



Thank you for your purchase of the Spiral Groove Centroid SG Integrated Tonearm. The Centroid SG Integrated model is designed for use with with Spiral Groove turntables. As the name implies, some functions, such as the arm lift, anti-skate support, and fluid damping, are integrated into the Spiral Groove armboard. The Centroid Universal Integrated model is designed for use with all other turntables and many of the arm mounting details are different in procedure than those outlined in this manual. The discussion of the tonearm design below provides much useful information for both model tonearms, but can be read before or after the installation and setup of the tonearm. Those with some experience, and who are eager to get listening, may want to skip directly to the setup procedures outlined on page 5, which will guide you easily to superior results. Enjoy!

The Centroid unipivot tonearm

The Centroid tonearm design effort had two main goals. The first, and most obvious: to design a tonearm that provides the best mechanical and electrical conditions for a phono cartridge to transmit the signal from a record with the greatest fidelity and lowest noise. The second goal, and one less frequently considered: to provide the simplest and most consistent means of setting up the arm and cartridge in order to fully realize the performance capabilities designed in to the arm. As a result, the Centroid is able to realize the greatest performance benefits in the greatest number of turntable systems than any previous tonearm. The beauty of the design – its inherent elegance – allows the basic elements to be understood in fairly simple terms.

A few words about the Centroid's design...

The Centroid evolved from a holistic approach called *Balanced Force Design™*, which focuses on preventing mechanically induced resonances from adversely affecting the music signal by modulating the moments of inertia and in effect balancing the forces involved during playback.

Moment of inertia can be described as a body's resistance to angular acceleration. In the case of a tonearm, the lower the resistance, or moment of inertia, the more effortlessly the cartridge is able to respond to the normal record warps and the basic conditions of disc playback.

It might be easiest to think about the influence of these forces on the arm/cartridge system by imagining holding a broom at the end of its handle, farthest away from the head or bristles. Your ability to move the broom under precise control will be very difficult. The moment of inertia in this case is high. The closer you move your hand to the head of the broom, the easier it is to control, because the moment of inertia is being lowered. At a certain point, the broom will be balanced at the center of the mass, or the centroid. At this point, the broom head is easiest to control, because the moment of inertia is at its lowest.

The dynamic forces involved in controlling a broom during even the heaviest sweeping are not nearly as complex as those found in the process of tracking of a microscopic record groove. In order to achieve a similar level of control for a tonearm under those conditions, many unique, even patent pending, features have been developed for the Centroid tonearm.

The tonearm uses a unipivot design. This means that the bearing assembly consists of a single pin and cup. Taking advantage of this simple structure, the Centroid design puts the stylus tip and the single pivot point of the unipivot bearing on exactly the same plane, contributing elementally to the balance of the forces involved in the operation of the tonearm and drastically lowering the moment of inertia.

Working in conjunction with this functional element, the patented counterweight takes further advantage of the unipivot design by being able to wrap down and around the bearing in a way that places the center of the arm mass, the centroid, at the optimal position in relation to the bearing. With the optimal placement of the centroid, and the pivot point and stylus tip in the groove being on the same plane, global moment of inertia becomes vanishingly low and the stability of the system in all planes is very high.

The positioning of the mass relative to the pivot point is critical in a unipivot in order to take advantage of its inherent virtues. Indeed if the mass is distributed incorrectly, it can destabilize the tonearm as it reacts to any resonance or record warps. However, because of the strategic distribution of counterweight's effective mass, placing the centroid just below the pivot point, the tonearm stabilizes extremely fast due to its inherently balanced nature, resulting in the extremely linear dynamics of the tonearm. This is one of the reasons why the arm feels increasingly more solid and stable as it is moved in to playing position, in that the balanced mass around the unipivot bearing provides the essential mechanical loading and lateral stability the closer the stylus gets to the plane of the bearing.

