

HELPFUL HINTS ABOUT AMPEX 300 RECORDER TRANSPORTS (APPLIES TO 300 MONO, 300-3 AND 300-4)

Copyright 2013 by David Dintenfass, Full-Track Productions, Seattle, Washington

www.fulltrackproductions.com

Rev 1 / 6 June 2013

Disclaimer: the following information is based on personal experience and is technically accurate to the best of my knowledge. Full-Track Productions and/or the author are not liable for any damages caused by use/misuse of this document.

Oiling the capstan

- 1) Remove the capstan cover (there is a set screw on the side of the cover).
- 2) Remove the hex screw to expose the large oil hole (the small hole is just a vent to allow the oil to go into the oil reservoir). If necessary, heat the top of the bearing with a heat gun (or pencil torch) to loosen the hex screw. Use medium turbine oil (ISO 46).
- 3) Note that there is no other place to oil the capstan bearing. If it is still noisy, you need to replace the lower capstan bearing.

A few words about pinch rollers

- Clean with ethyl alcohol and occasionally with a rubber cleaner/renewer (such as *Fedron*).
- If you have a VIF or ElectroSound aftermarket type, these use ball-bearing assemblies and are not oiled.
- The original Ampex type has a dust cap that you have to pry off. Then you oil the felt with medium turbine oil. Clean the bearing surfaces first if necessary (carefully note placement and number of shims).

Capstan assembly overview

The lower capstan bearing is a standard ball-bearing. However, replacing it is difficult. First you need to remove the entire capstan assembly (see below). Once that is done, you can CAREFULLY press out the large roll pin (using a No. 4 Mayhew roll pin punch and small ball-peen hammer, no larger than a 4 oz hammer). NOTE ORIENTATION and mark it with a paint pen or scratch a mark with a carbide scribe. OTHERWISE the roll pin will jam if you rotate the flywheel 180 degrees relative to the capstan shaft when you try to re-install the pin.

You will need to wipe clean and then heat the flywheel to remove it once the roll pin is out. This is difficult as the fit is very tight. You may need to fabricate a puller. NOTE location of any shims.

Once the flywheel is off the capstan shaft, you can remove the retaining clip and then heat the aluminum housing to allow the capstan shaft (with the attached ball bearing assy) to slide out. Use EXTERME CAUTION as things are easily damaged here. Replace the ball bearing and re-install in reverse order.

None of this is for the inexperienced. Many 300 bearing assemblies have sustained damage from previous repair attempts and I have run into quite a few that were damaged beyond repair. And we are not even DISCUSSING the rubber tire condition (another problem) as the tire must be soft (50 durometer), consistently soft all the way around, with no dents, and of the correct diameter or the machine will never run at the correct speed.

You can see why the direct-drive Ampexes (such as the 350/351/AG-350/AG-440) have held up so much better over the years. Keep in mind that the amount of labor involved to restore a 300 transport can be staggering.

Understanding the indirect capstan drive

The Ampex 300 (including mono 300s and 300-3 and 300-4 multi-track recorders) and other Ampex machines that used similar transports (307 instrumentation machines and 3200/3300 high-speed duplicators) used an indirect drive capstan system. The capstan motor (normally a 1800/3600 rpm synchronous motor, usually fitted with a one-inch diameter pulley) is mounted on a spring-loaded swinging assembly that is pulled into the capstan flywheel (which has a rubber tire on its outside surface) by a solenoid when the machine is in record or play mode.

When the machine is not in record or play mode, the motor is held away from the flywheel by spring tension. There is usually a steel clip that can be manually engaged to keep the motor bracket from swinging when the machine is moved or shipped; otherwise the rubber tire will be damaged.

Keep in mind that rebuilding an indirect-drive Ampex transport is an order of magnitude more difficult (and expensive) than a direct drive transport such as a 350/351/354/AG-350/AG-440. It begins to approach the difficulties of restoring an old automobile.

Ampex 300 transports re almost NEVER turn-key situations. Plan to spend hours reading up on things, doing more research, and then spending money until all is good. The transports are also very heavy, easily damaged, and not intuitive to service. And very early ones are nearly insanely difficult to service due to non-user-removable capstan assemblies.

If you have an Ampex transport with an indirect capstan drive (such as a 300 or 300-3/300-4), you will ABSOLUTELY need to have new flywheel rubber installed. The flywheel rubber absolutely has to be soft and of a correct size or you will never get the machine to run on-speed AND you run the risk of overheating the motor.

The flywheel rubber should be around 48 to 50 durometer (a measure of hardness) and exactly 5.975 inches in diameter. Only very few vendors are qualified to do this sort of work. Contact Full-Track Productions for more information.

No matter how clean, old flywheel tires dry out and shrink and the machine will never run on speed. The exact diameter is important because you need to adjust the dig to deform the rubber a certain amount to find the sweet spot (done by eyeballing a strobe sticker on the capstan shaft, which is removed after adjustment). There is a scan of such a sticker on the recordist.com web site; copy and glue it to a paper disc, punch a hole in the middle, then affix to the capstan shaft using a screw (there is a threaded hole in the capstan to accommodate a sleeve).

By the way, the use of a capstan sleeve is generally not a good idea as they usually aren't accurate enough for minimal flutter. The stock 1800/3600 capstan motor with a one-inch pulley will pull tape at 7.5/15 ips on an Ampex 300 transport. Duplicator machines used a two-inch pulley on the motor for a base speed pair of 15/30. Not all Ampex 300 transports can accommodate a motor with a two-inch pulley due to the geometry of the motor bracket.

Notes on capstan assembly removal

Before you can remove any of the capstan assemblies, you need to loosen the three large socket-head bolts that hold the motor swing assembly to the underside of the “banjo” casting (the large cast piece that is held to the underside of the Ampex 300 transports). Remove two of the bolts but leave one in place to swing the entire motor-bracket assembly to permit removal of the capstan. It is best to remove the capstan motor—make a note of the wire orientation.

On "newer" Ampex 300s (and most/all 3200 duplicators), there is an aluminum retainer ring on the underside of the transport. To remove this, put a hex wrench through one of the two holes in the capstan flywheel. **HOLD THE CAPSTAN ASSY** as it will drop out after you remove the three screws. It is heavy so be careful.

On older Ampex 300s (those made before approximately 1956, though some older machines were retrofitted with newer capstan assys), **THERE IS NO RETAINER RING** (as described above). To remove the capstan assembly, you need to release the "circlip" retaining ring that fits into a groove on the outside of the aluminum capstan assembly near the top. However, to get to this clip, you need to remove the stainless transport skin or you need to "drop the banjo" (the rigid subchassis that was used the 300/3200 transports to tie together the reel idler, headstack, and capstan assembly). Neither way is pleasant/easy/fast/smooth/fun. You can remove the banjo by cutting screw slots in the retaining screws and hold a screwdriver in there while turning the outside nut with a wrench. This may also involve removing the motor solenoid bracket and other goodies.

Alternatively, you can **CAREFULLY** press out the roll pin that holds in the pinch-wheel arm and start removing everything else that keeps the skin held to the transport.

Working on the capstan of an older 300 is such a pain that I would avoid older transports for just this reason. Look at the flywheel first thing... if it doesn't have two holes, my advice is to **WALK AWAY**.

###