

Easy approach of CCTV Camera(1)

Definition & Terms based on a Catalog of Vision Hi-tech Inc.

What is CCTV?

CCTV (Closed Circuit Television) is a television transmission system intended for only a limited number of viewers. Because of its use of transmission line, wired or particular wireless, the general public could not use it without permission. It is used in a whole industry sectors: industry, education, medical service and local information service, etc. so it is also called industrial television (ITV) or Independent television. The products of Vision Hi-tech are used at security market.

*** Classification of TV system**

- | | | |
|-----------|---|--|
| TV System | { | A. Closed Circuit System |
| | | – To transmit a picture information to limited viewers with special purpose. |
| | | – CCTV, ITV or Independent television |
| | | B. Open Circuit System |
| | | – To transmit a picture information to an unspecified number of the general public |
| | | – General broadcast television (MBC, KBS, SBS etc) |

How is CCTV system composed of?

The basic structure of CCTV system has 3(three) sub-systems; Image-capture sub-system that captures images (pictures) and converts them into electrical signals, Transmission sub-system that transmits its electrical signals to a distant place, & Image-receiving sub-system that reproduces video signal from received electrical signals. Even small-sized system could not be systemized without one of the above three systems. In a large-sized system, Control sub-system is included additionally because each system becomes complex so needs to be controlled as a whole. In each sub-system or reciprocally between sub-systems, recording or reproducing of video signals may be requested or managements and analysis by information processing device may be needed. Thereby, CCTV system is composed in combination with Control sub-system including recording, reproducing, processing & management of video signals.

1) Image-capture sub-system (Vision Hi-Tech's camera is included in this part)

Image-capture system is subject to CCTV cameras. According to purposes, the types of cameras, lenses & filters are decided and then camera housing & installing brackets to position cameras are needed. Except them other accessories are needed when controlled remotely mutual relations among camera main body, lenses, mutual position between cameras and objects. Image-capture sub-system does not mean to install the only camera main body. To select accessories from the point of view 'Does we take (capture) a subject (objects) exactly & certainly?' or to consider 'How prevent the camera main body from the environmental condition on installation?' are needed. This will be the factor to select the quality of the entire CCTV system.

2) Transmission sub-system

Transmission sub-system is to transmit video signals into the aimed place to use images (pictures). It is divided into wire transmission and wireless transmission. Commonly In CCTV, wired transmission is more because of its limited usage. And implementation of wireless transmission is limited only for special purpose in reality because it requires allocations of radio frequency. In case of wire transmission, Base-band transmission that transmits video signals by itself is widespread/common. There are various use of a carrier-wave transmission, PCM (pulse code modulation) transmission, optical communication transmission and so on.

3) Image-receiving sub-system

Image-receiving sub-system is to receive and reproduce the video signal transmitted from imaging processing device. It's rarely used for just human's visual sensation. It is widely used with a image processing device by information processing devices like processing, recording & reproducing of images in connection with systems

4) Control sub-system

If CCTV system is composed with a large system, its information amount to proceed is increasing. For examples, when numbers of cameras increased and we should reproduce them into limited monitors, the necessity of reproducing video signals into image-receiving sub-system (monitors) in a timely order. When it is systemized with Alarm System, the alarm occurred pictures are reproduced and recorded on Image-receiving sub-system. For controlling all these procedures control sub-system becomes an essential factor. At a recent announcement of CCTV system, we can see CCTV system that this control sub-system is improved. According to the performance of this sub-system, the performance of CCTV system is influenced.

Note.

There are mistakes of wrong definitions, poorly explanations and other simply typos that I could not find. We, however, are sure definitely that this will be the one of valuable guides for someone who wants to know about CCTV camera.

Let's master a Catalog

CCTV security camera products of Vision Hi-tech are the important factor to determine the quality of the total system as the main body of image-capture system. Let's start to master the characteristics of cameras studying the specifications of Vision Hi-tech. (All specifications taken from page. 5: 1/3" CCD Color C/CS mount camera)

Image Sensor: STD: High resolution 1/3" DSP Color CCD, Sony
Option: 1/3" Ex-view HAD CCD, Sony

1. What is Image Sensor?

Image Sensor is a device (or electronic component) to capture the objects and transfer them to electric video signal. CCD (charge coupled device) is a kind of Image Sensor with a built-in IC that includes a thousand pixels (picture elements) to transfer from light energy into electric signal. Most CCTV cameras use CCD technology, a very few use CMOS technology. Of the CCD technologies used, Sony is dominant with SuperHAD and Exview. Panasonic, Samsung, and Sharp produce CCD imagers. Vision Hi-tech is using Sony, Sharp products. To convert the invisible range of infrared rays into being visible is also an important function.

We can see that the above spec of image sensor is the CCD products of Sony easily.

