

WaveCAST

Assistive Listening System WF T5

USER MANUAL



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Safety Warnings and Instructions

WARNING! TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CAUTION! TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

POWER CORD NOTICE FOR INTERNATIONAL OPERATION - Please call Williams AV Customer Service at 800.328.6190 to order the appropriate power cord for the country of use.

Important Safety Instructions:

1. Read and follow these instructions
2. Keep these instructions
3. Clean only with dry cloth.
4. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
5. Do not install near any heat sources such as radiators, heat registers, stoves, or other appliance (including amplifiers) that produce heat.
6. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
7. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the appliance.
8. Only use attachments/accessories specified by the manufacturer.
9. Unplug this appliance during lightning storms or when unused for long periods of time.
10. Refer all servicing to qualified service personnel.
11. Power Sources - The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
12. Object and Liquid Entry - Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through the openings. Do not use this appliance near water or expose it to liquids.
13. Servicing - The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Precautions:

1. Power – WARNING, BEFORE TURNING ON THE POWER FOR THE FIRST TIME, READ THE FOLLOWING SECTION CAREFULLY. The unit is designed for use only with the line cord of the region in which it will be operated.
2. Voltage Label (Rear Panel) – A label located at the rear panel power connection indicates the DC power input for the unit. The label will read 24VDC. Note: use the Williams AV TFP 062 power supply for this unit.
3. Do Not Plug in the input, output, Ethernet, or Dante connections while the power switch is switched to the ON position.
4. Do Not Touch the WaveCAST [D] with wet hands. Do not handle the WaveCAST [D] or power cord when your hands are wet or damp. If water or any other liquid enters the WaveCAST [D] cabinet, take the WaveCAST [D] to qualified service personnel for inspection.
5. Place the WaveCAST [D] in a well ventilated location. Take special care to provide plenty of ventilation on all sides of the WaveCAST [D] especially when it is placed in an audio rack. If ventilation is blocked, the WaveCAST [D] may over heat and malfunction. Do not expose the WaveCAST [D] to direct sun light or heating units as the WaveCAST [D] internal components temperature may rise and shorten the life of the components. Avoid damp and dusty places.
6. Care – From time to time you should wipe off the front and side panels and the cabinet with a soft cloth. Do not use rough material, thinners, alcohol or other chemical solvents or cloths since this may damage the finish or remove the panel graphics.

Wi-Fi Network Required

The WaveCAST connects to the installation location's Wi-Fi Network. It does not provide a network on its own. The Wi-Fi network will need to be installed and established before the WaveCAST can be used.

You may connect the WaveCAST to a computer via a hardwired connection to help troubleshoot any networking problems.

Recycling Instructions

Help Williams AV protect the environment! Please take the time to dispose of your equipment properly.



Product Recycling:

Please do NOT dispose of your equipment in the household trash. Please take the equipment to a electronics recycling center for proper disposal.



Battery Recycling:

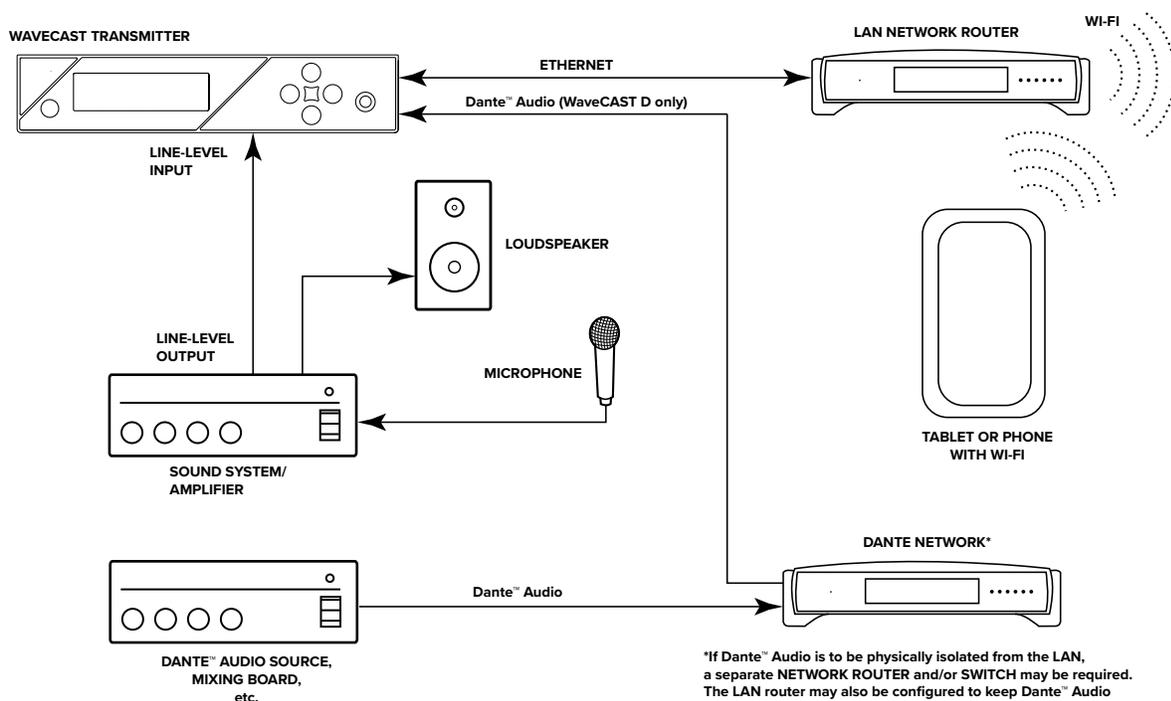
Please do NOT dispose of used batteries in the household trash. Please take the batteries to a retail or community collection point for recycling.

System Overview

WaveCAST provides true, professional audio quality over Wi-Fi, and features DSP audio processing. Setting up and configuring the WaveCAST for the Wi-Fi network is straightforward and simple. Up to four WaveCAST systems can be connected to the same Wi-Fi network to provide multiple listening channels, supporting up to 45 connections in unicast mode, or 1500+ in multicast mode depending on network configuration (see "Router and Network Equipment Selection" on page 7).

The WaveCAST audio processor offers multiple preset audio options. The high quality audio can be optimized for hearing assistance, music can have high-fidelity playback, and voice can be set for maximum speech intelligibility. Custom presets can also be created to meet specific performance needs.

The WaveCAST app provides an easy-to-use, intuitive user interface and will be available in iOS or Android. The app allows listeners to easily select their channel and volume level once their personal device is connected to the Wi-Fi network.



Quick Setup Instructions

1. Connect the power supply to the Power Supply connector located on the back of the WaveCAST. Press in the power button on the front of the WaveCAST. The power button should light up. If not, go back and check the power connections.

2. Choose and configure the audio source.

CAUTION! This source **must be configured in the menu** before plugging the source into the jack. Voltage sent to the jack based on the source selected in the menu. Selecting the wrong configuration could send the wrong voltage to the source and cause damage.

