VIDEO NETWORK SERVERS TEST DRIVE (1)

This is the first article in the two-part series of Video Network Servers test drive, prepared by our Russian CCTV Focus team, which will test and compare a number of Video Servers. In this issue we'll cover the Samsung SNS-110P, Axis 250S MPEG-2 and Axis 2400/2401. In the next, we'll talk about the Mitsubishi DX-VS1UE, VCS VideoJet series and the Linux Video Server.

*T*he main advantage in using Video Servers compared to LAN-cameras is that the servers are separate boxes, where the analogue video signal is converted to digital, compressed and streamed down to a central server. Because it is a separate and independent box from the camera itself, with the video servers you have a choice of variety of cameras, lenses, including PTZ ones. LAN-cameras are attractive because of their concept "everything into one box", but they do not offer the choice of lenses and high quality CCD chips as is the case with a stand-alone "real" CCTV cameras, which offer better resolution, better low light performance, including day/night features.

There are a quite a few LAN video servers (some prefer to call them streamers) on the market and we had quite a task ahead of us to get a sample of each. This is our first (Russian) massive Test Drive and we, naturally, wanted to get as many units as possible, in all their variety. Practical reasons did not allow us to have it this way. Some companies were canceling their promises to give us a unit, using a variety of excuses, others were having certain products that only existed in their price lists and we could not see them with our own eyes. It was quite a challenge to collect a few units to take a complete photo for this test drive. On the other hand many of the suppliers were very helpful with their assistance and help in setting their products correctly.

The testing method

The aim of this test is to benchmark the quality of the transmitted image, the networking and other functionality of the various video streamers in CCTV applications.

During this testing we have limited to verifying the horizontal resolution, the image quality at various compression settings, colour accuracy, compression artifacts, dynamics of the signal, the image update speed via the network, with and without multiplexed cameras, etc.

We have also tested the quality of motion images as encoded and transmitted by the streamers, using the specially designed video signal generator by Stream Labs where a circle broken up in 25 segments rotates with each segment at the PAL rate, i.e. 25 revs per second.

We have also listed the average cost of each of these (Editor's Note: These prices are in US$ and as available in Russia). Due to time and other constrains we did not test the PTZ functionality of the streamers and therefore left this out from this analysis.
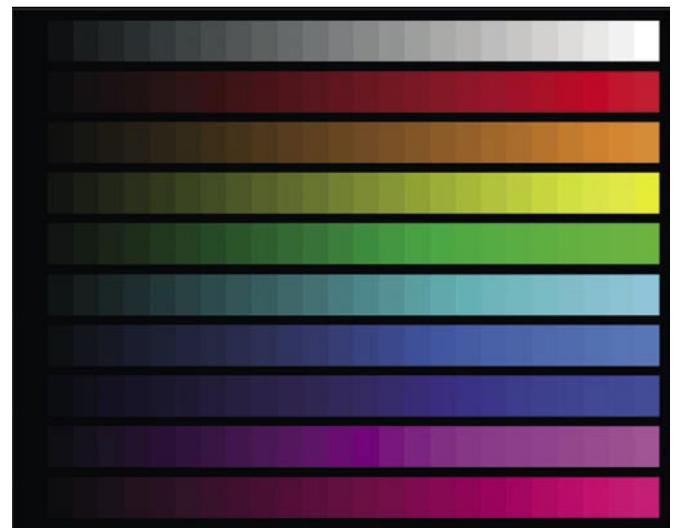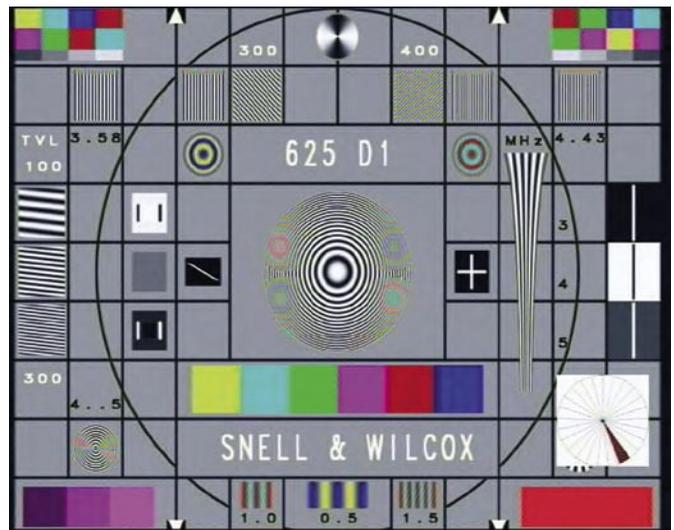
How does a video server work?

