

Radial Audio: Stealth One – Owner Manual

Overview

This manual addresses the day-to-day care and maintenance of the Stealth One. Refer to the Setup manual for instructions on how to install the tone arm on your turntable. The Stealth One is unique in the world of tone arms. It is assembled from over 400 parts, the most important of which are milled from Delrin stock.

Delrin is an engineered thermoplastic used in precision parts requiring high stiffness, low friction and excellent dimensional stability. Delrin is also a sonically “dead” material, unsupportive of resonances.

The bill of materials for the arm includes these unique parts:

1. 30+ Delrin and Plexiglas parts
2. 10 LEDs
3. 10 Bearings
4. 100+ gold pins and connectors
5. 100% Litz wire construction

Other unique parts include:

1. 4 silicone encapsulated carriage bearings
2. Sliding cartridge mounting pad
3. Stylus illumination
4. Magnetic capture: arm to arm base plate
5. Precision Swiss motors
6. Photo Coupled Interrupter Modules (Servo and Lift/Lower operations)
7. PCB hosted circuitry

Warranty

Radial Audio warrants this product to be free from defect in materials and workmanship (subject to the terms set forth below). Radial Audio will repair or replace (at Radial Audio's option) this product or any defective parts in this product for a period of 1 year from the date of purchase. The warranty is transferrable to any subsequent owners. The warranty is invalid if the product has been substantially modified from its original manufacturing state.

To obtain service of any type, please contact Radial Audio. You will need to ship this product in its original shipping container, or request a replacement shipping container from Radial Audio. Please save the original shipping container for service of any kind in the near or distant future.

This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of, or to any part of the product (exceptions will be considered by Radial Audio). This warranty does not cover damage due to improper operation, maintenance or installation, or attempted repair by anyone other than Radial Audio. Any unauthorized repairs will void this Warranty (please contact Radial Audio for advise/consultation at no cost to you).

Repairs or replacements as provided under this warranty are the exclusive remedy of the consumer. Radial Audio shall not be liable for any incidental or consequential damages for breach of any express or implied warranty in this product except to the extent prohibited by law. This warranty is exclusive and in lieu of all other express and implied warranties whatsoever including but not limited to the warranty of merchantability and fitness for a practical purpose.

Normal Operating Environment

Stealth One is powered by an AC wall adapter power supply that supplies 5 volts. The power supply is plugged into an AC wall outlet on one side and into the tone arm on the small plug side. The tone arm “idles” when the wall adapter is plugged in, no need to unplug the AC wall adapter or the DC plug in the tone arm. A power adapter of less than 4.5 volts will not provide enough voltage to power the two photon coupled Interrupter modules (one for the servo motor, the other for the lift/lower motor). An adapter of more than 5 volts would change the speed of the servo motor, provided components on the PCB board are not stressed or fail. If your wall adapter fails for any reason, contact Radial Audio for a replacement. Do not use any wall power adapter with a plug that happens to fit into the power receptacle on the servo motor box.

When powered, the tone arm displays four or five illuminated LED's:

1. One round blue LED momentary tactile push button switch is always illuminated, supporting the manual lift/lower operation, especially in a dim or dark environment. Press this LED to initiate the lift or lower operation.
2. One rectangular green LED is always illuminated inside the Plexiglas channel when power is available to the PCB board's circuits.
3. One white stylus spotlight LED, if mounted, illuminates the stylus's health (dirty, clean). It can also aid in the cuing the stylus.
4. Two small green LED's near the top of the servo motor box, under the Plexiglas channel. These two LED's show where the corresponding heat shrunk green wire should be plugged into the servo motor box.

Two more LED's illuminate during certain arm operations

1. One rectangular red LED illuminates inside the Plexiglas channel when a manual or an automatic lift/lower operation is running. It is not-illuminated when the arm is at rest, or when a record is being played. This LED illuminates when the stylus is drawn into the lead-out dead wax area.
2. One rectangular yellow LED illuminates inside the Plexiglas channel when some portion of the infrared beam's emitter is being received by the infrared detector. The yellow LED may display dimly at the start of an LP, slowly increasing in intensity while the stylus approaches 90 degrees, and finally display full intensity while the 90 degree angle is constantly maintained. If the yellow LED has a pulsing intensity, the probable cause is an off-center pressing.

Wand mass adjustments

Here are a few actions you can take at the front end of the “ladder” wand if the total mass of the cartridge ladder wand is less than needed to arrive at balance with the counterweight.

