

TAPE TRANSPORT MECHANISM

GENERAL

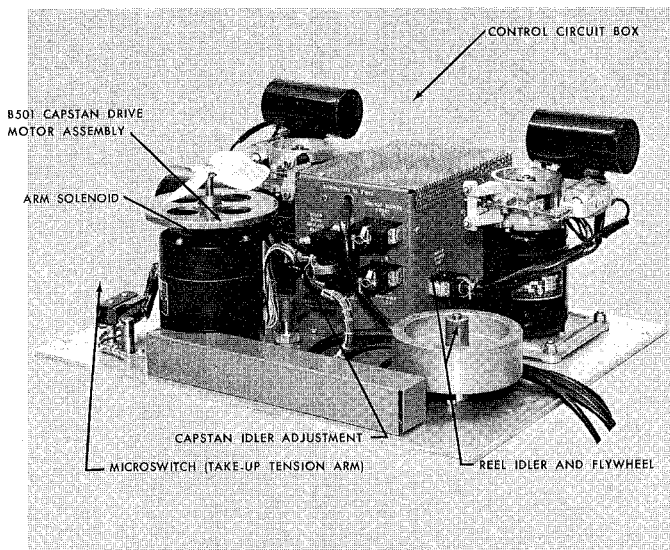
The tape transport mechanism provides tape motion for all modes of operation. Interaction of four basic assemblies and their associated components—the tape supply system, the tape take-up system, the tape drive system, and the control circuit—insures smooth, positive movement of the tape across the head assembly, and proper tape tension. All tape motion controls, a reel size selector, a safety microswitch and the head assembly are located on the tape transport.

TAPE SUPPLY AND TAKE-UP SYSTEMS

From the supply reel, on the left side of the tape transport as the operator faces the equipment, tape is delivered to the take-up reel when the PLAY or FAST FORWARD buttons are pressed, tape is rewound onto the supply reel when the REWIND button is pressed. Proper tape tensioning is maintained during all modes by means of two induction torque motors.

The reel idler assembly on the supply side of the tape transport is composed of a pulley, a spring-pivot-mounted arm and a flywheel for smoothing out transient speed variations in the supply turntable assembly.

On the take-up side of the tape transport, the tension arm assembly with a spring-pivot-mounted arm performs two main functions. The first function of this assembly is to provide a small tape storage loop which prevents tape breakage during the starting and stopping of tape motion. Secondly, this arm is used to stop



Component and assembly callouts

the machine if tension is lost due to tape breakage at the end of the tape or other failure. Near the base of the shaft on which the tension arm is mounted, a drive-lock pin actuates the safety switch (S501).

Both the tape supply and take-up assemblies are composed of induction torque motors (B503 supply-rewind, B502 take-up), a turntable mounted directly on each motor shaft, a brake housing assembly and a flange for mounting the entire assembly. Because the brake housings are mirror images of each other, these assemblies are not interchangeable although the motors are identical. The brakes are solenoid operated, remaining in the braking position until the brake solenoids K505 and K506 are energized at which time the brakes are released.

During all operating modes, the two induction torque motors B502 and B503 act as tensioning devices and in the fast forward and rewind modes the motors respond to the commands from either pushbutton by alternately operating each motor at maximum torque in the selected function.

The supply (rewind) and take-up induction torque motors are so connected that when power is applied with no tape threaded, the turntables, fixed to their shafts, will rotate in opposite directions. The tape supply turntable will rotate clockwise and the tape take-up turntable, counterclockwise.

Motor torque in the reproduce and record

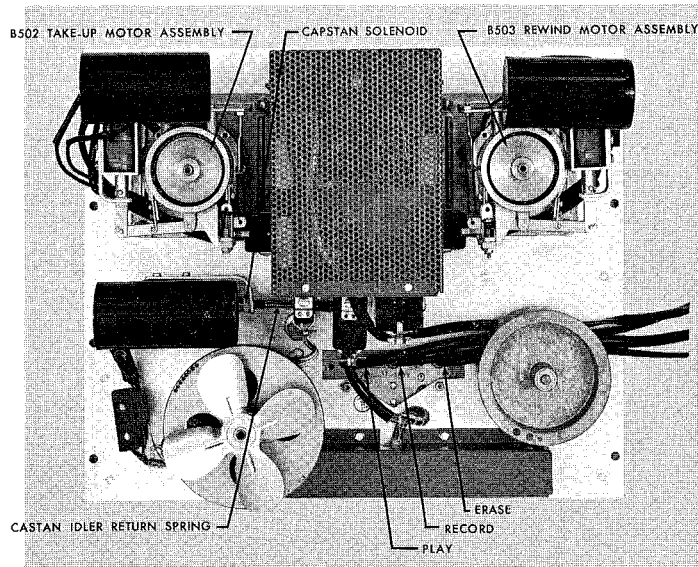
modes is adjusted to equality by the tensioning adjustment resistors (R503 TAKE-UP and R503 HOLDBACK) in series with each motor. In the fast forward mode, the torque of the supply (rewind) motor is reduced considerably by introduction of a series resistance (R504). In the rewind mode, R504 is in series with the take-up motor. Basic tape tensioning operation is shown in the illustrations.

In the fast forward mode, the take-up motor operates at full torque, the supply motor at reduced torque, and the tape is pulled from the tape supply reel. Because the torque of the tape supply turntable motor (rewind motor) is applied in the opposite direction to the turntable rotation, the tape is held under continuous tension as it is pulled from the reel.

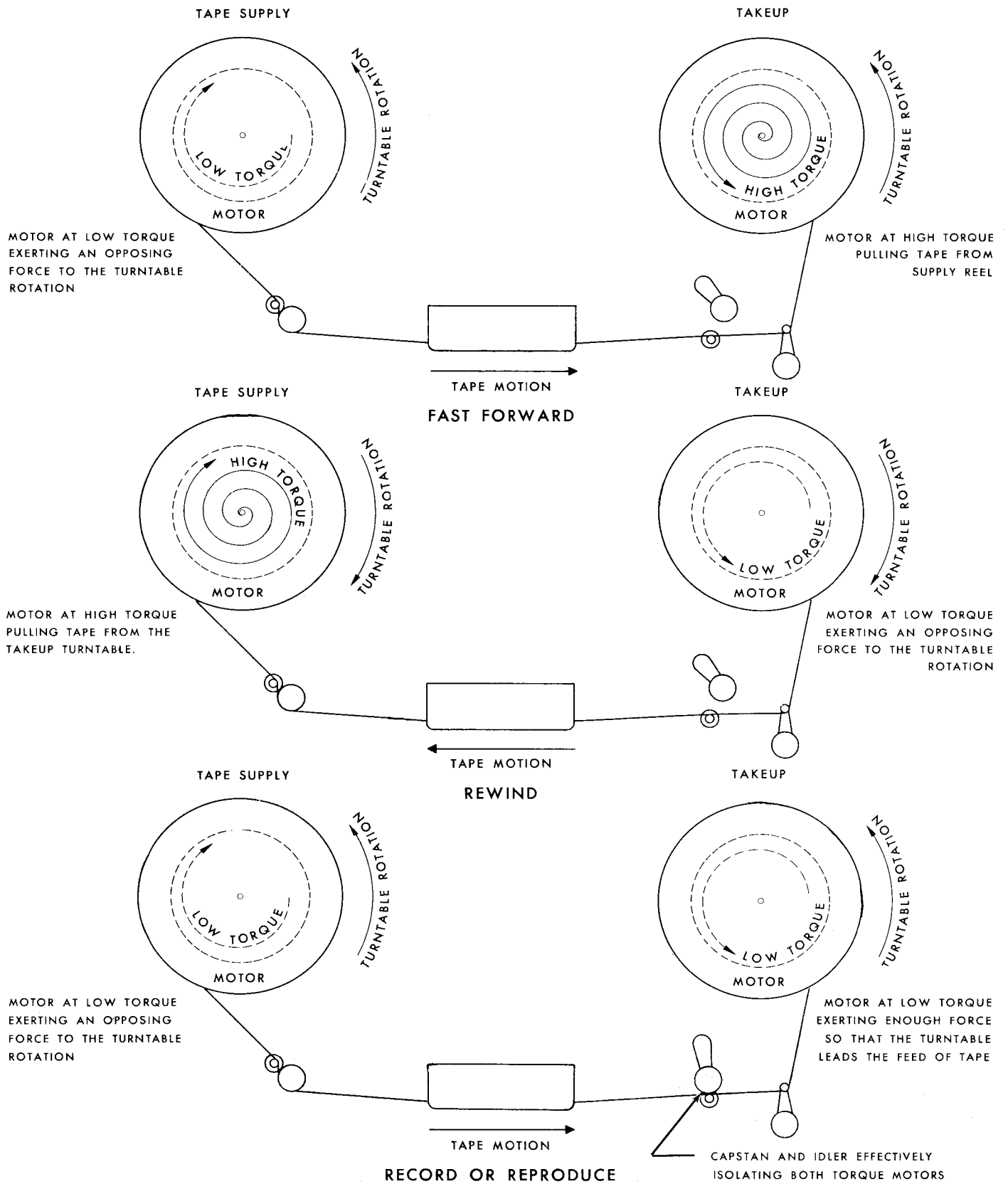
In the rewind mode, the supply motor operates at full torque and the take-up motor holds the tape under continuous tension by its opposite and reduced torque.

