Limit Setting Value	Wide Limit		Tele Limit	
Limit Setting Value	Zoom Position	Zoom Ratio	Zoom Position	Zoom Ratio
00	0000	1	4000	30
10	00C4	1.02	3F3B	25.5
20	0188	1.04	3E77	22.7
30	024C	1.06	3DB3	20.7
40	0310	1.08	3CEF	19.1
50	03D4	1.11	3C2B	17.8
60	0498	1.13	3B67	16.7
70	055C	1.15	3AA3	15.7
80	0620	1.18	39DF	14.8
90	06E4	1.2	391B	14
A0	07A8	1.23	3857	13.2
B0	086C	1.26	3793	12.5
C0	0930	1.28	36CF	11.8
D0	09F4	1.31	360B	11.2
E0	0AB8	1.34	3547	10.6
F0	0B7C	1.38	3483	10
FF	0C33	1.41	33CC	9.5

Title setting

Line number	00 to 0A	
H-position	00 to 1F	
Blink	00: Dose not blink	
	01: Blinks	
Color	00	White
	01	Yellow
	02	Violet
	03	Red
	04	Cyan
	05	Green
	06	Blue

00	01	02	03	04	05	06	07
A	B	C	D	E	F	G	H
08	09	0a	0b	0c	0d	0e	0f
I	J	K	L	M	N	O	P
10	11	12	13	14	15	16	17
Q	R	S	T	U	V	W	X
18	19	1a	1b	1c	1d	1e	1f
Y	Z	&		?	!	1	2
20	21	22	23	24	25	26	27
3	4	5	6	7	8	9	0
28	29	2a	2b	2c	2d	2e	2f
À	È	Ì	Ò	Ù	Á	É	Í
30	31	32	33	34	35	36	37
Ó	Ú	Â	Ê	Ô	Æ		Ã
38	39	3a	3b	3c	3d	3e	3f
Õ	Ñ	Ç	ß	Ä	Ï	Ö	Ü
40	41	42	43	44	45	46	47
Å	$		¥		£	¿	¡
48	49	4a	4b	4c	4d	4e	4f
ø	”	:	’	.	,	/	-

Temperature Reading Conversion Value (Reference Value)

Reading Value pq (hex)	Temperature Conversion Value (°C)
FB	−8 to −2
00	−3 to +3
0A	7 to 13
14	17 to 23
1E	27 to 33
28	37 to 43
32	47 to 53
3C	57 to 63

Register Setting

The register settings are enabled when the power is turned off and then back on again. After turning the power back on again, verify that the mode settings have been changed.

	Register No.	Value	
VISCA Baud Rate	00	00 (Default value)	9600 bps
		01	19200 bps
		02	38400 bps
Monitoring Mode	72	01 (Default value)	1080i/60 (Frame out: 30PsF)
		02	1080i/59.94 (Frame out: 29.97PsF)
		03	NTSC Analog Output (Stop Digital Output)
		04	1080i/50 (Frame out: 25PsF)
		05	PAL Analog Output (Stop Digital Output)
		06	1080p/30
		07	1080p/29.97
		08	1080p/25
		09	720p/60
		0A	720p/59.94
		0B	NTSC Analog Output (Stop Digital Output)
		0C	720p/50
		0D	PAL Analog Output (Stop Digital Output)
		0E	720p/30
		0F	720p/29.97
		10	NTSC Analog Output (Stop Digital Output)
		11	720p/25
		12	PAL Analog Output (Stop Digital Output)
Output Enabling	73	01	Analog Output enabled
		02	Digital Output enabled
		03 (Default value)	Both Analog/Digital Output enabled
Zoom Limit	50	00-FF (Default value: 00)	Wide Limit (0: Disabled)
	51	00-FF (Default value: 00)	Tele Limit (0: Disabled)
E-Zoom Max	52	00-EB (Default value: EB)	Max. digital zoom ratio = 256 ÷ (256-Value)
StableZoom	53	00 (Default value: 00)	OFF
		01	ON

	Register No.	Value	
FocusTrace @ZoomDirect	54	00	OFF
		01 (Default value: 01)	ON
FocusOffset @DomeCover	55	00-FF (Default value: 00)	00: None to FF: Max.
SAV/EAV	56	00 (Default value: 00)	OFF
		01	ON

- Angle of View in 720p Mode.
  An image is cropped both in 720p/60 and 720p/30 modes.
  In this mode, angle of view at wide end will narrow.

Others

AF Active Time[1)]	00	to	FF
AF Interval Time[1)]	00	to	FF
Spot AE X position	00	to	0F
Spot AE Y position	00	to	0F
R Gain	00	to	FF
B Gain	00	to	FF
Aperture Level	00	to	0F
AE Response	01	to	30
AutoICR ON → OFF Threshold Level	00	to	1C
MD Threshold Level	00	to	FF
MD Interval Time[1)]	00	to	FF
MD Set Horizontal Position	00	to	10
MD Set Vertical Position	00	to	08
Color Enhancement threshold value	01	to	FE1
Color Enhancement high-intensity color specification	00	to	08
Color Enhancement low-intensity color specification	00	to	08
Chroma Suppress setting level	00	to	03
Color Gain setting level	00	to	0E
Color Hue setting level	00	to	0E