Additionally, the counterweight design allows for the most effective use of the widest range of cartridge types: from low weight/high compliance to high weight/low compliance. Cartridges weighing from 4 to 20 grams can be used without any additional counterweight. The micro-adjustable counterweight movement allows ultra-precise fine-tuning of tracking force. Similarly precise in adjustment precision is the azimuth control, adjusted by using a stainless steel setscrew on the side of the counterweight. This setscrew is set up high, near the pivot point, and buries very deep into the weight. Like the counterweight itself, it requires very little movement to accommodate any azimuth adjustment required, while its position further contributes to maintaining system stability through its close relationship to the centroid of the arm and the plane of the record.

The single bearing is composed of a complimentary set of Swiss sapphire jewel cup and bearing pin matched for "Zero Tolerance" precision. This builds upon a unipivot's inherent advantage in providing a direct-coupled low impedance energy path from headshell to bearing for superior control of resonances. The design of the Centroid's VTA adjustment mechanism takes further advantage of a single point bearing by allowing for the raising and lowering of the arm without altering the relationship of the pivot point to the record plane. A setscrew on the top of the arm that is easily accessed adjusts the VTA. However, the screw is quite stiff to turn, for performance reasons, therefore does not allow for adjustment "on the fly."

The patent pending anti-skate system is equally unique. It may not be well known that skating force during playback is not constant. The design of the Centroid's anti-skating force mechanism addresses this fact, in that it applies the exact inverse force to the skating force in order to position the stylus with uniformity in the groove regardless of its position on the record.

The anti-skate force is applied using a weight hanging from a string and connected to the arm body through a precisely positioned guide system. Sapphire ring jewels, inset at contact points in

the mechanism, allow for frictionless system function. The point at which the thread connects to the arm body is variable in height; so, no matter where the VTA is set, the point at which the anti-skate applies force on the arm is centered within the mechanism.

The point where the string and guide mechanism are centered is also the precise height of both the platter and the bearing, thereby applying the anti-skate force on the same plane and in balance with the major elements of the tonearm; this can easily be seen by laying a ruler on the platter and gauging the height of the string. The result is that the anti-skating mechanism will not misalign the azimuth setting and further contributes to the stable dynamics of the arm.

Additional design elements that contribute to controlling system resonance include a carbon-wrapped aluminum arm tube, yielding the ultimate in lightweight, rigidity, and damping characteristics. An adjustable silicone fluid damping system helps further to control system resonance.

Even the cueing mechanism is designed for superior control, in that its undamped, direct, mechanically controlled action combines with stable horizontal positioning for greater precision when placing the stylus in the groove.

The same level of attention to the mechanical elements of the tonearm has been applied to the electrical elements. A custom wire harness of ultra-low-mass GrooveLine wire connects directly to Eichmann RCA connectors, for maximum signal transfer and low noise. The wire itself is composed of 68 individually insulated 50-gauge wires. The reasons for using a wire of this configuration, known as "Litz", and size are two-fold. The first is that the Litz configuration reduces electrical resistance due to the increased overall surface area relative to diameter. The second is that mechanical resistance is reduced due to the wire bundle's extremely low mass and inherent flexibility.

A few words about Centroid installation...

Unless properly installed, aligned, and adjusted, the features outlined above for the Centroid tonearm would never realize their potential for providing superlative performance. To make the setup of the tonearm both easy and effective, a patented alignment system provides precise fine adjustment of overhang, VTA, azimuth, and zenith.

The use of this system will result in a setup that provides a better alignment of the tonearm than most people are capable of, unless they have extensive experience in turntable setup. This, in effect, gets the setup in the bull's-eye. However, getting the setup to the very center of that bull's-eye – those final fine adjustments necessary to wring the absolute best from any system – must still be done by ear. There is no substitute for this final step.

The alignment system tools consist of an etched mirror alignment protractor, a guide base, and a locating pin. Additionally, there is a patented locator pinhole in the headshell that is precisely above the point where the stylus will be positioned. These simple elements form the tool used to set up all major alignment parameters.