Video servers are devices that, as said in the introduction, convert analogue video signals into digitized and then compress it for streaming.

The video compression can be any of the known and popular standards such as JPG, Wavelet, MPEG, H.261, etc. This streaming can be continuous or available on demand, when a web browser, or specially written application for example, requests the stream-

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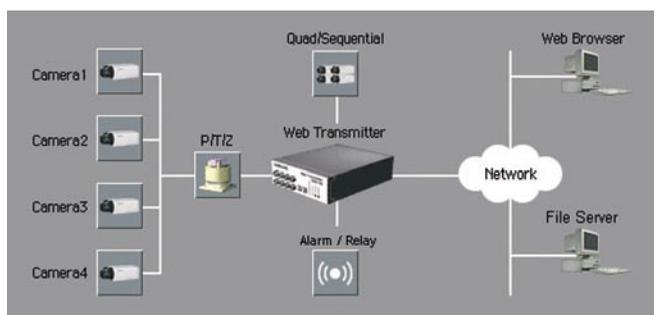
ing via any IP (Internet Protocol) network connection.

Typically, the streaming is made on a local network - LAN (Local Area Network) or WAN (Wide Area Network), but it could also be made via telephone line (PSTN) or ISDN.

The main advantage of video streamers is therefore their capability to send video signals via IP networks, which today make 99% of all the networks in the world, including the unavoidable Internet.

The second, also important, advantage is that the video signal travels via the IP networks in a digital format. Cable distances therefore do not affect the digitized video signal with accumulative noise and losses, as is the case with analogue signals and coaxial cables. There are certainly limitations of how far a network cable can go without loosing the signal completely, but then network repeaters and routers can be used in multiple stages without introducing additional noise. The picture quality is then mostly dependent on the source itself – the camera and the digitizing quality of the streamer itself, which includes the quality of the digitization stage and the video compression used.

Another important advantage of video streamers is the possibility for them to be used on existing company IP networks. For security and performance purposes it is clearly a better solution if networks used are specifically installed for such an IP CCTV system, but the idea of retrofitting video streamers in existing company networks.

In CCTV today, there is no doubt more and more systems are IP based solutions, and as such the video streamers are very important new addition to the CCTV family of products.

Samsung Web transmitter SNS-100P

Let's begin our testing with the simplest and possibly the cheapest video streamer – the Samsung Web Transmitter SNS-100P, also known as Samsung webTX.

This is a 4-channel streamer that uses Motion-JPEG compression. The Samsung webTX is of a simple design, and even an inside look shows a budget solution. When the unit was supplied it came with an instruction manual, power supply and a serial cable. There are 4 BNC connections for composite video inputs and 4 BNC for video outputs. Next to these there are sockets for serial data, power indicators, LAN activity indicators and two buttons for resetting the unit to factory default settings.
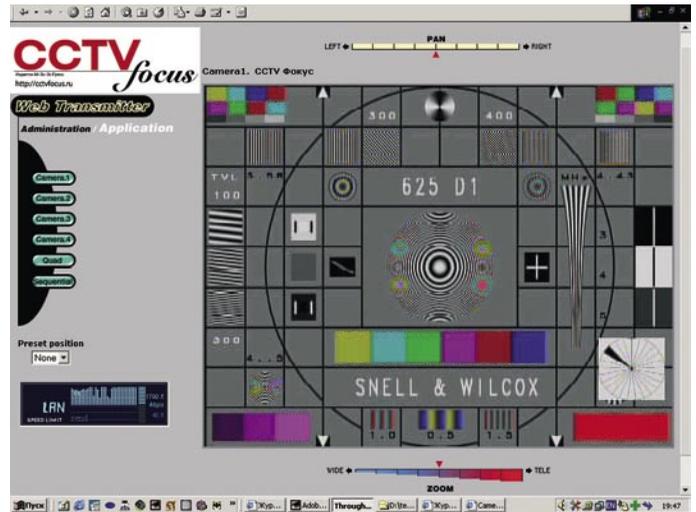

The Samsung SNS-100P web browser test display

The setting of this device can be a bit difficult (because there's no IP installer software) without special utility software. If one could not set an IP address using the ARP protocol, the only other alternative is the setting via the serial port. When this is done terminal window such as Hyper Terminal in Windows can be used to do the settings. During the first connection with the streamer additional drivers for decoding the M-JPEG in your web browser should be installed.

