

OWNER'S MANUAL

Palo Santos Presentation

LOW OUTPUT MOVING COIL CARTRIDGE

S U M I K O

Dear New Palo Santos Presentation Owner,

Thank you for your purchase of our new moving coil cartridge. Our intention in producing the Palo Santos is simple and unequivocal: to deliver the highest level of real world performance to the vinyl lover. The Palo Santos is the result of our over thirty years of service to the analog devotee; music lovers who value the expressiveness and emotional authenticity available only from analog records. There is also a populist sentiment in our decision to produce a genuine reference quality cartridge with more than sufficient output to drive normal moving coil phono sections. We wanted real people, music lovers like you and us, to be able to enjoy the greatness contained within your record collections. And we wanted you to have enough money left over to be able to buy more vinyl records. Good luck and good listening.

In the next few pages, we will take you on a tour of the design choices we made during the development of the Palo Santos. The second half of the manual is intended to provide you with simple, visual clues to get the most music from your new Palo Santos.

Enjoy the Music and Celebrate!

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Why a low output moving coil cartridge?

Along the conceptual path, we examined closely the possibility of several construction methods. Moving magnet, or moving iron cartridges were rejected for their inability to deliver the high resolution and emotional intimacy possible only through the reduced moving mass of the better moving coil designs. Conventional, very-low output moving coils, while theoretically offering the lowest moving mass and generator impedance, were generally found to require too much from the phono section in terms of performance. We found that while the theoretical performance envelope was very high indeed, the delivered sound quality in real world systems rarely reached the intended performance goal. By using a higher than usual output (0.5mV) in the Palo Santos, the phono section is not tasked with the accessing the nether regions of the unit's gain limits. Radio frequency interference (RFI) and circuit noise floor are less impactful on the sound, resulting in wider dynamics and a quieter background. Additionally, bass response is rich, extended and complete.

DESIGN SPECIFICS

In the field of moving coil design, controlling the magnetic field within the generator is of paramount importance. Non-linear magnets, poor physical construction, poor magnetic saturation of the yokes, and poorly held tolerances can all be sources of an uncontrollable and non-linear magnetic field. A non-linear magnetic field means non-linear sound, resulting in sound that can range from bright and sterile to dull and boring. In the new Palo Santos, we've chosen an expensive Alnico magnet for its pure saturation qualities. This quality helps provide the Palo Santos with a very solid brass foundation and very wide dynamics. But, not stopping there, the front yoke of the generator is high-pressure fit against the Alnico magnet, ensuring a linear magnetic density, giving you, the listener, a vast open soundstage, a natural and pure midrange, and high frequencies that are extended but never bright.

We specified a long grain boron cantilever for the Palo Santos, which provides excellent energy transfer from the stylus to the coils. There is, among some factions of audiophiles, a misconception that boron cantilevers produce a somewhat sterile sound quality. Nothing could be further from the truth. However, the choice of a still cantilever necessitated excellence within the suspension design of the cartridge.

Suspension Design

Virtually all conventional moving coils get by with a suspension element made from a butyl material. For the Palo Santos, we choose to use a synthetic rubber where the hardness (10 degrees) and repulsion factor (8%) of the material can be tightly controlled with molding temperature, cure time and skin tension. Additionally, with this synthetic material, the specified parameters of the cartridge will perform as designed for a longer period of time, and will last considerably longer than other designs. The final result provides a combination of superior dynamics and excellent long term tracking ability.

The Heart of the Diamond

Your Palo Santos is fitted with a specially ground, Vital PH stylus. No more expensive stylus is available. PH styli cost roughly five times more than the next most expensive grade available. The precision polish and clarity of the PH diamond is legendary within cartridge design circles, lending sweetness to the sound unavailable at lower cost. Our decision to produce a special stylus is based on over twenty years of experience in producing and designing using boron cantilevers. The Vital stylus removes all excess material from the rectangular billet of diamond. This results in only that which is most vital remaining. Doing so removes moving mass closest to the tip of the cartridge and

produces effortless, airy high frequencies. We refer to this as working with only the Heart of the Diamond.

