Thorens TD 295 Mk III
Tune-up Info & Casual Review

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I purchased this table used. The price was right, probably because of some questionable modifications made by the previous owner. While returning the table to factory condition and giving it a tune-up, various questions arose that were not addressed in the manual or on the web. Hopefully this document will help others who work on this or similar tables. I also made some measurements and formed opinions on various aspects of the table, so I offer a casual review of it as well.

First, a summary of the table specifications from the manual, some extra measurements that may prove handy, and notes on the performance of this particular example as first acquired.

s/n	0003xx
Speed as received	0.58% fast
Motor pully diameter	0.847"
Sub-platter diameter	5.819"
Pulley ratio	0.1456 or 6.8701
Motor RPM	229 (approximate, measured with Strobotac)
Belt dimensions (measured)	0.156" wide, 0.031" thick, 20.2" inner circumference
Belt p/n from web	Z6800574
Alternate belt p/n from web	1407-220 (19.437")
Belt speed, installed	29.31 rpm (2.047 seconds/rev)
Top spindle diameter	0.2814"
Bottom spindle diameter	0.2814"
Bearing clearance	0.001"-0.002" (estimated)
Platter weight	2.3 kg (published)
Platter weight	2.37 kg (measured)
Pivot to spindle distance	209.0 mm (measured, revised)
Tone arm effective length	229 mm (published)
Overhang	18.8 mm (published)
Offset angle	25° (published)
Tone arm effective mass	8.5 g (published
Pickup range	4-8 g (published)
Cable capacitance	160 pf (published)
Mass of anti-skating weight	3.524 grams (includes small tube and monofilament)
Dimensions of weight	0.350" diameter by 0.318" long,
Monofilament diameter	0.005" (appears to be 2 lb. test, Stren or similar)
Auxillary weight (see text)	0.350" diameter by 0.050" long, 0.043" hole, brass, 0.6 g
Power	16VAC, 500mA (published)
Power (switch off)	1W, 90mA, 0.43 power factor (measured)
Power (switch on)	5.8W, 448mA, 0.55 power factor (measured)

History

Table was purchased on 7/28/2007. It included the manual and cartridge alignment gage, though I set it up with a Geodisc. The Geodisc agreed with the supplied paper gage, and allowed correct overhang adjustment at the inner limit of the slots. (Update- improved alignment with

custom calculated Baerwald gage and cartridge is no longer at the limit of the slots) The previous owner had installed very large brass feet with sharp points, probably the reason I got it for a good price. This was a bit nasty, as the feet removed any isolation from vibration and were screwed into the base with big 3/8" diameter lag screws. The base had been drilled at the original foot locations and it was still filled with particles and sawdust. Because the original foot locations were inset, and the brass feet were larger in diameter, the screws pulled up the MDF base material around the holes. There were also small adhesive damping disks stuck to various places on the tone arm, plus three large damping plates stuck to the bottom of the plinth.

Refurbishment

Repair was made by machining four brass disks, about 0.15" thick, with #8-32 holes form tapped in the center. The inset area of the base was cleaned up and leveled, then the brass disks were epoxied in place with JB Weld. The original rubber isolating feet were then installed with #8-32 cross point machine screws and washers- fortunately the prior owner and the dealer had the good sense to save them! The repair turned out functionally and cosmetically excellent.

The spindle bearing appeared to have been run with not quite enough lubricant for the upper part of the bearing, which showed slight wear marks. Or, it could just be normal wear. The spindle was re-polished with fine metallurgical polishing film, the bearing cleaned, and lubricated with Hoppe's gun and instrument oil. This is a clear oil with slightly greater viscosity than standard mineral sewing machine oil. It takes about 10 drops of oil in the bearing to correctly lubricate and damp the spindle. Bearing performance appeared excellent after this treatment.

