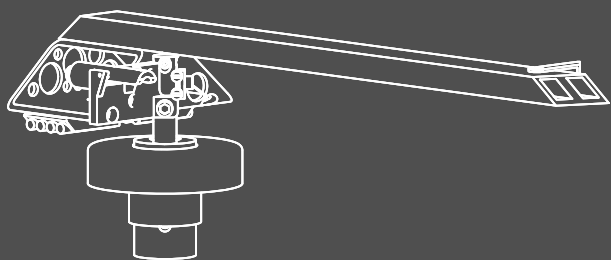


SUPATRAC



Blackbird

Instructions

SUPATRAC Blackbird

Thank you for choosing the SUPATRAC Blackbird, a revolutionary tone arm for high-performance turntables.

The Blackbird is the world's first Sideways Uni-Pivot Arm (SUPA) with a patented* novel bearing design which directly opposes the varying drag on the stylus so that energy and time in musical recordings are reproduced with unprecedented accuracy.

This manual explains how to install, set up and maintain your Blackbird Sideways Uni-Pivot Arm for a lifetime of dependable performance.

* UK Patent 2599073, international patents pending

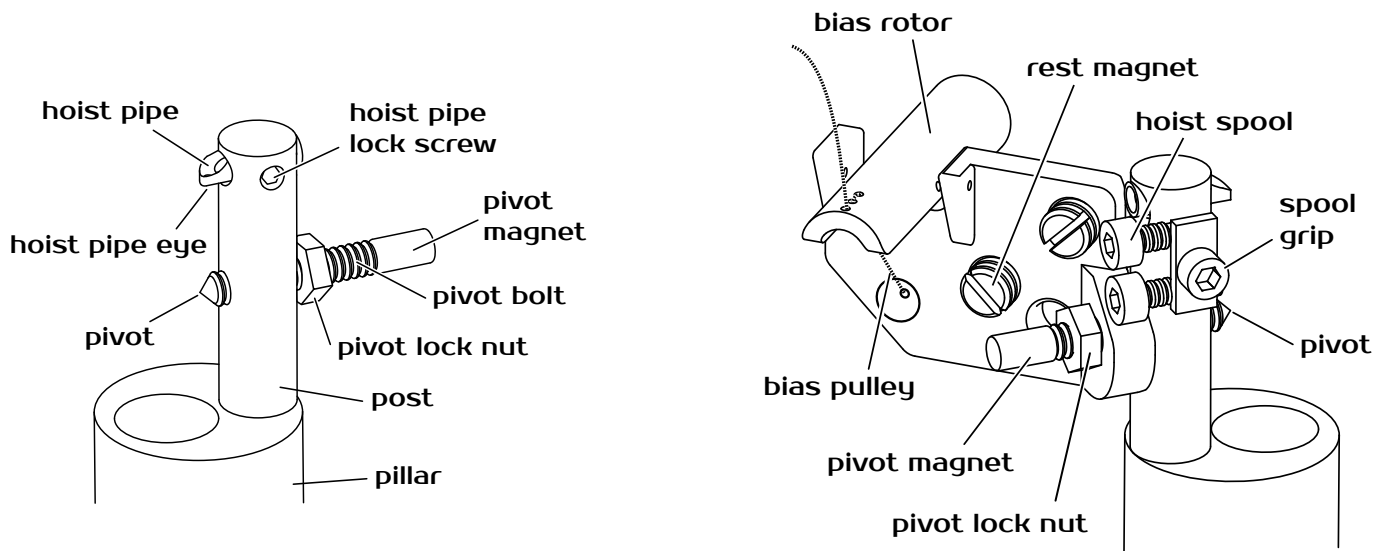
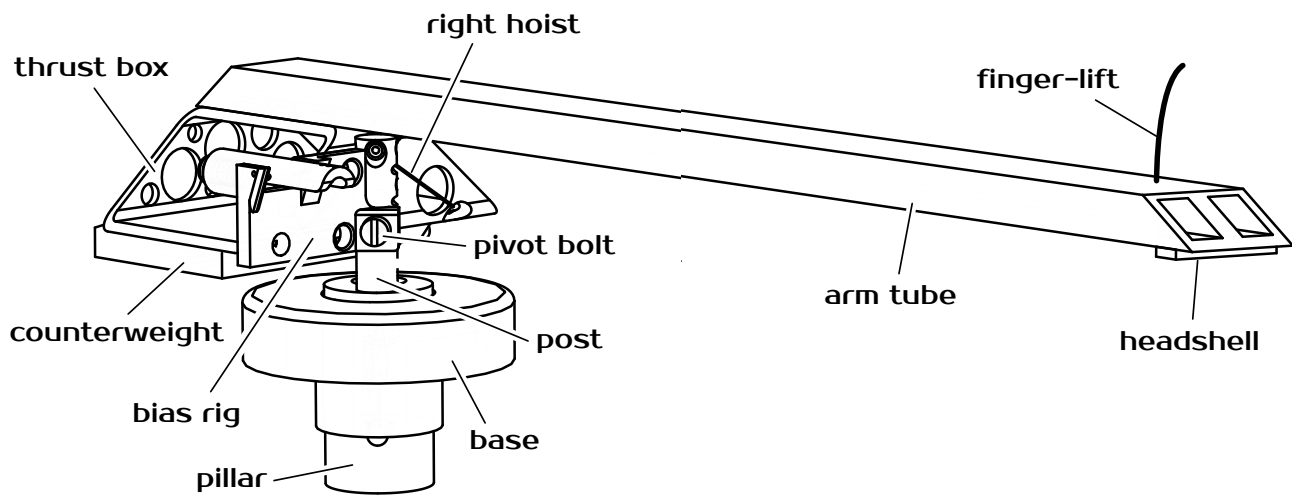
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**HAZARD WARNING:
SHARP EDGES - USE
GLOVES PROVIDED
TO AVOID INJURY**

