

How to service record players

Last month, we concentrated on turntable drive mechanisms. In this, the final chapter of the series, we take a look at common tonearm and cartridge problems.

by KINGSLEY HOWE

Tonearm problems

As with multiplay record decks, a tonearm lifter is employed in manual decks to raise the stylus clear of the record surface when the arm is returning to its rest.

Two basic types are in use. One consists of a plain metal pin with a plastic or rubber cap. The other type is generally moulded from plastic in the form of a post with a wing (curved guide) on top. These may be termed as: (1) Plain Post Lifters; and (2) Winged Post Lifters. Both work in similar ways.

When the main gear begins to turn, a cam follower operates linkages below the deck. These raise the tonearm from the record surface, and then return the arm to its rest. In the latter position, a microswitch opens to cut power to the deck motor.

However, this does not always happen as described. The tonearm may lift but not return; move part of the way only; shudder or jerk; or drop clear of the rest post and land on the deck base. Sometimes, the tonearm will settle on the rest, then jump off, just before the platter stops.

On occasions, the tonearm may pause for several seconds after lifting, then make a wild swing across the deck.

The metal post lifter

The lifter is retained by a plastic or metal bush fixed to the deck baseplate. The upper part is tipped with soft plas-

tic or rubber. This is in the form of a plug with a head and shank. The head is the only part visible. The shank is pushed into a hollow in the lifter to retain the plug.

When the lifter rises, it contacts a metal wing attached to the tonearm. This provides support whilst the tonearm is in motion. Screws located under the tonearm hold the wing firmly in place. Sometimes these work loose, allowing the metal wing to tilt upwards at one end.

Depending on the degree of tilt, the tonearm will either drag the stylus across the record surface, or fall off the edge of the platter and on to the deck plate. The arm will then continue moving until it contacts the base of the armrest. At this point the return mechanism tries to push it further.

Pressure is then exerted on the locking screws at the lower end of the tonearm pivot plate below deck, which then throws the setting out of position. When attempting to play another record, landing and lifting positions may vary from normal by several centimetres. The tonearm must be lifted and the wing screws tightened before any adjustments are made.

Sometimes the thread is found to be stripped, and unable to be tightened. Using a larger screw is not advisable, as the light aluminium tube may split or develop a bend. Attempts to straighten the bend can easily fracture the tube.

If the above problem is encountered, remove the wing, apply a good contact adhesive to both surfaces and assemble whilst wet. Apply some to the screws, and fit these also. Although these may be loose, this is the only way that correct alignment can be obtained.

Once this assembly has taken place, return the tonearm to its rest, and clamp it with the transport clip. Some thin packing may be inserted between the wing and the lifter post to provide support whilst the adhesive dries.

Alternatively, an adjustable 'jack' may be used instead. This consists of a 12mm bolt and nut. Place the head of the bolt squarely on the deck plate, and simply turn the nut until the correct height is reached, then slide the nut under the end of the wing. The method used may vary from deck to deck, depending on space available. Check that the wing is parallel to the platter surface.

Note that any adhesive found on the polished aluminium arm must be removed whilst still wet. If allowed to dry, attempts at removal will leave unsightly scratches. Use a cotton bud or cloth dampened with mineral turps.

Caution: use as little as possible. Turps running on to the joint area will inhibit or prevent curing.

Jumpy or incomplete return

The main culprit for the above antic is the tip at the top of the lifter. These are prone to deteriorate with age, and become soft and sticky. The consistency is similar to that of road tar.

Some of this compound adheres to the underside of the metal wing, causing extremely high friction. Use of a small mirror to examine the underside is about the only means of detection. Removal is effected by the use of mineral turps.

On some decks, the tip may have been oiled by the owner. This application of oil will only cause the condition to worsen. The best approach is to remove the tip and clean out the centre hole with a small diameter drill. The tip may be replaced with a small dome-head screw or a nickel plated rivet. The latter is preferred, as the head is smooth, and there is no difference to normal operation.

