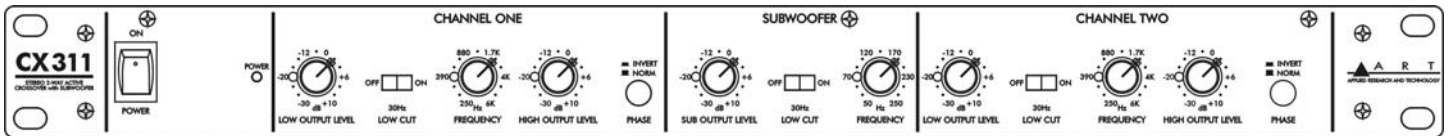


CX311

Stereo 2-Way Active Crossover with Subwoofer Output



SERVICE GUIDE



IMPORTANT SAFETY INSTRUCTIONS – READ FIRST



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltages inside the enclosure that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read the manual.

Read instructions

Retain these safety and operating instructions for future reference. Heed all warnings printed here and on the equipment. Follow the operating instructions printed in this user guide.

Do not open

There are no user serviceable parts inside. Refer any service work to qualified technical personnel only.

Power sources

Only connect the unit to mains power of the type described in this user guide or marked on the rear panel. The power source must provide a good ground connection.

Power cord

Use the power cord with sealed mains plug appropriate for your local main supply as provided with the equipment. If the provided plug does not fit into your outlet consult your service agent. Route the power cord so that it is not likely to be walked on, stretched or pinched by items placed upon or against.

Grounding

Do not defeat the grounding and polarization means of the power cord plug. Do not remove or tamper with the ground connection on the power cord.

Moisture

To reduce the risk of fire or electrical shock, do not expose the unit to rain, moisture or use in damp or wet conditions. Do not place container of liquid on it, which may spill into any openings.

Heat

Do not locate the unit in a place close to excessive heat or direct sunlight, as this could be a fire hazard. Locate the unit away from any equipment, which produces heat such as: power supplies, power amplifiers and heaters.

Environment

Protect from excessive dirt, dust, heat, and vibration when operating and storing. Avoid tobacco ash, drink spillage and smoke especially that associated with smoke machines.

Handling

Protect the controls from damage during transit. Use adequate padding if you need to ship the unit. To avoid injury to yourself or damage to the equipment take care when lifting, moving or carrying the unit.

Servicing

Switch off the equipment and unplug the power cord immediately if it is exposed to moisture, spilled liquid or the power cord or plug becomes damaged during a lightning storm or if smoke odor or noise is noted. Refer servicing to qualified technical personnel only.

Installation

Install the unit in accordance with the instruction printed in the user guide.

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OVERVIEW

The ART CX311 Stereo 2-Way Active Crossover with Subwoofer Output offers a superb level of sound quality and its straightforward user interface gives you quick and easy access to all of its features. Designed for home, club, or DJ system applications or live sound reinforcement, the CX311 employs 24dB/ octave state-variable, fourth-order, Linkwitz-Riley filters. These filters guarantee in-phase outputs at all frequencies. This ensures the proper acoustic summing of common signals from adjacent drivers in the crossover region.

The CX311 is a stereo 2-way electronic crossover with an additional subwoofer output. Each crossover channel splits the frequency of an input signal into two separate signals, which may then be sent to amplifiers or other signal processing equipment in a sound system. The subwoofer output can be used to add punch to low bass audio.

Each stereo channel features high and low output level and crossover frequency rotary controls, while the subwoofer channel features its own output level and crossover frequency rotary controls. A low cut switch for each channel may be used to remove unwanted subsonic audio that can damage amplifiers or speakers. Each stereo channel also includes a phase switch that can be used to detect or correct audio path connection errors. The rear panel features balanced XLR and 1/4" TRS input and output connectors. Power for the CX311 is internal.

The ART CX311 Stereo 2-Way Active Crossover with Subwoofer Output has been carefully designed, engineered and manufactured to provide you with years of great sound and reliable service.

Features

- Stereo 2-way operation with separate subwoofer output
- Fourth-order Linkwitz-Riley filters
- Balanced XLR and 1/4" TRS inputs and unbalanced 1/4" outputs
- Adjustable, wide crossover frequency range (250Hz to 6kHz)
- Independent output level control for each output
- Switchable low cut (30Hz) filters on each stereo channel and subwoofer
- Phase reverse switch on each stereo channel's High output
- Rugged, fully shielded all-steel chassis
- Internal AC power supply with standard IEC connector
- Three year warranty

INSTALLATION

The ART CX311 may be used in a wide variety of applications and environments. Enclosed in a 1U (1.75 inches high) rack-mountable, all-steel enclosure, the unit is designed for continuous professional use. The depth is 5 inches. Mounting location is not critical. However, for greater reliability, we recommend that you not place the unit on top of power amps or other sources of heat.

