e-Watch®

e-Watch IPVS Design Guide

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You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the e-Watch equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

Turn the television or radio antenna until the interference stops.
Move the equipment to one side or the other of the television or radio.
Move the equipment farther away from the television or radio.
Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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e-Watch® systems do not prevent crimes from being committed, but are intended to be used to monitor and investigate.

e-Watch components are electronic devices and complex commercial software products. As such, they may fail on occasion. Multiple devices with overlapping zones should be used for redundancy.

e-Watch event notification capabilities must be user programmed and activated prior to use. System reliability is dependent on the underlying network infrastructure and associated communications services that may fail on occasion. The user of the e-Watch system is advised to evaluate risk associated with network failures and operator errors. Routine auditing and preventive maintenance of the system is essential to assure optimum performance.

Event analysis and re-creation is subject to system configuration, lighting conditions, environmental conditions, lens and housing cleanliness, distance to subject, operator-invoked control settings, and many other factors.

Read and follow all documentation to assure proper performance.

CONTENTS

PREFACE

Scope

The several tables and equipment diagrams in the pages that follow are intended to assist in selecting a technical solution to satisfy a customer's requirement for an IP Video Surveillance System.

The design guide is a tool. It is not meant to replace a site survey. It is highly recommended that a site survey be performed before any requirements are finalized.

Step 1: Determine network suitability.

Step 2: Determine server suitability

Step 3: Determine monitor station suitability

Step 4: Determine camera placement.

Step 5: Choose a camera or encoder.

This document uses the following conventions:

Table 0-2. Conventions

Convention	Description
Boldface font	Commands and keywords are in **boldface**.
Italic font	Arguments for which you supply values are in *italics*.
[ ]	Elements in square brackets are optional.
{x|y|z}	Alternate keywords are grouped in brackets and separated by vertical bars.
[x|y|z]	Optional keywords are grouped in brackets and separated by vertical bars.
String	A non-quoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.

Table 0-2. Conventions

`Screen` font	Terminal sessions and information the system displays are in `screen` font.
`Boldface` `screen` font	Information you must enter is in **`boldface`** `screen` font.
`Italic` `screen` font	Arguments for which you supply values are in *`italic`* `screen` font.
^	The symbol ^ represents the key labeled Control - for example, the key combination of ^D in a screen display means hold down the Control key while you press the D key.
-->	This pointer highlights an important line of text in an example.
<>	Non-printing characters, such as passwords, are in angle brackets.

Obtaining Documentation

The following sections provide sources for obtaining documentation from e-Watch, Inc.

World Wide Web

e-Watch documents can be found by going to the e-Watch web site

www.e-watchinc.com

By Mail

e-Watch, Inc.
720 Lincoln Center
7800 IH 10 West
San Antonio, Texas 78230
210.349.2020

support@e-watchinc.com

Documentation Feedback

You can submit technical comments about e-Watch documentation in the following ways:

E-mail your comments to support@e-watchinc.com

To submit comments by mail, write to the following address:

e-Watch, Inc.
720 Lincoln Center
7800 IH 10 West
San Antonio, Texas 78230

We appreciate your comments.

Obtaining Assistance

The following sections provide sources for obtaining assistance from e-Watch, Inc.

Customer Support

For technical assistance please send requests to support@e-watchinc.com or your local e-Watch reseller. You may also call 210-349-2000 and ask for Customer Support.

Sales

For assistance with sales or marketing please call 210-349-2000 and ask for Sales or send requests to sales@e-watchinc.com.

CHAPTER 1

Camera Basics

Video Compressors

The cameras contain three separate video encoder chips. These chips may be configured to produce MPEG-1 video, JPEG and MJPEG images. The three chips produce 4 streams. End user controls allow you to configure the camera to stream from 1 to 3 simultaneous streams. Typically a video surveillance system is configured to transmit SIF and QSIF MPEG1 streams to monitor stations with a LAN connection. QSIF MPEG streams are typically streamed to WAN connections and MJPEGs are streamed across very small connections such as a satellite or cellular. The good news is that a single camera can support unlimited viewers accessing the same video over multiple connections of varying bandwidth.

The SIF MPEG1 stream is typically viewed over a high-speed network connection. It delivers good quality video at full motion. This video is displayed in the video window when full screen or divided into a 2 x 2 matrix.

The QSIF MPEG1 stream may be viewed over a high-speed or low-speed network connection. It delivers a limited quality, full motion video stream. It may be viewed over the high-speed connection when displayed in the video window as a 3 x 3 or 4 x 4 matrix. It may be viewed over the low-speed connection as a single pane of video or in a 2 x 2 matrix. This is a good choice when viewing video over an ISDN, cable or DSL link.

The MJPEG stream may be viewed over a high-speed or low-speed network connection. It may be configured to deliver a variable quality image at variable frame rates. This stream is typically used to deliver video at 3-5 fps over a 30-50 kbps connection. This typical for customers employing satellite and cellular links.

The MPEG and MJPEG streams may be transmited as multicast or unicast streams. If necessary, the server(s) can rebroadcast a unicast stream as a multicast and a multicast stream as a unicast. In this manner, a totally non-blocked network architecture is achieved allowing any camera to stream

video to a virtually unlimited number of viewers anywhere on the LAN/ WAN/Internet.