The audio source must be configured in the menu before plugging the source into the jack (except Dante Audio - skip to step 7). Push the center Menu button and push the right arrow button once to display AUDIO SOURCE on the screen. Push the right arrow button to access the audio sources. Using the up arrow or down arrow menu buttons, choose between ANALOG LINE IN, MIC, PHANTOM MIC +12V, or DANTE. When the desired audio source is displayed, press the right arrow button to apply the setting. Press the Menu button to exit the menu.

3. Push the power button to turn the unit off.

4. Connect the audio source to the audio input jack on the rear of the WaveCAST.

5. Push the power button to turn the unit on.

6. (WaveCAST D only) Connect an Ethernet cable from the Dante network to the connector labelled Dante on the transmitter.

Note: Dante IP Address and other settings are configured externally through the Dante Controller software; there are no settings in the transmitter for Dante, other than choosing Dante as the input source).

7. If Dante audio is being used, the Dante source must be connected, must be playing audio, and the Dante Controller software must be used to route audio from the Dante source to the WaveCAST.

8. With the audio source playing, adjust the Audio Level on the WaveCAST so that the green 0 dB LED generally lights and the red +9 dB LED lights occasionally. To do this while on the main info screen, press the up button to increase the audio level in 1.0 dB steps, or press the down button to decrease the audio level in 1.0 dB steps.

9. Select an Audio Preset. The WaveCAST has three pre-configured Audio Presets to choose from: Hearing Assist, Music, and Voice. A Custom preset is also available. The performance of the WaveCAST is optimized for each of the pre-configured Audio Presets. Using the menu and control buttons on the front of the WaveCAST, push the Menu button, the display will change to show Audio Settings. Use the forward right arrow button to display Audio Source in the selection box. Push the down v button to show Audio Presets. Now press the right arrow button to display the list of Presets. Use the up and down buttons to alternate between Hearing Assist, Music, Voice and Custom selections. When the desired Audio Preset is displayed, press the right arrow button to apply the setting. If Custom is desired, push the right arrow button to enter the custom settings. Press the Menu button to exit the menu.

10. Connect an Ethernet cable from your local area network, or Wi-Fi router to the Ethernet port on the WaveCAST. This network will be used to broadcast the audio.

11. Once the transmitter detects an active network is present (either Ethernet or Dante), the WaveCAST's Ethernet control IP address will be displayed in the upper left part of the home screen.

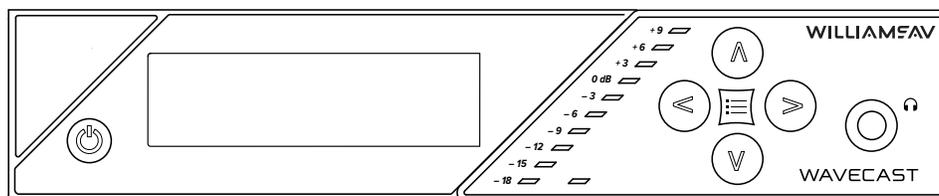
12. Use a device, such as a smartphone, with the WaveCAST App installed to listen to the audio and test that device is working and sounds correct.

To adjust any settings via a web browser:

1. Open a web browser on a computer or mobile device that is also connected to the same LAN, subnet, and VLAN as the WaveCAST. In the address bar of the browser, type in the IP address that is shown on the front of the transmitter's main info screen, and push the enter key on the keyboard. (Note: it is not necessary to type "http://" or "www." preceding the IP address, just the characters following "IP:", including the periods. For example: 192.168.1.123)

2. The browser will open the transmitter's web page, displaying a Login button. Click the log-in button and enter the user name "admin" and the default password "admin".

3. The web browser will now show the transmitter's Home Page, which shows the current WaveCAST status info. The tabs at the top navigate to different pages that allow adjustment of the transmitter's settings.



Router and Network Equipment Selection

The WaveCAST is intended to be set up on an already existing Wi-Fi network; however, upgrades to your network equipment may be necessary depending on the performance desired from the WaveCAST. For instance, a higher-end, more powerful router will allow more users to connect to your audio stream than using a cheaper, less powerful router.

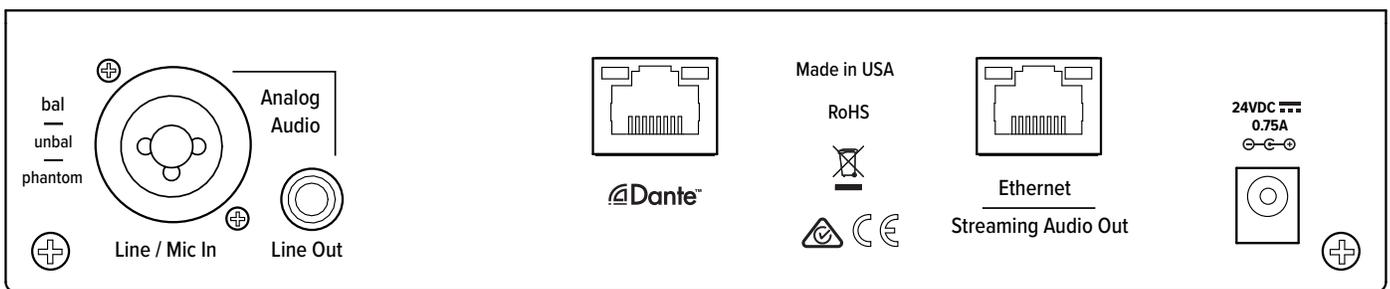
The Wi-Fi network will need to be accessible to the users who will be listening to the audio. A public or Guest Wi-Fi network will usually be ideal for ease of accessibility. If the user's devices cannot connect to the network due to security settings, they will not be able to hear the audio.

The WaveCAST system will put a demand on the network. If the network cannot handle the demand, whether because it is being used for other networking needs or because the networking hardware is not strong enough, the WaveCAST will be unable to reach its maximum audience.

When streaming to a small or medium sized audience, a basic networking configuration may suffice. When streaming music using multiple channels (such as having several WaveCAST units on your network), a powerful router and network configuration is more likely to be required.

The **WaveCAST Networking Guide** is available on the Williams AV website for additional networking tips. The WaveCAST networking guide applies to the FM + as well as other WaveCAST products.

Wiring and Connections



Power Supply Connection

Connect the power supply to the Power Supply Jack located on the rear of the WaveCAST server.

Ethernet and Dante RJ-45 Connection

If connecting to a network or directly to a PC, an Ethernet cable must be used. In some cases, (like older PCs) a crossover cable may need to be used.

Audio Source Connections

IMPORTANT: When a suitable audio source has been determined, you MUST configure the audio source in the menu of the WaveCAST before plugging that source in.

