

ATLAS PlayStation CD-ROM Mechanism Repair Manual

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1. Introduction

The ATLAS PlayStation CD-ROM Mechanism Repair is the only existing method for repair of PlayStation CD-ROM drive mechanisms, particularly the first of versions, released November 1994 in Japan, and the subsequent models released worldwide, manufactured up to the later months of 1996. There are approximately 10 million units of them sold worldwide by that time. The repair method provided here is not only an effective but also a cost-effective alternative to replacing the entire optical pick-up assembly with a brand new one (If you're a tech, that means more bucks to your pocket from your flat rate charge!).

The CD-ROM mechanisms of these units has a common flaw, which shows itself in the initial stages as skipping FMV (full motion video), and streaming audio such as background music during gameplay. In the middle stages, worse skipping is exhibited, plus longer loading times and random hanging and abortion of FMV playback. In the later stages, mechanism totally fails to read data from CD-ROM that it wouldn't read the table of contents of the disc, and successfully boot-up a game. The screen would go directly to the blue Memory Card/CD player selection interface instead of the black background, PlayStation logo screen which indicates game boot-up. Anywhere these stages, proper working operation of the CD-ROM mechanism can only be regained when the PlayStation is operated upside-down.

98% of the time these problems can be attributed to a misaligned optical pick-up, due to wear of mechanical parts responsible for it's proper alignment. The mechanisms described here are the ones that have the plastic optical pickup carriage, later revised in the newer models as an entirely metal (die-cast) unit, and also designed to facilitate easier replacement of the parts subject to frictional wear. There are a couple of points on the optical pick-up carriage known to wear down and cause these problems, but at the moment a machine first exhibits these problems, only one point needs addressing for repair as the other one would cause problems only later, and not as critical as the first. Although some machines have both wear problems occurring at almost the same time.

This manual covers troubleshooting of PlayStation CD-ROM related problems, disassembly of the mechanism, repair of optical pick-up carriage which involves installation of ATLAS replacement

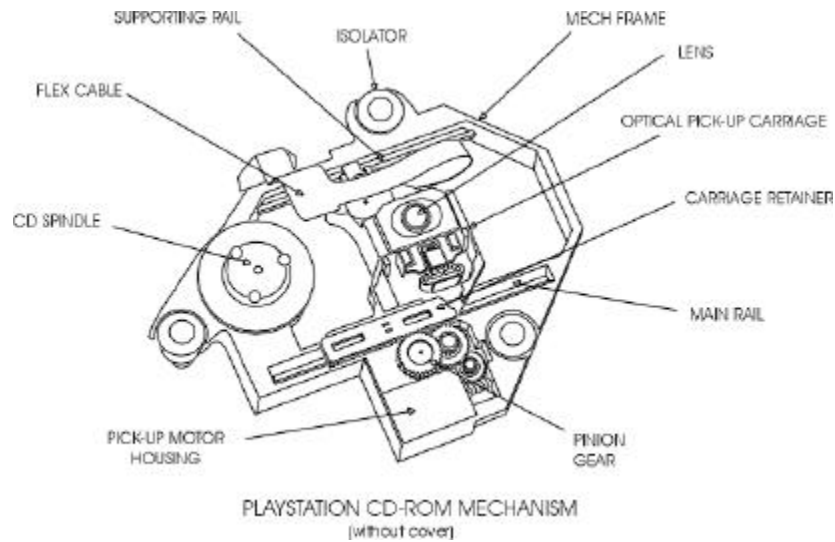
supports and dealing with wear on the other side of the carriage -- the other wear point. This also covers proper electronic adjustments and calibration of potentiometers, all in all a very useful information for proper recondition and A1 performance of these mechanisms.

2. CD-ROM Drive Mechanism Repair

You may want to jump to Section 3 of the manual to find out if you are faced with a unit with messed-up potentiometer settings, namely, the F. BIAS, F.GAIN, PUSH-PULL AMP, and Laser diode current (unlabeled, located on the ribbon cable at the side of the mechanism itself). A few cases of skipping and loading failures can be attributed to bad pot setups or a slightly misaligned optical pick-up which could be remedied by having them adjusted (for the meantime that is).

2.1 CD-ROM mechanism parts description

Non industry-standard terms could be in use here so description and definition of the mechanism parts are provided for reference throughout this manual.



