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## Application Note 24Z2.1W-30X-EXSDI



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## 1. Document History

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Revision	Issue Date	Reason	CN#
Rev A	01-07-17	Initial release	17-0006

## 2. Key Features

- 1/3" CMOS sensor  
2.4M Pixels (Total) / 2.1M Pixels (Active)
- 30x Optical Zoom  
Built-in 30x optical zoom lens
  - Auto Focus
  - Auto Iris
  - Auto D&N
  - Zoom Function
- Full HD Resolution
  - 1920x1080p / 30fps (25fps)
  - 1920x1080p / 60fps (50fps)
  - 1280x720p / 30fps (25fps)
  - 1280x720p / 60fps (50fps)
- DAY & NIGHT (ICR)  
The ICR will automatically engage according to the ambient light. It can trigger the camera to do color in day mode and monochrome in night environments and other applications.
- WDR (Wide Dynamic Range)  
WDR, an optimum fusion ratio combines the high speed shutter used in bright areas and the low speed shutter used in dark areas.
- DNR (Digital Noise Reduction, 2D+3D)  
DNR technology eliminates noise to generate a clear visual image. Our DNR function utilizes both an adaptive 2D filter reducing noise in the brightness of the image and an adaptive 3D filter reducing noise *caused by movement*.
- Privacy mask Function  
The privacy zone function makes it possible to mask out specific areas of the scene.
- On Screen Display (OSD)  
See OSD Menu (10).
- Intelligent motion detection  
A alert signal can be generated when motion of an object is on the screen (Useful when you have to monitor several screens simultaneously).
- Output  
Digital output: HD-SDI, EX-SDI  
Analog output: NTSC, PAL Composite (without WDR).
- Protocol  
This camera supports multiple-protocols (VISCA, PELCO-D, PELCO-P).

### 3. Specifications

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#### Electrical

Image Sensor	2.4 MP 1/3" format sensor	
Total Pixels	1956 (H) x 1266 (V)	
Active Pixels	1944 (H) x 1092 (V)	
Scan Mode	Progressive	
Sync. System	Internal	
Resolution	Digital	1080p, 720p (60/ 50/ 30/ 25 fps)
	Analog*	>700 TVL (NTSC/PAL)
Min. Illumination	1/30s	Color: 0.5 lux, B&W: 0.1 lux DSS
	DSS 1/7.5s	Color: 0.125 lux, B&W: 0.025 lux
Video Output	EX-SDI/ CVBS analog*/ HD-SDI/ LVDS opt. model	
Communication	Visca / Pelco-D / Pelco-P	
Power Supply	9VDC to 15VDC	
Current Consumption	250mA	
*Operates concurrently if WDR mode is off.		

#### Parameter Controls

Focus		Auto/ Trigger/ Manual
	Distance Presets	0.1m/ 1.0m/ 3.0m/ 6.0m/ 10.0m
Zoom	Optical	30x
	Digital	Off/ up to 32x
Exposure	Auto/ Manual	
Gain Control (AGC)	Off/ On	
Shutter Speed	Auto 1/30 (NTSC), 1/25 (PAL)-1/30,000 sec. or 14 Fixed speeds	
Iris	0 ~ 20 steps	
Digital Slow Shutter	Off / x2 / x4 ( x8 60 or 50 fps mode only )	
Brightness	0 ~ 20 steps	
WDR/ BLC	WDR / BLC Off/	
Day & Night (Passive)	Auto/Day (color)/ Night (B/W)/ External Input	
White Balance	Auto/ Push to Set/ Manual/ Indoor/ Outdoor	
HLC	Off/ On/ Night Only	
DNR	Auto/ Off/ Low/ Middle/ High	
Mirror/Flip	Off/ H (mirror)/ V (flip)/ H&V	
Edge Enhancement	0 ~ 10 steps	
Auto Contrast Enhancement	Off/ Low/ Middle/ High	
Defog	Off/ On (Auto/ Manual)	
Privacy Mask	Off/ 24 Positions	
Motion Detection	Off/ 3 Positions	
Pixel Detection	Off/ On	

#### Environmental

Operating Temperature	-10°C ~ 50°C (14°F ~ 122°F)
Storage Temperature	-20°C ~ 60°C (04°F ~ 140°F)

#### Mechanical

Dimensions WxHxD	50mm x 60mm x 93mm (1.97" x 2.4" x 3.7")
Weight	240g (8.5oz)

#### Lens

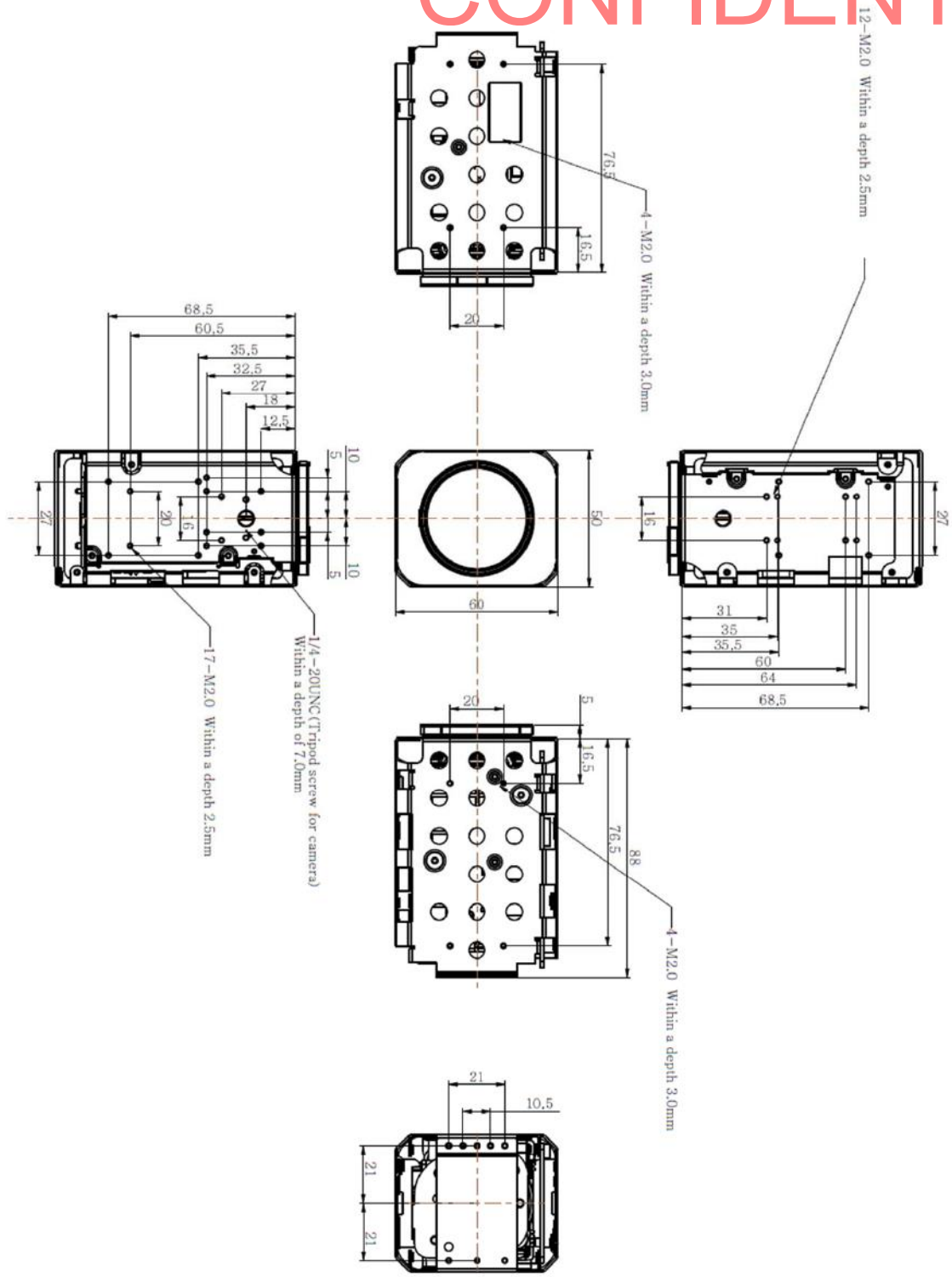
Lens	Lens Type	30x Day/Night (passive) Zoom Lens
	Zoom Ratio	Optical 30x, Digital 32x
	Focal Length	f = 4.3mm ~ 129mm
	Aperture Ratio	F1.6 (Wide) ~ F4.7 (Tele)
	Field of View (DxHxV)	Wide 71.3° 58.9° 45.3° Tele 2.58° 2.11° 1.61°

#### Accessories

Control Board	60MC0002	
Transmitter/ Receiver Packages	Coax	60TR0001
	UTP	60TR0002
	UTC	60TR0003
Repeater	Coax Only	60RP0001

# 4. Dimensions

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## 5. Connectors

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J103 FPC FFC 30POS 0.4 MM



J100 MMCX

J101 FPC ZIF 9POS 1mm

J101 FPC ZIF 9POS 1mm

Pin No.	Name
1	RXD
2	TXD
3	GND
4	DC12V_IN
5	GND
6	CVBS-OUT
7	GND
8	Reserved
9	GND

J100 MMCX

HD-SDI default  
EX-SDI via OSD control

J103 FPC FFC 30POS 0.4mm

Pin No.	Name	Pin No.	Name
1	Reserved	16	
2	GND	17	
3	CVBS-OUT	18	
4	GND	19	
5	TX_HPD	20	DC+12V
6	TX_SDA	21	DC+12V
7	TX_SCL	22	GND
8	TXC-	23	GPIO2
9	TXC+	24	GPIO1
10	TX0-	25	ADKEY (OSD Control)
11	TX0+	26	D/N-IN
12	TX1-	27	IR-ON
13	TX1+	28	Motion Detection OUT
14	TX2-	29	RS-485 (-)
15	TX2+	30	RS-485 (+)

HDMI

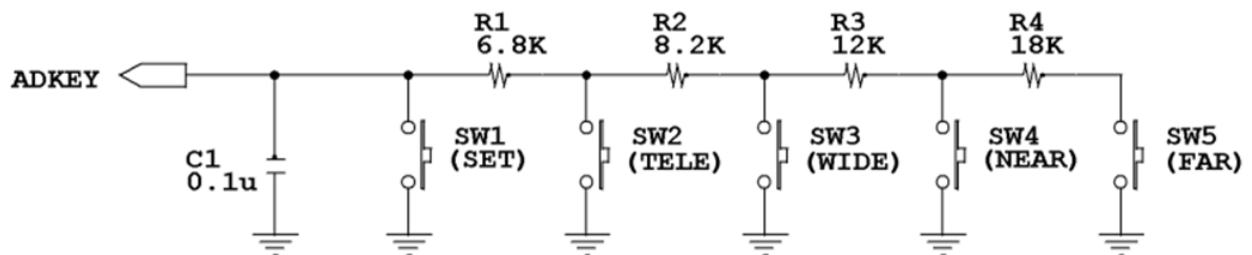
### 5.1. Day & Night IN (J103 pin 26)

Port giving input of any external signal in Day & Night "Ext-In" Mode

- Day Mode: High (+3.3V)
- Night Mode: Low (Ground)

### 5.2. OSD Control (J103 pin 25)

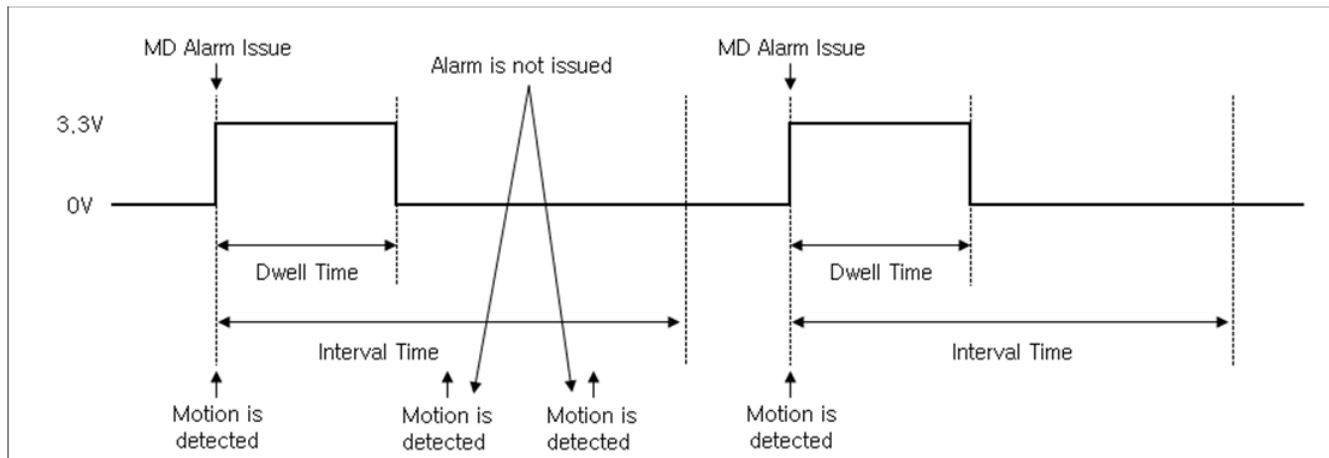
The external wired remote controller connector.





### 5.3. Motion Detection (J103 pin 28)

Alert signal port to motion detection (intelligent) alarm.



