

## NEMETODE Technical Note #01

# Watec 902 & 910 Series Cameras

### Overview, Differences between Versions and Recommended Settings when used for Meteor Detection

This document provides an overview of the Watec 902 & 910 series of cameras; describes the differences between versions and provide recommendations as to the optimal settings that should be selected when using these cameras for meteor detection. The recommendations are based on user experience within the [NEMETODE](#) team and on input from others. Where possible the authors have included references to the rationale behind the recommendations provided.

#### Watec Cameras: Differences between Versions

As of the time of writing (January 2015), there are three different generations of the Watec 902H. The first was known as the 902H, the second as the 902H Supreme and the third the 902H Ultimate. Also in use by NEMETODE is the 902DM2S camera (based on a recommendation from Armagh Observatory) [1] and the 910HX / RC. Images of these models are shown in Figure 1.

For a period of time Watec marketed their products in the US under the Genwac brand. In use within the NEMETODE group are a number of Genwac 902H cameras. Functionally these have been found to be identical to the Watec 902H except that they operate to the NTSC (29.97 frames per second) standard (EIA: 768 x 494) instead of the PAL (25 frames per second) standard (CCIR: 752 x 582). Achieving the camera's maximum resolution with particular video interface devices is discussed in NEMETODE Technical Note #2 "Troubleshooting Resolution Issues".

#### H / H2 / H3 Suffixes and Sensor Dimensions

The original Watec 902H was only available with a  $\frac{1}{2}$ " format sensor. Later versions, denoted "Supreme" and "Ultimate", were available with either  $\frac{1}{2}$ " or  $\frac{1}{3}$ " sensors. In order to differentiate between the sensor sizes, Watec added a suffix to the end of the model name with the 902H2 designation highlighting that the camera had a  $\frac{1}{2}$ " sensor fitted while the 902H3 had a  $\frac{1}{3}$ " sensor fitted. The DM2S is fitted with a  $\frac{1}{2}$ " sensor, as is the 910HX.

It should be noted that the exterior of the camera may not be labelled with the H2 or H3 suffix. This being the case, and in the absence of accompanying information, the sensor will need to be measured in order to determine if it is the  $\frac{1}{2}$ " or  $\frac{1}{3}$ " model. It is important to note that  $\frac{1}{2}$ " sensors do not measure  $\frac{1}{2}$ " across their diagonal. It is a similar situation for the  $\frac{1}{3}$ " sensors – see Table 1.

Sensor Size	Horizontal / mm	Vertical / mm	Diagonal / mm
$\frac{1}{2}$ "	6.8	5.0	8.4
$\frac{1}{3}$ "	5.1	3.8	6.4

**Table 1:** Actual sensor dimensions for what are marketed as  $\frac{1}{2}$ " and  $\frac{1}{3}$ " sensors. The number of pixels (and hence the resolution) of both the H2 and H3 cameras is essentially the same. The H3 models have smaller pixels and hence a physically smaller sensor.  $\frac{1}{2}$ " and  $\frac{1}{3}$ " are legacy terms from the days when lenses of  $\frac{1}{2}$ " and  $\frac{1}{3}$ " focal length gave a "standard FOV" with an early cine / video camera. This is analogous to a 50mm lens giving a "standard" FOV on a SLR camera: the film itself isn't 50mm across [2].

When choosing a lens to be fitted to the camera it is important to ensure that the lens selected is matched to the sensor size. Some lenses are designed for use with  $\frac{1}{3}$ " sensors – using these on cameras with  $\frac{1}{2}$ " sensors will result in significant vignetting (darkening at the edge of the field of view) as the lenses will not fully illuminate the edges / corners of the sensor. A wider than expected field of view (FOV) will also be apparent though in all likelihood with significant lens distortions at the edges of the image. Conversely, using a lens designed for a  $\frac{1}{2}$ " sensor on a camera fitted with a  $\frac{1}{3}$ " sensor will result in a fully illuminated image although the observed field of view (FOV) will be smaller than would be expected as some of the light from the lens will fall beyond the edges of the sensor. [This link](#) is useful for estimating the typical FOV for a given sensor size and lens focal length.

#### Comparative Performance

This document is not intended to provide a back to back comparative performance evaluation of the different models other than to say that in general later models are more sensitive than earlier ones (see

Appendix for Minimum Illumination values for each model). Some work has been performed by others and the authors recommend a review of the information provided by the manufacturer (see Appendices) and [here](#). Currently the Watec 910HX is the most sensitive camera in operation within the network and has a limiting magnitude that is approximately +1 better than the Watec 902H. The NEMETODE team, in conjunction with others, have determined what they believe to be the optimal settings when using these cameras for the purpose of meteor detection. These are detailed in Tables 2, 3, 4, 5 and 6.



Watec 902H



Genwac 902H



Watec 902H Supreme



Watec 902H Ultimate



Watec 902DM2S



Watec 910HX

**Figure 1:** Different generations and models of the Watec / Genwac series of cameras as used by NEMETODE. In some cases the name is printed on the side of the camera body but if not one should note the differences in the rear and side panels.

### Watec 910 Additional Information

This camera is available in two models. The 910 HX/RC is the “standard” camera with a hand paddle / remote controller. The 910BD is a board camera, mounted on an electronic circuit board. Following the initial release of the 910HX Watec began producing newer models containing a sensor that was twice as sensitive as the earlier version. Confusingly they retained the “910” designation. The more sensitive cameras have serial numbers of 1001 onwards [2].

Option	Recommended Setting	Rationale
<b>Shutter (ON / OFF)</b>	OFF	<b>Electronic Shutter.</b> External switch on the rear of the camera. While having it in the ON position may help to prevent sensor damage if the camera is exposed to bright light, maintaining it in the OFF position ensures that the sensor has a constant gain, important when attempting to estimate the magnitude of meteors: if the gain were to vary while a bright meteor was detected then this could lead to an incorrect magnitude estimate [3].
<b>AGC (LO / HI)</b>	LO or HI	<b>Active Gain Control.</b> Dip Switch located inside the camera and accessed by removing the rear panel. By default is set to HI upon shipment from factory. Retain at HI in order to maximise sensitivity [3] though some users (e.g. in light polluted areas) may wish to experiment with setting this to “LO” [2].

**Table 2:** Recommended settings for the Watec / Genwac 902H camera when used for the purposes of meteor detection.

Option	Recommended Setting	Rationale
<b>EI / FL / OFF</b>	OFF	External switch on the rear of the camera.  <b>EI: Electronic Iris.</b> Camera will attempt to adjust exposure to compensate for varying lighting conditions [4].  <b>FL: Flicker Mode.</b> Used indoors when camera may be affected by fluorescent lighting. Sets exposure to $\frac{1}{100s}$ to synchronise with the lights and hence prevent flickering of the image [4].  Keep in the “OFF” position [5].
<b>AGC (LO / HI)</b>	LO or HI	<b>Active Gain Control.</b> Dip Switch located inside the camera and is accessed by removing the rear panel. By default is set to HI upon shipment from factory. Some users prefer setting this to the “LO” position as “HI” setting can result in a noisy image while others find “HI” to give an acceptable image[2].

**Table 3:** Recommended settings for the Watec 902H2/3 Supreme camera when used for the purposes of meteor detection.

Option	Recommended Setting	Rationale
<b>Gamma (HI / LO / OFF)</b>	OFF	External switch on the rear of the camera. SonotaCo recommends this be set to OFF [6]. Corresponding values of Gamma are as follows: OFF (1.0), LO (0.45), HI (0.45) [2].
<b>AGC (HI / LO / MGC)</b>	LO ... or MGC?	<p><b>Active Gain Control.</b> External switch on the rear of the camera. SonotaCo recommends this is set to LO [6]. MGC is Manual Gain Control and can be controlled via a trimming pot on the rear of the camera marked "L" (Low) to "H" (High).</p> <p>Alex Pratt notes "<i>I tried AGC HI which boosted the gain but it increased the noise level and from my suburban ... back garden [in Leeds] it did not result in a fainter limiting magnitude nor more meteors</i>" [7].</p> <p>Jeremy Shears notes "<i>The other noise I came across is random noise on the frame - it looks like the "snow" from a TV tuned between channels. This happens when the sky is very dark and with the gain at Hi - switching to low removes it, but then I lose sensitivity. So I have now put the Gain to manual and used the trimming pot to manually adjust the gain to a point just below where the noise manifests itself (which is a tad below maximum gain).</i>" [8].</p> <p>This illustrates that gain can be adjusted to suit local observing conditions [2].</p>
<b>BLC Switch 1 (Up / Down)</b>	Down	<b>Back Light Compensation.</b> External switch on the side of the camera. Up is the "ON" position [8], Down is the "OFF" position [2].
<b>BLC Switch 2 (Up / Down)</b>	Down	<b>Back Light Compensation.</b> External switch on the side of the camera. Up is the "ON" position [8], Down is the "OFF" position [2].
<b>Shutter Switch 3 (Up / Down)</b>	Down	External switch on the side of the camera. Up is the "ON" position [8], Down is the "OFF" position – this locks it to $1/50s$ (CCIR/PAL). While Jeremy Shears operates in the "Down / OFF" position [8], Alex Pratt has his set to the "Up / ON" position – see AE Mode Control [2].
<b>Shutter Rotary Dial (0 – 9)</b>		<b>AE Mode Control.</b> Only takes effect if Shutter Switch 3 is in "Up / ON". SonotaCo recommend a setting of 8, known as EI:OFF, which operates the shutter at $1/50th - 1/100000th$ sec to support observations in twilight and to stop the camera 'hunting' (over-compensating) [2].

**Table 4:** Recommended settings for Watec 902H3/3 Ultimate camera when used for the purposes of meteor detection.



Option	Recommended Setting	Rationale
EI / FL / OFF		External switch on the rear of the camera.  <b>EI: Electronic Iris.</b> Camera will attempt to adjust exposure to compensate for varying lighting conditions [4].  <b>FL: Flicker Mode.</b> Used indoors when camera may be affected by fluorescent lighting. Sets exposure to $\frac{1}{100s}$ to synchronise with the lights and hence prevent flickering of the image [4].
B.L. ON / OFF		<b>Back Light Compensation.</b>
Switch 1 (Up / Down)		<b>AGC: Active Gain Control.</b> Up appears to be the ON position?
Switch 2 (Up / Down)		<b>Gamma.</b> Up appears to be the ON position?
Switch 3 (Up / Down)		<b>Inverted.</b> Up appears to be the ON position?

**Table 5:** Recommended settings for Watec 902DM2S camera when used for the purposes of meteor detection.

### Iris Control

Many c-mount camera lenses have a square 4-pin plug fitted as standard to control the auto-iris on the lens. Lenses come in two types: **DC auto-iris** and **Video auto-iris**. For a DC auto-iris lens the control circuit to operate the auto-iris resides inside the camera whereas for a Video auto-iris lens the control circuit resides inside the lens. The original 902H camera does not have the requisite control circuitry within the camera and hence the socket on the side of the camera body will not drive a DC auto-iris lens. Later models (902H Supreme and 902H Ultimate) do contain the requisite circuitry and hence will drive DC auto-iris lenses.

If the camera is unable to drive the auto-iris there is a workaround that involves applying (in most cases - check datasheet for the lens in question) 12V DC across the lens auto-iris – this will fully open the iris. As the Watec cameras themselves operate at 12V DC the simplest way accomplish this is to split the power feed to the camera and use the additional line to power the auto-iris. Removing the 4 pin connector and exposing the wires (again, check the datasheet for the lens in question to determine appropriate wire colours) is one solution while a more elegant approach is to use a spare 4 pin socket (Figure 2).

Option	Recommended Setting	Rationale
<b>Exposure Menu:</b> Shutter Sens Up AGC – Auto Gain Control BLC	$1/50S$ OFF OFF: Set Manual Gain to 36dB OFF	These settings are very similar to other Watec cameras and have produced good results. These are my preferred settings for meteor detection. Gain should be set manually or the camera will automatically adjust the image within its set range [4].
<b>Adjust Menu:</b> Sharpness Gamma	10 0.45	These settings seem to provide a good image with reasonable contrast. Increasing gamma will give more contrast but may lose stars and in general is personal preference [2], [4].
<b>XXX Menu:</b> DNR WDR	ON: 10 OFF	Dynamic Noise Reduction can be useful if used sparingly [4]. Not needed. May affect meteor magnitude results if used [4].
<b>Functions Menu:</b> Effect Motion BPC – Hot Pixel Removal	Not Used OFF Use as Needed	
Level trimmer pot on camera body		Level adjustment screw on the side of the camera. Assumption is that this is to adjust the image when using DC iris or manual lenses. Left at default factory position [4].

**Table 6:** Recommended settings for Watec 910HX camera when used for the purposes of meteor detection.



**Figure 2:** Auto-iris activation using a 4 pin socket, the power to which is achieved by splitting the 12V DC feed to the camera itself. In addition to showing the power supply for converting 230V AC to 12V DC, the upper picture also shows a ground loop isolator attached to the “video-out” connector on the rear of the camera. This device helps reduce the appearance of electrical interference / banding on the resulting image.

## Camera Protection

Having a bright light (such as direct sunlight) fall on to the sensor will almost certainly result in damage to the camera. Making use of the auto-iris may help to reduce the likelihood of this happening. An alternative approach is to have the camera point in a direction from which there is never direct sunlight or to disable power to the camera and iris during daylight – this deactivates the sensor and closes the iris. NEMETODE experience has been that the light from the full moon (even through lenses of 12mm focal length with the iris fully open) does not cause damage to the camera sensor.

## DC Power Connector for the Camera

12V DC, Centre Positive

Power Pin Size: External Diameter 5.5mm; Internal Diameter 2.1mm

These are reasonably standard in the CCTV industry. Self wire models are readily available on internet auction sites – search on “CCTV 5.5mm 2.1mm”.

## Fine Focussing Ring

This is located on the front of the camera and consists of a ring with allen-screws located around the circumference at 120° spacing. An allen-key is usually supplied with the camera and loosening the screws allows the lens mount to be shifted back and forth by a small amount. This can be useful when attempting to focus the lens at infinity (required for meteor work).

## Aberration Compensation Filters – Issues with Fitting

The sensors in Watec 902 / 910 series cameras are sensitive to a wide range of wavelengths. One of the disadvantages associated with this is the fact that lenses focus different wavelengths of light at different distances from the rear of the lens element. Lens manufacturers often address this issue by recommending the use of what they typically call a “B/W Aberration Compensation Filters (ACF)”. These items fit between the lens and the camera. It is not clear if these are filters (which block certain wavelengths) or additional lenses (which bring the different wavelengths to focus at a common plane). NEMETODE users suspect it is the latter and have reported a significant improvement in focus and limiting magnitude when using ACFs compared to not using them with the greatest improvement being on lenses with the shortest focal lengths.

The lens mount on the original Watec 902H, the 902DM2S [1] and the 902H2/H3 Supreme is of a design which does not permit the fitting of an ACF between the lens and the camera – the ACF comes up against the stepped inner surface of the lens mount before the lens mounting threads are able to engage. Hence the original 902H, 902DM2S and 902 Supreme H2/3 cameras cannot be used with the recommended ACF fitted. Without the ACF fitted the image is still acceptable, even at focal lengths as low as 3.8mm - they're just not as “sharp” at the field edges as the user may desire. Later versions of the 902H (Ultimate) and 910 HX do not have this stepped inner surface and the recommended ACF can be successfully fitted.



**Figure 3:** The “Stepped” lens-mount on the Watec 902H (left) prevents the Aberration Compensation Filter (ACF) recommended by certain lens manufacturers from being fitted. Later camera models (e.g. Watec 902H Ultimate, right) do not have such a step in their lens mount and hence the ACF can be successfully fitted.

## References

- [1] Mike Foylan, personal communication, December 2013
- [2] Alex Pratt, personal communication, December 2014
- [3] William Stewart, personal experience
- [4] Allan Carter, personal communication, December 2014
- [5] Michael O'Connell, personal communication, December 2014
- [6] Alex Pratt, personal communication with SonotaCo, developer of UFO xxx Software Suite, December 2013
- [7] Alex Pratt, personal communication, March 2014
- [8] Jeremy Shears, personal communication, March 2014
- [9] <http://meteorobserver.proboards.com/thread/168/20141208-054744-gmt>
- [10] <http://meteorobserver.proboards.com/thread/171/another-watec-910hx-rc>

## Appendices

- Appendix 1: Securing the Control Cable on the Watec 910 HX/RC
- Appendix 2: Extending the Control Cable on the Watec 910 HX/RC
- Appendix 3: Video Baluns / Reducing the number of cables to the Watec 910 HX/RC
- Appendix 4: Watec Datasheets

## Version 1

William Stewart, First Issue, Released 27<sup>th</sup> January 2015

## Acknowledgements & Feedback

Sharing best practice within the video meteor observing community was the rationale behind creating this document and the author, William Stewart, is extremely grateful to the NEMETODE team members who have provided valuable input to this document. This was very much a team effort!

If you have any questions, feedback or recommendations then please contact the author at [ws@nemetode.org](mailto:ws@nemetode.org)

## Appendix 1: Securing the Control Cable on the Watec 910 HX/RC

As supplied, the Watec 910HX/RC has an Achilles Heel - a small and delicate 6-pin connector (Figure 4, top). To avoid accidentally pulling out the wires some owners secure the hand controller cable to the larger, more robust video cable (Figure 4, lower left). The cable may also be looped (not tightly) around the top of the camera then held in place with a small  $\frac{1}{4}$ " threaded bolt / screw [9]. Some vendors (e.g. [Modern Astronomy](#)) may offer a more permanent solution (Figure 4, lower right) [10].



**Figure 4:** Fragility of the control cable connector on the “as supplied” Watec 910HX (top), mitigated by tie-wrapping to the stiffer, more secure video output cable (lower left) or by certain vendors (lower right).

## Appendix 2: Extending the Control Cable on the Watec 910 HX/RC

As supplied, the control cable on the Watec 910HX/RC is relatively short, approximately 1.5m and hence may not be suitable for remote operation. The following modification, courtesy of Allan Carter [10] is offered.

**CAUTION! This modification may invalidate your warranty and users do so at their own risk.**

- i. Cut the cable about 125mm from the camera connector and remove 10mm of outer sheath from both cut ends (Figure 5, left).
- ii. Add an RJ45 connector to each end. Be absolutely sure to keep the coloured wires in the same order on each RJ45. There are 6 wires, and should be inserted starting from the left as you look at the back of the RJ45. This will leave 2 empty slots at the right hand side of the RJ45 (Figure 5, right).
- iii. You can now use the handset normally by using a RJ45 extension plug as shown or, in conjunction with a second extension plug, add a standard CAT5 data cable of desired length between the camera and handset.

You can now control the camera from inside your house or observatory. If you find after doing this that you have lost the function of any buttons on the handset, then recheck the wiring. It's easy to get these little wires mixed up.



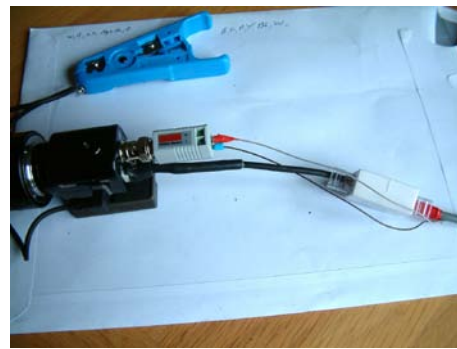
**Figure 5:** The remote control cable of the Watec 910HX/RC may be extended by splitting the cable and fitting RJ45 connectors that can then be used in conjunction with extension plugs and standard RJ45 cables.



### Appendix 3: Video Baluns / Reducing the number of cables to the Watec 910 HX/RC

Keeping cable lengths to a minimum offers a number of advantages: reduced losses in the video signal, decreased likelihood of interference pickup and cost. Good quality shielded video cables of 10m length or less are readily available at reasonable costs. These are sufficient for most users needs and in the majority of domestic circumstances no appreciable signal degradation is apparent. However on occasion 10m is insufficient and indeed some may wish to reduce the number of cables running to / from the camera. Following on from Appendix 2, Allan Carter again outlines a solution that uses a CAT5 5 twisted pair cable for the handset extension **and** for carrying the video signal. As Allan explains, *“This reduces the number of cables going to the camera. If you already have a good signal through your video feed, there is no need to do this. For this extension I used a 15m CAT5 UTP data cable. Use any length you want”*.














- i. If you cable already has RJ45 connectors fitted, remove them from each end of the cable.
- ii. Split the outer sheath and peel it back for about 180mm, exposing the internal wires.
- iii. Keep the brown and light brown twisted pair as is but cut 160mm from the other 6 wires and outer sheath.
- iv. Remove another 10mm from the outer sheath and add an RJ45 connector using the 6 wires only, as described in Appendix 2. This should leave you a normal looking data cable with 2 long wires (the brown and light brown twisted pair) hanging out.
- v. Install a video balun to these 2 long wires as shown in Figure 6 (left). Repeat this process for the other end of the cable ensuring that the coloured wires follow the same sequence as in the first end. You can now use this cable for the video signal **and** handset control.



**Figure 6:** Modifying a standard CAT5 cable to extend the remote control cable and carry the camera video signal via a balun.

### Appendix 4: Watec Datasheets

The following pages are copies of datasheets / manuals generated by Watec for the cameras discussed in this document. These can be difficult to find on the web hence are reproduced here for convenience. This document was produced in MS Word then converted to a .pdf following which the aforementioned documents were appended. Hence pages subsequent to this one do not have page numbers. Clicking on the relevant icon takes you to the correct Watec document.

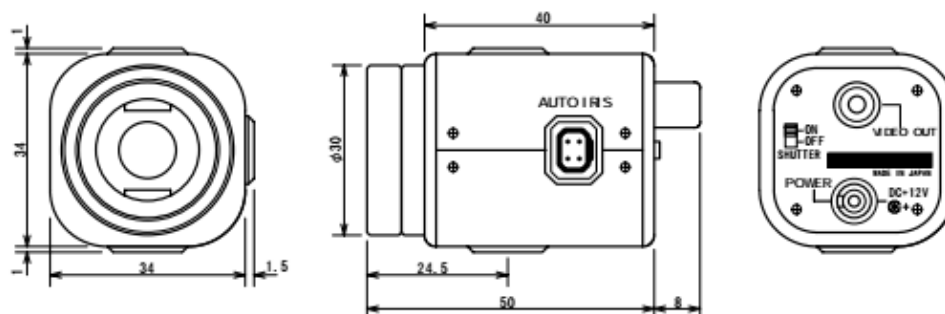
Model	Specification	Operation Manual	Spectral Response	User Manual
902H				
902DM2S				
902H Supreme				
902H Ultimate				
910 HX / RC				

# WAT-902H Monochrome camera

## 【SPECIFICATIONS】

Model	WAT-902H (EIA, CCIR)
Pick-up element	1/2inch Interline transfer CCD image sensor
Number of total pixels	811(H) × 508(V) : (EIA) 795(H) × 596(V) : (CCIR)
Number of effective pixels	768(H) × 494(V) : (EIA) 752(H) × 582(V) : (CCIR)
Unit cell size	8.4 μm(H) × 9.8 μm(V) : (EIA) 8.6 μm(H) × 8.3 μm(V) : (CCIR)
Scanning system	2:1 interlace
Synchronizing system	Internal
Video output	Composite Video, 1Vp-p, 75ohm Unbalanced
Resolution(Horizontal)	570TV lines(center)
Minimum illumination	0.002 lx. F1.4 (AGC Low) 0.0003 lx. F1.4 (AGC High)
Gamma correction	$\gamma \approx 0.45$
AGC	Hi:5~50dB, Lo:5~32dB
S/N Ratio	46dB (AGC OFF)
AE mode	ON(Electronic iris): 1/60~1/100000sec. (EIA) 1/50~1/100000sec. (CCIR) OFF: 1/60 (EIA), 1/50 (CCIR)
Back light compensation	ON
Lens mount	CS-mount
Installation screw	U 1/4inch (D=5mm) (Top/Bottom)
Connection terminal	Video out(RCA), Power, Auto iris
Power supply	DC +10.8~13.2V (12V±10%)
Current	Max. 160mA
Operating temperature	-10°C ~ +40°C
Storage temperature	-30°C ~ +70°C
Dimensions	35.5(W) × 36(H) × 58(L)mm
Weight	Approx. 90g
Accessories	DC-plug(WPDC12), Iris-plug(AIC)

## 【DIMENSIONS】 (mm)





CCD CAMERA

WAT-902H

# OPERATION MANUAL

## INTRODUCTION:

Thank you for choosing the WAT-902H, B/W CCD Camera.

