APPENDIX 11/3

TEST RESULTS FOR AVerComm H300

Manufacturer:	**AVerMedia**
Model:	**AVerComm H300**
Software Version:	**D1.00.02.14**
Optional Features and Modifications:	**None**
Date of Test:	**26th – 30th September 2011**

CODEC Front view

CODEC Rear view

HD Camera

Remote Control

Table Hub

Desk Microphone

CO N T E N T S **Page No.**

A: INTRODUCTION

The AVerComm H300 system is a high definition (HD) IP videoconferencing solution capable of conferencing up to a maximum picture resolution of 1280x720 pixels (720p) at a maximum connection speed of 4 Mbit/s. Compatibility with other H.323 CODECS is achieved across a range of resolutions from SIF (352x240) to 1280x720 pixels. The quality of the conference is dependent upon the capability of the remote CODEC and the connection speed. The system includes a high definition (HD) camera, and a Table Hub that contains the microphone, a loudspeaker, laptop connectivity and a connection for a second monitor/display device. A four site onboard Multipoint Conference Unit (MCU) is included and a memory stick interface to permit conference recordings. A more basic unit the AVerComm H100 provides a similar specification but without the MCU and conference recording facilities.

Feature Summary:

- A compact high definition videoconferencing system which supports several resolutions up to 720p (1280x720).
- Operating at connection speeds up to 4 Mbit/s over H.323.
- H.261, H.263, H.263+, and H.264 video coding.
- G.711, G.722, G.722.1, G.728 audio coding
- Separate high definition pan and tilt camera.
- VGA, composite and Y/C outputs for the main viewing monitor
- Table Hub including microphone, loudspeaker, laptop input and second monitor VGA output
- Auxiliary composite and Y/C video inputs.
- Analogue audio input for connection of DVD/VCR audio.
- Far-end camera control.
- H.239 second video channel up to XGA resolution in point to point and Multisite calls. Only the VGA input or a grabbed video still image may be shared on the H.239 channel.
- AES Encryption
- Conference recording to USB memory stick.
- Four site internal H.323 MCU supporting Continuous Presence only.

B: SETUP PROCEDURE

Setting up the AVerComm H300 system was straightforward. The CODEC unit may be conveniently mounted on a shelf in an under-monitor cabinet. A rack mounting kit is not available. The HD camera may be positioned either on top or below a picture monitor. The Table Hub unit, infrared remote control and external power supply completed the basic package.

Setup included:

- Connecting the supplied VGA leads between the CODEC and the high definition monitors.
- Connecting the 26 pin-D-sub cable between the CODEC and the camera.
- Connecting the 26 pin-D-sub cable between the CODEC and the table hub.
- Connecting the supplied cable between the microphone and the table hub.

- Establishing an Ethernet IP network connection through the single RJ45-RJ45 cable.
- Connecting power to the CODEC from the external power supply.

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

Approximate set-up time: 20 Minutes

Documentation quality: Quick Setup cards for hardware and network were supplied together with more detailed documentation on a CDROM and on the web. The CDROM also contained the AVerComm VCplayer application. All instructions were concise and easy to follow.

C: HARDWARE DESCRIPTION

General

This IP-only CODEC with one 10/100Mbps auto switching Ethernet port delivered a maximum image resolution of 720p with a maximum connection bandwidth of 4Mbit/s. The CODEC supports single and dual monitors via VGA, composite and Y/C video outputs. Both input and output analogue audio connections are provided. The system includes a four site continuous presence MCU and the facility to record the conference to a memory stick.

The AVerComm H300 system supports multiple video resolutions including:

- The basic CIF format resolution of 352x288 pixels
- SIF at 352 x 240
- 4CIF at 704 x 576
- 4SIF at 704 x 480
- High definition (HD) w720p 1280 x 720

The call connection bandwidth determines the upper image resolution. In calls between two AVerComm H300 systems the negotiated resolution is indicated in the table below. The audio protocol at all speeds was G.722.1C

Connection Bandwidth	Resolution
128 Kbit/s	SIF
384 Kbit/s	4SIF
768 Kbit/s	4SIF
1 Mbit/s	720p
2 Mbit/s	720p
4 Mbit/s	720p

Single or dual picture monitors may be used with the CODEC: A choice of VGA, composite or Y/C video outputs are provided for the main output, but only VGA for the second monitor. As the main output has a limiting resolution 1024x768 (XGA) care must be taken in selecting display monitors; as the normal 1280 x 720 wide screen aspect ratio has to cope with the CODEC's reduced 1024 x 768 pixels signal output. Therefore the monitor will be required to stretch the input signal to fit the widescreen format.

The main audio output signal is provided on the Table Hub loudspeaker, an additional analogue audio output is also provided on the rear of the CODEC.

System control is achieved through the infra red remote together with the on-screen menus that are included on the main video output.

Main Menu Not in a Call

Both Picture in Picture (PIP) and Picture outside Picture (POP) display formats are offered which allows both near and far end images to be displayed simultaneously on a single picture monitor or projector. The PIP image which is displayed following a change in image layout disappears after four seconds. There is no option to retain the PIP or to turn it on/off.

Side by Side Near and Far Images, Picture outside Picture (POP)

Image Aspect Ratios In Multi Image Layouts.