** Size of CCD sensor

Sizes of CCTV sensors varies 1/3", 1/2", 2/3", 1/4" etc. If installed 24 hours surveillance system outside, the sensor's size are important because bigger sensors make better sensitivities of cameras. If sensors are big, they can capture the objects as much as its size and then proceeds images through electrical device.

** The dimensions of CCD chip (Unit : mm)

CCD Size	Horizontal	Vertical	Diagonal
1"	12.7	9.5	15.9
2/3"	8.8	6.6	11
1/2"	6.4	4.8	8
1/3"	4.8	3.6	6
1/4"	3.6	2.7	4.5

* Classifications of camera sensors

- a. Tube Camera or Camera tube
- b. Solid-state sensor
 - XY address type Solid State Device
 - Charge transfer type Solid device
 - BBD
 - CCD, CID, MOS, ICCD, etc.

* Tube Camera: a (vacuum) tube in a camera that converts optical information of objects into electrical signals.

- It is made with a glass tube and a light-sensitive phosphor coating on the inside of the tube. The light projected onto the tube phosphor coating has sufficient energy to cause electron ejection from the phosphor crystal structure. And then these electrons scanned by the beam converted electrical signal (composite video signals).
- Image Orthicon, Vidicon, Newvicon, Plumbicon, etc.
- They has been using as TV cameras and all use lenses with certain focal lengths and certain angles of view, cubic or superficial.

** Solid-state sensor: a image sensing device that is integrated as a type of semiconductor.

- On a substrate of a semiconductor, 2-dimensional array of pixels (and sometimes superficial array), that has a function of photoelectric transformation and accumulation of charges, and the function, which scans charges accumulated on in a certain order, can be combined and then it made them as solid-state in one structure. At this time, its substrate is made of one crystal silicon. In order to make a solid-state sensor more economical with smaller size, better performance and reliability, the rapid promotion of R&D started from the middle of 1960 based on the development of IC technology. There are two scanning types according to two methods of reading signals.

. XY address types-Solid state device: this device replaced the electron beam scanning methods of Tube camera (general state sensor) into alternating scanning of solid-state circuit. According to selected pulse, it scans each pixel in a timely order and read its accumulated signal of charges. According to the structure of photoelectric transformation, there are (X)×(Y) photodiode, (X)×(Y) transistor. (X) is the number of horizontal picture elements. And (Y) is the number of vertical picture elements.

Charge Transfer types-Solid state device: this solid device is by the method of CCD(charge coupled device) or BBD(bucket brigade device) that have a function of transferring photo generated charges. This solid device scans with a transfer (frame, interline, frame and interline) of accumulated charges at each pixels to one direction in a timely order. CCD is simpler than BBD and has higher degree of integration. So, lately CCD type is mainly used.

- MOS(Metal Oxide Semiconductor), CCD(Charge Couple Device)
- Facsimile, Image Measurement instruments.

** MOS(Metal Oxide Semiconductor) Sensor : at this stage, CMOS is a family of MOS and is using a lot. CMOS (complementary metal-oxide semiconductor) is the semiconductor technology used in the transistors that are manufactured into most of today's computer microchips. Semiconductors are made of silicon and germanium, materials which "sort of" conduct electricity, but not enthusiastically. Areas of these materials that are "doped" by adding impurities become full-scale conductors of either extra electrons with a negative charge (N-type transistors) or of positive charge carriers (P-type transistors). In CMOS technology, both kinds of transistors are used in a complementary way to form a current gate that forms an effective means of electrical control. CMOS transistors use almost no power when not needed. As the current direction changes more rapidly, however, the transistors become hot. This characteristic tends to limit the speed at which microprocessors can operate.

* CID (charge injection device)

CID sensor was developed by GE. The difference between others is that this sensor scan/positions in a pixel randomly rather than other's horizontal/vertical order procedure. CID is less sensitive to be overcharged from the bright part of image. However, CCD may have black vertical line at this case.

* Other solid state sensors: SIT (Silicon Intensified Target), ISIT(Intensified SIT), ICCD(Intensified CCD), etc.

Effective Pixels : . NTSC: 512(H)x492(V), PAL: 500(H)x582(V)

2. What is Effective Pixels?

Of pictures that CCD took, the Pixels of pictures that are used on screen actually are Effective Pixels. The minimum unit that pictures are composed of is 'picture elements' i.e., PIXEL. More pixels there are, more clear & better pictures are. Pixels of CCD of General camcorders are about 250,000~400,000 pixel. All these pixels are not used on reproducing video signal. These have some margins at all directions. So, in respect to the Pixels of CCD, the numbers of effective pixels (NEP) is more important than the total number of pixels. The resolution depends on NEP. The price of products is influenced by NEP.

In a sheet of Specification, it presents NEP in case of NTSC system or PAL system.

Please refer to the below definitions of TV systems and comparisons of them.