**DANGER WARNING:
SMALL MAGNETS -
KEEP AWAY FROM
CHILDREN**

SUPATRAC Blackbird Parts and Their Names



BOX CONTENTS

Blackbird tone arm

Arm support pillar

Mounting base [optional clamp]

Counterweights

Mass adaptors

Amplifier cable

Downforce scale

Rigid finger-lift

Pivot magnets

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Alternative bias weights

Spare filaments

Allen keys

Spanner

Protractor

Instructions & warranty

CARRIAGE

To transport a turntable short distances with your Sideways Uni-Pivot Arm attached it is recommended that you...

1. place a severally-folded tissue between the pivot point and thrust box
2. stabilise the arm with a support
3. attach a stylus guard

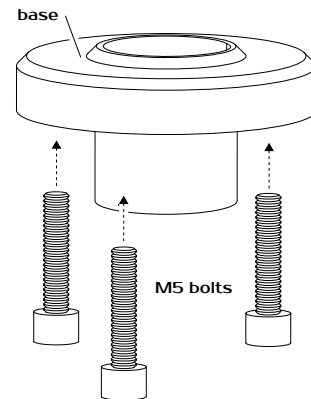
For longer journeys, remove the arm from the post so that it can be packed separately. See the 'Disassembly' chapter.

INSTALLATION

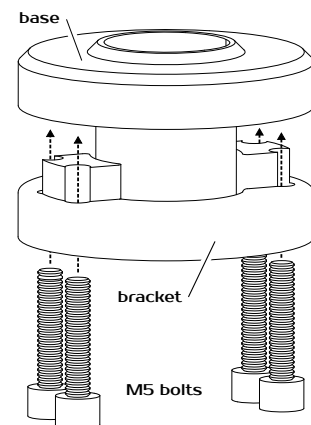
Attach Base

Attach the base to the arm board or plinth of your turntable using standard metric bolts.

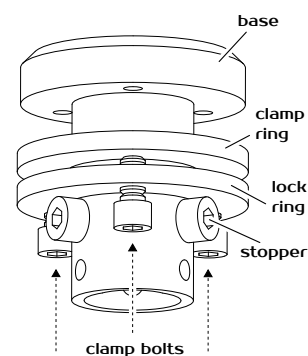
For Linn:



For SME:



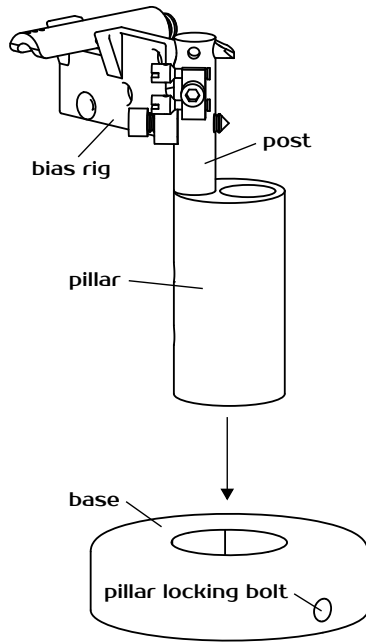
For Rega, Jelco, VPI:



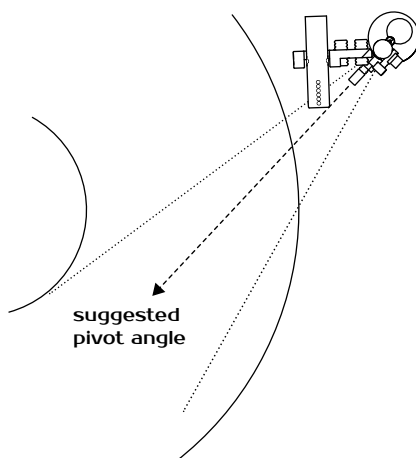
The Rega/Jelco/VPI base can either be clamped using the clamp and lock rings or bolted on.

