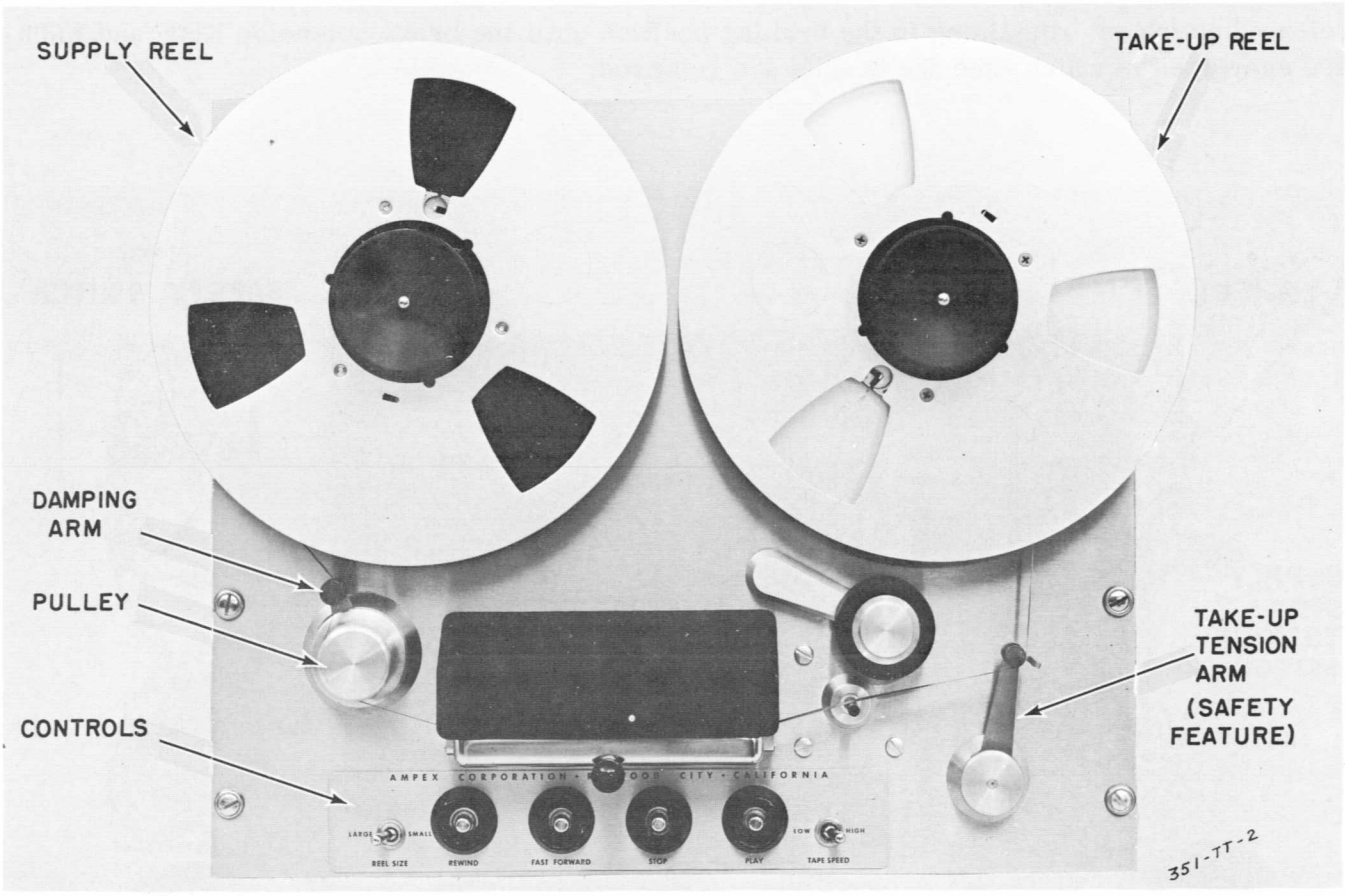
SECTION 4

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 tensioning when the equipment is in the record or reproduce modes. All tape motion controls, a reel size selector, a LOW-HIGH tape speed switch, a safety microswitch and the head assembly are located on the tape transport.



TAPE SUPPLY AND TAKE-UP

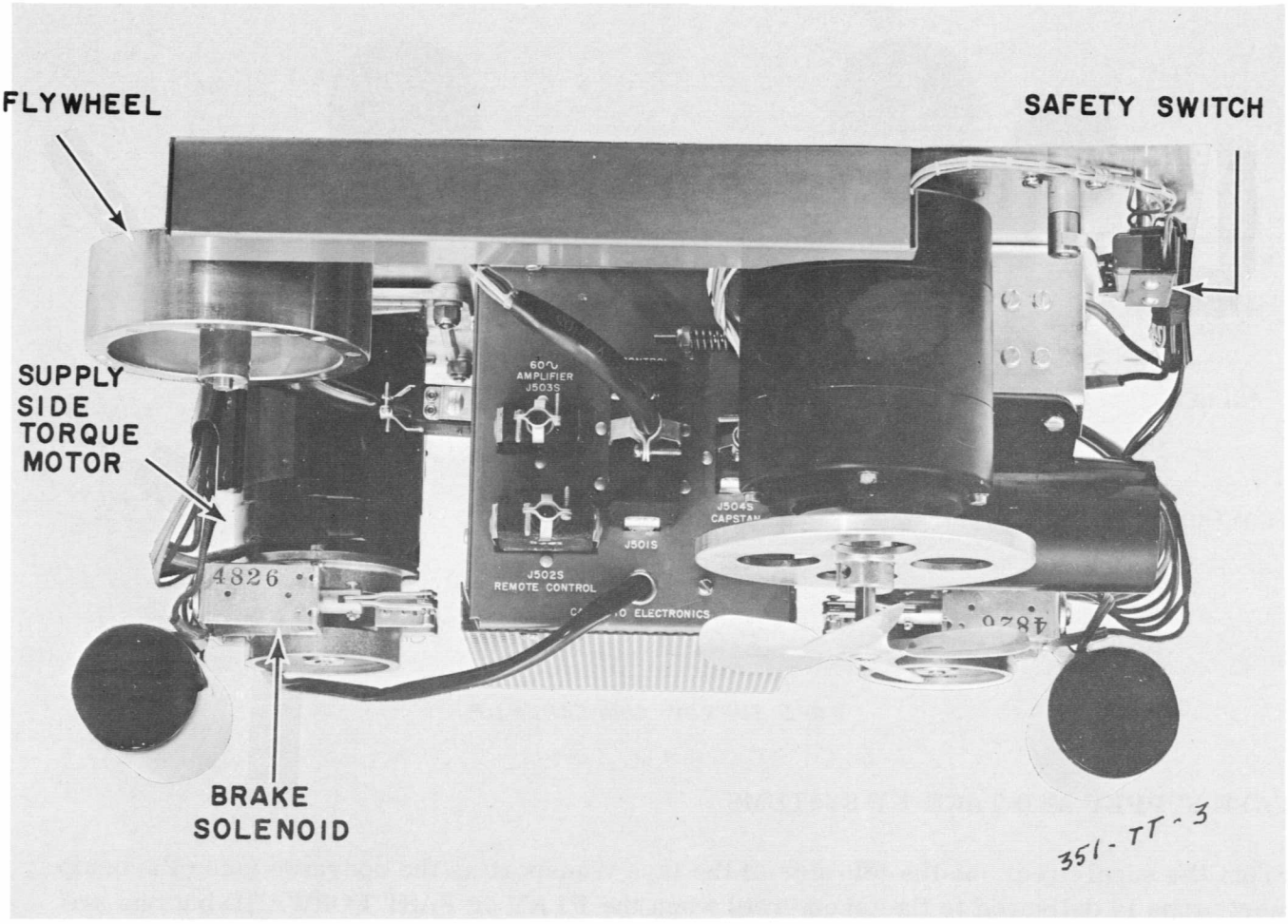
TAPE SUPPLY AND TAKE-UP SYSTEMS

From the supply reel, on the left side of the tape transport as the operator faces the equipment, tape is delivered to the takeup reel when the PLAY or FAST FORWARD buttons are depressed, tape is rewound onto this same supply reel when the REWIND button is depressed. Proper tape tensioning is maintained during the record and reproduce modes by means of two reel induction torque motors, the supply reel idler and damping arm.

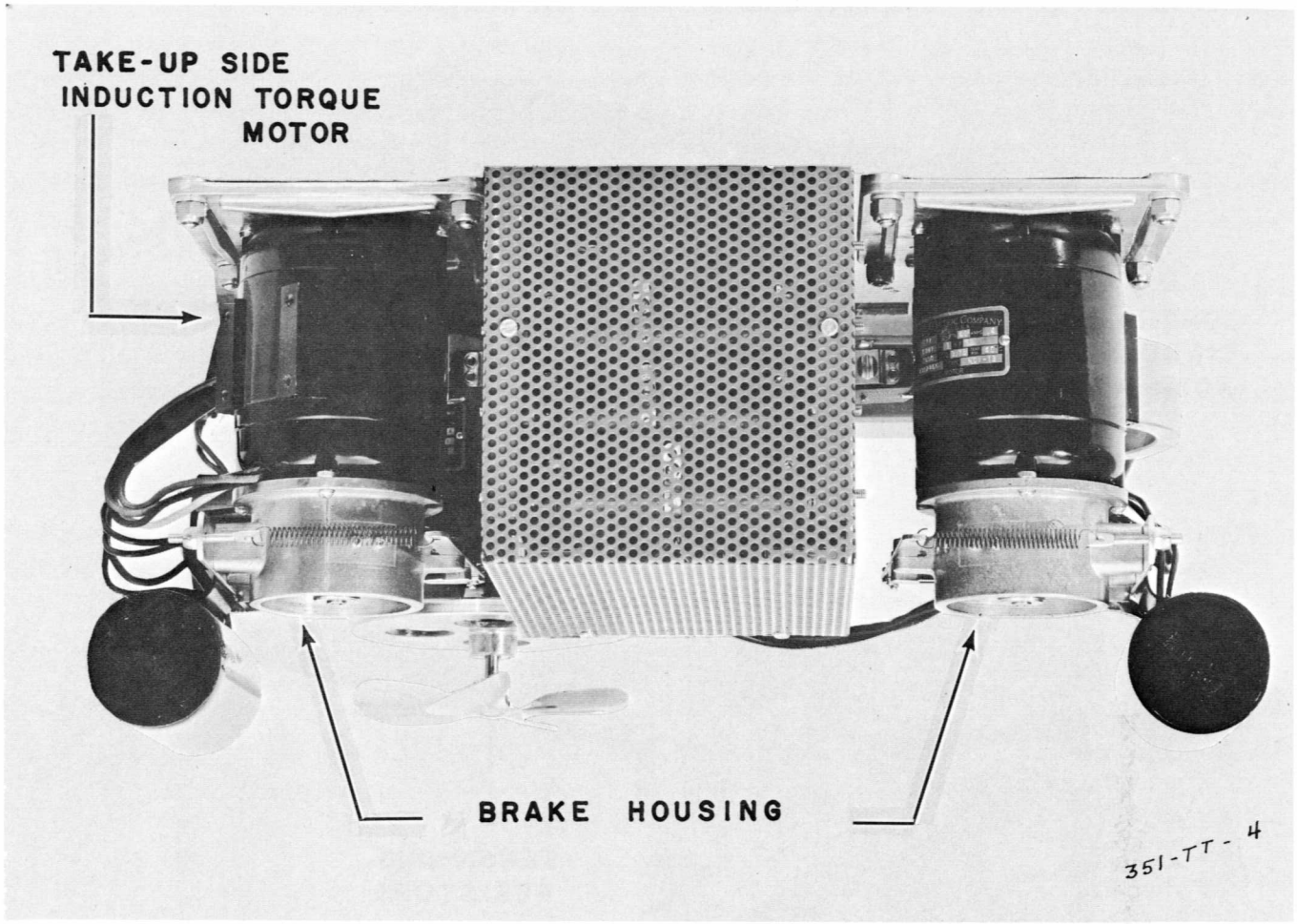
The reel idler assembly on the supply side of the tape transport is composed of a pulley, a spring-pivot-mounted arm and a flywheel for the purpose of smoothing out transient speed variations in the tape system.