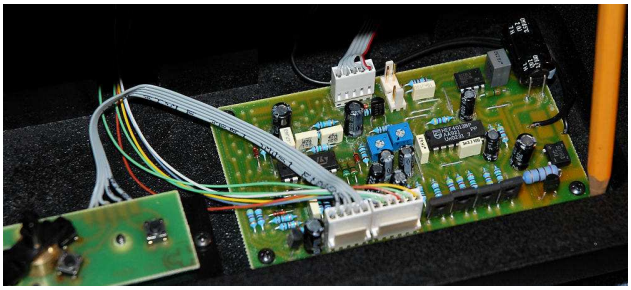
The small damping disks stuck to the tone arm were removed, but the larger plates on the bottom of the plinth were left alone as removal would likely pull away finish and material. They do no harm, but probably have little benefit. Naturally all sawdust and debris was removed from the internal areas.

Speed Adjustment

I'll say right off that I don't have a good feeling for how accurate speed needs to be, but a couple tenths of a percent seems like a good maximum to shoot for. The upper part of the table is basically a rectangular piece of highly finished MDF attached to the lower part with four large flat head machine screws. These are accessible under the sub-platter. To adjust the speed, the platter, belt, and sub-platter are removed, followed by the four screws. Because the tone arm wiring is attached at the rear, only the front of the top plate should be raised slightly to gain access to the motor control board. The speed selector knob must be pulled off, and the start/stop button will fall out in the process of raising the top. Be sure to tape or tie the tone arm to its rest and remove the plastic cover before beginning.

Support the top with a short stick, pen, pencil, or block of wood, then carefully reinstall the sub-platter, belt, and platter. They can operate at a slight angle briefly for the purpose of this adjustment. Place a strobe disk on the platter and start the table. Illuminate the strobe disk with a neon bulb or florescent lamp (not the high frequency types!). The motor control board has two small adjustment potentiometers near the center. The one on the right, closest to the tone arm, is the 33 1/3 rpm speed adjustment. Observe the strobe disk and adjust for as close to zero drift of the bars as possible. You'll need a very short adjuster. The adjustments turn easily so an ordinary toothpick shaved to a wedge will likely suffice. A strobe bar every few seconds is tolerable. The other adjustment is probably for 45 rpm, but I didn't adjust it as I don’t play 45s.

The view from the front looks like this. Note the two blue adjustment pots near the center:



While you're in there, check for ruptured and leaking capacitors. This table isn't really old enough to need replacements, and claims of improved performance by changing parts are mostly wishful thinking. I checked the operation over a wide voltage range and saw absolutely no difference in motor speed, stability, or anything else. Since the AC input is rectified to DC, line frequency stability should have no effect on performance either. I can only conclude that the circuit is well regulated, the parts have been chosen for low temperature coefficient, and that aftermarket speed stabilizers and regulators would have zero effect and be a waste of money.

The motor wires tend to come up out of their channel and be squashed on reassembly, so be sure to push them down or even put a piece of foam in the slot to hold them. If no other service is to be done, hold the start/stop button in place, lower the top and reinstall the four screws. Tighten them in a gentle cross pattern so all are snug, but don't over-tighten them. Match up the flats and reinstall the speed knob.

My Review

At this point the table is close to the way we would hope the factory shipped it. The platter bearing is very quiet and the speed is accurate.

The first thing you notice about this table is how nice it looks. The gloss black top is flawless, and the controls are minimalist but sufficient. The gloss black surface does show every speck of dust so you'll want to keep a soft brush or cloth close by. I'll now cover each subsystem individually.

Arm lift

The arm raising and lowering mechanism works well and has about the right amount of damping. The arm has a small curved plate that the lift mechanism acts on, and unfortunately this plate is slightly too short. When the arm is lifted at the end of a record, the contact is at the very tip of the plate. The arm thus can make a slightly jerky motion as it lifts. Worse, if the arm is moved over the label, the stylus can drop all the way to the label. As you'll see, this lack of attention to design details makes the difference between what is, and what could have been.

Cover

The clear plastic cover isn't quite as rigid as I'd like, but does its job. The small adhesive pads at the front of the cover tend to slide around or come off, so you should keep an eye on them to prevent marring the top of the table.