For low mass cartridges, mass can be added at the ladder wand’s front end in five ways:

- a. Add wand finger lift: (.5 gr: optional mounting, but handy for cuing). Two stubs on either side of the arch fit into the same two slots holding the cartridge mounting pad. If the fit is a little loose, bend the arch out just a bit and try again. The finger lift is fixed to the wand by inserting it in place at about a 30-45 degree angle, and then forcing it into a 90 degree angle, where it locks into place.
- b. Add the cartridge overhang threaded rod and blue knurled nut: (1.6 gr). This part can double as a manual front-end finger lift.
- c. Add the cartridge overhang memory screw: (.n gr)
- d. Add stylus spotlight LED illumination: (.2 gr)
- e. Add dampening putty: Scoop a small amount of the lavender “silly putty”, and roll it into a sausage shaped ball. Place the “sausage” into the milled depression at the top of the cartridge mounting pad, and let set overnight. The “sausage” will flatten over time to fill the depression area. Be careful not to place more silly putty into the depression than it can hold at surface level. The putty does not have surface tension. Therefore, any excess after arriving at a flat silly putty then seeks lower ground. The excess will flow over the depression, and into the unused cartridge mounting pad holes. Better to use too little as first.

Cleaning and Handling

Stealth One is assembled from parts made of materials not subject to-corrosion: (Delrin, Plexiglas, Gold, Stainless Steel).

The Stealth One has little need for cleaning, other than:

1. For airborne dust accumulation use a new, dry, soft bristle paint brush to clear the arm’s channel top and the arm base plate of accumulated dust. Alternately, use the microfiber cloth with a tiny amount of EndDust to remove air born dust that has settled on the arm base plate.
2. To clean the towers of fingerprints, use the microfiber cloth provided in the accessories. There is no need to moisten the cloth with cleaning fluids. Do not use any cleaning fluids containing alcohol, ammonia or abrasives. You might spray the microfiber cloth with the very lightest spray of EndDust, to just barely dampen the microfiber cloth.
3. DO NOT clean the front tower where the words “Radial Audio” and “Stealth One” are engraved. The white lettering in the engravings is comprised of Plexiglas micro shards that are locked together within each engraved word. Cleaning the engraved words would change their color from white to a gray shade of white. If you need to clean in close to the engraved letters,

place a piece of Scotch Magic Tape over the engraved letters, to protect them before using the microfiber cloth.

4. Delrin is impervious to liquids, but can be scratched easily. The surface finish of the Delrin parts is composed of many passes of a milling cutter to produce “cut” lines that blur to a matte finish appearance. The matte finish on the Delrin parts cannot be improved, so be advised not to “improve”.

Adjusting Stylus Force

The Stealth One is capable of tracking with a fraction of a gram of vertical force on the stylus. However, it is recommended that the tracking force is adjusted to within the limits specified by the cartridge manufacturer. The desired stylus force should be set directly with a digital stylus force scale gauge. If more force is needed, at the counterweight, turn the inner blue knurled nut toward the channel, then move the counterweight in the same direction by turning the outer blue knurled nut. When the desired stylus force is present, then lock the counterweight by turn the outer blue knurled nut to snug up against the counterweight.

When setting stylus tracking force, pay close attention to the counterweight’s distance from the outer gimbal. The wand and breech block must swing freely, not touching the outer gimbal. Binding could occur if the counterweight is adjusted too close to the gimbals.

Operating the Stealth One

The carriage/wand can be moved along the channel by gripping the blue LED “handle”, (without depressing the blue LED). In the lift position, the arm can be moved along the channel in either direction by applying a slight force with your hand. Do not move the carriage/wand along the channel once the wand is in the latched position.

To cue an LP from the start, draw the carriage/wand to the front tower. Further draw the wand manually, so that the wand is sitting in the Off-LP detent (which should correspond to bumping against the front tower). Place an LP on the turntable. Move the wand forward from the Off-LP detent to the On-LP detent. Press the blue LED momentarily. Refrain from holding the blue LED button down too long, as that will result in a lower cycle, followed automatically by a lift cycle without pause. The blue LED is a momentary switch device that does not need to be held down long.