On the take-up side of the tape transport, the tension arm assembly with a spring-pivot-mounted-arm forms a safety feature. Near the base of the shaft on which the tension arm is mounted, a drivelock pin actuates the safety switch (S501), stopping tape motion if the tape tension is lost for any reason including tape breakage.

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. 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.



TAPE SUPPLY AND TAKE-UP (BOTTOM VIEW FRONT)



TAPE SUPPLY AND TAKE-UP (BOTTOM VIEW REAR)

During the reproduce or record modes, the two induction torque motors B502 and B503 act as tensioning devices (see Tape Tensioning in this SECTION) and in the fast forward and rewind modes the motors respond to the commands from either pushbutton by operating at maximum torque in the selected function.

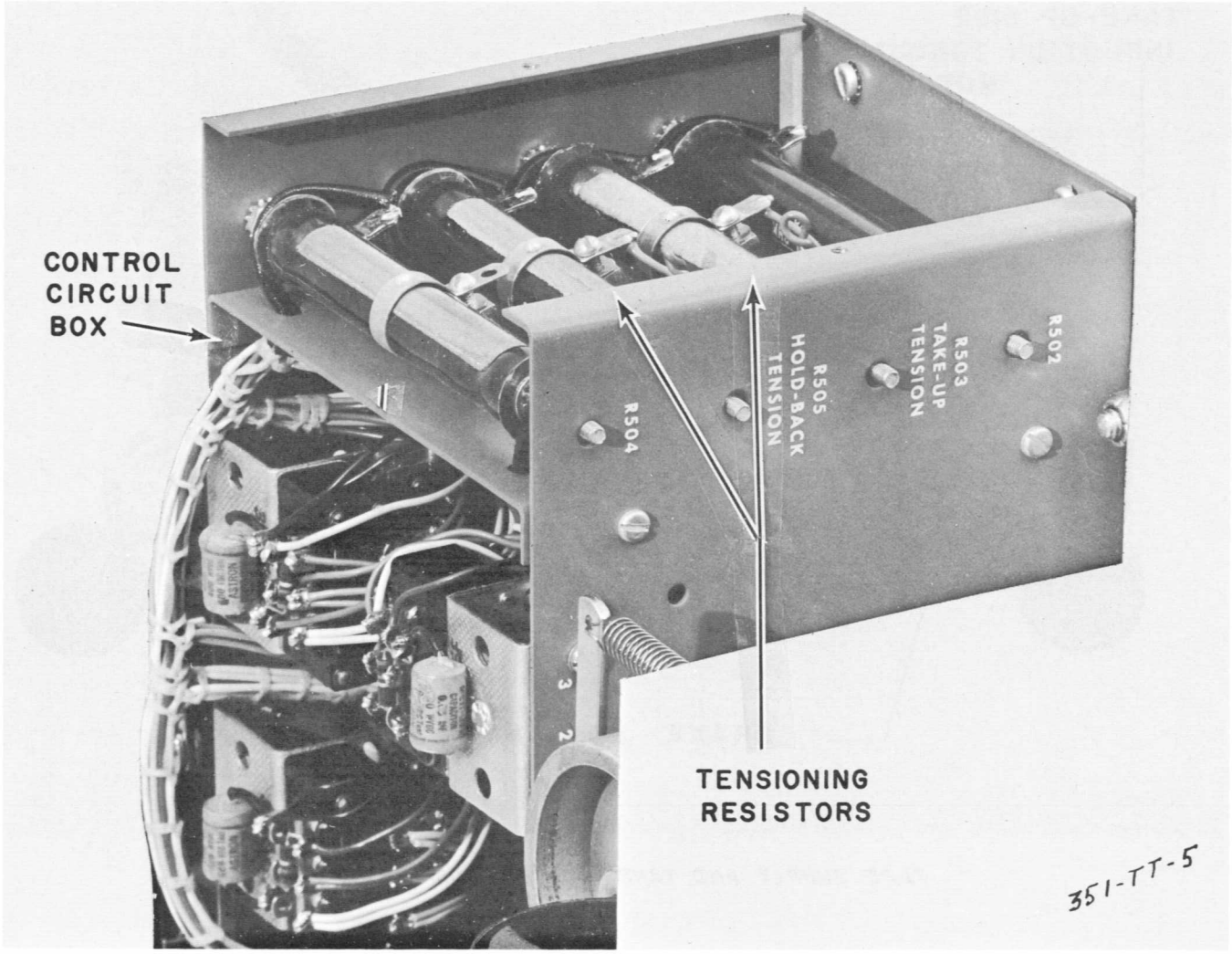
Tape Tensioning

The purpose of the Tape Tension System is to provide proper tape tension in all modes of operation.

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, fixed to its motor shaft, will rotate clockwise. The tape take-up turntable, fixed to the take-up motor shaft, will rotate counterclockwise.

Motor torque in the reproduce and record modes is adjusted to equality by the tensioning adjustment resistors (R503 TAKE-UP and R505 HOLDBACK) in series with each motor. In the fast forward mode, the torque of the supply (rewind) motor is reduced considerably by intro-

duction 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.



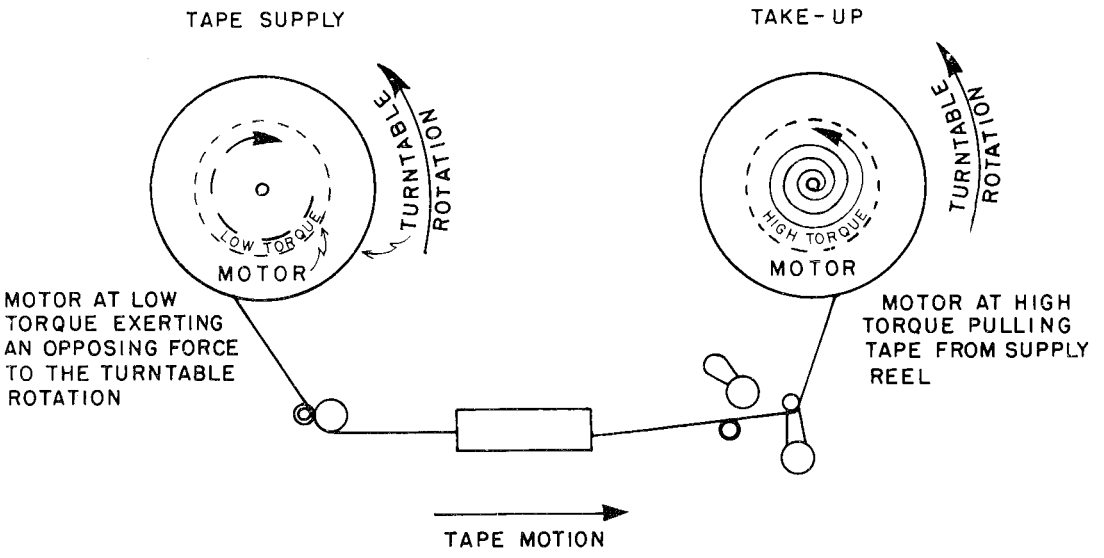
TAPE TENSIONING RESISTORS

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.

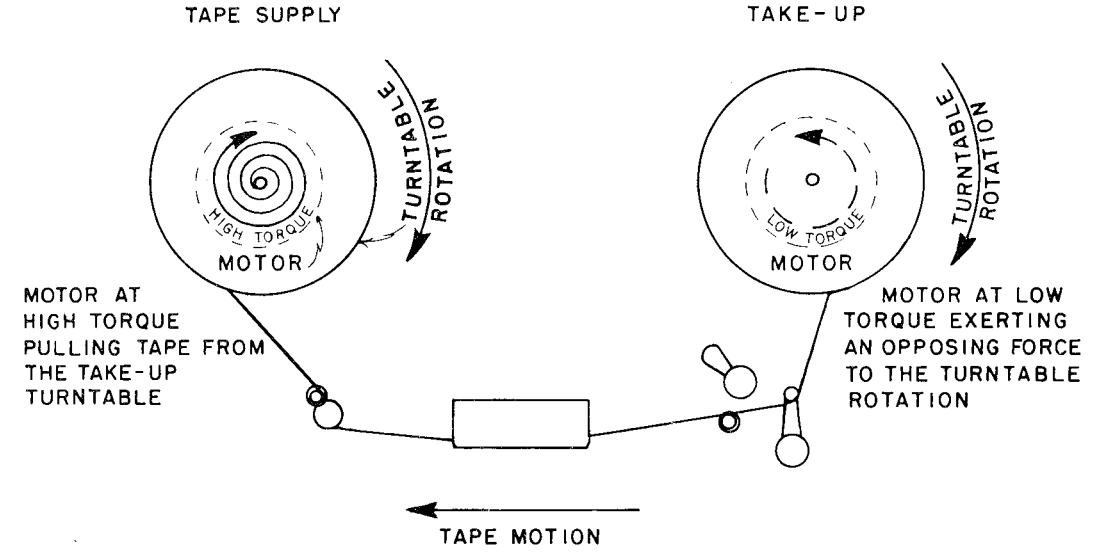
In the rewind mode, the supply motor operates at full torque and the take-up motor holds the tape under continuous tension by its opposite and reduced torque

In the reproduce or record modes, both torque motors operate at 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.

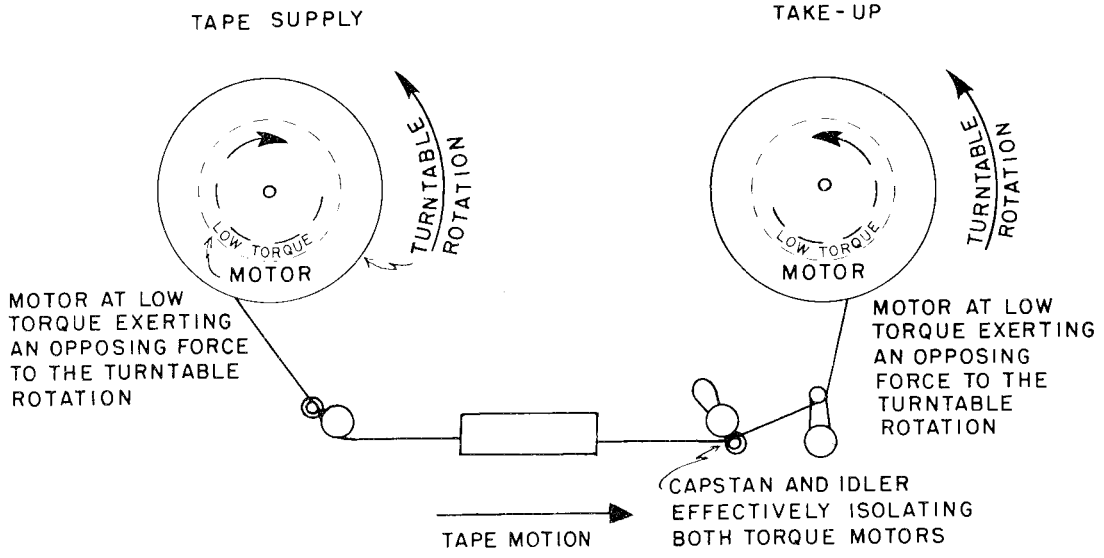
From the point of view of the tape supply turntable, the capstan and idler action exerts sufficient pull on the tape to overcome the opposing torque of the supply motor, which constitutes the hold back tension. From the point of view of the tape take-up turntable, the capstan and idler action is feeding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