WATEC hopes that both the quality and design satisfy your requirements.

Before proceeding to install or operate the WAT-902H, please read and understand thoroughly the contents of this Operation Manual.

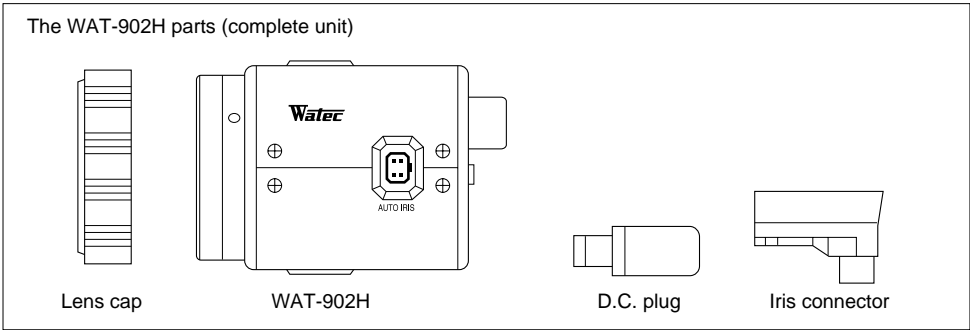
For future reference we also advise safe keeping of this manual.

## CAUTIONS:

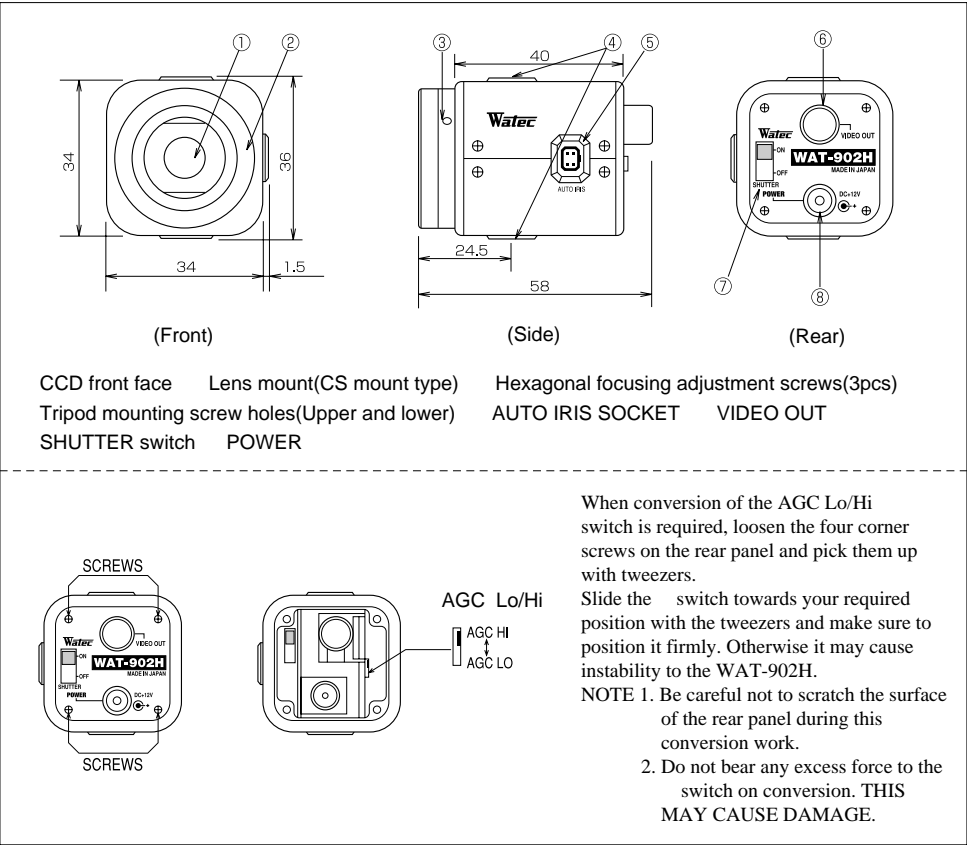
1. Use only the AD-901 or equivalent power adaptor for the WAT-902H. Power supplied without voltage stabilization and/or the voltage range is not maintained at  $\pm 10\%$  12VD. C. may cause damage to the WAT-902H.
2. Do not expose the WAT-902H to wetness or high moisture conditions. The WAT-902H is designed and approved for indoor use only.  
If the location of the WAT-902H is outdoors or in an outdoor like environment, we recommend that you use an OUTDOOR CAMERA HOUSING.
3. Avoid the striking of hard objects or dropping the unit.
4. Do not disassemble and/or modify the WAT-902H or the component parts or accessories. WATEC can not be held responsible for equipment failure or any damage or trouble caused by such action.
5. Do not install the WAT-902H near a heat source, such as radiators or heating air ducts, or in a position subject to direct sunlight , excessive dust, mechanical vibration or shock.
6. When the WAT-902H is used under fluorescent or mercury lighting conditions, a flickering phenomenon may occur on the monitor screen. This does not mean that the WAT-902H is damaged.
7. A white dot affected by cosmic rays may casually appear on the monitor screen. This is a characteristics which the CCD cell unit has and is not considered abnormal.
8. When installing the WAT-902H in an industrial or commercial environment (i. e. within equipment housing, near other electronic device, etc.) make sure to avoid any strong electromagnetic field, Otherwise the video output may be distorted and monitor sharpness compromised.
9. Check and protect the WAT-902H from any source generating a strong electromagnetic field from your equipment, when the WAT-902H is fitted near or inside that unit.
10. Do not connect any power supply directly to the VIDEO OUT terminal of the unit. This may cause damage.
11. When a cable operation system such as video/power multiplex transmission is being used, check the specifications or requirements of your monitor for proper connection to the video signal terminal of the WAT-902H.
12. Do not make connections and/or operate the WAT-902H with wet hands.
13. Should the WAT-902H not work properly, switch off the power and then check that power and video terminals are properly connected.  
Sunlight shinning directly onto the camera lens can cause damage to the CCD.

## CONTENTS:

Using the contents figures below, check to make sure all parts are present before use.



## DESCRIPTION OF CAMERA PARTS (Unit:mm)



CCD front face (light receiving face of the CCD camera)

NOTE: 1. Handle the CCD and the lens with special care.

2. Always attach the lens cap so as to protect the lens and the CCD from contamination and damage.
3. Dirt, water or oil deposits on either will cause an unclear picture on the monitor and scratches will become permanent damage.

Lens mount (CS mount type)

NOTE: Any standard model C mount lens can be attached to the WAT-902H, if our optional C mount ring, 30CMA-R is fitted to the unit.

Hexagonal focusing adjustment screws (for fine focusing adjustment by the lens mount ring.)

There are three hexagonal focusing adjustment screws each placed at intervals of 120 ° around the lens mount ring for the forward and backward motions of the lens mount.

Tripod mounting screw holes (Upper and lower)

Thread size and depth are the same as those for the standard camera tripods.(U1/4")

AUTO IRIS SOCKET

Female connector for the auto-iris lens.

NOTE: When the BLC(back light compensation)switch is ON in conjunction with the auto iris lens, the iris control is shown within the restricted area on the monitor screen. See Sec. 9 of OPERATION in the operation manual for a more detailed explanation.

VIDEO OUT-The RCA terminal for video signal output.

NOTE: A 3C2V or 5C2V cable with 75 impedance must be used for connection with the WAT-902H.

SHUTTER switch-The electronic shutter speed conversion switch

	Symbol Shutter mode selection chart (second)	
ON	EIA: 1/60~1/100000	CCIR: 1/50~1/100000
OFF	EIA: 1/60	CCIR: 1/50

POWER-The power input terminal

NOTE: The optional power adaptor, AD-901 (DC+12V, 250mA) is recommended for use with the WAT-902H.

AGC Lo/Hi-AGC gain switch

The switch is set to Hi gain at the upper position and to Lo gain at the lower position.

The switch is set to Hi upon shipment.

## OPERATION:

NOTE: Ensure that before any connections are made to the WAT-902H the power is switched OFF.

- 1) Remove the Lens Cap from the CCD front face and attach the lens.  
NOTE: When the C mount type lens is used, mount the optional 30CMA-R, C mount conversion ring before the lens is mounted.  
Confirm the specifications of the lens to be used, when it can not be mounted onto the WAT-902H smoothly. (Mounting a non standardized lens may cause damage to the threads of the lens and lens mount too.)
- 2) Using the Auto Iris lens  
Connect the iris control cable to AUTO IRIS SOCKET on the WAT-902H, when the auto iris lens is used.

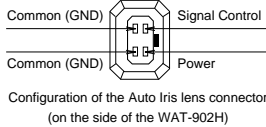
### IMPORTANT NOTES FOR AUTO IRIS USAGE

: Ensure that the connector mentioned in the operation manual of the Auto-Iris lens can be applied to the one shown in the diagram on the right connect it firmly to the connector on the right side of the WAT-902H.

: Insert the pins as shown in the picture on the right. If the pin configuration is different from that shown, use the special adaptor supplied with this unit.

CAUTION: Do not touch the power pin or the signal control pin with the Common (GND) pins on the extra connector for the Auto Iris lens.

:The power (pin) in the drawing on the right must be used for connection with the auto iris lens only, otherwise this may cause damage to the WAT-902H.



3) Insert the DC plug of the power adaptor to POWER on the rear panel of the WAT-902H.

NOTE: Ensure that the power adaptor is not ON before insertion of the DC plug into POWER .

### IMPORTANT NOTES FOR POWER ADAPTOR USAGE

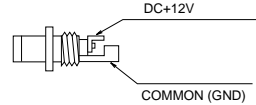
: Use a stabilized power adaptor designed for DC+12V  $\pm 10\%$  with a current capacity of 250mA.

: Use the optional DC plug when the shape or polarity of the DC plug of the DC power adaptor can not be fitted to POWER on the WAT-902H.

: Connect the cables to the DC adaptor using the drawing on the right.

CAUTION : Be careful not to touch any other terminal while wiring.

NOTE : This may cause damage to the WAT-902H and power adaptor or may cause fire if the above care and attention is not adhered to.



4) Connect VIDEO OUT on the WAT-902H to the monitor, using the coaxial cable with 75 impedance such as 3C2V or 5C2V.

### IMPORTANT NOTES ON THE MONITOR SPECIFICATIONS

: Select a monitor with the same transmission mode as the WAT-902H.

There are two versions, EIA and CCIR.

: A monitor with 700TV lines is recommended.

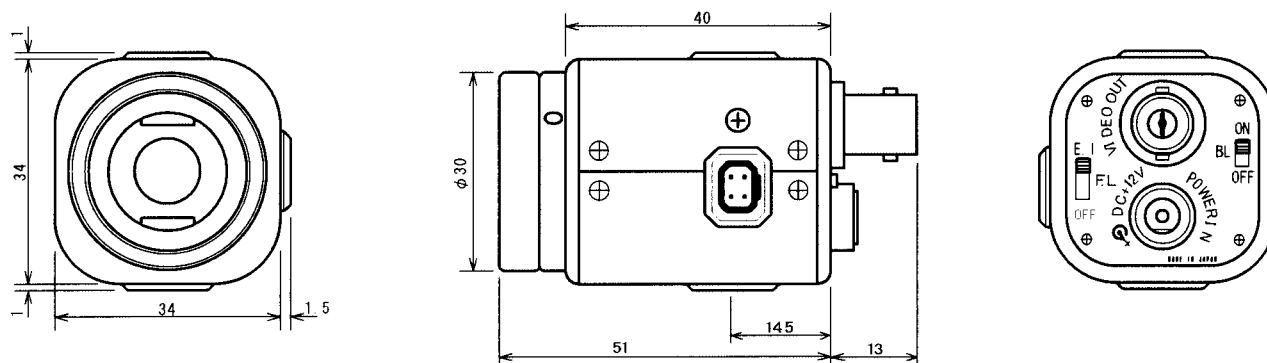
Caution: Do not use a monitor which uses a video signal/power multiplex transmission cable.

# WAT-902DM2s DSP Monochrome Camera

## 【SPECIFICATIONS】

Model	WAT-902DM2s (EIA/CCIR)
Pick-up element	1/2inch interline transfer CCD image sensor
Number of total pixels	811(H) × 508(V) : (EIA) 795(H) × 596(V) : (CCIR)
Number of effective pixels	768(H) × 494(V) : (EIA) 752(H) × 582(V) : (CCIR)
Unit cell size	6.35 $\mu$ m(H) × 7.4 $\mu$ m(V) : (EIA) 6.5 $\mu$ m(H) × 6.25 $\mu$ m(V) : (CCIR)
Scanning system	2:1 interlace
Synchronizing system	Internal
Video output	Composite video, 1 Vp-p, 75ohm Unbalanced
Resolution(Horizontal)	570TV lines(Center)
Minimum illumination	0.0006lx. F1.4 (AGC HI)
Gamma correction	$\gamma \cong 0.45$ , $\gamma \cong 1.0$ (Switchable with internal switch)
AGC	HI:8~40dB, LO:8~22dB
S/N ratio	52dB (AGC OFF=8dB, $\gamma=1.0$ )
AE mode	OFF:1/60(EIA), 1/50(CCIR), FL:1/100(EIA), 1/120(CCIR), EI:1/60~1/100,000sec. (EIA), 1/50~1/100,000sec. (CCIR)
Back light compensation	ON/OFF selectable
Lens mount	CS-mount
Installation screw	U 1/4inch (D=5mm) (Top/Bottom)
Connection terminal	Video out(BNC), Power, Auto iris(Video/DC auto. selection)
Power supply	DC +9.0~15.0V
Current	Max. 120mA
Operating temperature	-10°C ~ +40°C (w/o condensation)
Storage temperature	-30°C ~ +70°C (w/o condensation)
Dimensions	35.5(W) × 36.0(H) × 64.0(L)mm
Weight	Approx. 90g
Accessories	DC-plug(WPDC12), Iris-plug(AIC-G), Hex. wrench

## 【DIMENSIONS】 (mm)





## MONOCHROME DSP CCD CAMERA

# WAT-902DM (2S, 2, 3S, 3) OPERATION MANUAL

### INTRODUCTION:

Thank you for choosing the WAT-902DM, Monochrome DSP CCD Camera.

Watec hopes that both the quality and design satisfy your requirements.

Before proceeding to install or operate the WAT-902DM, please read and understand thoroughly the contents of this operation manual.

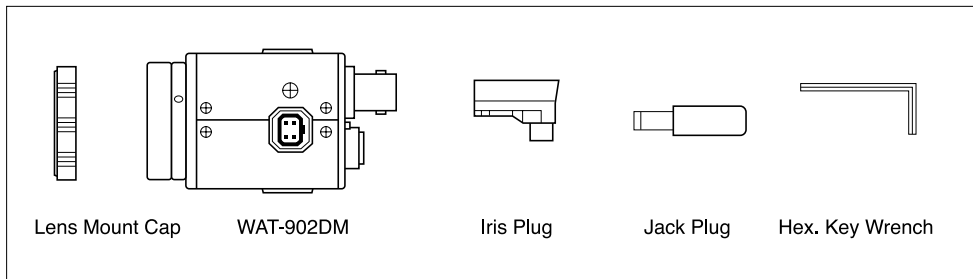
For future reference, we also advise safekeeping of this manual.

### CAUTIONS:

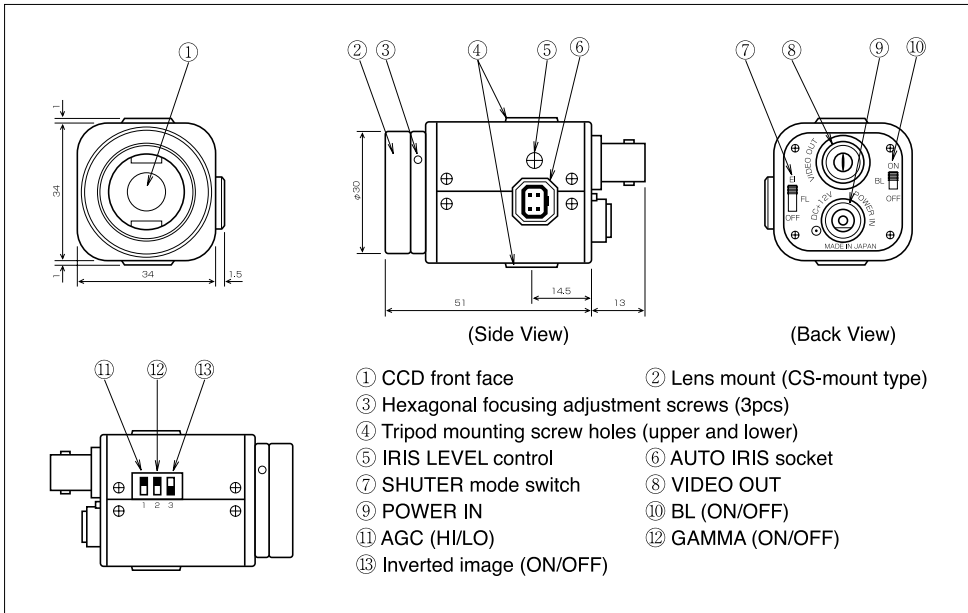
1. Power supplied without voltage stabilization and/or the voltage range not being maintained at  $DC + 12V \pm 15\%$  may cause damage to the WAT-902DM.
2. Do not expose the WAT-902DM to wetness or high moisture conditions. The WAT-902DM is designed and approved for indoor use only. If the location of the WAT-902DM is outdoors or in an outdoor-like environment, we recommend you to use an outdoor camera housing to cover the WAT-902DM.
3. Avoid the striking of hard objects or dropping the unit.
4. Do not disassemble and/or modify the WAT-902DM, its component parts, or accessories. Watec cannot be held responsibility for any equipment failure, damage, or trouble caused by such actions.
5. Do not install the WAT-902DM near heat sources, such as radiators or heating air ducts, or in a position subject to excessive dust, mechanical vibration, shock or direct sunlight. (Direct sunlight shining onto the camera lens can cause damage to the CCD.)
6. When the WAT-902DM is used under fluorescent or mercury lighting conditions, a flickering phenomenon may occur on the monitor screen, this does not mean that the WAT-902DM is damaged.
7. When installing the WAT-902DM in an industrial or commercial environment (ex. within equipment housing or near other electronic devices), be sure to avoid any strong electromagnetic fields; otherwise, the video output may be distorted, the monitor sharpness compromised, and damage may occur to the camera.
8. Do not connect any power supply directly to the VIDEO OUT terminal of the WAT-902DM as this may cause damage.
9. This camera is not designed for use with a video/power single transmission cable. It has to be used with a separate power cable and separate video cable. In addition, please check your monitor specifications to make sure it does not use a power/video single cable transmission.
10. Do not make connections and/or operate the WAT-902DM with wet hands.
11. When the WAT-902DM does not work, switch off the power, and then check all the required connections, making sure the power and video cables are connected properly.

### CONTENTS:

(Make sure all parts listed on the content figures below are present before use.)



### DESCRIPTION OF CAMERA PARTS (UNIT: mm) :



#### ① CCD front face: light receiving face of the CCD camera

NOTE: 1. Handle the CCD and the lens with special care.  
2. When a lens is not attached to the camera, put the lens mount cap on the lens mount to protect the CCD from contamination and damage.  
3. Dirt, water and oil deposits on either will compromise picture quality on the monitor, and scratches will cause permanent damage.

#### ② Lens mount (CS-mount type)

NOTE: Any standard model C-mount lens can be attached to the WAT-902DM by using the optional C-mount ring, 34CMA-R.

#### ③ Hexagonal focusing adjustment screws: for fine focusing adjustment using the lens mount ring

There are three hexagonal fine focusing adjustment screws, each placed at intervals of  $120^\circ$  around the lens mount ring, allowing the forward and backward motion of the lens mount.

#### ④ Tripod mounting screw holes (upper and lower)

Thread size and depth are the same as those for standard camera tripods (U1/4")

#### ⑤ IRIS LEVEL control: auto iris volume level adjustment

When using a DC driven iris lens, the volume level of the auto iris can be adjusted using this function.

#### ⑥ AUTO IRIS socket: provides the power and control signal to an attached video/DC iris lens using an iris connector

#### ⑦ SHUTTER mode switch: the electronic shutter speed conversion switch

(The electronic shutter function is set to OFF upon shipment.)

Mode	Shutter Speed	
EI	EIA: 1/60 - 1/1000000	CCIR: 1/50 - 1/100000
FL	EIA: 1/100	CCIR: 1/120
OFF	EIA: 1/60	CCIR: 1/50

#### ⑧ VIDEO OUT: the BNC terminal for video signal output

NOTE: An RG-58/U or an RG-6/U coaxial cable with 75  $\Omega$  impedance must be used with the WAT-902DM.

#### ⑨ POWER IN: the power input terminal for DC12V power supply

#### ⑩ BL (ON/OFF): the switch to control back light compensation

#### ⑪ AGC (HI/LO): the switch to control AGC

The switch in the upper position is for AGC high (8-40dB) and in the lower position for AGC low (8-22dB) (AGC is set to HI upon shipment.)

#### ⑫ GAMMA (ON/OFF): the switch for gamma correction

The switch in the upper position is for gamma ON ( $\approx -0.45$ ) and in the lower position is for gamma OFF ( $\approx 1.0$ ).

(The Gamma correction switch is set to ON upon shipment.)

#### ⑬ Inverted image (ON/OFF): the switch for image inversion

The switch in the upper position is for an inverted image and in the lower position for a standard image.

### OPERATION:

NOTE: Ensure that the POWER to the WAT-902DM and the monitor are set to OFF before making any connections.

#### 1. Remove the Lens mount cap from the WAT-902DM and attach the lens.

(When using a C-mount model lens, attach the optional adaptor (34CMA-R) to the lens mount.)

NOTE: When a lens being attached to the WAT-902DM cannot be mounted smoothly, confirm the specifications of the lens.

#### 2. Connect the iris control cable to ⑥AUTO IRIS socket on the WAT-902DM when an auto iris lens is used.

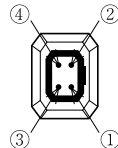
NOTE: Confirm the version (video or DC) of the auto iris lens which is to be used.

##### 1) Video driven iris lens

The pin configuration is subject to EIAJ configuration.

The differences in configurations are as follows:

Pin No.	EIAJ configuration	Watec configuration
①	Power	Power
②	Unused (NC)	Control (iris) signal
③	Control (iris) signal	GND
④	GND	GND
	✓	Rewiring is required



NOTE: No electronic damage occurs to the WAT-902DM even if the auto iris lens is wired to the Watec configuration instead of the EIAJ configuration, but in this case, the auto iris lens will not work correctly.

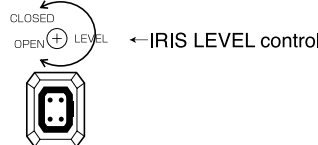
When an auto iris lens which has already been used with other Watec models is applied to the WAT-902DM, rewire the attached iris connector as shown in the above EIAJ configuration table.

##### 2) DC driven iris lens

The pin configuration of a DC driven iris lens is standardized to EIAJ specifications.

If the DC driven iris lens does not work, check the wiring configuration in the table below.

Pin No.	DC driven iris lens arrangement (EIAJ)
①	Control - (DUMP-)
②	Control + (DUMP+)
③	Drive + (DRIVE+)
④	Drive + (DRIVE-)



NOTE: Check the configuration of the iris plug before it is connected to ⑥AUTO IRIS socket of the WAT-902DM.

After connecting, adjust the ⑤IRIS LEVEL control by turning clockwise or anti-clockwise as shown above.

\*The WAT-902DM is compatible with both video driven iris lenses and DC driven iris lenses (patent pending).

#### 3. Connect the power cable to ⑨POWER IN on the rear panel of the WAT-902DM.

### IMPORTANT NOTES FOR POWER ADAPTOR USAGE

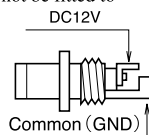
1. Use a stabilized power adaptor designed for  $DC + 12V \pm 15\%$  with a current capacity of more than 250mA.

2. Use the optional DC plug if the shape or polarity of the DC plug of the DC power adaptor can not be fitted to ⑨POWER IN of the WAT-902DM.