The wand is held in the “ready-to-lower” position by an upside-down blue round head screw in contact with the bottom of the bullet well. The blue screw is fixed to the underside of the breech block. The screw is in contact with the bottom of the bullet well during the lift and lower cycles. In the lift cycle the bullet well rises and makes contact with blue screw, pushing the stylus up and off the record surface. During the lower cycle the wand and breech block descend together, until the stylus contacts the record surface. The bullet continues downward, leaving the stylus to play the record.

When the lowering cycle is complete the red LED dims, and the yellow LED illuminates. The brightness of the yellow LED corresponds to the amount of power being sent to the servo motor. If the yellow LED dims and brightens, the arm may be playing an off-center LP. Otherwise the yellow LED illuminates steady, throughout the travel to the end of play.

When the stylus reaches the lead-out groove in the inner dead-wax, the red LED illuminates again, in concert with the lift operation. The lift operation can be fired with a lead-out space of as little as $3/8$ ". Less than $3/8$ " of dead-wax will probably find the wand tracking in the lead-out dead-wax area, as the LP continues to rotate. The stylus can be manually lifted by pressing the blue LED any time during playback.

Adjustments: Factory and User

Stealth One allows for a number of adjustments, some are set at the factory, while others are the user's responsibility. Here is a list of all factory and user adjustments:

Stylus height above record (Factory/User)

Stylus height: (vertical open gap between stylus and record) there is a blue round-head hex screw hanging vertically from the breech block, into the bullet well. This screw can be adjusted from below, thru the hole in the bullet. Extending the vertical length of the screw tends to raise the wand to a greater vertical distance above the record (as in the lift operation). Distance above the record can vary from a minimum of 1/8", where the bullet's flat surface is in full contact with the breech block (not contacting with the blue screw head), to about 1/4" where the blue screw contacts the bullet well before the breech block body can make contact. To adjust the blue screw, turn the arm over on the channel back and move the wand to the 90-degree angle. Insert the hex wrench and turn counter-clockwise to extend the blue screw, setting more vertical stylus distance above the record surface. A word of caution: it's possible to extend the blue screw sufficiently so that the screw is contacting the bullet-well while not allowing the stylus to contact the record fully at the desired stylus force setting. Over-extending the blue screw approaches when a gap of 1/16" of the blue screw's thread is visible between the bullet and the breech block.

Stylus overhang (User)

This topic is discussed in detail in the Setup Manual. In summary, the tone arm must be setup thru a Large Iteration process, where the position of the tone arm mounting plate is determined, and then followed up with the Small Iteration process. In the small iteration process, the blue knurled nut with the 50mm threaded rod attached is used to move the cartridge mounting pad outward in extremely small increments until the stylus bisects a line emanating from the center spindle outward.

Wand/Arm height (User)

The general objective is to be able to have the wand/cartridge at level to the record surface when in play. Ideally, the tone arm carriage elevators should be level with the two (front and back) vertical towers. Since the height of turntable platters varies widely, the approximate height of the arm is first set within the proper range by supplying a base that spans the vertical distance between the plinth surface and the platter surface. In general, the bottom of arm's base plate (the Plexiglas plate with holes and slots) should be (2.5", 50mm) below the turntable platter surface. On turntables with tall platters, an additional vertical base height extension will be required.

Horizontal gimbal bearings (Factory)

Horizontal bearings: horizontal bearing pressure can be set thru a hole in the outer gimbal. It is best to set the horizontal bearing pressure before setting the vertical bearing pressure. Make sure that the horizontal screw point opposite the outer gimbal hole is already seated. Hold the gimbals and breech block steady while using an M3 L wrench to tighten the horizontal bearing screw point into the inner gimbal. Delrin is not as rigid as metal, so the horizontal bearing pressure is set first, followed by the vertical bearing pressure.

Vertical gimbal bearings (Factory)

Vertical bearings: vertical bearing pressure is adjusted with the exposed grub (set) screw on the outer gimbal's bottom surface. A reset may be needed if the wand extraction operation unseats the inner gimbal's bottom vertical bearing. The top vertical bearing inside the carriage should never be adjusted, as the vertical clearance of the M2 horizontal stainless steel rod (upon which the servo flag is mounted) is calibrated by the distance between the top vertical bearing and the inner gimbal's top surface.

Vertical bearings: vertical bearing pressure can be set thru a screw in the outer gimbal bottom surface. It is best to set the horizontal bearing pressure before setting the vertical bearing pressure. Make sure that the screw point is seated in the top outer gimbal's bearing. Hold the gimbals and breech block steady while using an M3 L wrench to tighten the bottom screw point into the outer gimbal's bottom bearing.

