

Bulletin	Summary of tension adjustments for Ampex recorders
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Overview

This is a brief summary of tension adjustments for various Ampex transports. The procedures shown here apply to the following recorders:

- *Adjusting takeup and supply tension:* for Ampex 350, 351, 354, AG-350
- *Adjusting three-spring reel-motor brakes:* for Ampex 351 (later versions), AG-350, AG-440*
- *Adjusting single-spring reel-motor brakes:* for Ampex 300, 350, 351 (earlier versions)
- *Adjusting capstan idler force:* for Ampex 300, 350, 351, 354, AG-350, AG-440

NOTE

While the adjustment procedures shown here are effective, they will not compensate for problems caused by deferred maintenance on your Ampex transport—this includes dirty or damaged tape-guidance components, worn reel-motor bearings, or improperly adjusted (or damaged) brake bands or dirty brake drums.

Disclaimer: Unless otherwise noted, the procedures in this bulletin were copied directly from the Ampex AG-350 manual (dated 1966 Jan) with the exception of the single-spring reel-motor brake procedure which was copied from the Ampex 351 TM1008 manual (dated 1959).

Required equipment

- Spring tension scales to measure 5–6.5 oz, 12–17 ounces, and 4.5–5.5 pounds (in most cases, a sensitive 0–16 ounce scale and a 0–15 pound scale are adequate)
- Waxed linen nylon, or polyester cord (ordinary string or twine can be used)
- Empty NAB reel (large hub size is required for accuracy; do not use a small plastic reel)
- 5/16-inch nutdriver or wrench
- 3/8-inch open-ended wrench and 3/8-inch nutdriver
- Long cross-point screwdriver (to access screws on three-spring brake assemblies)

Acknowledgments

Full-Track Productions would like to thank Jay McKnight (*Magnetic Reference Laboratory, Inc.* San Jose, California) for reviewing this bulletin.

* *Ampex introduced the three-spring brake assembly in 1960 to reduce damage to thinner tapes then coming into use. Many older machines were retrofitted with newer reel motors with three-spring brake assemblies.*

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Adjusting takeup and supply tension

Tape tension is measured indirectly by determining the takeup and supply reel motor torques in the play mode. These torques are adjusted by positioning sliders on resistors in the transport control box.

- 1) Apply power to the equipment and place an empty NAB reel on the supply turntable. Check that the REEL switch is to the right (toward the large circle).
- 2) Wind the length of cord or twine counter-clockwise on the hub of the empty reel, leaving the loop in the cord at the free end.
- 3) Use pressure sensitive tape or a rubber band to hold the takeup tension arm away from its rest position, so that it does not contact the safety switch.
- 4) Insert the hook on the appropriate spring scale (see Step 5) in the loop on the cord. Hold the scale stationary and press the play pushbutton. **To avoid damaging the spring scale, remove any slack in the cord before pressing play** (*this sentence added by Full-Track Productions*).
- 5) Still holding the scale stationary, tap lightly on the reel (to ensure a true reading) and note the scale indication. It should be between 5 and 6-1/2 ounces.
- 6) If the indication in Step 5 is incorrect, turn power off, remove the cover on the transport control box, and adjust the slider on resistor R505 (see Fig. 4-1) as applicable. Correcting a high reading requires that the slider short a lesser part of the resistor, correcting a low reading requires that more of the resistor be shorted. After adjustment, re-apply power and check the torque. Repeat as necessary to obtain the readings quoted.
- 7) To check proper adjustment, place the REEL SIZE switch to the left (toward the small circle) and recheck motor torque. The indication should be from 2-1/2 to 3-1/2 ounces (still on the NAB hub). If not, readjust the torque until it is within tolerances for both the large and small reel positions of the REEL switch.
- 8) Repeat the entire procedure at the takeup turntable. Note that the cord should be wrapped clockwise on the reel hub, and that adjustment is made at the slider of R503 (see Fig. 4-1). Scale INDICATION should be the same as for the rewind turntable.