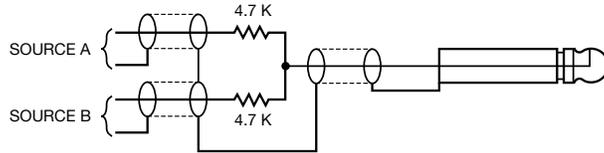
The WaveCAST transmitter will accept the following audio sources:

1. Balanced/Unbalanced Microphone with 12 volt phantom power (DIN 45596) on a 3-pin (XLR) connector.
2. Balanced/Unbalanced microphone with or without phantom power on 1/4 inch (TRS) jack.
3. Balanced/Unbalanced Line on a 3-pin (XLR) connector without phantom power.
4. Dante on an RJ-45 jack (optional).

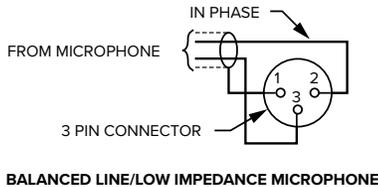


WARNING:

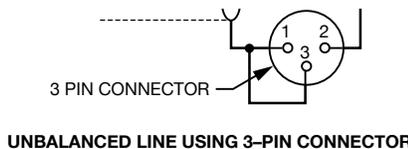
The WaveCAST is not designed to accept 70 volt speaker signals! This may result in damage to your system. The sound source should come directly from the system mixer or Dante source as a low-level or unprocessed signal.



CONNECTING TO A MULTI-CHANNEL OR STEREO SOURCE



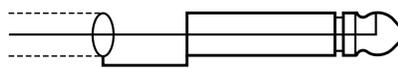
BALANCED LINE/LOW IMPEDANCE MICROPHONE



UNBALANCED LINE USING 3-PIN CONNECTOR



BALANCED LINE USING 1/4" CONNECTOR



UNBALANCED LINE USING 1/4" CONNECTOR

Multi-Channel Sources

By constructing a simple resistive mixer, stereo (or 3 channel) sources can be connected to the WaveCAST. Additional channels can be accommodated by adding a resistor for each source.

Note: The Dante audio input will automatically mix the left and right channels.

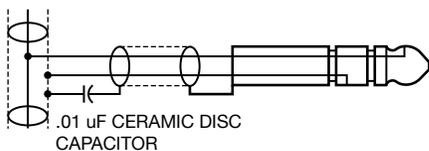
Connecting Additional Sound Systems

The **Analog Audio Line Output (RCA)** jack can be used for monitoring, recording, or routing the WaveCAST's processed audio into another sound system. For help connecting your sound system, contact Williams AV's TechBlue technical support team.

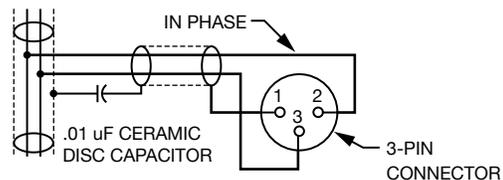
Otherwise, audio output is only available over the Wi-Fi network.

Avoiding Hum in the Audio (as a Result of a Ground Loop)

A hum created by a ground loop can often be eliminated by connecting a capacitor in series with the audio line shield to the transmitter's ground. This method also maintains good radio frequency shielding. Determining the effectiveness of this method for your installation usually requires some experimentation.



BREAKING A GROUND LOOP WHEN CONNECTING TO A UNBALANCED LINE



BREAKING A GROUND LOOP WHEN CONNECTING TO A BALANCED LINE

Selecting an Audio source Appropriate for Hearing Assistance

The WaveCAST transmits audio with excellent fidelity. Therefore, the audio source signal should be of the highest audio quality and not subject to a compressor, limiter, reverberation, or other signal processing equipment. While compressed audio is available through the WaveCAST, excessive compression is not helpful to users requiring hearing assistance and can contribute to excessive noise in the audio.

The WaveCAST audio source signal is usually connected to a mixer's line output signal which is behind the mixer's parametric equalizers but ahead of any equalization used for house loudspeakers.

If audio delay is available for use in large auditoriums, it's usually best to use it. Because radio signals travel faster than sound, delaying the transmitted audio so that an average listener (in the middle of the listening area) hears the transmitted audio a few milliseconds after audio from the main sound reinforcement system speaker is helpful. This will also help audience members who lip read.

Connecting to other Devices

The **Analog LINE/MIC Input (XLR / 1/4")** jack can be used with standard pro audio electronics such as standard pro audio line level condenser microphones up to 15v or an analog line output from a mixer. The combination jack accepts either XLR or 1/4" (TRS).

CAUTION! This source *must be configured in the menu* before plugging the source into the jack. Voltage sent to the jack based on the source selected in the menu. Selecting the wrong source configuration, or plugging in the source too early, could send the wrong voltage to the source and cause damage.

The **Analog Audio Line Output (RCA)** jack can be used for monitoring, recording, or routing processed audio to another sound system.

The **Ethernet** and **Dante RJ-45 jacks** can be used to connect the WaveCAST to either a local network or directly to a single computer or Dante device. An Ethernet connection will not allow the Wi-Fi broadcast features to work, a Wi-Fi connection must be established.

Controls and Features

Power Button

Latching push-button switch turns the transmitter on or off. The desktop power supply provides power to the unit at all times.

OLED Display

This shows current operation settings and is also used with the menu control buttons for configuring the WaveCAST. Each time the power of the unit is turned on, the OLED Display shows a Williams AV start-up screen. After seven seconds, the default Main Info Screen screen will be displayed. The WaveCAST is now fully operational.

NOTE: If the transmitter's internal tests fail, the transmitter will attempt to auto-recover by rebooting itself.

Audio Input Level Indicator

The bar graph indicator shows audio level in 3dB steps at the input of the audio level processing circuit. The indicator is peak responding and is calibrated so that optimum level is reached when the 0dB LED lights up often and the +9dB only lights occasionally. Use the Audio Level settings in the menu to set the audio levels.

Input Overload Indication

The OLED Display shows an overload warning screen each time the audio signal exceeds the capacity of the input circuit. Either the source of the audio coming in to the WaveCAST needs to be adjusted to correct this or the Audio Input Gain needs to be adjusted.

Menu Controls

The menu system can be navigated via the buttons on the front panel of the device. See "Navigating the Menu" on page 10 for more details.

Headphone Jack

A headset plugged into the headphone jack allows monitoring the WaveCAST audio output after it gets processed.

Main Info Screen and Screen Navigation

The Main Info Screen will show the following information: Device Description, Audio Source, Audio Preset, Audio Input Gain Setting. The IP address will be displayed if the device is connected to the network.

Additional WaveCAST Servers

Several WaveCAST devices can be on the same network. WaveCAST devices include the original WaveCAST, FM+, IR+, and WaveCAST EIGHTS, along with their Dante counterparts. The number of devices that can be put on the network depends on if the device is a unicast or multicast device.

Up to eight WaveCAST EIGHTS can be on the same network, as these devices are all multicast. Adding in an original WaveCAST or FM+ running in unicast mode will lower the maximum number of devices to four, because those devices are unicast.

The maximum number of devices allowed on the network can be adjusted with the Max Servers on Subnet option on the webpage. This may be necessary if you have a mix of unicast and multicast devices.

