Restoring An Audio Classic, The SME 3009 Series II Tonearm

By Brian Kearns

Prologue

It has been over 40 years since the first samples of the SME 3009 / 3012 series II tonearms rolled off the production line at Steyning. These tonearms (and their variants, the 3009 S2 improved, the 30XXR etc) have been staples for analogue reproduction for practically the full duration of their long history. The lineage of the SME 3009 / 3012 series II, goes back to 1959 and ended only recently with the introduction of the M2 series, in 2004. The first generation of SME 3009 / 3012 tonearms, were actually introduced in 1959; however, due to the growing popularity of stereo records in the early 60s and the resulting increase in demand for quality tonearms, the series I range were replaced with the series II range which were capable of being produced in larger quantities. Hallmarks of the SME 3009 / 3012 series II tonearms are the pointed yoke which sits above the saddle bearing, the reverse facing calibrated rod from which the anti-skating weight is hung, the perforated headshell shaped like an archer's shield, the outrigger on which the auxiliary weight for setting VTF is fixed, the sliding base (introduced by SME and still used on the SME V tonearm) and the locking arm rest.

There are still many examples of the series II in commission; thanks to the simplicity of the design of this tonearm they have generally survived the normal effects of aging and continue in fine working order, but even the most meticulously designed pieces of mechanical equipment have parts which give way over time and which need to be replaced. One of the common problems that the 3009 series II tonearm can develop with age is a sagging counterweight, this is caused by hardening of the coupling rubber which secures the tonearm stub to the main tonearm tube. Another point to note about the SME 3009 series II (and most of it's variants) is that the inner tonearm wire is not up to the standards of modern tonearms.

The following photo story illustrates the servicing and re-wiring of an SME 3009 series II which was purchased on EBay for about UKP150.00. The arm was in good condition, but suffered from the sagging counterweight problem as described above. The objective was to restore this venerable tonearm to its original condition in most respects, except with improved inner wire and with an improved tonearm cable. The result being a restoration which exploits the sonic capabilities of this arm to the fullest level.

Getting Started.

Just a few basic tools are needed, an imperial set of Allen keys, a selection of flat head screwdrivers ranging from ~1.5 to 2.5mm, a soldering iron, a tin of lighter fluid, some lint free rags, a pair of long nose pliers.

For rewiring the SME 3009 or the 3012, a pre-wired wiring harness and headshell socket is available directly from SME (p/n 1802/9 for the 3009 or p/n 1802/12 for the 3012); this part can be purchased with a choice of either linear crystal copper wire or Van den Hul MCS 150 M silver wire. The headshell socket is also available without any wire for UKP29.80*.

I decided to opt for the MCS 150 M wired version which retails for UKP 123.42*; it's not cheap, but I thought it would better to pick the silver option to avoid the feeling of regret that often creeps in after making a value-for-money based decision for an upgrade, particularly when there is a significant investment of effort and time involved. The pre-wired harness offers the benefit of there being 4 less joints to solder and the new headshell socket ensures good contact with the cartridge via it's gold plated inner sprung pins. As mentioned above, the headshell socket can be purchased separately which allows the user to choose from a greater selection of inner wire, and which is more cost effective route than the pre-wired options.

The replacement headshell socket, is designed as a perfect fit for the 3009 S2 improved and the 30XXR tonearms, but for the 3009 and 3012 series II tonearms, there is a small kludge required to make the replacement headshell socket fit: there is a tapped hole in the bottom of the headshell socket into which a round headed bolt is inserted through a slot in the lower side of the tonearm tube. This bolt keeps the headshell socket in place and prevents the headshell from moving beyond a permitted range of azimuth adjustment. A large washer fits between the headshell socket and the end of the tonearm tube, and this washer prevents the locking collar of the headshell socket from being slid back along the tonearm tube. For the series II tonearms, if the replacement headshell socket is fitted with the single supplied washer, the hole will be too far back and will not align with the slot in the base of the tonearm tube. A solution to this problem

is to double up on the supplied washers which fits between the headshell socket and the tonearm tube. Using two washers, as described provides a perfect fit and probably gives rise to a slightly smoother azimuth adjustment in the finally reassembled tonearm. I have commented to SME about this slight defect with the replacement headshell socket, and they assure me that they will supply the headshell socket with the extra washer if required. However, it would be necessary to advise SME that you want an additional washer to be included with the headshell socket or wiring harness when placing the order – the required washers can be seen in the plastic bag on the left-hand side of the Photo 1 below.

