Radvision XT5000 - Evaluation results main document

Radvision XT5000

Manufacturer: RADVISION, an Avaya company

Model: XT5000

Software Version: 3.1.0.36

Optional Features and modifications: Nine Site Multipoint Conference Unit (MCU) 12 Mbit/s Extended IP

Date of Test: 3rd – 7th December 2012

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CODEC Rear view

Remote Control

Desk Microphone

Setup Procedure

Setting up the XT5000 system was straightforward. The compact CODEC and the HD camera can both be mounted adjacent to the picture monitor/s. A system microphone pod, infrared remote control and an external power supply completed the package.

The connections for basic operation were clearly illustrated on the installation guide and in the documentation and involved:

- Mounting the camera adjacent to the monitor(s)
- Connecting the combined HDMI-HDMI video, control and power cables between the camera and the CODEC
- Connecting the supplied HDMI-HDMI cables between the CODEC and the monitor/s
- Cabling the microphone to the CODEC
- Establishing an Ethernet IP network connection through the RJ45-RJ45 cable
- Connecting the external power unit to the CODEC

System set up was conveniently configured through the “on-screen” menus via the hand held remote control. IP address, IP Gateway, Subnet mask and Gatekeeper address were all entered through these menus.

Approximate set-up time: 15 minutes

Documentation quality: The concise User, Installation and Administrator Guides were all easy to follow.

Hardware Description

This compact XT5000 CODEC may either be mounted within a picture monitor cabinet or adjacent to the monitors/s. Provided with two auto switching 10/100/1000 Ethernet connections and capable of conferencing up to a bandwidth of 6 Mbit/s point to point and a combined MCU bandwidth of 12 Mbit/s. The system can display a maximum image resolution of 1080p at 60 frames/second on both the main and H.239 channels. The Vari-Speed cooling fan was very quiet in operation and unobtrusive in the conference environment.

System options include:

1. A four or nine site on-board Multipoint Conference Unit (MCU).
2. 12 Mbps Extended IP Bit Rate.
3. Additional Digital Microphone Array Pod.
4. Advanced Audio CODEC pack (G.728 andG.729A).
5. Support for Scopia desktop and mobile.

Systems supplied for evaluation included a range of the above options.

The main HDMI connection carries the digital audio output but digital Optical audio inputs and outputs are also available by using a mini-TOSLINK adapter to the 3.5mm jack connector. Separate analogue audio input and output connections are also provided.

The XT5000 Plus system supports eleven video resolutions including:

- The basic CIF format resolution of 352 x 288 pixels.
- wCIF (512 x 288).
- Optimal resolution w448p (768 x 448).
- High definition w720p (1280 x 720).
- High definition w1080p (1920 x 1080).

The achievable image resolution and frame rate are dependent not only on the call connection bandwidth but also on whether the “Video Quality Sharpness” is set to ON or OFF. OFF is the default setting that maximises frame rate at very low connection bandwidths.

Video Quality Sharpness	OFF		ON	
Connection Bandwidth	Resolution	Frame rate	Resolution	Frame rate
128 Kbit/s	416 x 240	25	624 x 352	15
384 Kbit/s	848 x 480	25	848 x 480	25
768 Kbit/s	1280 x 720	25	1280 x 720	25
1 Mbit/s	1280 x 720	50	1280 x 720	50
2 Mbit/s	1920 x 1080	50	1920 x 1080	50
3 Mbit/s	1920 x 1080	50	1920 x 1080	50
4 Mbit/s	1920 x 1080	50	1920 x 1080	50

6 Mbit/s	1920 x 1080	50	1920 x 1080	50

In addition to the traditional Picture in Picture (PIP) display format, the CODEC also supports Picture outside Picture (POP). This allows both near and far end images to be displayed side by side simultaneously on a single picture monitor.

Full screen of the Far- End image
Near- Image Picture in Picture (PIP)

Large Far- Image, small Near- Image
Picture outside Picture (POP)

Far and Near-Image, Side by Side (POP)

POP is particularly useful when a single large screen display device such as a plasma/LCD panel or video/data protector is used as it permits greater flexibility in the choice of image layout. In single monitor mode a maximum of two images may be displayed, it is thus not possible to view the near, far and presentation images simultaneously.