### 5.4. 485-DIR (J103 pin 29 & 30)

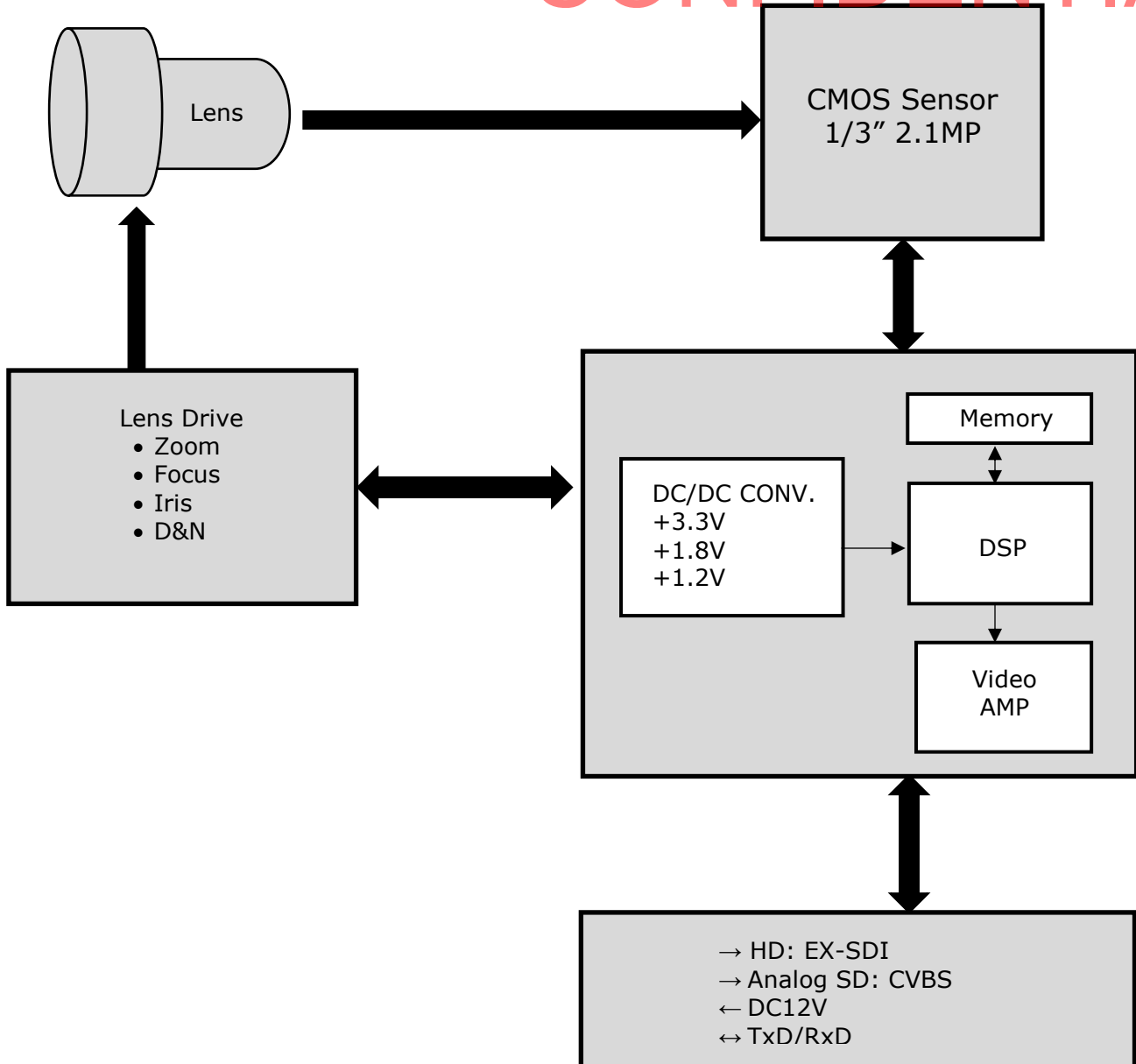
TxD/RxD direction in RS-485 communication

- TxD: High (+3.3V)
- RxD: Low (Ground)

	<b>Module Type</b>	<b>Box Type</b>
Use	Select to apply to SpeedDome. (Appropriate setting with using Visca Protocol control)	Select to apply to Stand alone Camera. (Appropriate setting with OSD Menu Control)
EX-SDI On/Off	OSD Menu, command or hot key  *EX-SDI On/Off Toggle hot key : Up > Down > Left > Right > Left  * The hot key doesn't work in the OSD menu.	EX-SDI ON (J103 pin 25) Pin input
OSD Display Freeze	Default : Off	Default : On
Zoom Position when camera starts up	Zoom In/Out does not work if "Freeze On". If you use Zoom/Focus Direct Command Zoom/Focus will work in "Freeze On". (Preset Freeze function is available.)  Set position with CAM_CUSTOM Command. (Default : 1x)	When you control Zoom/Focus in "Freeze On", Freeze "On" turns to "Off" automatically.  When the camera reboots, Zoom position goes to last position.

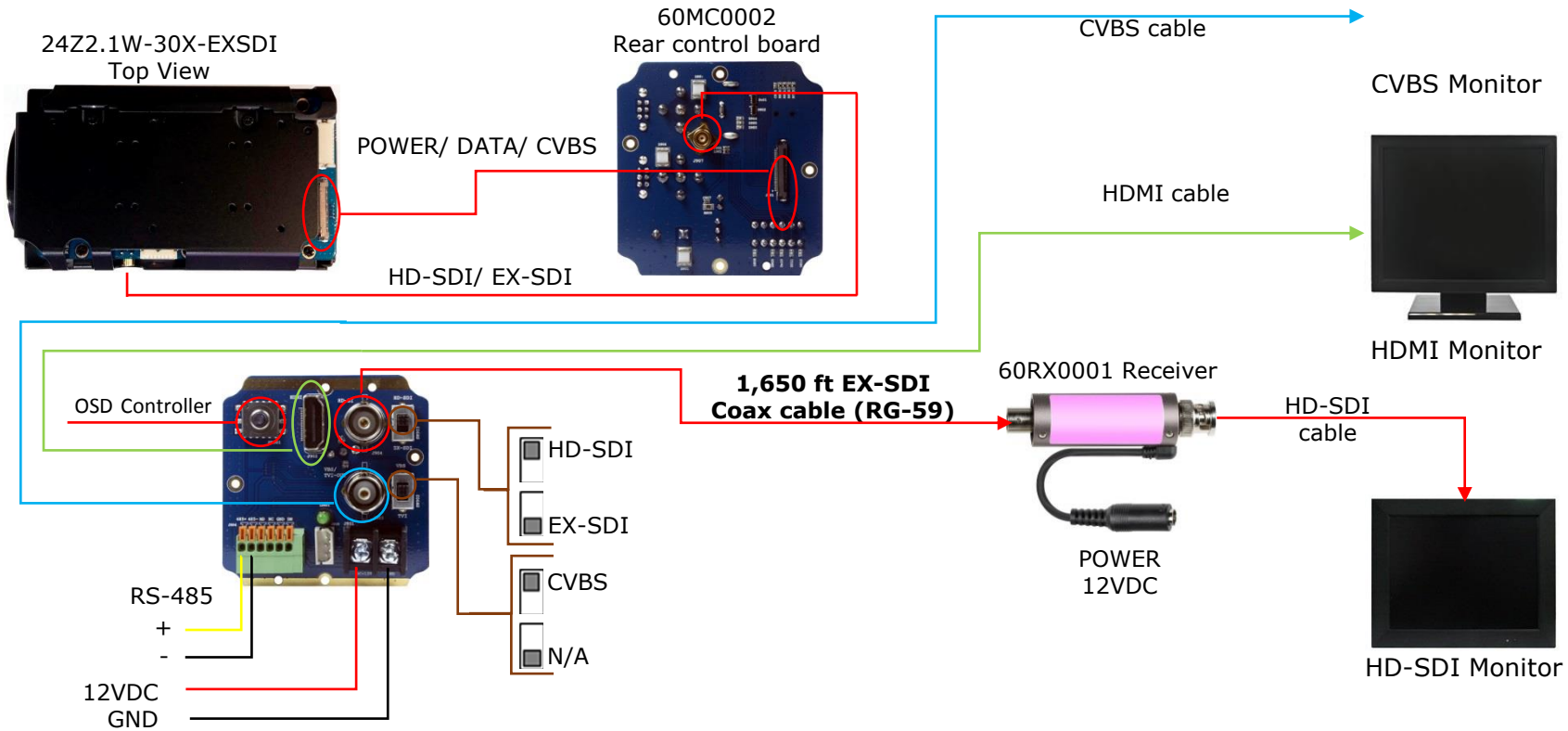
## 6. Block Diagram

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## 7. Wiring Diagrams

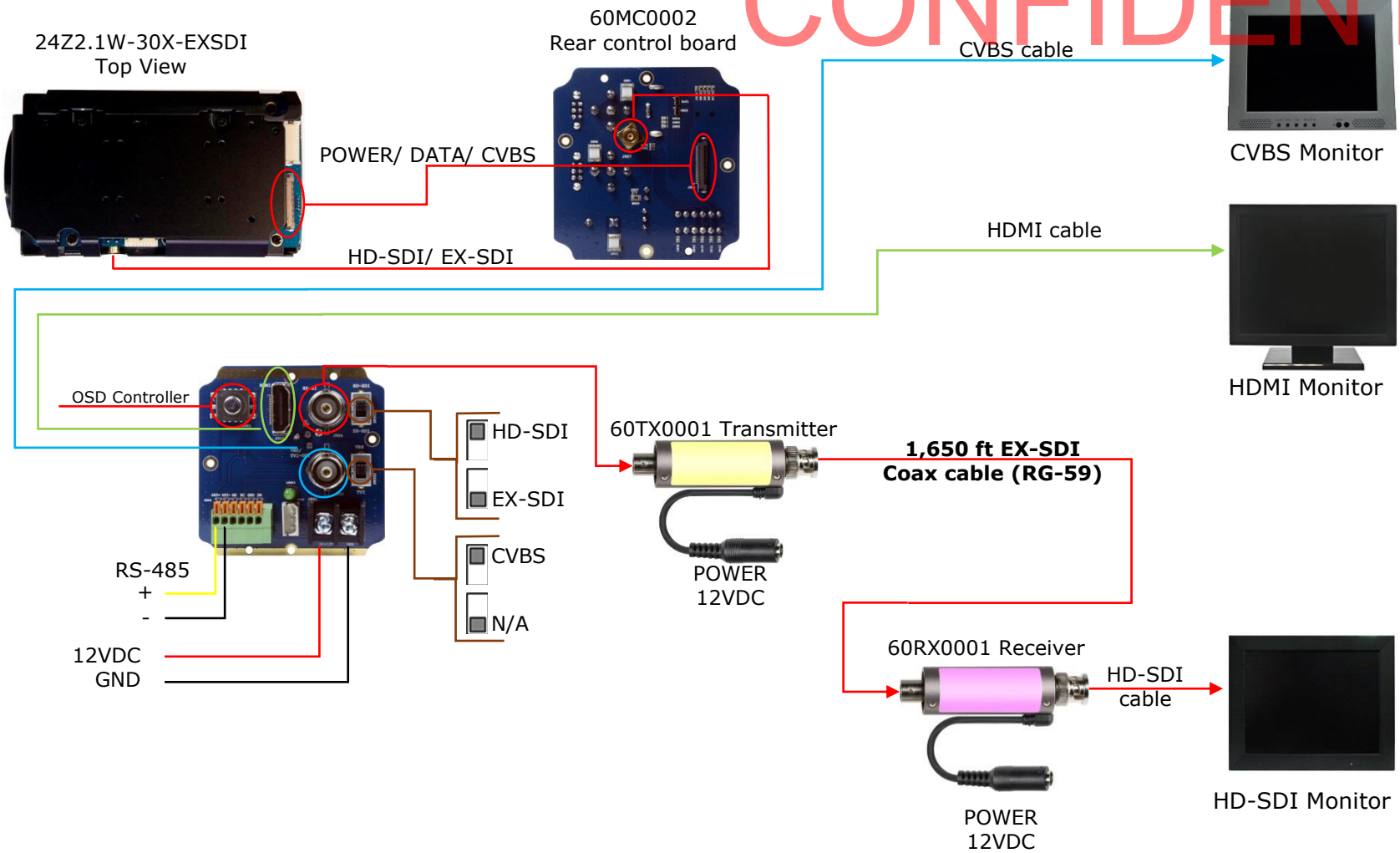
### 7.1. Coax EX-SDI Receiver Only Wiring (RG-59)\*



**\*Note:** Greater distances can be achieved with higher grade cabling.

7.2. Coax EX-SDI Transmitter and Receiver Wiring (RG-59)\*

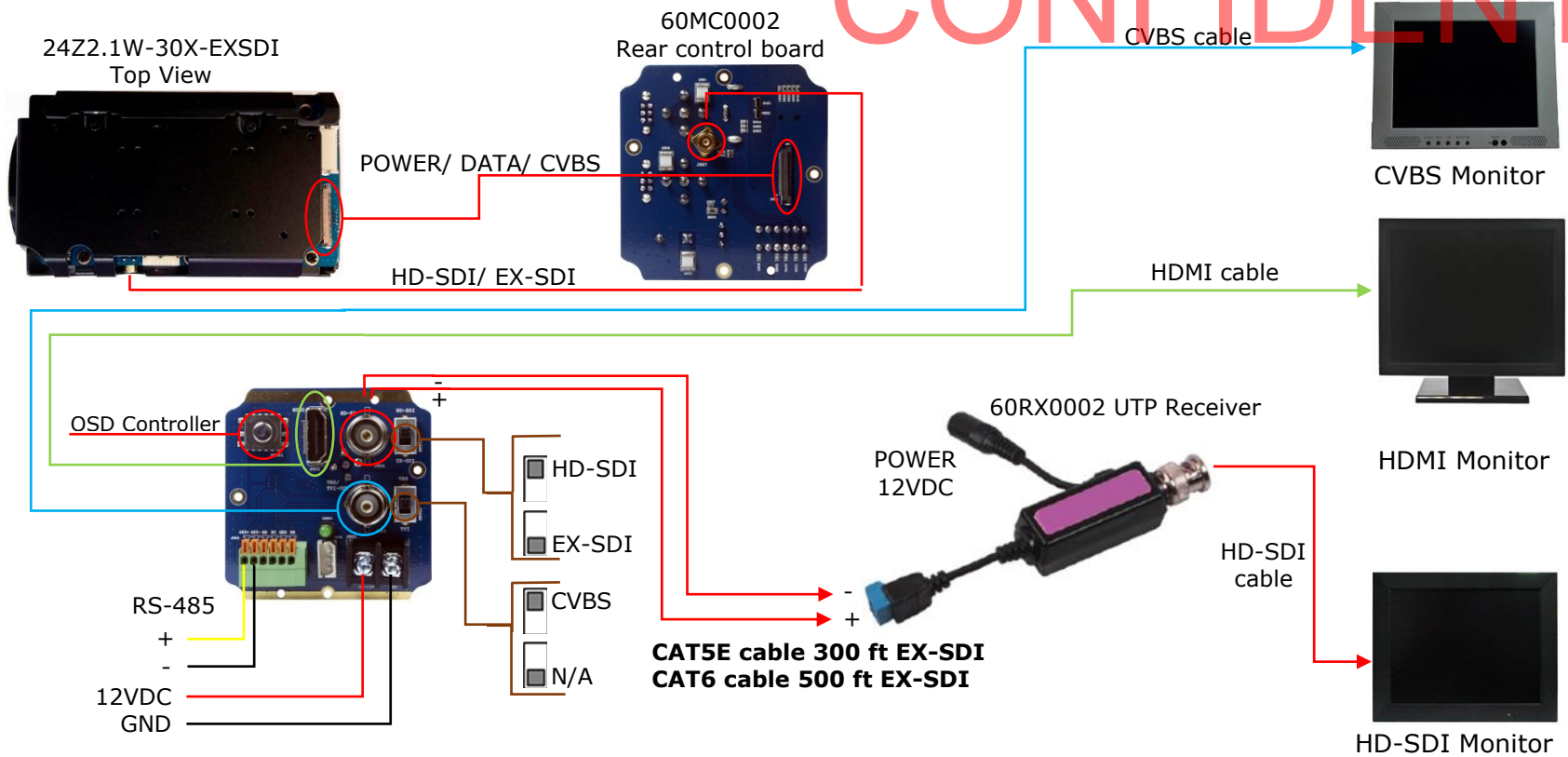
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**\*Note:** Greater distances can be achieved with higher grade cabling.