This setting must match on all multicast devices on the same network, or the devices will throw an error and be unable to stream. Unicast device will always be limited to 4 devices on the network, and therefore do not have a Max Servers on Subnet setting. If unicast systems are included on the network, the Max Servers on Subnet setting on multicast devices must be set to 4.

If only multicast devices are included, the maximum can be set to 4 or 8, as long as Max Servers on Subnet settings is the same on all devices. If settings are mismatched, the server will be unable to stream audio and will throw an Incompatible Server error. Devices that are missing this feature may need their firmware updated.

Main Info Screen



While navigating through the menu, directional arrows (<, >, ^, v) will show up, indicating that parts of the menu exist off-screen to the left, right, above or below. Use the corresponding buttons on the front panel to navigate the menu.

Navigating the Menu

- While the transmitter is displaying the Main Info Screen, the **Up ^** and **Down v** buttons adjust the **Audio Input Gain**.
- The **Menu** button is a Enter/Exit Menu function only. It does not select anything within the menu. It allows the user to quickly return to the Main Info Screen from any place in the menu.
- While the transmitter is displaying the Menu on the screen:
 - The **Up ^** button navigates upward in the menu, changes a setting, or acts as a page up on info screens.
 - The **Down v** button navigates downward in the menu, changes a setting, or acts as a page down on info screens.
 - The **Left <** button backs out of the menu one step at a time.
 - The **Right >** button navigates forward in the menu or selects a setting.

Screen Time Out

When in the menu system, once a setting is selected, no additional action is necessary. If no buttons are pressed, after 5 minutes the OLED will return to the Main Info Screen, then after another 10 minutes show a screen saver, then go blank after an amount of time set in the Screen Time-Out preference (see "Screen Time-Out" on page 12).

System Settings

Settings can be selected using the arrows on the front panel of the WaveCAST to navigate the OLED menu system or be set via the web interface by using a computer. Not all settings are available in the front panel menu or through the web interface, and using both may be necessary for your initial set up.

If audio is present, the audio input level LED's will pulse with the level of the audio.

Audio Settings

The Audio Settings provide the ability to change the audio characteristics for different listening applications, choose the input source, adjust the input level, set audio presets, and adjust the headphone volume.

Audio Source

The Audio Source menu is used to configure the WaveCAST for the audio source jack and type of source that will be used. The audio source **must be configured in the menu** before plugging the source into the jack.

The Audio Source menu has four possible selections to choose from: Analog Line In, Mic, Phantom Mic +12V, 400 Hz Test Tone or Dante (optional).

Audio Input Gain

The Audio Input Gain adjusts the incoming audio level into the WaveCAST. This adjustment only affects analog audio. Changes to the input level will affect the level indicated by the front panel LED's when audio is present. Audio Input Gain is adjustable from 0 dB to -50 dB in 1 dB steps.

Audio Presets

The Audio Presets allow the user to quickly and easily configure the WaveCAST for common applications. There is a **Custom** setting if customization is desired, or three pre-configured settings.

There are three pre-configured to choose from: **Hearing Assist, Music, and Voice**. When one of these selections is made, the performance of the WaveCAST is immediately optimized for the needs of that application (an adjustment is automatically made to the Low-pass Filter, High-pass Filter, and Compression). Refer to the chart below for a comparison of the Audio Preset configurations.

By default, the WaveCAST is shipped in the **Music** mode.

Audio Preset Configuration Table

Preset	High-pass	Low-pass	Compression
Voice	125 Hz	6.3 kHz	1:1
Music	31 Hz	16 kHz	1:1
Hearing Assist	500 Hz	8.0 kHz	2:1

For music, concerts, and other applications where the highest audio quality is desirable, **Music** is the recommended mode of operation.

For hearing assistance applications or applications where the message is critical for listening, **Hearing Assist** is the recommended mode of operation.

For speaking and other voice applications, **Voice** is the preferred mode of operation.

Custom Audio Preset

If the three preset configurations do not meet the needs of the venue, the Custom audio preset can be used. The custom preset allows the user to adjust the High-Pass Filter cutoff frequency, Low-Pass Filter cutoff frequency, and choose the Compression Ratio. If the audio preset is changed from Custom to Music, Hearing Assist, or Voice, the Custom settings are still saved for use in the future.

High-pass Filter

A high-pass Filter cuts off low frequencies and lets high frequencies pass through. The pole frequency chosen is the point where the cutoff takes effect. The high-pass filter will help to remove low frequency noise from the transmitted audio signal, such as room noise, a line hum, or breath accents picked up from an improperly installed microphone. Available frequencies are: 31, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, and 630 Hz.

Low-pass Filter

A low-pass Filter cuts off high frequencies and lets low frequencies pass through. The pole frequency chosen is the point where the cutoff takes effect. The low-pass filter will help to remove high frequency noise from the transmitted audio signal, such as hiss in the audio line as a result of room noise, sharp speech sounds, or other uncomfortable high frequency sounds. Available frequencies are: 3.5, 4.0, 5.0, 6.3, 8.0, 10.0, 12.5, and 16 kHz.

Dynamic Range Compression

Dynamic range compression reduces the volume of loud sounds and amplifies soft sounds. This type of compression is typically used for voice and hearing assistance applications for a listener who has difficulty hearing the quiet sounds of an audio broadcast.

For listening to music programs, concerts, etc., lower compression ratios or no compression is generally used. The WaveCAST has three selectable modes of compression: 1:1 (compression off), 1.5:1 (low compression) or 2:1 (high compression).

For applications such as music and voice, where high audio quality is desirable, 1:1 is the recommended mode of operation. For hearing assistance or applications where the transmitted message is critical for listening, 1.5:1 or 2:1 is recommended.

NOTE: The WaveCAST is shipped from the factory at a 1:1 compression ratio (no compression).

NOTE: Some hearing impaired people cannot tolerate as loud of a sound as those with normal hearing. Using compression can help protect those users. However, compression also can make audio sound flat. Only use compression when it is the best choice for the listeners.

Headphone Volume

The headphone volume level can be increased or decreased by using the Headphone Volume setting in the menu.

Screen Time-Out

The Screen Time-Out setting determines how long the transmitter displays the screen saver. The transmitter waits for 10 minutes, after no front panel button pushes, then displays the screen saver. After displaying the screen saver for the period of time set with the Screen Time-Out Setting, the transmitter display will shut off to conserve energy.

This feature is not available on the web interface.

User-Entered Description

The Description field allows the user to easily identify the transmitter. This typically comes into play when multiple transmitters need to be distinguished from one from another. The description appears on the front main info screen, and also on the web page. In a rack, all the user has to do is activate the main info screen with a touch of any button on the front, and the description is displayed as one of the fields on the main info screen.

The description can only be edited from the web interface.

Restore Defaults

The Restore Defaults action will restore the transmitter to its original factory settings. Restoring defaults from the front panel of the WaveCAST will reset all settings.

