Creating the future of analog music.

DS Audio

Creating the future of analog music

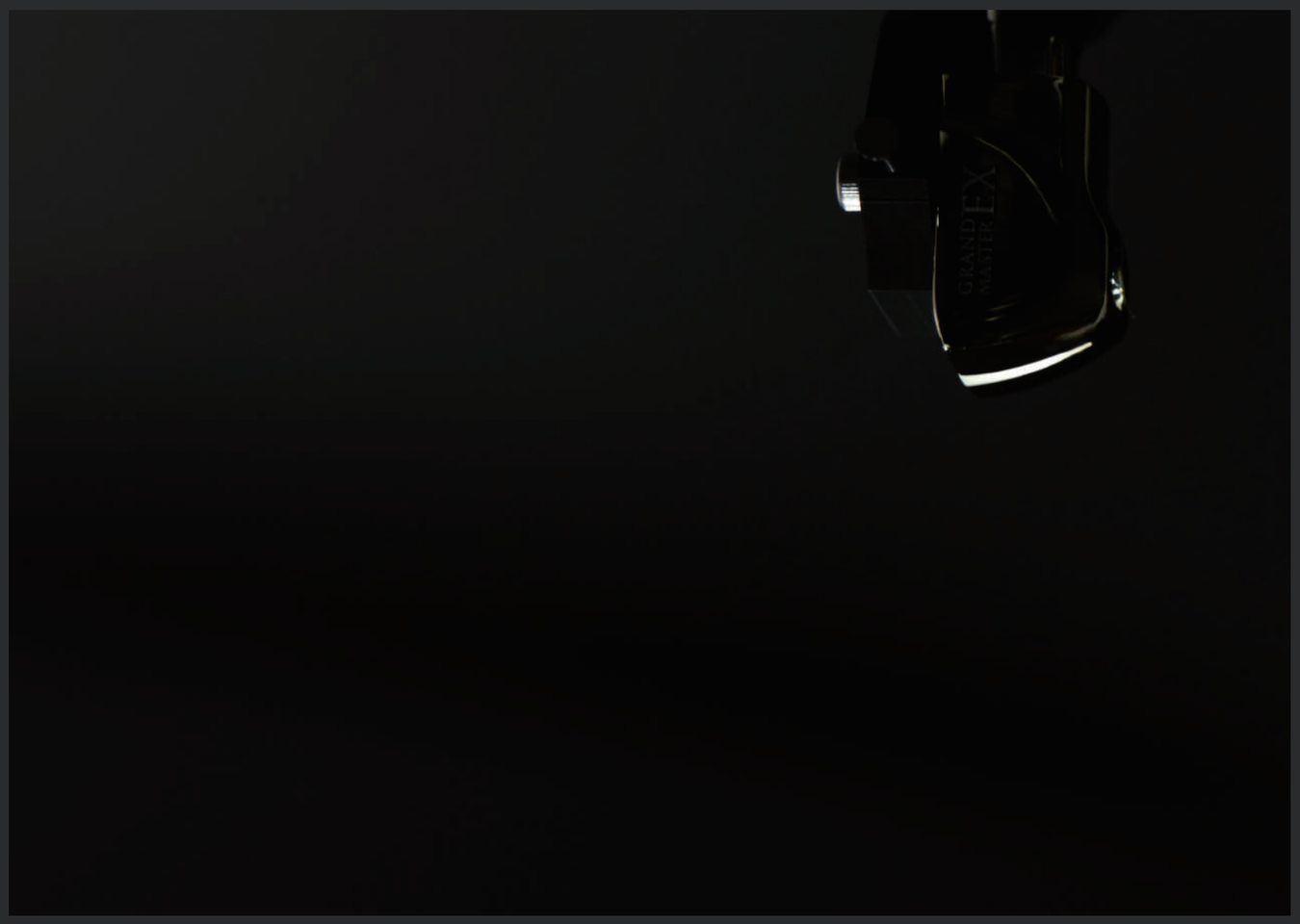
Our mission is to "create the future of analog music”

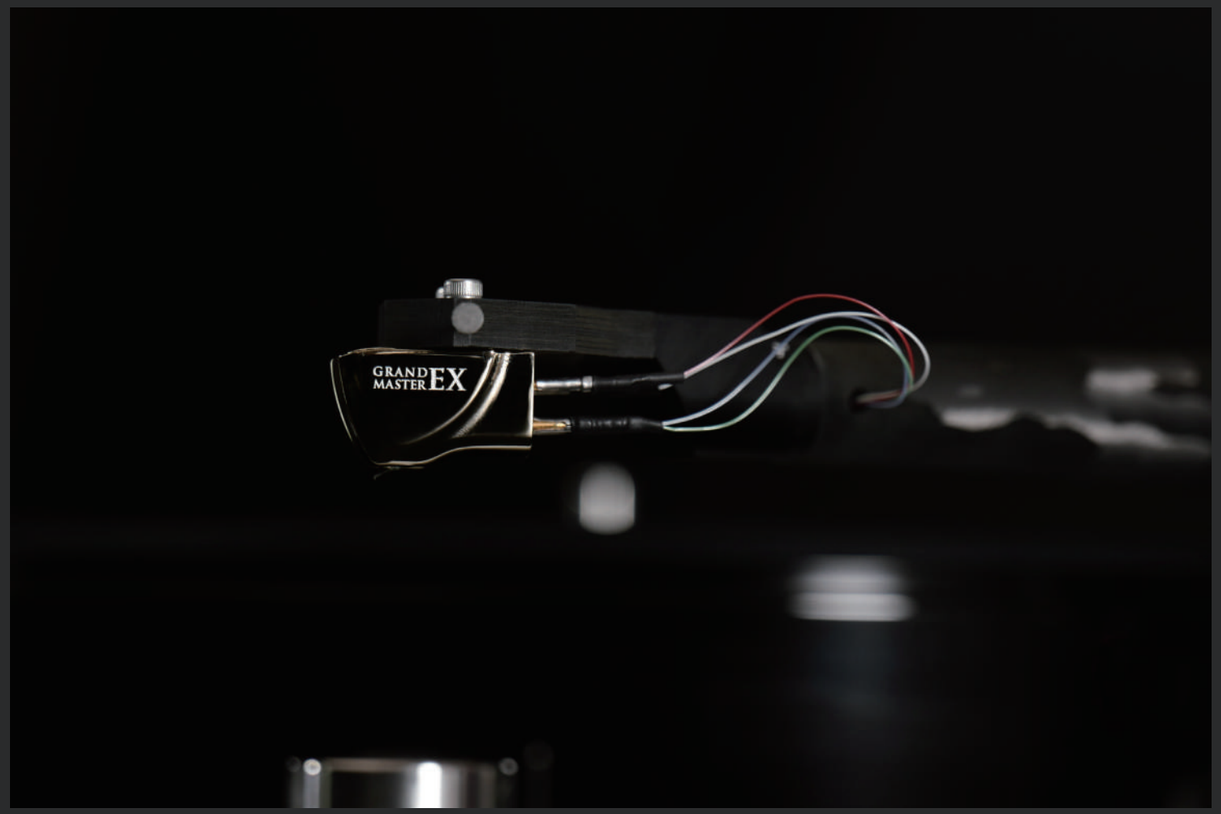
We will continue to take on challenges to make the future a reality.