*** NTSC (Abb. National Television System Committee)

American committee that set the standards for color television as used today in the U.S., Canada, Japan and parts of South America. NTSC television uses 3.58 Mhz sub-carrier whose phase varies with the instantaneous hue of the televised color and whose amplitude varies with the instantaneous saturation of the color. NTSC employs 525 lines per frame and 60 fields per second.

Rf. PAL (Phase Alternation by Line system)

European color TV system developed by Germany. PAL is featuring 625 lines per frame, 50 fields per second and a 4.43 Mhz sub-carrier. Used mainly in Europe, China, Malaysia, Australia, N.Z. the Middle East and parts of Africa. PAL-M is a Brazilian color TV system with phase alternation by line but use 525 line per frame, 60 fields per second and a 3.8 Mhz sub-carrier.

Rf. SECAM (Sequential couleur avec memoire color television system)

A color television system developed by France with 625 lines per frame(used to be 819) and 50 fields per second. Color difference information is transmitted sequentially on alternative lines as an FM signal.

** 3(Three) international standards for television.

	NTSC	PAL	SECAM
Lines per frame	525 TV Lines	625 TV Lines	625 TV Lines
Frame per second	30/sec	25/sec	25/sec
Vertical Frequency	60Hz	50Hz	50Hz
Interlaced scanning	2:1	2:1	2:1
Aspect ratio(V:H)	3:4	3:4	3:4
Video Bandwidth	4.2MHz	5.5MHz	5.5MHz
Audio frequency range	6MHz	7MHz	8MHz

** CCIR(Committee Consultatif International des Radiocommunique or Consultative Committee for International Radio) The

standards for B/W television accepted by most of Europe, Australia and others. It is initially monochrome but later extended to color signals, is called Pal. 25/sec, 625 lines.

** EIA (Electronic Industries Association)

The standards for B/W television accepted in US, Canada & Japan. 30/sec, 525TV lines.

H.Resolution: 380 TV Lines

3. What is H. Resolution (Horizontal Resolution)?

Horizontal resolution is the maximum number of vertical lines that a camera is capable of solving. This is usually expressed as a number of black to white transitions or lines that can be differentiated. It is limited by the bandwidth of the video signal or equipment. The definition of resolution between TV and lenses are different so that it should be careful.

** Resolution

The number of picture elements that can be reproduced with good definition. There are Vertical resolution and Horizontal resolution. In television, the maximum number of B/W horizontal lines across the height of TV is Vertical resolution. The maximum number of B/W vertical lines across the width of the monitor is Horizontal resolution. In a case of Facsimile, The resolution is the number of B/W-striped lines drawn by turns within unit length.

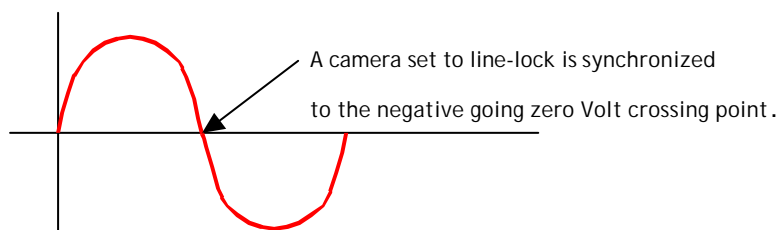
Synchronizing system : Internal / Line Lock

4. What is Synchronizing system?

Synchronizing system. Synchronism. A video camera takes 30 frames per second and, during making moving motion, timing used to take 1 frame is called 'synchronization.' There are horizontal synchronization and vertical synchronization. To operate CCTV cameras, taking this system is necessary. According to synchronize internal or external ways, there are Internal Synchronism, External Synchronism, Line-Lock and HD/VD synchronism, etc.

There are many security-applications where more than one camera is used in order to cover many places. And then they need some kinds of switching methods among cameras. If the cameras are not synchronized properly, the "rolling" of monitor will be appeared when a video switcher select different cameras, since video output of cameras is free running and generated and also their frames arrive at the video switcher at different times. This is why all manufacturers have their own methods to insure synchronism. Vision Hi-tech introduced Line Lock & Internal methods for synchronism. (It can be controlled by dip switches at the back sides of cameras)

1) Line Lock: Without using synchronizing signal generator or cable for use of synchronizing, Line-lock synchronizes with mains supply frequency. It is used a lot overseas but never be used when the field frequency of TV are different each other. When the camera is line-locked, it's synchronized using a fixed point on the A.C. supply's cycle. Generally the point that the A.C. cycle passes through zero point. (Refer to the below figure) Setting all of the cameras to line lock mode will ensure that they all output video frames at the same time relative to one another. Clearly, to use this feature, cameras must be operating from an A.C. supply and be on the same mains supply phase.



* Note: Cameras on different mains phases can still be synchronized.