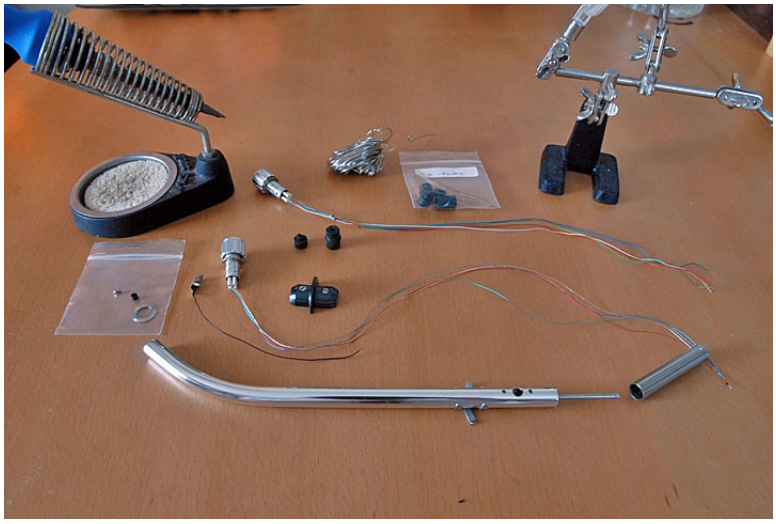

Photo 1 – 3009 series II arm tube with replacement (silver wired) and original wiring harnesses.

As noted, the original coupling rubbers which secure the rear stub to the main tonearm tube generally do not stand the test of time, and need to be replaced. Replacement coupling rubbers are also available directly from SME (p/n 1808/9) at a cost of UKP 9.30*. The replacement rubbers are much less compliant than the original parts; this is in-line with modern thinking on tonearm design where a less compliant coupling between the two tonearm sections is considered preferable. It is best to replace the coupling rubbers before replacing the inner wire, because removing the old rubber can be messy and requires cleaning of the tonearm tube with lighter fluid.

Dismantling the Tonearm.

So I began by preparing the tools and dismantling the tonearm, which is very easy to do. Separating the stub from the tonearm tube is achieved by pulling and twisting the two pieces; ideally the old rubber section will not fully disintegrate during this step, so that there is not an excessive amount of rubber to be removed from inside the tonearm tube and stub. Still, excess rubber will remain behind, and this needs to be cleaned from the two parts of the tonearm. Lighter fluid is the preferred solvent to remove the residue of rubber: the stub can be fully immersed in lighter fluid; and the inside of the tonearm tube can be cleaned using a soaked cotton bud – photo 2 and photo 3. It is also recommended to soak the replacement coupling rubbers in lighter fluid briefly and to wipe dry in order to remove any grease or grime that may have contaminated the outer surfaces thereof.