GRAND MASTER EX

New analog extreme.

GRAND MASTER EX





Details

Cartridge

One-piece diamond cantilever

The Grand Master Extreme employs a 0.22mm square one-piece diamond cantilever, where the diamond cantilever and the needle tip are crafted from a single diamond. Typically, the diamond tip of the cantilever and the needle tip are bonded together using adhesive. However, with the one-piece diamond cantilever, the cantilever and the needle tip are integrated into a single unit, enabling a more direct transmission of information from the needle tip.

Price

Cartridge

Grand Master Extreme Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	27db more(1kHz)
Weight	7.7g
Output signal level	70mV more
Canti-lever & Needle	ONE PIECE DIAMOND
Body material	Ultra duralumin
Cantilever holder material	Stainless
Needle pressure	2.0g～2.2g(2.1g is recommended)
Stylus	Micro Ridge

Enter the next generation...
enter grand master.

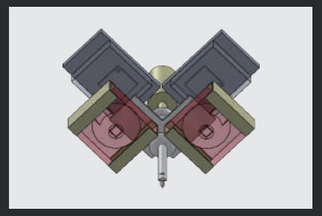
"The Grand Master is so truly supreme in resolution, transparency, spatial recreation, neutrality and any other parameter I can name that it's impossible for me not say what I usually try to avoid: 'This may be the best cartridge I've ever heard.'"

Ken Kessler Hi Fi News 2021

GRAND MASTER

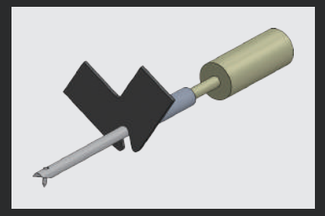
Details

Cartridge



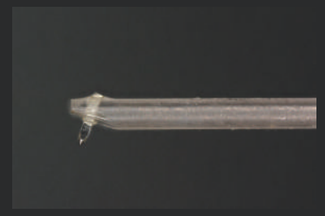
Independent LED and photo-detector arrangement for the left and right channels

The new Grand Master optical cartridge system has been optimized by implementing an independent LED and photo-detector arrangement for the left and right channels. As a result, the cartridge output voltage has increased from 40mV to 70mV. The Grand Master cartridge offers an improved S/N ratio compared to its stable mates, resulting in an even lower noise floor and far greater musical clarity.



Weight of shading plate is reduced by more than 50%

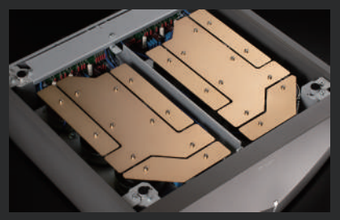
The implementation of independent left and right channel LEDs allow for the positioning of the optical system to be optimized as well as necessitating the use of a newly designed shading plate that has been significantly reduced in size compared to our earlier designs. In addition to this reduction in size, the material used to produce the shading plate has been changed from aluminum to 99.9% pure beryllium to reduce its mass further.

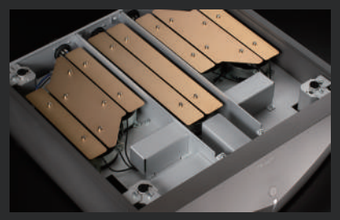


Diamond cantilever

The Grand Master is the first DS Audio cartridge to feature a diamond cantilever with a MicroRidge stylus. The unique cartridge body structure was designed to promote maximum rigidity. In addition, the Grand Master utilizes internal wiring 1.6 times thicker than used in the second-generation cartridges to reduce impedance.

Equalizer





Power unit and equalizer unit are completely separate units

The DS Audio Grand Master system features a separate equalizer and power supply, each in an independent chassis. Using 2.34 million uF and 2.97 million uF electrolytic capacitors within the equalizer and power supply units, respectively, has resulted in a significantly stronger power supply design and improved reproduction of deeper low frequencies. In addition, the Grand Master equalizer incorporates special film capacitors custom-built to DS Audio's specifications, along with non-induction winding resistors. The design features three transformers, each with a capacity 1½ times greater than that of the DS Master 1, one for the left and one for right channels, with the third handling the power supply to the optical cartridge.

Total of 6 optional low frequency cut off points

The Grand Master equalizer features single-ended RCA and balanced XLR outputs. Additionally, you can choose from 6 different low-frequency cut-off points, allowing it to seamlessly integrate with any hi-fi system.

Price

Cartridge

Grand Master Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	27db more(1kHz)
Weight	7.7g
Output signal level	70mV more
Canti-lever	Diamond
Body material	Ultra duralumin
Cantilever holder material	Stainless
Needle pressure	2.0g～2.2g(2.1g is recommended)
Stylus	Micro Ridge

Equalizer

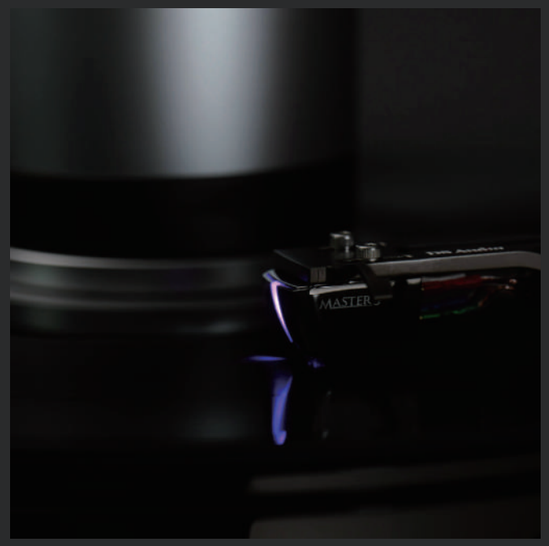
Grand Master Equalizer for Optical Cartridge

Output voltage	700mV(1kHz)
Output impedance	RCA 120Ω, XLR 120Ω
Pre amp input impedance	More than 10kΩ
Input terminal	RCA terminal
Output terminal	RCA terminal×3, XLR terminal×3
Size	W45.2cm×H15.2cm×D48.6cm(Both)
Weight	25.1kg(Equalizer unit), 29.8kg(Power unit)

Semi-Flagship model
DS Master3

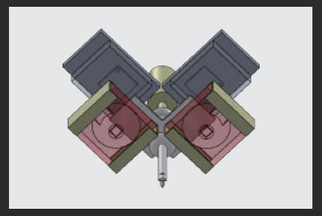
DS MASTER 3

The successor to DS Master1, which has created the history of DS Audio



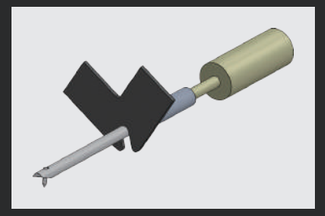
Details

Cartridge



Independent LED and photo-detector arrangement for the left and right channels

The new Master 3 optical cartridge system has been optimized, by implementing an independent LED and photo-detector arrangement for the left and right channels. As a result, the cartridge output voltage has dramatically increased from 40mV to 70mV. The Master 3 cartridge offers a greatly improved S/N ratio compared to its stablemates, resulting in an even lower noise floor and far greater musical clarity.