Image layout selection may be achieved via two methods; using the graphic on screen user interface or a combination of layout and PIP buttons on the remote control.

Selecting the OK button on the remote control accesses an on screen menu of user controls which allows selection of image layouts from the graphic menu.

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Graphic User Interface images

Alternatively the layout and PIP buttons on the remote control may be used, while this two button control provides flexibility in selection it could prove confusing to an occasional system user.

The “PIP” button on the remote control selects between the following layouts:

- Full screen of the far end image with near image PIP
- Near and far end images side by side POP
- Large far end image, small near image POP
- Full screen of the far end image

The “Layout” button swaps images around so for example it would toggle between

- Large far end image, small near image POP
- Large near end image, small far image POP

When H.329 dual images are either transmitted or received in single monitor display mode the “PIP” button can select these combinations:

- Full screen of the presentation image with far image PIP
- Presentation and far end images side by side POP
- Large presentation image, small far image POP
- Full screen of the presentation image

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In Dual monitor mode without Presentation material the monitors display:

	Not in a Call	In a Call
Main monitor	Near Image + Menu	Far Image + Menu
Second monitor	Near image	Near

When presentation material is transmitted or received the second monitor displays the presentation material and the main monitor normally carries the menu information. The “PIP” button then selects the following layouts for the main monitor:

- Full screen of the far end image with near image PIP
- Near and far end images side by side POP
- Large far end image, small near image POP
- Full screen of the far end image

The “Layout” button again swaps images around so for example it would toggle between

- Large far end image, small near image POP
- Large near end image, small far image POP

Some HD picture monitors have a tendency to crop images at the edges and lose information. The main video output of the XT5000 CODEC contains the on-screen menus which are vital to operate the CODEC, so to avoid problems an HDMI Over-scan control is provided within the set-up menu which adjusts the size of the display images to preserve all of the information. Presentation images from a PC may similarly be adjusted to avoid cropping.

The PTZ (Pan Tilt and Zoom) 1080p HD camera supplied has a native resolution of 1920 x 1080 pixels and horizontal viewing angles of 70 degrees.

Far end camera control (FECC) is supported.

CODEC inputs include the HDMI HD camera input and a separate DVI-I interface for PC connection which will automatically select to:

- Analogue RGB
- Digital

This input supports Extended Display Identification Data (EDID).

The HDMI and DVI inputs do not support High Definition Content Protection (HDCP).

Dual video coding H.239 is supported providing a second unidirectional video channel. Thus presentation material from a camera and material from a PC could be transmitted simultaneously and displayed on two monitors at the remote site.

When two XT5000 systems conferenced together over a 6 Mbit/s connection set to the UK location default settings it was possible to transmit two simultaneous high resolution images, the main camera channel at 1080p @50fps and the presentation channel at 1080p @60fps.

Within the “Admin” settings the Video Quality control may be set to Sharpness ON/OFF, this only affects conferences of 384 Kbit/s and below.

The table illustrates this:

	Main Channel Only		Main Plus Presentation Sharpness: No		Main Plus Presentation Sharpness: Yes	
Call Bandwidth	Sharpness: No	Sharpness: Yes	Main	Presentation	Main	Presentation
6Mbit/s	1920x1080 @50	1920x1080 @50	1920x1080 @50	1920x1080 @60	1920x1080 @50	1920x1080 @60
4Mbit/s	1920x1080 @50	1920x1080 @50	1920x1080 @50	1920x1080 @60	1920x1080 @50	1920x1080 @60
2Mbit/s	1920x1080 @50	1920x1080 @50	1280x720 @50	1920x1080 @30	1280x720 @50	1920x1080 @30
1Mbit/s	1280x720 @50	1280x720 @50	1280x720 @25	1920x1080 @30	1280x720 @25	1920x1080 @30
768 Kbit/s	1280x720 @25	1280x720 @25	848x480 @25	1920x1080 @30	848x480 @25	1920x1080 @30
384 Kbit/s	848x480 @25	848x480 @25	512x288 @25	1920x1080 @30	848x480 @25	1920x1080 @30
128 Kbit/s	416x240 @25	624x352 @15	416x240 @25	1920x1080 @30	416x240 @25	1920x1080 @30

The reported frame rates in the table above reflect ‘target’ frame rates, for example in a lower bandwidth connection with significant motion within the image the actual frame rate achieved was observed to be significantly lower than the reported target.

