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(A big thank you to Mr. Dave Clark!)

\$1000 Worth of Sound for \$100 (or less): Refurbishing a Vintage Turntable

by Ed Kobesky



Analog is a smarter bet than ever for audiophiles on a budget. Excellent turntables are available from Pro-Ject and Music Hall for around \$300, although that may still represent a big investment for those who want to experiment with analog before making a high-dollar commitment. Another low-cost possibility is to refurbish the classic turntable that is lying dormant in your attic or waiting for you in a neighbor's yard sale or on eBay. Dust it off and start playing records! Turntables from the 1970s and 80s can equal or exceed the sound quality offered by today's entry-level models. If properly set up, some may even approach the quality of \$1000 CD players!

Analog is the antithesis of digital—a tweeker's paradise. To me, buying new is no fun, and rolling up my sleeves is part of the pleasure. There's nothing more satisfying than turning a \$20 yard-sale find into a real music maker for a few dollars and some elbow grease. If that doesn't sound like your cup of soy milk, you can stop reading right here.

While it's impossible to cover the finer points of analog in a single article, I will attempt to guide you through the process of buying, refurbishing, and setting up a turntable for less than \$100. The first

part, shopping for a table, is the easiest. While eBay may offer the best selection, you'll probably pay top dollar because you will be competing with fetishists from around the world. Then there's the shipping issue. Unless a turntable is carefully disassembled and properly packed, there's little chance it will make the trip to your front door in one piece.



Your best bets are yard sales, thrift stores, even pawnshops. You'll probably find an assortment of plastic junk with plug-in, P-mount cartridges. These should generally be avoided, although a few linear-tracking models (in which the arm moves in a straight line across the record) are worth considering. The Technics SL-5 and SL-6 can be had for less than \$75 in good condition, and \$30-\$50 with minor cosmetic scars. Both

offer decent performance, and you can even use your own interconnects, a feature usually found only on today's finest turntables. If possible, check the condition of the cables and insure they are in good working order. Sometimes the ground wire is included, other times it is incorporated in the RCA's. Again, a quick check can save some headaches after. If your table has the means to use removable cables, ditch the freebie interconnects and consider something a bit better. There are many cables available both on-line and from dealers without breaking the bank.

Linear tracking isn't perfect, particularly when it's done on the cheap, and a pivoting arm is preferable. That said, if the bearings, contacts, and tracking mechanism of the linear arm are clean and well-lubricated, it's nearly impossible to damage your records, and they'll be preserved for the day when you can afford to step up to a higher-quality unit. (I used a linear-tracking table during the 1980s, and my records are in near mint condition.) When shopping for a linear-tracking model, be sure the arm moves smoothly across the record surface without dragging. Also, be sure that the automatic features work properly. Disassembling and servicing a linear-tracking turntable takes some know-how, so stay clear of any that aren't 100 percent operational.

If all is as it should be, the rest is simple. Setup involves only plugging in a new cartridge, setting the tracking force, and sitting back to listen. A wide range of both 1/2" & P-mount cartridges is available, starting at less than \$30. The Grado Black (approx. \$70.00) offers a full, rich sound, fleshing out the lightweight sonic signature of these turntables, but if your unit is in exceptional condition, it may be worth considering a high-output moving coil cartridge. Once you are this arena however, do your homework!

Bang & Olufsen turntables can be an excellent choice, especially those with pivoting arms, but only if you get a bargain. They are beautifully built, elegant-sounding, and setup is very simple thanks to B&O's proprietary plug-in cartridge system. The downside is, if yours has a worn or damaged cartridge, replacements are expensive and difficult to find.



That leads us to your best option—a traditional direct or belt-drive turntable from the late 70s or early 80s. Anything older is likely to be too worn for our purposes. Some companies (including Dual and Thorens) used unusual electronics and drive mechanisms that are prone to failure, though most turntables of that era were simple enough. Another plus is that these turntables were introduced as the compact disc was gaining a foothold, and often had only very light use. Many were even stored, unused, for years, and are simply waiting to be unearthed in like-new condition.

Depending upon whom you ask, direct-drive models are less desirable, with Denon and Technics models being notable exceptions. That said, excellent sound quality is attainable from direct-drive designs by companies like Sony, Onkyo, JVC, and others. Prices start at around \$30. Belt-drive tables like the ubiquitous Dual CS505 are safe choices, but factor in \$15 or so for a new belt (available on-line or your favorite audio shops). Most Dual turntables have suspensions, so be sure that the springs are still springy. A gentle tap of the plinth should produce a firm rebound, followed by a gentle bounce or two. (Insure that the traveling screws are spun back and not tight).