The initial difficulties ended up here. With the user friendly and easy to learn graphical web interface the Samsung SNS-100P can be simply but efficiently managed. This server has everything that it is designed to have, although simplified. For example, there is no motion detection, which quite frankly we didn't expect to see in such a budget design. But it
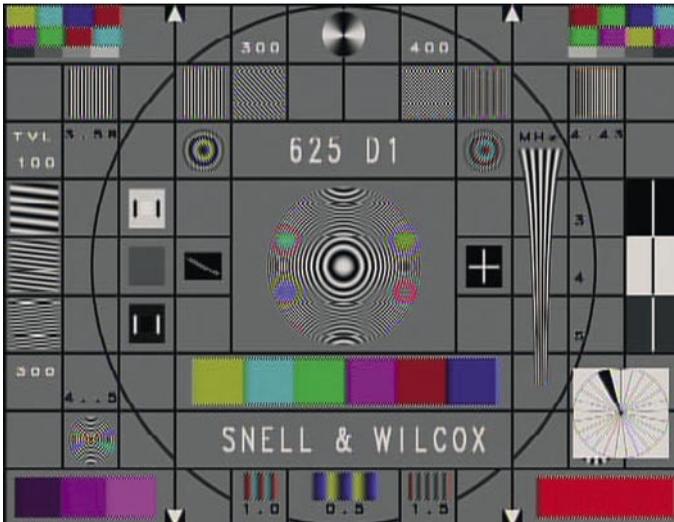
An exported test image of Samsung SNS-100P

is possible to send image shots to an e-mail address or to an FTP server. This can be initiated by a timer or external alarms. The minimum interval between sending images is 1 second, but there is also a possibility to use the 12 MB onboard memory so as to send up to 32 images initiated by an external alarm.

Overall, the images were of a sufficient quality on all three levels of compression: low, medium and high. The Samsung webTX has three image size settings: 176X136; 352X272 and 704X544 pixels, of which only the last two make sense as the 176X136 is a very small thumb-nail image size, barely offering recognition of people or cars.
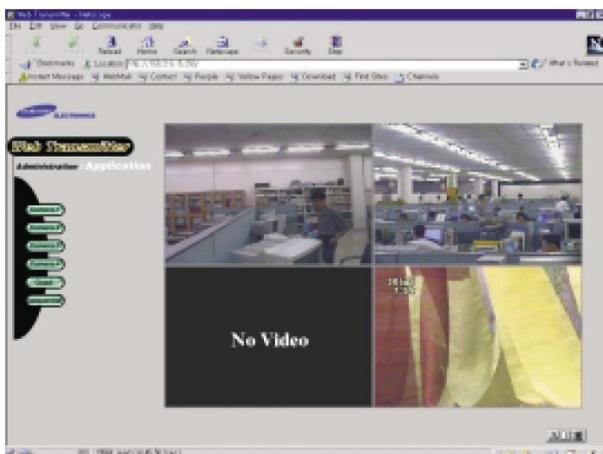
Web browser quad view of the SNS-100P

The image quality settings can be camera individual or for the whole group of 4 inputs. When more than one camera is connected to the SNS-100P the highest pixel resolution 704X544 is not possible, and the maximum transmission speed is 2 images/second. Only when the image setting is 352X272 we managed to get 25 images/second transmission speed, but only for

one camera. Even with 2 clients (web browsers) connecting to the SNS-100P we managed to get the same streaming speed, but only with the maximum compression selected. When using medium or low compression (medium or high picture quality) the transmission speed was slightly slower. When the picture setting of 704X544 pixels was used, the transmission dropped to 12 i/s. It is possible to have this speed and quality while sequencing between cameras.

The maximum number of clients that can simultaneously connect to the SNS-100P is 12 (under condition 1 camera to 1 client). In summary, cameras to 12 users can be streamed at any one time independent of the speed of connection and network bottlenecks will not cause dropouts immediately.

We also tested if lowering the transmission bandwidth will disconnect the connection, or just lower the update speed. By reducing the bandwidth to 5KB/s the transmission speed dropped down to 1 image every 3~4 seconds (at 352X272 pixels, low quality), but the SNS-100P continued to stream images – which is what we expected with M-JPEG compression.

So the overall first impression about the Samsung SNS-100P streamer was fully as expected. This streamer, even though it is with basic functionality allows for a reasonable image quality of up to 4 cameras.