The weight of the shading plate is reduced by more than 50%

The implementation of independent left and right channel LEDs allows for the positioning of the optical system to be optimized as well as necessitating the use of a new shading plate that has been significantly reduced in size compared to our earlier designs. In addition to this reduction in size, the material used to produce the shading plate has changed from aluminum (as used in the second-generation cartridges) to 99.9% pure beryllium.

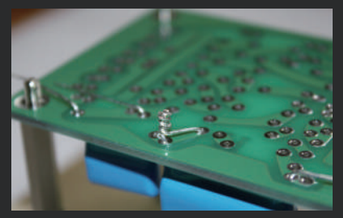
Diamond cantilever

A first for DS Audio, the Master 3 cartridge features the combination of a square pillar diamond cantilever with a Micro Ridge stylus. The cartridge body structure has been designed in such a way as to promote maximum rigidity. In addition to these features, the Master 3 utilizes internal wiring 1.6 times thicker than used in the second-generation cartridges in order to reduce impedance.

Equalizer

Dual monaural circuit design with three transformers and six selectable output patterns

The DS Master3 equalizer is a dual monaural circuit design with three transformers and completely independent L-channel and R-channel circuits. The power supply has been overwhelmingly strengthened to enable deeper, richer low-frequency expression. The DS Master3 equalizer has balanced and unbalanced outputs, and the low-frequency cutoff frequency can be selected from six different options.



Hand-made in Japan circuit board

Every component part used in our products is tested and evaluated by our expert Japanese technicians. In addition to using a specially printed circuit board, the twist-connection of the component legs is further evidence of DS Audio's excellent attention to detail. Each and every product is hand-made and quality assured by our skilled engineers.

Price

Cartridge

DS Master3 Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	27db more(1kHz)
Weight	7.9g
Output signal level	70mV more
Canti-lever	Square Pillar Diamond
Body material	Ultra duralumin
Cantilever holder material	Stainless
Needle pressure	2.0g～2.2g(2.1g is recommended)
Stylus	Micro Ridge

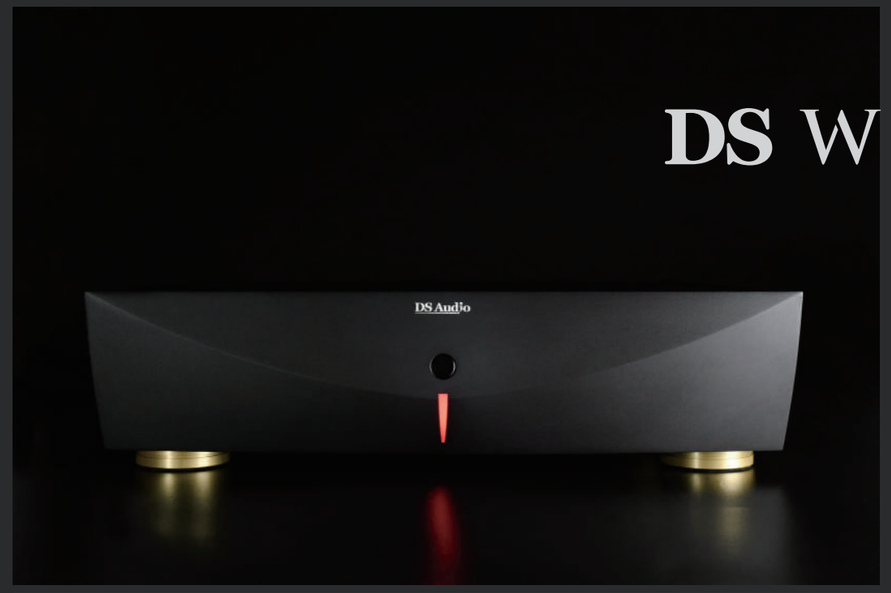
Equalizer

DS Master3 Equalizer for Optical Cartridge

Output voltage	700mV(1kHz)
Output impedance	RCA 120Ω XLR 120Ω
Pre amp input impedance	More than 10kΩ
Input terminal	RCA terminal
Output terminal	RCA terminal×3, XLR terminal×3
Size	W45.2cm×H15.3cm×D48.4cm
Weight	23kg

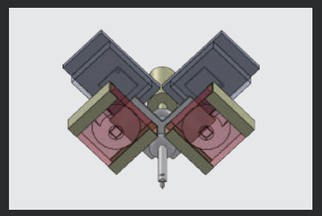
New DS Audio reference model

DS W3



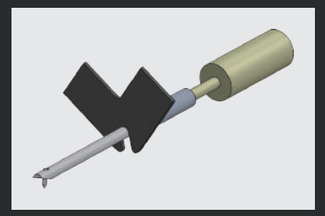
Details

Cartridge



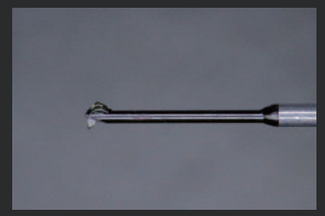
Independent LED and photo-detector arrangement for the left and right channels

The new DS-W3 optical cartridge system has been optimized, by implementing an independent LED and photo-detector arrangement for the left and right channels. As a result the cartridge output voltage has greatly increased from 40mV to 70mV. The DS-W3 cartridge offers a greatly improved S/N ratio when compared to its stable mates, resulting in an even lower noise floor and far greater musical clarity.



Weight of shading plate reduced by more than 50%

The implementation of independent left and right channel LED' s allows for the positioning of the optical system to be optimized as well as necessitating the use of a new shading plate that has been significantly reduced in size compared to our earlier designs. In addition to this reduction in size, the material used to produce the shading plate has changed from aluminium (as used in the second generation cartridges) to 99.9% pure beryllium.



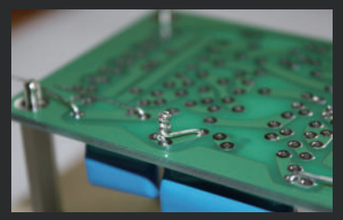
Boron cantilever & Aluminum body

The DS-W3 cartridge features the combination of an boron cantilever with a line contact stylus. The cartridge body is made by aluminum and the structure has been designed in such a way as to promote maximum rigidity. In addition to these features, the DS-W3 utilizes internal wiring 1.6 times thicker than used in the second generation cartridges in order to reduce impedance.