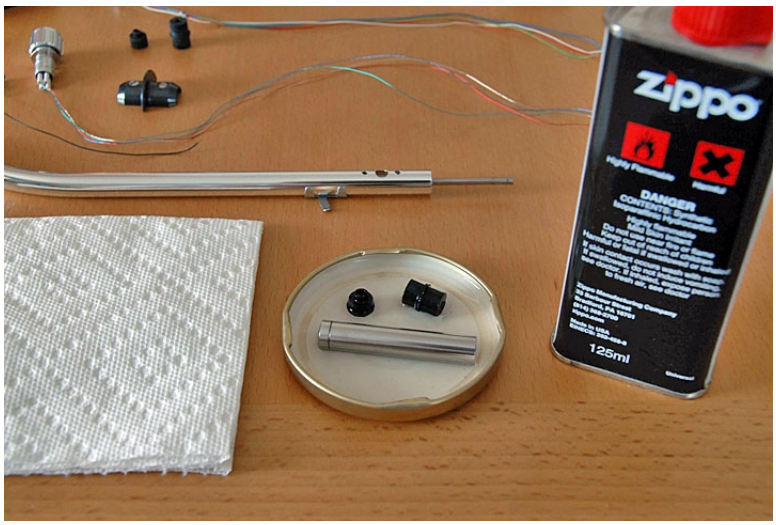

Photo 2 - Soaking the coupling rubbers in lighter fluid.

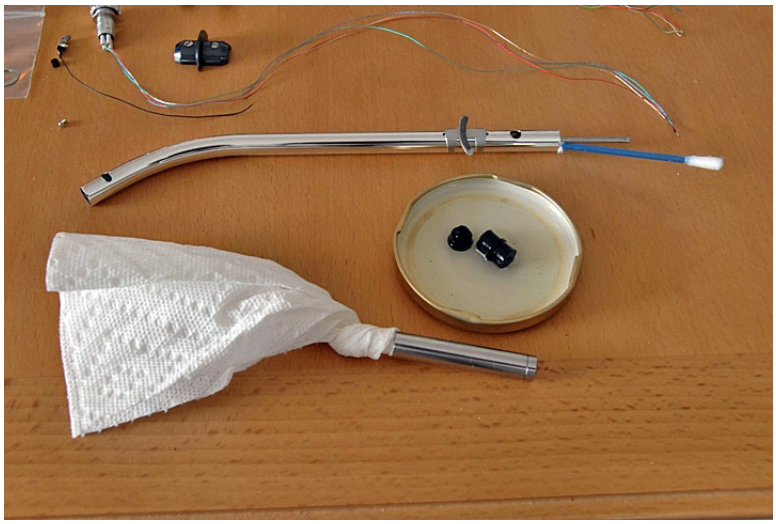

Photo 3 – Cleaning out the tonearm tube and rear stub.

Fitting the Replacement Coupling Rubbers

Ideally all of the residue of rubber will be removed at this stage, and the inner surfaces of the tonearm tube and tonearm stub will be clean. Next the larger of the two coupling rubbers is pushed over the protruding rod at the rear of the tonearm tube; the rubber is arranged so that the the shorter fatter side is closest to the tonearm tube. The curved side of the coupling rubber adjacent to the tonearm tube is liberally coated with cyanoacrylate adhesive and the rubber is pushed inside the tonearm tube. When the rubber is pushed into the tonearm tube, a ring of wet glue will be forced to the outside of the rubber. This should be removed immediately with a lint free rag wetted with lighter fluid. Any traces of glue which remain on the outer surface of the tonearm tube can be scraped away with a fingernail – photo 4 and 5.

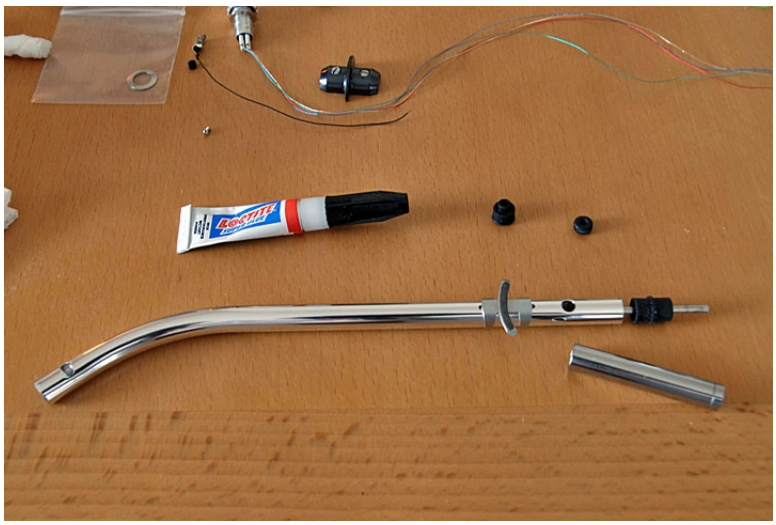

Photo 4 – Fitting the large coupling rubber to the protruding rod at the back of the tonearm tube

Next step is to fit the smaller of the two coupling rubbers to the end of the protruding rod at the rear of the tonearm tube, this is fitted by applying adhesive to surface of the rod, and by quickly sliding the rubber so that it is flush with the end of the rod – photo 5.