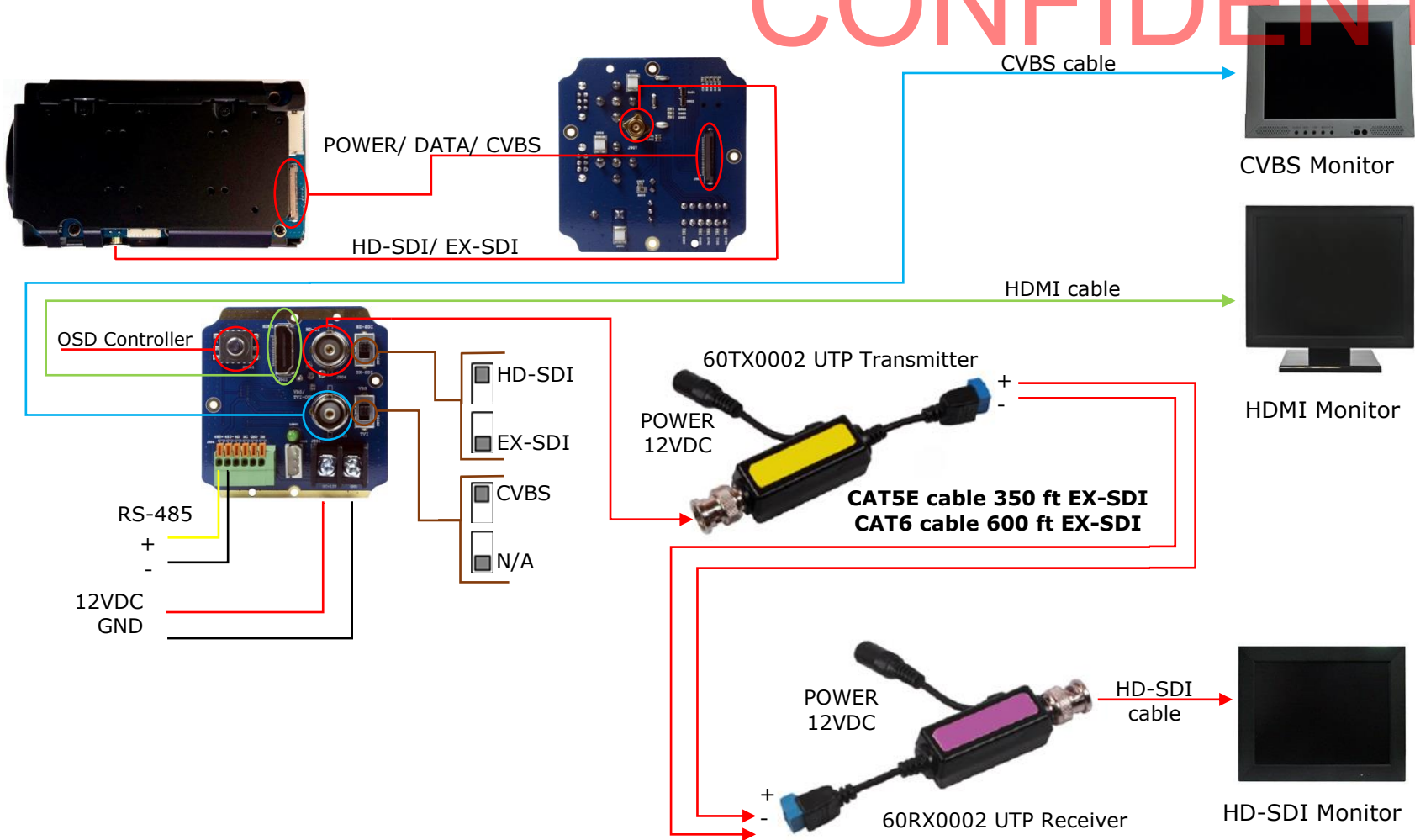
7.3. UTP (Unshielded Twisted Pair) Receiver Only Wiring

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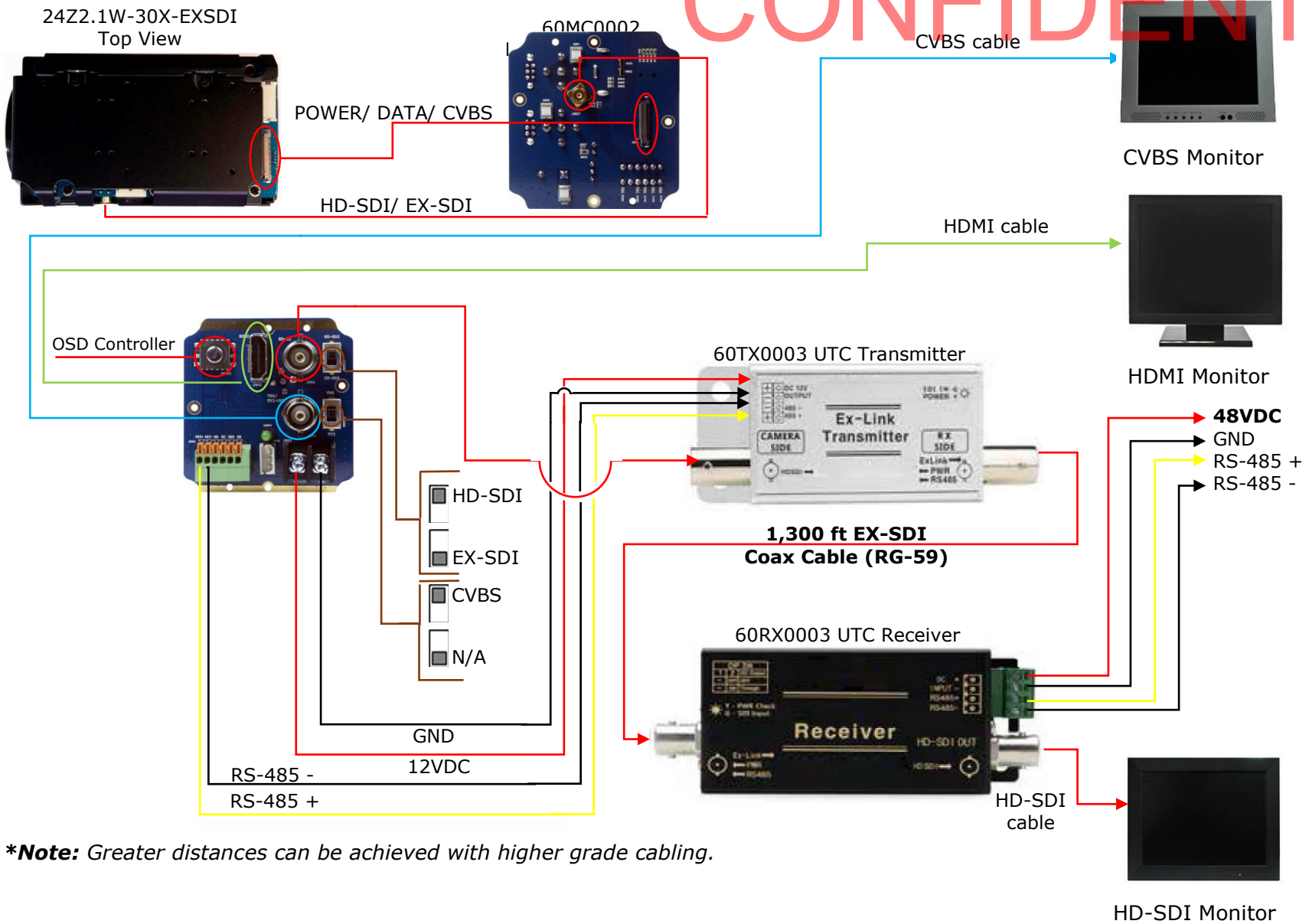
7.4. UTP (Unshielded Twisted Pair) Transmitter and Receiver Wiring

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7.5. UTC (Up The Coax) Transmitter and Receiver Wiring (RG-59)\*

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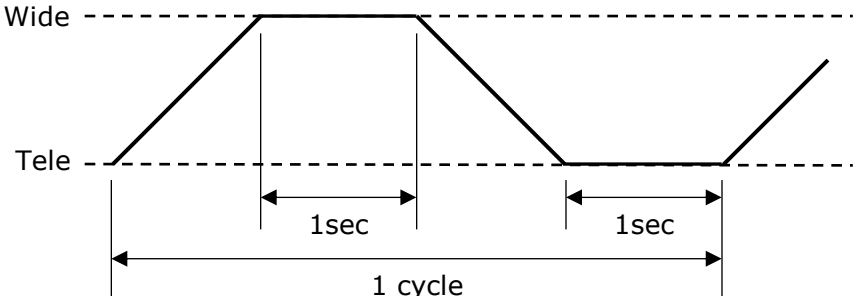


**\*Note:** Greater distances can be achieved with higher grade cabling.

## 8. Reliability

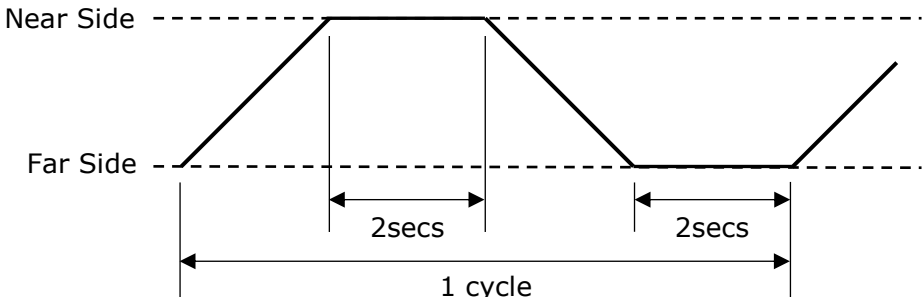
### 8.1. Zoom

- 1) Zoom operation cycle: 200,000 cycles
- 2) Operation condition: See below
- 3) Test condition: Normal temperature



### 8.2. Focus

- 1) Focus operation cycle: 200,000 cycles
- 2) Operation condition: See below
- 3) Test condition: Normal temperature





## 9. Function

### 9.1. Zoom

- Max. zoom ratio
  - Optical Zoom : Max x30
  - Digital Zoom : Max x32
  - Optical + Digital Zoom : Max x960

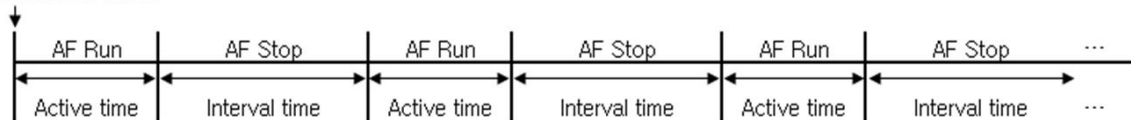
**Note** - NO Digital Zoom when the motion detection is turned on.

- Digital zoom mode
  - Combined mode: After the optical zoom has reached its maximum level, the camera switches to digital zoom mode *when zooming in*. The camera switches to optical zoom mode again after the digital zoom has reached its minimum level when *zooming out*.
  - Separate mode: (VISCA only) optical zoom and digital zoom can be operated separately. (See Overview of VISCA functions Section [14.2 Zoom](#))

### 9.2. Focus

- Select minimum distance in focus between camera and object.
  - 0.1 / 1.0 / 3.0 / 6.0 / 10.0 m
- Auto focus mode
  - Auto Mode: Auto Focus automatically adjusts the focus position to maximize the high frequency content of the picture in a center measurement area, taking into consideration the high luminance and strong contrast components. Auto Mode is the normal mode for AF operation.
  - Interval Mode: The mode used for Auto Focus movements carried out at particular intervals. The interval time and active time for AF movements and for the timing of the stops can be set.

Interval mode start



- Zoom trigger mode (One push mode): When the zoom is changed with the TELE or the WIDE buttons, the pre-set value becomes that for AF mode. Then it stops.
- Manual focus mode
  - Focus position can only be adjusted by manual mode using either Far/Near button or Far/Near command.
  - One push trigger: When a Trigger Command is sent, the lens moves to adjust the focus for the subject in the scene. The focus is held in 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 (Focus Distance)
  - Can be set to minimum range of focus.

## 9.3. White Balance

- AUTO mode
  - This mode computes the white balance value output using color information from the entire screen. It outputs the proper value using the color temperature.
- One push mode
  - This is a fixed white balance mode that may be automatically readjusted only at the request of the user (One-push Trigger)
- Manual mode
  - Manual control of R and B gain.
- Indoor mode
  - 3700K base mode
- Outdoor mode
  - 5100K base mode

## 9.4. Auto Exposure

- Exposure mode
  - Auto mode: Full Auto with Auto Iris and Shutter Speed. User can turn on/off AGC and Digital Slow Shutter feature.
  - Iris priority mode: User can set Iris Level, and shutter speed is set automatically according to the brightness of the subject. User can turn on/off AGC and Digital Slow Shutter.
  - Shutter priority mode: User can set variable shutter speed, and Iris is set automatically according to the brightness of the subject. User can turn on/off AGC.
  - Manual mode: User can set Iris, Shutter speed and Gain. User can also use Digital Slow Shutter by adjusting the shutter speed.
  - Bright mode (Manual): User can set Iris and Gain.

**Refer to the Exposure Control in Command List (Visca Protocol Command List section 14.10) for the value range of AGC Gain, Shutter Speed, Iris and Exposure Compensation.**

- Exposure compensation (Brightness)
  - Function to offset the internal reference brightness level used in the AE mode.

## 9.5. WDR (Wide Dynamic Range)

This function extracts details "lost" or "hidden" both within very dark and overly lighted areas of a scene. It is achieved by combining multiple images of varied exposure durations.

**WDR doesn't work in Manual Exposure Mode, Shutter Priority Mode and Composite Video.**

## 9.6. BLC (Back Light Compensation)

The BLC function provides compensation by increasing the brightness of the overall scene. Thus "objects" that are too dark due to being within a larger very bright region effectively brighten up for better detail retrieval.

**WDR and BLC cannot operate concurrently.  
When WDR ON, BLC is OFF and when BLC is ON, WDR is OFF**

**BLC doesn't work in Manual Exposure Mode.**

### 9.7. Day & Night (ICR mode)

The infrared (IR) cut-filter can be disengaged from the image path for increased sensitivity in a low light environment. More near IR light is allowed to pass in dark scenes. The ICR will automatically engage depending on the ambient light, allowing the camera to be effective in day/night environments.

- Auto Mode: It 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. With a level of brightness, the IR Cut Filter is automatically enabled.
  - IR Detection for systems equipped with an IR light, the internal data of the camera is used to make the proper decisions thus avoiding malfunctions.
- Ext-In Mode: It switches to Day mode when the input from D&N-IN Port is high and switches to Night mode when it is low.

### 9.8. DIS (Digital Image Stabilizer)

The DIS function internally detects vibrations of the image due to physical camera movement and shaking. It performs digital compensation processing to suppress this shaking and vibration to stabilize the image output.

### 9.9. Sharpness (Aperture)

This function enhances the edge of objects in the scene. They become more prominent.

### 9.10. Freeze

It captures an image into the field memory of the camera, so that this image can be output continuously. In other words, when turned ON, it keeps a still of the image constantly on the screen, when turned OFF it goes back to normal video mode.

