

The logo for Ex Machina features the words "EX" and "MACHINA" in a bold, sans-serif font. The text is centered within a circular graphic composed of three concentric, slightly offset arcs that create a sense of motion or a stylized 'C' shape.

EX
MACHINA

ARCTURUS MANUAL

On behalf of our entire team at Ex Machina Soundworks, thank you for choosing Arcturus, and welcome to the family. Whether you use them as professional tools, for your own listening pleasure, or maybe even for a bit of both, we are confident they will reward you with a level of accuracy and realism that will redefine what you come to expect from a loudspeaker.

To activate your extended warranty, and to receive product updates, please register your serial number at www.exmachinasound.com/register

TL;DR

1. Don't touch the tweeter. It is less than 100 microns thick, and even TeXtreme doesn't like being poked and prodded at that thinness.
2. Don't max out the speakers for hours on end. Speakers, like cars, are physical objects with physical limits. And just like redlining your car in neutral for the boys, blasting your monitors as loud as they can go constantly *will* eventually break something, to say nothing of what it will do to your ears. Melting a voice coil is expensive. Damaging your hearing is forever.
3. There's a really powerful DSP inside each amp pack - when you turn the amps off, wait at least 45 seconds before turning them back on again so the flash memory can purge. If you don't, you may get startup errors and have to power cycle them again.
4. Leave at least 1RU above *AND* below the amp packs. They will overheat if you don't.
5. The switch on the back labeled HP/LL cycles between high precision mode and low latency mode. High precision mode does all the phase magic, but requires 46ms of latency. Low latency mode only flattens frequency response, which cuts latency to about 3ms.
6. The switch on the back labeled FS/HS/SM cycles between tuning for the loudspeakers away from walls in free space, up against the walls in half space, and in the wall or in the corner of your room.
7. The subwoofer amp channels have a *LOT* of power. Be very careful not to accidentally connect them to the coax input. This is the fastest way to achieve that melted voice coil we talked about earlier.
8. Don't use a 2-prong IEC cable or buy a "fancy" IEC cable. It will not make the speakers sound better; at best it might create hum, at worst it might blow something up. If you need a longer IEC, buy a standard molded 14AWG cable, and don't exceed a max of 10 feet.
9. Sit at least a meter away from the speakers, and place them at least two meters apart from each other. Arcturus is a fluffy boy.

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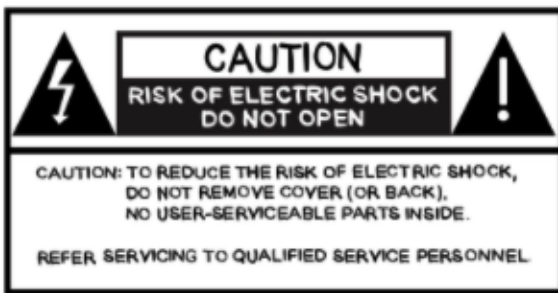
SECTION 1: IMPORTANT SAFETY INFORMATION

NOTE • The information in this manual is subject to change without notice. The manufacturer assumes no responsibility for any errors that may appear in this manual. The reproduction, transmission or use of this document or contents is not permitted without express written authorization.

WARNING • Before using, read this manual to ensure that you have a thorough understanding of the correct usage and handling of these loudspeakers. Incorrect handling of this product may result in personal injury or physical damage. The manufacturer assumes no responsibility for any damage caused by mishandling that is beyond normal usage defined in the manuals for these speakers.

Please read the following safety instructions before setting up your system. Keep the instructions for further reference.

Please heed the warnings and follow the instructions.



DANGEROUS VOLTAGE:

The lightning flash symbol here is intended to alert the user to the presence of dangerous voltage within the product's enclosure or in normal operation that may be of sufficient magnitude to constitute a risk of electrical shock.



ATTENTION:

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.



STOP:

The hand inside the circle with a line through it is intended to alert the user of important precautions the user must take when installing, handling and operating the appliance.



Caution: To reduce the risk of electric shock, do not open the loudspeaker. There are no user-serviceable parts inside. Refer servicing to your **dealer or qualified service personnel**.



Never replace any fuse with a value or type other than those specified. Never bypass any fuse.