3. Connect the cable to the DC adaptor as the drawing on the right.

CAUTION: Be careful not to touch any other terminal while wiring.

If the above care and attention is not adhered to, it may cause damage or even fire to the WAT-902DM and power adaptor.



4. Connect ⑤VIDEO OUT on the WAT-902DM to the monitor with a coaxial cable of 75 Ω impedance such as the RG-58/U or the RG-6U.

**IMPORTANT NOTES ON THE MONITOR SPECIFICATIONS**

1. Select a monitor, which has the same transmission mode (EIA or CCIR) as of the WAT-902DM.
  2. A monitor with 700TV lines is recommended for use with the WAT-902DM.
- Caution: Do not use a monitor which has a single video/power transmission cable.

5. Switch on the WAT-902DM, monitor, and all the other allied equipment(s).

NOTE: When a picture does not appear on the monitor screen, switch off all the equipment and check if all the cables are connected correctly.

6. Adjust the focus of the WAT-902DM while looking at the monitor screen.

NOTE: When the unit cannot be focused manually, use the fine focusing adjustment method set out below.

**IMPORTANT NOTES ON FINE FOCUSING**

1. Attach the required lens on the WAT-902DM and loosen the ③Hexagonal focusing adjustment screws (3pcs).  
Be extremely careful not to drop the lens.
2. Set the focus ring to the infinitive (∞) position, and while looking at the monitor screen, move the lens forwards or backwards to focus.
3. Tighten up the ③hexagonal focusing adjustment screw (3pcs) when focusing has been completed.

7. Select the required shutter speed by ⑦SHUTTER mode switch.

**EXAMPLE FOR SHUTTER SWITCH SETTING**

Select the most appropriate mode out of the following three for your monitoring.

EI (electronic iris mode)

: This mode is effective when the WAT-902DM is used with a fixed lens without auto iris function and the brightness of an object is not stable. (Ex. Continuous 24-hour outdoor surveillance)

FL (flicker less mode)

: This mode helps to reduce the flickering phenomena occurring on the monitor caused by fluorescent and mercury lamps. This mode is most effective with the use of the following commercial power supplies (50Hz for NTSC and 60Hz for PAL).

OFF (shutter off mode)

: This mode is effective when the WAT-902DM is used with an auto iris lens and the light is less variable. (Ex. Indoor monitoring)

When an object with high brightness is monitored, smear phenomenon may appear on the monitor screen, especially in the OFF position. This is normal and it does not mean that the camera is damaged.



**IMPORTANT NOTES ON ⑪GAMMA, AND ⑬INVERTED IMAGE**

Settings of ⑪, ⑫ and ⑬ switches are effective when they are respectively reset in combination with one another for a required situation.

⑪AGC HI/LO

HI: Use this setting when minimum illumination is more important than the S/N ratio.

LO: Use this setting when a clear picture is required in sufficient lighting conditions.

⑫GAMMA ON/OFF

ON: This setting is effective for a general surveillance monitoring system.

OFF: This setting is effective when gamma correction function is disruptive for image processing on a computer.

⑬Inverted image

ON: The setting which is to show an inverted image on the monitor

(Ex: back monitoring system for vehicles)

OFF: The setting used for a standard image on the monitor



- 1: AGC HI/LO
- 2: GAMMA ON/OFF
- 3: Inverted image ON/OFF

**SPECIFICATIONS:**

Model No.	*WAT-	902DM2	902DM2S	902DM3	902DM3S	902DM2	902DM2S	902DM3	902DM3S
Version		EIA				CCIR			
Pick-up element		1/2"		1/3"		1/2"		1/3"	
Total pixels		811(H)×508(V)				795(H)×596(V)			
Effective pixels		768(H)×494(V)				752(H)×582(V)			
Unit cell size		6.35 μm(H)×7.4 μm (V)				6.5 μm(H)×6.25 μm(V)			
Sync. system		Internal				Internal			
Scanning system		2:1 interlace				2:1 interlace			
Video output		1Vp-p 75 Ω (unbalanced)				1Vp-p 75 Ω (unbalanced)			
Resolution		570TVL (center)				570TVL (center)			
Min. illumination *F1.4		0.0018 lx.	0.0006 lx.	0.002 lx.	0.0012 lx.	0.0018 lx.	0.0006 lx.	0.002 lx.	0.0012 lx.
S/N ratio		52dB (AGC OFF)				52dB (AGC OFF)			
Shutter	ON	1/60-1/100000 sec.				1/50-1/100000 sec.			
	OFF	1/60 sec.				1/50 sec.			
	FL	1/100 sec.				1/120 sec.			
AGC		8-40dB(HI)/8-22dB(LO)				8-40dB(HI)/8-22dB(LO)			
Gamma characteristic		$\gamma \approx 0.45(\text{ON})/\approx 1.0(\text{OFF})$				$\gamma \approx 0.45(\text{ON})/\approx 1.0(\text{OFF})$			
Inverted image function		Normal/inverted image output selectable				Normal/inverted image output selectable			
Iris control		Video/DC driven(auto-select)				Video/DC driven(auto-select)			
Back light compensation		ON/OFF				ON/OFF			
Power supply		DC+12V±15%				DC+12V±15%			
Current		120mA				120mA			
Storage temperature		-30℃ - +70℃				-30℃ - +70℃			
Operating temperature		-10℃ - +40℃				-10℃ - +40℃			
Weight		90g				90g			

**This device complies with Part 15 of the FCC Rules.**

Operation is subject to the following two conditions.

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

**Important note:**

The camera mentioned above does not comply with this regulation if it is modified at your disposal.

Design and specifications of this model are subject to change without notice.

Watec is not responsible for any inconvenience or the attendant damages to the video or audio and monitoring recording equipment, cause by misuse, miss-operation or improper wiring of our equipment.

If for any reason the WAT-902DM does not work properly, or if you have any questions regarding installation or operation, please contact the distributor or dealer from which it was purchased.

**Watec**  
Watec Co., Ltd.

Address: 254-2, Nihonkoku, Daihoji, Tsuruoka-Shi, Yamagata-Ken, 997-0017, JAPAN  
Phone: +81-235-25-7164 Fax: +81-235-23-4409  
URL: http://www.watec.net E-mail: info-o@watec.co.jp



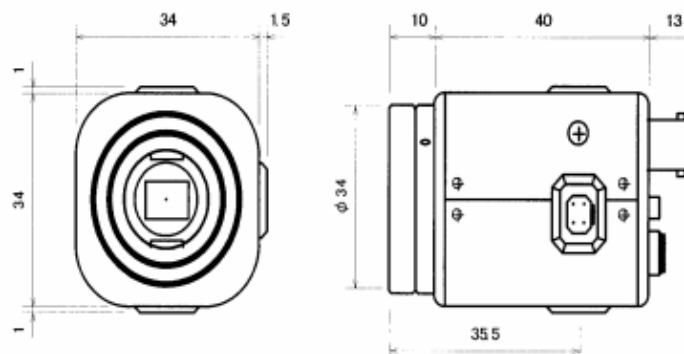
**SPECIFICATIONS**

Model	WAT-902H2 SUPREME (EIA)	WAT-902H2 SUPREME (CCIR)
Pick-up element	1/2" interline transfer CCD image sensor	
Number of total pixels	811(H) × 508(V)	795(H) × 596(V)
Number of effective pixel	768(H) × 494(V)	752(H) × 582(V)
Unit cell size	8.4μm (H) × 9.8μm (V)	8.6μm (H) × 8.3μm (V)
Shutter speeds	EI: 1/60 sec. - 1/100,000 sec. FL: 1/100 sec. OFF: 1/60 sec.	EI: 1/50 sec. - 1/100,000 sec. FL: 1/120 sec. FL: 1/50 sec.
Minimum illumination	0.0003 lx F1.4 (AGC HI)	

Model	WAT-902H3 SUPREME (EIA)	WAT-902H3 SUPREME (CCIR)
Pick-up element	1/3" interline transfer CCD image sensor	
Number of total pixels	811(H) × 508(V)	795(H) × 596(V)
Number of effective pixel	768(H) × 494(V)	752(H) × 582(V)
Unit cell size	6.35μm (H) × 7.40μm (V)	6.50μm (H) × 6.25μm (V)
Shutter speeds	EI: 1/60 sec. - 1/100,000 sec. FL: 1/100 sec. OFF: 1/60 sec.	EI: 1/50 sec. - 1/100,000 sec. FL: 1/120 sec. FL: 1/50 sec.
Minimum illumination	0.0005 lx F1.4 (AGC HI)	

Common specifications	
Synchronizing system	Internal sync.
Video output	1Vp-p, 75ohms, unbalanced
Resolution (H)	570TVL (Center)
S/N ratio	46dB (AGC OFF)
AGC	HI: 5-50dB, LO: 5-32dB
Back light compensation	ON (Center + lower)
Gamma correction	0.45
Power supply	DC12V±10%
Current	160mA
Operating temperature	-10°C - +40°C
Storage temperature	-30°C - +70°C
Dimensions(W×H×L)	35.5 × 36 × 63 (mm)
Weight	90g

\*Design and specifications are subject to change without notice.

**DIMENSIONS (mm)**


**WAT-902H2 WAT-902H3**  
**SUPREME SUPREME****Operation Manual**

This Operation Manual covers safety, camera functions, installation and correct operating procedure for the WAT-902H2/3 SUPREME. First, we ask you to read the manual thoroughly, then install and operate the WAT-902H2/3 SUPREME as advised. In addition, for future reference, we also advise safekeeping of this manual.

Please contact the distributor or dealer from which the WAT-902H2/3 SUPREME was purchased, if you do not understand the installation, operation, or safety instructions laid out in this manual. Not understanding the contents of the Operation Manual sufficiently may cause damage to the camera.

## Cautions for Safety

The WAT-902H2/3 SUPREME is designed to be used safely. However, electrical goods may lead to physical accident caused by fire and electric shock if not used correctly. Therefore, please keep and read the "Cautions for Safety" for protection against accidents.



- Do not disassemble and/or modify the camera.
- Do not operate the camera with wet hands.



- Use only the AD-901 or equivalent power adaptor for the camera.

The recommended voltage is DC+12V  $\pm$  10%.

- Do not expose the camera to wetness or high moisture conditions.

The camera is designed and approved for indoor use only. This camera is not water-resistant or waterproof. If the location of the camera is an outdoor or in an outdoor-like environment, we recommend you use an outdoor camera housing.

- Protect the camera from condensation.

Keep the camera dry at all times during storage and operation.

- Should the camera not work properly, switch off the power immediately.

Please check the camera according to the "Problems and Trouble shooting" section.



- Avoid the striking of hard objects or dropping the camera.

The camera uses high quality electrical parts and precision components.

- Do not connect any power supply directly to the VIDEO OUT terminal of the unit.

Do not connect the camera with any monitor using a video/power single transmission terminal. This camera is not designed for use with this type of equipment. We also advise you to read the operation manual of the monitor you plan to use before any connections are made.

- Do not install the camera in a position subject to direct sunlight.

Sunlight shinning directly onto the camera lens can cause damage to the CCD.

- Select a stable place for installation of the camera.

Use a support of durable strength around an installation position on a ceiling or wall when a camera stand or a stable tripod is used.

- Do not move the camera with the cables connected.

Before moving the camera, always remove the video cable(s), and power cable from the rear of the camera first.

- Avoid using the cameras near any strong electro-magnetic field.

Avoid emission sources of electromagnetic waves when the camera is installed into main equipment.

## Guide to the Safety Symbols

The meanings of the symbols used in this Operation Manual are:



When you do not adhere to or take notice of the "Danger" sign, it may lead to serious accident such as death or injury caused by fire or electric shock.



When you do not adhere to or take notice of the "Warning" sign, it may cause severe damage such as a physical injury.



When you do not adhere to or take notice of the "Caution" sign, it may incur injury and cause damage to peripheral objects in the immediate surroundings.

## About EMC

The camera is in conformity with EMC test standards carried out by an authorized organization in Japan.



Do not modify the camera. Modification to the camera is dangerous, and in addition, the camera may not conform to EMS test standards.

## Problems and Trouble Shooting

If any of the following problems occur when using the camera:

- An optimal picture cannot be obtained after checking all the cables and connections are correctly in place.
- Smoke or any unusual odor emerges from the camera.
- An object becomes embedded or a quantity of liquid seeps into the camera housing.
- More than the recommended voltage or/and amperage has been applied to the camera by mistake.
- Anything unusual occurring to any equipment connected to the camera.

**Disconnect the camera immediately according to the following procedure:**


**Switch off the main power supply to the camera.**

Remove the power and video cables connected to the camera. Contact the distributor or dealer from which the camera was purchased.


The following phenomenon is not camera malfunction:

The picture on the monitor flickers when the camera is used under fluorescent and mercury lighting, which is called the "flicker" phenomenon. The flickering can be reduced by "FL (flickerless)" on the AE mode switch on the back panel.


Contents



**Lens Cap**  
For protection of the CCD.  
Attach this cap to the camera.

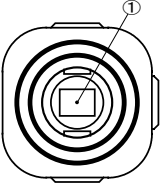


**Camera**  
WAT-902H2/3 SUPREME



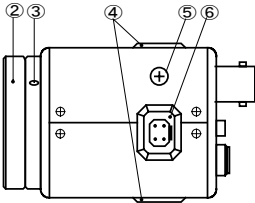
**Hexagonal Wrench**  
Tool to adjust the focus by tightening or loosening the hexagonal screws on the lens mount.

Description of Camera Parts & Functions



**CCD FRONT FACE**

- Dirt, water or oil deposits on the CCD will cause an unclear picture on the monitor.
- Attach the lens cap to protect the lens and the CCD from contamination and damage.

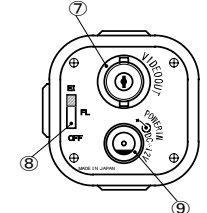


**LENS MOUNT**

- Mount for the lens (Thread type)

**HEX. FOCUSING ADJUSTMENT SCREWS**

- There are 3 screws each placed at intervals of 120 °

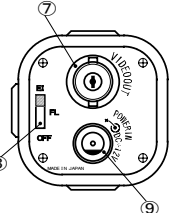


**TRIPOT MOUNTING SCREW HOLES**

- The size of these threads are 1/4", 20 threads, 4.5 ± 0.2mm, which is the same as any standard camera tripod (U1/4").

**IRIS LEVEL VOLUME**

- By controlling the volume, the iris level of the DC iris lens can be adjusted.



**AUTO-IRIS SOCKET**

- The function is compatible for both video and DC driven iris lenses. The switching function is automatic and does not need setting manually.

**VIDEO OUT (BNC)**

- The terminal for composite video signal output

**EI / FL / OFF SELECTION SWITCH**

- “EI” is selected upon shipment.
- For detailed information, please see “Set-up and Operation” No. 4.

**POWER IN**

- The terminal designed for connection with a DC-plug from an appropriate power supply.
- The optional power adaptor, AD-901(DC+12V, 250mA), is recommended for use with this camera.

Preparation for Set-up


Recommended Lens

- For the WAT-902H2 SUPREME, CS-mount lenses for a 1/2" CCD camera is recommended.
- For the WAT-902H3 SUPREME, CS-mount lenses for a 1/3" CCD camera is recommended. (For a more effective picture, use an IR lens.)

Applicable Auto-iris Lens

- The camera automatically recognises the type of lens attached.  
Applicable auto-iris lenses are:  
EIAJ video auto-iris lenses      EIAJ DC auto-iris lenses

Wiring for Auto-iris Connectors



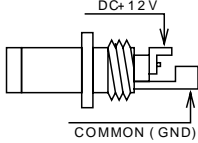
**Caution**

Before connecting the auto-iris lens, please make sure that the pin configuration is correct by confirming with the above table. If the configuration of your iris connector is different from the above, the plug and pins will need to be rewired.


Pin No.	EIAJ Video Auto-iris Lens Arrangement	EIAJ DC Auto-iris Lens Arrangement
	Power	Control -
	Not Used	Control +
	Iris Signals	Drive +
	Common (GND)	Drive -

Applicable AC Adaptors

- If any other power adaptor besides the AD-901 is used, please use a stabilized power adaptor designed for DC+12V ± 10%, with a current capacity of more than 250mA.
- Use the optional DC plug if the shape or polarity of the DC plug of the power adaptor to be used is not compatible with the camera, see the drawing on the right. Be careful not to touch any other terminal while wiring.



DC+12V  
COMMON (GND)



If the above-mentioned care and attention are not adhered to, it may cause an electrical fault.

Attaching a Lens

- Take off the lens cap attached to the camera, then screw on the lens.
- If an auto-iris lens is used, please confirm the lens specification, and connect the auto-iris control cable to the AUTO-IRIS SOCKET.

Set-up and Operation

Connection to Peripheral Equipment

1. Make sure that all the power to the camera and the peripheral equipment is turned off.
  2. Connect ⑦VIDEO OUT to the monitor using a cable with 75 Ω impedance (for example, an RG-59 (TG-140/U, 3C-2V) or an RG-6A (5C-2V)).
  3. Turn the camera, monitor, and any other equipment on.
  4. Select the required function, EI, FL, or OFF, by turning EI / FL / OFF SELECTION SWITCH.
- EI (Electronic Iris):      The electronic shutter speed varies automatically in accordance with the brightness of an object in a range of 1/60 to 1/100,000 EIA and 1/50 to 1/100,000 CCIR. (The EI function is used in combination with a lens without an iris mechanism.)

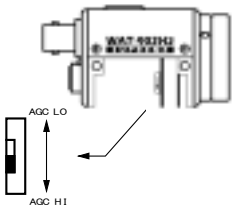
FL (Flickerless) :      This is effective in reducing flickers on the monitor screen caused by various lighting, such as fluorescent and mercury lamps. (Effective only in areas using 50Hz EIA and 60Hz CCIR.)

OFF :      The shutter speed will be fixed at 1/60 EIA or 1/50 CCIR.
- Adjustment of the iris is made by turning IRIS LEVEL VOLUME of a DC auto iris lens or lens volume of a video auto iris lens.
5. If there is no picture on the monitor, switch off the power to all equipment and check that the power, video, and any other related terminals are properly connected, and then retry.

Changing the AGC

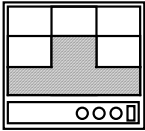
- The AGC switch must be changed without the AC adaptor and the video cable connected.
  - High or low gain can be selected by operating the switch up or down after dismantling the lower housing cover as shown in the drawing.
- AGC HI :      Selected when sensitivity is a priority.

AGC LO :      Selected when S/N ratio is a priority.
- The switch is set to “AGC HI” on shipment.



Notes on Back Light Compensation (BLC)

Strong lighting from above or behind an object being monitored causes a silhouetted picture on the monitor. The back light compensation is a function to reduce the darkness of a silhouetted image. With the WAT- 902H2/3 SUPREME, this function works constantly. (The drawing on the right shows the dark area targeted by the back light compensation.)



Specifications

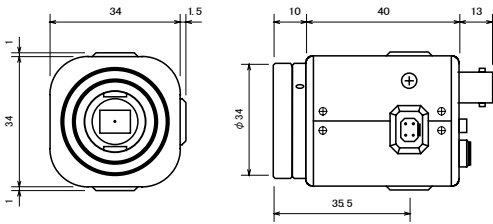
Model	WAT-902H2 SUPREME (EIA)	WAT-902H2 SUPREME (CCIR)
Pick-up Element	1/2" interline transfer CCD image sensor	
Total Pixels	811(H) × 508(V)	795(H) × 596(V)
Effective Pixels	768(H) × 494(V)	752(H) × 582(V)
Unit Cell Size	8.4 μm(H) × 9.8 μm(V)	8.6 μm(H) × 8.3 μm(V)
Shutter Speeds	EI : 1/60 - 1/100,000 sec. FL : 1/100 sec. fixed OFF : 1/60 sec. fixed	EI : 1/50 - 1/100,000 sec. FL : 1/120 sec. fixed OFF : 1/50 sec. fixed
Minimum Illumination	0.0003 lx F1.4 (AGC HI)	

Model	WAT-902H3 SUPREME (EIA)	WAT-902H3 SUPREME (CCIR)
Pick-up Element	1/3" interline transfer CCD image sensor	
Total Pixels	811(H) × 508(V)	795(H) × 596(V)
Effective Pixels	768(H) × 494(V)	752(H) × 582(V)
Unit Cell Size	6.35 μm(H) × 7.40 μm(V)	6.50 μm(H) × 6.25 μm(V)
Shutter Speeds	EI : 1/60 - 1/100,000 sec. FL : 1/100 sec. Fixed OFF : 1/60 sec. fixed	EI : 1/50 - 1/100,000 sec. FL : 1/120 sec. fixed OFF : 1/50 sec. fixed
Minimum Illumination	0.0005 lx F1.4 (AGC HI)	

Common Specifications	
Sync. System	Internal
Video Output	1.0Vp-p, 75 (Unbalanced)
Resolution (H)	570TVL (Center)
S/N Ratio	46dB (AGC OFF)
BLC	ON (Center + lower portion measured)
Gamma Characteristic	0.45
Power Supply	DC12V ± 10%
Current	160mA
Operating Temperature	-10 - +40
Storage Temperature	-30 - +70
Dimensions	35.5(W) × 36(H) × 63(L) (mm)
Weight	90g

- Design and specification are subject to change without notice.
- Watec is not responsible for any inconvenience or the attendant damages to the video, audio, and monitoring recording equipment caused by misuse, misoperation, or improper wiring of our equipment.
- If for any reason the camera does not work properly, or if you have any questions regarding installation or operation, please contact the distributor or dealer from which it was purchased.

Dimensions



OPTIONALS



**AC Adaptor**  
**AD-901**  
The recommended AC adaptor for the WAT-902H2/3 SUPREME for a constant and stable power supply.



**DC Plug**  
**WPDC12**  
Use this plug if the DC plug of your power adaptor does not fit the WAT-902H2/3 SUPREME.



**Auto-iris Plug**  
**AIC-G**  
Use this connector if the iris connector of your lens does not fit the WAT-902H2/3 SUPREME auto-iris socket.



**C-mount Adaptor**  
**30CMA-R**  
This mount adaptor is used to convert a CS-mount into a C-mount.



**Mini-stand**  
**MS-50**  
A convenient stand for the WAT-902H2/3 SUPREME. With this stand, the camera can be fixed to any desired angle.

Watec Co., Ltd.

254-2 Nihonkoku, Daihoji, Tsuruoka-Shi,  
Yamagata-Ken, 997-0017, Japan  
TEL: +81-235-25-7164 FAX: +81-235-23-4409  
E-mail: Info-o@watec.co.jp  
URL: http://www.watec.net

# WAT-902HB, WAT-902H Supreme, & WAT-902H Ultimate series

## Relative Response Chart

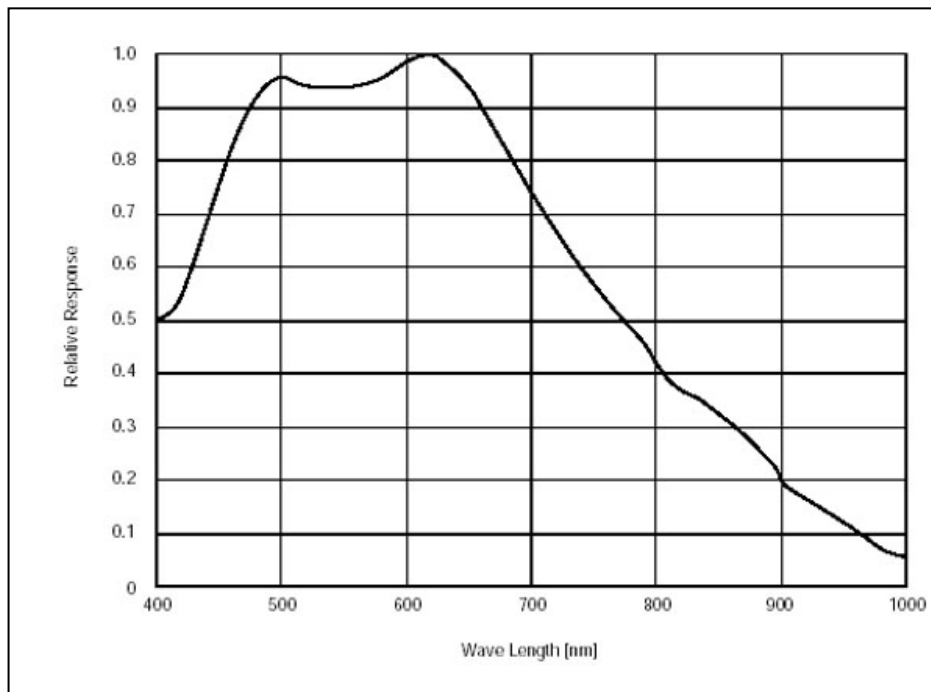
### Features

1. 2.5 times more sensitive in the visible ray wavelength.
2. 3 times more sensitive in the near-infrared wavelength
3. Smear reduced by -10dB.
4. Signal amplifier has been increased to improve the S/N ratio.
5. Visibility is assured in conditions with a minimum illumination of 0.0003 lux (F1.4)
6. Sensitive to 940nm. An infrared illuminator (700nm~950nm) can be used to monitor an object in absolute darkness.
7. High resolutions of 380K(EIA), 440K(CCIR) pixels (570 horizontal TV lines).