The JPEG stream is for archival purposes. Whereas the MPEG and MJPEG streams may be viewed live or archived, the high-quality JPEG images are streamed only to the archive. When live viewing is desired, the end user wishes to see full motion video. When recreating an event, the emphasis is not on full motion, but on quality. A quality image is more likely to allow identification of target subjects. Typically, end users set the frame rate at 1fps and the quality at 77. A quality of 100 delivers an image with lossless compression. This image, while of very good quality, is also very large in size. It would take an inordinate amount of storage space to archive these images. A quality level of 77 approximates a 10:1 compression ration. Since the human eye does not discern video artifacting until aproximately 14:1, this compression level is a good compromise between quality and image size. The Q=77 image averages 30-40KB in size. This translates into an average of 1.5GB/day/camera. See the storage calculator at www.ewatchinc.com in order to more closely calculate your storage needs.

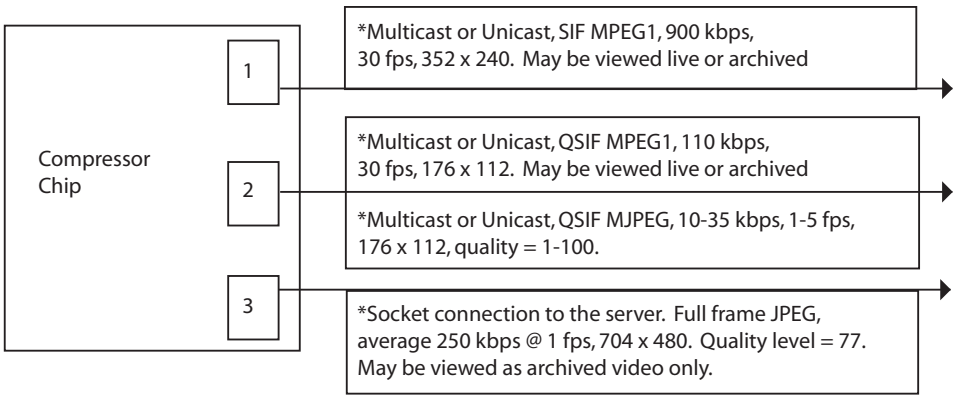

Figure 1-1. Compressor Chip

Motion Detection

The JPEG encoder chip is programmed to continually capture and save uncompressed images into the system memory. The PowerPC processor analyzes differences between adjacent images to detect motion and to determine the location of the motion within the image. Upon detection of motion, the camera stores the current JPEG or MPEG images on a network server based on the configuration selected by the user.

The degree of motion used to define Motion Detection is user configurable. Controls are available to determine the both sensitivity and threshold.

Processor

The cameras and encoders contain a PowerPC core and an embedded ATI/ Nucleus® Real-Time Operating System. Application software controls the camera module, encoder chips, installed options, and supports the IP network stack.

Network Interface

The camera contains an integrated Ethernet Interface operating at 10 or 100 MBits/second over CAT5 twisted-pair cabling. The interface auto-negotiates the network speed as required, and is fully compliant with the IEEE 802.3 Ethernet standard.

The 200 Series cameras may be connected wirelessly through use of wireless bridges. The 300 Series cameras may be ordered with an integrated 802.11 NIC.

Power

The wired cameras and encoders consume approximately 9 watts 24VAC 9-42V DC power. The wireless cameras and encoders consume approximately 14 watts.

For 200 Series cameras, power is normally supplied over the Ethernet cable on the unused Ethernet pairs 1/2 and 4/5 using a mid-span device. Alternatively, a common 12 VDC regulated power brick may be used. The 12VDC power option has also been used in scenarios where solar power is employed. When external 12 VDC power is supplied, the camera disables the internal Power-over-Ethernet circuitry.

A commonly-available DC power adapter, available from a variety of sources, may be used. Camera DC power requirements are as follows:

Table 1-1. Camera DC Power Requirements

Camera Supply Voltage	12 VDC ± 10%, regulated
Camera Load Current	750 mA DC maximum
Ripple voltage	250 mV maximum
Connector	2.5 mm pin jack, center-positive
Reverse-polarity protected	

A variety of suitable DC power adapters are commonly available. A few examples include:

- ElpacWP1112-760 (www.elpac.com)
- ElpacWP1212-760(www.elpac.com)

As mentioned before, 200 Series e-Watch cameras and encoders accept DC power supplied via the CAT5 Ethernet cabling using a mid-span device. With this method, a 'power inserter' is placed in the Ethernet cable between the Ethernet switch and the camera. The power inserter applies DC power to the two unused pairs within the 4-pair Ethernet cable. This approach eliminates the need for any DC power adapters to be located near the camera. The 200 Series is not 802.11 af compliant.

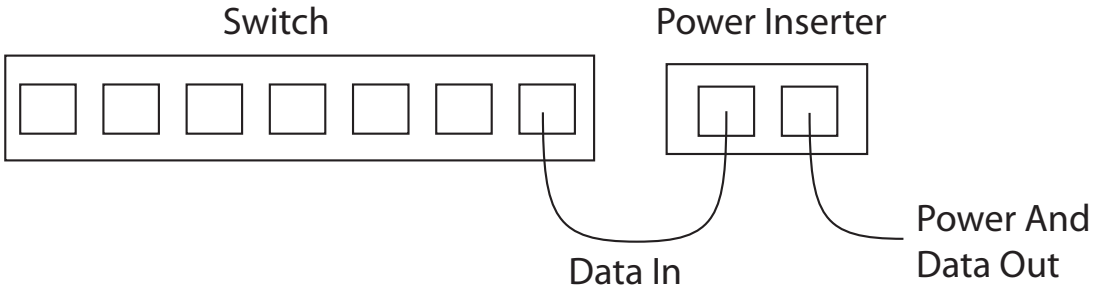

Figure 1-2. Power Inserter Diagram

Table 1-2.Power Options

	PowerDsine mid-span inserter
PWR-201	12VDC wall power supply
PWR-202	Multi-cam indoor 24VAC transformer
PWR-210	Outdoor 24VAC supply for DOM's and 300 series outdoor cameras.