Note that the deck must be tested for correct loading of the stylus. Any departure from the normal landing position (3mm in from the edge of the record) indicates slippage of the locking screws on the tonearm pivot plate, or bending of the linkage between the tonearm pivot plate and the main gear cam follower.

Winged post lifters

Most winged post lifters are made from plastic, although some contain a rubber insert. When returning across the deck, the tonearm slides on the flat section until the rest is reached. At this point, a cutaway in the end of the wing allows the tonearm to drop into the cradle.

The lifter then retracts into the deck, leaving the arm resting safely. Sometimes the tonearm will reach the rest, and then jump off before the deck stops.

If the arm parks in the cradle, it can be safely assumed that the deck linkage adjustments are not at fault. The main problem appears to be caused by the tonearm riding on the flat part of the lifter. It may reach the end, near the cutaway, but not drop into it completely. The arm then kicks back, due to small movements of the deck linkages, just prior to shutdown.

To correct this problem, enlarge the cutaway by removing several millimetres of the flat section with sharp knife. Start with one or two millimetres at first, and only remove more if required.

Keep the cutout corner fairly sharp (square) to arrest any kick back. After this modification, the tonearm should drop squarely into the cradle. It may give a slight jerk, but should remain in place.

Sometimes, the rubber insert may be missing. This may be replaced by a small piece of black cable insulation with the wire removed. Apply a coating of adhesive to the lifter, then fit the plastic piece to it. Use narrow strips of masking tape to hold it in position. When the glue has set, paint the area with tyre black to enhance appearance.

Resetting the tonearm

The locking screws mentioned above may be loosened, and the arm repositioned. Clip the tonearm to its rest before any alterations are made. Bear in mind that the ratio of the tonearm pivot plate to the tonearm length can vary from 5:1 to 20:1. Any slight movement of the plate will thus be multiplied greatly.

If the tonearm has been subjected to any strain, check the upper swivel assembly (found near the counterweight) for play. To do this, grasp the headshell and rock the tonearm from side to side. The swivel pin may be loose or bent. Some of the cheaper models cannot be adjusted, as the pin is simply inserted through a plastic housing.

Better quality decks are fitted with tapered metal bushes and locking nuts. If the tonearm feels sloppy, release the locknuts and turn the threaded bush slightly clockwise to tighten. Over tightening may bend the swivel pin, or prevent the tonearm from lifting high enough.

Whenever any alteration of this type is made, check the stylus for correct attitude. Load the stylus onto a stationary record and sight the stylus directly from the front of the cartridge. It must sit vertically. Any tilt or slant of the stylus will throw a heavy load on one wall of the microgroove. As the stylus pressure is around several tonnes to the square centimetre, and its running temperature is normally three times that of boiling water, any slight error will have drastic results.

One wall usually wears at the top, and the opposite wall wears at the bottom. Once this happens, the stylus side movement is severely restricted and the reproduced sound exhibits distorted treble and low volume.

With the stylus dead vertical, the pressure is shared equally by both walls. The running temperature is still the same, but under these circumstances, the record surface melts and reforms to its original shape.

Tonearm linkage adjustment

With most record decks, the linkage between the cam follower and the tonearm swivel plate is not adjustable in the usual sense. No screws or movable parts are to be found on it.

Some types are deliberately offset with two bends in the centre forming a 'Z' shape. It is common practice on assembly lines to make the linkage shorter or longer, by gripping the mid-section

of the 'Z' with a heavy pair of pliers and altering the angle. This is done to ensure that the automatic trip operates at the end of play, when the stylus is close to the last runout groove.

On decks where the tonearm loads and unloads automatically, alteration of the landing position may cause either premature lift-off or none at all. Where no independent adjustments are possible, a compromise must be reached to satisfy both conditions. Otherwise, the landing and lift-off positions may be altered independently.

Premature lift-off (last track on record not played completely) may be found on a few records where the recorded track is closer to the spindle hole than the industry standard. This problem was around for many years before a conference between the deck manufacturers and the record companies agreed to set a specific distance from the centre of the disc as a cut-off point for recording. Peace reigned for several decades after this, as all records then played right through and the trips functioned at the correct setting.