We have selected a special stylus profile for your Palo Santos that requires slightly more care during set-up than a milder shape such as the standard elliptical. However, this shape was necessitated by our desire to extract higher overall performance than was possible using an elliptical and results in slam and attack on leading edge transients that are only possible using this technique. Set-up remains consistent and direct, and most experienced set-up technicians will find the Palo Santos quite easy to align and optimize. As always, musicality and warmth are strong priorities for us but to this, we have been able to produce extra measures of speed and detail while maintaining balance.

Old World Craftsmanship

Each Palo Santos is painstakingly crafted by hand in a process that involves hours of labor. After assembly, final adjustments are made using a battery of test records, and performance is hand-calibrated. Each cartridge is subjected to this process and is critically auditioned before it is shipped. No computer or machine is yet capable of matching the precise adjustments necessary to extract the highest level of performance from a reference quality phono cartridge.

The Point of the Exercise

The purpose of fine adjustment of a phono cartridge is simple: you are trying to optimally align the playing surface of the stylus with the groove wall in the record, doing so in a way that the stylus is securely seated against the groove wall with neither too much or too little force, in all directions. All of these adjustments would be child's play if the stylus was the size of a baseball, and the groove was the size of a rain gutter.

The tricky part comes in the fact that the stylus is so tiny that no one can possibly see the scanning surface of the stylus (the part that actually touches the record groove) without the aid of a microscope. Add the fact that the stylus is moving at the equivalent of about three hundred miles per hour and is being asked to maneuver faster than a Formula One race car and the problem becomes quite complex. Luckily, with a little patience and training, there is a grand equalizer: your ears.

So, let's get to it!

BEFORE YOU BEGIN SETTING UP THE CARTRIDGE

Preliminary User Note:

Before we begin, it might prove helpful to obtain an overview of correct set-up, why you are doing it, and what you hope to accomplish. This is not intended as a theoretical treatise, but merely as good, simple, practical tips on how to go about getting the most from your Palo Santos.

WARNING: Phono cartridges are inherently delicate things. Work SLOWLY, and in a methodical fashion with lots of light and enough space to work comfortably. Rushing to make an adjustment is likely to have the unhappy result of, at best, performing a lousy adjustment, or at worst, damaging the cartridge. Don't forget the wisdom in the old adage, "There never seems enough time to perform a task properly the first time, but there is always enough time to do it again".

Slow down and enjoy the process!

All the adjustments we speak of in the following pages are small incremental adjustments. As a general frame of reference, virtually any change you make will be less than one-eighth of an inch. Some, such as vertical tracking angle adjustments may end up being a few thousandths of an inch!

The Line Drawings

As the saying goes, “a picture is worth a thousand words,” so we chose to add some simple illustrations to the manual. The line drawings included in this manual are there for you as a guide, illustrating what your cartridge will look like when both properly and improperly mounted and adjusted in your tonearm. Although there is no way to show you exactly what a perfectly adjusted cartridge will look like in a tonearm, the line drawings can serve to give you a mental template for your particular set-up. Found on pages 19 and 24, these line drawings will illustrate gross problems found in VTA and Azimuth adjustments. Directly after the text on adjusting VTA and Azimuth, the illustrations on page 26 will allow you to see what your cartridge should generally look like when properly set-up.

For instance, if your particular cartridge sounds best with a more exaggerated negative rake, so be it. If the visual aspect of your particular cartridge looks as if the azimuth is tilted very slightly to one side, but this is the attitude that allows for the best sound, this too is okay. So use this guide as just that, a guide. Explore the possibilities of what you can extract from your cartridge, and you will be rewarded with great music.

BASIC MOUNTING INSTRUCTIONS

There are two basic functions you are seeking to accomplish: physically bolting the cartridge to the tonearm, and making the necessary four electrical connections to complete the audio pathway. Note: Make sure the volume control is turned all the way down when you are making any electrical connection.