Ensure that the specified voltage matches the voltage of the power supply you use. If this is not the case, do not connect the loudspeakers to a power source! Please contact your dealer or distributor to resolve this issue.



This product, as well as all attached extension cords, must be terminated with an earth ground three-prong AC mains power cord like those supplied with the product. To prevent shock hazard, all three component contacts must always be used.



Always switch off your loudspeakers before connecting or disconnecting any cables. Never turn your system on after you've turned your speakers on. Doing so can result in damage to the loudspeaker.



To completely disconnect from AC mains, unplug the power supply from the power socket. The loudspeaker should be installed near the mains connection, and you should ensure easy access to the power socket to disconnect the device if necessary.



Protect the power cord from being walked on or pinched particularly at the connectors and sockets, as well as at the rear of the loudspeaker.



Unplug this loudspeaker during lightning storms or when unused for long periods of time. Always keep electrical equipment out of the reach of children.



Do not expose this product to rain or moisture, never wet the inside with any liquid and never pour or spill liquids directly onto this unit. Please do not put any objects filled with liquids onto the speaker.



Use only with stands that are rated to handle the weight of your loudspeaker. Additionally, make sure the stand you use is able to support the physical dimensions of the loudspeaker. These loudspeakers are heavy; please take proper precautions when lifting the loudspeaker into place. Arcturus is nearly 100lb, and requires two people assist. Failing to take these precautions can result in personal injury.



Always ensure your cables are tested. Bad or defective cables can harm your loudspeakers as well as result in the introduction of noise, hum, crackling, etc.



Avoid using flammable or combustible chemicals for cleaning **ANY** audio components.



Install in accordance with the instructions explained in this manual.



Never expose this product to extremely high or low temperatures.



Never operate this product in an explosive atmosphere.



BE AWARE: High SPL can damage your hearing! Please avoid getting too close to the loudspeakers while using them at high volumes.



DO NOT TOUCH THE TWEETER! Doing so will result in a replacement charge, as it will not be covered under your warranty. Additionally, be aware that the drivers in these loudspeakers emit a magnetic field, and can subsequently be damaged by magnetic items such as rings, necklaces etc.



Please keep all magnetically sensitive items at least 1.5 feet (0.5m) away from the loudspeaker.



You must ensure free airflow behind the speakers to maintain sufficient cooling, with a minimum distance of at least 4 inches (100mm) to any wall.



Avoid exposing the loudspeaker to any open flame.



Do not expose the loudspeaker to water. Do not set up the loudspeaker near a water source.



Use a dry cloth or duster for cleaning. Be careful not to touch the tweeter with any rough or rigid material. Doing so can damage the tweeter.



Do not to install near any intense heat sources such as radiators, hot air vents, stoves, or other equipment [including amplifiers] that produce heat.



Do not disconnect the ground wire in the plug. An earthed plug has live and neutral prongs, plus a third prong for grounding purposes which is included for your safety. If the provided plug does not fit into your socket, consult an electrician to have the socket replaced.



Only use attachments/accessories specified herein.



Allow 25-30 seconds after power on for the DSP to boot up before sending audio signals to the loudspeaker. Additionally, always allow 45 seconds for complete DSP shutdown after turning the loudspeaker off before turning it back on again. Failure to do so may result in memory and startup errors.



All servicing must be performed by qualified service personnel.

Servicing is required when the loudspeaker has been damaged in any way, e.g. if the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the individual drivers (such as fingers, necklaces), careless handling or if the loudspeaker has been exposed to rain or moisture, does not operate normally, or has been dropped.

SECTION 2: KEY FEATURES OF ARCTURUS



COAXIAL MIDRANGE/TWEETER

Arcturus features our second generation signature coaxial midrange/tweeter drive unit. Thousands of additional R&D hours and dozens of iterations have brought a significant step forward in performance to our original design collaboration with SEAS. Below are four of the key attributes that make this one of the highest performance drivers ever made.