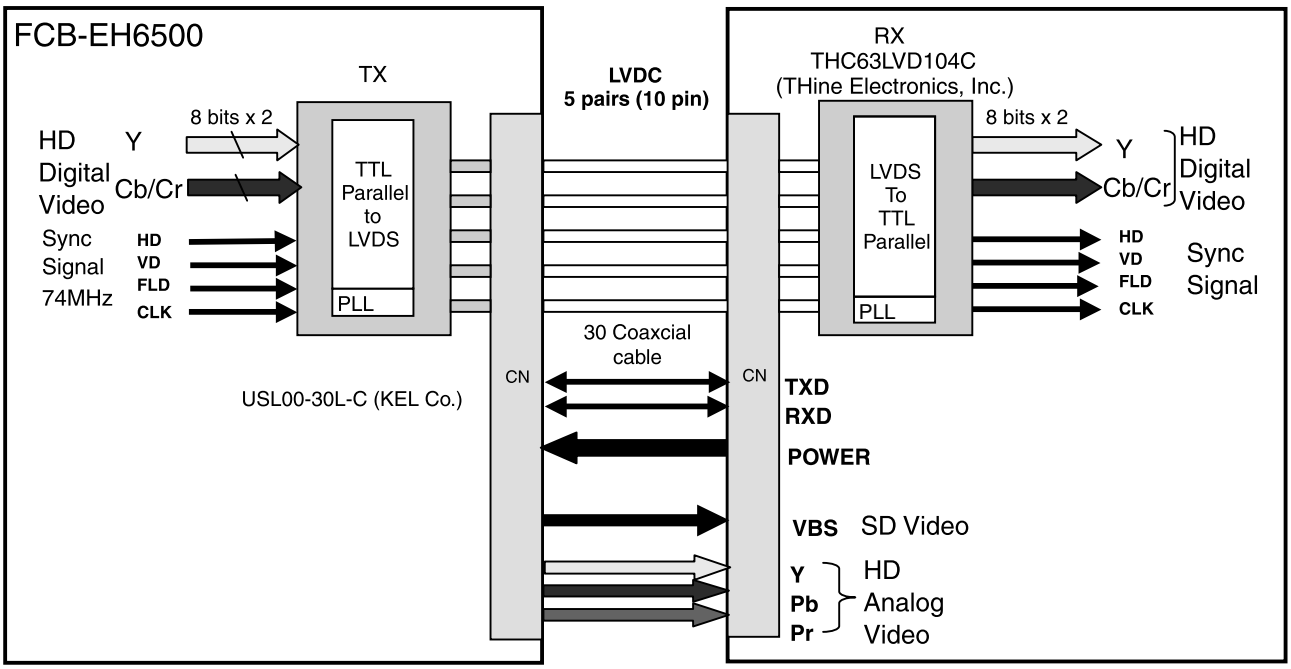
[1)] Unit: One second

Specifications

Imager 1/2.8 Type Exmor CMOS Sensor
Picture elements 3270K pixels
Lens 30× zoom
F= 4.3 mm (WIDE) to 129 mm (TELE), F1.6 to F4.7
Zoom movement speed
Optical WIDE – Optical TELE
4.6 sec (Focus Tracking ON)
3.2 sec (Focus Tracking OFF)
Optical WIDE – Digital TELE
6.7 sec (30p/60p mode)
7.1 sec (25p/50p mode)
Digital WIDE – Digital TELE
2.2 sec (30p/60p mode)
2.7 sec (25p/50p mode)
Focus Movement time
∞ to Near 1.1 sec
Digital zoom 12× (360× with optical zoom)
Angle of view (H)
Approx. 59.5 degrees (WIDE end), approx. 2.1 degrees (TELE end) (1080i mode)
Approx. 40.6 degrees (WIDE end), approx. 1.43 degrees (TELE end) (720p mode)
Min. working distance
10 mm (WIDE end), 1200 mm (TELE end)
Sync system Internal
Min. illumination (Typical value) 0.5 lx (1/30 sec, 50%, High Sensitivity mode ON)
1.7 lx (1/30 sec, 50%, High Sensitivity mode OFF)
0.08 lx (1/4 sec, 1/3 sec, 50%, High Sensitivity mode ON)
0.26 lx (1/4 sec, 1/3 sec, 50%, High Sensitivity mode OFF)
ICR-ON Mode
0.095 lx (1/30 sec, 50%, High Sensitivity mode ON)
0.3 lx (1/30 sec, 50%, High Sensitivity mode OFF)
0.005 lx (1/4 sec, 1/3 sec, 30%, High Sensitivity mode ON)
Recommended illumination
100 lx to 100,000 lx
S/N ratio 50 dB (Weight ON)
Back light compensation
ON/OFF
Electronic shutter speed
60/30 mode: 1/1 sec to 1/10000 sec (22 steps)
50/25 mode: 1/1 sec to 1/10000 sec (22 steps)
White balance AUTO, ATW, Indoor, Outdoor, One Push WB, Manual WB, Outdoor Auto, Sodium Vapor Lamp (Fix/Auto)
Gain Auto/Manual (–3 dB to +28 dB, 16 steps)
Max. Gain Limit (6 dB to 28 dB, 12 steps)
Wide dynamic range
ON/OFF/AUTO
Noise reduction
ON/OFF (level 5 to 1 / OFF, 6 steps)
Color Enhancement
ON/OFF
Aperture control 16 steps
Preset 6-POSITIONS
Serial interface VISCA protocol (CMOS 5V)
9.6 kbps, 19.2 kbps, 38.4 kbps, Stop bit, 1 bit
Video Output HD: Analog component (Y/Pb/Pr)
Digital (LVDS)
Analog SD: VBS
Storage temperature/Humidity
–20 °C to +60 °C (–4 °F to +140 °F)/20% to 95%
Operating temperature/Humidity
–5 °C to +60 °C (23 °F to +140 °F)/20% to 80%
Power requirements/Power consumption
6 V to 12 V DC/3.2 W (3.8 W)
Weight Approx. 265 g (9.3 oz.)
Dimensions 50.0 × 60 × 89.7 mm ($2 \times 2\ ^3/_8 \times 3\ ^1/_2$ in.) (w/h/d)

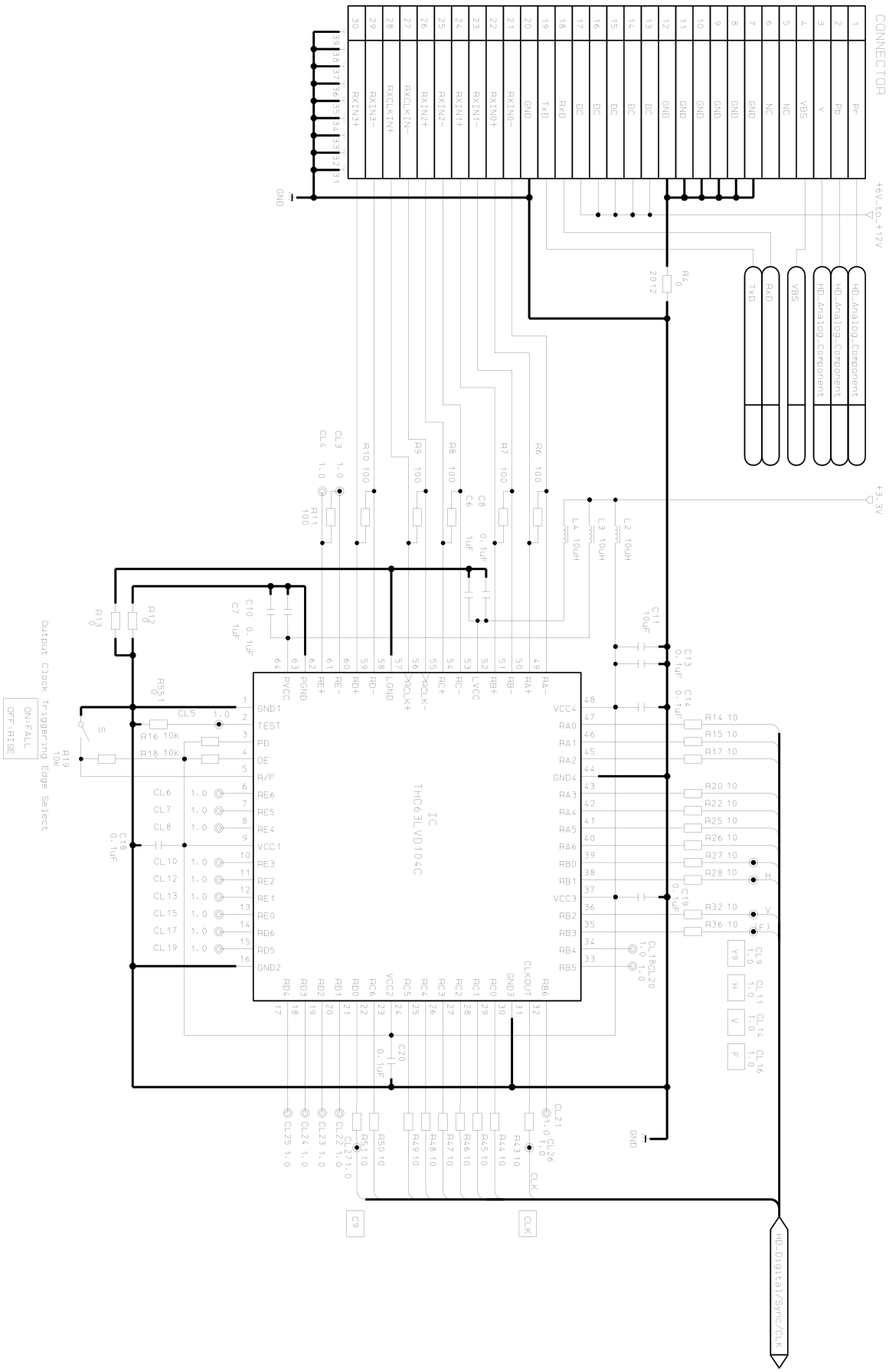
Design and specifications are subject to change without notice.

Interface



- The FCB-EH6500 uses the LVDS transmitter IC chip. The LVDS receiver IC chip (e.g., THC63LVD104C) is recommended.
- Recommended connectors and cables
  Cable: #42 thin coaxial cable
  Connector: USL20-30S (KEL)

LVDS receiver circuit example

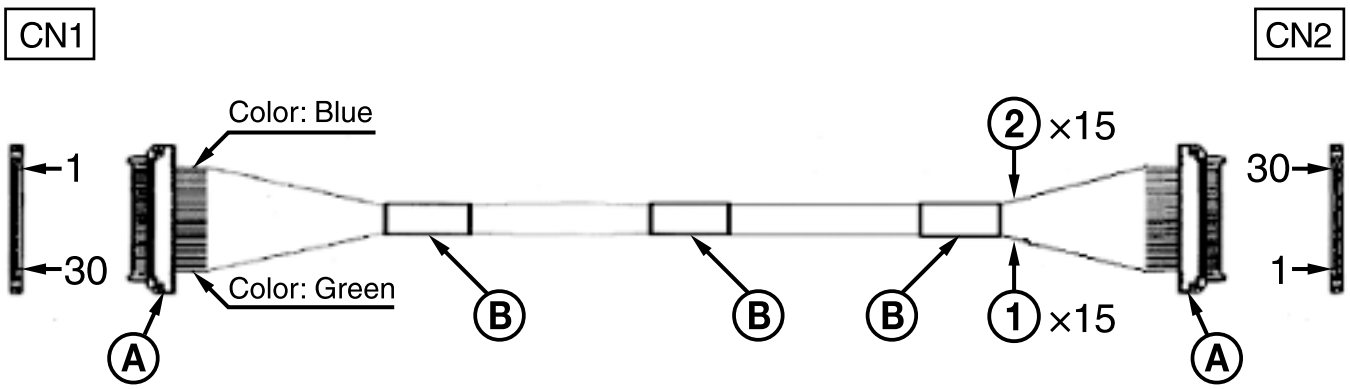


- When using the circuit example, use 1-N crossover cables. (The pin numbers of the unit are reversed in the circuit example.)
- SW selects whether to input at the rising edge or falling edge of the signal.