We prefer first to bolt the cartridge to the headshell, using the supplied stainless steel mounting bolts. Next, attach the audio leads. The order in which you perform these tasks is functionally irrelevant, but if you should slip while trying to affix one of those tiny wires, at least the cartridge will not drop to the ground!

Using a pair of needle-nose pliers, fasten the color-coded audio leads to the appropriate color-coded pins on the cartridge. If the headshell space is limited, as it is on some British tonearms, loosen the mounting screws and move the cartridge forward to give yourself more room to fit the wires. If you still don't have enough room, remove the cartridge entirely and then re-bolt the cartridge when you're done with the wiring.

A Tip to Remember

One helpful little tip learned from a technical mentor years ago was to remember that “Christmas colors go together to form the right channel, and hot colors are “hot.” By this he means that red and white (red hot and white hot) are the positive leads, so red is right channel hot. The only wire left is blue which is, by process of elimination, left channel ground. We may have thoroughly confused you by this, but try it once or twice and it should make more sense.

And a Few Basic Definitions

Before we press too far ahead, let's define some very basic concepts and items that can get confusing. Basically, there are four different alignment angles to be concerned with: 1. HTA, 2. Offset Angle, 3. VTA, and 4. Azimuth. There is also the pre-loaded weight of the arm and cartridge combination which is Tracking Force.

Additionally, there is the amount of compensation required to counteract the inward pull developed by tracking a spiral-wound groove. This is of course Anti-Skate. A discussion of these parameters will follow later in this manual.

Setting Tracking Force

Now that you've got the cartridge mounted and wired, the next thing you'll want to do is set the basic tracking force, or the amount of down force that will be applied by the stylus on the record. This setting not only determines the amount of stylus force in the record groove, but also loads the suspension system and aligns the coils to the yoke. This setting determines the tracking ability and properly aligns the coils to the magnetic field of the magnets, contributing to the linearity of the cartridge. The cartridge should be set to 2.0 grams of tracking force.

To set the tracking force, first neutrally counterbalance the tonearm. Locate the counterweight. On virtually all pivoted tonearms, it will be located at the rear of the tone arm (meaning the opposite end from the cartridge). Generally, it looks like a fairly large, shallow cylinder, usually black in color and often has numbers ranging from 1 to 3 or more grams printed on it. Move the counterweight backwards, usually done by turning it clockwise, (when viewed from the front), moving it towards the rear of the tonearm. As you move the counterweight backwards the cartridge end of the arm will lighten (reducing stylus tracking weight), while moving the counterweight forward will increase the stylus tracking weight.

The first objective is to “statically balance” the arm, which is to achieve the proper weight balance such that the arm “floats” level. Practice a bit and you’ll find it’s fairly easy to achieve. After achieving static balance, adjust the counterweight to apply 2.0 grams tracking force.

A Brief Discussion on Tracking Force

Tracking force is primarily responsible for the pre-loading of the cartridge’s suspension system so that it works optimally. It is useful to think of a cartridge’s suspension as being similar to an automobile suspension. Too stiff a shock absorber on too light a car will result in poor dynamic performance and a rattly, uncomfortable ride. Similarly, a relatively stiff performance suspension on a phono cartridge, set at too low a tracking force, will result in performance that is bass light, and harsh sounding in the high frequencies. While the mechanical characteristics of the tonearm (how inert it is, how well it allows energy to pass through it, etc.) also bear on this, the tracking force is something we can exert control over here and now.