The advantage of a mirrored protractor is that it has depth, or is three-dimensional, which provides alignment precision impossible with any two-dimensional tool. Etches on the glass face of the mirror correspond to reflections on the silvered surface under the glass. Similarly, the cantilever corresponds to its image in the mirror. Aligning the cantilever not only with the etched lines but also with their reflections assures that you are able to find the precise viewing point from which to gauge alignment accurately.

Put another way, two-dimensional protractors can actually allow for misalignment, while a three-dimensional protractor allows us to use parallax view to see any error in viewing position – first the image of the etch mark has to be aligned so there is one line, not two – one at the surface and one below the surface; then when these two elements are correctly aligned, the cantilever must cover both the combined etches and its reflection in the mirror. These four elements need to be aligned – the two etched images and the cantilever and its image in the mirror – in order to achieve proper alignment of the cartridge.

The patent pending stylus to pivot point locator pinhole on the headshell deserves further discussion. It works in a few ways to aid alignment. First, to determine cartridge height, the guide base and locator screw is inserted into the protractor, and the protractor is placed on the spindle of the platter. The cartridge is then put on its back next to the guide, and the locator screw is then raised or lowered so that the screw's shoulder is at the same height as the stylus tip. From here, the locator pin serves to locate the protractor in the correct position to adjust the overhang of the cartridge. This is accomplished by rotating the protractor from the spindle so that the locator pin can be inserted in to the headshell pinhole. Once the pin of the guide is in the pinhole, the tonearm can be leveled, based on the predetermined cartridge height, by raising or lowering the back of the arm, using the VTA adjustment screw, until the tonearm tube is level.

At this point, the cartridge is installed, with overhang and zenith adjustments being made using the protractor. Adjustment of overhang involves positioning the stylus tip on the appropriate spot on the protractor.

Note: When using the new generation Lyra Delos or Kleos cartridges, overhang is even simpler to achieve, in that these cartridges have pinholes in the top of their bodies directly above the stylus. So, overhang adjustment is simply a matter of removing the locating pin from the base and inserting the pin through the pinhole from the top of the headshell. Then the pin is inserted into the pinhole of the Delos or Kleos to determine overhang. The cartridge is then rotated around the pin to adjust for zenith.

Whether using a Lyra or other cartridge correct zenith is achieved when the cantilever is aligned with the etched line on the protractor that runs under the tonearm. When adjusting for zenith with other cartridges, care must be taken to maintain the overhang previously determined using the protractor.

It must be noted that while there is a patent on the arm's stylus point locator hole system, the patent is really only to maintain a standard. All cartridge and tonearm manufacturers are invited to use this system in an effort to standardize and make all tonearm setup easier. Credit must be given to both Jonathan Carr of Lyra and Allen Perkins of Spiral Groove for their conceiving and executing this system. It is done in the spirit of furthering the art and not market competition.

A few final words about the resulting application of these design elements...

When both the design elements and the setup tools are brought fully into play, the result is a noise floor lower than that achieved in any other tonearm, allowing for inner details to be revealed in a coherent way as of yet unheard. This means that virtually any cartridge can be used in such a way that its fullest potential is realized and that the system, and a record played on it, performs at a level that provides greater involvement and enjoyment.

Centroid SG Integrated Tonearm Assembly and Mounting

The Centroid SG Integrated Tonearm comes shipped in three parts and final assembly should be done before attaching the tonearm to the turntable. The three parts are the tonearm base, the armrest, and the upper arm assembly.

Assembly and mounting is best accomplished on a level, flat, clean, and well-lit work surface that provides plenty of clear space.

1. Installing the arm rest:
 - a. Facing the arm base, position the curved rubber covered area of the arm rest to the left and then insert the armrest into the cuing mechanism.
 - b. Move the lift lever to raise the armrest to its highest position.
 - c. Gently tighten the allen head set screw in the back of the lift to hold the rest in place.
 - d. Move the lift lever to lower the arm to its lowest position.

