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Evaluation

Windows Collaboration Display by Avocor – AVW-6555 – Q4 2020

A Hands-On Assessment of Avocor's 65-Inch Windows Collaboration Display

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Executive Summary

- The Avocor AVW-6555 is a 65-inch Windows collaboration display (WCD) – and the first WCD specifically to be certified for Microsoft Teams. The WCD (as Avocor refers to its display) features FlatFrog InGlass technology, supports up to 20 points of touch, and includes integrated audio and video capabilities and built-in IoT Digital Twins sensors.
- There are three specific ways to deploy a WCD: it can be 1) used as a Microsoft Teams Room, typically with a locked down micro form factor PC; 2) used in a "bring your own device / video client" setup, connecting a laptop via USB-C (which Microsoft prefers to be called Type -C) connector and utilizing the WCD's camera, microphone and speakers; and 3) configured with a dedicated in-room or micro form factor PC running chosen third-party meeting software services and other software packages.

The quantitative results match our qualitative assessment – the Avocor AVW-6555 has a highly responsive and accurate annotation experience and provides a very high quality 4K display. Among the areas in which we believe the unit excels are the following:

- The inclusion of a Type-C connector for laptop charging and excellent touchback capability.
- The ability to switch easily between a user's connected laptop and the Microsoft Teams Room appliance approach.
- Ability to use the WCD's audio and video capabilities with a connected laptop.
- Annotation accuracy is very high and provides an excellent experience working with third-party ideation software.
- The 4K display delivers a high-quality viewing experience, and the display is about as good as it gets in terms of consistent brightness and color quality.
- Touch responsiveness is excellent.
- Pen functionality and the ability to use both inking and eraser functionality makes writing natural and frictionless.
- The proximity sensors enable the board to awaken when someone walks into the room, and they add a level of manageability and measurement any enterprise will find appealing.

Areas of potential improvement include pan/tilt/zoom camera control (which may be outside the Microsoft specification) and the addition of wireless casting.

The WCD specification highlights the religious wars faced by the UC&C industry: do we want to lock down meeting rooms via limited functionality available in a Microsoft Teams Room? The locked-down nature of a Microsoft Teams Room means a user gets the benefits of a one-touch meeting launch, easy scheduling, and hopefully frictionless meetings. Or do we want users to be able to easily attach their devices for a BYOD/BYOM experience and productive collaboration? (To add complexity: it is not either / or. Users still can connect a laptop directly to the HDMI or DisplayPort on a WCD that has been configured as a Microsoft Teams Room; the source auto-switches and resets to Microsoft Teams Room status easily.) Every enterprise will have its own preference.

This hands-on evaluation explores the Microsoft Windows collaboration display specification and how it is implemented by Avocor, reviewing the display quality, USB-C capabilities, touch and whiteboarding experience, and audio / video experience using Microsoft Teams Room and Zoom video services. It also describes the display's IoT sensors and their benefits to enterprises and meeting rooms.

Introduction

The Avocor AVW-6555 is a 65-inch Windows collaboration display (WCD). While not the first Microsoft-certified WCD, a status first claimed by Sharp, it is the first WCD specifically to be certified for Microsoft Teams. The WCD (as Avocor refers to its display) features FlatFrog InGlass technology, supports up to 20 points of touch, and includes integrated audio and video capabilities and built-in IoT Digital Twins sensors.

There are three specific ways to deploy a WCD: it can be 1) used as a Microsoft Teams Room, typically with a locked down micro form factor PC; 2) used in a "bring your own device / video client" setup, connecting a laptop via USB-C and utilizing the WCD's camera, microphone and speakers; and 3) configured with a dedicated in-room or micro form factor PC running chosen third-party meeting software services and other software packages. Avocor recommends the Logitech Tap Base Model and the Lenovo Hub 500 for Microsoft Teams Room configurations.

The Avocor AVW-6555 began shipping in late August 2020. WH evaluated the Avocor WCD in November 2020 in its evaluation lab in Cincinnati, OH.