Equalizer

Changed the thickness of the circuit board and the thickness of the copper foil.

Compared to the DS-W2 equalizer, the thickness of the circuit board has been changed from 1.6 mm to 2.0 mm, and the thickness of the copper foil has been changed from 35μ to 70μ.Components are also optimized for third-generation cartridges.In addition, the DS-W3 equalizer has four different low-frequency outputs to choose from. The DS-W3 equalizer has both unbalanced and balanced outputs, so you can choose the output that best matches your system.



Hand-made in Japan circuit board

Every component part used in our products is tested and evaluated by our expert Japanese technicians.
In addition to using a specially printed circuit board, twist-connection of the component legs is further evidence of DS Audio' s excellent attention to detail.
Each and every product is hand-made and quality assured by our skilled engineers.

Price

Cartridge

DS-W3 Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	27db more(1kHz)
Weight	7.9g
Output signal level	500mV more
Canti-lever	Boron
Body material	Aluminum
Needle pressure	1.85g～2.05g(1.95g is recommended)
Stylus	Line contact

Equalizer

DS-W3 Equalizer for Optical Cartridge

Output voltage	500mV(1kHz)
Output impedance	More thana 120Ω
Pre amp input impedance	More thana 10kΩ
Input terminal	RCA terminal
Output terminal	RCA terminal×2, XLR terminal×2
Size	W45cm×H12cm×D435cm
Weight	13.5g

Inheriting the essence of the Grand Master

DS 003

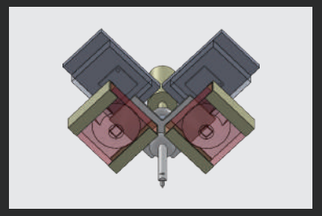
Stereo Sound Magazine's 2021 Best Buy Phono Cartridge Category #1

"Honestly, I think the price is too low for this sound."

Hiromi Wada, Stereo Sound Magazine #221

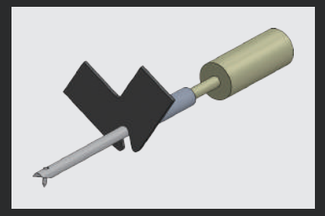
Details

Cartridge



Independent LED and photo-detector arrangement for the left and right channels

The new DS003 optical cartridge system has been optimized, by implementing an independent LED and photo-detector arrangement for the left and right channels. As a result the cartridge output voltage has greatly increased from 40mV to 70mV. The DS003 cartridge offers a greatly improved S/N ratio when compared to its stable mates, resulting in an even lower noise floor and far greater musical clarity.



Weight of shading plate reduced by more than 50%

The implementation of independent left and right channel LED' s allows for the positioning of the optical system to be optimized as well as necessitating the use of a new shading plate that has been significantly reduced in size compared to our earlier designs. In addition to this reduction in size, the material used to produce the shading plate has changed from aluminium (as used in the second generation cartridges) to 99.9% pure beryllium.

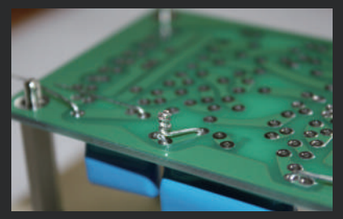
Aluminum cantilever & Aluminum body

The DS003 cartridge features the combination of an aluminum cantilever with a line contact stylus. The cartridge body is made by aluminum and the structure has been designed in such a way as to promote maximum rigidity. In addition to these features, the DS003 utilizes internal wiring 1.6 times thicker than used in the second generation cartridges in order to reduce impedance.

Equalizer

Changed the thickness of the circuit board and the thickness of the copper foil.

Compared to the DS002 equalizer, the thickness of the circuit board has been changed from 1.6 mm to 2.0 mm, and the thickness of the copper foil has been changed from 35μ to 70μ.In addition, the DS003 equalizer allows you to select the cutoff frequency for the low frequency range from four types, allowing you to select an output that better matches your system.



Hand-made in Japan circuit board

Every component part used in our products is tested and evaluated by our expert Japanese technicians.
In addition to using a specially printed circuit board, twist-connection of the component legs is further evidence of DS Audio' s excellent attention to detail.
Each and every product is hand-made and quality assured by our skilled engineers.

Price

Cartridge

DS 003 Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	27db more(1kHz)
Weight	7.7g
Output signal level	70mV(1kHz cartridge output)
Canti-lever	Aluminum
Body material	Aluminum(A5052)
Cantilever holder material	Stainless
Needle pressure	2.0g～2.2g(2.1g is recommended)
Stylus	Line contact

Equalizer

DS 003 Equalizer for Optical Cartridge

Output voltage	500mV(1kHz Equalizer output)
Output impedance	RCA 120Ω
Pre amp input impedance	More than 10kΩ
Input terminal	RCA terminal
Output terminal	RCA terminal×2
Size	W33cm×H9.2cm×D29.5cm
Weight	5.0kg

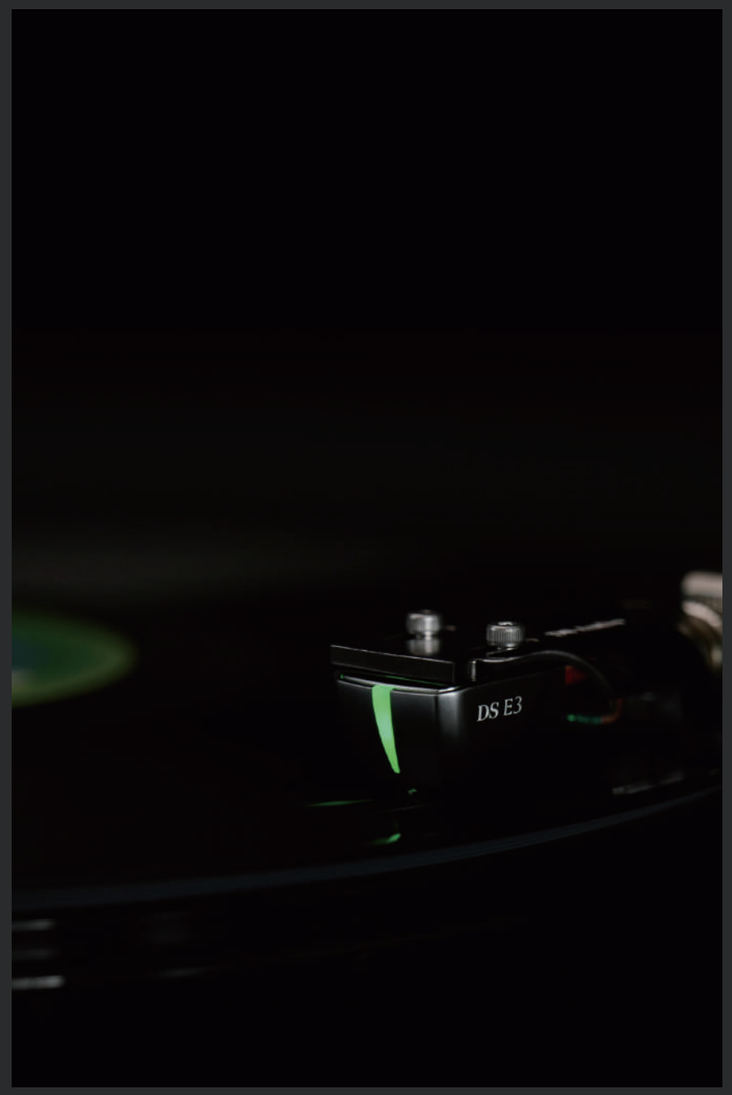
"The game changer"

DS E3

Truly beyond price.