Axis 250S and 2400

Among all the video servers we tested, we received the two new and interesting products from the Swedish known manufacturer Axis, the model 250S and the model 2400 (recently a new and improved version 2400+ came out).

The Axis 250S is a single channel LAN video server, without a hard drive, supporting MPEG-2 format, which means it is capable of transmitting audio as well. The overall product quality of Axis is, as usual, at a high level. When you buy the server, beside the

device itself we also got in the box detailed instruction manual, warranty card, a couple of screws of pieces for easy mounting, power supply, and as expected, a CD with all the necessary software including all the details of the Axis web site, which also contains all the technical details and software (in case you loose the

original CD).

The video server Axis 250S itself is different from others with its compact design. The small dimensions of 27 X 112 X 133mm make it an easy installation challenge, it easily be concealed above ceilings, cabinets or even inside camera housings. The weight is not more than 700gr (without the power supply). The video input sockets are at the front of the 250S. There are two types of video that can be connected to the 250S model – the composite video (BNC connector) and the S-VHS video (Y/C connector). There are also inputs for a microphone, or other audio source.

At the back of the 250S, there is a power supply socket, serial data port (RS-232, and RS422/485, for PTZ control data), RJ-45 socket for the LAN connection, and activity LED indicators.

The setting up of the 250S server is very simple and doesn't take time at all. All it requires is powering up the camera and connect to the server, and allocating

an IP address. For the setting of an IP address the easiest way is to use the Axis IP installer available on the CD. All the multimedia software that is required for the MPEG-2 streaming, such as Windows Media Player and DirectX is installed on most of desktop computers or are available for download from the Internet.

The Axis 250S runs on embedded Linux operating system.

At the initial setup (we already setup the user name and password) we were able to configure the other details of communications.

Once the 250S IP address is typed in the web browser you are welcomed by the first Livepage, where real time video can be viewed.

It is possible to change the settings by entering with an appropriate password, although the setting sis not graphical, but textual, but it is reasonably simple and intuitive. The 250S uses continuous video signal to produce live streaming and as such doesn't work

with motion detection, but it can send continuous live streaming to an FTP site, not just still images at certain points in time, which was the case with the other M-JPEG products of Axis. This is why the popular Axis Camera Explorer (which works with JPEG) cannot be used with this model.

The setup of the 250S and how to react on alarms is very easy and efficient, which makes it suitable for various practical tasks. The Event menu, under the Configuration, is done as follows: First an alarm trigger is selected and then events that need to be performed (executed) are defined. The number of configured events is not limited, although it should be noted that the 250S couldn't send video images to more than three FTP sites simultaneous. In addition, during the saving of images on the FTP site, if the compression is changed, or another resolution is set, the upload stops and should be reinitiated (the file is completed, and new does not start – just the upload stops, because 250S sends single images and not a stream, that's due to the specific limits of FTP, in theory real-time streaming is practically possible but is very unstable). There is no warning for such an operation, so it should be remembered as a potential loophole.

As triggers the following events can be used:
- External sensors/devices (4 inputs, whose status need to be defined at the beginning)
- Video signal loss
- Scheduler (during a specified period)
- Scheduler (during a specified periods of time e.g every hour for 2 minutes)
- Video server reboot
- Internal messages of the video server
- User defined, for which purpose it is possible to define a button on the Livepage and this action can be initiated manually.
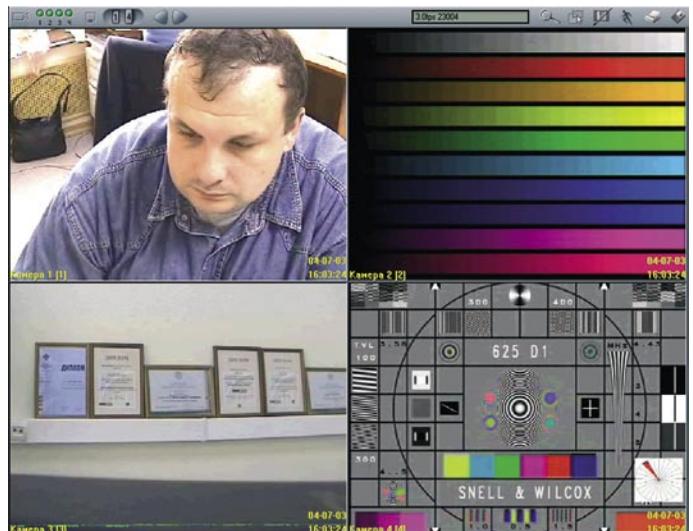
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As a response to the alarms above, three types of actions are possible:

- Firstly, upload to the FTP server. The length of this footage can be defined, or it can be set to stop when the alarm trigger stops. There is also a possibility to save even lengthier footage than allowed by the operating system by dividing the files into smaller, allowed lengths. Also pre-alarm of up to 1 minute is also possible by using the memory buffer.
- Secondly, output relay can be switched.
- Thirdly, a notification can be sent, using e-mail, HTTP or TCP.