## 9.11. Privacy Mask

- Mask can be set on up to 24 places according to Pan/Tilt positions.
- Individual on/off zone masking settings.
- Two groups from among 14 colors in each group transparency can be individually set for each or 24 privacy zones.
- Interlocking control with zooming.
- Interlocking control with Pan/Tilt. (Interlock mode)
- Parameters in Visca Command (Privacy related commands in Command List)
  - Mask Number (mm): Mask A = 00h ~ Mask X = 17h

**Mask A has highest priority and Mask X has lowest priority**

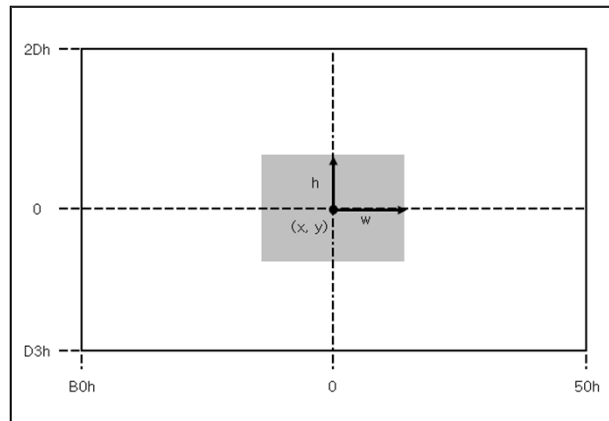
- Mask setting bit (pp pp pp pp)

	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

- Mask Modify setting (nn):  
 00h = modifying the mask size for the existing mask size  
 01h = setting newly the mask size to default value
- Mask Center Position:  
 x (pp) = B0h(-50h) ~ 50h  
 y (qq) = D3h(-2Dh) ~ 2Dh

**Can be set in Non-Interlock mode only.  
Fixed as (0,0) in Interlock mode.**

- Mask Size  
 w (rr) = B0h(-50h) ~ 50h  
 h (ss) = D3h(-2Dh) ~ 2Dh



- Mask Color (qq, rr)

Color		Code(qq, rr)	
		Non-transparency	Transparency
Black		00h	10h
Gray	Light ↑	01 h	11 h
	↕	02 h	12 h
	↕	03 h	13 h
	↕	04 h	14 h
	↕	05 h	15 h
	Dark ↓	06 h	16 h
White		07 h	17 h
Red		08 h	18 h
Green		09 h	19 h
Blue		0A h	1A h
Cyan		0B h	1B h
Yellow		0C h	1C h
Magenta		0D h	1D h

## 9.12. Motion Detection

It instructs the camera to detect movement within the monitoring area and the send an alarm signal automatically.

- You can set up to 3 Motion Detection Windows.
- When the motion is detected in the set frame, the Alarm activates through Alarm ACK and MD-Out port.
- The interval of alarm detection and dwell time can be set up to 255 seconds in units of one second.
  - Interval Time: The MD Alarm isn't activated again till the interval time passed by.
  - Dwell Time: It keeps the MD Alarm Signal (MD-Out) and MD Zoom Preset Position during the set dwell time, after the alarm activated.

## 9.13. DNR (Digital Noise Reduction)

By using both of 2D DNR (space-based) and 3D DNR (time-based), the amount of low illuminance noise has been significantly reduced and the signal-to-noise ratio(S/N) as well as horizontal resolution has been improved, resulting in a clear and sharp image display even in the dark environment.

**If the DNR Level is set too high, a ghost can appear within dark environments.**

## 9.14. Mirror

This function reverses the video output from the camera upside down or left/right reverse.

## 9.15. HLC

Select High Light Compensation. When extremely bright light is projected to the camera masking is used on the portion to prevent partial saturation on the monitor.

## 9.16. DEFOG

Eliminate amount of fog on display screen. When DEFOG is ON, ACE and WDR function cannot turn on.

## 9.17. Lens Initialize

Initialize the zoom and focus of the lens. Even when power is already on, it initialize the Zoom and the Focus.

## 9.18. Comp Scan

A pixel blemish-masking feature, which can be made to reevaluate overall CMOS pixel blemishes and mask severely flawed pixels automatically upon receiving the COMP SCAN command. This feature helps to make the flaws found in CMOS images, even after the camera has been powered on for some time.

**When you use this function, do not let any light into the lens.  
Cap the lens to prevent any light entering within the lens.**

## 9.19. Custom Preset

As with the position preset function, the camera settings can be stored and recalled. The settings are recalled when the power is turned on.

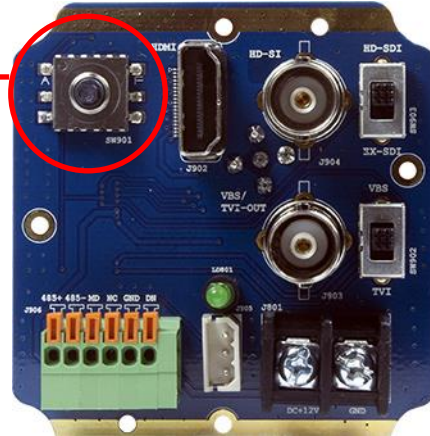
## 10.OSD Menu

# CONFIDENTIAL

### 10.1. How to Use the Camera

Settings can be implemented using the miniature joystick located on the optional OSD control board (60MC0001).

Press the joystick IN on the control board to display the SETUP window.



### 10.2. Camera Setup

#### 10.2.1. Main Menu

Functions can be setup using "Menu Key Command".

The menu consists of the "Main Menu" and "Sub Menu".

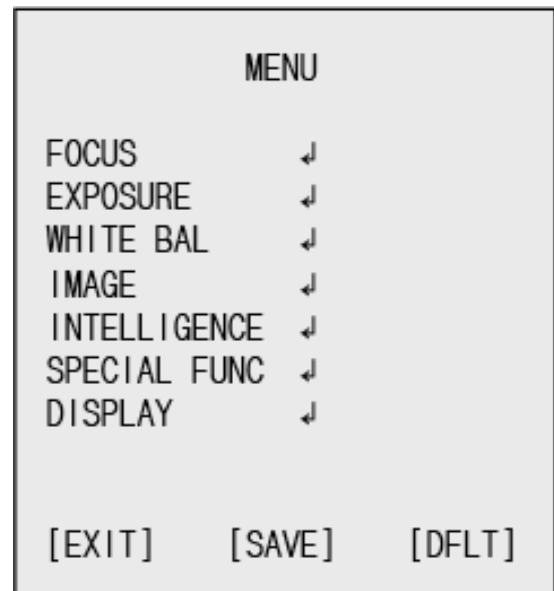
The main menu is displayed where 7 camera functions can be selected.

Upon pushing each main menu selection, the sub-menu is displayed.

To save the setting changes, select **[SAVE]**.

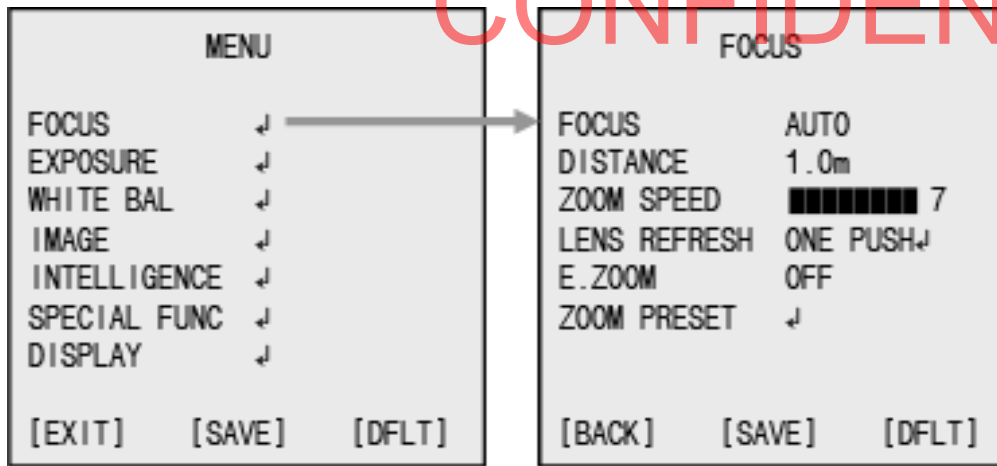
To disregard the setting changes, select **[EXIT]**  
(After select, Power off -> on)

To return to factory settings, select **[DFLT]**



10.2.2. FOCUS

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**FOCUS:** Select auto focus mode  
▶ AUTO, ONE PUSH, MANUAL

**DISTANCE:** Select minimum distance in focus between camera and object.  
▶ 0.1 / 1.0 / 3.0 / 6.0 / 10.0 m

**ZOOM SPEED:** Select Zoom Speed  
▶ 0 (Slow) ~ 7 (Fast)

**LENS REFRESH:** Lens origin calibrated automatically.  
▶ ONE PUSH↓ / ON (1 day ~ 10 days)

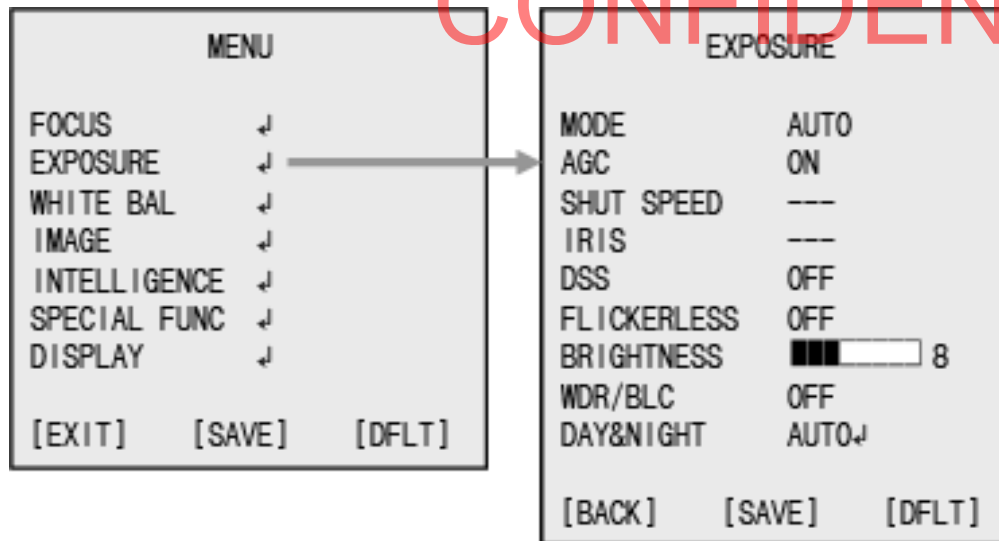
**E.ZOOM:** Select maximum digital zoom magnification.  
▶ OFF / ON (max x2 ~ x19, x21, x23, x25, x28, x32)

**ZOOM PRESET:** Select zoom preset  
▶ PRESET #: Select Zoom preset number (1 ~ 5)  
▶ MODE: OFF / ON ↓  
▶ ON ↓: Adjust the Zoom Position



### 10.2.3. EXPOSURE

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**MODE:** Select Exposure Mode

- ▶ AUTO / IRIS.P / SHUT.P / MANUAL

**AGC:** Select Auto Gain Control

- ▶ OFF / ON (AUTO, SHUT.P or IRIS.P Mode)
- ▶ 0 ~ 10 (MANUAL Mode)

**SHUT SPEED:** Can be set in SHUT.P or MANUAL mode

60/50 fps mode

- ▶ x8, x4, x2, 1/60(50), 1/120(100), 1/250, 1/700, 1/1000, 1/1600, 1/2500, 1/5000, 1/7000, 1/10000, 1/30000 sec

30/25 fps mode

- ▶ x4, x2, 1/30(25), 1/60(50), 1/120(100), 1/250, 1/700, 1/1000, 1/1600, 1/2500, 1/5000, 1/7000, 1/10000, 1/30000 sec

**IRIS:** Iris level can be set in IRIS.P or MANUAL mode

- ▶ 0 ~ 20

**DSS:** Select maximum DSS (Digital Slow Shutter)

60 / 50 fps mode

- ▶ OFF / x2, x4, x8

30 / 25 fps mode

- ▶ OFF / x2, x4

**FLICKERLESS:** Select flickerless mode

- ▶ OFF / ON (remove screen flicker)

**BRIGHTNESS:** Adjust brightness level

- ▶ 0(dark) ~ 20(bright) steps

**WDR/BLC:** Select WDR (Wide Dynamic Range) or BLC (Back Light compensation)

- ▶ WDR↓
  - ▷ LEVEL: Adjust WDR level.
- ▶ LOW, MID-LOW, MIDDLE, MID-HIGH, HIGH  
WDR will not work in Manual Exposure Mode or Shutter Priority Mode.

**When WDR is ON, CVBS output is disabled**

- ▶ BLC↓
  - ▷ POSITION: Adjust the window position
  - ▷ SIZE: Adjust the window size

**WDR and BLC will not function at the same time.**

If WDR is ON, BLC is OFF

If BLC is ON, WDR is OFF

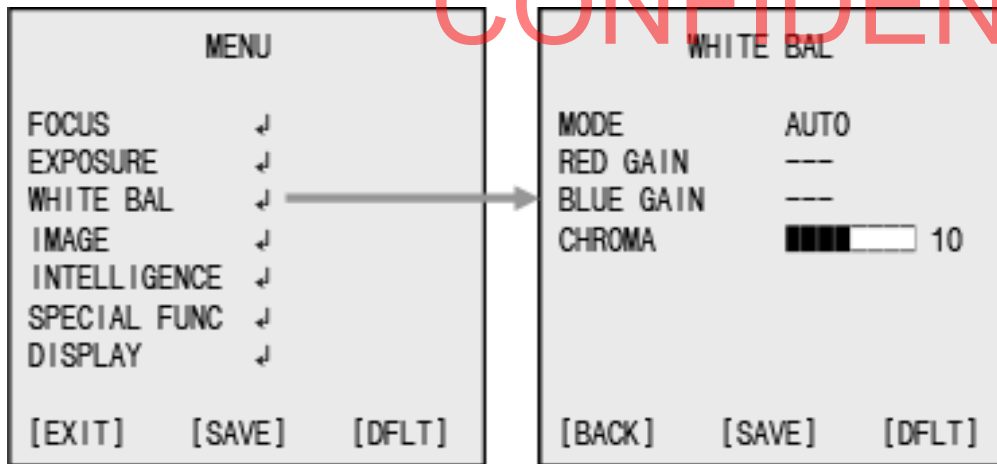
**BLC will not work in Manual Exposure Mode.**

**DAY & NIGHT:** Select Day & Night

- ▶ MODE: AUTO↓ / EXT-IN↓ / DAY / NIGHT↓
  - ▷ AUTO
- ▶ DELAY: 0 ~ 255 sec
- ▶ THRS: 0 ~ 28  
Day↔Night switching level in Auto Mode.  
Switching in lower lux with lower threshold level.
- ▶ GAP: LOW, MID-LOW, MIDDLE, MID-HIGH, HIGH  
Margin between Day→Night switching level and Night→Day switching level.
- ▶ IR DETECTION: Setting IR Detection mode. (ON / OFF)
- ▶ IR DET LEVEL: Setting IR Detection level. (LOW, MID-LOW, MIDDLE, MID-HIGH, HIGH)
- ▶ BURST: OFF / ON
  - ▷ EXT-IN
- ▶ DELAY: 0 ~ 255 sec
- ▶ BURST: OFF / ON
- ▶ POLARITY: External Input polarity (ACTIVE LOW / ACTIVE HIGH)
  - ▷ NIGHT
- ▶ BURST: OFF / ON

#### 10.2.4. WHITE BALANCE

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**AWB:** Select WHITE BALANCE mode