Windows Collaboration Display Specification

Microsoft introduced the WCD specification in 2018. Sharp delivered the first Microsoft-certified unit in 2019, followed in summer 2020 by Avocor and, more recently, ViewSonic. This specific unit is designed to go into huddle (which Microsoft likes to call *focus)* and smaller meeting rooms.

The idea behind the Microsoft Windows collaboration display specification is to address common "pain points" specific to the Microsoft Teams Room experience, including:

- Long meeting start times (delays)
- Poor remote attendee experience
- Difficult collaboration and content sharing
- Connectivity issues
- Difficult installation and management

One pain point addressed is to have a device that *can lock down* the system into serving as a Microsoft Teams Room "appliance," whereby the only functionality is Microsoft Teams and some associated applications like MS Whiteboard. We note that the Microsoft Teams Room experience is somewhat like the locked down Skype Room System approach out of Microsoft. Alternatively, the Windows collaboration display spec provides a Surface Hub alternative, offering other deployment and user experience options, such as the ability to run software of choice when not configured as a Microsoft Teams Room.

Other pain points are addressed by the inclusion of a Type-C input, allowing users to bring their own laptops and video clients (perhaps one with which they are more familiar than Microsoft Teams). USB-C also allows for touch capabilities to control the laptop from the WCD and brings ideation software to the big screen. There is little IT management needed for the WCD if no permanently connected PC is installed in the room.

Yet other pain points are meant to be addressed by the inclusion of Azure Digital Twins sensors, which measure ambient room temperature and room brightness, and which also serve as proximity sensors. The sensors send telemetry data automatically to Azure with no need for a PC to be connected to the display. The idea is to enhance manageability, gather data, and make it easier for the system to know when to awaken.

Avocor AVW-6555

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Specifications

- 65” 4K 3840 x 2160 resolution @ 60Hz display
- 2mm optically bonded, anti-glare, anti-fingerprint glass
- InGlass technology support for up to 20 points of touch, including up to four simultaneous passive pens
- 370 [cd/m2] brightness
- 178° viewing angle
- 120° field of view integrated camera
- Built-in speakers: 2 x 30W Stereo Full Range
- Microphone array: 4 x beam-forming, linear array, far-field, SSP, AEC, ANS, DRC, EQ
- Weight: 108.02 lbs.
- $6,999 USD

Available Ports

- SPDIF (Sony/Philips Digital Interconnect Format)
- Audio out
- IR input for a remote blaster
- 2 HDMI 2.0 inputs
- DisplayPort 1.2 input
- 3 USB 3.0 Type-B (power for touch)
- USB-A for external peripherals
- USB Type-C for video / audio/ power / USB / Ethernet
- Ethernet input

- Ethernet in / out for loop through; can be used to get Ethernet connection to Microsoft Teams Room or backpack PC
- RS-232

All ports are located on the left side of the WCD and are accessible even if the unit is mounted to a wall.

The front of the WCD has the following controls:

- Power
- Source
- Microphone mute
- Windows Start Menu
- Speaker mute
- Volume down / up

In addition, a centrally located magnetic pen holder is capable of holding the two passive pens included with the unit.

Avocor AVW-6555 Control Panel

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What Comes in the Box

- 1 x remote control & batteries
- 2 x passive pens
- Power cables (1 x US, 1 x UK, 1 x EU, 1 x Australia/NZ)
- 1 x ten-foot USB-B 3.0 cable
- 1 x ten-foot HDMI cable
- 1 x six-foot Type-C cable
- 5 x cable clips
- 1 x VESA 75 x 75mm / 100 x 100mm adapter plate
- 1 x quick start guide

Display Quality

The 65” display is bright without washing out any colors. Highly detailed 4K images are presented sharply and uniformly across the panel. We measure the brightness at 500 candelas per square

meter (cd / m2) at the center of the display, 400 cd / m2 at the bottom corners, and 380 cd / m2 at the top corners. We note that it is typical for displays to have different brightness levels from center to corners, but we are impressed that the variance is progressive without hot spots appearing in random areas. There is a slight brightness drop off at 25° off the perpendicular axis of the panel and another at approximately 60°. This is also expected behavior. The specifications call for a viewing angle of 178° and we confirm this spec.