HTA (Horizontal Tracking Angle) and Offset Angle

We've combined these two categories because they are essentially interrelated. Other than to give a brief description of what you are adjusting for, we will leave these adjustment parameters to the maker of whatever tonearm you intend to use. The reason? Many tonearm manufacturers supply alignment templates with their tonearms and their tonearm geometry may be maximized around this template. Briefly, HTA or Horizontal Tracking Angle, is the fore/aft adjustment of the cartridge within the headshell (though some tonearms, like SME, use a fixed cartridge position in the headshell and require the entire arm be moved). By moving the cartridge position forward or backward in the headshell, the angle that the cartridge will describe over the entire playing surface of a record can be altered and optimized. Suffice it to say that obtaining a good alignment gauge and following its instructions is the best way to go about doing so. Within the headshell the angle of turn in required is a function of the amount forward or backward the cartridge is moved. We recommend the Dennesen Soundtracker s being the best; easy to use and highly accurate, albeit a little pricey. Note: When the HTA alignment process is completed, remember to re-check the tracking force of the cartridge as any movement of the cartridge in the headshell forwards and backwards will change the tracking force value.

Antiskate Adjustment

It is now time to adjust for antiskate. But before we get into setting and calibrating antiskate, it seems useful to identify what part of the tonearm the adjustment mechanism is actually located in. On all tonearms, the antiskate is located towards the rear of the tonearm, in the vicinity of the bearing housing. The adjustment device typically takes one of the following forms. 1. a dangling weight hanging off the side of the arm, with some adjustment mechanism, such as slots cut into a fixed post. The further away from the tonearm the string is attached on that post, the greater the antiskate applied. 2. More commonly, a dial with numbers printed on the dial face indicating 1, 2, 3, grams and fractions thereof.

Antiskate, as defined earlier, is a force applied in such a way as to approximately counteract the inward pull created by the record's decreasing radius spiral groove. We say approximately because the record groove is constantly changing and no existing antiskate is up to the task of correcting for all the non-linear force present. The velocity of the groove changes with frequency, amplitude and position of the stylus, relative to the center of the record. As the velocity changes, so does the way to accurately correct for this dynamic situation. While it is common for manufacturers to suggest setting the

antiskate to exactly match the tracking force indicated (e.g., 2 grams tracking force equals 2 grams indicated antiskate force), our data suggest that an alternative approach is called for since the compliance of the suspension is not taken into account in this approach. In particular, modern moving coil cartridges, such as your cartridge, are lower in compliance and are not as affected by the vector force applied by the record's groove.

In the case of the Palo Santos, we suggest about 2/3 as much antiskate as tracking force indicated, so in the case of the cartridge, about 1.25-1.3 grams antiskate indicated. If more antiskate is applied, the sound may begin to lose delicacy, and a sense of construction will set in.

Test records will not yield particularly good results because they are testing for worst case scenarios. Using our method in real world conditions, the user will obtain higher average results. Going back to the automobile analogy, running a higher antiskate setting is like driving on snow tires year-round on the unlikely chance you might run into a snow storm. Additionally, some will recommend the use of mono records to set antiskate. The problem with this method is that a mono record is cut quite differently from a stereo record. Additionally, some recommend a blank record. Setting the antiskate

should be done in a real world situation and not a steady state or laboratory experiment simulation.

Fine Tuning, VTA and Azimuth are the Tricky Parts

To this point all the adjustments we've had you do have been relatively straightforward, intended to obtain and set a specific parameter. If this is the first time you've attempted these settings, it may have been a bit tricky, but we hope the diagrams have gotten the point across. From this point on, though the work becomes more qualitative and good judgment enters into it as you will be called on to make assessments entirely subjective in nature. Relax and go slowly. It is unlikely that you will totally foul things up. With a little patience and finesse, you can obtain a much more musically satisfying performance from your turntable.

VTA ADJUSTMENT

Vertical Tracking Angle (more precisely, Stylus Rake Angle) is the front-to-rear rake of the stylus within the groove and is controlled by raising or lowering the pivot end of the tonearm. Look for a small screw, possibly two, located low on the mounting collar where the tonearm meets the turntable. You should always refer to your owner's manual to familiarize yourself with all the functions of your arm, so now would be a good time to do that for this function. VTA adjustment's primary effect is upon the time domain behavior of the musical presentation. Often, we hear and read about tonal balance differences attributed to changing VTA. But in the changing of the time signature, one necessarily affects the arrival of high frequencies relative to the low frequencies. The more on rakes a cartridge back, the more the high frequency content is "slowed" resulting in, to a point, subjectively richer, rounder sound. Inversely, raising the VTA will have the effect of sharpening up or focusing the sound. Too high a setting and stridency results.