- ▶ AUTO / ONE PUSH↓ / MANUAL / INDOOR / OUTDOOR
  - ▷ AUTO: adjusts color over to the environment color temp.
  - ▷ ONE PUSH: fixed white balance mode is automatically readjusted only by pressing ONE PUSH (push set)
  - ▷ MANUAL↓: Color can be corrected when the user increases or decreases "RED GAIN" or "BLUE GAIN".
  - ▷ INDOOR: Set color temperature to be Indoor light (3700°K)
  - ▷ OUTDOOR: Set color temperature to be Outdoor light (5100°K)

**RED GAIN:** Adjust R gain value adjusts

- ▶ 0 ~ 20 steps

**BLUE GAIN:** Adjust B gain value adjusts

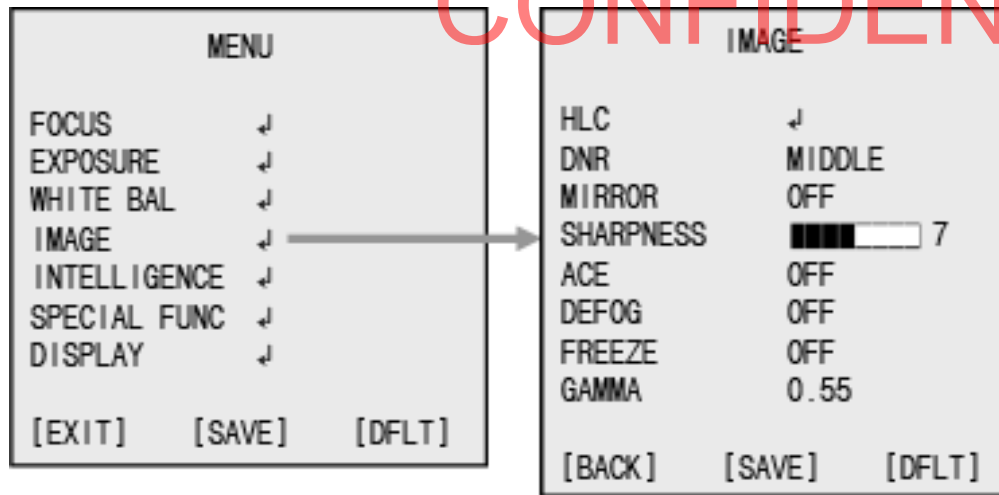
- ▶ 0 ~ 20 steps

**CHROMA:** Adjust CHROMA gain value adjusts

- ▶ 0 ~ 20 steps

## 10.2.5. IMAGE

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**HLC:** Select High Light Compensation.

A mask overwrites an area of extreme bright light to mitigate saturation in the scene.

- ▷ MODE: OFF / ON / NIGHT
- ▷ LEVEL: 0 ~ 20 steps
- ▷ COLOR: 0 ~ 13 steps

**DNR:** Select Digital Noise Reduction

- ▶ OFF / LOW / MIDDLE / HIGH / AUTO

**MIRROR:** Select a flip mode

- ▶ OFF / H / V / H&V
  - ▷ H: flips the picture horizontally on the screen
  - ▷ V: flips the picture vertically on the screen
  - ▷ H&V: flips the picture horizontally & vertically on the screen

**SHARPNESS:** Adjust sharpness level

- ▶ 0 ~ 10 steps

**ACE:** (Adaptive Contrast Enhancer) Select Digital WDR (Wide Dynamic Range)

- ▶ OFF / LOW / MIDDLE / HIGH

**DEFOG:** Implements defog function

- ▶ OFF / ON↓
  - ▷ MODE: AUTO / MANUAL
  - ▷ LEVEL: LOW / MIDDLE / HIGH

**DEFOG and ACE cannot operate concurrently.  
(When ACE is ON, DEFOG is OFF and when DEFOG is ON, ACE is OFF)**

**FREEZE:** Select real or still mode

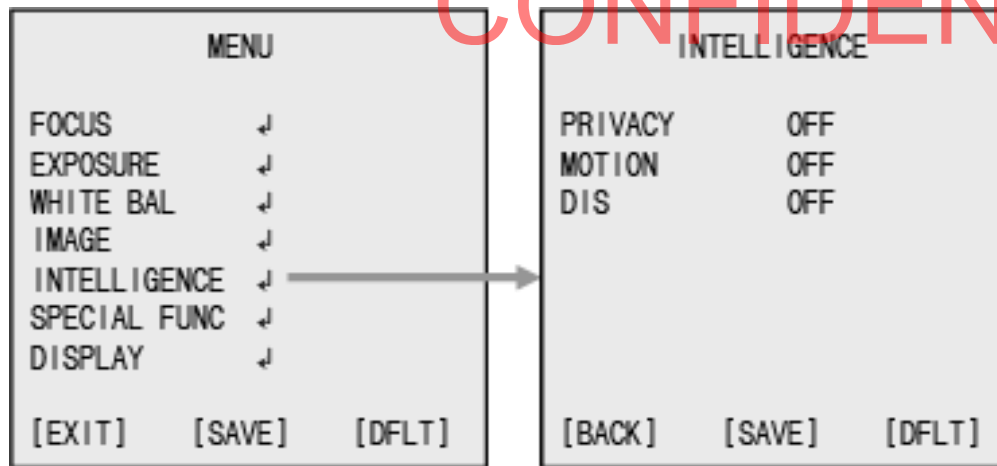
- ▶ OFF / ON

**GAMMA:** Select GAMMA

- ▶ 0.45 / 0.55 / 0.65 / 0.75

## 10.2.6. INTELLIGENCE

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**PRIVACY:** Hide an area you want to hide on the screen

- ▶ OFF / ON↓
  - ▷ MASK#: Select mask area number (1 ~ 24)
  - ▷ MODE: Mask enable or disable (OFF / ON)
  - ▷ POSITION: Adjust the mask position
  - ▷ SIZE: Adjust the mask size
  - ▷ COLOR: Select mask color (0 ~ 13)
  - ▷ TRANS: Select mask transparency level (0 ~ 4)

**MOTION:** When there is movement of the subject in the scene, it will be detected.

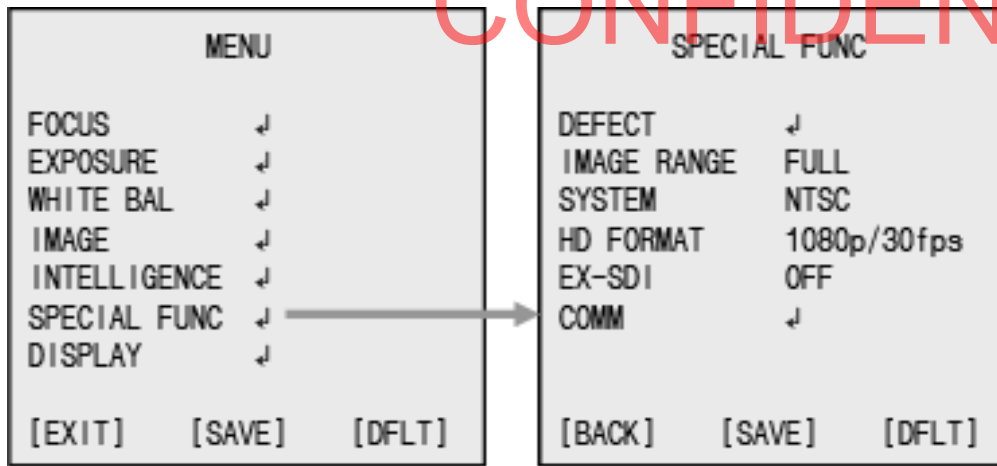
- ▶ OFF / ON↓
  - ▷ AREA#: Setting 3 areas (1~3) of motion detection
  - ▷ MODE: OFF / ON (Limit and define areas of motion detection)
  - ▷ SENSITIVITY: Adjust sensitivity of MD (0 ~ 20 steps), to increase sensitivity, lower the number.
  - ▷ POSITION: Adjust the Area position
  - ▷ SIZE: Adjust the Area size
  - ▷ INTERVAL: Select the alarm interval time (0 ~ 255sec)
  - ▷ DWELL TIME: Select the duration time about changing MD mode (0 ~ 255sec)
  - ▷ ZOOM PRESET: Select Motion Zoom Preset Mode and Position (OFF / ON↓)

**DIS:** Select Digital Image Stabilizer mode

- ▶ OFF / ON↓
  - ▷ RANGE: Set the image compensation range. (10%, 20%, 30%)
  - ▷ FILTER: Set the sensitivity to hold DIS function in worst case. (LOW, MIDDLE, HIGH)
  - ▷ AUTO C: Set Auto Centering mode (OFF, HALF, FULL)

10.2.7. SPECIAL FUNCTION

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**DEFECT:** Compensates for bad pixels that may occur. Works when the whole screen is in full black or if there is much pixilation and it changes the THRS values until the screen is fixed.

**When you use this function, you have to cap the lens to remove the light.**

**IMAGE RANGE:** Select image bit range. (Full: 100%, Compressed: 75%)

- ▶ FULL, COMP, USER↓
- ▷ LEVEL: Select user mode level (0 ~ 32)

**SYSTEM:** Select NTSC (30/60fps) or PAL (25/50fps).

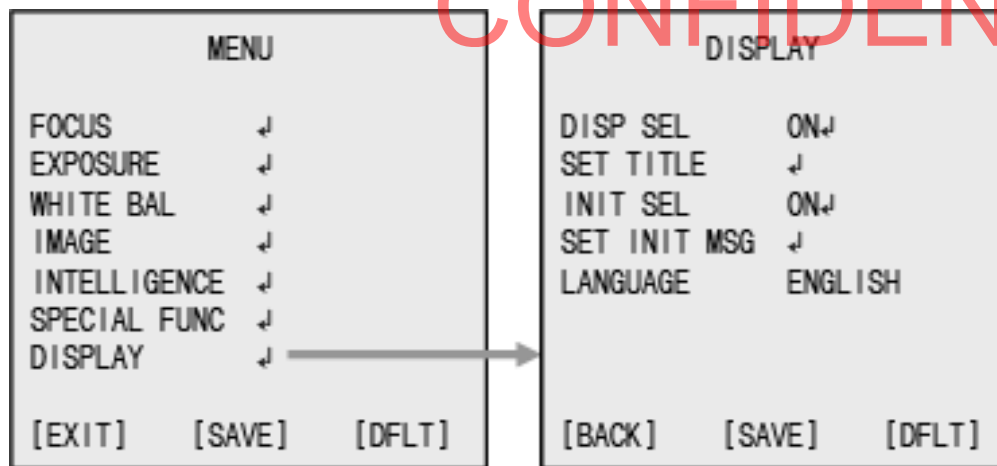
**HD FORMAT:** Select Digital output (1080p/30(25) fps, 1080p/60(50) fps, 720p/30(25) fps, 720p/60(50) fps)

**EX-SDI:** Select EX-SDI mode (OFF / ON)

**COMM:** Set up the camera ID, baud rate, protocol

- ▷ ID: Select the camera ID
- ▶ 1 ~ 255
- ▷ BAUD RATE: Select serial communication speed
- ▶ 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200bps
- ▷ PROTOCOL: Select operating protocol
- ▶ VISCA / PELCO-D / PELCO-P / UPDATE (Videology programming use only)

10.2.8. DISPLAY



**DISP SEL:** Select display item.

- ▶ OFF / ON↓
  - ▷ ID: OFF / ON
  - ▷ TITLE: OFF / ON
  - ▷ ZOOM RATIO: OFF / ON
  - ▷ SYSTEM MSG: OFF / ON (MD Alarm and Wait message)

**SET TITLE:** Select camera title menu (Text edit- max 40 characters)

**INIT SEL:** Select display initial message.

- ▶ OFF / ON↓
  - ▷ ID: OFF / ON
  - ▷ BAUDRATE: OFF / ON
  - ▷ PROTOCOL: OFF / ON
  - ▷ VERSION: OFF / ON
  - ▷ INIT MSG: OFF / ON

**SET INIT MSG:** modify initial message. (Text edit – max 40 characters)

**LANGUAGE:** Select language.

- ▶ English / Japanese / Simplified Chinese / Traditional Chinese

Character Table of Text edit Mode

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z , . ( ) { } [ ] 0 1 2 3 4 5 6 7 8 9 \* + - / = ~ ! ? " ' `

10.2.9. BACK

Select to go back to the previous screen

10.2.10. SAVE

Saves all the setting changes.

10.2.11. DEFAULT

The default option will restore factory settings.

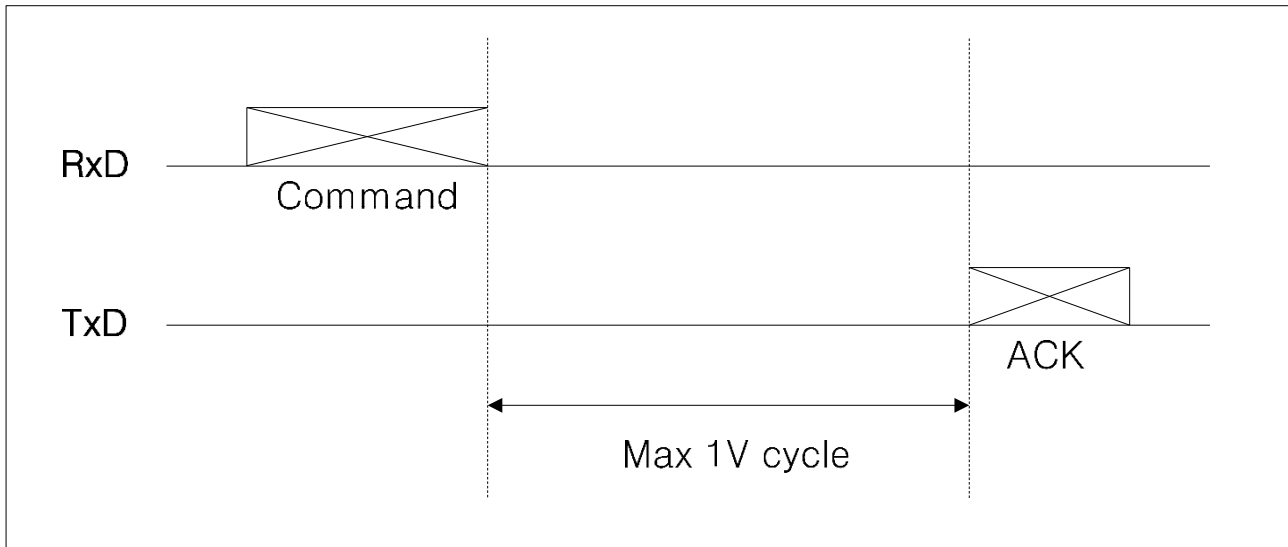
## 11. Protocol

### 11.1. Timing

As 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.