2) Internal: To synchronize with an internal oscillator. This feature can be especially useful where the camera is designed to run off a D.C. supply. If a camera designed to operate at 50Hz, the camera would not be able to use the line-lock mode in a country where the mains supply frequency is at 60Hz. However, Setting it to synchronize to its internal oscillator will overcome this problem. A side effect of this setup is that the lighting in the scene seems to flicker.

Rf. flicker

Human's eye see that the image flickers in some light conditions, esp. fluorescent. It is usually caused by interaction of Shutter speed of AC frequency of the lighting. An annoying picture distortion, mainly related to vertical syncs and video fields display. Some flicker normally exists due to interlacing, apparent in 50 Hz system (PAL). Flicker shows when static images are displayed on the screen such as computer-generated text transferred to video. Poor digital image treatment, found in low-quality system converters, creates an annoying flicker on the screen. To avoid Flickers, CCTV camera applies 1/100 second (NTSC), 1/120sec(PAL) of Electric shutter function.

3) External (Generator Locking): A synchronizing signal generator is to combine several kinds of synchronizing signals of video signal supplied from outside. CCD has the same function. This operation is called 'synchronizing combination' as meanings of synchronizing generators with external signals. Lately, there are many cases of using Video signal as external synchronizing signal. Input signals for use of synchronizing are B/W composite video signal(VS), Color composite video signal(VBS), Black buster signal, etc. For distribution of these signals, video signal distributor are using, not synchronizing distributor. As though Generator locking is the best way to synchronize cameras, it have a disadvantage such as the need for an extra cable for each camera so its installation cost will be much higher. And also Video generator needs many outputs.

Scanning system : NTSC 525 Lines, PAL: 625 Lines 2:1 Interlaced

5. What is Scanning system ?

*** Interlaced Scanning

In order to display a moving motion on the screen, it needs to transfer several images per unit time. To reproduce fast moving motions properly, it increases the quantities of images to transmit per unit time. And the bandwidth of necessary transmission is widened. So, We scan one image by plural times loosely. We use a method of increasing scanning times, not increasing the bandwidth of transmission. For example, on television, the frames are not composed of only one line from top to bottom. After scanning odd lines first and even lines next, the frames are composed of odd and even lines. To scan one after the other but with the physical position of all the lines interleaving each other is called '2:1 interlaced scanning.' Compared with 'progress scanning' its quality is not lower and it can reduce its bandwidth of frequency in half. It can reduce flicker at the bandwidth of certain frequency so that the present TV system uses/adopts the interlaced scanning.

* Progress Scanning:

In case of displaying on the screen or outputting electrical signal, its scanning is to scan in order from top to bottom without skipping lines.

Video output: 1.0Vp-p Composite, 75 Ohms

6. What is Video output?

→ 75Ohms load, 1.0Vp-p composite Video signal.

The output of composite video signal, 1.0Vp-p Composite Video via 75 Ohms, is the standard of video output.

*Composite Video Signal: A signal in which the luminance and chrominance information has been combined using one of the coding standards NTSC, PAL, SECAM, etc. A signal that combines video signal, which is needed to compose images of CRT or monitors, and synchronizing signal, which have the presenting timing on the screen. It includes Image, Horizontal & Vertical blanking, Sync Pulse etc.

S/N ratio (Signal to Noise ratio) : More than 50 dB (AGC off)

7. What is S/N ratio (Signal to Noise ratio)?

→ When AGC function is off, S/N ration is more than 50dB.

An S/N ratio can be given for the luminance signal, chrominance signal and audio signal. The S/N ratio is the ratio of noise to actual signal, and it shows how much higher the signal level is than the level of noise. It is expressed in decibels (dB), If the value is bigger, the noise is smaller.

* DB(Decibel):

A logarithmic (relative) ratio of two signals or values, usually refers to power, but also voltage and current. When power is calculated, the logarithm is multiplied by 10 while for current and voltage by 20. So, common logarithms is expressed as Bel(B). 0.1Bel is 1dB(decibel).

* AGC (Automatic Gain Control)

A control part in an electronic circuit that has feedback and regulates a certain voltage level to fall within predetermined margins.

Min. Illumination : STD : 0.5Lux/F2.0 or 0.1Lux/F1.4
Option : 0.1 Lux/F2.0 or 0.02Lux at F1.4 (EX-View HAD CCD Version)

8. What is Min. Illumination?

The standard products have 0.5lux/ F2.0 or 0.1lux/F1.4 as Min. illumination.

A customer can select a better one that has 0.1Lux/F2.0 or 0.02Lux/F1.4 with EX-View HAD CCD as an option.

Minimum illumination is the lowest illumination that needs to picture the objects. The Unit is Lx(Lux). We should take into account that we need more 10(ten) times of min. illuminations to picture the objects.

e.g.)