FAST FORWARD



REWIND



RECORD OR REPRODUCE

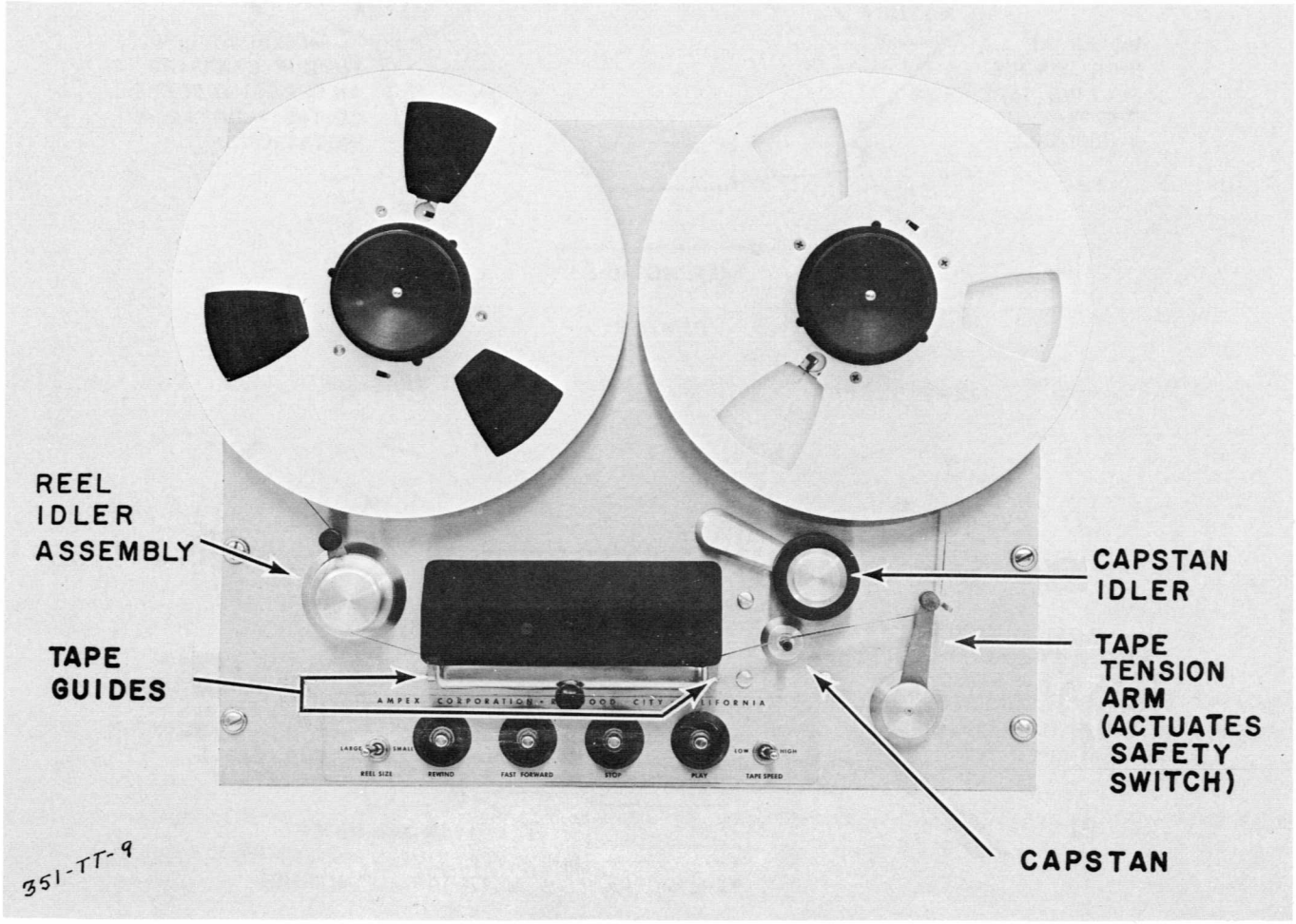
351-TT-8

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 tension 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 hold-back 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

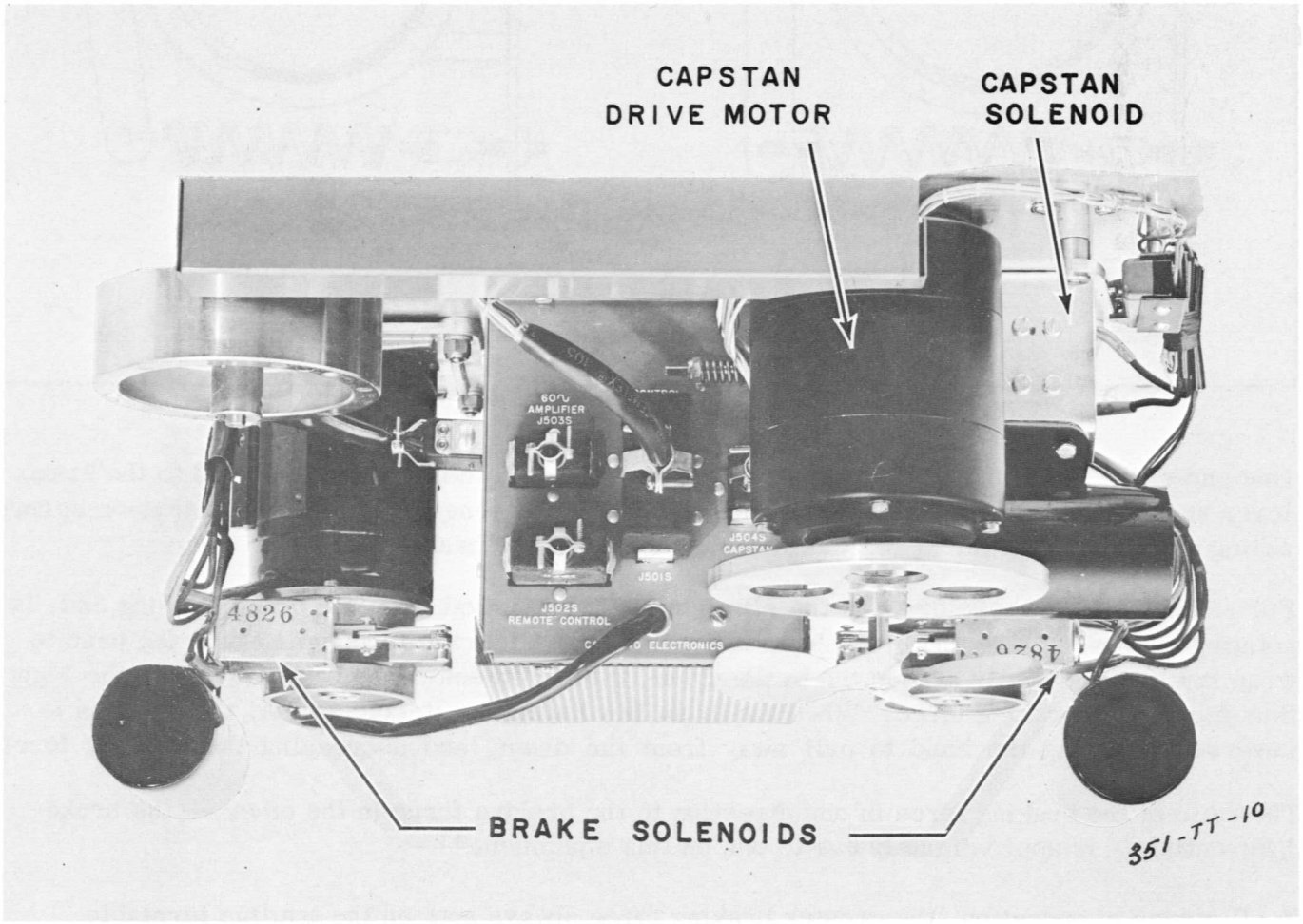


TAPE DRIVE SYSTEM

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

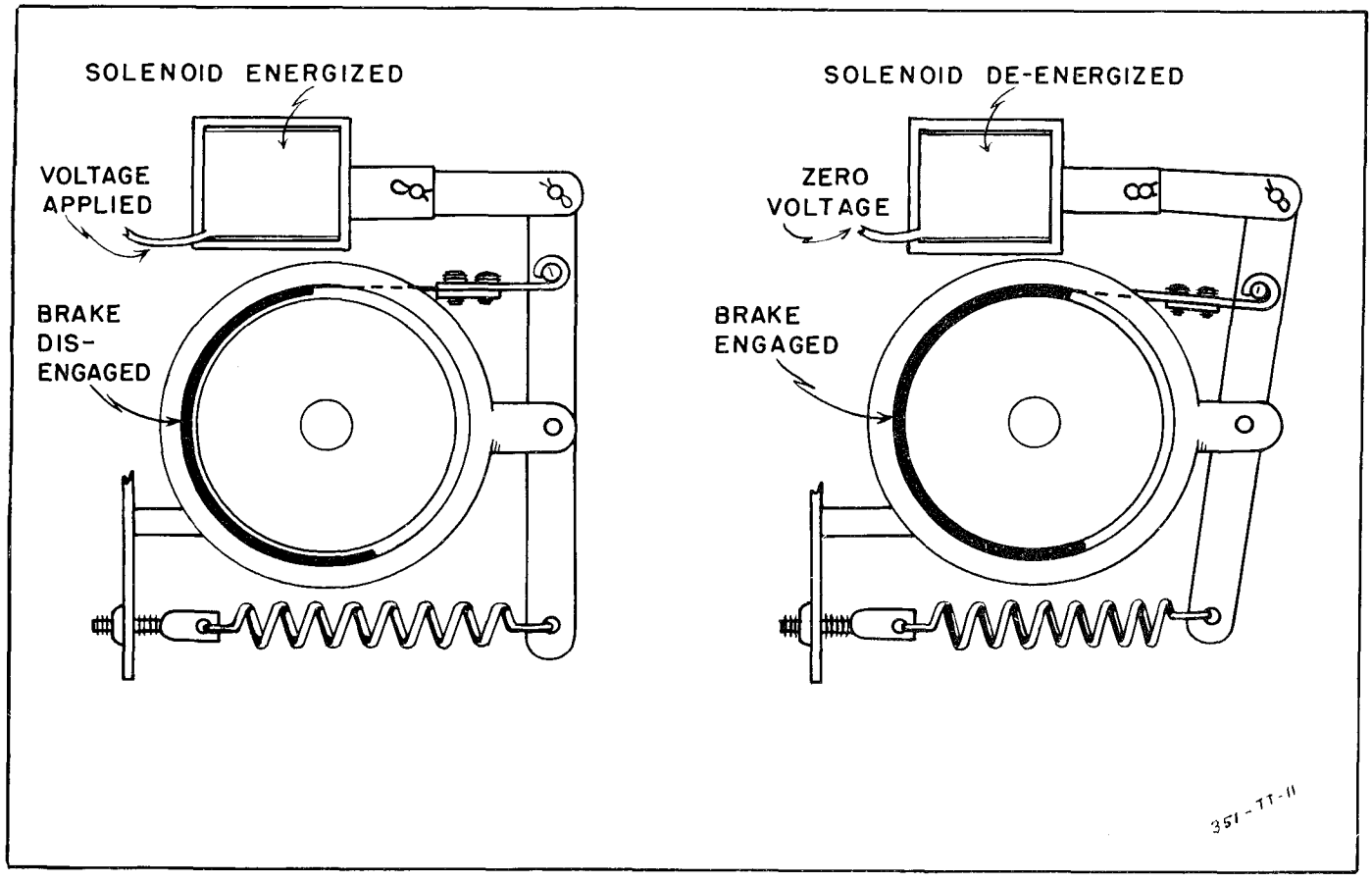
After the POWER switch at the electronic assembly has been placed in the ON position, the drive motor operates continuously, its capstan awaiting the PLAY command (the RECORD function is selected at the amplifier). When the PLAY button is depressed (provided the tape is properly threaded or the tape tension arm controlling the safety microswitch has been locked in the on position with masking tape or a rubber band as in some function checks), 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.



TAPE DRIVE SYSTEM (BOTTOM VIEW)

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 (the trailing turntable) in any of the modes of operation must always exceed the braking force acting on the turntable taking up the tape (the leading turntable) to prevent the throwing of tape loops.



BRAKE OPERATION

One end of the brake band is fixed to the brake housing. The other end is linked to the brake lever 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.

For example 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 itself more tightly around the brake drum, the linked end of the band moving to the right. thus increasing braking force. When the drum is rotating counterclockwise, the process is reversed, causing the band to pull away from the drum, and decreasing the braking force.