Note: Final height adjustment will be done after attaching the arm to the table and installing the cartridge.
2. Attaching the upper arm assembly to the base:

Note: Always move the arm and RCA block as one unit to avoid putting any stress on the wires connecting the arm to the RCA block.

 - a. Carefully lift the arm and RCA block out of the packing.
 - b. Place the RCA mounting block into the recess on the back of the arm base, with the RCA connectors facing toward the back.
 - c. Gently lower the arm onto the bearing.
 - d. Once the tone arm is seated on the bearing, lock the arm tube in place in the tone arm clip.

Note: The wires should form a smooth arch between the RCA block and the arm body. The wires can accidentally be twisted when removing the arm and RCA block from its packaging. Rotate the RCA block if necessary so the wire forms a smooth arch.

 - e. Secure the RCA block to the arm board using the 4-40 screw through the hole on the bottom of the base.
 - f. Using the tweezers fit the loop of the anti-skate thread over the end of the anti-skate rod, making sure that the loop rests on top of the o-ring.
3. Place the assembled tone arm on the turntable. Be sure that the surfaces of both the bottom of the tone arm board and the turntable tone arm mounting plate are completely clean and free of any debris.
 - a. SG1.1 bayonet mount: Attach the arm to the turntable by inserting the arm into the turntable and turning the arm clockwise until it locks into position.

Note: The bayonet mount is included with the SG1.1 turntable, not with the Centroid SG Integrated Tonearm. SG1.1 bayonet mounts are available from Spiral Groove.
 - b. SG2 - using the six mounting bolts, secure the tone arm to the turntable from the underside of the turntable.

Tonearm and Cartridge Alignment

1. Level the entire turntable from the arm board. This will ensure that the unipivot bearing is aligned properly for superior performance.
2. Immobilize the platter using a wedge or a blue “painters” tape.
3. Initial Tonearm Alignment
 - a. Place the mirrored gauge on the platter through the spindle hole.
 - b. Assemble the alignment tool by inserting the guide base into the mirror gauge, and then screwing the locating pin into the base.
 - c. Place roughly an 8” strip of tape over the Spiral Groove name on the gauge so that it adheres to the gauge but not the platter, in preparation for securing the gauge to the platter in a later step.
 - d. Place the cartridge, on its back, on the mirrored gauge next to the locating pin base. Adjust the height of the locating pin so that the shoulder, or flat spot, is at the height of the stylus tip, and then set the cartridge aside.
 - e. Position the guide and the tonearm so that the locating pin can be inserted into the headshell alignment hole. Sometimes the pin cannot be inserted into the pinhole until the arm tube is level. If this is the case, complete the next step with the headshell against the locator pin, and then insert the pin into the headshell.
 - f. Using the included spirit level, bring the tonearm tube level, or parallel to the platter, by turning the Vertical Tracking Angle (VTA) adjustment screw. Turning the screw clockwise will raise the arm body and counter clockwise will lower the arm body. This provides correct overhang for the cartridge at a neutral VTA.
Note: the VTA screw is very stiff. Hold the arm tube in the tone arm clip firmly to prevent it from slipping out and causing damage to the cartridge, tonearm, or turntable.
 - g. Using the tape previously attached to the gauge, secure the alignment tool to the platter.
 - h. Remove the guide base and screw from the mirrored alignment gauge.
4. Cartridge Installation
 - a. Install and connect the phono cartridge, then dial in 1 gram of tracking force using a tracking force gauge. The cartridge should be able to rest lightly on the surface of the mirrored alignment gauge for the following adjustments.

Note: The next steps use the mirror alignment gauge. When using the mirror alignment gauge, always be sure that you position your head so that the etched line appears to be a single line. If your head is not in the correct position, you will see two lines, the etched line, and its reflection in the mirror. By making sure you see a single line, a mirror gauge will provide the most accurate alignment.