Illumination

0.5 Lux

 /

F2.0

Aperture(F-number of Lens)

The above examples means that the Min. illuminations is 0.5 Lux at Aperture F2.0

** Aperture – The opening of a lens that controls the amount of light falling the surface of the state device. In general the sizes of the aperture are controlled by the iris adjustment. According to the increase of F-stop number (F1.4, F2.0, F3.0, etc), the amount of light falling the surface is decreasing.

*** F-number – it indicates the brightness of an image formed by a lens.

In lenses with adjustable irises, the maximum iris opening is expressed as a ratio; F No. = D(foal length of lens)/ F(maximum diameter of aperture). When the iris is opened or closed, its ratio is changed. Generally, when the number of F-number is low, it is bright (but, in this case, we are saying” F-Number is big”). Nowadays F No. 0.7 of 35mm film camera is on the market. The brightness of lenses is in reverse proportion to the square of F-number. For example, the lens of F No.1.4 is brighter quadruple than F 2.8. It means the lens of F1.4 can take a picture at the darker area by four times..

* F- Stop – the same meaning of F-number but this is more commonly know.

* Illumination

The luminous flux per unit area on an intercepting surface at any given point. It is most commonly used term in CCTV. The illumination falls off with the square of the distance when the perpendicular area is being lit. The symbol is E and Unit is Lx. When luminous flux of 1 lumen fall on an area of 1m²(square meter) it is measured in lm per square meter or meter candelas(cd). It is known as lux(lx).

* Typical levels of illuminations according to the lighting conditions.

Light conditions	Lux Level
Direct rays from the sun	100,000
Sun with light clouds	70,000
Sun shining with heavy clouds	20,000
Office and home lighting	100~1,000
Sunrise and sunset	500
Streetlight	1~10
Twilight	4
Full moon	0.2
Quarter moon	0.02
Overcast moon	0.07
Clear night sky	0.001
Average starlight	0.0007
Overcast night sky	0.00005

BLC: ON/OFF by Dip Switch

9. What is BLC (Back Light Compensation)?

When we take a picture against the light and then it is reproduced on the screen, the background (behind the object) is brighter (saturated by white color) and the object is so darker that it could not be distinguished. To prevent this, BLC features is a function of improving the picture quality at the situation of Black lighting.

For examples of BLC, in a case the light outside the door is brighter than the indoor light, a camera exposure system operates itself according to the average light level of scene. However, if someone opened the door and enters into the room, its system reacts automatically according to its increasing level of light. Because of this reaction, the man who entered is hardly distinguishable like a book with silhouettes. The BLC feature helps to solve this problem. Refer to the below sample pictures (with On/Off).



Fig 1. BLC Off



Fig 2. BLC On



Fig 3. Fixed BLC window

Normally, the expose circuit within the camera takes an average reading from the illumination present in the entire scene and uses this to adjust the electronic iris. Ideally, the camera would calculate the exposure based on the light level in the part of the scene that is of interest to the viewer. The BLC feature uses a 'window' to set the exposure. All outside the window is ignored by the exposure system. On most cameras, the exposure window is fixed to the central portion of the scene. Because the camera is calculating its exposure based on the lighting in a darker area of the scene, the lighter areas will overexpose and, in some cases, 'White Out (a condition in which no object casts a shadow, the horizontal cannot be seen and objects cannot be discriminated, and only dark objects are discernible, esp. this condition occurs in a snow-covered place as a polar region)'. The effect is seen in the background of Fig.2.

Shutter Speed: NTSC: 1/60 ~1/100,000 sec PAL: 1/50 ~1/100,000 sec

10. What is Shutter Speed?

Fast shutter speed can capture the fast moving object that be made sharply. At this time the fast shutter speed can allow a little light to be fallen on CCD so that the image can be darker. If it needs the fast shutter speed, it needs a proper light, too. If selected the shutter speed in manual, the objects can be overridden.



Slow shutter speed



Fast shutter speed

* Electronic shutter

A function that controls the exposure time according to adjust electronically the accumulating time on CCD chips.

Gamma correction : Standard =0.45, Switchable =1.0 by Dip Switch

11. What is Gamma correction?

It is a correction of the linear response of a camera in order to compensate for the monitor phosphor screen nonlinear response. It is measured with the exponential value of the curve describing the non-linearity. A typical monochrome monitor's gamma is 2.2, and a camera needs to be set to the inverse value of 2.2 (which is 0.45) for the overall system to respond linearly (i.e., unity).

As we see, the reproduction characteristics of most cameras and video displays are not linear. If images with the ambient light, a small change in the light level falling on the CCD will produce a given output signal. The same amount of change in the very strong ambient light will not produce the same amount of output signal. This non-linearity is known as "Gamma". Namely, it results in poor discrimination of gray areas in the scene at low light levels.