In the reproduce or record modes, both torque motors operate at the same value of reduced torque. The tape drive capstan and the capstan idler, between which the tape is clamped, then determines the tape speed, and the tensioning system supplies tape or takes it up as metered by the capstan drive.

From the point of view of the tape supply turntable, the capstan and idler action exerts sufficient pull on the tape to overcome the opposing torque of the supply motor, which constitutes the hold back tension. From the point



Component and assembly callouts



Tape tensioning

of view of the tape take-up turntable, the capstan and idler action is feeding the tape to it. The tape is held under tension here, because the take-up rate exceeds the feed rate (a tape loop will be thrown on the right side of the capstan whenever any malfunction causes the feed rate to exceed the take-up rate).

If a tape loop is thrown, or the tape breaks, the take-up tension arm will actuate the safety switch S501 and stop the equipment. The take-up tension arm is not a part of the tape tension system. Its function is to take up tape slack, especially when starting, and to operate the safety switch.

The reel idler assembly smooths out transients in the supply reel system. For example, when starting the tape in the reproduce mode, the momentary strain transmitted through the tape to the tape supply turntable when the capstan idler forces the tape against the capstan is considerable. Under some circumstances, this impulse tends to stretch or break the tape. A momentary decrease in holdback tension might be sufficient to start a transient oscillation in the tape tension system which would be reflected as a periodic variation in the distance of the tape from the heads. This variation might be of sufficient magnitude to appear as an undesirable fluctuation in the signal level at the start of recording or reproduction. The reel idler arm absorbs most of the starting strain, and prevents or minimizes this type of oscillation. The reel idler pulley and flywheel provide additional stability in the tape tension system, by smoothing out such transients as motor torque fluctuations and irregularities due to faulty tape wrap on the supply reel. This is accomplished because the high inertia of the reel idler pulley and flywheel effectively isolate the reel assembly from the heads.

TAPE DRIVE SYSTEM

The tape drive system is composed of the drive motor, the extended shaft of which forms the capstan, the capstan idler arm and idler, and the tape guides at the tape entrance and exit within the head assembly.

The purpose of the tape drive system is to transport the tape across the heads at a uniform speed during the record and reproduce processes. By means of a hysteresis synchron-

ous capstan drive motor (B501) and a capstan idler, the magnetic tape is driven at a constant speed after power has been applied to the equipment and the PLAY button is pressed. (The drive motor has two sets of windings to provide two tape speeds, either of which can be selected at TAPE SPEED toggle switch S503).

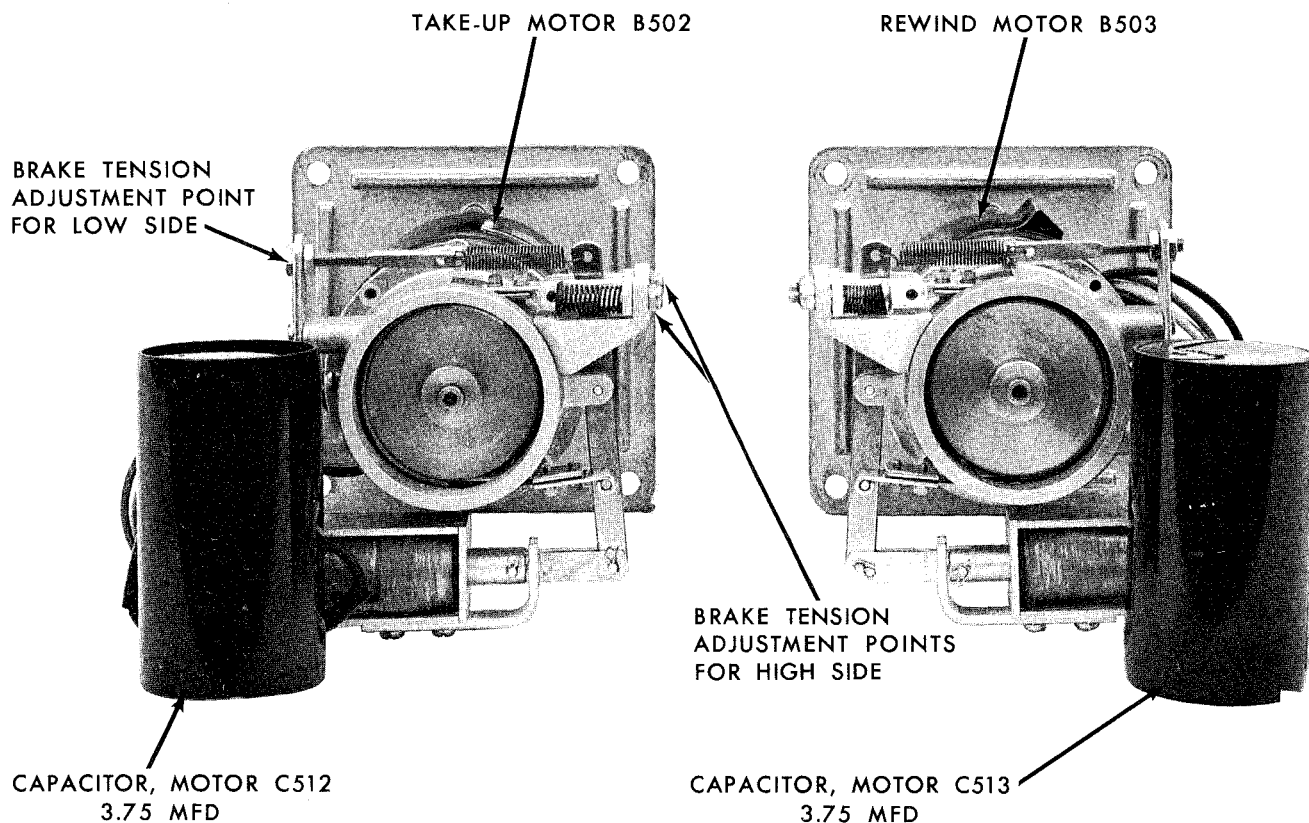
After the POWER switch at the electronic assembly has been placed in the ON position and the tape is threaded actuating the safety switch, the drive motor operates continuously, its capstan awaiting the PLAY command (the RECORD function is selected at the amplifier). When the PLAY button is pressed, the capstan solenoid (K501) and the brake solenoids (K505 and K506—releasing brake pressure) are energized. The capstan solenoid pulls the rubber tired capstan idler wheel, which is mounted on a swivel type arm, against the tape, causing the tape to make firm positive contact with the capstan. The tape is then driven at a constant speed across the head assembly.

BRAKE OPERATION

Smooth brake operation is extremely important in maintaining proper tape tension when stopping the tape. Because the holdback tension, supplied by the trailing turntable motor torque, is lost after the STOP button is pressed, maintenance of tape tension then becomes a function of brake operation. The braking force acting on the turntable from which the tape is being pulled (trailing turntable) in any of the modes of operation must exceed the braking force acting on the turntable taking up the tape (the leading turntable) to prevent tape loops forming.

One end of the brake band is fixed to the cross head by a roll pin and two socket head cap screws which is attached to the anchor mounted on the brake housing. The other end is linked to the brake lever by a drivelock pin and is free to move. When the brake solenoid is de-energized, the brake tension spring acting on the brake lever draws the brake band against the brake drum.

If the brake drum of the supply motor, as viewed from the brake housing end, is rotating clockwise when the brake band is applied, the frictional force will cause the band to wrap



Take-up and rewind motor assemblies

itself tightly around the brake drum as the brake lever end of the band moves to the right, increasing braking force. When the drum is rotating counterclockwise, the process is reversed, causing the band to tend to pull away from the drum, decreasing the braking force.

The ratio of the braking force in one direction to the braking force in the other — the brake differential — is approximately two to one on this equipment.

In all modes of operation, the greater braking force always acts on the trailing turntable, maintaining the proper tape tension as the system is stopped.