Insert Pillar

Insert the pillar into the base, taking care not to allow it to drop. The bias rig can safely be held up with one hand while gently tightening the pillar locking bolt with the other. Do not over-tighten the pillar locking bolt. Start with the pivot point just lower than the platter surface.



Orient the pillar so that the pivot bolt points away from the position of a stylus when it plays the second half of a record side.



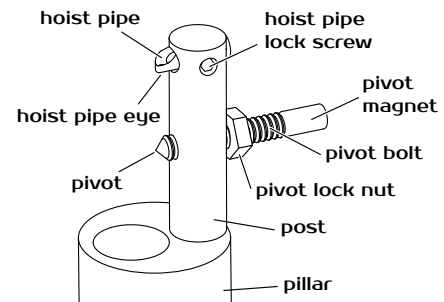
Set Spindle-Pivot Length

Use the supplied protractor ('Supatractor') to set or record spindle-pivot distance:

- push the protractor hole onto the spindle
- rotate the protractor point towards the pivot
- base position is ideal when the points touch
- if points don't touch, close the gap by loosening the base and moving it sideways
- a small gap of a few millimetres may be compensated by extending the pivot bolt and hoist pipe, see 'Extending Pivot' below
- alternatively, measure the discrepancy to calculate a new optimal pivot-stylus length
- large gaps need a different arm board or arm

Extend Pivot (Optional)

If your spindle-pivot length does not correspond to your arm's pivot-stylus length by a millimetre or two, the pivot and hoist pipe can be adjusted forwards or backwards.



- loosen pivot lock nut with supplied spanner
- turn pivot bolt with a small screwdriver to withdraw or extend it by the desired length
- use screwdriver to maintain pivot bolt position and re-tighten pivot lock nut
- loosen the hoist pipe lock screw
- extend or withdraw the hoist pipe by the same length as the pivot bolt was adjusted
- take care not to overtighten hoist pipe lock screw as thread is short and ductile

Connect Amplifier Cable

Insert the amplifier cable DIN plug into the base of the pillar.

If you are using a right-angle DIN plug it may be necessary to rotate the 'Black Knight' pin holder inside the pillar so that the DIN plug exits in the desired direction as follows:

- remove the pillar
- insert the DIN plug into its base
- loosen two Black Knight locking screws at side
- rotate the pillar so that the right-angle DIN plug is correctly oriented
- gently tighten the locking screws
- remove DIN plug and inspect pillar from both ends to make sure screws do not contact pins

Some decks provide inadequate clearance for the DIN plug underneath the pillar. Contact SUPATRAC to exchange your pillar for a shorter one if this is required.

Swap Finger-Lift (Optional)

The string finger-lift provides a firm grip on the arm without applying much sideways or downwards pressure on the cartridge.

However, if you prefer a rigid finger-lift, use tweezers to pull the base of the string from inside the arm tube, untie the knot, and remove the string. To attach the rigid finger-lift, use putty or a small loop of sticky tape on the end of a screwdriver to hold the nut in place to receive the bolt. Once the nut and bolt have engaged, insert a flat screwdriver between the nut and the inner wall of the arm tube to stop it while you tighten the bolt. Do not over-tighten as this could damage the fragile carbon-fibre arm tube.

Install Cartridge

If you have a stylus guard or removable stylus you may wish to install your cartridge before mounting the arm.

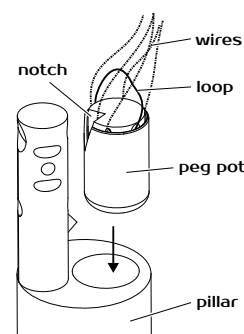
For a three-bolt mounting, temporarily remove the finger-lift by pulling the base of the string from inside the arm tube with tweezers, untying the knot, and use the hole to access the third bolt with an Allen key or screwdriver.

Large-headed cartridge bolts or large nuts will not fit in the headshell. It is possible to file large bolt-heads and nuts in a drill or by hand.

Contact SUPATRAC if you are unable to procure compatible bolts.

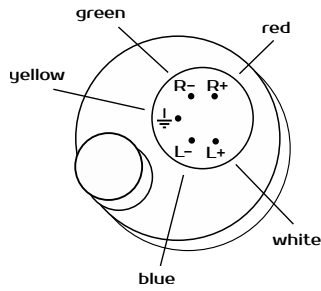
Connect Signal Wires

With your left hand hold the arm in the playback position and push the peg pot onto the pins inside the pillar with your right. Take care not to strain the fragile signal wires. The peg pot has a notch to allow it to pass without catching the pivot. It may be necessary to rotate the peg pot once it has passed the pivot so that it can find the pins inside the pillar.



It is also possible to unscrew the peg pot and remove the pegs so that they can be fitted to the pins individually, but this is not recommended as it is fiddly.