Restoring defaults from the web page will reset all settings except Network and Dante connectivity settings (IP Address, Subnet Mask, IP Address Mode, and Web Password). This maintains connectivity between the Web Page and the WaveCAST, as well as the optional Dante source, after the WaveCAST reboots.

In the web interface, this feature is under the Admin menu. On the front panel menu, it is under Preferences.

Network Configuration

Network Settings can only be edited from the web interface. An IP address will be automatically assigned to the WaveCAST once an Ethernet cable has been connected to the device and network connection found. Additional configuration would need to be made through the web interface.

Adjusting Network Settings

The Network Settings screen where the IP Address Mode (Static or DHCP), the IP Address, and Subnet Mask are set via the web interface. See "Network Settings Page" on page 15 for details on how to use the web interface.

IP Address Mode Static or DHCP

IP Address If the IP Address Mode is set to Static, this is where the IP Address is manually entered

Subnet Mask If the IP Address Mode is set to Static, this is where the Subnet Mask is manually entered

Gateway If the IP Address Mode is set to Static, this is where the gateway is manually entered

Multicast Address If needed, the multicast cast address can be enabled and either manually set or randomly generated. This setting is under the Advanced options.

DHCP IP Addresses are automatically created, and are usually preferred to a manual static IP address.

To set up a static IP Address:

1. Determine an appropriate static IP address for the WaveCAST.
 - a. If you are unsure of an appropriate IP address, contact your network administrator.
2. Enter the information on the device website on the Network Settings page. Select 'Static' for the fields to show.
3. Click **Submit** when ready.
4. A prompt will ask to restart the device. Click **Yes** to reboot the device.

Dante Settings

Some Dante settings can be viewed through the web interface, but must be configured through the Dante system, not the WaveCAST. See "Network Settings Page" on page 15 for details on how to use the web interface. See your Dante device manual for information on setting up and working with your Dante network.

The Dante settings will only show up in the menu if the optional Dante feature is installed (WaveCAST D). It will not be present for other models.

The WaveCAST cannot provide Dante information until a physical connection to the Dante network is established through the Dante port on the back panel.

Web Control Interface

The WaveCAST provides a web interface to manage the device settings. These web pages can be accessed over either a hardwired or wireless network connection with most modern internet browsers.

Changes take effect when applied or saved. Some changes require a reboot. Any updates made through the front panel will show up on the web interface once the current page has been navigated away from, either by refreshing the page or going to a new page.

1. Open the web browser of your choice. Chrome is our recommended browser.
2. In the address bar of the browser, type in the IP address of the WaveCAST and hit Enter. The IP address can be found on the front panel of the WaveCAST.
3. You should see the Login Page of the WaveCAST.
 - If you only see a page asking for a firmware update, your device may have been corrupted. See "Website problems" on page 18

Login Page

The default User name is "admin" and the default password is "admin". The user name and the password can (and should) be changed on the website's Admin page.

Check with your system administrator for the most recent login credentials.

Login

Error Alert

If the WaveCAST encounters an error, a message may appear at the top of the screen. Clicking the Clear Error button will hide the alert. Not all errors require action, however, if an error continues occurring or affects system performance, contact Customer Service.

Audio/Main Settings Page

The Audio or Main Settings page displays all current audio settings, as well as corresponding web-based controls. It is the first page to appear when logging into the website. The name of this page may change depending on your firmware version.

An audio monitor is visible at the top of the page. It is for informational purposes only, and does not set any settings.

Note: Network speed can affect the audio monitor updating and web page performance.

The transmitter information displays which device is being edited. If needed, the description can be adjusted on the Preference page.

Audio Input Gain is the increase in audio volume. It can be incremented one dB at a time.

The audio input source is the audio source that will be broadcast.

Audio Presets adjust the sound to specific settings to improve the audio quality depending on if you are broadcasting audio that is primarily voice, music, or for an audience requiring hearing assistance. The audio settings can also be manually adjusted in the custom presets section.

See "Audio Settings" on page 10 for more details on adjusting any of these settings.

-18 -15 -12 -9 -6 -3 0dB +3 +6 +9

Transmitter Information

Model: **WaveCAST**
Description: **TestServer1**

Audio Input Gain

0 Down Up

Audio Input Source

Analog Line In (XLR / ¼)

Audio Presets

Voice Music Hearing Assist Custom

Custom Preset

High Pass Filter: 31 Hz Low Pass Filter: 3.5 kHz

Compression: 1:1 1.5:1 2:1

Submit

Preferences Page

The Preferences page displays user preferences that can be tailored to each WaveCAST system.

The description sets the name of the device, which may be used to uniquely identify the device without referring to the IP address.

Other features may be available in different models of the WaveCAST, such as systems with Dante.

Description

Server Channel Number: CH 1 *Reserved special characters cannot be used.*

WaveCAST

Submit

Network Settings Page

The Network Settings page displays network and Dante connectivity settings. Typically these are not needed after initial installation.

Changing a static IP address or subnet will not instantly take place. The changed IP address or subnet will only take effect once the device is rebooted. This can be done manually or from the Admin menu.

Note: If the IP address or subnet of the device was changed and the device is being rebooted, the website may not be available at the same URL location. Take note of the network information before rebooting the device.

Under Advanced Options, several settings for device performance can be adjusted.

TTL can be modified if there is a need to adjust the audio latency. The recommended setting for the least latency is 1, but it can be set up to 31. This setting should not be adjusted without proper consideration for your system setup.

Secure Mode can be enabled or disabled, and a 6-digit PIN number can be assigned. If enabled, users will need to use this PIN to log on to the audio stream. Users attempting to listen to the stream without the PIN will be unable to do so.

Audio TX Mode determines if the device is broadcasting in unicast mode or multicast most.

If the device is broadcasting in multicast mode, a multicast address can be automatically assigned. If a specific multicast address is required, the device administrator can enter the desired multicast address.

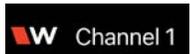
If available, Dante information will be displayed at the bottom of the page. This information cannot be edited via the WaveCAST and should be edited via your Dante or other audio setup.

Additional networking information is described in "Adjusting Network Settings" on page 12.

<p>IP Address Mode</p> <p><input type="radio"/> DHCP <input checked="" type="radio"/> Static</p> <p>Static IP</p> <p>192 168 100 173</p> <p>Subnet Mask</p> <p>255 255 255 0</p> <p>Gateway</p> <p>223 221 222 220</p> <p>Changing the IP address or address mode will reboot the device.</p>	<p>Advanced Options</p> <p>TTL</p> <p>1</p> <p>A TTL of 1 is recommended for the least latency. The maximum value is 31.</p> <p>Secure Mode</p> <p><input type="radio"/> Enabled <input checked="" type="radio"/> Disabled 6-digit PIN: 000000</p> <p>Audio TX Mode</p> <p><input type="radio"/> Unicast <input checked="" type="radio"/> Multicast</p> <p>Multicast Address</p> <p>Multicast addresses are typically automatically assigned, but a custom address may also be used.</p> <p><input checked="" type="checkbox"/> Declare Custom Address 123 122 121 124</p>
--	---

Upload Image

An image can be uploaded that will display next to the channel name for any users listening using the WaveCAST Receiver app.