*Comparing the WAT-902H  
with the WAT-902A.*

### CCD Response

Visibility is assured in conditions with a minimum illumination of 0.0003 lux (F1.4).



**WAT-902H SUPREME,  
WAT-902H ULTIMATE, &  
WAT-902HB Series**  
*CCD Imager Sensitivity*

## SPECIFICATIONS

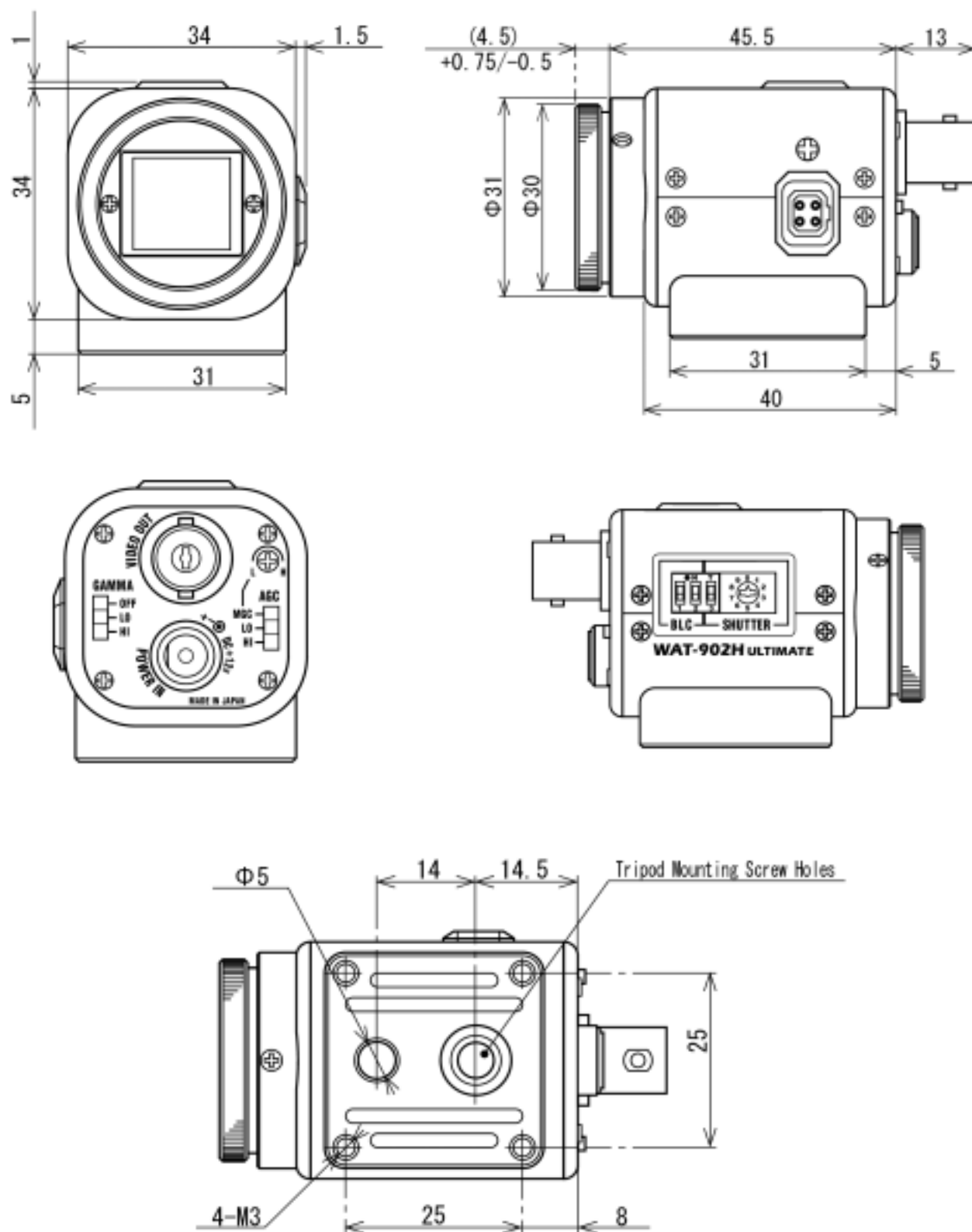
Model	WAT-902H2 ULTIMATE (EIA)	WAT-902H2 ULTIMATE (CCIR)
Pick-up element	1/2" interline transfer CCD image sensor	
Number of total pixels	811(H) × 508(V)	795(H) × 596(V)
Number of effective pixels	768(H) × 494(V)	752(H) × 582(V)
Unit cell size	8.4μm(H) × 9.8μm(V)	8.6μm(H) × 8.3μm(V)
Shutter speeds	EI1: 1/60 sec. - 1/100000 sec. EI2: 1/100 sec. - 1/100000 sec. FL: 1/100 sec. OFF: 1/60 sec.	EI1: 1/50 sec. - 1/100000 sec. EI2: 1/120 sec. - 1/100000 sec. FL: 1/120 sec. FL: 1/50 sec.
	1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/100000 sec.	
Minimum illumination	0.0001 lx. F1.4	

Model	WAT-902H3 ULTIMATE (EIA)	WAT-902H3 ULTIMATE (CCIR)
Pick-up element	1/3" interline transfer CCD image sensor	
Number of total pixels	811(H) × 508(V)	795(H) × 596(V)
Number of effective pixels	768(H) × 494(V)	752(H) × 582(V)
Unit cell size	6.35μm(H) × 7.40μm(V)	6.50μm(H) × 6.25μm(V)
Shutter speeds	EI1: 1/60 sec. - 1/100000 sec. EI2: 1/100 sec. - 1/100000 sec. FL: 1/100 sec. OFF: 1/60 sec.	EI: 1/50 sec. - 1/100,000 sec. EI2: 1/120 sec. - 1/100000 sec. FL: 1/120 sec. FL: 1/50 sec.
	1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/100000 sec.	
Minimum illumination	0.0002 lx. F1.4	

Common specifications	
Synchronizing system	Internal sync.
Video output	1Vp-p, 75ohms, unbalanced
Resolution (H)	570TVL (Center)
SN ratio	More than 50dB (AGC OFF)
AGC	①HI: 5-60dB ②LO: 5-32dB ③MGC(5-60dB)
Back light compensation	①OFF(Default) ②Center ③Lower ④Center + lower
Gamma correction	①HI ( $\gamma \div 0.35$ ) ②LO ( $\gamma \div 0.45$ ) ③OFF ( $\gamma \div 1$ )
Power supply	DC12V±10%
Power consumption	1.32W (110mA)
Operating temperature	-10°C - +40°C
Storage temperature	-30°C - +70°C
Dimensions(W×H×L)	35.5 × 40 × 63 (mm)
Weight	approx. 98g

Design and specifications are subject to change without notice.

# **DIMENSIONS (mm)**







## Monochrome CCD Camera

# WAT-902H2 ULTIMATE WAT-902H3 ULTIMATE

## Operation Manual

This Operation Manual covers safety, camera functions, installation and the correct operating procedure for the WAT-902H2/3 ULTIMATE. First, we ask you to read this Operation Manual thoroughly, then install and operate the WAT-902H2/3 ULTIMATE as advised. In addition, for future reference, we also advise safe keeping of this manual.

Please contact the distributor or dealer from which the WAT-902H2/3 ULTIMATE was purchased, if you do not understand the installation, operation or safety instructions laid out in this manual. Not understanding the contents of the Operation Manual sufficiently may cause damage to the camera.

## Cautions for Safety

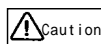
WAT-902H2/3 ULTIMATE is designed to be used safely; however, it may lead to physical accident caused by fire and electric shock if not used correctly. Therefore, please keep and read the "Cautions for Safety" for protection against accidents.



- **Do not disassemble and/or modify the WAT-902H2/3 ULTIMATE.**
- **Do not operate the WAT-902H2/3 ULTIMATE with wet hands.**



- **Use only the AD-901 or equivalent power adaptor for the WAT-902H2/3 ULTIMATE.**  
The recommended voltage is  $DC+12V \pm 10\%$
- **Do not expose the WAT-902H2/3 ULTIMATE to wetness or high moisture conditions.**  
The WAT-902H2/3 ULTIMATE is designed and approved for indoor use only. The WAT-902H2/3 ULTIMATE is not water-resistant or waterproof. If the location of the camera is outdoors or in an outdoor like environment, we recommend that you use an outdoor camera housing.
- **Protect the WAT-902H2/3 ULTIMATE from condensation.**  
Keep the WAT-902H2/3 ULTIMATE dry at all times, during storage and operation.
- Should the camera not work properly, switch off the power immediately. Please check the camera according to the "Problems and Trouble Shooting" section.



- **Avoid the striking of hard objects or dropping the WAT-902H2/3 ULTIMATE.**  
The WAT-902H2/3 ULTIMATE uses high quality electrical parts and precision components.
- **Do not connect any power supply directly to the video out terminal of the unit.**  
Do not connect the WAT-902H2/3 ULTIMATE with any monitor using a video/power single transmission terminal. The WAT-902H2/3 ULTIMATE is not designed for use with this type of equipment. We also advise you to read the operation manual of the monitor you plan to use before any connections are made.
- **Do not install the WAT-902H2/3 ULTIMATE in a position subject to direct sunlight.**  
Sunlight shining directly onto the WAT-902H2/3 ULTIMATE lens can cause damage to the CCD.
- **Select a stable place for installation of the WAT-902H2/3 ULTIMATE.**  
Use a support of durable strength around an installation position on a ceiling or wall when a camera stand or tripod is used.
- **Do not move the WAT-902H2/3 ULTIMATE with the cables connected.**  
Before moving the WAT-902H2/3 ULTIMATE, always remove the video cable and power cable from the rear of the camera first.
- **Avoid using the WAT-902H2/3 ULTIMATE near any strong electromagnetic field.**  
After installing into main equipment, if the WAT-902H2/3 ULTIMATE is exposed to electromagnetic waves causing the monitored image to become distorted, we recommend the camera be shielded by appropriate protective casing.

## Guide to the Safety Symbols

The meanings of the symbols used in this operation manual are:



When you do not adhere to or take notice of the "Danger" sign, it may lead to serious accident such as death or injury caused by fire or electric shock.



When you do not adhere to or take notice of the "Warning" sign, it may cause severe damage such as a physical injury.



When you do not adhere to or take notice of the "Caution" sign, it may incur injury and cause damage to peripheral objects in the immediate surroundings.

## About EMC

The WAT-902H2/3 ULTIMATE is in conformity with EMC test standards carried out by authorized organizations in Japan.

E I A FCC Part15 class B  
CCIR EN61000-6-3/EN50130-4

Do not modify the WAT-902H2/3 ULTIMATE. A modified camera may not conform to EMC test standards.

## Problems and Trouble Shooting

If any of the following problems occur when using the WAT-902H2/3 ULTIMATE,

- An optimal picture cannot be obtained, after checking that all the cables and connections are correctly in place
- Smoke or any unusual odor emerges from the WAT-902H2/3 ULTIMATE.
- An object becomes embedded or a quantity of liquid seeps into the camera housing
- More than the recommended voltage or/and amperage has been applied to the WAT-902H2/3 ULTIMATE by mistake
- Anything unusual occurring to any equipment connected to the WAT-902H2/3 ULTIMATE.

Disconnect the camera immediately according to the following procedures:

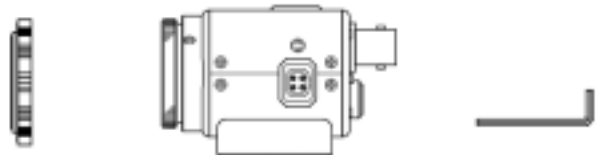
**Switch off the main power supply to the camera.**

Remove the power and video cables connected to the WAT-902H2/3 ULTIMATE.

Contact the distributor or dealer from which the WAT-902H2/3 ULTIMATE was purchased.

## Contents

Using the contents figures below, check to make sure all parts are present before use.

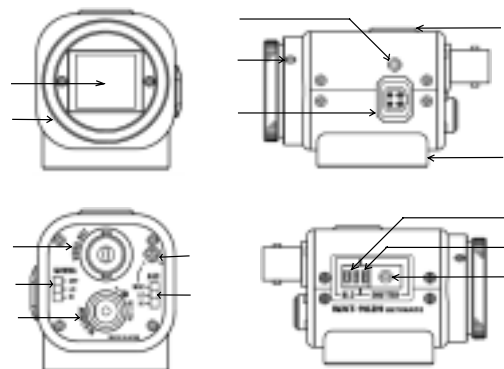


Lens Mount Cap

WAT-902H2/3 ULTIMATE

Hex. Wrench

## Description of Parts



CCD FRONT FACE

- The light receiving face of the CCD camera  
(Dirt, water or oil deposits on the CCD will cause an unclear picture on the monitor. Attach the lens cap to protect the lens and CCD from contamination and damage.)

## LENS MOUNT

- Mount for the lens (Thread type)

## IRIS LEVEL VOLUME

- By controlling the volume, the iris level of a DC iris lens can be adjusted.

## FOCUSING ADJUSTMENT SCREWS

- There are 3 hex. adjustment screws each placed at intervals of 120° for fine focusing of the lens.

## AUTO-IRIS SOCKET

- This socket is for a video or DC auto-iris lens cable connector.  
(Video/DC: Auto selected by the camera)

## TRIPOD MOUNTING SCREW HOLES

- Mounting holes for stands. The size of these threads are 1/4", 20 threads, 4.5 ± 0.2mm, which is the same as any standard camera tripod (U1/4").

## CAMERA BASE

- The camera base has a thread for fixing to a standard tripod and four M3 size holes for additional easy fixing.

## VIDEO OUT (BNC)

- The terminal for composite video signal output

## GAMMA CORRECTION SWITCH

- Three gamma values are selectable, 1.0, 0.45, 0.35.

## POWER IN

- The terminal designed for connection with the DC-plug of the power adaptor

## MGC VOLUME ADJUSTING

- The volume for setting manual gain control

## AGC/MGC SELECTION SWITCH

- Switch for setting AGC HI, LO or MGC

## BACK LIGHT

- The switch for back light compensation

## ELECTRONIC SHUTTER ON/OFF SWITCH

- The switch for the selecting electronic shutter mode

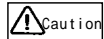
## AE MODE CONTROL

- The switch for the shutter speed mode control according to the object

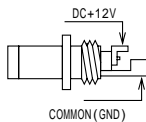
## Power Supply

If any other power adaptor besides the AD-901 is used, please use a stabilized power adaptor designed for DC+12V ± 10%, with a current capacity of more than 250mA.

Use the optional DC plug if the shape or polarity of the DC plug of the power adaptor to be used is not compatible with the camera (See the drawing on the right).



The wiring on the connector must be exact. Be careful not to touch the other terminal while wiring. Protect the wiring portion by using insulation tape after wiring. If the above care and attention is not adhered to, damage to the WAT-902H2/3 ULTIMATE and power adaptor may occur or may cause fire.



## Auto-iris Lens

Before connecting the auto-iris lens, please make sure that the pin configuration is correct by confirming with the following table below. If the configuration of your iris connector is different from the following, the plug and pins will need to be rewired.

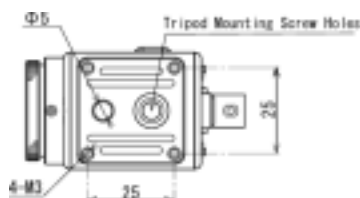


Pin No.	EIAJ Video Auto-iris Lens Arrangement	EIAJ DC Auto-iris Lens Arrangement
	Power	Control -
	Not used	Control +
	Iris signals	Drive +
	Common (GND)	Drive -

## Camera Base

There is a tripod mounting screw hole as shown in the diagram on the right.

In addition, there are 4 corners holes M3 size and one for stability.



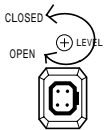
## Set-up and Operation

- Ensure that the power to the WAT-902H2/3 ULTIMATE and the peripheral equipment is turned off before making any connections.
- Remove the lens mount cap from the WAT-902H2/3 ULTIMATE and attach the CS-mount lens. Use the optional C-mount adaptor (30CMA-R) when a C-mount lens is used.
- Connect the iris cable to AUTO-IRIS SOCKET on the WAT-902H2/3 ULTIMATE when an auto-iris lens is being used.
- Connect VIDEO OUT on the WAT-902H2/3 ULTIMATE with the monitor, using a coaxial cable with 75 impedance, such as an RG-58/U or an RG-6/U. Select a monitor with the same television system as the WAT-902H2/3 ULTIMATE: EIA or CCIR. A monitor with more than 600TV lines is recommended.
- Insert the power plug of the power adaptor into POWER IN on the back panel of the WAT-902H2/3 ULTIMATE. Confirm that the power adaptor is not connected to the power supply before insertion of the power plug into POWER IN.
- Turn on the power to the WAT-902H2/3 ULTIMATE, monitor and all other allied equipment. When a picture cannot be obtained on the monitor, or a strong smell of burning is present, or smoke is visible, check and follow the procedure mentioned in the Problems and Trouble Shooting section.
- Focusing: Follow the operations mentioned below while looking at the screen on the monitor for focusing.

Manual Lens	Adjust the focus and iris to the best position on the lens.
Video Auto-iris Lens	Adjust the focus on the lens.
DC Auto-iris Lens	Adjust the iris level on the camera, then adjust the focus on the lens. See below.

### Iris Level Adjustment (for DC auto-iris lenses only)

Adjust IRIS LEVEL VOLUME placed on the side of the unit until an acceptable light level is attained. No change will occur if a video iris lens or manual iris lens is fitted.



When an auto-iris lens is used, set AGC/MGC SELECTION SWITCH to AGC off and set AE MODE CONTROL to any position other than 8 (EI). If AGC and EI are needed, change the switch settings according to your requirements.

- Select any required gamma by the GAMMA CORRECTION SWITCH.

Mode	Gamma	Effect
OFF	1.0	Required for image processing such as data storage for PCs and for FA.
LO	0.45	Standard setting for using TVs and Monitors. Natural images can be obtained in dark areas.
HI	0.35	Dark areas can be lightened and bright areas can be reduced.

Select LO position for normal use. In a low light environment or dark viewing, HI mode is recommended

- Select any required gain control by the AGC/MGC SELECTION SWITCH.

Mode	Range	Effect
MGC	5 ~ 60dB	<ul style="list-style-type: none"> <li>In a low light environment, when illumination of the object is important, increase the manual gain. Lower the gain control for a clearer picture with less noise. (Factory automation or Image processing)</li> </ul>
AGC HI	5 ~ 60dB	<ul style="list-style-type: none"> <li>When minimum illumination is more important than the S/N ratio (Surveillance in a low light environment)</li> </ul>
AGC LO	5 ~ 32dB	<ul style="list-style-type: none"> <li>When SN ratio is more important than minimum illumination.</li> <li>When adequate lighting is present or a stable lighting condition is available.</li> </ul>

- Set the gain to any required environment by MGC VOLUME ADJUSTING. Manually adjusted in a range between 5 to 60dB. In a low light environment, when illumination of the object is important, increase the manual gain. Lower the gain control for a clearer picture with less noise.

- 1) Select any required back light area by BACK LIGHT to one of its 4 positions.

	Area	Switch
1. Default		
2. Center		
3. Lower		
4. Center + Lower		

- 12) Set the shutter mode by ELECTRONIC SHUTTER ON/OFF SWITCH  
When shutter mode is OFF, fix the shutter speed to EIA1/60, CCIR1/50. When shutter mode is ON, select the shutter speed mode by AE MODE CONTROL.
- 13) Select any required shutter speed by the AE MODE CONTROL to one of its 10 positions.

No.	Mode	Shutter Speeds (Sec.)	
		EIA	CCIR
0	FL	1/100	1/120
1	ES	1/250	
2	ES	1/500	
3	ES	1/1000	
4	ES	1/2000	
5	ES	1/5000	
6	ES	1/10000	
7	ES	1/100000	
8	EI: OFF	1/60-1/100000	1/50-1/100000
9	EI: FL	1/100-1/100000	1/120-1/100000

In EI mode, intense light may leave a trail on the screen longitude. This smearing is a natural phenomenon and is not due to equipment failure.

## Options

To purchase these options, please contact the distributor or dealer from which you purchased the WAT-902H2/3 ULTIMATE.



### AC Adaptor (AD-901)

The recommended AC adaptor for the WAT-902H2/3 ULTIMATE for a constant and stable power supply.



### C-mount Adaptor (30CMA-R)

This lens mount adaptor is used to convert a CS-mount to a C-mount.



### Mini Stand (MS50)

A convenient stand for the WAT-902H2/3 ULTIMATE. With this stand, the camera can be adjusted to any desired angle.



### Auto-iris Plug (AIC-G)

Use this connector if the iris connector of your lens does not fit the WAT-902H2/3 ULTIMATE auto-iris socket.

## Specifications

### WAT-902H2 ULTIMATE

Model	WAT-902H2 ULTIMATE	
	EIA	CCIR
Pick-up Element	1/2 inch interline transfer CCD image sensor	
Unit Cell Size	8.4um(H) × 9.8um(V)	8.6um(H) × 8.3um(V)
Minimum Illumination	0.0001lx. F1.4	

### WAT-902H3 ULTIMATE

Model	WAT-902H3 ULTIMATE	
	EIA	CCIR
Pick-up Element	1/3 inch interline transfer CCD image sensor	
Unit Cell Size	6.35um(H) × 7.4um(V)	6.5um(H) × 6.25um(V)
Minimum Illumination	0.0002lx. F1.4	

### WAT-902H2 ULTIMATE / WAT-902H3 ULTIMATE

Model		WAT-902H2 ULTIMATE	WAT-902H3 ULTIMATE
		EIA	CCIR
Number of Total Pixels		811(H) × 508(V)	795(H) × 596(V)
Number of Effective Pixels		768(H) × 494(V)	752(H) × 582(V)
Scanning System		2:1 interlace	
Sync. System		Internal	
Video Output		Composite video, 1.0V(p-p) 75 (Unbalanced)	
AGC	ON	HI: 5 ~ 60dB / LO: 5 ~ 32dB	
	OFF	5 ~ 60dB (MGC)	
Back Light Compensation		OFF(Default) Center Lower Center+Lower	
Resolution (H)		570TVL	
S/N		More than 50dB (AGC=5dB, off)	
Auto-iris		Video / DC (Auto-Select)	
Gamma Characteristics		HI( 0.3 ) / LO( 0.45 ) / OFF( 1.0 )	
AE Mode	OFF	1/60 sec.	1/50 sec.
	FL	1/100 sec.	1/120 sec.
	ES	1/250, 1/500, 1/1000, 1/2000 1/5000, 1/10000, 1/100000 sec.	
	EI: OFF	1/60-100000 sec.	1/50-1/100000sec.
	EI: FL	1/100-100000 sec.	1/120-100000sec.
Power Supply		DC12V ± 10%	
Power Consumption		1.32W	
Operating Temperature		-10 ~ 40	
Operating Humidity		Less than 95% RH (Without condensation)	
Storage Temperature		-30 ~ 70	
Storage Humidity		Less than 95% RH (Without condensation)	
Size		35.5 × 40 × 63 (mm)	
Lens Mount		CS-mount	
Weight		98g	

- Design and specifications are subject to change without notice.
- Watec is not responsible for any inconvenience or the attendant damages to the video and monitoring recording equipment caused by misuse, mis-operation or improper wiring of our equipment.
- If for any reason the WAT-902H2/3 ULTIMATE does not work properly, or if you have any questions regarding installation or operation, please contact the distributor or dealer from which it was purchased.