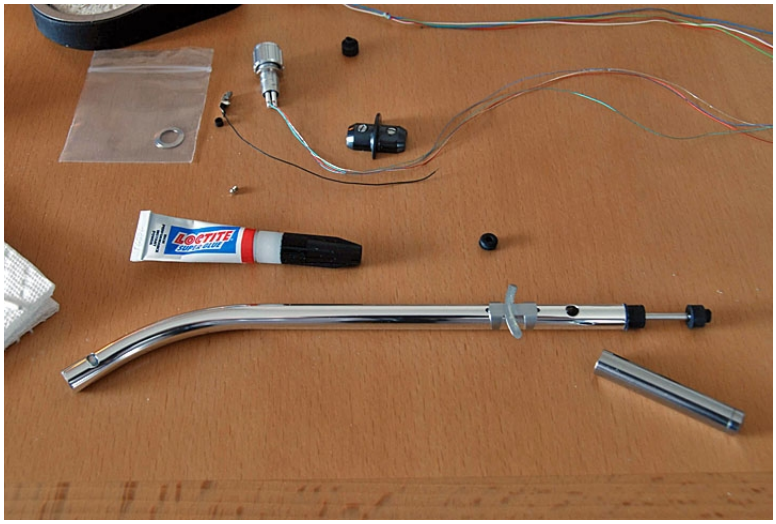

Photo 5 – Both coupling rubbers fitted and glued.

The adhesive should be allowed to set for over an hour before proceeding to the next step. After the adhesive has set, the rear stub is fitted as follows: adhesive is applied to the second side of the larger of the two coupling rubbers ONLY and the rear stub of the tonearm is pushed over both coupling rubbers and up against the arm tube quickly. Again, a ring of glue will be forced to the outer surface of the rubber, and this should be removed with a lighter fluid wetted rag. As before, traces of adhesive on the polished surface of the arm tube can be scraped away using a fingernail – photo 6.

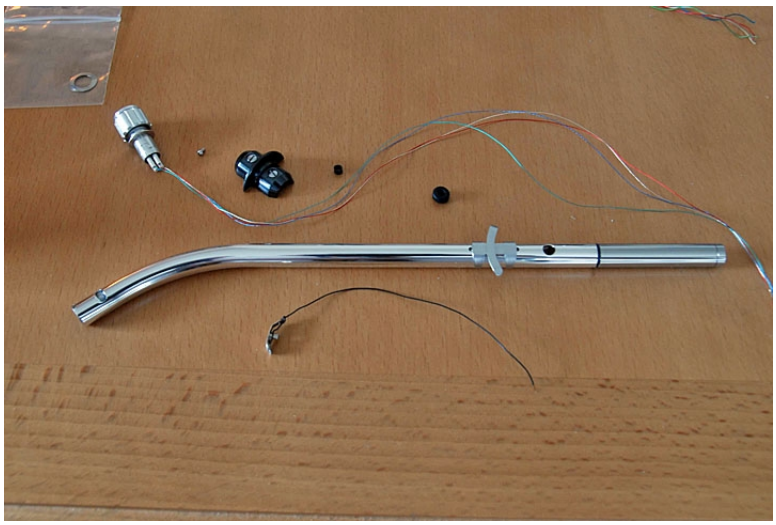

Photo 6 – Tonearm tube and rear stub re-assembled with new coupling rubbers.

Rewiring the Tonearm.