The 300 series cameras may be ordered with one of three different power supply options:

1. 802.11af – typical wired network configuration.
2. 24VAC and 9-42VDC – typical mobile application configuration.
3. 24VAC and 12VDC regulated

CHAPTER 2

Step 1 Determine network suitability

Infrastructure

The SiteWatch™ Situational Awareness System is intended to run on a dedicated server using multicast network technology. While it is possible to run the system without using a dedicated server, it is not recommended nor supported. The following list of requirements are suggested as guidelines for developing the system infrastructure. Individual systems will vary in their performance.

SiteWatch is a network-based application. As such, the network infrastructure is a key component to the efficient running of the SiteWatch system. There are a few absolute network requirements in running the e-Watch® Situational Awareness System, one of which is that the network be Ethernet multicast compliant.

Multicast is an IP technology that allows for streams of data to be sent efficiently from one source to many destinations. Instead of setting up separate unicast sessions for each destination, packets are replicated at router hops where the paths to different destinations diverge. e-Watch can use multicast to efficiently route video streams to multiple viewing stations. In order to use multicast on your network, it will need to support multicast IP traffic as opposed to just unicast IP traffic. Certain types of network topologies do not work well with the multicast protocol and require special hardware and/or software configurations. In some cases these network topologies cannot support multicast at all.

If your network topology supports the use of multicast, you will also need switches and routers that are multicast compliant. Standard switches, hubs, and routers will allow the use of multicast at the expense of network performance and reliability. Compliant routers are the central communication points for multicast traffic. On these routers, multicast is managed by special hardware and services which allow multicast traffic to co-exist in a unicast environment without adversely affecting the normal network traffic. Using non-compliant equipment will generally result in

poor system performance and even, in some cases, limited or total network outages.

Multicast traffic is much easier to control when the switches and routers used are both multicast compliant and use IGMP (Internet Gateway Multicast Protocol) version 2 traffic control protocol. IGMP version 1 will also work, but will have some limitations. (See document "Using IGMP to Control Your Multicast Needs" for detailed explanation.)

If you own Cisco switches and routers, you should check to see if they support CGMP (Cisco Gateway Multicast Protocol). CGMP is a hybrid version of the IGMP protocol. This protocol allows CGMP compliant routers and switches to send multicast to specific requesting clients without flooding multicast to non-members (network users not requesting any multicast).

e-Watch multicast data streams are typically too large for a shared 10Mb network to sustain without adversely affecting system performance. We recommend installing e-Watch equipment in networks with at least switched 100Mb per second bandwidth.

Your network topology becomes even more important when multiple networks are used together. Special considerations must be taken to evaluate network equipment and the physical network itself because some setting and configuration changes may be required.

If your network is set up to run virtual physical networking schemes such as VLANs and/or ELANs, you may have to upgrade your equipment to meet the load requirements to use multicast. In some cases, loading multicast on top of existing services overloads system routers and causes network failures.

e-Watch cameras and encoders are designed to be used on Ethernet networks; therefore, the normal 100 meter network drop limitation applies. If a repeater is added to the drop, the maximum cable length can be extended greatly. Repeaters range in distances from a maximum of six hundred feet to thousands of feet.

e-Watch has designed a network diagnostic utility. We suggest you execute this utility across the network during the site survey and network design phase. The utility will assist in identifying problems.

If e-Watch cameras are used as part or for all of your security system, you should keep all network equipment in controlled access areas. This will minimize the risk of security system outages due to tampering.

If e-Watch cameras and/or encoders are being used with your security system, uninterruptible power should be applied on all network equipment associated with the security system.

SiteWatch can be run over a wireless system by using wireless access points and wireless clients connected to your existing network. Changes to the ARP (Address Resolution Protocol) table update intervals and other special considerations may be necessary to make the wireless client operate properly.

For more information, refer to the FAQ section of the e-Watch web site at www.ewatchinc.com/FAQ.htm or the e-Watch® Product Overview at www.ewatchinc.com/documents/ProductOverview.pdf.

Cabling Requirements

e-Watch Cameras and Encoders require ordinary CAT5 Unshielded Twisted Pair (UTP) cabling, commonly used for 100 Mbps Ethernet. This cable must be compliant with the ANSI/TIA/EIA 568 standard for Category 5 Data Cables. In addition, the cabling may require compliance with local building codes. Verify building code requirements prior to cable installation. Typical cable types include:

Belden 1245A2 (www.belden.com)

Commscope 0590 (www.CommScope.com)

Alpha 9504F (www.alphawire.com)

Straight-through Connections

"Straight-through" cables may be purchased from a variety of sources. Check with networking equipment suppliers in your area. Alternatively, pre-assembled straight-through CAT5 cable assemblies may be purchased from:

- Black Box — EVNSL21-0010 (www.blackbox.com)
  (10 foot, Blue)
- AMP — 1-212198-10 (www.amp.com)
  (10 foot, Blue)

Testing The Cable Installation

Prior to using the cable, test the cable to verify that the cables have been terminated correctly. A variety of cable testing "scanners" are available. These testers range widely in price and sophistication, but all of them will

at least verify the correct wiring of the cable, end-to-end. Some representative cable testers are:

- Black Box — 31616 (www.blackbox.com)
- Black Box — TS-800A (www.blackbox.com)
- Black Box — TS-680A (www.blackbox.com)

If you are powering your camera via a mid span power inserter, there is an additional requirement. Power-over-Ethernet requires that the DC resistance of each wire, end-to-end, must be less than 20 ohms. The more advanced TS-680A listed above will measure this directly, but is quite expensive. To measure this with a common ohmmeter:

- On the far end of the cable, short pin 4 to 5 and pin 7 to 8.
- On the near end of the cable, measure the resistance between pin 4 and 5, and between pins 7 and 8.
- The DC resistance should be less than 40 ohms in each case. The number of ohms is doubled in this case because we are measuring the cable in parallel instead of singly.

