FULL-TRACK PRODUCTIONS
professional products division

SERVICE BULLETIN

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Bulletin	Servicing Beau Industries capstan motors
Models	Ampex 350, 351, 354, AG-350 (Beau motors do not fit Ampex AG-440 recorders)
Date	19 Oct 2021
Revision	2
Total pages	3

Introduction

Beau Industries capstan motors were common retrofits for Ampex transports at radio stations. The most common model operated at 300/600 rpm but there were other speed combinations (including three-speed models). These motors often had different mounting collars: Scully (three threaded holes), Ampex (four threaded holes), and a universal flange for Ampex or Scully (seven threaded holes).

The two-speed Beau models were usually 3.75/7.5 ips. This was the only practical way to get a 35x transport to run at 3.75 ips (the motors are too wide to fit into a 440 transport) since the 300 rpm low speed permitted a normal-sized capstan shaft—in contrast, the Ampex 3.75/7.5 ips motors (typically Bodine or Ashland versions) had very thin capstan shafts which were not only extremely fragile but did not pull tape very well (resulting in excessive flutter).

The three-speed Beau motors were made in seven-lead (non-reversible) and eight-lead versions (reversible).

The eight-lead models do not easily retrofit to the Ampex control box since the lead assignment requires more complex switching to move the motor-run capacitor to the correct lead.

Required Parts

To replace the bearings, you will need the following parts:

- R6ZZ bearings (two)
- R6 pusher tool (see below) to fit the **outside** race of the bearing.

Pusher tools

Unlike traditional motors (where the bearings are first fitted to the motor shaft), the Beau motor is an inside-out (outside rotor) design. This means that the *motor bearings are installed into the motor housing first* and then the motor shaft is slid into the already-installed bearings.

The R6ZZ is a standard double-shielded precision ball-bearing with a 7/8-inch (0.8750) outside diameter. You can make a pusher tool from a piece of pipe with a smooth outer-diameter that is slightly smaller than 0.8750” but not too much smaller (you don’t want to press on the bearing’s dust shield).

You can also make a pusher tool from one of the old bearings. Carefully pry off the dust shields, remove the balls, the ball cage, and the inner race; this leaves only the outside "ring" of the old bearing. Use the ring to press home the new bearing—the avoids any accidental pressure on the inner race.

Procedure

Note that the following procedures assume familiarity with motor repair and require mechanical dexterity and access to appropriate tools. Do not undertake the following procedures if you are unqualified to do so.

1) Remove the nut on the rear of the capstan shaft (don't remove the flywheel yet).
2) With a plastic mallet, GENTLY tap the rear of the capstan shaft. The dust shield on the front of the capstan shaft should pop out (nudged by the retaining clip on the front of the capstan shaft). Set aside the dust shield. Sometimes you need to use a heat-gun to warm the cast flywheel.
3) At this point, you should be able to press out the capstan shaft by hand. Wipe it clean and set aside.
4) Remove the flywheel. Be very careful to remove the special aluminum spacer and wavy washers that go between the rear bearing and the flywheel. Also, the motor windings are now exposed and **EXTREMELY** vulnerable. Be careful here.
5) Remove the old bearings. Using the largest flat-bladed screwdriver (or nut-driver) that will clear the inside hole of the bearings, GENTLY tap the inside surface of the bearing opposite the one facing you. The idea here is to push out one of the bearing assemblies (it doesn't matter which one). Tap gently using the screwdriver only—don't use a hammer—and tap different points around the bearing to drive the bearing out straight. If it doesn't seem to work, put the screwdriver in from the other bearing and try driving out the other bearing. Warning—this destroys the old bearings, so don't reuse them. Note that it is often necessary to heat the aluminum bearing tube with a heat-gun first so that the bearings will pop out more easily.
6) After removing one bearing, press out the remaining bearing using a very large nut-driver or wooden stick. Tap gently.
7) Wipe the inner and outer bearing races with a lint-free cloth to remove any debris. Then carefully press the bearings into the motor housing. Typically, only hand-pressure is required (be press on the outer race only). At this point, the bearing isn't quite home. Again, you may want to use a heat-gun to expand the bearing tube slightly to allow easier bearing insertion.
8) Repeat the previous step for the other bearing.
9) Carefully wipe the capstan shaft to ensure it is clean. Then slide the shaft into the motor (the threaded end goes first, inserted into the upper bearing). With some bearings, the shaft will slide into the inner bearing races without any difficulty—with other bearings, this may be more difficult. Do not force the shaft; if it binds, make sure all surfaces are clean. It may help to lubricate the shaft with a very small amount of thin oil (such as penetrating oil).
10) Reinstall the aluminum spacer and wavy washers over the bottom bearing. **Make sure the spacer is reinstalled with the "ridged" side inward**, facing the bearing—this is important to ensure that only the inner bearing race contacts the spacer (which is what actually couples the flywheel to the capstan shaft).
11) Carefully reinstall the flywheel. Make sure you don't dislodge the wavy washer.
12) Reinstall the nut and tighten moderately (on some motors, you may have to grab the top of the capstan shaft with your hand while tightening). Don't overdo it.