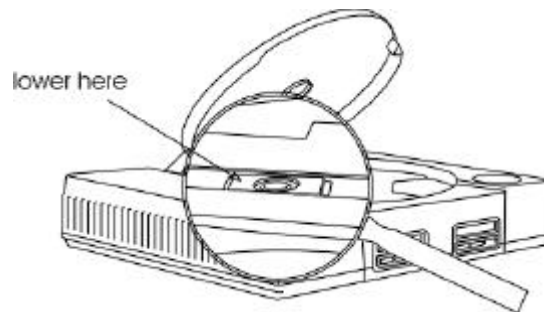
2.2 CD-ROM drive troubleshooting

| TROUBLE | PROBABLE CAUSES |
|--|---|
| PlayStation powers on, but CD-ROM mechanism doesn't work / No beam from lens. | <ul style="list-style-type: none"> • CD lid switch is faulty • Optical pickup carriage/motor/gear is stuck or jammed. • Faulty or damaged drive controller chip or drive controller ICP fuse |
| CD won't spin or spins at slow pace & continuous 'clicking' sound. | <ul style="list-style-type: none"> • Bad pots setup (See Section 3). |
| CD spins at hi-speed and won't load game. | <ul style="list-style-type: none"> • Bad pots setup (See Section 3). |
| CD starts spinning sluggishly, random boot-up success but difficulty maintaining pace (CD speed) and loading game. | <ul style="list-style-type: none"> • Bad pots setup (See Section 3). • Faulty spindle motor • Hair, thread, etc. caught up with spindle motor shaft. |

| | |
|--|--|
| CD spins, loads game but full-motion video intro skips. | <ul style="list-style-type: none"> • Misaligned optical pick-up/worn carriage supports • Bad pots setup (See Section 3). |
| CD spins, loads game but full-motion video intro skips and/or aborts plus, longer loading times. | <ul style="list-style-type: none"> • Misaligned optical pick-up/worn carriage supports • Bad pots setup (See Section 3). |
| CD spins but doesn't speed-up, stops & switches to CD PLAYER / MEMORY CARD screen. | <ul style="list-style-type: none"> • Badly misaligned optical pick-up/worn carriage supports • Bad pots setup (See Section 3). |

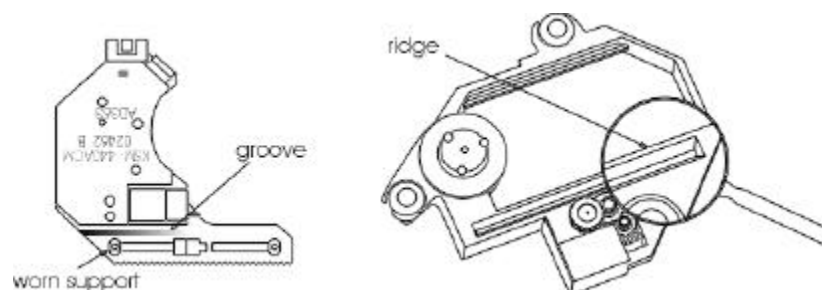
There are other ways to know for sure if the unit you're dealing with indeed has a worn optical pick-up carriage support:

- **On an assembled mechanism** (installed) - Carriage halfway along the rails and viewed from the lower left corner of the PlayStation, the lens' surrounding shield appears to sit lower at the rear. The right, inner edge of the mechanism cover slot (slot for the carriage) can be used as reference guide for the lens shield levelness. The carriage rear support is worn if the lens shield is not horizontally aligned with it, and if there's a great degree of up and down play when carriage is lifted at the rear.



- **On a disassembled mechanism** – Turn over carriage/optical pick-up assembly and locate the carriage rear support. Between the support and optical housing, if you'll see an approx. 1.25mm wide groove being formed starting anywhere from the middle of the entire length of the carriage's rack gear section (underside), going deeper towards the rear, this is enough indication that the support has indeed worn down and needs to be replaced. Sliding friction of the rack gear section's underside surface with the main rail ridge of the mechanism frame forms this groove. This can be described as a mere 'by-product' of the carriage support wear process, although easier to notice and therefore a good indicator than wear on the support itself.