CHAPTER 3

Step 2 Determine server suitability

The following is a list of the customer furnished hardware requirements for the SiteWatch Situational Awareness server component. In order to function correctly and at its maximum efficiency it is recommended that the SiteWatch server run on a dedicated machine. The SiteWatch application runs in real time and relies heavily on system resources. If it is necessary for other applications to be installed, the memory and CPU requirements will be increased considerably.

Processor

A fast processor is highly recommended. e-Watch processes video data for storage and rebroadcast in real time. This means that the system is continually manipulating and rebroadcasting data as it receives it. If the server misses packets because its processor was busy, those packets will be lost. Occasional lost bits or even packets will not seriously degrade the images being transmitted. To prevent as much data loss as possible, we recommend the latest state of the art processor available.

- Minimum 1 GHz Intel or AMD processor.
- Recommended 2GHz +

Memory

The memory requirements for the server hardware are not as great as those for a monitor station. This base memory configuration assumes you do not have any other major application running. Although it is not recommended or supported, if you plan to run other applications including a monitor station on the same server, please increase the memory accordingly.

- Minimum 512 MB
- Recommended 1GB

Peripherals

In order to use the telephony feature of the e-Watch Situational Awareness Software, a modem must be installed in the computer. Also are required:

- Monitor
- Keyboard
- Mouse
- 10/100 Network Interface Card

Monitor

Make sure to use a high quality monitor. Even though flat panel displays are more asthetically pleasing, the low-mid quality devices are not as sharp as good quality CRT's.

Bus

The server should have a true server bus. A server bus is typically faster than that found on a desktop PC.

Storage

The storage requirements on the server are directly related to the amount and type of e-Watch imaging data you wish to collect, as well as the number of cameras connected to the system. Because e-Watch uses Activity Gated Storage™ to reduce storage requirements, the frequency of activity in the cameras' fields of view is also a factor in the amount of storage required. A tape drive or tape library is required for the optional offline storage configuration. e-Watch supports the use of AIT 50 tape devices. Please refer to the e-Watch storage calculator at www.ewatchinc.com/storagecalc.htm for a useful tool in calculating your probable storage needs.

When considering storage requirements, ask the following questions:

1. What do you want to store? Still images? Full motion video? Storage requirements average 1-1.5GB per day per camera.

2. How long do you need to keep the stored data? Typically 1-2 weeks.

Anecdotal evidence points to the following:

- Approximately 80% of the events (theft, malicious damage…) are discovered within 2 weeks.
- Approximately 90% of the events are discovered within 3 weeks.
- Approximately 95% of the events are discovered within 4 weeks.

Operating System

SiteWatch currently supports Microsoft® Windows 2000 Server, and Microsoft® Windows 2003 Server.

Service Packs

e-Watch has taken great steps to ensure compatibility with current service packs. It is advisable to upgrade the server to the latest service pack and security upgrades. If you believe a service pack, security patch or upgrade has caused a problem with your e-Watch software, please contact e-Watch Customer Support support@ewatchinc.com.

Internet Information Services (IIS)

SiteWatch is a web-based system and relies heavily on its web server. Currently SiteWatch runs only on Microsoft's IIS web server. The IIS server must be installed before the SiteWatch application is installed.

Simple Mail Transfer Protocol (SMTP)

One of the communication options the SiteWatch application uses is e-mail for alert and alarm notification. To enable this feature, SMTP must be installed on the server. SMTP is installed as an option with IIS. For further information on installing SMTP and IIS, please consult your Microsoft documentation.

Trivial File Transfer Protocol (TFTP)

e-Watch cameras and encoders upgrade their firmware or internal code by using TFTP. To upgrade your hardware to the latest firmware release (usually included on the CD with the server software), a TFTP server will be required, such as the TFTP server from SolarWinds.net support.solarwinds.net/updates/New-customerFree.cfm.

CHAPTER 4

Step 3 Determine monitor station suitability

Processor

- Recommend 2 GHz

Memory

- Recommend 1GB of RAM

Peripherals

The standard manufacturer supplied peripherals should be sufficient, with the exception of the video card. Because of the resource demand to render video, you should have a video card that has 16MB or more of onboard RAM. Some of the usual supplied peripherals include:

- Monitor
- Keyboard
- Mouse
- Video adapter 16MB or better with 1024X768 resolution
- 10/100 Network Interface Card
- Modem optional for telephony features
- CD-ROM Drive

Operating System

The ViewWatch module has been tested and is supported on.

- Microsoft® Windows 2000 Professional
- Microsoft® Windows XP SP2 or bove

Software

- Microsoft® Internet Explorer, Version 6.0
- Microsoft® Media player 9
- Microsoft® DirectX 9 or Above

CHAPTER 5

Step 4 Determine camera placement

Site Selection

Select a location for installation of the camera. The location must be clean and dry, and the temperature and humidity must not exceed the Environmental Specifications found in the camera specifications. Failure to do so may result in equipment failure and loss of warranty protection.