1V cycle

- 30fps mode : 33.3ms
- 60fps mode : 16.7ms
- 25fps mode : 40.0ms
- 50fps mode : 20.0ms



### 11.2. Communication parameter

- Protocol : VISCA, Pelco-D, Pelco-P
- ID : 1~7 (VISCA), 1~255 (Pelco-D, Pelco-P)
- Baud rate : 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
- Data bit : 8
- Start bit : 1
- Stop bit : 1
- Non parity bit



## 12. Pelco-D Protocol Command List

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Function	Message format (Hex)						
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Focus Mode	FF	ID	00	2B	00	00,01:Auto 02 : Manual	CS
Focus Near	FF	ID	01	00	00	00	CS
Focus Far	FF	ID	00	80	00	00	CS
Stop	FF	ID	00	00	Don't care		CS
Menu (Set)	FF	ID	00	03 or 07	00	5F	CS
Esc	FF	ID	00	03 or 07	00	60	CS
Up	FF	ID	00	08	00	XX	CS
Down	FF	ID	00	10	00	XX	CS
Left	FF	ID	00	04	XX	00	CS
Right	FF	ID	00	02	XX	00	CS
Set Zoom Preset	FF	ID	00	03	00	Preset ID (01 ~ 05)	CS
Clear Zoom Preset	FF	ID	00	05	00	Preset ID (01 ~ 05)	CS
Go to Zoom Preset	FF	ID	00	07	00	Preset ID (01 ~ 05)	CS
Zoom Tele	FF	ID	00	20	00	00	CS
Zoom Wide	FF	ID	00	40	00	00	CS

- ID: Camera ID (1 ~ 255)
- XX: Speed (10h < XX ≤ 40h)
- CS (Check Sum): An 8bit sum of byte 2 ~ 6 in the message.

### 13. Pelco-P Protocol Command List

# CONFIDENTIAL

- ID: Camera ID (1 ~ 255)
- XX: Speed (10h < XX ≤ 40h)
- CS (Check Sum): An XOR sum of byte 1 ~ 7 in the message.

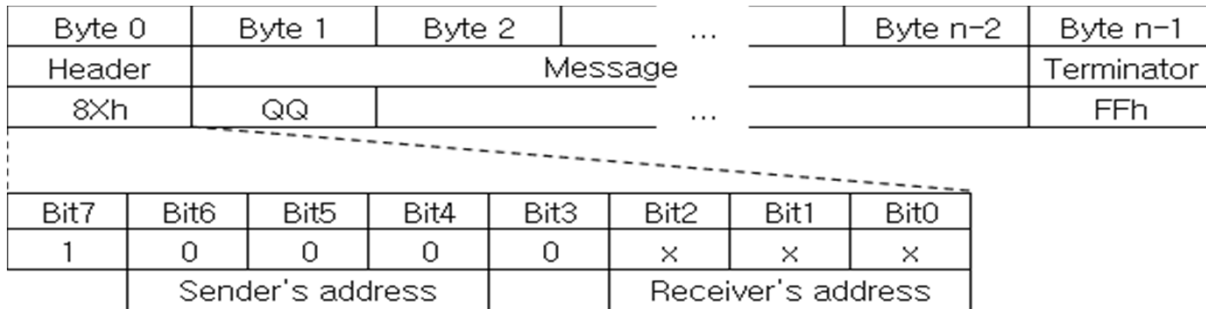
The protocol is **“zero indexed”** so that the hexadecimal address sent in the protocol for the receiver is 00 which corresponds to address 1

Function	Message format (Hex)							
	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Focus Near	A0	ID	02	00	00	00	AF	CS
Focus Far	A0	ID	01	00	00	00	AF	CS
Stop	A0	ID	00	00	Don't care		AF	CS
Menu (Set)	A0	ID	00	03 or 07	00	5F	AF	CS
Esc	A0	ID	00	03 or 07	00	60	AF	CS
Up	A0	ID	00	08	00	XX	AF	CS
Down	A0	ID	00	10	00	XX	AF	CS
Left	A0	ID	00	04	XX	00	AF	CS
Right	A0	ID	00	02	XX	00	AF	CS
Set Zoom Preset	A0	ID	00	03	00	Preset ID (01 ~ 05)	AF	CS
Clear Zoom Preset	A0	ID	00	05	00	Preset ID (01 ~ 05)	AF	CS
Go to Zoom Preset	A0	ID	00	07	00	Preset ID (01 ~ 05)	AF	CS
Zoom Tele	A0	ID	00	20	00	00	AF	CS
Zoom Wide	A0	ID	00	40	00	00	AF	CS

## 14. Visca Protocol

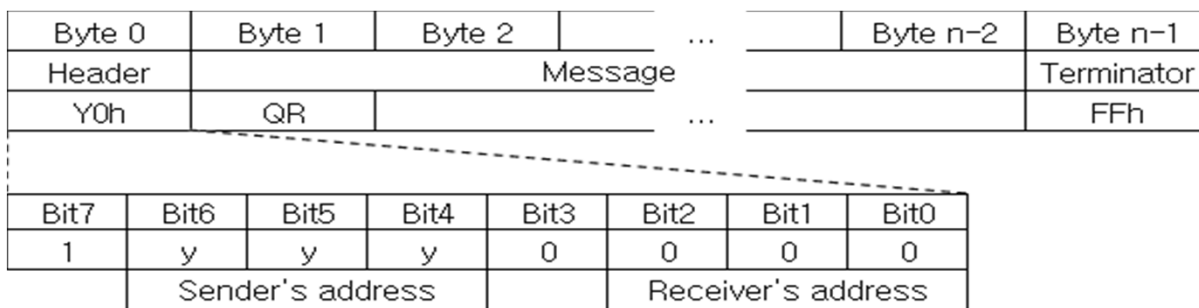
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- Command packet (Variable packet length)



- X: 1 ~ 7 (Camera address)
- QQ: 01 (Command), 09 (Inquiry)

- Ack message packet (Variable packet length)



- Y : 9 ~ F (Camera address + 8)
- Q : 4 (Receive Ack), 5 (Completion message), 6 (Error message)
- R : Socket Number (1 ~ 3)

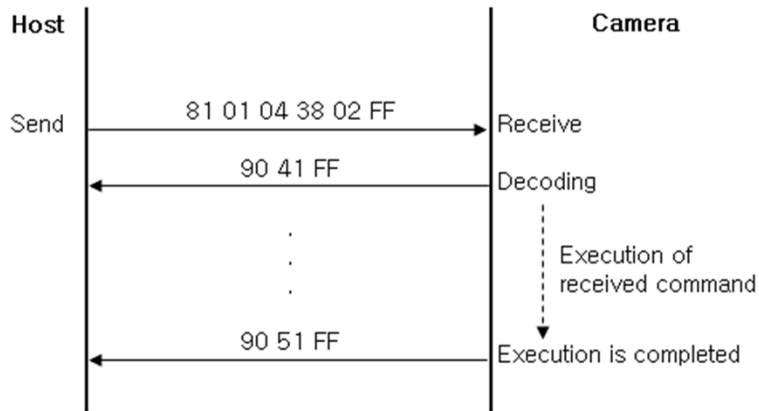
When command messages are sent to the camera, it is normal to send the next command message after waiting for the completion message or error message to return. However to deal with advanced uses, the camera has three buffers (memories) for commands, so that up to three commands including the commands currently being executed can be received. When the camera receives commands, it notifies the sender which command buffer was used by using the socket number of the ACK message.

Ack type	Reply packet	SS	Description
Recevie Ack	Y0 4R FF	01	Message length error
Compeletion (Commands)	Y0 5R FF	02	Syntax error
Compeletion (Inquiries)	Y0 50 ... FF	03	Command buffer full
Error	Y0 6R SS FF	04	Command cancelled
		05	No socket (to be cancelled)
		41	Command not executable

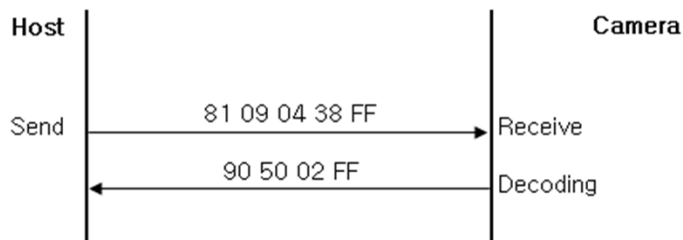
## Example of communication

- Camera ID : 1
- Socket number : 1

## Command



## Inquiry command



## Network change message

- 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.

Y0 38 FF

- Y : 9 ~ F (Camera address + 8)

## 14.1. Overview of VISCA functions

### 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.

## 14.2. Zoom

The camera employs a 10× optical zoom lens combined with a digital zoom 32x function; this camera allows you to zoom up to 320×.

### Optical 30×, f = 5.1 mm to 51 mm (F 1.6 to F 1.8)

Digital Zoom enlarges the center of the subject by expanding each image in both the vertical and horizontal directions. When 960× zoom is used, the number of effective picture elements in each direction reduces to 1/32 and the overall resolution deteriorates.

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

**Standard Mode** – zooms at a standard speed. (Requires a stop command to stop zoom operation)

**Variable Mode** - Eight levels of zoom speed. (Requires a stop command to stop zoom operation)

**Direct Mode** – Set the zoom position to allow for quick movement to the designated position.

### Digital Zoom ON/OFF

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

**Combined Mode** - In this mode 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.

**Continuous Zoom Position Reply** - With Zoom Direct mode, or when zooming according to a preset, the camera outputs its zoom position data when CAM\_ContinuesZoomPosReply is set to ON via VISCA command. The CAM\_ContinuesZoomPosReply will be: y0 07 04 69 0p 0p 0q 0q 0q 0q FF Where pp = the D-Zoom position and qqqq = the Zoom position. If the zoom mode is set for Combine then pp will equal 00.

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## 14.3. 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 maximize 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 increments using the Set Time Command. The initial value for both is set to five.

- *Zoom Trigger Mode* - When the zoom is changed, the pre-set value (initially set at 5) becomes that for AF Mode when it stops.

### **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 ( $\infty$ ) to F000 (10 mm). Default setting: D000h (30 cm)

## 14.4. 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.

### **Indoor**

3200K Base Mode

### **Outdoor**

5100K 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

### 14.5. 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 and Manual in the AE mode. Use this setting when image signal-to-noise ratio is particularly important.

#### **Shutter Priority**

Variable Shutter Speed, Auto Iris and Gain (1/1 to 1/30,000 sec., 11 high-speed shutter speeds plus 3 low-speed shutter speeds)

- 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, 14 steps at 0 dB: F1.6, 24 steps from 0 to 28 dB)

#### **AE – Shutter priority**

The shutter speed can be set freely by the user to a total of 14 steps – 11 high speeds and 3 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 1/30,000s. The iris and gain are set automatically, according to the brightness of the subject.

#### **AE – Iris priority**

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

#### **AE – Manual**

The shutter speed (14 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 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." When switching from the Shutter Priority mode to the Bright mode, the shutter speed set in the Shutter Priority mode is maintained.

14.6. Exposure Compensation

Exposure compensation is a function which offsets the internal reference brightness level used in the AE mode.

**Aperture Control**

Aperture control is a function which adjusts the enhancement of the edges of objects in the picture. There are 10 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). When Wide Dynamic range mode is turned on the Analog output is turned off.

**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.

**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 exists. In such a case, set the hand shake correction function to OFF.

**Slow shutter – Auto/Manual**

**Auto** - ensures that the slow shutter is set automatically when the brightness drops. Effective only when the AE mode is set to "Full Auto."

**Manual** - can be set to **x2**, **x4** or **x8**

**Note**

- The Slow Shutter Auto function is not available in WD mode.
- x8 not available in 25 & 30fps.



**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.

**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.

**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.

**Picture FLIP**

This function rotates image 180 degrees

**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 the Vertical cycle, the captured image is always 3 vertical to 4 vertical cycles after the sending of a command. Thus, you can not specify a time period after sending an EVEN, ODD or a command.

**Memory (Position preset)**

Using the position preset function, 10 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
- 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.

**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. 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

Where mm = Register No. (=00 to 7F) and

Where pp = Register Value (=00 to FF)

**Register Inquiry Command:**

8x 09 04 24 mm FF

Where mm = Register No.

y0 50 0p 0p FF

where 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 allows digital output mode configuration.
- Output Enable:** 73 - "Analog Output", "Digital Output", or "Both" can be set.
- E-Zoom Max:** 52 - The maximum digital zoom limit can be specified

## 14.7. 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.

## 14.8. 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".
nn	Selects new setting or resetting for the zone. See "nn: Setting" in "Parameters".
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".

**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.

- 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".
-------------	---

**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

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### Parameter:

pp pp pp pp	Each 24 Privacy Zones correspond with the BIT. See "pp pp pp pp: Mask bit" in "Parameters".
qq	Set the color code
rr	Set the color code. See "qq, rr: Color code" in "Parameters".

**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".

**Comments:** Pan/Tilt angle settings are hexadecimal data.

The resolution of Pan/Tilt angle is 0.088 degrees.

- 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".
ppp	Pan Angle (000 to FFF) See "Setting pan/tilt angle" in "Parameters".
qqq	Tilt Angle (000 to FFF) See "Setting pan/tilt angle" in "Parameters".
rrrr	Zoom Position (000 to 4000) See "Zoom Ratio and Zoom Position (for reference)".

**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

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### Parameters:

mm	Setting Mask See "mm: Mask setting list" in "Parameters".
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".

**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

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

## 14.9. 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 windows.
- When the motion is detected in the set window, the Alarm Replay VISCA command is sent.
- The threshold level for detection can be set (common to four windows).
- The interval of alarm detection can be set up to 255 seconds in units of one second.
- You can set on/off for each window.
- The frame number is also sent with Alarm Replay to report in which window the motion has been detected.

### Windows

#### Setting windows

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

#### When motion is detected within the range where windows overlap

The alarms are sent for both windows.

### 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 window 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 Window Set command. By sending an MD ON command, the window is displayed when motion is detected in the set Window. 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 window, and set the Threshold Level and the Interval Time.

8x 01 04 1C 0m 0n 0p 0q 0r 0s FF

Where m = Display Mode on/off (bit0 = Window)

Where n = Detection Window set on/off (bit0 = Window0, bit1 = Window1, bit2 = Window2, bit3 = Window3) -- (0 to F)

Where pq = Threshold -- (00 to FF)

Where rs = Interval time set -- (00 to FF)

(When pq and rs are 0, the command is received, but the setting is disabled.)