LVDS receiver IC (example: THC63LVD104C)
Pin assignment LVDS input - CMOS/TTL output

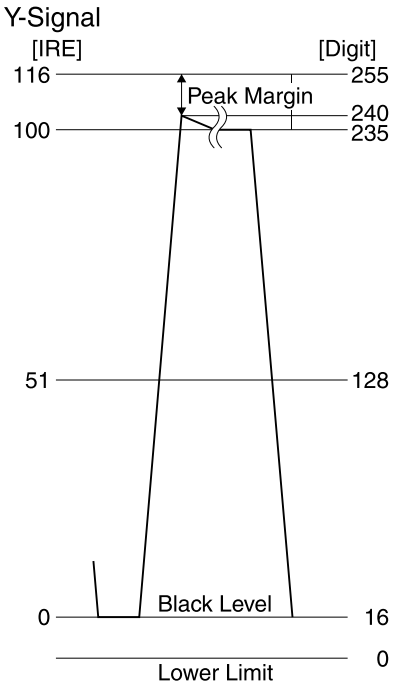
Pin No.	Description	Signal	Pin No.	Description	Signal
1	GND1		33		
2	TEST		34		
3			35	RB3	FLD
4			36	RB2	VD
5			37	VCC3	
6			38	RB1	HD
7			39	RB0	Y7
8			40	RA6	Y6
9			41	RA5	Y5
10			42	RA4	Y4
11			43	RA3	Y3
12			44	GND4	
13			45	RA2	Y2
14			46	RA1	Y1
15			47	RA0	Y0
16			48	VCC4	
17	RD4		49	RA−	RXIN0−
18	RD3		50	RA+	RXIN0+
19	RD2		51	RB−	RXIN1−
20	RD1		52	RB+	RXIN1+
21	RD0	C7	53	LVCC	
22	RC6	C6	54	RC−	RXIN2−
23	VCC2		55	RC+	RXIN2+
24	RC5	C5	56	PCLK−	RXCLKIN−
25	RC4	C4	57	PCLK+	RXCLKIN+
26	RC3	C3	58	LGND	
27	RC2	C2	59	RD−	RXIN3−
28	RC1	C1	60	RD+	RXIN3+
29	RC0	C0	61	RE−	
30	GND3		62	RE+	
31	CLKOUT	CLK	63		
32			64		

Cable reference specifications (crossover)



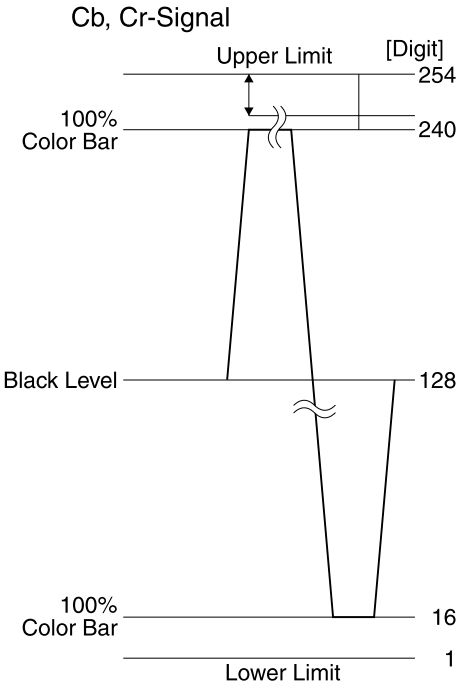
• Recommended connectors and cables
Cable① green: #42 thin coaxial cable
Cable② blue: #42 thin coaxial cable
ConnectorⒶ: USL20-30S (KEL)
Binding tapeⒷ

DIGITAL Image Output Y, Cb, Cr 4:2:2 FORMAT



Data Format : Straight Binary
Black Level : 16 (10H)
100IRE : 235
Prohibited Data : 0,255 (0h,FFh)

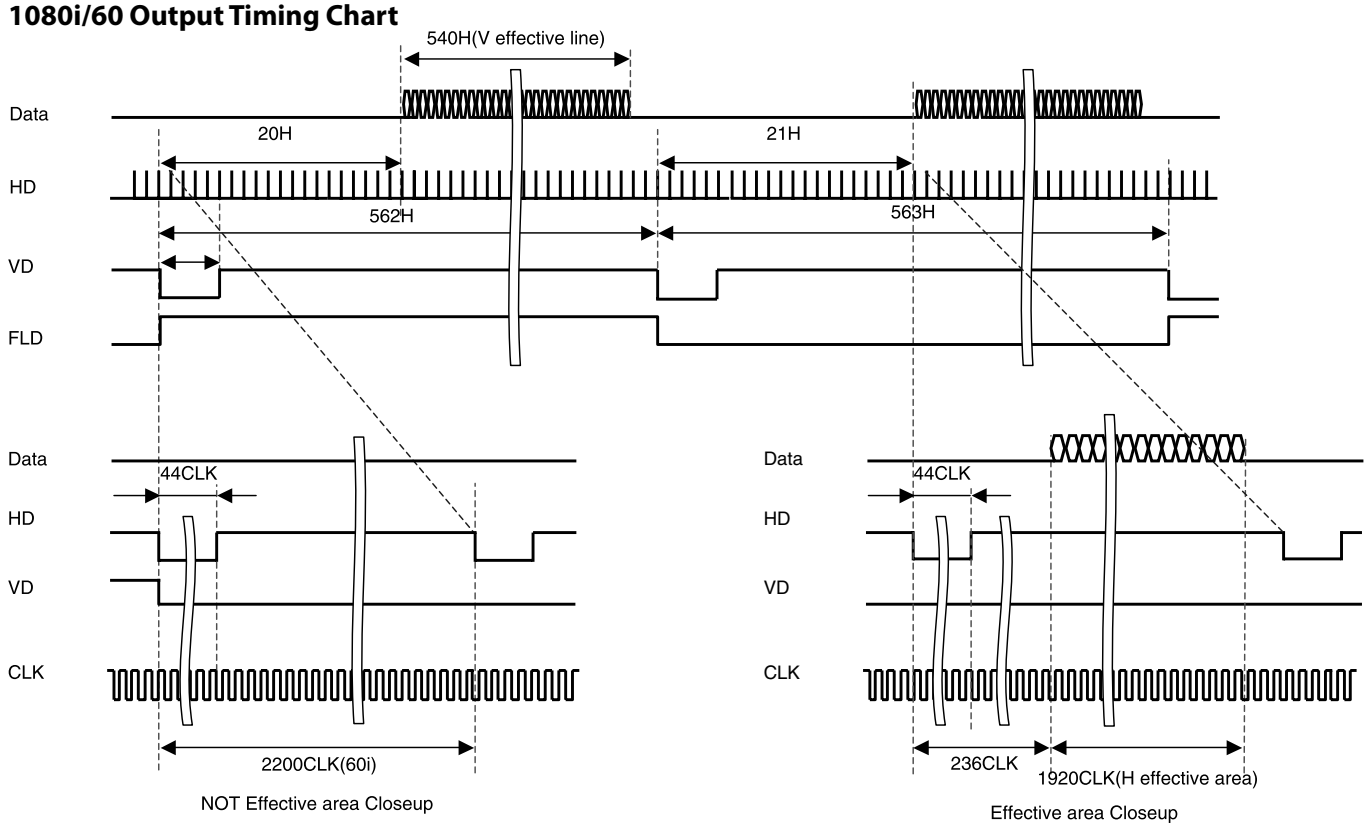
Color coding complies with BT709.