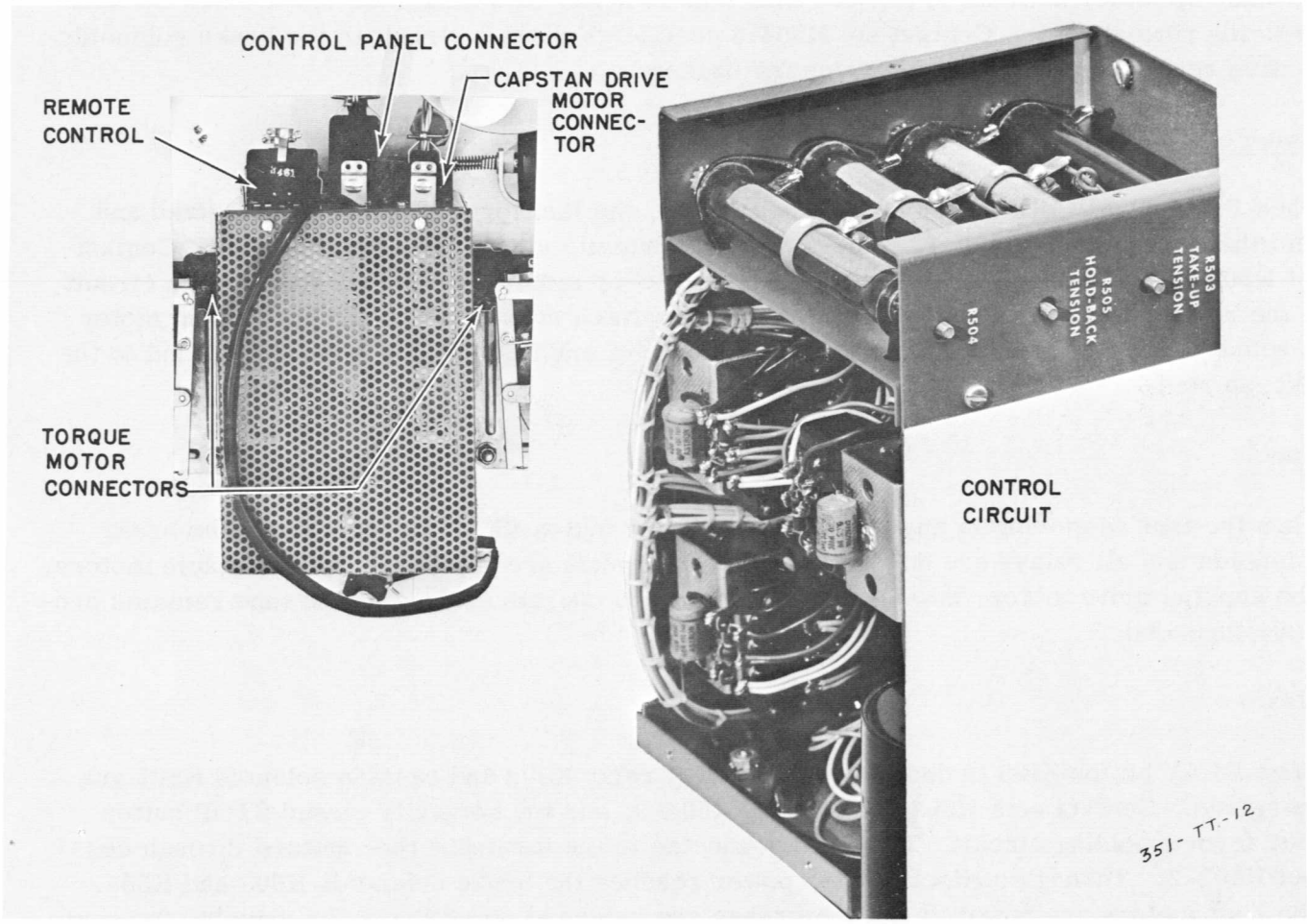
The ratio of the braking force in one direction to the braking force in the other -- the brake differential -- is approximately two to one on this equipment.

In all modes of operation, the greater braking force always acts on the trailing turntable, maintaining the tape under 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 Transport 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 the 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 between the tape transport and accessory units such as remote control panels and a 60 cycle precision frequency source (when furnished).



CONTROL CIRCUITS

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.

All functional control of the tape transport, with one exception, takes place at the control circuit switch assembly comprising four pushbuttons: 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.

Rewind

When REWIND button S507 is depressed, 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 operates at full torque and the take-up motor at reduced torque, thus 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 depressed, the fast forward relay 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 depressed, the brake solenoids and all relays are de-energized. The brakes are applied to both turntable motors. The capstan drive motor, however, will continue to operate so long as the tape remains properly threaded.

Play

When PLAY button S505 is depressed, both play relay K502 and capstan solenoid K501 are energized. 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 power reaches 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.

NOTE

The record mode is not a tape motion control function, but it is interlocked and dependent on the PLAY button which must be depressed 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 not possible 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 depressed in too rapid a sequence when the tape is in either high speed 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 diameter 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 10-1/2 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 to prevent excess tape tension. This is done by inserting resistor R502 in series with the take-up and rewind motors thus reducing the torque of both motors when the EIA reels are used. The REEL SIZE switch is a SPST switch placed across the resistor R502. It is closed when the LARGE position for 10-1/2 inch diameter NAB is selected; and open (resistor R502 in the torque motor circuits) when the SMALL position is selected.

ROUTINE MAINTENANCE

Carefully follow the routine maintenance program outlined below if proper performance is expected of the equipment at all times. Keep an Operation and Maintenance Log.

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 Catalog No. 087-007). 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 denatured alcohol. 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.

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 one of these oils or its equivalent:

Caloil OC-11 (Ampex Catalog Number 087-005)
Standard Oil Company of Indiana-Standard No. 18 or No. 25
Socony Vacuum, Oil Company - Gargoyl DTE Light

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:

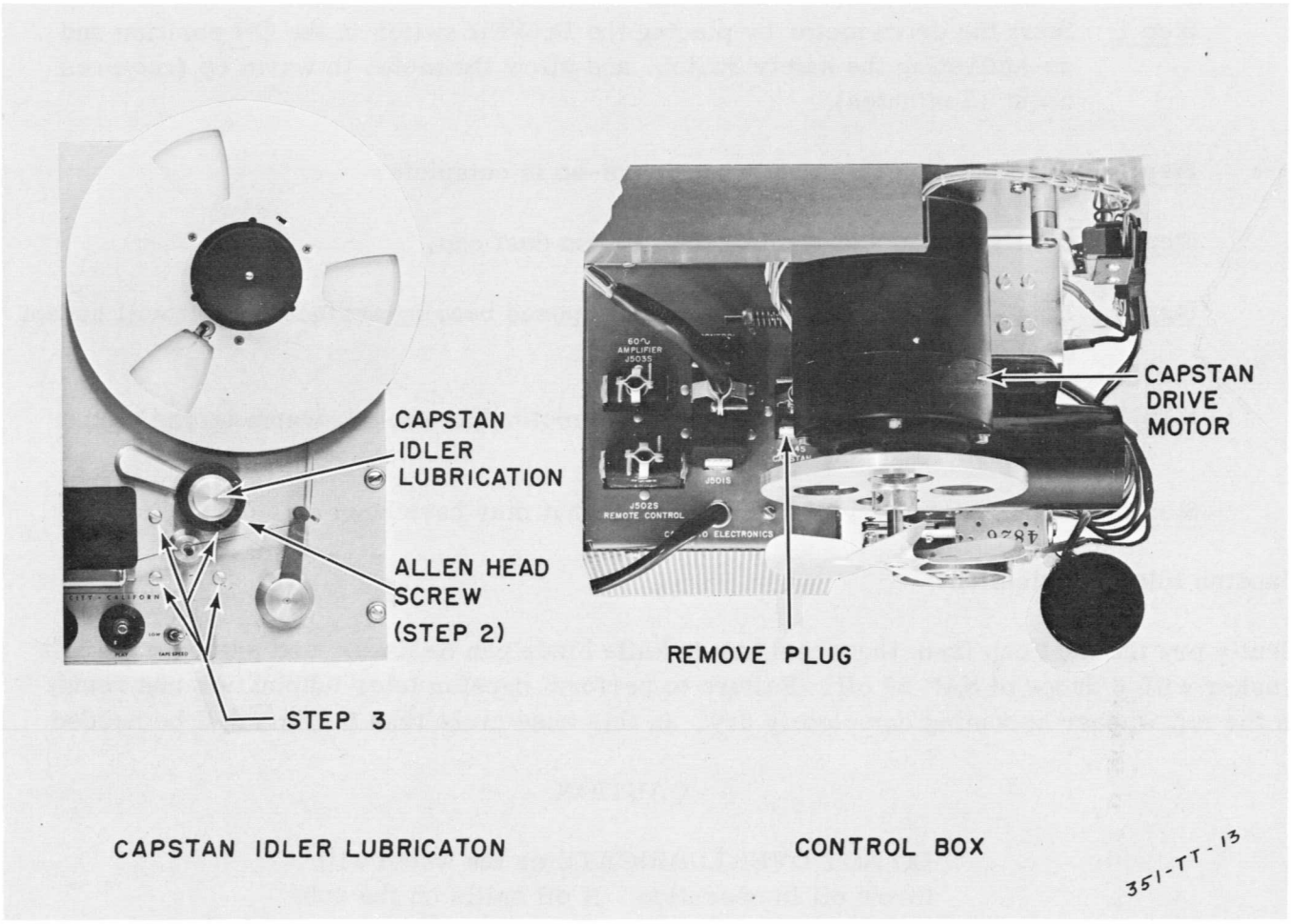
Step 1: Unplug the motor connector P504P from its receptacle J504S at the control circuit box.

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 mounting 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.



REMOVING DRIVE MOTOR FOR LUBRICATION

Step 6: Place about ten drops of a recommended lubricant in the oil hole.

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 the proper distance from the idler arm. Thread tape on the equipment along the prescribed tape threading 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: Start the drive motor by placing the POWER switch in the ON position and de-activating the safety switch, and allow the motor to warm up (requires about 15 minutes).

Step 2: Turn off the equipment when warm-up is complete.

Step 3: Gently pry up and remove the capstan dust cap.

Step 4: Drop the recommended oil on the exposed bearing surface until it will accept no more oil.

Step 5: If the bearing appears dry after the motor has cooled, warm up the motor and repeat the above procedure.

Step 6: Wipe 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 saturate the felt washer with 6 drops of SAE 20 oil. Failure to perform capstan idler lubrication can result in the felt washer becoming completely dry. In this case more than 6 drops will be needed.

CAUTION

DO NOT OVERLUBRICATE or the wheel will throw oil in operation. If oil spills on the rubber tire, clean it immediately with ethyl alcohol.

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 further 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 will 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.

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.

Do not test the continuity of the heads with an ohm meter.