    What happens here is that the inner race of the top bearing is loaded by the spring clip (near the top end of the capstan shaft) and the inner race of the lower bearing is loaded by the aluminum spacer. The bearing "preload" force needs to be tight enough to keep the inner races turning with the capstan shaft but not so heavy as to unduly load the bearings. *Some finesse is required.*

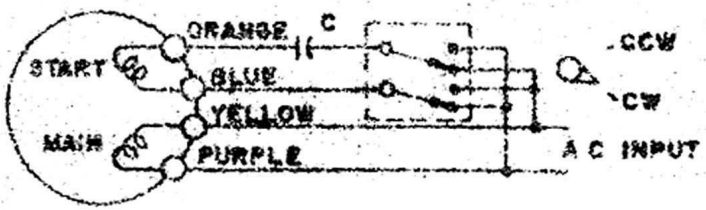
    In some cases, a service-removable adhesive may be required to secure the inner races to the capstan shaft. For example, you can use Loctite® 242 or other low-strength compounds (use the one specified for bearings; don't use a permanent thread-locking type). In most cases, this is not necessary as these motors have a threaded end at the flywheel side to permit secure loading on the inner races). If you use a locking compound, be sure to clean mating surfaces with alcohol or other mild solvent first.

WIRING DIAGRAM

BEAU MOTOR DIV., UMC ELECTRONICS CO.
NORTH HAVEN, CONNECTICUT

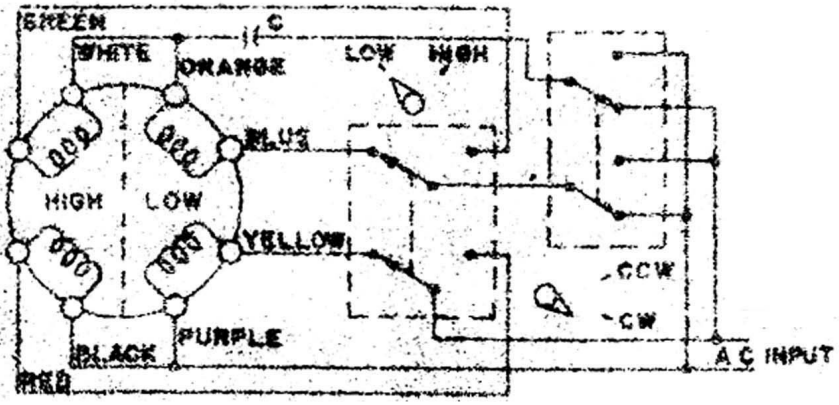
SINGLE SPEED - REVERSIBLE

ROTATION AS VIEWED FROM OUTPUT SHAFT



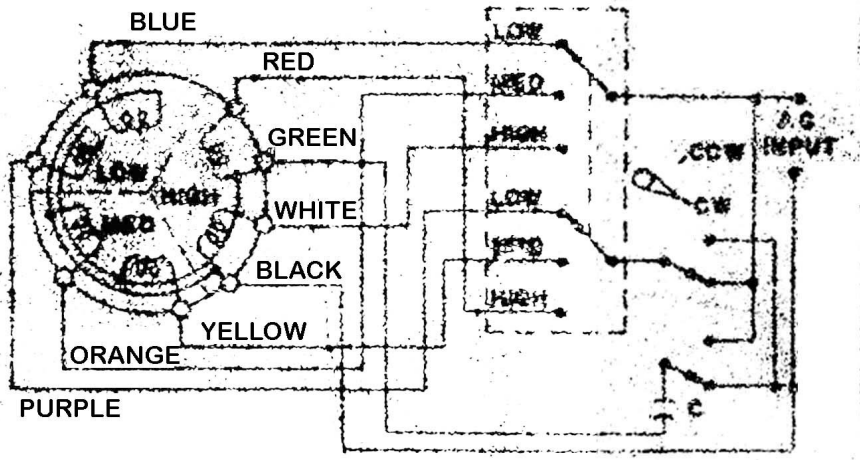
DUAL SPEED - REVERSIBLE

ROTATION AS VIEWED FROM OUTPUT SHAFT



3 SPEED - REVERSIBLE

ROTATION AS VIEWED FROM OUTPUT SHAFT



3 SPEED NOT REVERSIBLE

ROTATION C.W. AS VIEWED FROM OUTPUT SHAFT