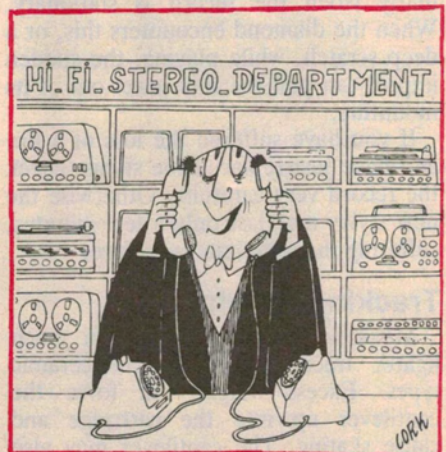
However, an occasional recording will be found to be non-standard. Setting the trip to play these through fully will cause the standard record to fail to operate the trip. On some models, a compromise can be reached. This is dependent on the date of manufacture of the turntable, and the standard prevailing at that time.

Partial lift or no lift

The lifter pin is raised by a metal plate beneath the deck. The plate is often bent at an angle, and more or less lift may be obtained by altering the angle using long nosed pliers.

Others are set by a screw and nut combination, fitted to the top of the pin.

Always check that the pin is not bent



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and jamming in the guide bush. The tonearm should clear the side of the rest before lowering into the cradle. If it does not, then more height is required. A small piece of metal, such as a screw-head, may be glued to the top of the pin, if there are no adjustments. In some cases, a screw and nut may be employed where space permits, for fine adjustment. A portion of the pin may need to be filed off to permit this.

Skating and/or no sound (magnetic)

The diamond tip in this type of cartridge is very tiny. When the tracking weight is found to be correct, and the tonearm skates, the tip may be missing. Remove the stylus holder from the cartridge and examine it with a magnifier. A small black jewel may be seen mounted near the end of the cantilever. If a tiny hole is evident, you may safely assume that a replacement is needed.

Sometimes a collar of hard material forms around the tip, and this may not allow it to sit properly in the groove. The collar is formed by dust and particles of vinyl worn from the record.

As the collar becomes wider, more material is trapped beneath it. This has a 'jacking' effect as the buildup increases, until the stylus may lift right out of the groove. The coating may be removed with stylus cleaner liquid and a soft brush, available from hifi stores.

Replacing the stylus

Before playing any records after the stylus has been replaced, check each record surface for scratches or deep pits. A pit on the surface of a record will result if the tonearm is allowed to fall on it. The diamond then digs in to form a small pit with steep sides, particularly when the record is stationary. When the diamond encounters this, or a deep scratch, while playing, the sudden impact can pull the tiny jewel out of its mounting.

If you have suffered the loss of a tip, and have just replaced the stylus, check the record very carefully. Otherwise the new stylus may last only a few minutes, suffering the same fate as before.

Tracking weight

Magnetic cartridges require a much lighter tracking weight than ceramic types. Excess weight will force the cantilever up into the cartridge and cause skating. The cantilever may also

develop a permanent bend, which will lift the diamond clear of the surface.

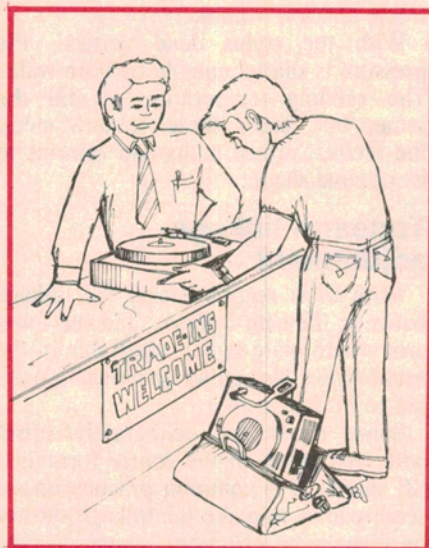
All magnetic styli are colour coded. The replacement must not only fit the cartridge properly, but be of the correct colour as well. Some are interchangeable, if the substitute is selected with care.