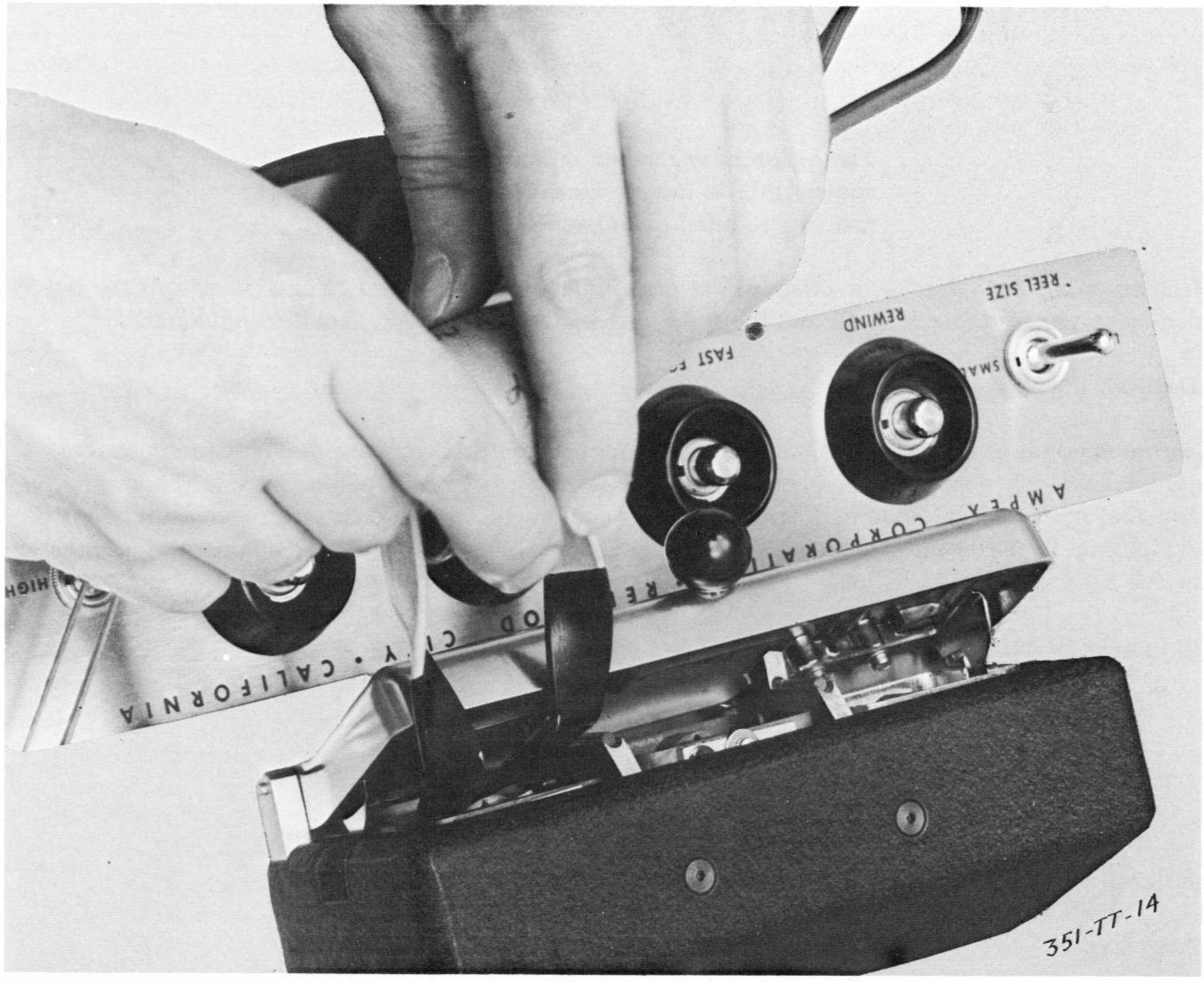
If the heads become magnetized, proceed as follows, using an Ampex Demagnetizer, Catalog No. 704:

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.



DEMAGNETIZING THE HEADS

Step 3: Bring the tips of the demagnetizer to within approximately 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 will 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 become magnetized, a few passes of the demagnetizer along their lengths and the slow withdrawing technique should be adequate.

ADJUSTMENTS

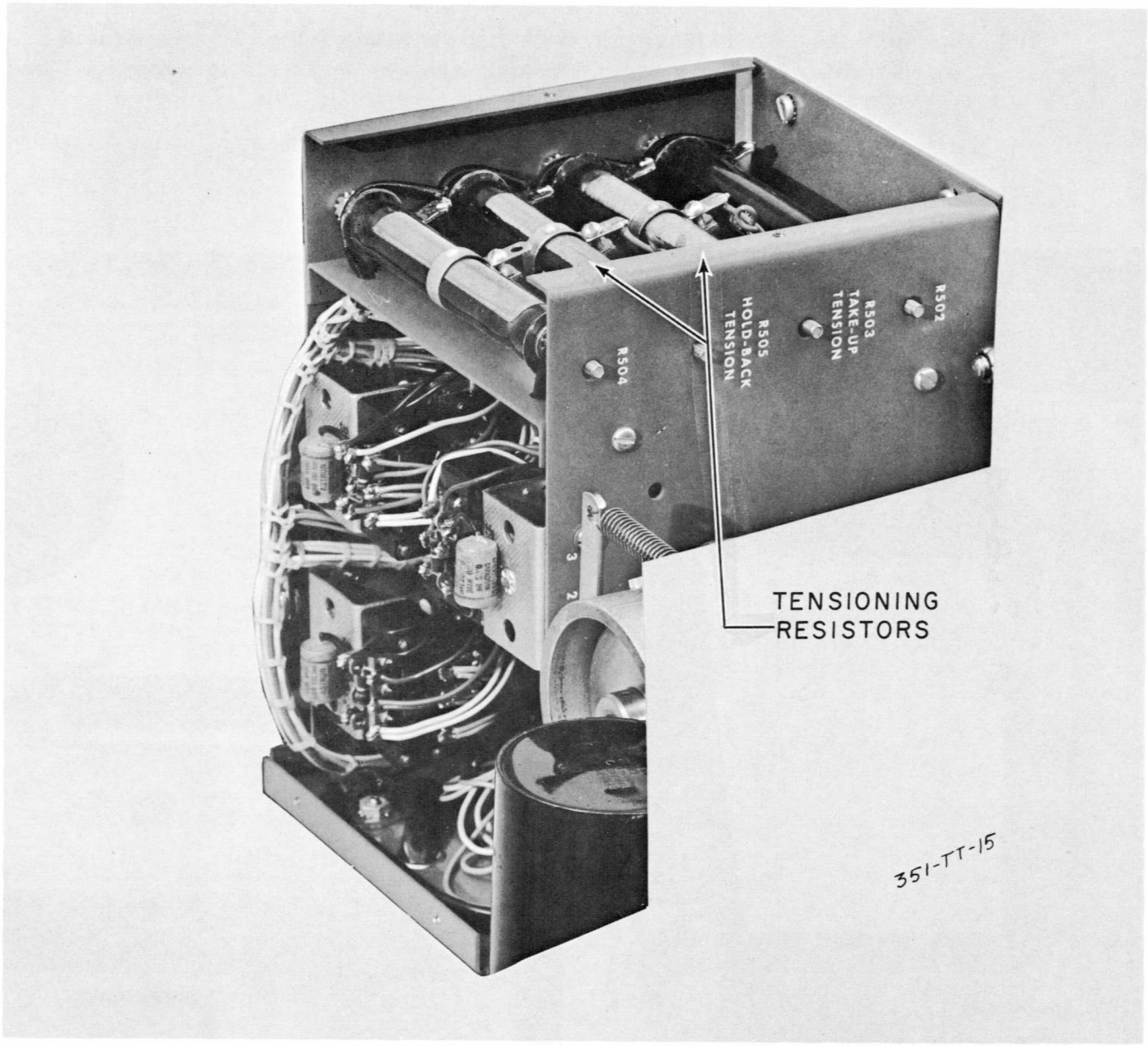
The mechanical assembly is shipped from the factory with all adjustments set for correct performance. It should be unnecessary to change any adjustment before putting the equipment into service, unless shipping damage has occurred. In the course of wear in normal service, or in the event of component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

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.



LOCATION OF TAPE TENSIONING RESISTORS

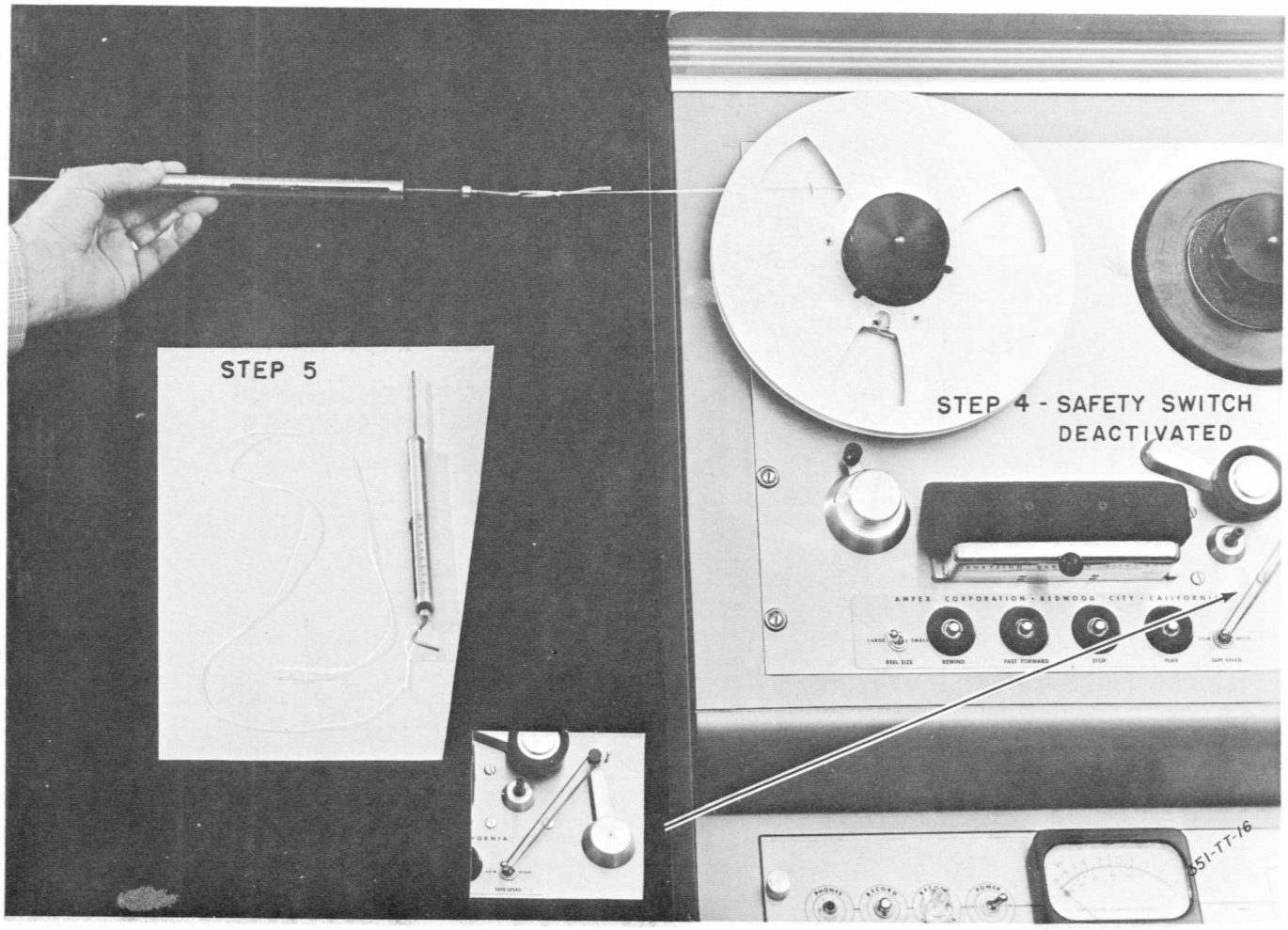
The torque of both the rewind and take-up motors must be adjusted to between 6 and 8 ounces as read on the 16 oz spring scale at NAB reel hub diameter. Checking techniques are not difficult and should be performed carefully.

Step 1: Place an empty 10-1/2 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 de-activated (a rubber band or piece of masking tape will hold the arm as though tape were threaded on the equipment).



MEASURING TAPE TENSIONING

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: Depress 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 6 and 8 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 approximately one-half the LARGE reel size reading.

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 10-1/2 inch NAB reel on the tape supply turntable.