Your best bet for sound quality and ease of setup is a non-suspended belt-drive turntable. You'll pay less for less desirable nameplates, yet the sound quality may be very good. When shopping, the two most important factors are the condition of the platter bearing and the tonerarm bearings. Spin the platter with the belt removed. Its rotation should be silent, smooth, and steady, with no wobbles or rubbing noises. If it doesn't spin like a greased roulette wheel, look elsewhere. Next, grasp the tonearm by the headshell (where the cartridge is mounted) and give it a gentle tug horizontally and vertically. If there is any play in the bearings, the table is to be avoided. Most tonearm bearings should only be adjusted and lubricated by a professional. If you find an otherwise nice table with a hazy or scratched dustcover, don't be deterred—it can be polished.

If you've found a good turntable with a smoothly operating platter and arm, your next step is to give it a good cleaning. Remove the platter, dustcover, dustcover hinges, headshell, and counterweight (on the back end of the tonearm). Use a can of compressed air or a vacuum cleaner to remove any dust or dirt, then give the cabinet a good cleaning with Windex and some shop towels. If the base is genuine wood or wood veneer, a little oil or polish can restore it to good condition. Gently—and I mean gently—clean the arm, platter, and platter mat with Windex. Use dampened Q-Tips to get into any tight spaces.

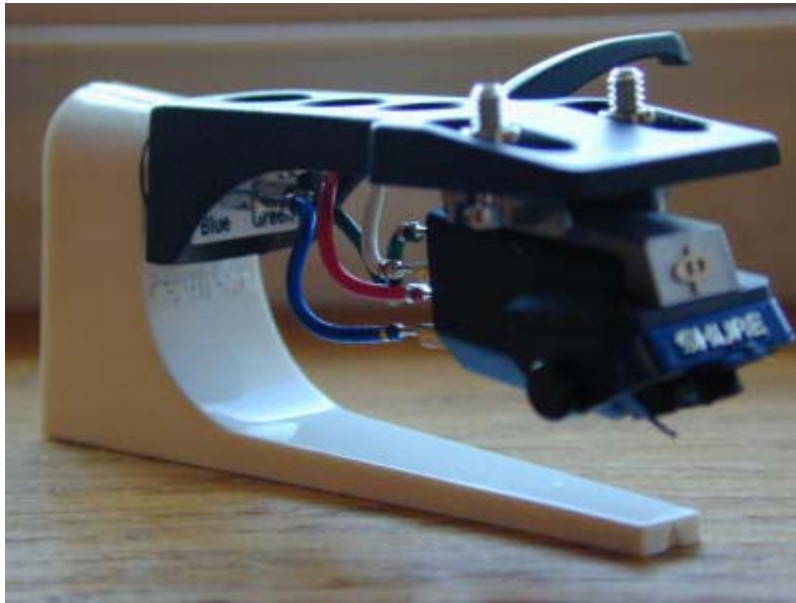
Next, use a good contact cleaner or metal polish to clean the RCA plugs and power cord. Brasso is cheap and works great. Most hardware stores carry it. You can also clean the contacts on the headshell, but I'd avoid cleaning the cartridge clips on the headshell wires. A new set is about \$5 and worth every penny. Finally, if the dustcover is scratched, you can polish it. Novus makes products designed for plastic windshields that work well. They're available at motorcycle and boat dealers nationwide. However, an application of automotive rubbing compound, followed by a buff with 3M OneStep Cleaner Wax, 3M Imperial Hand Glaze, or other non-abrasive product also works well, and you may already have those in your garage. If the dustcover is not scratched, give it a few shots of Windex and buff it with a soft cotton cloth or shop towel. (A really great tip is to use Pledge furniture polish. Not only does it do a great job on minor scratches but it also makes plastic shine!) It is a good idea to clean and lubricate the dustcover hinges before reinstalling them. A few shots of compressed air or a quick vacuum, followed by a drop of sewing machine oil, should have them working like new.