1. Avoid locations where sunlight falls directly on the camera.
   a. Sunlight will 'wash-out' the camera's image.
   b. Direct sunlight may overheat the camera.
2. Choose locations which offer “choke points” in the traffic flow. These include ingress/egress points and hallway intersections.
3. Position a camera at the appropriate height and angle in order to “see” the face of oncoming traffic.

When choosing a camera site, consider the following:

1. How far are the cameras from the monitor facility?
2. What type of connectivity is available? For example:
   a. COAX
   b. Fiber - Multimode or single mode - Type of connector
   c. CAT5 UTP
   d. Wireless 802.11b, 802.11a,802.11g, 802.16
3. Is power available at the camera site or do we need to get power from somewhere else.
4. If we need to provide power, can it be done through an ethernet connection to the camera or can it be provided through a separate cable run?

Lens Selection

e-Watch cameras have an integrated 18x optical motorized zoom lens and are equipped with 37 mm threads which allow the attachment of optional external adapters.

- For greater distance, optional 2X Teleconverters are available through 3rd party sources.
- For a wider Field-of-View, .7X Wide Angle adapters are available through 3rd party sources.
- At 1x zoom; f = 4.1mm, f = 1.4, 48° HAoV
- At 18x zoom; f = 73.8mm, f = 3, 2.7° HAoV

The exception is the CAM-303 Entry-Level camera. The CAM-303 Entry-Level Camera has the same basic components as the Daylight Camera without integrated zoom and optics. Customers are required to supply their own lenses. The Entry-Level Camera has a CS-mount for attachment of an appropriate lens. This camera employs a 1/3" CCD. Computar makes a viewfinder which is very helpful in determining the focal length of CS-mount lenses for this camera.

Unofficial testing has revealed a significant difference in the resolution required to "detect" activity as opposed to the ability to "identify" a subject. Buildings may be identified miles distant from a camera. Vehicle movement and general identity may be detected several hundered feet or yards away. The horizontal field of view in both instances may be hundreds of feet, or more, wide. However, to identify facial features or read a license plate, the horizontal field of view must be very narrow. We have found that facial features are identifiable when they have at least 4+ pixels per linear inch on target. So, for an 8 inch wide face, you would want 30-40 pixels on target. The JPEG viewing pane is 704 pixels wide. This means the horizontal field of view may by necessity be as narrow as 10-20 feet. Please visit our website, www.ewatchinc.com for several sample images as viewed at different focal lengths with various horizontal fields of view.

Camera Mounting

e-Watch Cameras are equipped with standard ¼ x 20 mounting threads located on the enclosures.

This threaded hole makes the camera compatible with a wide variety of camera mounting brackets. When installing the camera on a mounting bracket, care should be exercised to ensure that the mounting screw

protrudes no more than 3/8" (10 mm.) into the camera to avoid damage to the internal camera module.

Encoder mounting

e-Watch encoders are equipped with ¼ x 20 mounting threads located on the bottom surface of all enclosures. Additionally, the 300 Series cameras have 4 ea 8-32 threaded inserts on the bottom of the enclosure.

As a rule of thumb, the bracket selected should be capable of supporting 3 times the weight of the camera plus any optional lenses. The camera weighs 1 lb. 14 oz., and the optional 37 mm adapters weigh 7 oz. Please refer to the Camera Decision Matrix for a detailed presentation of mounting hardware.

Table 5-1.Camera Mounting

KIT-301	Indoor pan/tilt kit
KIT-304	Outdoor pan/tilt kit
HDW-201	Mount for KIT-301
HDW-200	Dual option mount for CAM-3XX
HDW-206	Medium duty outdoor mount
HDW-207	Pole mount for HDW-206
HDW-208	Heavy duty outdoor mount
HDW-209	Required articulating head for HDW-208
HDW-210	Ceiling/wall/pedestal mount
HDW-301	Parapet mount for DOM-124
HDW-302	Pole mount adapter for HDW-301
HDW-304	Indoor wall mount with 24VAC for DOM-124

Outdoor Installations

The –E version of e-Watch cameras are for use in an outdoor environment. These cameras have a thermal range of 0 to 40 degrees C.

Cable Requirements for DOM Series Cameras

Table 5-2. Cable Distance

Cable Type	Maximum Distance
RG59/U	750’ (229m)
RG6/U	1000’ (305m)
RG11/U	1500’ (457m)

Minimum cable requirements

- 75 ohms impedance
- All-copper center conductor
- All-copper braided shield with 95% braid coverage

24VAC Wiring distances

The following are the recommended maximum distances for 24VAC applications and are calculated with a 10-percent voltage drop (10 percent is generally the maximum allowable voltage drop for AC-powered devices.)

Table 5-3. Wire Gauge

Total vA	20	18	16	14
30	94’	150’	238’	380’
75	37’	60’	95’	152’

Use a 24VAC transformer with the following minimum vA:

- 40vA per dome for indoor pendant cameras without heater.
- 100vA per dome for outdoor pendant cameras with heater.

General Installation Procedure

The e-Watch camera models have an integrated camera, lens and video encoder. The e-Watch encoder models provide a BNC connector for connecting the video encoder to a standard NTSC camera. The following steps apply to both camera and encoder models.