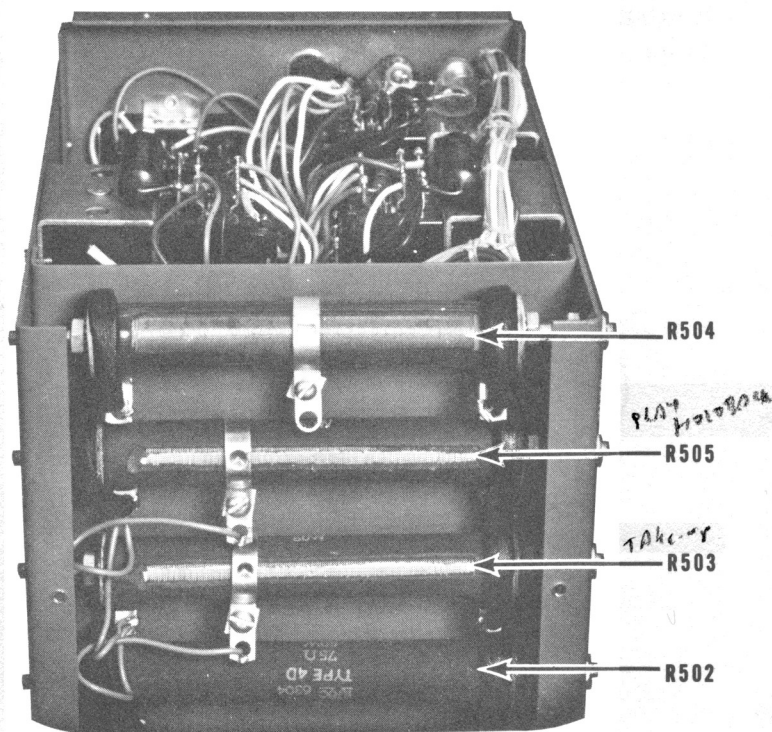


Fig. 4-1 Tape Tensioning Resistors

WARNING

Full line voltage is present in the control box when power is applied. **Do not make this adjustment with the power on.**

Adjusting three-spring reel-motor brakes

Brakes are adjusted with no power applied to the equipment. Since the braking force is different for each direction of rotation (to provide the brake differential) the force must be checked and adjusted for each direction.

- 1) Clean the brake drum and brake band with alcohol; you can remove the brake assembly to do this or slide a piece of stiff paper between the drum and the band (saturate the paper with alcohol after it is between the drum and band); repeat as needed. If the band has separated from its metal backing, carefully glue it with *Pliobond* cement and let it set up. (*This step added by Full-Track Productions.*)
- 2) Place an empty NAB reel on the supply turntable.
- 3) Wind the cord or twine counterclockwise on the reel hub, leaving the loop at the free end of the cord.
- 4) Insert the hook on the appropriate spring scale (see Step 4) through the loop at the end of the cord.
- 5) Being sure the cord does not touch either reel flange, pull on the scale to make the reel rotate counterclockwise. Take the reading with the scale in slow, steady motion. It should be from 12 to 17 ounces.

NOTE

The initial force required to start the reel in rotation will be excessively high. Do not take the reading until the reel is in slow, steady rotation.

- 6) If the indication in Step 5 is incorrect, adjust the "high" braking force with the two nuts indicated in Fig. 4-2. Run the nuts in to increasing braking force, out to decrease. Be sure both nuts are turned in and out an equal number of turns.
- 7) Wrap the cord on the supply reel in the clockwise direction and repeat Steps 4 and 5, using the appropriate scale. The indication should be 1/2 that obtained for the counterclockwise rotation (+2, -1 ounce). If necessary, adjust the "low" braking force at the point indicated in Fig. 4-2.
- 8) Repeat the entire procedure at the take-up turntable. Note that the high braking force acts when this reel is rotated clockwise. Indications should be within the same tolerances quoted for the supply brake.