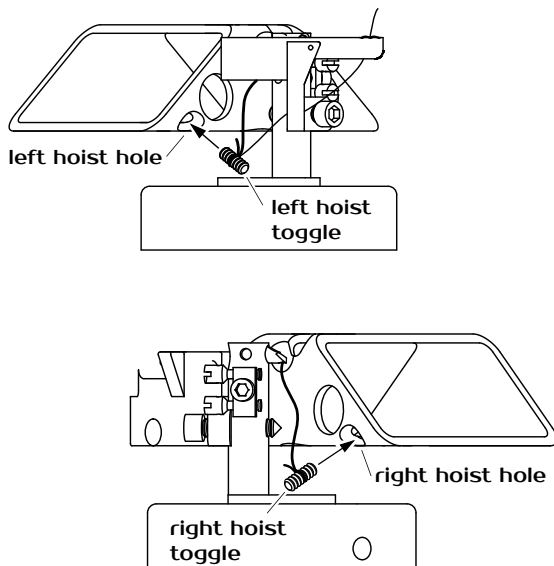
The positions of the pins are shown below:



If you have rotated the Black Knight pin holder inside the pillar then these pin positions will also have rotated correspondingly.

Mount Arm

With the arm held in your left hand about 15mm above the play position to provide slack in the hoists, insert the hoist toggles into the small holes on the thrust surface. Take care not to strain the signal wires. Ensure the hoist toggles are fully through and snagged. Note that the left hoist toggle is also attached to the bias pulley. The right hoist toggle is fixed only to the right hoist.



If necessary, adjust the hoist spools so that the arm is suspended by both hoists and level. Normally there is a clearance of about two millimetres between the underside of the arm

and the top of the post. This will be accurately adjusted later during the Calibration process.

If None, Install Cartridge

If you did not install your cartridge before mounting the arm, place a folded tissue between the pivot and thrust box to protect them during cartridge installation.

For a three-bolt mounting, temporarily remove the finger-lift and use its hole to access the third bolt with an Allen key or screwdriver.

Large head cartridge bolts or large nuts will not fit in the headshell. It is possible to file large bolt-heads and nuts in a drill or by hand. Contact SUPATRAC if you are unable to procure compatible bolts.

Attach Counterweight

When setting downforce, always obstruct movement of the arm by holding it in your left hand while adjusting the counterweight with your right. Attach a magnetic counterweight under the thrust box and squeeze it forwards for more downforce or backwards for less. Keep the counterweight centred on the axis of the arm by pinching the thrust box from both sides between thumb and fingers. You can centre the counterweight by feel. Keeping the counterweight centred in this way makes it less necessary to adjust lean (azimuth) after adjusting downforce.

Multiple counterweights are normally supplied to cater for an extremely wide range of cartridges weights, compliances and tracking weights (downforces).

To measure downforce with the supplied downforce scale, place it on the bare platter

with either a penny, a cent or a centime in the appropriate bed as the balancing weight. The dimples in the scale represent 1/10 gram increments in the range 1.2g - 4g. Adjust the counterweight until the scale balances with your stylus resting in the dimple corresponding to your desired downforce.

Level Arm (VTA)

The 'Vertical tracking angle' can be set by raising the pillar. Take care to support the pillar while loosening the locking screw as there is no brake. Slide the pillar up or down and tighten the locking screw gently. The tightness of the locking screw can affect the sound, so adjust it to taste. Tighter is not necessarily better.

It may be necessary to re-adjust VTA after optimising the hoists.

Adjust Hoists

Ensure that the turntable is level before adjusting the hoist lengths. With the arm in the playing position adjust both hoist spools so that the arm is suspended with no lean to the left or right and the pivot makes contact with the thrust box exactly on the straight line between the flex points where the hoists meet the thrust box. See the section on Calibration for more information about configuring the hoists.

Set Pivot-Stylus Length

Remove the Supatractor from the platter spindle and place it under the arm so that the pivot and protractor points touch. Use the curved lines to move cartridge to desired pivot-stylus length.

Align Cartridge

Replace the protractor on the platter spindle and use the null point grids to align the cartridge.

Install Pivot Magnet

Attach one of the supplied cylindrical magnets to the flat end of the pivot bolt in order to augment pivot contact. A 3mm diameter neodymium magnet is normally adequate.

Set Bias

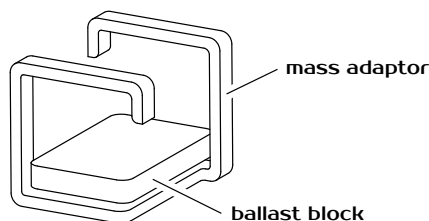
Initially the anti-skate force can be set by holding the bias rotor in the vertical position and gently pulling the loose end of the bias pulley until it slips and becomes taut. Then gently cue the arm as far as the record label so that the pulley slips back to a length which allows the playing of a full side. For optimising bias, see the chapter on Calibration.