Unlike the ceramic cartridge, a magnetic cartridge has no rubber yoke to support the cantilever. The cantilever in the stylus holder is mounted on a miniature pivot; tension is applied internally according to the tracking weight.

When the correct conditions are met, the magnet inside the protective tube will assume a central position, clear of the tube walls. This allows the magnet to faithfully follow any motions of the stylus and generate a clear signal. With the incorrect selection of a tracking weight, the magnet may come into contact with the tube walls, or assume a position such that the magnet is not equidistant with respect to the two pickup coils inside the cartridge. Thus, when substitutions are made for the original stylus, tracking weight must be altered to suit.

Correct weight

The correct weight setting may be obtained by the use of a tonearm balance sold by hifi stores. If the tonearm is calibrated in grams, the tonearm may be brought to a zero weight condition by moving the weight backwards, until the whole assembly assumes a horizontal position. The tracking weight may then be selected by moving the weight forwards by the appropriate number of graduations.



Loss of signal

Loss of signal from the cartridge is also covered in the ceramic cartridge section. Note, however, that the output from magnetic cartridges is far smaller, and any corrosion on the contacts of plug-in headshells or slide-on pin connections will completely block the signal.

The contacts may be cleaned with a soft brass brush. These are not to be confused with steel wire brushes. The wires on the steel brush are too stiff, and may well remove any protective electroplated coating.

The main purpose of the brass brush is to remove any oxides from the pins. Steel wool does not reach into all the corners, and only cleans the outside of the pins. Clean off any remaining dust or grease with solvent or methylated spirits. With the latter, dry as soon as possible, as this chemical contains a minor amount of water.

Do not touch any cleaned contacts with your fingers. Salt and oil on the fingers is naturally present at all times. An invisible film forms on any surface contacted, and this leads to further corrosion.

Skating and/or no sound (ceramic)

There are several faults which can cause skating with ceramic cartridges. The most common is from wear or damage to the stylus. If the tip is too wide to enter the record groove, the tonearm will slide over the record surface toward the centre.

In less severe cases, the stylus will start groove hopping, and may reach the centre of the record after ten revolutions or so. If the yoke has collapsed back into the cartridge housing, the stylus will follow suit, allowing the cartridge to contact the record. Excess tracking weight or fractured ceramic transducers will produce the same effect.

If the complete cartridge is replaced, or a new player purchased, check to see whether the stylus guard is still in place.

No sound

The no sound condition may be caused by a faulty cartridge or broken connections. The fine wires attached to the cartridge connectors are easily broken. Check the four pin clips on the cartridge first. The soldering may be at fault or a wire may be detached.

Some of these fine cables are held to the connection sleeves by means of crimping. These are prone to loss of

electrical contact, although they may feel mechanically secure. Alternatively, one or more of the tubular connectors may be loose, and may be restored to a tight fit by squeezing gently with pliers.

Before re-fitting the clips, check for continuity between each clip and terminal strip beneath the deck. The four pins protruding from the rear of the cartridge housing are normally firmly fixed. Sometimes, however, the pins become loose and the internal connections are lost, although the cartridge may otherwise appear to be in good condition.

Sometimes the fine wires fracture inside the tonearm, and will go open circuit only when the tonearm is in a particular position. This can happen partway across the record; the sound will suddenly cut off, then start again as the arm moves inward. On some decks, the exposed cable at the opposite end of the tonearm may be damaged. Any slight movement of this may produce intermittent signals.

The only safe cure is replacement of the whole length, from the stylus to the terminal strip. Note that using cable of heavier size will drag on the tonearm and either arrest the inward motion, or cause groove hopping.

Headshells and cartridges

Apart from the standard slide-on connectors, there are models fitted with headshells which plug directly into the tonearm socket. Most are generally held in place by a threaded locking collar. European designs may employ a locking lever to secure the headshell. This often doubles up as a fingerlift as well. To release the entire assembly, simply slide the lever horizontally.