The panel has minimal glare. We tested the WCD in a windowed room with the sun shining directly into the room and experienced no visibility challenges or glare (brightness was set to only 50%). The panel does not show any excessive smudging when displaying content. When turned off, or while displaying a very dark image, some smudging is visible as is to be expected.

There are five display modes: cinema, game, sports, vivid, and user-defined. These display modes allow for differentiated brightness, contrast, and saturation based on application or user preference. Color temperature can also be changed to minimize eye strain.

The WCD Experience

An external laptop or PC / Mac is necessary to provide compute power to the WCD (a VESA bracket is available for mounting a micro form factor PC; there is no open-pluggable specification-compliant mounting area). Avocor ships an optional micro form factor PC or an enterprise can supply its own external laptops or PCs.

The USB-C connector is a key component of the WCD, as it permits the following features:

- Touchback from a laptop
- Power to a laptop
- Usage of the WCD's AV peripheral (microphone, speakers and camera) by a connected laptop
- Wired Ethernet (assuming the display is connected to a wired Ethernet

Type-C

We tested the Type-C capabilities of the WCD with a higher end, i7-based HP Spectre X360 laptop and a lower end, i3-based Microsoft Surface Pro, each equipped with a USB-C output. The USB-C is essential in supporting the presentation of laptop or PC content and touchback manipulation of that content.

Touch Experience

Our testing with a connected laptop involves using touch in place of a mouse for general Windows control and testing the ideation capability with both FlatFrog Board and Microsoft Whiteboard software packages.

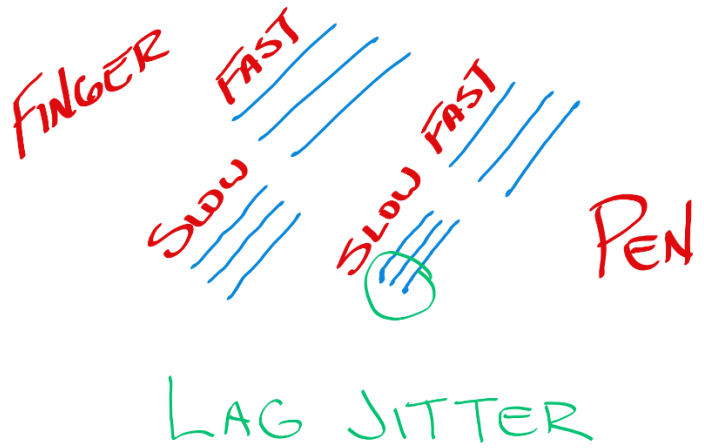
The overall touch experience using the board to control laptop content is excellent. The WCD is highly responsive while controlling a laptop. Dragging and resizing apps is as smooth as we have seen. Often it is difficult to resize apps on some interactive monitors because the touch accuracy just is not there. This is not the case with the WCD – the accuracy with finger or pen touch for general Windows manipulation is excellent.

Lag Jitter

Our lag jitter test is performed by drawing angled lines both fast and slow with a finger and the included pen. The primary means for testing lag jitter is to determine how accurately users can

annotate. We look for straight versus jagged lines as a measure of annotation accuracy; the straighter the lines, the better.

Avocor AVW-6555 Lag Jitter



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As the image above shows, fast annotation is very accurate using either a pen or finger. Slow drawing, however, suffers from some minor amount of lag jitter. Notice the area circled in green. Annotating very slowly can lead to an ever-so-slight misconception of where the ink is placed in relation to the pen. In an effort to achieve perfect accuracy, we find that slow writing is slightly less accurate than just annotating at a normal speed.

Another factor affecting accuracy is the pen. The included passive pen has a solid tip, which does not negatively affect accuracy versus pens that have a soft tip.