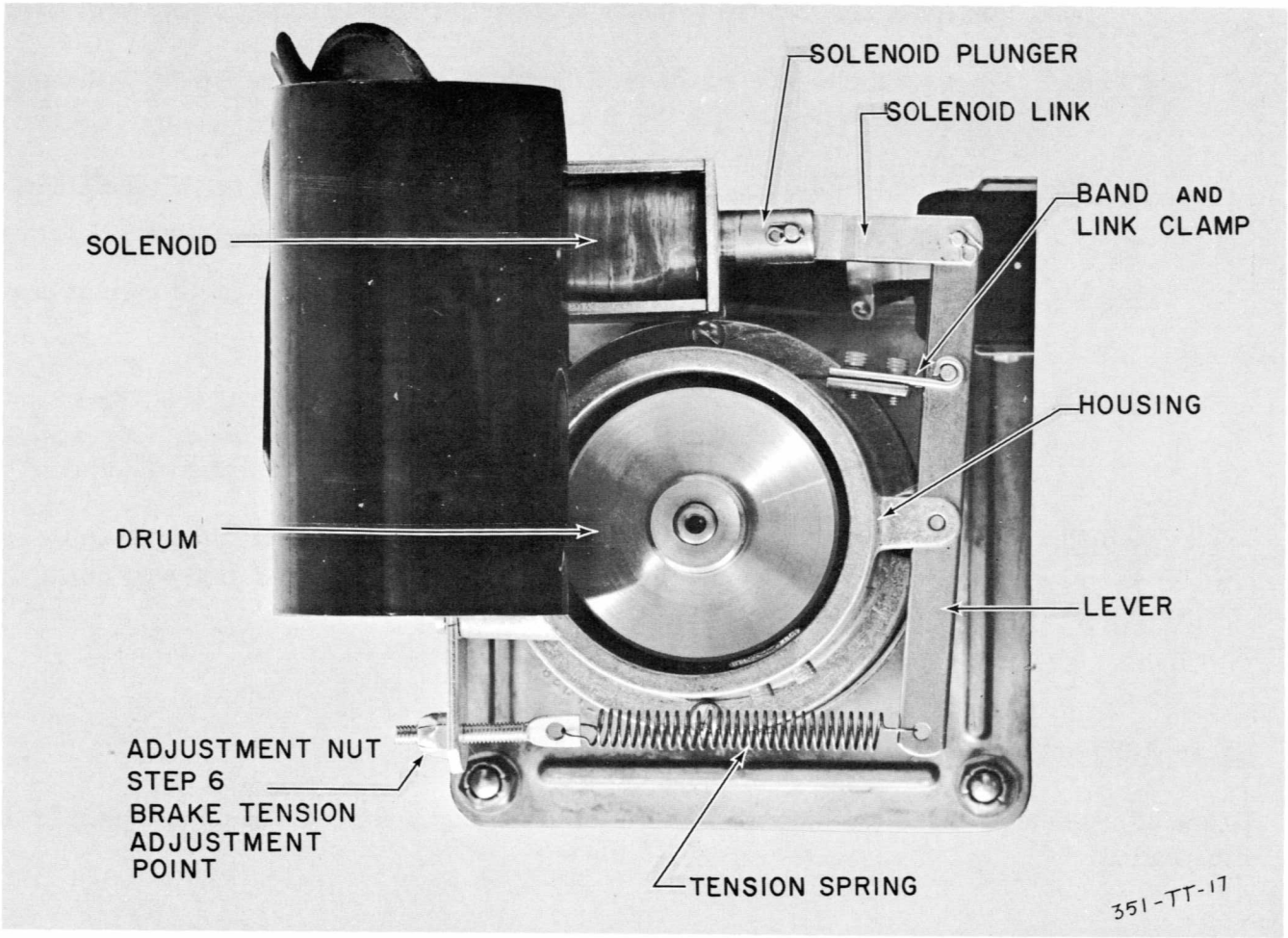
Step 2: Make small loops at both ends of a thirty inch piece of nylon lacing twine.

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 (rewind) motor brake for a scale reading of approximately 14 ounces (+3 oz -2 oz).



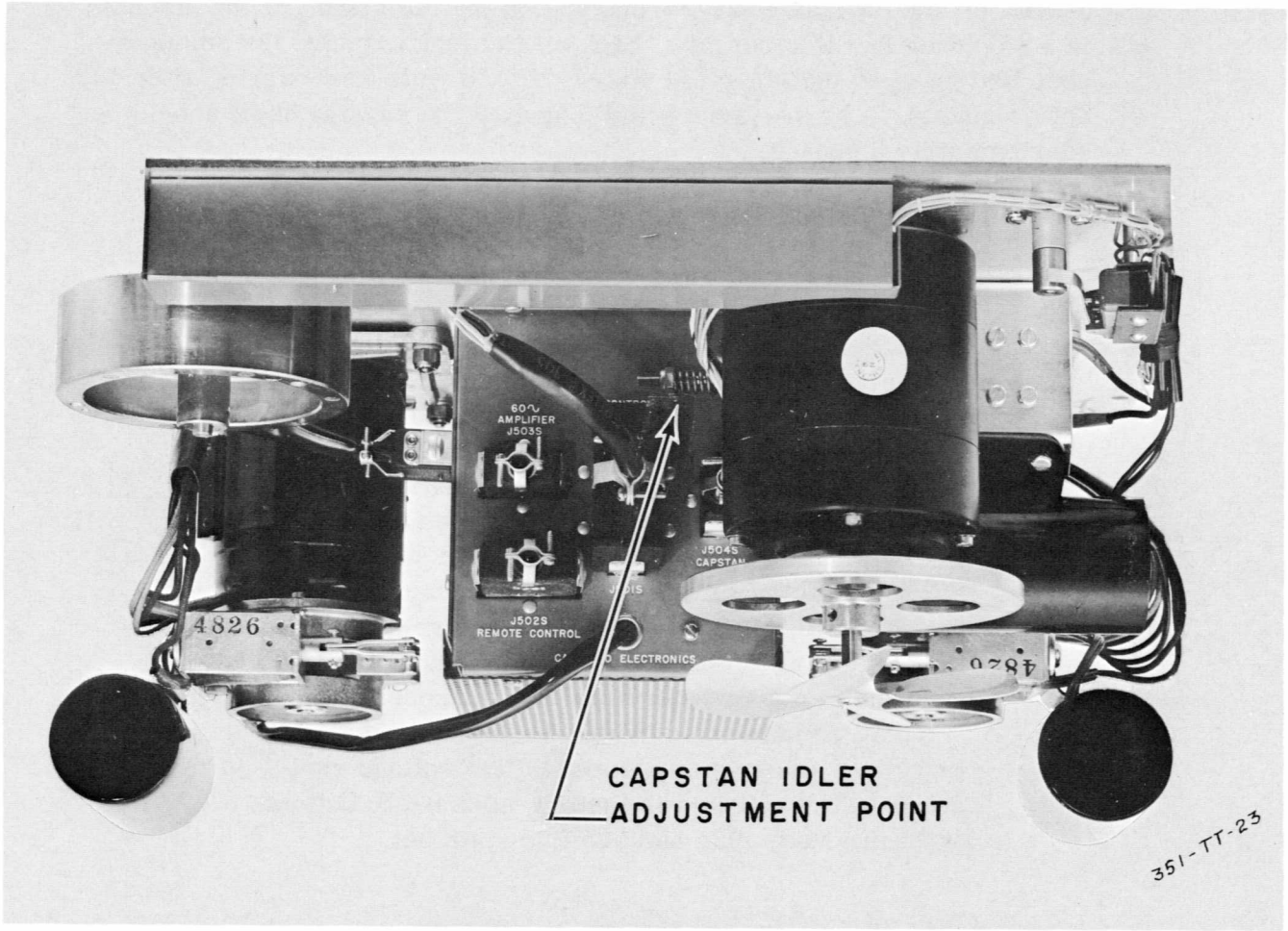
BRAKE TENSIONING ADJUSTMENT

Step 7: 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 oz -1 oz) ounces (two-to-one brake differential).

Step 8: 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.

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



CAPSTAN IDLER PRESSURE ADJUSTMENT POINT

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 tension arm so that the safety switch is de-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 1/2 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.

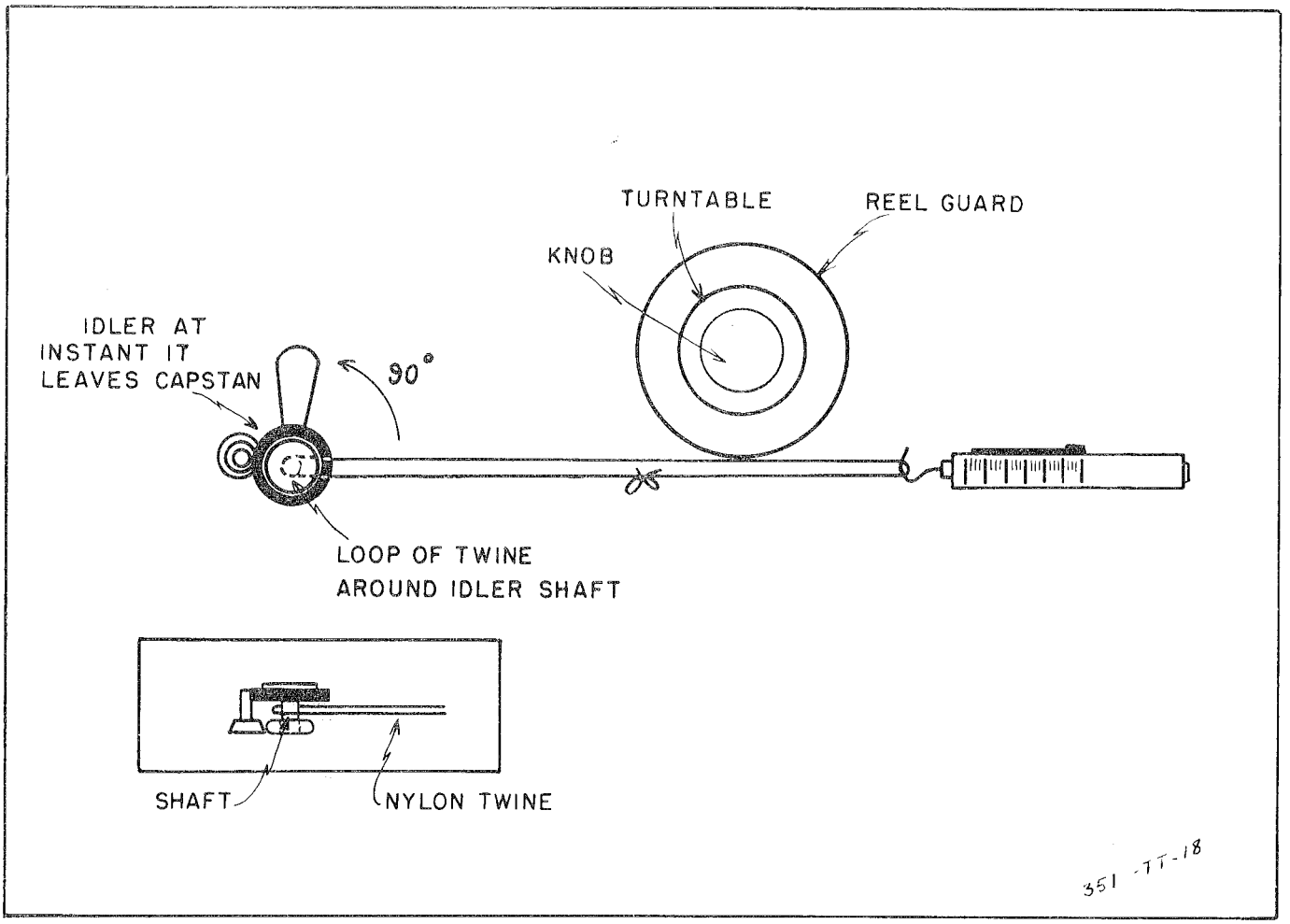
Step 4: Slip the twine loop just formed between the idler and idler arm so that the nylon rests against the idler shaft.

Step 5: Attach the other side of the loop to a 0 to 80 oz scale, letting the nylon twine remain slack.

Step 6: Depress 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



CAPSTAN IDLER PRESSURE MEASUREMENT

Step 8: (Cont'd) leaves the capstan. The scale reading should be 5 lbs ± 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 dismounted with the use of a screwdriver and a few small socket-head screw keys.