Examine the pins and contacts for corrosion. These are often plated with silver for superior conduction properties. However, a reaction with airborne sulphur fumes (vehicle emissions, etc) produces a heavy tarnish ranging in colour from brown to dull black. With flat strip contacts, use steel wool for cleaning. Make sure that any strands of steel wool are removed before replacing. With pin contacts, use a soft brass brush as with magnetic cartridges.

When there is no sound at all from the deck, check the stylus cantilever for correct seating on the yoke. Sometimes the two may not be in close contact. The stylus fitted may be of the wrong type or bent out of shape.

Alternatively, the yoke may be distorted (off centre) or the ceramic transducers inside the cartridge may be cracked.

Some of the cheaper crystal cartridges are subject to breakdown with rising humidity. Ceramics are not so prone to this; however, a few suffer the same fate after several years use, producing muffled and low level output. Replacement is the only cure.

Cartridge replacement (ceramic)

Ceramic cartridges come in all sorts of shapes and sizes. As there are some 1500 different types in use, an exact replacement may not be found.

Where mounting holes do not correspond with the holder or the headshell, some drilling and filing may be needed to fit the substitute cartridge. As a last resort, some types may be glued in position using contact adhesive.

Many cartridges are held in place by a clip system. The clip is fixed to the headshell by screws, and may be of plastic or thin stainless steel.

With the larger type, the distance from the clip base to the tip of the stylus is about twenty millimetres. If fitted to a deck, make sure that the tonearm lifts high enough to clear the record surface. In the case of automatic turntables (multiplay), up to six records may be on the platter. There must be enough space to clear the stack of records on the platter, and those on the dispensing spindle.

If the tonearm or cartridge fouls the edge of the record when feeding in, and the tonearm jams, then a lot of damage will be done to the delicate mechanism under the deck. This may take several hours of work to correct, if the deck is complicated.

Integral units

A few special types will be found with the headshell and cartridge integrated. The only way of removing the cartridge with this type is to break it into small pieces using a pair of sidecutters. The residue can then be cut away with a sharp knife. Do not try to force the unit apart with a screwdriver, as this will distort or fracture the shell itself.

Once the old cartridge has been removed, the replacement can be glued into position using contact adhesive (the original idea was to replace the whole tonearm as a unit).

Testing and operation

A large number of problems arise from failure or abuse. As both stylus and cartridge are user-accessible, expect anything. Many cartridges are damaged by owners attempting to replace the

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stylus. Crystal and ceramic types are fitted with thin, brittle transducers. Too much pressure on the yoke will cause one or both to fracture.

When functioning correctly, vibrations from the cantiliver are transferred through the rubber yoke to the transducers. As the yoke moves, stresses are induced into the thin strips. This generates an electrical signal to drive the amplifier.

Always examine the transducers with a strong light and good magnifier. Both should appear straight and unbroken. The outer surface is silver coated, and the base material will appear white to light brown if exposed (cracked). If the yoke will not maintain a central position, suspect a fractured transducer, even though the damage may not be visible.

This condition may be checked by connecting a high impedance multimeter to two of the connecting pins (or leads) and lightly stroking the yoke or stylus tip with a finger. The highest resistance range should be used; a FET meter is the most suitable.

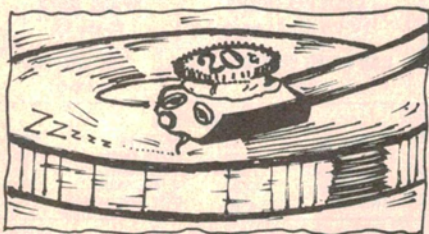
Movement of the needle should be approximately the same for both sides (left and right outputs). This method is useful as a means of identifying the connections on a cartridge, when a diagram is not available.

The cartridge may also be checked when connected to the amplifier; however, bear in mind that one of the leads may be broken, in the tonearm or elsewhere. This fault may not always be obvious, and a perfectly good cartridge may be discarded as a result.