AC POWER HOOKUP

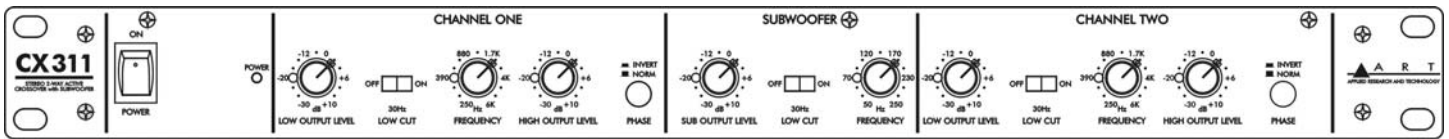
The CX311 has an internal power supply designed to operate from 105 to 120VAC at 50/60Hz. Units manufactured for use outside of the United States have been modified to comply with the required electrical specifications for the country of destination. Before plugging the CX311 into the AC mains, make sure that all of the equipment following the crossover outputs are turned off or that all of the outputs are turned down.

INPUT/OUTPUT CONNECTIONS

The CX311 has XLR and 1/4" TRS phone jack connectors for each input. Audio input connections are active balanced although the 1/4" phone jack connections can easily be converted to unbalanced operation by using two-conductor phone plugs. All output connections are unbalanced and use 1/4" TS phone jacks.

OPERATION

FRONT PANEL CONTROLS



POWER SWITCH

The POWER switch applies and removes power to the unit. Make sure that all equipment after the CX311 is either off or the outputs are turned all the way down before turning the CX311 on or off.

LOW OUTPUT LEVEL CONTROLS

Each channel of the CX311 has a LOW OUTPUT LEVEL control. These controls are used to trim the output levels to the LOW OUTPUT jacks on the rear of the unit.

These controls cover the range of -30dB to $+10\text{dB}$ of output gain trim, as indicated on the front panel. In most cases you would set them to 0dB , for flattest response from the crossover. You can use these controls to compensate for amplifier gain variations or efficiency of your speakers.

LOW CUT FILTER SWITCH

The LOW CUT switch activates a 30Hz high pass filter. There is one for each of the LOW OUTPUT jacks and one for the SUBWOOFER OUTPUT. This filter is a 2-pole Butterworth design (12dB/octave). Its response reduces spurious subsonic frequencies, which tightens up the low end and helps to protect your amplifiers and speakers.

CROSSOVER FREQUENCY CONTROL

Each channel of the CX311 has a crossover FREQUENCY control to set the crossover point for the high and low frequencies. These controls cover the frequency range of 250 Hz to 6 kHz . All frequencies below the set frequency will be sent to the LOW OUTPUT and all frequencies above the set frequency will be sent to the HIGH OUTPUT.

The main crossover filters are 4-pole Linkwitz-Riley designs (24dB/octave). This yields a sharp rolloff to help protect speakers and the outputs sum to a flat response.

HIGH OUTPUT LEVEL CONTROL

Each channel of the CX311 has a HIGH OUTPUT LEVEL control. These controls are used to trim the output levels to the HIGH OUTPUT jacks on the rear of the unit.

These controls cover the range of -30dB to $+10\text{dB}$ of output gain trim, as indicated on the front panel. In most cases you would set them to 0dB , for flattest response from the crossover. You can use these controls to compensate for amplifier gain variations or efficiency of your speakers.

PHASE SWITCH

Each channel of the CX311 has a PHASE switch. These switches are used to switch the polarity (invert the phase) of the signals going to the HIGH OUTPUT jacks. Normally you would leave these

switches in the out (NORM) position. Pushing a button in (INVERT position) may be used to help correct audible phase-related problems.