1. Our 25mm dome tweeters have been redesigned from the ground up using the first Composite Sound Metamodal TX™ diaphragms ever deployed. Woven from the same Textreme™ spread tow carbon fabric as our midranges, but leveraging the unique, audio specific expertise of Composite Sound, the fiber architecture and geometry of this diaphragm has been fully optimized not just for stiffness and directivity, but to actively control resonances and modes. The end result is a perfect piston response nearly 10kHz higher than our previous generation diaphragms, and such precise control of breakup that a typical driver exhibits less than .1% THD+N power average in the all critical 2-10kHz midrange.

2. Our 18cm Composite Sound Metamodal TX™ midrange features iterative improvements over the original generation as well. While still a perfect piston over two octaves past its in use frequency range, we have now optimized the ratio of radial to circumferential stiffness to further improve off-axis behavior as we approach our 2khz crossover. The diaphragm is still precisely shaped to behave as an optimized waveguide for the concentric tweeter, and the newly designed geometry of the tweeter diaphragm has been further optimized to load this waveguide.

3. The thin-lip, fully underhung surround all but eliminates the on-axis suckout and phase cancellation issues that plague most coaxial drive units.

4. The advanced neodymium motor structure and high performance spider have been further augmented with a new copper shorting sleeve to lower high frequency inductance, resulting in even lower distortion than our first generation drive units.

SUBWOOFERS

Arcturus' twin 26cm subwoofer design is quite simply the most advanced we have ever put into a loudspeaker. We began with SEAS' legendary L26ROY architecture, and then completely revamped the motor system. In lieu of the high performance ferrite design of the stock driver, Arcturus' subwoofers use a novel, ultra high performance twin ring radial neodymium motor design that splits the magnetic gap in two, allowing for almost perfect symmetry across the entire linear stroke, with essentially no loss in motor strength until nearly Xmax. This in turn translates to the lowest distortion we have ever measured in a subwoofer unit - typically less than 0.3% at 50hz, running 100db at a meter.

CABINET

All our loudspeakers feature highly braced, sealed cabinets, which completely eliminate the group delay, air compression and chuffing that plague most traditional ported loudspeakers. They are made from a combination of 19mm and 30mm thick Valchromat: a much stiffer, denser and better damped material than the traditional MDF. This makes our cabinets highly inert and non-resonant, all but eliminating destructive coupling to the pistonic output of the drive units. Arcturus takes this a step further, using a laminate construction 38mm front baffle with radiused insets for the subwoofers to eliminate diffraction artifacts from the large tall-boy surrounds.

AMPLIFIERS

All our loudspeakers employ second generation Hypex Ncore amplifier modules, which combine high efficiency with ultra-low distortion and output impedance. Arcturus is remote powered from a dedicated four channel, 2RU amplifier pack, providing 400W of power to each subwoofer, and 100W each to the midrange and tweeter. **A MINIMUM OF 1RU ABOVE AND BELOW THE AMPLIFIER IS REQUIRED FOR ADEQUATE VENTILATION. FAILURE TO PROPERLY VENT THE AMPLIFIERS MAY RESULT IN DAMAGE NOT COVERED UNDER WARRANTY.**

DSP & CONVERSION

The final, “secret sauce” of our loudspeakers is our proprietary, in-house DSP deployment and calibration technology, which MkII improves even further. Each loudspeaker now features a dedicated 5th generation SHARC+ DSP, providing 4x the computing power of our previous generation, as well as flagship AKM AK4493 and AK5572 based discrete conversion. As the final step in production, a unique, serial number specific measurement and calibration is applied to each loudspeaker, linearizing the frequency response to +/- 1db, and the phase response to +/- 15° across the entire specified range. This in turn means that any two speakers of a given model will always act as a matched pair. Finally, the newly available compute headroom has allowed us to improve the precision of our calibration code to a point where our loudspeakers can accurately reproduce square wave and single cycle impulses, even at the crossovers.