The DS-E3 is a revolutionary technology in historic record reproduction.

Ikuo Tsunoda, Audio Critic

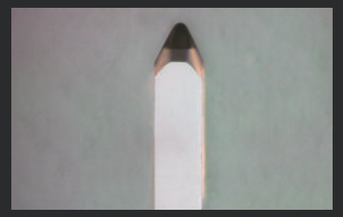


Details

Cartridge

Uses a third-generation optical cartridge mechanism

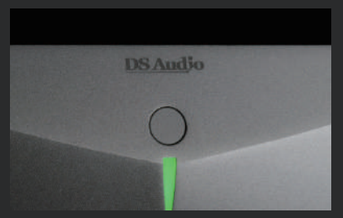
The DS-E3 uses a third-generation optical cartridge mechanism, the same design as our other products.
The DS-E3 achieves an overwhelmingly low price while inheriting the merits of the third-generation mechanism, such as higher output due to independent LED and PD, improved channel separation, and the use of a beryllium light shielding plate.



Aluminum Cantilever with Elliptical needle

The cantilever is made of aluminum and the needle tip is a solid elliptical needle. While adopting the third-generation optical cartridge mechanism, the channel separation is set 1db lower to improve mass production efficiency.

Equalizer



New Amplification and Power Supply Circuits

In the DS-E3 equalizer, the amplification circuit has been made symmetrical, and the voltage supplied to the cartridge has been stabilized to achieve a clearer and faster sound.

Miniaturization is achieved by using an operational amplifier

The DS-E3 equalizer uses an operational amplifier as the amplifying element to minimize the signal path, thereby greatly reducing the number of components and achieving a smaller size. As a result, the DS-E3 equalizer is about 1/3 the size of the DS003 equalizer.

Price

Cartridge

DS-E3 Optical Cartridge

Signal output	Photo-electric Conversion
Channel separation	26db more(1kHz)
Weight	7.7g
Output signal level	70mV more
Canti-lever	Aluminum
Body material	Aluminum
Needle pressure	2.0g~2.2g(2.1g is Recommended)
Stylus	Elliptical Needle

Equalizer

DS-E3 Equalizer for Optical Cartridge

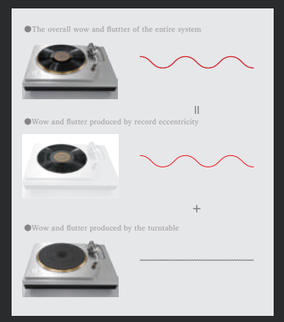
Output voltage	500mV(1kHz)(at Equalizer output)
Output impedance	120Ω
Pre amp input impedance	More than 10kΩ
Input terminal	RCA terminal
Output terminal	RCA terminal
Size	W26cm×H6.9cm×D19.5cm
Weight	1.86kg

Enjoy better music without Eccentricity

ES-001 stabilizer

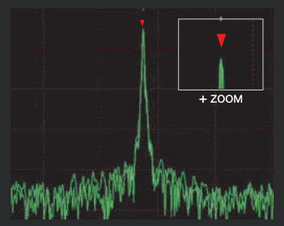
The world's first eccentricity detection stabilizer (patent applied)

Details & Price



The overall wow and flutter of the entire system cannot be significantly reduced unless the eccentricity of the record is corrected

With an eccentricity width value of 0.34mm, even if there is no inherent wow and flutter (speed error) produced by the turntable in use, it reaches around 0.15% (WTD RMS) on the innermost grooves of the record playing surface. The average speed error value of even the highest-quality turntables is around 0.008%. These factors combined can result in an overall wow and flutter value 20 times worse than that of the turntable in isolation. Simply put, when using even the finest quality turntables available, the overall wow and flutter of the entire system can only be significantly reduced if the eccentricity of the record is corrected. To faithfully reproduce the source material, it is imperative to reduce the record eccentricity as much as possible.



No eccentricity : Frequency does not change

Excessive wow and flutter presents two problems

The first is that the unstable rotation causes fluctuations in pitch across the frequency range. Second, if the record eccentricity is not corrected, the cartridge and tonearm will be forced to sway from side to side as they follow the groove. This impairs the stylus's ability to accurately track the groove, resulting in a muddy sound and an unstable sonic image. As a result, the listener will not realize the full potential of even the highest-quality systems. Correcting this eccentricity as much as possible allows you to unlock much more of the potential performance from your equipment.

Adjustment in 3 Steps

step.1 Mesurement : When the record player is rotated, the upper part of the stabilizer is held to stop the rotation of the stabilizer, and the stabilizer detects the rotation and shifts to the measurement mode. When switch to the measurement mode, the display on the outer circumference of the stabilizer starts to rotate and the [Tap to start measure] button is displayed. Next, when you press the [Tap to start measure] button, the display changes to the [Measuring] button and the measurement is completed in about 2 seconds.
step.2 Adjustment : Stop the record player when the measurement is complete. Next, while looking at the stabilizer screen, press the record board to bring the cross mark (center of rotation) as close as possible to the absolute center position. The degree of eccentricity of the record is indicated by the color of the screen (outer circumference, cross mark & display bar at the bottom).
step.3 Restart : When the center of rotation is aligned with the absolute center position, rotate the record player again to check that the eccentricity of the record is gone(or reduced) and then play the record. *Be sure to rotate the record player (33 rotations or 45 rotations) when measuring. If the record player is not spinning, the stabilizer will not be in measurement mode.

ES-001 Eccentricity Detection Stabilizer

Size	ϕ80×H70mm
Weight	620g(including batteries)
Material	Aluminum & Tungsten
Batteries	Two AA batteries
User Interface	Touch panel (2.4inch)

"The best phono cable
for the optical cartridges"

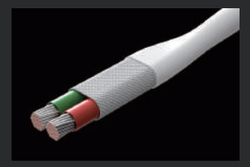
PH-001 Phono cable

Maximum performance phono cable
for optical cartridges

Details & Price

The highest quality construction throughout

When using an MM or MC cartridge, the cold side of the phono cable serves only as a ground. In the case of optical cartridges, however, the cold side supplies power from the equalizer to the cartridge. Therefore, in such an application, the cold side of the cable is just as important as the hot side. The PH-001 features identical materials and construction on both the hot and cold sides, ensuring that the power supply is kept stable.