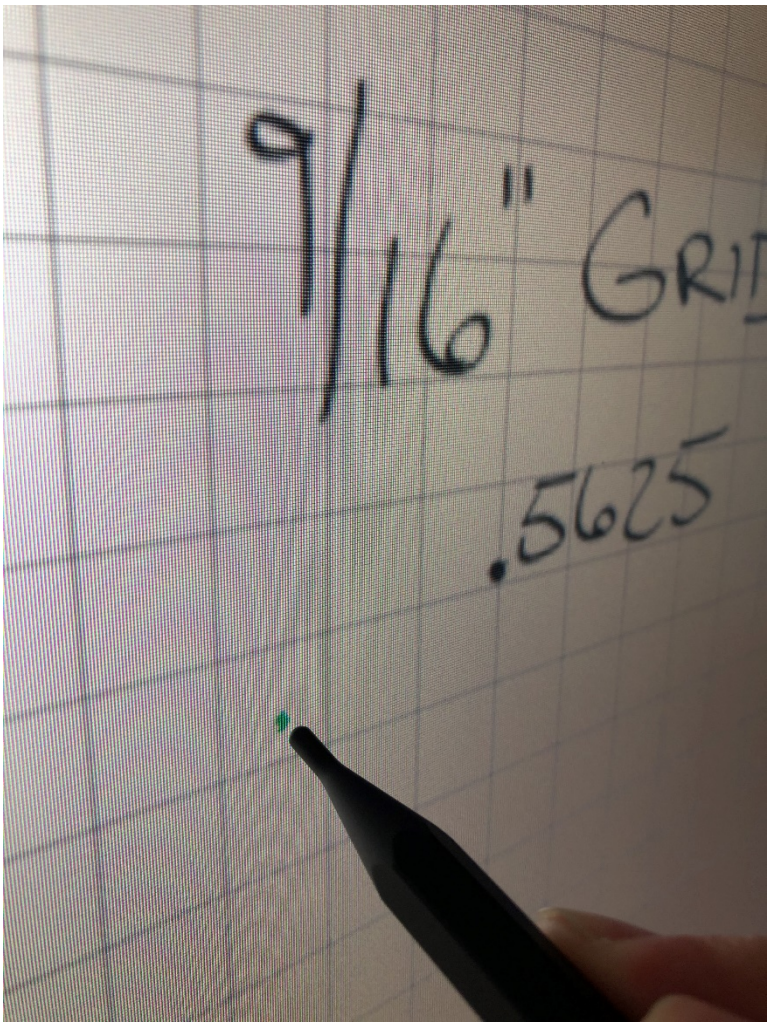
Lag Latency

Lag Latency is the distance between the “ink” and pen when drawing. The “ink” often needs to catch up to the pen. The longer the distance, the higher the likelihood of imprecise drawing. The shorter the distance, the better and more accurate is the drawing experience. While drawing fast using FlatFrog Board software, we measure the latency at 0.25”, which is impressive. Equally as impressive is the slow drawing latency, which is negligible.

Parallax

Parallax effect is the distance between the detected touch location (or ink location) and the user’s perception based on the pen location touching the display. This effect is magnified when writing on thicker glass, and it affects accuracy in fine detailed annotation. Thanks to the 2 mm. optically bonded glass, parallax is minimized, and a high degree of accuracy can be achieved on the WCD.

Avocor AVW-6555 Parallax



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The preceding image shows the “ink” appear almost directly under the tip of the pen, save for the thickness of the glass. For reference, the software used is FlatFrog Board with a background grid measuring 0.5625” square. Wainhouse considers this to be highly accurate inking.

Pen

Avocor Pen

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The pen has the look and feel of a traditional pencil, complete with an “eraser” tip. While using both FlatFrog Board and Microsoft Whiteboard software, flipping the pen and touching the eraser to the canvas performs the erase function without any other user input (no need to tap an erase icon).

Power

The WCD provides up to 60W maximum power delivery via the Type-C connection. This provides power to connected laptops, so users are not left needing to recharge their devices after a long collaboration session.

Audio / Video Client Experience

The workflow for a video conferencing client on a Type-C connected laptop is largely the same as the user would expect, except for the following: touch capability and usage of the WCD’s integrated audio and video components with the client. If the video conferencing client includes ideation tools, there will be the additional benefit of using pen or finger touch for annotation, highlighting, or other features provided by the client.