Solenoid guide

NOTE

The brake band normally makes full contact with the brake drum when power is off or when the transport is not in motion.

However, the brake band will not fully contact the brake drum if the brake solenoid guide does not allow the solenoid to fully release—this causes abnormally low brake tension as the brake band does not make good contact with the drum.

Using the two screws that secure the guide to the side of the solenoid, adjust the guide to allow clearance so that the full force of the brake band is applied when the power is off.

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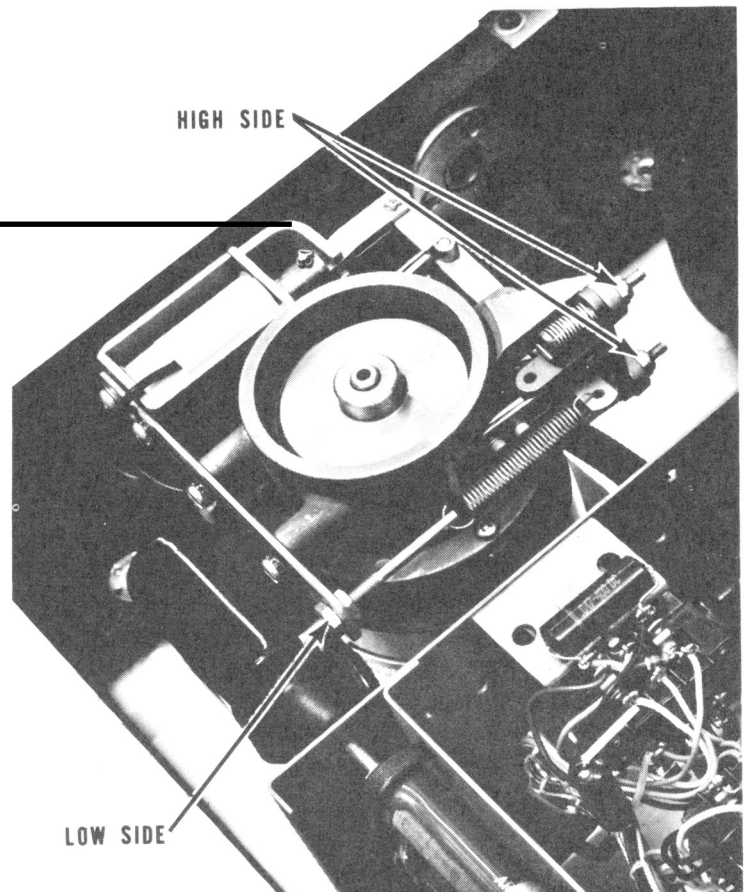