Depending on the lining in the inside of the arm tube, the inner wiring can be fed through with the help of gravity. If this doesn't work a semi rigid wire (e.g. the copper core of from a length of mains cable) can be inserted into the tonearm tube from the hole near the stub, and can be fed to the headshell end. When the wire emerges at the headshell, it can be used to pull the inner cable back through. If this operation seems daunting, an alternative route is to leave the original wires inside the arm tube when replacing the coupling rubbers, and these can be used as a pull through for the replacement wire. After the wire is fed through, the headshell socket is pushed over the open end of the tonearm tube and is rotated so that it is correctly aligned (fitting a headshell can simplify this step), then the round headed bolt (described above) is inserted from below – photo 7. The headshell should be able to rotate by about +/- 5 degrees, this adjustment is used for setting azimuth. Ideally the movement of the headshell in the arm tube should be free but tight.

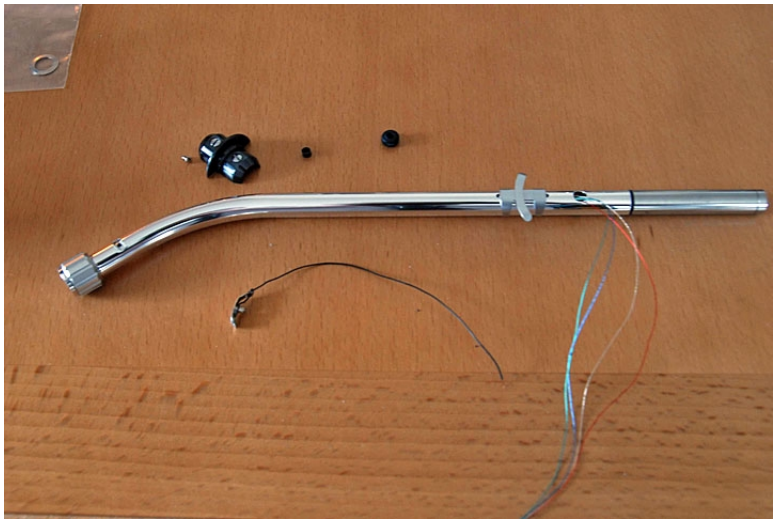

Photo 7 – New inner wire fitted and headshell socket aligned.

The next step is the most difficult! The steel saddle must be fitted, and to do this one of the two securing bolts must be threaded through a grounding tag which fits inside the tonearm tube – the tag can be seen soldered to the end of the length of black wire in photo 7. Aligning the ground tag inside the tube with the hole in the saddle feels a bit like keyhole surgery, but a thin long nose pliers can help for this step; grip the end of the ground tag with the pliers, align the threaded hold with the appropriate hole in the upper side of the tonearm tube. While still gripping the ground tag, place the steel saddle so that it is aligned with the hole in the arm tube, then screw in the bolt carefully. An extra pair of hands can be useful for this delicate operation! Once the ground tag has been fitted, the second bolt for the saddle is fitted easily and both bolts

are tightened. A rubber grommet (shown above the tonearm tube in photo 7) is pushed over the protruding wire, and covers the hole where the inner wires exit the tonearm tube – the runner grommets are also available from SME (p/n 3504) at a nominal cost.

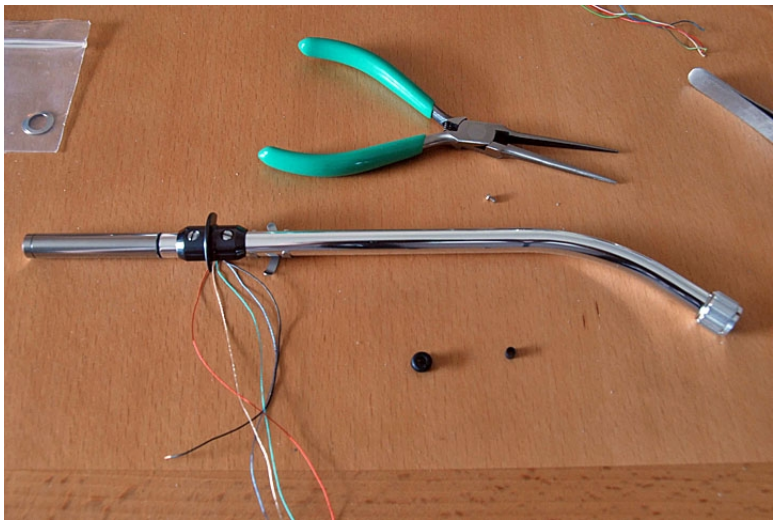

Photo 8 – Steel saddle fitted at last!