Platter, Bearing & mat

The platter is reasonably massive and well balanced. It runs true. Electrically, the platter is completely isolated, so there is no path for static charges to drain off. The spindle is polished steel, running in a bronze bearing. The end of the spindle has a radius, and does not use a separate ball. The lower part of the bearing wasn't disassembled, so the contact design isn't known. It is, however, extremely smooth and quiet. The seal is questionable, as the bearing will drip a bit of oil when the spindle is inserted. This isn't overflow, but appears to bleed from the lower threaded area under pressure. Not normally of concern. Factory issue is a felt mat. It does its job, but there are many opinions on what type of mat sounds best. I tried a scheme that floats the record on several small spots, without contacting the playing area. This sounded thin and

peculiar. I went back to the felt mat, and then finally settled on a particular type of shelf liner material.

Tonearm

The tone arm is a simple straight line design that appears to be made of aluminum. It's held in a conventional gimbal and uses a damped counterweight. The pivots appear to run in a white plastic or possibly jewel insert in each adjustment screw, and were adjusted just tight enough to provide a bit of damping to the vertical arm motion. See later notes on this. My first efforts with the Geodisc suggested that the arm is a couple mm too long. To get perfect overhang, the cartridge had to be mounted at the full rear-most position of the mounting holes, and another quarter mm would have been welcome. (Update- it's difficult to point the Geodisc at the pivot accurately. Using a custom calculated arc template, and a stylus with a cut away housing, a more accurate alignment was obtained with the cartridge better centered in the slots.)

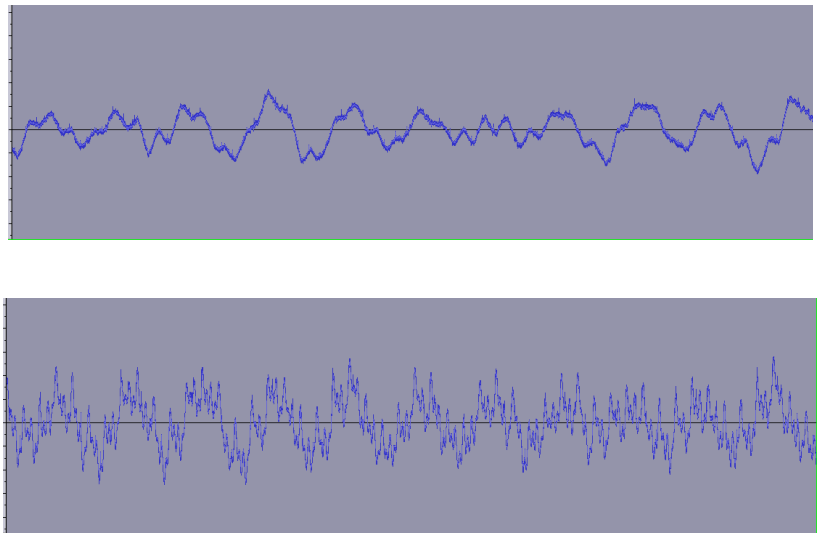
More importantly, the weight of an Ortofon OM30 (including it's small metal insert) is just a bit light. This means that the counterweight ends up quite close to the pivots, causing two problems. First, the arm can't be lifted more than a few mm, as the counterweight hits the turn-off flag that extends down into the base and shuts off the record when the inner grooves are reached. I worry that the tracking force might be altered if someone were heavy handed lifting the arm. Second, there is little clearance for the anti-skate mechanism's monofilament. Depending on how the support wire is adjusted, the monofilament tends to hit the counterweight when the arm is in the rest position, or it hits the inner gimbal when the inner grooves are approached. This is less serious than it sounds, but surprising on a table at this price point, and not something the user should have to fool with to get it right. The easiest solution to both problems is to add a very small amount of weight at the cartridge so the counterweight balances a bit further back. Simply using brass screws instead of aluminum might be sufficient. (Update- The gimbal is also at the bottom of its adjustment range with the Ortofon. Adding a 1/16" or so aluminum shim under the cartridge optimizes both the arm height range, and the mass problem. These shims are often supplied with new cartridges.)