Fig. 4-2 Brake Adjustment Points

Adjusting single-spring reel-motor brakes

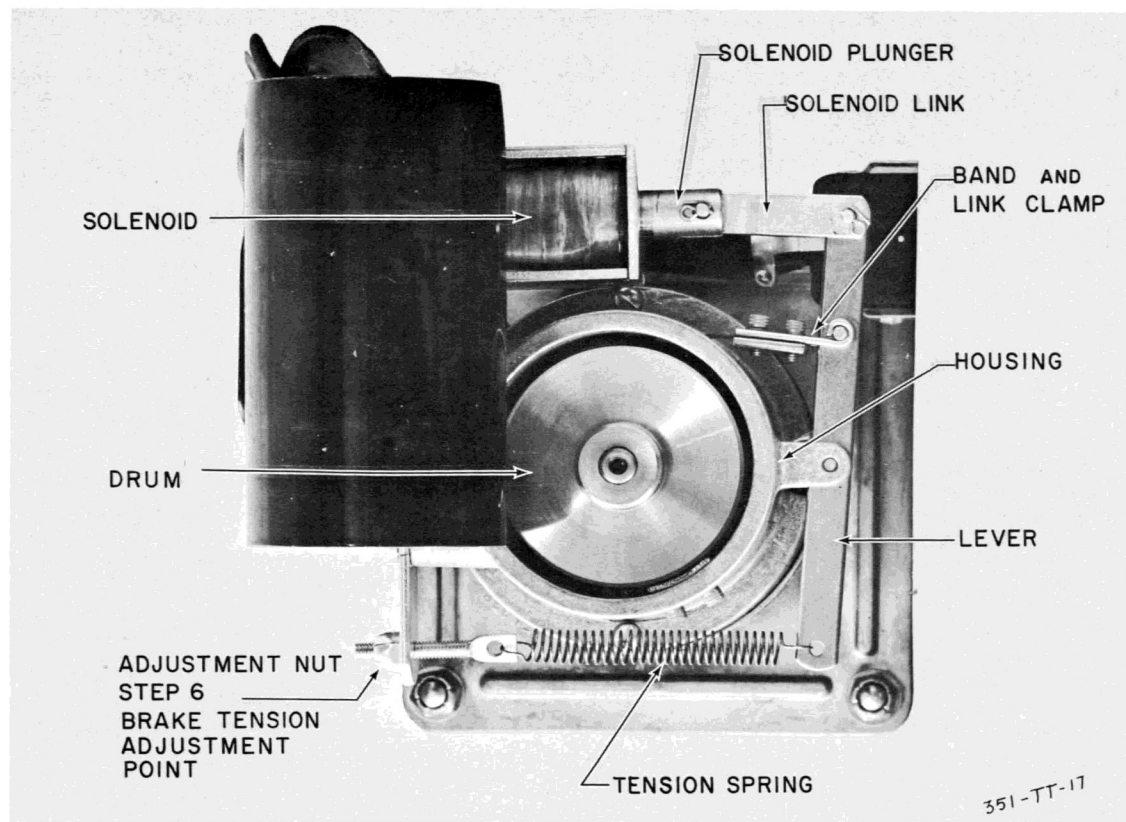
NOTE

Ampex introduced the three-spring brake assembly (along with a new brake-band formulation) in 1960 to reduce damage to thinner tapes then coming into use. Many older machines were retrofitted with newer reel motors with three-spring brake assemblies—in that case, use the three-spring brake procedure.

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Brake adjustment is made (with no power applied to the equipment) at the point shown in the illustration.

- 1) Clean the brake drum with alcohol; remove the brake assembly to do this. Single-spring brake assemblies were supplied with graphited felt brake-bands. You can re-lube by combining powdered graphite with a light solvent (such as Ronsonol lighter fluid) and shaking well before applying to the felt. (*This step added by Full-Track Productions.*)
- 2) Place an empty 10-1/2 inch NAB reel on the tape supply turntable
- 3) Make small loops at both ends of a thirty inch piece of nylon lacing twine.
- 4) Attach one loop to the tape anchor on the reel hub and the other to a 0–16 oz. spring scale.
- 5) Manually rotate the reel clockwise to wind several turns of twine onto the hub.
- 6) Pull the scale, making certain that the twine does not touch either flange of the reel. The turntable will rotate counterclockwise. Take a reading only when the turntable is in steady motion, because the force required to overcome the static friction will produce a false and excessively high initial reading.
- 7) Adjust the supply (rewind) motor brake for a scale reading of approximately 14 ounces (+3, –2 ounces).
- 8) Now wind the twine on the hub by rotating the reel counterclockwise; pull, and take a reading. The turntable will rotate clockwise. The reading should be approximately 7 (+2, –1) ounces (two-to-one brake differential).
- 9) Repeat the entire process on the take-up turntable. Again adjust for approximately 14 ounces when the table is rotating clockwise and approximately 7 ounces counterclockwise.