The stereo speakers are forward-facing and located below the screen. The speaker quality is very good and appropriately loud enough for larger conference rooms. Our tests achieved a high of 99dBA for music and 93dBA for voices with no distortion present at maximum volume. We note the factory audio setting sounds slightly thin, but bass and treble can be adjusted using the remote control and on-screen menu.

The audio capture quality while in a video meeting can be largely dependent on the feature set of the video client used. We tested Microsoft Teams and Zoom as part of our evaluation. Zoom has built-in noise cancellation and this is reflected in the quality of the audio stream to far participants. At the date of our testing, Microsoft Teams does not have noise cancellation capabilities and that is also reflected. The WCD does nothing to hamper or help the audio experience when introducing adverse noises into the meeting. The capture quality of the microphone extended to the limits of the meeting room used in our testing. However, we note that the audio capture drops at approximately five feet away from the WCD. This level drop was experienced with both Zoom and Teams.

The microphone array is located on the top of the WCD, near the integrated camera.

Avocor AVW-6555 Camera and Microphone Array

The camera, located in the top bezel of the WCD, has a fixed focal length and field of view. The 120° field of view is wide enough to capture all meeting participants. The video quality from the camera is very good, with excellent color replication. The camera automatically adjusts to varying light conditions so that it works well, whether in dimly lit spaces or areas with proper office lighting.

The camera does have some rough edges. First, because the camera angles downward, which is necessary to capture close participants, a trapezoidal effect appears on vertical elements of the image that may seem unnatural to some users.

Avocor AVW-6555 Camera Capture

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Second, and more important, is that there are no pan, tilt and zoom (PTZ) capabilities provided by the camera. We expect the WCD typically will be used by a small group of people in a local room, thus perhaps limiting the need for PTZ. However, for single users, being able to adjust the camera would be a welcome addition to make the participant in the room appear larger to far participants in a meeting. This limitation relates to how Microsoft defined the WCD specification, with the assumption that in small meeting rooms there would be no need for PTZ functionality.

We find no perceptible difference in the Type-C experience between our higher and lower end laptops. Each performs exceptionally well with ideation software, video conferencing clients, and general control of Windows.

Whiteboarding and Brainstorming Experience

Wainhouse tested several whiteboarding products: FlatFrog Board, Microsoft Whiteboard, and via Zoom calls, Zoom whiteboarding.

Microsoft Whiteboard is an application that is available to users in two forms: as a stand-alone application and as an integrated element of Teams. As a stand-alone application, it works with full functionality but it is not part of the Teams Meeting. As an integrated element of Teams, its functions are pared down, and we note that it is available only when calls have been pre-scheduled.

If using the WCD with a third-party video client such as Zoom, the client's features will determine the quality of the ideation experience. If using the WCD with ideation software like FlatFrog or Bluescape, the experience is superior – and WH recommends these products for those serious about content creation and ideation.

Avocor Workspace Intelligence

The WCD contains integrated Azure Digital Twins sensors that provide real-time environmental data that can be analyzed for planning and support purposes using a service called Avocor Workspace Intelligence (WSI). The specific IoT sensors in the Avocor unit measure data such as room temperature, presence and occupancy rates, and ambient light.

The sensors are designed to feed to Azure every five minutes several types of data: 1) display level data such as available input ports, power on / off status, how much power is being used; and 2) broader data such as space reservation status, meeting details, and system failures. WSI also can draw geolocation data related to weather, as well as Microsoft 365 and Azure Active Directory data. Alerts may be configured according to Avocor at any hierarchal level, meaning at the company, campus, building, or floor level (as an example). While other WCD vendors provide similar types of IoT services, one Avocor-exclusive feature is to use those to provide over-the-air firmware updates.

Longer-range sensor benefits might include the ability to connect to third-party AI services that provide additional functions such as automatic switching on of displays and microphone array services, temperature regulation, and in-room lighting systems. WSI is a service that was launched January 2021, and it is available as an annual or monthly subscription service. A free trial period is available as well.