## Contact information



Watec Co., Ltd.

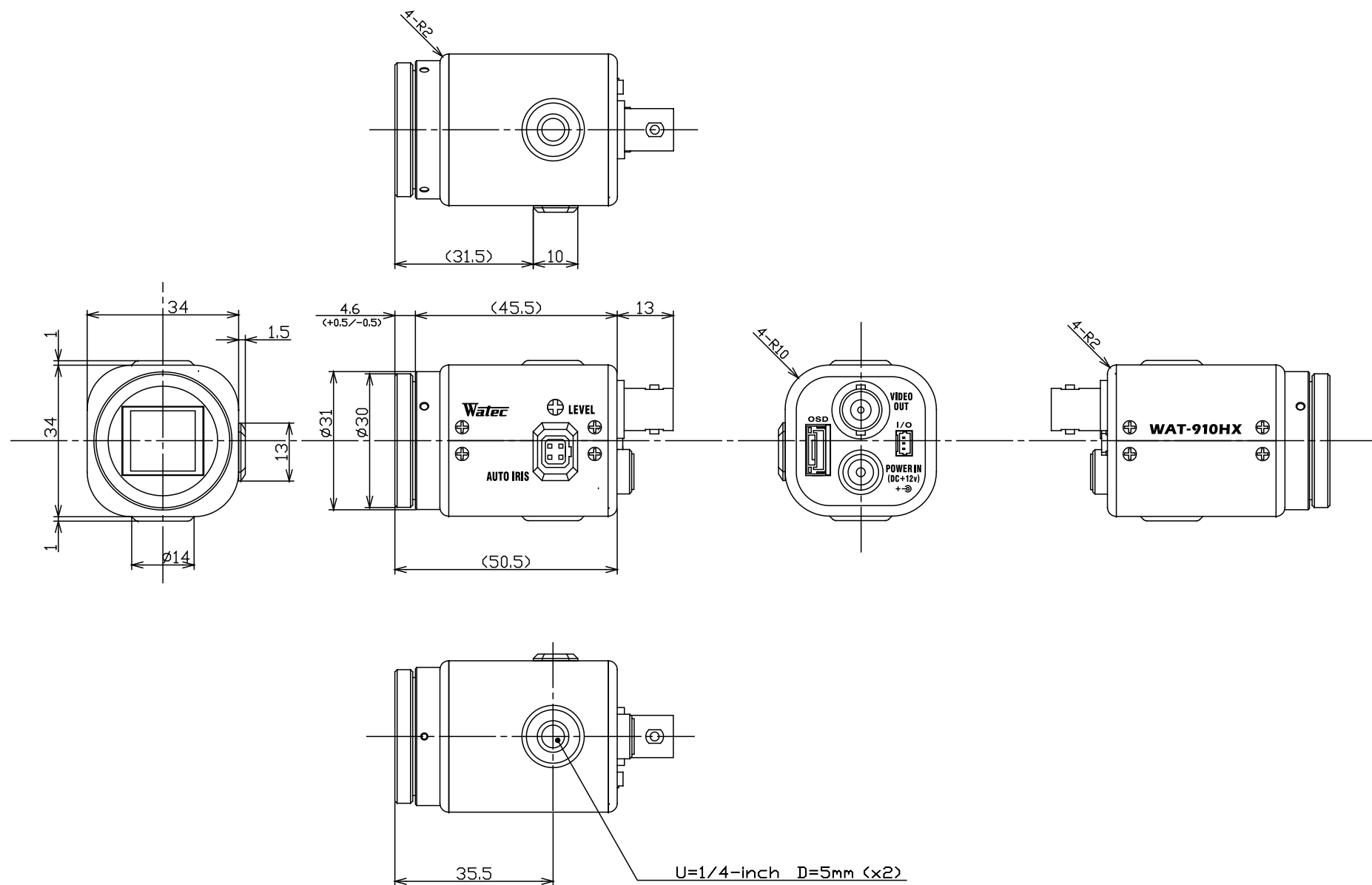
Addr.: 254-2 Nihonkoku, Daihoji, Tsuruoka- Shi,  
Yamagata-Ken, 997-0017 Japan  
TEL: +81-235-23-4400 FAX: +81-235-23-4409  
Email: [info-o@watec.co.jp](mailto:info-o@watec.co.jp)  
URL: <http://www.watec.net>

**SPECIFICATIONS**

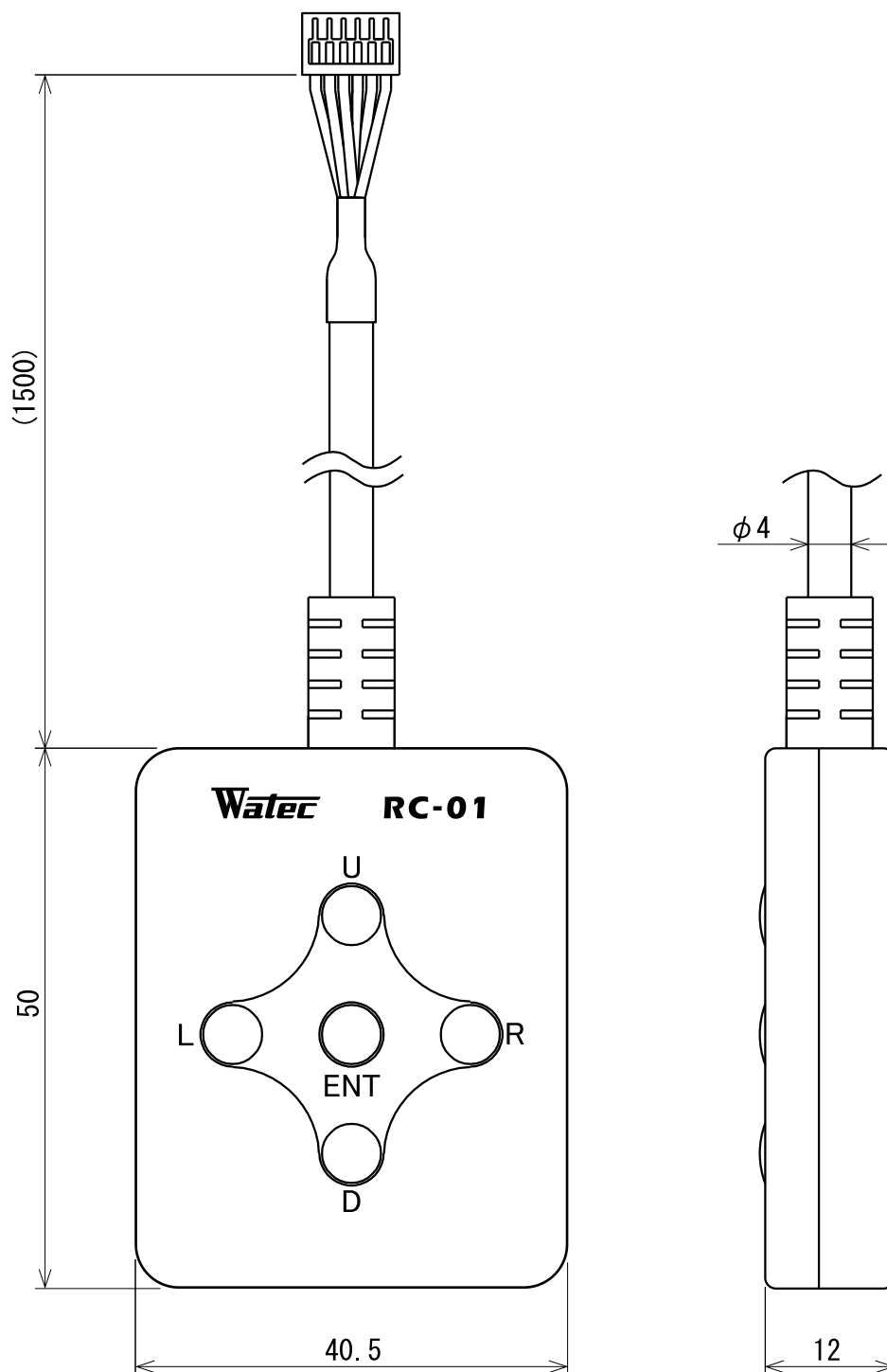
Model		WAT-910HX/RC (EIA)	WAT-910HX/RC (CCIR)
Pick-up element		1/2 inch interline transfer CCD image sensor	
Number of total pixels		811(H) × 508(V)	795(H) × 596(V)
Number of effective pixels		768(H) × 494(V)	752(H) × 582(V)
Unit cell size		8.4μm(H) × 9.8μm(V)	8.6μm(H) × 8.3μm(V)
Synchronizing system		Internal	
Scanning system		2:1 interlace	
Video output		Composite Video, 1.0 V(p-p), 75 Ω, unbalanced	
Resolution (Horizontal)		More than 570TVL (Center)	
Minimum illumination		0.000005lx. F1.4 (Shutter: x256, AGC: HIGH, γ : 0.35)	
S/N		More than 52dB (AGC=6dB, γ =1.0)	
Function settings		OSD (On Screen Display) operated by remote controller	
Electronic iris		1/60-1/100000 sec.	1/50-1/100000 sec.
		x256(field) *selectable -1/100000 sec.	
Electronic shutter		x2, x4, x8, x16, x32, x64, x128, x256 (field)	
		1/60, 1/100 sec.	1/50, 1/120 sec.
		1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/100000 sec.	
AGC	ON	LOW: 6-30dB / MID: 6-34.5dB / HIGH: 6-41dB	
	OFF	6-41dB (1dB step) *selectable	
Gamma characteristics		γ ≐ 0.05-1.00 (0.05 step), USER *selectable	
Noise reduction		3DNR ON *selectable / OFF	
Wide dynamic range		WDR(Digital Wide Dynamic Range) USER1 / USER2 / OFF	
Motion detection		Max. 4 areas selectable (Out-put terminal available)	
Lens iris		Video / DC (Auto-select)	
Back light compensation		OFF / BLC / HSBLC	
White blemish correction		Up to 64 dots correctable by OSD operation	
Power supply		DC+12V±10%	
Power consumption		1.38W (115mA)	
Operating temperature		-10 – +50°C	
Storage temperature		-30 – +70°C	
Operating / Storage humidity		Less than 95% RH (Without condensation)	
Lens mount		CS (Back focus adjustable)	
Weight		Approx. 83g	

※Design and specifications are subject to change without notice.

### DIMENSIONS (mm)



**DIMENSIONS (mm)**







Multi Function / Super High Sensitivity

# WAT-910HX/RC

## Operation Manual

This Operation Manual covers safety, camera functions, installation and the correct operating procedure for the WAT-910HX/RC. First, we ask you to read this Operation Manual thoroughly, then install and operate the WAT-910HX/RC as advised. In addition, for future reference, we also advise safekeeping of this manual.

Please contact the distributor or dealer from which the WAT-910HX/RC was purchased, if you do not understand the installation, operation or safety instructions laid out in this manual. Not understanding the contents of the Operation Manual sufficiently may cause damage to the camera.

## Guide to the Safety Symbols

The definitions of the symbols used in this operation manual are:



When you do not adhere to or take notice of the “Danger” sign, it may lead to a serious accident such as death or injury caused by fire or electric shock.



When you do not adhere to or take notice of the “Warning” sign, it may cause severe damage such as a physical injury.



When you do not adhere to or take notice of the “Caution” sign, it may incur injury and cause damage to peripheral objects in the immediate surroundings.

## Cautions for Safety

The WAT-910HX/RC is designed to be used safely; however, if not used safely, it may lead to a physical accident caused by fire and electric shock. Therefore, please keep and read the “Cautions for safety” below for protection against accidents.



- **Do not disassemble and/or modify the WAT-910HX/RC.**
- **Do not operate the WAT-910HX/RC with wet hands.**



- **Use a stabilized power adaptor designed for DC+12V±10%, with a current capacity of more than 250mA for the WAT-910HX/RC.**

The recommended voltage is DC+12V±10%

- **Do not expose the WAT-910HX/RC to wetness or high moisture conditions.**

The WAT-910HX/RC is designed and approved for indoor use only. The WAT-910HX/RC is not water-resistant or waterproof. If the location of the camera is outdoors or in an outdoor like environment, we recommend that you use an outdoor camera housing.

- **Protect the WAT-910HX/RC from condensation.** Keep the WAT-910HX/RC dry at all times during storage and operation.

- Should the camera not work properly, switch off the power immediately. Then check the camera according to the “Problems and Trouble shooting” section.



- **Avoid the striking of hard objects or dropping the WAT-910HX/RC.**

The WAT-910HX/RC uses high quality electrical parts and precision components.

- **Do not connect any power supply directly to the video out terminal of the unit.**

Do not connect the WAT-910HX/RC with any monitor using a video/power single transmission terminal. The WAT-910HX/RC is not designed for use with this type of equipment. We also advise you to read the operation manual of the monitor you plan to use before any connections are made.

- **Do not install the WAT-910HX/RC in a position subject to direct sunlight.**

Sunlight shining directly onto the WAT-910HX/RC lens can cause damage to the CCD.

- **Select a stable place for installation of the WAT-910HX/RC.**

Use a support of durable strength around an installation position on a ceiling or wall when a camera stand or tripod is used.

- **Do not move the WAT-910HX/RC with the cables connected.**

Before moving the WAT-910HX/RC, always remove the video cable and power cable from the rear of the camera first.

- **Avoid using the WAT-910HX/RC near any strong electromagnetic field.**

After installing into main equipment, if the WAT-910HX/RC is exposed to electromagnetic waves causing the monitored image to become distorted, we recommend the camera be shielded by appropriate protective casing.

## Problems and Trouble Shooting

If any of the following problems occur when using the WAT-910HX/RC,

- An optimal picture cannot be obtained, after checking that all the cables and connections are correctly in place
- Smoke or any unusual odor emerges from the WAT-910HX/RC
- An object becomes embedded or a quantity of liquid seeps into the camera housing
- More than the recommended voltage or/and amperage has been applied to the WAT-910HX/RC by mistake
- Anything unusual occurring to any equipment connected to the WAT-910HX/RC

**Disconnect the camera immediately according to the following procedures:**

① **Switch off the main power supply to the camera.**

② Remove the power and video cables connected to the WAT-910HX/RC.

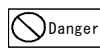
③ Contact the distributor or dealer from which the WAT-910HX/RC was purchased.

## About EMC

The WAT-910HX/RC is in conformity with EMC test standards carried out by authorized organizations in Japan.

E I A    FCC Part15 class B  
CCIR    EN61000-6-3/EN50130-4

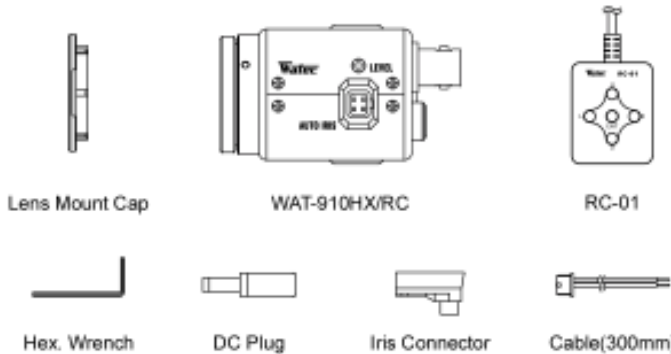
※Please use an auxiliary power supply (eg: UPS) to this camera to comply with EN50130-4 of EMC standards.



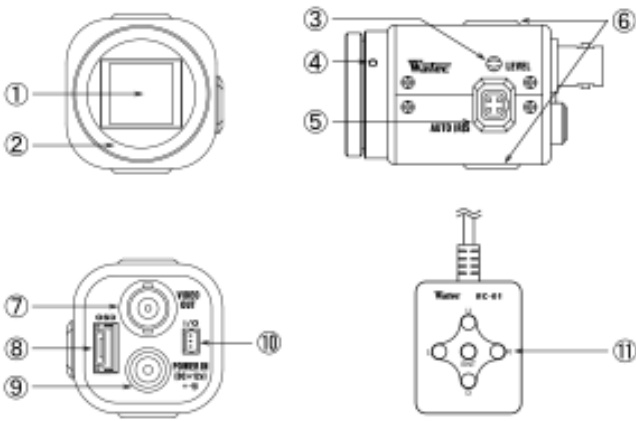
Do not modify the WAT-910HX/RC. A modified camera may not conform to EMC test standards.

## Contents

Using the contents figures below, check to make sure all parts are present before use.



## Description of Parts



① IMAGE SENSOR FRONT FACE

- The light receiving face of the image sensor  
(Dirt, water or oil deposits on the image sensor will cause an unclear picture on the monitor. Attach the lens cap to protect the lens and the CCD from contamination and damage.)

② LENS MOUNT

- Mount for the lens (CS-mount)

③ IRIS LEVEL VOLUME

- By controlling the volume, the iris level of the DC iris lens can be adjusted.

④ FINE FOCUS ADJUSTMENT SCREWS

- There are 3 hex. adjustment screws each placed at intervals of 120° for fine focusing of the lens.

⑤ AUTO-IRIS SOCKET

- This socket is for the video/DC auto-iris lens cable connector.  
(Video/DC: Auto selected by the camera)

⑥ TRIPOD MOUNTING SCREW HOLES

- Mounting holes for stands. The size of these threads are 1/4", 20 threads, 4.5±0.2mm, which is the same as any standard camera tripod (U1/4").

⑦ VIDEO OUT (BNC)

- The terminal for composite video signal output

⑧ OSD(On Screen Display) CONNECTOR

- The terminal designed for connection with the remote control for setting the functions on the screen.

⑨ POWER IN

- The terminal designed for connection with the DC-plug of the power adaptor.

⑩ I/O CONNECTOR

- The control terminal for the Motion Detection.

⑪ OPERATION BUTTON

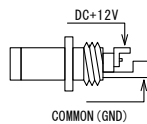
- The operation button for setting the functions on the screen.

## Power Supply

Use a stabilized power adaptor designed for DC+12V±10%, with a current capacity of more than 250mA. Use the optional DC plug if the shape or polarity of the DC plug of the power adaptor to be used is not compatible with the camera (See the drawing on the right below).

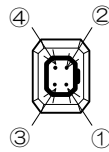


The wiring of the connector must be exact. Be careful not to touch the other terminal while wiring. Protect the wiring portion by using insulation tape after wiring. If the above care and attention is not adhered to, damage to the WAT-910HX/RC and power adaptor may occur and may also cause fire.



## Auto-iris Lens

Before connecting the auto-iris lens, please make sure that the pin configuration is correct by confirming with the following table. If the configuration of your iris connector is different from the following, the plug and pins will need to be rewired.



Pin No.	EIAJ Video Auto-iris Lens Arrangement	EIAJ DC Auto-iris Lens Arrangement
①	Power	Control —
②	Not used	Control +
③	Iris signals	Drive +
④	Common (GND)	Drive —

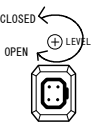
## Set-up and Operation

- 1) Ensure that the power to the WAT-910HX/RC and the peripheral equipment is turned off before making any connections.
- 2) Remove the lens mount cap from the WAT-910HX/RC and attach the CS-mount lens. Use the optional C-mount adaptor (30CMA-R) when a C-mount lens is used.
- 3) Connect the iris control cable to ⑤ AUTO-IRIS SOCKET on the WAT-910HX/RC when an auto-iris lens is being used.
- 4) Connect ⑦ VIDEO OUT on the WAT-910HX/RC with the monitor, using a coaxial cable with 75Ω impedance, such as an RG-59 or an RG-6/U.  
※Select a monitor with the same television system as the WAT-910HX/RC EIA or CCIR. A monitor with more than 600TV lines is recommended.
- 5) Insert the power plug of the power adaptor into ⑨ POWER IN on the back panel of the WAT-910HX/RC. Confirm that the power adaptor is not connected to the power supply before insertion of the power plug into ⑨ POWER IN.
- 6) Turn on the power to the WAT-910HX/RC, monitor and all other allied equipment. When a picture cannot be obtained on the monitor, or a problem occurs, check and follow the procedure mentioned in the 【Problems and Trouble Shooting】 section.
- 7) After following the procedure below and the picture is still out of focus, open the iris fully and loosen ④ FINE FOCUSING ADJUSTMENT SCREWS with the hex. wrench and move the lens forwards until a clear picture is obtained.

Manual Lens	Adjust the focus and iris to the best position on the lens.
Video Auto-iris Lens	Adjust the focus on the lens.
DC Auto-iris Lens	Adjust the iris level on the camera, then adjust the focus on the lens. See below.

### Iris Level Adjustment (for DC auto-iris lenses only)

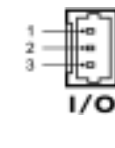
Adjust ③ IRIS LEVEL VOLUME placed on the side of the unit until an acceptable light level is attained. No change will occur if a video iris lens or manual iris lens is fitted.



※When an auto iris lens is used, connect the remote control to ⑧ OSD(On Screen Display) CONNECTOR, then set SHUTTER to 1/60 (1/50), SENS UP to OFF and AGC to OFF by ⑪ OPERATION BUTTON. Then adjust ③ IRIS LEVEL VOLUME until an acceptable light level is attained.

- 8) When detailed settings are required or an adequate image is not obtained, connect the remote control to ⑧ OSD(On Screen Display) CONNECTOR, then set the functions on the screen by ⑪ OPERATION BUTTON.

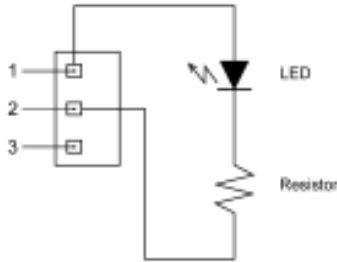
9) When controlling the motion detection function, connect to ⑩I/O CONNECTOR after wiring using the attached cable. See the pin configuration as follows.



PIN No.	Cable color	Title	Function
1	Brown	MD_O	Alarm out
2	Black	GND	Camera GND
3	-	NC	

■Alarm output terminal

When the motion detection function is used, the alarm output terminals 1 and 2 are hot during detection of movement in the monitored area. If an LED is connected as shown in the diagram below, the alert turns on the LED by voltage output. Please make sure that the attached alarm supply voltage is 3.3V or less between the two terminals and the output current is 6mA or less.



Options

To purchase these options, please contact the distributor or dealer from which you purchased the WAT-910HX/RC.



C-mount Adaptor (30CMA-R)

This lens mount adaptor is used to convert a CS-mount to a C-mount.



Mini Stand (MS50)

A convenient stand for the WAT-910HX/RC. With this stand, the camera can be adjusted to any desired angle.

Specifications

Model		WAT-910HX/RC (EIA)	WAT-910HX/RC (CCIR)
Pick-up Element		1/2 inch interline transfer CCD image sensor	
Number of Total Pixels		811(H) × 508(V)	795(H) × 596(V)
Number of Effective Pixels		768(H) × 494(V)	752(H) × 582(V)
Unit Cell Size		8.4μm(H) × 9.8μm(V)	8.6μm(H) × 8.3μm(V)
Sync. System		Internal	
Scanning System		2:1 Interlace	
Video Output		Composite Video, 1.0 V(p-p), 75Ω (Unbalanced)	
Resolution (H)		More than 570TVL (Center)	
Minimum Illumination		0.000005lx. F1.4 (Shutter: x256, AGC: HIGH, γ: 0.35)	
S/N		More than 52dB (AGC=6dB, γ=1.0)	
Function settings		OSD (On Screen Display) operated by remote control	
Electronic iris		1/60-1/100000 sec.	1/50-1/100000 sec.
		x256(field) *selectable -1/100000 sec.	
Electronic shutter		x2, x4, x8, x16, x32, x64, x128, x256 (field)	
		1/60, 1/100 sec.	1/50, 1/120 sec.
		1/250, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/100000 sec.	
AGC	ON	LO: 6~30dB / MID: 6~34.5dB / HI: 6~41dB	
	OFF	6-41dB (1dB step) *selectable	
Gamma Characteristics		γ ≒0.05-1.00 (0.05 step), USER *selectable	
Noise Reduction		3DNR ON *selectable / OFF	
Wide Dynamic Range		USER1 / USER2 / OFF	
Motion Detection		Max. 4 areas selectable (Out-put terminal available)	
Lens-iris		Video / DC (EIAJ arrangement, Auto-select)	
Back Light Compensation		OFF / BLC / HSBLC	
White blemish correction		Up to 64 dots correctable by OSD operation	
Power Supply		DC+12V±10%	
Power Consumption		1.38W (115mA)	
Operating Temperature		-10 ~ +50℃	
Operating Humidity		Less than 95% RH (Without condensation)	
Storage Temperature		-30 ~ +70℃	
Storage Humidity		Less than 95% RH (Without condensation)	
Lens Mount		CS-mount (Back focus adjustable)	
Size		35.5(W)×36(H)×63.5(D) (mm)	
Weight		Approx. 83g	

- Design and specifications are subject to change without notice.
- Watec is not responsible for any inconvenience or the attendant damages to the video and monitoring recording equipment caused by misuse, mis-operation or improper wiring of our equipment.
- If for any reason the WAT-910HX/RC does not work properly, or if you have any questions regarding installation or operation, please contact the distributor or dealer from which it was purchased.