CONTROL CIRCUIT

(Refer to schematic diagram—Tape Transport Control Circuits)

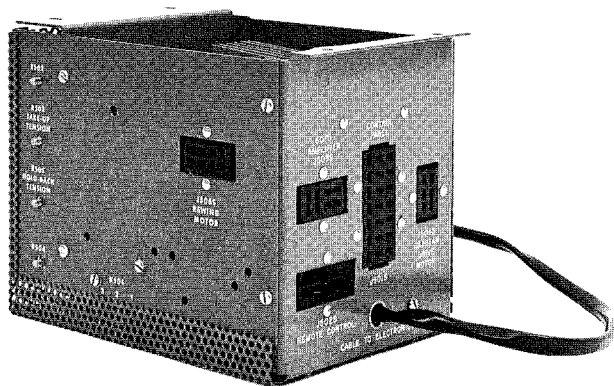
Located in the control circuit box underneath the tape transport are all relays, the tension adjustment resistors, and electronic components such as the capacitors and resistors shown in the foldout illustration, Tape Trans-

port Control Circuits, with the exception of the three motor starting capacitors, the capstan solenoid, the brake solenoids and the safety microswitch (which are mounted adjacent to the assemblies they serve).

On the outside of the control circuit box receptacles are available for cables from the drive motor, supply motor, take-up motor and control cluster. Female receptacles and plugs (cables not supplied) are also available for interconnecting the tape transport and accessory units such as remote control panels and a precision frequency source when furnished.

NOTE

The special connector jumper plugs supplied for receptacles J503S 60 CYCLE AMPLIFIER and J502S REMOTE CONTROL must be plugged into their receptacles when these accessory units are not used because jumpers in these plugs complete the necessary circuits in the system for proper operation.



Control circuit box

All functional control of the tape transport, with one exception, takes place at the control circuit switch assembly comprising four push-buttons: REWIND, FAST FORWARD, STOP and PLAY. Two toggle switches REEL SIZE and TAPE SPEED are mounted at either end of the control cluster. The exception is the RECORD function which is controlled at the amplifier. The safety switch (not an operating control) is mounted under the tape transport.

Play

When PLAY button S505 is pressed, play relay K502 is energized. Capstan solenoid K501 is energized through K502-1. Contact sets K502-1, K503-1, K504-3, and the normally closed STOP button S502 form a holding circuit. Power is connected to the turntable reel motors through contact K502-2. Through contact K502-3, D.C. voltage is applied to the brake solenoids K505 and K506. The reel motors are powered and the brakes are released simultaneously, causing the equipment to operate in the reproduce mode at the speed selected by TAPE SPEED SWITCH S503.

Rewind

When REWIND button S507 is pressed, rewind relay K504 is energized and held in this condition by relay contact sets K504-1, K503-3 and the normally closed STOP button S502. Contact set K504-2 connects the full a-c power directly to the rewind (supply) motor, and places R504 in the a-c circuit to the take-up motor. The rewind motor thus operates at full torque and the take-up motor at reduced torque, and tape is pulled at a maximum speed from

the take-up to the rewind reel. Contact set K504-3 completes the d-c circuit to the brake solenoids at each reel assembly, thus releasing the brakes.

Fast Forward

When FAST FORWARD button S506 is pressed, fast forward relay K503 is energized and held through contacts K503-1, K504-3 and the normally closed STOP button S502. Contact set K503-2 connects the full a-c power to the take-up motor, and places R504 in the circuit to the rewind motor. The take-up motor now operates at full torque and the rewind motor at reduced torque, causing the tape to be pulled at a maximum speed from the rewind to the take-up reel.

Stop

When the tape is moving in any mode and the STOP button (S502) is pressed, the brake solenoids and all relays are de-energized. The brakes are applied to both turntable motors. The capstan drive motor will continue to operate so long as the tape remains properly threaded.

NOTE

The record mode is not a tape motion control function, but it is interlocked and dependent on the PLAY button, which must be pressed before the record mode can be energized at the amplifier.

Safety Interlocks

When the tape is moving in either of the high speed modes (fast forward or rewind) it is impossible to switch to the play mode without first pushing the STOP button. In fast forward, contact K503-1 interlocks the play relay and capstan solenoid. In rewind, K504-3 is the interlock.

CAUTION

If the STOP and PLAY buttons are pressed in too rapid a sequence when the tape is in either fast winding mode, tape will almost invariably be broken or deformed. Always allow

time for the tape to stop completely when switching from either of the fast modes to play.

Reel Size Switch

Selection of proper holdback tension, depending on reel hub size, is made at the two position toggle switch labeled LARGE-SMALL. Holdback tension is not a constant in any mode of operation, varying directly as a function of the trailing turntable motor torque, and inversely as a function of the effective trailing reel hub diameter (hub meter includes the tape wound on the hub). For a given torque on the trailing motor, the holdback tension will increase as the effective hub diameter of the trailing reel decreases. Reducing the torque on the trailing turntable motor will decrease the holdback tension.

The holdback tension resistors for adjustment of take-up and rewind motor torques are factory-set for NAB 10½ inch reels. If the smaller (7 or 5 inch) EIA (formerly RETMA) reels are used, compensation for the overall increase in holdback tension must be made by placing the switch in the SMALL position. This places resistor R502 in series with the take-up and rewind motors, thus reducing the torque of both motors in any mode of operation when the EIA reels are used. If it is desired to accelerate faster in the rewind or fast forward modes, the switch may be placed in the LARGE position during these modes. The REEL SIZE switch is a SPST switch placed across the resistor R502. It is closed when the LARGE position for 10½ inch diameter NAB is selected; and open (resistor R502 in the torque motor circuits) when the SMALL position is selected.

NOTE

In the LARGE reel position both the rewind and take-up reels must be NAB type and in the SMALL reel position both reels must be EIA.

NOTE

The Catalog Number 5700 tape transports used on earlier models changed PLAY tension only when in the SMALL reel position.

ROUTINE MAINTENANCE

Carefully follow the routine maintenance program outlined below if proper performance is to be expected of the equipment at all times. It is recommended that an Operation and Maintenance Log be kept.

Cleaning

Clean the capstan, the head faces and tape guides daily. Clean the capstan idler wheel weekly. Great care must be taken to see that oil does not reach the rubber tire. Avoid, as much as possible, touching the tire with the fingers.

The agent for cleaning AMPEX head assemblies is a mixture of Xylene and 0.1% Aerosol, and is available in 4 oz. bottles (AMPEX AUDIO Part No. 823). Other solvents can have detrimental effects on these precision parts.

To clean any head assembly, wind a clean, lintless cloth on a wooden swab-stick and moisten with this mixture. Swab the heads periodically to remove all dirt and accumulated oxide deposited from some tapes.

CAUTION

Do not use any other solvents as there are some which may damage the laminations of the head assembly. Do not use metal swab-sticks.

Cleanliness of all parts of the tape drive mechanism is required for consistent optimum performance. Clean all parts except the head assembly using a lintless cloth moistened with Iso-Propyl alcohol (easily obtained). This cleaning is of particular importance because most tape manufacturers lubricate their tapes, and the lubricant will gradually form a coating on the components in the tape threading path which will result in a loss of positive drive at the capstan, flutter and wow, drop-outs or poor high frequency response.

NOTE

It is imperative that Iso-Propyl alcohol be used on the cleaning of the capstan idler wheel (rubber) and not the recommended Xylene cleaner for heads.

Lubrication

The following parts of the tape transport mechanism require lubrication every three months, or after every thousand hours of operation, whichever occurs first.

CAPSTAN DRIVE MOTOR LUBRICATION

Lubricate the upper sleeve bearing of the capstan drive motor with this oil or its equivalent:

Caloil OC-11 (AMPEX AUDIO Part No. 827), Standard Oil Company of California, San Francisco, California. Class "C"

Medium turbine oil, petroleum base with inhibitor additives to increase oxidization and corrosion preventive properties. Essential characteristics are as follows:

Characteristics	Required (Limit)
Viscosity in Centistokes at 130° F	40.0-48.0
Pour Point	25° F (Max.)
Flash Point	370° F (Min.) ±20° F

There are two ways to lubricate the drive motor, the first of which requires its removal. The second, and simpler method, does not require removal of the motor. See alternate method. To remove the drive motor proceed as follows:

- Step 1: Unplug the motor connector P504P from its receptacle J504S at the control circuit box.
- Step 2: Remove the capstan idler by loosening the Allen head screw on the idler arm and gently pulling the idler assembly away (the capstan idler must be removed because one of the mount-screws is beneath it).
- Step 3: Support the motor in one hand and remove the four mounting screws that hold it to the tape transport.
- Step 4: Now pull the motor free.
- Step 5: Locate the oil hole which will be on the top or the side of the motor end bell.
- Step 6: Place not more than four drops of a recommended lubricant in the oil hole (OC-11).