To make up for this and improve the linearity of the system, there are two embedded gamma correction circuit. Namely, we can select Standard(=0.45) or Switchable(=1.0) by Dip Switch. Standard setting has the effect of stretching the camera's response to the black and mid-gray components of the scene while compressing the white components. This makes it easier to see differences in those shades of gray that are close to each other so it useful when more visibility is required in darker areas of the scene.

But, the white compression can make it difficult to differentiate shades of white in lighter areas of the scene. At the below two image, when we see the linear gray scale (circled by red color), Standard setting shows more gray scales.



** Gamma (ray) – a photo emitted spontaneously by a radioactive substance. Its wavelength is shorter than X-ray and its ability of penetration is better. Effects of Ionization, photographic & fluorescence are much weaker.

White Balance: Standard 2100 ° K~8200K Auto
Manual setting by Dip S/W & UP/Down by Push BTN

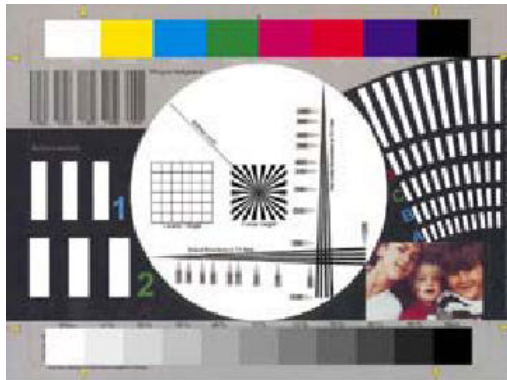
12. What is White Balance?

It is an electronic process used in video cameras to retain true colors. It is performed electronically on the basis of a white object in the picture.

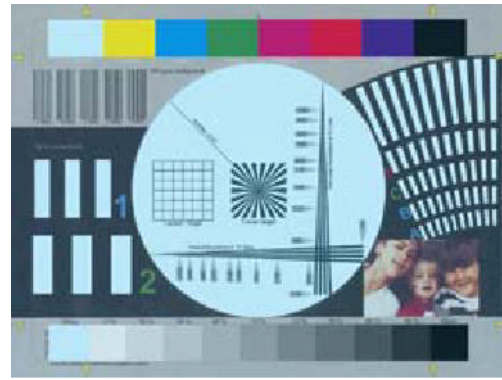
As the name implies, this feature is common to color cameras only. Cameras that have the color balance feature generally have four modes of use; Indoor, Outdoor, Fluorescent and Auto.

The white balance feature compensates for the temperature color "casts" that different light sources can cause. Color casts can make white appear with a slight hue under different light sources (e.g. tungsten and fluorescent). To see the effects caused by different lighting conditions, point a camera set to auto color mode out of a window. Allow the camera

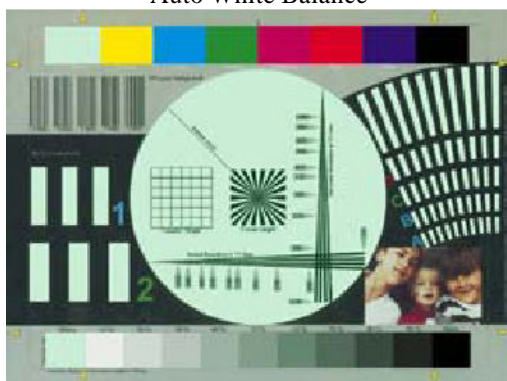
then seconds or so to balance to the outside lighting, then point the camera indoors at a room scene lit with artificial lighting. Any white areas in the scene will show a definite color tint. After a few seconds you will see the camera compensate and the white areas will be rendered correctly.



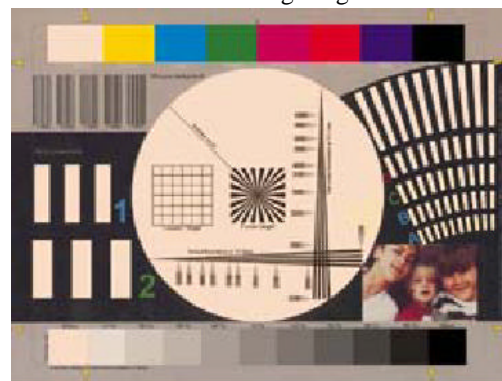
Auto White Balance



Outdoor lighting



Fluorescent lighting



Tungsten Lighting

Gain Control : Standard: 8dB ~ 30dB Auto Maximum by Dip Switch

13. What is Gain Control?

AGC- automatic gain control. A section in an electronic circuit that have feedback and regulates a certain voltage level to fall within predetermined margins (typically, 1Vpp). If it is over, the circuit will not apply any gain to the signal. But, when the video level is low, it amplifies gain to bring the video signal to a regulated level.