5. Cartridge Overhang Adjustment
 - a. Move the cartridge in the head shell slots so that the stylus tip is positioned at the junction of the etched “T” in the mirrored alignment gauge. Use the included magnifying glass to view the stylus position.
Note: The width and depth of the etched line is intentionally large, so that the stylus tip can clearly be seen within the groove. Therefore, it is possible to achieve absolute overhang precision by placing the stylus at the exact junction point of the grooves by examining the tip’s position from both the front and the side with the included magnifying glass.

- b. Take care when placing the stylus tip onto the mirrored alignment gauge, as well as to lift the stylus tip off the gauge when repositioning the cartridge within the headshell.

Note: Lyra cartridges, starting with the Delos, have a stylus point alignment guide hole on the top of the cartridge body corresponding to the alignment guide hole in the Centroid headshell, which allows for precise overhang positioning using the location screw. This feature will be included in the design of every new Lyra cartridge introduced in the future. To take advantage of this feature, remove the screw from the location guide, and, using the pin, align the holes in the headshell and the cartridge. Keep the guide pin in place when adjusting for zenith (see below), as this will keep overhang at the correct position during that step.

6. Cartridge Azimuth Adjustment

- a. Adjust cartridge azimuth from the screw point on the side of the counterweight.
- b. Place the spirit level on the top of the headshell.
- c. Place cartridge on to the mirrored gauge at the overhang position.
- d. Adjust azimuth screw so that the spirit level indicates a level position side to side (ignoring front to back indication).
- a. Fine adjustments to azimuth can then be carried out by ear or preferably by using one of the commercially available electronic instruments designed specifically for the purpose.

7. Cartridge Zenith Adjustment

- a. With the stylus tip at the intersection of the crosshairs, sight along the cantilever to view its relationship to the vertical line of the "T" that runs under the cartridge body toward the pivot point of the arm.
- b. Reposition the cartridge so that the cantilever and the vertical line are in alignment. Do not use a reflection of the cartridge body in the mirror; only adjust using the cantilever as reference point.
- c. As you adjust zenith, take care to maintain overhang position. Once zenith is set, double check that overhang remains correct using overhang adjustment procedure described above.
- d. Tighten the cartridge into position to the cartridge manufacturer's specification.

8. Adjust the tracking force according to the cartridge manufacturer's suggestions, with the thought that finer adjustments can be done by ear during the vertical tracking angle and azimuth adjustment procedures.

9. Arm Rest and Cueing Lift Height Adjustment

- a. Remove the mirrored alignment tool from the platter.
- b. Place a record on the platter, and adjust the armrest and cueing height using the setscrew on the back of the cueing mechanism, accessible when the mechanism is fully raised.
- c. As the lift mechanism is not damped, it is recommended that the distance from stylus tip to record surface be no more than 1/4", both for safety and for accuracy reasons.

10. Anti-Skate Adjustment

- e. Check to be sure that the anti-skate string is at the center of the sapphire ring jewel insert. If not, move the o-ring up and down on the post using the supplied tweezers until the string is level or at the center of the insert. This is required for the mechanism to function correctly.

- f. Apply anti-skate force by slipping the thread through the slots on the anti-skate disc weights, allowing them to rest on the attached disc. Starting with the smallest, or lightest, add discs until the anti-skating force produces the best performance. Various combinations of the discs should provide just the right force for best results.

11. Vertical Tracking Angle (VTA) Adjustment

- g. Coarse VTA adjustment will have already been accomplished during the installation and alignment procedures outlined above. With tone arm and cartridge installed and aligned, fine VTA adjustment can be performed.
- h. Turn the vertical tracking angle allen screw (bearing pin) at the top of the tone arm bearing assembly to raise or lower the body of tonearm to provide the best alignment of the stylus tip within the groove of the record.