### Window Set

You can set up to four windows by assigning the starting and terminating points. 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

Where m = Select Detection Window (0 = Window0, 1 = Window1, 2 = Window 2, 3 = Window3)-- (0, 1, 2, 3)

Where p = Window set Start Horizontal Position -- (00 to 0F)

Where q = Window set Start Vertical Position -- (00 to 07)

Where r = Window set End Horizontal Position -- (01 to 10)

Where s = Window set End Vertical Position -- (01 to 08)

### Alarm Reply

When motion is detected in the set window, the camera issues this command. This command includes the information on the number of the detected window.

y0 07 04 1B 0p FF

Where p = Window Number (bit0 = Window0, bit1 0 Window1, bit2 = Window2, bit3 = Window3)

14.10.Visca Protocol Command List

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Command Set	Command	Command Packet	Comments	
AddressSet	Broadcast	88 30 01 FF	Address setting	
IF_Clear	Broadcast	88 01 00 01 FF	I/F Clear	
		8x 01 00 01 FF		
CommandCancel		8x 2p FF	p : Socket No.(1 ~ 3)	
CAM_Power	Power Reset	8x 01 04 00 03 FF	Camera Rebooting	
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 (Slow) ~ 7 (Fast)
	Wide (Variable)	8x 01 04 07 3p FF		
	Direct	8x 01 04 47 0p 0q 0r 0s FF		pqrs : Zoom Position
CAM_ZoomPreset	Set	8x 01 04 67 01 0p FF	p : Zoom Preset Number (0 ~ 4)	
	Run	8x 01 04 67 02 0p FF	p : Zoom Preset Number (0 ~ 4)	
	Clear	8x 01 04 67 03 0p FF	p : Zoom Preset Number (0 ~ 4, Fh : All)	
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 Separated	
	Stop	8x 01 04 06 00 FF		
	Tele (Variable)	8x 01 04 06 2p FF	p : 0(Slow) ~ 7(Fast)	
	Wide (Variable)	8x 01 04 06 3p FF	* Effective separate mode	
	x1/Max	8x 01 04 06 10 FF	x1/Max Magnification switchover * Effective separate mode	
	Direct	8x 01 04 46 00 00 0p 0q FF	pq : D-Zoom Position * Effective 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(Slow) ~ 7(Fast)	
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	
CAM_AF Mode		Normal AF	8x 01 04 57 00 FF	
	Interval AF	8x 01 04 57 01 FF	Interval AF Mode	
	Zoom Trigger AF	8x 01 04 57 02 FF	Zoom Trigger Mode	
	Active/Interval Time	8x 01 04 27 0p 0q 0r 0s FF	pq : Active Time(1~255), rs : Interval Time(1~255)	
CAM_ZoomFocus	Direct	8x 01 04 47 0p 0q 0r 0s 0t 0u 0v 0w FF	pqrs : Zoom Position tuv : Focus Position	

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Command Set	Command	Command Packet	Comments
CAM_Initialize	Lens	8x 01 04 19 01 FF	Lens Soft Reset
	Comp Scan	8x 01 04 19 02 FF	Execute White spot compensation
	Comp Scan Thrs	8x 01 04 19 03 00 0p 0q FF	pq : Threshold of White spot compensation
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 AWB	8x 01 04 35 03 FF	One Push AWB Mode
	Manual	8x 01 04 35 05 FF	Manual Control Mode
	One Push Trigger	8x 01 04 10 05 FF	One Push AWB trigger
CAM_RGain	Reset	8x 01 04 03 00 FF	Red Gain Manual setting
	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(0~14h)
CAM_BGain	Reset	8x 01 04 04 00 FF	Blue Gain Manual setting
	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(0~14h)
CAM_Chroma	Direct	8x 01 04 13 00 00 0p 0q FF	pq : Chroma level (0~14h)
CAM_AE	Full Auto	8x 01 04 39 00 FF	Auto exposure mode
	Manual	8x 01 04 39 03 FF	Manual control mode
	Shutter Priority	8x 01 04 39 0A FF	Shutter priority auto exposure mode
	Iris Priority	8x 01 04 39 0B FF	Iris priority auto exposure mode
	Bright	8x 01 04 39 0D FF	Bright Mode (Manual control)
CAM_SlowShutter	Auto (On)	8x 01 04 5A 02 FF	Auto Slow Shutter ON/OFF
	Manual (Off)	8x 01 04 5A 03 FF	
CAM_MaxDSSLev	Direct	8x 01 04 5A 1p FF	p :Max Slow shutter level (0:x2, 1:x4, 2:x8) * You can't select "x8" in 30 or 25 fps mode
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 (0 ~ Ah)



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Command Set	Command	Command Packet	Comments
CAM_AGC	On	8x 01 04 5C 02 FF	AGC Mode
	Off	8x 01 04 5C 03 FF	
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	
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	
CAM_Flickerless	On	8x 01 04 7A 02 FF	Flickerless ON/OFF
	Off	8x 01 04 7A 03 FF	
CAM_BLC	On	8x 01 04 33 02 FF	Back Light Compensation
	Off	8x 01 04 33 03 FF	
CAM_BLCFunc	Area OSD Display	8x 01 04 3C 0p FF	p : 0(Area OSD Off), 1(Area OSD On)
	Area Start X	8x 01 04 3C 10 00 0p 0q FF	pq : Start Horizontal Position (0 ~ 36h)
	Area Start Y	8x 01 04 3C 20 00 0p 0q FF	pq : Start Vertical Position (0 ~ 3Ch)
	Area End X	8x 01 04 3C 30 00 0p 0q FF	pq : End Horizontal Position (4~3Ah)
	Area End Y	8x 01 04 3C 40 00 0p 0q FF	pq : End Vertical Position (4~40h)
CAM_HLC	Mode	8x 01 04 32 0p FF	p : HLC Mode - 0(Off), 1(On), 2(Night Only)
	Level	8x 01 04 32 10 00 0p 0q FF	pq : HLC Level (0~14h)
	Clip Color	8x 01 04 32 3p FF	p : HLC Color - 0 ~ Dh (0:BLK, 1~6:Gray1~6, 7:WHT, 8:RED, 9:GRN, Ah:BLU, Bh:CYN, Ch:YEL, Dh:MAG)
CAM_WD	On	8x 01 04 3D 02 FF	Wide-D ON/OFF
	Off	8x 01 04 3D 03 FF	
CAM_WD_Level	Direct	8x 01 04 7D 0p FF	p : WDR Level (0 ~ 4)
CAM_ACE	On	8x 01 04 1A 02 FF	ACE ON/OFF
	Off	8x 01 04 1A 03 FF	
CAM_ACELevel	Direct	8x 01 04 1A 10 0p FF	p : ACE Level (0 ~ 2)
CAM_Defog	On	8x 01 04 65 02 FF	Defog ON/OFF
	Off	8x 01 04 65 03 FF	
	Level	8x 01 04 65 10 0p FF	p : Defog Level (0 ~ 2)
	Mode	8x 01 04 65 20 0p FF	p : 0(Manual), 1(Auto)
CAM_DNR	Mode	8x 01 04 53 0p FF	p : 0 (Off), 1 ~ 3 (Manual Level), 4 (Auto)
CAM_GAMMA	Direct	8x 01 04 5B 0p FF	p: Gamma setting (0:0.45, 1:0.55, 2:0.65, 3:0.75)
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	

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Command Set	Command	Command Packet	Comments
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	Freeze Picture ON/OFF
	Off	8x 01 04 62 03 FF	
CAM_PictureFlip	On	8x 01 04 66 02 FF	Picture Reverse On/Off (Rotate 180 °)
	Off	8x 01 04 66 03 FF	
CAM_ICR	Night	8x 01 04 01 02 FF	ICR Mode ON/OFF
	Day	8x 01 04 01 03 FF	
	Auto	8x 01 04 51 02 FF	ICR is changed automatically by AGC Gain
	Ext-In	8x 01 04 51 05 FF	ICR is changed by external input
	Threshold	8x 01 04 21 00 00 0p 0q FF	pq : Trheshold level of Auto mode (0 ~ 1Ch)
	Gap	8x 01 04 21 10 00 00 0p FF	pq : On/Off Threshold Gap of Auto mode (0 ~ 4)
	Auto ICR Delay	8x 01 04 41 00 00 0p 0q FF	pq : Auto mode delay - 0(0sec) ~ FFh(255sec)
	Ext-In Delay	8x 01 04 71 00 00 0p 0q FF	pq : Ext-In mode delay - 0(0sec) ~ FFh(255sec)
	Burst On	8x 01 04 72 02 FF	Burst On/Off
	Burst Off	8x 01 04 72 03 FF	
	IR Detection On	8x 01 04 6E 02 FF	IR Detection On/Off
	IR Detection Off	8x 01 04 6E 03 FF	
	IR Detection Level	8x 01 04 6E 10 0p FF	p : IR Detection Threshold Level ( 0 ~ 4h)
CAM_Stabilizer	On	8x 01 04 34 02 FF	Stabilizer ON/OFF/HOLD
	Off	8x 01 04 34 03 FF	
	Hold	8x 01 04 34 00 FF	
CAM_StabilizerFunc	Range	8x 01 04 54 00 0p FF	p : DIS Dzoom Range (0:10%, 1:20%, 2:30%)
	Filter	8x 01 04 54 10 0p FF	p : DIS Filter (0:Low, 1:Middle, 2:High)
	Auto Center	8x 01 04 54 20 0p FF	p : Auto centering mode (0:OFF, 1:Half, 2:Full)
CAM_MEMORY	Reset	8x 01 04 3F 00 0p FF	p : Memory number (0 ~ 9)
	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 in this mode at Power On
	Set	8x 01 04 3F 01 7F FF	
	Recall	8x 01 04 3F 02 7F FF	
CAM_MemSave	Write	8x 01 04 23 0t 0p 0q 0r 0s FF	t : 00 ~ 07 (Address) Total 16Byte pqrs : 0000 ~ FFFFh (Data)
CAM_Display	On	8x 01 04 15 02 FF	Display ON/OFF
	Off	8x 01 04 15 03 FF	
	On/Off	8x 01 04 15 10 FF	
CAM_DispSel		8x 01 04 14 00 0p FF	Display Item On(1)/Off(0) p : bit[0] - ID, bit[1] - Title, bit[2] - Zoom Position bit[3] - System Message

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Command Set	Command	Command Packet	Comments
CAM_MultiLineTitle	Title Set1	8x 01 04 73 1L 00 nn 00 qq rr 00 00 00 00 00 FF	L : Line Number (0 ~ Eh), nn : H- Position (0 ~ 27h), qq : Blink, rr : Opening Title
	Title Set2	8x 01 04 73 2L mm nn pp qq rr ss tt uu vv ww FF	L : Line Number (0 ~ Eh) mnpqrstuvw : Set of characters (1 ~ 10)
	Title Set3	8x 01 04 73 3L mm nn pp qq rr ss tt uu vv ww FF	L : Line Number (0 ~ Eh) mnpqrstuvw : Set of characters (11~ 20)
	Title Clear	8x 01 04 74 1p FF	Title Set clear (p: 0 ~ Eh, Fh= all line)
	On	8x 01 04 74 2p FF	Title display On/Off (0 ~ Eh, Fh= all line)
	Off	8x 01 04 74 3p FF	
CAM_MENUKey	Up	8x 01 04 16 01 FF	
	Down	8x 01 04 16 02 FF	
	Left	8x 01 04 16 04 FF	
	Right	8x 01 04 16 08 FF	
	Menu	8x 01 04 16 10 FF	
	ESC	8x 01 04 16 20 FF	
CAM_User OSD	Display String	8x 01 05 10 xx yy cc ss "nnnnnnnnnnnn" FF	xx : X position ( 0 ~ 27h ) yy : Y Position ( 0 ~ Eh ) cc : Color (Fixed, 07 : White) ss : NORMAL = 00 INVERSE = 01 BLINK = 02 "nnnnn...." : Display String (Max 26 char)
	Blue Screen	8x 01 05 20 0p FF	p : Blue Screen Display - 0(Off), 1(On)
	Screen Clear	8x 01 05 30 01 FF	Screen All clear
CAM_Mute	On	8x 01 04 75 02 FF	Mute 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 : MaskSettings nn : 00=Modify, 01=New rr : W, ss : H
	Display	8x 01 04 77 pp pp pp pp FF	Mask Display On/Off pppppppp : MaskSettings (0 : OFF, 1 : ON)
	SetMaskColor	8x 01 04 78 pp pp pp pp qq rr FF	pppppppp : 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, qq : Tilt
	SetPTZMask	8x 01 04 7B mm 0p 0p 0p 0q 0q 0q 0r 0r 0r FF	Pan/Tilt/Zoom Settings for Mask mm : Mask Settings ppp : Pan, qq : 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, qq: Y, rr: W, ss: H
CAM_KeyLock	Off	8x 01 04 17 00 FF	Key Lock ON/OFF
	On	8x 01 04 17 02 FF	
CAM_IDWrite		8x 01 04 22 0p 0q 0r 0s FF	pqrs : Camera ID ( 0000 ~ FFFFh)

< Visca Protocol Commands >

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Command Set	Command	Command Packet	Comments
CAM_MD	On	8x 01 04 1B 02 FF	Motion Detection 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 (bit[0]:1, bit[1]:2, bit[3]:3) pq : Threshold Level (00 ~ 14h) rs : Interval Time set (00 ~ FFh)
	Window Set	8x 01 04 1D 0m 0p 0q 0r 0s FF	m : Select Detection Frame Number (0,1,2) p : Start Horizontal Position ( 00 ~ 0Eh) q : Start Vertical Position (00 ~ 07) r : End Horizontal Position (01 ~ 0Fh) s : End Vertical Position (01 ~ 08h)
	MD Zoom Preset	8x 01 04 1E 02 FF	MD Zoom Preset On
		8x 01 04 1E 03 FF	MD Zoom Preset Off
	Set MD Zoom Pos	8x 01 04 1E 10 FF	Set MD Zoom preset to current zoom position
	Alarm (Reply)	y0 07 04 1B 0p FF	p : Detection Frame Set
CAM_Continuous ZoomPosReply	On	8x 01 04 69 02 FF	Zoom Positon data continues 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 D-Zoom Mode is Combine qqqq : Zoom Position
CAM_Reply IntervalTimeSet		8x 01 04 6A 00 00 0p 0q FF	pq : Interval Time [Vertical timing]
CAM_UTC	On	8x 01 05 1C 02 FF	UTC On/Off
	Off	8x 01 05 1C 03 FF	
CAM_UTCForward	On	8x 01 05 0C 02 FF	UTC to UART Command forwarding On/Off
	Off	8x 01 05 0C 03 FF	
	(Reply)	y0 07 05 0C 0p 0p 0q 0q 0r 0r 0s 0s FF	pp : Pelco-D word 3 qq : Pelco-D word 4 rr : Pelco-D word 5 ss : Pelco-D word 6
CAM_RegisterValue		8x 01 04 24 mm 0p 0q FF	mm : Register No. (00, 52h, 60h, 72h, 73h, 90h, 91h, 9Ah, 9Bh) pq : Register Value

14.11.Visca Protocol Inquiry Command List

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< Visca Protocol Inquiry Commands >

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	On
CAM_ZoomPosInq	8x 09 04 47 FF	y0 50 0p 0q 0r 0s FF	pqrs : Zoom Position
CAM_ZoomPresetInq	8x 09 04 67 FF	y0 50 00 00 0p 0q FF	pq : bit[0]:0 ~ bit[4]:4, (1:Set, 0:Unset)
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
CAM_AFMModeInq	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_AFStateInq	8x 09 04 26 FF	y0 50 0p FF	p : AF State - 0(Stop), 1(Run)
CAM_AFTimeSettingInq	8x 09 04 27 FF	y0 50 0p 0q 0r 0s FF	pq : Active Time, rs : Interval Time
CAM_CompScanThrsInq	8x 09 04 19 03 FF	y0 50 00 00 0p 0q FF	pq : White spot compensation Threshold
CAM_WBModeInq	8x 09 04 35 FF	y0 50 00 FF	Auto
		y0 50 01 FF	Indoor
		y0 50 02 FF	Outdoor
		y0 50 03 FF	One Push AWB
		y0 50 05 FF	Manual
CAM_RGainInq	8x 09 04 43 FF	y0 50 00 00 0p 0q FF	pq : R Gain (0~14h)
CAM_BGainInq	8x 09 04 44 FF	y0 50 00 00 0p 0q FF	pq : B Gain (0~14h)
CAM_ChromaInq	8x 09 04 13 FF	y0 50 00 00 0p 0q FF	pq : Chroma level (0~14h)
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	Off
CAM_MaxDSSLevInq	8x 09 04 5A 10 FF	y0 50 0p FF	p :Max Slow shutter level (0:x2, 1:x4, 2:x8) * You can't select "x8" in 30 or 25 fps mode
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_AGCMModeInq	8x 09 04 5C FF	y0 50 02 FF	On
		y0 50 03 FF	Off