Keep in mind that the AGC (Automatic Gain Control) circuit can't work miracles and some light must be present within the scene. As a consequence of amplifying a weak signal, the noise present in signal is also amplified. Therefore a weak lit scene with lots of gain will appear noisy and grainy. AGC is accepted generally in deference to the alternative of having no picture at all.

* Gain- any increase/decrease in strength of an electrical signal that is measured in terms of decibels (dB) or number of times of magnification.

Smear Effect: 0.05%

14. What is Smear Effect?

'Smear' is an undesired signal that appears as a bright vertical (from top to bottom) stripe emanating from a bright part of the image. It is produced by scattered photons tunneling into the darkened vertical shift register rather than being collected in the photodiodes of the image sensing area (Potential barrier) in case of interline-transfer CCD.

MTBF: 80,000 hours

15. What is MTBF(mean time between failure)?

or even tens of thousands of hours between failures.

It also means average time between failures.

$$MTBF = (T_1 + T_2 + \dots T_n)/n$$

T_i : hours of operation, n : the number of failures

Power source: DC12V(Tolerance: 9V~40V) or DC12V~AC24V Dynamic or AC230V(± 30V)

16. What Power source means?

What kinds of input for cameras? DC12V, DC12V~AC24V or AC230V.

There are various power sources in the world that supplies power to cameras. Dynamic power working tolerance & Non-polarity input of Vision Hi-tech maximizes the reliability of the unit from damages in power circuitry troubled during the installation or after installation. It works from DC9V to DC40V and from AC15V to AC35V. Standard power is DC12V or AC24V. The wide tolerance accepts most of unstable power supplies without failure before or after installation. Furthermore it accepts either DC12V power supply or AC 24 V unit and non-polarity input with no need of adjustment on the camera.

Operating current: 100mA, 60mA, 10mA

17. What Operating current means?

It means the value of current that the products/devices get operated at the time the current flows on the wire/coil of electrical products.

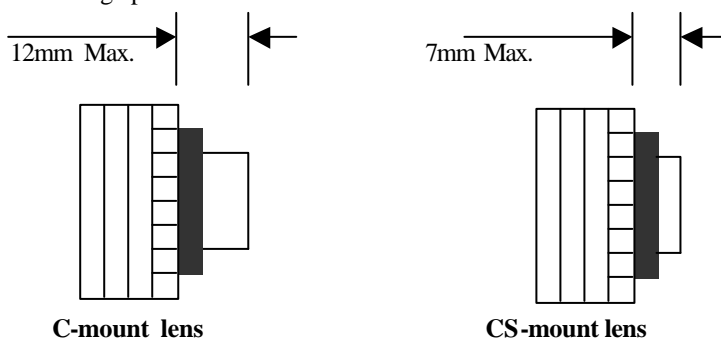
Lens Mount Dynamic Range : CS-Mount (12mm flange back)
C-Mount(17.5mm Flange back) & Fine focus ± 1.0mm

18. What Lens Mount Dynamic Range means?

With the advent of smaller CCDs such as 1/2", 1/3", the CCTV camera has adopted the CS-mount.

The difference between CS-mount and C-mount is the distance between the back-flange of a lens and the CCD image plane.

1. C-mount: this is a standard mounting from the early days of tube cameras. It consists of a metal ring with a 1.00/32 mm thread and a front surface area at 17.5 mm away from the image plane.
2. CS-mount: It is new standard intended for smaller camera and lenses. It use the same thread of C-mount but it is 5mm closer to the image plane.



The products Vision Hi-tech have a mechanism for adjusting the position of the CCD assembly with Adjustment Lever located over the parts between a lens and camera.

**** Flange Back**

The distance from the starting point of lens mount(flange) to focal point.

Iris Control : Video Iris/ESC/DC Iris

19. What Iris Control means?

Automatic Iris (AI) is an electronic circuit controlling the iris of a lens to help compensate for large changes in illumination levels. It, at CCD camera, is to control the amount of light falling on CCD. It can control/set iris opening using Peak and average of Video Signal. Namely, the circuit of analyzing images is built in a camera.

* ESC (Electronic Shutter Control)

* DC Iris – It use circuitry within camera to provide a drive signal and a damping signal.

The lens contains no signal analyzing electronics and is therefore directly driven by the camera. The drive signal controls the iris and the damping signal is used to prevent 'hunting'. The camera has to be capable of supplying these signals via the correct connector. The potentiometer on the side of the camera is used to adjust the level for the lens.

* Damping:

As though there are troubles on the part of signal systems, It dissipates the troubled part and continues to operate the system at the fiery condition of function and performance.