Before reinstalling the platter, change the bearing oil. Some bearings are sealed, so there's nothing you can do, but if, when you lift the platter, the spindle comes with it, use a long Q-Tip to get down into the shaft and absorb the old oil. Wipe any remaining oil from the spindle, and then add a drop or two of fresh sewing-machine oil or any good-quality synthetic motor oil. A little goes a long way, so don't go nuts. Reinsert the spindle and platter onto the shaft, but don't push down. Let the weight of the platter slowly displace the oil. After the spindle is fully inserted, remove it and check the oil level using the spindle as a dipstick. If the oil line indicates at least three-quarters full, you're done. If you overfilled, clean up any excess oil that was forced out of the housing and reinstall the platter.

Check the belt for cracking, dryness, or damage. If it looks bad, replace it. If that's out of the question, a brief soak in ArmorAll can temporarily revive a failing belt, but I don't recommend it. (For the extra few bucks a new belt costs it's better to simply bite the bullet and get one, and possibly a spare). Some new belts can be installed as is. Others need to be treated with talcum powder before they can be used. If you install the belt and find that it rides up or down on the pulley instead of in the center, put it in a bag with some talc. Give it a quick toss (like shake 'n' bake), remove any excess, and then reinstall it. (In some cases belts will turn to 'goo' over time. If this has happened remove all excess remnants and give the platter a good rubbing of steel wool {#000 / #0000} along the area where the belt will travel to remove any debris).

The next order of business is to install a cartridge. Even if your turntable came with one, it's a good idea to replace it, or at least replace the stylus. Like a car, a cartridge's suspension system deteriorates, affecting its function. Cartridge shopping is fairly easy today, and you will have many choices. Moving magnet cartridges work with nearly all Phono preamps, as do most high-output moving coils. Avoid low-output moving coils for now. You may also want to avoid any cartridges with a "fine line," "nude," or "hyper-elliptical" stylus. A conical or standard elliptical stylus is more forgiving of not-quite-perfect setups and not-quite-top-quality turntables.

If you're working with a turntable from the late 70s to early 80s, chances are it was designed for use with a high-compliance cartridge. Compliance refers to the "give" built into the cartridge's suspension. Mounting a high-compliance cartridge onto a high-mass tonearm is like throwing a load of cinder blocks into your Miata. Likewise, mounting a low-compliance cartridge onto a low-mass arm doesn't load the suspension enough to make it work effectively. Ortofon's OM ("Optimum Match") series of cartridges works with a wide range of arms. For other options, consult your dealer.



If the headshell or cartridge carrier is removable, remove it before mounting your new cartridge or installing a new stylus on your existing cartridge. Normally, the new cartridge will come with instructions. If it doesn't, you'll need a small screwdriver and pliers to attach the cartridge loosely to the headshell, using the screws and nuts that came with it. Protect the stylus at all times, or better yet, remove it. Use needle-nose pliers or tweezers to gently slide the headshell wires over the pins on the cartridge. Red goes to red, blue goes to blue, and so on. Again, be gentle, especially if your tonearm does not have a detachable headshell. If you strip a connector from one of the delicate tonearm wires, you'll need to solder on a new one. If you pull the wire out entirely, the game is over. The tonearm will need to be rewired professionally, at a cost far beyond our budget.



Aligning the cartridge is critical to getting the best sound and minimizing record wear. If your turntable came with an overhang gauge, you're in luck. Simply insert the headshell, keeping the cartridge firmly attached but still moveable. Then line up the stylus tip with the markings on the gauge. Usually, this is all that's required to achieve proper alignment. (Overhang and alignment are actually two different matters. Overhang refers to the position of the cartridge in the headshell relative to the platter spindle. Alignment refers to its side-to-side orientation. However, most overhang gauges handle both.)



If your turntable came with a paper protractor, follow the instructions provided. This usually involves placing the stylus onto a dot and aligning the cartridge sides so that they are parallel to a set of printed markings. If your cartridge does not have square sides, align the cantilever (the tiny metal shaft that holds the stylus) with the line underneath it. Paper alignment protractors are available free at various websites.

There's no way to achieve perfect alignment with a pivoting arm, so don't get obsessed with cartridge alignment. If you're dead on with your chosen gauge, be satisfied. There will be plenty of time to obsess over alignment if you buy a more expensive table and cartridge. Of course, you may be able to skip cartridge installation entirely if your dealer does it for you. If you're lucky enough to have such a dealer, stick with them—they're worthy of your business. They will also likely have plenty of great advice regarding the finer points of analog setup.