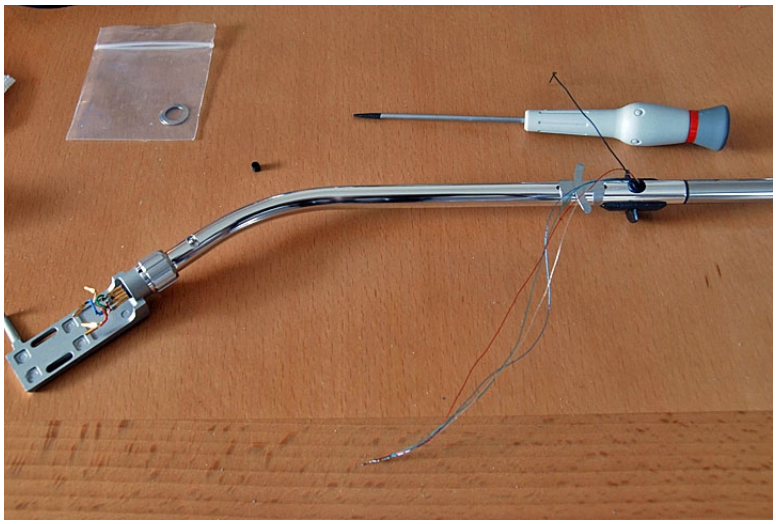

Photo 9 – Rubber grommet fitted to underside of tonearm tube!

Reassembly.

Now it is time to reassemble the tonearm. This is quite straight forward, but firstly check that the v-shaped slots in the pillar bearing are clean and free from nicks – see photo 10. These are often badly marked from excessive movement or load on the knife edges of the steel saddle. Fortunately, replacement pillar bearings are also available from SME (p/n 2240), at a cost of ~UKP99.00*. The replacement bearings are machined to tighter tolerances than the old pillar bearings, which often display noticeable degree of radial play. If the old bearings are OK, do not be tempted to tighten these to reduce the radial play. The SME 3009 / 3012 sounds a lot better with loose and free bearings. One of it's strong points is very low lateral and vertical friction. I opted to replace the pillar bearing, because the original bearing has been lubricated by it's (well meaning) previous owner, and on dismantling the bearing, I found that the oil become had become discoloured from accumulated grime. Several attempts at cleaning the ball-races by soaking in alcohol did not restore them to a satisfactory level of smoothness.

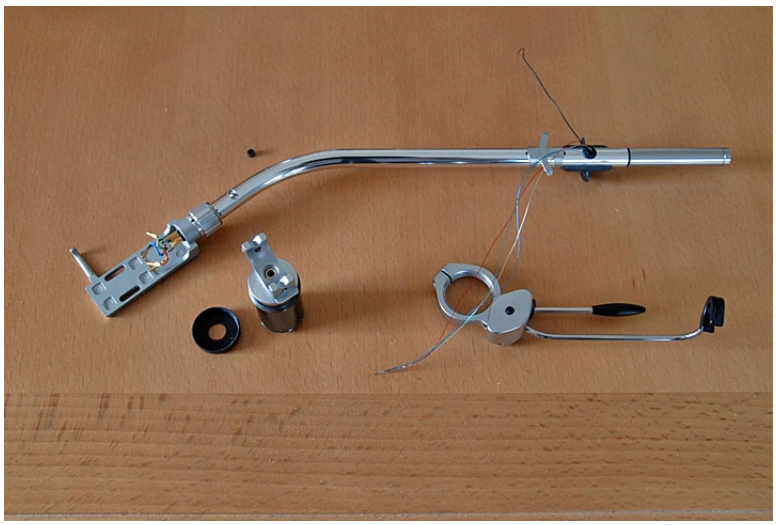

Photo 10 – Tonearm tube, pillar bearings and cueing mechanism ready for re-assembly.