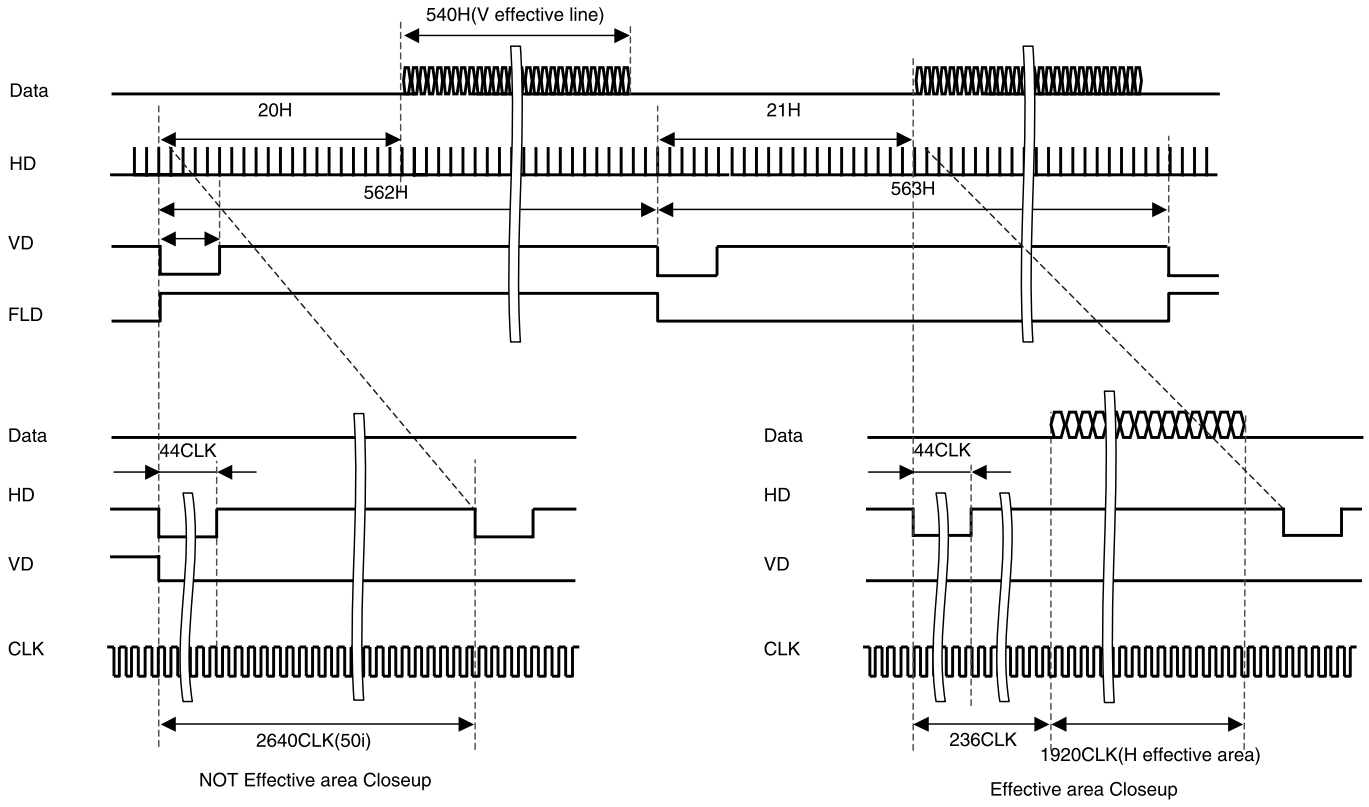
Data Format : Straight Binary
Black Level : 16 (10H)
100IRE : 235
Prohibited Data : 0,255 (0h,FFh)