Major Hint: We find it useful to obtain a copy of Wilson Audio's excellent "Ragtime Razzmatazz, Vol. 1" Using the cut, That Old Piano Roll Blues, and the instructions included within the album, has proven over the years to be both educational and accurate.

You will, with a little practice, find the exact height that allows a good balance between sharpness of focus and correct image scale.

When you get very close on VTA adjustment, note that adding a touch more or less tracking weight (assuming your initial tracking weight is 2.0 grams) is a simple way of fine-tuning the VTA. Adding a tiny bit of weight is effectively lowering the arm height, and reducing the weight will have the apparent effect of raising the back of the arm. Be careful, since adding force also changes the mechanical damping of the system as well as the relationship of the coils to the magnets. Still, for all but the most talented among us, adjusting the weight is, at the very least, a useful interim tool in fine-tuning VTA.

Always, always, always start with the arm lower than necessary and slowly raise its position. Trying to start above the eventual point and lowering the arm will not work, we guarantee it. Please refer to the line drawings on the facing page. On page 23, illustration No. 3 shows a cartridge with 2° of negative cartridge rake, which is a good starting point for you to work with.

Remember, the time domain will not lie, and the ear is quite sensitive to time arrival cues, whereas trying to guess whether a piece of program material has too much or too little bass, for example, is an exercise in madness.

When VTA is right, the sound will take on a properly large image scale (not bloated, simply full in size), with an easy “breath” to the music that emulates the natural ebb and flow of live music. When wrong, the sound can be either too dull at one extreme, or pinched and small sounding at the other. Remember, you are working within a very small window of acceptability. The total height differential you are working with is perhaps 1/4” and that included the “falsing zone”, the area above and below correct that you will wind up finding by trial and error.

Illustration No. 1 shows a neutral attitude of rake. The cartridge will almost never look like this on the turntable. There will always be some negative rake angle to the correct cartridge set-up.

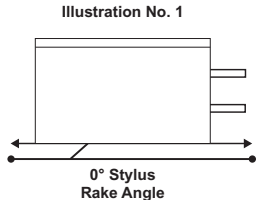


Illustration No. 2 shows a positive rake of 2°. This too will never be the correct adjustment in a properly set-up cartridge. This attitude will result in a thin sound and could result in record damage.

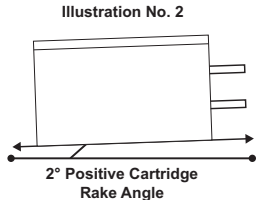
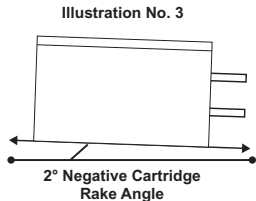


Illustration No. 3 shows what a negative rake angle looks like. This illustration shows a negative 2° attitude. This degree of rake angle is too great for the cartridge but serves to show what your cartridge should generally look like when starting the VTA adjustment process.

Please refer to the section in the manual titled VTA Adjustment (p. 17) for further suggestions.



AZIMUTH ADJUSTMENT

Azimuth is probably the most misunderstood adjustment in analog audio. We believe this stems from the fact that its primary effect can be relatively subtle, but when it is not precisely correct, its effect on other parameters such as VTA can be dramatic. As you can see from the diagram on the facing page, azimuth describes the left-right angular orientation when viewed from the front of the cartridge. Necessarily, this affects the balance of left-versus-right information, but not as dramatically in the lower treble (basic high frequency performance). Additionally, groove tracing ability will be affected by incorrect azimuth adjustment. Because the stylus does not sit perfectly vertical in the grooves (see VTA), an azimuth misalignment will also result in the stylus “scrubbing” in the grooves, resulting in mistracking and contributing to poor high frequency response.