CAUTION

Do not over-lubricate. Wipe off excess oil.

- Step 7: Replace the motor.
- Step 8: Replace the capstan idler.

CAUTION

The capstan idler must be properly placed in relation to the tape. Thread tape on the equipment along the prescribed tape thread-path, and set the idler so that the tape travel is centered on the tire. Placement is not critical and visual alignment is adequate.

- Step 9: Readjust the capstan idler pressure if necessary (see *Capstan Idler Pressure*).

The alternate method for drive motor lubrication is:

- Step 1: Gently pry up and remove the capstan dust cap.
- Step 2: Before activating the safety switch, apply not more than four drops of lubricant (OC-11) to the exposed bearing surface.
- Step 3: Replace the capstan dust cap.
- Step 4: Start the drive motor by placing the POWER switch in the ON position, activate the safety switch and allow the motor to warm up (requires about 15 minutes).
- Step 5: Turn off the equipment when the warm-up period is complete.
- Step 6: If the bearing appears dry after the motor has cooled, repeat the above procedure.
- Step 7: Wipe the capstan dry of any excess oil that may have been applied accidentally.

CAPSTAN IDLER LUBRICATION

Gently pry the dust cap from the wheel hub (a knife blade can be used) and oil with not more than 3 drops of OC-11, on the felt washer. Failure to perform capstan idler lubrication can result in the felt washer becoming completely dry, and a dragging idler can contribute to flutter.

CAUTION

DO NOT OVER-LUBRICATE or the wheel will throw oil in operation. If oil spills on the rubber tire, clean it immediately with Iso-Propyl. Oil will deteriorate the rubber wheel.

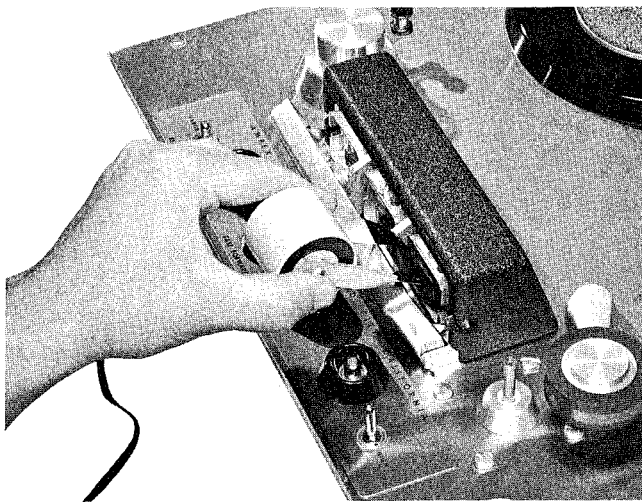
NOTE

The reel idler assembly, the take-up tension arm assembly and the take-up and rewind motors contain permanently lubricated bearings, and require no lubrication.

Head Demagnetization

Occasionally, the heads may become permanently magnetized through electrical faults in the amplifiers, improper use of the equipment, or by contact with magnetized objects. Magnetized heads may cause an increase of 5 to 10 db in background noise level, and can impair good recordings by partially erasing high frequencies. The full dynamic range of the equipment cannot be realized if the heads are magnetized.

Any phenomena that tend to put large unbalanced pulses through the record head will magnetize it. Observe these precautions and no difficulty should be experienced. Do not remove any tube from the record amplifier while the equipment is recording. Do not connect or disconnect the input leads or the head leads while recording.



Demagnetizing the heads

Do not saturate the record amplifiers with abnormally high input signals. Such signals would be 10 db greater than tape saturation or approximately 30 db greater than normal operating level.

If it becomes necessary to test the heads with an ohmmeter, they must be demagnetized afterwards.

If the heads become magnetized, proceed as follows using a head demagnetizer (AMPEX AUDIO Part No. 820):

- Step 1: Place the equipment power switch in the OFF position.
- Step 2: Plug the demagnetizer into a 117-volt a-c source.

NOTE

If the plastic coating wears off, place one layer of electrical friction tape on the demagnetizer tips. Scratching the heads will then be prevented.

- Step 3: Bring the tips of the demagnetizer to within approximately $\frac{1}{8}$ -inch (if the demagnetizer tips are taped or covered, contact with the heads can be made) of the record head core stack, straddle the head gap and draw the demagnetizer tips up and down the length of the core stack three or four times.
- Step 4: Remove the demagnetizer slowly from the head stack to a distance of 3 or 4 feet, thus allowing its a-c field to diminish gradually. This slow removal is extremely important.

CAUTION

Do not unplug the demagnetizer while it is near the heads; the collapse of its magnetic field may re-magnetize the head.

- Step 5: Repeat Steps 3 and 4 at the reproduce and erase heads.
- Step 6: If necessary, repeat the process till complete demagnetization is effected in each case.

NOTE

The erase head, under certain conditions, is susceptible to magnetization by spurious sources and can require demagnetization.

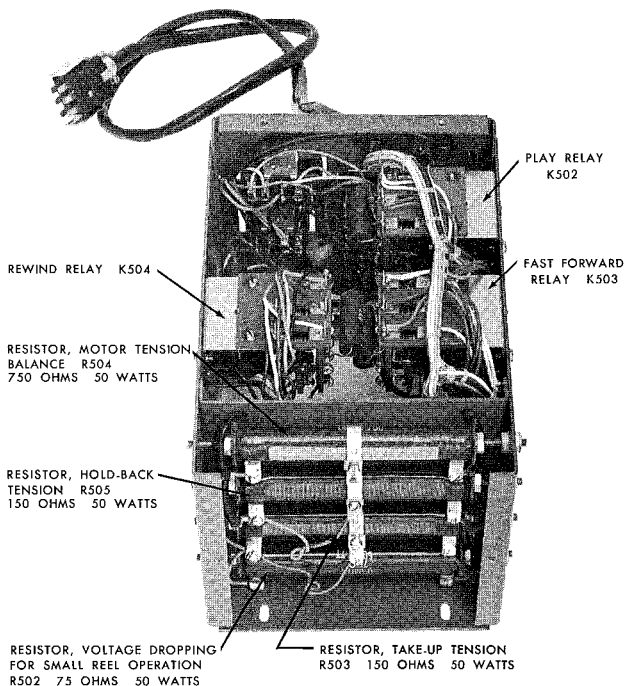
If the capstan, tape guides or other metal parts be come magnetized, a few passes of the demagnetizer along their lengths and the slow withdrawing technique should be adequate.

ADJUSTMENTS

The mechanical assembly is shipped from the factory with all adjustments set for correct performance. It should be unnecessary to change any adjustment before putting the equipment into service, unless shipping damage has occurred. In the course of wear in normal service, or in the event of component failure, and replacement of parts, some readjustments may be necessary.

Equipment Required:

- Spring Scale 0-16 oz.
- Spring Scale 0-80 oz.
- 3/8-inch Nut Driver
- 3/16-inch Screwdriver
- Nylon Lacing Twine or Strong String
- 7/16-inch Socket Wrench
- 5/64-inch Allen Wrench



Control circuit box callouts

Take-up and Supply (Rewind) Tension

Take-up and supply tensions are determined by the positioning of the sliders on resistors R503 and R505 located in the tape transport control circuit box. The torque of both the rewind and take-up motors must be adjusted to between 5½ and 6 ounces as read on the 16 oz. spring scale at NAB reel hub diameter. Checking techniques are not difficult and should be performed carefully.

- Step 1: Place an empty 10½ inch NAB reel on the tape supply turntable.
- Step 2: Place the POWER switch in the ON position.
- Step 3: Place the REEL SIZE switch in the LARGE position.
- Step 4: Hold the take-up tension arm so that the safety switch is activated (a rubber band or piece of masking tape will hold the arm as though tape were threaded on the equipment).
- Step 5: Make small loops at both ends of a thirty inch piece of nylon lacing twine.
- Step 6: Attach one loop to the tape anchor on the reel hub and the other to a 0 to 16 oz. spring scale.
- Step 7: Press the PLAY button and allow the clockwise motion of the supply reel (torque motor tension) to draw a turn of twine onto the hub.
- Step 8: Make certain that the twine is now parallel to the plane of the top of the tape transport and that the twine is centered and not touching either reel flange.
- Step 9: Now, let the torque motor pull the twine slowly onto the hub by following the torque motor force with the scale.
- Step 10: Using this "following" technique, observe the readings on the scale until a constant reading is obtained.
- Step 11: If necessary, adjust the slide on resistor R505 in the control circuit box until a scale reading between 5½ and 6 ounces is achieved.
- Step 12: A good check consists in placing the REEL SIZE switch in the SMALL position, then checking the torque using the same procedure as above. The

scale should indicate tape tension as 1½ - 3 ounces.

