GENERAL

Period of Time:

July / August 2010

**SW-Version:**
TC3.0.0.211036

**Device class:**
The device TANDBERG C20 is a High Definition video conference system up to a resolution of 1920x1080 (1080p). Due to its option of using image formats from CIF (352 x 288) on and the adaptation to the existing connection bandwidth it is compatible also to older H.323 systems. The device is designed as group system.

**Scope of delivery:**
The Tandberg C20 is available in two versions in the market. Version "Quick Set C20", only has a camera with 4 times zoom. The maximum resolution is 720p with 30fps and only one monitor can be connected. In version "Quick Set C20Plus", a camera with up to 12 times zoom is integrated. The system can then be used with 1080p and 60fps and two monitors.

In both cases, the system is delivered completely with codec, PrecicionHD 1080p camera, microphone, remote control and all necessary cables.

**Bandwidth**
The system can be operated with a bandwidth of up to 6 Mbps for video conferences in LAN areas. The protocols H.323 or SIP can be used then.

**Installation**
The installation turns out to be easy with the enclosed documentation. The operating state can be set up fast.
Operation
The system is controlled primarily by a remote control that accords to the MXP series and was extended by context sensitive function keys (see figure on the right side, click to enlarge). Depending on menu item or state of connection, different options are displayed at the lower screen frame while using the remote control, which can be activated by the respective keys (for instance, switching to Far End Camera Control is possible during a present connection).

The design and arrangement of the menus differs from Tandberg systems of other series essentially in optics, which is no disadvantage for the operability. The well structured alignment of the menu items and their distinct labelling as well as the intuitive menu navigation enable a quick and precise control of the system. Even primary users will get along quickly due to the clear structures.

Audio
The system has an analog input for stereo (e.g. for connecting a PC) and an analog stereo output. Furthermore, a digital HDMI output is supported.

The quality of the audio connections can be rated very good in all tests except for one. Codecs AAC-LD or G.722 were used always. In connections to Mirial Softphone (Windows as well as Mac version), G.711 was used, so that the quality can only be rated as fair.

However, other users report audio problems, which arise from the interaction with 100Hz LCD displays. Echo problems and long audio tuning phases occur when the speaker changes. This is due to the artificial video contortion of the 100Hz displays, the audio delay connected to that and the echo canceller which does not work reasonably anymore then. Here, only workaround solutions are known that reduce the good features of the LCD displays significantly. Connecting separate speakers directly at the codec is another way of finding remedy, so that the audio output of the display is not used. You have to accept a certain asynchronity between audio and video here, though.

Video
In all tested connections, the codec H.264 was used for transferring the video. The resolution was always 720p in connection to hardware based HD systems. In conferences with TANDBERG_EX90 and TANDBERG_C90, even 1080p on both directions was used.

In connection to Mirial Softphone, a resolution of 1920 x 1200 (Full HD) is received despite deactivated 1080p. This leads to the appearance of many artefacts in the image and the quality of the received video declines massively.

The connections to the Polycom PVX can only be rated with "good". Here, video formats (QVGA, QCIF) unacceptable for current demands in the video area are negotiated.

H.239
With only one monitor connected to the system, it comes with the so-called "Picture outside Picture" option (PoP) next to the customary "Picture in Picture" mode (PiP). This describes a view that does not display the different images and channels on top of each other, but separately next to each other. Especially with plasma or LCD monitors in 16:9 format, PoP often comes up as an alternative. All in all five different layouts are possible using H.239:

- Full screen presentation
- Full screen presentation with small integrated self image
- Presentation in large size and small images of the own side and remote side each
- Presentation and remote side as images in the same size, self image as smaller image
- Remote side in large size and small images of the own side and presentation each
The transmission in the second channel is carried out with a maximum resolution of WXGA (1280 x 768). Receiving and sending static contents (such as slide presentations, for example) always proceeded in very good quality in all tests. No problems in the field occurred. In some connections, the resolution of the video channel was reduced during the H.239 transmission, which had no negative impact though to the quality of the connection.

A differentiated image appears on transferring videos using the data channel in SD or HD resolution. Here, the technical equipment of the remote system plays an important role. The H.239 transmission of videos of all kinds worked without restrictions in both directions with the remote systems Tandberg EX90, + Tandberg C90, Polycom HDX 8004, Sony XG80 and LifeSize Room.

When the C20 sends videos in the second channel, the practical applicability is given with the remote systems Polycom PVX, Mirial Softphone, Tandberg 990 MXP, Tandberg 6000 and Polycom CMA. Also if the frame rates are not very high, still an acceptable video reception is given at the remote side. However, receiving videos in the H.239 channel from those remote systems is nearly impossible in the field. C20 shows more of a slide show than a video in this case.

Video transmission with the Sony PCS G70 is not possible in the data channel. With the used frame rate of 0-2 fps, no reasonable transmission comes about.

Detailed test results are available in the compatibility matrix.

Remote control

The remote control worked under existence of the preconditions in all tests.

MCU

The cooperation with the Codian MCUs in the DFNVideoConference service worked without restrictions. The quality of audio and video was very good. AAC-LD and H.264 with 720p were used in both directions. In connections with the Full HD MCU, the device sends 720p with 30fps and receives 1080p with 25fps.

The cooperation according to H.239 was carried out with H.264 and 720p with very good quality for presentations as well as SD and HD videos.

Gatekeepers

The cooperation with the gatekeepers GNU-GK 2.0.7 and CISCO MCM worked without restrictions.

Test patterns

The tests of the test patterns for resolution ability and color fidelity showed that the PrecisionHD 1080p does not have color changes in the scope of the muted natural colors and records color values authentically. The visual resolution conforms to the capabilities of current HD cameras. The image quality is very good. Color, sharpness and contrast are excellent and also the control of the camera (pan/tilt/zoom) works quickly and noiseless. The autofocus could also satisfy.

Miscellaneous

The device Tandberg C90 could not built up an SIP connection to the DFN-MCU with the syntax "conference-ID@mcu.vc.dfn.de". Also URI dialing according to H.323 Annex O (e.g. via "mcu.vc.dfn.de##conference-ID") did not work, independent of whether the system was registered at a gatekeeper or not.

The connection encoding with AES according to H.235 always worked in all connections, except for Mirial Softphone(encoding functions for H.323 are not implemented here).

According to the data sheet, the device supports Firewall-Traversal according to H.460.18 and H.460.19.

CONCLUSION

The Tandberg C20 group system is a high-capacity video conference system with a very good cost-performance ratio. In connection to modern systems it satisfies in all areas, but also conferences with older systems are possible. With the latter, however, the system's capacity is not fully demanded and utilized.
Unfortunately, the system can not be used in large rooms such as an auditorium due to its few available connections. The audio problems in interaction with the LCD displays should also be resolved by the involved companies.

**Documentation**
Manufacturer: Tandberg
Distributor: MVC

<table>
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<th>Supported standards</th>
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<td>Audio encoding</td>
<td>G.711, G.722, G.722.1, MPEG4 AAC-LD (plus Stereo)</td>
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<tr>
<td>Video compression</td>
<td>H.261, H.263, H.263++, H.264</td>
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<td>Bandwidth</td>
<td>up to 6 Mbps</td>
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