It is also possible to define a timer for the alarm activities, so that at night for example there are no alarms being sent, or the other way around.

Let's now analyse the quality and speed of image streaming from the Axis 250S.

The 250S server uses two pixel resolutions: 352X288 and 720X576. It encodes video at a frame, which makes the interlace comb appearance of moving objects apparent, but this is normal with most of the recorders that use frame recording or playback.

It is possible to control the MPEG-2 streaming from 0.25Mb/s to 8Mb/s (just a reminder to the readers that 4Mb/s reproduces movies with DVD quality).

Axis recommends using bandwidths from 1Mb/s (for low res) to 4Mb/s (for hi res) for best compromise between the image quality and speed of streaming. Using the CIF size (352X288 pixels) of streaming allows for live motion at full 25 i/s at any bandwidth, while if you switch to full frame size (720X576 pixels) around 20 i/s are achieved when the real video streaming varies between 1.8 and 4.2 Mb/s.

If we set it between 6 Mb/s and 8 Mb/s the frame update reduces to around 18 i/s, but the image quality is higher.

Once you see the full frame resolution it seems silly to go down to the CIF size, and even at the cost of having the speed dropping to 20 i/s, it is a much better picture quality. It is interesting to note that there is no difference in transmission speed and quality when connecting a monochrome camera, contrary to what one might expect (It processes monochrome image as if it were a full-colour image.

The image quality and dynamics at the full frame resolution were stunning, and we managed to measure up to 500TVL of resolution, using our signal test pattern generator. With the substantial bandwidth reduction the quality would change abruptly, while with gradual reduction of the bandwidth the one second picture delay was increasing.

Overall, our conclusion was that the Axis 250S video server produces high quality images, especially when the bandwidth is kept around 4Mb/s.

The other Axis video server, model 2400, is different from the previous model in that it uses M-JPEG, which allows for multiplexing, so that the 2400 is designed to accept up to 4 cameras. Although this model does not allow for audio streaming, it is possible to use the optional Axis 2191 module, which in such a case needs to be connected to the second serial port. The 2400 model is not as compact as 250S, measuring 42X145X220 mm. The weight, without the power supply, is 800gr.

On the front panel there 4 BNC connectors, activity LED indicators and a button for defaulting the unit to factory settings.

On the back panel we have the serial ports, alarm input/output terminal, RJ-45 LAN port and power supply socket.

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The initialization procedure of the Axis 2400 is the same as for the previous Axis model.
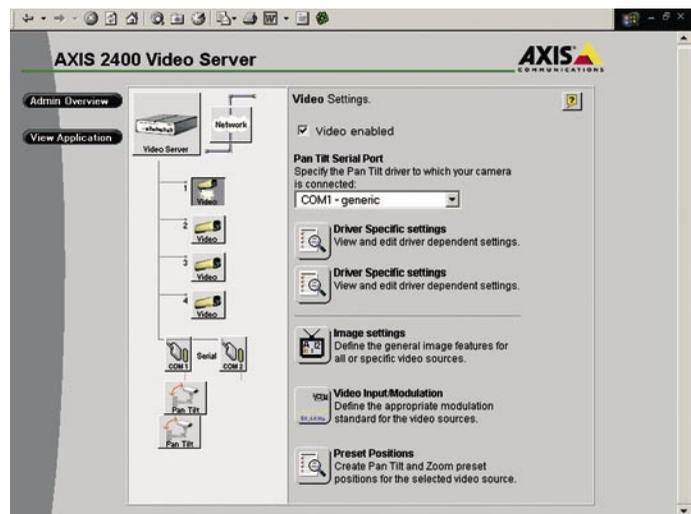
The control of the 2400 is done via the built-in web server. The Axis 2400 web server has a very pleasant and clever graphic interface which allows for quick access to all the necessary settings. We'll only describe the most interesting points.