SUB OUTPUT LEVEL CONTROL

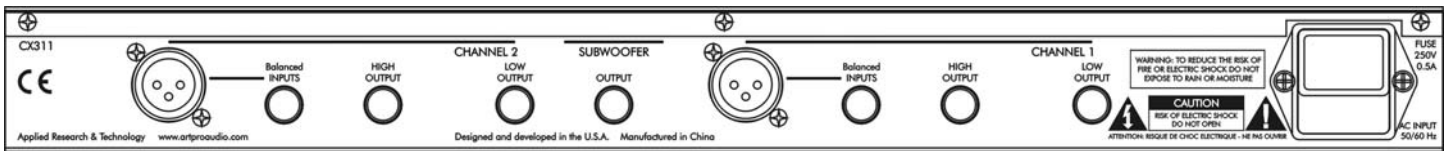
This control is used to trim the audio output level to the SUBWOOFER OUTPUT jack on the rear of the unit. The subwoofer signal is used to provide extra bass via a mono subwoofer speaker in your system.

This control covers the range of -30dB to $+10\text{dB}$ of output gain trim, as indicated on the front panel. In most cases you would set it to 0dB . You can use this control to compensate for amplifier gain variations or efficiency of your speaker.

SUBWOOFER FREQUENCY CONTROL

The SUBWOOFER FREQUENCY control sets the crossover point for signals going to the SUBWOOFER OUTPUT jack. This control covers the frequency range of 50 Hz to 250 Hz . For this function, both of the input channel signals are combined and frequencies below the set frequency will be sent to the SUBWOOFER OUTPUT. This is in addition to the normal signals that are sent to each of the channels other outputs.

REAR PANEL CONNECTORS



It is easy to interface the unit with a wide variety of equipment. The rear panel has balanced XLR and $1/4''$ inputs as well as unbalanced $1/4''$ outputs.

XLR INPUT JACKS

The XLR input connections are balanced and follow the AES standard for wiring: Pin 1 = Ground, Pin 2 = Hot (+) and Pin 3 = Cold (-). These inputs directly parallel the $1/4''$ inputs.

$1/4''$ INPUT JACKS

The $1/4''$ input connections are balanced with Tip = Hot (+), Ring = Cold (-), and Sleeve = Ground. These inputs directly parallel the XLR inputs.

$1/4''$ OUTPUT JACKS

The $1/4''$ output jacks are unbalanced with Tip = Hot (+) and Sleeve = Ground. They are used for sending signals to amplifiers, or other unbalanced equipment.

APPLICATIONS

Typical Setup

For a stereo 2-way system, separate high frequency (horn or tweeter) and low frequency (bass) speaker cabinets are used for each channel (left and right) of the sound system and are driven by their own power amplifiers.

The crossover is used to split each channel's signal into two frequency bands, which feed separate amplifiers. This delivers the proper frequencies to each speaker cabinet as well as allowing its associated amplifier to produce acoustic power more efficiently.

It is very important that you use caution when selecting the crossover points for any system. Refer to the documentation that came with your speaker cabinets for information on their proper frequency ranges. This is especially important for high frequency horns; damage may occur from sending lower frequencies than specified into the drivers!

Signal Flow

In most situations, the crossover is the last piece of equipment in the signal chain before the power amplifiers. Signal flow is as follows:

Mixer → Equalizer → Crossover → Power Amplifier → Speaker Cabinets

Sometimes a limiter is placed between the mixer outputs and the equalizer or after the equalizer for system protection.

Initial Setup Tips

1. Set all level controls to their full counter-clockwise position (-30dB.)
2. Connect the outputs of your mixer (or equalizer) to the inputs of the CX311. If stereo, Channel One is left.
3. Connect the LOW output of Channel One to the power amplifier powering the low frequency cabinets (left).
4. Connect the HIGH output of Channel One to the power amplifier powering the high frequency cabinets (left).
5. Repeat for the right side of the system (Channel Two).
6. Connect the SUBWOOFER output to the subwoofer amplifier.
7. Set the crossover frequency for both channels (they should be the same if your PA cabinets are the same).
8. Set the crossover frequency for the SUBWOOFER output to that recommended for the subwoofer.
9. With the power amplifier volume controls turned all the way down, turn on all equipment in the system.
10. With a program source running through the system, turn up the power amplifier volume controls and slowly turn up the crossover output controls while checking each individual output for sound and performance.