As seen on the image below, there are two supports. Why then the rear support wears down fast and the other doesn't? It's because the optical pick-up carriage has an unbalanced design, wherein much of the weight is concentrated at the rear, therefore greater load on the rear support and increased frictional wear.



- As discussed earlier, try to operate the PlayStation whilst upside-down and see if things get rectified. More than often it does, and the reason this works is because the optical pick-up carriage assembly is pulled down by the gravity towards the disc, back to proper alignment, or parallel-ness with the same.

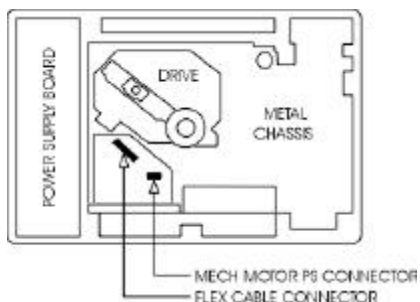
2.3 CD-ROM Mechanism removal & disassembly

Before removing the mechanism from the PlayStation, make sure the carriage is in the middle or the maximum outward position along the rail, away from the spindle, otherwise it would be very difficult to remove the mechanism cover. You can accomplish this by playing back the last track of an audio CD and then turning off the PlayStation or, if mechanism is already disconnected from mainboard, just turn the worm gear of the pick-up motor several times in the right direction (spindle side towards you) using the index finger, until carriage is at least halfway along the rails.

CD-ROM mechanism uninstall

To uninstall CD mechanism from the main unit, take the following steps:

1. Disconnect power cord from PlayStation and remove CD.
2. Turn the PlayStation upside-down and remove all five console cover screws.
3. Turn PlayStation rightside-up again and slowly raise cover.
4. Now that entire mechanism and other PlayStation inside parts are visible, locate the connector of the mechanism flex cable on the motherboard. It is colored black on most units. Not far from it is the 4-wire connector colored white and green combination on most units.



5. As a precaution, prevent the possibility of electro-static discharge that could permanently damage the unit by touching any large metal/grounded object.
6. Using the index fingers' nails of both hands, lift top (holder) of flex cable connector on mainboard carefully at both ends. Take CAUTION that this cannot be lifted and removed all the way, this only loosens to approx. 2 millimeters upwards and once it does, you can now remove the flex cable. In re-installing the flex cable, just insert it back into the connector and push down the holder onto place.
7. Disconnect the motor wiring from mainboard. You can accomplish this by carefully pulling the female connector by the wires just above the connector. In reinstalling it, check the correct orientation for proper insertion then carefully push the female connector down.
8. All two wirings disconnected, lift CD mechanism from chassis mounting and place it atop a well-illuminated clean surface.

Carriage removal from CD-ROM mechanism frame

Take the following steps for removal of optical pickup carriage from the mechanism frame (see last page of the manual for the referenced mechanism disassembly images):

1. Remove the two screws that hold down mechanism cover, located on both opposite sides of CD spindle by using a small size or jeweler's Phillips screw driver (img. 1).
2. Making sure carriage is at least halfway from spindle, pull the drive cover away from spindle slightly raising the back end as it comes off (img. 2).
3. See underside of mechanism at the pick-up motor area and locate the locking end of the pinion gear (img. 3). Using a pair of tweezers or long nosed pliers, squeeze lock (hooks) on both sides and gently push the axle out towards the other side (img. 4).
4. Remove by pulling the unlocked pinion gear from the topside of the mechanism (img. 5).
5. Now that pinion is removed, move carriage to the maximum outward position away from spindle (img. 6).
6. Slide carriage retainer outwards up to the maximum position it would go, in the direction away from spindle. You will feel this snap as it loosens (img. 7).
7. Lift and remove carriage retainer from the top of the rack gear section of the carriage (img. 8).
8. Loosen flex cable from the holder on the mechanism frame (img. 9).
9. Now that nothing secures the carriage against the rail, lift carriage starting at the rack gear side up to about 30 degrees in relation to mechanism frame (img. 10), then carefully pull sled away from the supporting rail (img. 11).