Operating Temperature : 14 ~ 122 (-10 ~ + 50)

20. What is Operating Temperature? It's just the range of temperature for reliably operating cameras.

Humidity: Within 90% RH

21. What is Humidity?

Humidity is a moderate degree of wetness especially of the atmosphere. Humidity commonly known is Relative Humidity (RH). RH is the ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.

$$R = f/F \times 100 (\%)$$

f (the amount of water vapor actually present in the air)

F (the greatest amount possible at the same temperature)

As if the amount of water vapor in the air (f) is certain, the change of temperature changes the value of F. and then R (relative humidity) is changed. For examples, when the lowest temperature of a day appears at dawn, the highest RH is apt to be shown because of this change of F value.

Vision Hi-tech spec indicates that our products can work perfectly within 90% RH.

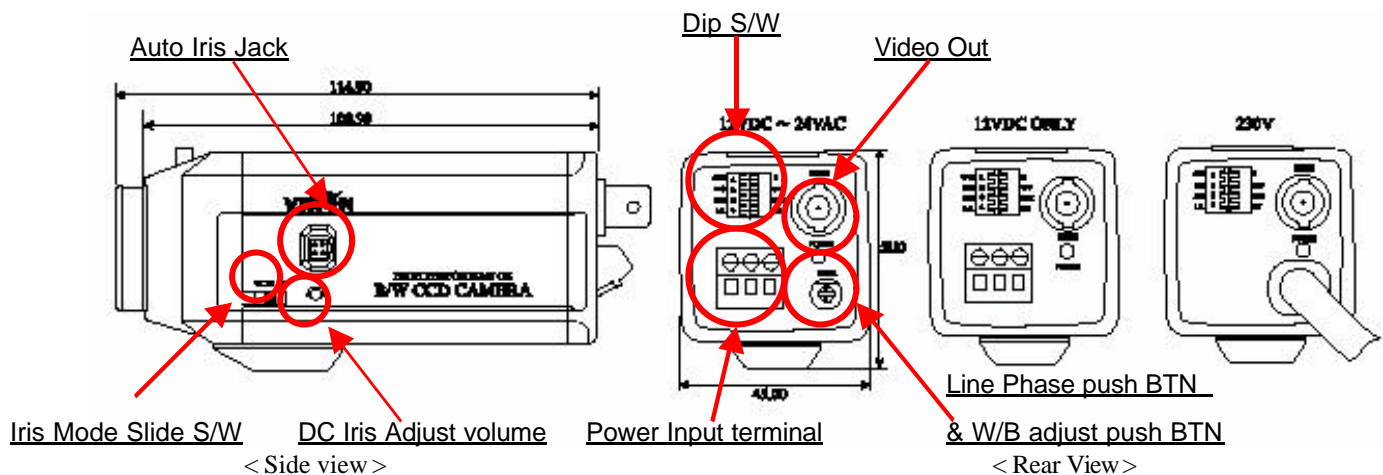
22. Measurement: Various

23. Weight (Approx.g) : Various

24. With Operational Features, Vision Hi-tech provides several choice for customers' applications.

IR sensitivity	Yes
Audio	Yes
Dual Power DC12~AC24V	12V only non Polarity
Line Lock	X or Yes

25. The specifications of panels outside the cameras.



1. Dip S/W control

BLC	On/Off
Flickerless	On/Off
AGC	STD/MAX
Gamma	0.45/1.0
White Balance 1	Manu/Auto
White Balance 2	
Line Lock	On/Off

* Flickerless

At the condition of some light, especially fluorescent light, images can be seen to flicker. This is usually caused by the interaction of the shutter with A.C. frequency. According to setting (Flickerless On), the Shutter speed of camera is changed in the value that will not cause flickers (PAL: 1/120s, NTSC: 1/100s). This way of fixing the shutter speed causes a bad effect to reduce the sensitivity of cameras. Since its setting's on, the feature of electronic iris will be turned off effectively and it will no longer to control the optimum exposure for available light conditions.

2. Rear Panel

Video Out	BNC - BNC connector
Power Indicator	Red LED
Power input terminal	Screw Joint or 230V AC VDE code
Line phase push BTN	Up/Down or not
W/B adjust push BTN	Up/Down (for a color camera)
Dip Switch	6 Pin Side Refer to the above figure that it is composed of 6(six) lines.

*BNC Connector (BNC stands for Bayonet-Neill-Concelman who developed its connector in 1940) - It is a widely accepted coaxial cable termination that are safe and convenient to connect the shielded cable of electronic equipments; in the pats of Video, Computer networking, etc.

*Dip Switch (Dual In-line Pin Switch) – A switch that have dual options (e.g., On or Off) in one line)

3. Side Panel

Auto Iris Jack	4Pin terminal - Terminal for connecting Auto Iris Lens.
Iris Mode Slide S/W	VI/ES/DC (Select one of 3(three) mode) VI (Video signal driven Automatic Iris); Lens itself operates automatically by Video signal from a camera. ES (Electronic Shutter) - Electronic Shutter operates automatically. DC (DC driven Automatic iris Control); that are operated automatically to DC signal from a camera.
DC Iris Adjust volume	Yes