Note: Remember to hold the tone arm securely, by the back of the counterweight (further stability can be gained by pressing the fingers holding the counterweight against the arm board), and in the tone arm clip when making this adjustment, as the high tension of the VTA adjustment screw will require some force when turning it.

12. Damping

- i. To take advantage of the damping feature, place a small amount of silicone (provided with the tonearm in a syringe) in the trough located on the tone arm board directly in front of the bearing assembly.
 - Remove black stopper from silicone syringe, replacing with dispenser tip. There is no cap on the dispenser tip, so it is ready to dispense the silicone. When finished, clean off the dispenser tip, and replace it with the stopper for safekeeping.
 - Fill the trough with 3/5 ml, or no more than halfway. Be careful not to over fill, as the movement of bringing the tone arm back to the tone arm rest could cause the damping paddle to push silicone over the edge of the trough and onto the arm board.Adjust the paddle so that it barely touches the surface of the silicone when playing a record.

Hints and Definitions:

1. Cartridge Tightening: Tighten the cartridge into position to the cartridge manufacturer's specification.
2. Overhang - is the distance the stylus extends beyond the spindle center. The correct position produces perfect tangency of the stylus to the record groove at two locations on the record and minimum tracking error over the remainder of the record.
3. Zenith - is the orientation of the stylus around a vertical axis. It is as critical to the sound as VTA and is similar mechanically, in that it is an attempt to match the stylus angle with the angle of the record grooves. This zenith adjustment assumes the manufacturer has placed the stylus correctly in the cantilever. Rotate the cartridge in the headshell to align the cantilever with the etch beneath it. When the cantilever is in the correct location and viewed from the front and above, it hides the etch, the reflections of the etch, and cantilever. Recheck the overhang adjustment after making the zenith adjustment to ensure that overhang has not changed. Tighten the mounting screws on the cartridge when both adjustments are correct.
4. Azimuth - is the side-to-side alignment of the stylus in the record groove. If the stylus tilts toward the right groove wall more than the left, the output from the right channel will be

higher. Therefore, the azimuth affects channel balance and thus imaging. Two methods for adjusting azimuth:

- a. The easiest but less accurate method is to adjust by eye. Using the mirrored gauge, pick a vertical edge or horizontal edge on the cartridge (e.g. the sides or front bottom) and line it up with the appropriate line on the gauge.
 - b. The second, and more accurate, method is to use one of the electronic devices that have come on the market lately, specifically designed to permit the adjustment based on electrically measuring the output of both channels to achieve channel balance. If one of these devices is not available, use a test record that allows for playback of a steady test tone. While playing the tone, use a voltmeter to measure the output of each channel at the amp output terminals. Compare the left and right channels and adjust the azimuth so the two channels have equal output.
5. VTA and SRA - are synonymous terms that mean Vertical Tracking Angle and Stylus Rake Angle respectively. VTA adjustment is an attempt to match the angle of the cartridge stylus to the angle of the cuts in the record groove. In theory, because the thickness of records, as well as the cutting angle used by different record manufacturers vary, VTA will differ for every record. In practice however, a careful adjustment of general VTA will yield significant improvement in sound, depending on needle type. A conical stylus will not be affected by VTA adjustment and setting the arm parallel is the best choice. An elliptical stylus has a narrower contact area and will benefit from careful adjustment. Line contact styli (micro ridge, micro-line, van den Hul) have the narrowest groove contact area and demand the most critical adjustment. However, they are capable of the finest reproduction with the least record wear.
6. Final VTA adjustment should be made after the cartridge is broken in. Play the cartridge to allow the suspension to warm up before adjusting. The best listening choice for VTA adjustment is acoustic music with simple mic'ing that has good center fill and natural tonal balance. Correctly adjusted VTA provides accurate phase retrieval, so if you use a multi-mic'ed studio recording, the phase is usually so incoherent that precise adjustment will be impossible. Start with the arm parallel to the platter surface with the stylus sitting on a record. After listening critically, raise or lower the arm in 1/8-inch increments. Properly adjusted VTA allows the stylus to track deepest into the sides of the record groove.
7. What you should expect to hear with the VTA adjusted correctly is a wide and deep soundstage with extended highs, good transient attack, and natural tonal balance. If the arm is set too high the leading edge of the notes (attack) will be exaggerated, the tonal balance will be bright, and the soundstage will be narrow and bunched up in the middle. If the arm is set too low the leading edge of notes will be muddy, the tonal balance will be dark and the sound will set in the speakers rather than create a good center fill. Keep in mind that the correct position is within a very narrow range, and you won't hear much change until you are close to the correct position.
8. The process of adjusting VTA is one of successive approximations. So, after making 1/8-inch changes and finding the general location, make smaller and smaller changes until you find the best spot. One turn of the wrench raises or lowers the arm 1/32 of an inch.