Step 13: Use the procedures in the preceding steps to check and adjust the take-up tension which is set at R503 (note that the reel on this side will move counterclockwise).

Brake Adjustment

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

Step 1: Place an empty 10½ NAB reel on the tape supply turntable.

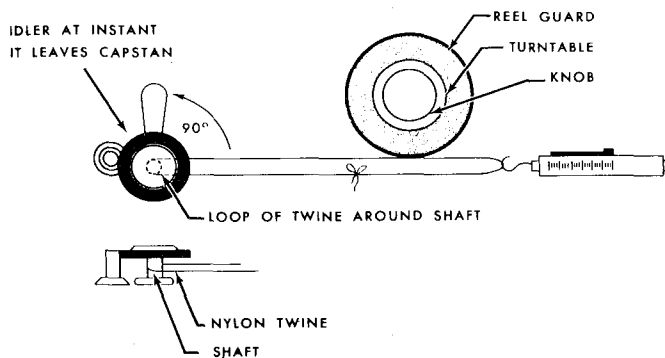
Step 2: Make small loops at both ends of a thirty inch piece of nylon lacing twine.

Step 3: Attach one loop to the tape anchor on the reel hub and the other to a 0-16 oz. spring scale.

Step 4: Manually rotate the reel clockwise to wind several turns of twine onto the hub.

Step 5: 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.

Step 6: Adjust the supply and takeup motors' brakes for scale readings listed below. Points of adjustment are shown by illustration.



Capstan idler pressure measurement

Step 7: Now wind the twine on the hub by rotating the reel counterclockwise; pull, and take a reading. The turntable will rotate clockwise.

Step 8: Repeat the entire process on the take-up turntable.

SPRING SCALE READING

Tape Width	Direction of Most Resistance—Supply	Direction of Least Resistance—Supply
	Counterclockwise Takeup	Clockwise—Takeup Counterclockwise
¼ inch	12 to 17 ounces	2:1 ratio ±1 ounce in accordance with High Side

Capstan Idler Pressure

The capstan idler is forced against the capstan by the action of capstan solenoid K501. Idler pressure is supplied by the capstan idler pressure spring, and is adjusted by a lock nut on the capstan solenoid spade bolt. See the illustration. Tightening the lock nut increases idler pressure until a point is reached where the solenoid will not bottom. At this point, idler pressure drops to a value which is inadequate to permit the capstan to drive the tape, and slippage will occur unless the nut is backed off. Excessive pressure also throws an unnecessary load on the upper sleeve bearing, of the drive motor. The recommended procedure for adjusting idler pressure is as follows:

Step 1: Hold the take-up arm so that the safety switch is activated.

Step 2: With the POWER switch in the ON position, press the PLAY button, and note whether the capstan solenoid is bottomed. (The capstan idler can be pushed off the capstan easily by pushing on the idler arm, if the solenoid is not bottomed). If necessary, back off the lock nut until the solenoid does bottom at 90 volts a-c when cold, or 105 volts when warm (after ½ hour running). The pressure ("dig") against the capstan shaft should be approximately 5 pounds.

NOTE

In the course of normal operation in the reproduce or record modes, the

temperature of the capstan solenoid will rise, and its d-c resistance will increase. Therefore, the minimum line voltage required to bottom the solenoid when it is hot will be greater than that required when it is cold. If the equipment is operating on unusually low line voltage (below 100 to 105v), sometimes encountered in areas where regulation is poor, the solenoid may fail to bottom after it has reached normal operating temperature. It is advisable, therefore, to allow the equipment to operate in the reproduce mode for about half an hour before making any necessary solenoid adjustments. This will allow the widest margin of safety with respect to line voltage variations. The solenoid is factory-adjusted to bottom at 90 line volts cold and 105 line volts hot.

- Step 3:** If it is desired to measure capstan dig, press the STOP button at this point and select a piece of nylon lacing twine about 30 inches long and tie the ends together.
- Step 4:** Slip the twine loop just formed between the idler and idler arm so that the nylon rests against the idler shaft.
- Step 5:** Attach the other side of the loop to a 0 to 80 oz. scale, letting the nylon twine remain slack.
- Step 6:** Press the PLAY pushbutton, causing the capstan idler to clamp against the capstan.
- Step 7:** Pull the scale away so that the nylon twine is taut and makes a 90 degree angle with the idler arm.
- Step 8:** Now, slowly pull the scale away with sufficient power to cause the capstan idler to leave the capstan, reading the scale at the instant the capstan idler leaves the capstan. The scale reading should be 5 lbs \pm 1/2 lb. If necessary, adjust the capstan dig at the point shown in the illustration.

Replacement of Parts

All sub-assemblies of the tape transport mechanism can be easily dismantled with the use of a screwdriver and a few small socket-head screw keys.

CAUTION

Do not attempt complete disassembly of any of the sub-assemblies. The list of individually replaceable parts under each assembly listing in the parts list should be used as a guide to disassembly limits. Replacement of parts other than those listed calls for precision work which should not be attempted in the field. Assemblies with defects in parts other than those listed as replaceable should be returned to the factory or to an Ampex Authorized Service Center for repair or replacement.

Write the Service Department for a proper authorized equipment return tag. Do NOT ship unidentified parts to factory; Ampex can assume no responsibility for their proper care or return under such circumstances.

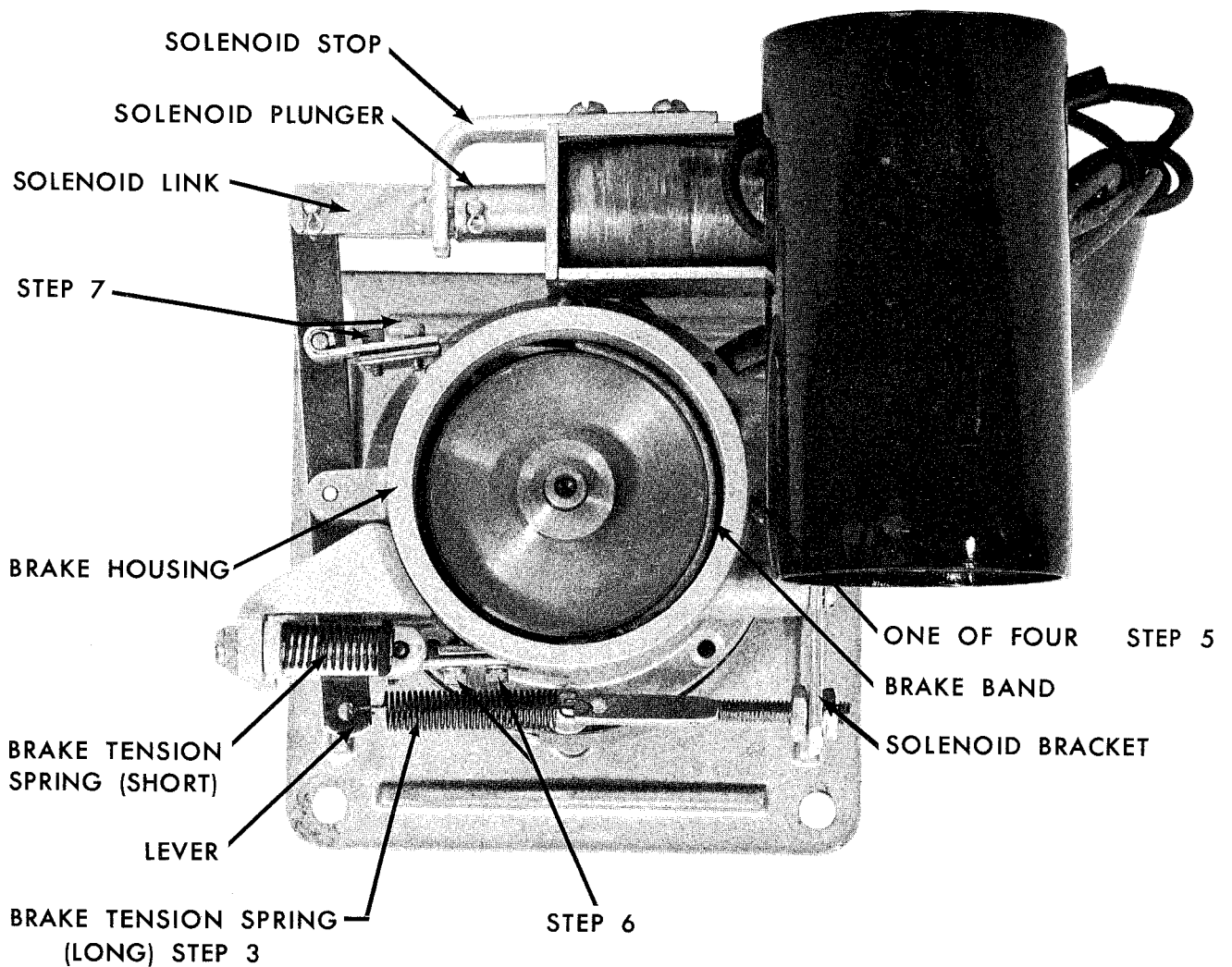
BRAKE BAND REPLACEMENT

NOTE

Brake Bands may be replaced without removing motor from tape transport on rackmount machines and deleting the first three steps.