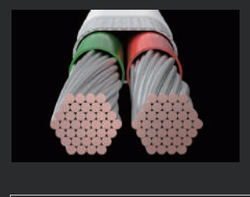


Complete Shielding

Optical cartridges have a relatively high impedance, partly due to the photo sensors used in their design. Because of this high impedance, external noise may be picked up if an unshielded phono cable is used. The DS Audio PH-001 phono cable is shielded with a silver-plated copper braid, eliminating potential interference.

RCA terminals machined from pure copper

The PH-001 features RCA phono connectors machined from pure copper; the pure copper base conductor is then gold-plated. Such high-quality connectors allow even more musical detail and texture to shine through, along with a heightened sense of openness.



Silver-plated copper conductors

The PH-001 cable features silver-plated pure copper conductors, each made up of 37 strands of 0.26mm (about 0.01 in) diameter wire. This gives the conductor an exceptionally large cross-section area of 1.964mm㎡.

PH-001 Phono cable	
RCA terminals	Pure copper
RCA terminal body	Aluminum
Cable outer diameter	15mmϕ
Cable material	Silver plated copper wire
Composition	ϕ0.26mm / 37wires
Conductor cross-sectional area	1.964㎟
Insulator material	FEP(fluoroplastic)
Shield	Mesh shield
Shield material	Silver plated copper wire
Length	1.2m

Available terminations:
DIN (Straight) to RCA or DIN (Right Angle) or RCA to RCA
※Can be used with MM/MC cartridges without any problem

ION-001 Vinyl Ionizer

“I can report with complete confidence that the Vinyl Ionizer ION-001 is without a doubt the most effective anti-static device I have ever used. My vinyl playback has never sounded quieter, more revealing, and more enjoyable.” Positive feedback

Details & Price

Generates positive and negative ions to neutralize and remove the static charge from vinyl records

Vinyl records have a surface static electricity charge created by friction. Two common sources of friction are the stylus drag that occurs during record playback and removing records from their jacket and sleeve. By emitting both positive and negative ions in a controlled fashion from its dual outlets, the ION-001 ionizer unit effectively neutralizes and removes static electricity from the record surface. Our unique "fanless" design allows for silent operation for continuous use while playing records. Additionally, the ION-001 performs charge removal for Compact Discs. Note: The degrees of electrostatic charge may vary depending on factors including stylus tip shape, vinyl record material, temperature, humidity, etc.

High power ionizer with low ozone emission

The ION-001 is a high-power device equipped with 4 ionizers, 2 each for positive and negative ions. It utilizes a specialized power supply controller that suppresses the generation of excess ozone, preventing unwanted oxidation.

Designed for quick installation

The architectural tower design provides placement of the ION-001 next to your turntable for quick installation, allowing easy changing of vinyl records. The tower design is effective with a wide range of turntables featuring overall platter height up to 18 cm (about 7.09 in) ". With turntables exceeding this platter height, please use a base/riser to position the ION-001 properly.

Vinyl Ionizer ION-001

Size	H84mm×W84mm×D250mm
Weight	950g
Input Voltage	DC12V(AC 100V-240V)
Number of ionizers	Positive(+) ion×2, Negative(-) ion ×2
Amount of ion	40×10^6pcs/cc(-) 40×10^6pcs/cc(+)
Amount of ozone	Less than 0.01ppm

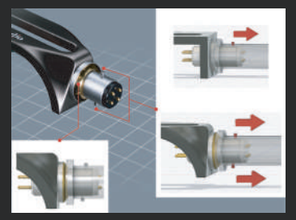
The best sounding

head shell in the world

HS-001 Solid Head Shell

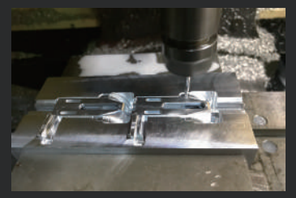
Reduce the number of contacts with the connector, make the contact with the tone arm more solid, and increase the strength of the head shell body.

Details & Price



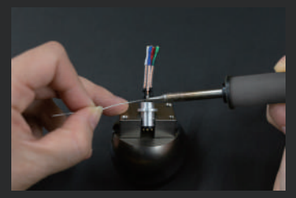
A vertical pin structure achieves uniform pressure on electrical contacts

Contact surface stabilized by spherical washer
Conventional headshells have a connecting pin attached only to the upper side, causing uneven contact pressure between the tonearm and the headshell. However, the HS-001 Solid Headshell adopts an upper and lower pin structure, equalizing the pressure on the contacts and applying force evenly across the connection to the tonearm. Additionally, we use a special spherical headshell washer (developed by DS Audio) independently at the tonearm's contact point. This enables superior stability over the entire circumference of the contact point, providing improved resonance control.



Machined Ultra Duraluminum

DS Audio precision machines each HS-001 out of a solid billet of duralumin for the ultimate in rigidity and resonance control.



Hand soldered Litz signal leads

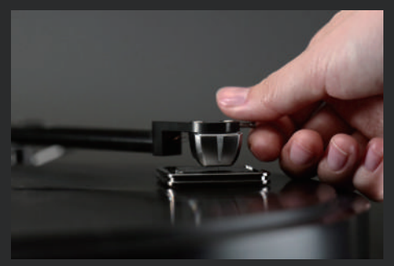
After extensive listening tests within the company, DS Audio selected a Japanese-made Litz wire. Further advances were realized by hand soldering this delicate lead wire to preserve signal integrity for optimal sound performance. (Lead wires and connector parts are also available unsoldered by dealer request.)

HS-001 Solid head shell	
Material	Ultra duralumin
Connector	Aluminum
Connector terminals	Gold plated
Lead terminals	Gold plated
External dimensions	H21 × W40 × D55mm(without connector)
Weight	Approximately 10.5g(without leads)
Lead wire	Litz wire 4Nϕ 0.08 × 10 × 3 yore rings
Hardware	Stainless steel bolt M2.6 L8×2, M2.6 L12×2

DS Audio's first accessory

ST-50 Stylus cleaner

An adhesive stylus cleaner that does not stain the needle tip with chemical substances



Details & Price

The ST-50's gel cleaning pad is made of a urethane resin developed specially for atmospheric micro-dust control in clean rooms

Extremely effective cleaning properties are required to meet the specified standards for such applications. The ST-50 gives you the absolute best in stylus cleaning performance. Many stylus cleaners apply excessive force to the stylus and cantilever during cleaning. The DS Audio ST-50 cleans your stylus at the tracking force set on the tonearm.