When the layout button is used to display multi images, POP images are displayed with a 4x3 aspect ratio, this causes an inconsistency between the local and remote display images. For the local 16x9 camera image, additional areas are added to the top and bottom of the picture, but for the transmitted (i.e. received at the remote site) 16x9 image, the left and right hand portions of the image are cropped to fit the 4x3 aspect ratio. This can cause problems as the local and transmitted images are different resulting in possible misalignment and cropping of the received image.

Single Monitor Mode with 16x9 Monitor Settings

Transmitted Camera Image	Camera Image Viewed Locally
	

In single monitor mode the "layout-button" on the remote control or the Table Hub cycles between several screen display layouts.

With the main camera only being transmitted there are 4 screen display layout options:

- Large far end image plus small near end image
- Side by side near and far end images
- Large near end image plus small far end image
- Full screen far end image plus PIP* of near end image

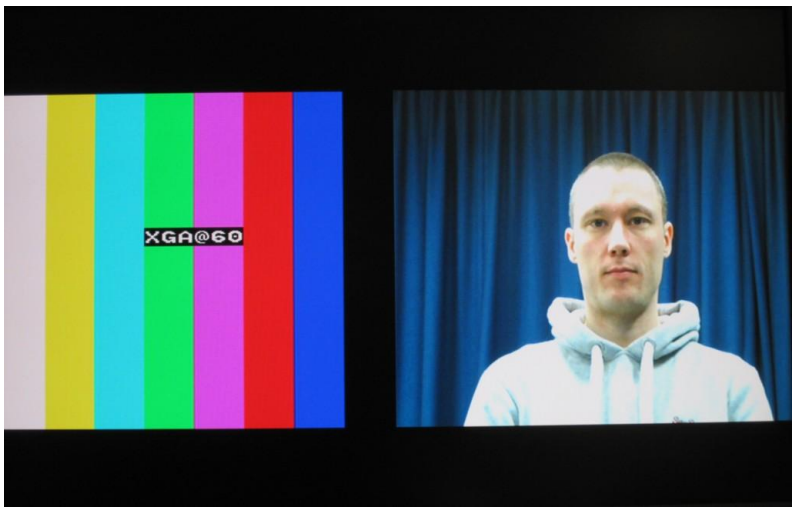
*The PIP disappears after four seconds.

When an H.329 presentation image together with the main camera image are either transmitted or received in single display mode, six screen display layout options are available:

- Large presentation image plus small near and far end images
- Large far end image plus small presentation and near end images
- Large near end image plus small presentation and far end images
- Presentation image full screen plus near end image as a PIP*
- Far end image full screen plus near end image as PIP*
- Presentation and far end images side by side and near end image as a PIP*

*The PIP disappears after four seconds.

Large Presentation Image, Small Far and Near Images



Side by Side Presentation and Far Images

In dual monitor mode, to maintain the correct aspect ratio display for presentation material the second monitor must have an aspect ratio of 4x3. This causes the (16 x 9) local image displayed on the second monitor to appear as 4x3 (with the top and bottom additions) but as these additional areas are not transmitted to the remote site i.e. the local image presented to the user is different from that transmitted to the far end, there is a strong possibility that the user will misalign the image from their local camera.
The dual monitors display the following images:

	Main Monitor	Second Monitor
Not in a call	Near image + menu	Source connected to the VGA input
In a call with no presentation material	Far image + menu	Near Image
In a call with presentation material transmitted or received	Layout options +menu	Presentation material

Layout Options

- Large presentation image plus small near and far end images
- Presentation image full screen plus near end image as PIP*
- Side by side presentation and far end images plus near end image as PIP*
- Large far end image plus small presentation and near end images
- Large near end image plus small presentation and far end images
- Far end image full screen plus near end image as PIP*

*The PIP disappears after four seconds.

The HD camera features pan, tilt and zoom functions and a rather restricted 62 degree field of view which is not as wide as that available on most other conferencing systems. Ten camera preset positions may be recalled from the remote control. A two metre multi-core cable connects the camera to the CODEC. The camera menu includes a range of automatic (auto) and manual settings for exposure, white balance and anti-flicker. When set to auto, the camera white balance could be inaccurate depending on image content. Optimum results were obtained by setting the white balance manually to match the room lighting. Camera focus and exposure settings could also be rather slow to respond. An auxiliary composite or Y/C connection is provided for a second standard definition camera, document camera or a VCR/DVD player.

The CODEC supports remote camera control but not remote video source selection.

A PC may be interfaced directly to the system via the VGA connector on the rear of the Table Hub unit, the following resolutions are supported:

VGA
640 x 480
800 x 600
1024 x 768
1280 x 1024

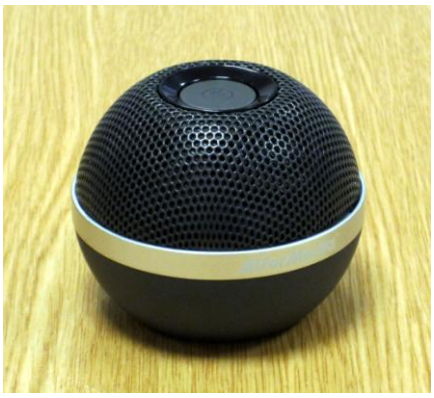
The maximum transmitted resolution over a conferencing link is XGA and while the system will accept wide screen PC formats they will be transmitted at best as a 4x3, XGA signal.