Avocor AVW-6555 Sensors

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Analysis

The quantitative results match our qualitative assessment – the Avocor AVW-6555 has a highly responsive and accurate annotation experience and provides very high quality, 4K video.

The primary (to WH) missing piece we discovered in our testing is the lack of pan / tilt / zoom capabilities (either electronic or automatic) with the camera. As stated earlier, the lack of camera control is per Microsoft's WCD specification. However, WH has evaluated both Yealink's VC210 and Poly's X30 devices, which are both certified as collaboration bars for Microsoft Teams. These two devices have both electronic PTZ capabilities and auto-adjusting group framing functionality. This speaks to a potential discontinuity within device certification across Teams. With so many vendors adding intelligence to their cameras (such as auto-framing and speaker-activation), WH believes the value of the Avocor WCD would be greatly enhanced by PTZ functionality – either via manual control or auto-framing.

We find that the WCD performs at its best when a 4K-capable source is connected to it. In our testing, we connected a PC that was only capable of delivering 1080p resolution to the WCD. While the annotation experience is acceptable, there is greater accuracy and a far better experience using a 4K capable PC output.

Other than the few nitpicks we had, overall, we had a very positive experience evaluating the WCD.

What We Like

- The inclusion of a USB-C connector for laptop charging and excellent touchback capability. That single-cable experience for a BYOD experience is a big deal. Avocor is not alone in providing USB-C, but to be commended for getting it done before some other vendors have delivered "the goods."
- Someone wishing to use their personal device like a laptop can enter the room, connect to the display, and collaborate using the full features of the display. Then when they unplug and leave the room, the WCD "resets" to being a dedicated Microsoft Teams Room appliance, ready for the next meeting – without the need for an IT person to come reset the room.
- Ability to use the WCD's audio and video capabilities with a connected laptop
- Annotation accuracy is very high and provides an excellent experience working with third-party ideation software.
- 4K display delivers a high-quality viewing experience, and the display is about as good as it gets in terms of consistent brightness and color quality
- Touch responsiveness is excellent.
- Pen functionality and the ability to use both inking and eraser functionality makes writing natural and frictionless.
- The proximity sensors enable the board to awaken when someone walks into the room, and they add a level of manageability and measurement any enterprise will find appealing.

Areas for Potential Improvement

- The WCD lacks the ability to control the camera's pan, tilt or zoom – to WH this creates challenges for experienced users of video conferencing. It is as if Microsoft fears users getting their hands on camera controls.
- Wireless casting from laptops would add flexibility for groups of users who might need to alternate who is sharing content from their laptops. We suspect this is a WCD specification (or lack thereof), a concern for security, or perhaps a means of keeping costs down when paying for built-in sensors. Or perhaps it is because the assumption is that it is enough to connect a single device via USB-C. Our take is that some organizations will want embedded wireless functionality.

- The bezels are quite large – an additional black surface area runs between the bezels and the on-screen image, making the area around the actual screen appear even larger than necessary.

Overall, Avocor has produced an excellent 65-inch, 4K interactive touch display, working with a challenging set of specifications that we believe evolved over time as Microsoft continued to refine its definition. The WCD will appeal to two kinds of organizations:

1) Those that want to lock down their user experience to a Microsoft Teams Room, meeting-only experience.
2) Those that don't want to lock down their users to a limited interface or functionality: one can do as much with an Avocor WCD as they can with their BYOD/BYOM environment by enabling users with USB-C laptops to use the interactive monitor as a launching pad for meetings and general collaboration.