SECTION 3: INITIAL SETUP

UNBOXING

Arcturus is shipped in custom plywood crates due to its size and mass. Inside each crate you should find:

- One Loudspeaker
- One Amplifier/DSP Pack
- One 6 foot IEC cable

Please observe the following steps to safely unpack your loudspeaker:

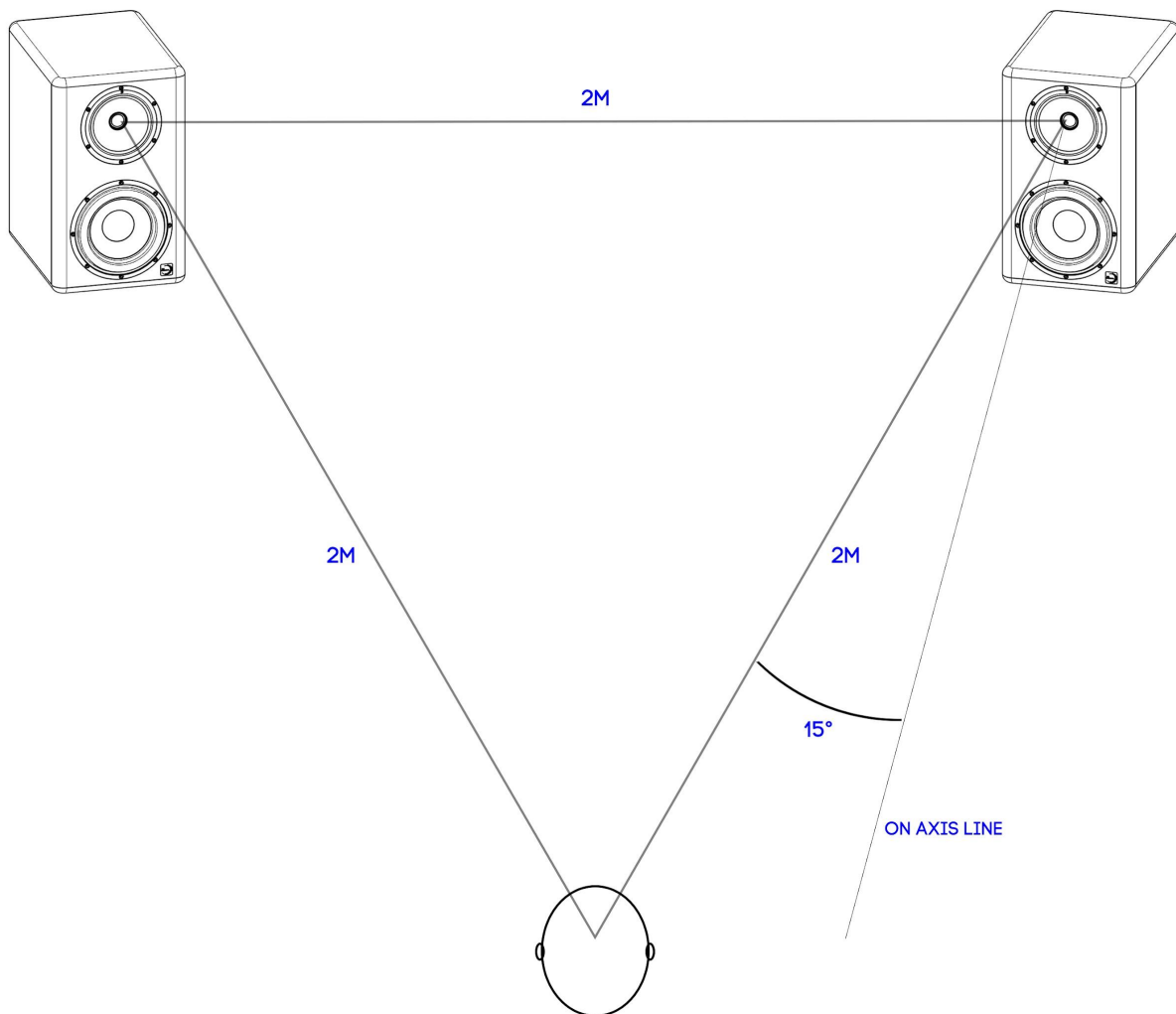
1. Begin by placing the crate lengthwise with the legended top cap facing up.
2. Unscrew the fasteners from the top crate cap, and remove the top cap.
3. Unscrew the fasteners from the side crate panels, and remove the side panels.
4. With the drivers facing up, remove the foam protection inside.
5. **WITH AT LEAST TWO ADULTS**, gently lift the speaker out from the bottom foam cradle.