SERVICE PARTS

PART #	DESCRIPTION	PART USAGE	LOCATION
100-5269-103	Rocker power switch		FRONT PANEL
311-1027-216	RSP POT SINGLE A100K	level pots	VR2A, 3A, 2, 3, 5
311-1027-218	RSP POT B50KX2	frequency pots	VR1A, VR1
311-1027-217	RSP pot C100K Dual	Sub Freq	VR4
100-5242-101	SWT DPDT LATCHING	SWITCHES INVERT/NORM	SW1, SW1A
311-2004-101	CON IEC POWER BLOCK W/FUSE AND SWT		
311-2005-101	XFM Transformer TFX113EID1		
311-2006-101	SWT SPDT SLIDE SWITCH	LOW CUT	SW2, SW2A
311-2007-101	CON JACK 1/4" STEREO	input and output jacks	J1, 3-5, J1A, 3A-5A
311-2008-101	MLD CAP POT BLK,GREY CAP w/black line		ALL POTS
341-2009-101	CON JACK XLR FEMALE	Balanced input jacks	J2, J2A
342-2002-101	MLD CAP SWITCH Round	switch caps INVERT/NORM	SW1, SW1A
310-2007-101	DIGI I.C. JRC2068		U1-14
100-1094-110	Fuse .5A/250V 5*20MM Slo Blo		IEC connector

FULL BILL OF MATERIALS

Assembly

ART PART#	VENDOR PART#	Description	Location	QTY
3112002201	MPP00R0251	face plate FOR CX311	black-finish, silk printing	1
3112003201	MCC00B2921	top cover FOR ACX30/40 black finish		1
3112001201	MBP00R0251	chassis FOR CX311	black-finish, silk printing	1
3112004101	JA100312I8	IEC socket AC holder ACR-315-B 6P	FUSE holder (115V / 230V)	1
1005269103		Rocker power swt		1
1001094110	FU31502D21	fuse 0.5A/250V 5*20mm Slow Blow		1
3422002101	KPCR081301	button round 7.3*11.8 INVERT/NORM	SW1 SW1A	2
3112008102	KPCT131601	knob CP-MB-5-T18(M704D0001H05)	VR1-5 VR1A VR2A VR3A	8
	NSA3008FB1	screw M3*8mm flat head, black	AC holder *2	2
	NSS3008PB1	screw M3*8mm round, black	XLR JACK *4	4
	NSA3006RB1	screw M3*6mm black	top cover chassis	6
	NSA3008RB1	screw M3*8mm black	face plate chassis	4
	NNN3025HN1	nuts M3*2.5mm Ni	isolation plate*2GND*1 transformer*2	5
	NNN4003HN1	nuts M4*3mm Ni	lock ground wire	1
3112005101	TFX113EID1	transformer EI-41 red/brown 187# black 110#terminal		1
	GA136BAGL3	plastic bag 120x250x0.07mm w/warning mark	for the power cord	1
1001057112	WPE37B32H1	power cord USA round 180 degree + IEC female jack		1
3115004102	GR025G0001	manual FOR CX311		1
	GE136BAGL1	plastic bag 260*570*0.07mm	for the unit	1
	GE026BAGL1	plastic bag 170*270*0.04mm	for the manual	1