H.239 provides a second unidirectional video channel during H.323 calls, but without a second audio channel. Thus the main camera video and a second vision source connected to the VGA input may be transmitted simultaneously and displayed on two monitors at the remote site.

While the VGA input may be transmitted on either the main or H.239 channels the composite or Y/C (S-video) signals may only be transmitted on the main channel.

Several audio formats are supported by the CODEC, including G.711, G.722 and G.728. The Table Hub acts as the microphone and loudspeaker during a conference and also includes the VGA input for a laptop or PC connection.

Table Hub



Microphone

The Table Hub radiates far end sound through its internal loudspeaker, and the silver dish in the centre of the Table Hub may be used to store the microphone.
To avoid echoes during a conference the microphone must not be operated on the dish but be moved some distance from the hub. An illuminated microphone mute button is built into the microphone. Controls for quick presentation start, display layouts and volume are conveniently located on the Table Hub.

Standard VCRs/DVDs can connect via the auxiliary line inputs, but this auxiliary audio input is inhibited when the main camera is selected as the main channel vision source. This means that a presentation from a PC including sound can only transmit sound when the VGA input is selected on the main channel. If the VGA input is selected on the H.239 channel, no PC source audio can be transmitted.

The MCU offers up to four-site H.323 multipoint conferences (the host AVerComm H300 system plus three remote sites). The speed of each site connection is dependent on the number of sites in the MCU conference and the connection bandwidth. Only continuous presence split screen is supported.

Conference recording

Conferences may be conveniently recorded to a USB memory stick connected to the CODEC front panel, recordings being initiated and controlled via the remote control. Recordings may be played back on the AVerComm H300 system or by using a separate PC running the AVerComm VCplayer application.

During a recording the conference is automatically downgraded to 4CIF at 4*3 resolution.

The recording uses approximately 30MB of storage per minute and is stored in a proprietary file format. The quality of replay from the AVerComm H300 system and the AVerComm VCplayer was very good. During playback from either the CODEC or PC application full layout control is available. The VCplayer also provides the facility to convert a choice of layouts into a .mov file for editing and web distribution, it also removes the interactive layout selection facility.

The images below demonstrate the same conference recording being replayed with different screen layouts selected

Screenshot reproduced by permission of AverMedia

D: SYSTEM OPERATION

The system is controlled locally from the infra red remote control. Dedicated user buttons include: Call, Hang up, Microphone mute, Near/Far camera, Display layout, Volume, Zoom, Input select, Record, Snapshot and Present. Rather unusually it also includes user control buttons for 4x3/16x9 monitor aspect ratio and Single/Dual monitor select, both of which would normally be set up through an administrator menu.

When the system is powered off on restart it defaults to single monitor mode. The camera has up to 10 preset positions which are stored and recalled via the remote control.

AVerComm H300 Remote Control

The system takes 75 seconds to boot up from cold. When not in a call the system may be set to auto power off after a user-definable period of 30 minutes, 1,2,3,4 hours or never. The system appears to go into sleep (standby) mode after a period but this is not documented, pressing a button on the remote control returned the system to live operation.

The Statistics menu displays call status data including resolution, connection speed, compression protocols, packet loss and frame rate for the main video and H.239 channels.

An H.239 connection is initiated by selecting “Present” on the remote control or "Quick presentation" on the Table Hub and using the on-screen graphical interface to select the presentation source from:

1. The VGA input
2. A snapshot grabbed from the camera or the auxiliary video inputs

Live video may not be shared on the H.239 channel.

Controlling an MCU conference is a simple procedure:

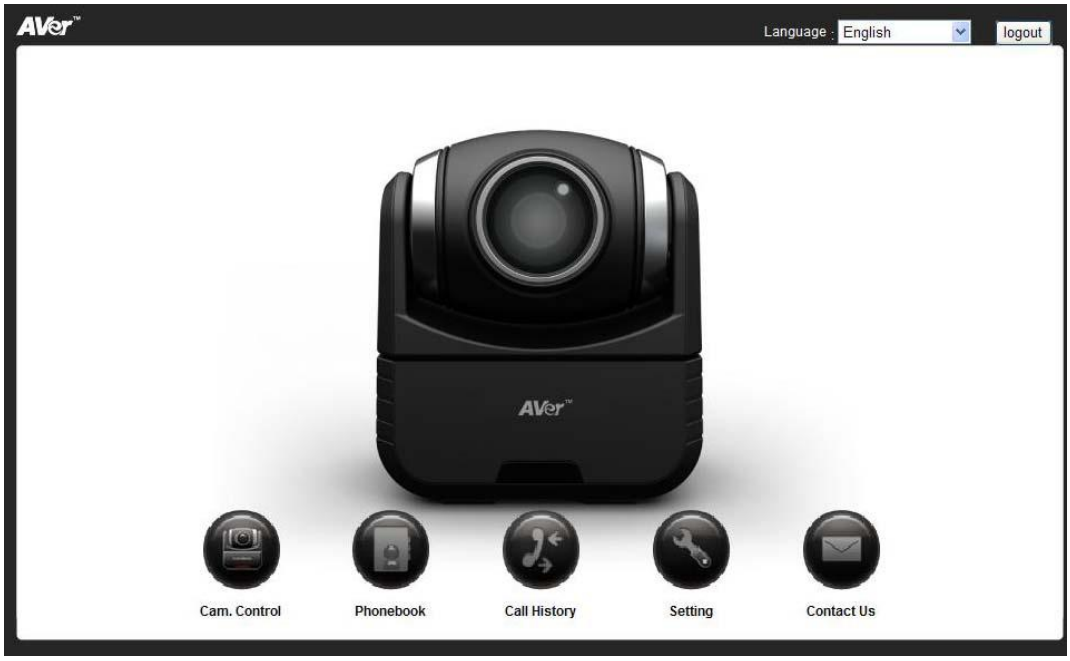
1. Select the “Call” button during a conference
2. Enter the number of the additional site into the call menu or select the site from the Directory or the Call History list.
3. The additional site will then be connected to the conference.