6. PLEASE DO NOT TOUCH THE TWEETER! (While our new Composite Sound Metamodal TX™ diaphragms are fairly mechanically robust, physical damage resulting from a strike will result in a replacement charge, as it will not be covered under your warranty.)

INITIAL SPEAKER PLACEMENT

Arcturus is primarily designed for soffit-installed applications in conjunction with a studio design professional or acoustician. Arcturus can however be configured with radiused edges for free-standing operation. For fully optimal performance, we recommend the following:

1. While optimal speaker spacing and listening depth can vary based on the acoustics of your room and your own listening preferences, we recommend starting with the standard “equilateral triangle” approach. However, when adjusting toe-in, we actually suggest aligning your primary listening position 15° off-axis from the direct tweeter angle on either side. This listening position very closely tracks our 0- 45° power average, and will allow for the widest sweet spot in typical monitoring conditions, where ideal listener location is not always possible. Below is a setup chart using 2 meter distancing as an example.



Arcturus is the only true “mains” design in our catalog, and due to its footprint requires a minimum 1m listening distance for proper integration.

2. For free-standing variants, to avoid coupling resonance and low frequency deterioration, we recommend installing our loudspeakers on high quality stands with load appropriate decoupling. Our preferred solution is the <https://spacelab.systems/> LiFT. Where stand mounting is not possible, we recommend a decoupling solution such as IsoAcoustics ISO-pucks.

3. Because of our conically coherent waveguides and concentric drivers, Arcturus can be oriented either horizontally or vertically with no adjustments necessary. However, for proper imaging and stereo separation, **please ensure the speakers are at least two meters apart tweeter to tweeter.**

4. In free-standing configuration, place the loudspeakers symmetrically in your room, ideally at least a meter from rear and side walls. While calibration adjustments are available on the remote AMP/DSP units for half and quarter space loading, our loudspeakers will perform their best in full space conditions.

SECTION 4: CONNECTIONS AND CONTROLS



1. IEC INLET

Arcturus uses an auto-switching power supply, and will automatically adapt to 110/220v power operation. Should you ever need to replace the provided 6 foot IEC cable, please ensure you use a properly grounded, 3-prong IEC of at least 16AWG (14 AWG if you require a longer cable). **Never use a 2-conductor power cable or leave the ground disconnected.**

2. POWER INDICATOR

A white LED indicator will illuminate when the loudspeaker is switched on and operational. Please allow 25-30 seconds after power on for the DSP to boot up before sending audio signals to the loudspeaker. **Additionally, ALWAYS allow 45 seconds for complete DSP shutdown after turning the loudspeaker off before turning it back on again. Failure to do so may result in memory and startup errors.**

3. XLR INPUT

The XLR connector is a balanced analog input, with a nominal full scale level of 8vrms, or +20dbu. The amplifier can optionally be factory configured for nominal full scale operation at 2vrms, or +8dbu. While the amplifier voltage gain for each loudspeaker is precisely right sized to help prevent long term damage to the drivers at clipping, **do not overload the input stage for extended periods of time.**

4. PROCESSING CONTROLS

Due to the precision and computational intensity of our proprietary calibration process, the full phase and magnitude calibration introduces approximately 46ms of latency. The “**H.P.**” (high precision) setting reflects this complete phase and magnitude calibration. For those applications such as tracking where minimal latency is necessary, the “**L.L.**” (low latency) setting removes the phase calibration and applies only a magnitude calibration, which reduces the total system latency to approximately 3ms. **Always make sure both loudspeakers are set to the same processing setting during operation to avoid phase distortion between the two speakers.**

5. BOUNDARY CONTROLS

Arcturus in its free-standing configuration is factory calibrated for optimal performance in full space setups (**F.S.**), away from side and rear walls. If setup close to a rear wall is necessary, the boundary control can be set to “half space” (**H.S.**) to compensate. The **S.M.** (soffit mount) setting is reserved for custom tunings for in wall deployments in conjunction with an authorized integrator, acoustician or studio designer.