9. **Note:** The oil damping system will cause VTA changes to also change tracking force. This is a result of the buoyancy created by the oil. As the arm is lowered into the oil the tracking force is reduced, or increased if the arm is raised from the oil. Readjust the tracking force accordingly.
10. Antiskate - counteracts the effect of centripetal force that pushes the stylus and cartridge, toward the center of the record during playback. This is sometimes referred to as skating, and places uneven pressure of the stylus on the inside groove wall. So, opposing or "antiskating" force is applied to provide even pressure of the stylus on both groove walls, counteracting the "skating" force. When attaching the various anti-skate discs, the audible characteristics to listen for as you set the level of antiskating force include:
11. Mis-tracking in one channel, which will require an increase or reduction in the force applied.
12. An increase in bass output and clarity, when the antiskating force is correct.
13. Ultimately, a uniform sound field, exhibiting the most linear energy, is the desired result.

Damping – of the arm by the silicone in the reservoir is to provide the arm with control of resonance, somewhat like shock absorbers on cars. If the car bounces, the mass of the car will keep it bouncing on its springs if the shock absorbers did not create a resistance. In a tonearm, damping resists the forces that are presented to it by the record groove via the cartridge. The ideal situation for the cartridge would be if it were held completely rigid, so that all the side-to-side and vertical forces delivered by the groove would be transformed into electrical energy without waste. Instead, some percentage of these forces lift and push the arm from side to side. Because the arm has mass, it has a tendency to keep going in the direction it is pushed until the resistance of the cartridge suspension stops it and pulls it back in the other direction. This out-of-phase motion keeps the coils out of their optimum position in the magnetic field, which causes blurred imaging and excessive wear on the suspension. The oil resists the sudden motions while allowing the slower motion of the arm moving across the record to go unhindered. This allows for precise imaging and long cartridge life.

Parts List

- Tweezers
- Silicone syringe, with separate dispenser tip
- Five hex key(s):
 - $\frac{5}{64}$ inch (for VTA)
 - $\frac{3}{32}$ inch (for RCA connector block hold-down bolt)
 - $\frac{5}{32}$ inch (for tone arm board mounting bolts)
- Six Armboard bolts (SG2 only)
- One RCA connector block hold-down bolt
- Four anti-skate weights (3 thicknesses: 1 x 1mm, 1 x 2mm, and 2 x 4mm)
- Tonearm and Cartridge Alignment tool – this setup device is composed of three parts:
 - Mirrored alignment gauge
 - Locating pin base (pressure fits into corresponding holes on the mirrored gauge via three pins on the underside of the base)
 - Locating pin (screws into locating pin base, and inserts into center-front pin hole on headshell)
- Cartridge Spacer
- Top capture “O” ring for Antiskate rod.

Should your Centroid ever need service, many items can be serviced in your home or studio, and a trip back to the factory may not be required. Every attempt has been made to allow for easy disassembly and precise re-assembly in the field. Please contact your dealer or Spiral Groove directly if your Centroid is not performing like new.

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