Once you have achieved proper alignment, snug down the cartridge bolts tightly, but not too tightly. You don't want the cartridge to move around, but you also don't want to crack or distort the cartridge body. Check the alignment again with your protractor to be sure you didn't accidentally move the cartridge while tightening it. One more thing—don't use a protractor together with an overhang gauge. You'll often find a conflict between the two. Use the one that came with your turntable. If that's not available, stick with the one you bought to replace it.

You're now ready to set the tracking force. Refer to your cartridge's owner's manual for the recommended or optimal tracking weight. Usually, a range of acceptable forces is given (1.0 grams to 1.5 grams, for example) with an optimal force (for instance, 1.25 grams) specified. A test record helps when it comes to determining the proper tracking force, but if you don't have one, set the tracking force at the highest specified value. It's usually better to track too heavily than too lightly, as this prevents the stylus from bouncing around in the groove and gouging the vinyl.



Set your table's anti-skating dial (usually a small round knob next to the arm) to 0. With the cartridge's stylus protector in place, move the arm between the armrest and the platter. Be sure the cueing lever is in the down position. Move the counterweight forward and back until the arm floats parallel with the platter. This is called zero balance. On most counterweights, you'll find a dial with a scale on it that twists independently of the counterweight. Set it to 0 without moving the counterweight, then turn the two together to apply the correct tracking force.



Some arms have no scale. In that case, you'll have to use a stylus pressure gauge (Ortofon, Rek-O-Kut, and Shure all make fine units for between \$10 and \$50) to set the tracking force. Even if your arm has a counterweight scale, they can be inaccurate, and it makes sense to use a stylus pressure gauge to double-check. Your dealer may let you borrow one, but I recommend splurging. It's cheap insurance against record wear. Now set the anti-skating knob to the same value as the tracking force. Anti-skating is necessary to counteract the inward pull generated by record rotation. This way, the stylus rides in the center of the record groove.

If your tonearm has provision for setting the arm height (vertical tracking angle), use it. If not, don't worry. Set the height—usually via a collar around the arm base—so that the arm is parallel to the platter's surface when the stylus is placed on an LP. Far less common is a provision for adjustment of azimuth, which is the vertical alignment of the stylus in the record groove. Any tilt to the cantilever may affect left/right channel balance. Adjust this so that the cantilever is perpendicular to the record

when viewed from the front. A small mirror is sometimes helpful.

Finally, if your turntable has a speed adjustment, use it. Direct-drive turntables often have a built-in strobe light that allows speed adjustment. If your table has no strobe, download the strobe disc at www.extremephono.com, print it out, and use it, along with a fluorescent light, to fine-tune the speed.

I found a really great site that offers not only downloadable strobe discs for 33.3/45 RPM 100/120Hz, but also a free downloadable cartridge alignment tool: <http://enjoythemusic.com/freestuff.htm>

You'll probably find that the default setting (a detent on the adjustment knob) is fine, but if the turntable's motor has gone out of spec, these adjustments will allow you to dial in the correct speed.

A word of warning about Thorens and other electronic tables—these models are often prone to malfunctions. The speed slowly drifts, altering the pitch of the music and making it warble. They are not repairable at a reasonable cost, and I strongly recommend that you do a speed check before buying one. You don't want to go through all of the steps described above only to find out that your turntable is toast.

Seasoned analog buffs will quibble with some of my suggestions. As you become more experienced, you will too. I've drawn some broad strokes here, and you'll need to supplement them with your own research and experimentation. The whole affair should have cost you around \$100:

Turntable: \$30-\$50

Cartridge or replacement stylus: \$20-\$40

Replacement belt (if necessary): \$10-\$20

Windex, Q-tips, paper towels, etc.: \$5-\$10

Sewing machine oil: \$2

Stylus force gauge: \$10-20

The LP is the original high-resolution source. Any well-designed turntable, even one that's far from exotic, can communicate the essence of music at a level that approaches \$1000 digital components. It takes some work to whip an old turntable into shape, but I think you'll find the sonic rewards worthwhile. You may even discover that the fun factor is off the charts, and the satisfaction of doing it yourself is a great payoff! Hit some yard sales, snap up a bunch of \$1 LPs, give them a good cleaning (ask your dealer about supplies), and get ready for some good listening. The vast majority of recordings originally issued on LP remain unavailable on CD. That, combined with the vinyl disc's inherent musicality, makes the turntable an essential component for any serious music lover.

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