Unfortunately, the 2400 doesn't have video motion detector. So most of the remote storage activation can be done by external alarm trigger or using a timer settings. External alarm can also activate pre- and post-alarm recording in the 4MB buffer, configurable via the Application Wizard. Images can be sent to an FTP server or to an SMTP e-mail server, or via a modem connected to the RS-232 serial port.

The Axis 2400 uses three pixel resolutions for PAL: 176X144, 352X288 and 704X576. For NTSC users these resolutions are 176X112, 352X240 and 704X480 pixels.

The level of compression is set from 0 to 100 (referring to the highest compression), corresponding to file sizes of anything between 180kB for a full frame PAL (704X576 pixels image size) down to 0.4kB (for 176X144 image size).

Axis has a single channel model with the same char-

acteristics and features (except it is a single channel) called 2401.

The streaming speed of 25 i/s is possible only with maximum 352X288 pixels setting and with compression between 25 and 100 (corresponding to an average file size of each frame between 24kB and 8kB). Using the better image quality of 704X576 pixels we were getting around 12 i/s when using a compression between 75 and 100 (corresponding to an average file size of between 28kB and 23kB).

For best image quality we were getting around 3i/s.

We found that the best compromise for a decent image quality and good update rate is the medium picture resolution setting of 352X288 pixels and compression setting of 50.

When using transmission bandwidth of around 5kB/s, which is approximately equal to a good modem connection of around 40kb/s, we were getting a picture every 4~6 seconds.

This obviously makes the Axis 2400 more suitable for LAN connections, where optimum required bandwidth is around 3.5Mb/s, sometimes peaking at 4.5Mb/s, for live streaming of 352X288 pixels.

With an additional software called Axis Camera Explorer (which runs on a desk-top PC or Pocked PDA PC) it is possible to connect and see all Axis LAN cameras and video servers, and also arrange for recording on a hard disk. [•]

(In the next issue some more network servers)

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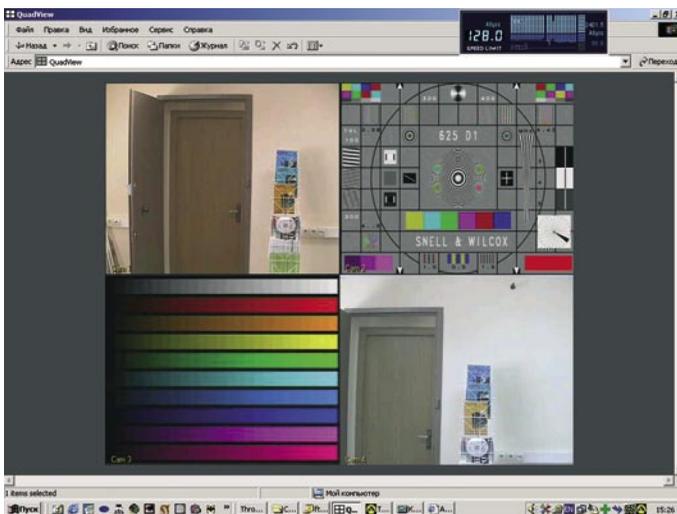
SAMSUNG SNS100

4 Camera Internet/WAN/LAN Camera Server
Alarming Email Push
DHCP IP to IP Streaming
Various network interface ; 10/100 Base-T, Cable Network, ADSL
Various screen size
  - Single : 704 x 544, 352 x 272, 176 x 136
  - Quad : 4 x 352 x 272, 4 x 176 x 136
  - Sequence : 704 x 544, 352 x 272, 176 x 136
Reinforcement of security
Web Transmitter can be used for security purposes as well as image monitoring
  - Alarm senor 4 input and relay 1 output
  - Pre alarm function
Storage of up to 32 prior images per channel in case of alarm occurrence.
  - When an alarm goes off, Web Transmitter image file to the designated E.mail address
  (max 5 image files) or FTP server(max. 999 image files)
  - Administrator can limit users authority
  - The number of users can be controlled through password
HTTP/FTP port change function
Image storage function
  When an alarm occurs, users can transmit images anytime by using FTP
  - Function of setting FTP time by camera list
  - Function of adjusting the number frames per sec. and setting resolution level
Additional control function
  - Camera Control(Pan/Tilt/Zoom/Focus) function for PELCO-P, SAMSUNG Electronics,
    VICON, AD, PHILIPS (TC8560, TC700), PANASONIC(WV-CS850)
  - External I/O box interface(Alarm in 10ch, Relay out 10ch)
Function for cable modem users(Dynamic IP environment) ; Under the cable modem environ-
ment, each time Web Transmitter is connected, IP address is changed.
If you register your e.mail through console, Web Transmitter will transmit a newly assigned IP
address to you via e-mail
Easy maintenance and repair
Software upgrade is available using a Web Browser