1. Mount the camera or encoder using all necessary mounting devices.
2. Connect the coaxial video cable from the legacy CCTV camera to one of the BNC connectors on the e-Watch encoder (encoder models only).

3. Connect the e-Watch camera or encoder to the network by connecting a CAT5 Ethernet cable to the RJ-45 connector on the camera or encoder.
4. Connect the CAT5 cable to a switch or other network device.
5. Provide power by one of the following methods:
    a. Connect a 12 VDC regulated external power source.
    b. Connect a 9-42VDC power source such as found in both commercial and military ground vehicles or airplanes.
    c. Connect a 24VAC power source.
    d. Connect the CAT 5 Ethernet cable to an Ethernet power inserter.
    e. Conect the CAT 5 Ethernet cable to an 802.3af compliant switch.

CHAPTER 6

Step 5 Choose a camera

e-Watch Video Cameras

Generally, we talk about “cameras”. However, all technical discussions are valid for encoders as well. The difference being, the encoders do not have an integrated camera. The encoders are designed to accept the input from an analog camera and transmit that video as if it were captured by an e-Watch IP camera. The e-Watch Daylight and Low-Light cameras use a professional-grade CCD camera module with 470 lines of TV resolution. The camera module provides user-controlled 18X optical motorized zoom. The CAM-203 Entry Level camera does not have an integrated lens. It does provide a CS-mount lens ring for the attachment of 3rd party lenses.

When choosing a camera, ask the following questions:

1. What is the purpose of the surveillance?

- Deter theft – Camera placed in areas with expensive equipment
- Monitor intruders – Camera placed at entrances/exits
- Monitor daily activity – wide field of view in common areas
- Identify perpetrators – narrow field of view. Camera placed at choke points in hallways and at entrances/exits aimed face-on to traffic flow.

2. How many cameras will be needed? How many areas will require surveillance? These trends have been noted within the education market:

- Rural elementary school needs 5 cameras
- Rural middle school needs 10-15 cameras
- Rural high school needs 15-25 cameras
- Large elementary school needs 5-15 cameras
- Large middle school needs 10-25 cameras
- Large high school needs 30-65 cameras
- Ratio of indoor to outdoor cameras is 10:1 or 20:1
- Infrequent use of pan/tilt

3. Do you want to attach a digital encoding device to an existing analog camera, or do you wish to replace the existing camera with a new digital camera?
4. Are these cameras:

- Indoor
- Outdoor - what is the temperature range
- Static (always point in the same direction)
- Do they require pan/tilt/zoom
- Do they need to "see in the dark"

Daylight Cameras

Daylight cameras are equipped with a color camera module. This module has a sensitivity of .15 Lux, with normal shutter speeds. This camera is intended for daytime use, and is not equipped with any features to enable its use under poor lighting conditions.

As the ambient light gets progressively darker, the camera's image will become noisy, and produce the 'snow' seen on television sets between channels. Given the .15-Lux sensitivity, this will begin to occur at lighting conditions similar to sunrise or sunset.

This video noise is somewhat dependent on the amount of zoom, and on any adapter lenses that may be in use.

To operate the camera below approximately .15-Lux, external illumination must be provided. In many applications, this may be accomplished with ordinary floodlights or streetlights.

Low-Light Cameras

Low-light cameras are equipped with an enhanced camera module, improving the sensitivity of the camera under poor lighting conditions. This is done under user control, by removing the camera's internal color filter. This improves the sensitivity of the camera, allowing operation of the camera down to .01 Lux with normal shutter speeds. This corresponds to lighting conditions similar to that of a quarter moon. The user can further improve the sensitivity of the camera by reducing the shutter speed - longer shutter times provide more sensitivity.

Note-The low-light cameras produce monochrome (Black-and-White) images when this low-light feature is in use.

Infrared Illuminators

When the low-light camera is operated with the color filter switched out, it is sensitive to infrared illumination. This allows the use of the camera in scenes which are apparently dark as viewed with human eyes, but which are well-illuminated by infrared light.

A variety of infrared illuminators are available from several manufacturers. These illuminators typically require a source of 12 Volt DC or 120 Volt AC power, which is not provided by the camera.

Inexpensive IR illuminators typically use an array of infrared LEDs, and require 12 VDC power. They produce invisible infrared light with a wavelength of approximately 940 nanometers. They tend to be directional, producing a 'beam' or narrow cone of infrared light, and, as such, are less effective at illuminating a wide scene. They are also limited in the amount of optical power they can produce. Typically a $50 illuminator is adequate for short hallways and small-medium sized rooms.

More expensive IR illuminators use special infrared flood lamps, powered by 120 volts AC. These illuminators can illuminate wider fields of view, or can be used at greater distances.

Some manufactures of IR illuminators are:

www.vitekcctv.com/IR_Illuminators.html

These are 110V powered, high-power IR spotlights, good for illuminating a specific area. Claim to be good for 200'. Also some 12.24 volt units good for 50'. They automatically switch on at dusk. Beamwidth is 65 degrees.

www.tycovideo.com/products_ir_illuminators.asp

The AD-1010 is a 110 VAC operated, 300W floodlight in a NEMA-4 enclosure. Range is 400+ feet. Can switch on automatically at dusk. The AD-1020 is an LED-based illuminator, operating from a 12 VDC source, and available in wattages up to 60 watts. Good for 150+ feet.

Entry Level Cameras

The e-Watch® Entry-Level Camera can be used indoors or outdoors (with an appropriate environmental enclosure). It is a fixed focus camera that requires the addition of an appropriate CS-mount lens. It's the right choice when you want a low-cost fixed-focus camera. Used in conjunction with SiteWatch™ Situational Awareness Software, the Entry-Level Camera is part of a comprehensive, scalable, and flexible IP-video surveillance system that meets the unique needs of both security and IT professionals in your organization.