The most convenient method for changing the brake band is first to remove the entire motor assembly.

- Step 1:** With a 7/16-inch socket wrench remove the four mounting nuts and washers at the motor mounting plate, carefully holding the motor with one hand to prevent it from falling. The turntable will remain attached to the motor assembly.
- Step 2:** Take the motor to a convenient work area.
- Step 3:** Unhook the brake tension spring from the brake lever.
- Step 4:** Remove the two screws holding the capacitor. Disconnect the capacitor wires at the knife disconnects and free the capacitor from the bracket.



Brake band replacement

- Step 5:* Remove the screws that hold the brake housing to the motor, noting the positioning of the washers, and spacers, and remove the entire housing.
- Step 6:* Remove the two cap screws holding one end of the brake band between the brake lever spring and the housing using a 5/64-inch Allen wrench.
- Step 7:* Loosen (do not remove) the two cap screws at the end of the brake band next to the solenoid.
- Step 8:* The brake band may now be removed taking caution not to lose the band leaf on the solenoid side. There is only one band leaf per assembly.
- Step 9:* Position the new brake band through the hole in the housing and place between the clamp and tighten the two cap screws loosened in Step 8.
- Step 10:* Replace the brake housing, making certain that the spacers, the housing, the washers and the screws are replaced in that order, and tighten the screws.
- Step 11:* Insert the brake band between the band link and band link clamp. Replace the two cap screws but **DO NOT TIGHTEN**.
- Step 12:* Push the solenoid in until it bottoms. Adjust the depth of insertion of the brake band between the link and

clamp so that the brake drum rotates freely with no drag; then tighten the screws.

CAUTION

If the band is set too far forward in the link, it will buckle slightly when the solenoid plunger is bottomed by hand. If this condition exists the plunger may not bottom when the solenoid is energized. The purpose of the band leaf is to keep the band from splitting when it buckles at the band clamp.

Step 13: Interconnect the wires at the knife disconnects and replace the capacitor to the bracket with the two screws removed in Step 5.

Step 14: Hook the brake spring to the brake lever. Step 4.

Step 15: Replace the motor assembly tightening the four screws that were removed in Step 1.

PACKING PRECAUTIONS FOR MOTORS

In packing motors for return to the factory, take particular care to prevent the bending of their shafts in transit.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	TAPE TRANSPORT ASSEMBLY, 7-1/2 - 15 ips: 60 cps; Catalog No. 02-30970-01	
	TAPE TRANSPORT ASSEMBLY, 7-1/2 - 15 ips: 50 cps; Catalog No. 02-30970-02	
	TAPE TRANSPORT ASSEMBLY, 3-3/4 - 7-1/2 ips: 60 cps; Catalog No. 02-30970-03	
	TAPE TRANSPORT ASSEMBLY, 3-3/4 - 7-1/2 ips: 50 cps; Catalog No. 02-30970-04	
B501	MOTOR ASSEMBLY, Drive: 7-1/2 - 15 ips; 60 cps	31210-01
B501	MOTOR ASSEMBLY, Drive: 7-1/2 - 15 ips; 50 cps	31210-02
B501	MOTOR ASSEMBLY, Drive: 3-3/4 - 7-1/2 ips; 50 cps	31210-03
B501	MOTOR ASSEMBLY, Drive: 3-3/4 - 7-1/2 ips; 60 cps	31210-04
C501	CAPACITOR, Motor	9487-02
	FLYWHEEL, Bodine motor	981-00
	FLYWHEEL, Ashland motor	2212-01
P504P	CONNECTOR, Plug: male; 6 contacts; Jones Part No. P-306-CCT-L	145-012
	FAN, Motor	591-001
	TAKEUP ASSEMBLY	9451-04
B502	MOTOR ASSEMBLY, Takeup	6768-03
	TURNTABLE	61462-01
	PAD, Turntable	958-00
P505P	CONNECTOR, Plug: 8 contact	17313-01
C512	CAPACITOR, Motor: 3.75 mfd	035-111
	BRAKE ASSEMBLY	17327-01
	HOUSING, Brake	17614-01
	BAND, Brake	17612-01
	LEAF, Brake Band; 1-1/8" long	61460-01
	SPRING, Brake Tension: long	322-01
	SPRING, Brake Tension: short	17323-01
	BOLT, Eye	69517-06
	CROSSHEAD	17324-01
	ANCHOR	17325-01
	SPACER	17322-01
	PIN, Roll: 1/8 in. dia. by 3/4 in. lg.	406-005
	SCREW, Machine: Cap; socket head; 4-40 by 1/4 in. lg.	470-008
	LINK, Brake Band	69528-01
	CLAMP, Brake Band	69529-01
	LEVER, Brake	69530-01
	PIN, Drivelock: 1/8 in. dia. by 1/2 in. lg.	403-008
	PIN, Cotter: 1/16 in. dia. by 1/2 in. lg.	401-005
	PIN, Clevis: 1/8 in. dia. by 9/32 in. lg.	400-002
K505	SOLENOID, Brake	69532-01
	STOP, Solenoid	17326-01
	BRACKET, Solenoid	69527-01
	LINK, Solenoid	69531-01
	CONNECTOR, Solderless: disconnect splice	171-008
	REWIND ASSEMBLY	9452-04
B503	MOTOR ASSEMBLY, Rewind	6768-03
	TURNTABLE	61462-01
	PAD, Turntable	958-00
P506P	CONNECTOR, Plug: 8 contact	17313-01
C513	CAPACITOR, Motor: 3.75 mfd	035-111
C513	CAPACITOR, Motor: 5 mfd	035-117
	BRAKE ASSEMBLY	17327-02
	HOUSING, Brake	17614-01
	BAND, Brake	17612-01

REF. NO.