Observe 90 degree (Factory/User)

Johnson RAS-70 Polystyrene Rafter Triangle/Square: use to observe the 90-degree progression of the wand across the record. The square has a double-flange on the base of the triangle that can be hooked and manually held over the arm's Plexiglas channel with the other 90-degree side presenting parallel to the wand. The most accurate approach to viewing the 90-degree angle is for the observer's head to be positioned at the cartridge end of the wand closing one eye and sighting down the length of the wand and the triangle. This is similar to sighting down rifle barrel sights. In this manner, viewing errors introduced by head and body movements are eliminated.

Arm Disassembly

This is the sequence for disassembling the Stealth One.

1. Remove all wires from the servo motor box.
2. Remove wand: hold counterweight in right hand, with left hand, at inner grip lines, push against the Plexiglas channel to pull wand off.
3. Dismount the arm from the tone arm mounting bracket.
4. On the servo motor end, pull off the elevator tower (press fitted).
5. Turn arm over onto its top.
6. Loosen 4 screws about $\frac{1}{4}$ " holding the servo motor box to the channel. Pull the servo motor box off and set it next to channel.
7. O-ring falls off servo motor pulley.
8. Turn arm to top side up and pull front tower off. Disengage O-ring carefully
9. Turn carriage top side up.

Arm Reassembly

This is the sequence for assembling the Stealth One.

1. Verify that wires from carriage to servo motor are not twisted around each other.
2. With carriage top-side up, lay the O-ring into the carriage. O-ring should lay close to the outer edges of the carriage, about the distance apart as the servo pulley diameter.
3. Slide Plexiglas channel over carriage wheels.
4. Turn arm upside down
5. Hook O-ring around front tower pulley and slide front tower onto the Plexiglas channel. Maintain tension of pulley with right hand.
6. Slide carriage toward front tower.
7. Turn servo motor box upside down and hook O-ring with servo motor pulley.
8. Lower servo motor box down into channel.
9. Hold motor box and align 4 servo motor box screws with mating holes in Plexiglas channel underside.
10. Fasten servo motor box with 4 long screws still inside the servo motor box.
11. Turn arm top-side up and push back tower onto the channel.
12. Place arm on arm mounting base, insure towers are fully seated in the Plexiglas channel.
13. Reinstall arm wand.
14. Plug in AC power adapter, ground and signal wires

Trouble shooting guide

Here are some situations encountered in developing the arm. While you may not experience any of these problems in using the arm in “production” mode, they are presented here to document what kind of solution is needed in case you experience something similar.

1. Lift/lower running full cycle, not stopping.
 - a. Check that flag is aligned properly inside the carriage and floating inside the two optoelectronic devices. The flag should be barely visible and have a small horizontal clearance between the flag and the flag holder.
 - b. Blue LED is a momentary switch, you may be holding it down too long, rather than a press and release.
 - c. Do not park a high intensity task lamp near the arm, as they give off infra-red waves that might bounce off the arm mounting plate, and be detected by either of two optoelectronic collectors.
2. No sound.
 - a. Check that the wand is fully seated in the breech block.
 - b. Are there 4-5 LEDs illuminated?
3. Wand is lifting, but not lifting fully.
 - a. The M3x10 black aluminum hex head countersunk screw that serves as the pivot for the lift/lower finger bracket may be a bit too tight. Loosen slightly.
4. Red LED illuminated, but manual blue switch LED does not lift/lower.
 - a. Check that the Red/Black lift/lower wire is connected properly to two gold posts and to the lift/lower motors.

Packing for shipment

When shipping the Stealth One back to the manufacturer for service, or to a subsequent owner, you should follow the ten preparation steps below to guarantee the best possible shipment outcome.

1. Remove the wand and cartridge from the breech block
2. Remove the counterweight and two blue counterweight thumb nuts, and counterweight bolt.
3. Lift the tone arm off the tone arm mounting plate and set aside temporarily.
4. Remove the four bolts that bind the base to the turntable mounting board.
5. Rejoin the tone arm and tone arm base plate.
6. From the accessories, find the carriage locking block and two M6 bolts.
7. Reinstall the carriage locking block onto the tone arm base plate with M6 bolts
8. Find the two shipping end plates, and mount them over the front tower and back tower.
9. Place the tone arm and end plates back into the original shipping carton
10. Place the counterweight, wand into the accessories box, as needed for shipment.