Individual calls or all connections may be disconnected through the graphic interface.

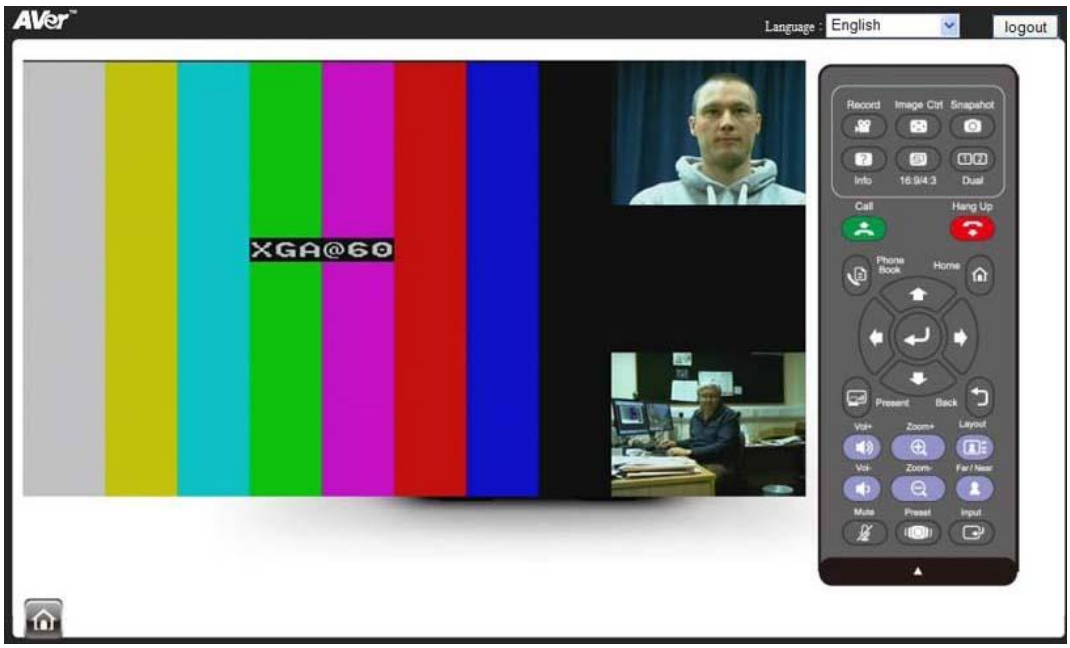
The MCU operates in continuous presence mode only and H.239 is supported during MCU conferences.

Limited configuration is available via WebTool, a web browser with password protection, including: updating the Phone Book, viewing Call History, updating system software and backing up system settings. WebTool also enables remote monitoring of conferences by providing low frame rate web snapshots of the main monitor images.