6. FIRMWARE INPUT

The USB input labeled “firmware” is for internal use only in calibration and servicing. **This input cannot be used for USB audio.**

7. SPEAKER OUTPUTS

Dedicated SpeakON outputs are provided for each drive unit in the total system. The top and bottom subwoofer outputs use keyed 2-pole SpeakON connectors, and correspond to the high power 400W output channels. **NEVER CONNECT THESE CHANNELS TO THE COAXIAL INPUT ON THE LOUDSPEAKER.** The coaxial output calls for a 4-pole SpeakON connection, with 100W channels for the midrange and tweeter. **CAREFULLY ENSURE THAT POLARITY MATCHES ON BOTH ENDS OF THE 4-POLE SPEAKON CABLE TO PREVENT DAMAGE TO THE TWEETER.**

SECTION 5: TECHNICAL SPECIFICATIONS

PERFORMANCE

- Linear Frequency Response: +/- 1db 28hz - 30khz (measured at 50cm cal position)
- Low Frequency Cutoff: -6db at 18hz
- Linear Phase Response: +/- 15° 20hz - 30khz
- Maximum Continuous SPL @ 1m: 117db, 112db @50hz
- THD+N (94db @ cal position): < .5% Power Average 100hz - 30khz
- Coverage Angle: 90° conical

DRIVER COMPLEMENT

- 176mm (7") midrange, 25mm (1") tweeter Custom SEAS/Ex Machina/Composite Sound Metamodal TX™ mid/high coaxial
- Twin 270mm (10.5") Flagship Ring Radial Neodymium SEAS Extreme Series Subwoofers

CROSSOVERS

- 200hz Sub/Mid, digital 4th order, phase corrected
- 2khz Mid/Tweet, digital 4th order, phase corrected

AMPLIFIER COMPLEMENT

- Subwoofers: Hypex NCAS500MP - 800W RMS
- Midrange: Hypex NCAS500MP - 100W RMS
- Tweeter: Hypex NCAS500MP - 100W RMS

DSP/CONVERSION

- A/D Chipsets: AKM AK5572EN
- D/A Chipsets: AKM AK4493EQ
- DSP: 5th Gen SHARC+ AD21565

INPUT SENSITIVITY

- 8vrms (+20dbu) to full scale
- 2vrms (+8dbu) to full scale - OPTIONAL HIGH GAIN CONFIGURATION

MASS & DIMENSIONS

- 839mm H x 338mm W x 355mm D (33" x 13.3" x 14")
- 43kg (95lbs)
- 2RU Amplifier/DSP Pack - 5kg (11lbs)
- **1RU TOP AND BOTTOM VENTING REQUIRED FOR AMPLIFIER/DSP PACK**

SECTION 6: TROUBLESHOOTING

If your loudspeaker is not reproducing sound, start by checking all power and signal connections. Ensure that the power indicator light on the rear panel is on, and that audio signal is coming into the loudspeaker. If the loudspeaker is still not reproducing sound, power cycle the unit. In rare instances, the DSP firmware can fail to load on initial boot up. This is usually solved by simply turning off the unit, waiting approximately 60 seconds, and powering it back on again.

If none of these solutions solve the problem, please visit:

<https://exmachinasound.com/support>

Fill out the form and submit a support request or contact your dealer and we'll promptly respond.

SECTION 7: WARRANTY AND SERVICING

- Ex Machina Soundworks, LLC warrants new products against defects in materials and manufacturing for a period of 6 years from the date the unit was registered.
- The warranty is tied to the product not to the customer and is transferable.
- During the warranty period, Ex Machina Soundworks will repair or replace a faulty unit (per our discretion).
- Warranty repairs must be carried out by either Ex Machina Soundworks or an authorized repair center, with the exception of driver units, which are field replaceable.
- You must contact your authorized dealer or Ex Machina Soundworks to initiate a warranty claim.
- Ex Machina Soundworks' liability is with its authorized dealers. Contact with the end user may occur, but the warranty claim must be referred to an authorized dealer. Until the product has been inspected, or determined to be in defect by Ex Machina Soundworks' service department, we will admit no liability.
- No warranty will be honored without a valid serial number.
- In the case of a warranty claim, the product or components must be returned to the factory at the customer's expense.
- If the warranty claim is accepted, shipping costs incurred will be reimbursed by Ex Machina Soundworks.