2.4 Carriage support replacement

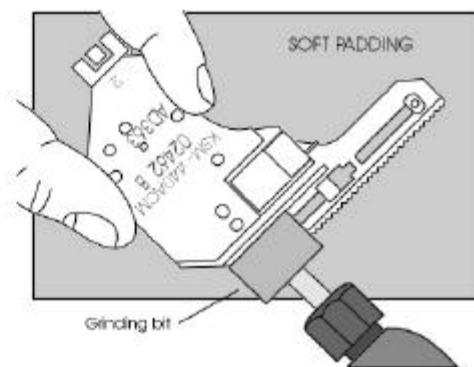
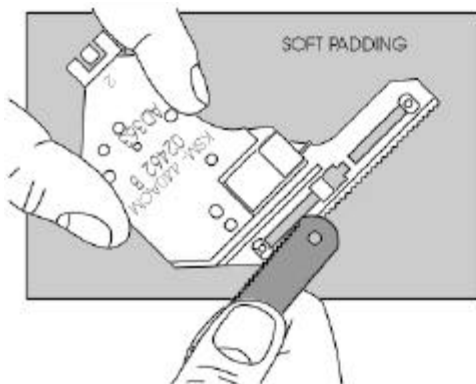
Before we go on further be advised that the following procedures require a bit of skill. If you are new to this, proceed on with the repair with care and caution most especially when using a power tool. That concerns both you and the optical pick-up carriage ☺.

Removal of worn carriage support

As discussed previously, the carriage support that wears down and needs to be replaced is the one nearest the optical pick-up housing.

Steps for removal of the worn support:

1. Rest the carriage upside-down on a soft padding or anything flat that won't scratch nor harm the lens. Or sandwich a folded tissue paper between the lens and work surface to protect it.
2. You can use a hacksaw blade to manually remove the worn support. The cut should be made at the base, and extreme care must be taken so as not to remove away a great amount of material, which isn't supposed to be removed. You can also use a grinding tool such as a Dremel, or even an industrial-grade die grinder (with the right grinding bit) in grinding down the worn support. Skilled persons could level flat the worn support using a grinder, ready for ATLAS install in no more than 5 seconds.



3. After worn support has been removed, make sure where the worn support used to exist is perfectly level, not necessarily smooth as, only level, with the flat underside surface of the

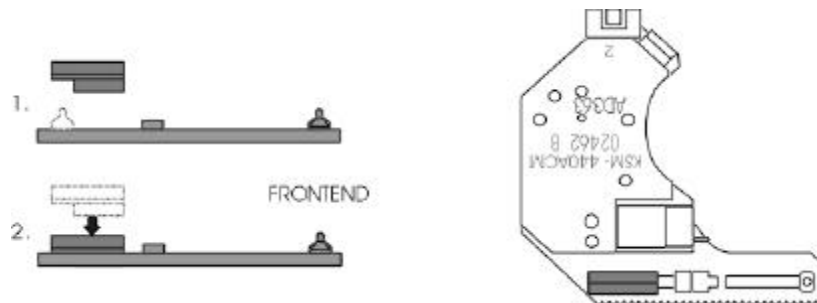
carriage's rack gear section. A small flat, or needle file would be very useful in finishing and leveling it down.

Installation of ATLAS replacement support

It is strongly recommended that, prior to installation of ATLAS supports, sand both the V-sides of the part first using 400 – 600 grit sandpaper until the high spots along the edges and corners are gone. These high spots on the part's V-sides could cause "over-lift" of the carriage's rear end when installed, and even the slightest "over-lift" could result in undesirable operation of the mechanism like that of having a badly worn support, e.g. loading difficulty and exclusive to that, distorted playback of audio CD's, which cannot be compensated any way by adjusting any of the potentiometers. ATLAS supports were designed with the accurate specifications however, slight warping causes small changes with the part's dimensions shortly after production. You can sand this by placing the paper on a flat surface and running the part's V-sides several times on it, until both the V-side's surfaces are level.

Installation of ATLAS on the carriage as follows:

1. Image shows where the worn support used to exist, indicated by the support's broken-line silhouette, and ATLAS' orientation prior to insertion.
2. Apply SuperGlue or similar adhesive on the right points and insert ATLAS in rectangular hole on the carriage, making sure the chopped top portion of ATLAS sits at the location where the worn support used to exist. Make real sure the whole part is seated flat on the surface when the adhesive sets in.