关于电子信息产品污染控制标识

环境使用期限	名称	有害物质或元素					
		铅	镉	汞	六价铬	PBB	PBDE
	外壳	○	○	○	○	○	○
	电子零部件	×	○	○	○	○	○
	电路板	○	○	○	○	○	○
	附件	○	○	○	○	○	○
	其它金属	×	○	○	○	○	○
○:表示该有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006规定的限量要求以下。 ×:表示该有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006规定的限量要求。 由该输入端子到端子金含有0%以下铅。CCD传感器玻璃中含有000,000ppm的铅。 为无制造成用品的标志。							
				再生日期在子包装的上部			
外包装箱	包装袋	气垫	附件袋	A	A	年	记号
				2011	A	1	1
				2012	B	10	A

Contact information



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# **WAT-910HX/RC**

## **OSD USER MANUAL**

Rev. 1.00

**Watec Co., Ltd**

January 23, 2013

## Change History

Rev. No.	Date	Changes	Remarks
1.00	2013.01.23		Initial Release

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## **1.Introduction**

- The WAT-910HX/RC user manual describes the functions and the adjustment method using the On Screen Display (OSD).
- When the settings of the WAT-910HX/RC is changed according to the WAT-910HX/RC user manual, check to see that the operation and the effects of the changes made to the camera are acceptable.
- The WAT-910HX/RC user manual is subject to change by design and the specifications of the product without notice.
- The copyright of the WAT-910HX/RC user manual shall belong to Watec Co, Ltd. Copying in whole, or in part without the authorization of the holders permission is prohibited.



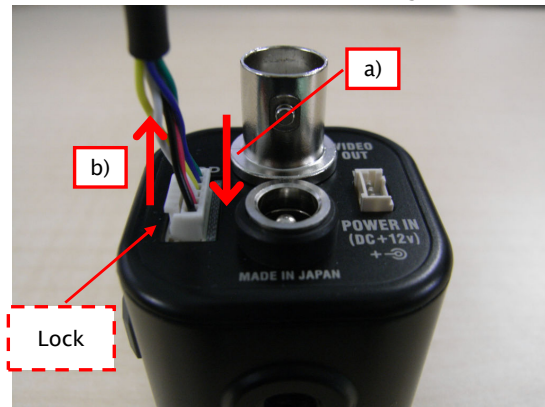
## 2.OSD MENU OPERATION

The functions and parameter settings of WAT-910HX/RC can be changed by OSD(On Screen Display).  
When operating OSD, Controller is used.



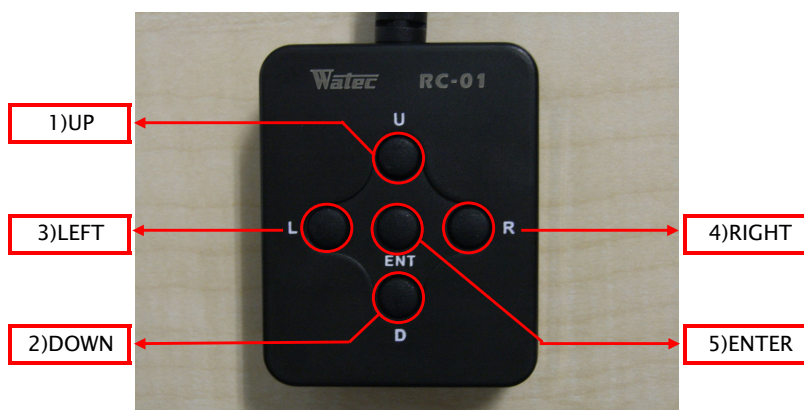
Controller Overview

- a)When using the Controller, insert the connector fully until it clicks.
- b)When disconnecting the Controller,pull the connector while pinching the Lock.



How to Connect Controller

Controller has five buttons, UP/DOWN/LEFT/RIGHT/ENTER.



The operation portion of the Controller

Use 5 buttons above to operate OSD Menu.

1)UP/2)DOWN : Mainly to move the cursor up and down to select an item on the lists on OSD Menu.

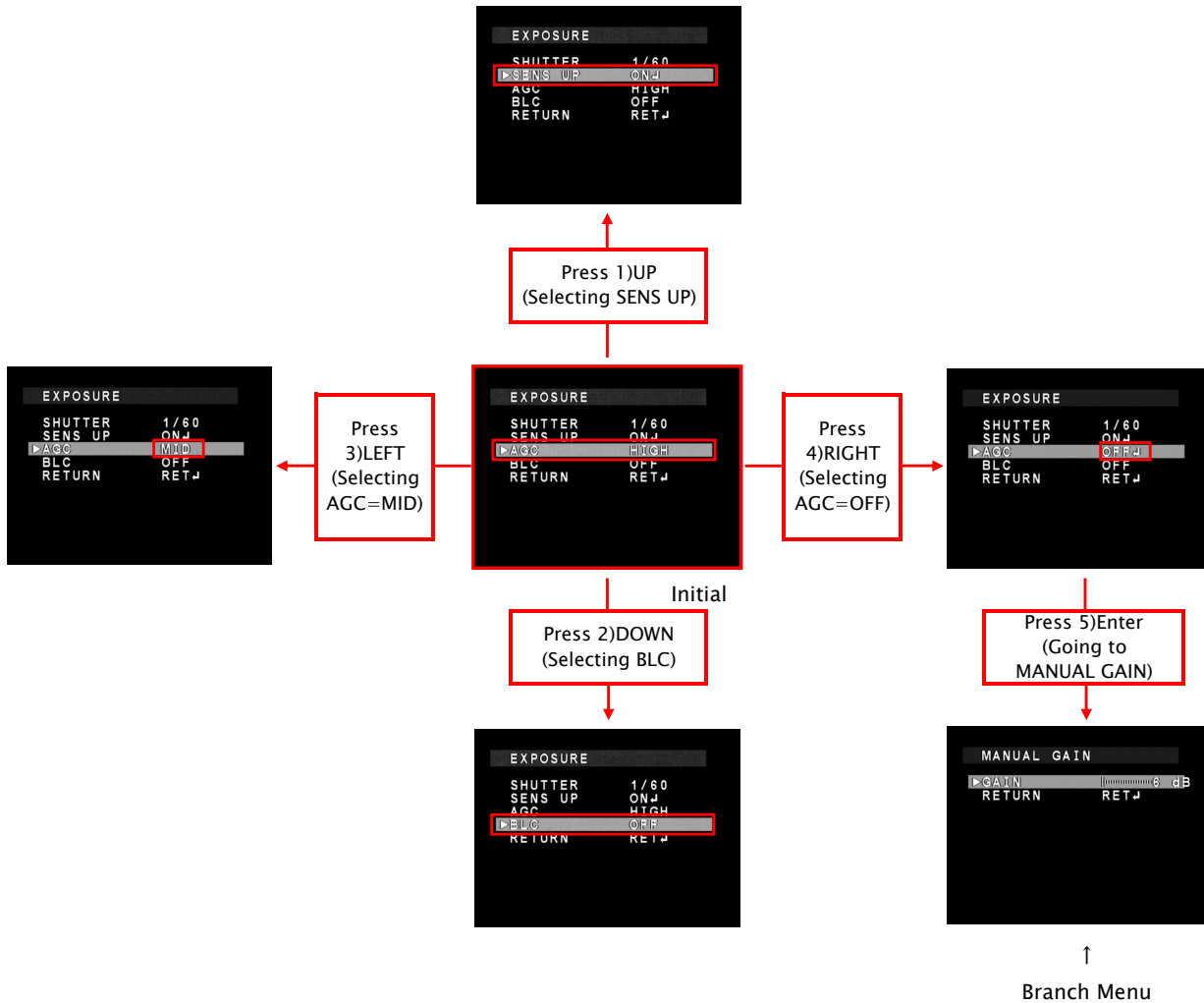
3)LEFT/4)RIGHT : Mainly to adjust and change the functions on each list on OSD Menu.

5)ENTER : Mainly to execute the selected list and function on OSD Menu.

The symbol "⏏" will be on some lists on OSD Menu to indicate that there are Sub Menus or selectable options by pressing 5)Enter.

Please refer to the following model operation pictures on the basic Controller usage.

AGC is highlighted in the center of the pictures, and they explain what happens when 5 buttons are controlled.



From the next page, each button is written as follows.

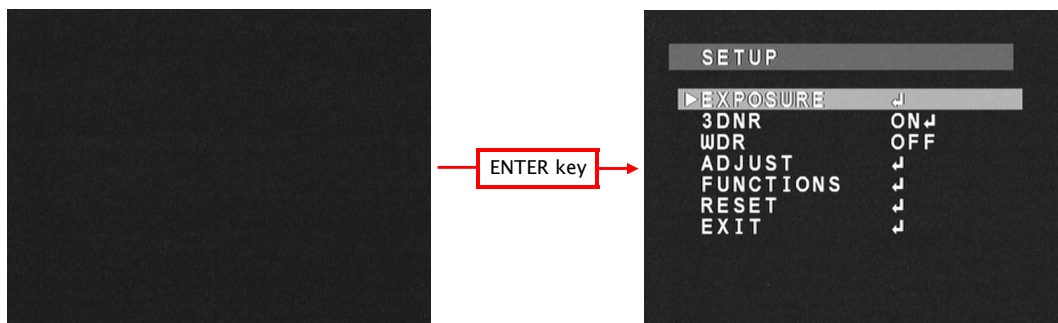
1)UP is written as "UP key", and 2)DOWN is written as "DOWN key".

In addition, 3)LEFT is written as "LEFT key", and 4)RIGHT is written as "RIGHT key".

5)ENTER is written as "ENTER key".

### 3.SETUP MENU(TOP MENU)

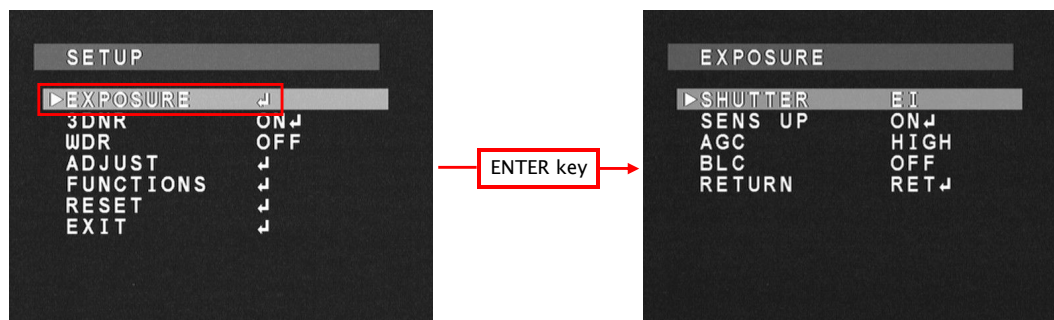
When pressing ENTER key, SETUP menu will appear on the screen.



#### 3.1 EXPOSURE MENU

When adjusting EXPOSURE settings, move the cursor to EXPOSURE and press ENTER key.

Press UP/DOWN button to choose one of the items in EXPOSURE, press the ENTER key to select, and change it with LEFT/RIGHT key. Press the ENTER key to set.



### 3.1.1 SHUTTER

Select Shutter Speed(or Shutter Mode) with LEFT/RIGHT key.

The default setting is EI.

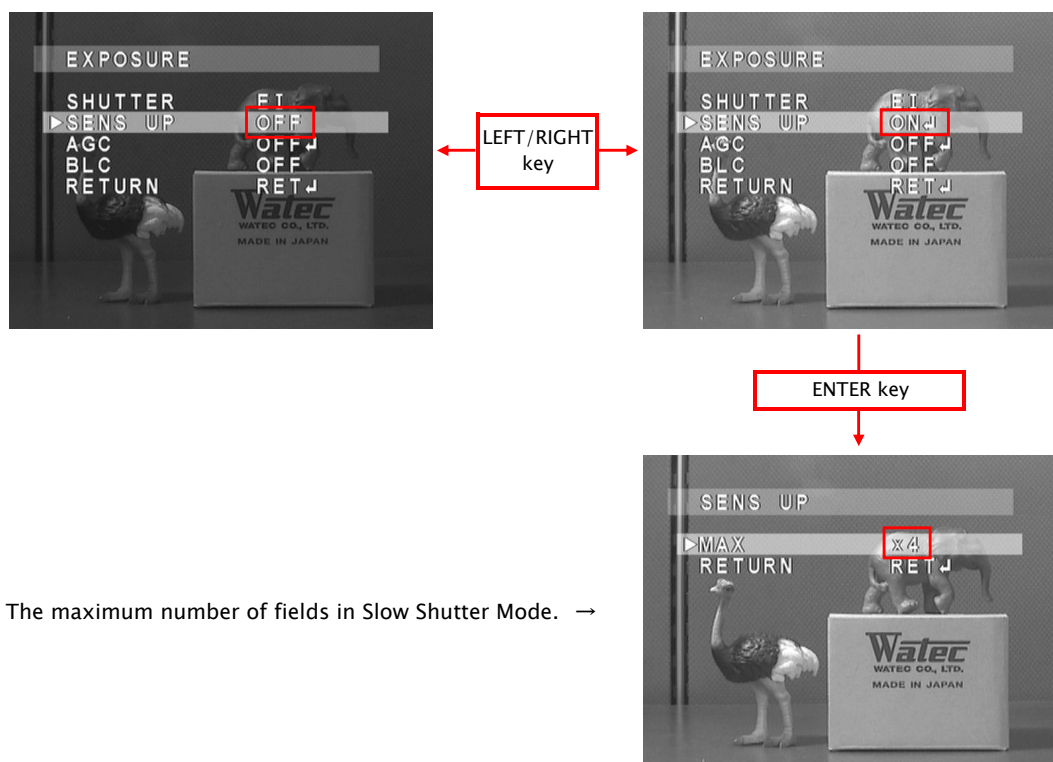
Shutter Speed	Shutter Mode	Details
x256	Slow speed shutter (fixed shutter speed)	Selected number of fields x 1/60s(EIA)or1/50s(CCIR) will be the calculated fixed shutter speed in seconds.
x128		
x64		
x32		
x16		
x8		
x4		
x2		
EI	Electronic iris	It is the function which adjusts the shutter speed from the slow shutter speed (selected with the SENS UP menu) to 1/100000(sec), which depends on brightness of a camera object, and maintains a proper exposure state.
*1/60(1/50)	High speed shutter (fixed shutter speed)	The High speed shutter is defined as the selected Shutter Speed. FL is the abbreviation of FLICKER-LESS(1/100(sec):EIA or 1/120(sec):CCIR).  Note. Only when selecting 1/60(1/50) Shutter Speed, the EI range is from the selected slow shutter speed in the SENS UP setting, up to 1/60(1/50), and the EI can maintain a proper exposure of a camera object within this range.
FL		
1/250		
1/500		
1/1000		
1/2000		
1/5000		
1/10000		
1/100000		

\* 1/60(sec):EIA, 1/50(sec):CCIR

### 3.1.2 SENS UP

When selecting EI(electronic iris) or 1/60(1/50) in SHUTTER, Slow speed shutter can be used to adjust exposure. Use LEFT/RIGHT key to select ON/OFF. When pressing ENTER key after selecting ON, the maximum number of fields under the SENS UP operation can be selected.

The default setting is x4.



The maximum number of fields in Slow Shutter Mode. →

Shutter Mode	SENS UP	Details
EI	OFF	Electronic Iris mode. (from 1/60(1/50)(sec) to 1/100000(sec))
	ON	Electronic Iris with slow shutter speed mode. (from SENS UP(number of fields) to 1/100000(sec)) The slow shutter speed can be selected from; x2/x4/x8/x16/x32/ x64/x128/x256. Use LEFT/RIGHT key to set the value.
EIA:1/60 CCIR:1/50	OFF	Fixed shutter speed mode(1/60(1/50)(sec))
	ON	Electronic Iris using slow shutter speed mode from SENS UP(number of fields) to 1/60s(1/50s). The slow shutter speed can be selected from; x2/x4/x8/x16/x32/ x64/x128/x256. Use LEFT/RIGHT key to set the value.
(other)	OFF	Fixed shutter speed mode.(selected in SHUTTER)

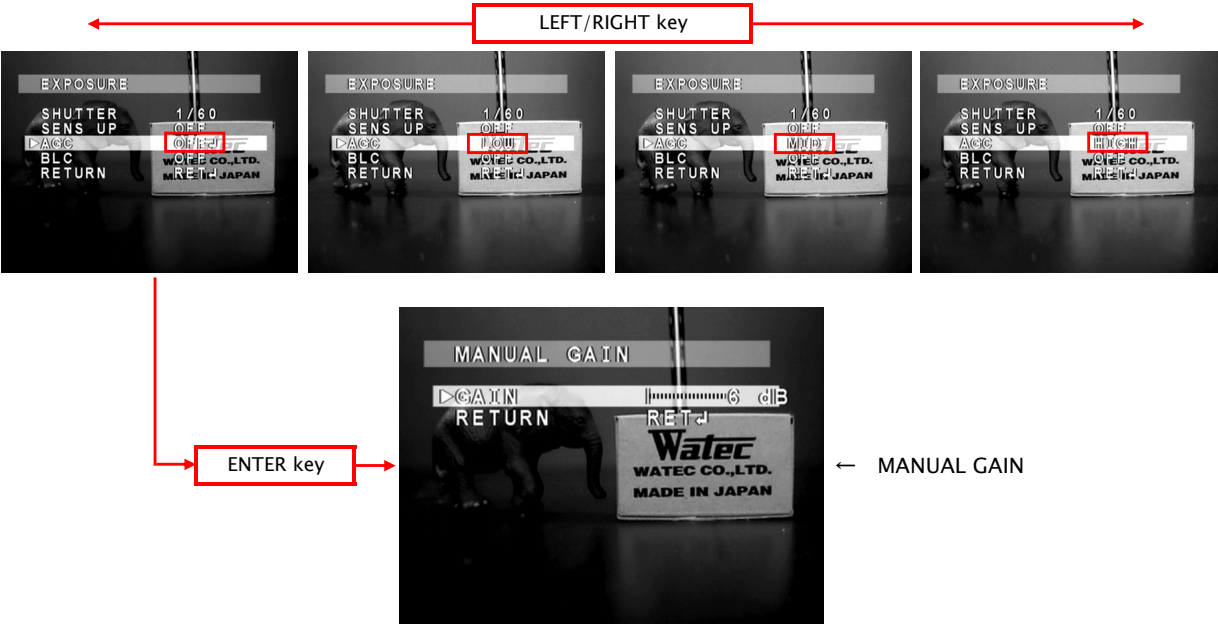
3.1.3 AGC

AGC Value can be changed.

Use LEFT/RIGHT key to setup AGC Value. During selecting OFF, when pressing ENTER key, SUB MENU for MANUAL GAIN Settings appears.

The default setting is HIGH. When selecting OFF, AGC is fixed to 6dB as default.

AGC Mode	(Sub Menu)	Details
OFF	GAIN	A fixed AGC level can be set. It can range from approx. 6 to 41(dB) Use LEFT/RIGHT key to change the AGC level.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to EXPOSURE Settings. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.
LOW	—	Gain range : approx. (min.)6 to (max.)30(dB)
MID	—	Gain range : approx. (min.)6 to (max.)34.5(dB)
HIGH	—	Gain range : approx. (min.)6 to (max.)41(dB)



### 3.1.4 BLC

Select Backlight operation on the menu. Traditional Backlight Compensation(BLC) mode and High Light Suppress Backlight(HSBLC) mode can be selected.

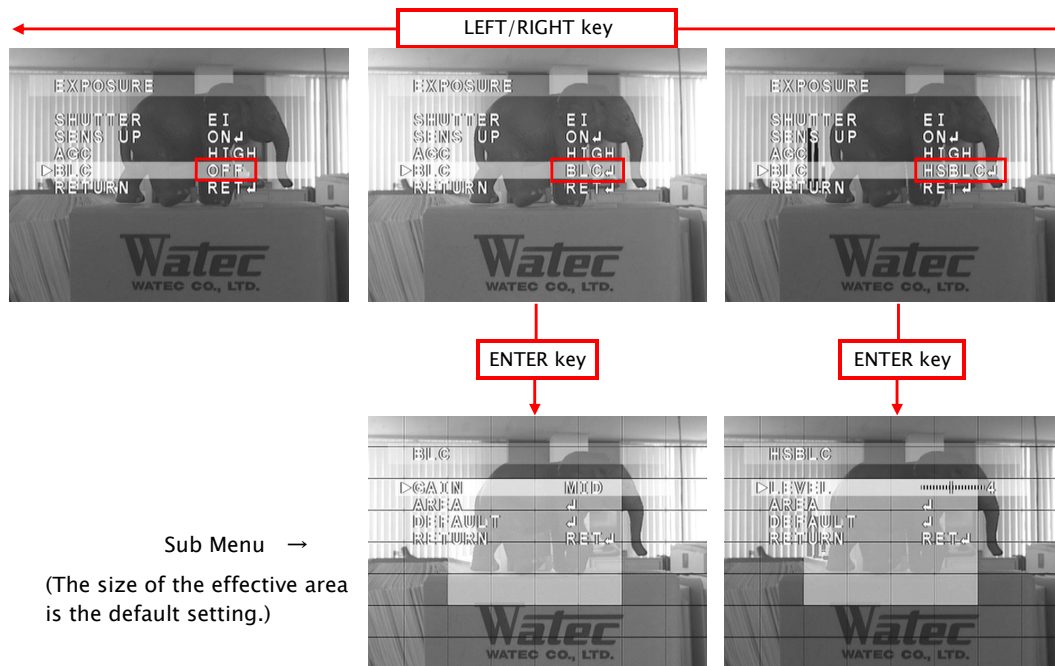
Use LEFT/RIGHT key to select OFF/BLC/HSBLC. When BLC/HSBLC is selected, press ENTER to show Sub Menu.

The default setting of BLC is OFF. When selecting BLC, the default GAIN is MID. When selecting HSBLC, the default level of HSBLC is 4. The area default of BLC HSBLC is as follows.

Note. BLC/HSBLC does not work under the condition below.

SHUTTER is fixed shutter speed mode & SENS UP is OFF & AGC is OFF

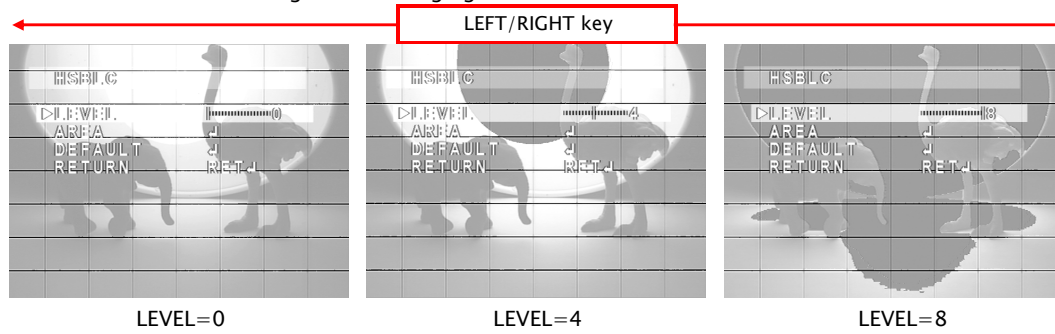
However, when selecting HSBLC, the high lighting area is masked.