Timing Chart

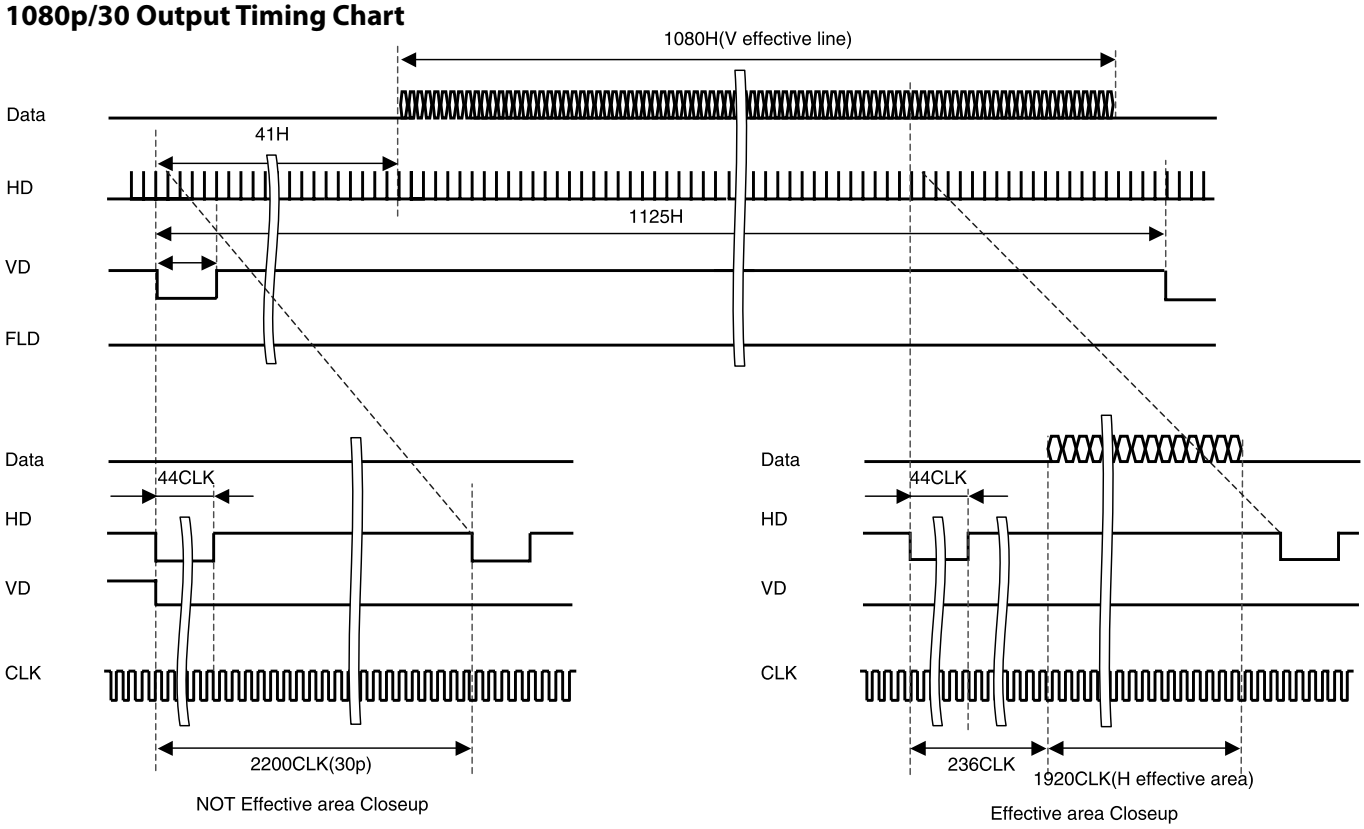
1080i/60 Output Timing Chart



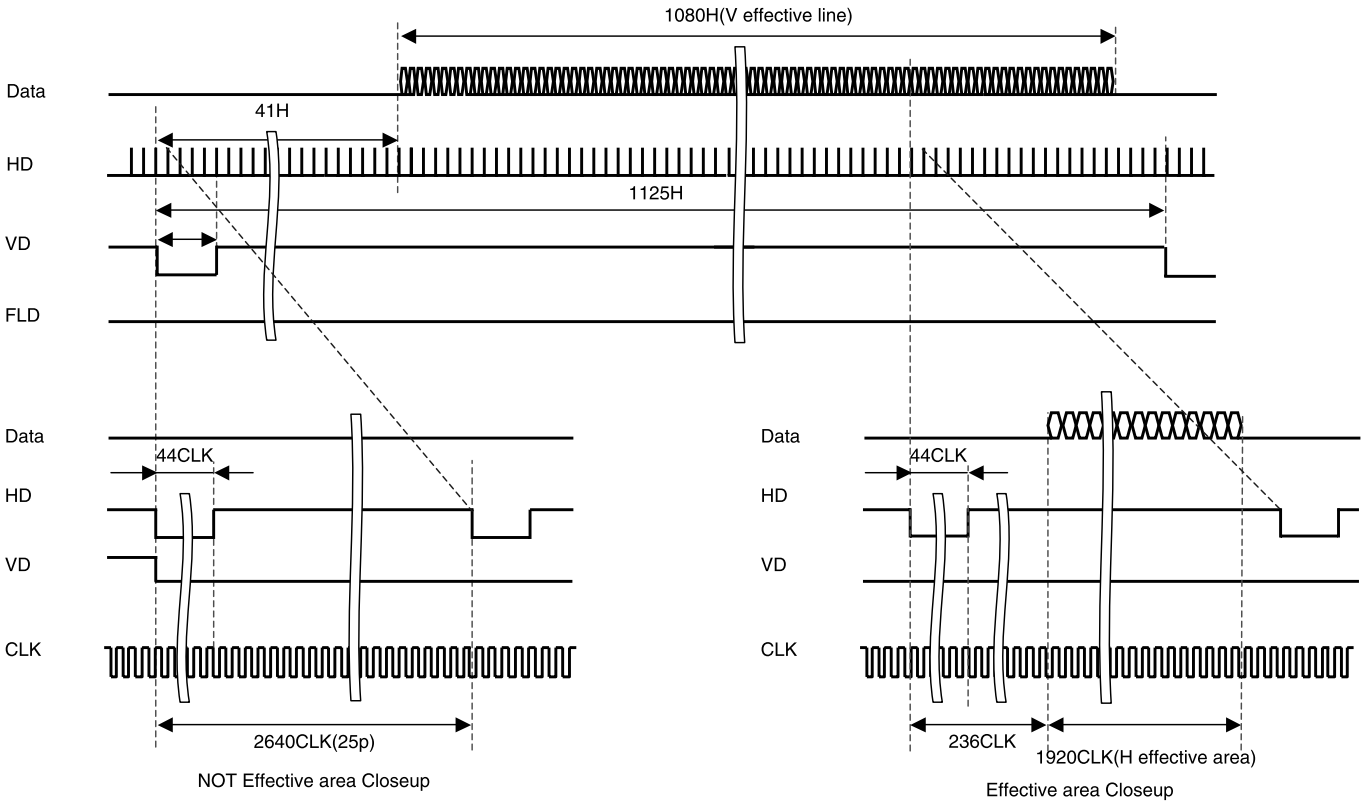
1080i/50 Output Timing Chart



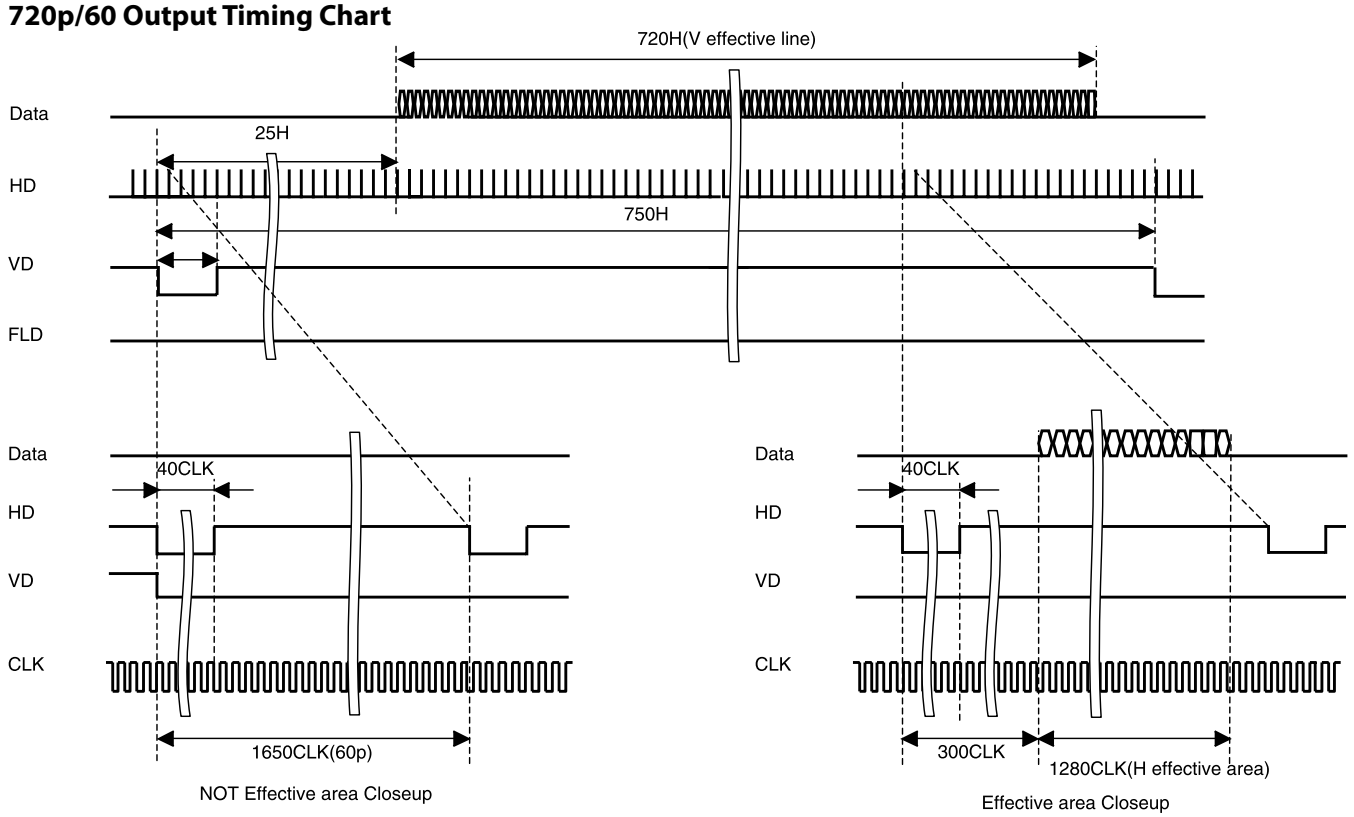
1080p/30 Output Timing Chart



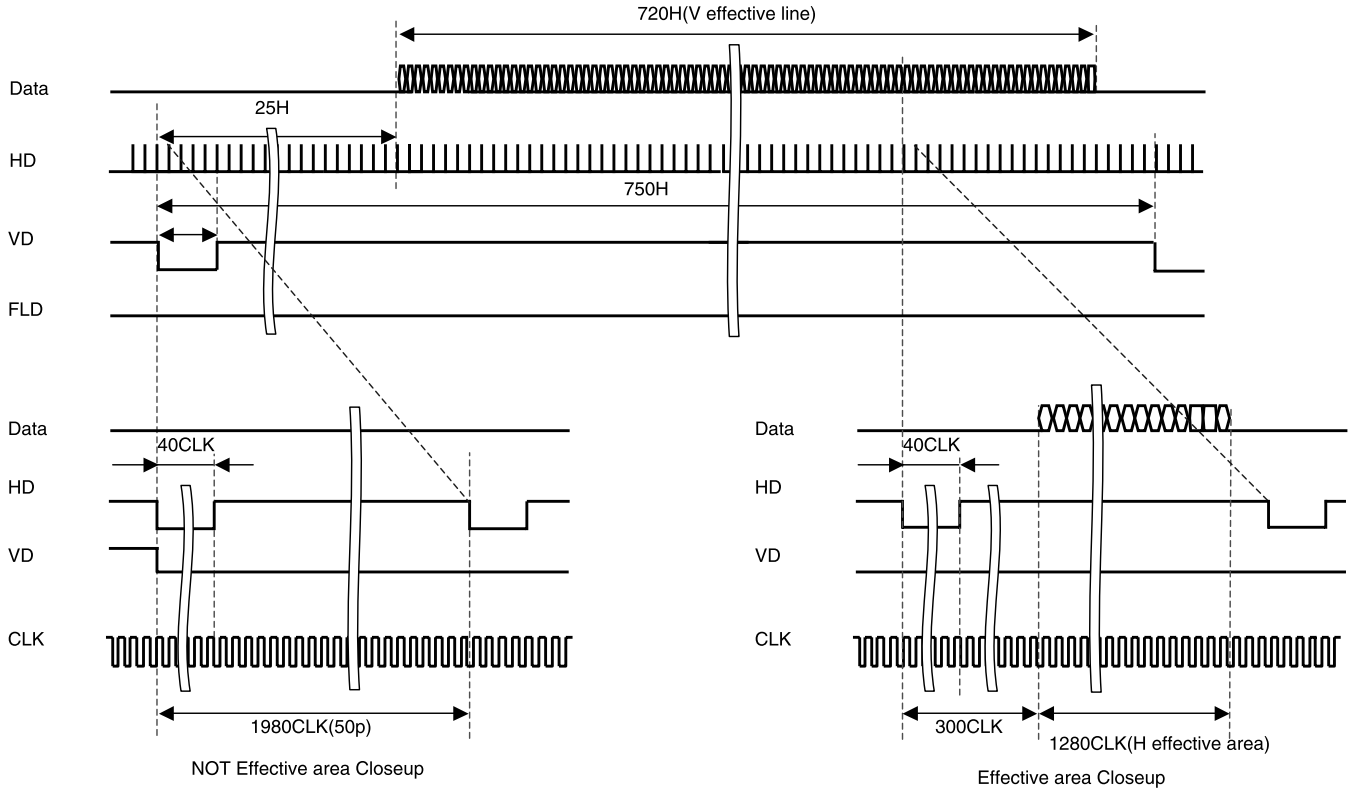
1080p/25 Output Timing Chart



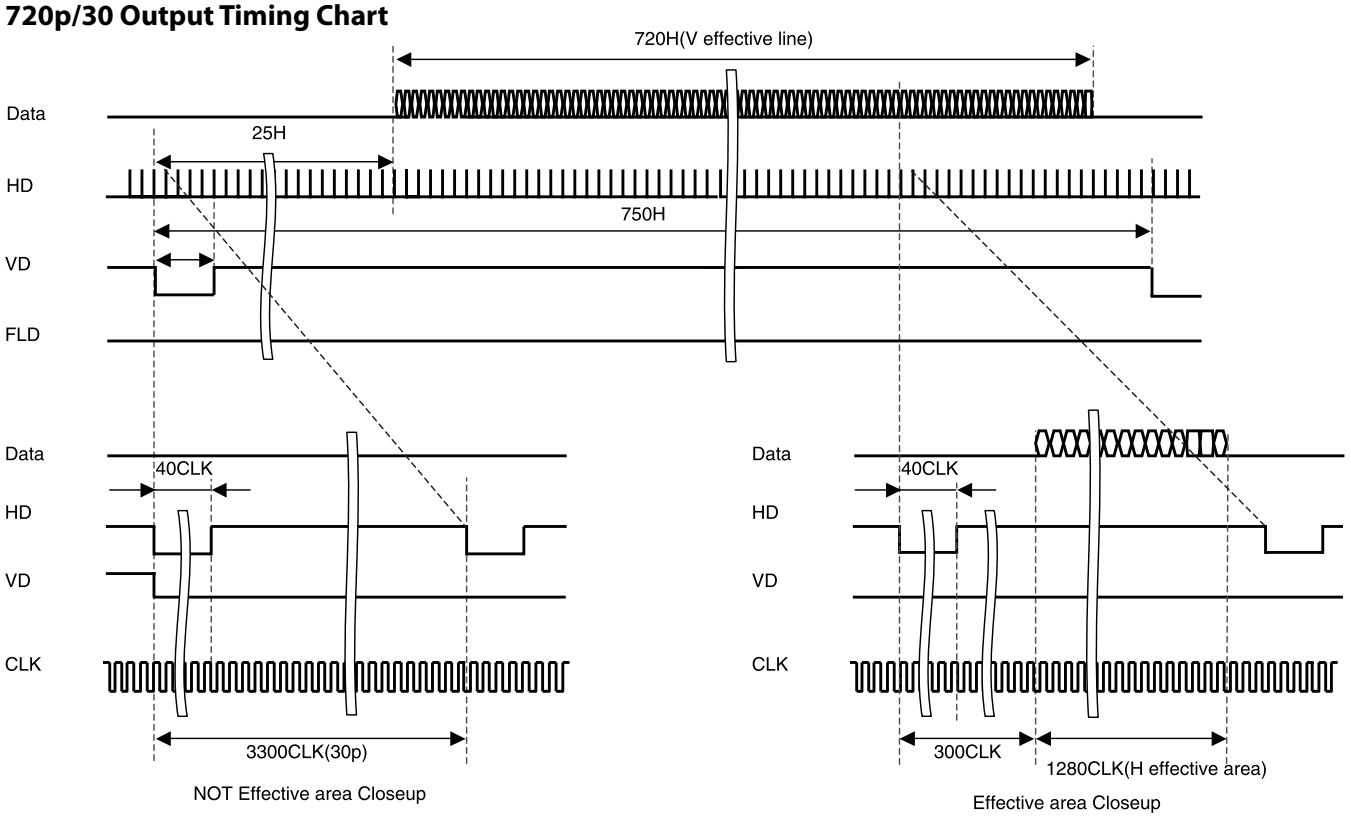
720p/60 Output Timing Chart



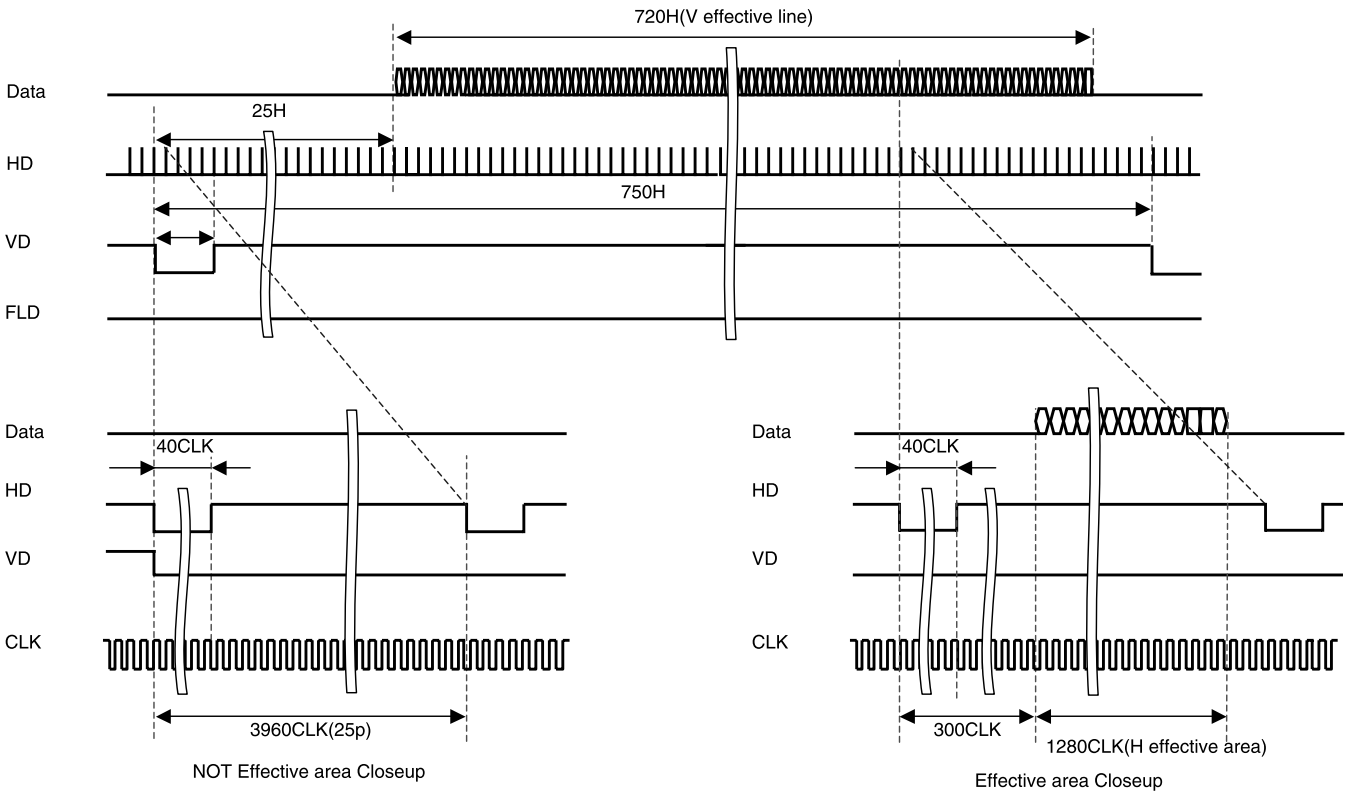