Operation

In the magnetic cartridge, a tiny magnet is attached to the end of the cantiliver to produce signals. With ceramic elements, the structure is far more complex.

The main body is flat and thin (approx 0.65mm) with four inner electrodes. The latter are circular in section, and evenly spaced across the width of the transducer. When viewed through a strong magnifier, the cross section



resembles ribbon cable.

Tiny leads are attached to the surface by a thin coating of silver. In normal use, this method is adequate. The unit will withstand a fair amount of abuse. If the cartridge is dropped, however, the sudden shock load can strip the silver coating from the main body, particularly so on a hard surface, such as a wooden floor.

Much debate rages on how often a stylus should be changed. Sapphire is much softer than diamond, and 400 hours is considered a sensible limit before replacement.

Diamond styli have a recommended life of around 1,000 hours, or 2,000 sides.

Note that the above figures are for upper limits under ideal conditions. The records must be cleaned regularly and be free from dust and scratches.

The playing of worn, damaged (scratched) or dusty records may reduce the time to one half.

Interchangeability

Magnetic and ceramic cartridges are not interchangeable, due to differences in their output voltages and input resistance requirements.

If converting a deck to magnetic input, a preamplifier must be inserted before the main amp. Try a prebuilt unit from Dick Smith Electronics, Cat. number F-4152 (stereo). Some are also available in kit form from electronic suppliers, such as Jaycar Cat. number KE-4207.

Budget priced portable players are often fitted with a crystal cartridge. The output may range from three to 6V. If the unit is brought in with the cartridge missing, the only way that a correct replacement can be made is to look at the amplifier. With a crystal cartridge, the amplifier board is likely to contain only three transistors per channel, or the cartridge may feed a single IC directly.

Tonearm skipping grooves

This condition sometimes arises when the tonearm reaches a position several centimetres from the end of the recording. The arm will keep jumping back to one spot and refuse to advance. This causes torn grooves and permanent damage to the record.

This fault is due to the small slider plates mentioned earlier, which are mounted on the main gear. These plates are used to trip the automatic return of the arm.

As the tonearm traverses the record, the linkage attached to it moves slowly inwards. Near the beginning of the last track, the linkage encounters the two small plates attached to the main gear. If these plates are stiff, the linkage will stop, arresting the movement of the tonearm attached to it.

When this happens, the stylus will attempt to follow the record groove. It will do so until the side-pressure overcomes the tracking weight. At that instant, the stylus springs from the groove, and tension on the tonearm forces it backwards.

Both record(s) or stylus will sustain damage. With ceramic or crystal cartridges, the extra stress on the rubber yoke may crack the thin transducers mounted inside. This can make one channel intermittent or inoperative. With magnetic styli, the cantiliver may be bent out of shape or the diamond tip ripped from its mounting.

To correct this condition refer to the previous section on automatic return (last month).

Multiplay decks: size selector problems

Some autochanger decks are fitted with a black plastic arm on the rear left side of the tonearm support pillar. This device is intended to catch the edge of 30cm 33rpm discs as they fall from the record dispenser spindle on to the platter. If the arm fails to lock back, the tonearm will then assume a landing position to suit 18cm 33rpm discs.

The condition may be of constant or intermittent nature, and is due to insufficient lubrication on the associated linkages and plates directly under the plastic sensing arm. The mechanism is very complex, so the dismantling of it is not advised. Spray the components with CRC-55, using the tube attachment to reach difficult spots.

Cartridge change (hidden screw)

The screw fixing the cartridge to the headshell is sometimes covered by an aluminium decorator plate on top of the shell. This plate may be removed by carefully sliding the blade of a retractable knife under one end. Keep the blade flat!

Eventually, the plate will lift and the cartridge can be replaced. The underside of the plate is usually coated with self-adhesive, thus making it easy to reattach. The use of liquid adhesive is not recommended as the cartridge may need changing again at a later date. 