< Visca Protocol Inquiry Commands >

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Inquiry Command	Command Packet	Inquiry Packet	Comments
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_FlickerlessInq	8x 09 04 7A FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_BackLightModeInq	8x 09 04 33 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_BLCAreaInq	8x 09 04 3C 00 FF	y0 50 0p FF	p : 0(Area OSD Off), 1(Area OSD On)
CAM_BLC_StartXInq	8x 09 04 3C 10 FF	y0 50 00 00 0p 0q FF	pq : Start Horizontal Position (0 ~ 36h)
CAM_BLC_StartYInq	8x 09 04 3C 20 FF	y0 50 00 00 0p 0q FF	pq : Start Vertical Position (0 ~ 3Ch)
CAM_BLC_EndXInq	8x 09 04 3C 30 FF	y0 50 00 00 0p 0q FF	pq : End Horizontal Position (4~3Ah)
CAM_BLC_EndYInq	8x 09 04 3C 40 FF	y0 50 00 00 0p 0q FF	pq : End Vertical Position (4~40h)
CAM_HLCModeInq	8x 09 04 32 00 FF	y0 50 0p FF	p : HLC Mode - 0(Off), 1(On), 2(Night)
CAM_HLCLevelInq	8x 09 04 32 10 FF	y0 50 00 00 0p 0q FF	pq : HLC Level (0 ~ 14h)
CAM_HLCColorInq	8x 09 04 32 30 FF	y0 50 0p FF	p : HLC Color - 0 ~ Dh (0:BLK, 1~6:Gray1~6, 7:WHT, 8:RED, 9:GRN, Ah:BLU, Bh:CYN, Ch:YEL, Dh:MAG)
CAM_WDModeInq	8x 09 04 3D FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_WDLevelInq	8x 09 04 7D FF	y0 50 0p FF	p : WDR Level (0 ~ 4)
CAM_ACEInq	8x 09 04 1A FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ACELevelInq	8x 09 04 1A 10 FF	y0 50 0p FF	p : ACE Level (0 ~ 2)
CAM_DefogInq	8x 09 04 65 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_DefogLevelInq	8x 09 04 65 10 FF	y0 50 0p FF	p : Defog Level (0 ~ 2)
CAM_DefogModeInq	8x 09 04 65 20 FF	y0 50 0p FF	p : Defog Mode - 0(Manual), 1(Auto)
CAM_DNRModeInq	8x 09 04 53 FF	y0 50 0p FF	p : 0 (Off), 1 ~ 3 (Manual Level), 4 (Auto)
CAM_GammaInq	8x 09 04 5B FF	y0 50 0p FF	p: Gamma setting (0:0.45, 1:0.55, 2:0.65, 3:0.75)
CAM_ApertureInq	8x 09 04 42 FF	y0 50 00 00 0p 0q FF	pq: Aperture Gain (0 ~ Ah)
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_PictureFlipModeInq	8x 09 04 66 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ICRStateInq	8x 09 04 01 FF	y0 50 02 FF	Night
		y0 50 03 FF	Day

< Visca Protocol Inquiry Commands >

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Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_ICRModeInq	8x 09 04 51 FF	y0 50 02 FF	Night
		y0 50 03 FF	Day
		y0 50 04 FF	ICR is changed automatically by AGC Gain
		y0 50 06 FF	ICR is changed by external input
CAM_ICRThresholdInq	8x 09 04 21 FF	y0 50 00 00 0p 0q FF	pq : Trheshold level of Auto Mode (0 ~ 1Ch)
CAM_ICRGapInq	8x 09 04 21 10 FF	y0 50 0p FF	p : On/Off Threshold Gap of Auto mode(0 ~ 4)
CAM_AutoICRDelayInq	8x 09 04 41 FF	y0 50 00 00 0p 0q FF	pq : Auto mode delay - 0(0sec)~FFh(255sec)
CAM_Ext-InICRDelayInq	8x 09 04 71 FF	y0 50 00 00 0p 0q FF	pq : Ext-In mode delay - 0(0sec)~FFh(255sec)
CAM_BurstInq	8x 09 04 72 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_IRDetectionInq	8x 09 04 6E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_IRDetectionLevelInq	8x 09 04 6E 10 FF	y0 50 0p FF	p : IR Detection Threshold Level (0 ~ 4)
CAM_StabilizerModeInq	8x 09 04 34 FF	y0 05 02 FF	On
		y0 05 03 FF	Off
		y0 05 00 FF	Hold
CAM_StabilizerRangeInq	8x 09 04 54 00 FF	y0 50 0p FF	p : DIS Dzoom Range (0:10%, 1:20%, 2:30%)
CAM_StabilizerFilterInq	8x 09 04 54 10 FF	y0 50 0p FF	p : DIS Filter (0:Low, 1:Middle, 2:High)
CAM_StabilizerAutoCInq	8x 09 04 54 20 FF	y0 50 0p FF	p : Auto centering mode (0:OFF, 1:Half, 2:Full)
CAM_MemoryInq	8x 09 04 3F FF	y0 50 0p FF	p: Last Recall Memory No.
CAM_MemSaveInq	8x 09 04 23 0t FF	y0 50 0p 0q 0r 0s FF	t : 0 ~ 7 (Address) pqrs : 0000 ~ FFFFh (Data)
CAM_DisplayInq	8x 09 04 15 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_DispSelInq	8x 09 04 14 00 FF	y0 50 0p FF	Display Item On(1)/Off(0) p : bit[0] - ID, bit[1] - Title, bit[2] - Zoom Position bit[3] - System Message
CAM_TitleDisplayModeInq	8x 09 04 74 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_MenuModeInq	8x 09 04 16 FF	y0 50 02 FF	OSD menu On
		y0 50 03 FF	OSD menu Off
CAM_BlueScreenModeInq	8x 09 05 20 FF	y0 50 0p FF	p : Blue Screen Display - 0(Off), 1(On)
CAM_MuteModeInq	8x 09 04 75 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_PrivacyPosInq	8x 09 04 76 mm FF	y0 50 0n 0p 0p 0r 0r 0s 0s FF	mm : Mask Number n : 0(Non-interlock Mode), 1(Interlock Mode) pp : X, qq : Y, rr : W, ss : H
CAM_PrivacyDisplayInq	8x 09 04 77 FF	y0 50 pp pp pp pp FF	pppppppp : Mask Display (0: OFF, 1: ON)
CAM_PrivacyColorInq	8x 09 04 78 FF	y0 50 pp pp pp pp qq rr FF	pppppppp : Mask Color Setting qq : Color Setting when 0 is selected Rr : Color Setting when 1 is selected
CAM_PrivacyPanTiltInq	8x 09 04 79 FF	y0 50 0p 0p 0p 0q 0q 0q FF	ppp : Pan, qqq : Tilt

< Visca Protocol Inquiry Commands >

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Inquiry Command	Command Packet	Inquiry Packet	Comments
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, qqg : Tilt, rrrr : Zoom
CAM_PrivacyMonitorInq	8x 09 04 6F FF	y0 50 pp pp pp pp FF	pppppppp : Mask is displayed now
CAM_KeyLockInq	8x 09 04 17 FF	y0 50 02 FF	On
		y0 50 00 FF	Off
CAM_IDInq	8x 09 04 22 FF	y0 50 0p 0q 0r 0s FF	pgrs: Camera ID
CAM_VersionInq	8x 09 00 02 FF	y0 50 00 20 mn pq rs tu vw FF	mnpq : Model Code (0466h) rstu : ROM version (0100h) vw : Socket Number (3)
CAM_ModelInq	8x 09 00 37 FF	y0 50 pp pp pp qq qq FF	pppppp : Model Code *Module Type : YY7C5Ah *Box Type : YY7C58h (YY : Custom. Code, standard model = 00) qqqq : Version
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 (bit[0]:1, bit[1]:2, bit[3]:3) pq : Threshold Level (00 ~ 14h) rs : Interval Time set (00 ~ FFh)
CAM_MDWindowInq	8x 09 04 1D 0m FF	y0 50 0p 0q 0r 0s FF	m : Select Detection Frame Number (0,1,2) p : Start Horizontal Position ( 00 ~ 0Eh) q : Start Vertical Position (00 ~ 07) r : Stop Horizontal Position (01 ~ 0Fh) s : Stop Vertical Position (01 ~ 08h)
CAM_MDZoomPresetInq	8x 09 04 1E FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_ContinuousZoomPos ReplyModeInq	8x 09 04 69 FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_UTCInq	8x 09 05 1C FF	y0 50 02 FF	On
		y0 50 03 FF	Off
CAM_UTCForwardInq	8x 09 05 0C 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, 52h, 60h, 72h, 73h, 90h, 91h, 9Ah, 9Bh) pp : Register Value



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## 14.12.< Exposure control values >

Shutter Speed (Hex)		
Step (Hex)	NTSC	PAL
0D	1/30000	1/30000
0C	1/10000	1/10000
0B	1/7000	1/7000
0A	1/5000	1/5000
9	1/2500	1/2500
8	1/1600	1/1600
7	1/1000	1/1000
6	1/700	1/700
5	1/250	1/250
4	1/120	1/100
3	1/60	1/50
2	1/30	1/25
1	1/15	1/12
0	1/8	1/6

Iris (Hex)		
11	Open	
10	↑ ↓	
0F		
0E		
0D		
0C		
0B		
0A		
09		
08		
07		
06		
05		
00		Close

Bright (Hex)		
Step	IRIS	GAIN
1B	11	A
1A	11	9
19	11	8
18	11	7
17	11	6
16	11	5
15	11	4
14	11	3
13	11	2
12	11	1
11	11	0
10	10	0
0F	0F	0
0E	0E	0
0D	0D	0
0C	0C	0
0B	0B	0
0A	0A	0
09	09	0
08	08	0
07	07	0
06	06	0
05	05	0
00	00	0

14.13.< Zoom & Focus control values >

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<b>Optical Zoom</b>	
Magnification	Zoom Position
×1	0000
×2	10BE
×3	1B66
×4	2258
×5	2729
×6	2AC1
×7	2D88
×8	2FCE
×9	31B9
×10	3360
×11	34DC
×12	362D
×13	3760
×14	387A
×15	397C
×16	3A6B
×17	3B3B
×18	3BF9
×19	3CA5
×20	3D38
×21	3DB9
×22	3E27
×23	3E83
×24	3ED9
×25	3F23
×26	3F60
×27	3F97
×28	3FC8
×29	3FED
×30	4000

<b>D-Zoom : Combine Mode</b>	
Magnification	Zoom Position
x1	4000
x2	6000
x3	6A80
x4	7000
x5	7300
x6	7540
x7	76C0
x8	7800
x9	78C0
x10	7980
x11	7A00
x12	7AC0
x13	7B40
x14	7B80
x15	7BC0
x16	7C00
x17	7C40
x18	7C80
x19	7CC0
x21	7D00
x23	7D40
x25	7D80
x28	7DC0
x32	7E00

<b>D-Zoom : Separate Mode</b>	
Magnification	Zoom Position
x1	00
x2	80
x3	AA
x4	C0
x5	CC
x6	D5
x7	DB
x8	E0
x9	E3
x10	E6
x11	E8
x12	EB
x13	ED
x14	EE
x15	EF
x16	F0
x17	F1
x18	F2
x19	F3
x21	F4
x23	F5
x25	F6
x28	F7
x32	F8

<b>Focus Near Limit</b>	
1000	10m
2000	
3000	
4000	5m
5000	
6000	3m
7000	
8000	
9000	1m
A000	
B000	
C000	
D000	10cm
E000	
F000	
F000	

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14.14.< OSD character values >

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V position	00 ~ 0Eh	15 Rows
H position	00 ~ 27h	40 Columns

Character code

Code	Character	Code	Character	Code	Character	Code	Character
00	Space	21	A	42	b	63	Ç
01	!	22	B	43	c	64	È
02	"	23	C	44	d	65	É
03	#	24	D	45	e	66	Ê
04	\$	25	E	46	f	67	Ë
05	%	26	F	47	g	68	Î
06	&	27	G	48	h	69	Ï
07		28	H	49	i	6A	Ñ
08	(	29	I	4A	j	6B	Ô
09	)	2A	J	4B	k	6C	Ö
0A	*	2B	K	4C	l	6D	Ù
0B	+	2C	L	4D	m	6E	Û
0C	,	2D	M	4E	n	6F	Ü
0D	-	2E	N	4F	o	70	ß
0E	.	2F	O	50	p	71	à
0F	/	30	P	51	q	72	â
10	0	31	Q	52	r	73	ä
11	1	32	R	53	s	74	ç
12	2	33	S	54	t	75	è
13	3	34	T	55	u	76	é
14	4	35	U	56	v	77	ê
15	5	36	V	57	w	78	ë
16	6	37	W	58	x	79	î
17	7	38	X	59	y	7A	ï
18	8	39	Y	5A	z	7B	ñ
19	9	3A	Z	5B	{	7C	ô
1A	:	3B	[	5C		7D	ö
1B	;	3C	\	5D	}	7E	ù
1C	<	3D	]	5E	~	7F	û
1D	=	3E	^	5F		80	ü
1E	>	3F	_	60	À	81	Œ
1F	?	40	`	61	Â	82	œ
20	@	41	a	62	Ä		

14.15.< Register Setting >

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Function	Register No.	Value	
BaudRate	00	10	2400 bps
		11	4800 bps
		00	9600 bps
		01	19200 bps
		02	38400 bps
		03	57600 bps
		04	115200 bps
E.ZOOM Max	52	00 ~ F8	Max. DZoom Ratio = 256 / (256 - Value)
Language	60	00	English
		01	Japanese
		03	Simplified Chinese
		05	Traditional Chinese
Monitoring Mode	72	06	1080p/30fps
		08	1080p/25fps
		09	720p/60fps
		0C	720p/50fps
		0E	720p/30fps
		11	720p/25fps
		13	1080p/60fps
Output Enabling	73	02	Analog output disabled
		03	Analog output enabled
		04	Analog output auto detection
Image range mode	90	0	Full mode
		1	Comp mode
		2	User mode
Image range custom level	91	0 ~ 20	
EX-SDI mode (* Module type only)	9A	0	Off
		1	On

14.16.< Other control values >

AF Active Time	00 (0sec)	~	FFh (255sec)
AF Interval Time	00 (0sec)	~	FFh (255sec)
R Gain	00	~	14h
B Gain	00	~	14h
Aperture Level	00	~	0Ah
Threshold Level of ICR	00	~	1Ch
Gap Level of ICR	00	~	04h

## 15.Contact Information

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For technical assistance with this product, please contact the supplier from whom the product was purchased.

For OEM inquiries, contact Videology® Imaging Solutions:

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