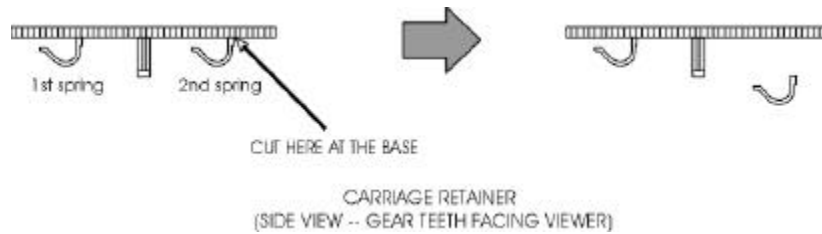


2.5 CD-ROM mechanism re-assembly

Before re-assembly of CD mechanism:

1. Thoroughly clean both rails on the mech frame.
2. Lubricate the rails with grease. *Labelle 106* is highly recommended.
3. Remove (rear) *leaf* spring of the carriage retainer. This must be removed permanently because the rectangular hole on the carriage's rack gear section where the spring used to go in, is now almost entirely occupied by the ATLAS support, and there's no way the carriage retainer can be installed without first removing it.

Here shows the spring to be removed. Use a sharp knife or razor blade for removal:



Rest assured there won't be any problems caused by removal of the carriage retainer spring. The carriage retainer's purpose, aside from holding down the carriage level with the main rail is to prevent play between the mesh of the carriage's rack gear and the pinion gear. The first spring would be sufficient in maintaining this. Tips for adjusting the spring if required is discussed in Section 4.

Follow in reverse the mechanism disassembly procedures for re-assembly of the mechanism. Take note that the most common mistake committed during re-assembly is improper installation of the carriage retainer. Make sure the front ends of retainer and rack gear are flush with each other after install of the pinion gear.

After re-assembly, reinstall CD mechanism on the main unit and connect the two wirings but don't put back the console cover yet, and test with a clean & scratch-free PlayStation CD-ROM.

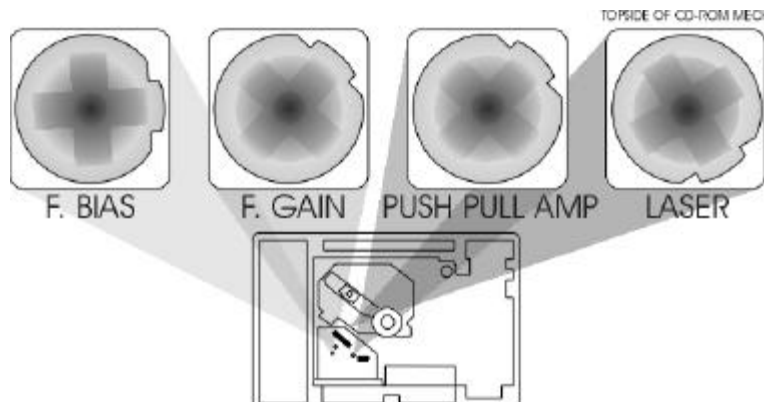
3. Potentiometer adjustments and calibration

There are four potentiometers in the PlayStation for adjustments concerning the CD-ROM drive. The F. BIAS, F. GAIN, PUSH PULL AMP, and the unlabeled one attached at the flex cable beside the CD-ROM mechanism itself, which is for adjustment of the laser current.

Take note the potentiometer that is most likely the candidate for adjustment and fine-tuning is the F.BIAS, followed by the one for the Laser located at the CD mechanism itself. The F.BIAS' final setting is actually dependent on other factors, evidence for this is the fact that turning this a bit clockwise on factory adjusted units could remedy the first signs of FMV skipping. In other words, it can compensate for a slightly misaligned optical pick-up.

Take note also, that you may not need adjust anything on an ATLAS repaired mechanism if the pots are in their original factory settings.

Here shows the potentiometers lined up but in their actual orientation on the PlayStation mainboard, and the typical wiper positions on factory adjusted units. Wiper positions for the F.BIAS and Laser shown may not be accurate for ALL machines and fine-tuning might be required, but these are generally good wiper positions to start with (wiper design may vary on some units).



FINE TUNING

Before making the final settings for these, it is recommended but not required to heat the unit with a heat gun to simulate a PlayStation's normal operating (temperature) conditions. Changes in pot values could occur if the final settings were done "cold" that could result to improper operation when the unit heats up.