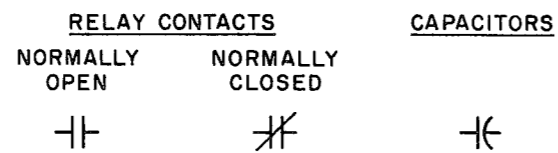
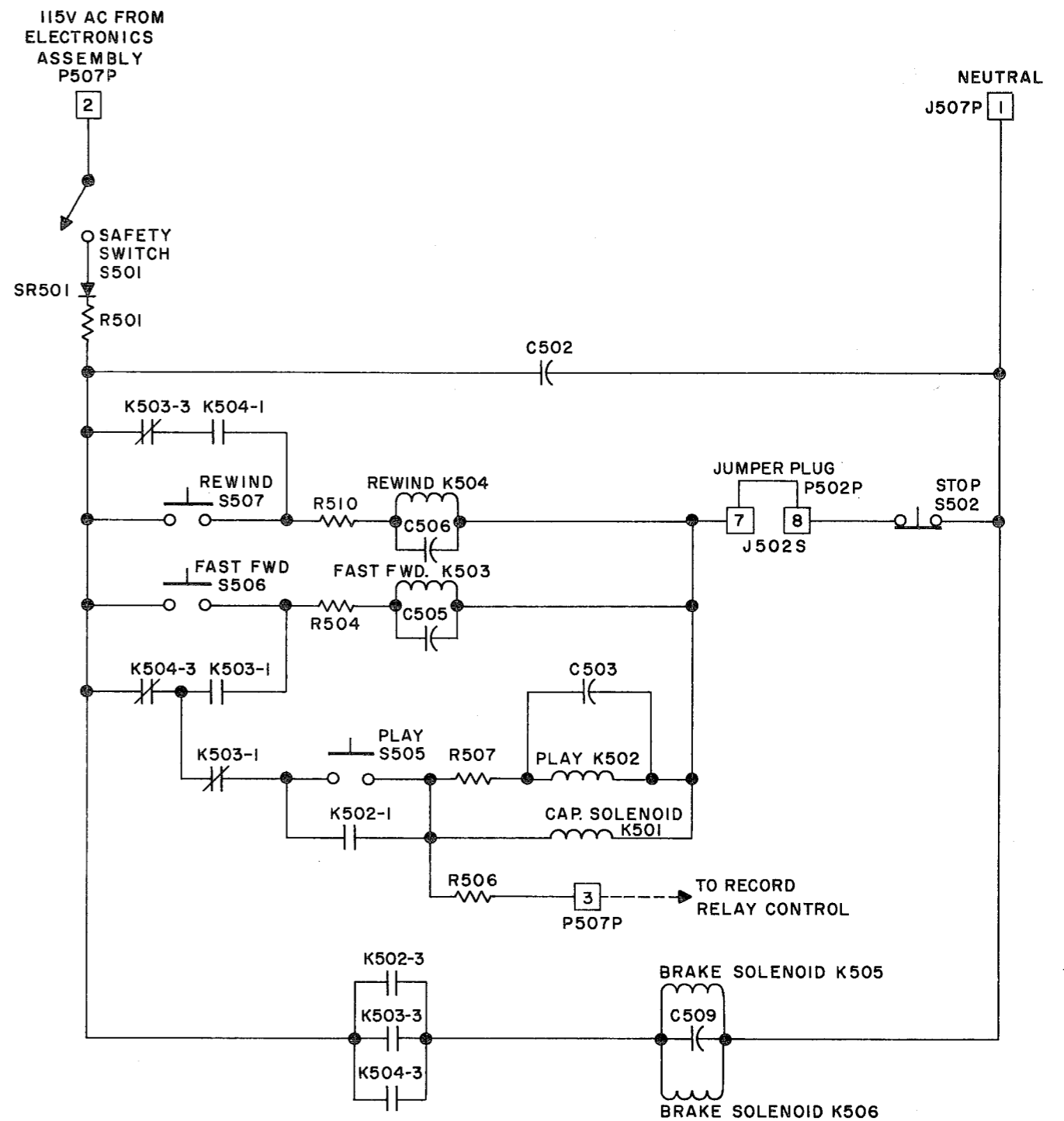
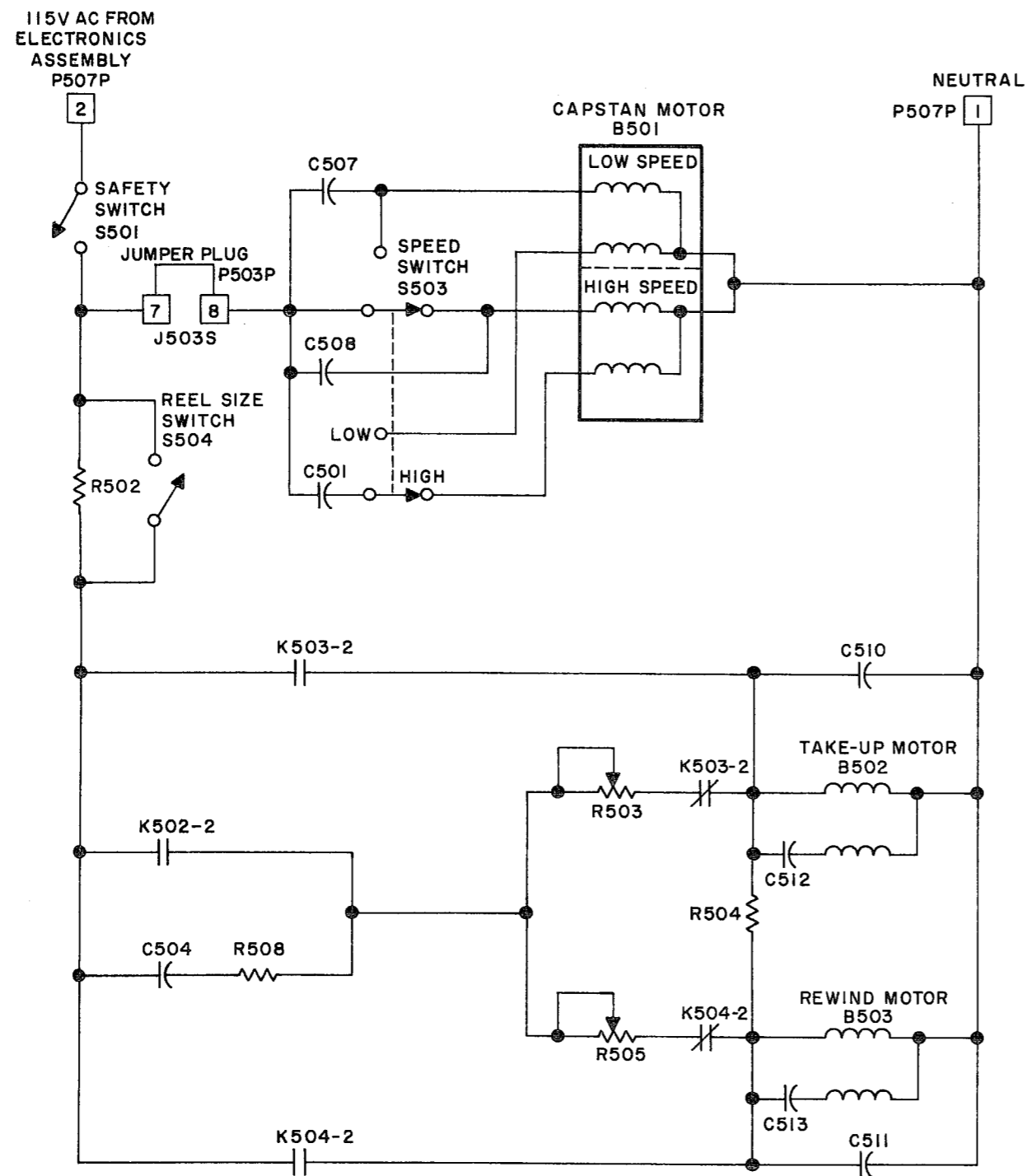
PART DESCRIPTION

AMPEX PART NO.

	LEAF, Brake Band: 1-1/8 in. long	61460-01
	SPRING, Brake Tension: long	322-01
	SPRING, Brake Tension: short	17323-01
	BOLT, Eye	69517-06
	CROSSHEAD	17324-01
	ANCHOR	17325-01
	SPACER	17322-01
	PIN, Roll: 1/8 in. dia. by 3/4 in. lg.	406-005
	SCREW, Machine: cap; socket head; 4-40 by 1/4 in. lg.	470-008
	LINK, Brake Band	69528-01
	CLAMP, Brake Band	69529-01
	LEVER, Brake	69530-01
	PIN, Drivelock: 1/8 in. dia. by 1/2 in. lg.	403-008
	PIN, Cotter: 1/16 in. dia. by 1/2 in. lg.	401-005
	PIN, Clevis: 1/8 in. dia. by 9/32 in. lg.	400-002
K506	SOLENOID, Brake	69532-01
	STOP, Solenoid	17326-01
	BRACKET, Solenoid	69527-01
	LINK, Solenoid	69531-01
	CONNECTOR, Solderless: disconnect splice	171-008
	ARM ASSEMBLY, Takeup tension	425-00
	SPRING, Takeup tension arm	30946-01
	GUIDE, Tape: 1/4 in.	675-00
	HOOK, Tape Guide	69542-01
	REEL IDLER ASSEMBLY: 7-1/2 - 15 ips	4459-00
	REEL IDLER ASSEMBLY: 3-3/4 - 7-1/2 ips	4459-03
	GUIDE, Tape	257-00
	PULLEY ASSEMBLY: 7-1/2 - 15 ips	5893-00
	PULLEY ASSEMBLY: 3-3/4 - 7-1/2 ips	5893-01
	BASE, Reel Idler	30840-01
	FLYWHEEL, Reel Idler	636-01
	WHEEL ASSEMBLY, Capstan Idler: 7-1/2 - 15 ips	30945-01
	WHEEL ASSEMBLY, Capstan Idler: 3-3/4 - 7-1/2 ips	30945-07
	CAP	5770-00
	RING, Retaining: external; for 0.250 in. dia. shaft; Truarc Part No. 5100-25-S	430-004
	RING, Lock	5772-00
	WASHER, Cambric	9482-01
	WASHER, Shim: brass; 0.250 in. ID by 0.437 in. OD by 0.002 in. thk.	501-049
	WASHER, Felt	5771-00
	ARM, Capstan Idler	372-01
	BUSHING, Capstan Idler Arm	5755-00
	DUST CAP, Capstan: 7-1/2 - 15 ips	3506-00
	DUST CAP, Capstan: 3-3/4 - 7-1/2 ips	3506-01
	WASHER, Felt	3583-02
	RING, Retaining: rubber; Plastic and Rubber Products Co. Part No. PRP6227-14, 209-70	432-007
	SOLENOID ASSEMBLY, Capstan Idler	5783-01
K501	SOLENOID, Capstan	670-00
	BOLT, Eye: Capstan solenoid	396-03
	STOP, Capstan Solenoid	388-00
	WASHER, Felt; 1/4 in. thk.	503-015
	SPRING, Solenoid pressure	676-01
	SPRING, Solenoid Return	5757-00
	GUARD, Pushbutton	361-00
	GUARD, Reel	5708-00