CAUTION

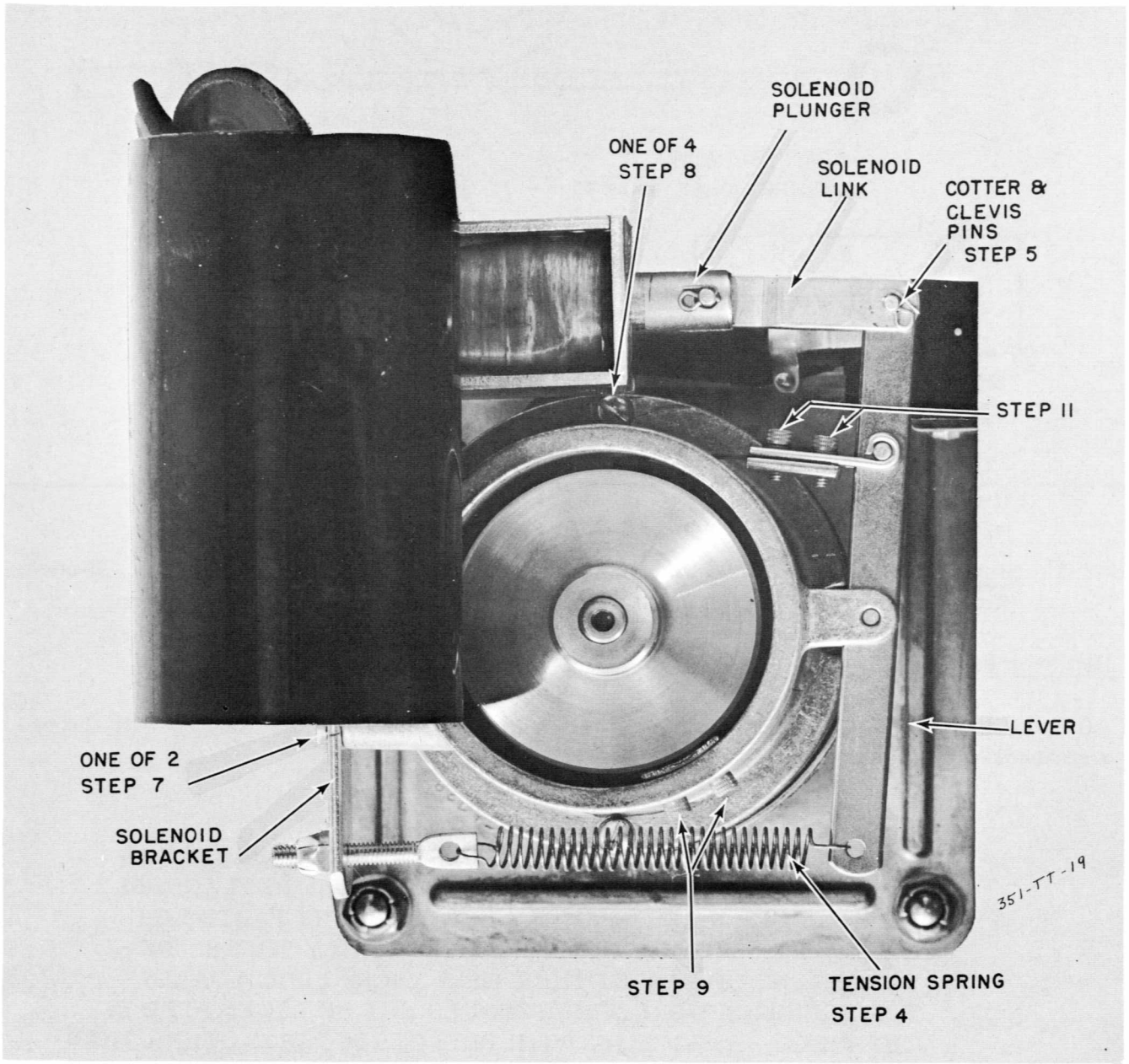
DO NOT ATTEMPT COMPLETE DISASSEMBLY OF ANY OF THE SUB-ASSEMBLIES. THE LIST OF INDIVIDUALLY REPLACEABLE PARTS UNDER EACH ASSEMBLY LISTING IN THE PARTS LIST SHOULD BE USED AS A GUIDE TO DISASSEMBLY LIMITS. REPLACEMENT OF PARTS OTHER THAN THOSE LISTED CALLS FOR PRECISION WORK WHICH SHOULD NOT BE ATTEMPTED 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

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 screws and washers at the motor mounting plate, carefully holding the motor with one hand to prevent it from falling.



BRAKE BAND REPLACEMENT

Step 2: If the tape transport is in a rack or opened console, support the reel guard with one hand to insure that it doesn't fall and gently draw the motor free. The turntable will remain attached to the motor assembly.

Step 3: Take the motor to a convenient work area.

Step 4: Unhook the brake tension spring from the brake lever.

Step 5: Remove the cotter and clevis pin from the solenoid link.

Step 6: Remove the solenoid plunger.

Step 7: Loosen (do not remove) the two screws holding the solenoid bracket to the brake housing.

Step 8: Remove the four screws that hold the brake housing to the motor, noting the positioning of the washers and spacers, and remove the entire housing.

Step 9: Using a 5/64-inch Allen wrench remove the 2 cap screws on the brake housing between the brake lever and the solenoid bracket.

Step 10: Remove the band link clamp, the 1-1/8 inch leaf spring and the 7/8-inch leaf spring.

Step 11: Loosen (do not remove) the two Allen head screws holding the brake band link and band link clamp, and pull the brake band free.

NOTE

Immediately before installing the new brake band assembly, it should be pressed flat between two boards in a vise in order to compress the felt lining. If this is not done the lining might be too thick to permit free rotation of the brake drum after installation, which will result in dragging brakes and improper brake differential. Once the band is installed, the felt will no longer swell, as it might when the bands are not bent in their normal curve.

Step 12: Position the new brake band, 1-1/8 inch leaf spring, 7/8 inch leaf spring and clamp in the housing and replace the 2 cap screws removed from the brake housing in Step 9.

Step 13: 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 14: Insert the brake band between the band links and band link clamp. DO NOT tighten the two cap screws loosened in Step 11.

Step 15: Push the solenoid plunger down 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.

Step 16: Replace the solenoid plunger.

Step 17: Replace the solenoid link, the cotter and clevis pins.

Step 18: Tighten the solenoid bracket screws loosened in Step 7.

Step 19: Hook the brake spring to the brake lever (Step 4).

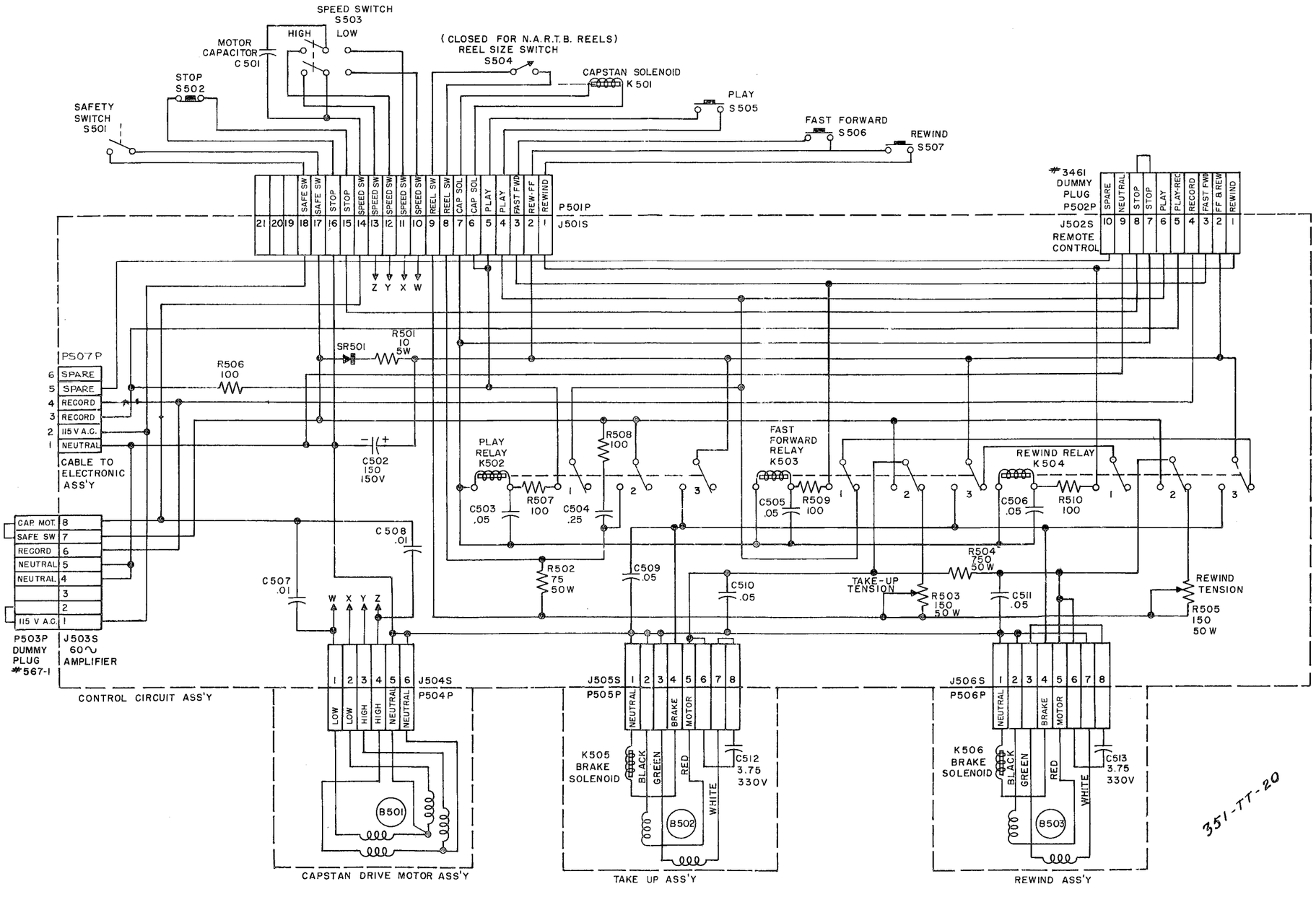
Step 20: Replace the motor assembly, tightening the four screws (Step 1).