Main Ckt Board

ART part#	Vendor part #	Description		Location	QTY
CAPACITORS					
1001162124	CE107012M2	100UF	EC 100UF/25V ±20% 2.5mm TAPING	C27 C28	2
1001038101	CC1010B4M2	100PF	CC 100PF/50V ±20% 5.0mm TAPING	C3 3A 4 4A 9 9A 15 15A 31 35 35A	11
1001162107	CE228033M1	2200UF	EC 2200UF/35V±20% 7.5mm	C24 C26	2
1001162104	CE106014M2	10UF	EC 10UF/50V ±20% 2.5mm TAPING	C1 1A 2 2A 10 10A 13 13A 14 14A 19 22	12
1001037105	CM1030B5J2	.01UF	PEI 0.01UF/100V ±5% 5.0mm TAPING	C5-8 C5A-8A	8
1001037111	CM1040B5J2	.1UF	PEI 0.1UF/100V ±5% 5.0mm TAPING	C23 25 29 30 32 33 34	7
	CM2720B5J2	272PF	PEI 272PF/100V ±5% 5.0mm TAPING	C36-39 C36A-39A	8
1001037109	CM4730B5J2	.047UF	PEI 0.047UF/100V ±5% 5.0mm TAPING	C16 17 18	3
1001037110	CM6830B5J2	.068UF	PEI 0.068UF/100V ±5% 5.0mm TAPING	C11 11A 12 12A 20 21	6
RESISTORS					
1001001301	RE810013F4	1K	MF 1/4W 1K ±1% TAPING	R48	1
1001001401	RE810023F4	10K	MF 1/4W 10K ±1% TAPING	R5 5A 6 6A 7 7A 8 8A 10 10A 12 12A 15 15A 20 20A 22 22A 23 23A 25 25A 27 27A 28 28A 29 29A 30 30A 34 34A 35 35A 41 41A 42 43 50	39
	RE810033F4	100K	MF 1/4W 100K ±1% TAPING	R1-4 1A-4A 32A 32 36 36A 37 37A 39 39A 53 54 55	19
	RE815023F4	15K	MF 1/4W 15K ±1% TAPING	R9 9A	2
	RE818723F4	18.7K	MF 1/4W 18K7 ±1% TAPING	R44 45	2
1001001333	RE821013F4	2.1K	MF 1/4W 2.1K ±1% TAPING	R13 13A 16 16A 18 18A 21 21A	8
	RE822003F4	220	MF 1/4W 220 ±1% TAPING	R31 31A 40 40A 56	5
1001001334	RE822013F4	2.2K	MF 1/4W 2.2K ±1% TAPING	R57	1
1001001339	RE824913F4	2.49K	MF 1/4W 2K49 ±1% TAPING	R17 17A	2
1001001434	RE822023F4	22K	MF 1/4W 22K ±1% TAPING	R51 26 26A	3
	RE833033F4	330K	MF 1/4W 330K ±1% TAPING	R46 47	2
1001001354	RE835713F4	3.57K	MF 1/4W 3K57 ±1% TAPING	R14 14A 19 19A	4
1001001464	RE847023F4	47K	MF 1/4W 47K ±1% TAPING	R38 38A 52	3
	RE868013F4	6.8K	MF 1/4W 6.8K ±1% TAPING	R24 24A 33 33A 49	5
DIODES					
ALTO319	DE14004001	1N4004	diode 1N4004 1A/400V TAPING	D1-4	4
8062001101	DE52103001	GREEN LED	diode D=3mm green	LED1	1
REGULATORS					
1001042102	IC00781552	7815	IC 7815 isolated TO-220	U15	1
1001042101	IC00791552	7915	IC 7915 isolated TO-220	U16	1
	MHC00E1361		Heatsink K217	U15 U16	2
ICS					
3102007101	IC2068DD11	2068	IC NJM 2068DD DIP	U1- 14	14

ART part#	Vendor part #	Description		Location	QTY
JACKS					
3112007101	JA406311L4	1/4" STR JACK	EAR PHONE D=6.3mm EJ-63 JACK 4P STEREO female	J1 J1A J3 J3A J4 J4A J5	7
3412009101	JA700311L2	XLR FEM	XLR JACK female LX-1604H-3 INPUTS	J2 J2A	2
POTENTIOMETERS					
3111027218	VR0B503B1D	B50KX2	VR F-16KN B50K L: 12KQ CH1&2 FREQUENCY	VR1 VR1A	2
3111027216	VR5A104B1D	A100K SINGLE	VR F-16KN A100K L: 12KQ LEVEL	VR2 VR2A VR3 VR3A VR5	5
3111027217	VR7C104B1D	C100K DUAL	VR F-16KN C100K L: 12KQ SUB FREQUENCY	VR4	1
SWITCHES					
3112006101	SW02120002	SWTSPDT	SW SKE 22F07G5-KS SLIDE LOWCUT	SW2A SW2 SW3	3
3115242101	SW03220002	SWTDPDT	switch A-S2DLN2 INVERT/NORM	SW1 SW1A	2

The schematic diagram illustrates the internal circuitry of the Cx311 audio amplifier, divided into two frequency response sections: 250Hz -- 6KHz and 50Hz -- 250Hz.

250Hz -- 6KHz Section:

- Input Stage:** The input signal (IN) is connected to a pre-amplifier stage consisting of op-amp U1A and U1B, configured as a voltage follower.
- Amplification Stages:** The signal then passes through a series of op-amp stages (U2A, U2B, U3A, U3B, U4A, U4B) configured as inverting amplifiers, providing gain and frequency response shaping.
- Output Stage:** The final output stage (U5A) is configured as a voltage follower, driving the speaker (H OUT) and subwoofer (SUB WOOFER) outputs.
- Phase Shifter:** A phase shifter circuit (U5A) is used to adjust the phase of the output signal.
- Low-Pass Filter:** A low-pass filter (U12A) is used to filter out high-frequency noise from the output signal.