LANplayer
Software That Allows For Instantaneous Location/Time/Date Searches of Recorded Video From
Other PCs on a Network (Requires PC Win 95/98/2000/ME/NT4)
Includes RS-232 Interface
RS-422/485 Interface

SPECIFICATIONS

Hardware CPU	32Bit RISC Processor
Flash	2MByte
SDRAM	32MByte
Operation System	RTOS(pSOS)
Video Input	4Ch, 1.0Vp-p, 75 , Composite, Loop-Through, BNC Type
Video Output	4Ch, Loop Through, BNC Type
Network Interface	Ethernet(10/100 Base-T), Cable Network,ADSL(Static IP)
Image Compression	Motion JPEG
Protocol	TCP, IP, ARP, HTTP, FTP, SMTP, DHCP, RARP, ICMP
Resolution	Single:　704 x 544, 352 x 272, 176 x 136
	Quad: 4 x 352 x 272, 4 x 176 x 136
Performance	Single:　Max 30 Frames/Sec
	(1 User single mode connection)
	Quad: Max 7 Frames/Sec (1 User single mode connection)
Alarm Control Input:	4 Ch
Output:	1 Ch
Notification	Mail, FTP(Send JPEG Image)
Pre/Post Alarm	Saved 32 Image(Each Alarm Ch)
Serial Connector	RS-232C 1 Port : Console
	RS-485 1 Port : Pan/Tilt/Zoom/Focus Control
	PELCO-P, SAMSUNG, VICON, AD, PHILIPS, PANASONIC
External I/O	Reset Button, Preset Button,
LED indicators:	Power/Network Status/General Status
Security	Password Protection : Configured by the Administrator
Operating Temp.	5~50ºC(40~125ºF)
Operating Humidity	20~80%
Power Requirement	input Rating : AC100 ~ 220V, 50 ~ 60Hz, 0.5A
Output Rating :	DC5V, 3A
Power Consumption	10Watts

AXIS 250S

Video/Audio Compression:
• MPEG-2. User controlled bandwidth utilization control
• Bit rate configurable: 0.25-8 Mbit/s per client
• Available resolutions: 720x576, 720x480, 352x288, 352x240 pixels
• 16 bits stereo sound

Video Inputs
• 1 BNC composite video input with 75 Ohm termination/Hi Z
• Y/C (S-VHS) Input
• NTSC or PAL Configurable

Audio Inputs
• Stereo microphone input
Low sens. Max: -18.1 dBu (270 mVpp)
High sens. Max: -39.0 dBu (25 mVpp)
• Line input Max: +2.7 dBu (3.0 Vpp)

Networking
• 10baseT Ethernet or 100baseTX Fast Ethernet,TCP/IP, HTTP, FTP, SMTP, NTP, ARP, DHCP,

General I/0:
• Two Terminal Block connectors providing four digital alarm inputs and a single transistor output
• Event-triggered actions for remote video storage via File Transfer Protocol (FTP)
• E-mail notification of events (SMTP)
• Pre-alarm video storage

Serial Connectors:
• One 9 pin D-SUB RS-232 max 115 kbit/s
• One RS-485/422 transceiver max 38.4 kbit/s, half duplex

Pan/Tilt/Zoom
• PTZ support for remote camera control.

Currently supported units and protocols include:
BT Trippy, Canon VC-C3, VC-C4, Daiwa, Diamond SmartScan III, Ernitech ICU 51PA, Kalatel, Lilin, Panasonic, Pelco-D, Sony EVIG20/21, EVI-D30/31, Surveyor, VCL, Videmech (UOCP), Videor, and Videotronic.