Your listening cue is to listen for stridency, sibilants or an unusual metallic clang on instruments that do not normally produce a sibilant or clang. The sound of an unnatural “tssk, tssk” on cymbals, and other leading-edge transients, are telltale signs of misaligned azimuth. A very slight adjustment will correct for this problem. Only in grossly misaligned arms will you hear an actual channel imbalance whereby the left channel actually sounds as though it is playing louder than the right, or vice versa.

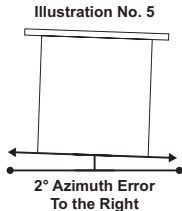
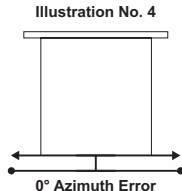
Note: When you have achieved correct azimuth, the sound will take on a tidy, integrated character that simply sounds “right”.

Some people have reported good results by playing mono records and listening for the focus of image as a determinant for azimuth. We are reluctant to recommend this method, since the groove geometries of mono records are different than stereo records. We believe that a real world, dynamic set-up is the way to achieving a satisfying cartridge alignment, and using mono records to set-up for stereo records is not applicable.

Addendum: Further experimentation will reveal that small changes made to azimuth may necessitate an additional slight change to VTA. This area is the trickiest part of fine-tuning. That is, the interactive nature of azimuth and VTA changes can be misleading. A legitimate improvement to one area can lead to a subjective degradation in another simply because an initial error has been exposed. As always, it is important to listen rationally and build up enough of an experience base so that you can easily determine whether the changes you made are a true improvement or simply an irrelevant alteration.

Illustration No. 4 shows the attitude of the cartridge when the azimuth is set correctly. The bottom of the cartridge may be used to set azimuth by eye. However, the final setting will be done by ear.

Illustration No. 5 and 6 show azimuth errors of 2° , tilted severely to the right and left. These angles may result in volume imbalances, biased toward the right or left channels.



More importantly, this azimuth error will not allow proper tracing of the grooves resulting in mistracking. An edgy, hyper-detailed high-frequency sound will result if the azimuth is set wrong.

Please refer to the manual section titled Azimuth Adjustment (p. 26) for further suggestions.

These illustrations show what the cartridge should look like when properly mounted and adjusted in the tonearm.

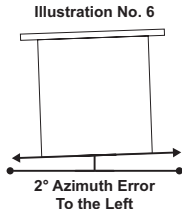


Illustration No. 7 shows azimuth at 0° of error in side-to-side tilt.

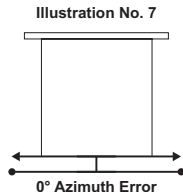


Illustration No. 8 shows a negative rake angle, (VTA), of 1.2° . This angle will result in a very fast, dynamic, and robust sound.

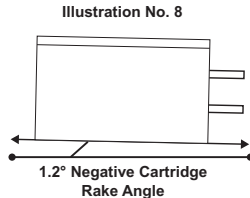
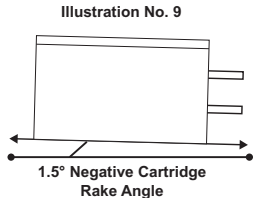


Illustration No. 9 shows a steeper negative rake angle than Illustration No. 8 where the angle has been increased by only 0.3, barely perceptible to the naked eye. The negative angle of 1.5° will result in a more rounded low frequency dynamic structure, less clarity in the midrange, and a reduced high frequency component.