To have the machine running with the cover off, have something to hold down the CD lid switch such as a ball of tissue paper. Adjustments are done whilst the unit is running unless otherwise specified.

- **F. BIAS**

Pop in a scratch-free PlayStation CD-ROM with a long FMV intro. Turn the unit on and see how fast the screen goes from the initial, white background 'Sony Computer Entertainment' logo screen to the black background PlayStation logo screen which indicates game disc boot-up. (If CD won't spin at all or hesitantly w/ clicking noise, please refer to Laser pot fine tuning below)

If CD spins during the initial screen, stays there and background sound begins to fade out and CD still doesn't speed up, turn the F. BIAS wiper slowly clockwise until CD speeds up and the PlayStation logo screen shows up (If you get a loud clicking sound made by the lens by merely touching the wiper with your screw driver, switch to another one, preferably insulated or all plastic). Turn off the PlayStation and on again and see if it boots up this time. If the game boots-up before the background sound of the initial screen begins to fade out, that is acceptable. If it doesn't but boots up anyway, let it continue loading the game.

Wait for the FMV intro and see if it doesn't skip. If it does, let it continue playing the FMV and carefully adjust the F.BIAS slowly a little more clockwise (this way you get real-time results). Turn it slowly clockwise until the FMV plays smooth. If it gets worse or CD stops reading, back off slowly counter-clockwise. You may turn wiper back and forth until you find the setting where the FMV doesn't skip or playback quality is acceptable.

Post-ATLAS repair notes:

If you're fine-tuning the F.BIAS after the repair has been made, exhausted all efforts and still can't seem to get the FMV play smooth following the fine-tuning procedures, it's likely the carriage has a worn slider on the supporting rail. Please proceed to Section 4 under sub-section 4.1 of the manual for the solution to this problem.

- **LASER**

Using an oscilloscope, connect to the test point at mainboard (exposed round solder-covered pad nearest the CD-ROM mechanism motor power connector). Adjust signal amplitude up by turning wiper clockwise, until signal starts to clip at the upper end, then back off a bit.

Without a scope, turn wiper counter-clockwise until CD stops spinning. Turn off the unit then on and turn the wiper clockwise until CD spins. Take note you'll have to accomplish this during the initial screen. Turn off unit again then on and let the CD-ROM boot up. If it exhibits lens dropping (clicking noise), the output is still weak and you have to adjust it up further. Turn off the unit again and turn the wiper clockwise a bit about 1/32 of a turn then test. Do this until the CD is read without any lens drop, just enough so that CD is read properly because too much current may shorten the life of the laserdiode. But you could

turn this further a bit clockwise as leeway for possible use of CD-ROMs with minor scratches and dirt.

Concerning the F.GAIN and PUSH PULL AMP pots, you can leave the wiper positions similar to the *Typical wiper positions* image provided above. As these pots, most especially the PUSH PULL AMP aren't really sensitive to slight adjustment deviations.

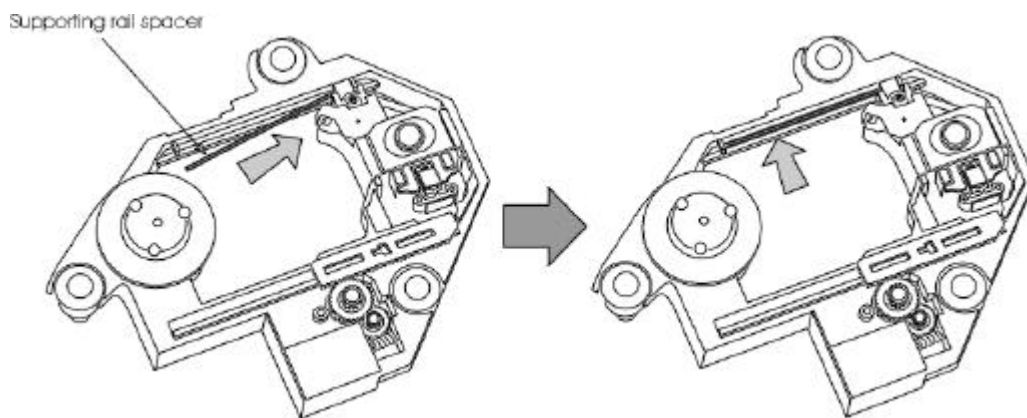
4. Extra CD-ROM mechanism repair information

4.1 Dealing with the optical pick-up carriage's second wear point

If you have exhausted all efforts fine-tuning the F.BIAS pot and still can't seem to get the FMV play 100% skip free, it's likely you have a mechanism unit with a worn carriage slider on the supporting rail. This is another misalignment problem, usually occurs long after dealing with the carriage rear support wear, although some machines have both wear problems occurring at almost the same time for some reason.