720p/50 Output Timing Chart



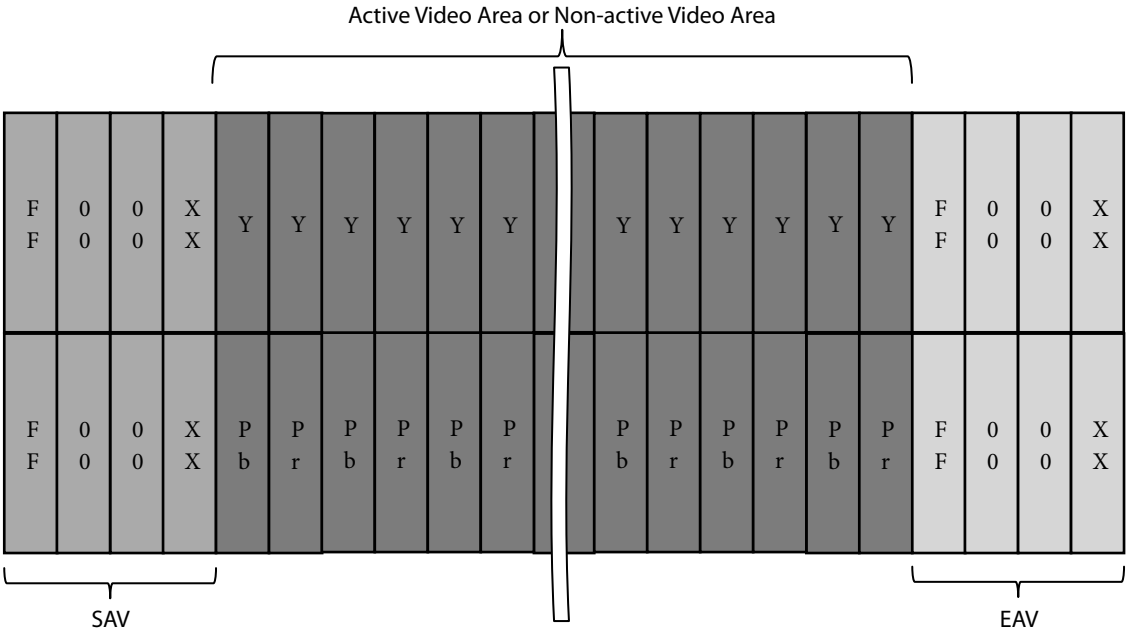
720p/30 Output Timing Chart



720p/25 Output Timing Chart



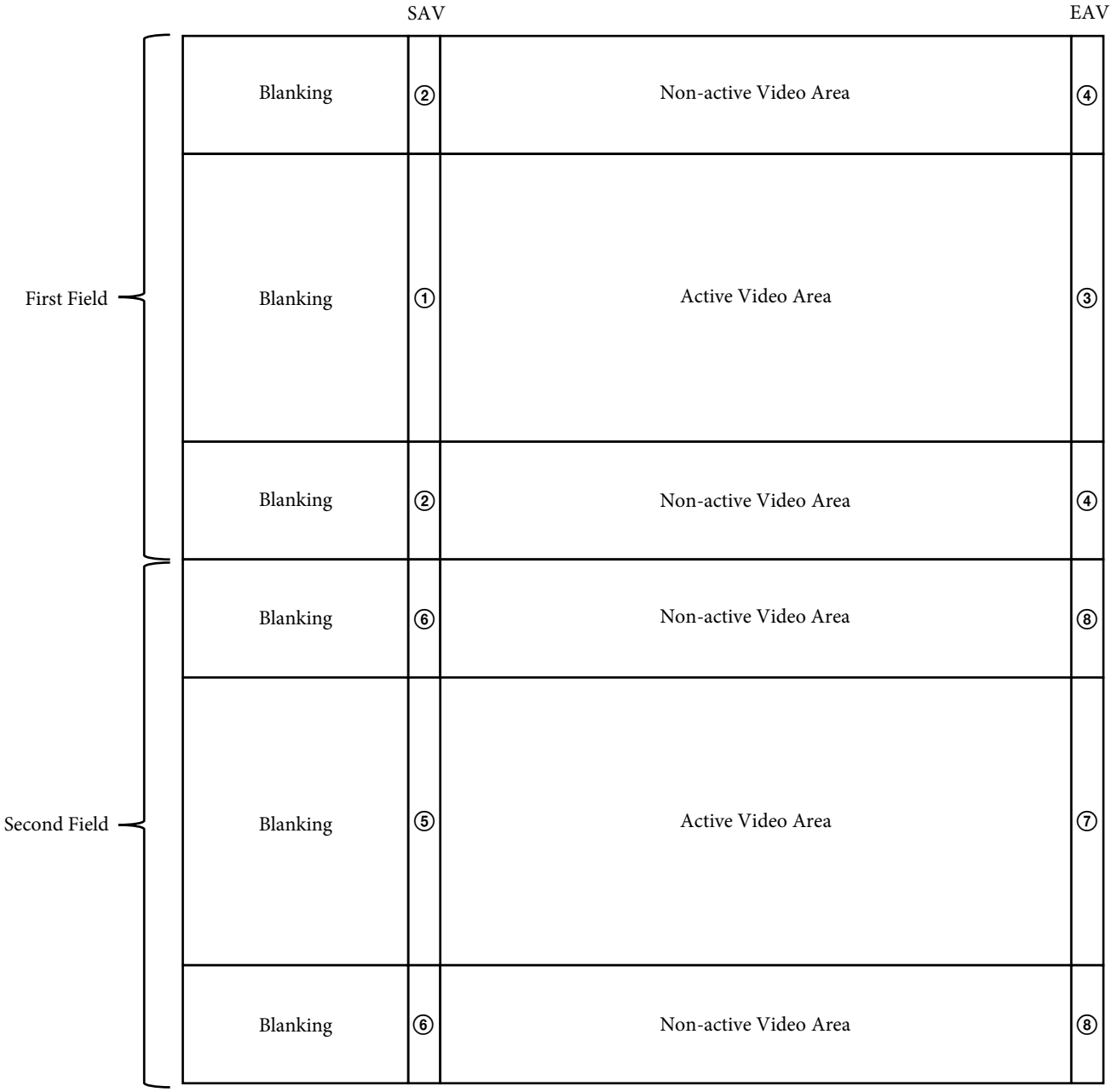
Digital output timing chart of Synchronized codes



		XX for SAV	XX for EAV
First Field	Active Video Area	80h	9Dh
	Non-active Video Area	ABh	B6h
Second Field	Active Video Area	C7h	DAh
	Non-active Video Area	ECh	F1h