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	HARNES ASSEMBLY, Switch	5782-01
	CONNECTOR, Plug: male; 21 contact	145-022
	SWITCH ASSEMBLY, Safety	6582-00
	SHIELD, Microswitch	5730-00
	SWITCH, Normally closed (STOP)	120-014
	SWITCH, Normally open (PLAY, FAST FORWARD, REWIND)	120-013
	SWITCH, DPST (TAPE SPEED)	120-004
	SWITCH, SPST (REEL SIZE)	120-005
	CONTROL BOX ASSEMBLY	5703-03
C502	CAPACITOR, Fixed: electrolytic; 150 mfd; 150 vdcw; Cornell-Dubilier Part No. 15015	031-045
C503	CAPACITOR, Fixed: Mylar; 0.047 mfd; $\pm 10\%$; 400 vdcw; Sprague Type 160P	033-234
C504	CAPACITOR, Fixed: paper; 0.25 mfd; $\pm 20\%$; 400 vdcw; Astron Part No. ML-4-25	033-008
C505	(Same as C503)	033-234
C506	(Same as C503)	033-234
C507	CAPACITOR, Fixed: paper; 0.01 mfd; $\pm 20\%$; 400 vdcw; Astron Part No. ML-4-01	033-005
C508	(Same as C507)	033-005
C509	(Same as C503)	033-234
C510	(Same as C503)	033-234
C511	(Same as C503)	033-234
J501S	CONNECTOR, Receptacle: female; 21 contacts; Jones Part No. S-321-AB	146-057
J502S	CONNECTOR, Receptacle: female; 10 contacts; Jones Part No. S-310-AB	146-018
J503S	CONNECTOR, Receptacle: female; 8 contacts; Jones Part No. S-308-AB	146-003
J504S	CONNECTOR, Receptacle: female; 6 contacts; Jones Part No. S-306-AB	146-004
J505S	(Same as J503S)	146-003
J506S	(Same as J503S)	146-003
K502	RELAY, 3PDT: 115 vdc coil; 10 amp contacts; Philtrl Part No. 33QA (PLAY)	020-006
K503	(Same as K502) (FAST FORWARD)	020-006
K504	(Same as K502) (REWIND)	020-006
P501P	CONNECTOR, Plug: male; 21 contacts; Jones Part No. P-321-CCT-L	145-022
P502P	CONNECTOR, Plug (REMOTE DUMMY PLUG)	3461-00
P503P	CONNECTOR, Plug (60 CYCLE DUMMY PLUG)	567-01
P504P	CONNECTOR, Plug: male; 6 contacts; Jones Part No. P-306-CCT-L	145-012
P505P	CONNECTOR, Plug: male; 8 contacts; Jones Part No. P-308-CCT-L	145-013
P506P	(Same as P505P)	145-013
P507P	(Same as P505P)	145-013
R501	RESISTOR, Fixed: wirewound; 10 ohm; $\pm 10\%$; 5 watt; Tru-Ohm Type FRL-5	043-156
R502	RESISTOR, Fixed: wirewound; 75 ohm; $\pm 5\%$; 50 watt; Tru-Ohm Type FR-50	043-002
R503	RESISTOR, Adjustable: wirewound; 150 ohm; $\pm 5\%$; 50 watt; Tru-Ohm Type AR-50	040-011
R504	RESISTOR, Adjustable: wirewound; 750 ohm; $\pm 5\%$; 50 watt; Tru-Ohm Type AR-50	040-007
R505	(Same as R503)	040-011

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
R506	RESISTOR, Fixed: composition; 22 ohm; $\pm 10\%$; 1 watt; MIL-R-11A:RC32GF220K	041-132
R507	RESISTOR, Fixed: composition; 100 ohm; $\pm 10\%$; 1/2 watt; MIL-R-11A:RC20GF101K	041-038
R508	(Same as R507)	041-038
R509	(Same as R507)	041-038
R510	(Same as R507)	041-038
SR501	RECTIFIER, Selenium: single phase; half wave; General Electric Part No. 6RS25PH6ATD1	582-016

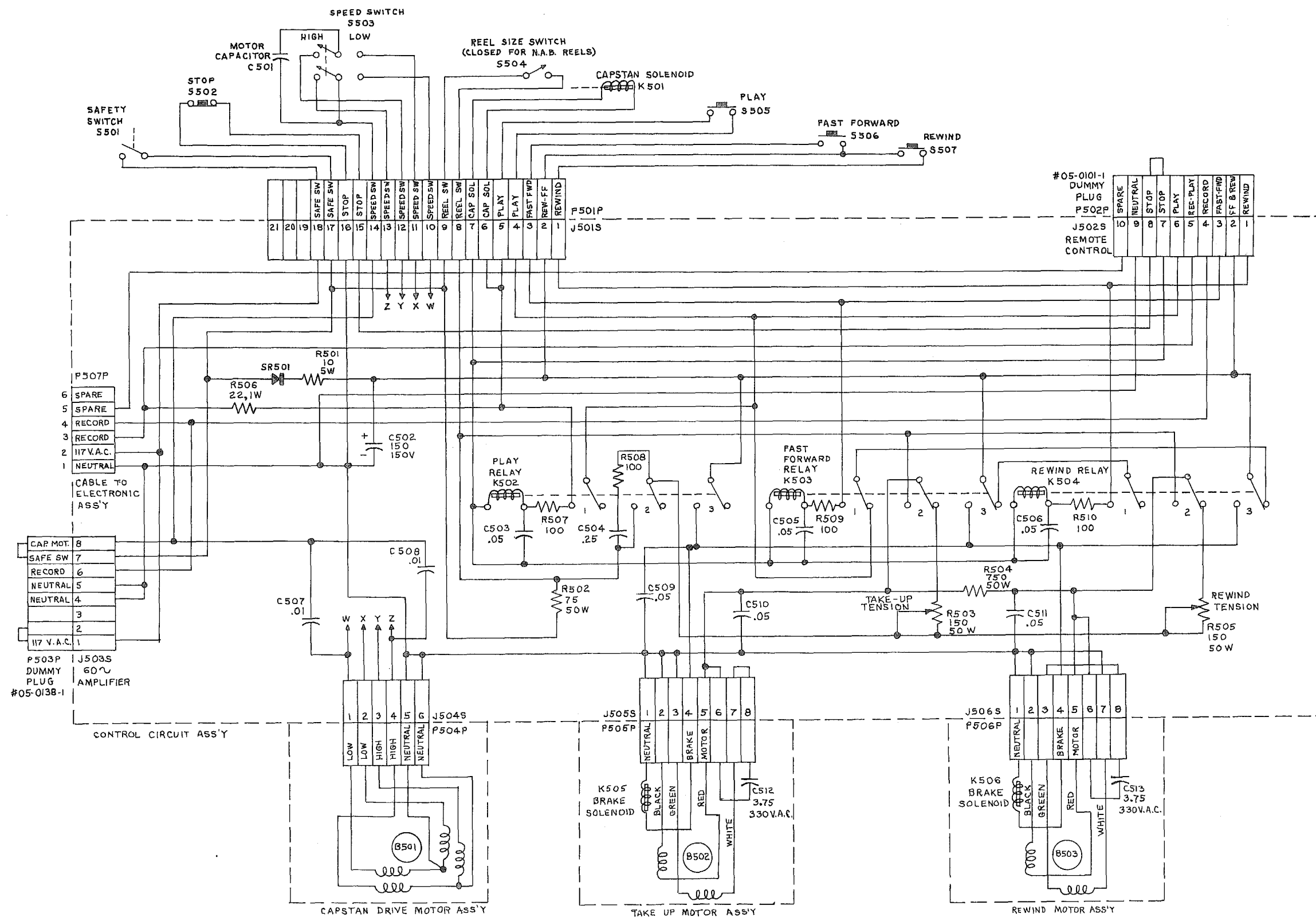


A-C CONTROL CIRCUIT

D-C CONTROL CIRCUIT

SIMPLIFIED CONTROL CIRCUIT SCHEMATIC

SCHEMATIC DIAGRAM
TAPE TRANSPORT
CONTROL CIRCUITS



- NOTES:
 1. ALL RESISTORS IN OHMS & RATED 1/2 WATT UNLESS OTHERWISE SPECIFIED
 2. ALL CAPACITORS IN MICROFARADS AND RATED 400V UNLESS OTHERWISE SPECIFIED