The simple solution for this is to cut a wire that would fit on the entire length of the supporting rail of the mechanism frame. The thickness size or gauge of wire that will be used depends on the wear condition of the carriage slider. 21 to 22 gauges are estimated to be the most usable ones. To avoid further wear on the slider, the wire should be smooth, straight and stiff enough so as not to bend easily, preferably stainless steel.

The wire is installed on top of the supporting rail by inserting between carriage slider and the rail.



You don't have to remove the carriage from the frame to install the spacer. Just remove pinion gear and position the carriage maximum outward along the rails (or max inward) and insert spacer between rail and slider from the inner side, then place the entire spacer onto the rail. Lubricate with grease, just enough to make the spacer stick on the rail. Slide carriage back and forth to test if it slides smoothly and without binding along the rails.

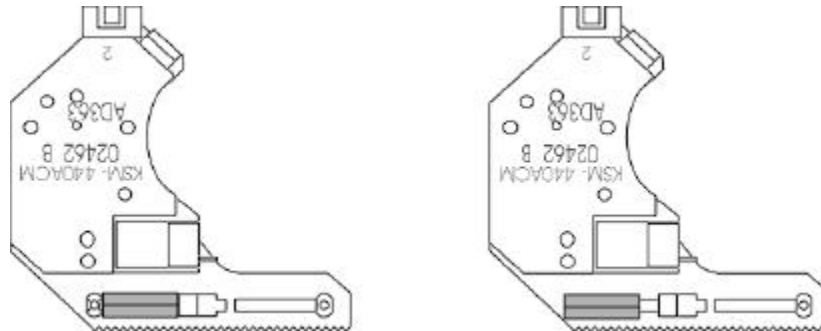
Take note, too much of elevation or too thick a spacer could result to CD read difficulty (boot-up & loading problems).

This solves 99% of post-ATLAS repair FMV skipping problems. The wire in effect becomes the new rail that side of the carriage is now sliding on, which elevates it back to proper alignment with the CD. It's pinned between slider and rail so even without use of adhesive, this won't move out of place (just make sure it's strictly straight), and there's a hump along the edge of the rail that keeps it from falling off.

4.2 ATLAS Fix without rear carriage support removal

Another way to use the ATLAS replacement supports is without removal of the worn support. This fix doesn't guarantee to solve FMV skipping problem 100%, even with installation of supporting rail spacer. But if you have a unit that won't run games at all and need to fix that fast and only that with minimal effort:

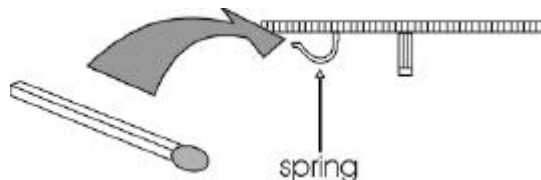
Insert the ATLAS piece on the second rectangular hole of the carriage. When re-assembling mechanism, removal of the carriage retainer's second spring also applies.



Carriage on the left shows how ATLAS is installed without removal of worn support as opposed to carriage on the right, which required removal of the support.

4.3 Tips

- ❑ Lubricate not only the rails but also the compound gears that moves the optical carriage.
- ❑ Make sure to clean the lens after every mechanism dismantle.
- ❑ Clean accumulated dirt on the laser prism under the lens by blowing with compressed air.
- ❑ To adjust the tension of the carriage retainer leaf spring, insert a spacer on the gap with the right width you wish the spring to conform to (for example, the width of a matchstick) and heat the spring then dip in water. This has to be done real quickly or else you'll melt away the spring. Take note also that too much tension could cause the front-end carriage support to wear abnormally.



Notice

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