Adjust Rest Position

In the rest position the thrust box rests against three M6 screws in the bias rig. Two of these have embedded magnets which capture the thrust box, whereas the uppermost screw relies on the arm's downforce for contact, and sets the rest level of the arm. They can be advanced or withdrawn with an Allen key to achieve a stable arm-rest position. Ideally both rest magnets will make contact with the thrust box when the arm is resting.

Add Inertia (Optional)

A nine-inch Blackbird has an effective mass of around 10g. If you intend to use a mid or low-compliance cartridge you may wish to add mass. The external mass adaptor can help to establish the ideal arm mass for your cartridge.



See the chapter on Calibration for more information on using the mass adaptor and calculating an equivalent position for the permanent internal mass.

CALIBRATION

Follow the check-list below routinely to establish and maintain optimum performance, especially with a newly-installed arm.

- (1) Level Turntable
- (2) Set Downforce
- (3) Level Arm (VTA)
- (4) Set Pivot Contact
- (5) Clear Signal Wires
- (6) Attach Pivot Magnet
- (7) Set Pivot Height
- (8) Set Azimuth
- (9) Set Bias
- (10) Adjust Inertia

A quick guide to calibration is at

www.supatrac.com/calibration

As with all tone arms, inaccurate configuration can produce poor results, whereas precise calibration will enable you to get the best from your records.

Level Turntable

It is important to level the turntable so that the arm hangs reliably against the bearing.

Set Downforce

Place the downforce scale on the bare platter with either a penny, a cent or a centime in the appropriate bed. The dimples in the downforce scale represent 1/10 gram increments in the range 1.2g - 4g.

To adjust downforce, hold the arm in your left hand and squeeze the counterweight forwards for more downforce or backwards for less. Adjust the counterweight position until the

scale balances with your stylus resting in the dimple corresponding to the desired downforce.

Keep the counterweights centred on the axis of the arm by pinching thrust box and counterweight from both sides so that it is not necessary to adjust lean (azimuth) after adjusting downforce.

Level Arm (VTA)

The 'Vertical tracking angle' can be set by raising the pillar. Take care to support the pillar while loosening the locking screw as there is no brake. Slide the pillar up or down and tighten the locking screw gently. The tightness of the locking screw can affect the sound, so adjust it to taste. Tighter is not necessarily better.

It may be necessary to re-adjust VTA after optimising the hoists.

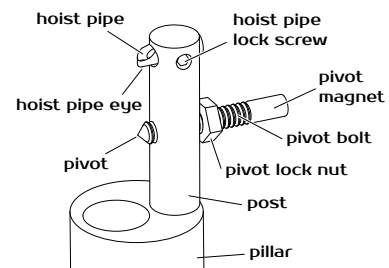
Set Pivot Contact

It is crucial to the correct function of the SUPA bearing that contact is maintained between the pivot point and thrust box during playback. To ensure this, remove the pivot bolt magnet, put the arm in the play position with a stylus guard on and gently tap the back of the thrust box. Any gap between the pivot point and thrust box should be discernible by sound, feel and seeing thrust box movement. Even when there is firm contact, if you look precisely across the thrust surface, you may see a slight gap between the hoists and the thrust surface if the hoists are hanging backwards by a small angle.

Correct these misconfigurations by loosening the hoist pipe locking screw and moving the hoist pipe so that its eye is directly above the pivot

point, and the hoists hang in a vertical plane while the pivot only just makes contact.

If the hoist pipe position needs adjusting, please take care not to pinch the hoists with any tool used for pushing the hoist pipe backwards or forwards. It is safer to apply pressure to the top edges of the hoist pipe, not the bottom edges.



Do not overtighten the hoist pipe locking screw as the thread in the post is short and ductile.

Clear Signal Wires

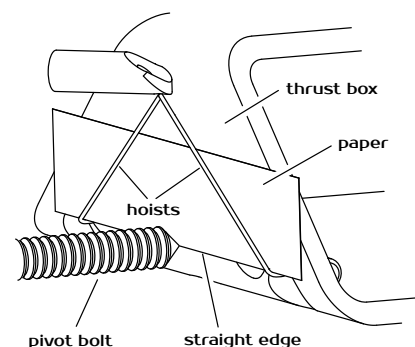
Ensure that the wires below the thrust box are not tangled or obstructing arm movement.

Attach Pivot Magnet

Do not forget to return the pivot bolt magnet to the blunt end of the pivot bolt after adjusting.

Set Pivot Height

A 10 x 60mm slip of paper with straight edges can be used to set correct pivot height.



Raise the headshell high and insert the paper between the hoists and the thrust box so that

the paper's straight edge sits on the flex points where the hoists meet the thrust surface. Pivot contact should occur just below the paper's edge. Adjust the upper and lower spools to level the arm and raise it to the correct height.

A period of incremental adjustments to pivot height can establish optimal performance.

Set Azimuth

Lean, commonly called 'azimuth', is the extent to which the cartridge leans towards the centre of the record or away from it. Zero lean is important for accurate playback and stylus/record longevity. Assess lean by looking at the cartridge from a position precisely on its central axis while it is playing.