Top-class materials incorporated into a fantastic, innovative design

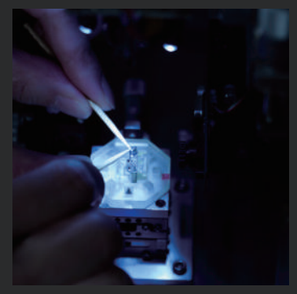
Optimize your vinyl playback system and enjoy the highest level of aural satisfaction. This exclusive design will complement your audio system and is essential for all vinyl enthusiasts. The casing is crafted from an aluminum block before being carefully buffed to perfection. It is then nickel-plated, and the precision laser-cut markings and leather cushion are installed. The finished piece is beautiful and reflects the high-quality standards DS Audio represents.

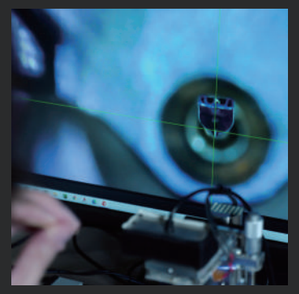
Washable Urethane Cleaning Gel

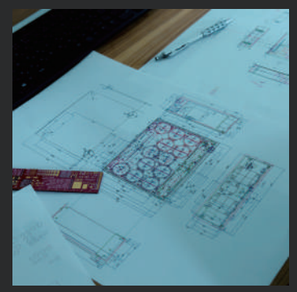
The DS Audio ST-50 gives you the best stylus cleaning performance every time. The urethane gel is washable and reusable. Rinse it gently under tap water and let it dry for 30 minutes at room temperature. Its cleaning performance will be completely renewed.

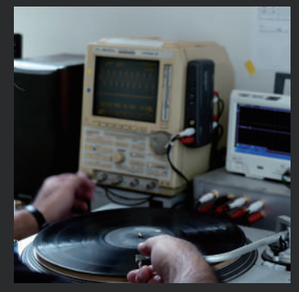
ST-50 Stylus cleaner	
Size	L42mm×W42mm×D13mm
Weight	28g
Gel size	L28mm×W28mm×H3mm
Case material	Aluminum(Nickel treatment)

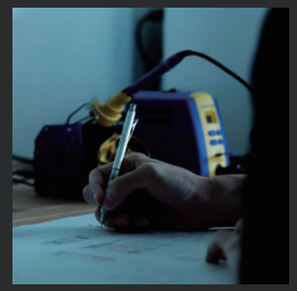

DS Audio

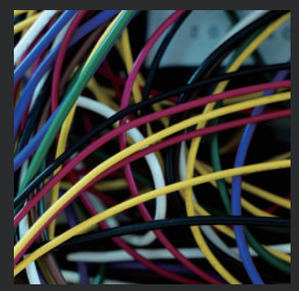




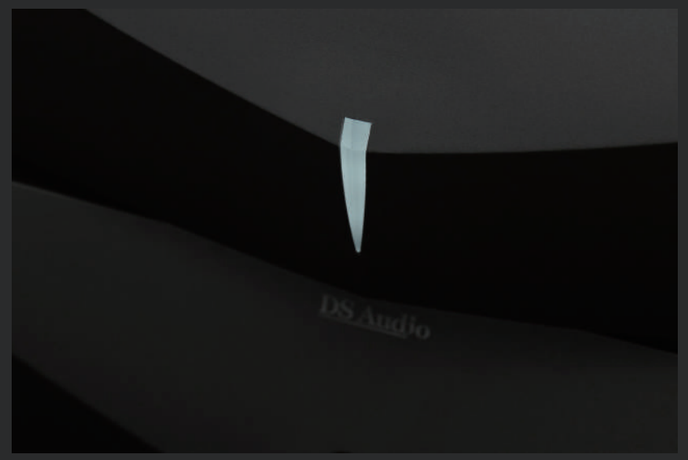


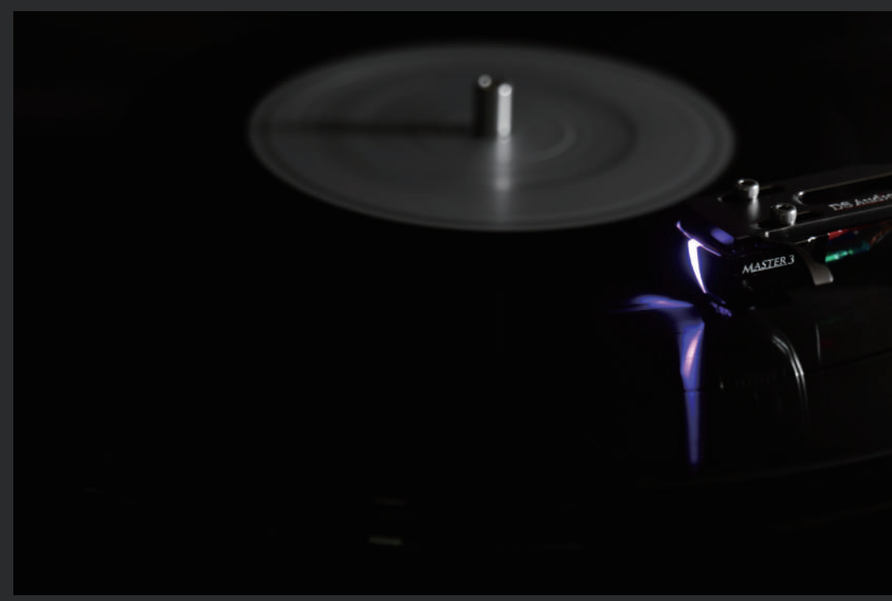







GRAND MASTER EX


DS Audio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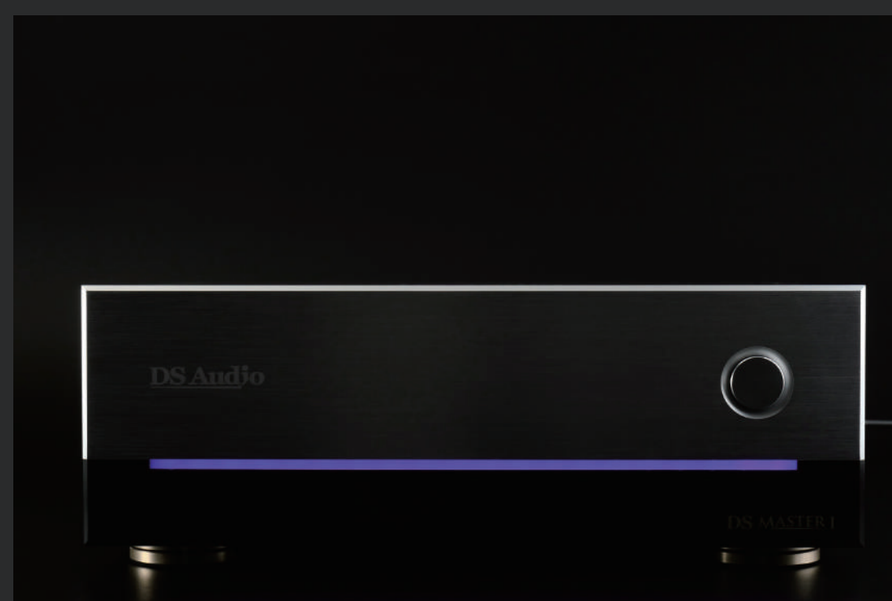
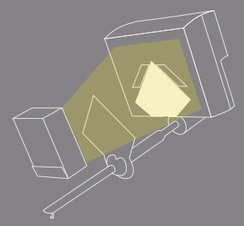
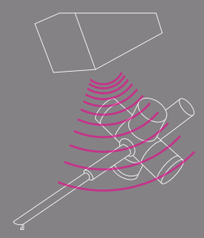

DS Audio
DS MASTER 1

About Optical cartridge

The Basic principle of the optical cartridge



Optical cartridge



MM / MC cartridge

First, We will explain the difference of detection principle between the optical cartridge and MM / MC cartridge.
Both the MM / MC cartridge and the optical cartridge read the record groove through the needle, but the usual MM / MC cartridge detects the music signal by vibrating the magnet (or coil) in the magnetic field.