This image can be used to easily distinguish the content of your audio broadcast. The image must be under 128kB and be in PNG or JPG format. If no custom image is uploaded, a Williams AV W logo will display instead.

The image can be replaced at any time. To completely remove the image, the device must be reset via the front panel menu.

Channel Image Upload

This image will be displayed to viewers of this channel on the WaveCAST App. It can be used to show a logo, a language for interpretation, or any creative icon. *File size limited to 128kB.*

Current Image:

No file chosen

Administration Page

The Admin page displays administrative controls that can be used for remote site troubleshooting purposes.

The login username and password for the website can be set from this screen. If the username or password is ever forgotten, it can be restored to its default value by restoring defaults via the front panel menu.

Limited Restore Defaults on the web interface will reset the devices settings that will not affect the website connectivity. Using the limited restore defaults from the web interface will **not** reset the username or password. For a full reset, the reset will need to be performed via the front panel of the device. See "Restore Defaults" on page 12 for more information.

Upgrades are performed from the Admin page. At the bottom of the page, upload the upgrade file (provided by Williams AV) and hit the upgrade button. Your system will begin the upgrade process from there, which will include a reboot. **Do not make any changes on the device until the system has rebooted.** There is no indicator for the progress of the update, but it should take around two minutes.

Upgrading or rebooting the device and make the website temporarily unavailable as the system resets.

Note: If the IP address or subnet of the device was changed and the device is being rebooted, the website may not be available at the same URL location. Take note of the network information before rebooting the device.

Change Password

User Name	<input type="text" value="admin"/>
Password	<input type="password"/>
Password Verify	<input type="password"/>

Additional Functions

System Update

Updates can be downloaded off our our company website. [Click here to check for the latest update](#)

Installed Firmware Version: 0.0.40
Website Version: 0.0.1

No file chosen

WaveCAST Receiver App

The WaveCAST Receiver app allows listeners to hear the audio on their personal, Wi-Fi connected devices, such as a mobile phone. The WaveCAST App can be downloaded from the Google Play Store for Android devices or the Apple App Store for iOS devices.

Download the WaveCAST App

Download the WaveCAST app from the Apple App Store for iOS devices or Google Play Store for Android devices.

It is recommended that the app is downloaded in advance over an internet-connected wi-fi network or cellular network.

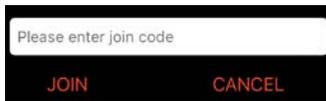
Join the WaveCAST Wi-Fi Network

Once the WaveCAST App is downloaded, join the same Wi-Fi network that the audio is being broadcast over. If no channels are listed when selecting an audio channel, there is no audio being streamed on this Wi-Fi network. Ensure you are on the correct Wi-Fi network.

Select an Audio Channel



When the App is opened for the first time, a list of available channels will appear. Tap on the channel to listen to the audio. The venue should provide the name of the channel to listen to for your event if more than one is available.



Channels marked with a lock icon require a code to join. Enter the join code assigned to the channel when prompted. If a channel is currently streaming, it will have a blue checkmark next to its channel name.

If there are many servers on your network, or your network is set so that servers cannot be discovered by outside devices, the WaveCAST app can connect to a server via IP address. Tap the **Discover by IP** text at the bottom of the channel screen then enter the IP address of the WaveCAST server. The channels being broadcast by that server will then be available on the channel select screen. *It is recommended that this feature is not used with a general audience as they may not type the IP address correctly.*

Listen to the Audio

Once an audio channel has been selected, the audio should start playing automatically. The volume of the audio can be adjusted using the slider in the middle of the screen, or with the physical volume controls on the personal device.



To mute the audio, tap the speaker icon. Tap it again to unmute the audio.

To switch channels, hit the back arrow at the top of the screen.

Note on Wi-Fi Assist/Smart Network Switching

The WaveCAST **does not require** an internet connection. It can be placed on an internal network with no internet connection.

Some phones expect network connections to provide internet access. When the phone cannot reach the internet, it may automatically try to switch to a network connection with an internet connection. Sometimes, the phone determines that the best internet connection is through a mobile data network.

This is not the desired behavior when using the WaveCAST network. The phone will automatically take the user off of the WaveCAST audio streaming network, and onto a unrelated internet network connection. This will prevent the user from hearing the audio, and they may not realize their phone switched networks on them.

Steps for disabling this feature will differ for every phone, but is typically found under the Wi-Fi or Mobile network settings. Look in the manual for your phone for instructions on disabling this feature.

Troubleshooting

Website problems

The full website is unavailable.

- If you are only able to install a firmware update, the website stored on the WaveCAST has been corrupted, likely by a power outage. Install the firmware for your current version (or newer) of the WaveCAST via the firmware update page to restore the website.
- Check your network settings. The IP address is viewable on the front panel of the device.

Lost username or password

- Using the front panel menu, restore defaults. See "Restore Defaults" on page 12.

Website not behaving as expected

- The website will only work with a modern browser. Do not use the website with IE11 or earlier.
- Try switching browsers. Google Chrome is our recommended browser.

Audio problems

No Audio heard in Phones jack

- Check to see if there is a signal coming from your audio source. Check and correct your audio source, if necessary.
- Check to see if the headphone volume level has been turned all the way down. If so, increase it.
- Check to see if there is an incorrect or defective connection from your audio source.
- Check and correct your audio gain level, if necessary.

Noise or Distortion in the Audio

- Check to see if there is noise in the audio source. To find out, disconnect the audio cable. If the noise disappears your noise problem is in the source. Correct or repair your audio source.
- Ensure the Audio Source configuration is set to match the audio source input device. See "Audio Source Connections" on page 7 for how to properly configure the audio source.
- Check for ground loops or noise on the input signal. If you are still having trouble, call your Authorized Williams AV dealer or representative.

Noise in audio grows when program is silent

- Check the WaveCAST Compression Ratio, which may be inappropriate for the type of program being transmitted. Try setting the Compression Ratio to 1:1 (compression off). See "Audio Settings" on page 10.

Reception or App difficulties

NOTE: Be sure to listen to the audio transmission on the WaveCAST headphone jack prior to checking the receiver reception.

No Reception

- Ensure the listeners have the correct app open are listening on the same channel as the WaveCAST.
- Ensure the phone is on the correct Wi-Fi network.

Missing Channel Image on App

- Images may not load when many users are connected. Try reloading the list of channels.

Users must turn receiver volume controls way up (near maximum) to get enough volume

- The audio gain control may be set incorrectly on the transmitter. Correct the Audio Gain control setting by adjusting it until the sound level peaks between 0 and 6 dB.
- It could be that the audio input is not configured for the audio source being used. If not, correct the setting of the Audio Source control menu. See "Audio Settings" on page 10.
- Some users may not be helped by this system. Severe hearing loss may require using the system with a T-coil and personal hearing aid rather than headphones. Some phones and tablets have the ability to broadcast to a T-coil; research the phone model to see if this is an option.