WebTool Screen Shots

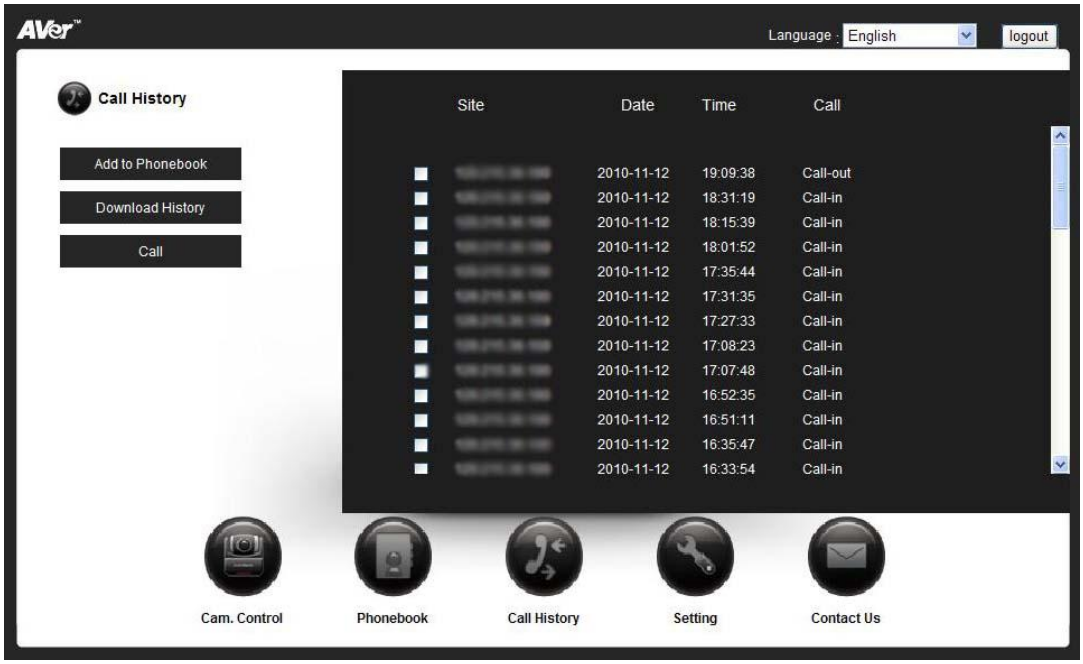


WebTool Main Menu



Camera Control

Phonebook



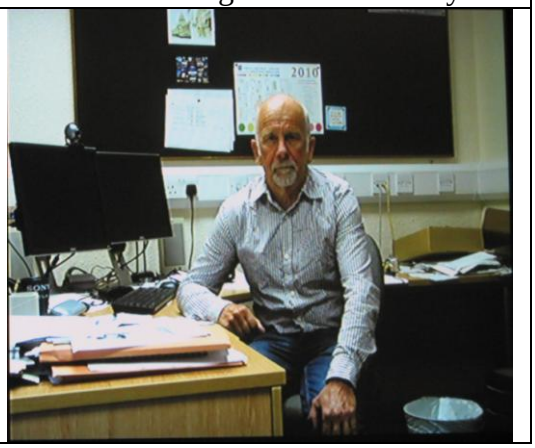
Call History

Screenshots reproduced by permission of AverMedia

E: VIDEO TESTS SUMMARY

The overall quality of the video was limited by camera performance. Adjustments to focus, exposure and white balance were all at times slow to operate and the auto white balance was very dependent on image content. Optimum results were obtained by manually setting the white balance to match the room lighting. The wide angle range of 62 degrees restricted the field of view when compared to the normal 72 degree coverage of most other conference camera lenses.

The inconsistency between local and transmitted images could cause problems as shown in the images below: With multi layout screens and dual monitor displays a 4x3 image of the local camera is displayed with additional image content at the top and bottom of the image as seen on the right, whereas the 16x9 transmitted image on the left crops this additional image content top and bottom. Thus a camera adjusted locally for an acceptable amount of headroom is very likely to have the heads chopped off at the remote site.

Transmitted Camera Image	Camera Image Viewed Locally
	

The accuracy of lip synchronisation was very variable. During the evaluation, synchronisation errors between the picture and its corresponding sound could be displaced by as much as one second - the sound always arriving before the vision. We attempted to trace the source of this problem but due to its inconsistent nature no detailed conclusions could be drawn.

F: AUDIO TESTS SUMMARY

Setup The echo canceller is fully automatic in operation.

	Lecture Theatre	Room
Audio levels adequate? (Yes/No)	Not tested	Y
Audio quality acceptable? (Yes/No)	Not tested	Y
Echo cancellation acceptable? (Yes/No)	Not tested	Y
Quality of double talk	Not tested	Very Good

Comments: The quality of echo cancellation and doubletalk was very good but the lip synchronisation was at times very poor. This problem occurred between AVerComm H300 systems, in calls with other vendor's CODECs and at all connection speeds. The delay varied during a single call and between different calls so was always a problem.

G: DATA TESTS

A PC may be directly connected to the CODEC via the VGA interface and may be transmitted on either the main channel or the H.239 channel. Audio from a PC may only be transmitted when the PC is selected on the main channel.

H: CONNECTIVITY

Connectivity between Like Machines

H.323

There were no problems connecting between the AVerComm H300 units over IP.

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
20 Seconds	Picture froze - successful reconnection, call does not terminate
30 Seconds	Picture froze - successful reconnection, call then terminates after 3-4 seconds

Time to Connect

H.323 12 Seconds

Connectivity with Other Machines (models listed with comments)

H.323

Successful connections were made in each direction with the following CODECs, where the system supported H.239 presentation material was also shared.

CODEC	**Call Bandwidth**	**Resolution Transmitted by the AVerComm H300**	**Resolution Received by the AVerComm H300**
Polycom® VSX7000 S/W 9.0.5.1	2 Mbit/s	4CIF 15fps	CIF
Polycom® PVX S/W 8.0	2 Mbit/s	704 x 480	QVGA
Polycom HDX 9002 S/W 2.6.0	4 Mbit/s	w720p	w720p
Tandberg Edge 95 S/W F9.0.2 PAL	2 Mbit/s	w720p 10-11 fps	w720p
Tandberg 6000 MXP S/W F9.0 PAL	4 Mbit/s	w720p 8-9 fps	w720p
Tandberg C40 S/W TC4.0.1	4 Mbit/s	w720p	w720p
Tandberg C60 S/W TC3.1.1	2 Mbit/s	w720p	w720p
Tandberg C90 S/W TC4.1.2	4 Mbit/s	w720p	w720p
Lifesize Team S/W 4.7.10	2 Mbit/s	w720p	w720p
Lifesize Room 200 S/W 4.7.10	4 Mbit/s	w720p	w720p

During connections between the AVerComm H300 and the Tandberg Edge 95 and 6000MXP CODECs The diagnostics reported low frame rate being transmitted from the H300 however the image quality did not appear to reflect this reduction in frame rate, suggesting a reporting error.