First step in reassembly is to fit the arm cuing assembly to the pillar bearing, then the tonearm wires are passed through the centre of the pillar bearing, and the yoke is fitted to the top of the pillar bearing. After that, the pillar bearing is fitted into the mount in the sliding base, and the bearing cap (if using the newer bearings) is attached.

Before soldering the leads to the terminals on the sliding base, it is a good idea to adjust the height of the arm cueing assembly on the pillar bearing so that the arm cues up and down from above horizontal to below – photo 11 and 12.

Photo 11 and Photo 12 – Tonearm cueing mechanism set for correct up and down movement.

Next the tonearm wires are soldered to the terminal block in the base; there is an option here to replace the older base terminal arrangement with a newer terminal arrangement supplied by SME featuring phono sockets. I have never been all that enthusiastic about this upgrade: the phono conversion kit is a rather plasticy looking affair, and lacks the simplicity of the original terminal arrangement. Moreover, the phono conversion kit requires the replacement of the original anodized metal screening cover with a plastic cover. Incidentally, there were two versions of the terminal arrangement from the original tonearm: one version was designed with the terminal block mounted vertically, so that the cable pointed vertically downwards and this version is ideally suited to turntables with thick arm mounting boards, or which require a spacer to mount the tonearm at the correct height (EG Garrard 301); the second version was designed so that the cable exited horizontally from the base and this version was more suited to turntables with shallow wooden bases (EG Linn Thorens etc.). The replacement phono conversion kit is only available in the horizontal version.

As regards soldering the inner wire to the terminal block, the copper leads are very easy to solder, but the MCS 150 wire is a bit more tricky, as the wire will vaporizes if too much heat is applied. For some reason I always find the green insulation coated wire the most difficult to solder – photo 13!

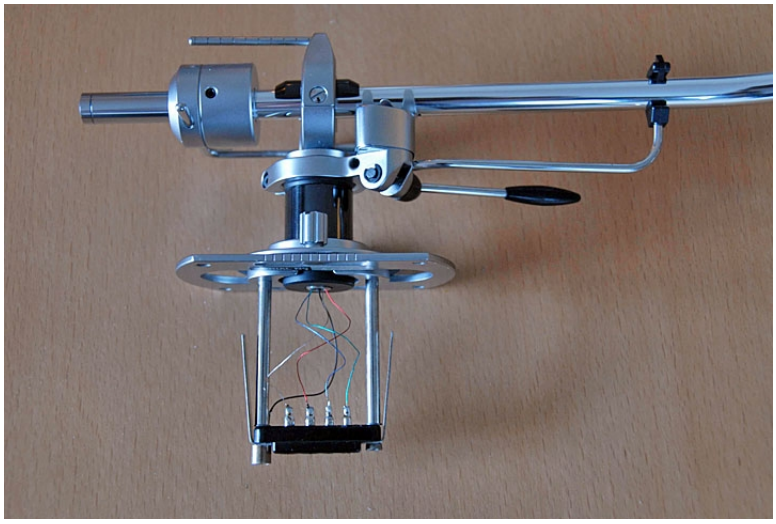

Photo 13 – Inner tonearm wire trimmed and soldered, old vertical terminal arrangement and terminal block retained.

Choice of Cartridge

The SME 3009 is a very suitable candidate for mating with a Denon DL103R cartridge, mounted in a heavy headshell (E.G. with a mass of 12-16g). This combination will outshine the sum of it's parts, and is capable of producing gob-smacking bass. The Denon cartridge further benefits if a 2mm spacer is added, this increases the distance from the stylus tip to the lower surface of the headshell from 15mm to a more typical value of 17mm. The spacer also has the effects of adding mass to the headshell, and lowering the centre of gravity of the tonearm.