Dome Cameras

Dome cameras may be used indoors or outdoors. The indoor models are available as a pendant, surface mount or in-ceiling mount. The commonly used dome cameras are listed in the table 6-1 DOM 100-126 cameras are Pelco Spectra III cameras mated to either an ENC-3XX encoder. The optical characteristics are similar to the CAM-202. In addition to high-grade optics, the cameras offer high-speed pan/tilt/zoom. To the end user, the cameras behave in the same way as the CAM series. All camera controls are available in the user interface.

The best choices for full-function, outdoor cameras are the DOM-112, 124, adn 126. These are Pelco Spectra III cameras mated to either an exterior encoder. (Refer to Table 6-2 for encoder choices) The optical characteristics are similar to a CAM-202. In addition to the high-grade optics, these cameras offers superior outdoor functionality in a NEMA enclosure that will operate within a thermal range of –40 to 50 degrees C.

Table 6-1. DOM Cameras

DOM-100	Indoor surface mount/White/Smoked
DOM-108	Indoor in-ceiling/White/Smoked
DOM-112	Environmental in-ceiling/Black/Smoked
DOM-124	Environmental pendant/Light gray/Smoked
DOM-126	Environmental pendant, stainless steel, pressurized.
DOM-301-Q	Indoor flush mount at wall-ceiling junction.
DOM-301-S	Indoor in-ceiling w/5 dome.

Table 6-2. ENC Cameras

ENC-300	.af legacy POE 10/100 UTP
ENC-310	24VAC, 9-42VDC 10/100 UTP
ENC-326	24VAC, 12VDC Multimode
ENC-330	24VAC, 12VDC Singlemode
ENC-340	24VAC, 9-42VDC 802.11b
ENC-340-E	24VAC, 9-42VDC, 802.11b NEMA 4

APPENDIX A

The e-Watch® Storage Calculator

The e-Watch Storage Calculator is a utility located on the e-Watch web site (www.e-watchinc.com/storagecalc.htm) used to calculate storage requirements for the e-Watch® Situation Awareness System.

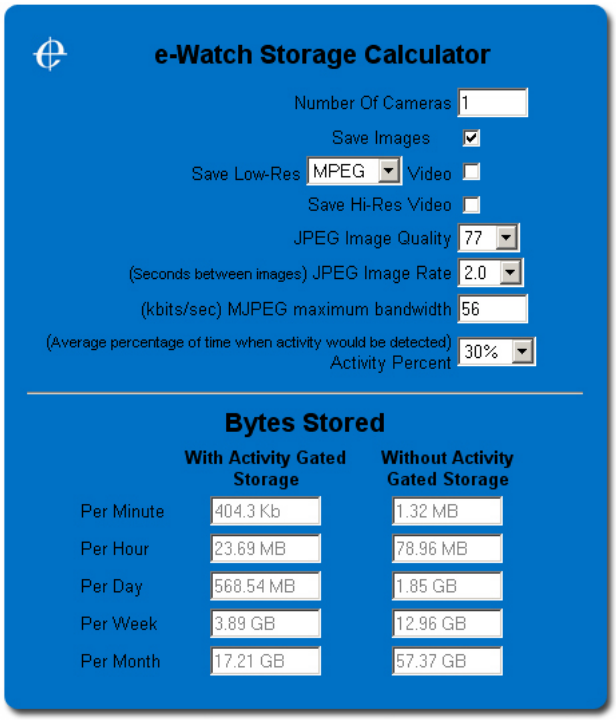

Figure A-1. Storage Calculator

Given the different combinations of compression and image rate, the storage requirements can vary considerably. The Storage Calculator can help determine the amount of storage required. This storage can be located on a local hard drive or a network resource, as long as the SiteWatch Server can map to it.

This document will cover the concepts used for the settings of the calculator. For a more complete description of these settings, please see the online documentation provided with the e-Watch Storage calculator.

Number of Cameras

Determining the amount of storage required is largely based on the number of cameras in use. The more cameras you have, the more storage you will require. Each camera can store several different types of data, JPEG images, low-res video, or hi-res video. Each type of image, and the compression used for those images changes the amount of storage required.

Save Images vs. Save Low-Res Video vs. Save High-Res Video

You can pick and choose the type of data to store for each camera. Images use less space and can be played back to simulate motion, but the motion tends to be jerky. Low-res video (QSIF, MJPEG) uses less resource than hi-res video but the quality is not as good. Hi-res (SIF) video is preferable if image quality and motion are key factors.

Image Quality

Another key factor in storage requirements is the compression used or image quality. The more you compress the data the less space you use; however, this also lowers the image quality. It is possible to compress the quality right out of the image. Determining the right combination of compression and desired image quality is important to the efficient running of your site. Normally 68% compression or 77-image quality is the best setting for most needs. You should modify these settings according to your site's specific requirements.

Image Rate

Selecting the image capture rate is important. The lower the interval between images the more images will be stored. More images provide a smoother playback; however, storage requirements will increase. The higher the image capture rate number, the less storage space will be required.

MJPEG maximum bandwidth

This setting determines the amount of bandwidth the camera will use for MJPEG streams. The camera will usually try to always keep the bandwidth at this level. The camera will compensate by adjusting the MJPEG quality and image rate.