Resolution in pixels and their common designation:

- 1280 x 720 720p
- 704 x 576 4CIF
- 352 x 288 CIF
- 320 x 240 QVGA
- 176 x 144 QCIF

Connectivity with JANET Videoconferencing Switching Service (JVCSS)

H.323

The CODEC connected successfully to the JVCS Codian MSE 8510 HD MCU negotiating H.264 Video, 720p resolution with G.722 audio transmitted to the MCU and G.722.1C audio received from the MCU.

The received audio level was measured as peaking to -4dBm.

MCU Software Version 4.1 (1.51) and Build 6.16 (1.51)

Procedure for making a call

1. Press Call button on the remote control
2. Select connection speed/quality (the system defaults to auto)
3. Input IP address or E.164 number
4. Press the OK button

Or use the Local Contacts directory available from the user interface. An extensive recent calls list is also available.

Appendix 1 Detailed Physical Information

CODEC

Dimensions: (w x h x d) 32 x 26 x 2.7 cm

Video Inputs	Type	Connector
Main HD camera	Digital	26 Pin D-sub
Auxiliary Video	Y/C	4 pin mini DIN
Auxiliary Video	Composite	RCA Phono

Video Outputs	Type	Connector
Main monitor	VGA	9 Pin D-type
Main monitor	Y/C	4 pin mini DIN
Main monitor	Composite	RCA Phono

Audio Inputs	Level	Connector
Auxiliary or VCR/DVD stereo	Line	Mini jack

Audio Outputs	Level	Connector
Main audio left and right	Line	Mini jack

Table Hub	Level	Connector
Audio and VGA		26 Pin D-sub

TABLE HUB

Dimensions: (w x h x d) 20 x 18 x 6.5 cm

Video Inputs	Type	Connector
PC or Laptop	VGA	9 Pin D-type

Video Outputs	Type	Connector
Dual monitor	VGA	9 Pin D-type

Audio Input	Level	Connector
Microphone	Microphone	26 Pin D-sub

CODEC	Level	Connector
Audio and VGA	Direct connection	26 Pin D-sub

Data

1. 1 off LAN 10/100 Mbits/s Ethernet connection (RJ45)
2. 1 off USB slot for recording media

Cables Supplied

1. 1 off 2 metre, 26 Pin D-sub camera cable
2. 2 off 2 metre, VGA-VGA monitor cable
3. 1 off 3 metre, RCA-RCA cable
4. 1 off 3 metre, Y/C-Y/C cable
5. 1 off 2 metre Mini jack – 2 RCA
6. 1 off 5 metre 26 Pin D-sub Table Hub cable
7. 1 off 2 metre RJ45-RJ45 network cable
8. 1 off 3 metre, microphone cable
9. 1 off IEC power cord

Mobility

The AVerComm H300 system is portable, lightweight and can be moved easily. To establish a connection each new location will need the local network information re-entered into the configuration menu.

Appendix 2 Detailed Video Tests

For the following tests the video resolution was:

Connection Speed	Resolution H.261	Resolution H.263	Resolution H.264
384 Kbit/s	CIF	4CIF	704x480
768 Kbit/s	CIF	4CIF	704x480
2 Mbit/s	CIF	4CIF	1280x720
4 Mbit/s	----	4CIF	1280x720

The corresponding audio standard was G.722.1C

Objective Video Tests: Signal measurements
1. 75% EBU bars
2. Grey scale

Subjective Video Impairments Tested:

Lip synchronisation	**LS**
Block distortion (tiling)	**BLK**
Blurring (reduced edge sharpness and spatial detail)	**BLR**
Colour errors	**CLR**
Jerkiness (distortion of smooth motion)	**JRK**
Object persistence	**OP**
(lagging images from previous frames as faded or outline images)	
Scene cut response (i.e. time to build up the new image)	**SCR**

Scale of impairments:

Imperceptible	**1**
Perceptible	**2**
Slightly annoying	**3**
Annoying	**4**
Very annoying	**5**

Test Tape:

Signals recorded	Time on tape
1. EBU colour bars	1min 30secs
2. Grey scale	1.40 - 2.40
3. Blue field	2.50 - 3.50
4. Medium close up female face, still	4.00 - 5.00
5. Medium close up female face, talking	5.10 - 6.10
6. Close up face, nodding	6.20 - 7.20
7. Close up face, shaking head side to side	7.30 - 8.30
8. Zoom out slowly to wide angle three people	8.40 - 9.40
9. Zoom in quickly to close up of centre person	9.50 - 10.50
10.Turntable speeds: 1,2,3 and 4	11.00 - 15.30
11.Football sequence	15.40 - 16.40
12.Zoom in and out of "A to Z" map	16.50 - 17.50
13.Text legibility, font sizes 20 to 12 pt	20.30 - 20.50

14.Cut tests, scenes various with camera movements 21.00 - 22.00
15.Man teaching at whiteboard 22.10 - 23.23

Test 1a (H261): Colour bar test
(Insert 75% EBU bars at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	1	1	1
BLR	2	2	2
CLR	1	1	1