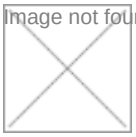
Several audio formats are supported by the XT5000 CODEC. Radvision has implemented the ITU standard G.719 audio protocol giving 20KHz analogue audio bandwidth requiring 64 Kbit/s of connection bandwidth.

PC audio input and stereo audio outputs are both available via industry standard 3.5mm mini jack connectors. The main HDMI output carries the digital stereo signals, optical digital audio input and output connections are also available via mini-TOSLINK adaptors

Encryption is provided at all connection speeds through Advanced Encryption Standard (AES) with a 128 bit session key.

SYSTEM OPERATION

The system may be operated locally from the infra-red remote control. The on-screen menus are logical and easy to follow. The system may also be configured and controlled via a web browser interface from a network connected PC. For security this remote web connection is password protected. The CODEC may also be interfaced to a room control system via an IP network connection.



The remote control includes a comprehensive selection of single operation control buttons. As the same remote control is also used on the companies XT1000 CODEC the four multifunction colour coded buttons are redundant on the XT5000.

The CODEC remote control includes a single start/finish presentation source button:

- Pressing this button for a short period selects the PC presentation source and opens an H.239 connection
- Pressing the button again for a short period closes the H.239 connection

An H.239 connection is initiated and terminated on the remote control via the on-screen graphical interface. The main camera occupies one channel and the source connected to the DVI-I input the second channel, normally a PC. At the remote site these two images may either be viewed on two separate monitors or using POP displayed on a single screen. The DVI-I input may also be switched to transmit on the main channel if H.239 is not in use.

Alternatively several user controls are available during a call from the graphic user interface; this is accessed by pressing the OK button on the remote control.

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Graphic User Interface

The system takes a significant period to boot up from cold (~70 seconds), on screen graphics provide useful user feedback that the system is booting up. When not in a call the system automatically goes into sleep mode after a user-definable period of time, it can also be put into standby mode via the remote control. An incoming call or a remote control button press will return the system to active mode.

The Statistics menu displays call status data including connection speed, compression protocols and packet loss.

The system may also be configured, controlled and monitored via a password protected web browser from a network connected PC. This facility provided control and monitoring facilities including an online version of the system remote control. Snapshot images of the local video at the CODEC are also provided and the user may select the image size and refresh rate of this image, this web video image of the local camera is however only available when the system is not in a call. Video snapshots of the far end video are not available.

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The XT5000 proprietary microphone pod includes three microphones to guarantee 360 degree coverage, audio beam forming is used to steer the overall microphone pod pickup in the direction of the speaker. The pod includes a mute button; this button is illuminated red when muted. The mute button inhibits all audio transmission to the remote site, including PC audio. A second microphone may also be connected to the CODEC via a daisy chain connection to the first microphone pod.

Optional MCU

An optional four or nine site MCU supports up to three or eight remote sites plus the host XT5000 MCU CODEC. The maximum combined conference bandwidth is 12 Mbit/s.

Controlling an MCU conference is a simple procedure:

1. Select the “Make a Call” button during a call.

2. Enter the number of the additional site into the call menu or select the site from the directory or the recent call list.

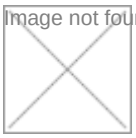
3. Press the “OK” or “Make a Call” button.

4. The additional site will then be connected to the conference.

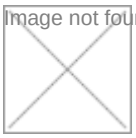
Individual or all connections may be disconnected using the graphic interface.

All sites receive a continuous presence split screen display with the local MCU CODEC controlling several layout options. For example:

- Remote sites equal size
- Large voice switched current speaker image with small images of other sites



When presentation material is transmitted or received the available layouts include:



In dual monitor mode the Presentation material is displayed on the second monitor.