Lean is adjusted by shortening and lengthening the two hoists in equal and opposite measure so that the pivot contact remains on the line between the suspension points. After twisting the upper and lower spools by equal and opposite amounts, reset the bearing by pushing the arm backwards and gently letting it settle again. Always check that the pivot contact lies on this line after lean adjustments by resetting the bearing and applying the paper test again.

Set Bias

The anti-skate ('bias') mechanism is designed to balance the forces on each side of the stylus even though the record pulls the arm at an angle. The chief benefit of well-calibrated bias is stylus and record longevity.

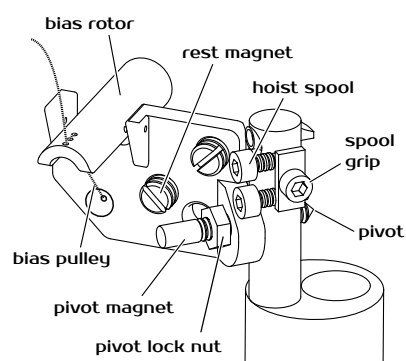
Precise instantaneous bias is dependent on signal strength, record speed, stylus profile and other factors, so aim for a level of bias which

roughly neutralises the net sideways playback forces on the stylus.

Recommended ways of judging bias are:

- looking at the cantilever exactly head-on while music is playing and at the moment when the stylus is lowered into the groove
- observing whether the arm moves centripetally or centrifugally when the stylus is lowered onto the flat surfaces between the grooves
- listening for balance across speakers with passages which are difficult to track or with a test/set-up record
- looking for long-term unloaded deflection of the cantilever to the right (inadequate applied anti-skate) or to the left (excess applied anti-skate)

To calibrate bias, first make sure that the signal wires are free and not constraining arm movement in any way. The anti-skating force is supplied by the bias rotor, which pulls the bias pulley, a nylon filament attached to the left hoist toggle.



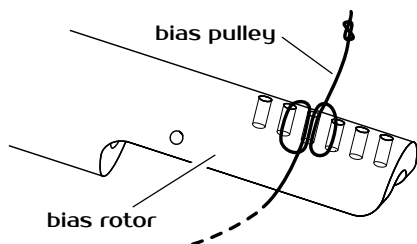
The force can be adjusted by screwing the bias weight further into the bias rotor or further out. Different lengths of M6 screw are supplied for compatibility with the widest range of

cartridges and downforces. The further the grub screw is from the rotor's axle, the more bias will be applied. Do not tighten as far as the axle.

The difference between the bias at the start and end of a record can be increased by shortening the bias pulley or decreased by lengthening it. To shorten the pulley, pull at the loose end when the arm is at rest until it slips. To lengthen the pulley gently cue the arm beyond the end of side. After adjusting pulley length be sure to adjust the bias weight screw again. Repeat until the bias at the beginning and end of the record are roughly appropriate.

Always lengthen the pulley enough to ensure that the bias rotor does not reach the vertical position before the final groove. Always shorten it enough so that the bias rotor begins to rise before the arm is cued to the intro groove.

The difference between start and end bias can be adjusted further by unthreading the bias pulley from the rotor and re-threading it in a different hole. The hole nearest the rotor axle will provide greater difference in applied bias from start to end, whereas the hole furthest from the rotor axle will provide the least difference in bias as the arm progresses across the record. Re-threading the pulley in the rotor holes is easier with a needle-threader or a strand of copper wire bent into a pointed hoop.



A figure-of-eight pattern through three of the bias rotor's holes, as illustrated, is normally

enough to grip the bias thread while also allowing it to slip when forced. Add a loop if it slips too easily.

It is also possible to adjust bias by rotating the pillar in the base if you have difficulty reaching correct bias by the above methods.

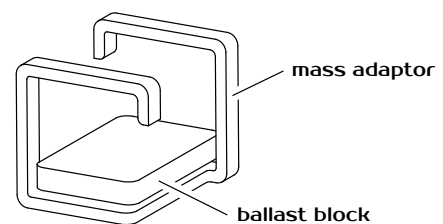
Finally, if the arm has a strong intrinsic bias this can be corrected by unhitching the right hoist toggle, feeding it around the left hoist, and returning it into the toggle hole.

By these four means applied bias can be adjusted so that lateral forces are appropriate across the full width of the playing bands.

Set Arm Inertia (Optional)

When adjusting arm mass, always restrict movement of the arm by holding it firmly in your left hand. Arm inertia can be adjusted to suit your cartridge suspension, either by calculation or by trial and error. High compliance cartridges work better with low inertia, whereas low compliance cartridges work better with higher inertia.