Drive System & Isolation

The excellent performance of the bearing has already been mentioned. The 10-pole motor, like any synchronous/stepper motor, creates some cogging, but this appears to be made negligible by the elasticity of the belt, combined with the mass of the platter. At first, I saw what I thought was a slight speed variation, but this turned out to be an imperfectly centered strobe disk. After replacing my strobe disk, there was no detectable variation what-so-ever.

The rubber isolation feet do a good job of keeping room vibrations out of the table, though the resonant frequency is not as low as a fully suspended system. There is, however, a significant source of vibration already installed- the motor. Surprisingly (to me anyway), the motor is solidly mounted to the plinth. All the motor vibration is transmitted through the plinth, through the platter bearing, and right into the record. This is easily shown by removing the belt, setting the stylus on a record, and turning the motor on and off with the volume full up. The whine of the motor is audible through the record, especially with headphones. The level appears to exceed any noise and rumble contributed by the platter bearing, the thing people worry about most. I believe that motor noise should be well buried in the noise of the preamp, especially when it's at a limited number of easily audible frequencies. This is, in my opinion, a design flaw at the Engineering 101 level. At this price point, better motor isolation is expected. I tried some simple home remedies that involved mounting the motor with various compliant silicone washers, but with little success. Spectrum analysis showed that the energy could be shifted to different frequency modes, but not easily eliminated. Fixing this properly would almost certainly require re-machining the motor area of the plinth. So as not to paint too bleak a picture, the gain was extremely high; you likely won't hear the motor under normal listening conditions. Compared to the calibrated 0 dB levels on an STR-100 test disc, the motor noise is around -70dB. Here is a

screen capture of the preamp signal with the motor off, showing some hum, LF tone arm and foot resonance, followed by identical conditions with the motor on.



End of Record Shut-off

The idea of using an opto interrupter scheme to shut off the table is a good one. What needs to be included is an instruction on how to set the exact trip point. On this sample, some records shut off perfectly, others not at all. Probably an easy fix if the information were available. (Update- After adjusting the VTA, shut-off became far more reliable. It turns out that the gimbal assembly can also be rotated when the arm height set screws are loosened. If the motor fails to shut off, set the rest position of the arm closer to the right side of the table. If the motor shuts off too soon, set the rest position square or more to the left.)

Conclusion

Because vinyl is so much less popular than in it's heyday, I have mixed feelings about how to judge this table. It's a very serviceable table, and better than most of the mass market tables of a number of years ago. It gets an "A" for cosmetics. In pure performance terms, it does not, in my opinion, live up to its price point of about $1k. That opinion is, unfortunately, based on a time when production volumes of turntables were far higher, the economies of scale were greater, and a dollar went further. Still, the arrangement of the anti-skating mechanism needs to be a bit more polished and the non-isolated motor keeps it out of hi-end territory. The tonearm is good, but not exceptional. I believe it is built in the same factory as Pro-ject tables, and has various parts and design features in common with them, including a similar tone arm, though they can be had for one third the price. If a TD295 Mk III were available for a reasonable price (as this one was), it would be a fine table for the moderately serious user, but a dyed-in-the-wool audiophile with good mechanical skills might consider applying the same funds towards the refurbishment of an older Thorens floating design, or possibly saving up for one of the more exotic "boutique" tables.

Possible Upgrades

I had little success isolating the motor, but a more ambitious effort might yield results. If the mounting areas were machined out, compliant inserts could be installed (Sorbothane?), and the motor mounted to those. I don’t like modifications that can't be reversed, and in this case there is no way to know if the mod will be successful. Since some of my efforts had the result of converting a lot of distributed energy into a single high amplitude frequency, this should not be undertaken without an accelerometer and a spectrum analysis program on the pc.

There are various commercial and diy mat designs available, and some of them will likely be better than the factory felt. My DIY choice is Manco Easy Liner #25029, about 0.1" thick, which was unfortunately only available in taupe when I bought it. Black would be far nicer. It should be washed in soapy water, rinsed and dried before use. Never leave a record on it overnight, as marks have been reported. I also tried similar material with a slightly coarser texture, made for tool boxes and such, but the sound was inferior.