Test 1b (H263): Colour bar test
(Insert 75% EBU bars at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	1	1	1	1
BLR	2	2	1	1
CLR	1	1	1	1

Test 1c (H264): Colour bar test
(Insert 75% EBU bars at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	1	1	1	1
BLR	2	2	1	1
CLR	1	1	1	1

Test 2a (H.261): Grey scale
(Insert grey scale at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	2	2	2
BLR	2	2	2
CLR	1	1	1

Test 2b (H.263): Grey scale
(Insert grey scale at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	2	2	2	2
BLR	2	2	2	1
CLR	1	1	1	1

Test 2c (H.264): Grey scale
(Insert grey scale at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	2	2	2	1
BLR	2	2	1	1
CLR	1	1	1	1

Test 3a (H.261): Blue screen
(Insert blue screen at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	2	2	2
CLR	1	1	1

Test 3b (H.263): Blue screen
(Insert blue screen at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	2	1	1	1
CLR	1	1	1	1

Test 3c (H.264): Blue screen
(Insert blue screen at local site, measure at remote site)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	1	1	1	1
CLR	1	1	1	1

Test 4a (H.261): Medium close up female (still)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	3	2	2
BLR	2	2	2
CLR	1	1	1

Test 4b (H.263): Medium close up female (still)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	2	1
BLR	2	2	2	2
CLR	1	1	1	1

Test 4c (H.264): Medium close up female (still)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	2	2	1	1
BLR	2	2	2	1
CLR	1	1	1	1

Test 5a (H.261): Medium close up female (talking)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
LS	5	5	5
BLK	4	3	2
BLR	3	3	2
CLR	1	1	1
JRK	2	2	1

Test 5b (H.263): Medium close up female (talking)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
LS	4	4	5	5
BLK	3	2	1	1
BLR	2	2	2	1
CLR	1	1	1	1
JRK	1	1	1	1

Test 5c (H.264): Medium close up female (talking)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
LS	4	2	2	2
BLK	3	2	1	1
BLR	2	2	2	1
CLR	1	1	1	1
JRK	1	1	1	1

Test 6a (H.261): Close up head (nodding)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	2	2
BLR	3	2	2
CLR	1	1	1
JRK	2	1	1

Test 6b (H.263): Close up head (nodding)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	2	2	2	2
CLR	1	1	1	1
JRK	1	1	1	1

Test 6c (H.264): Close up head (nodding)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	2	2	1	1
CLR	1	1	1	1
JRK	1	1	1	1

Test 7a (H.261): Close up head (shaking side to side)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	3	2
BLR	3	3	2
CLR	1	1	1
JRK	2	1	1

Test 7b (H.263): Close up head (shaking side to side)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	1
BLR	3	2	2	2
CLR	1	1	1	1
JRK	1	1	1	1

Test 7c (H.264): Close up head (shaking side to side)

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	1
BLR	3	2	2	2
CLR	1	1	1	1
JRK	1	1	1	1

Test 8a (H.261): Medium close up, slow zoom out to three shot

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	3	2
BLR	3	3	2
CLR	1	1	1
JRK	3	2	2

Test 8b (H.263): Medium close up, slow zoom out to three shot

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	2	1
BLR	3	2	2	2
CLR	1	1	1	1
JRK	3	2	2	2

Test 8c (H.264): Medium close up, slow zoom out to three shot

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	3	2	2	1
CLR	1	1	1	1
JRK	3	2	2	2

Test 9a (H.261): Three shot, quick zoom in to medium close up centre person

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	3	2
BLR	3	3	2
CLR	1	1	1
JRK	2	2	2

Test 9b (H.263): Three shot, quick zoom in to medium close up centre person

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	3	3	2	2
CLR	1	1	1	1
JRK	2	2	2	2

Test 9c (H.264): Three shot, quick zoom in to medium close up centre person

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	2	1
BLR	3	2	2	2
CLR	1	1	1	1
JRK	2	2	2	2

Test 10a (H.261): Turntable speed 1

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	3	3	1
BLR	2	1	1
CLR	2	2	1
JRK	2	2	2

Test 10b (H.263): Turntable speed 1

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	1	1	1	1
CLR	2	1	1	1
JRK	2	2	2	2

Test 10c (H.264): Turntable speed 1

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	2	2	1	1
BLR	1	1	1	1
CLR	2	1	1	1
JRK	2	2	2	2

Test 10d (H.261): Turntable speed 2

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	3	1
BLR	3	1	1
CLR	2	2	1
JRK	3	2	2

Test 10e (H.263): Turntable speed 2

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	1	1	1	1
CLR	2	1	1	1
JRK	3	2	2	2

Test 10f (H.264): Turntable speed 2

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	1	1
BLR	1	1	1	1
CLR	2	1	1	1
JRK	3	2	2	3

Test 10g (H.261): Turntable speed 3

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	4	3	2
BLR	3	2	2
CLR	2	2	1
JRK	4	3	3

Test 10h (H.263): Turntable speed 3

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	1
BLR	2	2	2	2
CLR	2	1	1	1
JRK	3	2	2	2

Test 10i (H.264): Turntable speed 3

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	2
BLR	2	2	2	2
CLR	2	1	1	1
JRK	4	2	3	3