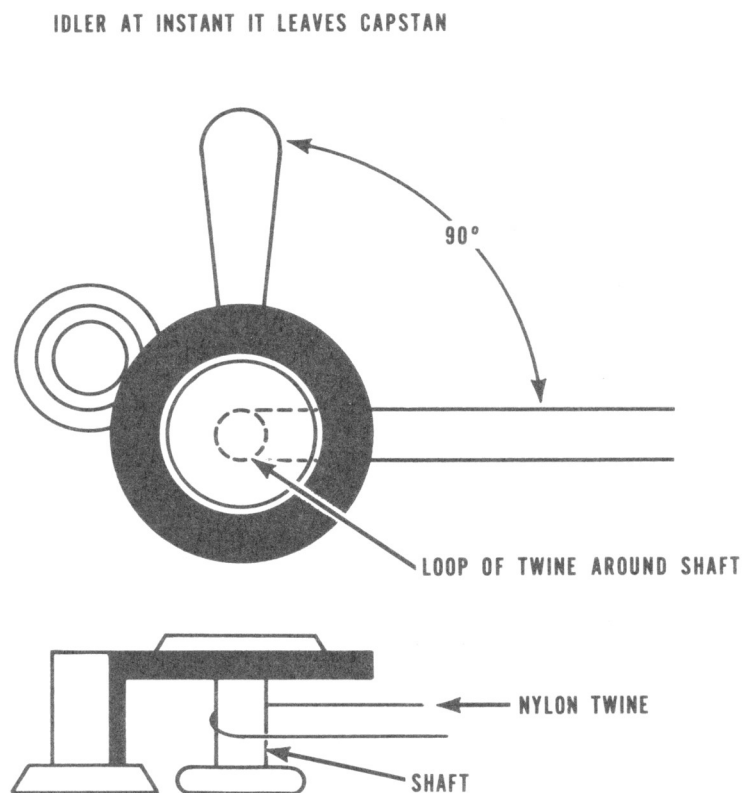


BRAKE TENSIONING ADJUSTMENT

Adjusting capstan idler force

The force of the capstan idler against the capstan is determined by a pressure spring on the capstan solenoid. It is adjusted by a lock nut on the capstan solenoid spade bolt. If the recorder is operated in areas where line voltage is low, read the discussion following the step-by-step procedure before making any adjustments.

- 1) Apply power to the equipment and use pressure sensitive tape or a rubber band to hold the takeup tension arm away from its rest position (so it does not contact the safety switch).
- 2) Tie the two ends of the cord or twine together, so that it forms a continuous loop. Place one end of the loop over the capstan idler and position it on the idler shaft (between the idler and arm, see Fig. 4-3).
- 3) Press the Play pushbutton. The idler will move to contact the capstan and both will rotate.
- 4) Insert the hook on the appropriate spring scale (see Step 5) through the loop of cord, and pull the cord taut at a 90° angle to the idler arm.
- 5) Pull on the scale and take the reading just as the idler loses contact with the capstan (the idler will stop rotating at that point). The scale indication should be 5 pounds ($\pm 1/2$ pound).
- 6) If the indication in Step 5 is incorrect, adjust the lock nut on the capstan solenoid as required to achieve a reading within tolerances. Running the nut in will increase pressure, out will decrease.
- 7) After the adjustment is completed, check that the solenoid will bottom (if not, the idler can be easily pushed away from the capstan). If the solenoid does not bottom, the lock-nut must be run out until bottoming is possible. The resistance of the solenoid will rise with its temperature during operation, and the voltage required to bottom the solenoid will be greater when it is hot. In areas where power line regulation is poor it is advisable to allow the equipment to operate continuously in the play mode for approximately 30 minutes before making any adjustments to the capstan solenoid. At the factory the solenoid is checked to assure it will bottom at line voltages of 90 volts (cold) and 105 volts (hot).



NOTE

Note that more than 5 pounds of pinch pressure on a transport pulling quarter-inch tape may cause excessive wear on the upper capstan-motor bearing.

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Fig. 4-3 *Measuring Capstan Idler Pressure*