I believe some record surface noise is actually static discharge, not debris. While the plinth is apart, a ground wire with a small ring lug could be attached to one of the bearing attachment screws. A 1Mohm resistor should be placed in series with it. This should probably be brought out and attached to the preamp chassis, though an internal ground connection might be ok too. The electrical path to the platter is questionable, but there should be enough leakage through the bearing and through the spindle hole to get the job done.

I later adjusted the tonearm bearing. These screws are extremely tight, so you'll need a pin spanner with about 3mm spacing. Bad tools will almost certainly end up damaging the screw head and/or lead to some expensive-to-fix disaster. I'd suggest sacrificing a pair of medium nose electronic pliers and custom grinding the points to the correct shape and diameter. Adjusting the bearings for no significant friction and minimum play seemed to result in improved sound and better tracking. The combination of this adjustment and better cartridge alignment brought the sound quality to a very high level.

Though the manual makes no mention of it, the vertical tracking angle can be adjusted by raising and lowering the arm pivot assembly. There are two set screws just above the depressed cup that mounts the arm. The size is odd, as a 1.5mm (0.059") hex key slips, but a 1/16" (1.588mm) hex key is too large. I don't know if there's such a thing as a 1.55mm hex key, but the best solution is to gently file the short end of a 1/16" hex key until it fits. Do not adjust the VTA with the stylus on a record! The aim is for the tone arm to be exactly level with the record surface. Some advise further adjustment by ear. The sound will change as the VTA is changed by relatively small amounts, and some of those changes will appear to be improvements. My experience is that improvements in one aspect of the sound are invariably at the expense of some other area, and that one should stay quite close to the nominal parallel adjustment.

The tone arm appears similar to various others that are better documented. Though not guaranteed accurate, it appears that the wire support for the anti-skating monofilament should be located exactly 37mm rearward of a line drawn through the upper (center) tonearm bearing and the two mounting screws, and exactly 38mm left of a line drawn through the upper (center) tonearm bearing, 90 degrees to the first line. I wanted an anti-skate setting half way between the marks, so I fabricated a small brass disk that could be slipped over the monofilament, resting on top of the main anti-skate weight. I believe this gives a better setting for 1.5 g tracking forces with the monofilament in the first notch position. Dimensions for the auxiliary weight are in the specification table. (Update- I went back to the original 1st notch setting with no extra weight.)

The friction of the monofilament over the wire support is not negligible. The wire support is also a spring, with its own resonant frequency. Though I have no direct evidence of it, the possibility of some stick/slip and wire resonance coupling back to the arm concerned me. Dry lubricants such as Teflon and silicone were **not** beneficial, and actually raised the friction and tendency to stick/slip. I fabricated a small bushing from an extremely low friction engineering plastic (graphite and Teflon loaded PEEK), that could snap into the wire support. This successfully reduced the friction and seemed to improve the sound quality.

Don't even think of installing spiked feet! There is simply no good reason to do so, and plenty of sound engineering reasons not to. Actually, they might be beneficial if you already have a heavy mass properly suspended, to set the table on, but spikes are only a part of properly engineered

support system. Note that the repair described above allows spiked or normal feet to be interchanged at will, with no damage to the turntable.

Since writing template generator software I've been experimenting with alignment. The jury isn't in, but you can't go far wrong with Löfgren A (a.k.a. Baerwald) and standard DIN groove settings. Löfgren B also works well, and it probably comes down to how sensitive one is to inner groove distortion vs. the rest of the LP. With my Ortofon OM30, Löfgren B puts the cartridge right at the forward limit of the slots.

Spindle lubrication- this isn't the mysterious black art it's sometimes made out to be, and exotic lubricants don't contribute much. The Hoppes gun oil referred to above works very well. Modern synthetic oils do offer improved protection in terms of film strength if you're willing to pay the price. I've used 5-20 Castrol Syntec with good results, though it's about $8/quart and you're only going to use ten drops.