Users complain of too much noise during soft audio. Dynamic range of music reduced too greatly.

- The device could be set for High Compression (2:1) when Reduced Compression (1.5:1) or No Compression (1:1) would be more suitable, given the program material. If so, set the Compression Ratio to 1.5:1 or 1:1 and see if this reduces the noise. See "Audio Settings" on page 10.

Buzz in other equipment when transmitter is on or off

- This is likely caused by incorrect audio connections, a ground loop, or defective equipment. To remedy, use proper audio wiring practice to make connections.
- Make certain the transmitter chassis is connected to the equipment cabinet rails. Buzz/hum in system may be experienced when the WaveCAST chassis is insufficiently grounded. In this case, install a ground wire to the WaveCAST chassis and terminate to a verified ground source.

Device is not working over the hardwired Ethernet network

Note: If you have a network system administrator, please contact them first before attempting to troubleshoot the network yourself. The following steps are things you can try on a small, non-managed network.

Check the entire signal path between the control device (laptop or desktop computer) and the WaveCAST. You can save some time by pinging the router and WaveCAST. Pinging allows you to verify the wiring path without physically having to trace the wires themselves.

1. Write down the IP address of the WaveCAST and the router. You can find the IP address of the WaveCAST via the menu on the front screen of the device.
2. Make sure the WaveCAST, Router, and any other devices that may be needed (such as an Ethernet switch) are all connected and powered on. You can save time tracing wiring/hardware paths with these next three steps:
 - Open a CMD window on the computer. (For example, on Windows 10 computers, in the search box, type "CMD". A black box should come up and the cursor will be blinking.)
 - Type "ping" followed by a space, followed by the IP address of the WaveCAST, and hit Enter. If you see a "reply from...[IP address]" this means the hardwired Ethernet path is OK. If you see "request timed-out", there is most-likely a break in the wiring path between the computer and the WaveCAST.
 - Try pinging the IP address of the router. If you can get a "reply from..." the router, but not the WaveCAST, the problem is either in the wiring between the router and WaveCAST, or the WaveCAST itself could be malfunctioning.
3. Check all of the wiring between the computer and the WaveCAST. Make sure every device in the signal path is plugged in, connected, and powered on. Unplug and plug back in firmly all Ethernet cables in the path between the computer and the WaveCAST. If you find one that was loose, plug it in and test the device connection again. If none are loose, try to replace Ethernet cables.

Note: When checking connections, make sure the WaveCAST Ethernet cable is plugged into one of the LAN ports on the router, not the WAN port.

4. If no loose cables were found, try re-booting in this order
 - the router
 - the computer
 - the WaveCAST (turn it off for 10 seconds then turn it back on)

Wait at least two full minutes for the WaveCAST to re-establish itself on the network. Then try testing the connection again

5. Once you have verified that you can ping the WaveCAST from the computer, open an internet browser on the computer. Type the IP address of the WaveCAST into the address bar of the internet browser.
6. Verify the connection by changing a setting on the WaveCAST through the internet browser. If you can change settings and get feedback on the web page (or verify the change on the front display of the WaveCAST), you are now connected to the WaveCAST.
7. If you can make changes to the WaveCAST initially, but then get disconnected, you may have to look at network issues such as IP address conflicts, power issues, or even settings in the router.
8. You can try restoring the WaveCAST to factory settings. This will clear out any changes and allow you to start clean.
9. If you have tried all of these steps and still can't connect, call Williams AV for additional troubleshooting help. Note that Williams AV cannot help in all cases as there are many variables within networks.

Device is not working over Wi-Fi

Note: If you have a network system administrator, please contact them first before attempting to troubleshoot the network yourself. If you don't have a system administrator, the following steps are things you can try on a small, non-managed network.

This situation is most often caused by the mobile device losing connection to the router when the Wi-Fi on the mobile device has been turned off (or the Wi-Fi reception is unstable).

1. In order to perform these steps you will need the SSID of the router, the router Wi-Fi connection password, and the IP address of the WaveCAST.
2. Make sure the WaveCAST and router are both ON.
3. Make sure the Ethernet cable going to the WaveCAST is plugged into one of the LAN ports on the router (not the WAN port).
4. Is the mobile device connected to the router? On the mobile device, go into the Wi-Fi Settings, and make sure Wi-Fi is turned on or enabled. More than one router may show up in the list of possible connections, depending upon how many routers are nearby. If you don't see the router that is connected to the WaveCAST in the list, make sure the router is on and broadcasting its SSID.
5. If you see the desired router SSID in the list, connect to it by clicking on it. Usually there is a check mark or some other indication of which router/SSID you are connected to. You may need to enter the Wi-Fi password/passkey to the router to connect to it.
6. Once you have verified that you have connected the mobile device to the router, exit the Wi-Fi settings on the mobile device (without shutting off the Wi-Fi) and open an internet browser. Type the IP address of the WaveCAST into the address bar of the internet browser and hit the enter key. You should see the WaveCAST login web page come up.
7. Verify the connection by changing a setting on the WaveCAST through the internet browser. If you can change settings and get feedback on the web page (or verify the change on the front display of the WaveCAST), you are now connected to and controlling the WaveCAST.
8. On the portable device, attempt the following steps:
 - Enable Network Permissions for the Wavecast App
 - Disable Private IP Addressing
 - Disable Random MAC address
 - Reopen App or Reboot portable device
9. Try re-booting in this order
 - the router
 - the computer
 - the WaveCAST (turn it off for 10 seconds then turn it back on)Wait at least two full minutes for the WaveCAST to re-establish itself on the network. Then try testing the connection again.
10. If you can make changes to the WaveCAST initially, but then lose that ability (get disconnected), you may have to look at deeper network issues such as IP address conflicts, power issues, or even settings in the router.
11. If there is interference, or low Wi-Fi signal on the mobile device, try moving the router to a better location.
12. Some mobile devices have known issues with certain routers. To fix this, you can investigate updating the operating system on the mobile device. Try a different mobile device just to verify that ANY wireless device can connect. If you can get one device connected, but not another, chances are the device that cannot connect has issues. A different brand/model of router may also fix the problem with certain devices not connecting.
13. You can try connecting a computer directly to the WaveCAST with a standard Ethernet cable to verify that the Ethernet connection on the WaveCAST is working. Once this has been verified you can place the WaveCAST back on the network and begin troubleshooting back to the mobile Wi-Fi device.
14. Try connecting to the WaveCAST using Wi-Fi on a laptop, rather than a mobile device, to verify that the mobile device is/is not the problem. If you can connect with a laptop, check the Wi-Fi settings on the mobile device and make sure Wi-Fi is turned on.
15. You can try restoring the WaveCAST to factory settings. This will clear out any changes and allow you to start clean.
16. If you have tried all of these steps and still can't connect, call Williams AV for additional troubleshooting help. Note that Williams AV cannot help in all cases, as there are many variables within networks.