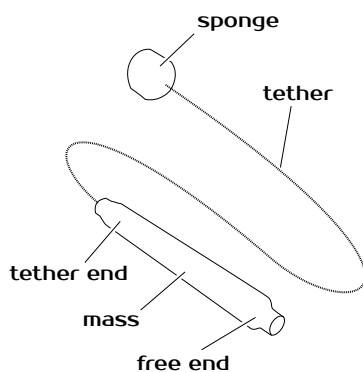
The external mass adaptor can be pushed up from under the arm and rotated counter-clockwise so the hooks straddle it, and then pushed down to grip it.



The magnetic ballast block can be placed on the mass adaptor platform to increase mass.

Any change in the position of the mass adaptor requires resetting the downforce. The further the weights are from the pivot, the higher will be the arm's inertia.

The internal permanent mass can be used instead of the external mass adaptor or in addition to it. Installation is more complicated than the external mass adaptor, but it is invisible inside the arm tube.



WARNING: use protective gloves during installation of the permanent mass as the tether and arm can cut your fingers.

WARNING: the carbon-fibre arm tube is fragile and may crack if excessive force is applied to it from inside or outside.

If you get stuck installing or removing the permanent internal mass, please contact **SUPATRAC** for advice rather than applying too much force. Replacement parts are available from **SUPATRAC**.

To install the permanent internal mass:

- calculate or guess desired mass position (see section 'Calculating Mass Position' below)
- attach cartridge guard
- dismount arm
- remove cartridge and finger-lift
- squeeze sponge and insert into right arm tube
- use a rod to push it far in

- insert the free end of the internal mass
- retain a part of the tether
- push the mass to the correct depth
- maintain mass position with rod and pull tether until mass is firmly wedged
- push surplus tether in to hide it
- re-mount arm

With long arms, heavy cartridges and added mass it may be necessary to place an additional counterweight inside the thrust box.

Remove the permanent mass as follows:

- attach cartridge guard
- dismount arm
- remove cartridge and finger-lift
- retrieve tether with a wire hook
- pull mass gently until it dislodges

Calculating Mass Position

To calculate the correct position for the internal permanent mass using the established external mass adaptor position:

- measure distance (d) from pivot to centre of external mass adaptor
- measure internal mass length (L)
- weigh external mass adaptor (m)
- weigh internal mass (M)
- recall arm's effective length (E)
- equivalent distance (D) from arm tip to internal mass will be:

$$D = E - (L / 2) - \sqrt{(m \times d \times d / M)}$$

This does not account for variation to inertia after counterweight adjustment, but should be close enough for most purposes.

MAINTENANCE

Calibrate Often

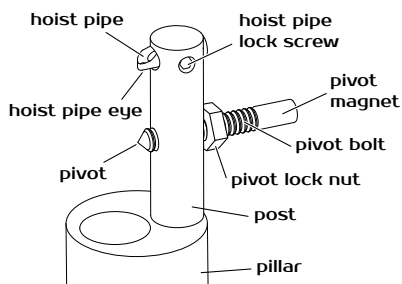
Cartridges last better on an arm which is well set up. Go through the Calibration check list regularly to ensure optimum performance, cartridge longevity and for peace of mind.

Thrust Box Bolts

After long periods check that the bolts which attach the arm to the thrust box are tight. Do not overtighten as this could split the tubes.

Pivot point

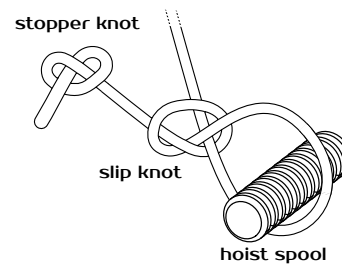
A severely blunted pivot point might compromise performance. However, it is easy to replace the pivot bolt with a newly-sharpened one. A sharpened mild steel M4 bolt suffices. HSS-tipped pivot bolts are available from SUPATRAC. Stainless steel is not recommended.



Hoists

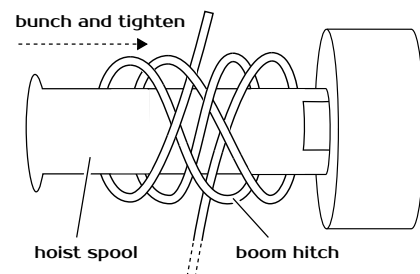
The hoists are made from an extremely hard-wearing moisture-proof braid. It is not known how long they will last before needing replacement. No visible signs of deterioration have been detected in the first few years of use. However, in case wear becomes discernible, look for fraying of the hoists at flexion points like the hoist pipe eye, which could indicate that they are ready for replacement.

When replacing hoists, terminate the ends with simple knots once they are through the hoist pipe eye, and use the bend of a slip knot around the hoist toggles.



The slip knot can be loosened in the future and will disappear if the stop knot is pulled once the toggle is removed. The stop knot will be small enough to thread through the hoist pipe eye.

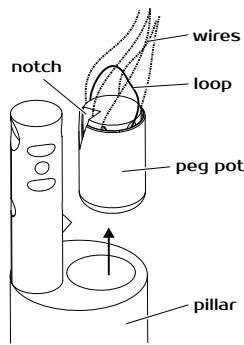
A boom hitch must be tied around the notched head-end of the spools. A well-tightened boom hitch should stop the hoist slipping around the spool and ensure that your tone arm remains perfectly configured for a long time.