WRAPPING UP THE INSTALLATION

Now that you have gone through the basic set-up procedure of your cartridge, you can expect the solutions that are outlined in this manual to aid you in optimizing your cartridge as it breaks in over time. You will find, that for the first 10-20 hours of playing time, the cartridge will go through changes in character, sound quality, and perceived output. As the suspension system settles in and becomes mechanically “free”, the VTA position you originally found to be satisfactory, will become less and less optimal and aberrations in the presentation will appear. Typically, the VTA will have to be changed so that the back of the tonearm is raised, which is why we advise you never to start with the VTA at a point that requires that you work your way downward. As the suspension settles in and the VTA becomes more and more wrong, the dynamic structure of the music will become compressed, leading to the perception of reduced output. We recommend that you not fiddle with the VTA too much for the first twenty hours of play time as the frequency and degree of changes required to keep the cartridge performing optimally during this time might drive you crazy. So, sit back and relax, accept the performance through the initial break-in period and listen to lots of records.

WARRANTY

WHAT IS COVERED: All parts defective in material and workmanship.

FOR HOW LONG: 1 Year, Parts & Labor

WHAT WE WILL DO: We will, at our sole option, repair or replace any defective parts free of charge.

WHAT WE WILL NOT DO: Pay shipping or transportation charges from you to us. PROVIDE SERVICE FOR PRODUCT NOT PURCHASED FROM AN AUTHORIZED DEALER. PLEASE CONTACT SUMIKO IF YOU HAVE ANY QUESTIONS REGARDING A DEALER.

WHAT YOU MUST DO: First, contact the dealer from whom you purchased the product to discuss the problem. Your dealer, in most instances, will be able to answer your questions or arrange for repair. In the event you are unable to resolve the situation with your dealer, notify the Sumiko Service Center located at 2431 Fifth Street, Berkeley, CA 94710 (tel: 510-843-4500) of any defect, malfunction, or nonconformity promptly upon discovery. Obtain from the Sumiko Service Center a return authorization number. Properly pack the product in the original carton for shipping (ask the Sumiko Service Center for packing instructions, if needed). Label and ship the product, freight prepaid and insured, to the

Sumiko Service Center with the proof of purchase from your authorized Sumiko dealer, and place the return authorization number prominently on the outside of the carton. Cartons not bearing a return authorization number will be refused.

OTHER CONDITIONS: This warranty is not transferable from the original owner to any subsequent owners. THE PROVISIONS OF THIS WARRANTY ARE IN LIEU OF ANY OTHER WRITTEN WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SUMIKO'S MAXIMUM LIABILITY SHALL NOT EXCEED THE ACTUAL PURCHASE PRICE PAID BY YOU FOR THE PRODUCT. IN NO EVENT SHALL SUMIKO BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES. This warranty does not cover a defect that has resulted from improper or unreasonable use or maintenance, accident, improper packing, or unauthorized tampering, alteration or modification as determined solely by us. This warranty is void if the label bearing the serial number has been removed or defaced.

OTHER LEGAL RIGHTS: This warranty gives you specific legal rights, and you may also have other rights which vary from country to country or state to state. Some places do not allow limitations on implied warranties or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

PALO SANTOS PRESENTATION SPECIFICATIONS

Generator:	Moving Coil
Suspension:	Synthetic rubber
Frequency Response:	10Hz - 40Khz +/- 1.5dB
Output Voltage:	0.5mV (3.54 cm/sec., 1kHz)
Channel Separation:	>30dB @ 1kHz
Channel Balance:	<0.5dB @ 1kHz
Optimum Tracking Force:	2.0 grams
Tracking Force Range:	1.8 - 2.2 grams
Dynamic Compliance:	8 x 10 ⁻⁶ cm/dyne
Internal Impedance:	12 Ohms
Load Impedance Range:	10 - 100 Ohms
Capacitance Range:	100 - 300 pf
Cantilever:	Long grain boron
Stylus Type:	Ultra low mass, solid diamond, 75µm x 5µm
Output Terminals:	Unique gold plated tapered brass pins
Weight:	8.3 grams

Mounting System:	Standard 0.5" hole spacing, threaded M2.5
Supplied Hardware:	Stainless Steel Mounting Bolts
	2 ea. - 2.5mm x 6mm, 8mm
	4 – Stainless Steel Washers, 2.5mm
	1 – M2 Allen Wrench

SUMIKO

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