Test 10j (H.261): Turntable speed 4

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	5	4	2
BLR	4	3	3
CLR	2	2	1
JRK	4	3	3

Test 10k (H.263): Turntable speed 4

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	5	3	2	2
BLR	4	3	3	3
CLR	2	1	1	1
JRK	3	2	2	2

Test 10l (H.264): Turntable speed 4

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	2
BLR	4	3	3	2
CLR	2	1	1	1
JRK	4	2	3	3

Test 11a (H.261): Football sequence

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	5	4	2
BLR	4	4	3
CLR	2	2	2
JRK	3	2	1

Test 11b (H.263): Football sequence

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	5	4	2	2
BLR	4	3	2	2
CLR	2	2	2	2
JRK	2	2	2	2

Test 11c (H.264): Football sequence

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	2
BLR	4	3	2	2
CLR	2	2	2	2
JRK	2	2	2	2

Test 12a (H.261): Zoom in and zoom out of ‘A to Z’ map

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	5	4	2
BLR	5	5	4
CLR	1	1	1
JRK	5	4	4

Test 12b (H.263): Zoom in and zoom out of 'A to Z' map

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	2
BLR	5	3	3	2
CLR	1	1	1	1
JRK	4	4	4	3

Test 12c (H.264): Zoom in and zoom out of 'A to Z' map

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	3	2	2	2
BLR	3	3	3	2
CLR	1	1	1	1
JRK	4	3	3	3

Test 13a (H.261): Text legibility (% of screen height) at viewing distance approx. 5x screen diagonal

Legibility H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
20 pt (3.5%)	Yes	Yes	Yes
16 pt (3%)	Yes	Yes	Yes
14 pt (2.5%)	No	No	No
12 pt (2.3%)	No	No	No

Test 13b (H.263): Text legibility (% of screen height) at viewing distance approx. 5x screen diagonal

Legibility H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
20 pt (3.5%)	Yes	Yes	Yes	Yes
16 pt (3%)	Yes	Yes	Yes	Yes
14 pt (2.5%)	No	No	Yes	Yes
12 pt (2.3%)	No	No	No	No

Test 13c (H.264): Text legibility (% of screen height) at viewing distance approx. 5x screen diagonal

Legibility H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
20 pt (3.5%)	Yes	Yes	Yes	Yes
16 pt (3%)	Yes	Yes	Yes	Yes
14 pt (2.5%)	Yes	Yes	Yes	Yes
12 pt (2.3%)	No	No	No	No

Test 14a (H.261): Video with several vision cuts

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
BLK	5	4	2
BLR	5	4	2
CLR	1	1	1
OP	1	1	1
SCR	3	3	2
JRK	4	4	3

Test 14b (H.263): Video with several vision cuts

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	2
BLR	4	3	2	2
CLR	1	1	1	1
OP	1	1	1	1
SCR	3	3	2	2
JRK	4	4	3	3

Test 14c (H.264): Video with several vision cuts

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
BLK	4	3	2	1
BLR	4	3	2	1
CLR	1	1	1	1
OP	1	1	1	1
SCR	4	3	2	2
JRK	4	3	2	1

Test 15a (H.261): Man teaching with flip chart

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s
LS	5	5	5
BLK	3	2	2
BLR	3	2	2
CLR	2	1	1
JRK	2	2	1

Test 15b (H.263): Man teaching with flip chart

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
LS	4	4	5	5
BLK	3	2	2	1
BLR	3	2	2	2
CLR	1	1	1	1
JRK	1	1	1	1

Test 15c (H.264): Man teaching with flip chart

Subjective Impairments H.323	384 kbit/s	768 kbit/s	2.0 Mbit/s	4.0 Mbit/s
LS	4	2	2	2
BLK	2	1	1	1
BLR	2	2	1	1
CLR	1	1	1	1
JRK	2	1	1	1

Test 16: Playback from a domestic VHS videotape player. Is picture stable?
Yes

Appendix 2 Detailed Audio Tests

Test 1: Frequency response (-3 dB)
(Insert -6 dB signal at the local site, measure at remote site)

G.711	G.722	G.722.1	G.722.1c	G.728
3.5 KHz	5.4 KHz	5.4 KHz	6.4 KHz	3.4 KHz

Test 2: Headroom (measured on G722 connection)
Insert increasing amplitude 1 KHz tone at local site, monitor for overload distortion at remote site

Overload occurs at: +2dBm

Test 3: Audio level
(Insert -6dBm 1KHz tone at local site, monitor received level at remote site VCR output)

Remote site signal measures: CODEC output is controlled by the Volume Control so output test could not be made.

Test 4: Echo Cancellation

Setup The echo canceller is fully automatic in operation.

	Lecture Theatre	Room
Audio levels adequate? (Yes/No)	Not tested	Y
Audio quality acceptable? (Yes/No)	Not tested	Y
Echo cancellation acceptable? (Yes/No)	Not tested	Y
Quality of double talk	Not tested	Very Good

Comments: The quality of echo cancellation and doubletalk was very good but the lip synchronisation was at times very poor. This problem occurred between AVerComm H300 systems, in calls with other vendor's CODECs and at all connection speeds. The delay varied during a single call and between different calls so was always a problem.