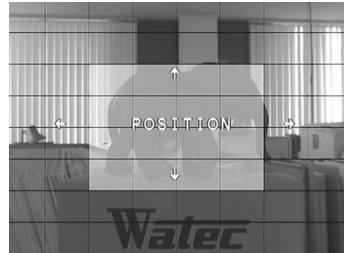
BLC Mode	(Sub Menu)	Details
OFF	—	The BLC function is OFF.
BLC	GAIN	Change the level of BLC effect with LEFT/RIGHT button. LOW / MID / HIGH Use LEFT/RIGHT key to select GAIN.
	AREA	Press the ENTER key to position and set the size of the BLC area window <sup>2</sup> .
	DEFAULT	Return the setting to default when pressing the ENTER key. If selecting DEFAULT, changed GAIN/AREA will return to the initial setting.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to EXPOSURE Settings. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.
HSBLC	LEVEL	Defining the brightness level of the high lighting area <sup>1</sup> to be covered by a mask. 0(only high brightness area) – 8(high and low brightness area) Use LEFT/RIGHT key to change the level.
	AREA	Press the ENTER key to position and set the size of the BLC area window <sup>2</sup> .
	DEFAULT	Return the setting to default when pressing ENTER key. If selecting DEFAULT, changed LEVEL/AREA will return to the initial setting.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to EXPOSURE Settings. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.



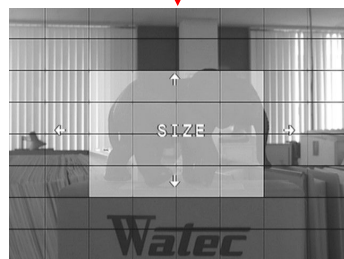
## 1 How HSBLC effects on image when changing LEVEL



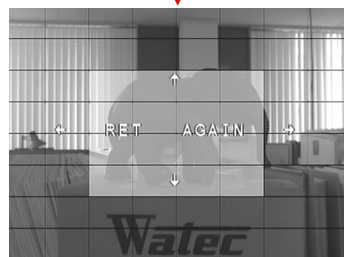
## 2 How to set up the BLC/HSBLC area



ENTER key



ENTER key



When pressing ENTER key on RET,  
returning to BLC/HSBLC Menu.

### (1) POSITION Setting

The position of the effective BLC/HSBLC area can be set on this Setting.

The position of the effective BLC/HSBLC area can be moved by pressing UP/DOWN/LEFT/RIGHT key.

The size can be set after the position is set by pressing the ENTER key.

\*HINT: When positioning the window, align the top left corner to the desired window position's top left corner, as the SIZE Setting references this corner.

When pressing ENTER key on AGAIN,  
returning to POSITION Setting.

### (2) SIZE Setting

The size of the effective BLC/HSBLC area can be adjusted on this setting.

Use UP/DOWN/LEFT/RIGHT key to adjust the size.

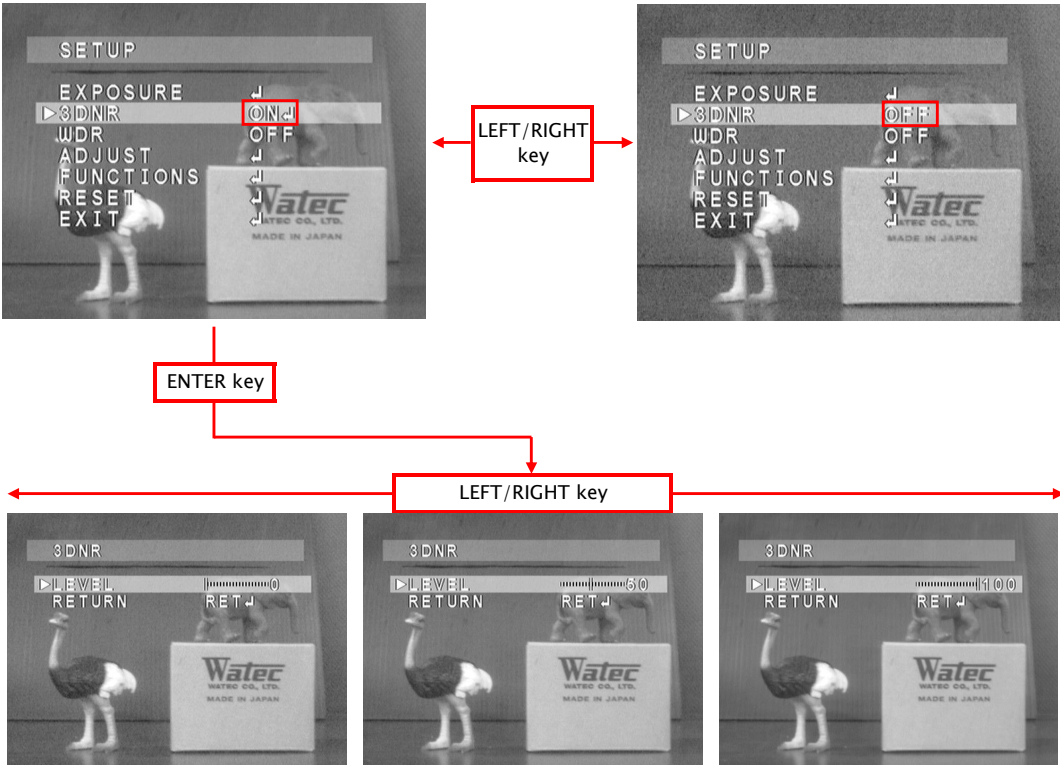
When finishing the size adjustment, press ENTER key.

### (3) RET/AGAIN Setting

Use LEFT/RIGHT key to select RET/AGAIN.

3.2 3DNR MENU

Three-dimensional noise reduction(3DNR) can be set on this menu.  
Use LEFT/RIGHT key to select ON/OFF. When ON is selected, press ENTER key to show Sub Menu.  
The default setting is ON, and the default level is 50.



LEVEL=0		
LEVEL=50		
LEVEL=100		
3DNR Mode	(Sub Menu)	Details
OFF	—	3DNR is OFF.
ON	LEVEL	Level of the 3DNR. From 0(weak) to 100(strong) Use LEFT/RIGHT key to change the level.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to SETUP screen. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.

Note. Setting the larger value of the 3DNR LEVEL means that random noise is reduced more effectively, however, moving object resolution may be reduced, and/or fixed pattern noises may increase.

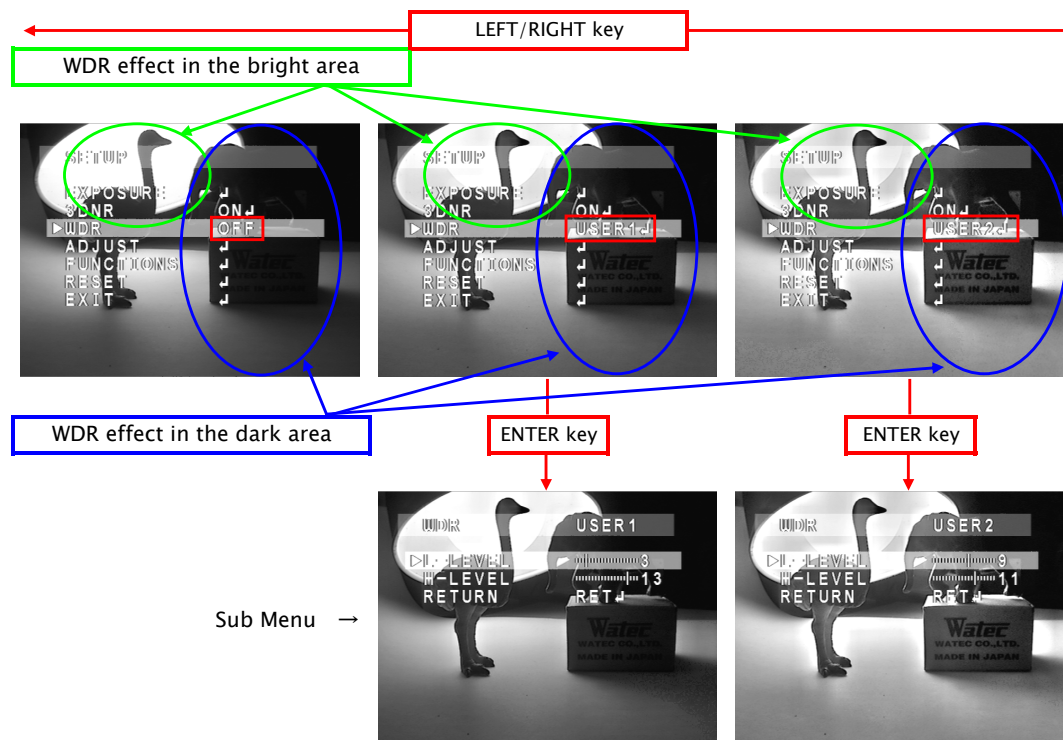
### 3.3 WDR MENU

The dynamic range of dark and/or bright part is expanded by digital processing.

Select WDR function OFF/USER1/USER2 with LEFT/RIGHT key.

When USER1/USER2 is selected, press ENTER key to show Sub Menu.

The default setting is OFF. The default setting of USER1/USER2 for dark part is 3(USER1)/9(USER2). The default setting for bright part is 13(USER1)/11(USER2).



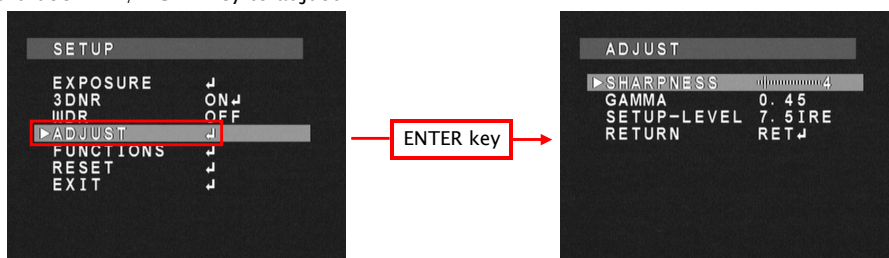
WDR Mode	(Sub Menu)	Details
OFF	—	Dynamic range expanding function is OFF.
USER1 / USER2	L-LEVEL	(L-LEVEL) Expanding level of the dark part. From 0(weak) to 15(strong) (larger value means more effective) Use LEFT/RIGHT key to change the level.
	H-LEVEL	(H-LEVEL) Expanding level of the bright part. From 0(strong) to 15(weak) (smaller value means more effective) Use LEFT/RIGHT key to change the level.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to SETUP screen. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.

Note. There is no difference with WDR function between USER1 and USER2.

### 3.4 ADJUST MENU

Use this setting to adjust the image quality.

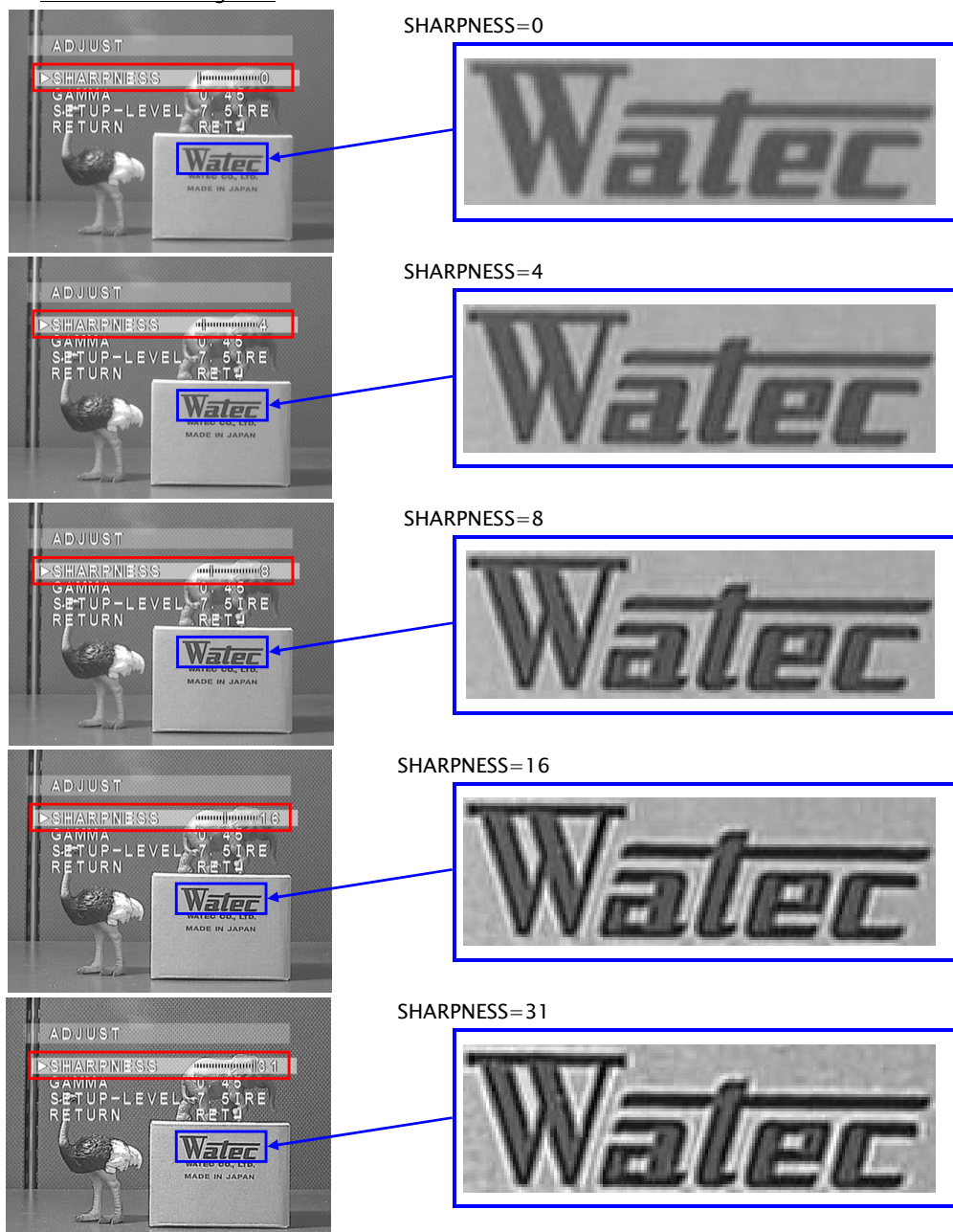
Select ADJUST and press ENTER key to show Adjust menu. Use UP/DOWN key to select one of the lists on the menu, and use LEFT/RIGHT key to adjust.



#### 3.4.1 SHARPNESS

By using LEFT/RIGHT buttons, SHARPNESS(edge enhancement) adjustment is available.

The default setting is 4.

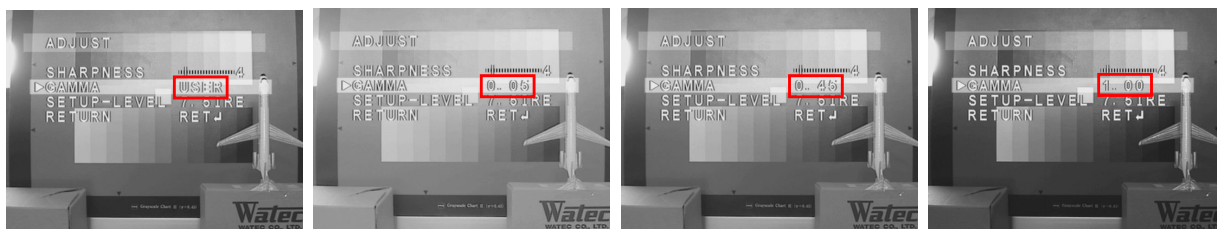


### 3.4.2 GAMMA

GAMMA characteristic is adjustable from USER<sup>3</sup>, 0.05 to 1.0 (0.05 steps).

Use LEFT/RIGHT key to adjust GAMMA.

The default setting is 0.45.



GAMMA=USER

GAMMA=0.05

GAMMA=0.45

GAMMA=1.00

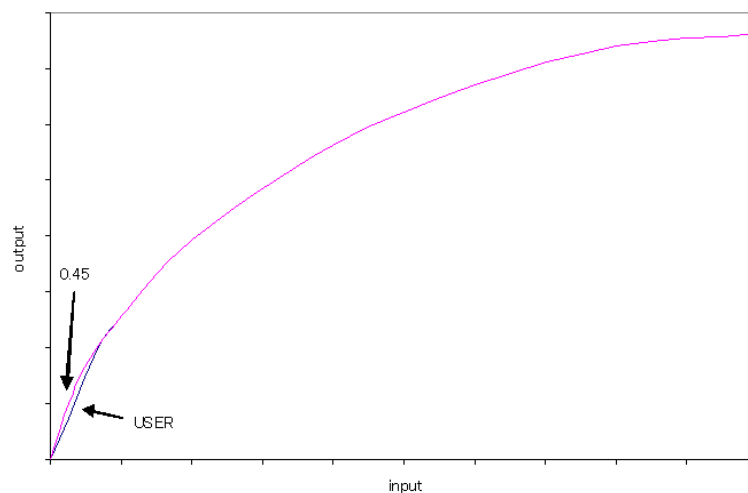
Please select a proper gamma value to match a monitor's characteristics. Generally, a dark part in a video frame becomes bright when gamma value is small. However, increases in appearances of "white outs" and noises may occur.

#### <sup>3</sup> The characteristic of USER mode

USER mode is a gamma curve of 0.45 which has improved S/N in dark parts of the image.

(However, the VIDEO output of dark parts in USER mode becomes lower than in 0.45.)

The figure of gamma characteristics is as follows.

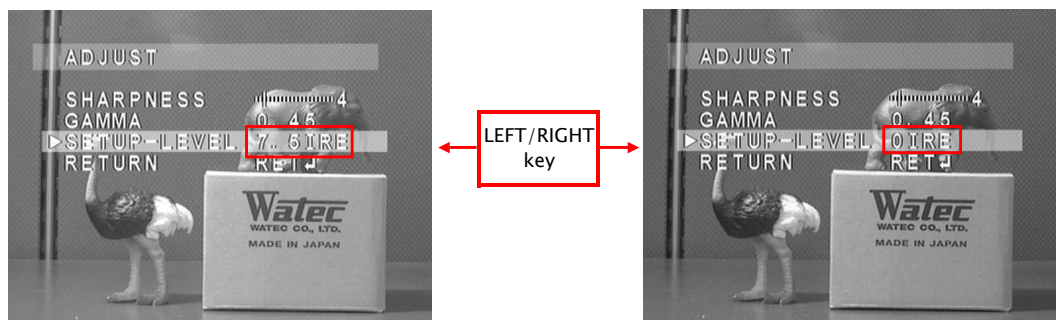


### 3.4.3 SETUP-LEVEL

Only 0IRE/7.5IRE can be set.

Use LEFT/RIGHT key to set the level.

The default setting is 7.5IRE.



Note. SETUP-LEVEL is available to EIA only. There is no menu available to CCIR.

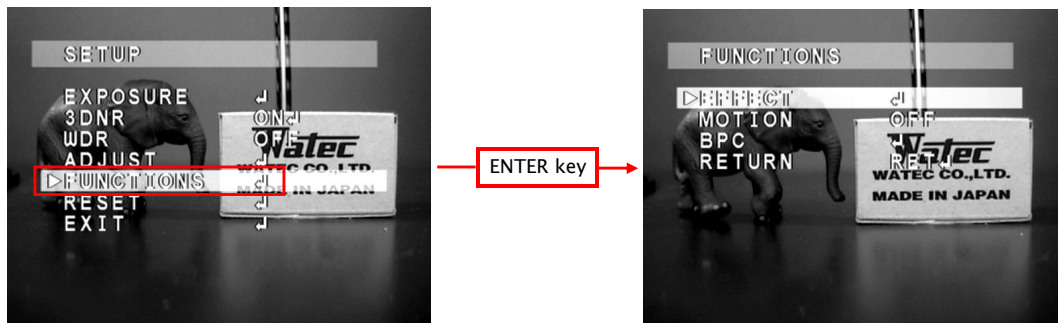


### 3.5 FUNCTIONS MENU

The digital image adjustment can be set.

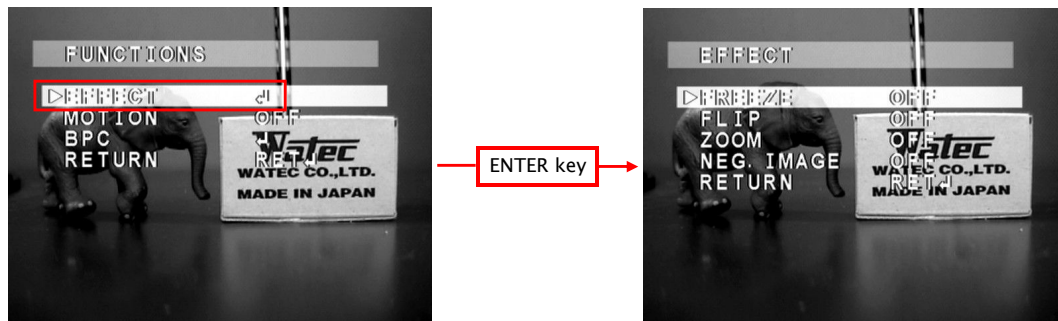
When pressing ENTER key on FUNCTIONS, FUNCTIONS menu will appear. Use UP/DOWN key to select one of the lists on the menu and press ENTER key. After that, Sub menu related to digital image adjustment will appear.

In selecting MOTION, use LEFT/RIGHT key to select ON/OFF.



#### 3.5.1 EFFECT

When pressing ENTER key on EFFECT, the list of digital image adjustment will appear.



##### 3.5.1.1 FREEZE

Select ON/OFF state by using LEFT/RIGHT buttons.

When the FREEZE function is turned ON, the video output signal will be a repeat of the same frame picture.

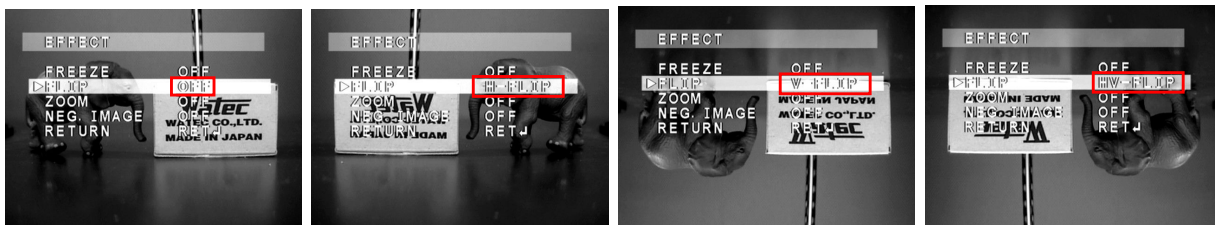
The default setting is OFF.

##### 3.5.1.2 FLIP

OFF(normal image), H-FLIP(horizontal flip), V-FLIP(vertical flip)

and HV-FLIP(horizontal and vertical flip) are available.

Use LEFT/RIGHT key to select one of the effects. The default setting is OFF.



(1) OFF

Normal Image

(2) H-FLIP

Horizontal Flip

For example, a back monitor on automobiles is a possible application.

(3) V-FLIP

Vertical Flip

(4) HV-FLIP

Horizontal and Vertical Flip  
Rotating the image by 180 degrees.

### 3.5.1.3 ZOOM

Digital zoom function is available.

Use LEFT/RIGHT key to select ON/OFF. When pressing ENTER key on ON, Sub Menu will appear.

The default setting is OFF.

When selecting ON, x1.0 is the default value of the magnification, and 0 is the default value of PAN and TILT.



ZOOM	(SUB MENU)	Details
OFF	—	Normal image(digital zoom OFF)
ON	ZOOM	Set up the magnification of digital zoom. The magnification ranges from x1.0 to x32.0. <sup>4</sup> By using LEFT/RIGHT buttons,it can be set to a maximum magnification of 32 times.
	PAN	Horizontal PAN position is specified (invalid when ZOOM is set to x1.0 magnification). From -100(LEFT) to 100(RIGHT) (0 is center position) Use LEFT/RIGHT key to set the imaging position.
	TILT	Vertical TILT position is specified (invalid when ZOOM is set to x1.0 magnification). From -100(LEFT) to 100(RIGHT) (0 is center position) Use LEFT/RIGHT key to set the imaging position.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to FUNCTIONS Settings. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.