Digital output timing chart of Synchronized codes

Interlace system (Comparable to SMPTE 274 M)



① SAV for First Field Active Video Area

② SAV for First Field Non-active Video Area

③ EAV for First Field Active Video Area

④ EAV for First Field Non-active Video Area

⑤ SAV for Second Field Active Video Area

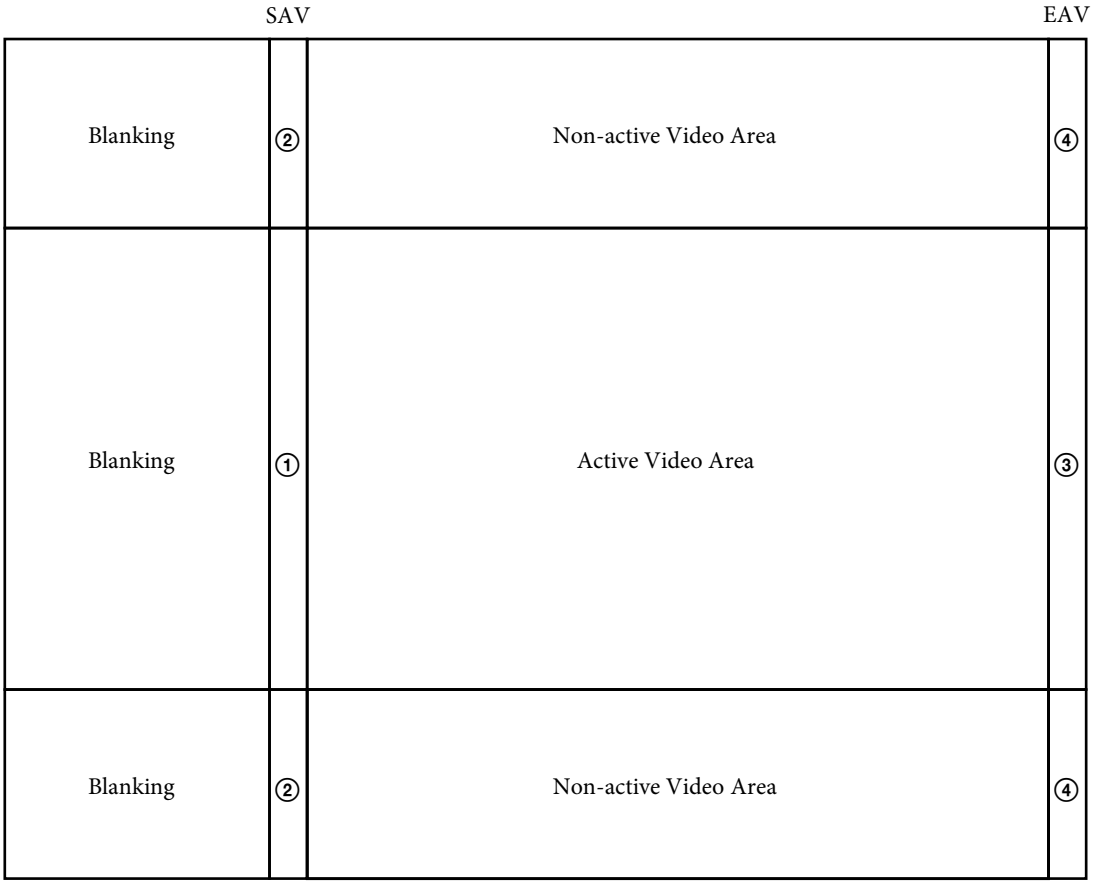
⑥ SAV for Second Field Non-active Video Area