50Hz -- 250Hz Section:

- Input Stage:** The input signal (IN) is connected to a pre-amplifier stage consisting of op-amp U7A and U7B, configured as a voltage follower.
- Amplification Stages:** The signal then passes through a series of op-amp stages (U8A, U8B, U9A, U9B, U10A, U10B, U11A, U11B) configured as inverting amplifiers, providing gain and frequency response shaping.
- Output Stage:** The final output stage (U12A) is configured as a voltage follower, driving the speaker (H OUT) and subwoofer (SUB WOOFER) outputs.
- Phase Shifter:** A phase shifter circuit (U12A) is used to adjust the phase of the output signal.
- Low-Pass Filter:** A low-pass filter (U12A) is used to filter out high-frequency noise from the output signal.

Power Supply and Components:

- The circuit is powered by a 15V supply.
- Various resistors (R1 through R40) and capacitors (C1 through C34) are used for biasing, timing, and frequency response shaping.
- A TOCASE component is shown at the bottom left, likely a thermal protection device.

Notes

WARRANTY INFORMATION

Limited Warranty

Applied Research and Technology will provide warranty and service for this unit in accordance with the following warrants:

Applied Research and Technology, (ART) warrants to the original purchaser that this product and the components thereof will be free from defects in workmanship and materials for a period of **three** years from the date of purchase. Applied Research and Technology will, without charge, repair or replace, at its option, defective product or component parts upon prepaid delivery to the factory service department or authorized service center, accompanied by proof of purchase date in the form of a valid sales receipt.

Exclusions

This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. This warranty is void if the serial number is altered, defaced, or removed.

ART reserves the right to make changes in design or make additions to or improvements upon this product without any obligation to install the same on products previously manufactured.

ART shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific rights and you may have other rights, which vary, from state to state.

For units purchased outside the United States, an authorized distributor of Applied Research and Technology will provide service.

SERVICE

The following information is provided in the unlikely event that your unit requires service.

1. Be sure that the unit is the cause of the problem. Check to make sure that the unit has power supplied, that all cables are connected correctly, and that the cables themselves are in working condition. You may want to consult with your dealer for assistance in troubleshooting or testing your particular configuration.
2. If you believe that the ART unit is at fault, go to www.artproaudio.com. You may contact Customer Service for more assistance, or directly request a Return Authorization for service in the “resources” area of the website.
3. If you are returning the unit for service, pack the unit in its original carton or a reasonable substitute. The original packaging may not be suitable as a shipping carton, so consider putting the packaged unit in another box for shipping. Print the RA number clearly on the outside of the shipping box. Print your return shipping address on the outside of the box.
4. Include with your unit: a note with the RA number and your contact information, including a return shipping address (we cannot ship to a P.O. box) and a daytime phone number, and a description of the problem, preferably attached to the top of the unit. Also include a copy of your purchase receipt.

Fill in the following information for your reference:

Date of purchase	_____
Purchased from	_____
Serial Number	_____

SPECIFICATIONS

Input Connections	XLR, 1/4" TRS, balanced
Output Connections	1/4" TS, unbalanced
Frequency Response	10Hz to 40kHz, +0/-0.5dB
Crossover Frequency Range	250Hz to 6kHz
Subwoofer Frequency Range	50Hz to 250Hz
Crossover Filter Type	Fourth-order Linkwitz-Riley, 24dB/octave
Subwoofer Filter Type	Two-pole Butterworth, 12dB/octave
Dynamic Range	>114dB
Signal to Noise Ratio	>95dB, Ref: 0dBu, 20Hz-20kHz, unweighted
Input Impedance	100k Ohms
Output Impedance	220 Ohms
Maximum Input Level	+21dBu
Maximum Output Level	+21dBu
Total Harmonic Distortion (THD)	<0.01% (20Hz-20kHz, 0dBu)
Maximum Gain	+4dB
Power Requirements	110-125V AC, 50-60hz, 15W (USA) Export units configured for country of destination
Dimensions (HWD)	1.75" x 19" x 5" 44mm x 483mm x 127mm
Weight	6.2 lbs. (2.8 kg)

ART maintains a policy of constant product improvement. ART reserves the right to make changes in design or make additions or improvements to this product without any obligation to install these changes on products previously manufactured. Therefore, specifications are subject to change without notice.



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CX311
V1.1