<sup>4</sup> Magnification Steps

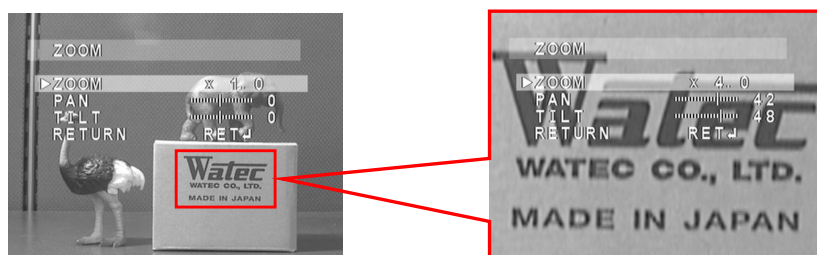
x1.0 to x4.0 : x0.1steps

x4.0 to x8.0 : x0.5steps

x8.0 to x16.0 : x1.0steps

x16.0 to x32.0 : x2.0steps

Example

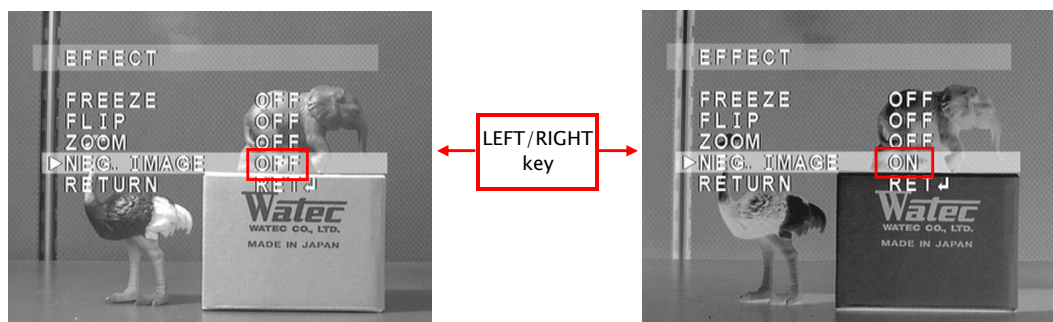




### 3.5.1.4 NEG.IMAGE

Select Negative image (NEG.IMAGE) function ON/OFF with LEFT/RIGHT key.

The default setting is OFF.

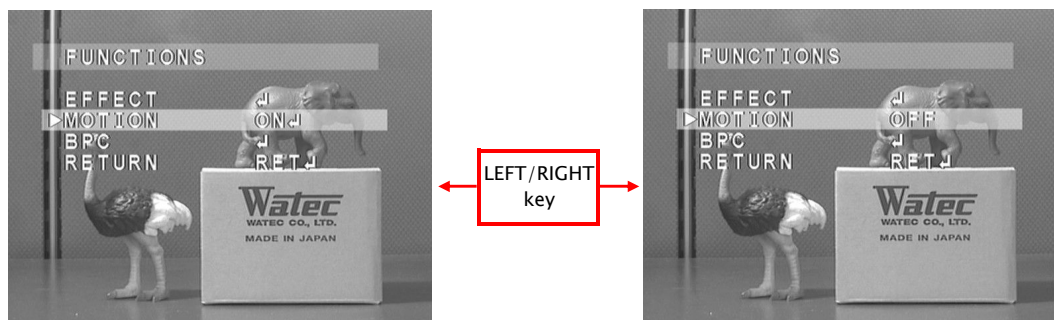


### 3.5.2 MOTION

Motion detection can be set.

Use LEFT/RIGHT key to select ON/OFF. When pressing ENTER key on ON, Sub Menu will appear.

The default setting is OFF. When MOTION is turned ON, AREA SELECT is AREA1, AREA DISPLAY is ON (AREA DISPLAY for AREA2-4 is OFF by default), default SENSITIVITY is 40. The other areas can be selected as below.

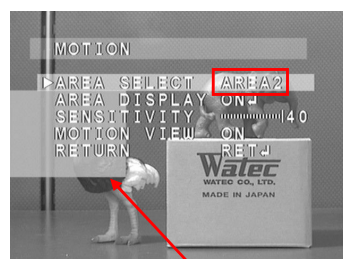


ENTER key

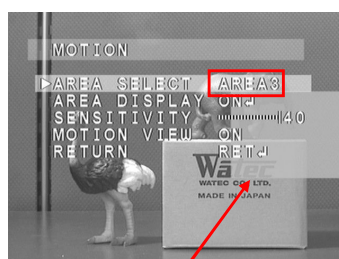
Sub Menu →  
(The size of the effective area  
is the default setting.)



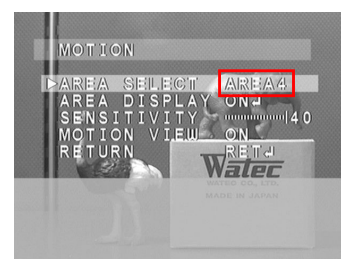
AREA1



AREA2



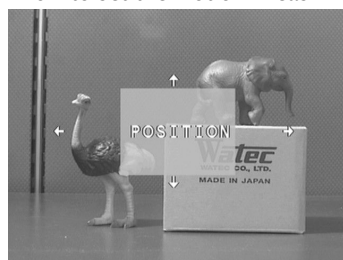
AREA3



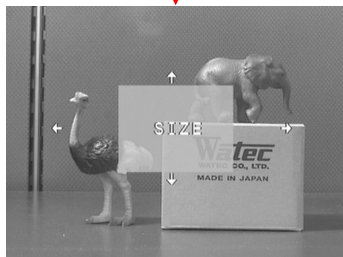
AREA4

MOTION	(Sub Menu)	Details
OFF	—	Motion detection is OFF.
ON	AREA SELECT	The present detection area can be selected. Select the area from Area1 to Area4. Use LEFT/RIGHT key to select the area.
	AREA DISPLAY	The area presently selected can be shown with ON, or not shown with OFF. Use LEFT/RIGHT key to select ON/OFF. Pressing ENTER key on ON, will proceed to Motion Detection area window position and size setting <sup>5</sup> .
	SENSITIVITY	Detection sensitivity can be adjusted. It ranges from 0 to 40. Use LEFT/RIGHT key to set the sensitivity.
	MOTION VIEW	MOTION VIEW can be set. Use LEFT/RIGHT key to set ON/OFF.
	RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, return to FUNCTIONS Settings. Pressing ENTER key on END, OSD menu turns off and SETUP is finished.

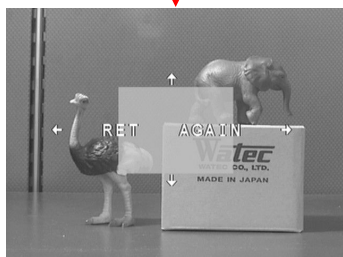
##### <sup>5</sup> How to set the Motion Areas



ENTER key



ENTER key



When pressing ENTER key on RET, returning to FUNCTIONS Menu.

##### (1) POSITION Setting

The position of the effective motion area can be set. Use UP/DOWN/LEFT/RIGHT key to set the position of one of the 4 detection areas. After the setting, press ENTER key to proceed to the SIZE setting.

\*HINT: When positioning the window, align the top left corner of to the desired window position's top left corner, as the SIZE Setting references this corner.

When pressing ENTER key on AGAIN, returning to POSITION Setting.

##### (2) SIZE Setting

The size of the effective detection area can be adjusted. Use UP/DOWN/LEFT/RIGHT key to adjust the size. After the adjustment, press ENTER key. When finishing the size adjustment, press ENTER key.

##### (3) RET/AGAIN Setting

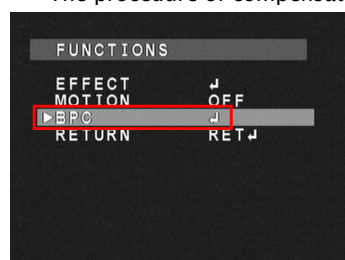
Use LEFT/RIGHT key to select RET/AGAIN.

### 3.5.3 BPC

This section explains blemished pixel compensation function.

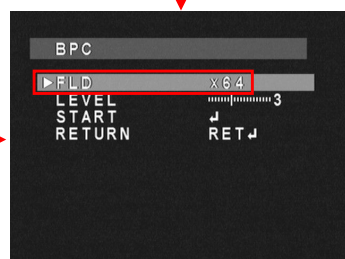
The default setting of the slow shutter speed is x64, and the default level is 3.

The procedure of compensation is as follows.



- (1) Select BPC on FUNCTIONS menu and push ENTER key.  
BPC menu will be displayed.

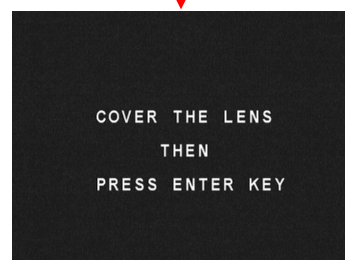
ENTER key



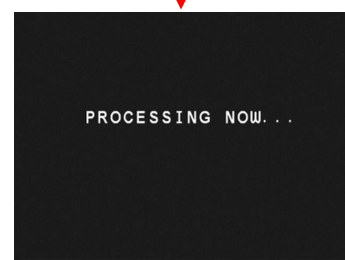
- (2) Set conditions for detecting blemished pixels.

BPC Mode	Details
FLD	Set slow shutter speed at the time of blemished pixel detection (unit in fields). Smaller white pixels can be detected with higher field counts, however, care must be taken not to exceed the maximum compensations points of 64 points. The slow shutter speed can be selected from; x4/x8/x16/x32/x64. *Recommending value: 64 fields Use LEFT/RIGHT key to select slow shutter speed.
LEVEL	White pixel detection is done with the level difference with neighboring pixels at dark condition. The number of detected white pixels are increases when LEVEL is small, but it may cause the number of detected white pixels to exceed the maximum compensation points of 64 points. It ranges from 1 to 6. *Recommending value: 3(when FLD is 64 fields) Use LEFT/RIGHT key to select level.
START	Press ENTER key to start detection and compensation.
RETURN	Use LEFT/RIGHT key to show RET/END. Pressing ENTER key on RET, returns to FUNCTIONS Settings. Pressing Enter key on END, OSD menu turns off and SETUP is finished.

ENTER key



ENTER key



- \* Please be sure to cover the lens (or close Lens iris) before conducting the detection and compensation.

- (3) White pixel detection and compensation start, and detection results are displayed.

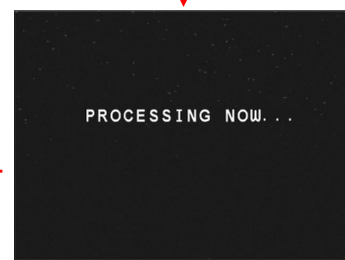
← During detection display(PROCESSING NOW...)

\* Process time is different by SHUTTER or SENS UP and FLD settings.  
It takes the most time to detect and compensate white pixels under the condition below.

SHUTTER is x256 or SENS UP is ON and MAX is x256, and FLD is x64.

← Detection results

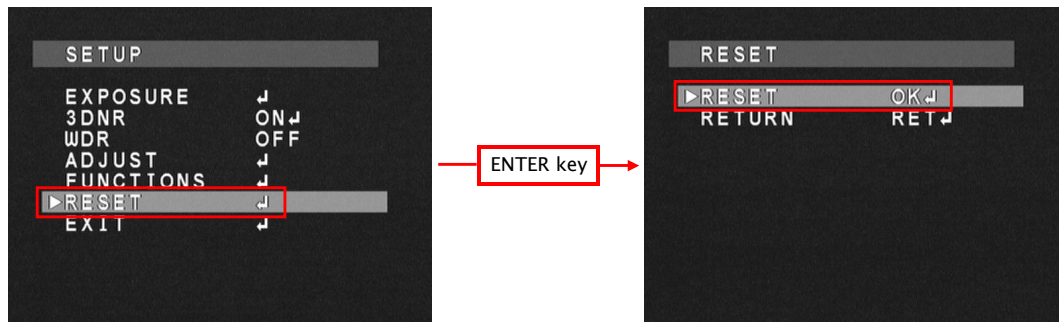
\* Return to the BPC menu automatically after the end of detection and compensation.



### 3.6 RESET MENU

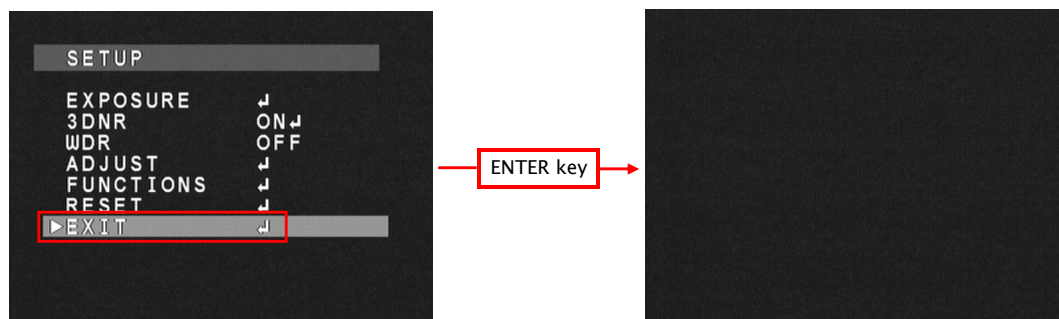
Select RESET and press ENTER key, and RESET menu is displayed.

Pressing ENTER key on OK in RESET menu will return the camera settings to the original factory settings.



### 3.7 EXIT MENU

Select EXIT and press ENTER key, and OSD menu will be closed.

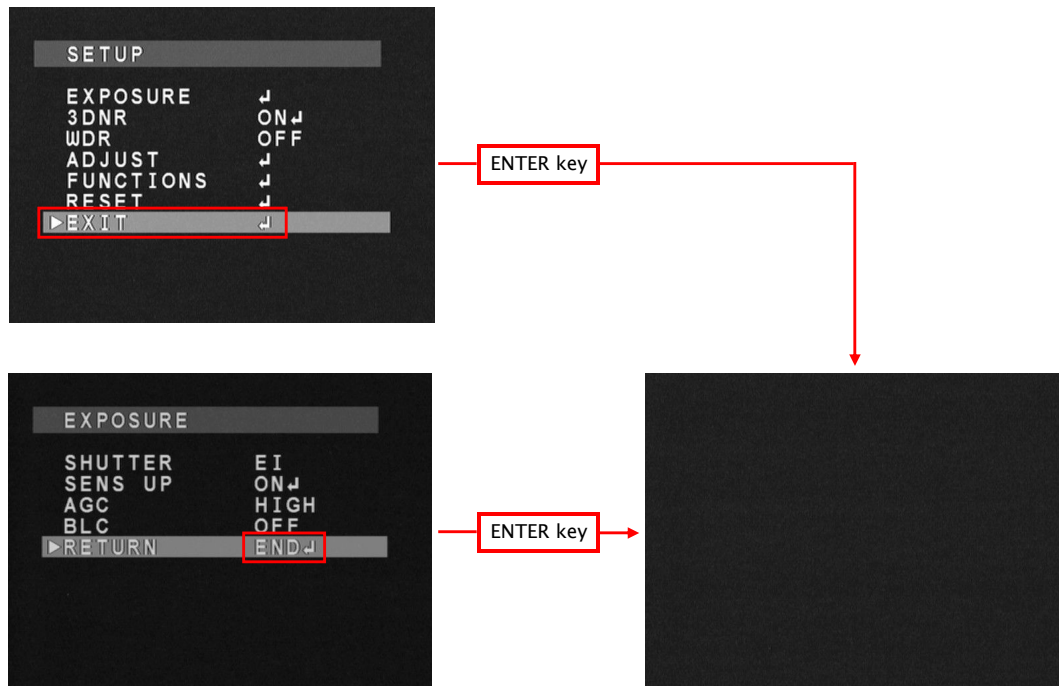


## 4. Save settings

All settings are saved when executing below.

When pressing ENTER key on EXIT in the SET UP Menu, or on END in all Sub Menus.

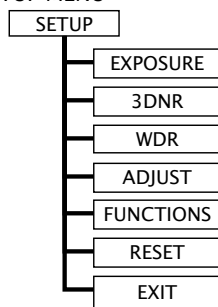
Saved settings are kept even after the camera is powered off.



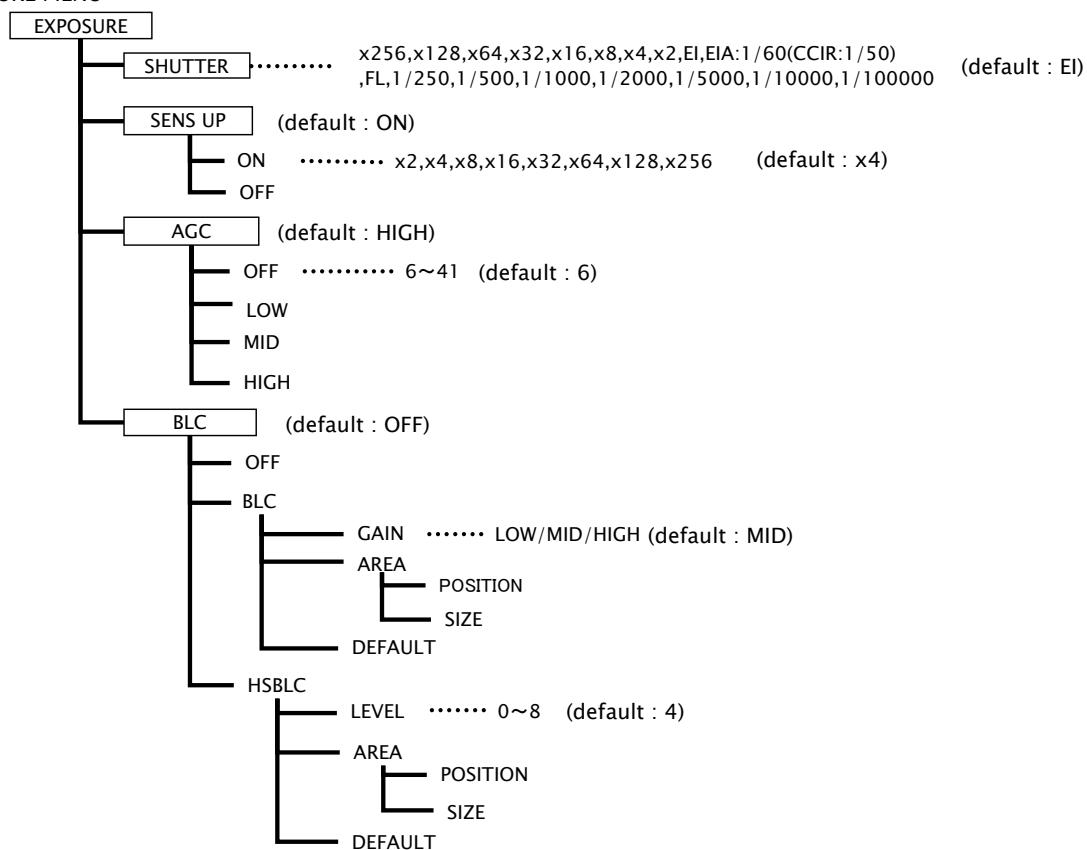
\* OSD menu will be closed.

## 5.OSD Menu Tree

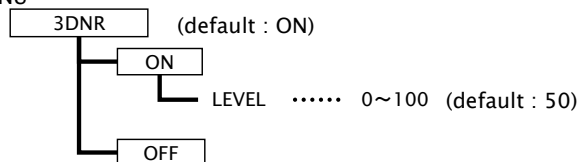
### •SETUP MENU



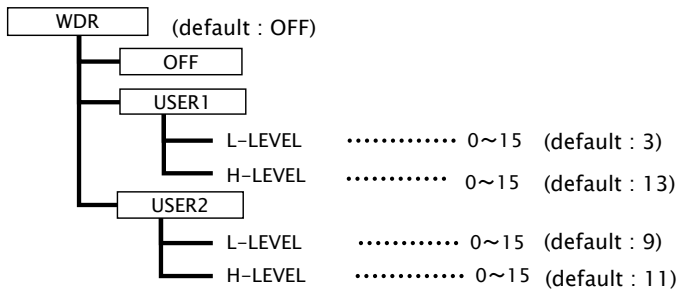
### •EXPOSURE MENU



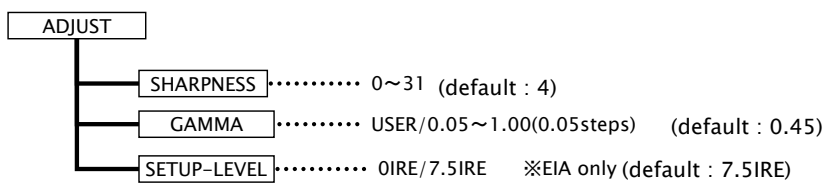
•3DNR MENU



•WDR MENU

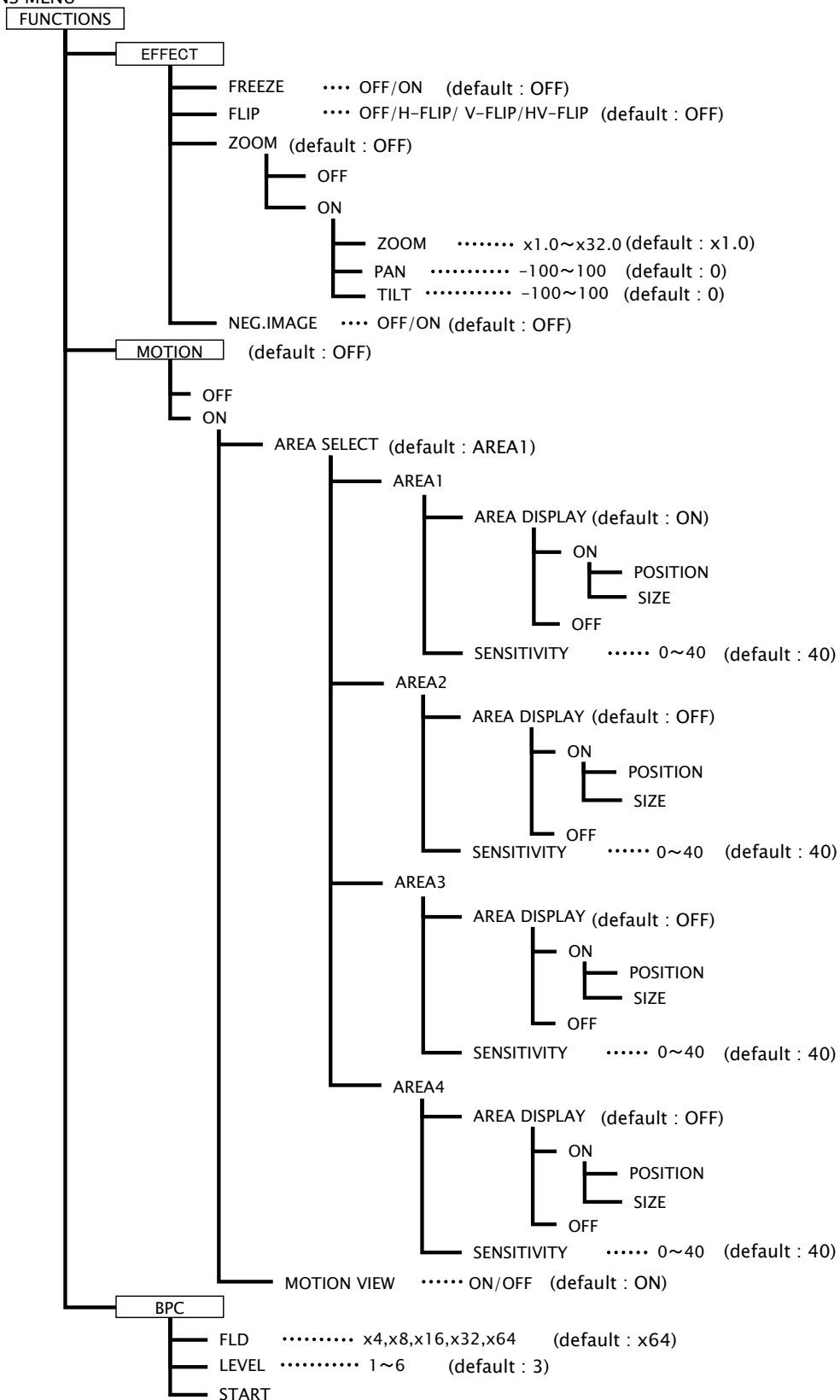


•ADJUST MENU

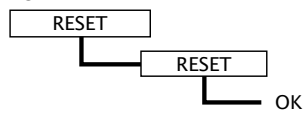




•FUNCTIONS MENU



•RESET MENU



•EXIT