Remote Control

Documentation is available for setting up Telnet/IP remote control on request. Please contact TechBlue support services for a copy of this document.

Specifications

Note: These specifications only apply to WaveCAST units with a serial number starting with C or later.

For specifications for serial numbers beginning with A or B, view the specification sheet on the Williams AV website.

Dimensions	8.45" W x 8.25" D x 1.72"H (21.5 cm x 21 cm x 4.4 cm)	
Weight	Transmitter: 3.0 lbs (1.36 kg)	
Color	Black/Silver with silver legends on the front, white legends on the back	
Rack Mount	Standard 19" Rack, one EIA rack space high, 1/2 space wide 1–2 units can be mounted in a single rack space with optional RPK 005 (single) or RPK 006 (double) Rack Mount Kits	
Power Supply	Desktop Style Transformer (TFP 062); Input: 100-240 VAC, 50/60 Hz. IEC Line Cord; Output: 24 VDC, 750 mA, 18W. 2.5mm ID center positive barrel connector	
Power ON Indicator	Push On/Push Off latching power button, backlit green indicates power ON, backlight off indicates power OFF, fading from bright to dark indicates Sleep Mode.	
Temperature Range	Operating: +32° F to +122° F (0° C to 50° C); Storage: -4° F to +158° F (-20° C to 70° C)	
Audio Processor Functions	DSP based; Compression: 1:1, 1.5:1 or 2:1; High-pass and Low-pass Filter Frequency control	
Frequency Response	31 – 16000 Hz, ± 3 dB ("Music" Audio Preset)	
Signal-to-Noise Ratio	≥ 74 dB Transmitted RF	
Total Harmonic Distortion	Less than 0.25% @ 1 kHz (RF output)	
User Interface	Front panel buttons or hosted web interface	
Common Mode Rejection	> 57 dB @ 1 kHz, Mic or Line	
Audio Inputs	(1x) Combination 3-pin XLR, 1/4" (TRS) jack for Mic or Line Level Analog Audio, Balanced or Unbalanced Line Level, or balanced or unbalanced microphone with Selectable Phantom Power	
Audio Input Gain Adjust	In menu, adjustable to 0 to -50 dB, in 1dB steps	
Phantom Power	14.4 VDC applied through 2.2 k Ω resistors to analog combo jack: Pin 2 and Pin 3 on XLR jack, or tip and ring on 1/4" TRS jack	
Audio Level Indicators	10-LED array that reads -18 to +9 dB at 3 dB intervals. 7 Green, 2 Amber, and 1 red LED. Green LEDs indicate normal operating audio level peaks, Amber LEDs indicate close to overload peaks, Red LED indicates overload peaks	
Headphone Output	1/4" TRS stereo jack, mono signal, 15.7 mW, maximum in 33 Ω (level adjustable in menu 0 to -40 dB in 2 dB steps) Directly tied to rear 1/4"/XLR input for purpose of listening/checking incoming audio.	
Line Output	RCA jack (black), -10 dBV (.32 VRMS); Output impedance 100 Ω	
Input Levels (Bal or Unbal) (at Audio Input Gain = 0dB)	Nominal (1st Amber LED)	Overload Warning (Displayed on Screen)
Microphone	-55 dBV (1.7 mV RMS)	-15 dBV (180 mV RMS)
Line	-25 dBV (55 mV RMS)	+16 dBV (6.3 V RMS)
Ethernet	RJ-45 on back of unit supports cable lengths up to 328 feet (100 meters); 10/100 Base-T IEEE 802.3 compliant, unique MAC address	
Approvals	FCC, RoHS3, WEEE, Industry Canada, CE, PSE, RCM, CB Scheme	
Warranty	2-year parts and labor	

NOTE: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

** Stresses above these ratings may cause permanent damage. Exposure for extended periods may degrade reliability.

2-Year Warranty

Williams AV, a brand owned by Williams AV, products are engineered, designed, and manufactured under carefully controlled conditions to provide you with many years of reliable service.

Williams AV warrants the WaveCAST transmitters against defects in materials and workmanship under normal use and conditions for the 2-years from the product from date of purchase.

This warranty is available to the original end purchaser of the product and can be transferred to subsequent purchasers of the product.

Microphones, earphones, headphones, batteries, chargers, cables, carry cases, and most other accessory products carry a 90-day warranty.

Williams AV has no control over the conditions under which this product is used. Williams AV, therefore, disclaims all warranties not set forth above, both express and implied, with respect to the WaveCAST, including but not limited to, any implied warranty of merchantability or fitness of use of such equipment including, without limitation, any warranty that the use of such equipment for any purpose will comply with applicable laws and regulations. Williams AV shall not be liable to any person or entity for any medical expenses or any direct, incidental or consequential damages caused by any use, defect, failure or malfunctioning of the product, whether a claim for such damages is based upon warranty, contract, tort or otherwise, the sole remedy for any defect, failure or malfunction of the products is replacement of the product. No person has any authority to bind Williams AV to any representation or warranty with respect to the WaveCAST System. Unauthorized repairs or modifications will void the warranty. This warranty is void if damage occurred because of misuse, or if the product has been repaired or modified by anyone other than a factory authorized service technician. Warranty does not cover normal wear and tear on the product or any other physical damage unless the damage was the result of a manufacturing defect. Williams AV is not liable for consequential damages due to any failure of equipment to perform as intended. Williams AV shall bear no responsibility or obligation with respect to the manner of use of any equipment sold by it.

This warranty does not cover reimbursement for your costs of removing and transporting the product for warranty service evaluation or installation of any replacement product provided under this warranty.

The exclusions and limitations set out above are not intended to, and should not be construed so as to contravene mandatory provisions of applicable law. If any part or term of this Disclaimer of Warranty is held to be illegal, unenforceable, or in conflict with applicable law by a court of competent jurisdiction, the validity of the remaining portions of this Disclaimer of Warranty shall not be affected, and all rights and obligations shall be construed and enforced as if this warranty did not contain the particular part or term held to be invalid. The terms of the warranty are governed by the laws of the State of Minnesota.

Prices and the specifications of the products are subject to change without notice.

For Complete Warranty Statement go to: <https://williamsav.com/support/warranty-product-registration/>

NOTICE: Williams AV products are NOT designed for use in extreme temperature, humidity or chemical environments. The introduction of chemicals such as chlorine, salt water or human sweat into the product will cause damage to the circuitry. Damage due to these causes is NOT covered under the Product Warranty.

If you experience difficulty with your system, call toll-free for customer assistance: **1-800-843-3544 (U.S.A.) or +1 952 943 2252** (outside the U.S.A.)

If it is necessary to return the system for service, your Customer Service Representative will give you a Return Authorization Number (RA) and shipping instructions.

Pack the system carefully and send it to:

Williams AV

Attn: Repair Dept.

10300 Valley View Road

Eden Prairie, MN 55344 USA

Your warranty becomes effective the date you purchase your system. If your sales receipt is not available, the date code on the product will determine your warranty status.

WILLIAMS AV

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