Activity Percent

Activity also plays a major factor in the space storage formula. The reason for this is the use of Activity Gated Storage™, which means that data will only be captured if there is motion in the camera's field of view. For the

average facility, e-Watch estimates 30% activity. This can be changed to suit your site.

The e-Watch storage calculator is a Java applet embedded in the e-Watch web site. To view it you will require a Java enabled web browser, such as Internet Explorer or Netscape. **www.e-watchinc.com/storagecalc.htm** is the URL for the calculator.

Using the calculator is very simple. The calculator loads using default numbers for the Number of Cameras, Image Quality, Image Rate and Activity Percent. Save Images is selected as well. These values can be changed to suit the needs of your facility. The calculator returns values for the number of bytes stored using Activity Gated Storage and without using AGS. It also returns the average amount of storage required Per Minute, Per Hour, Per Day, Per Week as well as Per Month. These numbers are guidelines and your storage use may vary.

APPENDIX B

The e-Watch® Network Calculator

The e-Watch network calculator is located on the e-Watch website (http://www.e-watchinc.com/networkcalc.htm). The calculator is used to estimate the amount of bandwidth that will be used by 1 e-Watch camera or encoder.

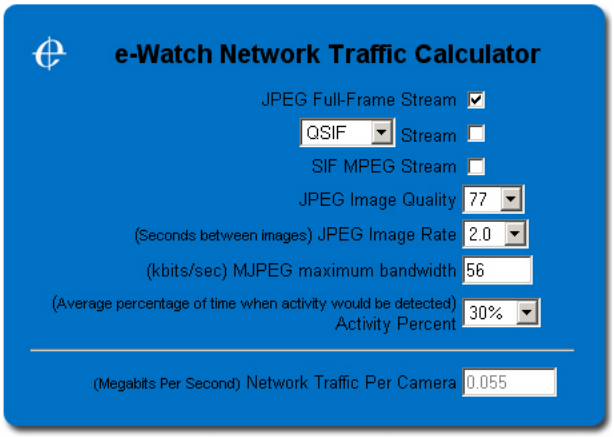

Figure B-1. Network Calculator

Image quality, Image compression and Image rate only pertain to JPEG.

MJPEG maximum bandwidth determines the maximum amount of bandwidth the camera will use for MJPEG streams. It will adjust the MJPEG quality and image rate to compensate.

Our experience indicates an Image quality of 77 is a good compromise between the need for high quality images with a minimum storage space. Quality level must be set based on individual business practices.

Activity percent defaults at 30% based on what we have observed in the typical office or K-12 education environment. Activity percent could be higher if coverage includes a field of view with a busy street in the background. Percent activity can be lower if the camera is in a side hallway, maintenance area, lunch room, etc.

APPENDIX C

Lightning Protection

e-Watch, Inc. does not endorse any specific lightning protection system, product or company. The website http://www.comm-omni.com may or may not offer insight when addressing lightning protection issues. This article is reprinted with permission.

Remote Mounted CCTV

Lightning Protection Information

Summary

Remote pole or wall-mounted closed circuit television cameras have special protection requirements.

Remote Mounted CCTV Cameras - Prime Targets for Lightning

Outdoor Closed Circuit Television (CCTV) Security Cameras can be prime targets for lightning. A lightning strike can destroy the camera and can damage the control console with energy flowing back through the coax and camera power wiring.

When lightning strikes a tower or other large structure, there is a high peak voltage at the strike point flowing outward and downward through any path it to earth ground. A support pole develops a high L di/dt peak voltage drop along its length to earth ground. A large steel reinforced structure can conduct the energy to earth ground through its steel reinforced concrete footers and electrical ground system. A camera mounted and grounded to a building with steel reinforced construction will usually have less inductance to ground than a camera mounted on a self-supported tower or pole. Less inductance to earth ground means less peak voltage at the camera. When lightning strikes a wood or other insulating support, whatever voltage is necessary to continue the arc is developed at the strike point to overcome the resistance of the non-conducting structure. This usually has catastrophic results.

Although very different, identical conditions exist for both examples. A high peak voltage occurs at the strike point with reference to earth ground. The video and power wiring to the camera are insulated from the strike point by electrical circuitry in the camera and the external covering around the wire. The energy will flow through the camera in an attempt to equalize the wiring with the instantaneous peak voltage occurring at the strike point.

To protect your equipment, you must provide a low inductance path to earth for lightning energy and install properly rated protectors on all interconnected wiring from the camera to the operating console. A properly rated protector at the camera allows the wiring to be equalized to the peak voltage at the strike point without allowing damaging currents flowing through the camera circuitry. An appropriate protector at the console blocks damaging incoming voltages from the camera wiring.

A camera mounted on a building should be grounded to the building' s structural steel as near the camera as possible. (Use 1-1/2 inch copper strap for grounding.) If the camera is mounted on a metal pole, it should be grounded to the pole and a proper ground system installed at the base. When mounted on a wood or other insulating support, the camera should be grounded to a 3 inch copper strap running from the camera mount to a proper ground system installed at the base. An additional 3 inch copper strap would run from a lightning rod or diverter to the ground system at the base. Separate the two straps on opposite sides of the pole and connect together only below grade. Side mounting the camera or providing a diverter above the camera provides some additional protection from a direct strike.

Appendix C

A lightning ground system would be capable of dispersing large amounts of lightning energy (usually electrons) into the earth very quickly. The faster it disperses electrons, the less time there is for damaging surges to flow in the coax and power wiring back toward your operating console.

APPENDIX D

List of Figures

APPENDIX E

List of Tables