⑦ EAV for Second Field Active Video Area

⑧ EAV for Second Field Non-active Video Area

Digital output timing chart of Synchronized codes

Progressive system (Comparable to SMPTE 274 M, 296 M)



① SAV for Active Video Area

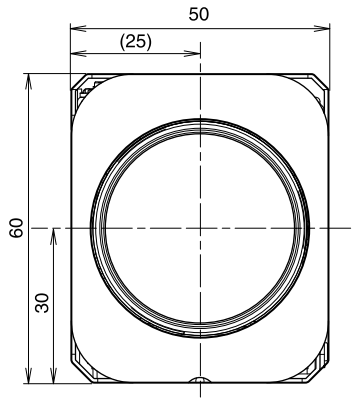
② SAV for Non-active Video Area

③ EAV for Active Video Area

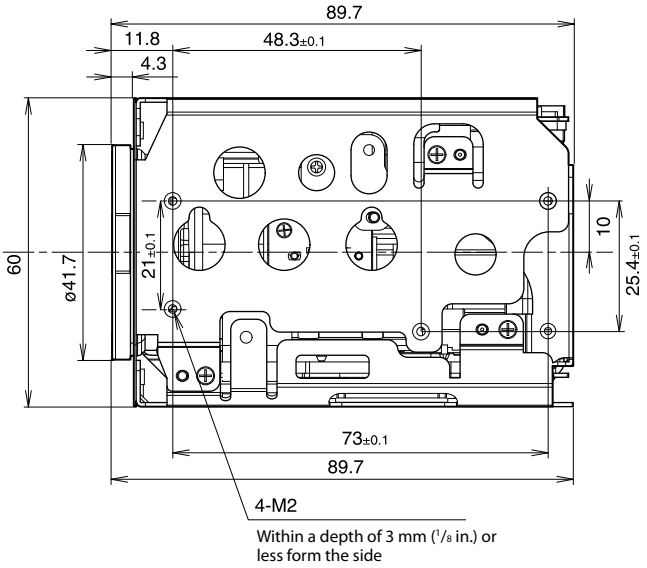
④ EAV for Non-active Video Area

Dimensions

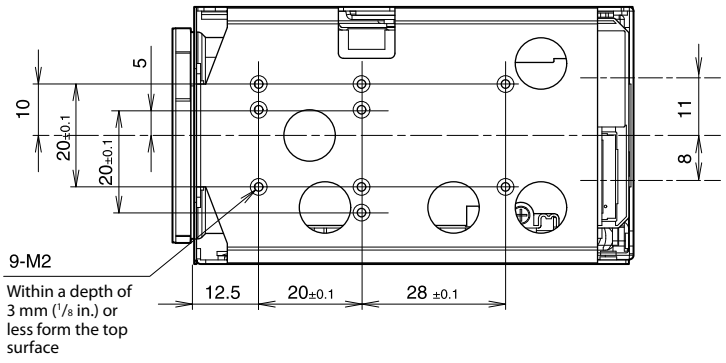
Front



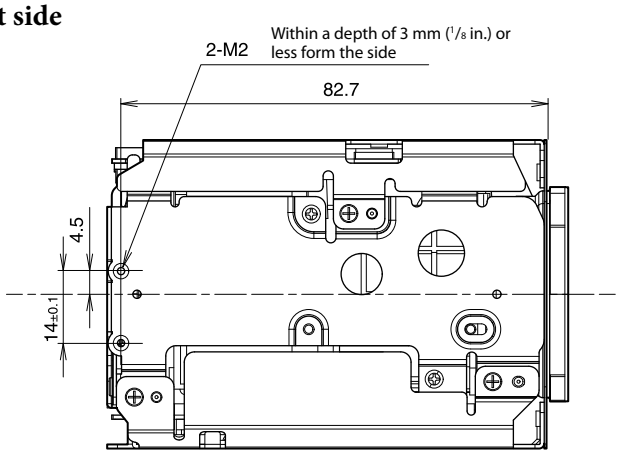
Right side



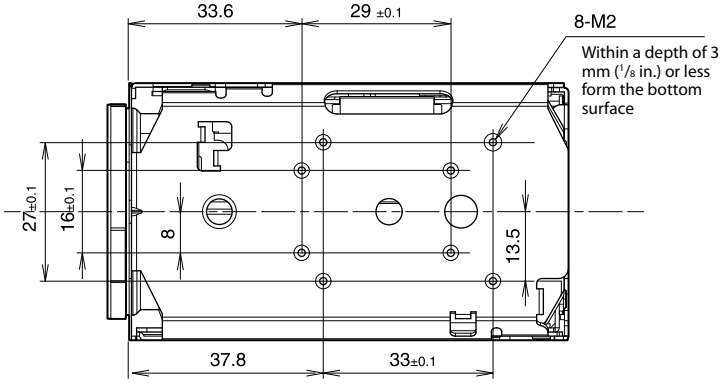
Top



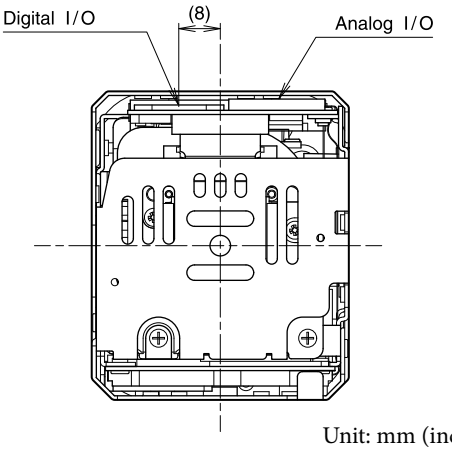
Left side



Bottom

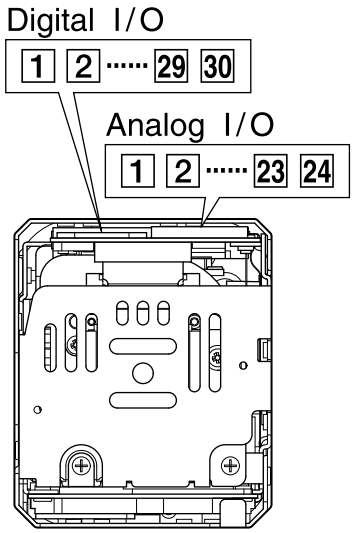


Back



Unit: mm (inches)

Pin assignment



CN601

KEL Co. USL00-30L-C

Pin No.	Name	Level
1	TXOUT3+	
2	TXOUT3–	
3	TXCLKOUT+	
4	TXCLKOUT–	
5	TXOUT2+	
6	TXOUT2–	
7	TXOUT1+	
8	TXOUT1–	
9	TXOUT0+	
10	TXOUT0–	
11	GND	
12	TxD	CMOS 5 V (Low: Max 0.1 V, High: min 4.4 V)
13	RxD	CMOS 5 V (Low: MAX 0.8 V, High: min 2.0 V)
14	DC IN	6 to 12 V DC
15	DC IN	6 to 12 V DC
16	DC IN	6 to 12 V DC
17	DC IN	6 to 12 V DC
18	DC IN	6 to 12 V DC
19	GND	
20	GND	
21	GND	
22	GND	
23	GND	
24	GND	
25	NC	
26	RESET	Reset: Low (GND), Normal: Open (1.8V)
27	VBS-OUT	
28	Y	HD Analog Component
29	Pb	HD Analog Component
30	Pr	HD Analog Component

CN501

Kyocera-elco 046240024006800+

Pin No.	Name	Level
1	GND	
2	TxD	CMOS 5 V (Low: Max 0.1 V, High: min 4.4 V)
3	RxD	CMOS 5 V (Low: MAX 0.8 V, High: min 2.0 V)
4	RESET	Reset: Low (GND), Normal: Open (1.8V)
5	GND	
6	NC	
7	GND	
8	NC	
9	GND	
10	VBS-OUT	
11	GND	
12	Y-OUT	HD Analog Component
13	GND	
14	Pb-OUT	HD Analog Component
15	GND	
16	Pr-OUT	HD Analog Component
17	GND	
18	Power	6 to 12 V DC
19	Power	6 to 12 V DC
20	Power	6 to 12 V DC
21	Power	6 to 12 V DC
22	GND	
23	Power	6 to 12 V DC
24	GND	