Hardware
• MPEG-2 compression chip
• ETRAX 100 LX, 32 bit RISC, 100 MIPS CPU
• 16 MB RAM
• 4 MB FLASH memory

Power
• External power supply 9V DC, 9W AXIS PS-K, included
• Alternative input voltage 7-20V DC, min 5W

Software
• No extra software needed. Direct Show filters and 3 Viewer (decoder) licenses included

Firmware Updates
• Flash memory for simple upgrades

Operating Environment
• Temp: 40-125°F (5-50°C)
• Humidity: 20-80% RH

Dimensions and Weight
• Height: 1.1" (2.7 cm)
• Width: 4.4" (11.2 cm)
• Length: 5.2" (13.3 cm)
• Weight: 0.70 lbs. (0.32 kg)

Approvals - EMC
• EN 55022:1998 (CISPR 22:1997), Class B - Emission, Europe
• EN 55024:1998 - Immunity, Europe (using line input)
• EN 61000-3-2:2000 - Power, Harmonic current emission
• EN 61000-3-3:1995+A1-Power, Flicker and inrush current
• FCC part 15, Subpart B, class B demonstrated by compliance with EN 55022 (CISPR 22)
• C-Tick AS/NZS 3548 - Australia
• Safety: EN 60950
• Safety: UL, CSA (power supply only)

Security
• User level password protection
• IP Address filtering

System Requirements
• The AXIS 250S MPEG-2 Video Server uses the standard Internet TCP/IP suite of protocols and can be used with high performance PC's running Windows 2000® or Windows XP®

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AXIS 2400/2401

SYSTEM REQUIREMENTS
Axis' video servers use the standard Internet TCP/IP suite of protocols and can be used with most operating systems:
Windows 95, 98 and NT as well as Linux, UNIX, Mac and several others. The only software needed is Internet Explorer 4.x with Axis´ camera ActiveX control or Netscape Navigator 4.x.
INSTALLATION
Physical network connection using RJ45 twisted pair cable. Installs directly to NTSC or PAL video cameras using BNC connectors.
MANAGEMENT
Remote configuration and status using Web-based tools.
COMPRESSION
Motion-JPEG, as well as single snapshot JPEG images. User controlled compression level.
VIDEO FEATURES
Time stamp and text overlay. Color control (B/W or color).
VIDEO INPUTS
AXIS 2400 – 4 BNC composite video inputs with 75□/Hi Z termination.
Autosensing for NTSC and PAL.
AXIS 2401 PAL – single BNC composite, PAL video input with one BNC video loop-through
AXIS 2401 NTSC – single BNC composite NTSC video input with one BNC video loop-through
NETWORKING
10baseT Ethernet or 100baseTX Fast Ethernet,TCP/IP, HTTP, FTP, SMTP, NTP, ARP, BOOTP.
GENERAL I/O
A single Terminal Block connector providing four opto-isolated alarm inputs and a single output relay. Event-trigged actions for remote image storage via File Transfer Protocol (FTP) or E-mail (SMTP), pre/post alarm image storage.
PRE/POST ALARM BUFFER
Up to 8 MByte memory available for pre/post alarm image storage.
SERIAL CONNECTORS
9 pin D-SUB RS-232 max 230 Kbps.
9 pin D-SUB RS-232 or RS-485/422 max 38.4 Kbps, half duplex.
PAN/TILT/ZOOM
PTZ support for remote camera control.
Currently supported units and protocols include: Pelco-D,Videmech (UOCP), Ernitech ICU 51PA, Sony EVI-G20/21, EVID30/31, Canon VC-C3 and Diamond SmartScan III.
Future support for other PTZ units will be added.
SECURITY
User level password protection.
OPERATING CONDITIONS
Temp: 40-125°F (5-50°C).
Humidity: 20-80% RHG.
APPROVALS
EMC: FCC Class A,VCCI.
EN 55022/1994, EN50082-1/1992.
Safety: EN 60950, UL, CSA.
DIMENSIONS
Height: 1.7" (4.2 cm).
Width: 5.7" (14.5 cm).
Length: 8.7" (22.0 cm).
Weight: 1.7 lb. (0.8 kg), excluding power supply.
HARDWARE
• ARTPEC-1 compression chip.
• ETRAX 100, 32 bit RISC, 100 MIPS CPU.
• 16 Mbyte RAM.
• 2 Mbytes FLASH PROM.
POWER
3 alternative power sources:
• External power supply 12V AC, 9.6 VA (PS-D, included).
• 9-20V AC, min 10VA.
• 6-30V DC, min 7W.
COMPLEMENTARY SOFTWARE
AXIS IP Installer - for quick installation of multiple units.
AXIS ThinWizard - for remote upgrade of multiple Axis units.
ActiveX components available for third party system integration and development.
THINSERVER™ TECHNOLOGY
Incorporating Axis´ ThinServer Technology, the AXIS 2400/2401 comprises: "thin" versions of the most popular network operating
systems,Web management tools, and Axis' own ETRAX 32-bit RISC processor — based on an open architecture, streamlined and optimized for device connectivity independent of any file server.