VIDEO TESTS SUMMARY

The video quality experienced between XT5000 systems at 1080p 50fps was excellent; the high resolution images and the superb motion rendition at 1080p 50fps were impressive. The ability to transmit two simultaneous channels of high resolution, high frame rate images is a welcome development.

The Radvision camera had some shortcomings. Dark areas of the image lacked contrast and appeared grey rather than black. When compared to other vendors cameras the image also appeared slightly soft. Tests using material from a PC or other HDMI cameras connected to the main camera input indicated that these issues were related to the Radvision camera and not to the CODEC or monitor performance. For connections exceeding 2Mbit/s the video was of a high quality, even fast moving movie trailer material that normally challenges conference links to the limit were almost artefact free.

At lower connection speeds on standard videoconference material the video quality was also very good. The detailed video test scores below confirm the products excellent performance across the board.

F: AUDIO TESTS SUMMARY

Setup The echo canceller is fully automatic in operation. The quality of echo cancellation and doubletalk from the system was excellent.

Audio levels adequate? (Yes/no)	Not tested	Yes
Audio quality acceptable? (Yes/no)	Not tested	Yes
Echo cancellation acceptable? (Yes/no)	Not tested	Yes
Quality of double talk	Not tested	Excellent

G: DATA TESTS

A PC may be directly connected to the XT5000 CODEC via the DVI-I interface.

H: CONNECTIVITY

H.323

There were no problems connecting between the Radvision XT5000 units.

Time to Connect with encryption On

H.323

All speeds	5 seconds

During an H.323 call the network connection was removed and reconnected after a specific time.

5 Seconds	Picture froze –successful reconnection, call does not terminate
15 Seconds	Picture froze –successful reconnection, call does not terminate
30 Seconds	Picture froze - call then terminates on network reconnection

Connectivity with Other Machines (models listed with comments)

H.323

Successful connections were made in each direction with the following CODECs, where the

systems supported H.239 presentation material was also shared.

Small incompatibilities between different manufactures CODECS is the norm but during these tests the XT5000 was error free.

CODEC	**Call Bandwidth**	**Resolution Transmitted by the XT5000**	**Resolution Received by the XT5000**
Polycom® VSX7000 S/W 9.0.5.1	2 Mbit/s	H263 CIF (352 x 288)	H263 CIF (352 x 288)
Polycom HDX 9002 S/W 2.6.0	2 Mbit/s	w720p @ 25	w720p @ 25
Tandberg 6000 MXP S/W F9.0 PAL	4 Mbit/s	W448p (768 x 448) @ 26	w720p @ 30
Cisco SX20 S/W TC5.1.4	6 Mbit/s	w1080p @ 50	w720p @ 60
Cisco C40 (MLVC) S/W TC5.1.1 (No Premium Res)	6 Mbit/s	w720p @ 25	w720p @ 30
Cisco C60 (Prem Res) S/W TC4.2.1	6 Mbit/s	w1080p @ 25	w720p @ 60

Connectivity with JANET Videoconferencing Service			
Cisco C90 (Prem Res) S/W TC4.2.1	6 Mbit/s	w1080p @ 25	w1080p @ 30
Lifesize Express 220 S/W 4.9.00	4 Mbit/s	w720p @ 30	w720p @ 50
Lifesize Team S/W 4.7.10	4 Mbit/s	w720p @ 25	w720p @ 30
Lifesize Room 200 S/W 4.7.10	6 Mbit/s	w720p @ 50	w720p @ 30

H.323

The XT5000 system connected successfully to the Janet Codian MCU negotiating H.264 video at 720p resolution with corresponding audio coding of AAC-LD 64Kb/s receive and G.722.1 48Kb/s transmit. H.239 content was also successfully shared via the MCU. The received audio level was measured as peaking to -5dBm.

Procedure for making a call

1. Press the “Make a Call” button on the remote control
2. Input IP address
3. Press the “Make a Call” button

Or use the local contacts directory available from the user interface Phone Book or the Recent Calls lists.