On the other hand, optical cartridges detect music signals by capturing shadow changes (brightness changes) using LEDs and PD (photo cells).
Because MM / MC cartridges generate electricity by cutting off the magnetic field, magnetic resistance always occurs when the magnet (or coil) moves.

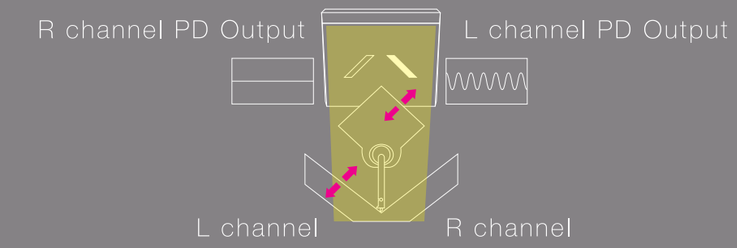
However, the optical cartridge detects only the change in brightness (shadow movement), so no magnetic resistance is generated when the vibration system moves.
Since there is no magnetic resistance applied to the vibration system, the tip of the needle can move smoothly.
This is the primary advantage of optical cartridge technology.

	MM/MC cartridge	Optical cartridge
Magnetic Resistance	Yes	No
Moving Mass	Heavy	Light

To detect music signals, the MM / MC cartridge must move the magnet or the core and the coil. However, in the case of optical cartridges, it is only necessary to move a light shading plate with a thickness of only 100 microns, so the moving mass is very low.
This is an additional advantage of optical cartridge technology.

What is the detection principle of the optical cartridge?

We will explain the detection principle of the optical cartridge in more detail.
The optical cartridge detects movement of the needle using infrared LED, light shielding plate and two PD (photo cells).
The operating principle is simple, the shading plate vibrates in front of the LED, and the PD (photo cells) behind it detects the change in brightness.



We will explain how to independently detect L and R channel signals from one shading plate.
The above diagram is a view of the light shielding plate and the photo cells from the position where the LED is located.
When the groove of the record vibrates (oblique 45 degrees), the vibration is transmitted from the tip of the needle to the cantilever, and the shading plate also vibrates together.
Since the shading plate vibrates in such a way as to block the light of the front LED, the brightness entering PD (photo cells) changes continuously from bright → dark → bright → dark.
As the photo cells detect changes in brightness created by record groove movement, the output voltage changes accordingly The movement of the shielding plate will be read as 2 separate stereo channels, by 2 independent photo detectors.
The angular movement of the shielding plate ensures that each photo detector can only pick up information from its corresponding channel. Information from the parallel movement of the opposite channel will not be read, ensuring accurate channel balance and channel separation.
※Since the brightness of the photo cell does not change because the motion of the light shielding plate becomes a parallel movement on the side of the reverse PD (photo cells) side, it is possible to detect audio signals of the left and right channels with one light shielding plate.

This basic detection principle is exactly the same as the photoelectric cartridge 40 years ago.
The important point here is that the output of the PD (photo cell) is the Pure analog sound because the movement of the shading plate = the motion of the record board is output as a voltage change. It is NOT Digital Sound.

	MM/MC cartridge	Optical cartridge
Output	Analog	Analog

The reason why you need a dedicated equalizer

With an optical cartridge, you can not use a phono equalizer for MM / MC, you must use a phono equalizer dedicated to the DS Audio optical cartridge. There are two reasons for this

① Voltage is required in order to power the internal LED inside the cartridge, and this voltage is supplied by the equalizer
Power is supplied to the LEDs of the optical cartridge using the tone arm ground (blue and green lines).
For that reason, in order to use the optical cartridge, it is essential that the four cables of the tone arm are properly independent.
(There is no problem with most arms that are currently on the market.)

② The standard RIAA equalization curve required for MM/MC is completely different from equalization required for optical cartridges.
Because the output of an MM / MC cartridge is proportional to its speed, the output increases as the speed rises (= higher frequency). However, the optical cartridge has an amplitude proportional output that outputs flat from the low frequency to the high frequency (same as the old crystal type and capacitor type).
Since the optical cartridge is classified as amplitude proportional and is not affected by changes in speed, even on the same record, it has totally different output properties. Much less EQ correction is required for the amplitude proportional output compared to traditional MM / MC. Because of this, the RIAA correction circuit of the optical cartridge requires much less manipulation of the signal compared to a speed proportional type MM / MC cartridge.
The RIAA correction circuit of the optical cartridge becomes an overwhelmingly simple circuit.
This is yet another advantage of optical cartridge technology

The amplitude proportional type optical cartridge can output the movement of the groove flat from the low frequency to the high frequency, so the RIAA correction circuit of the optical cartridge becomes an overwhelmingly simple circuit compared to the RIAA correction circuit of the speed proportional type.
The RIAA correction circuit of the optical cartridge becomes an overwhelmingly simple circuit.
This is also big merit of the optical cartridge.

Improvements over older optical designs

As you probably know, some photoelectric cartridges have been commercialized from Toshiba, Sharp, Trio, Kenwood etc over 40 years ago.
The reason why the optical cartridge once commercialized disappeared is that in the 1970s, it is the biggest factor that the development resources of major companies have shifted from analog to CD.
In addition to that, there was one problem that could not be overcome in the past optical cartridges by any means.
That is a problem of “Heat”.

Forty years ago, LED technology was not well developed, and the only light source available for an optical cartridge was a standard style bulb. These bulbs generated a large amount of heat, which warmed the damper rubber of the cartridge, softening it over time and changing the compliance characteristics. Each company took various measures to overcome this issue, but optical cartridges disappeared from the market before a fundamental solution could be found. Even with this drawback, the sheer quality of the sound of optical cartridges gave the technology a legendary status for over 40 years.

	Optical cartridge 40 years ago	DS Audio Optical cartridge
		
Light Source	Lamp	LED
Light Receiving Element	Phototransistor	Photodiodes with matching sensitivity characteristics

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