We noted earlier that the idea behind the Windows collaboration display specification is to address common "pain points" for meeting participants. Below we provide our "take"' on whether or not the WCD "approach" as defined by Microsoft accomplishes the challenge:

- Long meeting start times (delays) – *Yes, accomplished*, because simply attaching one's laptop via USB-C takes care of getting meetings launched more quickly.
- Poor remote attendee experience – *To some extent*, this is accomplished based on the specification that the unit meets certain Teams and Skype audio test specs and Teams video capture specs. But the fixed camera and lack of manual controls may or may not make remote attendees feel more included. We are just not certain how the WCD can improve the remote experience, based on what we see in it so far.
- Difficult collaboration and content sharing – *Yes, accomplished* to some extent but only via BYOD/BYOM and the third-party applications utilized. If there are multiple users in the meeting room, it certainly helps them collaborate.
- Connectivity issues – *To some extent, this is accomplished*. Two HDMI inputs and a DisplayPort let users plug in other devices. But organizations that want multiple users to be able to share content locally will be challenged to enable those users to do so without a wireless presentation system. We believe larger format WCDs from other vendors may include Miracast functionality.
- Difficult installation and management – *Yes, accomplished*. This is accomplished in two ways: 1) because there is no included PC, it can rely on external laptops bringing the meeting to the display (with only one cable, the Type-C), and 2) the sensors will improve an organization's ability to measure room occupancy and utilization, as well as control room temperature and adjust lighting, both of which can combine for energy savings.

Microsoft does not make the WCD specification publicly available, and there are some choices that we question. With our focus on video conferencing and ideation, we think the fault sits with Microsoft in how it has brought along the WCD spec. Collaboration bars for Microsoft Teams (which also are designed to go into small meeting spaces) support PTZ, so why would the WCD not provide the same support?

The question for buyers may come down to: are you using this product for video collaboration only, or brainstorming and collaboration only, or both? You can do either or both, but there may be limitations placed on the workflow based on software client choices.

The WCD specification highlights the religious wars faced by the UC&C industry: do we want to lock down meeting rooms via limited functionality available in a Microsoft Teams Room? The locked-down nature of a Microsoft Teams Room means a user gets the benefits of a one-touch meeting launch, easy scheduling, and hopefully frictionless meetings. Or do we want users to be able to easily attach their devices for a BYOD/BYOM experience and productive collaboration? (To add complexity: it is not either / or. Users still can attach a laptop directly to the HDMI or DisplayPort on a WCD that has been configured as a Microsoft Teams Room; the source auto-switches easily.) Every enterprise will have its own preference.

Our final take on the Avocor WCD is that the company has executed on a challenge: delivering the first Microsoft Teams-certified WCD. The experience working on the display is a step forward for Avocor, improving upon the touch, accuracy, and display quality experience we found previously working with an earlier-generation Avocor F8650 interactive touch display.

The following table represents our take on the Avocor WCD. Solid black Harvey ball = 4, highest rating. Empty Harvey ball = 0, lowest rating.

Avocor AVW-6555 Rating

Feature	Rating
Camera quality	◕
Speaker quality	●
Microphone quality	◕
Display Quality	●
Display Resolution	●
Display Uniformity	●
Viewing Angle	●
Type-C connectivity	●
Lag Jitter	●
Lag latency	●
Pen Quality	◕
Palm Rejection	○
Multiple pen touch	●
Source switching speed	◕
Writing precision / Accuracy	●
Touchback	●
Overall user-friendliness	●

Test Results

Avocor AVW-6555 Test Results

Test	Result
Input Lag	20ms
Voice loudness maximum	93dBA
Music loudness maximum	99dBA
Source switch USB-C to HDMI	7.5 sec avg
Source switch HDMI to USB-C	4.5 sec avg
Brightness - center	500 cd / m2
Brightness - top	380 cd / m2
Brightness - bottom	400 cd / m2
Angle to initial display drop off	25°
Lag latency – fast drawing	0.25”
Lag latency – slow drawing	negligible
Palm rejection – FlatFrog Board	No
Palm rejection – Microsoft Whiteboard	No

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About Us

About the Authors

Alan D. Greenberg, Senior Analyst & Partner. Located in Austin, TX, Alan is an expert in collaboration and conferencing applications for meeting rooms and classrooms. He specializes in ideation technologies, video conferencing, web conferencing, and video-centric products and services. Alan holds an M.A. from the University of Texas at Austin and a B.A. from Hampshire College, Amherst MA.

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