Packing Precautions for Motors

In packing motors for return to the factory, take particular care to prevent the bending of their shafts in transit. When packing a capstan drive motor, always remove the fan and flywheel from the motor shaft. Retain the fan and send the flywheel with the motor. This part is balanced with the individual motor.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	TAPE TRANSPORT MECHANISM	
B501	DRIVE MOTOR ASSEMBLY	
	7-1/2 - 15 ips, 60 Cycle Motor	6150-0
	7-1/2 - 15 ips, 50 Cycle Motor	6151-1
	3-3/4 - 7-1/2 ips, 60 Cycle Motor	5585-0
	3-3/4 - 7-1/2 ips, 50 Cycle Motor	5778-1
	Each includes:	
C501	Capacitor Assy., 5 uf	9487-2
	Flywheel	
	with Bodine Motor	981
	with Ashland Motor	2212
	Set Screw, 10-32 x 1/4	477-118
	Mounting Adaptor	2211
	Four Screws 8-32 x 1-1/2	471-489
	Plug, 6-contact, Jones	145-012
	FAN	591-001
B502	TAKEUP ASSEMBLY	9451
	Turntable Motor Assembly	7558
	Includes Motor, Mounting Flange, Brake Drum, and Turntable with Pad.	
	Pad	958
C512	Capacitor, 3.75 uf	035-111
	Brake Housing	317
	Brake Band Assembly (Kit of two)	7970-1
	Brake Band Leaf, 1-1/8" long	720-1
	Brake Band Leaf, 7/8" long	720-2
K505	Brake Solenoid	337
	Brake Tension Spring	322
	Plug, 8-contact, Jones	145-013
B503	REWIND ASSEMBLY (60 cycle)	9452
	Turntable Motor Assembly	7558
	Includes Motor, Mounting Flange Brake Drum, and Turntable with Pad.	
	Pad	958
C513	Capacitor, 3.75 uf	035-111
	Brake Housing	316
	Brake Band Assembly (Kit of two)	7970-1
	Brake Band Leaf, 1-1/8" long	720-1
	Brake Band Leaf, 7/8" long	720-2
K506	Brake Solenoid	337
	Brake Tension Spring	322
	Plug, 8-contact, Jones	145-013
B503	REWIND ASSEMBLY (50 cycle)	30782
	Capacitor, 4.00 mfd	035-116
	(All other parts identical to 60 cycle)	
	TAKEUP TENSION ARM ASSEMBLY	425-0
	Individually Replaceable Parts:	
	Takeup Tension Arm Spring	422-0
	Tape Guide	675-0
	Tape Guide Hook	355
	REEL IDLER ASSEMBLY, with arm and guide, but without flywheel.	
	For 7-1/2 - 15 ips Machine	4459-0
	For 3-3/4 - 7-1/2 ips Machine	4459-3
	Tape Guide	257-0
	Reel Idler Flywheel	636-1
	Pulley Assembly (7-1/2 - 15 ips)	5893
	Pulley Assembly (3-3/4 - 7-1/2 ips)	5893-1
	CAPSTAN IDLER WHEEL ASSEMBLY	
	For 7-1/2 - 15 ips Machine	500-0
	For 3-3/4 - 7-1/2 ips Machine	6092
	Capstan Idler Arm	372-1
	Capstan Idler Arm Bushing	5755
	Capstan Dust Cap	
	For 7-1/2 - 15 ips Machine	3506-0
	For 3-3/4 - 7-1/2 ips Machine	3506-1
	Individually Replaceable Parts:	
	Felt Washer	3583-2
	Retaining Ring	432-007
K501	Capstan Solenoid	670
	Capstan Solenoid Eye-Bolt	396-3
	Capstan Solenoid Stop	388
	Capstan Solenoid Felt Washer	503-015
	Capstan Solenoid Pressure Spring	676
	Capstan Solenoid Return Spring	5757
	PUSHBUTTON GUARDS	361
P502P	CONNECTOR, plug: male, 10 contacts (Remote dummy)	3461
P503P	CONNECTOR, plug: male, 8 contacts (60 cycle dummy)	567-1
S501	SWITCH ASSEMBLY, safety: SPST, normally closed; Unimax part No. 2HBT-215-1W	6582
S502	PUSHBUTTON, STOP: SPST, normally closed	120-014
S503	SWITCH, toggle, tape speed: DPDT	120-004
S504	SWITCH, toggle, reel size: SPST	120-005
S505	PUSHBUTTON, PLAY: SPST, normally open	120-013
S506	PUSHBUTTON, FAST FWD: Same as S505	
S507	PUSHBUTTON, REWIND: Same as S505	

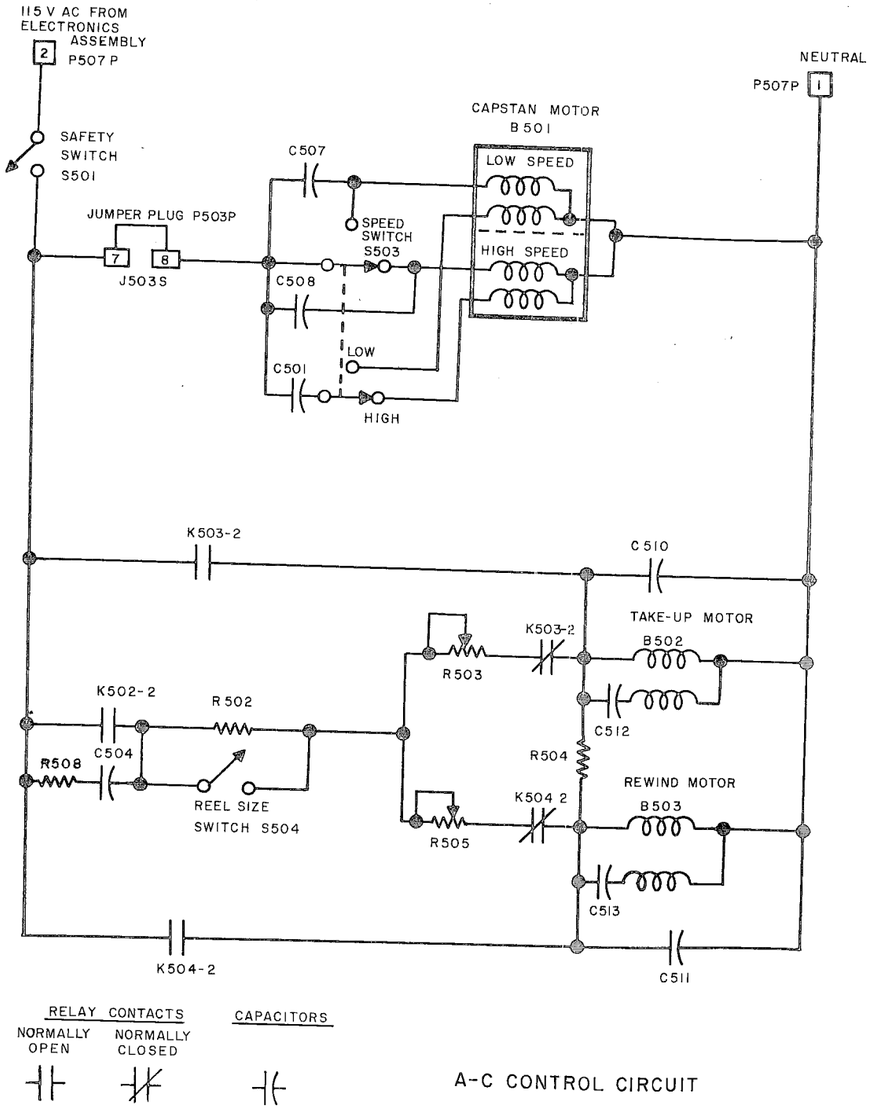
REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	ORDER BY AMPEX CATALOG NUMBER	
	CONTROL CIRCUIT ASSEMBLY Catalog No. 5703	
C502	CAPACITOR, fixed: electrolytic tubular, 150 uf, 150 vdcw; C.D. Part No. 15015	031-045
C503	CAPACITOR, fixed: metallized tubular, axial leads, .05 uf ± 20%, 400 vdcw; Astron Part No. ML-4-05	033-006
C504	CAPACITOR, fixed: metallized tubular, axial leads, .25 uf ± 20%, 400 vdcw; Astron Part No. ML-4-25	033-008
C505	Same as C503	
C506	Same as C503	
C507	CAPACITOR, fixed: metallized tubular, axial leads, .01 uf ± 20%, 400 vdcw; Astron Part No. ML-4-01	033-005
C508	Same as C507	
C509	Same as C503	
C510	Same as C503	
C511	Same as C503	
J501S	CONNECTOR, receptacle: female, 21 contacts chassis mounted; Jones Part No. S-321-AB	146-057
J502S	CONNECTOR, receptacle: female, 10 contacts chassis mounted; Jones Part No. S-310-AB	146-018
J503S	CONNECTOR, receptacle: female, 8 contact chassis mounted; Jones Part No. S-308-AB	146-003
J504S	CONNECTOR, receptacle: female 6 contact chassis mounted; Jones Part No. S-306-AB	146-004
J505S	Same as J503S	
J506S	Same as J503S	
K502	RELAY, PLAY: 3PDT, 115 volt dc coil std. 10 amp contact; Philtrol Part No. 33QA	020-006
K503	RELAY, FAST FWD: Same as K502	
K504	RELAY, REWIND: Same as K502	
P501P	CONNECTOR, plug, male, 21 contacts; Jones Part No. P-321-CCT-L	145-022
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 J505P	
P507P	Same as P504P	
R501	RESISTOR, fixed: wirewound, 20 ohm ± 10%, 5 watts; Tru-Ohm Part No. type FRL-5	043-154
R502	RESISTOR, fixed: wirewound, 75 ohm ± 5%, 75 watts; Tru-Ohm Part No. FR-50	043-002
R503	RESISTOR, adjustable: wirewound, 150 ohm ± 5%, 50 watts; Tru-Ohm Part No. AR-50	040-011
R504	RESISTOR, adjustable: wirewound, 750 ohm ± 5%, 50 watts; Tru-Ohm Part No. AR-50	040-007
R505	Same as R503	
R506	RESISTOR, fixed: composition, 100 ohm ± 10%, 1/2 watt; MIL-R-11A, RC20GF101K	041-038
R507	Same as R506	
R508	Same as R506	
R509	Same as R506	
R510	Same as R506	
SR501	RECTIFIER, selenium: single phase, half wave; G.E. Part No. 6RS25PH6ATD1	582-016



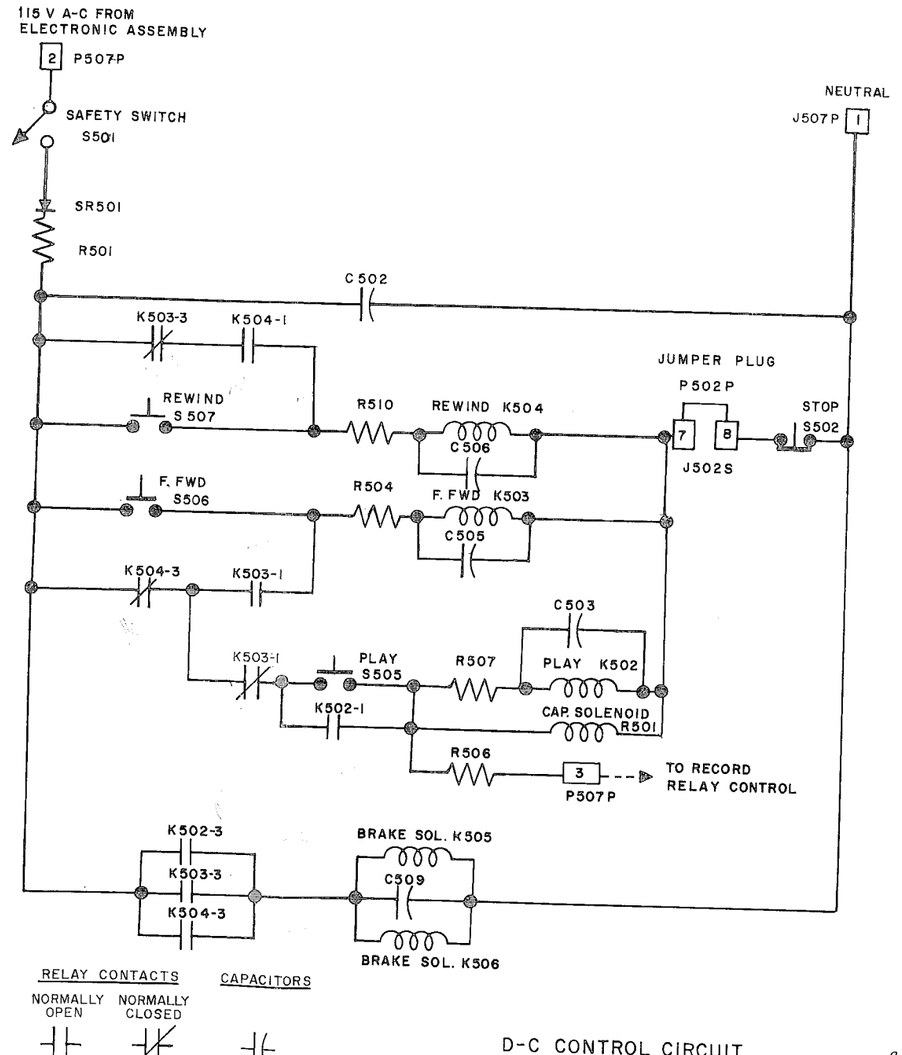
NOTE

1. ALL RESISTORS IN OHMS & RATED 1/2 WATT UNLESS OTHERWISE NOTED
2. ALL CONDENSERS IN MICROFARADS AND RATED 400 V UNLESS OTHERWISE SPECIFIED.

TAPE TRANSPORT CONTROL CIRCUITS



A-C CONTROL CIRCUIT



D-C CONTROL CIRCUIT

351 - TT - 21