DISASSEMBLY

To disassemble, reverse the installation:

- protect your stylus with a guard
- hold the arm in your left hand and raise it by half an inch to slacken the hoists and unhook the hoist toggles, taking care not to tug the signal wires



- gently lever the peg pot up out of the pillar using the loop or insert a small Allen key into the hole for the loop in the peg pot
- the arm is now detached and can be stored
- unplug the amplifier cable from the pillar
- hold the pillar in your left hand and loosen the pillar locking bolt to remove it
- unbolt and remove the base.

SOLVING PROBLEMS

Inconsistent Lean

When the arm is new, or when adjustments are made, lean may vary slightly between the start and end of a record. This will normally pass as the hoists settle in.

If this persists, it may result from under-extension of the hoist pipe eye relative to the pivot point. To extend the hoist pipe, loosen the hoist pipe locking screw and push the hoist pipe further out so that its eye is directly above the pivot point. Do not over-extend the hoist pipe lest contact at the pivot be lost. After extending the hoist pipe, you can test that contact is still maintained at the pivot by tapping the back of the thrust box towards the pivot. There should be no play or movement.

Excess Bias

Sometimes it can be difficult to set appropriate bias. The first step in solving excess bias is to make sure that the arm's yaw equilibrium is on or near the playing surface. Balance the arm with the counterweight so that it floats above the record surface or rises slowly. Disable the bias rotor in the upright position with a match or piece of paper. Observe the default track position of the arm. If it is not on or near the playing band, unhitch the right hoist toggle and feed it around the left hoist in one direction or the other, and reinsert the hoist toggle, before pushing the arm backwards and gently allowing the bearing to resettle. Repeat feeding the right hoist around the left in one direction or the other until the arm's yaw equilibrium is in or near the playing band. Once this is achieved, use the three other methods described in the

installation and tuning chapters to reach appropriate bias across the record.

Excess bias may also arise from the eye of the hoist pipe being too near the post as compared to the pivot, in which case extend the hoist pipe as described above.

Contact SUPATRAC if you have any other problems with the arm.

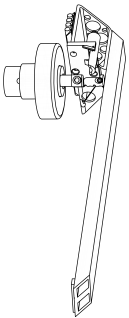
FURTHER INFORMATION

SUPATRAC tone arms are designed and made by hand in Chelsea, London, England.

For further information, please visit www.supatrac.com or email info@supatrac.com

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SUPATRAC Blackbird



SET-UP CHECK LIST

1. Level Turntable
2. Set Downforce
3. Level Arm (VTA)
4. Set Pivot Contact
5. Clear Wires
6. Attach Magnet
7. Set Pivot Height
8. Set Azimuth
9. Set Bias

1. Level Turntable

- accurately level turntable

2. Set Downforce

- place balance on bare platter
- lower stylus onto dimples to find balance weight
- hold the arm in your left hand while adjusting the counterweight with your right
- squeeze counterweight towards pivot to increase downforce and away to decrease it

- centre counterweight on arm axis

by pinching thrust box and

counterweight from sides

3. Level Arm

- put arm in play position
- view arm from side to see level
- hold pillar/post carefully to stop it dropping hard when loosening pillar lock bolt
- raise or lower pillar as required
- don't overtighten pillar lock bolt

4. Set Pivot Contact

- remove magnet from pivot bolt
- place arm in play position on stationary record
- gently tap back of thrust box to check for pivot contact
- look across thrust surface to check hoists are flush with it
- adjust hoist pipe extension if necessary by loosening hoist pipe locking bolt, taking care not to pinch hoists by pushing top edges of hoist pipe

5. Clear wires

- check that the arm wires can move freely and are not tangled or snagged
- tease them clear of any contact using an allen key
- make sure they apply no force or torque on the arm

7. Set Pivot Height

- lift headshell high
- insert a 10 x 60mm straight-edged piece of paper between hoists and thrust surface
- push paper down onto points where hoists meet thrust box
- put arm in play position
- adjust hoists so that pivot is at or just below paper edge

8. Set Azimuth

- observe cartridge and reflection while playing at middle of side
- turn hoist spools by equal and opposite amounts so that cartridge does not lean towards or away from the spindle
- reset bearing after hoist length adjustments by pushing arm back and letting it settle against the pivot again

9. Set Bias

- shorten bias pulley by pulling loose end until it slips
- gently cue arm to the edge of the label to extend pulley
- aim for slow motion towards centre on intro and outro flats
- lengthen pulley to make intro and outro bias more equal
- screw bias rotor bolt in or out for less or more anti-skate
- if cantilever develops a default offset, oppose it to compensate

6. Attach Magnet

- apply magnet to pivot bolt head
- select magnet size to taste
- 3mm diameter magnet is normally adequate