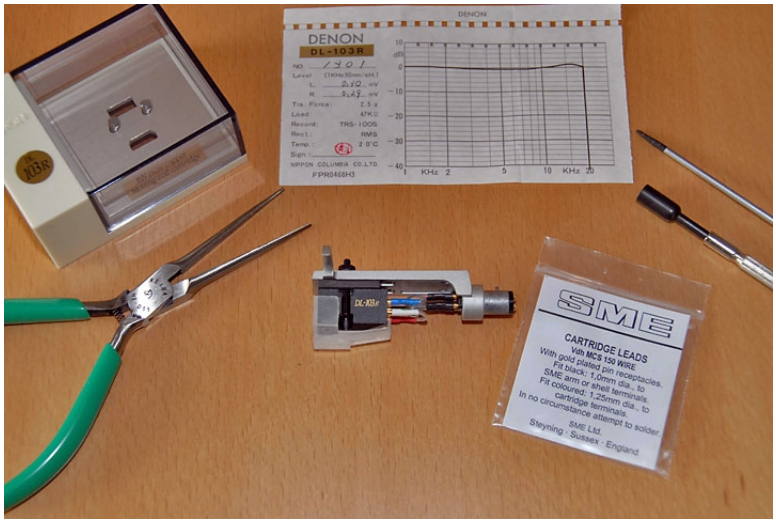

Photo 14 – Brand new Denon DL103R mounted in the headshell, with MCS 150 M headshell leads.

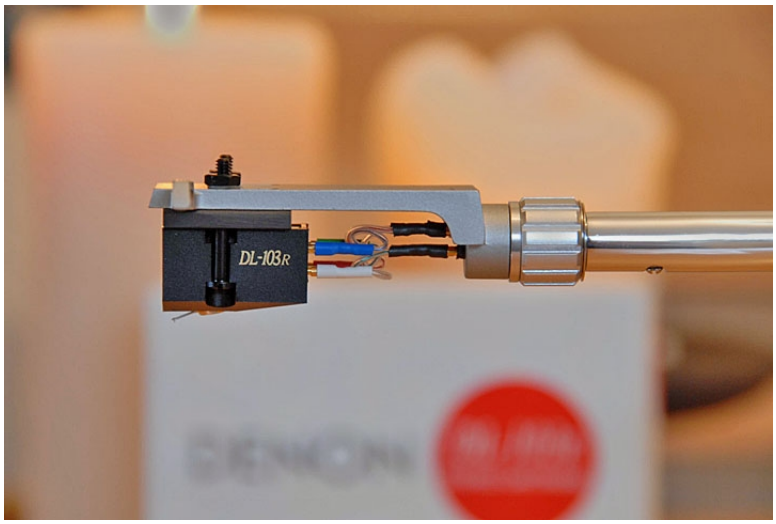

Photo 15 – Denon DL103R and headshell attached to the 3009 series II tonearm.

Final Checks – A Job Well Done!

Once the arm is re-assembled, it can be balanced (with or without a cartridge fitted), and the bearings tested for horizontal and vertical deflection. If the tonearm wire has not been pulled too tightly, or is not twisted excessively as it exits the tonearm tube, blowing lightly on the headshell should cause the arm to move easily to the left and to the right. Vertical deflection can be tested by dropping squares of paper on the headhsell. The weight of the paper can be determined from the paper type, e.g: one square centimeter of 80 gsm paper will have a weight of 8mg; a 5 x 5 mm square will have a weight of 2mg.

The finished article looks like it should: an audio classic and a piece of industrial art that has earned it's reputation through 40 years of endurance – photo 16!

Photo 16 – The finished product – just like how it was when Alastair Robertson-Aikman gave it his approval for packing and shipping all those years ago in the SME factory.

Footnotes:
** All prices are subject to a UK sales tax of 17.5%*

Next update, the SME 3009 series II, suitably partnered with a fully restored Garrard hammertone grease bearing 301.